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TOWARDS SUSTAINABLE FISHERIES: COUNTRY REPORTS

The OECD study Towards Sustainable Fisheries is composed of 3 volumes. The publication on sale "Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources" provides a comprehensive assessment of the economic performance of management regimes based on the analysis of over 100 fisheries in the OECD countries. The general diffusion document "Towards Sustainable Fisheries: Issues Papers", contains thematic contributions which were prepared for the project by individual countries based on their experiences. Finally, the Country Reports which are contained in this volume describe national fishery management policies in Member countries.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

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AUSTRALIA

Introduction

In Australia, as elsewhere in the world, governments have a key role in fisheries management to address the fundamental economic and biological concerns which arise from open access fisheries. Commonwealth and State (and Territory) Governments are responsible for management of Australian fisheries within their relevant jurisdictions. Except where agreement is reached to the contrary, the Commonwealth Government jurisdiction extends from the three nautical mile limit to the 200 mile limit of the Australian Fishing Zone, while State jurisdiction is from the coastline to the three nautical mile limit.

In 1992-93, State managed fisheries accounted for 77 per cent (A$ l 065 m) of the gross value of fisheries production in Australia (A$ l 374 m). Management within the states is generally centralised within the relevant departments with responsibility for fisheries. The exception is Queensland, where state fisheries are managed by the Queensland Fisheries Management Authority. At the Commonwealth level, responsibility for fisheries management was passed to a statutory authority, the Australian Fisheries Management Authority (AFMA) which was established on 3 February 1992.

The jurisdictional allocation of fisheries responsibility in Australia has significant implications for the effective management of fisheries resources. This is particularly the case in a number of fisheries where stocks cross the boundaries of state and Commonwealth jurisdiction. Some of these problems are addressed through agreements between the state and Commonwealth governments under the Offshore Constitutional Settlement. This is discussed further in the following section along with management arrangements for Commonwealth and state fisheries. In the final section of the paper key management problems and issues are discussed.

Management regimes in Australia

Offshore Constitutional Settlement

As mentioned earlier, Commonwealth Government fisheries responsibilities include all fish stocks from the three nautical mile limit to the 200 mile limit of the Australian fishing zone, while State responsibilities are for fisheries up to the three mile limit. In some cases, by agreement under the Offshore Constitutional Settlement (OCS), the Commonwealth and relevant state governments can make agreements whereby management responsibility for the whole of a fish stock or commercial fishery from the low water mark to the 200 mile limit is passed to a single authority or is undertaken jointly (joint authority). In particular, three management categories exist under these agreements:

- Joint authority management: where the Commonwealth and one or more of the States can form a single legal entity which manages a fishery under a single law, either Commonwealth or State;

– State management: where a fishery is located off only one state, arrangements can be made to manage that fishery under a state law;

– Commonwealth management: where a fishery is adjacent to more than one State, the fishery can, by agreement between all parties, be managed by the Commonwealth.

At present only three joint authorities have been established - one with Western Australia for the shark fishery, one with the Northern territory for pearling and one with Queensland under the Torres Strait Treaty in the area of Australian jurisdiction in the Torres Strait Protected Zone. There are a number of problems with joint authorities including them being administratively cumbersome and they tend to perpetuate the problems of divided responsibility (Commonwealth of Australia, 1989). Hence, it is preferred that responsibility be allocated to a single authority.

While single authority arrangements have been put in place for some fisheries (for example, day to day management of the west coast shark fishery has been passed fully to Western Australia) there are a number of fish stocks which cross State and Commonwealth jurisdictions for which effective management requires an OCS agreement to be established. In particular, both the South East Fishery and Southern Shark Fishery are unlikely to be effectively managed without an OCS agreement being reached.

Commonwealth managed fisheries

Commonwealth fisheries in Australia are administered by three bodies with separate responsibilities for management, policy and research and development. The Australian Fisheries Management Authority (AFMA) is responsible for managing Commonwealth fisheries. While AFMA has the management responsibility, policy making responsibility remains with the Commonwealth Department of Primary Industries and Energy (for example, foreign fishing access rights, taxation rulings on fisheries management and policies on the environment). Its functions involve "... providing advice to, and support for, the Minister on broad industry matters including matters affecting the industry's profitability and market access. They will encompass the impact of government policies (including budgetary policies) on the industry, and will also include environmental considerations which are not specifically related to fisheries management" (Commonwealth of Australia, 1989, p. 103).

The principal responsibility for allocating industry provided research and development funds for Australian fisheries (both State and Commonwealth) lies with the Fisheries Research and Development Corporation (FRDC). The FRDC is a statutory authority funded jointly by the Commonwealth government (maximum of 0.75 per cent of the gross value of production for fisheries) and industry (0.25 per cent of the gross value of production). Additional funds for fisheries research, not allocated by the FRDC, are provided by the Commonwealth Government (through the Fisheries Resources Research fund), State governments and a number of government research agencies (such as CSIRO, ABARE and the Bureau of Resource Sciences).

This section focuses on the management side of fisheries administration in Australia, and hence AFMA's responsibilities and method of operation are discussed here.

The AFMA's responsibilities for managing Commonwealth fisheries are defined under the Fisheries Administration Act 1991. The objectives of AFMA are:

- implementing efficient and cost-effective fisheries management on behalf of the Commonwealth;
- ensuring that exploitation of fisheries resources be conducted in a manner consistent with the principles of ecologically sustainable development;
- maximising economic efficiency in the exploitation of fisheries management;
- ensuring accountability of AFMA's management of fisheries resources to the fishing industry and the Australian community; and
- achieving government targets in relation to the recovery of costs of the Authority.

Its functions defined under this Act are:

- devising fisheries management regimes, fisheries adjustment and restructuring programs and exploratory and feasibility fishing programs for Commonwealth fisheries;
- consulting and co-operating with industry and members of the public on AFMA's activities;
- consulting and negotiating with foreign governments and foreign business interests on foreign fishing vessel access to Australian fisheries and Australian ports;
- consulting and exchanging information with overseas fisheries agencies;
- establishing research priorities for fisheries managed by the Authority and arranging for research to be undertaken;
- undertaking general consultation as specified in the legislation;
- developing Corporate and Annual Operational Plans and Annual Reports in accordance with the Act; and
- such other functions as are conferred on the Authority by or under this Act or an associated law (Australian Fisheries Management Authority 1993a, p. 66).

The Fisheries Management Act 1991 deals with management of fisheries plans, statutory fishing rights, granting of permits and licences, offences for the taking of certain marine species and bans driftnet fishing in the Australian fishing zone. AFMA may determine a management plan for a fishery after it has given public notice of its intention and both invited and considered representations. A plan must set out its objectives and the methods for achieving those goals, and may also include the amount of fish which can be taken, fishing concessions, procedures for selecting persons to whom concessions are to be granted, and the kind and quantity of equipment that may be used. The various levy Acts define the collection of levies from the fishing industry for cost recovery of management charges, charges on access by holders of statutory fishing rights, foreign fishing licence payments.

Use of management advisory committees in Commonwealth fisheries

While responsibility for determining management arrangements lies directly with AFMA, the Fisheries Administration Act 1991 allows the establishment of Management Advisory Committees (MACS) to assist AFMA "... in the performance of its functions and the exercise of its powers in relation to a fishery". AFMA can delegate functions to the MACS, in which case the MACs can hold the same level of power as AFMA. In these circumstances the MAC must act in accordance with policies determined by AFMA and must comply with directions AFMA gives it. In the NMCs issues relating to a fishery are discussed, problems identified, possible solutions developed and recommendations made to AFMA. MACs provide a forum for AFMA to consult with industry on its management arrangements, for industry to make its views known to AFMA and for consultation between researchers and industry.

The MACs comprise an independent chairperson, the AFMA officer responsible for the management of the fishery, and up to seven members determined by AFMA after consultation with States, industry and researchers. In practice, in the latter category the MACs have a number of industry representatives, at least one member representing State fisheries organisations and one from the fisheries research community.

The key functions for the MACs include:

- To advise and make recommendations to AFMA with respect to the management of the fishery.

- To provide a forum for the discussion of matters relevant to the management of the fishery and to act as a conduit for the two-way flow of information between participants in the fishery and AFMA.

- To provide advice and make recommendations to AFMA on:

    - the development of plans of management;
    - on-going measures required to manage the fishery in accordance with the provisions of the plan of management; and
    - amendments to the plan of management as required.

- To provide advice and make recommendations to AFMA on research priorities and projects for the fishery, and to ensure that processes are in place for industry to receive advice from researchers in a form appropriate to the audience.

- To establish such sub-committees as are required to ensure that the diversity of management issues are given proper attention.

- To liaise with appropriate AFMA staff to ensure that effect is given to operational matters necessary to implement agreed management measures.

- To undertake on behalf of, and in accordance with, policies determined by AFMA, such functions as the Authority from time to time determines.

The MACs are also responsible for preparing an annual budget for management of its fishery for consideration by the AFMA Board. The budget is used by AFMA as the basis for determining levies payable by those in the fishery.

Management instruments

Commonwealth Government policy with respect to fishery management is based on the principle that fisheries are a community owned resource. While access rights to a fishery can be privately owned in Australia marine resources remain the property of the community. Under the Fisheries Management Act 1991, AFMA may allocate four separate types of fishing concessions - statutory fishing rights, fishing permits; scientific permits; and foreign fishing licences.

- Statutory fishing lights are defined as a right to a specified quantity or proportion of fish; a right to use a boat in a managed fishery; a right entitling a person to use specified type or quantity of fishing boats or equipment; or any other right in respect of a managed fishery. These rights include fish quota and boats and/or gear units. They are freely transferable, unless otherwise specified in the management plan. The term of the right, if not otherwise specified in the management plan, win continue until it is surrendered, cancelled or the plan revoked (Meany, 1992). By allowing the right to be permanent, the owner of the right has a planning horizon that is relatively secure which provides better incentives to make efficient investments in harvesting techniques and in developing new markets.

- Fishing permits are defined in a similar manner to statutory fishing rights, but are used where no plan of management for a fishery exists. Fishing permits allow access to specific fisheries and to specific areas of the Australian fishing zone subject to certain conditions (such as equipment that can be used or species that can be taken).

- Scientific permits are granted to allow an agreed program of scientific research to be carried out. They may be granted to an Australian or foreign boat, but in each case they are only granted for a maximum of six months.

- Foreign fishing boat licences are fishery specific and have a maximum period of one year. The master of a foreign fishing boat is also required to hold a Foreign Master Fishing Licence.

A range of output and input based management techniques are applied to Commonwealth fisheries in Australia (see Table 1). Input controls include time based controls, such as seasonal closures; location based controls, such as area closures; entry based controls, such as licensing; and gear based controls, such as net limits and boat size limitations. Output controls include total allowable catches and individual transferable quotas. ITQs are currently applied to the southern bluefin tuna Fishery and to 16 species in the south east fishery. Trends in fisheries management in these two fisheries are included in appendix A. In most fisheries a combination of management mechanisms are applied involving limited entry, time and area based controls and either gear and/or output based mechanisms. For example, in the Northern Prawn Fishery operators need endorsements (licences) to fish, are subject to seasonal closures and area limitations, and are required to hold a minimum number of units based on boat size and operating configuration.

Table 1. Management arrangements in Commonwealth fisheries

Fishery	Principal species	Principal management arrangements
Northern Prawn	Banana, tiger and endeavour prawns	Input controls (limited entry, seasonal and are closures, gear restrictions, daylight trawling bans and boat replacement rules)
Torres Strait	Prawns, rock lobster, Spanish mackerel	Input controls (limited entry, individual effort entitlements for prawns, seasonal and area closures, gear restrictions and minimum size lengths for rock lobster)
South east	Dories, morwong, flathead, blue grenadier, orange roughy, redfish, gemfish, warehou, school whiting and ling	Input controls (limited entry and vessel size limits) and output controls (total allowable catch (TAC) and individual transferable quotas (ITQs) for 16 quota species)
Great Australian Bight	Deepwater flathead, bight redfish, orange roughy	Input controls (limited entry)
Southern bluefin tuna	Southern bluefin tuna	Output controls (total allowable catch and individual transferable quotas)
East coast tuna	Yellowfin and bigeye tuna	Input controls (limited entry, and boat replacement rules)
East coast purse seine	Skipjack tuna	Input controls (limited entry, gear restrictions and boat replacement rules)
Southern shark	Gummy and school shark	Input controls (seasonal and area closures, gear units and minimum size lengths)
Bass Strait scallops	Scallops	Input controls (limited entry and seasonal closure) and simple output control (bag limit)
Jack mackerel	Jack mackerel	Input controls (limited entry)

Cost recovery

In 1992-93, 90 per cent of management costs which were attributed to industry were recovered by way of levies on commercial operators. The proportion recovered is to increase to 100 per cent as from 1 July 1994.

The Commonwealth Government began recovering management costs in 1985-86 when 38 per cent of attributable management costs were recovered from the northern prawn and southern bluefin tuna fisheries. By 1988-89, this had increased to 75 per cent of attributable costs in 10 separate fisheries. Recovery of costs was increased to 90 per cent in 1989-90.

At present a charge to provide a return to the community from the use of marine resources is not recovered from Commonwealth fisheries.

State managed fisheries

State governments have the responsibility of administering Australia's fisheries within three nautical miles from the coast line. Most fisheries are managed using a variety of input controls although quota management systems are in place in a small number of fisheries. As mentioned above, the management of most commercial fisheries in state waters is under the control of the various State governments through their respective fisheries departments, although the responsibility for fisheries management in Queensland is the responsibility of a statutory body - the Queensland Fish Management Authority (QFMA). In addition, there are varying degrees of community involvement in the management process between states.

Western Australia

The Fisheries Department of Western Australia is responsible for the administration and management of fisheries in that state. Commercial fisheries are managed through a system of limited entry licensing which aims to prevent the over-harvesting of fish stocks. Controls are set out in the management plan for each fishery or group of fisheries. In recent years this approach has been extended to include not only the major commercial fisheries, but also the State's smaller, important regional fisheries. Individual transferable quotas are applied to the abalone fishery, the limited entry snapper fishery and the pilchard fishery. Integrated management through interaction with, and response to, the community, industry, other government agencies and other groups with an interest in the optimal use of aquatic resources is an important part of the management process.

The Department consists of four divisions: Fisheries Management Policy; Operations; Research; and Corporate Services. The key objectives of the Fisheries Management Policy Division are to develop policy which will provide for the conservation and optimum use of fish stocks and to facilitate the approval of aquaculture proposals by providing a framework for the dissemination of available information, and to encourage the development and use of appropriate fish farming technology. The Fisheries Operations Division aims to provide a field liaison with those engaged in the capture or sale of fish, to promote community understanding of fisheries management rules and ensure community compliance with fisheries and aquaculture legislation. The Research Division's objectives are to provide sound biological information on Western Australia's wild fish stocks and on species suitable for aquaculture and to provide sound scientific information relevant to the conservation of the State's aquatic environment and biological resources.

Queensland

The Queensland Fish Management Authority (QFMA) was established on 25 November 1982 with the charter of providing for the management and control of the supply and marketing of fish and the protection, conservation and managed utilisation of the resource to ensure its continuing existence for future generations. The QFMA involves the community in reviews of fisheries and consultation with resource users on a regular basis, including through membership on management advisory committees is undertaken. The Queensland Department of Primary Industries is also involved in managing Queensland's fisheries through its Natural Resource Management program. Commercial fisheries are currently managed under a variety of input control measures, including limited entry, area and seasonal closures, and, in some fisheries, size limits apply. Some controls are also applied to recreational fishing, including bag limits together with some restrictions on gear and seasonal and area closures.

New South Wales

Management of NSW fisheries is the responsibility of the NSW Department of Agriculture and Fisheries. The aim of the department is to manage the aquatic habitat and fish resources in order to conserve fish stocks and optimise the sustainable yield for commercial and recreational fishers. This is done through a variety of input control measures together with limited entry to all the state's fisheries. Currently quota management measures are being considered for a number of fisheries (as discussed in the issues section below) and have been implemented for rock lobster and abalone.

South Australia

The management of South Australia’s aquatic resources are the responsibility of the Fisheries Group of the Department of Primary Industries. Research is undertaken by an associated research body - the South Australian Research and Development Institute (SARDI). All fishing resources in South Australia are now managed by Integrated Management Committees, made up of representatives from all areas, including commercial and recreational fishers, scientists and fisheries managers. The goals of fisheries management in South Australia are to manage the living resources of the state so that their utilisation and culture are ecologically sustainable. In addition, management aims to maximise long term economic and social benefits to the South Australian community. AU commercial operators are required to be licensed and possess the appropriate endorsements for the fisheries they operate in. These endorsements specify the type of gear to be used and regulate the quantity permitted to be deployed. Currently most fisheries are managed under a variety of input controls, although the southern zone rock lobster fishery and abalone fishery are subject to individual transferable quota regimes. Recreational fishers are also subject to regulations devised and implemented by the fisheries division.

Northern Territory

The Division of Fisheries of the Department of Primary Industries is responsible for managing fisheries in the Northern Territory. The Division has three main programs concerned with fisheries management, fisheries development and aquaculture. The division has developed or is in the process of developing management plans for all of its fishery resources to ensure the sustainable development. These management plans and associated fisheries legislation and regulation, form the basis for Northern Territory fisheries management. In common with the other states, commercial fisheries management is by limited entry, with a variety of input controls. Recreational fishers are subject to area and bag limits, together with gear restrictions and area and seasonal closures.

Victoria

Management of Victorian fisheries is the responsibility of the Victorian Department of Conservation and Environment. The aim of the state fisheries policy is to manage and conserve Victorian aquatic resources and the habitats that support them. This involves working cooperatively with industry, conservation and community groups. The management of Victorian aquatic resources is undertaken through three sub-programs concerned with commercial fisheries, recreational fisheries and habitat protection.

The Fisheries Branch is responsible for the management of commercial and recreational use of Victoria's aquatic resources. The Marine Resources Management Branch provides advice on the sustainable commercial and recreational use of marine and estuarine fish resources. Marine fisheries research is undertaken by the Marine Science Laboratories

The Department requires all commercial operators to be licensed in order to fish in state waters. Commercial fisheries are required to be managed on a sustainable basis, ensuring the long term conservation of fish stocks and the marine environment. Most fisheries are subject to input controls, although the abalone fishery is subject to individual transferable quotas. Recreational fishing is also managed through the issue of amateur fishing licences, the release of native and introduced species into Victorian waters, and through consultation with fishers on issues which effect their interests.

Tasmania

The Fisheries Division of the Department of Sea Fisheries is responsible for the management, research and development of the State's wild fisheries. The Fisheries Division is serviced by two branches, the shellfish branch and the finfish branch. These branches are responsible for conducting fisheries management research programs and providing independent advice on the status and management of the State's commercial and recreational fisheries resources.

The Fisheries Division is responsible for the issue of licences to allow the commercial catching and selling of most varieties of wild finfish, shellfish and crustaceans. Some licences are personal and can only be used by the owner and do not apply to a particular boat. Others are issued to a specific individual but refer to a specific vessel, although the licensee may choose to employ a skipper to operate the boat on his behalf.

Although most of Tasmania's fisheries are managed under input controls, the abalone fishery is managed using individual transferable quotas. This fishery is also subject to a charge designed to provide a return to the wider community from the use of its resources.

Key management problems and issues

The major underlying problem in most Australian fisheries is substantial excess fishing capacity. This leads directly to over fishing and considerably less than the maximum profitability in most fisheries. The majority of management arrangements are directed specifically at limiting fishing effort by one means or another. Initial efforts at fisheries management in Australia were in the form of limited entry arrangements. Such arrangements had little impact on fishing effort. Often fishers with only a limited history of involvement in a fishery gained access rights and so were able to increase effort in that fishery. Moreover, effective effort in a fishery could still be increased through technological improvements. As a consequence of these problems, in recent times more sophisticated input and output control mechanisms have been applied to most fisheries in Australia by the relevant fisheries managers (as discussed in the previous section).

As an example of trends in fisheries management case studies of management arrangements in two fisheries, the south east fishery and the southern bluefin tuna fishery, are attached. Both these fisheries have an ITQ management system in place, consistent with the desired trend towards output based management systems indicated in the 1989 fisheries policy statement (Commonwealth of Australia, 1989). However, the case studies show that there can be a number of problems in ITQs which need to be addressed prior to their introduction.

An issue which has been raised in respect to fisheries management is the appropriate role for industry and other user groups in decision making. This issue is discussed in more detail below. Other issues which still need to be addressed by Australian managers to improve the economic performance of fisheries and to meet conservation objectives include identifying fisheries where output based management can be used, allocation of access rights, setting of total allowable catches, bycatch discarding and highgrading, and costs and priority setting in research. These issues are also discussed below.

The role of industry and other resource users in fisheries management

There has been a trend toward increased industry involvement in the management of Australian fisheries. This trend has progressed the most in South Australia, where all fishing resources are now actively managed by Integrated Management Committees, made up of representatives from all areas, including commercial and recreational fishers, scientists and fisheries managers. These Committees are responsible for the adoption of policy initiatives into South Australian fisheries.

Although less progressed for Commonwealth fisheries, following the creation of AFMA in February 1992 industry is being given the opportunity to play a more important role in participating in management Management Advisory Committees (MACs) which consist of an independent chair, scientific, industry and management representatives could potentially play an important role in providing input to AFMA's decision making process.

Despite the increased role of industry in management, there is a perception among many operators that AFMA does not consult sufficiently with the MACS, that the MACs are not sufficiently representative and that consultation is often superficial with little real notice being taken of the views of the industry (Commonwealth of Australia, 1993). There has also been some questions regarding the appropriateness of AFMA's objective of maximising economic efficiency in the exploitation of fisheries resources. It has been argued that government management of fisheries should be restricted to ensuring sustainability of the resource through the setting of biologically safe reference points and that industry should be responsible for harvesting the resource as they see fit while adhering to such conservation criteria.

A final issue in this regard is the appropriate role for other resource users and interest groups in fishery management. As mentioned, in South Australia recreational fishers already have some say in management of fisheries. Resolving the appropriate role of industry and other resource users in management will be important to future management arrangements in Australia.

Identifying fisheries where output based management can be used

Before introducing an output based management system, there are two aspects of individual rights that need to be clearly defined to ensure an effective tradable right system - the property for which the rights are defined and the individual user rights.

The tradable rights to a resource should reflect the use of the resource by all user groups and the amount of resource available for assignment. In some fisheries it may not be cost effective to include all users. Where some users of the resource are not included in the tradable rights system, the total allowable use of the resource would need to reflect this and governments may need to periodically reallocate the resources to encourage their efficient use. However, the absence of adequate information may create difficulties in identifying an appropriate level of resource for which the rights are assigned and some loss in efficiency may result.

The manner in which the characteristics of user rights (in terms of excludability and exclusivity), enforcement, divisibility, duration and transferability are combined also determine the size of the efficiency gains. Where individuals are ensured of exclusive and certain, long term rights to a natural resource or some aspect of it, they are likely to use the resource in a more efficient manner. In addition, divisibility and transferability of individual rights are also important factors in allowing those who place the highest value on the end use of the resource to gain access to it (see Appendix A).

When appropriately defined and enforced, tradable rights system of management could result in efficient use of resources. However, it is not likely to ensure that other goals of fisheries management, such as equity and conservation, are also addressed. A tradable rights system often results in adjustment costs and income redistribution. For such reasons, these effects would need to be considered when establishing markets in tradable rights, and other regulations may be necessary. In some cases a lack of information may prevent complete specification of rights. Supplementary instruments may then be needed to address these information gaps. However, such supplementary instruments may still fail to yield efficient and sustainable resource use if the information on which the instruments are structured is flawed. Complete conservation of a resource might also involve prescriptive regulations.

Allocation of access rights

While ownership of Australian fisheries resources is specifically vested in the Australian community, governments may provide preferential rights to access to individual members of the community to exploit those resources. A key issue in the management of both input and output controlled fisheries are how the rights to exploit the resource should be allocated.

There is a considerable literature on rights allocation in a range of resource based industries. Mechanisms which have been suggested include auctioning of rights, lottery type systems, finders rights systems, and systems based on the level of historical use or investment.

In Australia, allocation has generally been based on historical use or investment in a fishery. However, the application of this mechanism in some fisheries has caused considerable disputes with industry. In particular, the initial individual quota allocations for some species in the south east fishery in Australia were believed to give insufficient weight to immediate past catch records relative to earlier catch records. This caused considerable dissension in the industry and impeded the establishment of effective trading arrangements for ITQs in the fishery. Further details are given in the attached case study on Australia's experience with ITQs in the south east fishery.

In New South Wales there is currently a proposal to improve property rights in that State's fisheries. The proposed arrangements include allocation of shares to commercial fishers in proportion to their catch history in various defined fisheries. The shares are intended to be valid for 10 years, with a review and a right of renewal every five years. As part of the proposed scheme, fishers would be required to surrender 2.5 per cent of their quota holding each year. These shares would then be sold by the fishery managers and the proceeds would represent a return to the community. Such a mechanism has previously applied in some forest areas of Canada (see, for example, Peel, 1991).

The choice of appropriate allocation mechanisms represents an issue of considerable relevance to fisheries management in Australia and other countries.

Setting of total allowable catches

Integral to any output control management system is a total allowable catch (TAC). A number of difficulties have been experienced in setting TACs in Australia. These include the lack of appropriate biological information and harvesting strategies for recovering stocks. In the south east fishery, quotas are in place for 16 species. Adequate biological information for assessing total allowable catches are available for only four species, with some information on a further six species. The remaining six species have little or no biological information other than recent catch levels. For most species, total allowable catches are set on the basis of historical catch levels. For one species, the toed allowable catch for the trawl sector is arrived at by negotiation with trawl and hook sector representatives. As some TACs are based on biological considerations, some on historic catch levels, and another on negotiations, the resulting set of TACs do not necessarily correspond with the usual catch ratios. As a consequence, over quota catches and discarding of some bycatch species has occurred.

A further difficulty in TAC setting has been harvesting strategies for recovering stocks. Where a fishery has been over fished in the past, TACs have been set low to enable the stock to rebuild. The harvesting strategy affects the speed with which the stock rebuilds and the flow of profits that can be earned. As there is uncertainty in most biological parameters, and as depleted stocks are highly vulnerable to environmental fluctuations, there are certain risks associated with the alternative harvesting strategies. Bioeconomic models are being developed to assess the potential profits of alternative harvesting strategies against the risk of stock collapse.

The issues faced by Australian fisheries managers are what is the appropriate means for setting of TACs and what type and amount of information is required for their setting. For example, TACs may be set to either maximise profits, maximise catch on a sustainable basis, or on some other basis. It can be argued that as long as the harvest level does not threaten the continuing existence of the stock, the level of harvest is largely an economic question. It is possible that TACs could be set within biological reference points, such as a minimum biomass, that ensure conservation objectives are met. The appropriate mechanism for setting the TAC within these reference points remains a relevant issue.

Bycatch discarding and high grading

With every targeted shot, a fisher is likely to also catch some unwanted fish as bycatch which may then be discarded. In an output controlled fishery discarding may occur for two reasons. First, fish may be discarded if the operator does not hold quota to cover the catch. The second form of discarding relates to the unintentional by-catch of unprofitable fish, even though quota may be held. Small sized fish (and in some cases, large sized fish) and damaged fish often receive a low market price relative to other grades. Since the operator is constrained on how much can be landed of a particular species, there are strong incentives to dump the low value grades in expectation of replacing them with higher value grades from subsequent shots. This is usually referred to as high grading. A form of high grading can also occur in situations where an operator unintentionally harvests a species for which quota is held, but decides to discard the bycatch because prices are temporarily low.

High grading and over quota discarding result in difficulties in biological analysis of the fishery as the true catch is not known. Over quota bycatch discarding can be reduced through a bycatch management plan. In Australia, a system of quota substitution for the south east fishery is being examined. This involves allowing operators to land their over quota bycatch against quota of other species. The effect of this on the total catch and potential total allowable catch overrun will depend on the substitution rates between species. A bycatch management plan has yet to be developed that can reduce the incidence of high grading.

Costs and priority setting in fisheries research

Reliable information is one of the cornerstones of effective fisheries management (and any business decision). Information required for management could cover a wide range of topics covering fish biology, fisheries economics or fish marketing. Detailed fishery specific information is often unavailable and governments often invest in fisheries research and development to encourage appropriate research and development to occur. In Australia fisheries research is funded partly by industry and partly by governments. The Commonwealth Government currently contributes 0.5 per cent of the industry gross value of production to research funds held by the Fisheries Research and Development Corporation (FRDC). The industry contributes up to 0.25 per cent of GVP to the FRDC which is matched by the Government. The Commonwealth Government also provides a special fund for public interest research and research into collapsed or developmental fisheries (equivalent to 0.25 per cent of GVP minus A$1 million). In addition, direct appropriations are made by the Commonwealth and State Governments to a number of research institutes undertaking fisheries research. All up, A$40-50 million is spent each year on fisheries research in Australia of which A$8.4 million is allocated by the FRDC, A$2.2 million by the FRRF and the remainder by other agencies.

The key issues in funding of research are whether there is an appropriate level (too much or too little) of funds going to fisheries research and whether the funds are being appropriately allocated to the highest priority areas. Where many research agencies and funding sources are available, there is a danger of duplication and research overlaps. If this happens, the community wig not get the best value from scarce research funds. To help identify, organise and coordinate the most effective selection of individual research projects and research programs for Australia, research and funding agencies need to identify priority categories of research (problems or opportunities where research is needed) within a fishery and across fisheries.

A consistent set of research priorities across fisheries (and management jurisdictions) is, however, likely to be difficult to identify. The main difficulties arise when the base value of each fishery is not known or when the expected payoffs of research can not be quantified. There is no common basis for comparing the relative merits of research since research priorities would need to be identified using qualitative and quantitative information about the magnitudes of expected payoffs of research in each fishery across different jurisdictional boundaries.

In such circumstances, a systematic approach is still needed to identify research priorities to reduce inconsistencies in allocations across both research areas and fisheries. For example, in Australia, research prioritisation at the national level (by the Fisheries Research and Development Corporation) is based on structured and coordinated input from each state and the Commonwealth, who identify their own research issues of importance and provide a common set of information. No doubt there would remain a degree of subjectivity. Nevertheless, research priorities could be identified in a consistent manner across all fisheries using a common set of information.

Appendix A

INDIVIDUAL TRANSFERABLE QUOTAS IN AUSTRALIAN FISHERIES MANAGEMENT

Traditionally, fisheries management in Australia, as elsewhere in the world, has been based on the use of input controls, such as limited entry and restrictions on quantity or type of gear and size of boats, to restrain the level of fishing effort. Such input based management strategies have generally proved ineffective in controlling the level of fishing effort because fishers have replaced the regulated inputs with unrestricted inputs. This has often led to biological over fishing and a decline in industry profits (Commonwealth of Australia, 1991). As a response to these problems output controls in the form of total allowable catches and individual transferable quotas (ITQs) have been introduced in some Australian fisheries.

While ITQs have been successfully introduced in a number of fisheries throughout the world, there are many fisheries where they have been plagued with difficulties and at times failed entirely. The Australian experience with the system dates back to 1984 when ITQs were introduced in the southern bluefin tuna fishery. Since then individual quotas have been introduced in abalone fisheries in New South Wales, Victoria, South Australia, Western Australia and Tasmania, the Australian pearl industry and more recently in another Commonwealth fishery - the south east fishery. ITQs are generally considered to have been successful in conserving the stock in pearl and abalone fisheries and in encouraging efficiency gains in the southern bluefin tuna fishery.

However, in many fisheries, multiple species are caught by many different user groups using different gear types. Often the same species is caught across jurisdictional boundaries or in more than one fishery, and many represent both a targeted species and a bycatch species depending on the circumstances. To illustrate the relevance of such issues to the implementation of ITQs for managing a fishery, the use of quotas in the south east fishery is reviewed. Operators in the south east fishery fish in both state and Commonwealth waters, and catch a number of different species using many different gear types. It is also a fishery where both recreational and commercial sectors target many of the same species. Although ITQs were only introduced in the south east fishery in January 1992, some useful lessons can be drawn from the experiences.

Individual transferable quotas in the southern bluefin tuna fishery

Background

Southern bluefin tuna found in the Australian fishing zone are part of a highly migratory fish stock of the south oceans. Juveniles form large surface schools off southern and south eastern Australia while mature southern bluefin tuna are dispersed throughout the southern oceans. Both Australian and Japanese vessels fish for southern bluefin tuna inside the Australian fishing zone, while outside of the zone tuna are caught by fleets from Japan, Korea, Indonesia, Taiwan and New Zealand.

Until the 1970s, there were no specific management arrangements for southern bluefin tuna in force. This reflected a scientific assessment in 1966 that the stocks were still subject to relatively low exploitation by the Australian fishery and possibly little affected by the Japanese and Australian fleets (Caton, McLaughlin and Williams, 1990).

During the mid-1970s, in response to the impact that increased effective effort was having on tuna stocks and the fishery's economic performance, a ban on the further entry of purse seiners and pole and line boats was implemented.

However, instead of containing effort in the fishery, the freeze on the number of pole vessels encouraged increases in effective fishing effort per boat. Major changes occurred in the sophistication of the fleet and industry infrastructure. Expansion in fishing effort was possible despite the freeze which limited only vessel numbers and placed no restrictions on types and sizes of vessel replacements. Because the freeze on the number of pole and line vessels was ineffective in restraining the build up of effort, the freeze was removed in March 1981.

Although the total catch of southern bluefin tuna was still increasing, with a record Australian catch being taken in 1982-83, the economic position of many operators in the fishery began to deteriorate markedly in the early 1980s (Geen and Nayar, 1989).

Management of the southern bluefin tuna fishery was complicated by the fact that a number of states were involved and the interests of different groups of fishers and governments did not coincide. In 1982, a Senate Standing Committee on Trade and Commerce reviewed the management of the fishery and found that there had been a failure to restrain effort. It concluded that the current form of management needed revising and that the fishery should be managed in a coordinated manner across the states.

In 1982, a meeting of biologists from Australia, Japan and New Zealand confirmed the CSIRO's 1979 estimates of the decline in parental stocks. However, it was not until 1983 that the trilateral scientific meeting concluded that urgent steps should be taken to ensure that parental biomass did not decline any further than the estimated 1980 level. It was considered that below this level there was significant risk of recruitment failure (Caton et al., 1990).

On the basis of scientific advice and the recommendations of the 1982 Senate Standing Committee on Trade and Commerce, in 1983, Australia adopted an interim management plan to restrain the level of exploitation by Australian fishers and to reduce catches of small southern bluefin tuna. The main features were a 21 000 tonne total catch limit unilaterally set on the Australian industry and minimum landing size limits. The competitive quota was allocated on regional basis - New South Wales and South Australia as the eastern sector and western Australia as the west sector.

While a 21 000 tonne total allowable catch was placed on the Australian catch, a similar proposal to limit the Japanese catch of southern bluefin tuna was rejected by Japan. Consequently Japanese fishing vessels were excluded from waters south of 340S in the Australian fishing zone in 1984, the objective being to reduce the Japanese catch of southern bluefin tuna and to stop unconstrained Japanese fishing activities in Australian waters.

Around the same time, an Industries Assistance Commission inquiry found that the competitive total allowable catch system introduced under the interim management plan led to an increase in fishing costs (Industries Assistance Commission, 1984). First a catch limit administered as a competitive quota provided fishers with the incentive to 'rush to fish' in an attempt to increase their share of the total catch. This encouraged investment in larger, more powerful boats, leading to increased competition and further capitalisation in a fishery already identified as being overcapitalised.

Second, imposing minimum landing sizes for fish increased the cost of fishing because it forced fishers to spend more time searching for schools of larger fish, or sorting and discarding fish to ensure they met the size limit.

Finally, because purse seining was assessed as being the most efficient method of catching southern bluefin tuna (in terms of the cost per tonne caught) restricting the use of this technique was seen as increasing costs to the industry.

These factors together with the biological concern of recruitment failure (see Majkowski and Hampton, 1983) led to the recommendation by the Industries Assistance Commission that a management system based on ITQs would be the most direct means of pursuing the joint goals of stock conservation and industry efficiency in the Australian southern bluefin tuna fishery.

The removal of operational constraints would lower fishing costs. Trading in quota rights would lower costs by enabling operators to adjust their quota holdings to match their most efficient operation. As a way of conserving the resource, ITQs strengthen the incentive for fishers to target the larger more valuable tuna to increase their returns. By increasing the average size of fish in the catch, the number of fish needed to fill the quota is reduced, resulting in more fish surviving to the enter the parent stock.

After consultation with relevant state governments and industry organisations, the Australian government established a management system based on ITQS. On their recommendations, the Australian Fisheries Council agreed on a long term ITQ based management arrangement to commence in October 1984, and the total allowable catch was reduced to 14 500 tonnes. The Fisheries Act 1952 provided the legislative framework for these management policies.

By this time, progress towards the use of country quotas for management was being made. In 1985, after two sessions of trilateral management discussion between Australia, New Zealand and Japan, Japan agreed to limit its 1986-87 southern bluefin tuna catch to 23 150 tonnes. Further reductions in the total allowable catches occurred in the following years, reflecting the continuing decline in southern bluefin tuna parental stock to historically low levels. The global quota, referred to as the three country quota, for 1994 remains unchanged from the 1990 level of 11 750 tonnes, with Japanese, New Zealand and Australian total allowable catches set at 6 065 tonnes, 420 tonnes and 5 265 tonnes respectively.

Management of the southern bluefin tuna stock, today, is under a trilateral arrangement between Australia, Japan and New Zealand. Development of the trilateral management arrangement occurred at a time when Australia, Japan and New Zealand were the major participants in the fishery and southern bluefin tuna catches by other nations were insignificant. At the annual trilateral meetings total catch quotas for each of the three countries are determined. This arrangement continues despite the fact that catches by nations outside of the trilateral arrangements, primarily Taiwan, continue to increase.

Although the three country quota system has been implemented, catches by the Japanese fishing fleet did not reach the agreed level until 1989-90, when the catch limits were significantly constrained. The quota system was not a force in containing Japanese catches for the years prior to 1989, which continued to decline despite high fishing effort (Caton et al., 1990). In contrast, the Australian catch has been close to the catch limit each year.

Operation of ITQs

Individual rights are defined in relation to the Australian quota of southern bluefin tuna commercially harvested within the Australian fishing zone. These rights apply to southern bluefin tuna found in either state or Commonwealth waters. The Commonwealth government manages the whole of the fishery under the Offshore Constitutional Settlement which permits the management jurisdiction of the fishery to be passed to a single entity. The fishing rights are also clearly defined to allow individuals the flexibility to divide and transfer their quotas to suit their desired level of participation. Such transfers could be made to any commercial operator using the same or other gears. The transfers, that are often made either through the Tuna Boat Owners Association of Australia or brokerage firms, can be made on a temporary or permanent basis. The effectiveness of the ITQ system in the Australian southern bluefin tuna fishery is contingent on these rights having some long term tenure so that quota owners can choose the most efficient scale of operation in harvesting and marketing.

lnitial allocation of quotas

Eligibility for participation in the initial quota allocation was determined on the basis of three criteria designed to objectively identify those fishers with a current dependence and financial commitment to the fishery, combined with a history of involvement (Franklin, 1987). They involved the operation or acquisition of a boat that had taken at least 15 tonnes of southern bluefin tuna in at least one of the three designated years, 1980-81 to 1982-83. Fishers not eligible through the 15 tonne provision, but who took more than 5 tonnes of southern bluefin tuna in one of the designated fishing years by fishing methods such as longlining, trolling or droplining were initially permitted to take up to five tonnes in a season. This temporary, non-transferable allocation was legally withdrawn in 1988, along with a similar provision to allow any Commonwealth fishing boat licensee to take up to one tonne of southern bluefin tuna. 'Me system of ITQs did not apply to fishers who took less than 5 tonnes of southern bluefin tuna incidental to other fishing operations, fishers who had entered the fishery during the period of the interim arrangements and recreational fishers whose activities remain unrestricted.

Allocation of quota units was based on catch history, which was given a weighting of 75 per cent in the formula, and investment in the fishery, which was given a weighting of 25 per cent Each fisher's best catches between 1980-81 and 1982-83 were used to calculate the catch based component of that fisher's quota allocation. Individual logbook information, sale receipts from tuna canneries and export documentation were used to determine individual catch histories. The market value of tuna fishing vessels, including fishing and navigation equipment, was independently assessed by a marine surveyor contracted by the Commonwealth government a year before the introduction of ITQs.

Most of the initial problems with allocating quota related to vessels that were sold or sunk during the qualifying periods, or to special circumstances where the fishers did not, for one reason or another, fish full time for southern bluefin tuna within the specified period. Of the 198 applicants for quota allocations, 149 received initial allocations. As a result, 24 appealed to the Administrative Appeals Tribunal for either an initial allocation of quota or for an increase in their quota. Only five of the applicants either had their quota increased or were issued initial quota allocations by the Tribunal. There are now only 76 southern bluefin tuna quota unit holders. Of these only 38 hold quotas of less than 5 tonnes (or 5.076 units). As a result of the appeals process 22 tonnes (or 22.34 units) became surplus which, in effect, is "owned" by the Commonwealth government.

Assessment of ITQs in the southern bluefin tuna fishery

The effectiveness of the use of ITQs is assessable in terms of gains in economic efficiency, the cost effectiveness of its implementation, the ability to meet the conservation objective of fisheries management and any income distribution effects that may occur.

Efficiency

ITQs provide individual fishers with strong incentives to change their fishing pattern to maximise their returns from their limited allowable catch and thus could result in efficiency gains.

Economic performance

A bioeconomic model of the fishery was developed to simulate the expected flows of benefits and costs to southern bluefin tuna fishers under a system of ITQs compared to the expected flows of benefits and costs resulting from two feasible alternative management regimes (Geen and Nayar, 1989). The analysis was undertaken three years after the introduction of ITQs. By that time the fleet had adjusted to the introduction of ITQs and a reduced total allowable catch as evidenced by a stable fleet structure and few occurrences of significant quota transactions (Geen, Nielander and Meany, 1993).

The economic survey and subsequent analysis of the fishery's economic performance under ITQs indicated that despite several reductions in the total allowable catch, the industry remained profitable, with the cost of catching a tonne of tuna falling by 25 per cent and resource rent of A$6-7 million being earned in 1986-87 (Geen and Nayar, 1989). Simulations of the fishery operating under alternative aggregate quota management schemes suggested that at best, fishery profitability would have been only around 25 per cent of the level achieved under ITQs.

Gains have also been made from improved fishing techniques encouraged by the introduction of ITQs. For example, Australian fishers have begun concentrating on harvesting the larger, more valuable tuna caught by longline fishing methods for the lucrative Japanese sashimi market. Providing individuals with security over fish catches has also resulted in the innovative farming of southern bluefin tuna. Small tuna are captured live and placed in cages in coastal waters around Port Lincoln to grow out. Fish are then harvested for export to the Japanese sashimi market (Krueger, 1991).

Compliance and enforcement

Individual quota systems require monitoring of the total harvest to ensure that the total allowable quota is not exceeded, as well as monitoring of individuals' allocations. Success depends on the monitoring system being capable of detecting abuse by both domestic and foreign operators. Owners of the rights must be confident that others can not circumvent the system and thus diminish the value of their rights.

In the southern bluefin tuna fishery, monitoring and surveillance of domestic operators is conducted by state government agencies on behalf of the Commonwealth. The type of monitoring and surveillance undertaken differs between the states, reflecting the relative importance of the quota holdings in each state and the number of landing points.

For instance in South Australia, Port Lincoln is the major landing point for southern bluefin tuna. In this port the landing and weighing of fish are supervised by state fisheries officers. The monitoring system is enhanced by a vessel reporting system adopted by the commercial operators, whereby fishers alert fisheries officers when they are coming into port and how much fish they have on board. These procedures cover the majority of southern bluefin tuna that is airfreighted fresh to the Japanese sashimi market.

Cost effectiveness

Education was the desired outcome of monitoring and surveillance activities when ITQs were introduced (Gleeson M., Australian Fisheries Management Authority, personal communication, April 1993). Fisheries managers were concerned about the general acceptability of the system as the appropriate form of management for the fishery. Once the industry understood and appeared to endorse the use of a transferable quota system as a form of management, the enforcement of individual quotas became the focus of surveillance and monitoring. Estimated expenditure on surveillance and compliance for the domestic fishery in 1991-92 was about A$310 000, which was about 64 per cent of the southern bluefin tuna fishery management budget.

There have been some problems with monitoring and enforcing the program, although these have been related more to the changing nature of the fishery than to ITQs directly. For example, the change in fishing pattern towards longlining and direct shipment of unprocessed whole fish to Japan has meant that fish could be landed anywhere along the coast and shipped to Japanese markets without being detected since surveillance of all coastal ports is almost impossible.

There are also difficulties in obtaining verifiable information to prosecute operators who may be involved in dumping of fish in order to increase the value of their limited quotas. Although dumping is not a problem peculiar to an ITQ system of management, such a problem is likely to increase when individuals are restricted in their catch. The extent of dumping is, however, not known, since it is difficult to monitor activities at sea (Auditor General, 1991).

Conservation

A major aspect of the management regime in the southern bluefin tuna fishery is the failure to contain fishing mortality at levels consistent with the sustainability of the resource. Sustainable catch is defined in relation to the maximum sustainable yield and not maximum economic yield. Ideally, catches at maximum economic yield would provide maximum benefits to the community; and maximum economic yield is generally lower than the maximum sustainable catches. The maximum sustainable global yield of southern bluefin tuna is estimated by biologists at around 50 000 tonnes per year. At present the three country annual quota for southern bluefin tuna is 11 750 tonnes, considerably lower than the maximum sustainable yield. This lower catch level is necessary because earlier fishing effort caused declines to both the spawning stock biomass and recruitment, so that current levels of these are now lower than is required to produce the maximum substantial yield (Sainsbury, 1992). These declines have continued through to the most recent years. Because of the slow response of the southern bluefin tuna stock to changes in fishing mortality induced by management changes, it is not possible at present to ascertain whether the parent southern bluefin tuna fish stock (fish older than eight years of age) has begun to rebuild in response to recent management restraints (Australian Fisheries, 1990).

One problem is that management arrangements do not apply to all fishing effort directed at the stock. In particular, the expansion of commercial catches of southern bluefin tuna by vessels from Taiwan, and to a lesser extent Indonesia and Korea, which are outside the trilateral arrangement, is becoming a problem in achieving sustainability of the stock. The absence of restrictions on these non-trilateral catches is likely to become of greater concern if further reductions in the TAC are made on the basis of concerns by the trilateral scientific working group. Recovery of the stock could also be jeopardised if non-commercial catches were to increase in the future.

Distribution effects

By allowing transferability of quota holdings, fisheries managers enabled fishers to elect to cease fishing for southern bluefin tuna and either sell or lease part or all of their quota to other fishers who wished to consolidate their quota holdings. As a result, the structure of the southern bluefin tuna fishery in Australia underwent radical changes in the years immediately after the introduction of ITQs.

The total allowable catch in the first year of operation of ITQs was 14 500 tonnes, 30 per cent lower than the previous year. This reduction in total allowable catch meant that individual participation in the fishery was also significantly reduced (quotas averaged 40 to 60 per cent of best annual catch over the period 1980-81 to 1982-83 (Franklin, 1987)). As most initial quota allocations were insufficient to allow operators to maintain a viable operation in the fishery, many operators chose to sell their small quota holdings and leave the fishery.

The net result of the substantial tuna quota trading that occurred in the first year was a consolidation of quota holdings into the South Australian sector of the fishery. While the size of the fisheries in Western Australian and New South Wales contracted substantially, Western Australian fishers received more than A$2 million from interstate transfers of their quotas, and New South Wales fishers between A$1 million and A$2 million (Franklin, 1987). One of the reasons for the regional consolidation of quota holdings was differences in the capital structure of fleets in the three states. As South Australian operators had few alternative fishing opportunities and many may have considered the capital in their boats as 'sunk', these operators were willing to offer higher prices for quota than fishers in other states. Another reason for the consolidation of quota was the almost complete disappearance of surface schools of fish off the New South Wales coast during the years immediately after the introduction of ITQS. The collapse of the New South Wales fishery, it has been argued, was partly due to heavy fishing pressure in South Australia and Western Australia (Caton et al., 1990).

Besides this regional aggregation of quota, there has been a concentration of quota ownership. In 1992-93 over 62 per cent of total southern bluefin tuna quota was held by 5 per cent of quota holders. In this fishery there is no restriction on the maximum size of individual quota holdings. From an efficiency perspective this is unlikely to be a problem if a competitive market for quota exists and the ownership of the quota is acquired by those that are the most efficient operators.

Apart from the rationalisation of quota holdings there has been a large reduction in the number of boats that actively fish for southern bluefin tuna. Within two years of the introduction of ITQs the number of boats fell by around 70 per cent. As with quota holdings, the fleet contracted to South Australia. However, there was some erosion of the efficiency gains following adjustment because many departing operators redirected their effort towards other fisheries, some of which were already overcapitalised. In particular, the rationalisation that occurred in the southern bluefin tuna fishery accentuated the overcapitalisation problem in the south east trawl fishery. Of the total number of boats that left the southern bluefin tuna fishery, eleven New South Wales boats and some South Australian based boats obtained endorsements to fish in the south east trawl fishery (Industry Commission, 1992).

Similarly, in Western Australia there was considerable dislocation and disruption in the main ports and a generally undesirable spill over into other already heavily exploited western Australian fisheries (Franklin, 1987). However, there was a beneficial impact on the tuna stock due to this change in fishing activity in that a considerable amount of fishing effort was diverted away from concentrations of very small fish off western Australia to considerably larger southern bluefin tuna off South Australia. The ability of some fishers to direct their effort into alternative fisheries was an important factor influencing the pace and regional impact of adjustment.

Concluding remarks

In the medium to longer term a system of ITQs in the southern bluefin tuna fishery is thought to have a number of advantages over other management systems. Assigning individual access rights in the southern bluefin tuna fishery means that commercial operators in the fishery acquired exclusive user rights to the fish stock. This avoids some of the structural problems that occur under a competitive total allowable catch system. The allocation of individual rights eliminates the 'rush to fish', and contributes to efficient operation of the industry.

However the fishery is a single species fishery managed under one jurisdiction, this is in contrast with the south east fishery where managers have encountered a wide range of problems associated with the introduction of ITQs due to the fishery's biological and structural characteristics.

Individual transferable quotas in the south east fishery

The south east fishery is a multi-species fishery with a long history of commercial fishing. It covers trawl fishing in the area from Barrenjoey Point off Sydney to South Australia, including the waters off Tasmania, from three miles offshore out to the 200 mile limit of the Australian fishing zone.

During the late 1970s and early 1980s many new vessels were constructed to operate in the fishery in response to improved profitability, due largely to the development of a gemfish fishery off the New South Wales coast.

During the early 1980s there was an expansion of effort in the south west sector of the fishery. The development of the deep water fishery for blue grenadier, then later for orange roughy stimulated this expansion. Since 1986, when the first large aggregation of orange roughy, was discovered, this species has fanned the largest and most valuable portion of the total south east catch. Species like orange roughy, blue grenadier and warehou can be effectively targeted by fishers. In contrast, most of the east coast catch is of mixed species. Some of these species are also caught in state waters and thus are subject to different management arrangements.

Background

Management was introduced into the fishery in 1985 in response to concerns about increases in effort and pressure on stocks. The South East Trawl Management Advisory Committee was set up in 1986 to provide for consultation between industry, scientists and managers. In 1988, the arrangements were formalised in the South East Trawl Fishery Preliminary Management Plan 1988.

During the early years, a limited entry regulatory approach was adopted together with restrictions placed on various inputs. Access was limited to fishers holding a Commonwealth Fishing Boat Licence endorsed for operation in the fishery. Under this plan the fishery was split into two sectors, the Eastern and south west, the former being divided into two regions with separate entry criteria into both. The division of the Eastern sector was to take account of the concerns of Victorian fishers regarding possibly uncontrolled expansion of the effort by operators in New South Wales in waters adjacent to eastern Victoria.

Endorsements for one or more of the three management zones were issued to fishers who qualified on the basis of proven operation in the fishery during specified periods. These endorsements were transferable and gained a significant capital value. Other input controls included a two way freeze on the transfer of units between Danish seiners and trawlers, and restrictions on vessel size and mesh size. The management arrangements included hull and engine units based on the size and power of the vessel. These units were combined to form the applicable number of units in relation to a boat, which were transferable and thus had a trading value attached to them.

In 1986, a boat replacement policy was introduced to try and limit the expansion in fishing effort by licensed operators through the upgrading or replacement of their boats. Under this policy, fishers wanting to upgrade or replace boats had to purchase additional units from operators leaving the industry or buy small replacement boats. In addition, units were subsequently forfeited to the Commonwealth government and removed from the fishery. The objective of the scheme was to reduce the total number of units used in the fishery, so reducing the physical capacity of the fleet each time a boat was replaced or modified. The increase in costs of upgrading and replacing boats under this policy was meant to provide disincentives to fishers to build more efficient boats.

However, there was a strong demand for boat units from the south west sector operators wishing to either build larger boats or upgrade existing boats to fish for the developing orange roughy fishery. Although the forfeiture provisions reduced the number of units used in the fishery, fishing effort continued to increase. The main reason for this was that the boats that left the fishery were generally poor performers, putting in little fishing effort and taking small catches, whereas the boats to which their units were transferred became high effort producers. Also the boat replacement policy could do nothing to prevent operators simply increasing the amount of time they spent fishing. Catches continued to increase, to levels that threatened to deplete certain fish stocks. This led to the introduction of a 20 000 tonne competitive total allowable catch of orange roughy in February 1987.

In 1988, following scientific advice, the gemfish catch during the spawning run off the east coast of New South Wales was limited to 3 000 tonnes. This allowable catch was managed as a competitive quota, and resulted in increased competition, inefficient fishing operations and market gluts (Coutts, 1991). The increase in fishing capacity and the development of target fishing revealed the inability of the then current management arrangements to either contain fishing effort and catches or to improve economic efficiency in general.

As a result of continued increases in effort, declines in catches and the generally poor economic performance in the south east fishery an Australian Fisheries Council subcommittee, comprising Commonwealth and state fisheries directors was established in July 1989 to produce recommendations for future management. This committee reported in December 1989 and recommended that a system of ITQs be introduced. The Minister for Primary Industries and Energy announced in April 1990 that an ITQ system based on quantity would be introduced for the fishery, although the system was not operational for another year and a half.

Operation of ITQs

The Quota Implementation Team was set up within the Australian Fisheries Service (the predecessor to the Australian Fisheries Management Authority) in July 1990 to put the new arrangements in place. Assisting the Australian Fisheries Service in overseeing the implementation process was an Australian Fisheries Council subcommittee and an industry liaison group established under the auspices of the South East Trawl Management Advisory Committee. Extensive consultations with industry were undertaken by the Quota Implementation Team between the formal announcement of the introduction of the quota system and its commencement on 1 January 1992.

Initial allocation of quotas

The total allowable catch of the sixteen species placed under quota for the 1992 fishing season was 31 680 tonnes, of which approximately 29 000 tonnes were allocated. No allowance was made for catches taken by fishing methods other than trawling, such as droplining and longlining. The recreational sector was also not explicitly allocated any quota. Catches by other methods or users of the resource were considered to be taken outside the 'south east fishery' as designated in the management plan, and were therefore not monitored or controlled by that system.

The operation of two distinct trawl fisheries in the south east fishery - Danish seine and otter trawl fisheries - meant that for species caught by both fleets, the total number of quota units available for allocation was first divided between the two. This division was based solely on each sector's historical catch. Once that division was made, the vessels in each sector were allocated a portion of the respective number of quota units available to each sector.

The formula developed to allocate the catch between otter trawl operators took into account historic catches (based on an average of the percentage of a species in each of the operator's best five years over the period 1984 to 1989) and investment in the fishery (based on the number of units of capacity assigned to the boat). The relative weights assigned to historic catch and investment differed between species. The split was 80 per cent catch history and 20 per cent boat units for all species except orange roughy and blue grenadier. For these two species, the weighting was equally divided. In the case of Danish seine vessels, weighting factors were 70 per cent for historic catch and 30 per cent for investment in the fishery.

The initial allocation formulae were derived after a lengthy consultation process that took over six months. A vessel's catch history was considered to be attached to the licence endorsement to operate in the fishery. This catch history was deemed to have been transferred when and if an endorsement exchanged hands, unless it was explicitly excluded in the agreement between the two parties (Australian Fisheries Management Authority, 1992a). Catch histories were collected and verified. Commonwealth fisheries officers visited all fishers at least once and fishers were asked to provide documentary evidence supporting their catches over the period 1984 to 1989.

The formula used to determine individual quotas seemed to give unrealistic weight to vessels that had caught certain species, such as orange roughy, during the developmental phase of the fishery. There was a belief that it had been selected to reward those who had developed the fishery in the earlier years (Australian Fisheries Management Authority, 1992c). This led to a considerable amount of industry dissatisfaction and one company instigated legal action against the Commonwealth about the statistical accuracy of the market share formula.

This resulted in a change in the allocation formula to one involving summing the catches in the best five years for each vessel for each species over the qualifying period and expressing this as a percentage of the total catches for all vessels for each species over the period. Such a method would prevent operators being granted allocations of quota that were significantly larger than their historical catch levels, and provide a more equitable distribution of quota that also reflected the current pattern of operations in the fishery.

Assessment of ITQs in the south east fishery

Although the ITQ system in the south east fishery has been in operation for just over a year, some conclusions can be drawn about its effects on the fishery and its likely effectiveness in addressing the management goals given the existing constraints.

Economic performance

The introduction of ITQs has had mixed success in the three sectors of the south east fishery. Between 1989-90 and 1990-91, before the introduction of quotas, the reduction in the competitive total allowable catch for orange roughy resulted in a fall in returns to capital of the offshore fleet (Table 1). Profitability in this sector was higher in both 1991-92 and 1992-93 than in 1990-91. This was despite a reduction in the total allowable catch for orange roughy. Such an increase was possible because offshore operators who owned more than one vessel were able to amalgamate their quota, offsetting the reduction in their individual quotas (Pascoe, Baulch and Power, 1992) and prices for orange roughy increased.

Table 2. Rates of return to capital at full equity in the South East fishery

	Danish seiners	Inshore boats	Offshore boats	Total fishery
1989-90	23	27	34	32
1990-91	26	15	16	16
1992-92	30	15	42	33
1992-93p	22	25	30	28

na (not available), s (ABARE estimate), f (ABARE forecast).
Sources: ABARE 1993a, 1993b.

In the Danish seine sector the introduction of ITQs appears to have had little impact on the level of profitability. The rise and subsequent decline in the rates of return to capital for the Danish sector are largely due to changes in the price for whiting rather than the effect of ITQS.

For the inshore sector of the fishery the rate of return in 1991-92, after the introduction of ITQS, was considerably lower than that for other sectors. While declines in the total allowable catches for some of the key species have contributed, the problems previously discussed such as the way quota were initially allocated and the restriction on transfers of quota, may also have contributed to the decline in relative profitability. Bycatch management problems may also have contributed to the loss and these are discussed below. As in the case of the southern bluefin tuna fishery, the introduction of individual quotas in the south east fishery occurred at a time when many of the species in the fishery were fully or over exploited. As such, fishers are adjusting their fishing operations to reflect lower total allowable catches that are a reflection of past fishing practices.

Conservation

Most major commercial fish stocks in the Eastern sector are fully or over exploited and catch rates are declining (Kerin, 1990). Whilst total catches have increased in recent years, this has only occurred due to the discovery of orange roughy stocks. The main species caught in the Eastern sector has been gemfish. Management of gemfish is based on two clearly identified stocks. It became necessary to manage these stocks separately because of the serious depletion of gemfish in the Eastern sector. The 1993 total allowable catch for eastern gemfish was set at zero (Australian Fisheries, 1993). In the non-eastern fishery, about 300 tonnes of gemfish are caught primarily as a bycatch and the western gemflsh stock is not under threat.

Whether ITQs in the south east fishery are successful in meeting the conservation objective of fisheries management is too early to assess. Much will depend on the explicit total allowable catch limits being correct, plus the implementation of an appropriate bycatch management system. In the south east fishery there is a wide divergence between species in the knowledge and level of information necessary for biologists to estimate total allowable catches and give scientific advice as to how to address the bycatch problem. While there is a long time series of data for species such as redfish and gemfish, for many other species, such as orange roughy, the stock structure is unknown (Nicon, 1993).

Distribution effects

It is difficult to assess the distributional effects of ITQs in the south east fishery since quota trade did not occur due to dissatisfaction with the initial allocation of quotas. However, there was a perception that the initial allocation of quota was inequitable.

The lack of an effective market for quota has affected the rate of adjustment in the fishery and hence the economic performance of the fishery. Whereas in the southern bluefin tuna fishery there was a rapid adjustment of the fleet following the introduction of quotas, the rate of adjustment in the south east fishery is likely to be slower. There are a number of factors that will influence this rate of adjustment. First, the number of fisheries subject to limited entry has increased, thus fishers have limited opportunities to move into other fisheries. In addition, the employment prospects in many coastal communities in a time of recession are not conducive to leaving the fishing industry.

Second, the Australian Fisheries Management Authority is adopting a policy which prohibits 'licence splitting'. Many operators hold licences to fish in more than one fishery. Often, these licences are not fully utilised. Under most current restructuring proposals, operators are not able to separate these licences because the intention is to prevent a unit effort which may be latent for most of the year becoming fully effective on a full time basis. The inability to separate the licences has, however, proved an inhibiting factor to adjustment in the fishery.

The third factor is the size of individual quota holdings. If total allowable catch limits are reduced, or if the allocation method favours one group of operators over another, the value of the quota packages may be lower than the value of a licence or boat units prior to the introduction of quotas. This arises because of the uncertainty in how the quota market may operate. Thus individuals may find it difficult to sell their quotas and may delay leaving the fishery. In remaining in the fishery they may attempt to become viable by activities such as highgrading and by over catching their quota (as discussed below). This would affect the ability of the management system to achieve the goals of efficiency and sustainability.

Constraints to operation

The effectiveness of quotas to achieve the fishery management objectives is constrained by four major factors: inadequately defined user rights; jurisdictional limits in the fishery which constrain the effectiveness of the policy, although this would be a problem regardless of the form of management; management strategies that apply to operators using only one of the many gear types used in the fishery or to only one of the user groups; and the nature of the fishery itself and the problems that are caused by implementing ITQs in a multi-species fishery.

Definition and initial allocation of user rights

For an ITQ based management system to encourage gains in efficiency, individual operators must have clearly defined rights that give, amongst other things, maximum flexibility regarding sale and transfer of quotas. While such flexibility was allowed in the southern bluefin tuna fishery, in the south east fishery restrictions were placed on the transfer of quotas between those operators who had received the original allocation. Moreover, permanent or seasonal transfers were not permitted initially, due to the concerns over the allocation of quota, though temporary leases were possible. Since early 1993 permanent transfer of quota is permitted, however, it applies only to the transfer of whole quota packages not to individual species quota. This too is likely to be reviewed in the new management plan. The lack of permanent transferability prevented many inshore operators from exiting the fishery. While leasing of quotas could occur, the lack of a formal quota market has made quota leasing difficult, a problem which could have been compounded by the manner in which quotas were initially allocated.

Dissatisfaction with the initial allocation process together with the lack of respect for the rights, particularly when the same species could be caught outside the Commonwealth waters, are some of the factors that may have contributed to the absence of a quota market, and may have also affected the level of efficiency gains.

Multiple jurisdiction

While management powers in the southern bluefin tuna fishery were passed to the Commonwealth under the Offshore Constitutional Settlement, in the case of the south east fishery, five governments maintain control on fish harvests in their waters. Governments from the four states involved in the fishery - New South Wales, Tasmania, Victoria and South Australia - have jurisdiction out to three nautical miles, beyond which the Commonwealth government has jurisdiction out to the limit of the Australian fishing zone. Differences in management practices between the states and the Commonwealth impinge on the effectiveness of the ITQ system in the south east fishery.

Under the current arrangements, the total allowable catch limits only apply to fish caught in Commonwealth waters. This creates enforcement problems, as most fishers in the south east fishery are licensed to fish in both state and Commonwealth waters. Since quotas have been introduced, many operators have recorded increased catches of quota species in the unregulated state waters by comparison with historical catch patterns which may reflect either a transfer of effort into state waters or some misreporting of catch locations (Baulch and Pascoe, 1992). Although total allowable catches for the south east fishery have been set below the levels considered to be the maximum sustainable levels to allow for catches in other jurisdictions and other

Commonwealth fisheries, such increases in catches of quota species in state waters is causing concern that overall total allowable catch limits may be exceeded (Australian Fisheries Management Authority, 1992c).

Multiple gear and users

ITQs in the south east fishery only apply to fish caught by trawling methods. Some fish species, particularly some inshore species, are caught by other methods such as droplining, trolling and trapping. Catches by such methods are not counted against an individual's quota allocation. This is in contrast to the southern bluefin tuna fishery where catches are recorded against quota regardless of the fishing method used. It must be recognised that the introduction of ITQs provides an incentive for fishers to seek to maximise the returns for their catches rather than maximise their catch. This may mean for some species a change in fishing technique to provide a high quality fish for the market. Such techniques for the inshore species are most appropriate to maximise the value of the catch.

In a partial response to these concerns, on 19 January 1994 AFMA announced that ITQs would be introduced for two species, ling and blue warehou, caught by net, hook and trap sectors of the south east fishery.

Multiple species, highgrading and bycatch

The other factor influencing the effectiveness of an ITQ system is discarding of bycatches. Discarding could occur for two reasons. First, operators may discard fish if they do not hold quota to cover the catch. Second, low grade or damaged fish may be discarded if operators anticipate that they wig be able to catch enough higher valued fish later to fill their quota (highgrading). For ITQs to work successfully, monitoring of actual harvests is fundamental. Unrecorded catches can threaten the ability of output controls to achieve the biological and economic objectives of management. AFMA is currently considering a range of alternative management options to address the bycatch problem, including a system of quota substitution, permitted limited quota overruns, a tax on landed catch over quota, and surrender (Baulch and Pascoe, 1992).

Concluding remarks

ITQs are potentially useful where individual rights can be defined and assigned to a share of a common property resource and market mechanisms can be used to achieve efficiency in their use. To encourage efficiency in the use and conservation of fisheries resources, are user groups targeting the same fish species and deriving either market or non-market benefits would need to be managed under a single management system (this applies to output as well as input controls).

ITQs are likely to be most effective when fishers are assigned clearly defined use rights in relation to well specified and geographically and biologically independent fish stocks. In such a system individuals would have the flexibility to decide where and how to catch their individual shares of the total allowable catch of specific species of fish. Flexibility in the use and the transfer of individual quotas would then encourage efficiency in the use of fisheries resources.

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CANADA

The purpose of this paper is to provide an overview of the Canadian fisheries and describe the techniques and instruments adopted to manage one of Canada's most vital resources.

Canada has a multitude of fisheries within which are employed a wide variety of management techniques. Furthermore, the management of each fishery is woven through distinct social and economic conditions that exist in the regions which depend on fisheries resources. Given the complexity of the Canadian fisheries, it is difficult to draw hard and fast conclusions on the effectiveness of the various management regimes. Therefore, rather than providing an empirical assessment of various policy instruments employed in the Canadian fisheries, this paper attempts to identify general management trends and arrives at tentative conclusions as to the effectiveness of these techniques.

The first section provides an overview of the Canadian commercial and recreational fisheries. The second section discusses the various fisheries management policies that have been used to manage Canadian fisheries resources, how these policies have evolved in recent years and also how successful they have been as fisheries management instruments and in addressing the problems that have, and continue, to influence the industry.

1. Overview of the Canadian fisheries

The Canadian Atlantic and Pacific commercial fisheries preoccupy the federal Department of Fisheries and Oceans' (DFO) policy development agenda. The policy challenges arise out of a complex series of factors relating to the structure of the industry and other unique characteristics at play. In particular, the fishing industry is distinguished by uncertainty and volatility in both the harvesting and processing sectors.

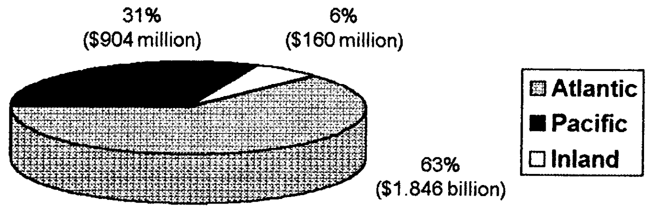
Several important challenges currently face the fishing industry - the most prominent being dramatic declines in Atlantic groundfish stocks and the closure of most major cod fisheries. In the shadow of this, there are a number of related policy issues relating to depressed incomes and excess capacity. On the Pacific coast, major policy issues include the Aboriginal Fisheries Strategy (AFS) and the negotiations of key parts of the Canada - United States Pacific Salmon Treaty.

This section of the paper provides a broad overview of commercial fisheries, followed by individual discussions on the Atlantic, Pacific, Inland, recreational fisheries and aquaculture.

National overview

The traditional Canadian commercial fisheries (excludes aquaculture) are centred in three main areas: Atlantic and Pacific coasts and inland waters on the Prairies and the Great Lakes.

1993 Value of Fisheries Production

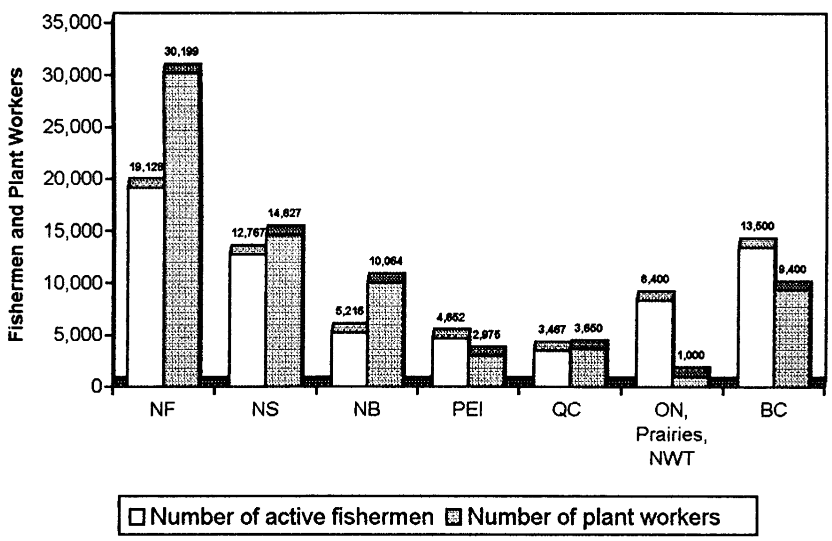


Nationally, the commercial fisheries contribute about 0.3 per cent of GDP. In 1993, Canadian fisheries production was valued at C$2.9 billion.

Regionally, the commercial fisheries are a critical source of employment and income. On the Atlantic coast in particular, the fishery is the mainstay of economic life in about 1 000 coastal communities.

In total, Canada's commercial fisheries are estimated to generate direct employment for about 140 000 individuals.

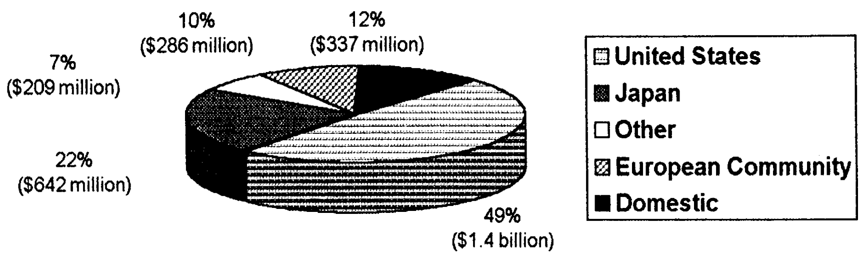
Employment in Fisheries by Province, 1991



The types of jobs provided in the fishing industry vary by region and fishery, ranging from low-wage seasonal employment to well-paid year-round jobs.

Canada exports over 80 per cent of its fishery production to some 100 countries around the world. The United States is Canada's largest export market, followed by Japan and the European Community. These three destinations collectively account for approximately 90 per cent of total exports, or three-quarters of Canadian production. In 1993, Canada imported C$1.1 billion worth of fish products.

1993 Markets for Canadian Fisheries Products
Total: 2.9 Billion



The last decade has witnessed increasing competition and globalisation of international fish markets. Over 100 countries now actively compete in the global seafood market. Reflecting groundfish supply constraints, Canada accounted for 5.6 per cent of world seafood exports in 1993, down from 6.3 per cent a year before. In world markets, Canada's fishing industry is a price-taker. As a consequence, domestic harvesters and processors are vulnerable to price fluctuations and volatility in foreign markets.

While Canadian fish producers used to be dominant suppliers of groundfish in the United States, canned salmon in the United Kingdom and frozen herring roe in Japan, Canadian market share has gradually eroded in these market segments for a number of reasons:

- substitution of traditional cod and other groundfish products in the US market with low-priced domestic products like Alaskan pollock;
- Norway and Russia now dominate the cod market in Europe;
- Ireland and other emerging suppliers are putting increasing pressures on Canadian exports of herring roe to Japan;
- world aquaculture production is increasing; and
- Alaskan salmon has made inroads in European markets, displacing Canadian product.

Notwithstanding increased competition from abroad, Canada remains a major fish supplier in world markets.

Instability of the Resource

One of the primary challenges in fisheries management stems from the nature of the resource base, which is both invisible and migratory. The stock assessment process by which quotas are determined is based on biological benchmarks such as target yield and mortality rates which can have significant margins of error. In an environment of imperfect information, uncertainty is the norm, both for management of the resource and for industry participants.

One reason for industry instability are year-over-year fluctuations in the resource. Most fish populations follow cycles of abundance and scarcity. In addition, a variety of uncontrollable environmental factors are at play. For example, droughts and flooding can affect salmon stocks in British Columbia. Similarly, global warming may be related to the current decline in the Atlantic cod stocks. Given this uncertainty, industry participants often demonstrate a tendency to focus on maximising their returns in the short-term.

Common property problem

This tendency is reinforced by the "common property" nature of the resource. As a common resource, no individual has claim to any particular part of the resource until the fish are caught. Consequently, fisheries stakeholders are often preoccupied with protecting and expanding their catch and, in the absence of controls to the contrary, will engage in a counter-productive "race for the fish".

Left unabated, the common property nature of the fisheries leads to resource over-exploitation, economic waste and social conflict, characterised by overcapitalisation, heavy borrowing, large debts, excess capacity and unstable incomes.

Controlling access and fishing effort

The Department of Fisheries and Oceans uses a variety of management techniques to address instability and mitigate the common property problem in commercial fisheries. The choice of management methods depends on species characteristics, specific fleets and locations fished. Such methods include regulating the type and size of gear used, vessel length, fishing times and areas. Other tools for regulating access and effort include catch limits, limiting the number of licenses available to fish, and quasi-property rights (individual quotas) in some fisheries.

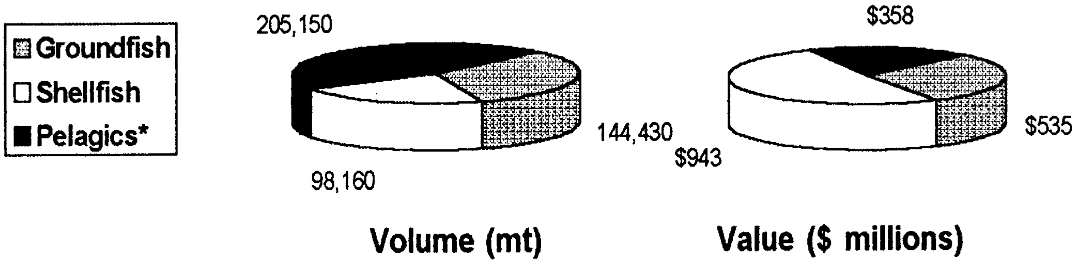
The Atlantic fishery

In 1991, the Atlantic fishery generated employment in the order of 45 000 harvesting jobs and 62 000 processing jobs -- three-quarters of all harvesting and processing jobs in Canada. Atlantic Canada has the country's largest fishery, with total production in 1993 worth over C$1.8 billion.

Stock dependency

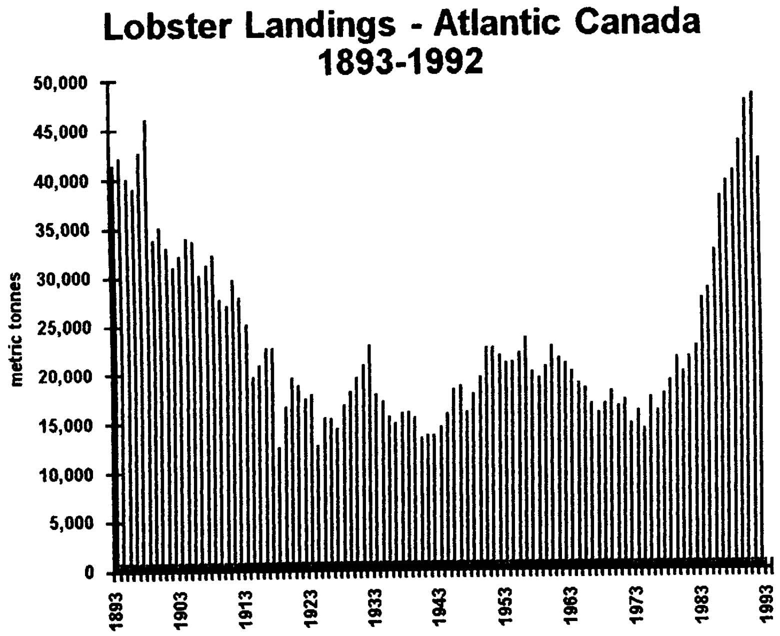
In terms of volumes landed (and employment dependency), ***groundfish*** is the mainstay of the Atlantic fishery, typically accounting for close to 50 per cent of total production volume and value. However, in light of dramatic resource declines, groundfish accounted for only 32 per cent of production volume and 29% of total production value in 1993.

1993 Atlantic Coast Production Volumes and Values



*** Includes small amount of miscellaneous fish products.**

While volumes harvested are low, ***shellfish*** (lobster, crab, scallops, shrimp, etc.,) is very important in terms of value, accounting for 51 per cent of total production in dollar terms. Lobster yields are down somewhat in 1993, following on the heels of several years of record level catches not seen since the turn of the century.



The relative economic importance of fisheries varies by province. Newfoundland and Quebec tend to be very dependent on groundfish, whereas the southern Gulf of St. Lawrence -- PEI in particular -- tends to be much more dependent on shellfish (lobster). New Brunswick is disproportionately dependent on pelagics (e.g. herring), although it also has a substantial lobster fishery.

Nova Scotia, in contrast, has a more diversified fishery, although there are sub-areas that tend to specialise (e.g. Cape Breton's dependence on groundfish).

Given these stock dependency patterns, the impact of recent groundfish declines has been most severe in:

- Newfoundland
- Cape Breton and eastern Nova Scotia from Halifax to Canso
- Gaspé and the lower north shore of Quebec
- the Acadian Peninsula in New Brunswick.

Fleet characteristics

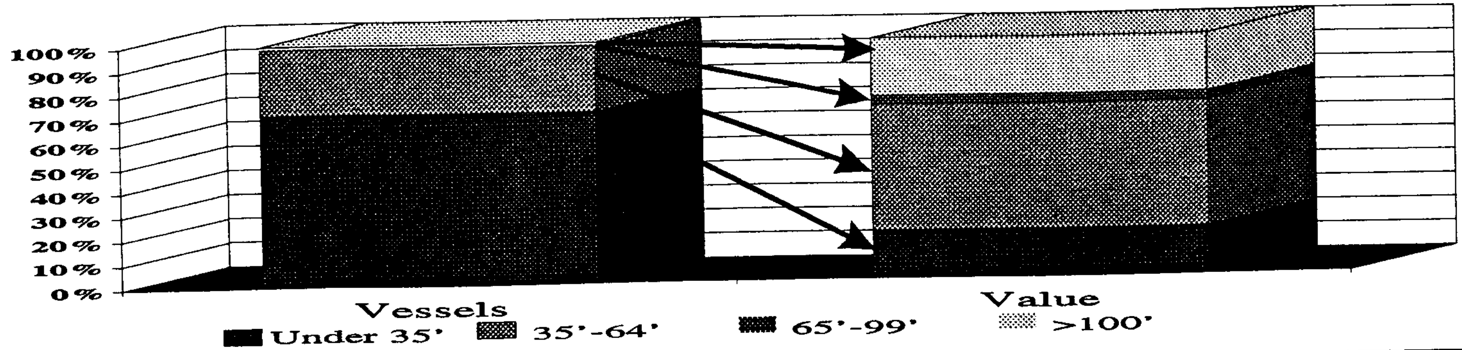
The fleet is usually broken down into ***inshore*** (less than 100') and ***offshore*** (greater than 100') components. Approximately 93 per cent of registered fishers are in the inshore fisheries. The fleet operates seasonally from some 27 000 vessels less than 100 feet in length. The vast majority of these vessels are privately owned.

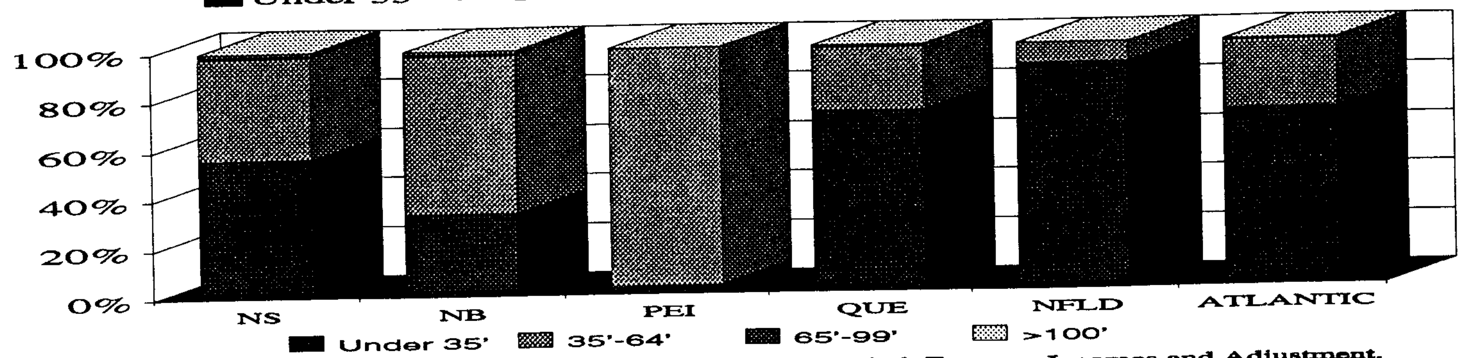
Of this number, 20 000 vessels are less than 35 feet in length. These vessels -- the ***traditional inshore*** fleet -- represent about 70 per cent of all commercial fishing vessels on the east coast and account for 20 per cent of the catch. Two-thirds of all vessels less than 35 feet in length are in Newfoundland. The fleet is very labour intensive, employing traditional fixed gear harvesting technology (traps, handlines, gillnets). Traditional inshore vessels typically fish within sight of land, are usually operated by two or three fishers, and can go to sea only during warmer months. The traditional inshore fleet generally operates in competitive fisheries; that is, there are no individual quotas or catch limits (although they may be limited in the amount and type of gear used).

At the other end of the spectrum is the ***offshore fleet***, dominated by two publicly-held corporations: Fisheries Products International (FPI) and National Sea Products, each with a small fleet of capital-intensive, offshore trawlers and about 25 large year-round plants. As a result of recent groundfish closures, much of this fleet is tied up, and many offshore plants are closed or reduced to operating on a seasonal basis. The vast majority of offshore vessels are based out of Newfoundland and Nova Scotia. Offshore fleets operate under a system of ***enterprise allocations***; basically, these are company quotas.

FPI, National Sea Products and a third vertically-integrated company -- Clearwater Fine Foods -- together account for over 50 per cent of production in the Atlantic fishery.

Distribution of Registered Vessels and Total Landed Value
Atlantic Fleet, 1991





Source: Catch and Effort Summary Database Prepared for Task Force on Incomes and Adjustment.

Between the traditional less-than-35' inshore and greater-than-100' offshore fleets are about 7 600 "***mid-sized***" vessels, 7 500 of which are 35-65 feet in length. Depending on the area, the size of the vessels and gear used, terminology used to describe these vessels can include "inshore", "nearshore" and "midshore". Most of these vessels fish the southern Gulf of St. Lawrence, where mid-sized vessels form the majority of the fishing fleet. About one-third of mid-sized vessels are based in Nova Scotia -- most in the southwest part of the province. Like the traditional inshore fleet, mid-sized vessels tend to be independently owned. Less labour-intensive than traditional inshore vessels, the various mid-sized fleets generally employ either fixed-gear (e.g. longlines) or mobile gear technology (e.g. draggers) to harvest fish. Mobile gear vessels, like their offshore counterparts, generally operate under individual quota systems and harvest higher volumes than the more numerous fixed gear vessels in competitive fisheries. Nearshore and midshore vessels generally have the capacity to travel long distances and fish many of the same areas as large offshore trawlers, except in icy conditions.

Gear sector conflicts

Conflict between gear sectors in the Atlantic fishery is endemic: between independently-owned inshore boats and company-owned offshore vessels, and between fixed gear fishers and mobile gear fishers. There are several dimensions to these conflicts. On one level, gear sector conflicts reflect a basic economic reality that each individual user group is competing to maximise its share of the available and fixed supply of harvestable fish. In this regard, the debate is often cast in terms of the relative economic strengths of each fleet -- jobs (inshore) versus efficiency (nearshore/offshore).

On another level, it reflects tension between traditional community-based labour-intensive fishing methods and more technologically sophisticated, highly mobile and capital-intensive fishing methods. This tension has been exacerbated with groundfish stock collapses, throwing the future of many long-established fishing communities into question.

On still another level, gear sector conflicts arise in debates about the impact of different harvesting technologies on the long-term sustainability of fish stocks. In this context, fixed gear fishers often portray mobile gear technology (i.e. draggers) as being harmful to the long-term sustainability of fish stocks. Mobile gear fishers, in turn, point to indiscriminate fishing practices employed by some fixed gear fishers (e.g. gillnets).

Processing sector

The processing sector consists of some 900 existing establishments, ranging from small chill storage facilities to modern offshore plants. Larger processing operations are technologically sophisticated, producing a wide range of products, including ready-to-serve consumer products developed for the export market. Smaller plants tend to process the landings of fishers from the immediate area, and include freezing, canning, roe processing and curing operations. While larger offshore plants tend to be year-round operations, the more numerous smaller plants tend to be seasonal.

In hundreds of Atlantic coastal communities, processing plants are the only significant source of land-based employment. Atlantic-wide, there are three processing jobs for every two harvesting jobs. This underscores a difference with the Pacific Coast where there are a third ***fewer*** processing jobs than harvesting jobs.

Within Atlantic Canada, however, there are important provincial differences. In Newfoundland, the estimated 30 000 plant workers employed in 1991 was about 50% higher than the number of fishers who worked in the same year. A similar pattern exists in New Brunswick. In Nova Scotia and Quebec, the ratio of plant workers to fishers is more-or-less even. In PEI, there are about three plant workers to every four fishers.

While some of these differences are accounted for by the labour requirements in processing different species, there is nonetheless a significant degree of excess processing capacity on the Atlantic coast.

Employment dependency

While there are over 100 000 individuals employed in the Atlantic fishery, the nature of that employment varies considerably between regions, species, and whether the individual is in the harvesting or processing sector. Variations in the effects of seasonal employment are most evident in processing jobs where, Atlantic-wide, each person year of employment is shared by 2.2 people.

Table 1. Processing plant employment (1991)

	Person years of employment	Individuals employed	Ratio of individuals employed to person-years of work
NFLD	10 900	30 199	2.8
NS	9 836	14 627	1.5
NB	4 174	10 064	2.4
PEI	1 481	2 975	2.0
PQ	1 549	3 650	2.4
Atlantic	27 939	61 515	2.2

In Newfoundland, which accounts for 4 out of every 10 person-years of processing employment in Atlantic Canada and one out of every two processing jobs, almost three people share every person-year of work available in the sector.

In the harvesting sector, Atlantic-wide, there are 64 000 commercial fishers registered with DFO. However, only about 45 000 are "active" fishers, regularly earning at least some fishing income. Of these, about 30 000 are classified as "full-time" or "bona fide" fishers in DFO's licensing system. While definitions vary by region, full-time and bona fide fishers are generally those who spend the better part of the fishing season on the water. Of the 30 000 full-time/bona fide fishers, about 20 000 are license holders in limited entry vessel-based fisheries. This represents about 90 per cent of all vessel-based commercial license holders in Atlantic Canada.

Table 2. Selected fishing employment statistics (1990)

	DFO registered fishers	Tax filers reporting fishing income	"Full-time" or "bona Fide" fishers	Self-employed fishers claiming UI benefits*
NFLD	28 830	16 940	14 355	13 950
NS	15 951	14 600	8 189	8 330
NB	8 494	6 580	2 306	2 940
PEI	5 546	4 430	1 387	2 580
PQ	5 425	3 510	2 982	2 130
Atlantic	64 246	46 060	29 219	29 930

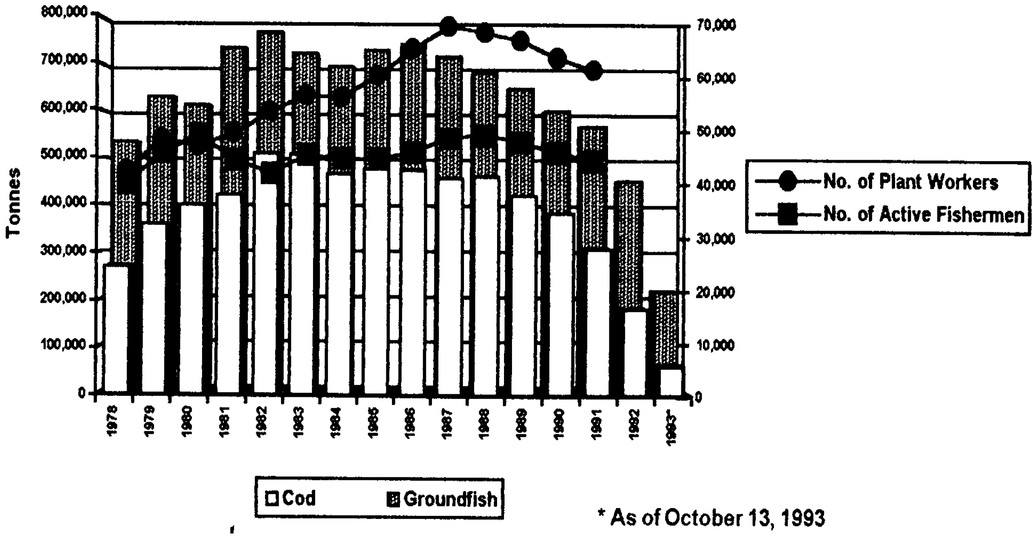
This is not necessarily the same 30 000 who are full-time or bona fide fishers: part-time fishers often qualify for UI. By the same token, there are full-time/bona fide fishers who rarely apply for UI.

As in the processing sector, employment in the Atlantic harvesting sector - particularly the traditional inshore sector -- tends to be seasonal, evidenced by the fact that about 30 000 fishers regularly file a UI claim (either fisher's" or "regular" UI)*.

Excess capacity

Declining groundfish catches, the northern cod moratorium and the recent closure of most major cod fisheries, have highlighted the pre-existing sharp imbalance between the number of individuals who depend on the resource for their livelihood and the ability of the resource to sustain them.

Cod, Groundfish Catches and Jobs in Atlantic Canada 1978-1993



* As of October 13, 1993

In 1992, a Task Force on Incomes and Adjustment in the Atlantic Fishery was established to address the problems of over-capacity and unstable incomes in the Atlantic fishery and to make recommendations to the federal Ministers of Fisheries and Oceans and Employment and Immigration (subsequently renamed Human Resources Development). The Task Force was comprised of industry representatives with broad fisheries, legal and business expertise and worked cooperatively with federal and provincial governments.

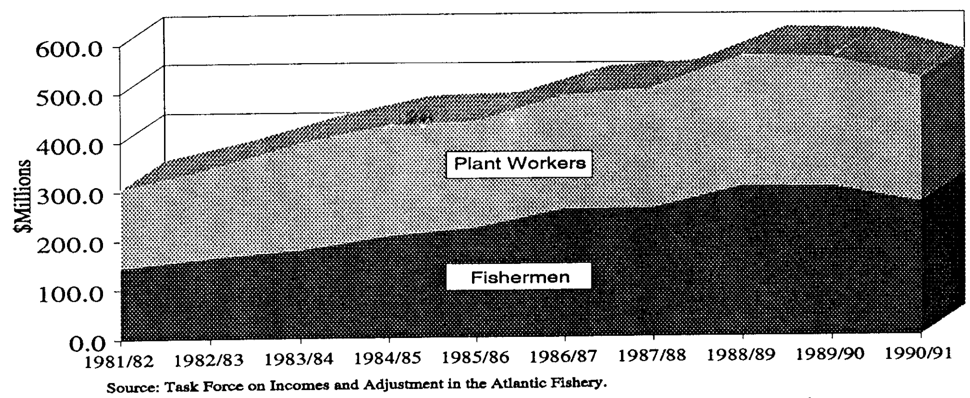
Prior to the northern cod moratorium in 1992 and the more recent fisheries closures in 1993/94, conventional wisdom held that there was substantial excess capacity in both the harvesting and processing sectors. This view was supported by the Task Force on Incomes and Adjustment in the Atlantic Fishery, which concluded that there is roughly 50% excess harvesting and processing capacity in the Atlantic fishery.

A number of factors contributed to the over-capacity situation:

- overly optimistic expectations about the performance of the fishery following the extension of jurisdiction to 200 miles in 1977;
- relatively unrestricted access to the fishery (currently, anyone 16 years of age or older can be registered as a commercial fisherman upon payment of a nominal administrative fee); and
- historic family and community dependence on the fishery, combined with the lack of alternative economic opportunities in those communities (evidenced by high unemployment rates and low labour force participation rates) -- see graphic on next page.

Layered on top of these factors is the structure of the Unemployment Insurance (UI) system. A resource that is unable to generate reasonable incomes for its participants has contributed towards increasing dependence on UI over the past decade. Arguably, the structure of UI in the context of a largely seasonal fishery in areas with limited economic alternatives has served to add to the number of people who now depend on the fishery for their livelihood, in turn, adding to pressures on the resource. In 1990/91, it is estimated that Atlantic fisheries workers received C$525 million more in benefits than they paid in premiums.

Net* Unemployment Insurance Benefits in the Atlantic Fishing Industry (constant $1991)



Source: Task Force on Incomes and Adjustment in the Atlantic Fishery.

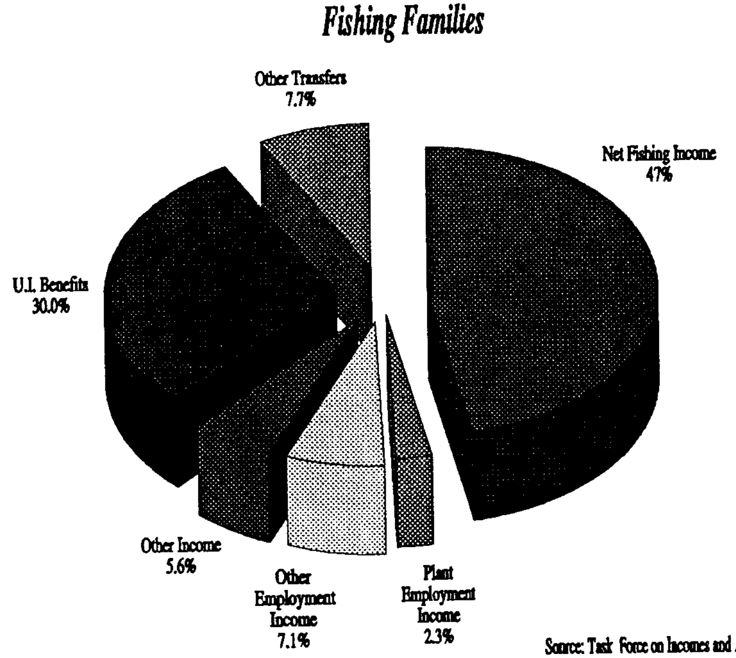
* Premiums paid by and on behalf of fishermen and employees of fish plant companies

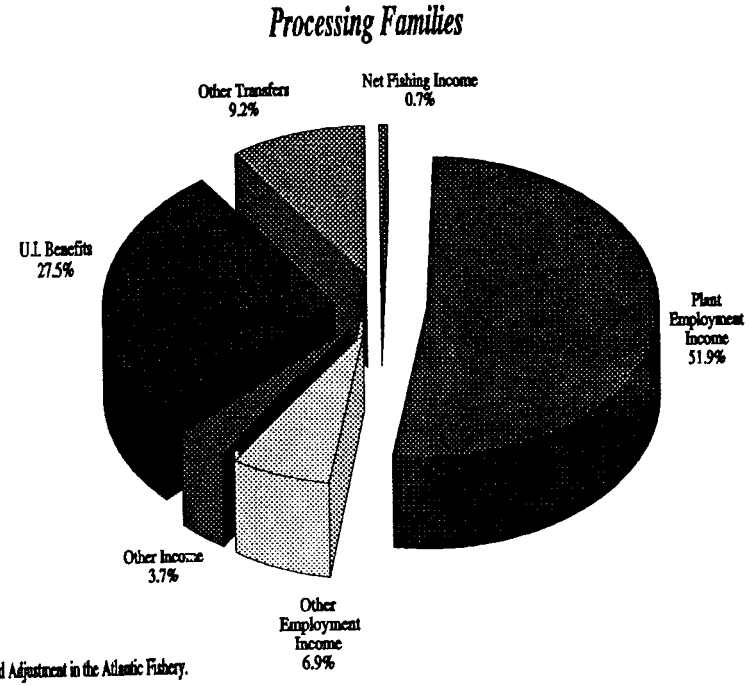
Excess capacity, over-dependence and pressure on the resource inevitably results in the low and unstable incomes characteristic of many Atlantic fishers and plant workers. The "average" income from fishing in Atlantic Canada was about C$12 500 in 1988 (last year for which comparable national data exist). This average, however, masks wide variations in income across regions and between various fleets. In Newfoundland, for example, almost one-half of all full-time fishers had net fishing incomes under C$5 000 in 1988. In contrast, southern Gulf fishers earned an average of C$17 266 while fishers in south-western Nova Scotia earned an average of C$26 752.

On average, Atlantic fishing and processing families depend on UI benefits to provide roughly 30 per cent of their incomes.

Again, however, Atlantic-wide UI-dependency figures mask important regional differences. Before the northern cod moratorium, fishers in Newfoundland, for example, derived over 40 per cent of their incomes from UI, whereas the comparable figure for Nova Scotia is just over 20 per cent -- reflecting both the shorter fishing season in Newfoundland, as well as the extremely high degree of specialisation on groundfish (cod) in Newfoundland.

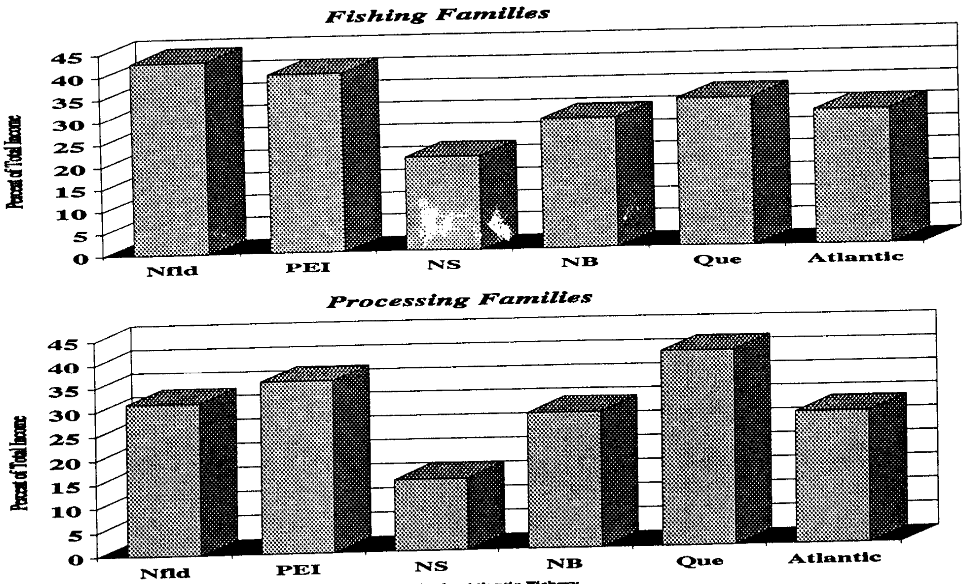
Average Income of Atlantic Fishing and Processing Families by Source of Income, 1990





Source: Task Force on Incomes and Adjustment in the Atlantic Fishery.

Unemployment Insurance Benefits as a Percent of Total Atlantic Fishing and Processing Family Income, 1990



Source: Task Force on Incomes and Adjustment in the Atlantic Fishery.

Existing responses to groundfish declines

Dependence on government transfers has increased with the downturn in groundfish stocks.

The Northern Cod Adjustment and Recovery Program (NCARP) was introduced following the moratorium announced in July 1992. The program had two basic objectives:

- address the immediate income needs of affected fishers and plant workers; and,
- stimulate adjustment through license retirement, early retirement and training opportunities.

The income replacement component of NCARP paid bi-weekly benefits to about 19 000 individuals out of a potential 26 000 affected fisheries and plant workers.

The Atlantic Groundfish Assistance Program (AGAP) was introduced in the spring of 1993 to respond to the large catch reductions announced for 1993. The program was subsequently expanded to include fishers and plant workers displaced by fisheries closures announced in the fall of 1993. AGAP was less comprehensive in scope than NCARP: the focus was on short-term income replacement through temporary job creation projects (known as Job Development Projects).

The distinguishing feature of AGAP was the Transitional Fisheries Adjustment Allowance (TFAA) which supplemented UI benefits earned as a result of Job Development projects administered and funded by the federal Department of Human Resources Development (HRD). TFAA -- a DFO program administered with HRD -- ensured that combined benefit levels from UI and DFO were comparable to those under NCARP. While the program was structured to provide assistance to over 10 000 individuals, many qualified for UI before fisheries closed in the fall of 1993.

Both NCARP and AGAP/TFAA terminated on May 15, 1994. In light of further fisheries closures and declining groundfish stocks about 30 000 plant workers and fishers were estimated to be without work and without sufficient skills to find other employment after May 15, 1994.

Consequently, The Atlantic Groundfish Strategy (TAGS), the successor program to NCARP and AGAP, was developed and implemented on 16 May 1994. TAGS is a comprehensive C$1.9 billion five-year program that is designed to provide:

- adjustment measures for individuals, administered by HRD; and

- significant capacity reductions and industry restructuring, to be administered federally by the Department of Fisheries and Oceans and HRD.

Following consultations with provinces and industry, the Minister of Fisheries and Oceans proposed that capacity reduction would be most effectively achieved through the establishment of industry renewal boards to administer the industry reduction process in a balanced, coordinated manner and provide all stakeholders with the opportunity to be actively involved.

Among the most significant challenges to adjustment in the Atlantic fishery are the age and education levels of affected individuals. Almost three-quarters of Atlantic fishers are between 25 and 54 years of age and have been out of school (or in the fishery) for at least ten years. In this regard, fully 75 per cent of Atlantic fishers left school to enter the fishery before receiving a high school diploma, leaving them ill-equipped to find work elsewhere. That said, the experience under NCARP and AGAP was encouraging given that a large majority of the clients opted for training and skills upgrading courses. This is expected to continue under TAGS.

The Pacific fishery

Pacific fisheries products accounted for about 30 per cent of the total value of Canadian fish products in 1993. Salmon is the mainstay, followed by herring roe. In addition to gear-type restrictions, regulating openings and closings are the principal tools used to control effort in both fisheries.

Regional importance of the fishery

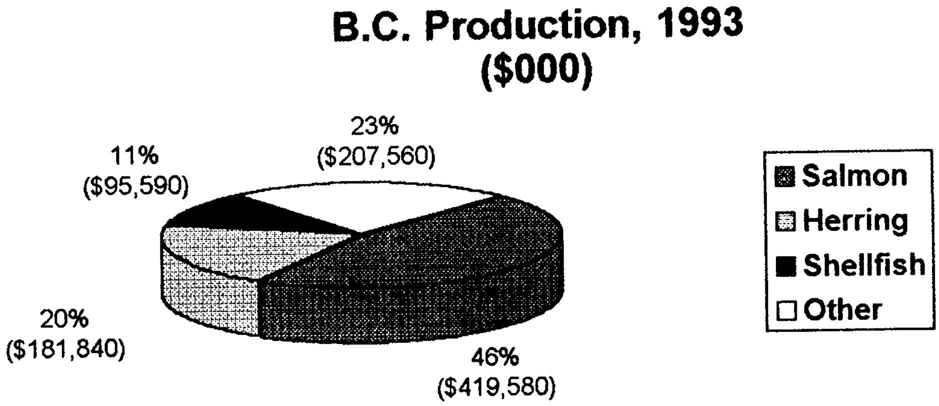
Fishing activity is concentrated around the lower mainland and Prince Rupert. More than half of British Columbia's fish processing jobs are concentrated in the Vancouver area. However, as a proportion of local economic activity, the industry is relatively more important for Prince Rupert and other small coastal communities. The harvesting sector is composed largely of 4 500 active vessels under 100 feet in length. Processor ownership or financial control over segments of the fleet is significant.

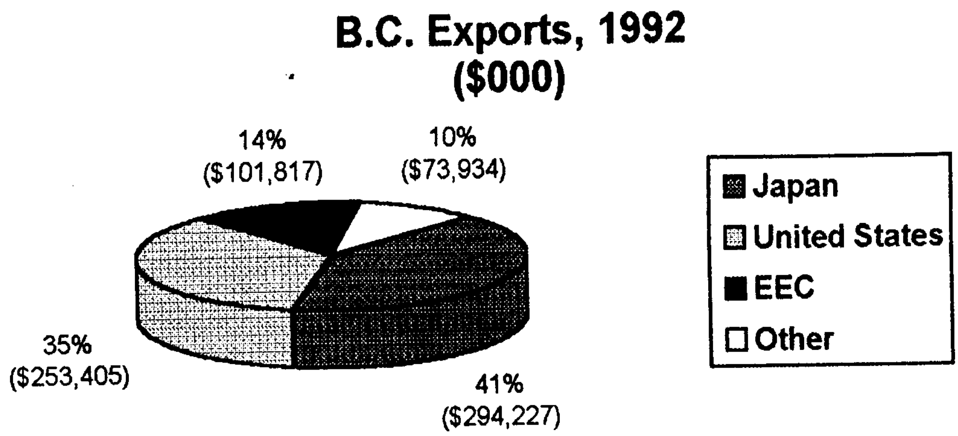
Processing sector

Processing occurs in about 200 plants, most of which are seasonally operated. Ownership in the processing industry is highly concentrated in four major companies: B.C. Packers, McMillan Fisheries, Canadian Fishing and Ocean Fisheries, which together processed about 60 per cent of B.C. salmon in 1989.

Harvesting sector

There are about 13 500 active commercial fishers and 9 400 fish plant workers in B.C. The value of fisheries production was C$905 million in 1993. The production value of B.C. farmed salmon accounted for another C$245 million in 1993. In 1993, salmon and herring accounted for about 66 per cent of the total value of production. Canned salmon accounts for almost 50 per cent of the salmon output value. Pacific herring is primarily a roe fishery, where frozen roe typically accounts for over 90 per cent of production value.





User group conflicts

While different technologies prosecute the salmon and herring fisheries, conflict between fleet sectors is not as pervasive as on the Atlantic coast. However, highly charged conflict arises in allocations between the commercial fishery and the other principal user groups: Aboriginals and recreational fishers.

In this regard, the British Columbia fishing industry is characterised by a high degree of Native participation. About 20 per cent of all commercial salmon licenses are held by Natives. Their share of the commercial catch is estimated at about 25 per cent.

The 1990 landmark Supreme Court of Canada decision in R. v. Sparrow set the stage for a redefinition of the government's relationship with Aboriginal people regarding Aboriginal fishing. Sparrow recognised for the first time that Aboriginal people have a **constitutional right to fish** for food, social and ceremonial purposes. It held that the Department of Fisheries and Oceans (DFO) had to accommodate this right in priority to allocations to other harvesters and that it had to consult with Aboriginal peoples before making any decisions on resource allocations affecting them.

Sparrow exacerbated long-standing tensions between Native and non-Native harvesting sectors which each year during the fishing season have threatened to break out in violence and intense competitive positioning. The Sparrow decision presented DFO with an immediate necessity to manage a partially defined and evolving Aboriginal right, pending final resolution of the issue through the comprehensive claims process or further court judgements.

The Aboriginal Fisheries Strategy (AFS) -- C$140 million over seven years -- represents the federal government's response to Sparrow. The AFS is designed to offer stability to all fisheries stakeholders while gradually moving towards a greater Native role in fisheries management and harvesting while maintaining overall Ministerial responsibility. Beyond ensuring the Aboriginal right to fish, the AFS provides economic development and employment opportunities in Native communities while, at the same time, seeking to minimise conflict and disruption in the fisheries by involving all stakeholders in its implementation.

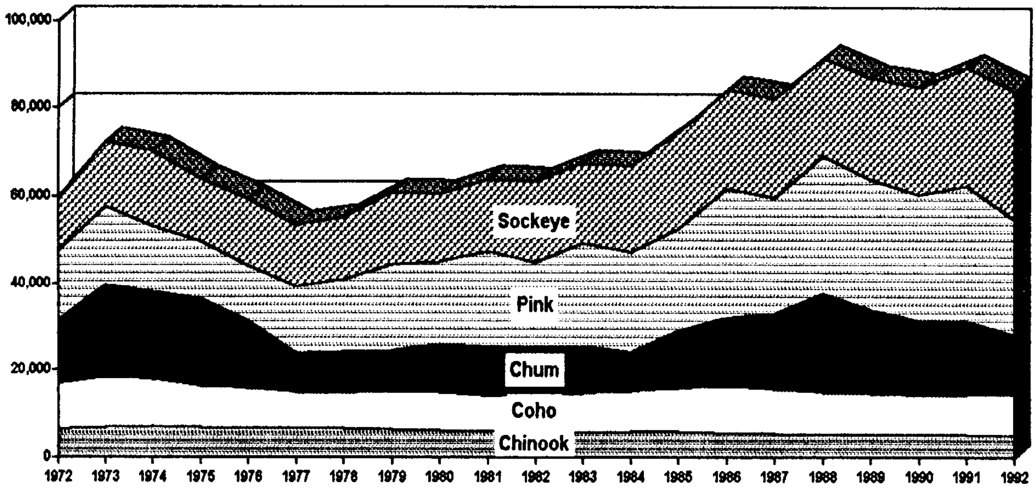
Excess capacity

1993 was a year of mixed results for the British Columbia fishing industry. Despite the fact that Pacific salmon catches were still quite high by historical standards, the B.C. processing industry has experienced negative returns in recent years due to depressed world salmon prices, a high cost structure and competition from other global suppliers. While not as severe as on the Atlantic Coast, there is growing recognition that excess capacity and over-capitalisation are significant problems in the B.C. industry. This is reflected in the fact that harvesting returns are down and processors are incurring significant losses.

That said, income levels in the Pacific industry are still considerably higher than in the Atlantic. The "average" income from fishing on the west coast was C$28 000 in 1988 (last year for which comparable national data exist). This is more than double the income levels on the Atlantic coast. Still, 47 per cent of fishers earned less than C$10 000 in 1988.

Commercial Salmon Landings in British Columbia
1972-1992

Four Year Moving Average
(tonnes)



Freshwater fisheries

Canada's freshwater fisheries are concentrated around the Great Lakes and in central and northern Canada. In 1992, freshwater landings totalled over 38 000 tonnes with a total value of C$160 million. A wide variety of freshwater species are processed, including whitefish, pickerel, northern pike and sauger.

The Freshwater Fish Marketing Corporation has the monopoly over sales of freshwater fish in the Prairie provinces, arising from matching federal and provincial legislation.

The United States is the major market for Canada's freshwater species, followed by Europe and Japan.

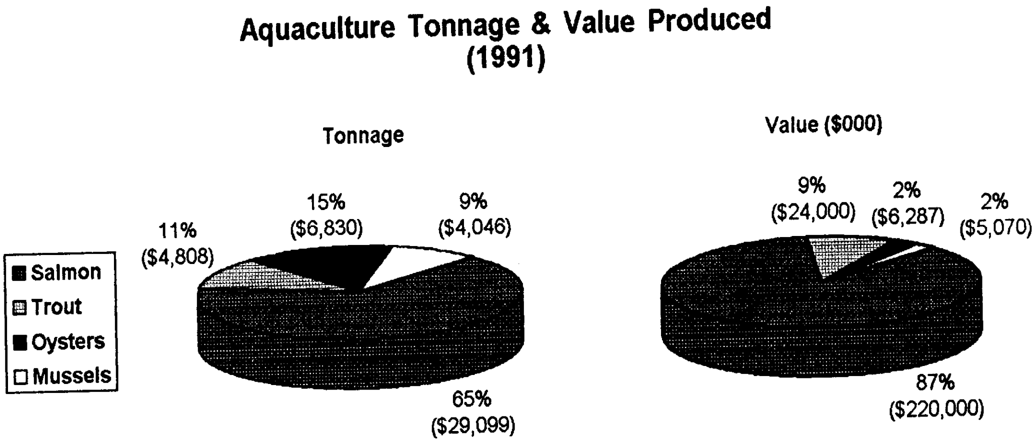
Aquaculture

Aquaculture, in Canada as in a number of other countries, has developed fairly recently and in direct response to economic forces; namely, increases in the world demand for fish products and the inability of traditional fishing fleets to satisfy all of this demand. All important groundfish and shellfish stocks world-wide are either fully exploited or overfished.

World-wide, farmed species (mainly shrimp, salmon, catfish and Asian local species) now account for some 15 per cent of global fishery output.

While still accounting for a relatively small proportion of domestic fish production, aquaculture has been growing rapidly in Canada. In 1984, the total farm gate value of aquaculture was C$7 million. By 1991, production had increased to C$260 million, of which 98% was generated by four principal species: salmon, trout, oysters and mussels. Farmed salmon in B.C. is particularly important - in 1993, it accounted for over a third of the value of all salmon produced in B.C. Almost 80 per cent of total production is destined for export markets.

markets.



The aquaculture service sector (e.g. feed, equipment, etc.) accounts for an additional C$265 million in annual revenues.

Commercial aquaculture production takes place across Canada:

- trout production is primarily concentrated in the central provinces (especially Ontario);

- salmon and oyster production takes place in British Columbia and New Brunswick; and

- mussel production is concentrated in Prince Edward Island.

In the salmon sector, which constitutes the largest component of the industry, Atlantic salmon are beginning to overtake Pacific salmon (Chinook and Coho) as the principal species on both the Atlantic and Pacific coasts. Rainbow trout remains the dominant species throughout central Canada, although small quantities of Arctic char are being marketed.

In 1991, commercial aquaculture provided more than 5 200 jobs -- some 2 800 in the production sector and 2 400 in supply and services.

With the rapid growth in aquaculture, regulatory and support initiatives have emerged from a number of government departments and agencies, each with different mandates and capabilities. In this context, the key issue for industry is the need for a coordinated and targeted approach to aquaculture development.

Recreational fishing

About five million Canadians and one million non-residents engage in recreational fishing each year in Canada. While difficult to quantify with precision, it has been estimated that recreational fisheries generate up to C$7 billion in economic activity annually and support over 150 000 full-time jobs.

About 90 per cent of recreational fishing takes place in freshwater, concentrated around population centres. Anglers pursue about 50 freshwater species, notably trout, walleye, northern pike, bass, smelt and perch. Ocean angling is most developed on the west coast, with four salmon species and rockfish comprising the lion's share of the action.

Salt-water species are managed federally. Management of anadromous fish -- which live at sea but spawn in rivers, e.g. salmon -- is shared with provinces. Freshwater fisheries management, for the most part, is handled provincially. In 1992-93, the federal government signed C$100 million in multi-year agreements with the four Atlantic Provinces aimed at fostering development of the recreational fishery through conservation and rebuilding of key stocks, improved sportfishery management, restoration of habitat, infrastructure development, raising public awareness and tourism promotion.

A key component of this program involves the retirement of commercial salmon licenses in Newfoundland and Labrador, at a cost of approximately C$40 million. This initiative serves to reduce pressure on the resource, provide financial compensation to affected fishers and lays the groundwork for the development of the salmon recreational fishery in Newfoundland -- a sector with significant growth potential in areas where economic development opportunities are often limited.

In the Pacific Region, key initiatives include the development of commercial salmon harvest management plans which are mindful of the need to protect and rebuild wild stocks of key sportfish species such as coho, steelhead and chinook. Habitat restoration is also a key focus.

Key client groups with an interest in federal recreational fishery initiatives include:

- domestic and international tourists/anglers;
- fish and wildlife conservationists;
- outfitters and suppliers of angling-related equipment; and
- communities dependant on recreational fishery/tourism.

2. Management of Canadian fisheries resources[1]

Canada's marine fisheries have historically been troubled by recurrent crises. This, due to the common property nature of the commercial fishery and also to the natural fluctuations in the environment, market conditions and in the resource itself. Over the past few decades, Canadian fisheries managers have instituted a complexity of regulations and policies to conserve fish stocks and, at the same time, alleviate conflicts that arise between user groups which have a vested interest in the exploitation of fisheries resources.

This section describes the various fisheries management techniques adopted to manage Canadian fisheries resources and provides a brief summary of the impact these management instruments have had on the industry. The first part focuses on the Canadian Atlantic groundfish industry. This narrower study of the industry is particularly relevant in light of the recent dramatic declines in Canada's most important fisheries resources. The second part provides an overview of limited entry and rights-based fisheries on the Pacific coast.

The Atlantic groundfish industry

Resource management

Modern management of the Atlantic fisheries began with the establishment of the International Commission for the Northwest Atlantic Fisheries (ICNAF) in 1949. Prior to the establishment of the ICNAF, there existed restrictions within Canadian waters on the various types of gear which could be used to harvest fish and local area closures were used to alleviate gear conflicts.

In 1953, the ICNAF introduced the first mesh size regulations. Some 20 regulations pertaining to mesh size and trawl construction were introduced during the first 15 years of the Commission. It was postulated that the impact of these regulations led to an increase in fishing effort in the groundfish industry. During the 1960s, fishing effort and fishing mortality increased rapidly even in areas where there were minimum mesh size regulations. It was clear that the anticipated benefits of mesh size regulations were not achieved as a result of the dramatically increased fishing effort and declining catch rates. By the mid 1960s, the ICNAF Standing Committee on Research and Statistics (STACRES) realised that the amount of fishing needed to be controlled by other means. The ICNAF agreed, in 1969, to global Total Allowable Catches (TACs) for haddock on the southern Scotian Shelf and Georges Bank. In 1973, the ICNAF adopted catch quotas for most of the major groundfish stocks in the Canadian Atlantic.

The TACs established by the ICNAF were based on fishing at Fmax or Fmsy depending on whether the stock was assessed with a yield per recruit model or general production model. Individual countries were required to enforce their national allocations set by the ICNAF. However, the enforcement measures undertaken by member countries were inadequate and catch rates continued to decline. In addition, stock assessments were limited by insufficient data as a result of inaccurate catch reports and time lags in acquiring data. The use of MSY as a reference point for setting TACs also did not provide a sufficient safeguard against assessment errors resulting from these factors.

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[1] The historical information and description of events for this section of the paper draws heavily on the book "**Management of Marine Fisheries in Canada**", by L.S. Parsons, 1993.

In order to address the problem of declining catch rates, Canada sought combined catch and effort regulations at the ICNAF in 1975. At the meeting of the Commission, Canada proposed a 40% reduction in fishing effort by non-coastal states. In 1976, in part as a result of Canada's efforts, the ICNAF adopted a 40% reduction in effort of non-coastal states in combination with stock specific quotas. During the same year, Canada secured agreement on TACs at the F0.1 level rather than Fmax which significantly reduced the TACs for most groundfish stocks.

The United Nations Convention on the Law of the Sea (UNCLOS) prompted Canada in 1977 to unilaterally declare an exclusive fisheries management zone and extend its jurisdiction over the fisheries resource to 200 miles. Within the 200 mile zone, Canada implemented a system of licensing and effort controls in co-ordination with individual stock quotas for foreign fishing. Following the extension of jurisdiction, Canada continued to use the TAC/allocation approach, maintained mesh size regulations, and implemented more rigorous fishing effort controls on foreign fleets fishing in Canadian waters.

Allocation of access

The introduction of national allocations of global quotas in the ICNAF was a major step toward mitigating the destructive effects of open access to fish resources. Once TACs were established by the ICNAF for a particular species and divided into national allocations, it was the responsibility of each country to decide how access should be controlled across each of its allocations.

With significant reductions in ICNAF-set TACs for stocks on the Grand Banks and Scotian Shelf, in addition to lower TACs for important groundfish stocks in the Gulf of St. Lawrence, there were widespread concerns that there was insufficient quota for the Canadian offshore fleet to operate year round. The extension of jurisdiction in 1977 fostered some hope that the groundfish fisheries of the Grand Banks would allow for expansion of Canadian effort in the long-run. At the time, the prospects for major groundfish fisheries of the Atlantic Coast were varied:

- slow growth: the Gulf, Scotian Shelf and Grand Banks;
- decline: fisheries of the Gulf entrance;
- sustainable growth: cod stocks of north-eastern Newfoundland (2J3KL).

This imbalance in groundfish resources led to a dramatic shift in fishing strategy of the Canadian offshore trawler fleet. In 1977, federal fisheries managers developed the first Atlantic Groundfish Management Plan to attempt to distribute stocks within an overall TAC. The Plan resulted in significant reductions for the Gulf and Scotian Shelf trawler fleets. The distribution of quotas under the Plan resulted in an overall northward shift in fishing effort by the offshore trawler fleet. This, as a result of incentives provided in the Plan for offshore trawlers to fish northern cod in the winter and which were intended to balance conflicting interests of stakeholders. At the time, approximately C$4.5 million was provided to fish in northern areas and under-utilised species in traditional fishing areas. The imbalance of fish resources, in combination with harvesting incentives provided under the Plan were the primary forces that introduced offshore Canadian fishing for northern cod.

In light of slower than anticipated growth of major Atlantic groundfish stocks, the debate intensified over the allocation of access to Atlantic groundfish resources including the division of allocation between the inshore and offshore sectors.

Inshore/offshore split

Canadian offshore trawler companies often argued that there had been a considerable bias in allocation to the inshore fleet following the extension of fisheries jurisdiction. In the decade following the Canadian declaration of a 200 mile exclusive fishing zone, the percentage share of catch harvested by offshore vessels averaged about 45%. But for a few exceptions, this proportional share for the inshore and offshore sectors changed very little in the annual Groundfish Management Plans from 1977-1986. One notable exception was the share of the total Canadian cod catch for the offshore fleet which increased steadily from a low of 18% in 1975 to 42% in 1986.

With few exceptions like northern cod, the inshore/offshore shares for groundfish stocks were determined annually on an ad hoc basis after the extension of fisheries jurisdiction. However, this changed in 1981 for stocks other than northern cod. Harvesting capacity in the inshore fleet was sufficient to exceed allowances in most years. This led to TAC overruns and additional pressures to reduce the share of TACs allocated to the offshore fleet. Once quotas were implemented in the inshore fisheries, further measures were introduced to prevent inshore mobile gear vessels (<65') from moving to other areas after taking their local quotas. The threat of these vessels moving out of local areas led to the introduction of *sector management* in 1982.

Under sector management, vessels under 65' were limited to within three geographical areas in order to better regulate the harvesting operations of the fleet. Sector management recognised the contrasting needs of the inshore groundfish sector. Provisions for historical overlap were included in the policy so that vessels could maintain traditional fishing patterns as much as possible.

Northern cod

The northern cod stock is fished on the offshore banks during the winter months as the fish congregate prior to spawning. The stock is harvested by fixed gear when it migrates to the inshore in late spring and early summer to feed. Reported catches of northern cod peaked in 1968 at 800 000 tonnes. TACs were first introduced by the ICNAF in 1973 at approximately 650 000 tonnes and reduced to 160 000 tonnes by 1976 corresponding to the F0.1 reference level. Stock abundance began to increase in 1977: catch rates in the winter offshore fishery increased significantly from 1 000 tonnes in 1975 to 45 000 tonnes in 1980; and inshore catches increased from 34 000 tonnes in 1974 to 90 000 tonnes in 1979. The higher catch rates fuelled expectations for greater stock abundance in the future.

With the anticipated increase in stock abundance over the next several years, the Canadian offshore fleet attempted to acquire a greater share of the TAC for northern cod. The 1982 Kirby Task Force on the Atlantic Fisheries assumed the TAC would reach 380 000 tonnes in 1987. One major recommendation of the Task Force was that the inshore/offshore allocations not be increased proportionately to anticipated increases in the TAC. Instead, a substantial proportion of the growth was allocated to supply resource-short plants in the off-season and support the development of the Scandinavian longliner fleet. The overall objective was to reduce the seasonality of processing activities along the north-east coast of Newfoundland. However, the anticipated increase in the northern cod stock did not materialise and the debate regarding the inshore/offshore split continued.

Industry renewal

In light of the recent serious decline of Atlantic groundfish stocks, the federal Department of Fisheries and Oceans has implemented a number of significant changes in the way the resource is managed. Following scientific advice in 1992 that indicated the spawning biomass for northern cod was at historically low levels, the federal Minister of Fisheries and Oceans declared a two-year moratorium on the harvesting of the stock. In 1993, scientific advice indicated the northern cod stock continued to decline and that there was evidence of serious decline in other major Atlantic groundfish stocks. This prompted the Minister of Fisheries and Oceans to close almost all of the major groundfish fisheries for a minimum of one year to several years for some stocks and indefinitely for other stocks including northern cod.

Industry adjustment programs (e.g. NCARP, AGAP, TAGS) were developed to address the immediate income needs of those affected by the downturn in the fishery and to promote adjustment through the availability of license and early retirement programs, and training and skills upgrading courses for employment outside the fishery. These programs were developed with advice and co-operation from industry and provincial governments.

In addition to these programs and management measures, the federal Minister of Fisheries and Oceans also announced the establishment of the Fisheries Resource Conservation Council in 1992. Created as a partnership among government, the scientific community and industry, the Council brings together fisheries and scientific expertise to make formal recommendations to the Minister on TACs and conservation measures for the Atlantic fishery. The Council also advises the Minister on scientific research and assessment priorities and methodologies. It replaces two advisory and consultative bodies, the Canadian Atlantic Fisheries Scientific Advisory Council, and the Atlantic Groundfish Advisory Council.

Limited entry licensing

Fishing licenses were first introduced in Canada as a fisheries management instrument in post-confederation years. It was not until the 1960s that limited entry licensing became widely accepted as a fisheries management technique. Limited entry can be described as any control of fishing that curtails or restricts the addition of fishers, fishing vessels, or equipment. In the Canadian fisheries, licensing remains the major instrument for limiting entry.

Atlantic fisheries

During the 1950s and 1960s, the primary fisheries policy focus was to develop the groundfish fleet and, in particular, the offshore trawler fleet. This policy thrust changed the size and composition of the Canadian fleet. Declining catch rates in the inshore cod fisheries from the late 1950s onward resulted in a decline in vessels under 10 tonnes. In effect, inshore fishers either left the industry or adapted to larger vessels. This is evidenced by the fact that the number of Atlantic inshore fishers declined from 49 000 in 1965 to 39 000 in 1973. During the same period, the number of near-shore, mid-shore and offshore fleets increased.

Evolution of limited entry controls

Prior to 1973, offshore trawlers and draggers and Danish Seiners were required to obtain fishing licenses but there were no restrictions on entry to these fisheries. As concerns about the rapid expansion in the catching capacity of the Atlantic fleet intensified, the federal government established a Licensing Policy Review Committee to review existing licensing arrangements and develop new policies.

In November 1973, the federal Minister of the Environment announced a new fishing fleet development policy for Eastern Canada; the primary objective of which was to match fleet size to fish stocks. Elements of the new policy included:

- registration of all commercial fishing vessels;
- licensing of all operators of fishing vessels;
- requirement of entry permits for lobsters, scallops, salmon, herring and snow crab.

Subsequent to the announcement of the new policy, the number of offshore trawlers was frozen and entry into the offshore fishery was restricted. Licenses were introduced for fixed gear fisheries in the Maritime provinces in 1974 but entry controls were not rigorously applied. Over the following seven years, similar measures were adopted for other groundfish fleet components:

1976: licenses for otter trawlers <65' were limited.
1978: moratorium placed on entry to groundfish fishing by vessels <65' in the Gulf and southern Newfoundland.
1979: moratorium relaxed to allow entry to vessels using baited gear only.
1980: freeze on entry of inshore vessels across the Atlantic coast.
limit placed on the issuance of otter trawl licenses for vessels <65' in NAFO area 2J3KL;
complete freeze on personal commercial fishing licenses.
1982: all Atlantic fisheries were placed under limited entry.

As a further measure to address the over-capacity problem, the federal government increased licensing fees significantly in 1981/82. This deterred a number of marginal participants from continuing in the fishery: the number of fishing licenses issued decreased from 35 000 in 1980 to 28 500 in 1981. In addition, the ratio of full-time to part-time licenses indicated that the increase in the apparent numbers in the inshore fisheries in the late 1970s was weighted heavily by the number of licenses issued to part-timers.

As part of the measures to address the influx of additional people and vessels, a reserve bank was developed, in 1980, for licenses which had been issued for vessels that were subsequently retired from the fishery. This new policy allowed the replacement of active vessels in which a single vessel could replace 2 or more vessels provided the length of the single vessel did not exceed 80% of the combined length of the replacement vessels. However, fishers circumvented the length ceilings by building wider vessels. This practice led to the development of a new fleet of jumbo vessels 45-65 feet in length.

Recognising that the over-capacity problem still persisted, particularly in the small vessel fleet, the Canadian Department of Fisheries and Oceans revised its groundfish vessel replacement policy in 1981. The revised policy restricted the replacement of vessels longer than 35' to a foot-for-foot, hold-for-hold basis. This policy was later modified so that vessels between 35' and 65' could be increased within five-foot intervals (i.e. 35'-39'11", 40'-44'11", etc.). Vessels between 65' and 100' could be replaced on a foot-for-foot basis with a 5% tolerance factor. In addition, the hold capacity of any replacement vessel 35' and over could not exceed that of the vessel it was replacing by more than 10%. For vessels less than 35', replacements could not exceed 34'11".

The Department of Fisheries and Oceans conducted a review of the vessel replacement policy with regard to the effectiveness in restricting the growth in harvesting capacity. The following is a sample of the findings in the review:

Gulf Region: The average overall length of vessels in the <65' range increased by 10%. The number of vessels declined by some 30%. This decline was accounted for primarily by vessels in the <35' class.

Newfoundland Region: The number of registered vessels decreased with all of the decrease accounted for by part-timers. The number of vessels operated by full-timers increased by 4% almost entirely within the <35' class.

Scotia-Fundy Region: The number of vessels licensed to fish groundfish declined between 1982 and 1986. The average length of vessels remained about the same.

The 1987 study noted that, while the 1981 groundfish vessel replacement guidelines had allowed a modest increase in the size and capacity of fishing vessels, it also permitted increases in effective capacity as a result of improvements in vessels, equipment and fishing gear.

By 1985, the Department of Fisheries and Oceans sought to clarify and standardise licensing policies for the various Atlantic fisheries. Following numerous internal discussions and consultations with industry representatives, the department issued a Proposed Licensing Policy document in 1988. The following year the Minister of Fisheries and Oceans issued the Commercial Fisheries Licensing Policy for Eastern Canada. While the Policy included many licensing practices which were already in effect, it also used licensing to pursue a broad range of conservation, economic and social objectives.

Managing the common property - individual quotas

The Department of Fisheries and Oceans initially considered the use of individual quotas to manage the fisheries because the input controls that were being employed (i.e. limited entry licensing and vessel replacement rules) only addressed the symptoms of the common property problem rather than the cause. As discussed above, in the early 1970s, the ICNAF had established national quotas to apportion international TACs and end the race for fish among countries for the available TAC. It was conceived, therefore, that individual quotas might end competition among user groups at the national level.

The offshore Atlantic groundfish industry - introduction of the enterprise allocation program

The first significant introduction of enterprise allocations in the offshore groundfish industry was during the period 1982 - 1984. One of the principal motivations for the program was the offshore northern cod fishery in which the quota was caught in a period of 6 - 7 weeks. Because of the intense competition for the resource in the offshore groundfish fishery, DFO developed a proposal for company quotas in 1981. In 1982, the four major offshore companies agreed to a set of principles to introduce enterprise allocations on a trial basis.

The success of the trial program initiated in 1982 led to a successor five-year program during the period 1984-1988. This enterprise allocation program was built upon the principles established in 1982 but with several new elements:

- the establishment for the first time of inshore/offshore shares on a percentage basis;
- the establishment of enterprise allocations as a percentage of offshore quotas rather than as absolute volumes.

This new program resulted in allocations for 9 major species, 34 stocks and 18 companies with a total of 200 EAs. In 1986, the program was modified to include the introduction of access fees to replace the existing individual licensing fee system. The vessel licensing fee system that was used at the time did not relate either to the value of the EA the company was entitled to fish or to the economic rents that the EA might generate. The new access fee was based on the value of the EA a company was entitled to fish. Species were assigned an index value relative to that assigned to cod. A predetermined value to be collected was set and the access fee for each company was calculated by the following formula:

$$\frac{|\{EAs \times Is\}|}{|\{EAt \times Is\}|} \times V$$

where EAs = the sum of allocations (tonnes) of species S;
Is = index number for species S;
EAt = the total allocations (tonnes) of species for all companies; and
V = the predetermined value to be collected.

The amount to be collected in access fees in 1986 was set at C$289 300 which was equal to the amount paid in licensing fees the previous year. By 1988, this increased to C$2.1 million as part of the government's cost recovery program. In 1991 and 1992 the amount to be collected declined to about C$1.4 million as a result of the decline in groundfish stocks.

Impact of the EA program

The precise impact of the program is difficult to assess given that other economic and environmental factors also affected the industry during the period. These included increases in groundfish prices, declining interest rates, declining fuel prices, favourable exchange rates, changes in the geographic availability of the resource and the restructuring of the offshore industry. It is accepted however, that the EA program improved practices by offshore companies. The program successfully mitigated the race for fish by removing the incentive on the part of the offshore companies to maximise their share of the offshore quota. This is evidenced, in part, by the reduction in the number of offshore fishery closures throughout the trial period. In addition, the companies acquired more flexibility with regard to harvesting their allocation during a given year. This increased flexibility in harvesting practices resulted in a more consistent distribution of landings throughout the year and a more consistent supply of groundfish to the market.

The EA program also played a significant role in fleet rationalisation through improved trawler utilisation, vessel modernisation and capacity reduction. For example, between 1982 and 1988, the offshore groundfish fleet decreased from 140 vessels to 129 and overall fishing effort (total annual fishing days) decreased by 10%. Even more importantly, these downsizing activities occurred during a period of favourable market conditions that otherwise would have promoted overcapitalisation. The companies involved in the program became more market driven as opposed to being motivated by volume; this, as a result of a more uniform utilisation of fish processing capacity and the integration of harvesting with processing and marketing operations.

The success of the EA trial program was largely a result of:

- extensive consultations between the federal and provincial governments and industry;
- industry's recognition that a new approach to managing the offshore groundfish fishery was required;
- the over-capacity problem in the offshore fishery at the time was not overly imposing; and,
- there were a relatively small number of participants.

The success of the 1984-1988 EA trial program and the support it received from the industry prompted the Minister of Fisheries and Oceans to adopt the EA system on a permanent basis in 1989.

The Western Newfoundland inshore otter trawl fleet

The first trial IQ program in the inshore groundfish industry was based in ports along the west coast of Newfoundland. The two major cod stocks off the west coast of Newfoundland in the Gulf of St. Lawrence, 4RS3Pn in the northern Gulf and 4TVn in the southern Gulf. The cod stocks are fished in the northern Gulf primarily in the spring and summer and in the southern Gulf during the winter.

The inshore otter trawl fleet in Newfoundland is comprised of about 100 vessels 40'-65' in length. During the period 1984 - 1989, the cod fishery for this fleet was managed under an EA system and quotas elsewhere in the Gulf for this fleet were fished competitively. Prior to the introduction of EAs in 1984, the Gulf inshore otter trawl fleet was involved in a highly competitive race for the fish. A flurry of harvesting activity usually took place during the spring and winter months when catch rates and prices were the highest. This attempt to maximise individual shares resulted in seasonal gluts, poor quality and a short harvesting and processing season which lasted only 8 to 10 weeks.

In 1983, the inshore otter trawl fleet was divided into four sectors and separate allocations were established for the winter and summer fisheries. A three year pilot project was introduced in 1984 to improve the quality of fish landed, reduce competitiveness in the harvesting sector, extend the harvesting season and reduce seasonal gluts in the processing sector. The pilot project was implemented on a voluntary basis with different allocations for various vessel length intervals within each sector. Despite some of the short comings of the program (i.e. limits on transferability, choice of technology), fishers were encouraged by the results of the program and the EA project continued in 1987 and 1988.

The project was successful in reducing the conflicts which were prevalent in the fishery at the time. In addition, the quality of fish landed improved and, with a more predictable and steady supply of fish, the processing season lengthened. The harvesting season also lengthened from an average of 9 weeks in 1983 to 20 weeks in 1986. Average operating costs and expenses for the otter trawl fleet also declined.

Other Atlantic IQ regimes

The following is an exhaustive list of Atlantic IQ/EA programs that have been introduced by the federal Department of Fisheries and Oceans.

Fishery	Date Introduced
Groundfish	
Offshore (>100')	1982
Midshore (65'-100')	1988
Mobile Gear (45'-64') (W. Newfoundland)	1988
Mobile Gear (<65') (Scotia-Fundy)	1991
Mobile Gear (<45') (Gulf)	1992
Shellfish	
Offshore Lobster	1985
Offshore Scallop	1986
Offshore Iceland Scallop	1991
Quebec Scallops	1991
Offshore Clam	1987
Northern Shrimp	1987
Gulf Shrimp	1991
Quebec Crabs	1989
Inshore Snow Crab	
- Cape Breton	1979
- Gulf of St. Lawrence	1986
- Quebec	1991/92
Mid-shore Crab	
- Gulf of St. Lawrence	1990}Pilot Project
Pelagics	
Offshore Bluefin Tuna	1987}Bycatch
Offshore Swordfish	1987}Bycatch
Herring Purse Seine	
- Gulf	1983
- Scotia Fundy	1983

Problems associated with Atlantic IQ/EA programs

Many of these IQ programs are still ongoing on either a permanent basis or under temporary management plans or trial programs. While IQ/EA systems have unquestionably yielded positive benefits, there have also been problems with these sorts of management regimes. Enforcement has proven to be one of the more difficult problems since rights-based management regimes contain a strong incentive to highgrade, dump/discard and misreport catches. By definition, it is difficult to quantify how widespread these problems are but anecdotal evidence suggests that they are significant. The relatively high cost of enforcement in IQ/EA programs is also a major reason why these management regimes have been used only where the number of vessels/participants in the fishery is relatively small.

DFO has implemented special enforcement mechanisms to mitigate irresponsible harvesting practices associated with IQs. These include dockside monitoring programs, observer programs, mandatory hails, and overrun and misreporting penalties.

Contrary to expectations, the Atlantic IQ/EA programs also appear to have had only limited success in promoting rationalisation in the harvesting sector. The structure of the IQ program in the Western Newfoundland otter trawl fleet, for example, prevented rationalisation of the fleet during a time when favourable market conditions, including high prices, made it attractive to remain in the fishery. Conversely, with the current decline in groundfish stocks, many enterprises in groundfish IQ programs are cash-poor with significant debt loads, inhibiting fleet rationalisation.

IQ programs have also had the tendency to exacerbate conflicts between the various gear sectors. The problems with discarding/dumping by vessels participating in IQ programs has, in some instances, reinforced the opposition by the fixed gear sector against mobile gear harvesting technology and practices, as well as against IQ management regimes in general.

The Pacific fishery

Limited entry fishery: groundfish trawl

The Pacific groundfish fishery involves over 50 species of fish, the majority of which are caught by bottom and mid-water trawl gear. The main species landed by trawl gear vessels include Pacific hake, Pacific cod, rockfishes, soles and lingcod. The trawl fishery is a complex mixed-species fishery with as many as 15 different species caught in a single trawl.

Trawl vessels have a limited ability to target on individual species or species aggregates (i.e. catch mostly Dover sole). Thus, the mixed-species nature of this fishery creates several problems as the species harvested have different levels of productivity. Stock depletion of the high productivity stocks (e.g. Pacific cod) may be detected quickly, but stock depletion can occur with the low productivity long-lived species, notably rockfish, that may not be detected for years.

Stock assessments and yield options for the various groundfish species are based on information from a variety of sources, including catch and effort data, biological samples, trawler surveys, and biomass estimates from research activities. Biological advice is reviewed by the groundfish subcommittee of the Pacific Stock Assessment Review Committee (PSARC), a peer review group which evaluates the stock assessment work. The recent stock status of various groundfish species or species groups are shown in Table 3. Many of the species, particularly rockfish, are "low to average" because they were over-harvested prior to the extension of Canada's fisheries jurisdiction in 1977 and have not been able to fully rebuild since.

Stock assessment and fisheries management staff recommend an annual quota and, in consultation with a committee of industry advisors, develop a management plan for each regulated species.

Table 3. Status of selected groundfish species

Species of species group	Current stock condition
Strait of Georgia Lingcod	low
Offshore Lingcod	average
Pacific cod	low to average*
Petrale sole	low
Rock, English and Dover sole	average to high*
Sablefish	average
Pacific hake	average
Spiny dogfish	average to high*
Walleye pollock	low to average*
Slope rockfish	low to average*
Shelf rockfish	low to average*
Inshore rockfish	low to average*

(*) depends on the specific stock.

Fleet

The groundfish trawl fishery has been under limited entry licensing since 1976. Currently, 142 "T" licenses are issued each year of which up to 130 are active in a given year. The license allows the use of mid-water and bottom trawls to target on groundfish, with the exception of halibut.

The trawl fleet includes vessels that vary widely in size and versatility. The average length of a licensed trawler is 68 feet with most trawlers between 50 and 80 feet. However, 13 are less than 40 feet and 12 are over 100 feet. Further, most trawlers have one or more licenses to fish other species. Over 80 per cent of the trawl vessels have one or more licenses to fish other species, most commonly for the salmon fishery.

Management

Management of the groundfish trawl fishery has changed considerably since limited entry in 1976. With extended jurisdiction, the trawl fishery was open year-round and catches were below the annual quota set for most species. By 1980, both fishing effort increased and trawl effectiveness improved, and more species and stocks became fully exploited and restricted by the annual quota. Initially, no further landings were permitted of a species once its annual quota was reached. Trawl vessels would continue to fish for other species that had not reached their quota and would discard any non-retention species taken as bycatch. By 1985, fisheries managers and groundfish industry representatives were concerned about the ever shortening duration of the fishery, discarding of valuable species and annual quota over-runs. At the time, trip limits were imposed to spread out fishing effort and landings over the year.

While groundfish management plans deal with a variety of species, rockfish have received the most attention because of their value, ease of harvest, relatively low annual quotas, and high mortality when discarded. In 1987, the management plan introduced quarterly rockfish management, in which the annual quota was divided into four three-month quarters. Rockfish trip limits were set at levels (e.g. 50 000 pounds per trip) to allow directed fisheries until 70 per cent of the quarterly quota was reached, then reduced to levels (e.g. 5 000 pounds) to allow incidental catches while the vessel trawled for other species.

Over the last several years, the size of the trip limits has been continuously reduced as it became more difficult to maintain a year-round fishery without exceeding the annual quota.

In 1993, eight species of rockfish were subject to quarterly quotas and trip limits (Pacific Ocean perch, yellowmouth, canary, silvergrey, yellowtail, redstripe, rougheye, and widow rockfish). Several other species (sablefish; dover, rock, lemon, and petrale sole; lingcod, and Pacific cod) are only subject to trip limits.

Economic

The groundfish trawl fishery is characterised by large harvests and relatively low prices, compared to other Canadian Pacific coast fisheries such as salmon and herring (Tables 4 and 5).

Table 4. Groundfish trawl and total groundfish catch and value*

Year	Groundfish trawl catch (tonnes)	Groundfish catch (tonnes)	Groundfish landed value ($000)	Groundfish wholesale value ($000)
1985	51 120	57 840	32 130	63 000
1986	74 060	81 430	41 380	75 780
1987	106 840	116 440	58 780	104 300
1988	104 230	115 010	59 640	93 840
1989	119 270	128 540	55 120	96 400
1990	127 610	138 570	66 510	116 040
1991	150 060	161 600	80 970	128 200
1992 (est.)	139 940	149 470	76 380	125 000

(*) excludes halibut.

Since extended jurisdiction in 1977, Canadian Pacific coast groundfish landings have increased from under 30 000 tonnes to over 150 000 tonnes, with most of these landings on trawl gear. Half of this increase results from the exploitation of the offshore hake stock in domestic and joint venture (Canadian vessels delivering to foreign factory trawlers) fisheries. But significant increases have also occurred for other species, notably rockfish. Fishing effort has also increased, rising from 38 000 hours towed in the late 1970s to over 60 000 hours in the early 1990s.

Several factors have contributed to increased groundfish landings, including increased fishing pressure in other fisheries reducing the season length and income, which has encouraged vessel owners to diversify, and improvements in sounder and rough bottom/mid-winter trawl technology.

Table 5. Trawl catch and value, 1992

Species	Catch (tonnes)	Value ($000)	Price ($/kg)
Pacific Ocean perch	3 990	2 270	.57
Other rockfish	20 050	13 060	.65
Pacific cod	10 070	5 440	.54
Soles	7 920	5 820	.74
Turbot	3 620	880	.24
Lingcod	3 280	2 050	.64
Walleye pollock	3 170	950	.30
Sablefish	450	1 260	2.81
Hake	86 370	13 490	.15
Other	1 110	570	.51
Total	140 030	45 790	.33

With such large quantities of groundfish landed, small changes in prices or costs can yield large changes in final profits. Groundfish trawlers tend to be the larger, more costly vessels in the B.C. fishing industry, so vessel owners have a substantial fixed cost to recover. In 1991, the average vessel actively trawling landed groundfish worth more than C$300 000, while landings of other species (using other licenses) added, on average, another C$100 000. The top 10 per cent of active groundfish trawl vessels caught nearly one-third of the total groundfish trawl landed value, with average landings worth nearly C$1 million. The bottom 10 per cent caught less than one per cent.

Most trawl-caught groundfish is processed into fillets, (roughly two-thirds fresh fillets and one-third frozen fillets). Processing roughly doubles the landed value of groundfish (see Table 4). The majority of groundfish caught in British Columbia is either consumed domestically or distributed to western US markets. Most restaurateurs and retailers sell groundfish in generic forms (e.g. rockfishes are usually identified as either red snapper or rockfish, not by the actual species). Groundfish fillets compete against other fish and meats for shelf and menu space and tend to be the low cost alternative.

Institutional agencies/groups

The federal Department of Fisheries and Oceans is responsible for the management of the fishery. Others involved include the Province of British Columbia, responsible for regulating the processing industry and the Groundfish Trawl Advisory Committee, which provides advice to DFO on groundfish trawl issues. The Advisory Committee represents trawl license holders (who elect their representatives), processors, and the United Fisherman and Allied Workers Union.

Assessment of trawl management

In recent years, the reported catch of groundfish has been consistent with annual quotas and the financial performance of the fleet has been good. Fisheries managers and industry representatives, however, are dissatisfied with the present management regime and have expressed concerns about the future. The most frequent criticisms are directed at-sea dumping of rockfish when trawlers exceed the trip limit (a problem that appears to have become more severe as trip limits get smaller), fishing for an increasingly complex "shopping list" of groundfish species with differing trip limits, delivery gluts of fish at the beginning of each quarter, and trip limit levels that make it difficult for larger trawlers to operate effectively. Specific concerns are detailed below.

Resource conservation

For the most part, reported catches equal or, at worst, slightly exceed the annual quotas set for most species. Nevertheless, concerns exist about stock health, particularly for rockfish, because the extent of at-sea dumping is unknown. Further, stock assessment work has been complicated by poor catch reporting (e.g. poor identification of the various rockfish species in catch reports) and changing trip limits which make the interpretation of catch per unit effort statistics difficult.

In addition, concerns exist for specific stocks in specific areas. As these stocks are either close to ports or easy to catch, only an alternative management scheme which includes area management might address this concern.

Fishing seasons

The fishing season remains open year-round for most groundfish species. Nevertheless, landings of the more profitable species of rockfish are concentrated in the first part of each quarter as trawlers fish aggressively before the trip limits are reduced to incidental levels. This fluctuation in market supply is a concern in the processing industry.

Economic performance of the fleet

Although information on net incomes is not readily available, it is acknowledged that the financial performance of the trawl fishery is good relative to other fisheries on the B.C. coast. However, increasing restrictions on trawl effort are reducing the profitability of the trawl fleet. In particular, the vessels most dependent on volume - the larger groundfish trawl vessels - are the most affected by lower trip limits.

Allocation problems

By-catch of halibut and sablefish by the trawl fleet creates conflicts with the fisheries licensed to target these species. Currently, trawlers are not allowed to retain any halibut and have a small sablefish allocation (8.75 per cent of the annual sablefish quota). Still, certain trawl fisheries (e.g. those targeting on Pacific cod and sole), face increased restriction to avoid halibut by-catch.

A rockfish hook and line fishery also exists that primarily catches inshore rockfish species. Although the trawl and hook and line fishery currently target on different species in different areas, increased effort in both fisheries point to increased conflicts in the future.

Market implications

The ability of the fishery to serve markets effectively is undermined by trawl vessels fishing hard before the trip limit is reduced. Catches are concentrated in the first part of each quarter, which lowers quality and forces a higher percentage of fish to be frozen. A recent study of groundfish markets suggested that higher prices could be received if supply to distributors could be smoothed out and a lower portion of the catch frozen.

Enforcement problems

A prominent enforcement problem in the trawl fishery is inaccurate catch information. This problem is linked to both at-sea practices and catch reporting at the dock. Trawlers are required to discard any catch of a species over the trip limit, which does not get recorded, and there is little incentive to accurately report the species composition landed. A port monitoring program is proposed for 1994, which will address the second concern.

Industry acceptance and views

The groundfish industry views the current management system as unacceptable, particularly since it is evident that increased restrictions are necessary to sustain both a year-round fishery and the annual quotas. Larger vessel owners feel that it is increasingly difficult to make a profitable return.

Unfortunately, little consensus exists within the industry for an alternative management approach. Individual vessel quotas, however, are being mentioned with increasing frequency.

Rights based fishery - halibut individual vessel quotas

Halibut, one of the larger groundfish found off the British Columbia coast, are prized for the quality of the meat. Halibut can grow up to 3 meters long and weigh over 100 pounds, although the average weight in the commercial fishery is 25 pounds.

Halibut have been fished by the aboriginal people for centuries while the commercial fishery began over a century ago. Because Halibut move between the US and Canadian waters and are caught by harvesters from both countries, the International Pacific Halibut Commission was formed in 1923 to ensure sound conservation.

Fleet

In 1979, the DFO limited entry into the halibut fishery and issued 435 halibut licenses "L". During the early 1980s, halibut stocks were depressed, landed prices were low, and only three quarters of the licensed fleet were actively fishing halibut. Since 1984, stocks have recovered, prices have improved and with the salmon season shortened, participation in the halibut fishery has increased substantially.

Technological advances such as circle hooks, snap-on gear, automatic baiting machines, and improved fish finding electronics have also increased fleet efficiency to levels unthinkable several years ago. In 1982, the halibut fleet took ten times longer to catch less than two-thirds the halibut caught in 1990 (Table 6).

Table 6. Halibut catch, season and average catch per day

Year (000lbs)	Catch (days)	Season length (000lbs)	Average catch/day ($000)
1982	5 269	61	86
1983	5 287	24	220
1984	8 891	22	404
1985	10 368	22	471
1986	11 881	15	792
1987	12 002	16	750
1988	12 392	14	924
1989	10 327	11	931
1990	8 340	6	1 390
1991	6 500	214	30
1992 (est.)	139 940	214	34

Management

Prior to 1991, the fishery was managed through timed openings which became progressively shorter as fishing effort increased. By 1990, virtually all licensed vessels were actively fishing halibut and the fleet caught more than 8.3 million pounds of halibut in a mere six fishing days. In 1991, an Individual Vessel Quota (IVQ) system was implemented in the halibut fishery on a two-year trial basis. The IVQ program was developed with extensive input from halibut industry advisors and license holders. The main features of the IVQ program are discussed below.

- The fishery is open from 1st March to 31 October.

- Initial individual quota allocations were calculated by a formula based on the license holders' vessel length and historical catch. The resulting 435 individual vessel quotas were fixed percentages of the annual TAC.

- During the first two years of the program, licenses and quotas were not transferable. Beginning in 1993, up to 2 quotas could be stacked on a vessel with a halibut license.

- There is a mandatory port monitoring program where fishers must notify an observer before they leave for the fishing grounds and again in 24 hours prior to landing their catch. The observer then meets the vessel, validates the weight of the halibut landed and tracks each quota holders' total landings.

- Quota holders are required to pay all incremental costs associated with the management, monitoring, and enforcement of the IVQ program. The cost recovery program also pays for some stock assessment and other research activities, at the discretion of the quota holders. The cost recoverable activities of the IVQ program paid by halibut license holders was nearly C$750 000 in 1991/92.

- Individual quota overages of 10% or less are deducted from their quota the following year and amounts more than 10% are relinquished to the Crown. Conversely, those quota holders at the end of the year that are 10% or less than the vessel's total IVQ have the equivalent poundage added to their quota in the next year and the amount under the quota in excess of 10% is forgone.

Economic

In 1992, the total landed value in the halibut fishery was C$21 million with average gross earnings of C$46 000 per license (Table 7).

Table 8. Halibut landings and value

Year	Catch (000lbs)	Landed value ($000)	Wholesale value ($000)
1982	5 270	4 700	5 500
1983	5 290	8 300	9 300
1984	8 890	9 400	11 600
1985	10 370	13 800	15 700
1986	11 880	24 400	25 500
1987	12 000	28 300	33 900
1988	12 930	23 200	26 800
1989	10 240	18 700	27 400
1990	8 340	21 100	27 800
1991	6 500	21 800	28 700
1992 (est.)	7 230	21 400	25 000

Institutional agencies/groups

There are three agencies/groups which have a significant role in the management of the Pacific Halibut fishery. DFO is responsible for the management of the stock. The department enforces halibut regulations and develops annual management plans through on-going consultation with stakeholders. The annual International Pacific Halibut Commission (IPHC) was created in 1923 and is funded jointly by Canada and the US. It's role is stock assessment and to set area quotas, which are enforced by the appropriate government. The Halibut Advisory Board (HAB) is comprised of halibut license holders and processing sector representatives. The members are elected by license holders. Their primary responsibility is to advise the Department of industry's concerns regarding conservation, fisheries management, enforcement, and quota monitoring.

Assessment of the IVQ program

Resource conservation

There has been no change in the IPHC's stock assessment of this fishery as a result of IVQs. In the past, fisheries managers estimate actions of when the TAC would be taken often led to over-harvesting and negative effects on the Halibut resource. With IVQs, the fishery was slightly under quota (by 3%) in 1991 which had not occurred since limited entry in 1980.

Additional stock assessment research is possible since the license/quota holders are now supplementing the cost of stock assessment. In 1993, they contributed C$34 000 to the IPHC for research projects.

There is concern that high-grading may be occurring. It is difficult, however, to assess the level of high-grading and the potential impacts on halibut stocks.

Fishing seasons

The season is now eight months long compared to six days in 1990.

Capacity/over-capacity

Fleet rationalisation has occurred under IVQs as quota stacking has resulted in fewer vessels fishing halibut - 350 in 1993 compared to 435 prior to IVQs. While it is likely that over-capacity still exists, it has been reduced and there is no longer the incentive to invest in catching capacity which existed under the previous limited entry management system.

Economic performance

The economic performance of the halibut fishery improved significantly with the introduction of IVQs. Improved performance is attributable to both higher revenues and lower costs.

Landed prices have risen under the IVQ system. Prior to IVQs, fishers received lower landed prices as a result of supply gluts and poor product quality. Landed prices increased by an estimated C$0.50 a pound in 1991/92 as a result of the positive marketing aspects of IVQs. The price increase translated into a jump in revenues of C$3.6 million for fishers.

During the limited entry fishery, fishing costs continued to increase as fishers tried to maintain their share of the catch with on-going gear and vessel improvements. With IVQs, total harvesting costs have decreased by C$440 000, mostly because of decreased crew payments.

Allocation problems

Few allocation problems currently exist, although the small but growing Aboriginal and recreational fisheries may eventually lead to conflicts.

Markets

Longer seasons have allowed both halibut harvesters and processors to deliver fresh and higher quality halibut to the market. Harvesters can also time their landings to match periods of high market demand and can better supply the high value fresh market.

Employment

Since the introduction of IVQs, the number of crew members employed has been reduced by nearly 300 and employment at the major halibut processing plants was reduced by a quarter. Those still employed, however, are working for a longer season, as the number of hours worked have gone up substantially, with higher pay.

Before IVQs, harvesters were under pressure to fish in bad weather and to overload their vessels. Now their working conditions have improved with a more stable environment.

Enforcement

The level of enforcement has increased under IVQs as license/quota holders paid (C$800 000 in 1993) towards the cost of fisheries enforcement and port monitoring. Their contribution provides for enforcement in addition to existing levels.

A port monitoring program, funded completely by license holders, ensures that the landings reported are accurate and allows quota holders to determine the balance of their quota immediately after landing their catch.

Industry acceptance

In December 1992, halibut license holders were asked to vote on whether to continue the halibut IVQ program. Ninety-one per cent of responding license holders voted in favour of IVQs. Since then, the trial program has been extended on a trial basis.

While there is a high degree of support for the IVQ program, it is not without its critics. Complaints focus primarily on the reduction in the number of individuals employed and the "windfall profits" accruing to halibut quota holders as the increased profitability of the fishery has translated into higher market values for quotas.

Conclusion

The Canadian fisheries have evolved through periods of dynamic change in the management of marine resources. With recurrent crises being the norm in the Canadian fishing industry, fisheries policy was often developed as a result of the push-pull behaviour between government and industry - the former attempting to minimise the social disruption of declining resources and conflicting user group interests, and the latter, attempting to maximise their stake in the fishery and safeguard their livelihood.

However, many of the successful fisheries management instruments that have been adopted by both government and industry were fostered through co-operative efforts of fisheries managers and those who make their living from the resource. The success of the first EA program in the Atlantic offshore groundfish industry spawned the development of EA programs in other offshore fisheries, as well as similar quota systems in the inshore sector. The IVQ program in the Pacific halibut fishery has also proven to be successful in reducing the race for fish, improving the economic performance of the fleet and extending the fishing season.

Limited entry licensing measures, in both the Atlantic and Pacific fisheries have proven less successful than rights-based management instruments. This is due, in large part, to the fact that limited entry techniques only address the symptoms of the problem ("too many fishers chasing too few fish") and not the actual cause - the common property nature of the fishery.

Canadian fisheries managers are presently faced with unprecedented challenges in light of the collapse of Atlantic groundfish resources. It is apparent now, more than ever before, that fisheries management must acknowledge the delicate interplay between the social, environmental and biological aspects of the fishery. The Canadian Minister of Fisheries and Oceans has committed to industry renewal with the rebuilding and conservation of fisheries resources being paramount for a viable fishery of the future. Important steps have been taken to mitigate the growth of capacity within the industry and foster the development of alternative opportunities for individuals who would otherwise continue to depend on the fishery as an employer of last resort.

These ideas are not new. What is new, however, is that there is now a broad consensus among industry and all levels of government that change is imperative. If nothing else, this new partnership is a critical ingredient in efforts to restore balance in the industry and ensure that all stakeholders have a greater voice in managing one of Canada's most vital resources.

INDEX OF ABBREVIATIONS

AFS: Aboriginal Fisheries Strategy
AGAP: Atlantic Groundfish Adjustment Program
DFO: Department of Fisheries and Oceans (federal)
EA: Enterprise Allocation. The same as an IQ except the allocation is assigned to an enterprise.
F: Rate of mortality due to fishing
$F_{0.1}$: Level of fishing mortality that can be described as that point where another unit of fishing effort will result in an increase in total annual catch which is only 10% as large as the average catch made by a fisherman who had exploited the stock as the sole fisherman operating in the fishery.
Fmax: The level of fishing mortality that will produce the maximum yield-per-recruit.
HAB: Halibut Advisory Board (Canadian)
HRD: Department of Human Resources Development (federal)
ICNAF: International Commission for the Northwest Atlantic Fisheries
IPHC: International Pacific Halibut Commission
IQ: Individual Quota. An output control in which an allocation of a given stock is assigned to a person.
ITQ: Individual Transferable Quota. The same as IQs except the federal Department of Fisheries and Oceans permits trading of the allocation.
IVQ: Individual Vessel Quota. The same as an IQ except the allocation is assigned to a vessel.
MSY: Maximum sustainable yield. MSY can be described as the simplest biological input objective that aims at the maximum harvest in perpetuity without altering the stock level.
NCARP: Northern Cod Adjustment and Recovery Program
PSARC: Pacific Stock Assessment Review Committee
STACRES: Standing Committee on Research and Statistics
TAC: Total Allowable Catch
TAGS: The Atlantic Groundfish Strategy
TFAA: Transitional Fisheries Adjustment Allowance
UI: Unemployment Insurance
UNCLOS: United Nations Convention on the Law of the Sea

EUROPEAN UNION

Introduction

The purpose of this report is to provide information about the EU policies concerning management of living marine resources. These policies are all included within the Common Fisheries Policies (CFP). The latter is founded on Article 39 of the Treaty setting out the aims of the Common Agricultural Policy (CAP), which, by virtue of Article 39 also apply to fish and fisheries products, in the interest of fishers and consumers alike.

The EU exercises its powers in the following areas:

- market organisation, the first component of the CFP set in place by the Council in 1970, based on the same principles and presenting many similarities with the CAP;

- structural policy, also in place since 1970, with the objective of rational development of the fishing industry to ensure a fair standard of living for fishers;

- conservation and management of resources, involving rules on the use and allocation of resources, technical conservation measures, special measures for inshore fishing and supervisory measures;

- relations with third countries and international organisations. Fishing agreements with third countries have enabled the essential interests of the Union and its Member States to be safeguarded, restored or developed in the waters of third countries and certain international waters.

The Union adopted in 1992 and 1993 a new set of regulations which in important ways modified the Common Fisheries Policy. These regulations are, however, still in the process of implementation at Union and Member States level. It has therefore been considered premature to assess the impact of the new policies in this report, although they are expected eventually to improve the performance of the CFP considerably.

The report follows the outline agreed for national reports in the OECD Ad hoc Expert group for the fisheries. Part I provides information about structural characteristics which influence the outcome of the management instruments. This part also contains a short description of the Common market policies for fish products, as a background for the assessment of the impact of the resource management policy in part III.

Part II describes the EU instruments used to manage the fish resources and the fleet. It also provides information about the state of exploitation of fish resources within EU waters.

Part III provides an assessment of the impact of the EU management policy in terms of their biological, social and economic observed outcome.

Part I: Background information

1. Basic data

The European Union is one of the five great world powers in terms of sea fishing (after China, Japan, Former USSR and Peru), accounting for some 7% of world production in 1991, and the largest world market for fish products[2]. Production in 1991 was about 5.8 million tonnes (over ECU 7 billion), to which must be added aquaculture production of just under one million tonnes in 1991.

Table 1. Member states fleet production in 1983 and 1991
(Landings in Member states and foreign ports)

	1983		1991	
	Volume (000 tonnes)	Value in ECU million	Volume (000 tonnes)	Value in ecu million
Belgium	43	58	36	91
Denmark	1 937	418	1 728 (1)	460 (1)
Germany	284	150	254	181
Greece	111	285	159	528
Spain (1)	1 145	1 314	1 000	2 422
France	526	702	383 (1)	797 (1)
Ireland	192	71	196	90
Italy	434	865	368	1 307
Netherlands	248	n/a	462 (1)	488 (1)
Portugal (1)	264	257	241	135
United Kingdom	770	477	902	685
Total	5 954	4 597 (2)	5 729	7 184

1. National landings in domestic ports only : OECD figures.
2. Does not include the value of Dutch landings.
Sources: Various sources including the Member States, OECD and EUROSTAT.

The number of full- and part-time fishers about 300 000 in 1983 (including Spain and Portugal), was estimated at about 289 322 in 1991.

2 See Annex 3 (FAO Information).

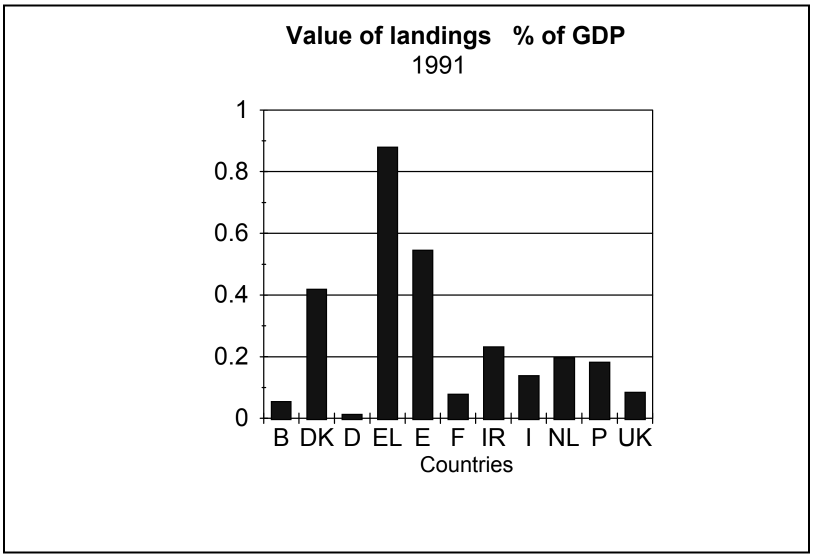


Table 2. Number of fishers by Member state and as a proportion of the active national population

	Number of full and part-time fishers		Number of full and part-time fishers as a proportion of the active national population	
	1983	1991	1983 %	1991 %
Belgium	1 274	818	0.033	0.02
of whom	385 (a)			
Denmark	8 345 (b)	6 886	0.308	0.24
Germany	2 656	4 291	0.010	0.01
Greece	26 700	40 164 (f)	0.701	1.01
Spain	99 975 (c)	84 838	0.730	0.56
France	19 500	30 971	0.084	0.13
Ireland	8 572	4 919	0.655	0.37
of whom	5 141 (a)			
Italy	34 000	49 766 (f)	0.151	0.21
Netherlands	3 553	3 932	0.063	0.06
Portugal	41 764 (c)	38 507	0.900	0.76
United Kingdom	22 181 (d)	24 230 (f)	0.081	0.09
of whom	6 263 (a)			

(a) = part-time; (b) = 1984; (c) = 1986; (d) = 1985; (e) = estimate; (f) = 1990
Sources: Various sources, including the EC Commission, Member States, OECD and EUROSTAT.

In general, the value of landings was less than 1% of GDP.

Price trends for five target species on the EU market between 1983 and 1992 are shown below:

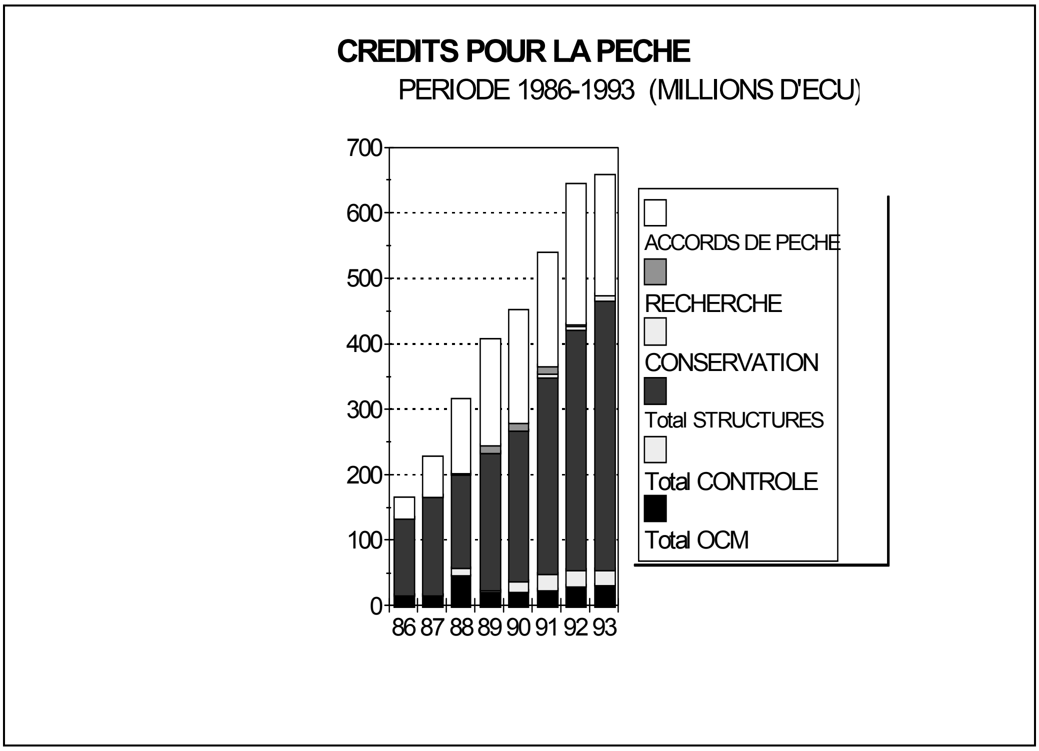
Table 3. Price trends for five target species on the EU market between 1983 and 1992
(ecu/tonne)

Species	Average market prices (current prices)		Guide prices	
	1983	1992	1983	1992
Cod	985	1.541 (*)	993	1.316
Plaice	1.059	1.159	708 (Jan.-Apr.) 912 (May- Dec)	796 (Jan.-Apr.) 1.085 (May - Dec.)
Herring	302	217	336	256 (Jan.-July & Oct.-Dec) 217 (Aug.-Sept.)
Med. sardine	353	416	408	458
Anchovy	780	1.372	509	950

(*) 1991.
Source: CEC.

Annual Budget expenditure on implementing the entire CFP amounts to about 1% of the EU budget. During the period 1986-1993 appropriations for the various CFP instruments were allocated as follows:

Graph 2. Allocation of fisheries appropriations



by sector from 1986 to 1993
Source: EU budget.

In 1994 the "Fisheries" budget is ECU 776 million, out of a total EU budget of 69 827 million (1.1%).

2. The importance of fishing in various regions of European Union

The importance of fishing has to be seen not merely in terms of its contribution to the gross domestic product, but above all in terms of its geographical concentration and the importance of the activities linked to it, for in most of the Member States the value of landings is less than 0.5% of GDP and fishers account for less than 0.6% of jobs[3].

If we look at the coastal region and local economy level, the socio-economic importance of fishing increases substantially, even if we restrict ourselves to the essential activities.

[3] See Annex 5.

The relatively modest economic role of fishing must also be judged in the light of the economic importance of aquaculture, product processing and connected activities (construction, maintenance and repair of fishing vessels and their gear; supplies and services to the vessels and aquaculture firms; management and maintenance of fishing ports and their facilities; packaging and marketing of fish and aquaculture products), even if it is impossible to isolate the fish-related element strictu sensu in the case of some of these activities. Other induced activities, multiplier effects and spinoff activities, such as tourism, must also be considered, although at this level trying to quantify the economic indicators becomes a risky affair.

The term "fishing", limited to essential activities as mentioned above, covers a very varied range of activities, from traditional coastal fishing to deep-sea industrial fishing.

Some traditional coastal fishing is a localised primary activity, both in terms of production and in terms of marketing and consumption. It is often done part-time to supplement other activities such as agriculture or tourism. It is above all an exploitation of a resource close at hand in poorly developed regions offering little or no other employment or income. Its disappearance, even partial, would destroy the delicate equilibrium of the communities concerned.

At the other extreme, highly industrialised and integrated fishing has primary (production), secondary (processing) and tertiary (distribution) elements. Sometimes it is very difficult to localise the activities: the fishing vessel's home port, the head office of the owner, the port of landing, the processing location, the distribution circuit and the marketing location can all claim to varying degrees to be the location of the economic activity.

If we look at the entire range of fishing and linked activities we have to note that there are two types of zone where fishing makes a significant contribution to maintaining the local socio-economic fabric:

- firstly, there are the developed and industrialised zones, with diversified activities and large conurbations, where some of the fishers are likely to be able to switch jobs in view of the theoretical potential of alternative activities;

- secondly, there are the less-developed, often rural zones, where the problem is a social one, quite possibly determining the survival or otherwise of the communities concerned, since fishing is the only activity possible for a large part of the workforce.

The economic indicators intended to characterise the type and degree of dependence of zones on fishing has been quantified in a series of regional studies on the socio-economic situation of zones dependent on fishing and aquaculture[4].

The dependence of employment on fisheries has been assessed in 300 coastal zones. These zones have a population of 106 mln (31% of EU total) and an employment of 38.2 mln. About 95% of all fishers (283 000) and 75% (234 000) of those employed in related activities can be found in these zones.

The fishing fleet alone provides over 10% of employment in 20 zones, along the Atlantic coast of Spain, in east Italy and in Scotland. There are about 52 000 fishers and 40 000 people in related jobs, i.e. about 15% of the total EU fisheries sector.

[4] See Pavel Salz, "Regional, Socio-economics Studies in the Fisheries Sector. Summary report".

In 82 zones the fisheries provided 2-10% of employment. In these zones some 100 000 people work on board fishing vessels and 80 000 are employed in related activities. Most of these zones are in east Italy, Spain, Greece, Portugal and the United Kingdom, although some zones in all other EU Member States are also included in this category.

In the remaining 197 coastal zones the employment dependence on fishing fleets remains below 2%. These zones have a total population of 97 mln people of whom 35 mln are employed. Still, there are almost 132 000 fishers, of whom 74 000 in the Mediterranean area. About 115 000 people are employed in other activities.

In most Atlantic regions the fleet depends for 60-75% on quota species. The Mediterranean fisheries are not affected through this mechanism.

3. Market policy

3.1 Background

The basic Regulation on the common organisation of the market in fishery products -Council Regulation (EEC) N° 3759/92 (which replaces Council Regulation (EEC) N° 2142/70 of 20 October 1970) - contains broad principles which underlie a permanent scheme derived from the obligations imposed by the Treaty.

The market organisation is the component of the CFP which is most closely analogous with the common agricultural policy. The initial elements of the organisation were largely inspired by the market organisations created in the agricultural sector during the 1960s, especially in fruit and vegetables.

It pursues the same objectives:

- to stabilise the markets,
- to guarantee security of supplies,
- to ensure that prices to consumers are reasonable.

It obeys the same principles:

- unification of markets,
- Community preference,
- financial solidarity.

However, there is one essential difference between it and the majority of the agricultural market organisations, a difference stemming from the fact that the customs tariffs for fishery products were bound under GATT in 1962.

This introduced an element of rigidity important to the organisation. It restricts the Union's scope for manoeuvre when adopting market management mechanisms both internally and in relations with third countries.

The GATT element largely explains why the market organisation in fish is so distinct from market organisations for most agricultural products.

The difference in approach introduced by this fundamental element can clearly be seen in the budget. Whereas for agricultural the structural budget is less than 10% of the markets budget, it is the opposite in the fisheries sector.

3.2 The mechanism

The common market organisation is designed to guarantee transparency and uniform conditions of trade, strengthen the solidarity of producers in their efforts to enhance the value to their production, guarantee the free circulation of the products and organise international competition as a function of the marketing restraints imposed at the internal level.

It is based on the following four main elements:

- common marketing standards,
- producer organisations,
- a common prices system,
- a system of trade with third countries.

3.3 EU trade for fishery and aquaculture products

EU international trade in fishery products is characterised by a structural deficit which is increasing steadily from year to year[5]. This dependence puts the EU market in a delicate balance. It is necessary to supply the market in order to meet the needs of consumers and the processing industry while preserving the interests of EU producers.

With respect to internal Union supply the results of resource management constraints and responses are apparent in the evolution of the volume and composition of landings. Landings of roundfish species such as cod and haddock have followed the evolution of TACs and quotas, i.e. moved in a downward direction, where TACs and quotas have represented real maximum production limits. The total availability of cod within the Union's fisheries zones (as determined by the TACs) had been reduced by 1991 to some 50% of its 1983 level. For haddock the reduction over the period has been greater : for 1991 the total of the TACs stands at some 34% of its 1983 level. On the other hand landings of some other demersal species, particularly flatfish, have increased where greater utilisation of quota and non-quota species was possible. The TACs for the two major flatfish species, sole and plaice, have remained relatively stable over the period since 1983, with total availability tending to increase towards the latter part of the period. Pelagic landings and landings of some shellfish species have also shown a tendency to increase in most cases.

At the same time, demersal fish as a group and many individual demersal species have become considerably more valuable in monetary and real terms. This observation is also applicable to many of the shellfish species but not to the pelagic group where in most cases monetary and real values have at

[5] See Annex 1.

best remained static or have even declined[6]. These price developments have been important in determining the gross earnings of fishing enterprises relying on the various species. The more recent reductions in some demersal TACs and quotas have led to a probable fall in aggregate real earnings for the vessels dependent on the stocks in question in spite of the favourable price changes[7].

While the price increases in real terms for demersal species have cushioned the impact of reduced landings on the economic viability of parts of the fleet, these increases also represent increases in real raw material costs to the whitefish processing sector. Furthermore the price elasticity of demand further down the distribution chain has been such that the possibility of fully recovering these increased costs has been limited, leading in some cases to financial difficulties and to the loss of jobs in the secondary sectors of the industry. These economic difficulties have been compounded by discontinuities in supply caused by the application of management measures to the primary sector.

Member States have become increasingly dependent on the import of fish and fishery products from internal EU and third-country sources to satisfy consumer demand with the processing sectors becoming increasingly reliant on whitefish imports from third countries for their supply of raw material. In some cases, fish imports have increasingly been in a secondary processed form, reducing the possibilities for added value activities in the processing sectors, with an attendant loss, through multiplier effects, of output, income and employment in the coastal economies[8].

Part II: POLICIES AND OUTCOME

1. The CFP instruments for the management of fish resources

1.1 Equality of access

As the Treaties prohibit all forms of discrimination between nationals of the Union on grounds of nationality the Council's decisions setting up a common fisheries policy in the seventies established the principle of freedom of access to the Union's fishing zone. Derogations were gradually introduced from 1973 onwards.

- In 1973, the Treaty of Accession of the United Kingdom, Ireland and Denmark contained specific provisions on the fishing industry, relating to fishing rights in coastal zones over the next ten years. Under these transitional arrangements derogating from the principle of free access, the Member States concerned were authorised to reserve fishing within the 6-mile zone, 12 miles in certain areas, for vessels which had traditionally fished the said waters from ports in the geographically adjacent areas.

- In January 1983 under Regulation (EEC) N° 170/83 (amended by Regulation N° 3760/92) the Council adopted a package of rules on conservation and management of resources.

Articles 6 and 7 of Regulation (EEC) N° 3760/92 provide for certain derogations from the principle of equal access to waters.

Article 6 establishes a derogation by extending the 6-mile limit to 12 nautical miles until 31 December 2002. As this arrangement then expires, any subsequent provisions must be decided by

6 See Table 3.
7 See Annex 3.
8 See Annex 1.

the Council of the Union. This safeguard provision was adopted in order to protect the traditional activities of coastal fishers, given that large segments of the Union fleet faced the risk of reduced fishing opportunities due to the application of 200-mile limits by the third countries.

Reservation of the coastal band for fishers from adjacent coastal areas not only helps to ensure that fishing remains a component of the socio-economic fabric of the regions concerned but also increases the degree of responsibility and safeguards certain local and regional fisheries.

Article 7 establishes a system for limiting fishing effort in the Shetland and Orkney regions. Fishing is subject to a licensing system managed by the Commission for species defined as "biologically sensitive because of their exploitation characteristics".

In 1986 the Act of Accession of Spain and Portugal introduced specific arrangements for a limited period involving reciprocal rights for the existing and acceding Member States.

The provisions ensure access to several fishing zones subject to certain restrictions on access authorised catches and the number of vessels allowed to operate simultaneously.

The arrangements laid down in the Act of Accession of Spain and Portugal will be integrated in the general regime of access to waters and to resources as of 1/01/96. Furthermore the access restriction laid down in Article 158 (Irish Box) will cease to apply from the same date. Consequently the Community will be faced with new conditions especially as regards the access of the Spanish and Portuguese fleets to EU waters and resources.

1.2 Limitation of exploitation rates

Since 1992, the Common Fisheries Policy rests on a new basic regulation (Regulation (EEC) N° 3760/92), establishing an explicit link between conservation of the resources and the restructuring of the fishing fleet. It maintains the possibility of managing the fishing activity by limiting the catches (output control), but adds regulation of the means of catching (input control). Moreover, it considers those measures in a pluriannual perspective and takes into account both their biological and socio-economic impact.

This regulation enables the Council to fix, for each fishery (defined by zone, one or more species and/or one type of vessel/fishing gear) and based on biological, socio-economic and technical analysis, limitations of the exploitation rates, according to the peculiarities of each fishery. Thus, the Council will be able to chose, on the basis of a Commission proposal and on a case-by-case basis, in response to the managing objectives which will be fixed, and on a pluriannual basis:

- to limit the catches, by fixing a TAC and its distribution among the Member States, or
- to limit the fishing effort, by fixing a maximum total of allowable effort (limiting, for instance, the total number of vessels of a given type, or the number of days at sea), or
- to use a combination of these two kinds of limitations (catches and fishing effort).

This widening of the available choice of instruments in the CFP should allow the Union to integrate the management of the sea resources into a more strategic approach, better suited to the needs of the fishing enterprises. It should also allow a better link between the structural policy and the resource conservation policy, tailoring the capacity and activity of the Union fleets to the resources available.

Scientific advice

The TACs are fixed in the light of available scientific advice. In the case of stocks in waters of the Union and neighbouring countries, the EU share is determined on the basis of agreements and arrangements with the third countries concerned.

In the case of fish stocks in international waters the Union actively participates in the international organisations which supervise such stocks in the light of its general policy of contributing to the establishment and respect for rules on responsible fishing.

1.2.2 Allocation of TACs between Member States

1.2.2.1 The criteria

The TACs are shared between the Member States in accordance with the criteria approved by the Council in May 1980[9] and mentioned in the Regulation fixing the TACs for 1982 and which defines the "principle of relative stability". It is specified that for "a fair allocation of available resources particular account must be taken of traditional fishing activities, the specific needs of areas particularly dependent on fishing and dependent industries and the loss of fishing potential in the waters of third countries"[10].

Briefly the allocation key was based on three considerations:

- Traditional fishing patterns.
- Specific needs of regions especially dependent on fishing (The Hague preferences).
- Loss of fishing opportunities in third-country waters.

1.2.2.2 Principle of relative stability

At the time of the first share-out of fishing opportunities under the TACs the principle of relative stability ensured a global balance between the fleets. When the first basic regulation was adopted this approach was regarded as one of the elements which form a rational basis for programming production activities so as to ensure reasonable security for communities dependent on fishing. A clear distinction must be made between the principle of relative stability and the method agreed on (quantitative reference data) for its application.

9 Council statement on 30 May 1980 on the common fisheries policy - OJ N° C 158, 27.6.1980, p. 2.
10 Fourth recital of Regulation (EEC) N° 172/83 of 25 January 1983 - OJ N° L 24, 27.1.1983.

The principle of relative stability, the effect of which is to maintain a fixed percentage per stock for each Member State, is embodied in Regulation (EEC) N° 3760/92. It is general in scope and applies to the share-out, in the form of national quotas, of all the fishing opportunities available to the Union.

The method agreed on, i.e. quantitative reference data, for applying the principle of relative stability has been defined in a series of Council regulations.

Naturally, the initial balance, resulting from the 1983 allocation (reference), may have to be adjusted because of changes in biological, economic and political factors. It is for the EU legislator to evaluate how far the 1983 allocation must be maintained in order to arrive at a solution which:

- is fair and non-discriminatory,
- contributes to relative stability of fishing of the stocks concerned.

1.4 Other conservation measures

1.4.1 Technical measures

The Common Fisheries Policy includes a complex and detailed corpus of legislation which seeks to ensure stock conservation while taking account of economic, social and regional considerations.

On the basis of Regulation (EEC) N° 3760/92 numerous technical measures have been adopted for the conservation of stocks to apply both in EU waters and for some aspects in certain international and/or third country waters.

The arrangements take account of the characteristics of the fisheries concerned, especially the regional context, species and types of gear used. In addition they lay down a system of allocation of competence between the Union and the Member States. For instance, the Member States may adopt urgent conservatory measures, which may than be confirmed, amended or cancelled by the Commission. The Member States are also authorised to take, vis-à-vis their own fishers and in respect of local stocks only, technical catch-limiting measures additional to the CFP measures. In cases of emergency the Commission may also take conservatory measures additional to or by derogation from the normal arrangements.

1.4.2 Supervision of fishing

The purpose of EU supervision of fishing is to ensure that the Member States apply the rules on resource conservation correctly and without discrimination, especially the rules on quota compliance, technical measures and specific arrangements. Article 11 of Regulation (EEC) N° 3760/92 provides for the adoption of supervisory measures to ensure compliance not only with the provisions of the Regulation itself but also with any implementing measures.

The general Union rules for monitoring the activities of Member States' vessels are laid down in Regulation (EEC) N° 2847/93:

- the basic principle is that each Member State bears first responsibility for monitoring fishing in its territory and maritime waters;

- the Commission has the power to verify, at sea and in fishing ports, the monitoring undertaken by the national authorities in this connection:

- there is a system for monitoring the take-up of TACs and quotas, based on the requirement that, while at sea, fishers must record in a Community logbook the size of their catches and the areas fished and, after landing, they must report the quantities landed;

- all Member States must cooperate and share responsibility in matters of quota management and fisheries control.

The Commission may also ask Member States for any information concerning the application of the Regulation and, where irregularities are suspected, require an administrative enquiry, with the optional participation of a Commission official.

These general rules are supplemented by specific arrangements applicable to:

- fisheries in a zone around the Shetland Isles (system of licenses administered by the Commission for the Union, the detailed rules being laid down in Commission Regulation (EEC) N° 2166/83 of 29 July 1983 establishing a system of licenses for certain fishing activities in an area situated to the north of Scotland (Shetland area)[11]:

- fisheries covered by Articles 158 to 163 and 349 to 352 of the Act of Accession of Spain and Portugal (lists of vessels). These rules are additional to the provisions of Regulation (EEC) N° 2241/87 which apply throughout the enlarged Union.

The supervision of fishing lies within the competence of the Member States. The Commission merely has the power to accompany the national authorities in order to check the correct application of the rules. Moreover, the scope of the present rules[12] is limited to the monitoring of measures relating to internal stock conservation and management .

With regard to waters covered by the Northwest Atlantic Fisheries Organisation (NAFO), EU inspections have been carried out since 1988 under the joint international Inspection scheme[13] in which all the contracting parties take part. The inspectors appointed by the Commission (EU or national inspectors) carry out inspections of vessels flying flags of a NAFO contracting party operating in the waters concerned. The Commission organises inspection trips each year aboard vessels which it charters or which are made available by a Member State in return for a financial contribution from the Union.

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[11] OJ N° L 206, 30.7.1983, p. 71.

[12] Council Regulation (EEC) N° 2241/87.

[13] Council Regulation (EEC) N° 1956/88 of 16 January 1988 adopting provisions for the application of the scheme of joint international inspection adopted by the Northwest Atlantic Fisheries Organization — OJ N° L 175, 6.7.1988, p. 1. Certain rules for applying the Scheme were adopted by Commission Regulation (EEC) N° 2868/88 of 16 September 1988 - OJ N° L 257, 17.9.1988, p. 20.

The purpose of inspections in NAFO waters is to check the application of the organisation's rules by the vessels of the various contracting parties and also the application of the Union's specific rules by vessels of Member states in those same waters.

Despite the fact that, for Antarctic waters, the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) provides for a system of observation and monitoring, and that the Council has implemented the system in the Union[14], EU Inspectors have not yet made any inspection trips in these waters, mainly because fishing operations by Community vessels are of minor importance there.

1.5 Management of Union fleet's fishing activities outside EU waters

Bilateral fishing agreements have been signed by the Union where coastal states have extended the areas under their fisheries jurisdiction. The objective is to maintain or restore the traditional activities of the Union's distant-water fishing fleets and also to develop them by creating fishing opportunities in waters under the jurisdiction of other coastal states or in international waters covered by an international convention. The Union is a member of various international fisheries organisations (NAF0, NEAFC, CCAMLR, NASC0, IBSFC, etc.).

With a view to meeting this objective the European Union has to date signed 25 agreements, 15 of them with African and Indian Ocean countries, 9 with North Atlantic countries, and 1 with a Latin-American country. Without these agreements, the general extension of waters under fisheries jurisdiction would have meant a considerable reduction in fishing opportunities, with attendant social and economic consequences.

The fishing opportunities offered by the agreements are considerable. The number of tuna purse seiners which can operate in the waters of the African and Indian Ocean countries alone varies from 21 to 54, while the number of pole-and-line tuna vessels and surface longliners exceeds 35 for several countries. The authorised total fishing effort for trawlers is of the order of 230 000 GRT, taking all species of fish together, with about 95 000 GRT in Moroccan waters, which gives opportunities for about 1 000 vessels of all types and tonnages.

The agreements are signed on a mutual interest basis, respecting the general principles relating to the rational utilisation of fisheries resources and the rights of coastal States or competent regional or international authorities. The existence of Union fisheries agreements does not preclude the conclusion of arrangements made directly by fishers themselves.

The acquisition of fishing rights in third-country waters is offset by the offer of compensation to that country. The type of fishing agreement varies according to the form the compensation takes: it may be exclusively financial, consist of trading concessions (respecting the Union's international obligations) or an exchange of fishing rights or be a combination of these elements.

Developments are expected, particularly as a result of "second-generation" fisheries agreements which should allow new forms of association, including the creation and development of joint enterprises, to achieve closer and more lasting cooperation with partner countries, particularly in terms of the transfer of technology and knowhow, supply of capital and equipment, vocational

[14] Council Regulation (EEC) N° 3943/90 of 19 December 1990 on the application of the system of observation and inspection established under Article XXIV of the convention on the conservation of Antarctic Marine Living Resources—OJ N° L 379, 31.12.1990 p. 45.

training, the development of distribution networks and the strengthening of scientific and technical cooperation. This kind of clause are embodied in the recent agreement signed with Argentina.

2. The instruments for the management of the fleet

2.1 1983-86 Fleet MGPs

The structural policy created in 1970 was developed to reduce overcapacity (Council Regulation (EEC) N° 2908/83 of 4 October 1983 on a common measure for restructuring, modernising and developing the fishing industry and for developing aquaculture[15]). One of the instruments essential to its implementation is the system of Multiannual Guidance Programmes (MGP).

The preamble to the Regulation clearly stated the desire to establish a fleet adapted to available resources and acknowledged the fact that the Union fleet's fishing opportunities had diminished.

The MGPs adopted over the period 1983-86 were approved with this in mind, and virtually all the decisions adopted by the Commission contained conditions to the effect that the objective of all the Member States must be to stabilise or reduce fleet capacity by the end of the period in question.

Nevertheless, fishing capacity has in general increased.

2.2 1987-91 Fleet MGPs[16]

In 1986 all structural measures in favour of the fishing fleet and aquaculture were grouped in one legal framework by Council Regulation (EEC) N° 4028/86[17]. This Regulation was amended in 1990 by Regulation (EEC) N° 3944/90[18] to extend the coverage of certain structural measures to vessels less than 9 metres in length between perpendiculars or 12 metres where the vessel is capable of trawling, and to define a measure in favour of joint enterprises.

The situation from previous programmes and the overcapacity of the fleets were taken into account when the 1987-91 programmes were approved by the Commission. It therefore fixed a final target for 31 December 1991 based on a reduction of 3% in tonnage and 2% in engine power from the previous programmes' targets. In order to reduce capacity progressively, intermediate targets were fixed for each year.

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[15] OJ N° L 2890, 22.11.1983, p. 1.

[16] The MGPs for this period were adopted by Commission Decissions :
- 88/121/EEC - 88/123/EEC (OJ N° L 62, 8.03.88, pp 21-23),
- 88/139/EEC - 88/142/EEC (OJ N° L 67, 12.03.88, pp 14-27) and
- 88/147/EEC - 88/150/EEC (OJ N° L 70, 16.03.88, pp 19-35).

[17] Council Regulation (EEC) N° 4028/86 of 18 December 1986 on Community measures to improve and adapt structures in the fisheries and aquaculture sector - OJ N° L 376, 31.12.1986, p. 7.

[18] Council Regulation (EEC) N° 3944/90 of 20 December 1990 amending Regulation (EEC) N° 4028/86 on Community measures to improve and adapt structures in the fisheries and aquaculture sector - OJ N° L 380, 31.12.1990, p. 1.

The Council adopted Regulation (EEC) N° 2930/86[19] with a view to using identical rules to define the characteristics of fishing vessels. This regulation is now being amended to simplify the calculation of gross tonnage for small vessels.

Commission Regulation (EEC) N° 163/89[20] brought about further standardisation of definitions and information concerning the fleet.

The procedure for monitoring the programmes was begun from the end of 1987. To this end the Member States regularly notify the Commission of information relating to the development of the fleets and the state of progress of the programmes. Monitoring is now done through the declarations to the fishing vessel register described by R 163/89.

Although the 1987-91 MGPs achieved some progress by comparison with the previous programmes the result was less than hoped for.

Member States have taken a number of legislative and administrative measures in support of the targets and as a result there was a general stabilisation in the fleet and in some cases significant movement towards a reduction.

2.3 The 1992 reform and the follow-up

Council regulation (EEC) N° 3760/92 provides a new framework for the Common Fishery Policy which may lead to significant changes in the management of the fisheries away from general measures and towards measures related to individual vessel with the objective of controlling the fishing effort at this level and of improving the Union's possibility of controlling the compliance with the management measures adopted. The regulation gives the Member States freedom to implement national licence based management systems regulating the fishing effort either by days at sea or by economic incentives. The regulation also introduces the possibility of setting multi-year and multi- species quotas with the objective of limiting the discard problem.

In 1992 the Commission adopted the Transitional Guidance Programmes[21].

Following on from Regulation 3946/92, which introduced the basis for controlling fishing effort using MGPs, the Commission adopted the 1993-96 Multiannual Guidance Programme[22].

The 1992 framework regulation was followed in 1993 by a regulation which provides a new framework for control with conservation measures and measures related to the management of resources, structures and markets (Council Regulation (EEC) N° 2847/93).

In 1993, a Union wide licence scheme involving the registration of all vessels was also implemented.

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[19] Council Regulation (EEC) N° 2930/86 of 22 September 1986 defining characteristics for fishing vessels - OJ N° L 274, 25.9.1986, p. 1.

[20] Commission Regulation (EEC) N° 163/89 of 24 January 1989 concerning the fishing vessel register of the Community - OJ N° L 20, 25.1.1989, p. 5.

[21] Commission Decisions 92/358/EEC-92/368/EEC, OJ N° L 193, 13.07.92, pp. 1-52.

[22] Commission Decisions 92/588/EEC-92/598/EEC, OJ N° L 401, 31.12.92, pp 3-70.

Table 4. MGP III: Comparison between situation and objectives in fleet capacity
tonnage (GRT)

Member state	End of year	1991	1992	1993
Belgium	Objectives	21 340	20 913	24 579
	Situation	27 089	25 800	24 498
Denmark	Objectives	119 188	116 804	114 709
	Situation	114 926	109 967	96 905
Germany	Objectives	85 336	83 629	81 413
	Situation	78 341	80 736	80 736
Greece	Objectives	126 528	123 997	122 316
	Situation	129 313	120 712	111 662
Spain	Objectives	673 303	659 837	649 571
	Situation	644 989	629 075	584 180
France	Objectives	201 604	197 572	193 273
	Situation	195 969	191 211	187 661
Italy	Objectives	268 198	262 834	259 421
	Situation	267 471	264 932	261 843
Ireland	Objectives	48 750	47 775	54 538
	Situation	50 693	55 652	52 363
Netherlands	Objectives			
	Situation	140 460	171 585	171 899
Portugal	Objectives	209 540	205 349	202 076
	Situation	187 993	167 066	148 336
United Kingdom	Objectives	193 027	189 166	185 239
	Situation	214 733	211 968	210 159
Total (*)	Objectives	1 946 814	1 907 878	1 887 134
	Situation	1 911 517	1 857 119	1 758 343

* Excluding the Netherlands.
Sources: Member States under the provisions of the MGPs.

Table 5. MGP III: Comparison between situation and objectives in fleet capacity engine power (KW)

Member state	End of year	1991	1992	1993
Belgium	Objectives Situation	69 242 79 816	67 857 74 979	73 199 70 758
Denmark	Objectives Situation	514 716 488 278	504422 459 470	487 251 411 297
Germany	Objectives Situation	206 465 190 273	202 336 176 730	197 716 176 730
Greece	Objectives Situation	688 203 710 062	674 439 695 642	670 243 662 505
Spain	Objectives Situation	1 955 372 1 910 145	1 916 265 1 930 342	1 889 907 1 833 857
France	Objectives Situation	1 055 050 1 072 428	1 033 949 1 054 358	1 012 734 1 034 034
Italy	Objectives Situation	1 541 664 1 536 518	1 510 831 1 528 924	1 499 293 1 526 444
Ireland	Objectives Situation	197 011 176 075	193 071 193 792	190 277 191 624
Netherlands	Objectives Situation	412 988 441 953	404 728 533 336	407 542 532 053
Portugal	Objectives Situation	541 003 504 067	530 183 472 943	524 649 438 464
United Kingdom	Objectives Situation	1 095 206 1 228 922	1 073 302 1 206 258	1 053 883 1 198 760
Total	Objectives Situation	8 276 920 8 338 537	8 111 382 8 326 774	8 006 692 8 076 526

Sources: Member States under the provisions of the MGPs.

3. The outcome

3.1 The fish stock

3.1.1 Classification of the state of the stocks

The fundamental requirement for assessing the state of a fish stock is an estimate of the fishing mortality rate to which the stock is subject. Fishery scientists define the state of a fish stock by asking two questions:

QUESTION 1: Is it likely that, in the future, landings could be noticeably and, on average, permanently increased by changing the fishing mortality rate on some or all age groups of the stock?

Long-established methods exist to answer this question and the state of exploitation of fish stocks can be classified (somewhat arbitrarily) into three groups on the basis of the reply:

Lightly Exploited - increasing the fishing mortality rate to the point at which the stock becomes fully exploited will result in an increase in average yield.

Fully Exploited - Increasing the fishing mortality rate will result in a negligible increase or a decrease in average yield.

Heavily Exploited - Yield will be maintained or increased by a reduction in the fishing mortality rate.

These definitions are useful and are widely applied to fish stocks for which the appropriate analyses can be carried out. However, the methods on which this classification is based do not consider the possibility that the stock is now in or may enter into a depleted state. Consideration of this possibility is essential.

QUESTION 2: Is it the case now that the stock is unable to replenish itself by reproduction or will this become the case if the fishing mortality rate is increased?

No fully satisfactory methods exist to answer this question. However, evidence of current low abundance of mature fish, especially if accompanied by associated estimates of low numbers of young fish entering the stock, is always cause for serious concern. If this appears to be the situation the stock may be classified as:

Depleted Stock - Heavily exploited to the point at which the mature fish left in the stock are insufficient to generate enough offspring for stock replenishment. If this condition persists it is possible that the stock will collapse to a level from which recovery will be difficult or, perhaps, impossible.

A difficulty with the classification given above is that by no means all stocks are subject to the kind of analysis which, strictly speaking, is required to allow allocation to an appropriate category. However, in many cases where gaps in data prevent cruder methods are applied and it is usually the case that some estimate of the state of the stock can be obtained.

3.1.2 State of fish stocks in EU waters

3.1.2.1 Stocks subject to TAC regulations.

Broadly speaking, no drastic changes have been observed on the state of roundfish stocks. The stocks of hake continue their steady decline, primarily due to the continuation of the adverse exploitation pattern to which hake is being subject.

The decline of roundfish in the North Sea and to the west of Scotland has not been reversed. Spawning stock biomasses continue reaching new record low levels or, in some cases, present slight improvements which, at the rate at which exploitation is being held, would only last one year if any. This is particularly the case of North Sea haddock, where the relatively high 1992 year class has allowed an important increase of the TACs for 1994. However, if subsequent year classes do not continue to be good, the situation is not likely to improve. For North Sea cod, the relatively high 1991 year class has also permitted a very slight and punctual improvement in the size of the spawning stock, but exploitation continues to be too high to be optimistic.

The stocks of flatfish are in a relatively good shape. However, it is considered that the exploitation rate is still too high and that long term gains would be expected from a decrease in the intensity of exploitation. This applies also to the stocks of Nephrops and other benthic fish (monk and megrim).

As far as pelagic stocks are concerned, western mackerel and horse mackerel continue in good shape; herring stocks have remained constant in recent years, except North Sea herring, for which scientists have detected a recent decline in population numbers and in mean weight and maturity of the individuals. As a result, the spawning stock of North Sea herring is close to its critical level, and no recovery is expected in the short term at the present level and pattern of exploitation. North Sea mackerel continues nearly extinct.

3.1.2.2 Stocks not subject to TAC regulation.

The state of stocks of this type continues to be somewhat unknown. Scientific assessments are rarely conducted, although many of these stocks constitute a non-negligeable proportion of total catch. Tuna and tuna-like fish are considered to be in a safe state, but this is somewhat uncertain for albacore. Deep-water fish stocks are cause of special concern, given that they are considered fragile and exploitation continues to increase.

Table 6. Number of stocks according to state of exploitation

Species	Pre 1983					1990					Total
	L	F	H	D	U	L	F	H	D	U	
HERRING		2	5				4	3			7
SPRAT	1		1		2	1			1	2	4
ANCHOVY					2					2	2
ATL. SALMON			1						1		1
COD		3	5					6	2		8
HADDOCK			4					3	1		4
SAITHE		2			1			2		1	3
POLLACK					3					3	3
NORWAY POUT			1					1			1
BLUE WHITING	1				1	1				1	2
WHITING			5		2			5		2	7
HAKE			2					2			2
HORSE MACKEREL	1		1			1		1			2
MACKEREL	1		1					2			2
PLAICE		3	5				1	7			8
COMMON SOLE		7	1		1		1	7		1	9
MEGRIM					3		3				3
ANGLER FISH					3			3			3
CRUSTACEANS					6	1	3	2			6
TOTAL	4	17	32	0	24	4	12	44	5	12	77

Key : L = lightly exploited; F = fully exploited; H = heavily exploited; D = depleted; U = unknown.
Source: Commission of the EU.

3.2 The socio-economic situation

Some of the allocation systems adopted at national level have not yet fully included all vessels fishing a given stock. Those vessels which are less strictly controlled may tend to increase their fishing effort in a tight quota situation thus bringing forward the date on which a fishery has to be halted by the authorities with negative effects for both the primary and the secondary sectors of the industries. Accompanying problems have included a perception of social inequality in some coastal communities with part of the fleet economically active and the other part constrained to inactivity in port. However for some Member States and for some species the quotas allocated have not set real constraints on primary productive activity as they have not been fully taken up.

For species where the quotas have set an upper limit to productive activity, Member States have increasingly used the device of quota exchange to provide some relief from constraints of the initial allocations. This flexibility in the system has been particularly important where the economic value of specific fisheries to Member States has changed since the mid 1970s and where economic and social development would have been held back in the absence of the opportunity to exchange quotas. In 1984 quota exchanges numbered some 46 separate transactions. By 1993, the number of voluntary transactions had increased to some 158, for a total of 112 000 tonnes.

For example, the local economies of Urk and Den Helder, which are important home ports for the Dutch beam-trawl fleet, have benefited of the increased fishing from opportunities given by quota exchanges between the Netherlands and the United Kingdom. Each year, the Netherlands transfer their entire quotas of different ICES Area VII species to the United Kingdom in exchange for plaice to allow a significant increase of the Dutch Plaice quota in the North Sea.

Indeed, the fishing opportunities foregone by each party to the exchange agreement may be of very little value because the fish would not have been caught anyway. The overall gain in such circumstances is equal to the gross gain in increased landed value together with the associated gains in enhanced economic activity onshore.

For some sectors of Member State fishing industries the TAC and quota system has only partially influenced the pace and direction of economic development. This is because some target species have either not been fully subject to the system (where TACs have been set but not generally divided into national quotas, e.g. horse mackerel) or have only been subject at the most to technical conservation measures, e.g. crab. In some Member States the aggregate contribution to landings value from non-quota species found in the Union's fishery zone has been significant, with certain coastal areas being particularly dependent on non-quota demersal, pelagic and shellfish landings.

In some Member States, fleet segments have expanded to take species in areas where national quotas were under-utilised and to exploit non-quota species. This expansion, together with the responses of other segments to various fishing opportunities, has produced varied aggregate changes at Member State level in the number of vessels and fishers. However, in association with capital modernisation and replacement, partly funded from public sources, the changes have generally put upward pressure on the capacity and capital intensity of the fleet.

Another way of adapting to the constraints imposed by quotas has been fraud. A hidden economy has developed, producing a gap between the official economy and the real one which prejudices the decision-making process. In addition, it has created a degree of inequity at the expense of those segments of the fleet subject to the strictest controls.

Thus, some parts of the Member State fishing industries have experienced relatively little limitation on their economic and social development while other parts, particularly those using larger vessels and fishing species subject to TACs and quotas, have faced reduced production ceilings for many of their major target species. This has often led to temporary or permanent diversification into mainly non-quota fisheries to maintain economic viability. While private responses of this type have been rational in the context of ensuring business survival, external costs and consequent social conflict have sometimes been generated. Such conflict, particularly due to incompatibility between fishing gear and the nomadic behaviour of some fishing vessels, has been evident in the fisheries for both quota and non-quota species. Other responses to ensure business survival have resulted in the generation of external costs in the form of discards and the development of a hidden fisheries economy which has affected the economic and social development of the coastal areas. Though increasing regulatory activity may have reduced private responses available to ensure business survival it is vital to ensure that social costs are maintained at a controllable level.

Fishing businesses have predictably responded by, for example, technical improvements aimed at reducing the adverse economic effects of the control measures on their performance. This has contributed to the upward trend in fleet capacity, with the result that many economic resources must now be wasted in enforced idleness or inefficient use, and potential longer-term production increases from many of the major stocks are necessarily sacrificed. Furthermore, negative effects have been experienced by other sectors of the industry, in terms of higher costs, and by consumers through higher prices.

Part III: ASSESSMENT

1. The biological impact of the CFP prior to 1992

1.1 Incomplete coverage by the TACs

Taking only the species managed by analytical TACs, i.e. excluding the precautionary TACs[23] less than 15% of the total landings value of catches taken in EU waters is covered by the TAC System.

The coverage of species by the TAC system is very different between the north (where it is high) and the south and certain coastal waters (very slight). Given this state of affairs the vessels affected by catch restrictions for species subject to a TAC have sometimes been redeployed to other resources previously exploited only lightly or not at all. This has restored some balance to the situation.

1.2 Multispecies fisheries

Even in Member States traditionally dependent on species now covered by TACs the contribution of the landings of other species may exceed 25% in terms of value. For certain coastal fisheries it may be as high as 100%.

Management with the aid of quotas defined for individual species is particularly difficult in the case of multispecies fisheries (several species in one area), very variable biological parameters and nonselective fishing methods and gear. In such cases the choice rests solely between TACs which are inapplicable for most of the species because they exceed effective catch potential (paper quotas) and discards on a massive scale.

Generally speaking multispecies fisheries are more common in the southern regions especially the Mediterranean, than in the north.

1.3 Discards at sea

Discards are a general phenomenon. Detailed data are often unavailable but the phenomenon accounts for hundreds of thousands of tonnes and billions of individuals. Two examples suffice to illustrate the situation:

- in the North Sea discards of haddock may exceed what is retained from a single trawl. The global estimate for 1985 was 460 million discarded individuals whereas landings amounted to 500 million;

- in the Bay of Biscay/Celtic Sea discards of hake in 1985 were estimated at 130 million individuals for a landing figure of 110 million.

The problem is not confined to a particular region. Even the Mediterranean is concerned despite the fact that the rules do not require discarding and high prices facilitate marketing. Discard rates of 10% are nonetheless common.

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[23] A precautionary TAC is a figure calculated without reference to exact scientific evaluation of the size of a stock. The purpose is to avoid large scale carryovers of effort to stocks not evaluated analytically.

It would also be wrong to think that the discard problem was exclusively confined to one or another fishery. All fisheries are concerned, no fish are discarded for two basic reasons: either because there is an obligation written into the rules or because it is deemed economically advisable.

The EU rules require that certain fish, even marketable species, be discarded. This is true in the case of undersized individuals or catches causing an overrun either of the authorised size of bycatches for fisheries subject to a derogation or of the quota of the species in question. Such losses are an accepted evil in order to deter fishers from certain other practices which, if allowed to get out of hand, would have even graver consequences.

In addition to the obligatory discards there are other discards which are made on the judgement of the skippers who regard it as pointless to encumber themselves with catches which offer no prospect of adequate returns at the marketing stage. This is true in the case of species with no commercial potential, such as brittle star and a whole series of invertebrates, but also when, for the fleet in question, there is no appropriate commercial network (cf. grey gurnard in the North Sea). The case also arises where, owing to the particular conditions of fishery, the packing, storage and landing costs exceed the hoped-for selling price, or where space must be reserved for species of higher commercial value. Targeting very high value species generally leads to an increase in discards, as certain freezer vessels illustrate. There is also, of course, the problem of fish damaged during the catch.

Discards would not exist if fishers could make the necessary selection before harvest. One of the most radical solutions would be to select the desired species and sizes before catch. But there are no completely selective fishing techniques at the present time, and progress is very slow on this front.

1.4 Environment

1.4.1 Impact of fishing on the environment

Fishing effects marine ecosystems in various ways, and intense exploitation of fish stocks is only the most visible aspect. Other effects are caused by bycatches, for instance of marine mammals and seabirds caught in fixed or drift nets, or the capture of groups of individuals or species by bottom trawl gear, which can also profoundly affect the seabed. These direct effects are probably made more complex by induced effects.

Over the past decade all the problems have become more acute because of the increased power of fishing vessels, their capacity to fish at depths hitherto not accessible to trawls (improved fish location techniques), and the development of new methods and gear.

Fishery resources form a link in the food chain and exploitation has an impact on the marine ecosystem. But it is difficult to assess the global impact of fisheries as the matter has been little researched.

1.4.2 Impact of aquaculture on the environment

The impact of traditional shellfish culture is merely spatial with occasional effects on sedimentation due to direct exploitation of plankton resources especially phytoplankton. Recent growth of shrimp and finfish farming however is leading to new environmental problems. Intensive units for fry production and ongrowing have been named as major sources of coastal pollution. The effluent from such units contains organic waste, chemical pollutants (pharmacological and cleaning agents), genetic pollutants (escape of genetically-altered individuals which can compete with natural populations). The consequences are aggravated by the concentration of such units in highly productive but ecologically sensitive locations.

1.4.3 Impact of the environment on sea fishing and farming

All resources are extremely sensitive to environmental change. Natural changes in the marine environment play a fundamental role - barely understood - in the very sharp variations in breeding performance from one year to the next. Because of such poor understanding it is very difficult to determine the respective roles of natural changes and degradation due to manmade pollution.

In the case of high-sea stocks there is no evidence to suggest severe damage due to pollution. But this cannot be ruled out in the case of certain coastal, lagoon and estuary resources. Pollution has a radical effect on the salubrity of shellfish (farmed) and is therefore of major importance for the economic future of the shellfish Industry. For certain types of chemical pollution and bacterial pollution the situation is perfectly clear, and it is essential to restore ecological health in large sectors of the shellfish farming Industry. On the other hand it is still proving impossible to identify the causes of the apparent proliferation of the toxic planktonic efflorescences (Dinophysis, Gonlaulax) which have caused major problems in the last decade .

1.5 Research

Fixing TACs every year on the basis of scientific proposals mobilises a considerable proportion of research capacity, which has to be diverted from other tasks, albeit essential for the future of the CFP, such as socio-economic aspects or environment/fisheries relations.

Whereas the politicians and fishing Industry professionals require ever more detailed and comprehensive analyses, the knowledge of stocks in certain regions (Mediterranean east of the Rhone, Atlantic from southern Gibraltar to Bay of Biscay, and Irish Sea) has progressed very little, the research effort has even declined in other zones (North Sea), and bioeconomic studies are still fairly rare.

In fact, the means of action placed at the Commission's disposal for encouraging research development have been fairly limited to date[24]. It has merely been possible to boost scientific cooperation where it was most needed.

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[24] The AIR programme provides for Community assistance for research in four areas: resource management, fishing techniques, aquaculture and value enhancement. Funds are also available for study grants and coordination of research.

1.6 Monitoring

The EU rules fixing the TACs and quotas and laying down technical conservation measures (mesh sizes, bans on fishing in certain zones, etc.) are in themselves difficult to enforce given the extreme heterogeneity of the fishing industry, the size of the zones to be policed, the mobility of fishers, the mixed nature of fisheries and the inevitable complexity of the legislation.

Fishers often challenge the justification of conservation measures, and their combativeness is occasionally turned on the authorities responsible for applying them. In addition, fishers are extremely sensitive about the uniform application of EU measures throughout the Member States. Such uniform application is extremely difficult to achieve.

Compliance with TACs and quotas has on the whole been very limited. Scientific working groups have made estimates of real catches, independent of official figures, as they have been doing for several decades. Such estimates bring to light considerable discrepancies, of as much as 60%, between official and "real" catches. The problem is not restricted to certain stocks nor to a single region. It affects all sectors. It takes very varied forms: there are even cases of over-reporting. This happens when a Member State fears a reduction of its "future antecedents" if it declares catches which are too low. Over-reporting may also be linked to false certification of the origin of catches, whereby under-reporting for one stock is simultaneously balanced by over-reporting for another.

Existing EU rules on the monitoring and recording of landings are not always applied with the stringency needed to ensure a full record of catches and their correct notification to the Commission. There are gaps in the monitoring of landings transported by lorry to the place of sale or processing plant or exported directly. In such cases, if no check is made on landings, the products vanish into the distribution network and their origin can no longer be traced.

While monitoring poses considerable difficulties for the CFP, such difficulties must not be exaggerated; they are encountered in any policy of fisheries management. There is constant conflict between short-term individual interests and long-term collective ones. The immediate personal interest of the fisherman leads him to catch as many fish as possible, regardless of size, as long as they can be sold. The sum of these individual interests eventually leads to the classic problems of overexploitation and misexploitation.

Rules are needed to safeguard the long-term collective interest. The fisherman then has to decide between complying with the rules, thereby losing potential income, and doing what he perceives to be in his interest, by contemplating fraud. If there is a high probability of an inspection and a penalty, and if the penalty provides enough of a deterrent, the fisherman might, in theory, find it preferable to observe the law. This "objective" analysis is complex, and includes psychological and cultural factors. In the best case, the fisherman includes in his reasoning a personal concern for good conduct. In the worst case, fraud becomes an acceptable sport.

In view of the objective limits of the system of monitoring and penalties, the subjective aspects of the issue of compliance with the rules are essential. The fisherman has no genetic propensity to defraud. If he accepts that a rule is justified, he will accept restrictions on his activities. Social pressure of the peer group can then play an important part in prompting compliance with the rules without it being necessary to set up a system of anonymous informers among fishers.

The scope of Regulation (EEC) N° 2241/87 was restricted to monitoring compliance with rules concerning conservation of resources. Therefore compliance with the rules of the market organisation and measures to implement the structural policy escaped the surveillance of EU inspectors. This has been rectified with the adoption of Regulation (EEC) N° 2847/93 which extended the powers of inspectors from 1 January 1994.

In the past the Commission has made little use of its power to close a fishery when a Member State had used up its quota. Legally, the Commission had no direct access to the information in vessel logbooks, but could receive copies upon request. Effective monitoring of the application of the rules was unsatisfactory on several counts:

- coordination of monitoring by national inspection services and prosecution of infringements by Member States;
- monitoring of compliance with technical conservation measures;
- checking of quantities landed and conveyed to places of sale;
- communication of data;
- human and material resources assigned to monitoring at sea;
- autonomy of Commission Inspectors.

Under the old monitoring system failure to comply with the rules triggered a system of sanctions against the relevant Member States and offending parties, which, however, involved procedures and mechanisms which were cumbersome and slow, limiting the efficiency of the system.

1.7 Technical conservation measures

In practice, the rules on technical conservation have proved insufficient to provide adequate protection of stocks. It has been impossible to make them sufficiently stringent from the outset, particularly as regards mesh size. The complexity of certain rules makes monitoring extremely difficult. And the technical measures are now somewhat outmoded as the context has evolved both in technical terms and as regards social demand. The emphasis on the protection of ecosystems is now the most important. A major overhaul is therefore under way and has already produced certain tangible results. On 28 October 1991 the Council adopted certain technical conservation measures which put an end to more than two years of constant negotiation to give credibility to the Union in one vital area of resource management. With regard to the increase in mesh size in certain regions, the Council fixed the effective date for the first increase at 1 January 1992 and undertook to decide on a second increase to become effective by 1 January 1995 if scientific advice then confirmed that the current measures had failed to achieve the reconstitution of the stocks in question.

1.8 Annual decision-making on TACs and quotas

At decision-making level the scientific proposals are systematically revised upwards. In fact, the decision-making procedure always leads to overfishing. In addition, the catch estimates from sources other than the Member States show that when a stock proves economically attractive catches are very often, and sometimes very greatly, over the quotas. The fact that discards are not deducted from the quotas creates a disparity between what should be booked (the catches) and what is actually booked (the landings). Systematic overruns of TACs are gravely prejudicial to the operational usefulness of the very cumbersome scientific, administrative and political machinery involved.

Apart from quota overruns there is another problem: that of quotas systematically underused. As soon as one enters the geographical area of precautionary TACs (outside the North Sea and some adjacent areas) one finds an increase in "paper quotas"[25] associated with precautionary TACs.

2. The socio-economic impact of the CFP prior to 1992

2.1 Global assessment

2.1.1 Benefits

The benefits from these programmes to date may be summarised as follows:

- The linkage of structural policy operation to the achievement of agreed capacity reduction objectives, on an annual basis;

- The establishment of the first steps in achieving eventual comprehensive classification of the EU fishing fleet. This is necessary in order to permit accurate identification of structural problems with consequent targeting of aid to solve these problems;

- Agreed global capacity reduction objectives;

- The programmes also made a regular flow of information available on both the situation and evolution of the fleets which created an awareness both in Member States and in the Commission of the need to introduce or improve measures to achieve the agreed objectives for the fleet.

[25] A "papel qota" is a quota which exceeds effective catch opportunities.

2.1.2 Limitations

A number of limitations on the effectiveness of these programmes has been identified, and a new strategic approach has been developed in 1992 by the Union.

The major limitation on adjusting instruments to the needs of the fisheries sector has been lack of adequate information.

The main limitations in the 1984/86 and 1987/91 programmes were:

- Insufficient classification of the fleet into categories related to the species caught, fishery zones and methods of fishing;

- monitoring of the fleet based on a limited number of physical capacity parameters only, without any consideration of the remaining parameters and fleet activity (fishing effort);

- absence of short- and long-term objectives based on the actual situation of particular stocks;

- lack of statistical data and inadequate measures to control fishing capacity and fishing effort;

- non-obligatory status of the programmes.

2.1.3 The structural measures

Under the MGPs the structural measures as a whole have suffered delays in implementation because activating the re-orientation (exploratory fishing, redeployment, joint ventures and joint enterprises) and restructuring measures (construction, modernisation and adjustment of capacities) is not a matter for the Union but for the Member States which have the political and budgetary initiative.

In addition, despite an attempt at dividing up the budget between the various structural measures there was no corresponding programming of the measures. This meant that global targets could not be realised and decisions were taken on a case-by-case basis with no overall strategy behind them.

2.2 Intrinsic limits

The problems with the present management system may be summed up as follows:

The TAC and quota system has provided fishers with an incentive to expand their fishing capacity in order to obtain advantages in relation to other fishers, with the result that total capacity has been maintained at a level well beyond what it is necessary to catch the TACs. The overcapacity is, in other words, a logical consequence of the system which cannot be alleviated by eliminating the overcapacity once and for all. The overcapacity is bound to reappear, hence the failure of previous plans to reduce the size of the EU fleet.

The chronic overcapacity has the economic consequence that the potential rent of the fishing resources is dissipated even if the TACs are respected. The economic rent forgone may be of the order of ECU 3 billion per year[26].

The present system of managing the fish resources also aggravates the problems of control, access for vessels and security of supply.

A fisherman who has an excess capacity clearly has a stronger incentive to break the rules than a fisherman who is operating at full capacity. The costs of enforcing compliance with the TACs is therefore higher under the present system than under an economic incentive system. The incentive for Member States to allocate resources to enforce the rules is also limited.

In order to maintain or restore traditional fishing possibilities as well as develop new fishing opportunities measures for acquiring access to fish resources outside the EU have been adopted. The assessment of the economic rationale for such acquisitions which are not or only partly financed by the fishers who receive them is also important.

The basic problem with the initial system was that the private costs of fishing were lower than the social costs because the fishers had no incentive to take into account the costs imposed on other fishers resulting from the depletion of the stock due to increased fishing effort.

A management system providing for more economic incentives where private costs of fishing are at a level similar to that of social costs could provide the solution to many of the problems which have been experienced in the past.

Conclusions

Despite the shortage of information, in particular reliable figures relating to fishing activities as a whole, and the resultant imperfect knowledge, the facts show that at the end of the first decade of the Common Policy for the Conservation and Management of Resources, the fisheries sector is characterised by overfishing, lower production and income than could have been obtained and the existence of a latent sectoral crisis.

The new framework for the Common Fisheries Policy which was established in 1992 and which is in the process of being implemented is expected to alleviate many of the problems experienced with the previous regulation. It is however too early to assess the outcome of the new measures.

- Over fishing

  All scientific and technical opinion is in agreement that taken as a whole, stocks are at risk owing to excess fishing mortality, mainly affecting juveniles - even though fishing is not solely responsible for this situation.

  However, this overall picture has to be adjusted and assessed, case by case, taking into account the species, fisheries and regions concerned.

[26] Estimated on the basis of 1989 landings values and a 40% overcapacity on average.

Stocks of round- and flatfish, representing about 35% of stocks subject to TACs, are fully exploited or heavily exploited; this means an appreciable reduction in landings, which restricts fishers's income to a level lower than that which could be obtained.

– A latent sectoral crisis

Fishing and aquaculture are first and foremost economic activities and certain socio-economic parameters indicate the existence of a latent crisis in the sector.

Although the demand for high-value fish has been constant, resulting in a deferment of the crisis engendered by the appreciable drop in landings of traditional species and favouring the reorientation of activities and economic survival, demand elasticity vis-à-vis prices and new alternatives will not be able to make the situation permanent. With regard to aquaculture production, the existence and development of certain products is conditioned by the state of the markets and physical and environmental limitations. As with other sources of supply, the Union's large trade deficit is tending to increase.

Fishing is an activity that traditionally offers a low return on capital. This delicate balance is currently being undermined by overinvestment accompanied by a growing scarcity of raw material. As a result, overinvestment leads to overfishing.

The European fishing industry is extremely vulnerable in terms of jobs. The most modern fleets are engaged in fisheries where rates of activity in general have to be reduced. Even though regulation of fishing vessels activities can in some cases limit the reduction in catch capacity, job losses must be expected, and all the sooner as major technological advances are made. Other fisheries which have not been fully involved in the modernisation process are facing another difficulty - low productivity. There is the risk that increased trade will quickly create competitiveness problems. This second type of problem is particularly serious since it affects regions which are highly dependent on fishing and where socioeconomic alternatives are rare.

With regard to regions, although coastal and island zones are generally involved in fishing and aquaculture activities, these activities are unevenly distributed, mainly on the basis of the location of fish stocks, the existence of suitable fish-farming sites, the importance of fishing traditions and the location of processing/marketing industries. The concentration of fish-related activities in specific regions or locations where fishing makes a significant contribution to maintaining the socio-economic fabric, creates a close dependence on fishing there.

ANNEX 1-1

Importations and exportations outside the community of fish produits for human consumption

(vol. in thousands of tonnes and val. in millions of ecus)

	1984		1985		1986		1987		1988		1989		1990		1991		1992		1993	
	Vol	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**	**Vol**	**Val**
Import.	1 352	3 188	1 410	3 576	1 663	4 145	1 896	4 782	2 141	5 384	2 287	5 814	2 599	6 433	2 719	7 253	2 753	7 200	2 574	6 591
Export.	649	907	713	1 086	854	1 228	791	1 211	789	1 169	888	1 249	890	1 204	959	1 303	1 063	1 238	1 071	1 260
Balance comm.	-703	-2281	-697	-2 490	-809	-2 917	-1 105	-3 571	-1 352	-4 215	-1 399	-4 565	-1 709	-5 229	-1 760	-5 950	-1 691	-5 962	-1 503	-5 331

Notes: Importations/Exportations/Balance = 03 + 1604 + 1605 (= Fish destined for human consumption with the exception of pastes.)
Importations/Exportations: *Source*: COMEXT, 1983: not available on COMEXT, 1984 - 1993: All the totals are from EUR-12.

ANNEX 1-2

Import fishery products into EU Members states

Member state	Quantity (000 kgs)			Value (000 ecus)			Value/Quantity (ecus/kg)		
	1983	1991	1992	1983	1991	1992	1983	1991	1992
Belgium	128.59	162.52	171.81	329.57	605.29	616.40	2.56	3.72	3.59
Denmark	265.42	468.96	436.16	342.23	938.79	892.83	1.29	2.00	2.05
Germany	402.56	669.24	683.46	707.88	1.595.10	1.579.99	1.76	2.38	2.31
Greece	41.57	63.96	57.99	78.23	141.52	133.32	1.88	2.21	2.30
Spain (*)	350.22	704.18	758.27	798.24	2.021.87	2.173.45	2.28	2.87	2.87
France	472.86	759.72	769.36	1.170.73	2.373.96	2.270.43	2.48	3.12	2.95
Ireland	31.31	34.91	37.17	37.91	67.91	63.91	1.21	1.95	1.72
Italy	320.83	626.81	596.73	784.44	2.120.13	1.982.76	2.45	3.38	3.32
Netherlands	138.69	437.52	505.82	219.18	711.70	735.18	1.58	1.63	1.45
Portugal(*)	140.93	257.35	244.34	256.08	613.08	570.91	1.82	2.38	2.34
United Kingdom	346.68	480.01	473.37	850.01	1.394.12	1.321.65	2.45	2.90	2.79

(*) 1986, 1991, 1992, 1983 NIMEXE, 1991-1992 CN.
Total fish for human consumption (03 + 1604 + 1605).
Source: EUROSTAT comext.

ANNEX 1-3

Export fishery products outside EU

Member state	Quantity (000 kgs)			Value (000 ecus)			Value/Quantity (ecus/kg)		
	1983	1991	1992	1983	1991	1992	1983	1991	1992
Belgium	30.275	45.177	41.127	78.447	182.049	166.643	2.59	4.03	4.05
Denmark	393.485	541.373	543.793	872.184	1.715.197	1.633.149	2.22	3.17	3.00
Germany	111.038	226.524	222.547	231.544	460.910	434.655	2.09	2.03	1.95
Greece	8.333	15.975	22.904	26.196	70.335	90.054	3.14	4.40	3.93
Spain (*)	214.769	282.855	244.367	421.078	553.202	508.358	1.96	1.96	2.08
France	160.422	316.804	336.428	355.487	757.871	739.407	2.22	2.39	2.20
Ireland	147.950	175.177	183.485	108.268	228.121	231.208	0.73	1.30	1.26
Italy	78.368	70.112	72.356	97.204	189.478	187.418	1.24	2.70	2.59
Netherlands	441.601	569.397	657.889	560.778	1.065.256	1.055.878	1.27	1.87	1.60
Portugal (*)	69.944	97.784	85.181	142.782	226.758	193.278	2.04	2.32	2.27
United Kingdom	358.809	408.421	411.221	343.194	814.980	762.664	0.96	2.00	1.85

(*) 1986, 1991, 1992, 1983 NIMEXE, 1991-1992 CN.
Total fish for human consumption (03 + 1604 + 1605).
Source: EUROSTAT comext.

ANNEX 2

Per capita consumption
(average 1988-1990)

Member state	**Food availability (*)**	**Population (**)**	**Availability by person (***)**
Germany	963 924	78 763	12.2
Belgium	192 578	10 266	18.8
Denmark	108 557	5 134	21.2
Spain	1 476 168	38 885	38.0
France	1 756 980	56 426	31.1
Greece	192 031	10 064	19.1
Ireland	56 049	3 519	15.9
Italy	1 158 925	57 551	20.1
Netherlands	145 170	14 848	9.8
Portugal	594 708	9 882	60.2
United Kingdom	1 142 485	57 444	19.9

(*) metric tonnes (live weight)
(**) '000 persons
(***) kg/year.
Source: FAO.

ANNEX 3-1
Landings
(in ‘000 tonnes)

Member states	1983				1988				1989				1990 Total	1991 Total
	Demersal species	Pelagic species	Crustacean and shellfish	Total	Demersal species s	Pelagic species	Crustacean and shellfish	Total	Demersal species	Pelagic species	Crustacean and shellfish	Total		
Belgium (1)	34	6	3	43	36	< 1	2	37	32	< 1	2	35	38	36
Denmark (1)	1.395	463	79	1.937	1.354 (g)	482	86	1.922	1.380 (g)	404	92	1876	1.45 9	1.72 8 (2)
Germany (1)	-	-	-	284 (a)	-	-	-	184 (a)	-	-	-	208 (a)	215	254
Greece (1)	-	-	-	111	-	-	-	152	-	-	-	152	154	159
Spain (2)	-	-	-	1.056 (b)	-	-	-	1.022 (b)	-	-	-	961 (b)	953	1.00 0
France (1)	-	-	-	526 (c)	-	-	-	603 (c)	-	-	-	560 (c)	583	383 (2)
Ireland (1)	38	144	10	192 (d)	44	180	10	234 (d)	38	147	12	197 (d)	184	196
Italy (1)	-	-	-	434 (c)	-	-	-	390 (c)	-	-	-	365 (c)	337	368
Pays-Bas (1)	-	-	-	248	-	-	-	277	-	-	-	305	538 (2)	462 (2)
Portugal (2)	-	-	-	384 (e)	-	-	-	347	-	-	-	331	322	241
United Kingdom (1)-(c)	428 (f)	249 (f)	72 (f)	770	366 (f)	280 (f)	96 (f)	835	306 (f)	273 (f)	86 (f)	751	726	902

1. Catches by national vessels in interior and foreign harbours.

   Catches by national vessels in interior and foreign harbours; (a) Equivalent live weight; (b) for direct consumption, weight of catch - figures from 1986 for 1983; (c) Equivalent weight of catches; (d) With the exception of oysters, mussels, salmon; (e) Figures 1987; (f) Catches by British vessels in interior harbours;
   (g) Including most catches of fish for reduction excluding horse mackerel.

Source: Various sources including Member states and OECD.

ANNEX 3-2

Landing values
(in million ecus)

Member states	1983				1988				1989				1990 Total	1991 Total
	Demersal species	Pelagic species	Crustacean and shellfish	Total	Demersal species	Pelagic species	Crustacean and shellfish	Total	Demersal species	Pelagic species	Crustacean and shellfish	Total		
Belgium (1)	51 (88%)	2 (3%)	5 (9%)	58 (100%)	69 (93%)	< 1 (<1%)	5 (7%)	74 (100%)	72 (92%)	< 1 (<1%)	6 (8%)	78 (100%)	84	91
Denmark (1)	(f) 321	61	36	418	(f) 334	63	45	441	(f) 339	61	54	454	443	460 (2)
Germany (1)	-	-	-	150	-	-	-	123	-	-	-	138	156	181
Greece (1)	-	-	-	285	-	-	-	445	-	-	-	504	500	528
Spain (2)	-	-	-	(a) 1.580	-	-	-	(a) 1.622	-	-	-	(a) 1.764	1.848	2.422
France (1)	-	-	-	702	-	-	-	941	-	-	-	943	945	797 (2)
Ireland (1)	28 (39%)	28 (39%)	15 (22%)	(b) 71 (100%)	57 (53%)	30 (28%)	21 (19%)	(b) 107 (100%)	51 (47%)	31 (28%)	28 (28%)	(b) 111 (100%)	74	90
Italy (1)	-	-	-	865	-	-	-	1.306	-	-	-	1.252	1.257	1.307
Netherlands (3)	-	-	-		-	-	-	-	-	-	-	-	465 (2)	488 (2)
Portugal (2)	-	-	-	(d) 239	-	-	-	279	-	-	-	275	377	135
United Kingdom (1)	(e) 344 (72%)	(e) 46 (10%)	(e) 87 (18%)	(e) 477 (100%)	(e) 417 (63%)	(e) 50 (7%)	(e) 138 (20%)	664 (100%)	(e) 398 (64%)	(e) 46 (7%)	(e) 134 (21%)	622 (100%)	700	685

1. Catches by national vessels in interior and foreign harbours.
2. Catches by national vessels in interior and foreign harbours.
3. Not available 1983, 1988, 1989.

(a) For direct consumption - figures from 1986 for 1983 and Mauritanians.
(b) With the exception of oysters, mussels et salmon.
(c) Excluding catches from the North and South Atlantic and from waters relating to COPACE with the exception of Maroccan waters.
(d) Figures from 1987 for 1983
(e) Catches by British vessels in interior harbours.
(f) Including most of the catches for reduction excluding the horse mackerel.

Sources: Various sources including Member states and OECD.

ANNEX 4

World catches by main producers
(in tonnes)

Countries or zones	**1989**	**1990**	**1991**
China	11 219 994	12 095 363	13 134 967
Japan	11 173 286	10 350 338	9 306 827
Former USSR	11 310 091	10 389 030	9 216 927
Peru	6 853 841	6 875 072	6 944 172
EEC 12	7 343 923	6 752 200	6 825 970
Chile	6 454 142	5 195 418	6 002 867
USA	5 763 321	5 858 506	5 473 321
India	3 640 121	3 794 038	4 036 931
Indonesia	2 948 406	3 043 183	3 186 000
Thailand	2 699 835	2 786 383	3 065 170
Korea (Rep.)	2 833 843	2 833 398	2 515 305
Philippines	2 098 787	2 208 823	2 311 797
Norway	1 908 759	1 711 336	2 095 912
Denmark	1 927 493	1 517 211	1 793 171
Korea (D.P.	1 700 100	1 750 100	1 700 100
Rep.)	1 572 841	1 624 335	1 529 779
Canada	1 469 871	1 400 885	1 429 137
Mexico	1 559 800	1 450 000	1 350 000
Spain	1 361 716	1 444 453	1 307 034
Other Asia	1 504 789	1 508 866	1 051 441
Iceland	843 611	847 830	892 700
Bangladesh	868 000	850 000	877 000
Viet Nam	909 669	898 477	812 773
France	850 000	802 860	800 000
Brazil	733 763	743 818	769 236
Myanmar	486 631	555 571	640 636
Argentina			

Source: FAO Yearbook - Fishery statistics, Catches and landings, 1991, Vol. 72.

ANNEX 5

Fleet and employment

Member states	1983				1991			
	Number of boats	TJB	KW	Fishers full-time part-time	Number of boats (f)	TJB (g)	KW	Fishers full-time part-time
Belgium	201	22.282	66.537	1.274	218	27.461	81.431	818
Denmark	(b) 3.291	(b) 123.319	(b) 521.457	(b) 8.345	3.726	117.663	496.248	6.886
Germany	678	n/a	n/a	2.656	1.839	76.629	177.095	4.291
Greece	n/a	n/a	n/a	26.700	21.763	117.934	705.927	(1) 40.164
Spain	(e) 17.665	(e) 671.804	(e) 1.921.170	(e)99.975	20.791	657.717	1.983.211	84.838
France	11.661	212.542	1.103.327	19.500	7.703	198.803	1.088.949	30.971
Ireland	3.020	48.388	n/a	8.572	1.424	53.615	184.519	4.919
Italy	22.981	316.788	n/a	34.000	16.972	270.033	1.521.873	(j) 49.766
Netherlands	703	n/a	440.128	3.553	1.465	172.465	539.898	3.932
Portugal	n/a	(c) 202.077	(c) 507.935	(c) 41.764	14.818	183.007	493.175	38.507
United Kingdom	7.227	n/a	n/a	(e) 22.181	10.923	211.566	1.193.260	24.230
EEC					101.642	2.086.893	8.465.586	8.465.586

Member states	1992				1993			
	Number of boats (f)	TJB (g)	KW ((f)	Fishers full-time part-time	Number of boats (f)	TJB (g)	KW (f)	Fishers full-time part-time
Belgium	198	25.800	74.979	762	198	25.943	74.563	----
Denmark	3.523	109.967	459.470	6.664	3.484	105.144	446.596	-----
Germany	1.684	72.922	165.556	4.337	1.684	72.922	165.556	-----
Greece	21.141	116.690	694.780	-----	-----	-----	-----	-----
Spain	20.481	628.819	1.926.064	-----	20.075	587.859	1.837.767	-----
France	7.271	191.211	1.054.358	-----	7.022	187.661	1.034.034	-----
Ireland	1.429	55.652	193.792	-----	-----	-----	-----	-----
Italy	16.848	264.726	1.527.933	-----	16.603	261.085	1.521.928	-----
Netherlands	1.533	171.585	533.336	-----	-----	-----	-----	-----
Portugal	14.164	167.332	472.506	33.966	-----	-----	-----	-----
United Kingdom	10.948	210.862	1.203.120	-----	11.129	210.104	1.204.580	-----
EEC	99.220	2.015.566	8.305.894					

(a) Including part-time.
(b) 1984, 34% schrimp boats and small vessels, 35% big longline trawlers.
(c) 1986.
(d) Small vessels.
(e) 1985.
(f) 1989 - 18% trawlers, 13% small longline trawlers.
(g) 1989 -50% trawlers, 10% seiners, 40% gill netters
(h) 1988-89% cutters (medium distance fishing, short distance)
(i) 1990 84 ocean fishing boats (big trawlers), 810 mid-shore fishing boats (sounder trawlers) 2.100 near-shore boats (nets, longline, traps, seiners, encircling nets)
(j) Boats L < 25 m : 98% (small-scale fishing); 25 m < L < 38 m : 1% (semi-industrial; 38 m < L : 1% (industrial).
Sources: Various sources including the CCE, Member states and OECD.

ANNEX 6

Processing industry 1990

Member state	Number of installations businesses	Workers
Benelux	50	1 242
Denmark	212	6 014
Germany	177	16 195
Greece	95	2 205
Spain	387 (a)	14 740 (a)
France	380	8 807
Ireland	85 (a)	2 217 (a)
Italy	504	8 160
Netherlands	46 (b)	3 344
Portugal	81 (a)	7 340 (a)
United Kingdom	284	21 000
Total EEC	2 301	91 264

(a) 1989
(b) businesses with more than 20 employees.
Source: Statistical Studies of Fish Processing for Human Consumption EEC, DG XIV.

ANNEX 7

Aquaculture production (EUR-12)

AQUACULTURE PRODUCTION (mt)

Member State	1986	1990
Belgium	530	675
Denmark	24 412	41 956
Germany (FR)	49 354	43 463
Germany(ex-DDR)	20 366	20 977
Greece	2 266	5 500
Spain	266 349	203 758
France	231 855	250 166
Ireland	12 882	26 700
Italy	107 800	142 934
Netherlands	87 950	100 902
Portugal	10 331	5 348
United Kingdom	23 061	48 990
CEE	837 156	891 369

AQUACULTURE PRODUCTION ('000 Ecu)

Member State	1986	1990
Belgium	1 525	2 375
Denmark	77 335	123 877
Germany (FR)	77 294	73 049
Germany(ex-DDR)	55 240	45 374
Greece	4 730	21 823
Spain	235 171	277 001
France	436 919	416 126
Ireland	12 926	38 106
Italy	207 427	292 363
Netherlands	65 084	52 566
Portugal	55 162	25 065
United Kingdom	106 029	144 735
CEE	1 334 843	1 512 459

Source: FAO Fisheries Circular N° 815 revision 4.

ANNEX 8

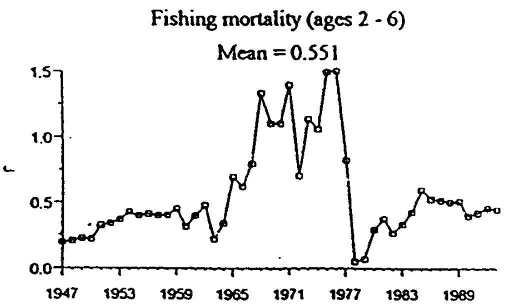
Details on biological outcomes

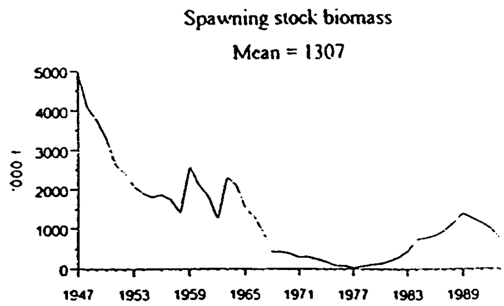
Country, state or province	Regulated fishery(ies)	Specific stocks	Biological outcomes
European Union, CFP	Roundfish and flatfish		All are least fully exploited, many heavily exploited, and some are approaching or already in a depleted state; in general, the state of the stock has not improved and, in some cases, has deteriorated since the inception of the CFP.
		Cod and haddock in the North Sea	Continuous decline in biomass of spawning stocks since 1983; in danger of not being able to be replenished by recruitment.
		Roundfish in North Sea and west of Scotland	In decline; spawning stock biomass reduced.
		Herring	Generally fully exploited; but have improved; constant stock size in recent years.
		North Sea herring	Stocks have recovered since 1983 (attributed to ban on fishing initiated in the 1970s), but recent decline in numbers and mean weight and maturity.
		Baltic herring (IIIa)	Remains heavily exploited.
		Flatfish	Heavily exploited, though not in danger.
		Pelagics	Most in good shape with little change. Increased rates of exploitation.
		Western mackerel	Overexploited, declining SSB.
		Mackerel in VIIIc & IXa	Heavily exploited.
		Crustaceans	Fully or heavily exploited.

ANNEX 9

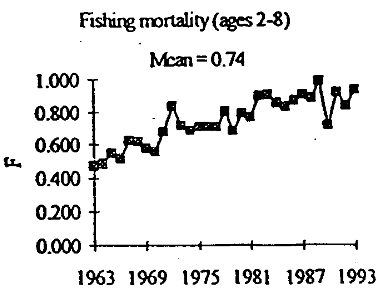
Trends in spawning stock biomass (SSB) for major SFP TAC stocks

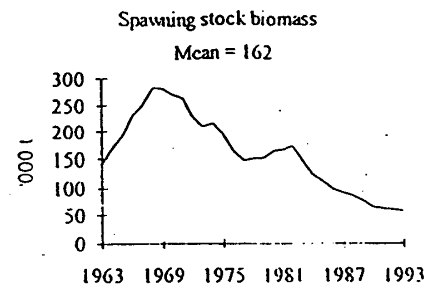
Herring in sub-area IV, Division VIId and Division IIIa (automn spawners)



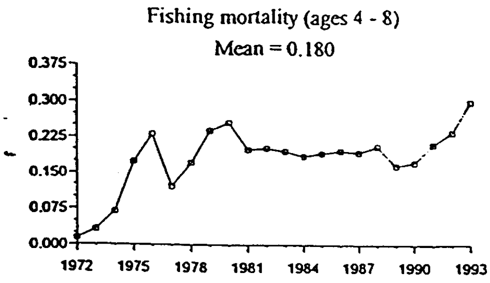


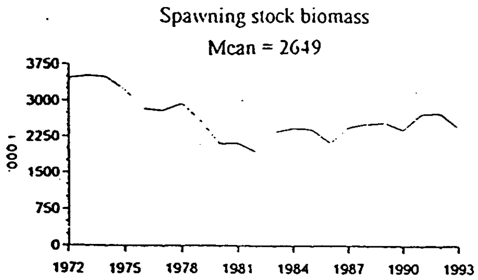
Cod in Sub-area IV (North Sea)



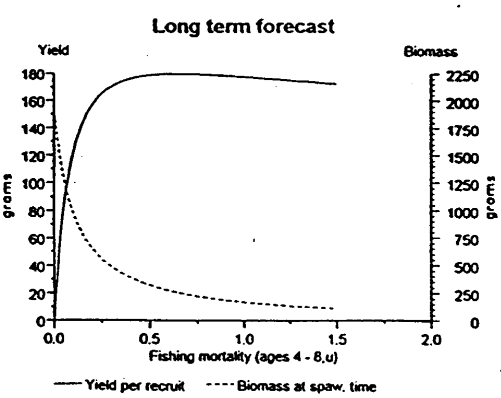


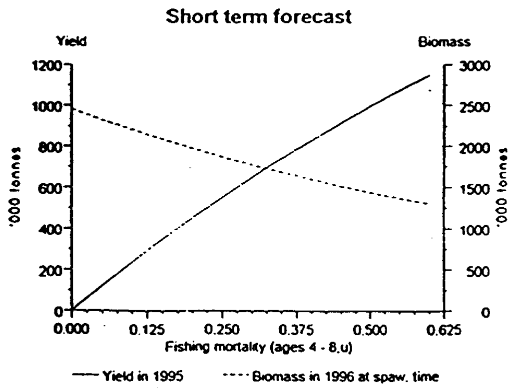
Western mackerel



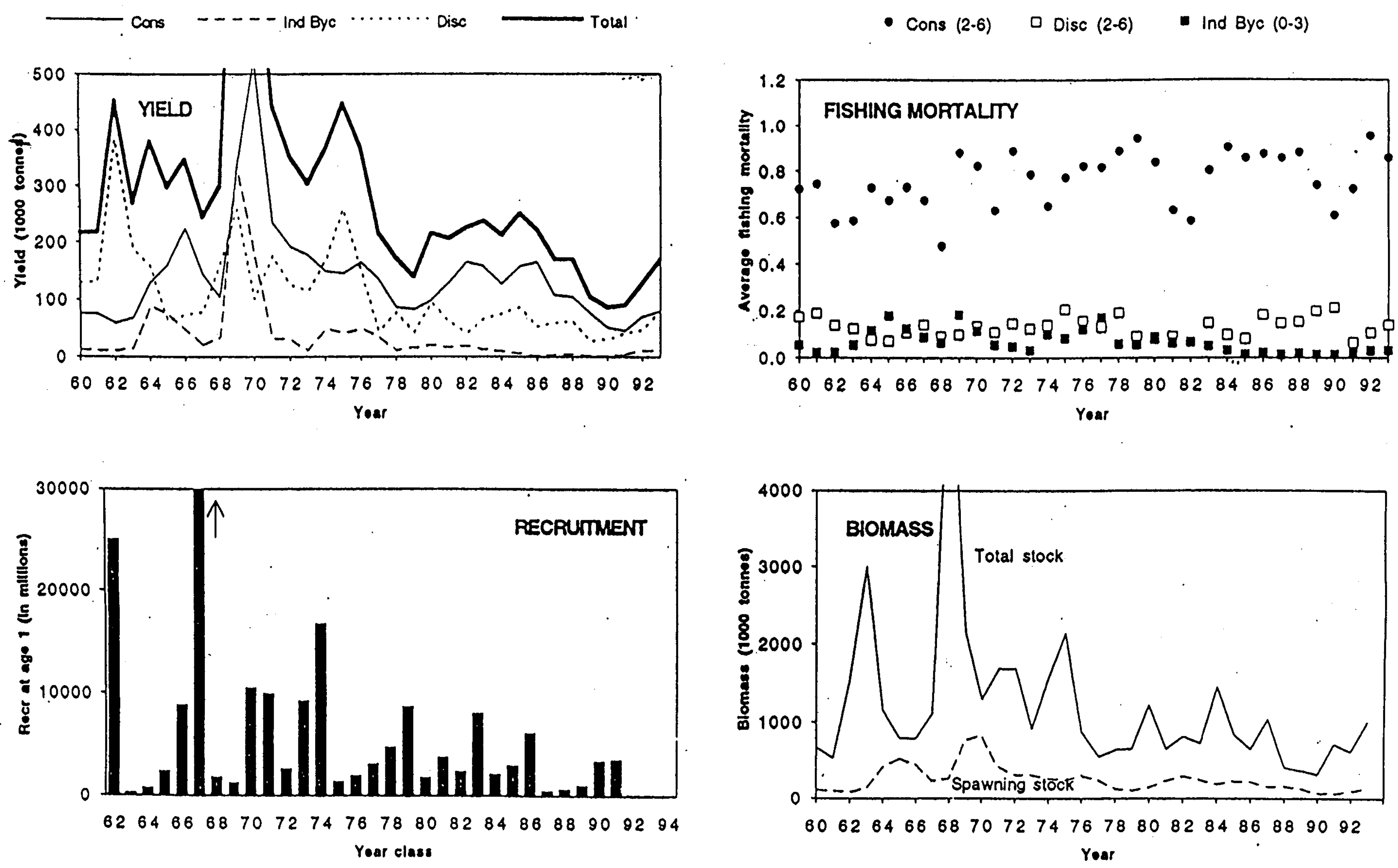


Yield and Spawning Stock Biomass

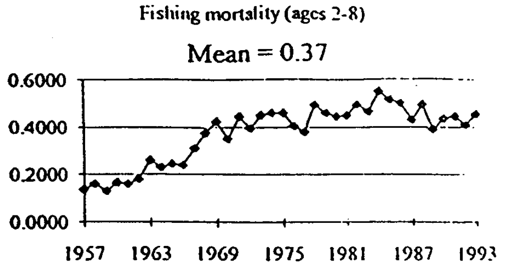


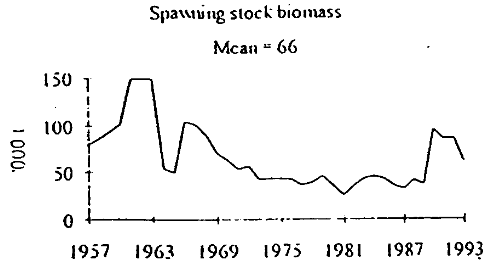


NORTH SEA HADDOCK

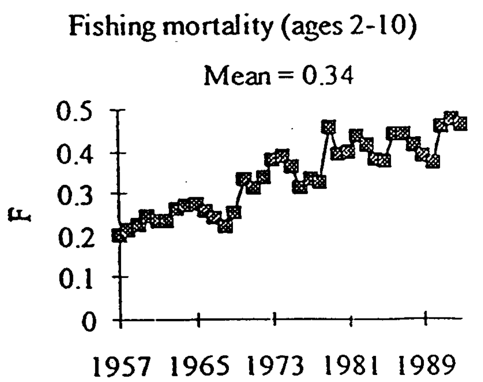


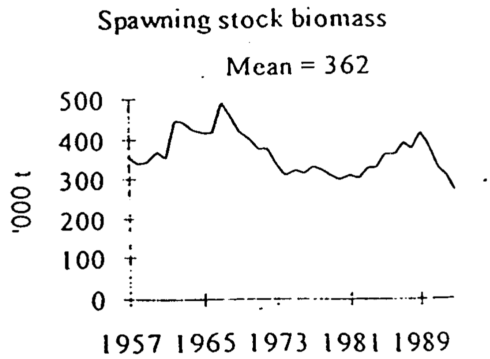
North Sea sole





North Sea plaice





BELGIUM

Introduction

Since Belgium has only 67 km of coastline, its fishing zone is quite a small one. The Belgian fleet works a wide range of fishing grounds, mostly in European waters: the North Sea, the English Channel, the Irish Sea, the Bay of Biscay and the Skaggerak. Some vessels fish common fisheries in Norway's exclusive economic zone. Given the distance to these fishing grounds, the ratio of days fishing to days at sea is on the low side.

A sizeable proportion of the Belgian fleet, specialised in the catching of round fish, once used to fish Icelandic waters. Since Iceland extended its zone to the 200-mile limit, however, there has been a steady reduction in Belgium's fishing activity in this area.

The overall engine capacity of the fleet declined considerably during the 1970s. The number of vessels fell from 330 to about 200, whereas the average engine capacity rose by 25 per cent to 290 kW. In the 1980s, the number of vessels remained steady, while average engine capacity increased substantially to 384 kW. Over the period 1992-1993, fleet strength fell from roughly 200 to 170.

There has been a gradual change in fishing methods, with double outriggers largely replacing otter trawlers. The Belgian fleet tends to concentrate on flat fish such as sole and plaice, which account for 40 and 25 per cent of receipts respectively.

In 1993, the fleet reported BF 3 billion in receipts for landings of 32 000 tonnes of fishery products. The sea fisheries sector, of minor importance at national level, plays a very much greater role and has much more significance for coastal areas.

Average annual consumption of fish and fishery products stands at about 18 kg per head. The rate of self-sufficiency lies somewhere between 15 and 20 per cent.

Management

Belgium being a member of the European Union, its fisheries policy is regulated by the EU. The common fisheries policy was introduced on 25 January 1983. Its technical measures and quotas entailed a number of obligations, some of an administrative character, such as the requirement to keep a log of estimated fish quantities. The completion and return of accurate landed weight records also became compulsory.

Various steps were taken within the framework of the EC Multi-annual Guidance Programmes in order to strike a balance between fisheries stocks and fleet capacity. There is nothing, however, to prevent member States from introducing regulations more stringent than EU legislation.

Fishing operations

The Belgian government has, since 1986, restricted the number of days a vessel may spend at sea, with a view to curtailing fishing. A Belgian vessel fishing in Community waters may spend no more than 280-285 days per year at sea. Seasonal limits have been introduced in order to spread fishing throughout the year: the maximum permitted until 1 May is 95 days at sea, and that until 1 October is 210 days. Vessels authorised to fish in Icelandic waters need not observe these limits but are barred from fishing in Community waters.

Technical measures

At certain times of the year, a ban is imposed on the fishing of sole by large double outrigger trawlers in some ICES zones.

Measures have also been taken concerning by-catches of certain stocks.

Minimum size has been increased to 27 cm for plaice and 40 cm for cod.

Maximum catches of sole per day at sea are set in accordance with ICES stocks.

The use of chain trawls by beam trawlers has been banned in certain sensitive zones.

Quotas

Belgium is attempting to make maximum use of its quotas. Quotas have been traded with other EC member States, as provided for under Article 9 of EC Regulation 3760/92.

It is still necessary, however, to declare an annual closed season on certain stocks. In 1993, 92 per cent of white fish quotas, expressed as cod equivalents, were filled.

Since 1992, restrictions on general fishing operations have been replaced by individual quotas. As a means of spreading the sole catch over the year in 1992, individual quotas based on engine capacity were introduced.

For the period January to April 1992, the total sole catch per vessel in the North Sea and eastern Channel was limited to:

- 300 kg per day at sea for vessels with an engine capacity exceeding 300 h.p.;
- 150 kg per day at sea for vessels with an engine capacity up to and including 300 h.p.

Individual sole fishing quotas were not set for other regions such as the Irish Sea, Bristol Channel or Bay of Biscay.

In 1993 and 1994, individual sole fishing quotas were allocated in direct proportion to engine power. They were set on a six-month basis to ensure a more even spread of landings over the year.

In the first half of 1994, the sole catch per vessel in the North Sea was restricted to 4 000 kg, with an additional allowance of 13 kg per h.p. of engine power.

This general rule did not apply to vessels of up to 300 h.p. engine power fishing sole in the North Sea. Their catch was limited to 3 000 kg, with an additional allowance of 25 kg per h.p.

The total North Sea sole quota for vessels of up to 300 h.p. was 500 tonnes in the first half-year. The North Sea sole quota for large vessels during the same period was 1 000 tonnes.

Fishing licences

Following the introduction of fishing licences by Royal Decree of 28 January 1988, no new vessel may be brought into service unless another vessel is taken out of service. Maximum engine capacity was simultaneously limited to 883 kW.

As a result, two new types of vessel were built: 800-883 kW double outrigger trawlers and 200-221 kW Eurokotters, which operate mostly within the 12-mile limit.

The introduction of licences has prevented any numerical expansion of the fleet, in line with the fleet structure targets of the EU Multi-annual Guidance Programmes. A later requirement stipulated that the main engine powering a new vessel could not exceed the capacity of the engine of the vessel being replaced. There has in fact been a steady increase in the number of auxiliary engines, although vessels are driven primarily by the main engine. The addition of nozzles around the propellers saves energy and contributes to more efficient fishing.

As well as being more efficient, the latest vessels offer more pleasant and comfortable crew accommodation and working conditions.

As of 1 July 1992, the tonnage of a new vessel may not exceed that of the vessel being replaced.

Cessation premiums

In line with the intentions of the EC Multi-annual Guidance Programmes, the Flemish government introduced a cessation premium scheme, whose premiums are the same as those provided under Council Regulation (EEC) 4028/86. For a number of years, shipowners did not take advantage of the scheme because fishing was too lucrative. Over the last two years, however, when profits have been leaner, cessation premiums have proved unexpectedly popular.

Conclusions

Operations

The setting of an upper limit to days spent at sea per vessel has induced shipowners to step up the ratio between days spent fishing and days at sea. This is made possible by landing catches in the ports of other EU member countries closer to the fishing grounds. More efficient use of days at sea can also be achieved by transhipping catches overland by lorry to the port of registry. The vessel may then stay on the fishing grounds for several hauls, despite the heavy demands this makes on the crew.

The quality of fishery products also benefits from transhipment and road haulage to the Belgian fishmarkets. The practice does, however, give rise to social and economic problems because it means that the crew members are away from their families for too long.

Technical measures

The setting of a standard minimum size for plaice in all fishing zones is a measure which is relatively easy to enforce. The increase in minimum size also means that catches fetch a higher price and that quotas are filled more slowly. The restrictions on catch size per day at sea has an adverse effect on the efficiency of vessels. Certain shipowners for this reason would prefer restrictions on the time spent fishing.

Quotas

The imposition of single vessel quotas on sole fished in the North Sea has stepped up the pressure on individual operators. To "manage" their quotas, skippers try to sell their catches through alternative networks. They can also declare that the fish have been taken in other waters. The introduction of individual quotas has clearly increased the need for supervision.

Since smaller vessels have a smaller operating range and are unable to fish in other zones, they are more seriously affected by the individual quota requirement.

Fishing within the 12-mile limit

Access to coastal fishing waters is restricted to vessels not exceeding 300 h.p. engine capacity, 70 tonnes and 24 metres. Vessels have been built to the maximum specifications compatible with this regulation. In practice, the capacity of the main engine does not always correspond to the registered capacity.

Fishing licences, cessation premiums

The introduction of fishing licences and cessation premiums has inflated existing vessel prices to artificial levels. Young fishers can no longer look forward to buying a boat of their own one day.

The old method of first buying a second-hand boat and then building a new one has become nearly impossible, except perhaps for shipowners' sons.

General

Supervision is needed to ensure that the regulations, which are becoming ever more complex, are being complied with. It is important that regulations should not be changed too often. Efforts must be made to improve transparency and legal provisions.

DENMARK

Introduction

Denmark consists of 400 islands of various sizes - to a total of 43 000 square kilometers. The coast line is approx 7 300 km. Geographical conditions have thus contributed to the development of a large fisheries sector in Denmark.

Approx 15 000 persons are employed in the fisheries sector (fishery, processing, aquaculture). Furthermore, a significant number is employed in industries related to the activities of the fisheries sector. The fishing industry is very important in some regions of Western and Northern Jutland and for some islands, i.a. Bornholm in the Baltic Sea.

The major part of the production is exported. Only 3 countries have larger exports of fish and fish products than Denmark. The EU is the most important market for Danish fishery products; in 1994, 82% of the total exports went to other EU member countries. The value of Danish exports of fish and fishery products was 15.6 billion DKK in 1994, and imports, which are dominated by unprocessed fish, came to 7.2 billion DKK. Figures for Danish imports and exports are given in Annex 8.

The general framework for Danish resource management is the Common Fisheries Policy (CFP) of the European Community. The CFP contains an agreement on the allocation of resources between member states as well as general rules on technical conservation measures, fisheries control, market arrangements and structural policy.

History

The Danish fishery consist of species for human consumption and species for reduction (fish oil, fish meal). The development in catches for the last ten years is shown in Figure 2.

Figure 1. Denmark and nearest waters

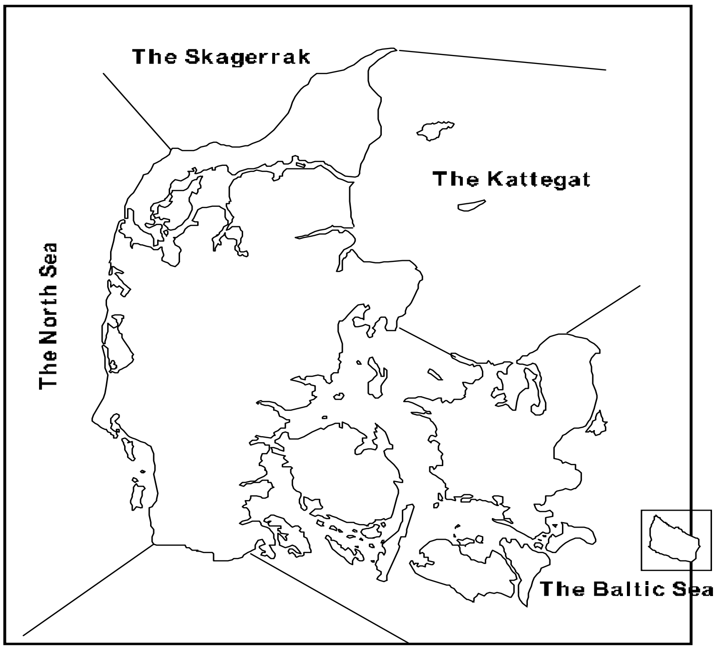
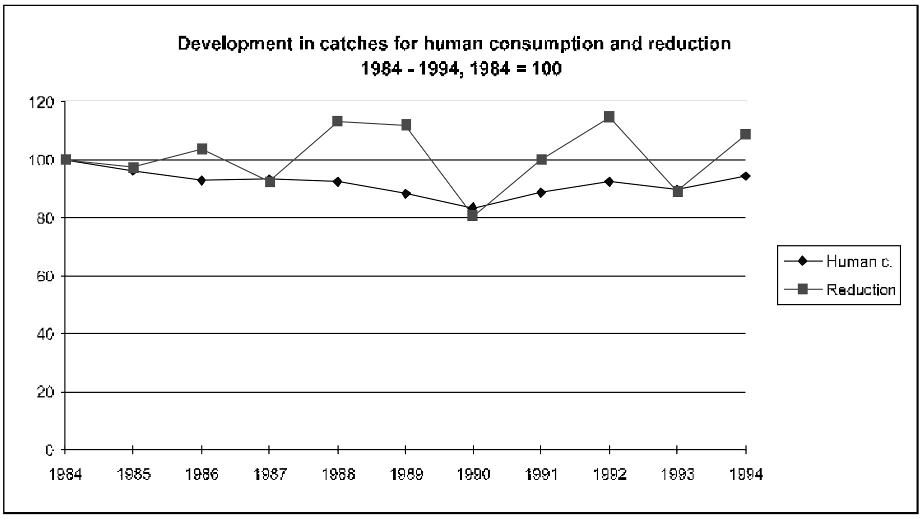


Figure 2. Development in catches for human consumption and reduction (fish meal and fish oil).



The industrial fisheries (species used for fish meal and fish oil) began in the early 1950s, and the total amounts caught by Danish fishermen subsequently increased in the period up to the beginning of the 1970s. Since then the total amount caught by Danish fishermen has been quite constant - around 1.8 million tonnes per year; however the amounts of different species caught have varied.

Since the 1970s, a major change has taken place in the Danish fisheries; an increasing part of the catch has been species for human consumption, which has put pressure on several species subject to quotas.

The change from industrial fisheries to fisheries for human consumption has taken place as a result of:

- stricter regulations in the industrial fisheries,
- lower prices for industrial species,
- higher costs (oil-prices).

Table 1. Danish fisheries for species covered by the EEC quota system
(value in DKK in 1984 and 1994 and % of value of total Danish catches in 1984 and 1994)

Species, important fishing areas	**Value 1 000 DKK 1984/1994**	**Percentage of total value, 1984/1994**
Cod, the North Sea, the Baltic Sea, the Skagerrak, the Kattegat, the Sound, the Belt Sea, Ices 2a, 2b	1.186.263 **532.866**	32.4 **18.4**
Saithe	29.275 **17.929**	0.8 **0.6**
Haddock, North Sea, the Baltic Sea, the Skagerrak, the Kattegat, Ices 2a	110.035 **28.687**	3.0 **1.0**
Whiting, the North Sea, the Skagerrak, the Kattegat, Ices 2a	32.010 **5.340**	0.9 **0.2**
European plaice, the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, the Sound, the Belt sea, ICES 4, 2A	259.792 **308.935**	7.1 **10.6**
Hake, the North Sea, the Skagerrak, the Kattegat	23.097 **50.592**	0.6 **1.7**
Sole, the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, the Sound, Ices 2	46.861 **146.463**	1.3 **5.1**
Northern prawn, the North Sea, the Skagerrak, Ices 5, 14	140.572 **69.733**	3.8 **2.4**
Norway lobster, the North Sea, the Kattegat, the Skagerrak, Ices 2	156.666 **139.873**	4.3 **4.8**
Salmon, the Baltic Sea	67.557 **14.175**	1.8 **0.5**
Mackerel, the North Sea, the Skagerrak, the Kattegat, ICES 2A	39.364 **86.372**	1.1 **3.0**
Herring, the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, the Sound, the Belt Sea, ICES 2a	226.369 **292.896**	6.2 **10.1**
European sprat, the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, ICES 2a, 7de	137.277 **139.489**	3.7 **4.8**
Blue Whiting, the North Sea, the Ices 2a, 5b, 6, 7	79.002 **13.100**	2.2 **0.5**
Norway pout, the North Sea, the Skagerrak the Kattegat, Ices 2A	238.193 **84.787**	6.5 **2.9**
Sandeel, the North Sea, Ices 2a	532.181 **448.011**	14.5 **15.4**
Horse Mackerel, the North Sea, Ices 2a, 6, 7, 8, 12, 14	12.332 **31.669**	0.3 **1.1**
Angler	12.000 **7.742**	0.3 **0.3**
Total revenue, DKK	3.666.665 **2.902.870**	

Resources

Most of the revenue earned by Danish fishermen derives from species which are in the EU quota system. (see Table 1). In 1994, less than 17 per cent of the total catch value came from species not in the EEC quota system.

The development in Danish fishermen's catches of species in the EU quota system is shown in the Figures 3, 4, 5, and 6.

Figure 3. Development in landings for cod and herring, metric tonnes, 1982-1994.

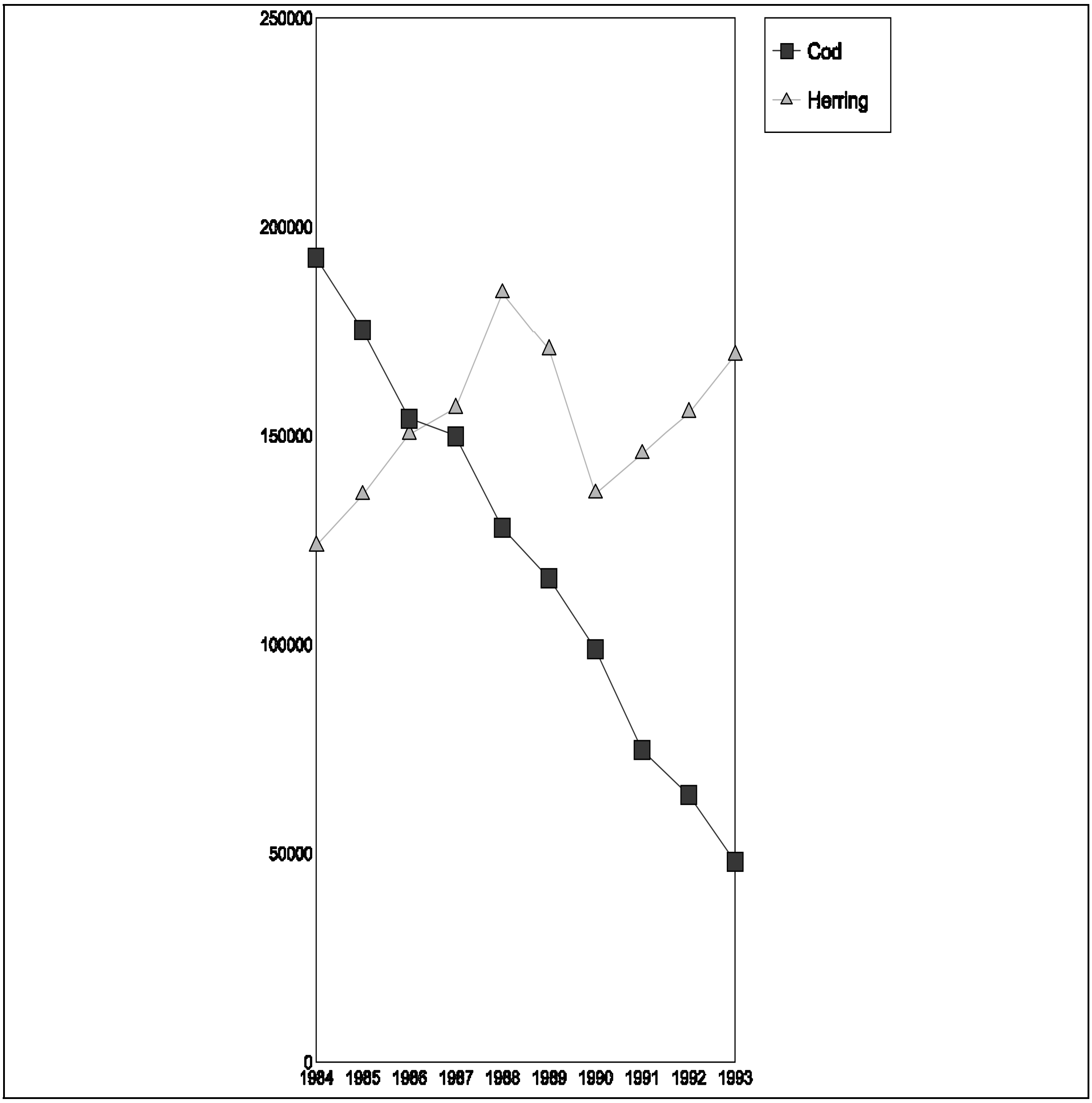


Figure 4. Development in catches of species for reduction, 1984-1993

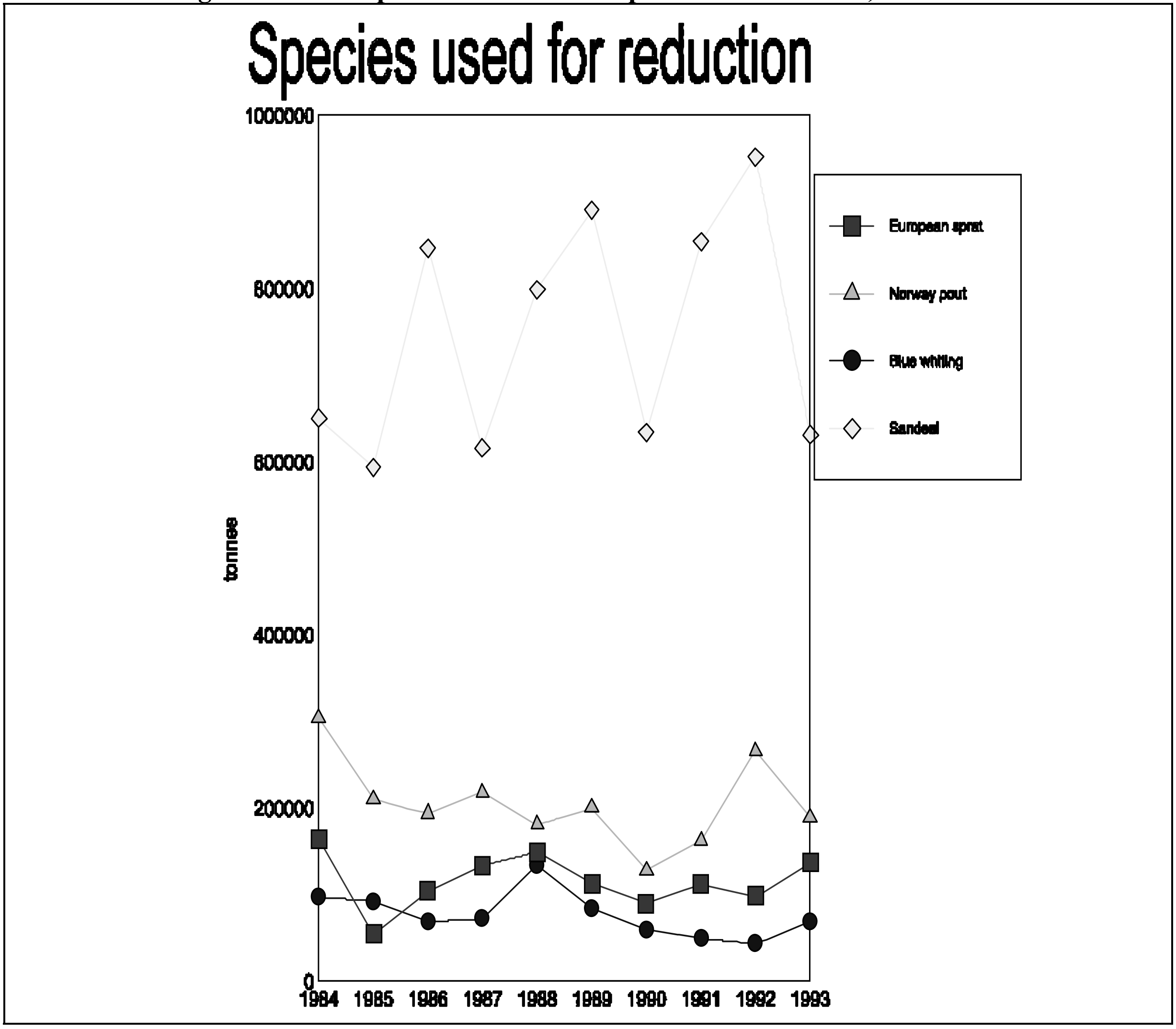


Figure 5. Development in the catches of saithe hake, sole, salmon, angler, Norther prawn and Norway lobster, 1984-1993

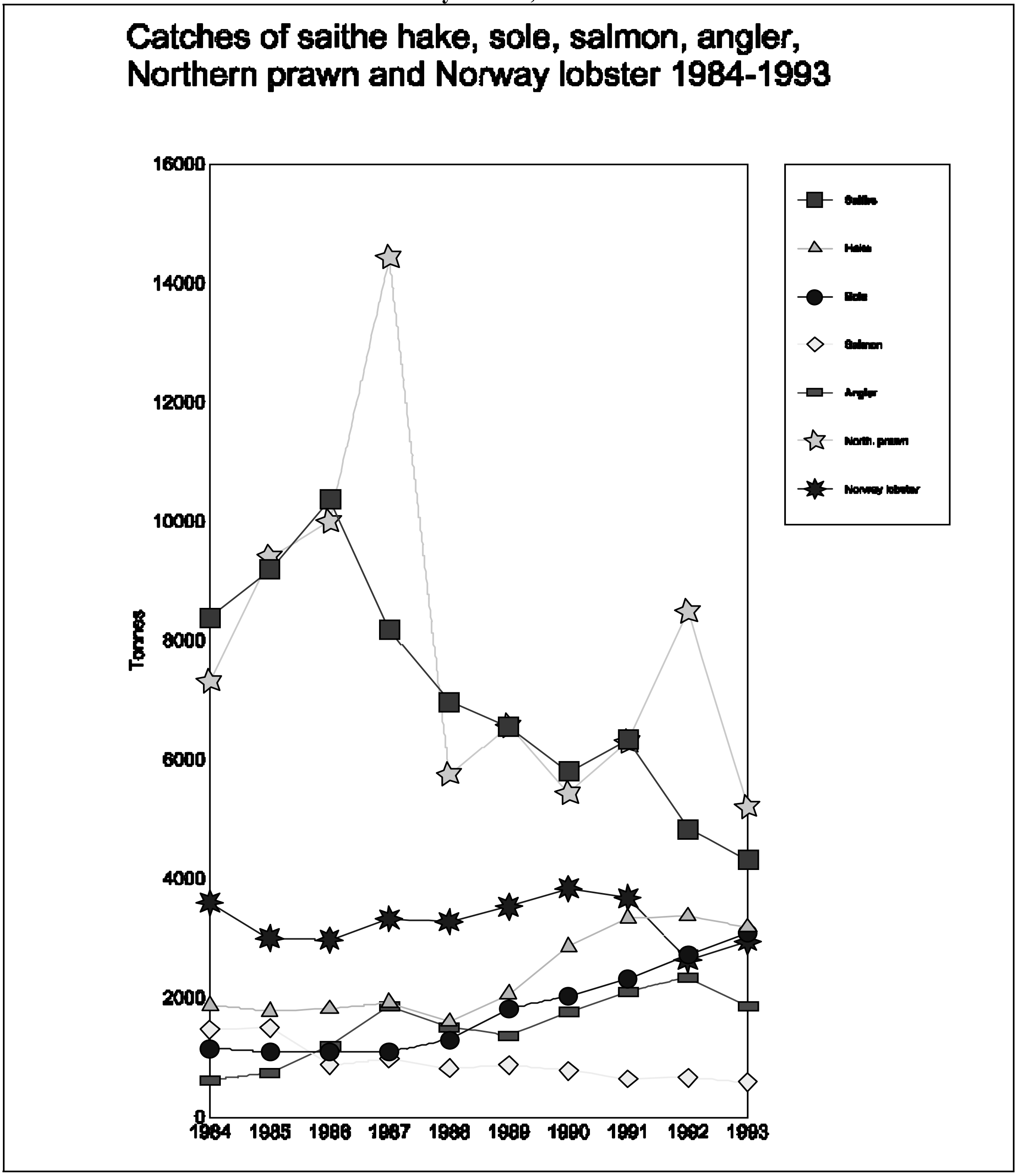
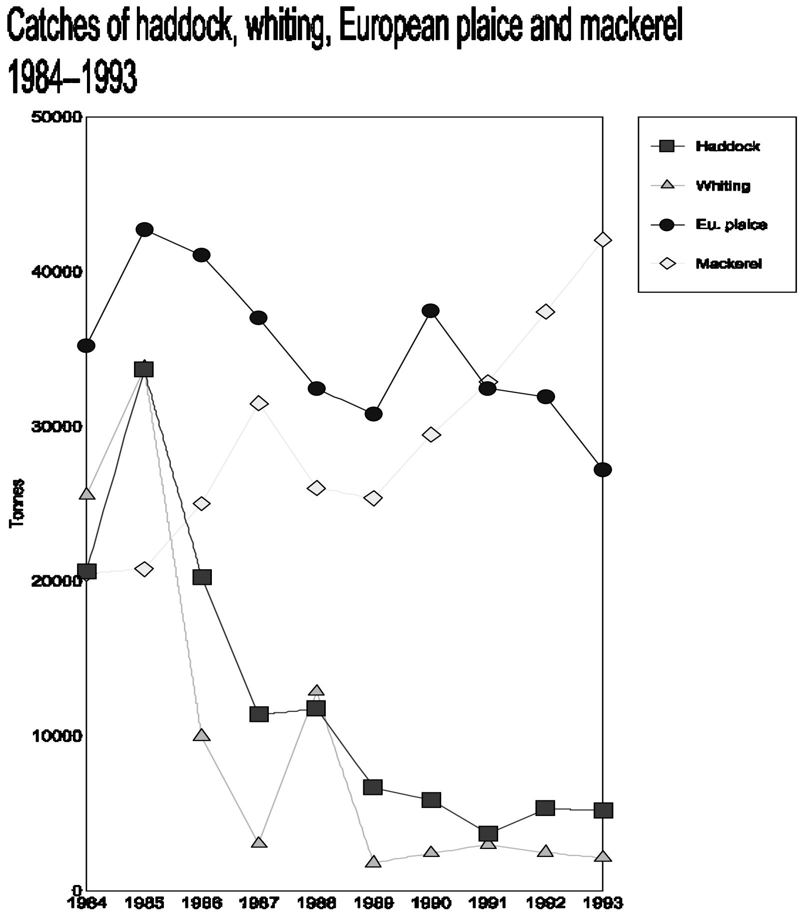


Figure 6. Catches of haddock, whiting, European plaice and mackerel, 1984-93



The fishing fleet

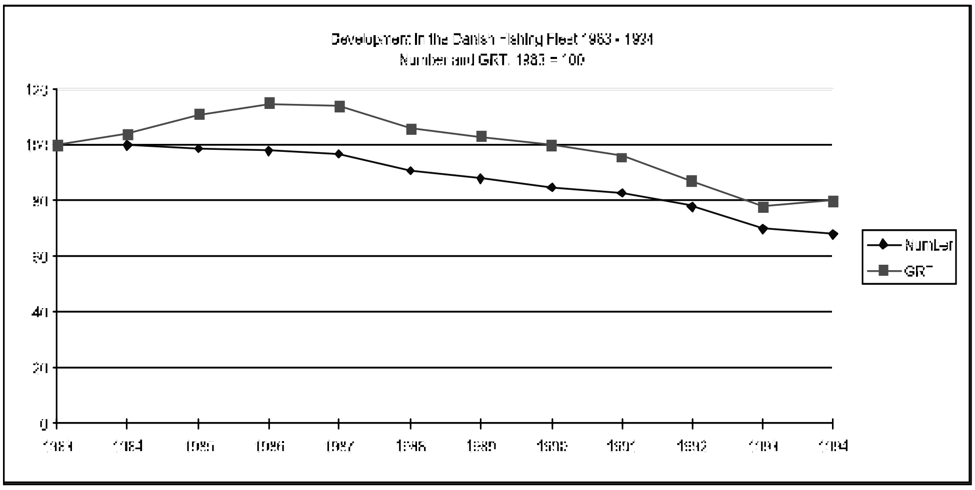
The Danish fishing fleet is dominated by gill netters, demersal trawlers and Danish seiners. The general imbalance between vessel capacity and available resources in the EU, has led to "the Multi-Annual Guidance Programmes" for EU member countries. The MAGPs have aimed at reducing the fishing capacity of the EU fishing fleet.

A Danish decommissioning scheme has reduced the fleet from over 137 000 GRT in 1986 to below 94 000 GRT in 1995. Only a few new vessels have been allowed to enter the fleet in the same period.

The Danish seine fleet has undergone the largest reduction, but the trawler fleet - especially medium sized vessels, i.e. between 60 and 60-150 GRT - has also been heavily reduced.

The development in the Danish fishing fleet from 1983-1994 is shown in Figure 7.

Figure 7. Development in Danish fishing fleet, 1983 - 1994.



The categories and size distribution of the Danish fleet are shown in Table 2, covering vessels of more that 5 GRT and/or above 6 metres in overall length. Between 900 and 1 000 smaller vessels - primarily in gill netting and pound netting - also take part in the fishery.

Table 2: The Danish fishing fleet as per 31/12 1994, grouped by category and GRT
Only vessels above 5 GRT and/or 6 meters

GRT	Trawlers	Danish Seiners	Purse seiners & multi-purpose vessels	Netters and others	Total
- 19.9	435	33	79	1 102	1 649
20 - 49.9	126	102	6	51	285
50 - 99.9	67	5	3	28	103
100 - 249.9	118	1	1	2	122
250 -	79	0	11	0	89
Total	825	141	99	1 183	2 248

See also Annex 5: Danish fishing vessels, 1983-1994, and Annex 6: Fishing vessels grouped by category.

Principal Danish Ports

In 1994, landings took place at 245 different locations. Total landings in Danish harbours are shown in Table 3.

Table 3. Landings in Danish harbours 1994, Danish and foreign vessels

	Tonnes for human consumption	Tonnes for reduction	Value in million DKK
Danish vessels	307 339	1 405 842	2 723 895
Foreign vessels	157 307	219 242	823 827
Total	464 646	1 625 084	3 547 722

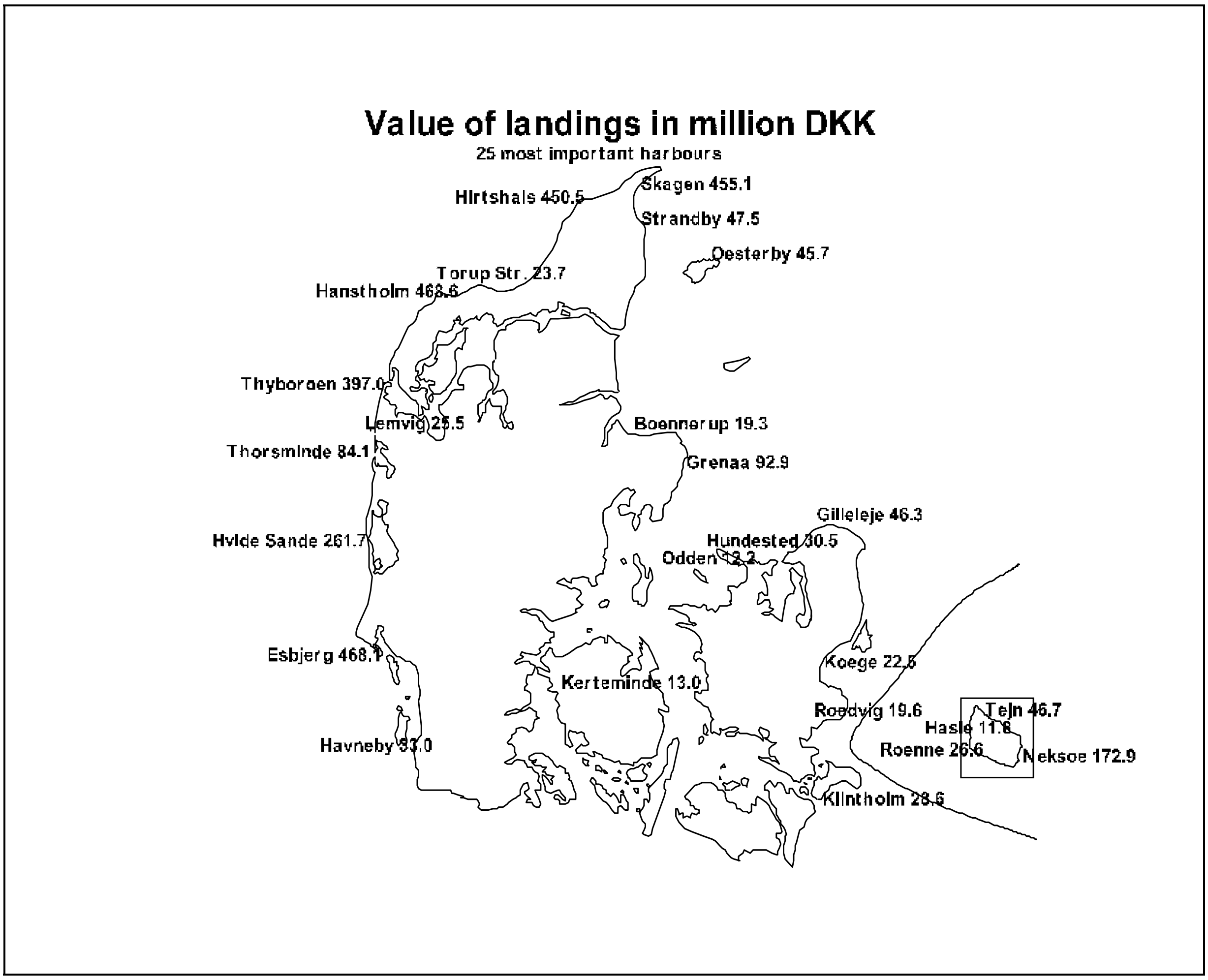
Eighty-two per cent of total landings (by value) took place in 10 harbours. The 25 principal harbours are shown in Figure 8.

Fish auctions

Most of the species caught for human consumption are sold at public auctions, where processing industries and retailers bid for the fish.

In some areas all fish is sold at fish auctions; in 1994 33 per cent by quantity and 67 per cent by value of all Danish landings in Danish harbours of fish for human consumption were sold at fish auctions. Landings from foreign vessels comprised 14 percent in terms of quantity and 86 per cent in terms of value sold at fish auctions.

Figure 8. The principal ports in Denmark, measured by value of fish, 1994



The processing industry

In 1992, Denmark had 420 companies dealing with processing and trade in fish products, see Tables 4 and 5.

Table 4. Number of companies in the Danish fisheries sector

Type of company	1981	1984	1989	1992	1993
Processing	96	63	65	86	90
Processing and wholesale	142	218	216	173	177
Wholesale	144	135	130	122	122
Fish meal and fish oil	18	16	8	5	5
Sales agency	22	22	22	17	17
Fish auction	20	20	17	17	17
Total	442	474	458	420	428

Table 5. Number of employees in companies in the Danish fisheries sector

Type of company	1981	1984	1989	1992	1993
Processing	2 932	3 157	1 765	4 169	4 111
Processing and wholesale	4 032	5 488	6 755	3 129	3 304
Wholesale	619	530	662	1 082	1 086
Fish meal and fish oil	665	617	489	358	347
Sales agency	231	200	207	145	130
Fish auction	228	248	172	123	111
Total	8 707	10 240	10 050	9 006	9 089

Note: in 1981 and 1984 full time employment, in 1989 and 1992 average number of full time employment. 1993 figures based expected employment medio 1993.

The Danish fishing industry, including the processing industry, consists mainly of small and medium sized companies. As seen in Table 6, nearly 60 per cent of the companies have less than 10 employees. Only a few companies have more than 100 employees; 35 per cent of total employees work in these factories. Employment has fallen approx 10 per cent from 1989 to 1992.

Table 6. Structure of the companies in the Danish fisheries sector, 1992

Number of employees	Companies		Employees	
	Number	Percentage	Number	Percentage
1 - 9	247	59	937	10
10 - 45	125	30	2 555	28
50 - 99	34	8	2 393	27
100 -	14	3	3 121	35

Aquaculture

In 1994, the number of fish farming installations was as follows:

- Freshwater 490
- Saltwater 40 (30 net cages and 10 land based marine fish farms)
- Eel 40

Total production of freshwater trout in 1993 was about 34 000 tonnes. Saltwater production reached approximately 7 900 tonnes, and the production of eel was about 850 tonnes.

Increased requirements on environmental production have led to major requirements for adjustments and investments in measures to improve the environment on the fish farms.

Experimental fisheries-quality seafood

The demand for high quality seafood is expected to rise in the future. Great importance is - and will continue to be - attached to improving the quality of the fish landed and processed.

A wide range of experimental fisheries is carried out, see alto II.2 (management instruments).

Increased interest in quality and control systems has i.a. led to a "Packing at sea" demonstration project with in-built quality assurance of catch handling and quality declaration of each individual box of landed fish. The vessels are equipped to sort the fish according to species and size, clean them, remove the blood before weighing and carefully packing in ice, as well as date marking the boxes. At the latest upon landing a report informing potential buyers of the catch will be forwarded to the auction. Besides having an effect on quality, the project is expected to give higher prices to the harvesting sector. The Danish Institute for Fisheries Research is behind this initiative.

Major fisheries

Most of the revenue earned by Danish fishers derives from species which are in the EU quota system. (see Table 1.) Other important species in the Danish fisheries are i.a. European eel, European flounder, common shrimp, common dab, garfish and blue mussel.

Many fisheries are mixed fisheries for species for human consumption; for example Norway lobster, cod and sole in the Kattegat or cod and haddock in the North sea.

Important fishing areas for the Danish fishing fleets are the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, the Belts and the Sound, but also the larger fjords and distant waters.

The Danish fishing industry has not been segmented into separate, distinct fisheries for the reasons listed below:

The Danish fishing fleet is, in general, flexible; vessels often take part in different fisheries throughout the year, and fishing patterns change from year to year.

In the late 1980s, a major analysis of the Danish fishing sector was carried out (a similar analysis has not been carried out since). Fifty-three different fishing patterns were described in the analysis. The analysis states that most Danish vessels take part in different fisheries, changing between species and areas throughout the year. The changes are caused by:

- biological situation, seasonal patterns and the fact that quotas vary from year to year;
- economic conditions, prices and costs change over time;
- limits due to regulation.

As the conditions above change from year to year, so do the fishing patterns of the vessels. A list of main fisheries is given in Table 7.

More detailed information on Danish catches is found in the annexes:

- Annex 1: Landings and total value by species 1985-1994,
- Annex 2: Nominal catches by species and fishing area,
- Annex 3: Monthly nominal catches by species, 1993,
- Annex 4: Nominal catches by species and vessel categories.

Table 7. Main fisheries in different fishing patterns for different groups of vessels

	Vessel size (GRT)							
	10-20	**20-40**	**40-60**	**60-100**	**100-150**	**150-300**	**300-400**	**> 400**
TRAWLERS, human consumption								
Norway lobster (the Skagerrak, the Kattegat)	x	x						
Mixed fisheries (the North Sea, the Skagerrak)	x	x	x	x	x			
Cod (the Baltic Sea)	x	x	x	x	x	x		
Prawn (the North Sea, the Skagerrak)	x	x	x	x	x			
Herring (the Skagerrak)					x			
TRAWLERS, industrial fisheries								
Sprat (the Skagerrak, the Kattegat)	x	x	x					
Sandeel (the North Sea)		x	x	x	x	x	x	x
Sprat (the North Sea)					x	x		
Norway pout (the North Sea, Atlantic Ocean)					x	x	x	x
Horse Mackerel (the English Channel)								x
PURSE SEINERS								
Herring (the North Sea, the Skagerrak)								x
Mackerel (the North Sea)								x
DANISH SEINERS								
European plaice (the North Sea, the Skagerrak, the Kattegat)	x	x	x					
NETTERS								
Cod (the North Sea, the Skagerrak)	x	x	x	x				
Plaice/sole (the North Sea, the Skagerrak)	x	x	x	x				

Source: The Danish Fishing Fleet, COWI consult.

Management systems

The general framework for Danish resource management is the Common Fisheries Policy (CFP) of the European Economic Community. The management responsibilities are thus shared.

Once the TAC/quota agreement is adopted in December, the national management scheme is decided by Ministerial Order. The principles used in the management scheme are discussed with the fisher's organisations and the fishing industry before the conditions are finally assigned. The discussions take place in the Regulatory Committee at which the organisations and the Ministry of Fisheries are represented. The Regulatory Committee meets every month to evaluate the present catch/quota situation for possible changes. The Regulatory Committee was set up in 1979 to advise the Minister of Fisheries both on national administration of the allocated quotas and the national capacity policy.

A series of national management schemes has been put into operation in order to achieve continued fishing opportunities, whilst at the same time ensuring that Danish quotas allocated under the CFP are not exceeded.

Policy instruments

Instruments used are i.a.

- Vessel catch limits (e.g. on a monthly basis)
- Time closures (e.g. in weekends, summer, etc.)
- Licenses (limited as well as not limited access)
- Minimum landing sizes (in some cases higher than those of the CFP)
- Exclusion of specific gear types in specific areas
- Limits on motor power in certain areas
- Notifying the fisheries control before landing.

When deciding on which instruments to use in a specific fishery many factors are taken into consideration, i.a.

- the nature of the fishery (seasons etc.)
- is it a directed fishery, mixed fishery or mainly bycatch
- the market situation
- experience from the regulation in previous years
- the need for adjustments due to development in catches and quotas
- natural fishing patterns of the fleets.

During the 1980s and the beginning of the 1990s, quotas for a number of the most significant species in the Danish fishery have been decreasing. This has implied that both the annual Order of management and the monthly changes to the Order have become more and more detailed.

A wide variety of management measures has been introduced over the years, inter alia catch limits during different periods, vessel rations according to vessel size, periodic bans, tie-up schemes, demand for notification, bonus quotas in the pelagic fisheries given to vessels with a high percentage of catches used for human consumption, etc.

In 1989, the regulatory system was expanded to include catch quotas per vessel per month, per week or per trip for cod, haddock and saithe. For pelagic fisheries, this principle was used for herring and mackerel. The system has later been extended to include more species.

The Danish fishing fleet is, as mentioned above, generally flexible; vessels often take part in different fisheries throughout the year - and the fishing patterns change from year to year. Regulations have, accordingly, been drawn up to allow the vessels to participate in whichever fishery the vessel owner finds most attractive; only in some fisheries has access been limited by licences.

There are a few (but increasing number of) exceptions to the rule that all vessels can participate, for example: the fishery for blue mussels (which has annually accounted for between 0.5 and 3 per cent of the total value of Danish catches in the last 10 years) and the fishery for common shrimp (which has annually accounted for less than 1 per cent of the total value of Danish catches in the same period) have been regulated through a limited number of vessel licences and vessel quotas). Likewise a new regulation scheme was presented for the pelagic fisheries (herring and mackerel) in 1994, whereby vessel quotas were allocated in 4 month periods, partly on the basis of historical fisheries. In 1995, (yearly) vessel quotas based on historical fisheries have been introduced in the mackerel and herring fisheries. A part of the Danish quota, however, has been reserved for vessels which do not have a vessel quota.

In 1993, a special laying-up arrangement was introduced for vessels dependant on Baltic cod, since fishing possibilities were exceptionally poor. Aid was given in connection with laying up vessels, and standby indemnity for the fishers concerned. Later a similar arrangement has covered vessels dependant on the sole fishery in the North Sea and the Skagerrak/Kattegat.

Experimental fisheries are frequently carried out in order to improve regulation methods. Experiments are currently being conducted in the Kattegat (effort regulation, days at sea) and in the North Sea and the Skagerrak (vessel quotas on the basis of historical fishing data).

Table 8. Summary of policy instruments used in the regulation of the Danish fisheries, 1994/95

Regulated fishery	Policy instrument applied	Comments
Cod in theNorth Sea and the Skagerrak	Periodic catch limits depending on vessel length (5 different length categories).	Rations are not the same in the North Sea and in the Kattegat in all of the year. In some periods, catches must be landed in North Sea or Skagerrak harbours.
Cod the Kattegat	Periodic catch limits depending on vessel length. For vessels in the experimental fishery of days at sea, limits on cod are the same as for the rest of the fleet in 1994 - in 1995 specific rules for cod.	In some periods the vessel quotas has been the same for all vessel lengths
Cod in the Baltic Sea (EU zone)	Periodic catch limits depending on vessel length - vessels must have a licence (not limited entry). In some periods the catch limit has been the same for all vessel lengths. In 1995 vessels can choose to have an individual quota for the year. Fishers only using pound nets can fish freely (unless a total stop is needed)	Vessels having an individual cod quota are not allowed to fish outside the Baltic Sea. A laying-up arrangement for vessels dependant on Baltic cod was introduced in 1993
Cod in the Baltic Sea (not EU zone)	A limited number of vessel licences.	
Cod (Ices IIa and b)	Vessel license and catch limits /individual quotas	
Hake (North Sea, the Skagerrak, the Kattegat)	"Free fishery" in some periods, periodic catch limits in other periods	
Haddock (North Sea, Skagerrak, Kattegat, Baltic Sea)	Periodic catch limits depending on vessel length	
Saithe (North Sea, the Skagerrak, the Kattegat , the Baltic Sea)	Periodic catch limits depending on vessel length	
Whiting (North Sea, the Skagerrak, the Kattegat)	Periodic catch limits depending on vessel length and "Free fishery"	
European Plaice (North Sea, the Skagerrak)	"Free fishery"	Sufficient catches of plaice gives right to larger catches of cod
Common Sole in the North Sea	Periodic catch limits depending on vessel length (4 different length categories)	When catching common sole in mix with plaice, only 10% sole is allowed Landings are only allowed in some harbours.

Common Sole (North Sea, the Skagerrak, the Kattegat (*), the Baltic Sea)	Periodic catch limits depending on vessel length	
Northern Prawn (Norwegian zone in North Sea, the Skagerrak)	Periodic catch limits depending on vessel length /"free fishery"	
Norway lobster (North Sea, the Skagerrak, the Baltic Sea)	Periodic catch limits depending on vessel length	
Norway lobster, the Kattegat	Experimental fishery - days at sea	
Species nei in Norwegian zone in the North Sea)	Periodic catch limits depending on vessel length	
Sprat in the Limfjord	Licence (not limited access)	
Sprat the Baltic Sea	Catch limit per trip in some periods	
Sprat in the Skagerrak and Kattegat	Periodic catch limits	
Sprat other areas	Periodic catch limits depending on vessel length	
Salmon (the Baltic Sea)	Licence (not limited access) and periodic catch limits (number of fish)	
Mackerel in the North Sea, the Skagerrak, the Kattegat, Norwegian Zone in the North Sea, Faroese zone	Experimental measures - vessel quotas based on historical fisheries For vessels not participating in the experimental fishery: Periodic catch limits	
Herring in the North Sea and the Skagerrak	Experimental measures - vessel quotas based on historical fisheries For vessels not participating in the experimental fishery: Periodic catch limits	Depending on the percentage of the catch used for human consumption, a bonus of additional catch are available for individual vessels.
Herring in the Kattegat	Licence (not limited access) and periodic catch limits depending on vessel length	
Herring in, the Baltic Sea	Licence (not limited access) and periodic catch limits depending on vessel length	Rules for landing of cod bycatches
Herring in the English Channel	Periodic catch limits depending on vessel length	

Species used for reduction - Sprat, Sandeel, Norway pout, Blue Whiting)	Periodic catch limits Before landing the catch the fisheries control must be notified.	
Blue mussel	Licence (limited access) and periodic catch limits and no fishery in the summer	
Common shrimp	Licence (limited access)	
Hake (North Sea, the Skagerrak, the Kattegat) **Haddock** (North Sea, Skagerrak, Kattegat, Baltic Sea) **Saithe** (North Sea, the Skagerrak, the Kattegat , the Baltic Sea) **Whiting** (North Sea, the Skagerrak, the Kattegat) **European Plaice** (North Sea, the Skagerrak) **Common Sole** (North Sea, the Skagerrak, the Kattegat (*), the Baltic Sea) **Northern Prawn** (Norwegian zone in North Sea, the Skagerrak) **Norway lobster** (North Sea, the Skagerrak, the Kattegat (*), the Baltic Sea) Species nei in Norwegian zone in the North Sea) **Hake** (North Sea, the Skagerrak, the Kattegat) **Sprat** (all areas - license needed in the Limfjord)	Periodic catch limits (vessel length) For some stocks (common sole, North Sea and the Skagerrak, landings can only take place in some harbours)	(*) experimental measures of days at sea (**) experimental measures of vessel quota per year
Salmon (the Baltic Sea) **Mackerel** (***) (the North Sea, the Skagerrak, the Kattegat, Norwegian Zone in the North Sea, Faroese zone) **Herring** (the North Sea, the Skagerrak, the Kattegat, the Baltic Sea, English Channel)	Vessel license and catch limits /individual quotas	(***) Experimental measures - vessel quotas based on historical fisheries
Species used for reduction - Sprat, Sandeel, Norway pout, Blue Whiting)	Periodic catch limits Before landing the catch the fisheries control must be notified.	
Blue mussel Common shrimp	Licence	

Note: Not all conditions on licences are mentioned. Eg. vessels in the experimental fishery of days at sea in the Skagerrak are allowed to go fishing in other areas - but their restriction on days goes for all areas.

Part III: Development in landings, value and average prices

The development in total income for the Danish fishing fleet is given in Figure 9. The development in catches of some of the most important species is given in Figure 10. Finally price-development for some important species is given in Figure 11.

Economic data

Cost data is not available for the Danish fleet, but will be available from 1996.

In Table 9, average gross income for different vessel categories in 1987, 1993 and 1994 is shown.

Table 9. Average gross income per vessel in 1000 DKK, 1987, 1993 and 1994

	1987	1993	1994	Index 1994	
				1993=100	1987=100
Trawlers	1 448	1 857	2 167	117	150
Danish seiners	1 093	1 233	1 350	109	124
Purse seiners and multi-purpose vessels*	8 298	1 989	2 028	102	24
Liners, gill netters etc	586	544	608	112	104
Total	1 100	1 133	1 289	114	117

(*) In 1987, mainly purse seiners, in 1993 and 1994 a number of smaller, multi-purpose vessel is included.

Other remarks

The steadily increasing level of detail in the management of resources has meant that the distance between the management system and the fishing industry and fishers has grown larger.

As the fishing industry has been put under increasing pressure due to decreasing quotas, falling prices etc., mis-reportings, inevitable bycatches, discards etc. have become an increasing problem. Fisheries Inspection has therefore expanded from the late 1980s to today.

Ministry of Agriculture and Fisheries, 27th of April 1995

Danish Fishing Vessels1),Status per 31st of December in the Years 1983 - 1994

	Number of	Gross tonnage		Engine power		Insurance value		Average age	Crew incl. skipper	
Year	vessels	Total	Average	Total	Average	Total	Average	in years	Total	Average
1983	3321	119205	35.9	508027	153.4	2923098	930.6	26.1	8377	2.6
1984	3307	123791	37.4	522871	158.3	3414016	1082.1	26.6	8331	2.6
1985	3301	132556	40.2	544200	165.0	4206589	1332.9	26.9	8381	2.6
1986	3265	137021	42.0	565625	173.4	5185607	1650.9	27.4	8311	2.6
1987	3228	136399	42.3	567072	175.8	5455193	1754.6	27.9	8197	2.6
1988	3027	126442	41.8	537830	177.8	5426637	1863.5	28.0	7589	2.5
1989	2924	122460	41.9	523555	179.2	5560947	1967.8	28.5	7270	2.5
1990	2830	118720	42.0	505563	178.8	5591923	2045.3	29.1	6945	2.5
1991	2749	114307	41.6	487939	177.6	5528716	2076.9	29.8	6682	2.4
1992	2577	104072	40.4	450020	174.7	5236578	2097.1	29.9	6183	2.4
1993	2339	93333	39.9	399583	170.9	4803529	2117.0	29.9	5491	2.4
1994	2248	94812	42.2	387646	172.5	4725503	2166.7	30.3	5295	2.4

1) For the years before 1992 vessel of less than 5 GRT are not included in the vessel register. From 1992 all commercial fishing vessels with an overall length of 6 metres or more are included.

TOTAL TONNAGE FOR FISHING VESSELS REGISTERED IN PER. 31/12 1993, GROUPED BY CATEGORY AND GROSS TONNAGE.

	VESSEL CATEGORIES								
GT/GRT	SIDE-TRAWLERS	STERN TRAWLERS	OTHER TRAWLERS	PURSE SEINERS	DANISH SEINERS	MULTIPURPOSE VESSELS	LINERS AND NETTERS	OTHER VESSELS	TOTAL
UNKNOWN	-	-	-	-	-	-	-	-	-
-9,9	41	143	56	-	19	177	4.376	1.200	6.012
10-14,9	413	342	214	-	26	311	2.148	286	3.740
15-19,9	5.445	643	769	-	606	386	2.857	260	10.966
20-24,9	23	-	-	-	-	-	24	-	47
25-29,9	196	-	86	-	201	30	140	79	732
30-34,9	646	-	97	-	780	-	298	31	1.851
35-39,9	570	76	259	-	1.489	37	413	-	2.844
40-44,9	557	211	128	-	763	124	256	41	2.081
45-49,9	1.743	438	440	-	1.348	47	619	46	4.681
50-59,9	1.126	225	116	-	277	109	390	-	2.243
60-69,9	514	192	135	-	-	-	950	-	1.791
70-79,9	453	-	226	-	-	-	-	145	824
80-89,9	412	173	251	-	83	-	87	-	1.005
90-99,9	862	490	282	-	-	-	199	-	1.834
100-109,9	210	517	201	-	-	-	-	-	927
110-119,9	-	337	350	-	-	-	-	-	687
120-129,9	249	250	-	-	-	-	-	-	498
130-139,9	276	411	822	-	-	-	-	139	1.648
140-149,9	1.489	2.825	2.379	-	-	-	-	-	6.693
150-249,9	2.491	5.286	4.534	208	156	-	-	-	12.675
250-499,9	1.647	13.173	2.548	1.628	-	-	-	-	18.996
500-999,9	-	1.467	3.565	3.415	-	-	-	-	8.447
1000-	-	-	-	2.111	-	-	-	-	2.111
TOTAL	19.362	27.199	17.457	7.362	5.748	1.220	12.756	2.228	93.333

Notes: COMMERCIAL FISHING VESSELS OF 5 GROSS REGISTERED TONNAGE OR MORE.
VESSEL SIZE IN GROSS TONNAGE, IF UNKNOWN - GROSS REGISTERED TONNAGE.

TOTAL TONNAGE FOR FISHING VESSELS REGISTERED IN PER. 31/12 1993, GROUPED BY CATEGORY AND GROSS TONNAGE.

	VESSEL CATEGORIES								
GT/GRT	SIDE-TRAWLERS	STERN TRAWLERS	OTHER TRAWLERS	PURSE SEINERS	DANISH SEINERS	MULTIPURPOSE VESSELS	LINERS AND NETTERS	OTHER VESSELS	TOTAL
UNKNOWN	-	-	-	-	-	-	-	-	-
-9,9	41	143	56	-	19	177	4.376	1.200	6.012
10-14,9	413	342	214	-	26	311	2.148	286	3.740
15-19,9	5.445	643	769	-	606	386	2.857	260	10.966
20-24,9	23	-	-	-	-	-	24	-	47
25-29,9	196	-	86	-	201	30	140	79	732
30-34,9	646	-	97	-	780	-	298	31	1.851
35-39,9	570	76	259	-	1.489	37	413	-	2.844
40-44,9	557	211	128	-	763	124	256	41	2.081
45-49,9	1.743	438	440	-	1.348	47	619	46	4.681
50-59,9	1.126	225	116	-	277	109	390	-	2.243
60-69,9	514	192	135	-	-	-	950	-	1.791
70-79,9	453	-	226	-	-	-	-	145	824
80-89,9	412	173	251	-	83	-	87	-	1.005
90-99,9	862	490	282	-	-	-	199	-	1.834
100-109,9	210	517	201	-	-	-	-	-	927
110-119,9	-	337	350	-	-	-	-	-	687
120-129,9	249	250	-	-	-	-	-	-	498
130-139,9	276	411	822	-	-	-	-	139	1.648
140-149,9	1.489	2.825	2.379	-	-	-	-	-	6.693
150-249,9	2.491	5.286	4.534	208	156	-	-	-	12.675
250-499,9	1.647	13.173	2.548	1.628	-	-	-	-	18.996
500-999,9	-	1.467	3.565	3.415	-	-	-	-	8.447
1000-	-	-	-	2.111	-	-	-	-	2.111
TOTAL	19.362	27.199	17.457	7.362	5.748	1.220	12.756	2.228	93.333

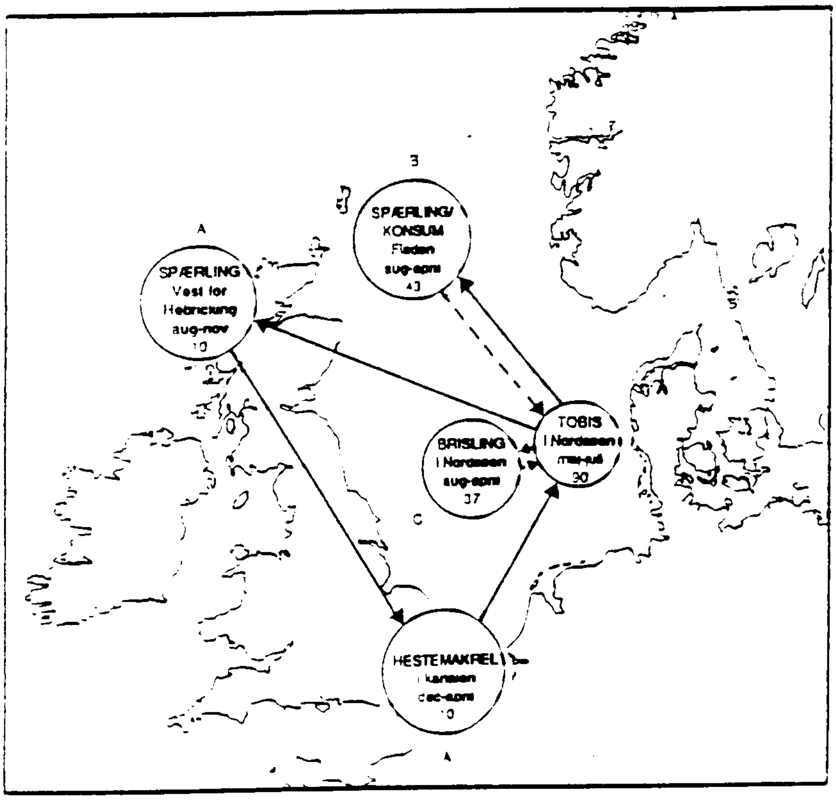
Notes: COMMERCIAL FISHING VESSELS OF 5 GROSS REGISTERED TONNAGE OR MORE.
VESSEL SIZE IN GROSS TONNAGE, IF UNKNOWN - GROSS REGISTERED TONNAGE

Examples of fishing patterns (according to analysis by COWIconsult)

Fishing patterns for trawlers (100-650 GRT) fishing for species not for human consumption:

A: Sandeel - Norway pout - horse makerel
B: Sandeel - Norway pout
C: Sandeel - sprat

The number of vessels participating in the fisheries is given in the circles.

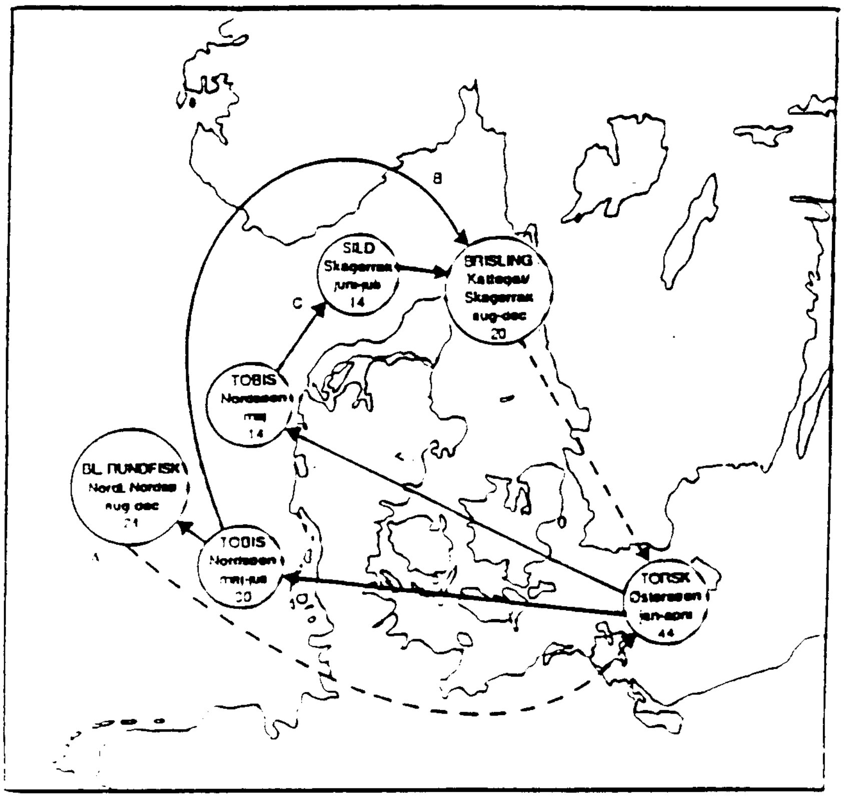


Examples of fishing patterns (according to analysis by COWIconsult)

Fishing patterns for trawlers (40-100 GRT) fishing for species for human consumption and for industrial purposes:

A: Cod - Sandeel - mixed round fish
B: Cod - Sandeel - Norway pout
C: Cod - Sandeel - herring - sprat

The number of vessels participating in the fisheries is given in the circles.

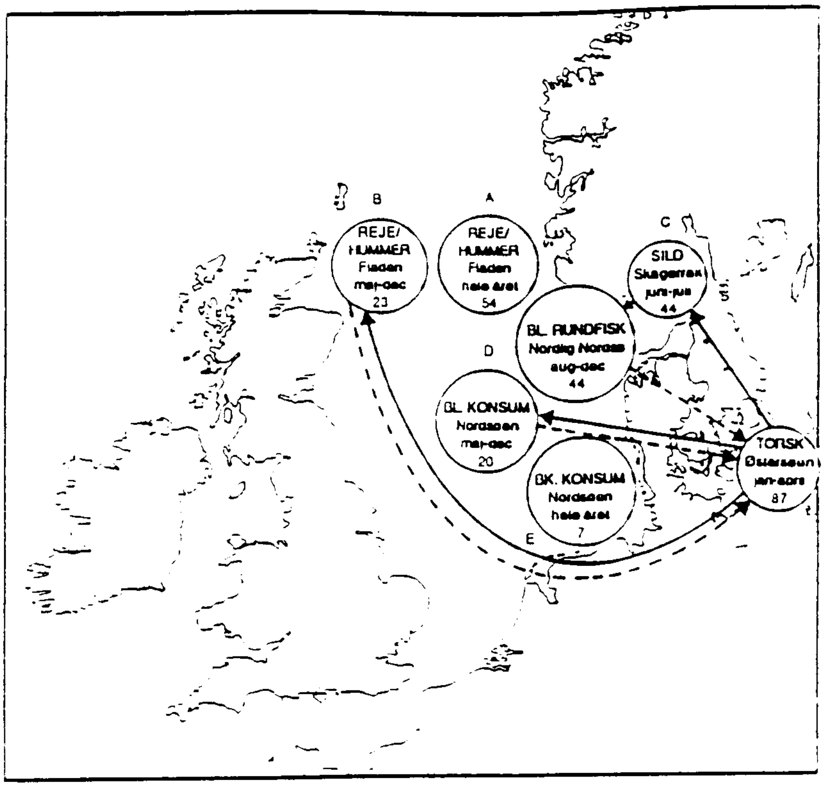


Examples of fishing patterns (according to analysis by COWIconsult)

Fishing patterns for trawlers (over 60 GRT) fishing for species for human consumption:

A: Common prawn - Norway lobster
B: Common prawn - Norway lobster - cod
C: Cod - herring - mixed human consumption
D: Cod - mixed human consumption
E: Mixed human consumption

The number of vessels participating in the fisheries is given in the circles.



Ministry of Agriculture and Fisheries
27th of April 1995

DANISH EXPORT OF FISH AND FISHPRODUCTS WORLD TOTAL IN 1993 AND 1994.

DENMARKS EXPORT	QUANTITY IN TONNES		VALUE IN 1000 KRONES		UNIT VALUE IN KRONES/KILO	
(JAN-DEC MONTHS)	1993	1994	1993	1994	1993	1994
1. AQUARIUM FISH	9	12	1.326	1.961	150,87	169,76
2. ROE, LIVER AND MILT	2.024	2.451	108.622	123.248	53,68	50,29
3. FRESHWATER FISH	82.057	77.125	2.451.992	2.484.651	29,88	32,22
OF WHICH:						
SALMON	49.696	47.039	1.514.115	1.610.498	30,47	34,24
TROUT	26.275	24.163	671.843	601.049	25,57	24,88
EEL	2.890	2.630	181.444	173.022	62,78	65,78
OTHER SPECIES	3.196	3.293	84.590	100.081	26,47	30,40
4. HERRING, FRESH/CHIL./FROZEN	38.314	39.114	191.932	181.511	5,01	4,64
OF WHICH:						
HERRING, FRESH/CHIL., WHOLE	16.760	20.743	76.183	82.595	4,55	3,98
HERRING, FRESH/CHIL., CUT	-	-	-	-	..	..
HERRING, FROZEN, WHOLE	9.000	9.280	46.134	46.396	5,13	5,00
HERRING, FROZEN, CUT	12.554	9.091	69.615	52.519	5,55	5,78
5. SALTWATER FISH, FRESH/CHIL. AND FROZEN, INCLUDING FILLET	248.091	249.829	4.032.680	4.166.801	16,25	16,68
OF WHICH:						
SPRAT, FRESH/CHIL.	881	1.854	2.335	7.938	2,65	4,28
MACKEREL, FRESH/CHIL.	9.636	11.982	35.133	37.177	3,65	3,10
COD, FRESH/CHIL.	25.960	31.463	510.536	572.431	19,67	18,19
SAITHE, FRESH/CHIL.	9.060	8.373	67.448	67.939	7,44	8,11
HADDOCK, FRESH/CHIL.	4.414	7.224	61.445	85.857	13,92	11,89
PLAICE, FRESH/CHIL.	8.634	8.700	130.175	134.536	15,08	15,46
SOLE, FRESH/CHIL.	3.822	3.122	200.100	166.889	52,36	53,45
OTHER SPECIES FRESH/CHIL.	15.048	14.144	441.235	394.219	29,32	27,87
FILLET OF COD, FROZEN	28.585	37.195	726.509	906.781	25,42	24,38

FILLET, OTHER SPECIES, FROZEN	35.147	26.462	658.469	561.023	18,73	21,20
OTHER GOODS, FROZEN	106.902	99.310	1.199.294	1.232.011	11,22	12,41

to be continued

continued

6. HERRING, SALTED	8.850	8.111	71.884	66.266	8,12	8,17
7. FISH, SALTED, IN BRINE, DRIED OR SMOKED	29.071	48.066	1.564.024	2.208.314	53,80	45,94
8. CRUSTACEANS AND MOLLUSCS	73.809	72.421	1.844.544	1.985.600	24,99	27,42
9. FISH, PREPARED OR CANNED	70.687	74.554	1.690.907	1.683.916	23,92	22,59
10. CRUSTACEANS AND MOLLUSCS, PREPARED OR CANNED	36.404	38.926	1.356.632	1.372.864	37,27	35,27
11. TROUT EGGS FOR HATCHING	-	-	-	-	..	..
12. FISH MEAL	267.717	285.361	967.816	1.036.933	3,62	3,63
13. FISH OIL	74.754	96.048	161.400	184.778	2,16	1,92
14. FISH SOLUBLES	321	217	2.005	922	6,25	4,26
15. FISH OFFAL	11.130	20.644	14.683	28.015	1,32	1,36
16. FISH NOT FOR HUMAN CONS.	782	2.484	12.382	17.093	15,84	6,88
TOTAL EXPORT	944.020	1.015.363	14.472.826	15.542.871	15,33	15,31

Ministry of Agriculture and Fisheries
27th of April 1995

DANISH IMPORT OF FISH AND FISHPRODUCTS WORLD TOTAL IN 1993 AND 1994.

DENMARKS IMPORT	QUANTITY IN TONNES		VALUE IN 1000 KRONES		UNIT VALUE IN KRONES/KILO	
(JAN-DEC MONTHS)	1993	1994	1993	1994	1993	1994
1. AQUARIUM FISH	30	37	8.265	9.011	280,08	240,42
2. ROE, LIVER AND MILT	3.410	5.355	30.923	54.684	9,07	10,21
3. FRESHWATER FISH	42.366	42.514	1.319.511	1.309.757	31,15	30,81
OF WHICH:						
SALMON	37.408	36.689	1.167.261	1.118.296	31,20	30,48
TROUT	834	1.207	19.396	21.592	23,27	17,88
EEL	1.661	1.974	92.349	105.023	55,61	53,21
OTHER SPECIES	2.464	2.644	40.506	64.847	16,44	24,52
4. HERRING, FRESH/CHIL./FROZEN	74.217	89.573	150.599	181.528	2,03	2,03
OF WHICH:						
HERRING, FRESH/CHIL., WHOLE	71.982	88.250	141.143	175.679	1,96	1,99
HERRING, FRESH/CHIL., CUT	-	-	-	-	..	..
HERRING, FROZEN, WHOLE	1.124	630	3.761	1.898	3,35	3,01
HERRING, FROZEN, CUT	1.111	694	5.695	3.951	5,12	5,70
5. SALTWATER FISH, FRESH/CHIL. AND FROZEN, INCLUDING FILLET	178.974	199.008	1.734.166	1.899.097	9,69	9,54
OF WHICH:						
SPRAT, FRESH/CHIL.	101	94	425	654	4,19	6,95
MACKEREL, FRESH/CHIL.	24.632	26.277	49.348	50.273	2,00	1,91
COD, FRESH/CHIL.	29.865	56.685	249.690	419.860	8,36	7,41
SAITHE, FRESH/CHIL.	24.044	20.306	102.221	90.799	4,25	4,47
HADDOCK, FRESH/CHIL.	3.187	3.692	24.876	30.076	7,81	8,15
PLAICE, FRESH/CHIL.	5.447	2.648	54.135	30.665	9,94	11,58
SOLE, FRESH/CHIL.	193	126	9.171	6.353	47,62	50,27
OTHER SPECIES FRESH/CHIL.	8.131	5.711	135.072	95.389	16,61	16,70
FILLET OF COD, FROZEN	7.168	7.235	171.026	158.170	23,86	21,86
FILLET, OTHER SPECIES, FROZEN	22.223	23.796	366.724	427.500	16,50	17,97

OTHER GOODS, FROZEN	53.983	52.436	571.479	589.358	10,59	11,24

to be continue

continued

6. HERRING, SALTED	237	95	2.146	587	9,07	6,15
7. FISH, SALTED, IN BRINE, DRIED OR SMOKED	10.222	15.851	243.505	383.079	23,82	24,17
8. CRUSTACEANS AND MOLLUSCS	61.857	66.651	1.422.712	1.495.540	23,00	22,44
9. FISH, PREPARED OR CANNED	14.338	14.897	399.242	373.714	27,85	25,09
10. CRUSTACEANS AND MOLLUSCS, PREPARED OR CANNED	19,102	25.537	843.005	1.078.553	44,13	42,24
11. TROUT EGGS FOR HATCHING	-	-	-	-	..	..
12. FISH MEAL	70.437	56.343	222.297	181.525	3,16	3,22
13. FISH OIL	34.362	22.724	82.851	71.712	2,41	3,16
14. FISH SOLUBLES	13	49	159	289	12,02	5,94
15. FISH OFFAL	31.518	42.619	23.204	32.326	,74	,76
16. FISH NOT FOR HUMAN CONS.	229.648	217.230	140.798	126.278	,61	,58
TOTAL IMPORTS	770.729	798.483	6.623.384	7.197.680	8,59	9,01

FINLAND

Introduction

Finland has a long sea-coastline, 200 000 lakes and a great number of rivers. That's why it is natural that fishing is an important hobby for many i.e. almost every second Finn. In Finland, there are about 4 thousand professional fishers. The proportion of fishery in the Finnish gross domestic product is at the level of 0.2 %. Herring and salmon are the most important fish-species in the professional fishing in the sea. For that reason the management of herring and salmon fishery has the main role when discussing about management of fishery in Finland and consequently in this report.

The structure of this report is the following:

- Chapter 2: the characteristics of the fisheries sector
- Chapter 3: the management objectives and the division of responsibilities between the national and the international level
- Chapter 4: the policy instruments that have been used
- Chapter 5: the outcomes of the used management instruments, the characteristics of the fisheries' sector and other exogenous factors
- Chapter 6: preliminary analyses of some of the outcomes are given
- Chapter 7: preliminary conclusions about herring and salmon fishery.

Chapters 4, 5 and 6 are structured so that the Baltic herring and the salmon fisheries are dealt with in separate sub-chapters and the others in a sub-chapter. For the salmon fishery some regulations that are hundreds of years old are described, otherwise the time period is usually the last twenty years.

This is the first version of the Finnish country report on management of fisheries. The report will partly be developed a lot before it is finished, this is especially the case with the chapters, in which the outcome of the management is explained. These chapters are just preliminary indications of what issues will be dealt with in the final version.

SYSTEM CHARACTERISTICS

Chapter 2: Characteristics of the fishing sector

Physical characteristics of the Baltic sea and the Finnish coast

The Baltic Sea is a 374 000 km^2 big brackish-water basin, with an average depth of 60 meters and a maximum depth of 459 meters. The deepest parts of the Baltic are in the Main basin, whereas the Finnish fishing zone generally is shallower deep. The average depth in the Gulf of Finland is 38 meters, in the Archipelago Sea it is 23 meters, in the Bothnian Sea it is 68 meters and in the Bothnian Bay it is 43 meters. (Ignatius et al., 1981 p. 84).

The water in the Baltic Sea is salty, but the salinity is much smaller than in for example the North Sea. In the Baltic Sea, the salinity is usually 0.1-1.3% depending on the area and depth (Kullenberg, 1981). The water inflow through the Danish sounds regulates the salinity. The magnitude of the water inflow varies hugely, large inflows occur while persistent western winds occur. The salinity level largely effects the ecosystem in the Baltic sea and many changes in the abundance of fish stocks depend on it.

The Finnish coastline is quite long compared to the size of the country. Measured without curves it is about 1 100 km, and measured on the general map it is about 4 600 km (the islands not included). The amount of islands in the Finnish area is huge and the main part of them are quite small, there are about 81 000 islands with an area of at least 100 m^2. The biggest islands are Aaland mainland 685 $km^{2,}$ Kemiö 524 km^2 and Hailuoto 195 km^2. (Anon., 1993 p. 33).

The fish resources

General

In Finland the most important commercially exploited fish stocks are situated in the Baltic Sea. Commercial catches of 17 species are reported on a regular basis, but of course individuals of other species are also caught now and then. Most of the species are fished only in the coastal waters, but the biggest volumes are caught in the of shore fisheries. In the Baltic Sea the most important commercially exploited stocks are Baltic herring, salmon and whitefish. In 1980s, the cod stock was abundant, but is at present small due to the successive weak year classes.

The four species mainly fished in the offshore fishery - Baltic herring, sprat, salmon and cod - are managed jointly by the countries around the Baltic sea. The catches of these stocks have accounted for about 95 per cent of the total catch taken by the Finnish professional fishers and about 75 per cent of the total firsthand value. The stocks of these species are assessed yearly in the International Council for the Exploration of the Sea.

Baltic herring, sprat, salmon and cod all interact with each other and the status, and some times also the behaviour, of one stock therefore depends on that of the others. As a very ruff generalisation one could say that Baltic herring and sprat are alternative sources of food for both salmon and cod. One example of the interdependence is given by the situation in the last years. When the cod stocks have been weak the mortality of Baltic herring and sprat caused by cod has dropped and these stocks has increased. On the same time the competition for food among Baltic herring and sprat have increased and the growth of Baltic herring in the parts of the Baltic, were there used to occur cod, has decreased. At the same time the growth of salmon has increased since there has been more food available. Also the migration patterns of salmon partly depend on the state of the Baltic herring stock - during years with good abundance of Baltic herring a bigger share of the Bothnian salmon stay in the Bothnian Sea instead of migrating to the Baltic Main Basin (Ikonen and Parmanne, 1992).

Despite the huge amount of lakes in Finland, the inland waters are only of minor importance for the Finnish fishing industry. The main reason for the low utilisation of the inland waters is the uneven and small value of catch per unit of effort. The inland waters are very important in the recreational and subsistence fishery. The main species in the inland waters are vendace, whitefish, perch and pike.

The Baltic herring and sprat stocks

The size of the Baltic herring and the sprat stocks has been increasing. There are biological preconditions to enlarge the fishing mortality. Of the southern and south-western coast of Finland herring are small in autumn, due to the migration of adult herring after spawning in spring to the central Baltic Sea. In recent years, the growth of herring has been slow, and the fish have been meagre. Because of the decrease of the cod stocks in the Baltic Sea the predator effect of cod on both Baltic herring and sprat has dropped radically. The sizes of these stocks are therefore big and therefore there are less to eat for each individual fish, that is the main reason for the meagre fish.

The salmon stocks

The salmon and sea-trout stocks in Finland are almost totally based on stocking programs. There are only two rivers left in Finland, flowing to the Baltic Sea, with wild salmon stocks; the River Simojoki and the River Tornionjoki. The present status of these wild salmon stocks is quite poor, as well as the state of the few wild sea trout stocks.

The Gulf of Finland has its own almost totally on rearing based salmon stocks that don't migrate widely out of the gulf. The management problems are therefore different compared to those in the main Baltic Sea; and have therefore been dealt with separately.

Most salmon migrate to the Baltic Main Basin, but some stay in the Gulf of Bothnia. After one to three years at sea the salmons will start their spawning migrations back to the rivers were they were born (Pruuki, 1993). A salmon leaving its river in the north of the Bothnian Bay on its feeding migration might swim in the fishing zone of nine different countries before it eventually might return to the river to spawn if it has not been caught. Even within the Finnish fishing zone it will meet different fishing methods and fishers living hundreds of kilometres apart.

Most of the stockings of salmon take place in the rivermouths in the most northern part of the Bothnian Bay, as compensation for damming of the rivers. Since the releases take place near the only two rivers which still has wild salmon production the salmons based on stockings and those with wild origin mainly has the same migration patterns and therefore the stocks are fished together, which makes management hard.

The success of the releases varies a lot from year to year. One of the most important factors affecting the success is the survival during the first year in the sea - called postsmolt survival. The postsmolt survival varies greatly - during the worst year (1987) in the 1980s the survival rate was 11% and during the best (1988) it was 30%. As reasons for these changes both the abundance of predator populations (Larsson, 1984) and the temperature during the first year (Kuikka, 1991) has been given.

Also the growth of salmon depends on the environment and on other species. The mean weight of a salmon after two sea years was 2.5 kg in the early 1980s and about 4 kg in the end of the decade. Explanation for the increased growth could be exceptional mild winters, increased smolt-size and the decreased amount of cod competition for the same food (herring, sprat).

Other species

The cod stock in the Baltic Sea started to decrease in the mid-1980s. The weak recruitment is connected to the stagnation of the Baltic Sea. The high fishing mortality and low recruitment have reduced the spawning stock to the lowest level observed.

Most parts of the whitefish stocks, as well as other freshwater species, off the coast of Finland are not biologically overfished.

Stocking programs

With the aim of improving catches, both commercial and recreational ones, and as compensation for environmental damages, stocking programs are carried out. Stockings are carried out both in the lakes, the rivers and into the Baltic Sea. 24 different species and are released each year.

Around 2.5 million salmon smolts, 0.9 million sea trout smolts and 10 million one-summer-old whitefish are released annually to the coastal waters of Finland. The most important releasing areas are in the northernmost part of the Gulf of Bothnia. Moreover, some other freshwater species stockings are carried out in the sea-area (pike-perch, pike).

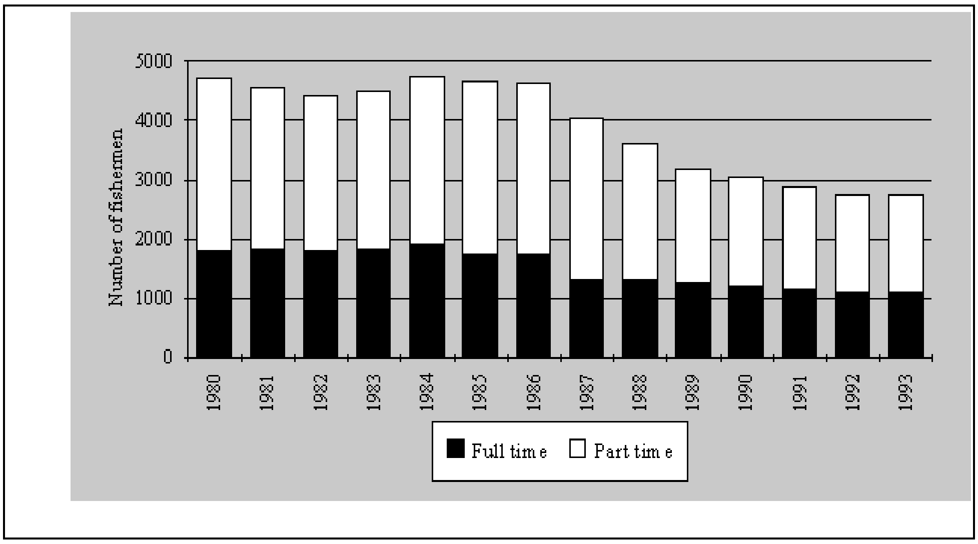
A large proportion of salmon and sea-trout releases is based on the obligations imposed by water courts (see Chapter 2), according to legislation that states that when damage has been done fish stocking should be carried out by those who has caused the damage. In addition to these stockings voluntary programs are also carried out financed by the state, local authorities or the owners of the water areas.

The professional fishers, the fleet and the catch

The amount of fishers, the vessels and gear they use and the catch they obtain is of course an outcome of the management instruments used, the characteristics of the fisheries' sector and other exogenous variables at earlier stages. These outcomes will therefore be dealt with in detail in Chapter 5. Since the outcome of the previous time periods, however, form the environment where the present management occurs a brief description is given here.

In 1993 there were about 2 750 professional fishers fishing in the sea (Figure 1). About 40 per cent of them got more than 50% of their income from fishing (full time fishers). The number of professional fishers has decreased continuously during last years but the number of full time fishers has been more stable. (Anon., 1993a)

Figure 1. The number of professional fishers in the marine fisheries 1980 - 1993



The number of fishing vessels was estimated to be about 2 400 in 1990. Most of the vessels were shorter than 10 meters. The number of registered fishing vessels has been quite stable in the 1980s after a sharp increase in the late 1970s. In 1991 there were 550 registered fishing vessels. Even if the number of registered vessels has not increased in the 1980s the vessels today are more efficient than they used to be (Hildén et al., 1991)

During years 1980-1993 the total catches of the Finnish professional marine fisheries fluctuated between 60 000 and 100 000 tonnes (Figure 2) and it's first hand value between FIM 144 and 241 million, in the price level of 1992. (FIM 241 million was about US$54 million in 1992.) The total catch was at the highest level in 1988. After 1988 catches declined, so that the smallest catch was caught in 1991. The total catch started to increase again in 1992 and was about 20 000 tonnes larger than in the previous year. Despite this increase in the volume of the catch the value of the catch continued to drop. (Anon., 1993a).

At average 90% of the total catches (and about half of the total first hand value) of the Finnish professional marine fisheries consisted of Baltic herring during 1980-1993 (Figure 2). This means that the fluctuations in the total catches mostly depend on fluctuations in the Baltic herring catches.

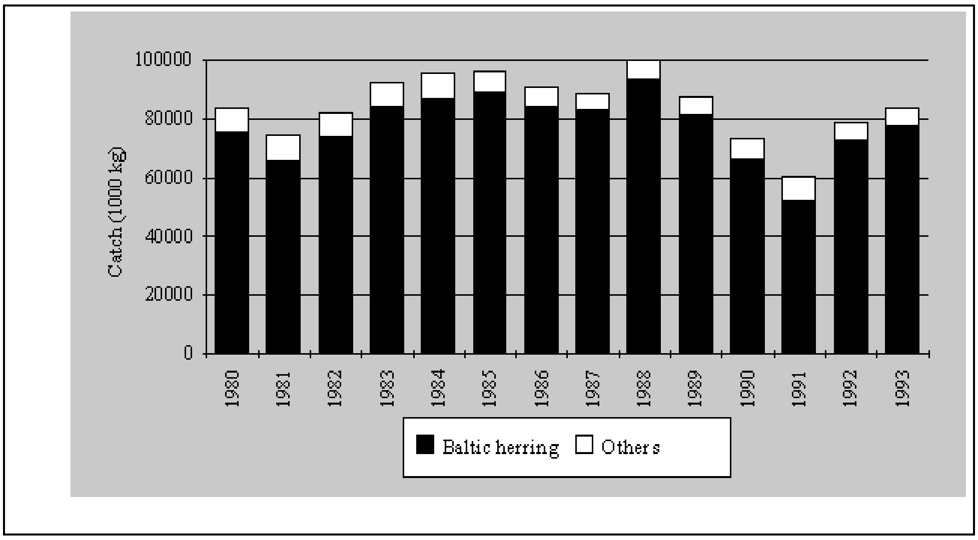
Table 1. The professional marine catches and their values for the main species in 1993.

	Catch (1 000 kg)	%	Value (1 000 FIM)	%
Jointly managed stocks				
Baltic herring	**77 353**	**92.57**	**86 442**	**54.38**
Sprat	**205**	**0.25**	**596**	**0.37**
Salmon	**1 618**	**1.94**	**35 096**	**22.08**
Cod	**203**	**0.24**	**797**	**0.50**
Sum	**79 379**	**94.99**	**122 931**	**77.33**
Stocks in the coastal area				
White fish	1 207	1.44	17 119	10.77
Pike perch	376	0.45	5 708	3.59
Brown trout	220	0.26	4 396	2.77
Perch 524	0.63	2 316	1.46	
Other species	1859	2.22	6 500	4.09
Total	**88 565**	**100.00**	**158 970**	**100.00**

Nowadays most of the Baltic herring catch is taken by trawlers (81 per cent in 1993). The rest is taken by the traditional fishing methods - trapnets and gill nets.

The main species taken as by-catch in the Baltic herring fishery is sprat.

Figure 2. The total catch of the Finnish professional marine fisheries in 1980 - 1993



The majority of the Baltic Sea commercial salmon fisheries take place in the Baltic Main Basin and in the Gulf of Bothnia. The largest proportion of the catch is taken during the months of September to April in the offshore waters of the Baltic Main Basin by Danish, Swedish and Finnish fishers. The Baltic Main Basin fishery intercepts salmon on their feeding migration. Stocks are also fished heavily during their spawning migrations in coastal locations. The preferred gear in the Baltic Main Basin fishery are drift nets and drifting long lines, whereas both drift gears and trapnets are used in the Gulf of Bothnia fishery.

The fishers fishing salmon usually aim at only salmon and they get quite few other species. The most common species caught as by-catch is sea-trout. Because almost all of the sea trout caught as by-catch is of reared origin these catches do not form any considerable problem. Then there is the possibility to get salmon as by-catch when one is fishing for other species. The only gear used mainly to catch other species than salmon, but with which catches quite big salmon catches is trapnets for whitefish. In 1992 about 230 tonnes of salmon was caught by trapnets for whitefish. The share of salmon in the total catch taken by trapnets for whitefish was 41 per cent in the Bothnian Bay in 1992, were it has been between 80 and 98 per cent for the salmon trapnets.

Even if the Baltic herring and the salmon fisheries are the most important ones, there are fishers who mainly fish other species, primary by nets or trapnets. In the gulf of Bothnia whitefish is the most important species for these fishers and in the other regions pike-perch and perch.

Typical for the Finnish fisheries is that quite few fishers catch a huge amount of the total catch of each species. In the Baltic herring fishery about 10% of the vessels take about 60% of the total catch. Also in the salmon fishery the trend has been towards bigger units, and in 1990 less than 20% of the fishers took more than 80% of the total catch.

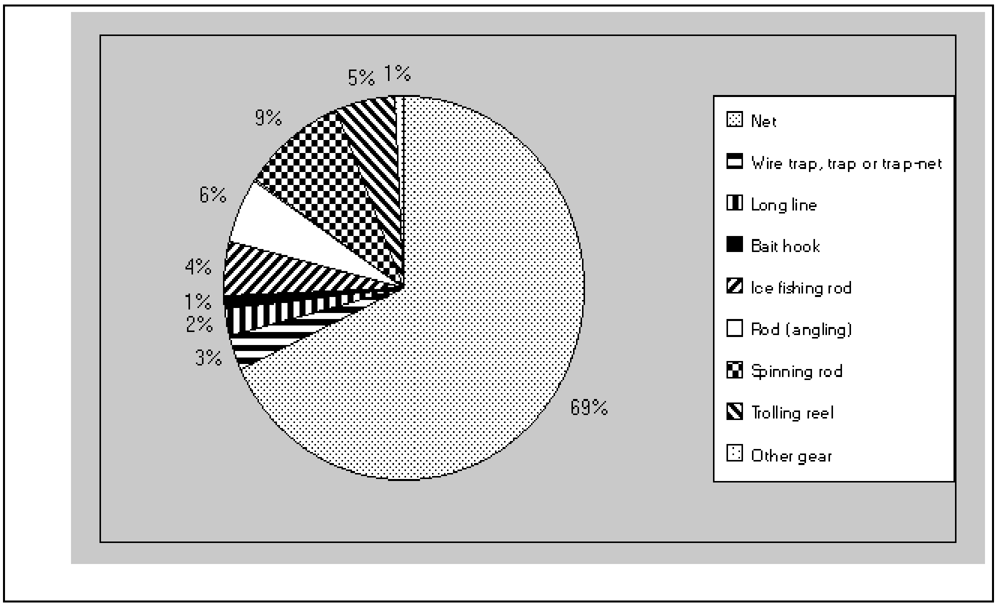
The recreational fisheries

The recreational fishers and their use of different gear

Recreational fishing is one of the most popular recreational activities in Finland. Yearly around 2 million Finns try their fishing luck. This means that 42 per cent of the Finns fished in their free time in 1992. The marine area was the most important fishing area for about 480 000 recreational fishers in 1992, whereas 1.6 million recreational fishers mainly fished in the lakes and in the rivers. Preliminary figures show that the total expenditures by recreational fishers on fishing gear, fees and tickets, travelling to the fishing areas, food on the fishing trips, lodging and so on amounted to at least 1 600 million FIM in 1992 (about US$360 million). (Anon., 1993b).

The passive gear types have an important place among the recreational fishers in Finland. About 50 per cent of the recreational fishers used nets in 1992. The only gear that was used by more of the households engaged in recreational fishing was angling, that had been used by 55 per cent. Spinning rods were used by 48 per cent, trolling reel by 21 per cent and fly rod by 6 per cent. In 1992, 69 per cent of the marine recreational fisher's catch in the marine area was taken by nets (14 500 tonnes), 6 per cent by angling (1 200 tonnes) and 9 by spinning rod (2 000 tonnes) (Fig. 3) (Anon., 1993b).

Figure 3. The total marine recreational catch for different gear types in 1992



The catch by the recreational fishers

The most important species, with respect to the weight, caught are perch and pike. In 1992 the recreational fishers in the marine area got 5 600 tonnes of perch and 4 000 tonnes of pike. The recreational fisher's share of the total marine perch catch was 92 per cent and of the pike catch it was 95 per cent. The recreational fisher's share of the total marine catch was about 20 per cent. The share of the other species except Baltic herring is about 74 per cent. (The recreational fisher's share was over 90 per cent of the catches in the lakes.) The two species for which the recreational fishers had a share under 10% were Baltic herring and cod and the share of the salmon catch in the marine area was about 13 per cent. (Anon., 1993b).

The catch taken by the recreational fishers in Finland is concentrated to the most efficient fishers. In 1992 the tenth percentage of the households that got most fish caught more than 50 per cent of the total catch taken by recreational fishers. The least efficient half of the households engaged in recreational fishing only got about 5 per cent of the total catch taken by recreational fishers. (Anon., 1993a).

The utilisation of the catch

As a consequence of the long coastline and high number of islands the catch is landed at many different spots. In 1992, more than one ton Baltic herring was landed at 104 harbours, but generally the amounts were small since only at six harbours the amount was more than 1 000 tonnes. In addition to these official harbours many professional fishers also land fish at their own private jetty.

Only a small share of the Finnish fish catch used for human consumption is processed in some way and very little of the imported fish is further processed in Finland. The main part of the catch is sold round, gutted or filleted. The processing rate and the number of fish products on the market have, however, increased in the 1980s.

There were 106 fish processing units in Finland in 1991. Over 70% of these were very small enterprises (the number of employees was less than 5). In 1988, the number of processing units was 88, with altogether over 900 employees and with total sales of about FIM 520 million.

The main species used by the Finnish processing industry are Baltic herring and farmed rainbow trout. In 1991 the fish industry bought 13 300 tonnes Baltic herring for processing. Some 10 000 tonnes was filleted and most of the rest was smoked. In addition the preserving industry used about 500 tonnes imported Baltic herring. Some 7 000 tonnes of rainbow trout was filleted, smoked or otherwise processed. Besides domestic rainbow trout, Baltic herring and whitefish the processing industries imported about 1 000 tonnes of whitefish from Canada and about 500 tonnes of other species that were smoked in Finland before distribution.

The volumes of Baltic herring used by the processing industry is concentrated to a few companies. In 1990 the five biggest companies (less than 10 per cent of the companies) used more than half of the total amount of Baltic herring processed and the ten biggest used more than 75 per cent.

Over 50% of the Finnish catch is used as fur animal fodder (56% in 1991 and 66% in 1993). In 1987 there were 52 fodder centres preparing fodder for the fur farms. These centres bought about 50 000 tonnes of domestic Baltic herring and imported about 216 000 tonnes of fish waste in 1987. Because of the declining demand for furs on the world market the amount of fish used by the Finnish fodder industry has decreased rapidly in the last years. In 1991 there were only 17 fodder centres left, they used 30 000 tonnes of domestic Baltic herring and 24 000 tonnes imported fish waste. However, after 1991 the use of fish by the Finnish fodder industry has increased.

In 1990 75% of domestic catch for human consumption was mainly sold as fresh fish, 7% of the catch was deep-frozen (Baltic herring and rainbow trout). 18% of the catch was otherwise processed fish.

In 1988 over 95% of all households were using fish or fish products. Nowadays the most important purchase places for fresh fish are self-services and supermarkets.

Social characteristics

There is a general concern about the possibilities for people to continue to live and work in the rural areas of Finland. This is also important with respect to fishing, especially in the archipelago areas were there often are few other employment opportunities. It has therefore been seen as a big problem that the amount of fishers in these areas has been dropping. There is a danger that the knowledge of how to fish in the archipelago areas will be lost if the number of fishers in the rural areas continues to decrease.

The Private ownership of seawater

Finland differs from most other countries in the respect that not only the land but also water areas are objects of private ownership. This is of great importance for the management of fisheries, especially since the legal position of private ownership is traditionally strong in Finland (Vihervuori, 1992 p. 26)

The private ownership has its roots in the times when Finland was part of Sweden. During the times until 1766 there was no general fishing act in Sweden, there were however specific rules and regulation and the local habits had a huge importance for the legislation to come. The fisheries act from the year 1776 was a compromise, between three interest groups: the farmers, the town based fishers and the king. The farmers wanted the private ownership of land to be increased to incorporate the water areas as well, the town based fishers wanted an open access fishery and the king was interested in getting a way to tax the fisheries but was also a big land owner and wanted to secure the fishing rights in these areas. The result was different rules in different parts of the country. On the south and the west coast of Sweden the town based fishers were strong and the tax interest of the king dominated, the result was therefore a system where the private ownership stops at the coast and fishing in the sea was free. In the Baltic Sea area of Sweden the farmers were strong and the result was a connection of the fishing rights and the ownership of the land on shore and on the islands. (Nybacka K. et al., 1991).

Today the Finnish water areas can be divided into tree groups on the basis of the ownership: some areas are owned by single individuals, i.e. parcelled water areas, these areas are most common in the southern and western parts of the country, then there are areas that are jointly owned by groups of private real estate holders and finally outside the village boundaries (and in the middle of the largest lakes) there are the public water areas owned by the state. (Vihervuori, 1992, p. 25-26).

In legal terms the proprietor of the areas that are owned by groups of private real estate holders is a shareholders' association for a registered village's common areas. The shareholders are not always organised, but sometimes they are replaced by the statutory shareholders' fishery association for the (respective) registered village's common waters. The shareholding estates per village vary between two and several thousands. The system is furthermore complicated by the fact that the archipelago water area is split by a network of village and estate boundaries. (Vihervuori, 1992, p. 25-26).

Within a system based on private ownership of water areas, there has also been a need to ensure public interests. The public rights of access and related citizens' rights, which are traditional attributes of the Nordic legal system and also apply on land, do limit the power of the water owners. There are also additional limitations as the explicit provisions for moving in the water areas, in the Water act, and some specific common rights of fishing, in the Fisheries act. The Fisheries act grants the citizens the right to angel with rod and to practise a form of ice fishing - jigging - without permission from the owner of the water area. Actually until 1994 persons over 18 were only free to angle with rod in their municipality and a special Ice Fishing Fee has to be paid to the state before one legally can practise jigging from the ice. Part of the income of this fee is yearly further distributed from the state to the water owners. (Vihervuori, 1992, p. 26, 133).

In order to secure public interests but also to ensure that rational large scale private construction projects are possible a permit system is in force. This permit system is in most cases based on the ban to closing or altering water bodies. Even when permits are given water-borne traffic, eventual timber floating, and migration of fish have to be guaranteed. Usually the permits are combined with certain conditions that aim at reducing the harmful effects of the project. An obligation to build a fish ladder is one example and fish planting obligations is another. (Vihervuori, 1992, p. 142-144).

It has been noticed that fishery interests have a bigger impact than their economical value. Whole construction projects have some times been rejected in courts largely because of the impacts on fish resources. In a famous case even the cultural values of the stories about trout fishing written by a famous author, were considered relevant for the decision not to give a permit for a power plant. (Vihervuori, 1992, p 135).

Other government actions

The Finnish government has also taken actions, affecting the fisheries, which has not been intended to affect the management, but which has had indirect effects on the management by affecting the fishing capacity or strategical choices by the fishers. One form of such action already mentioned are the stocking programs financed by public resources. Different forms of subsidies and trade restrictions are another important field.

In 1949, the Finnish government paid subsidies for the drying of herring in order to remove surplus catches of fresh herring. This system lost its significance when fur farming developed into a major user of surplus fresh herring (Viitanen, 1985). Since 1964, subsidies have been paid for the transport of herring more than 100 km during the spring season. The objective has been to get fish from areas with large catches and small demand to areas with smaller supply and larger demand and it has mainly served the use of herring in fur farming.

In 1975, a law on price subsidies was passed (Law 621/75). Removing adverse effects of price fluctuations was one of the major motivations for the law. The fact that the price on herring for human consumption reached levels paid for fodder fish during the spring season was of particular concern (Anon., 1974). Stabilising the income from fishing by determining the price in advance was therefore seen as a primary goal. In determining prices and subsidies the income development of fishers was also to be taken into account. In 1988, the law was changed from a law on price subsidies into a law on fisheries income (Law 1157/88), and guaranteeing the income development of fishers (in accordance with the income development of comparable parts of the population) became the primary goal.

There are also other subsidies than the price support for Baltic herring. The government has been supporting the investments by paying parts of the interest rates for the fishers, in cases when the investment has been approved. Another important form of subsidy is the aid to the six fishery insurance associations and one private company operating at Aaland islands. These insurance associations insure the fisher's vessels, boats and gear. Annually over 1 000 accidents are cowered (1466 in 1992) and the accepted claims have lately been about 9 mil. FIM/year. The governments share of the costs has been about 7 mil. FIM.

Presently salmonids and Baltic herring are the only species that can not freely be imported to Finland. Import licences are needed and the policy has been that licences are only given at special circumstances, as closure of a fishery or shortage of domestic fresh fish.

Finally the Finnish state is helping the fishers by negotiating catch quotas in the fishery zones of the other states surrounding the Baltic Sea. Normally quotas have been obtained by giving quotas of either the same species or a different species to the Finnish fishing zone. For 1994, the Finnish government bought some salmon quotas from the Baltic states. The fishers have then been allowed to use these quotas for free.

Aquaculture

On factor which has affected the market for fish and fish products in Finland a lot is the increased role of farmed fish, especially rainbow trout, during the last decades.

The number of fish farms increased rapidly in the end of 1970s and early 1980s. In 1978, there were c. 100 fish farms in the whole country, but only a few years later in the mid 1980s the number of fish farms had reached the level of 350 units. Roughly half of the farms are located in the interior.

The Finnish aquaculture production increased fairly steadily from 1978 to 1989 and from that year onwards up to 1991 the production remained more or less constant. The total food fish production was 3 205 tonnes in 1978 and increased subsequently reaching the level of 19 000 tones in 1989. Although the number of fish farms is equal in inland and sea areas, most of the food fish production comes from the sea areas. Larvae and juveniles are reared mostly in inland units and big sized food fish (1-3 kg) for the market in net cages in the sea.

The total monetary value of Finnish aquaculture production is nearly 500 million FIM. In 1991, the value of food fish production was 382 million FIM and the value of juveniles reared for stocking purposes was c. 80 million FIM.

In the whole country aquaculture industry gives full-time employment directly to 2000 persons and indirectly to c. 5000 persons. However, aquaculture can be considered regionally very important, because it creates employment opportunities in severe unemployment areas in the mid and central Finland and in the archipelago of south-western Finland where other employment possibilities are decreasing. These areas are also the same areas were commercial fishing is an important employment possibility. In some cases aquaculture and fishing are distinct employment alternatives, in other cases they are to be seen as complementing sources of income.

MANAGEMENT OBJECTIVES AND RESPONSIBILITIES

Management objectives

The main objectives for the management of the Finnish fisheries are stated in the first paragraph of the Fishing Act (1982/286):

"When engaging in fishing, effort shall be made to maintain the maximum permanent productivity of the waters. Special attention should be paid to exploiting the fish stock rationally, with consideration for the aspects of the fishing industry, and to caring for and increasing the fish stock. Consequently, such measures shall be avoided that might harmfully or adversely affect nature or the balance of nature".

Although the management objectives in the fishing act mainly focus on the biological side of fishing there are other, social and economical, goals for the management as well. It is for example in the fishing produce pricing act (1975/621) stated that "*In order to guarantee a fair level of income for the fishing population ...*" price support may be paid.

Principally the two main goals of the fisheries' management are to aim at a maximum permanent production and to assure the income of the fishers. To assure the income of the fishers has not however been seen as aiming at a maximum total income for the fishers. It can rather be seen as an objective to ensure a minimum income or the possibilities to continue fishing at times with low profitability. Additional not quite as explicitly stated objectives are the general interests of consumers and recreational fishers.

The International Baltic Sea Fishery Commission (IBSFC) was established in 1974 in order to promote better exploitation, conservation and sustainability of natural resources in the Baltic Sea area.

The principles how IBSFC is managing fish stocks in the Baltic are stated in the convention (Anon., 1984):

- The maximum and stable productivity of the living resources of the Baltic Sea and the Belts is of great importance to the States surrounding it.
- The states have joint responsibility for the conservation and the rational exploitation of the living resources,
- The conservation of the living resources of the Baltic Sea and the Belts calls for closer co-operation in the region,
- The States of the Baltic Sea Basin have extended their jurisdiction over living resources to waters beyond and adjunct to their territorial sea.

Without a clear specific objectives at hand from managerial bodies, scientific bodies have developed certain management objectives (ICES's Advisory Committee on Fishery Management, ACFM), which are mainly based on purely biological considerations. These international management objectives has been accepted as the base for the advice, without any major reservations by the IBSFC requesting information and scientific guidance.

For the management of the stocks IBSFC also make recommendations to the contracting parties on the various management regulatory measures. These are gear regulations, minimum landing size regulations, closed seasons and closed areas and Total Allowable Catches (TAC). Since the very beginning of IBSFC, TACs have been used as a main tool for managing Baltic Sea fish stocks.

Baltic salmon stocks form in some ways exceptions of the general management objectives in the Baltic. Because of the state of the wild salmon stocks, IBSFC has defined that the management objective for the salmon in the Baltic at the moment is to safeguard the wild salmon stocks. This safeguarding is, however implemented by setting a TAC for salmon stocks. But even in the salmon fishery there are other targets, as well. Another central goal also has been the income of the fishers. (Hildén and Kuikka, 1990). Instead of focusing directly on the income of the fishers the level of the catch has been in the highlight.

The management objectives in the fishing act mainly focus on the biological side of fishing and the implementation of the Fishing act aim at a maximum permanent production and sustainabilty. Thus on the national and local level, Finnish fishery has mainly been managed by technical regulatory measures i.e. by gear regulations, minimum landing size regulations, closed seasons and closed areas. TAC regulation has not been used on local level.

Division of responsibilities

In principle the division between the management responsibilities of IBSFC and national authorities is clear. The IBSFC deals with the management in the Convention area i.e. all waters of the Baltic Sea and the Belts, excluding internal waters, and all fish species in that area. The National authorities operate inside the twelve nautical miles measured from the base line. The problem however is that the fish does not recognise these borders and the management in the two areas is therefore by nature often interlinked.

The International Baltic Sea Fishery Commission is not the only way to jointly manage the fish stocks in the Baltic Sea, in addition there are bilateral agreements between the states. Quotas or fishing rights are exchanged or traded on an annually basis.

Most of the local management including fisheries management on Aaland Islands is carried out by the national authorities. They decide on additional technical regulations either for the species in question or for other species, if necessary.

The management of some migratory stocks, as salmon and sea trout, is further complicated by the fact that the border between Sweden and Finland is in a river - the river Tornionjoki. These stocks are therefore jointly managed even in the river, by the Finnish-Swedish Border River Commission. A similar system is also in place for the Tana river floating to the Atlantic, which partly forms the border between Finland and Norway.

MANAGEMENT SYSTEMS AND EXPERIENCE

Policy instruments that have been used

Baltic herring

General

Despite of the big catches of Baltic herring, the herring stocks are large in the northern Baltic Sea, and at present there are no biological reasons to restrict the fishery. There are, however, several complicated issues in the Finnish herring fishery, as:

- Marketing difficulties and low profitability,
- Small size of herring especially in the southern part of the Finnish fishery zone in autumn,
- A great part of the yearly catch is taken in spring during only two months,
- In the lack of other possibilities most part of the herring catch is used for animal fodder.

TACs for Baltic herring

International Baltic Sea Fishery Commission has managed the herring fishery by using catch quotas by countries or fishery zones since 1970s. The TACs for Baltic herring has, however, never led to a closure of the fishery.

Technical regulations

Earlier the minimum mesh size (bar length) in the Baltic herring fishery was 12 mm in Finland. Because a minimum mesh opening of 16 mm (10 mm bar length) was introduced to the fishery rules of the International Baltic Sea fishery Commission for the northern Baltic Sea in 1970s, the same mesh opening 16 mm was introduced also in the Finnish national legislation in 1977.

Time and area restrictions

Finnish herring catches increased in 1970s and at the beginning of 1980s due to the increased pelagic trawling. Part of the catches taken with the pelagic trawl consists of young herring, especially in autumn in the southern area of Finland close to the coast or the surface.

In order to diminish the catch of young herring, the trawl fishing of herring was forbidden in the southern Finland in internal marine waters in autumn 1986, except in a small area in the eastern part of the Gulf of Finland.

To protect young herring the trawl fishing of herring was forbidden in autumn 1987 in internal marine waters in the Gulf of Finland except in some places, and in a small area in the Bothnian Bay, northernmost Baltic Sea.

Price support

The Finnish price support system is not established for management purposes, but part of it has been used (and is still used) to resolve a management problem. During the winter 1990-91 the price the fishers got for the small Baltic herring was very low compared with the price for the bigger size classes, which can be used by the processing industry. It was then revealed that many fishers therefore discarded small sized Baltic herring instead of bringing the fish ashore. This behaviour was common, even if it was against the rules. In a study more than 300 fishing enterprises (single fishers, a household or a registered vessel) reported that they had thrown away ore given away Baltic herring during the year 1990 (Hildén et. al, 1991). The reason why the price for Baltic herring used as fodder was so low during the winter and spring is that it has to be stored for months before the season when the fur animals use the fodder starts.

Since increasing surveillance of the discards at sea enough to totally get rid of the discards would have been expensive, other solutions were looked for.

With this background information it was argued at the fish price negotiations that if the government would pay a certain storage support, this would decrease the costs for the buyers of Baltic herring for fodder and would therefore increase the price they would pay the fishers enough to stop the discards. The first support for storage of Baltic herring that had been sorted out to be used as fodder by processors of Baltic herring for human consumption was included as part of the price agreement for 1991. It was then agreed that during the time period 1.1. - 31.5 the government would pay 0.15 FIM/kg of Baltic herring and sprat that had been sorted out by the industry to be used as fodder.

Later the agreement has been changed; in 1992, the support was 0.25 FIM/kg during 1.1 - 31.3 and 0.15 during 1.4. - 30.6. (in 1993, this support was 0.18 FIM/kg), and in the agreement for 1993 a support of 0.35 FIM/kg was included for 1.12. - 31.12 1992. As part of the agreement for 1993, it was decided that not more than 80 per cent of a fisherman's catch could be stored for fodder. The storage support has only been paid for fish that has been bought at the price negotiated by the fisher's organisation and the fodder producers' organisation before each season. In 1994, for example, these prices have been 0.45 FIM/kg during 1.1. - 31.3 and 0.48 FIM during 1.4 - 30.6 (in the tree most northern provinces the prices have been 0.05 FIM/kg higher).

Other restrictions considered

In 1980s, when the herring catches in Finland increased to a record-high level, also other means were considered to protect young herring, to diminish the share of herring catches used for animal fodder, and to develop the management based on catch quotas. The considered means were minimum herring size, trawling ban on weekends, and individual catch quotas. However, no regulations were introduced. In the end of 1980s Finnish herring catches started to decrease and stocks increase. In the management the need for additional measured thus diminished.

Salmon

General

The salmon fisheries are the ones with the longest management history of all the Finnish fisheries. Technical regulations, as minimum fish size and mesh size, and closed periods and areas have been used fore more than hundred years. Also the need for international collaboration has been realised for the Baltic salmon fisheries for more than a century. Despite the long management history permanent solutions has not been found and therefore many of the measures are changed almost annually.

As salmon originating in the northern Baltic rivers, where fishery regulations during the spawning run were enforced, were caught in the hook and net fishery in the southern Baltic, a need for an international agreement on regulation of the salmon sea fishery was evident and first recommended by Malmgren (1884).

The decline of salmon stocks at the end of the 19th century and the establishment of the International Council for the Exploration of the Sea (ICES) in 1902 initiated international salmon research. Already in 1903, a Subcommittee within the ICES Baltic Sea Committee was formed to consider the salmon and sea trout problems.

After negotiations in 1953, 1954 and 1957 between the Governments of Denmark, the Federal Republic of Germany, Finland and Sweden, an international agreement was drafted in 1962. The agreement-"The Baltic Salmon Fisheries convention of 1962"- was ratified by Denmark, The Federal Republic of Germany and Sweden in 1963 and came into force in 1966.

"The Baltic Sea Conference 1972" was held in Stockholm in 1972. The Conference stressed that strict protective measures were urgently required if the natural resource represented by salmon was not to be lost. The Conference agreed that each state should therefore restore, or by stocking compensate for, their former smolt production, establish new spawning areas by constructing of fish ways, investigate the effect of different fishing methods, follow the fishery statistically and not allow too intensive a fishery. As the most urgent step the Conference agreed that all states should ratify the Baltic Salmon Fisheries Convention and in addition, proposed closed seasons and provisions regarding details of gear mounting and the maximum number of gears per fishing vessel (Christensen & Johansson, 1975).

In 1976, the articles of the "Baltic Salmon Fisheries convention of 1962" and recommendations of the Permanent Commission of this Convention were adopted by the "International Baltic Sea Fishery Commission" and included as Fishery Rule 14 of the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts" (Christensen & Larsson, 1979).

Minimum size regulations for salmon

In 1897, an agreement for the River Tornionjoki fishery was established for the salmon fishery. In the agreement the minimum size of salmon was 245 mm. Selling and buying of salmon below the minimum size was not allowed (Anon., 1897).

Since the ICES meeting in 1906, a general international size limit for the catch and sale of marketable salmon and trout was repeatedly recommended during the next decades. This lead to results when an article on minimum size was included in "The Baltic Salmon Fisheries convention of 1962". The minimum length of salmon was 60 cm.

In 1976, the articles of the "Baltic Salmon Fisheries convention of 1962" and recommendations of the Permanent Commission of this Convention were adopted by the "International Baltic Sea Fishery Commission" and included as Fishery Rule 14 of the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts" (Christensen & Larsson, 1979). According to the fishery Rule 14 as it reads in 1993: "*Salmon having a size less than 60 cm (measured from the tip of the snout to the tip of the tail fin) must not be kept on board. Furthermore, salmon smaller than 60 cm is not allowed to bring ashore, to offer, to keep for sale, to sell, to transfer in other way or to buy for re-sale.*" (Anon, 1993).

The national regulations on minimum size might differ from the IBSFC regulation in the national waters e.g. in Swedish coastal fishery in the Gulf of Bothnia and in Finnish coastal fishery in the Bothnian Bay the minimum size is 50 cm.

Mesh and hook size regulations for salmon

Minimum mesh and hook sizes were first suggested by ICES in 1953. The first international rules were included in "The Baltic Salmon Fisheries convention of 1962". The minimum mesh size of salmon drift nets of natural and synthetic fibres were 170 and 160 mm respectively. The minimum hook size (shortest distance between point and shaft) was 19 mm.

In 1976, these measures were included in the Fishery Rule 14 of the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts" (Christensen & Larsson, 1979). These regulations are still valid in 1993 concerning mesh and hook size: *Drifting nets and anchored floating nets for salmon fishery must have a minimum mesh-size of 165 mm when made of natural fibres and 157 mm when made of synthetic fibres*.

Regulations of the number of gears that can be used to fish salmon

The first known Finnish regulations of the number of gear that can be used in a salmon fishery is from the river Tornionjoki. Salmon weirs were prohibited in the river mouth in 1617 and their number was restricted from 83 to 69. Later the number was further restricted to 8, a decision by the fisher's union (Anon., 1898).

The reason why number of salmon entering the Tornionjoki River was decreasing was identified as the increasing coastal fishery in the river mouth (Anon., 1899). On the Finnish side the number of fishers and the number of gear used were licensed by the state. On the Swedish side the riparian owners had fishing rights since 1858 and the fishery consequently developed without any restrictions.

In 1979, the "International Baltic Sea Fishery Commission" adopted a measure limiting the amount of gear operated per boat, i.e. a maximum 600 drift net and 2 000 long line hooks (Anon., 1979).

In 1993, the number of gears are limited in the fishery Rule 14 of the International Baltic Sea Fishery Commission as follows: In fishing with drifting nets and anchored floating nets, no more than 600 nets per vessel may be used. The length of each net may not exceed 35 metres. Number of reserve nets kept on board are not allowed to exceed 100. In fishing with drifting lines or anchored lines the number of hooks is restricted to 2 000 hooks per vessel. A number of 200 reserve hooks may be kept on board. Hooks on drifting lines and fixed lines shall have a minimum distance between the point and the shaft (gap) of at least 19 mm.

Regulations by closed period and areas in the salmon fisheries

In 1897, an agreement on the river Tornionjoki fishery was established with the following rules for salmon (Anon., 1897): Closed period from 1 September to the disappearance of the ice cover in spring. Weirs should be removed by 25 September.

The salmon fishery rules in other rivers in the Rivers Tornionjoki, Kemijoki, Kokemäenjoki and Kymijoki one third of the width of the rivers should be left free from all fishing gear. In several other rivers weirs were permitted to close the whole width of the river, but in those rivers the weirs had to be open every week from Saturday 6 p.m. to Sunday 6 p.m., a rule based on old traditions. The existence of salmon in totally barred rivers was based on the fact that the weirs could not be established before spring flow had ceased (Sandman, 1897).

At the moment, the Finnish drift net fishery exploiting running salmon in the sea, is closed during four weeks in April-June distributed to these months as one week lasting units.

In the coastal fishery in the Gulf of Bothnia Finland regulated the salmon fishery by delaying the beginning of the fishing season in the years 1986-1991. The motivation is that, among the early running spawners as a larger share of wild-origin salmon than among the late running spawners. The coast was therefore divided into three areas with different opening dates. The exact dates were decided by the Government of Finland at a annual base. In 1991, the opening dates were: the 6 of June in the most southern area, the 11 of June in the middle area and the 19 of June in the most northern area. (Anon., 1991) A similar regulation is again in force in the coastal fishery in 1994.

The present Fishery Rule 14 of the International Baltic Sea Fishery Commission also include closed periods. Summer closure of fishing with drifting and anchored floating nets is from 15 June 15 September and with drifting lines and anchored lines from 1 April to 15 November. In the Gulf of Finland fishing with drifting lines and anchored lines is prohibited from 1 July to 15 September.

Nowadays still one third of the width of the rivers should be left free from all fishing gears. Ascending spawners in the rivers are protected by means of closed season from 1 September to 30 November. Angling and trolling during this closed period is, however, permitted from 1st to 10th September and 15th November onwards. On the river bases somewhat stronger and weaker measures are in force.

TACs for salmon

Since 1980 ICES has annually recommended a TAC for the Baltic salmon fishery except for the year 1991, when alternatively a recommendation on technical regulatory measures was presented.

TACs were agreed upon for salmon in 1991,1992 and 1993 (in 1993 in number, not weight) by the International Baltic Sea Fisheries Commission (Table 4). Finland did not agree to the allocation between the states of the TAC for salmon in the Baltic Main Basin and Gulf of Bothnia area for 1994.

Management of other professional fisheries

Sprat

The Finnish sprat catches are small. Most part of the sprat catch is taken as by-catch in the herring trawl fishery. The International Baltic Sea Fishery Commission has managed the sprat fishery by using TACs since 1970s. In recent years the Finnish sprat catches have been much lower than the Finnish sprat quota. (Table 5)

According to the fishery rules of the International Baltic Sea Fishery Commission, and national legislation, the minimum mesh opening in the sprat fishery is 16 mm, corresponding a bar length of 10 mm. The minimum mesh size is thus the same for sprat and herring in the northern Baltic Sea.

Baltic cod

In the Baltic there are two cod stocks. The distribution area of the western cod stock is in the areas west of Bornholm Island (Sub-divisions 22 and 24) and the eastern cod stock inhabits areas to the east and north from the Bornholm Island (Sub-divisions 25-32). Finnish fishery has exploited the eastern cod stock.

This stock has been managed mainly by TAC in 1976-1981 and 1989-1993. In 1982-1988 there were no agreement of TACs. Also technical regulatory measures has been used for the management. The minimum landing size will be increased at the beginning of 1 January 1995 to 35 cm south of latitude 59° 30', minimum mesh opening 105 mm for trawls and Danish seines and it is prohibited to conduct specialised fishery for cod for industrial purposes and animal fodder.

The implementation of minimum landing size rule to the south of latitude 59° 30' leaves most of the Finnish fishing zone outside this regulatory measure. The northern parts of the Baltic Sea area is only occasionally inhabited by the immature and maturing cod and the conservation of these specimens has been considered to be of minor importance.

Other

The coastal Finnish fisheries have mainly been managed by technical regulations. The access to fishing on the state owned waters have mainly been open, whereas access to the private water areas has been limited by the owners. In addition to already discussed minimum size limits there is presently in force a minimum size of 37 cm for pike-perch and 40 cm for brown trout.

The private water owners also use technical regulations. In addition many private water owners limit the access by limiting the number of permits they sell or limit the amount of gear to be used. For example the town of Helsinki sells permits for nets to the town waters, to the inhabitants, but not for more than four nets per person.

Recreational fisheries management

The same rules as for the professional fishers also apply for the recreational fishers (gear restrictions, time and area restrictions, minimum size etc.). In addition, there are some other regulations as well. Until 1993, recreational fishers were free to use any gear they wanted in the state water areas. In 1993 the fishing act was changed, so that the use of some gear was limited to fishers that get more than 30% of their income from fishing. (The income share was changed to 20 in 1994 when also the gears were slightly changed). Gears that only can be used, in state water areas, by those which earn more than 20% from fishing are today: trawl and seine, trapnets with a height of more than 1.5 m, nets with the total length of more than 900 meter and hook gear with more than 250 hooks.

For decades there has been a discussion going on about how the permits for recreational fishing on private water should be given. It has long been the case that for most sorts of fishing bought a national fishing fee and a permit by the water owner has to be bought. But as already earlier was noticed this is not the case for al forms of recreational fishing (angling and ice "jigging").

The debate has mainly been on which forms of fishing one should be allowed to do with only a regional or state permit. Some groups of recreational fishers argue that since the ownership is so decentralised it would be more efficient if the permits for different forms of hand gear were sold by regional authorities and the money then would be transferred to the owners. It is not clear how much these recreational fishers would be willing to pay. Others argue that the best way to achieve an optimal allocation of recreational fishing rights is the present system where either the separate owners sell the permits at the price they decide or they form voluntary associations so that the areas become bigger and better suited for some sorts of recreational fishing.

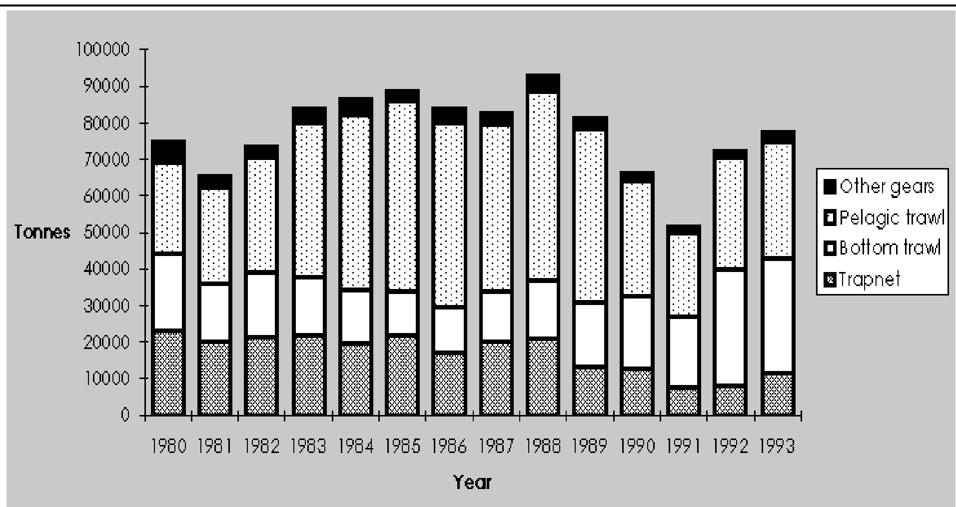
This debate has been especially active during last year and the fishing act was changed in December. Traditional angling is now free in the whole country, without any permission of the water owner, and persons that have paid the national fishing fee are now free to do ice jigging in the whole country, where these rights earlier were limited to the home municipality, at the same time the national fishing fee rose from 30 marks to 80 marks per year (from US$5.2 to US$14.0) (Anon., 1993e).

Chapter 5: Outcome

Baltic herring

The main gears used in the Finnish fishery are trawls and trapnets. In the first half of this century, the trapnet was the most important herring gear in Finland. Trawls came into use in the middle of the 1950s. 1975 was the first year when trawl catches exceeded trapnet catches. In the 1980s pelagic trawl was the most important gear (Figure 4). In recent years bottom-trawl catches have increased.

Figure 4. Baltic herring catches with various type of gear in Finland 1980 - 1993



The declining of the Baltic herring catches started in 1989 because of the crisis in the Finnish fur industry. In 1980, there were about 1 200 fishers fishing Baltic herring. In 1992, only 700 fishers were active in the Baltic herring fishery. Most of the fishers who were forced to stop fishing Baltic herring in the beginning of the 90s lived at the coast of the Gulf of Finland and in the archipelago area in south-west Finland. At the same time the Finnish trawler fleet has continued to increase its share of the total Baltic herring catches. In 1991, the trawlers caught about 86% of the total herring catch, while the traditional fishing methods - trapnets and gill nets - only had a 14% share. The catch has been distributed unequally between the fishers. About 20% of the vessels take 50% of the total catch. (Anon., 1993a and Hildén et al., 1991)

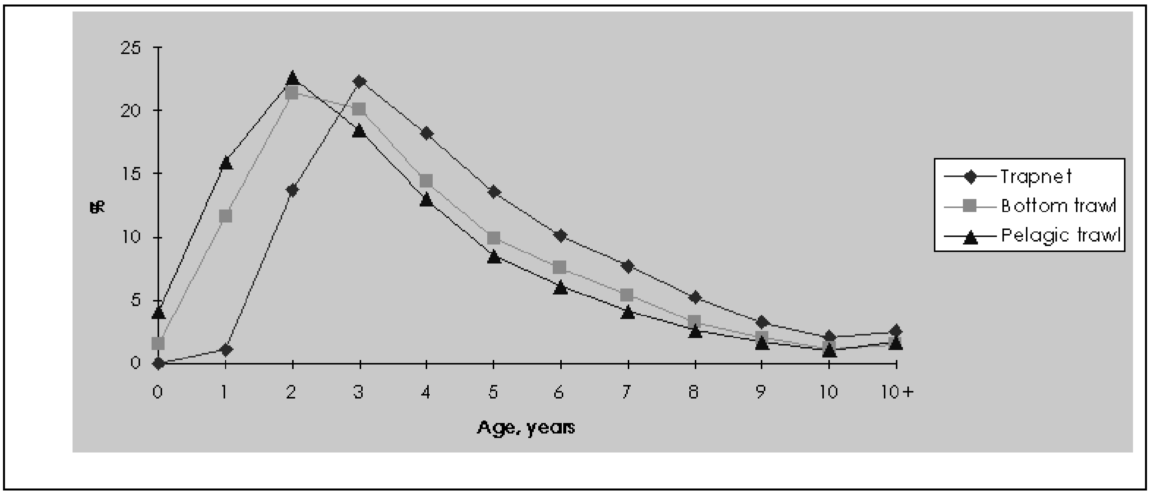
Table 2. Herring TAC allocations and catches (tonnes) in 1978-1994 for the Finnish fishery

Year	Agreed TAC for Finnish fishery zone in the management unit 3	Catches in the Finnish fishery zone in management unit 3	Agreed TAC for the Finnish fishery zone in the other area	Catches in the Finnish fishery zone in the other area
1978	64 000	66 018	15 500	19 450
1979	66 000	60 869	15 100	17 891
1980	65 000	68 527	15 100	14 713
1981	62 000	56 500	17 800	17 600
1982	63 000	62 800	22 300	26 600
1983	71 000	67 343	23 000	33 886
1984	71 000	72 582	23 000	29 691
1985	71 000	74 029	25 300	28 901
1986	71 000	74 165	26 700	25 668
1987	74 000	73 910	26 700	27 299
1988	76 000	58 348	26 700	19 932
1989	76 000	57 287	26 700	21 286
1990	69 000	51 480	26 700	11 330
1991	69 000	38 204	27 000	9 733
1992	69 000	56 673	27 000	7 881
1993	72 000	60 524	37 600	8 642
1994	72 000		37 600	

The amount of trapnets has actually dropped even more than the catch, in the beginning of the 80s about 2 600 Baltic herring trapnets were used in 1992 the number was 636. The trapnet season is quite short, the average number of days that the trapnet has been used has been around 60 per year. Strong seasonally is typical for the Finnish herring fishery. In some years in 1980s more than two-thirds of the annual catch was taken in May and June. In recent years, the share of the catch taken during the spawning period has declined.

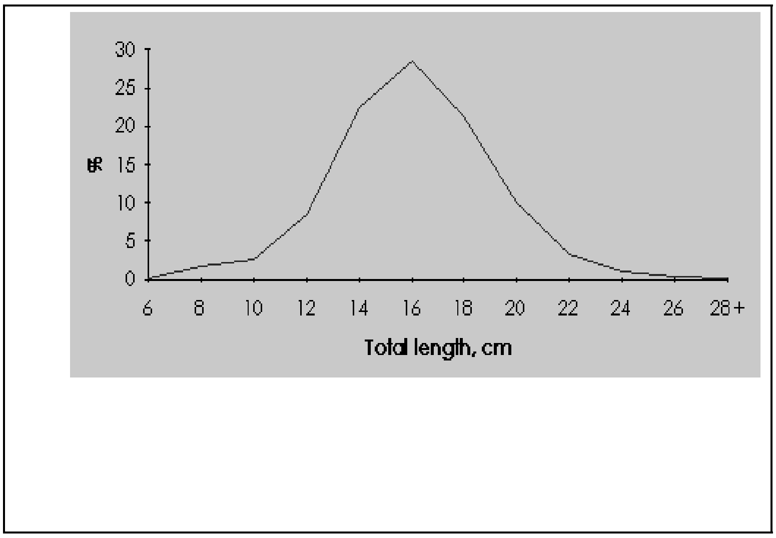
The most common age groups in the Finnish herring fishery are groups 1-5. In the trapnet catches, herring are older than in the trawl catches (Figure 5).

Figure 5. The Baltic herring age composition in the Finnish catches in 1970 - 1992



In the northern Baltic Sea, the size of herring is smaller than in the more southern areas. In the Finnish fishery, a considerable part of the herring are shorter than 14 cm (Figure 6). Especially in the autumn catches taken off the southern and south-western coast of Finland consist of small herring due to the migration of larger herring to the Baltic main basin in autumn.

Figure 6. The length distribution of Baltic herring in the Finnish catches in 1970 - 1992



The price of Baltic herring has been the only regulated fish price in Finland. The price for Baltic herring is negotiated annually and different prices and supports can bee agreed for different use of Baltic herring. The buyers do not have to pay the agreed price to the fishers, but if they pay less the fishers will not get any price support and if they pay more the support will be reduced accordingly. The prices during the last years can be seen in Table 3.

Table 3. The negotiated prices to be paid by the buyers of Baltic herring, the price support to be paid by the state and the price the fishers should received (FIM/kg).

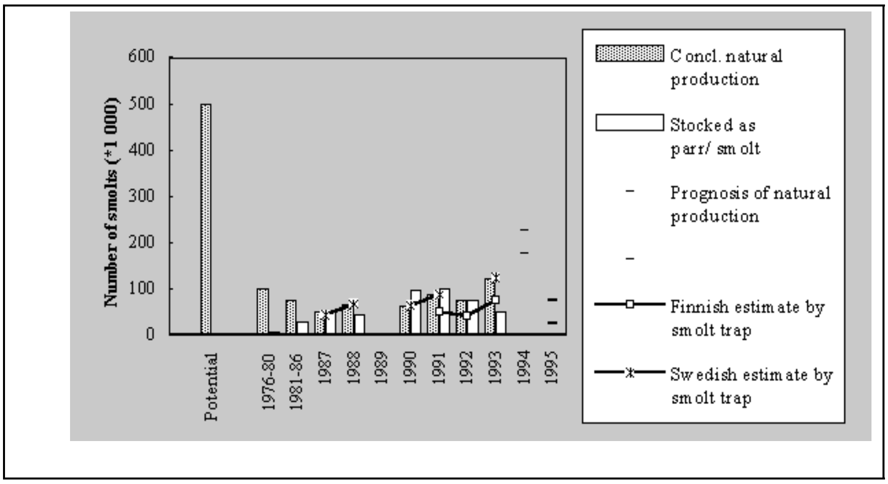
Year Use	Price paid by the buyer	Price support paid by the state	Price received by the fishers
1989			
Animal fodder	0.40	0.50	0.90
Canned or frozen	1.30	1.40	2.70
Otherwise Processed for human cons.	1.95	0.75	2.70
Unprocessed for human consumption	2.75	-	2.75
1990			
Animal fodder	0.35	0.55	0.90
Processed for human consumption	1.55	1.20	2.75
Unprocessed for human consumption	2.80	-	2.80
1991			
Animal fodder	-	-	-
Processed for human consumption	1.65	1.25	2.75
Unprocessed for human consumption	2.80	-	2.80
1992			
Animal fodder	-	-	-
Processed for human consumption	1.65	1.25	2.75
Unprocessed for human consumption	2.80	-	2.80
1993			
Animal fodder	-	-	-
Processed for human cons. size 0 (or>)	1.65	1.25	2.75
Processed for human cons. size 1	1.00	1.00	2.00
Unprocessed for human consumption	2.80	-	2.80
1994			
Animal fodder	-	-	-
Processed for human consumption	1.65	1.25	2.75
Processed for human cons. size 1	1.00	1.25	2.00
Unprocessed for human consumption	-	-	-

Salmon

Earlier, the salmon rivers flowing to the Baltic Sea and the Gulf of Bothnia annually produced 7-10 million salmon smolts. Nowadays, the natural production is less than 0.5 million. The main reason for the decreased smolt production is damming of the salmon rivers. In the salmon rivers left the smolt production has decreased; because of to heavy exploitation the naturally reproducing stocks suffer from lack of spawners. (Anon., 1992a)

Part of the lost smolt production is compensated for by releasing 4-6 million hatchery-reared salmon smolts yearly in the river mouths. These compensatory stockings also form the majority of the salmon recruiting to the salmon fishery and most of the fishing is on mixed stocks, i.e. the salmon originated from reared and wild smolts are caught in the same areas and by the same gear. Nowadays only 5 to 10 per cent of the salmon in the Baltic Sea is of wild origin. Since 1992, high yolk-sac fry mortality, probably caused by unknown reason (called M74) has ruined the positive development of wild salmon stocks. (Fig. 7).

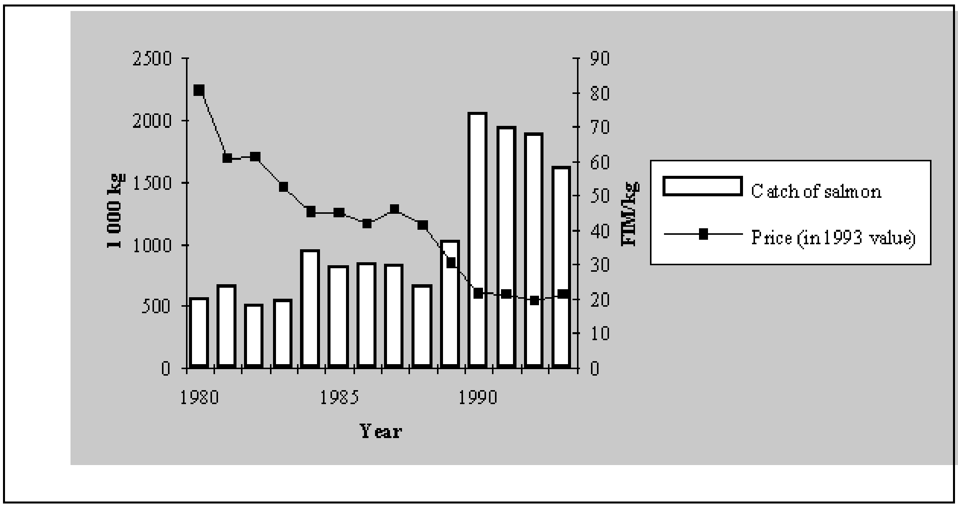
Figure 7. Number of salmon smolts in the river Tornionjoki



The majority of the Baltic Sea commercial fisheries take place in the Baltic Main Basin and in the Gulf of Bothnia. The Baltic Main Basin fishery intercepts salmon on their feeding migration. Stocks are also fished heavily during their spawning migrations in coastal locations. The preferred gears in the Baltic Main Basin fishery are drift nets and drifting long lines, whereas both drift gears and trapnets are used in the Gulf of Bothnia fishery.

The Salmon catches taken by the Finnish professional fishers increased drastically in 1990 (Figure 8). For Salmon the TACs for the Baltic Main Basin and the Gulf of Bothnia has led to a closure of the fishery. In 1991, the Finnish salmon fishery in the Baltic Main Basin and the Gulf of Bothnia was stopped from the 15 of November, in 1992, from the 23 of November and in 1993 from the 16 of September. Despite these closures Finland has fished more than the agreed TACs (Table 4).

Figure 8. The catch of salmon (*Salmo salar*) by Finnish professional fishers and the price they have got in the money value for 1993, 1980 - 1993.



Even if the catches have increased and become nearly four-fold, the income of the fishers has not improved that much, because the real price has dropped to only one fourth of what it was in the beginning of the 1980s (Figure 8). Also the number of professional fishers sharing the catch increased from about 600 in 1987 to almost 1 000 in 1990 (Anon., 1993a).

Table 4. TAC allocations for Finnish salmon fishery in the Baltic Main Basin and Gulf of Bothnia and total catches in 1981-1994 (1 000 kg).

Year	ICES: Recommended TAC for the whole area	IBSFC: Agreed TAC for the whole area	TAC allocations: Agreed TAC for Finnish fishery	Total Finnish catch (tonnes)
1981	1 140 - 1 880	No agreement	No agreement	631
1982	1 140 - 1 880	No agreement	No agreement	439
1983	1 550	No agreement	No agreement	423
1984	1 550	No agreement	No agreement	783
1985	1 700	No agreement	No agreement	656
1986	1 700	No agreement	No agreement	640
1987	None	No agreement	No agreement	641
1988	< 3 000	No agreement	No agreement	511
1989	2 900 (850 000[a])	No agreement	No agreement	787
1990	1 680 (420 000[a])	No agreement	No agreement	1 644
1991	None	3 350	700	1 493
1992	2 820 - 3 130 (626 000[a])	3 550	800	1 517
1993	500 000[a] (2250-2700)	650 000[a]	146 250[a]	217 000[a]
1994	500 000[a] (2250-2700)	600 000[a]	No agreement	

[a] individuals

Also within the year both catches and the price vary a lot. The biggest catch is taken in the beginning of the summer, when salmon is migrating north along the coast of the Gulf of Bothnia. The timing of the migration has been explained by the water-temperature (Anon., 1994a). The price the fishers get for salmon is usually lowest when the catches are biggest and normally the price is highest in December when it normally is about 50% higher than the average price.

In the Gulf of Finland salmon fishery is almost totally depending on hatchery production. In Estonia and probably in Russia there might exist a minor natural salmon production but its share is negligible. According to analyses available to distinguish wild and reared salmon, wild salmon originating from Gulf of Finland seem not enter to the Finnish salmon fisheries in the gulf.

Until 1980s, Finnish salmon fishery in the Gulf of Finland was offshore long lining utilising salmon originated from the former Soviet Union releases. After initiating releases in Finland in 1980s landings have increased accordingly and coastal and later minor river fisheries have developed.

Only very limited information about the costs in the salmon fisheries is available. A small survey (n=16) done in 1992 shoved that the average costs in the offshore fishery were 74% of the first hand value and in the coastal fishery it was 57%. The annual average income in the offshore fishery was 43 000 FIM and 38 000 FIM in the coastal fishery. As expected the variation was very large.

Management of other professional fisheries

Sprat

The Finnish sprat catch is small. Most of the sprat catch is taken as by-catch in the herring trawl fishery. In 1992, the catch was 2 445 t, i.e. less than 2% of the total Baltic sprat catches.

Table 5. Sprat TAC allocations and catches (tonnes) in 1974-1994 for the Finnish fishery

Year	Agreed TAC for the whole Baltic Sea	Agreed TAC for the Finnish fishery zone	Catches in the Finnish fishery zone
1977	275 000	5 500	8 000
1978	184 300	5 500	2 375
1979	161 000	19 200	17 122
1980	80 500	9 600	6 311
1981	60 000	6 100	5 800
1982	48 900	5 000	5 253
1983	48 900	6 000	3 965
1984	57 900	6 000	3 750
1985	84 800	6 000	4 944
1986	105 000	6 000	5 059
1987	117 200	6 000	4 728
1988	117 200	6 000	4 685
1989	142 000	6 000	4 411
1990	150 000	10 000	4 299
1991	163 000	10 000	2 921
1992	290 000	17 000	1 773
1993	350 000	16 000	1 696
1994	700 000	32 000	

Baltic cod

In the Baltic the control over cod fishery has been rather weak and insufficient. In early and mid 1970's there were no agreement on TACs and the first year TAC was implemented for the Baltic cod fishery was in 1977 (Table 6). When TAC has been agreed by IBSFC and implemented, it has always been for the whole Baltic and not on a stock basis. The cod stock in the eastern Baltic was at a low level in early and mid-1970s and its biomass increased very much in early 1980s because of two strong year classes in late 1970s. During this period of stock increase, TACs were in force but always exceeded. In the main distribution area of cod high opening pelagic trawls were introduced in mid-1980s, which increase total effort. Maximum catches were caught in 1984, 441 000 tonnes in the whole Baltic (Table 6) and between 1982-1988 there was no TAC regulation on cod fishery at all. When catch per unit of effort of trawl fishery started to decrease making it less profitable, gill net fishery started to increase in late 1980s and now more than 50% of the total catch is taken by gill nets. This change in fishing strategy has been very fast and now cod fishery has expanded to those fishing grounds where trawl fishery is not possible.

Cod stock started to decrease in 1982 and spawning stock biomass has decreased since then and it is now at the lowest level observed in the time series. During this period of cod stock decrease, TACs have been applied in 1989-1993, but the control over fishing effort and thus fishing mortality has been weak and fishing mortalities has been on a very high level (Table 6). TACs in the latest years has not been fished despite of the very high fishing mortalities. TACs were set much more higher level than recommended.

Table 6. Baltic cod stocks. TACs for both stocks and for whole Baltic, catches for whole Baltic and exploitation parameters for eastern stock in 1974-1993.

Year	Sub-divisions 22 & 24 Recommended TAC by ACFM ('000 tonnes)	Sub-divisions 25-32 Recommended TAC by ACFM ('000 tonnes)	Whole Baltic Sea Recommended TAC by ACFM ('000 tonnes)	Whole Baltic Sea Agreed TAC by IBSFC ('000 tonnes)	Whole Baltic Sea Total catch ('000 tonnes)	Eastern Stock Fishing mortality F(4-7)	Eastern Stock Spawning stock size (tonnes)	Eastern Stock Recruitment at age 2 (millions)
1974	-	-	-	No agreement	194	0.83	342	472
1975	-	-	-	No agreement	239	0.69	426	281
1976	41	150	191	No agreement	253	0.92	424	281
1977	39.6	120	159.6	185	211	0.84	399	462
1978	40	131	171	174	195	0.54	488	784
1979	39	136	175	175	273	0.50	727	567
1980	33	179	212	235	390	0.74	828	402
1981	27	170	197	227	385	0.81	781	655
1982	29	-	-	No agreement	364	0.74	806	652
1983	<54	-	-	No agreement	381	0.71	783	433
1984	-	<274	-	No agreement	441	0.91	759	280
1985	<33	<162	<195	No agreement	355	0.77	616	227
1986	<24	<232	<256	No agreement	279	1.13	451	244
1987	9	<245	<254	No agreement	236	0.96	373	330
1988	16	150	166	No agreement	224	0.88	354	202
1989	14	179	193	220	198	1.17	284	114
1990	8	129	137	210.5	171	1.30	217	106
1991	11	122	133	171	139	1.48	148	52
1992	SRF	LPF	-	100	73	1.38	77	90
1993	SRF	LPF	-	40	40*)	1.32	79	173

(*) assumed; SRF = substantial reduction of F.; LPF = lowest possible F.

Finnish cod catches were insignificant in early and mid 1970s and they started to increase in late 1970s. This was caused by the strong year classes in late 1970s. The maximum catch was obtained in 1984 totalling 9358 tonnes (Table 7). In early 1980s, the cod fishery was developing at the Aaland Islands, in the Bothnian Sea and in the Gulf of Finland and new fishing gears were introduced in these areas which had not been in operation earlier.

Also the markets for cod were developing rather rapidly and there even was a export of cod to Denmark and Norway. In late 1980s and early 1990s, the decrease of cod stock abundance in the Northern Baltic was very fast and catch levels are now at the same level as in the beginning of 1970s. Agreed TAC allocations for Finnish fishery in 1989-1993 (Table 7) have never been exceeded and the cod fishery has been more or less a unregulated open access fishery.

Table 7. TAC allocations for Finnish cod fishery and total catches in 1974-1994

Year	IBSFC: Agreed TAC for the whole Baltic (tonnes)	TAC allocations: Agreed TAC for Finnish fishery	Total Finnish catch (tonnes)
1974	No agreement	No agreement	160
1975	No agreement	No agreement	298
1976	No agreement	No agreement	287
1977	185 000	No allocation	310
1978	174 000	No allocation	1 437
1979	175 000	No allocation	2 938
1980	235 000	No allocation	5 962
1981	227 000	No allocation	5 681
1982	No agreement	No agreement	8 126
1983	No agreement	No agreement	8 927
1984	No agreement	No agreement	9 358
1985	No agreement	No agreement	7 224
1986	No agreement	No agreement	5 633
1987	No agreement	No agreement	3 007
1988	No agreement	No agreement	3 209
1989	220 000	4 000	2 254
1990	210 500	3 000	1 731
1991	171 000	2 400	1 712
1992	100 000	1 000	485
1993	40 000	400	230
1994	60 000	600	

ANALYSIS

Explanation of the outcomes

Baltic herring

In Finland, the marketing problems, and also the low price of herring, have regulated the fishery. Without the price support of the state the Finnish herring catch had been smaller. About 2/3 of the catch is used as animal fodder. In periods, when the need for fodder has been great, herring catches have increased, and vice versa. The variations in herring catches for human consumption have been much smaller.

In the first half of this century, when the herring catch was taken with trapnets, winter and beach seines and with gillnets, the private ownership of sea-water restricted herring fishing in Finland. Also nowadays, when the main part of the catch is taken with trawls, the private ownership restricts trawling in the archipelago area.

The small size of herring in the Finnish catches is a result of natural conditions. The growth of herring is slow in the northern Baltic Sea. The fishing mortality is low, and the effect of fishing on the mean size and age composition of the stock is small. On the other hand, the catch composition is dependent on the gears used. Earlier, when trapnet was the most important gear, the main part of the catch consisted of mature herring. The big share of trawl catch has increased the catches of young herring. (Figure 2)

TACs for Baltic herring

In the management the national quotas have not coincided with the stock boundaries used in the assessments.

In Finland the effects of herring quotas on the fishery have remained small. The main reason for this has been the difficulty to follow the utilisation of the quotas in real-time in the scattered landing system. In 1980s Finland often exceeded her herring quota. In recent years catches have been smaller than quotas. (Table 2).

In 1970s and 1980s, when the Soviet Union was interested to fish in the Finnish waters, Finnish herring quotas restricted the possibilities of Finland to admit fishing rights on her zone, and thus restricted the total herring catches in the Finnish fishery zone.

The existence of herring quotas have possibly slightly restrained new producers to start herring fishing.

Technical regulations of the Baltic herring fishery

The effect of mesh size regulation on the herring fishery is probably small. Obviously the resistance of the trawl in the water would mainly prevent smaller meshes than used at present. According to the preliminary results, an increase in codend meshes in the herring fishery would not lead to larger nor more valuable catches in the long-term because the survival of the cod-escapees is poor.

Time and area restrictions in the Baltic herring fishery

It is difficult to assess the effects of the trawling ban in autumn in the archipelago. In autumn 1986 the positive effect of the ban was weakened by permitting exceptions to twenty fisherman to fish herring for human consumption. In the same way the exceptional areas, where trawling was allowed in autumn in the archipelago, reduced the protection of young herring.

If in the future, the efficiency to protect young herring must be increased, the trawling ban in autumn in the archipelago of the Gulf of Finland should be reconsidered. Usually in that fishery most of the herrings are 0- or 1 year-old, and thus are at the beginning of their potential growth production, and have not yet spawned for the first time.

Price support for Baltic herring

The herring subsidies have, contrary to the objectives, contributed to the seasonal overproduction. Prices drop during seasons with large catches when market conditions determine the prices. The income of the fishing enterprises may nevertheless accumulate rapidly during seasons of low price, because the high catches per unit of effort compensate for the decline in the price (Hildén and Saarni-Vilo, 1989). The system with yearly fixed prices for herring decoupled the connection between quantity and price and created additional incentives to fish during seasons of high catchability, i.e. during the spring. The catch per unit of effort of trawlers is on average twice as high during late winter-spring than during autumn (Hildén and Söderkultalahti, 1990).

Trawling during spring has created a competition for markets between trapnet enterprises and trawlers. The trapnetters are confined to fish during spring time, whereas the trawlers are able to fish during other seasons as well. The trawlers have a competitive advantage in their relationship with the buyers and several trawlers are able to sell large amounts of fish for human consumption although the bulk of the trapnet catch is used as fodder

Discards of herring were a problem in Finland in winter 1990-1991 due to the very low price of small herring for animal fodder. The discarded herring catch in 1991 is estimated to have been 3 200 tonnes, i.e. 6.3% of the total Finnish herring catch in 1991. Discarding of herring was most common in the trawl fishery in the Bothnian Sea. After the first half of the year 1991 discarding of herring has been negligible. It seems reasonable to argue that this is do to the storage support for Baltic herring to be used as fodder.

Salmon

As described before need to regulate salmon fisheries were discussed already in the middle of the last century.

TAC as a management tool used in 1990s has had some decreasing effect on fisheries especially active offshore fishery, but passive gears like trap nets have utilised salmon saved in offshore fishery.

Any natural regulatory measures are not available, because hatchery smolt production has continued year by year almost totally independent on the status of fishery. Most of rearing is based on hatchery brood stocks and those rearing activities needing ascending spawners need those well less that needed in natural reproduction .

Number of fishers has increased and prise of salmon decreased. therefore landings have had to greater and greater to give earnings for salmon fishers.

In a recent econometric study (Mickwitz, 1994) the demand for Salmon was analysed, with annual data (1980-1993) and monthly data (which are available only since 1990). Both in the analysis of the annual and the monthly data the Finnish catch of salmon turns out to be the most important variable explaining the price. Other important explanatory variables in the monthly demand models are a dummy variable for December (the Christmas season) and the price of Rainbow trout. In the estimations with the yearly data also the production of farmed rainbow trout affects the price the fishers receive for salmon.

Coastal trap net bans when beginning of fishery have been postponed, have caused redistribution of landings. Fishers in south have been losers. Ban has not normally been in use in riparian areas and therefore spawners saved in other areas have been taken just before their enter to the rivers in these riparian areas.

Baltic salmon are internationally exploited. In comparison to the Atlantic salmon fisheries where interceptional fishery is limited and most of the exploitation takes place in home water. To chance situation to that direction also in the Baltic, the distribution of catches would be very much different. Three smolt producing parties could increase a lot of landings of hatchery reared fish and similarly save wild stocks concentrating fisheries near the releasing areas. Other parties used to operate only in the offshore area would loose totally continuation of salmon fishery.

Minimum size

Minimum size of salmon in the convention area of the IBSFC is 60 cm. National regulations might differ from it in the national waters. e.g. in Swedish coastal fishery in the Gulf of Bothnia and in Finnish coastal fishery in the Bothnian Bay the minimum size is 50 cm.

Minimum size of 60 cm in the offshore fishery is more or less a commercial size. Smaller than 60 cm salmon caught in the sea when bigger fish are also available, is not clever, because value of such small fish is small and because in the beginning of the second autumn salmon reach 60 cm size. This minimum size is therefore in linkage also into initiating of the offshore fishery.

Minimum size of 60 cm has very little to do in safeguarding large enough spawning stock. Grilse are normally smaller than 60 cm and when they do not enter to the offshore fishery, this size regulation saves grilse for initiate spawning run. In the Baltic Sea almost all grilse are males and therefore they have very little to do with reproduction if only a small number of females are available.

Offshore fishery begins to exploit salmon of 60 cm in the second autumn in the sea. This continues till spring, March-April, when those salmon left from the offshore fishery begins spawning run. At the moment this number is well below the amount needed for spawning run. Therefore, by increasing minimum size in the offshore fishery is possible to increase number of salmon in spawning run.

In the coastal fishery which exploits only salmon during their spawning run, when minimum size is 60 cm it safeguards grilse to enter to the rivers. Salmon are always larger than 60 cm and therefore this size limit does not restrict their exploitation. Because there are no lack of grilse in spawning population, and because grilse enter to the coastal fisheries, there are no need to 60 cm minimum size in coastal fishery and even 50 cm size is not needed, because grilse in the spawning run seldom recover from spawning and return to the sea to grow and then migrate a year later as salmon.

Mesh size and hook size

Mesh size in the drift net fishery (157 mm) is more or less in linkage to the minimum size of 60 cm. By increasing mesh size, size of salmon caught will be increased and number of salmon left when spawning run begins will be larger.

Hook size has not so straight effect on size of fish caught. If hook is large enough to regulate fishing of small salmon, size should be so large that it will affect on number of large salmon caught. At the moment, hook size (distance between point and shaft 19 mm) is however larger that used in 1950s but smaller than hooks used in the beginning of the century. It is obvious that bait size has larger effect on catch size than size of hook.

Number of gears

Limitations on gear number per vessel are 600 drifts net or 2 000 long line hooks which are allowed to use. Purpose of this gear limitation is to restrict fishing effort. However, allowed number of gears in use are so large that in many cases, depending on the width of area and weather conditions, it is not possible to use much larger number of gears.

Closed fishing periods

Closed period in offshore drift net fishery is also partly in linkage with avoiding undersized salmon during summer. Longer long line ban is also for avoiding undersized salmon. Long lining is also normally used more or less in weather conditions when drift netting is not possible. This has normally happened in November-February. In the gulf of Finland, where space for drift netting is limited , long line ban is shorter.

In the coastal fishery a ban of fishing in the beginning of the season is based on observations that in the early run of salmon wild-origin fish are more numerous that later. Also big females are more numerous than later. For reproduction purposes salmon in the early run are the most valuable to save and give those opportunity to migrate their home rivers for spawning.

A difficulty is how to decide the opening day of the fishery because spawning run along the Gulf of Bothnia coast varies year by year. There are quite reliable observations that timing of run is depending on sea water temperature during the first months of the year. If water temperature is lower than average in the southern Baltic, spawning run is delayed and when temperature is higher spawners enter to the coast earlier. Initiating coastal fishery too early, the most valuable share of run will be caught and when opening date is late, the distribution of the landings will be changed remarkably decreasing catches in the southern areas or far from the releasing sites and increasing landings closer the releasing sites i.e. northern part of the gulf where most of releases have been made.

In Finland, land owners have also privilege in fishery to the certain area in the coast (village waters). The regulatory measures used in state owned waters have faced difficulties to put into force in these riparian waters.

The concentration of the smolt releases to the mouths of dammed rivers, mostly in the Bothnian Bay area has created coastal fishery for by running salmon and terminal fishery which exploits salmon on stock basis, is limited to the four river mouths where most of the fishing sites are situated in the village waters when only limited number of fishers can operate there. To distribute these compensatory releases to the number of open rivers along the coast, terminal fishery sites could be increased a lot and salmon entering to the open rivers could create angling and also at least is small scale natural reproduction in these rivers. In this case it would be available many terminal fishery sites and regulatory measures safeguarding wild salmon stocks could be more effective without fear of underutilisation of the hatchery-reared fish.

TAC

TAC used in IBSFC area aiming to safeguard wild salmon stocks has not functioned so that target would have met. In the contracting parties which exploit salmon only during feeding phase by offshore fishery, the target have met. Fishing effort has decreased because of restricted TAC. Those smolt producing parties which exploit salmon both in offshore and coastal fishery, have met difficulties. When TAC is allocated as one figure for those contracting parties, and when TAC period is a calendar year, TAC as a management measure have not functioned at all. Decreased effort in offshore fishery has saved feeding salmon for spawning run. First spawners enter to the coastal fishery already in April- May. At that time national TAC is normally still underutilised and therefore fishing of the most valuable share of the spawning run will be done legally. Fishers are also worried about closure of the fishery when TAC is used and therefore they increase effort as high as possible during the early run of salmon. When number of spawners is large entering to the coastal fishery, TAC will be utilised in short period during the early summer. Later in summer to the releasing sites outside the dammed rivers enter salmon originating from the releases. TAC is, however, fully utilised and legally those fish cannot be caught. Rivers, where they have been released, are closed by dams when these fish cannot be fished but they cannot enter either into home river for spawning. If nearby is situated open rivers they can stray there and if these rivers support wild salmon stock, these strayers might cause remarkable genetical changes into these stocks.

TAC as a management tool in salmon fisheries should be restricted to the offshore fishery for feeding salmon. To establish TAC which is restrictive enough to allow needed amount salmon to enter for spawning run, this measure can be recommended. Technical regulatory measures are then urgently needed in coastal, river mouth and river fisheries to safeguard needed number spawners to enter to the rivers and to allow practical utilisation of reared salmon during spawning run. TAC do not fit to the coastal fishery.

Management of other professional fisheries

Sprat

In Finland, the effects of quotas on the sprat fishery have been small. In recent years catches have been much smaller than quotas. (Table 5).

In 1970s and 1980s, when Soviet Union was interested to fish sprat in the Finnish waters, the quotas restricted Finnish possibilities to admit fishing rights on her zone, and thus restricted the sprat catches on the Finnish fishery zone.

The existence of sprat quotas have possibly slightly restrained new producers to start sprat fishing.

Cod

TACs in the cod fishery

In the Baltic cod fishery TAC has not been very effective management measure. In 1970s when TAC was in force in the whole Baltic, they were exceeded. Finnish cod fishery has been more or less free fishery and the regulatory measures set by IBSFC have not been effective either. The management history of both cod stocks is, however a combination of management strategy and environmental conditions in the Baltic proper. In contrast to other cod stocks, the spawning success of the eastern Baltic cod stock is strongly dependent on salinity and oxygen conditions in the main spawning grounds in the Bornholm Basin, Gdansk Deep and southern Gotland deep. In 1980s and at the beginning of 1990s, there has been a long stagnation period in the spawning grounds and only below average or poor year-classes were produced. This combined to high TACs, high fishing mortalities and high fishing effort has caused the collapse of cod stock in the eastern Baltic.

Technical regulations in the cod fishery

It is also clear that minimum landing size combined to minimum mesh size regulation has not been effective enough to produce a sustainability for cod fishery in the Baltic. Discarding has been a problem in the cod fishery and discarding rate is always rather high when a average or above average year-class enters the fishery.

Conclusions

Baltic herring

Herring stocks have never collapsed in the northern Baltic Sea, as has happened for many oceanic herring stocks. The sustained herring yield in the northern Baltic Sea is not, however, a result of succeeded management, but is rather a consequence of biological and economical properties of herring fishery.

In the northern Baltic Sea, herring form dense prespawning and spawning shoals in spring, but in other seasons the distribution of herring is fairly scattered. Thus the catch per unit of effort is rather small outside the spawning season. In addition, the low price and marketing difficulties efficiently restrict herring fishing in the northern Baltic Sea.

In the Finnish fishery zone, the herring stocks are at the moment large and catches are smaller than the quotas. The utilisation of the Finnish TACs is not followed in real-time, and the quotas do not restrict the herring fishery. Therefore, the herring fishery in Finland has been similar to open access fishery. The effect of mesh size regulation may be of some importance in the archipelago areas with big amount of young herring, but in the other areas the effect of the regulation is obviously small.

At present the herring fishing in the northern Baltic Sea does not cause any major biological concern. The profitability of the fishery could probably be increased by efficient management. Individual catch quotas would decrease the marketing difficulties, because then the catches obviously were more even during the whole year. In addition, if the price of large herring is higher than that of small herring, and individual catches are limited, ITQs would direct the fishing towards big herring, as is also biologically desirable.

Salmon

Salmon stocks in the Baltic Sea have strongly been affected by man. Salmon is sensitive to fishing especially during the spawning run. Therefore river fishery regulations have been in power for centuries. When coastal fishery for running salmon was developed mainly during the last century, it was observed that it has even stronger effect on salmon stocks compared to river fishery, in which overflow in spring and early summer sometimes almost totally prevented fishing. In the middle of this century, offshore fishery increased when engine driving fishing vessels made long-lining and drift-netting possible.

Stronger effect than fishery has had man made changes in the rivers. Before industrialism in Finland there was 18 salmon rivers flowing to the Baltic Sea. It was estimated that Finnish rivers produced about 2.5 million smolt annually. At the moment only two naturally reproducing stocks are left. Most of salmon rivers have lost their salmon stocks because of damming the river for hydroelectric demand.

Before the development of the offshore fishery regulatory measures like minimum size, closed periods and gear restrictions in the coastal and river fishery had positive effect on salmon stocks. Since the 1950s, initiated hatchery-reared smolt releases in dammed rivers and simultaneously offshore fishery began to develop. Regulatory measures have not been effective enough to prevent weakening of most of stocks and even in some cases collapse of the stocks.

The share of hatchery-reared salmon in smolt production has increased since 1950s and at the moment about 90% of salmon smolts originate from hatchery-releases (5 million reared, 0.5 million wild) made mainly in the dammed rivers where no reproducing possibilities are available. Smolt releases in Finland are based on spawners reared in hatcheries. Thus the production is independent on ascending spawners. Mortality in hatcheries from egg to smolt is small. Salmon fishery is at the moment on the level based on hatchery reared production, which is almost insensitive on current fishery. There are no difficulties with reared salmon stocks because spawners are kept in hatcheries in Finland.

In some smolt releasing countries ascending spawners are used for obtaining eggs for hatcheries. The smolt production is then totally depending on spawners left after offshore and coastal and river mouth fishery.

Quotation of salmon landings has not had very much effect to protect wild salmon because inside quota it is possible to catch most of ascending spawners before the quota in fully utilised.

Coastal regulatory measures used in Finland are the way salmon stocks should be managed. These regulatory measures are based on closed period at the beginning of salmon run to safeguard wild salmon to enter to the river. However, this closure has been so far too short to give the needed effect. Closed salmon fishery in salmon river and mouth region give those fish opportunity to enter to the river. No regulatory measures are needed in those rivermouths where salmon is totally based on hatchery releases.

TAC as a regulatory measure in salmon fisheries as only measure do not function well. In the offshore fishery for feeding salmon it can be used. In the allocation of the TAC for fishers ITQ could be a suitable tool.

Restricted fishery in the offshore area to safeguard needed number of spawners to enter for spawning run towards the coast and then enough strong closure at the beginning of the coastal fishery including ban in wild salmon rivers and rivermouths would be beneficial for salmon stocks and salmon fisheries.

At the moment, however, high mortality of fry during yolk sac phase (unknown additional mortality of fry originating from wild salmon, called M74) do not sustain any fishery exploiting wild salmon stocks. Therefore a total ban of offshore and coastal fishery is recommended by ICES. Salmon should only harvested in the areas where hatchery reared smolt have been released and where they enter during spawning run. All reared smolts released should be finclipped to allow their identification in fisheries and no salmon without finclips should be landed.

When a unic salmon stock is lost also genetic material disappear. It is important to safeguard still surviving naturally reproducing salmon stocks. Salmon stocks kept in hatcheries help to safe genetic material but diseases or technical problems in hatcheries may destroy fish in hatcheries. Therefore naturally reproducing salmon stocks are of high importance.

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FRANCE

Introduction

En 1993, la production de la pêche maritime a été de 594 000 tonnes pour un chiffre d'affaires de 5.3 milliards de francs. Le secteur d'activité représentait 23 000 emplois directs (marins embarqués à la pêche) et la flotte française était de 7 000 navires en décembre 1993.

La pêche maritime représente ainsi dans l'économie nationale un chiffre assez faible (de l'ordre de 0.1% du PNB). Par contre, son poids économique est très inégalement réparti selon les régions et peut se révéler important localement. C'est le cas de la Bretagne.

Le secteur français des pêches a connu de profonds changements depuis 1945. Il a perdu plus de la moitié de ses navires, plus des 2/3 de ses équipages, pour une jauge globale en diminution lente depuis 1970. Mais dans le même temps, la puissance globale installée à bord des navires de pêche a considérablement augmenté, ainsi que la sophistication des équipements de bord. La difficulté d'accès aux zones de pêche étrangères s'est traduite par le déclin de la grande pêche, et la forte progression de la pêche artisanale, principalement les navires de moins de 16 mètres.

Enfin, les pêches françaises sont également marquées par une grande diversité des types d'exploitations, qui vont de la pêche à pied jusqu'à des entreprises de taille internationale exploitant des navires de grandes dimensions. Cette extrême diversité n'est pas reflétée par l'habituelle distinction entre " pêche artisanale " et pêche industrielle.

La consommation moyenne de produits de la mer en France - en légère augmentation chaque année - se situe à environ 20 kg/an par habitant. Ce chiffre place la France au sein de l'Europe à mi-chemin entre les pays du nord et les pays du sud. Dans ce contexte, la production des pêches françaises ne permet pas l'autosuffisance.

Gestion

L'objectif prioritaire de la gestion des pêches est de concilier la conservation de la ressource et la préservation de revenus et d'emplois dans des zones côtières qui ne présentent pas beaucoup d'alternatives de production ou d'activité.

La France est membre de l'Union Européenne. En matière de politique des pêches, celle-ci détient une très large part de compétence. La politique commune des pêches, en matière de gestion des ressources, est entrée en vigueur en 1983. Elle a notamment mis sur pied des mesures techniques et une gestion par TAC et QUOTAS.

Aujourd'hui, le régime de gestion de base est défini par le règlement 3760/92 du 20 décembre 1992 qui instaure un régime communautaire de la pêche et de l'aquaculture. Global dans son champ d'application, ce nouveau règlement se veut le cadre de la politique commune de la pêche auquel se réfèrent les différents textes mettant celle-ci en oeuvre dans chacun de ses secteurs ressources, marchés et structures.

En ce qui concerne la gestion de la ressource, le règlement maintient les outils traditionnels (les TAC et quotas, et les mesures techniques relatives aux engins ou aux captures) mais en crée également de nouveaux. Les nouveaux concepts se réfèrent à la gestion de l'effort de pêche, paramètre novateur évalué à partir de la puissance de pêche d'un navire et du temps d'activité effective. L'effort de pêche peut être comptabilisé navire par navire ou globalisé par flottille. Sur cette base, le règlement 3760/92 introduit notamment un nouvel outil de gestion de l'effort de pêche : le total autorisé d'effort de pêche.

Un total autorisé d'effort de pêche peut, en l'occurrence, compléter ou, le cas échéant, se substituer à un total autorisé de captures (TAC) s'il se révèle mieux adapté à la gestion et à la conservation d'un stock donné.

– Gestion des quotas

Pour les espèces communautaires, la répartition des quotas entre les professionnels français est assurée par le Ministre chargé de la pêche. Après consultation du Comité national des pêches maritimes qui est l'instance nationale de représentation des professionnels de la filière pêche, le Ministre chargé de la pêche répartit le quota national des espèces les plus sensibles en sous quotas, par façade maritime.

Pour chaque façade, après consultation des organisations professionnelles régionales et sur proposition des autorités administratives régionales, les sous-quotas sont attribués par organisation de producteur ou groupe d'organisations de producteurs, ou par groupe de ports d'immatriculation des navires.

Les critères de répartition utilisés reposent sur les antériorités de pêche et les caractéristiques des navires.

– Espèces non soumises à quotas

Pour les espèces qui ne font pas l'objet de mesures de gestion communautaire, certains stocks nécessitent une réglementation spécifique au niveau national ou régional.

Le Ministre chargé de la pêche fixe les règles générales - instauration d'une licence par exemple - puis en délègue la gestion au niveau régional (Comités régionaux des pêches).

Ainsi, la pêche des coquilles Saint-Jacques des gisements de Normandie fait l'objet d'un encadrement particulier pour éviter la surexploitation de ce stock : fixation de dates d'ouvertures et de fermeture, obligation de détenir une licence, fixation d'un maillage et d'un nombre d'engins minimaux, quota maxima de capture par bateau, par homme et par jour.

D'autres espèces, comme les crustacés et les poissons d'estuaire, font l'objet de mesures de gestion similaires.

En ce qui concerne les poissons vivant alternativement en eau salée et en eau douce, des conditions particulières et originales de gestion vont être mises en place par décret, en vue d'harmoniser la pêche de part et d'autre de la limite de salure des eaux. Des Comités de gestion regroupant les autorités administratives et les professionnels, établiront des plans de gestion sur cinq ans qui détermineront les mesures utiles à la reproduction, à la conservation et à la circulation des poissons ainsi que les quantités pouvant être prélevées chaque année.

– Cas particulier de la Méditerranée

La pêche en Méditerranée présente un certain nombre de caractéristiques qui tiennent :

- à la géographie ;
- à la diversité et à la densité des utilisateurs de l'espace maritime ;
- aux espèces cibles ;
- à l'absence de régime communautaire de la ressource.

Dans ce cadre, la France a mis sur pieds pour cette zone un régime spécifique de la gestion de la ressource. L'exploitation des pêcheries est basée sur un système de licence par " métier " : chalut de fond, chalut pélagique, senne à poisson de fond, drague à huîtres, " petits métiers " par exemple.

Un contingent de licences est fixé pour chaque métier. En outre, les zones de pêche autorisées, les caractéristiques des navires (longueur et puissance) et engins utilisés vont faire l'objet prochainement d'une réglementation spécifique.

– Réduction des capacités de capture

La gestion des pêches s'opérait jusqu'en 1988 par l'attribution communautaire de quota par espèce et par pays, ou " gestion par les stocks ". Depuis cette date, outre la continuation de la politique des quota, obligation a été faite par la CEE aux Etats membres de réduire leurs capacités de capture.

Au travers des programmes d'orientation pluriannuels, la France, pour sa part, a choisi d'instaurer dans ce but un système de Permis de Mise en Exploitation des navires de pêche (PME). Une loi du 3 juillet 1991 a institué le Permis de Mise en Exploitation des navires. Un décret ultérieur a déterminé les conditions de délivrance de ces permis. Enfin, ces permis ont été répartis entre les différents types de navires et entre les régions où s'exerce l'activité.

Par ailleurs, elle a mis en place un plan de réduction des capacités qui a conduit à diminuer la puissance globale de la flotte de 75 000 kw en 1991 et 1992, enchaînant sur un rythme de réduction annuel de 20 000 kw.

Analyse

La gestion de la ressource et la limitation de l'effort de pêche sont, dans leurs principes, admis par tous. Néanmoins, un certain nombre de difficultés subsistent. Cependant dans l'état actuel des travaux menés par l'administration française, il serait prématuré d'avancer une analyse fine et objective.

GERMANY

Historical overview

Previous developments

There has been an ongoing structural change in the German fleet since the end of World War II. In the 1950s, nearly 1 500 cutters, 200 trawlers and 100 herring luggers were active in the high seas. In the light of developments in maritime law, signs of overfishing and measures for the management and the conservation of fish stocks, fleet capacity has been showing a clearly declining trend for years. Lugger fishery has not existed anymore for years.

Large deep-sea fisheries[27]

Whereas, at the beginning of the 1970s, there were still 110 vessels of the large deep-sea fisheries in service (67 wet fish trawlers and 43 fishing and factory vessels) predominantly operating off the coasts of third countries, in early 1985 only 21 vessels - 9 wet fish trawlers and 12 fishing and factory vessels - were still in service. Afterwards, the large deep-sea fisheries were restructured and renewed through the building of small trawlers, through the modernisation of the remaining fishing and factory ships as well as by entering pelagic fishing with special vessels.

Until the unification of Germany in 1990, the large deep-sea fisheries fleet of the former West Germany was further reduced to a total of 11 vessels - 6 fishing and factory ships, two of which were specialised pelagic fishing vessels, and 5 wet fish trawlers.

The loss of important fishing grounds (especially those off the coast of Iceland since 1977), restrictions in fishing rights in the remaining fishing grounds, and difficult fishing conditions in certain fishing grounds due to biological, climatic and hydrological reasons as well as high costs, have made the deployment of the German fishery fleet less profitable and have led to, among other things, the inability to even completely exploit available fishing rights.

In the past, the former GDR had built up a considerably large fleet for distant fisheries. At the time of unification (1990), their deep-sea fleet consisted of 23 fishing and factory ships deployable world-wide as well as five pelagic fishing vessels. Following the privatisation of the formerly state-owned fleet, only seven vessels are involved in large deep-sea fisheries (distant fisheries), since the fishing rights off the coasts of third countries brought in by the former GDR could no longer be exploited under the different market economy conditions.

[27] Large deep-sea fisheries are conducted by fishing and factory ships - with over 3 000 g.r.t. - and fishing trawlers with around 300 to 800 g.r.t. and are targeted at fishing in grounds very far away (from the home port).

Small deep-sea and coastal fisheries[28]

The number of vessels engaged in small deep-sea and coastal fisheries has also been in decline. At the beginning of the 1970s, there were around 958 vessels engaged in small deep-sea and coastal fisheries; this number dropped to 655 cutters in 1985. The numbers of this fleet have not decreased as sharply as the large deep-sea fishery fleets. Despite the reduction in the number of vessels, there was no noticeable decrease in the catching capacity up to then, as the smaller cutters which were scrapped were replaced by larger, more efficient vessels.

Now, since the mid-80s, capacities in small deep-sea and coastal fisheries have also been noticeably reduced; by 1990, capacities had been cut by 40 per cent overall. At the time of unification (1990), this fleet only totalled 560 vessels in the former West Germany.

At the same time (1990), in the former East Germany, around 1 200 vessels of the small deep-sea and coastal fisheries were in service, of which the vast majority were only active in waters close to the coast.

Present situation

The German fishing fleet comprised nearly 1 600 vessels with a total tonnage of nearly 72 200 GRT. and a total engine capacity of nearly 168 000 kW in early 1994. Here, the large deep-sea fisheries fleet consisted of 19 vessels: seven remaining vessels of the long-distance fishery fleet of the former East Germany, 7 former West German fishing and factory boats, and five wet fish trawlers. With unification in the fall of 1990, as well as the incorporation of small vessels due to amendments of maritime regulations, the small deep-sea and coastal fisheries fleet increased, and now, in 1994, it consists of nearly 1 580 vessels, including 70 deep-sea cutters, 240 crab cutters, and 1 300 other coastal cutters and open vessels.

MANAGEMENT SYSTEMS AND EXPERIENCE

German fishery policy is conducted within the framework of the Common Fisheries Policy of the European Union. At a European level, the total fishing quotas allocated to the EU are divided among the Member States. Details of this procedure follow from the Report of the European Commission on Management Studies. The quotas available to Germany are then nationally administered in keeping with the rules of Community law. The following measures may be distinguished:

– Limited access

Due to the worrisome situation of the stocks accessible to the Community fleets, the Community has adopted measures intended to reduce the fishing effort. Thus, Germany has laid down in the Sea Fisheries Act that fishery enterprises only have the right to be granted a fishing licence if they use fishing vessels which were already in service in 1986 and 1987 on the basis of a licence or whose construction or purchase was or is financed through funds of the Federal Government or the Federal States (*Laender*). Those who wish to catch species of fish which are subject to a limitation of fishing effort according to EU law need a licence; i.e. virtually all species of fish caught commercially are affected.

[28] These include vessels up to 250 g.r.t., whose fishing grounds are mainly the North and Baltic seas.

All other purchase or new construction measures require the consent of the Federal Ministry of Food, Agriculture and Forestry. The prerequisite for the consent is, among other things, that the new vessel replaces a fishing vessel belonging to a fleet category where the capacity has already remained below the upper limit of the sub-capacity set by the Community for the German fishing fleet. The replacement vessel must not be larger or more powerful than the vessel to be replaced.

– Quota administration

General distribution of fishing quotas

The Total Allowable Catches (TACs) and fishing conditions are annually set for every member country for the important fish stocks or groups of stocks following scientific counsel by the Fisheries Council of the European Community. The fishing quotas allocated to the Federal Republic of Germany are distributed every year by the Federal Office for Agriculture and Food on the basis of the Sea Fisheries Act. In accordance with Section 3, paragraph 2 of the Sea Fisheries Act, when measuring the allocation, the effectiveness and suitability of the fishery enterprises, their previous participation in the fisheries at hand, the economic operation of the fishery fleet, and the best possible supply of the market are to be taken into account.

Fishing quotas are allocated at the end of the year in each case, as soon as the fishing amounts available for the following year have been determined. In the first step, the quotas are in each case divided among the cutter fleets and the deep-sea fleets. Afterwards, the criteria according to which the fishing quotas in the fleet categories are to be divided are then laid down. Prior to the final decision regarding allocation criteria, the professional association and the *Laender* involved are consulted. This arrangement is valid for all species of fish for which fishing quotas are set. Following the initial distribution among deep-sea and trawler fishery, there are different possibilities for individual fishery enterprises to use their fishing quotas:

General fishing licence

This is the rule and is in principle used for all types of fishery. At the beginning of a year, fishery is generally permitted until this permission is revoked. Thus, each fishery enterprise can establish the focal points of its fishery and can fish without further significant quota limitations until the revocation of this general fishing licence. This type of quota release is used in each case for those stocks for which quotas have been set where it is not likely that the available national quota will be exhausted in a very short time.

Individual fishing licence

In those cases where the fishing amount available is too small in order to permit unlimited fishing, individual fishing licences are issued. This gives individual enterprises or associations of enterprises, such as producers' organisations, permission to fish and land a set amount of a specific stock or group of stocks within a fishing area. This form of allocation is being practised with Baltic cod and saithe as well as and mainly with fishing quotas in third-country waters.

Other management measures

Besides the possibility of granting general or individual fishing licences, further forms of management are used. For example, for the fishing of sole, a maximum weekly or monthly catch amount is regularly set in order to prevent the premature overfishing of the quota. In some cases, a maximum allowable catch is set per fishing journey. Furthermore, in the case of low fishing quotas, specific fishing is forbidden in specific sea areas and only unavoidable by-catch is allowed. Thus, for example, according to the First Announcement Regarding Fishery by German fishery enterprises in 1995, in the ICES areas of III a N (Skagerrak) and III a S (Kattegat), for cod, only a by-catch of 5 per cent and for sole only 2 per cent of the total amount of fish caught on board are permitted.

Quota monitoring

In order to assure compliance with the maximum allowable catches, there is a comprehensive system of surveillance within the European Communities. Thus, in order to name two examples, according to Council Regulation (EEC) No. 2847/93 on the Introduction of a Control Regulation for the Common Fisheries Policy, every captain of a fishery vessel with a length of 10 metres or more is required to keep a logbook of fishery in which comprehensive information on the species caught, amounts, areas and time is to be recorded. Furthermore, the fishmongers who take over the initial marketing of landed fishery products, and/or the buyer, are required to present a sales invoice to the responsible authorities.

ANALYSIS

The yearly quotas also allocated by the German fisheries administration are the usual practice internationally. However, at the EC level, the permission of management on a multi-year basis is under consideration. Should the EU fix such quotas for the individual member states, this would also mean that the German national quota administrative board would allocate corresponding multi-year quotas to the fishers. Such multi-year quotas certainly bring the fishers advantages, since this would give the fishers more flexibility in managing their allocated resources. This is especially true regarding fish species whose main fishing seasons extend beyond the end of a calendar year. Such increased flexibility would surely bring economic advantages for the fishers.

From an administrative point of view, such a multi-year quota would mean more work for the quota administration. The surveillance of multi-year quotas could well be much more difficult than the surveillance of annual quotas.

The **general fishing licence** used often by German quota administration is surely the most favourable system of licensing for fishery. The right to conduct unrestricted fishery within a total allowable catch promotes those who work hardest; the abilities of the individual fishers are rewarded. Such a quota system is surely disadvantageous if the individual quota is very low or insufficient. In such cases, there is a danger of overfishing. In principle, such a system may only be used if sufficient quotas are available for all fishers.

In contrast to the general fishing licence, the **individual fishing licence** is the most stringent method. It dictates to the individual fisher precisely what species he may fish in which areas. The possibilities available to the fisher are very limited. Since such individual quotas generally also have to be distributed evenly, in such a system, the hardest-working are rewarded the least. Although they might be able to catch more, they can only fish within the limits set. This can especially lead to difficulties if the fishers have different costs in the financing of their enterprises. The individual quota system can also lead to illicit fishing. Although such individual quotas can be, administratively speaking, monitored very easily, this also means considerable administrative work for the allocation agency; each individual quota must be revised and added up.

The **"other rules"** which can be set for management can have various effects on fishery enterprises. Thus, for example, the requirement that only 5 000 kg of sole may be caught in one week has advantages as well as disadvantages for fishery enterprises. This would surely represent a considerable impediment to a fisher if, within a certain time frame, had the possibility of catching more sole. On the other hand, the enterprise can benefit from this if the quota is stretched out over a relatively long period of time. Often, when fishers land good catches, they land more fish than the market can absorb. This often happens in Germany during the summer months. Therefore, in that respect, the landing rule also ends up providing an even and continuous supplying of the market, thus preventing surplus supplies. This is also being understood by many fishers these days. Thus, fishers in the Federal Republic of Germany who primarily fish saithe undertook a voluntary set-aside programme in the summer of 1994; this was to prevent the landing of fish which in difficult times could not be successfully marketed.

A further management method is the setting of by-catch quotas. Small quotas which are necessary for the fishing of the main fish species are allocated to the fishers as by-catch. Even if these quotas are generally economically subordinate to the target species, they pose great economic significance for the fishers. Without a by-catch quota, fisheries for the target species would often have to be prematurely ended. At the same time, the setting of by-catch quotas allows the administration to assure that the species regulated through a by-catch quota is not overfished. Therefore, in this regard, the fixing of by-catch quotas is also a form of management.

GREECE

Introduction

The objective of the study is to present management techniques applied in Greek fisheries and then identify the biological, economic, social and administrative consequences of these techniques. Financial limitations and data availability limited however our analysis in this summary report to a great extent.

Management of living marine resources (1976-1992)

The basic fishery management policy applied by the Greek authorities is presented for the period 1976-1992. The main source of the information used is the yearly review of fisheries of the Greek Ministry of Agriculture.

In the study period, Greek fishery policy changed a lot. In the beginning, government policy was to help modernise and develop the fishery sector. Later on the fear of possible biological consequences forced the government to act in order to prevent overfishing. Financial support policy follows this pattern. During the 70s, government provided credit and several subsidies to help fishers. The financial assistance provided for the renewing and modernisation of vessels started in 1980. During the 80s, financial assistance was gradually limited in the role of keeping the cost of fishing low, subsidising the insurance costs and the price of salt and also keeping fuel prices low.

Selective gear limitations were applied from the beginning of the study period, setting a minimum mesh size and other limitations for some tools. It is not clear if these measures were successful in resource conservation, since the increase in average vessel size and power during that period seem to counteract the effects of these measures. In 1978, financial assistance was offered to change gear, from trawlers to other fishing tools. This selective gear type measure was institutionally easy to apply and had no social cost but its success from a biological point of view was rather poor since building new trawlers was not prohibited.

From 1987, the use of specific tools was limited or prohibited (gear "kouloura" and "volasma") and similar measures were taken in 1988 (gar-fish seiner) and 1991 (seasonal limitations in the use of beach seiners and circular nets). Authorities decided to limit (or prohibit) gears that have a very high catch rates, the success of this policy depends on how fast fishers will change their gear with new ones of different type.

Starting in 1978, fishing in some specific sensitive sea areas was prohibited and the same measure was introduced in other areas in 1986, 1988 and 1991, mainly for closed sea areas (gulfs etc.). These measures might be successful in resource conservation locally but they do not affect total resource stock conservation, since other sea areas will be overexploited from fishers that were forced to change fishing areas. The only effect of this policy seems to be the increase in the cost of fishing. Institutionally, the enforcement of this measure is costly, although the specific areas were well defined.

Fishing was prohibited during some seasons of the year using specific gears starting from 1980. The applied variations of this type of measure include restrictions in the use of specific gear for a season, restriction of the use of some types for a season and species specific seasonal restrictions. Limitations apply to a whole season (trip limits, days at sea, etc.) with the exception of some tools that are prohibited for specific dates, following the moon cycle. This type of restriction is institutionally easy to apply and control, since all vessels of some type have to stay in the port.

The target was mainly to allow fish to reproduce and also to reduce the catchability of some tools that are more effective in specific seasons of the year. The biological success of this policy is not easily observable, although it may be positive. There are no observed social consequences but the economic disadvantages are obvious. Capital is not extensively used, there is a tendency to invest in more effective tools and more powerful vessels (race to fish), and the cost of fishing is increased. In addition to the effects described in the reference paper by J. Sutinen [AGR/FI/EG(93)3], product availability is reduced and this may be an important disadvantage, especially when demand peaks during the restricted season. If a product is not available to the consumer all year, then in the long run the consumer will prefer other fish products. If the limitation is very general (many species restricted), consumer tastes may change and even the demand for the (not always available) Greek fresh fish might decrease while demand for (mainly imported and available year round) frozen fish will increase in the future. This long-run decrease in demand reflects quantities as well as prices: prices for fresh fish could decline and would not cover fishing cost. It is an economically and socially undesirable side-effect of the policy and the authorities could avoid extreme or general restrictions of this kind.

Licence limitations were informally introduced in 1984, when the issue of new licences for trawlers and purse seiners was postponed for some time. At that time, only a limited number of licences were provided and in 1987 new licences were issued only when an old vessel of the same size was withdrawn. From 1988 on, the capacity and the engine power of the new vessel had to be of the same size. There is also financial aid for the withdrawal of old vessels.

These measures seem to be very promising since they avoid all the social problems of the initial allocation of licences. The target is to keep fleet size constant but it is difficult to limit technological improvements that will increase fleet total catchability further.

Finally, there are only a few limitations in fishing specific species, like octopus (limitations starting in 1986) and swordfish (conservation programme starting in 1987).

Data used

Two data sources are used in this study:

- the Review of Fisheries in Greece, issued yearly by the Ministry of Agriculture, General Division of Fisheries, Directorate for Fisheries and Aquaculture, 1976-1992;

- the Annual Issues of the National Statistical Service of Greece (1964-1987).

Fishing fleet

The number of coastal fishing vessels did not change a lot in the study period, although their number is not measured accurately. The number of ocean sea vessels decreased from 68 in 1976 to 31 in 1982 but then increased between 1985-88 and stabilised to 84 in 1989.

The number of Mediterranean fishing vessels has been stable, fluctuating between 809 and 865 vessels. The number of fishers was about 5 000 in the 60s, declining to 3 434 in 1987 and then recovering, reaching 4 410 in 1987. Total tonnage was almost doubled in that period, while total horse power was tripled. Thus fishing vessels increased their size and power but decreased their crew.

Catch quantity

Ocean fishery total catch fluctuated a lot in the period 1976-1992, between 7 392 and 27 570 tonnes. These fluctuations are more related to the international agreements for fishing in the local waters of other countries than to the bioeconomical characteristics of the industry. This part of the Greek fishery has to be studied together with the foreign fleet sharing the same fish stocks in order to draw conclusions about the success of international fishery policy and about the biological condition of the fishing stocks. Mediterranean fishery catch was stable before 1985 and then started to increase. Coastal fishery catch almost doubled during the study period but data are not accurate.

Analysis of results

The available data limited our analysis to a preliminary stage. Further analysis suitable to test hypothesis presented in the reference paper [AGR/FI/EG(93)3] demands survey data which are not available. The analysis here presented is a study of the available catch and effort data using techniques that are widely used in practice for several fisheries, some of them presented in M. Nuske (1982). Fishery systems are very complex and they include factors that are not observable. Thus the direct optimisation of stock size and of Maximum Sustainable Yield (MSY) for each species and fishing area is impossible and indirect methods of estimation should be applied.

In practice, it is difficult to say if the (observed) catch quantities are higher or lower than the (unobserved) MSY. Many sophisticated theoretical methods can not be used to describe fisheries in practice because data are limited and the (bioecological) system is too complex to be described by simple mathematical equations. Simpler methods sometimes give better results, although many alternative methods should be applied to confirm the results.

The typical model to describe fisheries dynamics is the catch and effort model. All variables like fishing fleet size, gear, crew, technology, time spent in the sea and other inputs are aggregated properly to create a single index, the effort index. This index may include several variables, if data are available, or a single variable (like days spent in the sea) if this is the only available information.

Effort in the Greek fishery (using only the available data) can be defined as the number of vessels. This obviously is not the best measure. Alternatives the total employment, total tonnage or total horse power. A better approach is to aggregate these variables. We calculated the variable:

f = vessels X [(average crew X average tonnage X average horse power)]

where we use all the available information for the Mediterranean fishery. Other forms of the equation (weights, etc.) may give slightly different results.

Comparing a time series of catch (quantity) and effort some basic characteristics of a fishery may be identified. If for a fishery the effort index [$f=b*(e/b)*(t/b)*(hp/b)$, where: b = number of vessels, e = employment, t = tonnage, hp = horse power] is constant (a random variable) for a long time period and catch is also constant, then this fishery is "in equilibrium" (Nuske, 1982, p. 134); where catch is directly related to effort and catch is lower from the MSY. The Greek fishery is not in equilibrium since there is a positive trend in effort, when it is defined to include tonnage and horse power.

Using the number of vessels as an effort index, the catch per unit of effort index increases for ocean and coastal fishing. For the Mediterranean fishery, the index has a positive trend if vessel number or employment is the effort variable and negative if horse power is used, while no trend is observed when using tonnage. Using the aggregated variable f as an effort index, catch per unit of effort decreases in the study period. This is an indication that overfishing exists and the resource stock may be declining.

The classical model used for describing fishery dynamics is the Schafer model takes the form of the following equation (Nuske, 1982):

$$h/E = (qK) - (q^2K/r)E$$

where h is the catch quantity, E is the effort index, q is a catchability coefficient, K the average carrying capacity of the natural environment of the resource and r is the rate of growth of a species.

A variation of the basic model is the semi-logarithmic form that is:

$$\ln(h/E) = \ln(qK) - (q/r)E$$

In both models since the number of parameters is larger than the number of variables it is possible to estimate only a simplified form of the models:

$$h/E = b_0 - b_1E$$
$$\ln(h/E) = b_0 - b_1E$$

where b_0 and b_1 are used instead of the unknowns q, K and r.

Estimation of the models using vessel number as effort index is not recommended since effort depends on many other factors. Although the vessel number remained relatively constant in the study period for both Ocean and Mediterranean fisheries, the average vessel size and power increased resulting in a significant increase of effort. In addition the ocean fishery should be studied together with other countries fishery since they refer to the same resource stock.

For the Mediterranean fishery the estimation of both models using Ordinary Least Squares, gave the following results:

$$h/E = 31521.72 - 0.000419\ E$$
$$(30.89) \qquad (-11.23)$$
$$R^2 = 0.862 \quad F = 126.2 \quad DW = 1.199$$

$$\ln(h/F) = 10.445 - 0.0000004\ E$$
$$(275.1) \qquad (-15.0)$$
$$R^2 = 0.911 \quad F = 225.8 \quad DW = 1.225$$

Numbers in parenthesis are t-statistics, always significant. R-square and F-test statistics show that the models fit the data set. Durbin Watson statistics show the existence of auto-correlation. This can be corrected using the appropriate transformations, without any significant effect in the results.

It is shown that a small increase in effort will decrease the catch per effort index significantly. The strong relation between the two variables was confirmed.

In addition to the Schaefer model, a simple Cobb-Douglas production function was estimated, using the same data set. The function is the following:

$$h = A^0Ea$$

where A^0 is a constant and a is the production elasticity.

The estimated equation is:

$$\ln(h) = \ln(A^0) + aE$$

The estimation results using Ordinary Least Squares are:

$$\ln(h) = 2.876 + 0.464\ E$$
$$(6.58) \quad (17.99)$$
$$R^2 = 0.936 \quad F = 323.5 \quad DW = 1.451$$

R^2 and F statistics show the statistical significance of the equation while the DW does not show any auto-correlation problems.

The elasticity of production is significant and lower than 1. This is an indication that production level is in Stage II, that is an economically efficient level.

Remarks

Financial limitations and insufficient data limited the Greek report. It is urgent to find financial aid in order to extend this report.

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IRELAND

Management of fisheries

With annual quotas imposed on all the principal species the objective of fisheries management is to regulate and maximise the catching, sale and processing of fish within the limits set.

Each December, on the basis of probable quota allocations, the Department of the Marine, in consultation with the industry decides on management regimes for the following twelve months.

The majority of quota fisheries are controlled by means of separate Ministerial orders which restrict the fisheries as necessary, by the imposition of open and closed seasons. Practical implementation of management regimes falls to this Department's Sea Fisheries Officers on land, and the Naval Service at sea.

The term "pressure stock" is applied to certain, high demand species. Such species are subject to additional exigencies controlling times, areas and weekly or monthly amounts fished. An added stipulation requires early notification of intention to fish. At present the pressure stocks may be classed as follows:

Pelagic

- Western Stock Mackerel - In ICES Divisions IV, Vb, VI, VII
- North West Herring - In ICES Divisions VIa(N), VIa(S)/VIIbc
- Celtic Sea Herring - In ICES Divisions VIIfghjk

In addition to requiring sea fishing boat licenses, participants in the above fisheries must hold current pressure stock licenses. In consultation with the industry, an agreed amount is fished during Spring and Autumn fisheries after which they are closed by Ministerial order.

The quota allocations are further broken down into weekly boat quotas which, in the case of (1) and (2) above are decided upon in conjunction with the local, Industry led, management committees. Negotiations are afoot to introduce a global management committee for all herring fisheries. On occasion the administrative penalty of retention of license for a period following a breach of its conditions is imposed.

Demersal

Hake and Monkfish: In ICES Divisions Vb, VI, VII. Hake and monkish are valuable whitefish species requiring strict monitoring. The Department regulates monthly boat quotas by Ministerial Order which are designed to eke out the quotas for a full year and give a viable economic return to the fishers.

Sole and Plaice: In ICES Divisions VIIa, VIIfg, VIIbc. Sole and plaice are regulated by Ministerial Order and, dude to small quotas, generally operate on a by-catch basis for the entire year. This system of management is designed to maximise the economic benefit of the fishery.

By-catch Provisions: Generally, upon closure of a fishery a by-catch entitlement of 5 per cent or 10 per cent is allowed to vessels.

Copies of mackerel and herring pressure stock licenses and a copy of a Ministerial order will be available on request in the meeting room.

Issues for consideration

The main issue which might be considered by the Group is the perennial problem of achieving maximum sustainable economic benefits from fishing while ensuring that, in the process, resources are not irreparably depleted.

As the enforcement of agreed management regimes is central to effective conservation your attention is drawn to the recent Control Regulation agreed by the Member States on the European Community. In this context the study might also consider the recently agreed proposal to establish a pilot satellite monitoring program to assess the various methods of satellite monitoring and benefits which such a system would yield if introduced on a wider basis.

ITALY

PART I: THE SETTING

Historical overview

The design and implementation of a complete management scheme for the fishing sector in Italy is relatively recent and goes back to 1982. The reason for the delay could be found in the relative marginality of the fishing industry either in terms of GNP and also in social terms, considering the low geographic concentration of employment. The absence of a widespread environmental feeling also contributed to the delay in introducing a sound public policy for the management of the fishing industry. Indeed, before 1982 the usual biological tools for stocks recovery (mesh size, fish minimum size, closed areas and the like) were in use, but as in many other countries, this approach was unable to avoid the occurrence of the traditional resource overexploitation. As a matter of fact, the constant increase in wholesale price induced the constant increase of the fleet size, even if biological parameters were already deteriorating. Financial incentives and subsidies for the building of new fishing vessels (mainly trawlers) were largely dispensed for many years (and in some cases, as they are now). It is worth noting that before 1982 there was no administrative restriction limiting access to the resources. Finally, due to the greater ecological sensibility and to the state of the resources a new law was introduced in 1982, which put an end to, what was called at that time, fishers self management, meaning that no real management was undertaken by the public authority and exploitation decisions where left to individual fishers.

Before introducing the elements of the existing management regime, it is relevant to show the basic characteristics of the Italian fishing industry, in particular those which make the Italian fishing industry, which is an important share of the whole Mediterranean industry, different from other countries.

The structure:

- Fishing areas are scattered over the 8 000 km of coast and production is landed in a large number of sites. In particular, there are more than 800 landing sites, and no region can be considered as dependent on fisheries.

- 77% of the fleet (13 000 fishing vessels) belong to the 0-10 GRT class and only 7% of the fleet is over 50 GRT.

- 80% of the landings is caught within 6 miles from the coast.

- Vessels' owners income is generated almost exclusively by their work on board. This is the target of their activity, more than profit maximisation.

- The fishery is multi-species and multi-gear. The most important gears are 5, while all the others are included in an "other system" category. They are: bottom trawler, pelagic trawler, purse seiner, small scale gears (longline, gill nets, traps and the like), dredges, multiple gears. Apart from dredge, which is used for the catch of shells (clams in particular), each gear compete with all remaining for the catch of' the 140 and more existing commercial species, of which only 44 are statistically recorded at the moment (+3 statistical groups including fin fish, crustaceans and molluscs not elsewhere included).

- Concentration of landings of very low species shows a ratio species landed/total landings of less than 1%, while for 11 species the ratio is between 1 and 2%. The highest concentration in species landed is shown by sardines ca. 10%, and squid ca 8%, depending on the season, all the others falling in the range 2-6%.

- Apart from small pelagic species and some specific fishery (sardines juveniles, shrimps, swordfish, tuna, clams) fishers cannot target species they intend to catch, given the multi-specificity of the fisheries. In other words, this means that fishers cannot sell their quota, when this should be introduced and then switch to other stocks. The latter, together with point 4, makes difficult the design and implementation of an ITQ system in Mediterranean fisheries.

Other biological characteristics of the existing stocks should also be considered when completing the overview of the fishing industry structure and finding reasons for the introduction of the whole set of management tools. In particular, species interaction and recruitment age play an important role in designing management schemes in the Mediterranean fisheries as elsewhere even if, given their specific characteristics, their role appears to be more significant in the former case because of the important fluctuations in abundance determined by strong interdependencies of species having a short life span. In fact, recruitment age is very low and, for most species, varies in the range between 1 and 2 years. In other words this means that recruitment, which is a natural occurrence not influenced by human behaviour, is an important variable in defining the dimension of stocks. Moreover, the success of recruitment heavily relies on the interaction among a large number of species whose biomass is therefore highly fluctuating and this aspect also makes volatile predictions of stock biomass.

Much more than in many other cases, stock abundance is rather problematic to assess for Mediterranean fisheries and the impact of fishing effort on biomass can be rather difficult to estimate, in particular, when considering the influence of other causes of stock variability.

It is probably unavoidable for the Italian public authority, given the structure of the national fishing industry, to draw a management scheme based on the control of fishing effort through a generalised licensing scheme, and at the same time, maintaining those measures supposedly able to influence a successful stock recruitment. In particular, temporary decommissioning schemes in post spawning periods of most relevant species were chosen as an important measure of the scheme.

The previous considerations brought to the introduction of the actual conservationist policy based on a generalised licensing scheme when the Law 41/82 was enforced. But, this is only a part of the regime introduced after 1982. Perhaps, even more important, it is the setting of a conservation and management policy within a unique triennial plan which calls for the rationalisation and development of the whole fishing industry, where not only short and medium term targets, but also long term consideration are included. In particular, biological, technical, economic, social, commercial and financial features are all elements of a unique planning exercise, useful for the reaching of the objectives set by the public authority. In particular, given that the plan is the outcome of a consensus bargaining process among the various participant to the industry (fishers organisation, aquaculture associations, processing and frozen fish product industry, fishers trade unions, research representatives) the simultaneous utilisation of these elements within the process secure a greater flexibility to the drawing of the plan and to the allocation of public financial resources.

It is also important to stress the democratic and inexpensive approach of the decision making process introduced by the Law 41/82. As matter of fact, all categories above mentioned are represented in national Committees, which are responsible for all aspects of the industry: management, financing, scientific and technical research. At the same time, synergies are completely exploited given the contributions brought to the process by various participant. In particular it is the research side which is widely used as a source of information. Indeed, as required by the Law, the national public authority contributes to the drawing of a wide set of research (biological, economic, statistical, technical, aquaculture and mariculture, ecological, legal aspects are covered) useful for the implementation of a sound fishery management policy.

The role of the EU management policy should also to be quoted here, since a large number of measures and tools adopted within the national plan are also included in the recent EU policy documents. In the early 80s, while the national plans were experimenting with new and different approaches to the management of the industry, the EU was still involved with the more traditional resource management and two different policy documents, national and community planning programmes, often contrasting each other, were in place. Today, after a long adjustment process, the two approaches are quite similar, even if a different weight to specific actions can be found. In particular, it is the lack of a uniform and homogenous approach to the industry management from the EU side which makes the difference. Conservationist measures are not always linked to the structural measures and the two are not perceived as a unique planning exercise. Considering the different time horizons and the impact the former measures have on the socio-economics of the industry, it appears evident that there exists the need for a more stringent link among the two policy elements, and this is, on the other hand, the key features of the national planning exercise. It must be admitted that after the adoption of the Report 91, synergies between structure and conservation policy have been developed and structural measures are perceived as a means to support conservation targets. This goal has been achieved by implementing measures directed to supporting fleet reduction or vessel redeployment as a means to reducing fishing effort.

The present situation

At the moment, two different legal devices are in place: the EU rules and the national laws. As mentioned above, they are rather complementary, even if the two approaches show differences which call for the utilisation of different measures or for attaching a different weight to identical measures. In particular, it is the macro economic setting of the industry which makes the difference and requires a wider approach to the management of the industry.

As a matter of fact, total employment in the industry amounts to more than 70 000, of which about 45 000 are directly involved in resource exploitation, about 8 000 in processing and frozen industry, 6 000 in aquaculture farms, more than 12 000 in fish trade and marketing. Among the most relevant figures, which have a direct impact in the drawing of the fishing industry policy, there is the total turnover of the sector which amounts to more than 5 billion US$, of which 2 billion US$ are the value of landings and the same amount is the value of imports. 1 billion US$ are the value of the processing industry. Fish proteins self sufficiency is decreasing at a high rate given the steady increase in domestic consumption. In 1988, the self sufficiency level was around 51%, in 1991 the same level reached 45%. Per capita consumption has increased from 14 kg in the early 80s to 22 kg in 1991, where total consumption of fish products was 1.2 million tonnes. Even if the amount of imports is relatively high, the Italian fisheries policy is concerned more with its unit value. Internal product compared to imports, shows large differences in quality and production costs. In particular, it is the impact on fishers incomes and profits which matters, since they are decreasing in real terms and there is a risk of a widespread social pressure in the near future. According to the national plan, reduction in fishing effort is one of the many answers to the problem here discussed. A variety of measures are necessary and they are interdependent with the number of goals which the planning document considers:

- Modernisation and rationalisation of the catching sector through the utilisation of the fleet adjustment policy, decommissioning schemes and joint ventures. Temporary withdrawal plays an important role in the action of decreasing fishing effort and increasing the size of stocks. At the same time, given that a large part of the fleet is older than 15 years, it is important to allow old vessels to modernise. This policy segment is intimately linked with the licence management which will be dealt with later.

- Increase in the self-sufficiency level. This goal, it is believed, can be achieved through a more intensive and productive utilisation of coastal areas and the assignment of property rights to fishers cooperatives. The plan provides large financial resources, such as: the improvement of mariculture and aquaculture fish farming; more intensive lagoon utilisation and sea ranching experiments.

- Reduction of unemployment.

- Upgrading of internal production through different promotion techniques and market actions, direct participation of fishers cooperatives and organisation to the international trade and to credit management schemes are among those measures related to points 2 and 3 above which play an important role in the whole industry management process and which have been successfully introduced during the consensus-building bargaining process. It is believed that part of the unemployment generated by the recent EU Rules will find alternative job opportunities within these new initiatives.

PART II: MANAGEMENT SYSTEMS AND EXPERIENCE

Policy instruments

As for the resource management aspects, which are difficult to separate from the planning exercise adopted by the Italian authorities, it was previously anticipated that a generalised licensing scheme was introduced in 1982. This means that all vessels, fishing by means of all possible gears are required to possess a licence, which is centrally managed by the Direction of Fisheries of the Ministry of Agriculture Resource, Food and Forestry. In addition to the licensing scheme, single management measures are introduced and, if not specifically mentioned, apply to the whole fishing fleet.

Moreover, in case of specific fisheries such as clam, swordfish, tuna, sardine juveniles, some measures are added to those having a more general character. In most cases, input limits are usually introduced, net length for driftnets fishing swordfish, vessels' dimensions and power for sardine juveniles, but sometimes input and output limits are introduced and this is the case of the clam fishery, which will be dealt with later. Particular attention has also been attached in recent years to fishing effort reduction through the limitation of fishing time and this measure is believed to play a relevant role in the recovering of some stocks.

In what follows a brief analysis of each of the management tools introduced in the Italian fisheries will be reported.

Selective gears and fish size

Minimum mesh size

A 40 mm. minimum mesh size rule for bottom trawling has been in force from the beginning of the 80s, while a 5 mm. limit at the bottom of the net has been set in the case of the sardine juveniles fishing. In case of purse seine nets, the mesh size is limited to 14 mm. and a 20 mm. mesh size is valid in case of gill nets. No other gears are required to regulate its mesh.

Minimum fish size

In case of fish size, a specific national legislation has been in place from 1963 and a minimum size has been attached to each single species. Recently, the EU, in an attempt to transfer some of the northern seas Conservationist Rules to the Mediterranean, approved Rule 1626/94 which establishes technical limits and a new set of fish sizes, which unfortunately are lower that those being fished by the allowed mesh size. This measure gave rise to a period of social unrest and an agreement was found in order to limit its application.

Selective gears

Measures based on selective gears are largely used for the management of Italian resources and also the above-mentioned EU Rule establishes a set of technical measures restricting the use of different gears.

Restrictions apply to the following gears:

- Dredges used for catching clams and other molluscs. In particular, dredge cannot have a mouth larger than 4 meters.
- Drift nets used for swordfish. The net cannot be longer than 2 500 meters plus other minor limits.
- Purse seiners. The net cannot be longer than 800 mt. and wider than 120 mt. These limits do not apply to large tuna purse seiners.
- Fixed gears (gill nets and the like). The net cannot be wider than 4 mt and longer than 5 000 mt.
- Longliners. No more than 7 000 mt can be used in case of deep sea longliners, while the limit is set at 60 km for surface longliners.

As for the biological outcomes, emerging from the application of the previous selective gears limits, it is difficult to assess what is the real impact. The difficulty is due to the quality of these measures which tend to limit the fishing impact, more than to recover stocks. As a matter of fact, many other contextual measures are set and a direct link among measures and state of the stock are difficult to assess. Anyway, as for species caught by trawlers (60% of the national landings), stocks are improving in the most productive areas, while they are declining in the less productive areas. We will see that the reasons for the improvement can better be found using other measures.

Drift nets for swordfish. In this case, the limit is difficult to enforce given that fishing is simply not profitable. It is also true that the limit was set because of environmental pressure (dolphin by catch), more than caused by stock overexploitation.

In case of purse seiners, fixed gears and longliner limits are not considered as an effective measure in order to limit fishing effort and the impact is negligible.

Limits on mesh size used by trawlers (40 mm) and purse seiners are generally considered as a good approach to reduce the impact on stocks. These measures have been enforced for a long time now and the best it can be reported here is that fishers consider them as a good tool for enforcement.

Limits on fish size have been set, but compliance from fishers is difficult to achieve for a number of reasons. In particular, when the catch is made of many species at the same time and they are taken on board when they are already dead, it is useless to throw them away, given that in most cases there is a market. It is also true that fishers have no control on the size. Therefore, unless the use of a wider mesh size, which would provide a solution to part of the problem, there is no answer on how to cope with the problem. In any case, the impact on stocks is negligible.

As for the economic outcomes emerging from the introduction of the latter limits, also considering the structural rigidity of the Italian artisanal fisheries. It is only possible to say that in most cases there is a generalised increase of harvesting costs associated with fishing. In case of size limits there is an increase in discards, if the rule should be enforced, while in case of swordfish net length limit, it is an overall impact of the limit which, for technical reasons, would reduce the catch and make the activity non-profitable.

As for the social and administrative outcomes, it must be admitted that the enforcement costs are extremely high when considering the control of the restrictions mentioned above. This is due to the dimension of vessels and to their number which is widespread over 8 000 km of coast. Moreover, it must also be admitted that fishers are not always satisfied with the measures being introduced. In particular, those which involve a higher discard not dependent on a productive choice, are heavily contested by fishers. In these cases, measures are believed to be ineffective, compliance is difficult to enforce and fraud is likely to occur. The role of environmentalist protest must also be considered which, in cases of drift nets and trawlers, are likely to create a situation of social pressure on fishers.

Experience with effort limits

Effort limitation is achieved in Italy through 4 different means; all undertaken within the generalised licensing scheme:

- vessels decommissioning;
- vessels temporary decommissioning (closed season for trawlers and dredges);
- vessels redeployment (permanent or temporary joint ventures with non EU partners);
- introduction of effort limits.

In this section, the fourth issue will be dealt with. Effort limits have been introduced in Italy in the clam fishery only.

The case of clam fishery

The clam fishery is also subject to the licensing schedule, but in addition, input and output limitations have been introduced to reduce the level of overexploitation caused by 808 small vessels (not more than 10 GRT), fishing along 2 000 km of coastline. Management of clam resources has been a continuous experiment given that a wide number of measures were introduced in the fishery. The strategy was based on input and output limits which were introduced step by step, and discussed in this section; also days at sea limits were introduced.

The complete set of limits include:

- limitation on fishing days and hours;
- limitations on the size and power of the vessel;
- limitations in the area covered by each vessel;
- limitations on the daily catch quota;
- limitations on the dimension of clams landed;
- limitations on the landing sites (landings must be controlled when disembarked);
- limitations on licence transferability;
- season closure (1 and then 2 months each year).

The limits on days at sea and fishing hours have been introduced in order to limit overexploitation of the amount of clams taken on board per unit of time, the amount depending on which area is considered.

As for the biological outcomes of these measures, it must be admitted that something went wrong if the number of licensed vessels increased in 1992 after a six year stop in the issuing of new licences and, at the same time, the stock in some areas reduced profitability to negative levels. As a matter of fact, while the above mentioned measures were introduced continuously being introduced, a break in the issue of new licences happened in 1992 when 78 licences were issued and the total amounted to 886. At the end of 1994, a new plan was drawn and a number of licences (184) should be retired by the end of 1995 after a new decree will be approved by the Parliament.

It is important to add that the decrease in landings, which correspond to the clam stock depletion has been progressive through the years. The days at sea were unlimited in the beginning, then were reduced to 5 days a week, and after to 4 days a week. Also, fishing time was progressively reduced and today fishing is allowed for no more than 8 hours a day. Only recently, after the fishers themselves set the limits, stocks are recovering.

Given the entire set of limits introduced, it could be that either fraud was set at an unbelievable level, or that biological advice was optimistic as to the catches fishers were allowed to land.

The economic implications and outcomes are rather interesting, given that in the early years a rent of unforeseeable dimension was generated which accrued to existing licence holders. The rent and the high prices of clams worked against the management targets at the beginning, but also later on, when demand by consumers and canneries was still high, there was still strong pressure on prices putting pressure on the resource and the rent maintained its value even though a deep crisis was encountered. Of course, over-capitalisation has been a problem, which has been tackled by progressively introducing restriction and inefficiencies in the fishery. From this point of view, the role of social and political implications must be considered which were strong enough to create conditions for securing good income to fishers.

Finally, from a social point of view, the strategy's failure brought to a situation of social unrest which required the drawing of a new plan specifically designed to reduce the number of vessels and the number of licences, both bought by the Ministry through a "clam buy out budget". Considering that enforcement of the rules was that fishing was controlled in each part of its activity, there is a feeling that during the years fishers were allowed to fish more than needed.

Experiences with other vessel & gear restrictions

Following the technical limits already mentioned in section A in this section, we refer to limits set on vessel dimension. These measures were introduced in the clam fishery and in the case of sardine juveniles fishery. In both cases, a 10 GRT limit was imposed on vessels and can be considered as a part of a wider strategy. Other measures were associated with this one as their function was only conservative and no role was attached to them in terms of stocks recovering.

The implications of clams have already been discussed. In the case of sardine juveniles, results seem to be rather positive. Landings and prices follow the expected trends and no new entry is allowed. It is also true that this type of fishery is active in very few places and where this happens a strong importance is attached by fishers. An excellent economic profitability of each vessel is attained in a very short period. This is a seasonal fishery which is allowed for two months only. Some difficulties were encountered when the limits were first introduced and not all fishers were used to them. Given the strong artisanality of this fishery, it was difficult to get compliance at the beginning. After the first couple of years, the approach was understood and compliance rather high.

Experiences with time and area restrictions

Time restriction is a traditional management tool in the Italian fisheries. Year by year, a temporary closure is established for bottom and pelagic trawlers and for dredges. The duration of the period is variable from one year to another depending on the financial resource available to pay for it. The first years a 45 day continuous period of time was adopted, while in more recent years, only a 30 day period was approved. The closure calendar is chosen from year to year and is related to the spawning season. It is true that a choice must be made as to the species whose spawning period will be considered for closure, given the strong multi-specificity of the Mediterranean fisheries. In fact, the closure will affect some species more than others and the final choice is never perfect. The closure covers the whole country, but is subdivided in two or three periods of time. Usually the Adriatic sea stops fishing from mid-July to mid-August, lower Adriatic and Ionian stop from mid-August to mid-September. Tyrrhenian sea stops mid-September to mid-October. Moreover, the closure is compulsory for the eastern fishing grounds, while it is facultative in the western grounds. With exception, facultative closure is effectively followed by fishers. This measure secures a premium per day/per vessel and its amount is the same as the one established by EU Rules. In the clam fishery, a second month closure is compulsory, but no financial subsidy is provided.

The effectiveness of this measure is increasing year after year and is due to the specific features of the Mediterranean resources. In fact, considering the recruitment age of resources which is between 2 and 3 for almost all recorded species and is widely accepted that the sustainable curve is rather flat, it follows that a low elasticity coefficient of resources against effort is possible. In other words, this would mean that reductions in effort do not necessarily bring a parallel increase in the stock size in the short and medium period. When this happens, it is possible that it is recruitment that matters and therefore temporary closures in the spawning period could be more effective than the reduction in effort which, in any case, is performed through other means.

The biological outcome of this measure was rather positive in the more productive areas (eastern fishing grounds, which are known to be richer and with a large continental shelf), while rather inefficient in the less productive area (western fishing grounds and short continental shelf). In eastern ground fisheries, some species began to be exported and this was a complete novelty in the Italian import oriented structure.

The economic outcome is rather interesting to analyse. In fact, the increase in production registered in eastern grounds determined a generalised fall in prices, given that the area is more productive than the rest of Italy. The "overproduction" of this area has shown to have negative effects on the western industry, given the market competition which characterise the entire industry. The western grounds have higher unit production costs, either because of the deeper depth they are compelled to fish and because of the poorer landings determined by the low productivity of that sea. As a whole, the two areas cannot compete and, as a final result of the measure, it is clear that those who were already in good condition today are better off, while those who were in less productive areas are worse off compared with the first group. Given the generalised closure of the most productive gears, no over-capitalisation is experienced with the measure. There is, instead, a race to fish after the closure which has been limited by reducing activity to 3 fishing days for a 60-day period after the closure is over.

An indirect effect of the closure period can be found in the strong increase imports show in the period. Considering that the eastern coast provides about 50%, of the entire Italian catch, demand is largely fulfilled by imports. In particular, French, Spanish and other EU countries increase their market share, while prices show an upward trend.

The social outcome is also interesting because of the strong interest fishers show in favour of the temporary closures. They see it as an important biological tool to recover the stocks, but also as a period which can be used to finally stay at home.

From the administrative point of view, temporary closure plays an important consensus role and is also easy to enforce, given the fishers high compliance and considering the biological outcomes.

Experience with limited entry

The generalised licensing scheme

As previously stated, before 1982, fisheries management was limited to a generalised conservation policy whose responsibility was, of course, attached to biological advice. Fishing was possible without a licence, and an administrative permit, only obtainable on demand, was required. After 1982, a new law was approved and the fishing industry as a whole was considered as an unicum to be managed through a planning document drawn each three years.

Considering the main features of the Italian fishing industry, it was decided that a generalised licensing scheme was the most suitable tool for managing the industry and the resource. In fact, given the multi-specificity and multigear features of the industry, in particular considering that fishers cannot choose the species targets or, once a certain amount of a single or a small bundle of species have been caught, cannot switch to other species as it happens in other areas, the choice was to use licences as the most important tool to be used to regulate effort. Of course, the basic idea was to use licence as the main tool, while other collateral measures, either based on input or output control, can be introduced whenever necessary.

Licences are issued by the Ministry following the directives explicitly set in the triennial plan, which also considers the targets set in the EU MAGP Programme. It is worth noting that while the EU programme has global targets, only broken down by gears, the national plan allows for much more detailed decisions and the management goals also consider vessels' dimensions and fishing areas. Through the redistribution of fishing effort, the plan is drawn up taking into consideration the biological, technical and economic efficiency of gears in a given area to influence the structure of the catching sector. In other words, the plan identifies fishing areas where fishing effort exerted by a particular gear can be decreased or converted, in case of decreasing economic yields caused by resource overexploitation. However, for the last six years, with only a few exceptions, no new licence has been issued. Given the stop imposed by the administration, the EU targets have easily been reached and now there is a certain amount of GRTs which can be reintroduced in the fishery. This amount, while maintaining the ban on pelagic and bottom trawlers and dredges, will be distributed among the ocean going segment and other gears whose impact on resources is lower. In particular, some new licences will be secured to small scale gears, to those who need to reconvert their activity after a drift net moratorium plan will be approved. This gives an example on how the scheme is currently being utilised.

Among other things, the system gives the possibility:

- To redistribute licences which have been withdrawn or given back to the public administration according to the most efficient utilisation of biological, economic and public financial resources. Redistribution can take place considering different fishing areas, gears and vessel's dimension.

- New licences can be issued within the EU MAGPs fleet segments if specific targets have been previously achieved, unless fishing overcapacity has been identified in a given area, in such a case, priority is automatically given to permanent decommissioning.

- Licences can be reissued when old licences attached to vessels of identical or larger tonnage and power have been withdrawn. The permanent decommissioning of a higher percentage of tonnage and power is required in case of trawlers and dredges, i.e. in case of licences falling within those segments of the fleet where overcapacity has been assessed. The percentage is set within the measures foreseen in each plan.

- Licences can be reissued in case more smaller vessels are decommissioned aiming at the building of a new one whose dimension is not larger than the sum of those withdrawn.

- In particular cases where the level of exploitation is still acceptable, new licences can be issued against the withdrawal of 50% of tonnage and power only.

It is of some interest to know that in the first years of operation of the licensing scheme, a unique national target for fishing effort was chosen. After a few years of operation, it is possible to adopt more detailed targets based on fishing areas, gears and vessels dimension.

At the moment, the licensing scheme is used to limit fishing effort by controlling inputs, but shows to be helpful when deciding:

- When specific management intervention should take place to prevent resource overexploitation which limits the economic yields of the vessels;

- Which is the local fishing segment of the fleet which requires a specific management intervention, when operating in technical and economic non-efficiency.

This can be done through the utilisation of fishing effort cost structure and price level information:

- Where are the fishing areas which allow an increase in investment or a possible reconversion of the fleet in order to balance the reduction needed in other fishing areas.

This is done by following the life of the fleet over time through a sample of vessels considering gears, areas and dimensions. It is thus possible to monitor the state of the resources reflected by the variations in economic yields expressed in parameters as, for instance, the production per unit of effort (PPUE) which implicitly consider costs, prices and amount of landings. This approach allows the introduction of specific measures to be adopted by the public authority in given restricted areas. Case enforcement costs are much lower than a generalised action which, among other things, would affect all fleet segments, either efficient or inefficient.

The biological outcome of the scheme, which must be considered in association with the contextual undertaking of other measures, is difficult to assess given the indirect link with specific resources. Where this link exists, tuna fishery, swordfish, clam, sardine juveniles, shrimp, and assessment can be tried even if the limit of this approach is that there is no chance to test short term answers to stocks recovering. Biological interdependencies, gears interaction, impact of recruitment ages on the level of different stocks and the like do not allow to single out impacts on a species by species basis.

In general, the level of landings by species, and bio-economic parameters can therefore be used as an indirect measure of the success of the scheme. In particular, it is the use of bio-economic models, through the association of effort exerted by each gear on each different species, which allows the assessment of the state of the fishery. From this point of view, and also considering adequate information on landings, it is possible to say that stocks have not been depleting since the scheme has been enforced. Moreover, considering the strong increase in the landings caught in the eastern basin, one can conclude that stocks have been recovering in recent years. As for those stocks which have a more direct link with effort, being mono-specific fisheries, it turns out that for tuna, shrimp, sardine juveniles, swordfish state of the resource does not show any overexploitation signal. Once again, it is the clam fishery which, in some areas, shows dramatic biological problems.

The economic outcomes emerging from the enforcement of the scheme are rather positive. Effective effort has been decreasing over time, while the level of the landings has been stable in recent years. Total GRT has decreased from 273 695 in 1988 to 267 471 in 1992 and will be less than 249 000 by the end of 1996, considering an increase in the medium size ocean going fleet which will reduce pressure on Mediterranean stocks. The previous over-capitalisation trend has been inverted and now a more equilibrated ratio effort/resource is in place.

An indirect effect of the scheme is that fishers have perceived income stabilisation, i.e. that income has stablised over time and therefore there is no need to race for fish and to have a more powerful engine on board than actually needed. It followed a more rational approach when vessels had to be replaced and no extra power is now used on board.

Another important impact on the industry has been emerging during the last few years, but has nothing to do with internal resources. In fact, the strong positive trend in consumption has been satisfied by increasing imports, whose price is generally lower than the fresh fish which is usually consumed in Italy. Given this circumstance, competition between imports and fresh produce began. Import prices have increased while internal prices decreased (depending on the larger catches in the eastern basins). While in the latter areas the decrease in price was offset by larger catches, this has not been the case of western basins and a net loss in incomes has been experienced in recent years.

From the social point of view, the scheme was negatively perceived when it began. It is also true that the licensing process took a few years before it was completed and fishers felt the new scheme as a cumbersome and useless administrative tool. Only later, when the whole process was fully understood and the benefits started to accrue to fishers they took it as a part of the modernisation process. Today, fishers fully comply with the scheme and participate more actively in the rationalisation and development strategy undertaken by the government.

Administration has also benefited from the introduction of the scheme, meaning that through its enforcement, it has been possible maintain better control of the industry which began to be increasingly involved and participate in the decision-making process. In this way, other measures, which were previously difficult to enforce, have been accepted by the industry. An important reason underlying the achievement of these results is that the national triennial plan is a document which calls for a continuous change in the industry structure where consensus and participation is a prerequisite. In this regard, the entire process can be considered as a co-management system for what the national decision-making process is considered.

Individual quotas

As already stated, when illustrating the clam fishery, one of the measures introduced in this fishery was the restriction imposed on fishers as to the amount of clams they were allowed to fish each day (600 kg). In this respect, this amount was a total allowable catch per day whose measure was considered at that time as an important tool to be used for reducing overexploitation.

Unfortunately, this measure did not work out, given the continuous depletion of the stock. This could have happened either because fishers were cheating on landings (which is possible, but not in large dimension, given the need to disembark their produce in given places) or because biological advice was too optimistic as to the state of the stock. This measure did not bring about any economic benefit, nor did the stock recover. From the administrative point of view, it is also true that control is expensive and there is uncertainty about its efficiency.

PART III: EXPLANATION OF THE OUTCOMES

Review of outcomes

Since 1982, after a new law concerning the rationalisation and development of Italian fisheries and aquaculture was enforced, a new management regime was introduced in Italy. The new regime was, and is, based on a triennial planning document which foresees all possible measures, of any nature, which are considered as important for the enforcement of a sound management regime concerning the entire fishing industry. The drawing up of the document follows a consensus-like procedure where all categories involved in the industry participate. This feature is responsible for the high level of compliance which has been registered in recent periods. Of course, some exceptions are still possible, but in general, the new regime has attained a satisfactory level of compliance.

The previous situation was completely different, and before 1982, it was quite clear that some action had to be taken, given that until that date only a few conservationist measures existed and biological tools were prevailing in managing resources. At that time, compliance with the rules was rather low, either because the public was not aware of the importance of the sector, in social and economic terms, or because the ecological sensibility was still quite low and overexploitation problems were not perceived by a large part of the population.

With the new law in 1982, a generalised licensing scheme was introduced, whose first benefit was the creation of an Archive of Fishing Licences. A second benefit which can be considered directly derived from the scheme is the possibility to introduce other measures, each of a very different nature set within a large and detailed policy document which has been in place for a 3 year period.

The aim of the management regime was to follow a soft approach to the resource management problem in order to recover exploited stocks, but given the level of multi-specificity and multigear features, the biological characteristics of the resources show a very low recruitment age and a strong interaction among different species. It was obvious that the contextual working of these characteristics was unable to predict a high elasticity ratio effort to resources. In other words, a strong decrease in effort was not accompanied by a strong increase in stocks. According to this principle, in the short term, whatever would have been the level of effort, landings would have been affected only marginally. The idea was then to create conditions for a medium-to-long term recovery of the stocks, while considering the importance of social and economic aspects. In this respect, it was expected that even in case of large effort reduction, which was performed, the impact on resources would have been low. After a 7% reduction in GRT, the level of landings is rather stable and clearly independent from effort reduction, considering the reduction in fishing time, which amounts to 15% due to the temporary withdrawal. Independence can be observed, considering that the increase in landings are where effort reduction in terms of GRT were lower than average. It is now believed that the combination of temporary withdrawal to lessen the level of natural productivity is the key element for increasing stocks.

The rationalisation aspect of the management policy was pursued through the introduction on a step-by-step basis, of a number of technical restrictions, which were able to reduce effective effort and were able to select a specific aspect of fisheries and improve them.

As a result of the policy being applied in last 13 years, even if it has only been about 8/9 years, since it has been effectively applied considering the delay in enforcing the licensing scheme, it is possible to consider the following:

Demersal fisheries

As it has been stated, these resources can be caught by a variety of competing gears, each of which has a different economic, biological and social pattern. As would be expected, for the results showing that in the eastern fishing grounds, landings are increasing while effort is decreasing. The reasons are believed to be in the relation existing between temporary withdrawal and of the natural productivity of the area.

In the western fishing grounds, even when effort was largely reduced using the EU decommissioning scheme and the temporary withdrawal scheme, resources do not appear to have substantially benefited. The reason is believed to be found in the shorter continental shelf and in the natural productivity of these grounds which appear to be limited. In these areas, fishers are often changing from trawling to small scale fishing gears, given that the latter have reduced production costs and economic yields are higher even if personal incomes are lower.

Demersal fisheries include crustaceans as well. In this case, it is the interaction among different species which play an important role, so that the abundance of Norway lobsters is linked to the fall of Mantis and vice versa. High fluctuations are registered in cases like the previous one and one period is different from the other. In this case, as in many others, fishing effort play an indirect role in what the stock dimension will be in the next period of time, so that it is considered as an important, but general, ecological tool, whose influence on resources is not completely known.

Small scale gears are not considered as having an important impact on stocks. It is rather the social role of this fleet segment which is important, given the high employment opportunity offered by these gears. Nevertheless, it is a policy priority to increase the segment, while reducing trawling. The transfer of licences from trawling to small scale gears is an incentive, even if the value of the trawling licence is an impediment in the transfer.

Pelagic fisheries

Pelagic resources can be caught primarily by purse seiner and trawler, each of which has a very different social, economic and biological pattern. While purse seiners have been affected by the decommissioning scheme and by a few technical restrictions, pelagic trawling has been instead restricted in a number of ways. In this latter case, no licence was issued for a long time and the moratorium is still in operation. The difference being the high productivity of pelagic trawlers which have a strong impact on stocks. In the case of pelagic purse seiners, it is true that the lower vessel productivity is such that it can possibly match the natural productivity. In the former case, the link between effort and stocks is direct and restrictions have been correctly imposed.

The results have been obtained, meaning that these gears are still in operation and the value of their production is very high without considering the price effect. In the latter case, which is practiced in poorer western grounds, natural fluctuations have an important role and resources follow a stochastic pattern. Purse seiners which follow the resources and economic yields are also fluctuating.

Large pelagic fisheries

Swordfish and tuna are the main species caught in Italy which belong to this group. Each is caught by a different gear, even if longliners are becoming increasingly popular after the drift net moratorium is expected by the end of 1997.

At the moment, tuna (in particular tunnus tynnus) is caught by large purse seiners and its fluctuations are influenced by natural parameters controlling the direction of their course. In this case, no particular restrictions have taken place, while this segment of the industry, whose landings account on the average, for only 7/9 000 tonnes, is stable over time.

Swordfish are caught by means of drift net and longliner. After the restriction on the net length for drift nets (2 500 km) some fishers have already left the fishery, while others have effectively reduced the length of their net. Whatever the reason, longliners have not succeeded in balancing the decrease in swordfish landings. The final direct effect (some years later) is that abundance is increasing for both swordfish and dolphins, which were the cause of the moratorium. An indirect effect, which also must be considered, is that small scale fishers are protesting because nets are destroyed by dolphins while they are eating the catch they found in the nets.

Theory and evidence

It should be obvious by now that the structure of the Italian fishing industry does not allow for a clear cut comparison between theory and evidence. It has previously shown that the role of natural conditions is, in certain cases, overwhelming with respect to human controlled measures. This does not mean that a more traditional approach is useless or that it is worthless to implement.

The fishing effort reductions have been achieved and their level higher than expected, but the quantitative impact of each single measure on the mixed stocks is impossible to assess given the lack of a direct link between stock and effort. A possible solution to the limits set by the characteristic of the fishery can be found when comparing the variation in the level of landings with the variation in the level of activity (days at sea) and in the level of capacity (grt) by each gear in each fishing ground. The suggested criteria allows the monitoring of variations over time and can be considered a measure of success or failure of the management scheme. This has been done in Italy and various conclusions can be drawn. In particular, where the conservation measures were successful, as was the case along the Adriatic coast, a reduction in activity set by law brought an increase of capacity (which is fixed for the country) and landings followed an upward trend over the last few years. On the other hand, in less productive fishing grounds, a reduction in capacity was associated with a reduction in fishing activity, but landings showed the usual downward trend.

This is to say that simple models, when dealing with competing multi-gear and multi-species fisheries as those being dealt with here, allow an appraisal of the functioning of the scheme being applied, but if detailed answers are required, the use of more sophisticated models is needed.

In order to show the usefulness of such models, the Italian team choose to present a bio-economic model as an issue paper associated with this study. This model is intended for the evaluation of the impact of effort redistribution on a single species and fishing areas. Even though the explanatory capacity of this model is already satisfactory (average error of prediction 7%, maximum error at 27%) the model is under continuous revision in order to increase the reliability of the underlying biology and reduce the predicted error.

An example of the functioning of the bio-economic model can be anticipated here by simulating which outcomes there would be in case the EU fishing effort reduction plan would be fully achieved by 1999.

Among the main results, confirming the theory previously presented, it should be highlighted that after a 12% GRT reduction of the total GRT, which will be concentrated in the trawler segment only (in this case, it will represent 20% of the segment) there will be a decrease in the value of landings of approximately 7% (at constant prices), with a benefit in production costs set at 11%, while the biological parameter for measuring overexploitation will increase positively by 10%. The model allows estimates according to different hypothesis by year, by areas and by gear.

THE NETHERLANDS

Characteristics and historical overview of the fishing industry

General

The fisheries sector of The Netherlands, being only a small part of the national economy, is relatively prosperous. This holds for primary fisheries as well as for the processing industry and trade. Within the Common Fisheries Policy of the EU the cutter and trawler sectors are operating. Next to these sectors some inshore sectors (mussel and oyster culture, cockle fishing) are existing besides minor inland fresh water fisheries.

Sea fisheries

By far the most important sector is the cutter fishery, grossing about 65-70 per cent of total national landings value. Vessels of varying size are mostly owned by the skipper. Remuneration of the crew is by share contract. Fishing takes place in the North Sea, mostly using the double beam trawl. Target species are chiefly sole and plaice and next to it other demersal fish, herring and shrimps.

Table 1. Dutch sea fisheries 1987-1993
(converted to 1993 prices)

	1987	1988	1989	1990	1991	1992	1993
CUTTER SECTOR							
Active vessels	616	607	588	553	512	482	473
1000 HP	560	588	586	559	521	492	491
Crew	3 036	2 825	2 641	2 486	2 292	2 195	2 168
x million NLG:							
Landings value	856	744	748	764	791	669	611
Return to labour	282	205	190	235	305	237	177
x 1000 NLG:							
Return to labour per crew member	93	72	72	94	133	108	81
TRAWLER SECTOR							
Active vessels	13	13	13	13	13	13	12
1000 HP	59	68	76	80	80	81	74
Crew	378	360	312	82	426	430	423
x million NLG:							
Landings value	185	163	172	165	172	172	185

Source: LEI-DLO.

The size of fleet, crew and real gross proceeds contracted in the past six years. Within the exogenuous setting of fish stocks and prices the sector has reached a more or less well balanced relation between inputs and output. This left room for reasonable returns to labour, be it that these deteriorated in recent years.

The trawler sector accounts for 15-20 per cent of total national landings value. Large freezer stern trawlers, owned by integrated companies (including processing and trade activities), fish on pelagic species like mackerel, horse mackerel and herring. Remuneration of the crew is by labour contract, including a share basis. The trawlers fish generally West of the British Isles, on a smaller scale in the North Sea and in third countries' waters.

This sector contracted already in the seventies and early eighties. Since that time the sector's size is rather constant as also can be said of its gross landing value. No data on net income are available, but probably the sector is sailing well too.

Inshore fisheries

Of inshore fisheries the cockle fishery is the most important. However no detailed data are available. As for the fishery on mussel seed this is the first stage of mussel culture activities. Data on this sector are mentioned under the heading of shellfish farming.

Shellfish farming

Of this sector data are available of the mussel culture. Family enterprises, nearly all based in the Zeeland province, exploit mussel plots in the Wadden Sea and the Zeeland estuaries.

Table 2. Mussel culture 1987-1993 (converted to 1993 prices)

	86/87	87/88*	88/89*	89/90*	90/91*	91/92*	92/93*
Enterprises	72	74	74	75	75	73	70
Active vessels	77	79	79	82	82	82	80
1000 HP	27	29	31	35	38	39	39
Crew	235	241	242	250	251	251	243
Yield x mln kg	64	87	64	107	92	41	51
x million NLG							
Landings value	75	79	86	77	112	87	91
Return to labour	47	49	53	38	64	25	44
x 1000 NLG							
Return to labour per crew member	201	203	219	152	255	100	181

(*) estimated data.
Source: LEI-DLO.

The culture had satisfactory results. Even when landings are low higher prices kept the sector on a paying base. However there are extremely large variations in financial results of individual enterprises as physical productivity of plots may vary within a wide range from year to year.

Processing and trade

The fisheries sector as a whole is internationally oriented as a large part of landings is exported, mostly to other EU countries. Imports also are substantial, partly to serve as raw material for the processing industry, partly to satisfy consumers' demands. The country has a substantial export balance.

Table 3. Landings value, imports and exports 1987-1993
(x million NLG, converted to 1993 prices *)

	1987	1988	1989	1990	1991	1992	1993**
Landings value imports	1 166	1 033	1 047	1 100	1 105	1 011	960
Total	998	1 060	1 210	1 315	1 525	1 415	1 337
O.w. sole	101	66	102	93	112	110	60
plaice	73	87	81	123	171	156	105
cod	61	64	96	116	113	93	107
pelagics	91	110	125	144	158	169	138
shrimp	182	207	264	243	283	210	274
other	490	526	542	596	688	677	653
EXPORTS							
Total	2 160	2 081	2 288	2 538	2 616	2 460	2 331
O.w. sole	346	297	345	401	446	413	320
plaice	501	473	465	557	601	453	434
cod	97	95	80	76	75	59	78
pelagics	360	335	372	407	418	424	393
shrimp	216	230	312	318	295	311	357
other	640	651	714	779	781	800	749

(*) Data on individual species include fresh, frozen and processed products.
(**) Since intra-EU trade was liberated a change of the statistics system was made necessary; therefore trade data of 1993 are not fully comparable to those of previous years.
Source: CBS.

Table 4. Input and output of the processing and trade sector 1987-1993
(x million NLG, converted to 1993 prices)

	1987	1988	1989	1990	1991	1992
Landings	1 166	1 033	1 047	1 100	1 105	1 011
Imports	998	1 060	1 210	1 315	1 525	1 415
Total input	2 164	2 093	2 257	2 415	2 630	2 426
Gross margin	1 172	1 164	1 191	1 219	1 158	1 093
Total sales	3 336	3 257	3 446	3 634	3 788	3 519
O.w. exports	2 160	2 081	2 288	2 538	2 616	2 460
home cons.	1 176	1 176	1 160	1 096	1 172	1 059

Source: CBS; LEI-DLO.

Management systems

Sea fisheries

Policy instruments

Sea fishery is established within the framework of the Common Fisheries Policy of the European Union. The inshore fishery is a national concern and has to take into account national policies on physical planning, water and nature management.

In 1993, the Dutch government published its Policy Document on Sea and Coastal Fisheries, which embodies the Dutch fishery-policy up to the year 2003. The general objective of the Dutch fishery policy is "to promote responsible fishing efforts and a balanced durable exploitation of fish stocks". This means three things: first, fishing is promoted as an economic activity; second, the management of fishing resources is promoted in such a way that the continued viability of the fisheries sector is ensured and third, fishing effort must be harmonised with existing nature values. Until recently the Dutch government used several instruments to manage fishery activities.

Limitation of capacity

In 1985, a licensing system was introduced into the sea fishery sector (cutters as well as trawlers). Fishers could get a licence for the maximum engine capacity of their vessels. Thus a ceiling was introduced. As a transitional measure one could also obtain a licence for future engine capacity if investment commitments for building a new vessel could be proved. This transitional measure expired in 1992.

In 1987, a further reduction of engine capacity was introduced for the cutter fleet; new vessels were not allowed to have engine capacity in excess of 2 000 hp.

The Dutch government also has a voluntary decommissioning scheme. Premiums for decommissioning are paid by the Dutch government and the European Union. The Dutch fishery sector participated financially in a limited decommissioning target of 90 000 hp. This target was more than fulfilled within the period 1988-1992. More recently, applications for decommissioning fell because of the fleet reached a reasonable level of profitability.

Effort limitation

Effort limiting measures include limiting the number of days spent at sea, tuned in to fishery rights like individual quota and roundfish documents of individual vessels. This instrument has proved itself to be a very effective and flexible instrument in balancing individual effort to individual quota and national fishing effort to national quota.

Another way to limit the fishing effort was the reduction of the beam width of beam trawlers. Since 1987, the width of each of the beams may not exceed 12 meters.

Since the end of 1993, the Common Fishery Policy has recognised these effort limiting instruments.

Limitations of access

The Dutch government has divided its national quota into individual fishing rights. This conversion was based on two principles. For sole and plaice there is an individual transferable quota system. Such quota give the right to land certain quantities of sole and plaice. These individual quota can be traded or leased or be set aside for a maximum period of two years.

For cod and whiting a system of documents was chosen. Such a document would entitle the fishers to fish for these species and to land a certain quantity per trip, later on per month, depending on the volume of the national quota for cod and whiting.

This system limits the access to the fishery as the number of documents is limited. From January 1994 on this system is replaced by an individual transferable quota-system for cod and whiting.

In accordance to EU regulations fishing within the 12 mile zone was limited to vessels with an engine power not exceeding 300 hp.

To protect nursing areas also the plaice box is important. Access to coastal areas for bottom trawling is limited to smaller vessels only.

Inshore fisheries

These fisheries concerns cockles, seed mussels, oysters and shrimps. They take place in the Eastern and Western Scheldt, the Grevelingen, the Voordelta and the Wadden Sea.

Inshore fishery has to find a balance between the needs of nature (biotopes of old mussels, old cockle, and seagrass beds) and fishery and therefore integrated policies have to be developed.

The inshore fishery is also regulated by a system of licences. Fishing for shrimps, seed mussels, cockles, and oysters as well as other trawling and fixed gear fishing is regulated by licences. Conditions for these licences have been tightened over the past years.

Shellfish farming

The shellfish farming industry is also subject to licensing with the government renting out shellfish beds. In general the policy of limited access to shellfish farming will be continued. New shellfish beds will be allocated through public subscriptions for which present and prospective tenants can sign up.

Cultures in the water column are allowed within strict limitations. A restrictive policy will be adopted for the introduction of new species of shellfish to avoid ecological risks.

The institutional set-up

The Ministry of Agriculture, Nature Management and Fisheries (MLNV) is responsible for the national policy on fisheries, which is embedded in the Policy Document on Sea and Coastal Fisheries.

Enforcement and control of national and EU legislation in fisheries is executed by a special inspection department of MLNV.

The fishery sector is represented by the Commodity Board for Fish and Fish products (PVV) which is principal partner of the MNLV in implementing the policy. Furthermore, as a public body, it can also regulate some aspects of the fishery itself.

Fishers also have their own organisations to represent them, and Producers' Organisations exist as well.

The country has five fishery training institutes for secondary vocational education. Two universities and several institutes of higher education also teach fisheries and fish farming. The universities, the Government Institute for Fishery Research (RIVO-DLO) and the Fishery division of the Agricultural Economics Research Institute (LEI-DLO) carry out research. There is national and international cooperation in fishery research.

Experience

Sea fisheries

Specific Fishery Management Problems and Dutch Responses. The policy concerning sea fishery is mainly established within the EU framework. So far the aim of the Common Fisheries (CFP) was to achieve a sustainable fishery in socio-economic terms. TACs are set at stable levels over the years to ensure stable markets and a stable fishery. This may lead to a situation where fishers find that stocks are still abundant while at the same time they are not allowed to catch and land them. This gives rise to problems: fishers may not wish to support the fishery policy any longer. The government therefore has to increase the enforcement and control of the fishery sector. It has done so in several ways, described above.

The cutter sector

In 1993, the Dutch government adopted a new management approach for the cutter sector. In this approach the government remains responsible for the management of the national quota but the fishery sector itself is responsible for the management of its individual quota. To that end, fishers have been stimulated to organise themselves in groups, associated to POs. Fishers form associations with their own rules and regulations. In these groups the fishers pool their individual quota and sea days which allows them more flexibility in their fishing activities. The government tries to find positive incentives (e.g. extra days at sea) to stimulate the formation of groups.

The groups manage their collective resources by drawing up a fishing plan and by selling their fish through auctions. They also have a penalty-system for those who break the rules. Each group has its own managing board, which is responsible for the implementation of the rules. The rules among the 8 individual groups are harmonised in order to avoid disorder. The PVV, being the representative of the whole sector has an important role in this new approach.

The size of the fleet indeed has diminished (see Table 1). As to the fulfilment of quota one can look at the bulk of its catches: demersal species. As accurate data per species are not available the sector's gross proceeds out of them can be compared to the potential one (sum of national quota per species multiplied by average yearly prices). The result of this comparison is shown in Table 5.

Table 5. Potential and real gross proceeds of demersal species under EU quota regime

Year	Million NLG		Real as a percentage of potential (in %)
	Potential	Real	
1985	594	622	105
1986	581	588	101
1987	470	563	120
1988	469	503	107
1989	487	493	101
1990	578	528	91
1991	707	575	81
1992	628	495	79
1993*	614	459	75

(*) provisional.

It seems clear that (apart from 1987, in which year Dutch demersal quota were somehow lowered by 21% on average) as a whole the sector is fishing more and more to the quota and seemingly even under those. This situation obviously calls for a more flexible approach of fisheries management. The focus should now be shifted from capacity measures to effort control and multi-annual and multi-species quota.

Inshore fisheries

As in the sea fishery, the Dutch government has responded in a new approach to fish stock management. The starting point is to achieve a balance between fishing activities and nature values in coastal waters. A step by step approach is adopted here. In 1993 a quarter of the sand flats not covered by seawater at low tide in the Waddensea and one seventh of the Eastern Scheldt were closed for fishing.

The number of cockle fishing licenses and the cockle fleet has diminished sharply recently. No data are available on their production and financial results. As for mussel seed fishing the activities are a part of mussel farming described below.

Shellfish farming

The size of the mussel culture sector stayed rather constant (see Table 2). However, its production showed wide variations, which in a financial sense were compensated for by price flexibility effects. At the other side renewal programme of the mussel fleet caused a rise in costs.

Analysis

Cutter sector

The policy instruments so far seem to have the effect that fishing effort and landings are getting into agreement with national quota. Also it can be said that the reduction of the size of the fleet has led to a favourable economic situation of this fleet. It is not clear yet to which extent the instruments used have contributed to these results. However one has the impression that capacity and effort limitation measures had the biggest impact.

Furthermore it is too early to ascertain pros and contras of the newly introduced system of co-management.

New approach to fish stock management

First of all, policy goals need to be well defined. In this respect, the Netherlands advocate a biological fish stock management, which means that the biological preservation of species should have the highest priority. For stocks of various year classes whose spawning population exceeds target minimum levels, a more flexible TAC and quota policy should be pursued. Economic arguments to limit the TACs are not longer accepted in this approach, unless the sector itself (on a supra-national level) fully supports and controls this limitation. Therefore, the Netherlands have requested the introduction of both multi-annual TACs and multi-species TACs as an additional attempt to manage fishing effort. In the new CFP which became operative in 1993, these TAC-elements have been adopted.

Inshore fisheries

Restrictive policies in licensing fisheries have directly led to a sharp decline of the active cockle fleet. It is too early to ascertain in which way closing of various fishing grounds leads to fishing operations being balanced to nature values.

On the basis of a 1998 evaluation a decision will be made on the extent of closed areas, depending on the harmonisation of fishing activities with nature values like the growth of valuable biotopes.

Policies aimed at bird stocks may entail a further closure of these areas. In years when food shortages for birds seem imminent, cockle and mussel stocks will be reserved to satisfy 60 per cent of the birds' average need for food.

More structural measures like a restriction for fishing with fixed gear, a freezing of the number of trawling licences in the Wadden Sea and a restriction to collect shellfish manually for private consumption may further improve the situation.

The cockle and mussel sector will have to take up more responsibility for the management of their activities. They will have to draw up fishing plans which will have to be monitored.

A beginning has been made with this new approach but it still has to be further elaborated. The PVV plays a coordinating role.

Shellfish culture

As the number of enterprises in the mussel culture sector remained at the same level and as general economic results were satisfactory, policy on this sector seem adequate. However, as said production is varying considerably from year to year. One of the main factors influencing this production is the availability of seed mussels (one and a half year earlier). So there is a direct connection with natural developments and restrictions on inshore fishing activities in view of nature values. In this sense fisheries policy may contribute to those variations.

A high price flexibility leads to smaller yearly variations of the proceeds. However this flexibility also means that in years with a high production the sector can only partially benefit of it. It is conceivable that a stable high production will yield more.

The instability also leads to very great variations in outcome per enterprise. In 1992, for instance, 40 per cent of the enterprises had very large positive net results and 38 per cent very large losses. Only 22 per cent arrived around the zero line. It can be conceived that variations like these will have negative effects on the sector's continuity.

Future policy

Future research efforts will be focused on the development of selective fishing methods. Research into the effects of fishery on the ecosystem will have a high priority. A research project to study the welfare aspects of fishing activities will be set up to find alternatives for activities which are considered undesirable.

Stagnating proceeds call for a careful tuning in of the trade and processing sectors and the fishing sectors. Attention should be paid to product differentiation, quality control, market information systems and market structure. The auctions and the trade and processing industry should be involved in the implementation of the fisheries policy. This includes improvement of the logistics of auctions to get more transparent product flows and the set-up of a sectoral organisation of the trade and processing industry.

The Dutch government would like to see the following issues addressed:

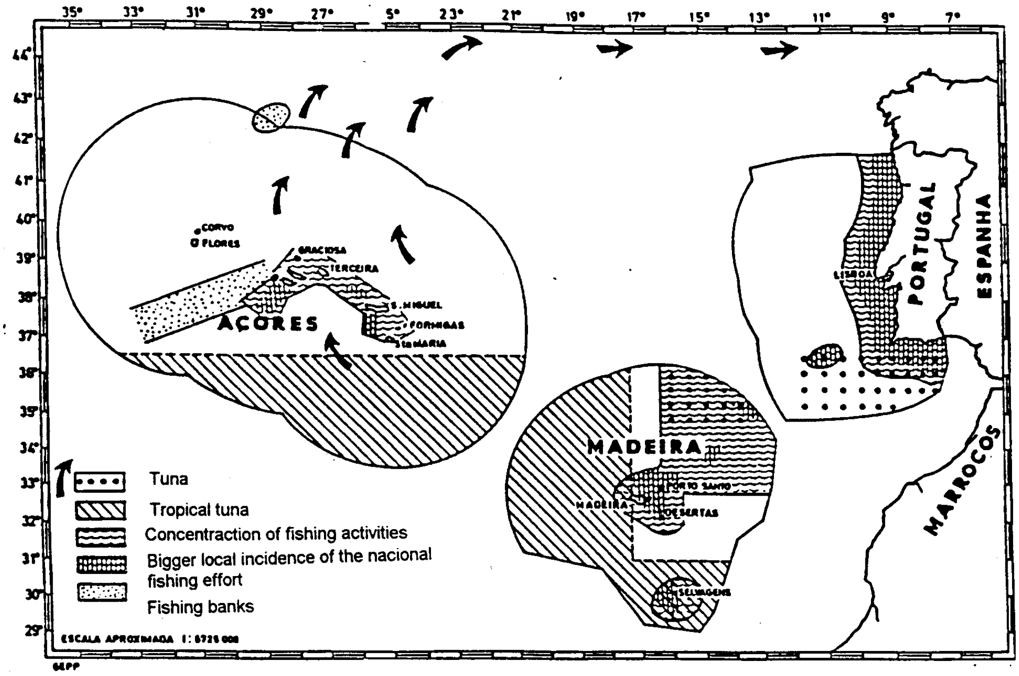
- how to turn the technological and quantity orientated attitude of various sectors to an economic optimisation of the sector;
- how to stimulate self management in the fishery and processing sectors (and what conditions are required to make it effective on a long term basis);
- to analyse in what ways economic analysis could improve the management of fish stocks.

PORTUGAL

PART I: CHARACTERISTICS OF THE SYSTEM

With the EEZ (Exclusive Economical Zone) of about 1.6 million km2, two archipelagos and one coastal extension of 760 km (Continent) (Figure 1), fishing constitutes an important and essential activity to the subsistence of the countless coastal communities.

Figure 1. Waters under Portuguese jurisdiction



However, production levels in this large area are limited as a result of some of its resources being in a transitional zone, and because of the narrow continental platform that it has.

In 1994, fishing landings by the Portuguese fleet totalled about $306 million and 259 thousand tonnes, of which 203 thousand originated in national waters.

Along the continent, the total capture achieved in national waters alone, reached approximately 174 thousand tonnes (1994), which is concentrated in the nearest coastal zones. The most abundant species in the catches are: sardine, horse mackerel, mackerel, hake, anglerfish, scabbardfish, octopus and clams. The most abundant of these species (namely, sardine), represents as much as half of the total landings quantities.

In insular zones with typically oceanic characteristics, the exploitation of pelagic species such as horse mackerel and Spanish mackerel, and the highly migratory species, predominates. Alternatively, as in the case of Madeira, the exploitation of black scabbardfish is important.

An ancient tradition is also the fishing for cod in the waters of the North Atlantic (New Foundland), and for hake along the African coasts.

The importance of fishing to the GNP is now about 0.5 and less than 1% concerning employment.

Meanwhile, there are some coastal zones where fishing is the most important activity and most people depend on fishing or fishing-connected activities.

Historical overview

As in other countries, the maximum values for captures occurred during the 1960s. The establishment of the EEZ and the over-exploitation of resources, were the reasons responsible for the successive reductions in captures ever since. In addition, the access restrictions on resources imposed by riverside countries of the occidental African coast during the last decade, where Portugal had activities (especially Namibia), contributed to a decrease in production levels.

According to the European Community, this resulted in the necessity to harmonise and extend the internal legislation. The main legislation that were then published were:

- Law decree No. 278/87 that fixed the legal regulation on the exercise of fishing activities and marine culture.

- Law decree No. 304/87 that establishes the first sale regimen of fresh fish.

- Regulation decree No. 43/87 (later altered by regulation decrees No. 3/89 and No. 28/90) that fixed conservation measures for fishing resources (reproducing community legislation - EEC regulation No. 3094/86).

In this way, the Portuguese fishing-activity regulation system suffered significant changes, allowing a change from varied, prescribed fishing regulations of various types (the gear characteristics, the minimum sizes for certain species and the number of authorised ships allowed to operate) to an integrated system whose main objective is the management of resources and its conservation, as a basic condition to ensure the perennial fishing activity.

The processing industry as well, has traditional characteristics and significant economic importance, particularly canning. This industrial segment depends mainly on the foreign market, specifically the canning of sardine and Spanish mackerel. The resultant vulnerability, together with a concurrent increase in non-EEC countries producing canning of similar species at competitive prices, has created a reduction in production.

Tables 1 to 4 indicate, by fishery, landings in quantities and values, fleet and fishers for the period 1985-94. Tables 5a and b represent average nominal landings prices in the period 1985-94 and monthly medium prices for the main species in 1994. Table 6 represents trade of fish products between 1985-1994.

Present situation

Continent

The continent represents about 90% of the fish products landings and 85% of the industrial production (1994). Most of the management experience that is described in the next sections concerns this portion of national territory.

There are currently 90 fishing communities of some importance and 135 fishing ports with diversified conditions and different levels of economic importance (Mendonça, 1992).

The most representative ports in terms of landings are: Matosinhos, Peniche, Sesimbra, Portimão e Olhão, which together represent around 62% of the landings of fresh and refrigerated fish on the Continent (Figure 2).

The zones with a greater number of registered fishers are: Vila do Conde 2.3 thousands, Peniche 2.2 thousands, Olhão 2.2 thousands, Sesimbra 1.6 thousands, Ilhavo 1.5 thousands (1991).

The coastal municipalities with a greater dependency on activities related to fishing activities are: Vila do Bispo (24.3%), Peniche (22.9%), Sesimbra (18.5%), Olhão (18.4%) and Murtosa (17.5%) (Mendonça, 1992).

In a descriptive summary of the main fisheries, four main sub-divisions should be considered: Polyvalent fleets , trawlers fleets , purse-seiners fleets and long-distance fleets .

In its majority, the landed product which is captured by vessels which exercise their activity in national waters or in the African occidental coast is constituted by fresh fish and refrigerated.

It is imposed by law that fresh and refrigerated fish should be sold in auction. 1 400 persons work in the auctions, depending from DOCAPESCA.

From the on board fish treatment and handling point of view, it is important to note that the majority of our fleet operates a few hours off shore, not having the possibility of processing the fish on board.

Meanwhile, the ships operating along the African coast have better conditions for fish handling and conservation.

Concerning the vessels operating in national waters, the fishers income consists of two parts: one, which includes a percentage from the fish sales, and the other, a part of the fish captured.

Polyvalent fleets

It is a non-specialised fleet that use diverse gears (gillnets, longline, traps), depending on the season of the year, the fisheries and species that are momentarily more financially attractive.

The main species in the captures are clams (21%), octopus (12%), black scabbardfish (6%), hake (5%), horse mackerel (5%), sardine (5%), pouting (4%), Spanish mackerel (4%), anglerfish (2%) (1993).

These fisheries are mainly artisanal, practised by many small vessels (about 9 000), which fish along the coast, up to 6 miles, in the estuary and river inlet zones. This being an individual or family-related activity, involves about 19 700 maritime individuals. Sometimes, it represents a complementary activity (to agriculture) and also a seasonal one.

What concerns local fisheries (practised by vessels smaller than 9 m. length) which is not well known because of the multiplicity of gears that are used, is the unknown quantities captured. The figures known (sales in auction) indicate an average output per vessel of around 1.8 ton/year, representing less than 800 thousands Esc (1994 figures relative to 3 905 vessels).

The species landed, which are highly valuable ones, are destined for direct sale or direct consumption (or indirectly to a small-trader), without a market transaction. This area of influence will be only a local one.

The imposition of eventual restrictions on these types of family activities can affect the aggregate family income, or even the survival of small fishing communities that depend mainly on fishing, and which are frequently found in Portugal.

By region, the south coast is the area where this type of fishery is most important. The second most important region, as far as catches of local fleet are concerned, is the Lisboa and Tagus valley region.

The fleet that is directed to clam fishing and practised with boat-dredges, consists mainly of local fleet. This kind of activity is especially important in the region of Matosinhos and secondarily, Setubal and Algarve.

Besides the local fleet, there are about 950 vessels that are longer than 9 m., constituting the coastal segment of the polyvalent fleet.

This fleet, like local fleet, operate near the coastal area at about six to eight hours off shore except some units that operate under official community or private agreements in waters such as the western coast of Africa, Morocco and Mauritania.

In 1994, 59 vessels had operated in Morocco, with an average output of 171 tonnes and $69* 10^6$ Esc. In Mauritania, 19 vessels had fish, with an average output of 75.4 tonnes and $41* 10^6$ Esc.

Some of the previous vessels authorised to fish in Morocco had become mixed companies that normally land their products at the Lisbon or Sesimbra ports.

The highest income in coastal polyvalent fleets is $36*10^6$ Esc/vessel/year, corresponding to about 664 tonnes/vessel/year.

The small shipowner predominates, and on a smaller scale, the producers organisations and co-operatives. This production has an ample market as a target, and mainly a regional influence.

The fact that the raw material that gillnets are made of has changed to a non-biodegradable one, has contributed to a increase of negative effects of apparatus loss (ghost fishing).

Concerning polyvalent fleet, we can consider the black scabbard fishery which started in 1983. This fleet involves small artisanal boats which use bottom longline with about 4 000 hooks, operating in the "Sesimbra grounds" (at depths between 1 000 and 1 600 m.) and landing at Sesimbra harbour (1994, Martins) (Table 7).

Now, catches of black scabbardfish (around 4 000 tonnes), represent about 23% of the total catches landed at Sesimbra. The main species by catches are sharks which are used for the production of oils.

The number of vessels increased until 1988 and has since been maintained.

The black scabbardfish stock has been exploited at the 0.1 level. The advice by scientists is that the maintenance of effort allows a better exploitation in terms of economic rent and assures a wealthy state of the stock (1994, Martins).

Trawlers fleet

About 125 vessels used trawl nets directed to demersal fishes. Normally, the number of fishers in each trawler varies between 8 and 10.

The quantities of the main species captured are: horse mackerel (39%), blue whiting (7%), pouting (4%), hake (4%), octopus (3%) (1993).

The greatest concentration of trawlers occurs in Algarve (particularly Olhão), Lisbon and Tagus valley region and Central region (namely in Aveiro and Figueira da Foz).

The crustacean fleet, with bottom trawl nets must be considered different from that used normally on fish, because it uses a fishing method, specified by law, with a minimum mesh size, constrained with a minimum of 30% of crustacean capture and a maximum of 60% of protected species.

It is a relatively recent fishery (started in 1983), that involves about 35 vessels, operating along the southern coast, and catching mainly Norway lobster and prawns, but also bentonic fish with a high retail value, such as anglerfish and hake (Table 7).

This fleet has remained stable in the last few years, with the exception of some improvements in technological and technical equipment.

Considering total catches of crustaceans by the entire fleet between 1981-1994 crustaceans landings increased faster between 1981-1984, then remained around 1400 tonnes in the period 1984-88, then decreased for around 900 tonnes in 1990-91 and, again, after 1991 to the actual level of 400 tonnes.

A recent study treated the problem of cost of this fleet. The most important costs constitute crew salary (45%), followed by fuel and lubrication (18%), social security (11%), repair and maintenance (10%) and sales taxes (7%) (Cadima, personnel communication).

Purse-seiners

The main species captured with purse seiners (in 1993) are: sardine (78%), horse mackerel (7%), Spanish mackerel (7%), and mackerel (1%).

There are about 200 vessels that use seine nets. The number of fishers involved in this activity is about 3700 (mean registered fishers 31.7 and 31.2.94, INE).

Catches per vessel diminished between 1991-92 and then raised until a maximum of 397 tonnes/vessel in 1994. Total income (in value) diminished between 1991 and 1993 and raised in 1994 to $27*10^6$ Esc, which is less than the total income per vessel in 1991.

Purse seiner which is a strictly directed fishery, has a dominant species (the sardine), and a small percentage of other species.

The market problems constraints of this fishery consist, mainly of the outflow of the captures and the fact that some of the species captured are not highly valuable.

The problem of sardines, which is an important raw material for the traditional canning industry, is the loss of competitiveness in third countries markets.

By region, the purse-seine is more important in the north area, namely in Matosinhos, followed by central zone where the most important landing port is Peniche.

Among the various gears used for fish capture, the purse-seiner is the least selective.

In the fishing sector, where frequently there is over-lapping of fishing areas from the vessels operating with the same kind of gears as for the vessels with different gears creating various conflicts between the operators. The main conflicts concerned the competition between fixed gears and bottom trawls and secondarily between purse-seiners and fixed gears.

Long distance fleet

This is practised by a fleet of more or less 70 vessels (1994), polyvalent in majority. In the North Atlantic fisheries, namely in cod fisheries. There are about 780 fishers (registered fishers in 31.12.94, INE).

Available indicators suggest production requirements of around 2000 tonnes/vessel/year as a minimum to ensures adequate yields (Mendonça, 1992).

The recent access restrictions to the traditional fishing grounds situated in the North Atlantic (fisheries directed to cod and secondarily, to redfish), and in the Southern Atlantic (hake in Namibia), have determined the reduction in this type of fleet.

This circumstance, as well as the fact that some of the traditional resources seem to be depleted, stimulated a gradual reorganisation of this fishing activity into a non-traditional one.

In this specific case, medium/large companies and larger vessels are concerned. Its target markets are both national and international ones, and involve a larger market.

In the vessels that operate on the African coast or NAFO the salary is a fixed one, plus a small value of the fishery share.

The larger vessels of long distance fleet are nowadays refrigerated and equipped with specialised cooling systems, fish treatment and proper fish innards cleaning of good quality. Therefore, landings are mainly frozen products.

Product utilisation and industrial organisation

The main destinations of the captures are for human consumption (60% of the total outputs) and fish processing industries (28%).

Discards at sea are not quantified. There are also discards at the auctions when the fish does not seem to be of good hygienic and preservation quality. The average quantity discarded is between 1991-1994 is 533 tonnes.

The Community determined that the fish not sold for the minimum stipulated price should be taken out of direct consumption. The average value of withdrawal between 1992-94 was 8 919 tonnes. In Portugal, because of the insufficient capacity to process fish into fish flour, the excess is returned to the sea.

During the last ten to fifteen years, non-traditional species and under-exploited species, appeared in the markets. Demand increased causing a considerable increase in prices. This concerns, among other species: anglerfish, octopus and the black scabbardfish.

There are approximately 340 production units which employ 12 000 workers (Mendonça, 1992).

From a geographical point of view, the fish processing industries (canning and semi-canning, prepared and frozen, dried and smoked), are concentrated in the main fishing centres.

The canning industry (60 factories) are mainly located in Matosinhos and Povoa de Varzim (north zone) Algarve and Azores, involving about 5000 workers (1992).

The Portuguese sardine canning industry involves 25 units and 3000 workers in Póvoa do Varzim, Matosinhos, Peniche, Olhão e Vila Real de Sto António.

The processing and freezing industry products (230 production units) are distributed at Aveiro and Figueira da Foz (central zone), Peniche and Lisbon (Lisbon and suburbs) and Matosinhos (north zone) and employ 2 700 persons (1992).

The fish drying industries are located in Aveiro (central zone) and are composed of 37 units. The level of utilisation of the cod production capacity has been reduced due to a reduction in cod captures.

The industry has been struggling to adapt its structures, such as: sector modernising, and quality improvement.

There have been numerous investments to restructure and restore existing sectors, and also for the construction of new factories.

The industrial sectors concentrate, in general, on secondary production activities and commercialisation.

Fish acquisition is effectuated by the supply contracts with the primary producers. These units are now using, more and more raw material imported from Spain (sardine) and Norway (cod).

Azores and Madeira

Both archipelagos of Madeira and Azores have an ultra-peripheral situation relative to Europe.

The productivity levels are limited because of the narrow continental shelf, few fishing banks and the irregularity of sea grounds.

The most important species captured are tuna, which constitutes an important raw material for the canning industry.

The Azores and Madeira are in the limits of the distribution area for tuna, in conjunction with the migratory character of tuna, whose distribution depends on the environmental factors, which lead to “fluctuations “ in the catches (Tables 1 and 7).

So, the catches in both regions could be highly variable, depending in the good or poor catches of tuna.

In Azores, these are the main reasons why landings have diminished in the last few years, in spite of the increase in the fishing effort (Pereira, 1992).

Concerning the state of the stocks, whose evaluation is performed by ICCAT, the only stock which is heavy exploited is the bigeye tuna (*Thunnus obesus*); the stock of skipjack (*K. pelamis*) is now of some concern while albacore (*T. alalunga*) is less exploited than the catches relating to MSY.

The multi-annual Guidance Programme for 1987-91 foresaw a global capacity increase in the fleet of the two regions. The result of the modernisation of the fleet led to an improved access to fishing areas at a greater distance from the coast, but did not increase the capacity.

The fact that stocks could be considered in good shape indicated that catches could also increase with the exception of some demersal fisheries in Azores, for which catch levels must stabilised.

Species submitted to TACs and quotas do not occur in both regions.

Azores

In Azores, besides tuna (which represents more than 50%), the most important species in the catches are: jack mackerel, seabream, wreckfish, alfonsino, black grouper and forkbeard.

Some of these are valuable demersal species (seabream, wreckfish) that are, on occasion, exported to other markets, especially to the continent and the USA/Canada.

The increase in the capture of these demersal species in the 80s led to the recent over-exploitation of some of these resources, namely the seabream, and now, scientists advise to decrease the fishing effort directed to these species.

The fleet, in general, consists of small wood vessels that operate near the shelf, while larger vessels exploit the fishing banks. These vessels use various gears, such as: long-lines, hand line, liftnet, gillnet and traps, depending on the season.

In Azores, the fleet uses live bait to catch tuna in small boats of 16-31 m. length. There had been an effort to modernise the fleet, which now constitutes vessels built after 1984; the older ones having been demolished.

Fleet activity is a seasonal one, operating 7 months a year alternating the main species: between April and July, bigeye; between July and October, skipjack; and in June, July, August and October and November, albacore.

For most fishers (around 4 500), fishing is complementary to other activities, in particular, agriculture and livestock production.

By volume of landings the most important island is S. Miguel, and secondarily Pico and Faial (Mendonça, 1992). These two islands are very dependent on fishing activities where catches of tuna and the canning industry are very important (Figure 3).

Canned tuna production units are located in these 3 islands and employ around 1 000 workers (Mendonça, 1992).

Fishing activities are more important in the Azores, not only because of the greater dependence on fishing related activities, but also because exports of fish products constitute about 45% of total exports of the Azores.

Madeira

In Madeira the most important species are tuna (60%), black scabbardfish, jack mackerel and Spanish mackerel.

The fleet is predominantly made up of small-sized wooden vessels that use various gear. Black scabbardfish captures are made using long-lines and tuna catches are made with hand lines and live-bait while a few purse-seiners capture small pelagic species.

Machico and Camara dos Lobos are the two ports that could be considered as highly dependent on fishing activities (with about 78% of total fishers) (Figure 4). The total number of fishers in the arquipelago is about 1 400.

In the last few years, landings have increased as the result of modifications in fishing patterns, namely the increased exploitation of fishing banks, the development of polyvalent fishing with more modern vessels and the increase in the exploitation of small pelagic fish with purse-seiners.

The tuna canning industry is the only one in existence, employing about 200 workers, (Mendonça, 1992).

PART II: MANAGEMENT SYSTEMS AND EXPERIENCE

Policy instruments

As a member state of the European Union who respects the agreed Community rules, a substantial part of the resources management has been allocated in the annual establishment of the Total Allowable Catches (TAC) and quotas for some species on national waters, and in the application of technical measures, as well as fishing activity control.

Efficient management depends mainly on knowing the national resources. It is an attribute of the Portuguese Marine Research Institute (IPIMAR) to develop the necessary conductive studies for this purpose. Representatives of this Institute assure the participation in international organisations such as ICES, NAFO and ICCAT.

TAC (Total Allowable Catches)

Since 1986, from the twelve species submitted to the Community regulation of capture limitations, through TAC and quota shares, only about half (horse mackerel, hake, anglerfish (2 species), megrim (2 species), sole, have represented a high degree of utilisation of quotas and the total landings of these species representing only about 15% of the total catches on national waters.

This occurred because the species with TAC are not the most important species in the national waters but those from northern Community waters (typical case of the pollack).

Otherwise, the main species captured (the sardine), a small pelagic found in abundance in southern zones of the Community waters, is not subjected, at present, to this type of regulation.

In addition, nearly all species subjected to these controls are not analytically assessed and therefore a precautionary TAC is fixed. Because these TACs are based on historical levels or recent captures, its value has remained unaltered since the first year of its implementation.

In the case of hake (southern stock), the situation is a different one, due to the accomplishment of analytical evaluation from the ICES working group. This group estimated that the SSB reached only very low values during the recent years and recommended a drastic reduction in fishing effort in agreement with TAC reduction. Meanwhile, the quota reductions approved by the Ministers Council of the Community, have been less significant, and today, the national quota represents 39% of the figure fixed for 1986. That is, it dropped from the 8 850 tonnes in 1986 to 2 990 tonnes in 1995.

Only a few times the quota has been exhausted and catches prohibited. This is the case of megrims in 1990 and 1994, anglerfish in 1991 and anchovy in 1995. In the case of the anchovy, the prohibition of fishing was important because it occurs in July, while the others fisheries had been closed in the last days of the year (December).

For these reasons, the management of the regulation for this specific group did not prove to be particularly efficient.

As a rule, TACs are used in conjunction with other measures, including licenses and technical measures.

Technical measures

There are four main types of technical measures: minimum landing sizes, minimum mesh size, establishment of maximum percentage of target species and minimum percentage of by-catches, closures in certain areas and seasons for specific fishing gear.

Technical measures are the most traditional type of measures used in Portuguese fisheries management. Among the restrictions imposed on the use of specifically fishing methods used on the continent, the most outstanding are:

- prohibition of bottom trawling in zones with a distance from the coast of less than 6 miles,

- mesh size for bottom trawl,

- prohibition of the use of drift trammel nets,

- regulation of gillnets and trammel nets establishing minimum operating distances from the coast, maximum dimensions, mesh size, maximum time of immersion, minimum distance between nets and closures,

- regulation about the use of purse seiner, with limitations regarding height and length of the nets, according to TAB, mesh size and the minimum depth utilisation,

- regulation that permits the use of the boat dredge in the capture of bivalves, establishing, operating zones, closure periods, and restrictions concerning quantities landed.

The hake resource, which is said to be a major preoccupation, has been the target of special protection measures. Between 1991-1994, trawling along the Alentejo coastal zone was prohibited for three months for the protection of the young fish. As of December 1990, the use of gillnets during the period December to February along the northern coast (Esposende-cape Mondego) was prohibited, with the objective of protecting the spawning stock.

Control of fishing capacity

From a more political and structural point of view, one of the main objectives of sector planning has been the restructuring of the national fleet to adjust it to the available resources.

During the last few years, the fleet has suffered considerable reductions (Table 2), as well as definite immobilisation of some units who are dedicated to the long distant fleet and to the constitution of mixed-societies.

Restructuring actions have resulted in the substitution or modernisation of smaller vessels, which were made obsolete by more efficient vessels with greater efficiency, better working conditions, better fish storage and freezing systems on board.

The greater autonomy has caused a reduction in the need for vessels to fish close to the coast, which was previously in demand. Vessel modernisation resulted in an increase in the economic efficiency of vessels activity.

The EU co-financed these adjustments, both in the new constructions as well as modernisations and dismantling.

The multi-annual Guidance Program for the Fishing fleet foresaw, for 1987-1991, a global reduction of 2% in the continent and an increase in the coastal fleet in Madeira and Azores.

The 1992-96 multi-annual Guidance Program foresaw, in Community waters, a reduction of 20% in the case of trawlers and the maintenance of purse-seiners and polyvalent, and a 15% reduction in polyvalent and trawlers in international waters.

Licence system

This is an administrative instrument, that when well used, can be an important auxiliary to the management policy.

According to the decree Nº 43/87 which provides that the constructions, acquisition and modification of fishing vessels, are submitted to previous authorisations (Art. 70º), and that the modifications and utilisation of certain gears are also submitted for previous authorisation. The same regulation foresees the annual licensing system (Art. 74º), that permits the use of determined fishing gear, as well as the use of determined fishing practices for specific fishing, directed to specific species (e.g. the licence for crustacean fishing).

A rule followed by the administration in order to control the fishing effort, has been to prohibit new vessel construction, only authorised to replace another vessel. The increase in number of licensed gears has also been prevented, only in replacement to substitute a "more predatory" to a "less predatory" type.

Individual quota system

During 1992 and up to the present, the aim of regulating the operational fleet in NAFO and Norway/Svalbard zones was the establishment of individual quotas.

An individual quota system per ship was introduced during the last two years (1993-1994), to manage the quota of hake that has suffered considerable reductions. This was considered to be the best solution to avoid quota exhaustion and the stop of fishing. To effectively stop fishing, it would be necessary to stop the capture by an important part of the fleet, which have a multi-purpose character.

During the latter part of 1993, a vessel quota was attributed to vessels with captures greater than 500 kg per year. In the quota calculations, the relative fleet percentages of hake per segment (during the last two years) and the average capture of each vessel over the same period, was considered. During 1994, annual quotas were established to maintain the same level as in 1990.

In both cases (long-distance fleets and hake), these quotas are attributed by the fishing administration (DGP), and do not constitute rights that are obtained or sold. Though they are transferable, as quota transfers among vessels or between associations, as a concession of supplementary quotas, are possible only with administrative authorisation. The specific role of the fishing associations was recognised, and the enterprises and shipowners association were given the possibility of managing the attributed quotas for their ships.

The landings quantities are all registered on official forms, by the auction services, to maintain efficient control.

Other limitations in special areas

In non-oceanic interior waters (Formosa river branch, Aveiro river branch, Mondego river, Cavado river, S. Martinho bay, Obidos lake, Douro river, Tagus river and Sado river), fishing activity is subjected to specific legislation involving zones, methods, species, recovery period, minimum sizes and limitations in the number of licences attributed.

The management of resources in these zones assumes a fundamental role, as these are biologically rich zones that shelter the very important young population of the same fish species.

Control and monitoring system

The monitoring and control system of fishing activities and the carrying out of legislation is the responsibility of the fishing inspection, which depends on the general fishing administration (DGP).

Since 1987, with the financial aid by the Portuguese authorities, a special monitoring and control system of fishing activities in the EEZ (SIFICAP), has been developed and implemented. This system makes use of computer technology and information is transmitted via satellite between the airforce (observation), navy and a central that is located inland.

This system includes the continuous monitoring of the sub-systems of fishing activities, and is regulated by decree Nº 3/93 which foresees the installation in determined fleet segments (vessels 15 m and longer for trawlers and vessel using gill nets) of transmission and receiving equipment. In this way, efficient control of the behaviour of these fishing vessels, is maintained by inland stations. The subsystem equipment (MONICAP) permits rigorous control of the fishing activities, and better knowledge of fishing grounds is as advantageous to fishers as safety.

Social and economic features

The reduction of the fleet and technical innovation has led to the reduction in the number of fishers. At a socio-economic level, measures have been taken aiming at the:

- abandoning of the fishing activities by the elderly, through early retirement (now 55 years old),
- transferring to other activities, including those related to aquaculture,
- conversion of fishers, and promoting their adaptation to new technology,
- improvement of the level of qualification of fishers, by attending professional courses,
- the creation of associations for production, processing, transport and the commercialisation of services.

Outcome

Between 1986 and 1994, the total capture by the national fleet decreased about 34% due to substantial major reduction in fisheries in exterior waters, suffering a reduction of 60% between 1986 and 1994 (Table 1).

Between 1986 and 1994, landings of fresh and refrigerated fish have globally decreased in the continent landings, mainly where trawlers and polyvalent fleets are concerned. Catches from Morocco and Mauritania decreased between 1986-88 and then increased to around 14 000 tonnes.

Concerning prices (Table 5a), in the last 5 years (1990-1994), the price of demersal fish and shellfish has increased while the price of pelagic fish either stabilised or decreased.

In Madeira, both quantities landed and income raised between 1987 and 1992, decreased in 1993 and 1994, while in Azores, quantities increased until 1988 and then fluctuated while income globally increased, except in 1994.

In the same period, the reduction of the fleet was of 20% in power and 37% in GRT.

In 1994, the number of fishers in the continent was 34 400; 1986 suffering a 3% reduction. This is a moderate fall in the direct labour, compared with the reduction in the capacity of the fleet and in catches.

Concerning the state of the most important fish stocks available in Portuguese waters, the demersal fishes are fully/heavily exploited, and pelagic stocks (like horse-mackerel and sardine), are in good and bad shape, respectively (according with the 1994 ACFM information).

TAC

As previously referred to, management through the application of TAC, for this group of 12 species, has not proven to be particularly efficient in terms of resource conservation.

Concerning this particular situation, some information about the state of resources is known, the most outstanding is:

- referring to the megrim, a decrease in the spawning stock biomass (SSB) and of the recruitment during the recent years as seen by the ACFM, that encourage the maintenance of the present fishing effort to reduce the present TAC value to the actual level of capture, which is substantially less than the TAC.

- the existing data regarding the anglerfish, namely the recent reductions of the catches and CPUE, and the reduction of the SSB indicate that stocks are, at present, very low (ACFM, 1994).

In both cases, the TAC value established at community level is higher than recent catches, for both stocks, balancing the Portuguese quota. It can be concluded that the existence of TAC values is not contributing to resource conservation, even if it did not signify the effective restriction of the fishing effort.

The situation of Norway lobster is different and indications show that a certain stability in catches, in fishing and in the SSB exists. The fixed TAC is a precaution TAC, based on levels of catches which have been stabilised during the last few years. In this specific case, the maintenance of TAC, together with the number of granted licence limitations for crustacean fleets , have impeded a increase on the fishing effort.

In regards to hake, the resource indicators show that it is over-exploited, with catches decreasing over the years. The reductions on the SSB were very high, and have reached the minimum value of 19 000 tonnes in 1994. The recruitment is reduced to 30% between 1986 and 1993, and that the actual fishing mortality levels are much higher than the FMAX value.

One interesting case of fisheries regulations by TAC occurs in 1995 with anchovy. It is a small pelagic fish whose quota is normally well above the catches. In the last few years, the only year with reasonable catches was 1986 (2 150 tonnes) and then catches decreased to a minimum of 23 tonnes in 1993.

In 1995, due to Portuguese exchange quotas with France, 3 700 tonnes were transferred to this country. However, this year, a greater abundance of anchovy in Portuguese waters (with catches of 970 tonnes in May) quickly led to the exhaustion of the quota and the fishery closed in July. In May, the median price was of 93 Esc/kg, which is about 1/3 of the median price of this species in the same months of previous years.

Because of the relatively low importance attributed to species submitted to TAC (in quantities), and also when landings of a specific species closed a conclusion cannot be drawn on market gluts, lower prices, excess processing capacity, increased harvesting costs or rent dissipation.

In the long distance fisheries of NAFO, Svalbard and Norway, the fishing season could be shorter. However, in the last few years, quotas were used in conjunction with individual quotas and the race to fish and the shorter season had not been verified.

Technical measures

Technical measures, including restriction on gear size and mesh size, areas and seasons where fishing activities are not allowed, closures, minimum landing size, are the most traditional measures used in the Portuguese system in the regulation of fishing activity.

Nevertheless, the persistence of declining catches and biomass in the last few years, especially concerning demersal fishing indicates that gear and size restriction are unable to assure resource conservation.

In the case of Portugal, where multi-purpose fisheries predominate, there are difficulties in establishing adequate minimum sizes.

In some cases, an increase in mesh size would maximise the income on a long term basis for a determined species, but taking into account the reduction in catches for other species, this would become an impracticable economic activity.

Essentially, the two types of measures taken (minimum mesh and fish size), would contribute to a minor catch of small, immature fish would be a method to discourage fishers in violating the applicable gears rules.

Regarding the establishment of area and seasonal closures which would be an acceptable measure to the fishers, that only demands a protection control zone. However, until this is established, only the control assures the conservation benefits of the resource.

In Portugal, the main closures zones aim to protect hake. In one case, bottom trawl fishing is prohibited, with the objective of minimising juvenile catches (Arrifana zone), while in another case, the use of gillnets is prohibited to protect the spawning stock (northern zone).

The trawling used for crustaceans which operates in the south-west and south, including the zone submitted to special protection, should not be affected as it operates at depths of 200 m to 750 m. This is deeper than the protected zone, mainly capturing bigger hake (Report of Southern Hake Task force, Lisbon 10-14 October 1994).

The protection zone and the implementation of legal mesh of 65 mm has resulted in a decrease in juvenile catches of hake (with size smaller than the minimum landing size of 27 cm). Additionally, the reduction of juveniles in the samples could also be the result of the loss of control of the undersized fish being sold in auction.

Figures 5 and 6 represent, in quantity and in value, the monthly distribution of the hake landings during the last years.

Relative to the monthly distribution of hake captured by trawl, the months with high landings are May (1989-1992), March and May (1993) and August to October (1994). Among the months when part of the coast was submitted to a closure, only during December 1993 and during January, February and December 1994, significant capture reductions were noticed. During 1993, due to the individual quota establishment since 1st. June, there were some distortions with low percentage of captures during the last 7 months of the year (59.3% average of the period 1990-1994 to 49.1% during 1993).

Regarding the landings of polyvalent fleet there was no considerable reductions in the captures during the months of closures in the north zone.

So, it seems that this type of measure was inefficient concerning resource conservation.

The average price for hake in auction reached during 1994 was 912.70 Esc concerning trawl and 962.20 Esc for polyvalent. In 1992, the year in which the captures where quite high, the average price dropped relative to 1990 and 1991. Between 1989 and 1994, the average medium price for hake increased 38% in trawl and 19% in polyvalent.

Month-wise, the highest prices occur in December and January (months where catches have a minimum) and are lowest in June.

Considering the specific composition of captures during this period (1990-92), hake is an important component of polyvalent catches, with more than 35% in quantity and 50% on the total value. Regarding trawl, the maximum percentage of hake reached 5% in quantity and 16% in value for 1992, for only 3.2% in quantity and 12% in value for 1990 and 1994.

The two last years' reductions could by attributed not only to the measures to continue the effort but also for an effective decrease in hake abundance, especially during 1994, when the available quotas for vessels where not reached (in this limited number of vessels only 70% of the quota was reached).

In relative terms, the species that represents a higher relative increase in trawl captures was horse-mackerel and mackerel; abundant species but with a low market value, which resulted in a decrease in the total value of landings since 1991. In the case of horse mackerel, its value had decreased. On the contrary, blue whiting had a relative valorisation, as the total quantity landed decreased.

Concerning polyvalence, the reductions in the quantities landed of hake followed by small increases in the percentage of other species who are less important in the capture: whiting, conger, sole, common dogfish, skate and seabreams. In terms of value, hake, anglerfish and wreckfish increased in importance.

In spite not yet being verified, many of the expected outcomes are possible, namely: the diminished race to fish, improved product quality, high-grading increase, little market gluts, increase in profits and greater economic stability.

The scientists consider that the reinforcement measures are insufficient to recover the fishing resources which would demand a decrease in fishing activity.

Due to the fact that the situation of resources is precarious, competition to access the scarce resources among fishers from different ports and gears has increased. This competition is especially high between fishers that use gillnets, long-lines and trawl nets. Recently, some conflicts occurred when, due to the scarcity of resources (notably, hake, in the north zone), the local fishers, that used gillnets began to operate in the south coast.

Control of fishing capacity

The multi-annual Guidance Programme for 1987-91 aimed at reducing some 2% in the global capacity of the mainland fleet. The effective reduction over this period, however, exceeded the established objectives, reflected in a reduction of around 7% in power and 14% in GRT.

For the period 1992-96 and for the continent, the multi-annual Guidance Programme foresaw, for the coastal fleet, a reduction of about 20% in trawlers, and the maintenance of the purse-seiners and the polyvalent.

The trawler fleet decreased from 150 in 1991 to 125 units at the end of 1994, while the polyvalent decreased 26% (Continent) and the total number of purse seiners vessels decreased 30% in the last four years.

This continuous reduction of the fleet over the last 10 years, especially in the long distance fishing vessels is a consequence of the decrease of possibilities of access to third countries waters. At the same time, there was a modernisation of the fleet.

Licence system

When the first licences were distributed in 1989, all the existing fishing vessels were authorised to use the gears which were normally used by them. In this way, the problems resulting in the fishing access restrictions did not occur, which resulted in the evaluation of the existing situation, i.e. the number of vessels, their characteristics and gears used.

The first and foremost advantage of the utilisation of the license system was that it allowed for a census of the fleet and the gears used.

The following years, the administration tried to prevent the increase in the fishing capacity and decrease the amount of licences for gears considered more predatory, substituting for less predatory gears, e.g. gill nets were replaced by hooks. If the rules are well defined and applicable without discrimination, these measures are accepted by fishers.

In the NAFO area, strong restriction occurred and there had been successive reduction on the number of vessels authorised to operate there, from 45 vessels in 1991 to 16 in 1995.

However, in Svalbard and Norway the number of licensed vessels had increased from 2 to 7, due to the increase of possibilities of fishing, especially cod, resulting from the EEE agreement.

However, it is true that the fishing effort could increase as a result of the utilisation of specific and expansive equipment.

It is believed that in dealing with an important instrument to enforce limitations, a fundamental role in the rational management and permits the adjustment of production capacity to the biological potential of the exploitable resources.

At the Community level, the implementation of the licence system and special fishing authorisation contributes to the decision-making, and a stricter management of fishing efforts directed to the various Community resources.

A system for individual quotas

The attribution of vessel quotas allow for an efficient control over the catches. Higher enforcement costs have occurred as well as an improvement of catch reports.

Regarding the individual quotas established for hake during 1993 (the first year of its implementation), indicated that if catches maintained the same rhythm, the quota would end by the month of August. As a consequence, the Administration decided to implement individual quotas from 1st June. This decision was accepted by the fishers because it represented the equitable distribution of the possibilities of fishing, and not stopping the fleet involvement in the capture of hake. At the same time, eliminating the race to fish also occurred. The distribution was based on recent captures (1990-92), and did not lead to problems with fishers or to the production organisation side.

In this particular case, IQ prove to be effective in limiting catches below the TAC determined by management authorities.

Awaiting an improvement of this individual quota system to integrate factors such as diversified fleet activities, and the regional characteristics of fishing, as well as individual efficiency and the following rules by the fishers and shipowners. We are dealing with the implementation of a system that pretends that it is not discrete and does not penalise a region or a fleet segment.

Conclusion

In Portugal, over the last few years, the fisheries sector was characterised by a reduction in production, as well as of the registered fleet.

Since the Portuguese adhesion to the European Community, the system of management had suffered great modifications. However, this does not provide for better resource conditions or higher income of the activities.

Quotas established for 12 species have not set real constraints in the fishing activity, as they have never been fully used up.

The rules on technical measures of conservation have proved to be insufficient to provide adequate protection of the stocks. Nevertheless, closures could be regarded as being efficient in decreasing the mortality of young.

In Portugal, as was the case for hake, measures distributing the quota allocated to a Member state by fleet are a step in the right direction to enhance the effectiveness of the system in restricting fishing effort and to reduce the disorderly race for fish (CCE, Report of the Southern Hake Task Force, 1994).

The new Common Fisheries Policy, established in 1992, provides new management instruments which are being introduced.

As from 1996, new Community law will be applied, with the aim of regulating and controlling the fishing effort, namely concerning demersal fisheries. However, only the reduction of the fleet and its adaptation to the resources available would allow the maximum profitability of fishing activities. Since there are regions highly dependent on fishing activities where alternatives are rare, many socio-economic problems will increase if measures are imposed without considering the characteristics of the fishing sector in each area of the Community.

With a more integrated policy and a management based on the establishment of objectives and strategies and in the control of the fishing effort, we consider that it would be possible to improve the efficiency of the stocks conservation and management and to assure the perenity and profitability of fishing activities.

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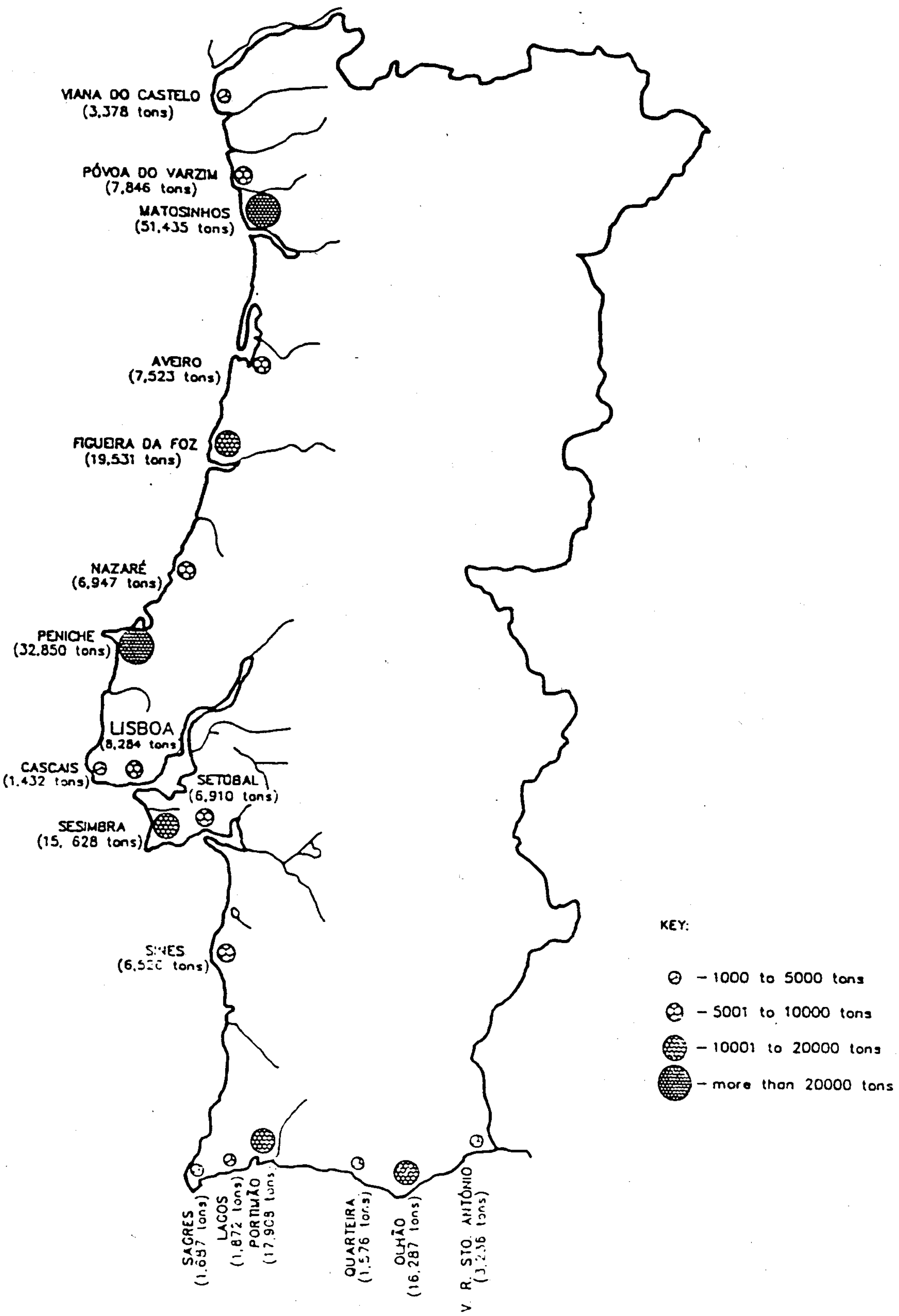
Figure 2



VIANA DO CASTELO
(3,378 tons)
PÓVOA DO VARZIM
(7,846 tons)
MATOSINHOS
(51,435 tons)
AVEIRO
(7,523 tons)
FIGUEIRA DA FOZ
(19,531 tons)
NAZARÉ
(6,947 tons)
PENICHE
(32,850 tons)
LISBOA
(8,284 tons)
CASCAIS
(1,432 tons)
SETÚBAL
(6,910 tons)
SESIMBRA
(15, 628 tons)
SINES
SAGRES
LAGOS
(1,872 tons)
PORTIMÃO
QUARTEIRA
(1,576 tons)
OLHÃO
(16,287 tons)
V. R. STO. ANTÓNIO
KEY:
– 1000 to 5000 tons
– 5001 to 10000 tons
– 10001 to 20000 tons
– more than 20000 tons

Figure 3. Azores

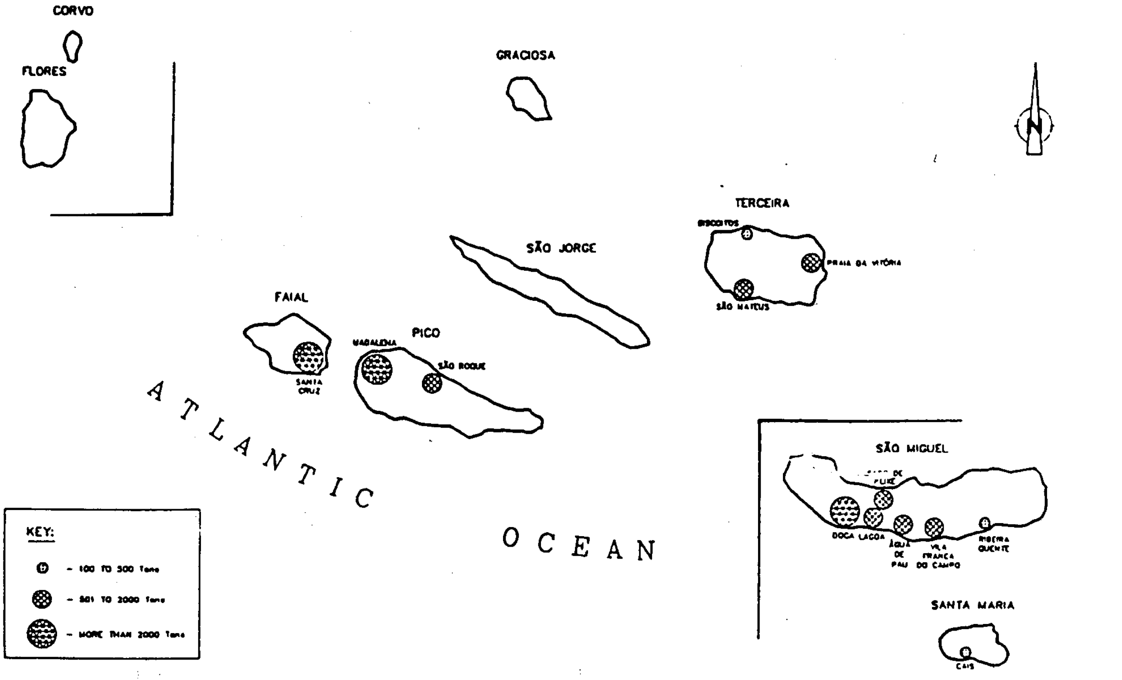


Figure 4. Madeira Island

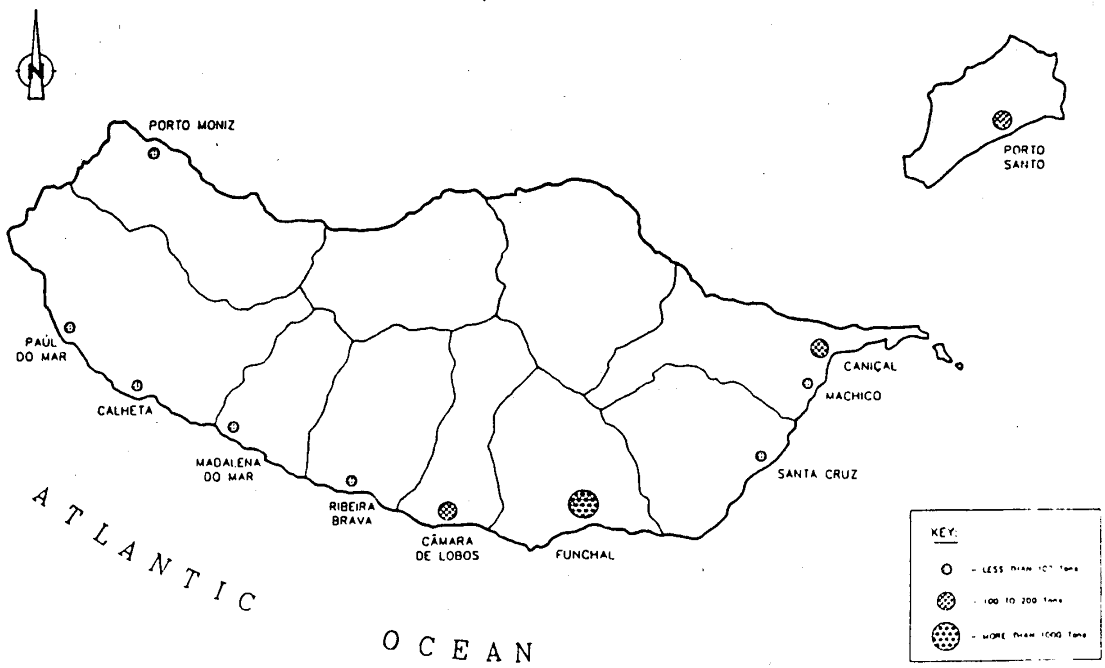
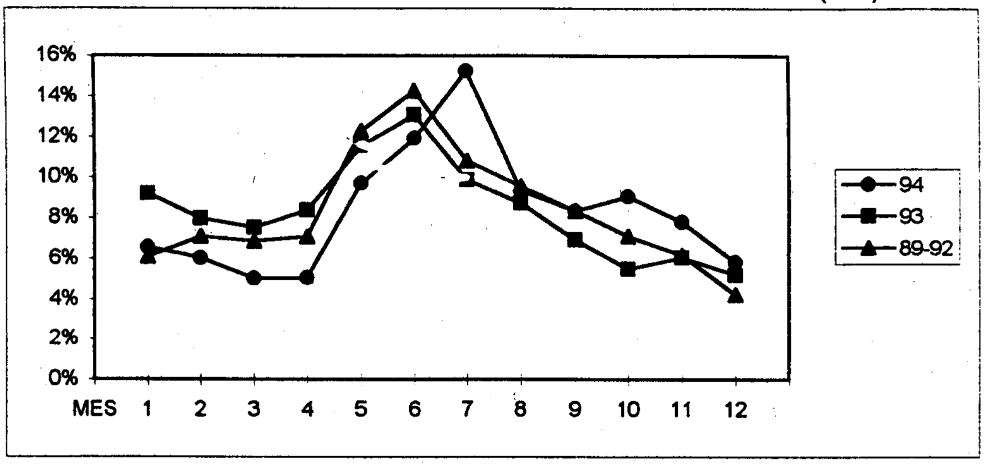


FIGURE 5

HAKE LANDINGS MONTHLY DISTRIBUTION

Polyvalents

(Ton)



HAKE LANDINGS MONTHLY DISTRIBUTION

Trawlers

(Ton)

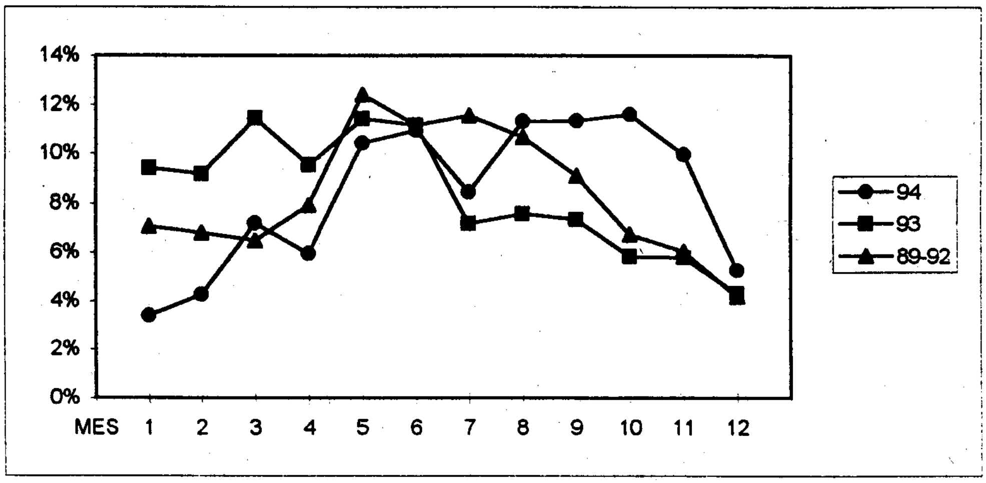
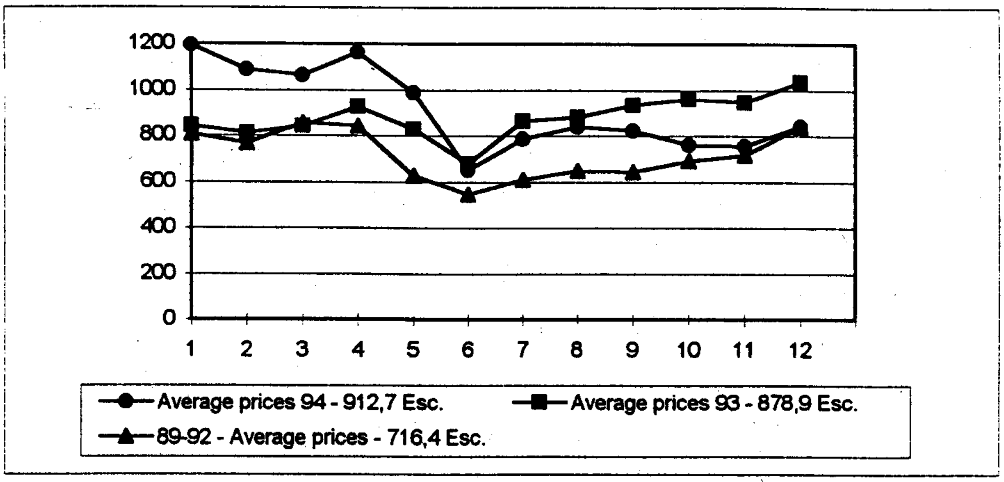


FIGURE 6

HAKE AVERAGE PRICES LANDINGS MONTHLY DISTRIBUTION

Trawlers



HAKE AVERAGE PRICES LANDINGS MONTHLY DISTRIBUTION

Polyvalents

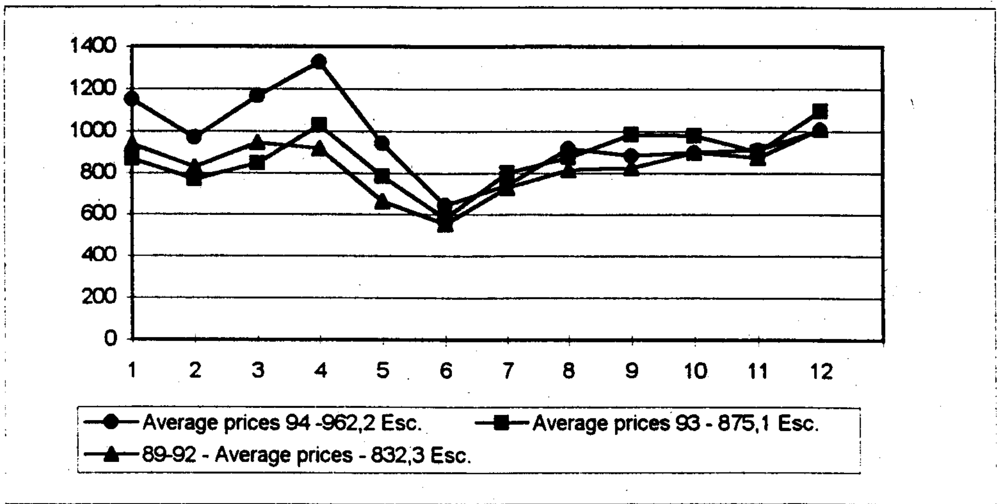


TABLE II - PORTUGUESE FLEET BETWEEN 1985-1994, BY FISHERY

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FLEET (31.12)										
TOTAL										
Number	18540	18067			16244	15896	14518	13910	12871	12299
GRT	208973	209193	208954	202599	196403	186523	183307	167764	148381	131309
Power (kW)		517060	516149	509004	501573	495966	492244	474155	439209	419418
CONTINENT										
Trawlers: Nº							151	145	135	125
GRT (tM)							21114	20159	18349	16570
Power (KW)							74359	71833	65745	58563
Polyvalent: Nº							12777	10853	9931	9479
GRT (tM)							48959	45227	41066	36814
Power (KW)							192915	184046	174938	178936
Purse-seiners: Nº							274	262	225	193
GRT (tM)							12238	11685	10025	8499
Power (KW)							54334	53113	46268	39568
Long-distance: Nº					103	100	97	89	81	71
GRT (tM)		99829	98600	93982	91750	83136	81274	69275	58703	50444
Power (KW)		125407	123158	119897	118833	111941	108721	98160	85449	74802
AZORES Nº					1904	1892	1884	1934	1913	1869
GRT (tM)		15580	17071	16900	15924	15888	16598	16762	14865	12395
Power (KW)		42217	45463	44998	44330	44463	46484	50549	48437	47034
MADEIRA: Nº					711	702	662	627	586	560
GRT (tM)		4602	4779	4667	4335	4698	4756	4677	5372	5282
Power (KW)		13070	13834	14982	15871	16844	16728	16454	18372	18161

SOURCE: DGP 1986-92 (Principais Indicadores das Pescas (Maio 1993) and GAE 1993

TABLE IIIa - TOTAL FISHERMEN REGISTED (IN 31.12) BETWEEN 1985-1994

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
. Continent	32900	35466	35121	34889	34617	34561	33167	33956	34454	
. Madeira	1464	1551				1409	1232			
Azores	5183	4758				4640	4108			

SOURCE: INE

TABLE IIIb - TOTAL NUMBER OF WORKERS IN THE PROCESSING SECTOR IN PORTUGAL BETWEEN 1985-1994

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
	...	8284	7338	6572	7340	...	...	...	...	...

Source: Étude Statistique du sector de la transformation des produits de la pêche et de l'aquaculture

TABLE I: TOTAL LANDINGS IN WEIGHT FOR PORTUGAL (METRIC TONS)

FISHERY	REGION	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Trawlers	Continent	28019	35593	39518	33309	33484	32526	30820	28602	27118	17736
Trawlers	Spain	...	...	2447	3266	2916	3285	3984	3395	3087	3962
Purse-seiners	Continent	74050	124660	106649	114804	106288	111175	103764	101773	103051	103810
Polyvalent	Continent	80349	56540	62651	61377	55559	54465	58044	71837	64024	51882
Polyvalent	Madeira	6874	7487	6638	7575	8844	9618	12674	13167	10342	10345
Polyvalent	Azores	15272	18838	19722	22167	16824	18996	12879	13897	18705	14796
Polyvalent + trawlers	East African coast (1)	21045	7059.8	4095	4619.6	9563.9	12083	12852	15605	13511	14134
Polyvalent + trawlers	NAFO	...	98135	82134	40269	49760	67334	75317	36014	35532	30156
Trawlers	Svalbard / Norway	...	5096	3692	2870	2479	1695	973	2506	4036	8059
Trawlers	SE Atlantic (2)	19368	36310	45444	32342	26155	1198	1492	1685	0	0
Trawlers	Falkland				10442	9676	5898	3244	1057	3521	3888
TOTAL		244977	389719	372990	333041	321549	318273	316043	289538	282927	258768

(1) - J. Ventures with Morocco not included.
(2) - In ICSEAF area - NAMIBIA - there are no captures after 1992.

"OCDE-1"

TABLE IV: TOTAL LANDINGS IN VALUE FOR PORTUGAL (10^6 PTE)

FISHERY	REGION	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Trawlers	Continent	3973.8	6235.9	7607.6	8804.8	8502.9	11698.0	10441.7	8189.1	7316.5	5872.4
Trawlers	Spain	...	...	...	453.9	552.0	633.6	662.0	781.7	581.2	763.5
Purse-seiners	Continent	1966.8	6305.7	5542.5	6808.7	6690.6	7807.7	9325.7	6876.0	6049.1	7152.4
Polyvalent	Continent	11194.9	14912.3	18668.7	21957.5	20528.8	21676.6	22612.9	24295.6	23016.7	21064.1
Polyvalent	Madeira	883.6	1093.3	1045.8	1258.6	1372.7	1663.6	2134.3	2178.4	1606.0	1860.1
Polyvalent	Azores	1607.2	2110.8	2535.8	3073.9	3058.5	3526.7	3727.0	3805.2	3999.1	3814.4
Polyvalent + trawlers	East African coast (1)	4134.3	2476.1	1576.6	2272.4	4430.8	5385.7	5753.9	5773.4	5047.6	5303.0
Long distance fisheries		...	13459.9	12206.5	12184.5	11754.2	14356.3	16436.6	5419.5	...	...
TOTAL		23760.6	46594.0	49183.5	56814.3	56890.5	66748.2	71094.1	57318.9	47616.2	45829.9

(1) - Morocco and Mauritania, J. Ventures with Morocco not included.

Table Va: Average nominal landings in Portugal in national currency

Unit: 10^6 PTE

SPECIES	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FRESH AND CHILLED										
Sardine	27$00	32$00	31$70	38$30	42$00	56$00	74$30	55$70	46$00	58$10
Horse-mackerel	142$00	164$00	149$80	165$60	180$70	212$70	233$00	199$40	168$60	179$50
Octopus	244$50	353$00	257$70	363$20	431$20	548$70	517$40	392$80	438$80	520$50
Silver scabbardfish	249$00	308$00	304$70	332$90	376$70	410$20	397$00	350$30	328$30	319$70
Blue Whiting	-	39$00	27$30	34$70	37$80	49$60	51$20	61$90	66$40	87$20
Hake	460$30	484$00	567$50	683$90	744$50	812$20	786$60	778$10	85$40	897$00
Black scabbardfish	-	125$00	122$60	159$50	188$50	211$70	200$80	176$60	187$10	272$00
Mackerel	28$30	54$00	57$30	61$00	48$50	64$60	79$30	60$20	62$10	61$60
Cuttlefish	312$40	348$00	396$00	413$20	481$90	499$30	560$90	548$10	561$20	643$90
Jack horse-mackerel **(a)**	-	107$00	109$40	72$70	64$30	84$10	77$00	110$60	96$50	101$00
Pouting	194$50	184$00	198$20	263$70	336$80	354$10	404$00	400$80	399$44	455$30
Anglerfish	212$20	321$00	470$10	539$80	685$00	660$60	702$90	779$30	825$55	920$20

(a)- Jack horse-makerel and other "*Carangidae*"
Source: GEPP, DGP

TABLE Vb: AVERAGE MONTHLY NOMINAL PRICES IN PORTUGAL IN THE NACIONAL CURRENCY FOR THE LAST AVAILABLE YEAR (PTE/KG)

SPECIES	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEP	OCT	NOV	DEC
EUROPEAN SARDINE	46.20	45.10	44.30	49.60	65.30	80.10	82.20	70.70	52.60	50.50	49.70	43.50
HORSE MACKEREL	163.50	211.60	211.30	243.50	180.60	149.00	163.20	165.10	184.20	156.30	164.50	186.00
SILVER SCABBARDFISH	407.90	313.70	280.80	360.80	322.70	249.80	388.40	389.20	401.10	298.50	234.10	257.20
OCTOPUSES	467.10	469.60	460.80	489.90	492.50	452.70	495.60	564.80	591.40	566.80	562.10	586.00
CHUB MACKEREL	54.20	49.10	34.90	35.60	50.60	44.30	43.10	42.40	38.40	32.50	35.30	43.00
EUROPEAN HAKE	1157.10	972.60	1092.70	1279.90	937.40	637.20	724.90	882.60	860.30	855.50	896.10	1063.30
BLACK SCABBARDFISH	292.20	241.50	276.40	333.50	342.90	209.50	335.20	302.70	325.80	246.90	226.00	192.90
POUTING	450.00	425.10	420.60	485.80	483.40	424.20	495.90	507.10	511.00	479.40	398.60	399.30
EUROPEAN CONGER	439.10	397.00	392.50	374.30	338.70	267.50	336.50	421.50	377.70	354.70	328.90	378.70
CLAMS	150.10	147.20	149.60	152.20	177.60	184.40	189.50	141.20	144.20	130.30	119.10	119.20
ATLANTIC MACKEREL	128.60	130.70	88.70	46.20	64.90	53.20	52.00	48.30	62.70	44.00	62.00	64.90
BLUE WHITING	87.60	73.80	64.90	71.50	64.70	63.70	103.40	114.70	127.70	101.80	87.20	93.90
SEABREAMS	451.20	410.90	315.20	361.50	390.40	420.50	445.60	428.60	388.30	367.90	439.40	510.10
SKATES	387.20	395.00	409.20	396.50	300.30	282.90	404.80	501.90	454.80	416.30	392.30	411.30
NORWAY LOBSTER	2997.20	3391.10	299.80	2221.90	2177.20	1808.20	1996.20	2524.00	3411.10	3760.30	3573.00	4266.40
DEEPWATER ROSE SHRIMP	3015.50	2601.90	1806.10	1811.50	1868.80	2103.80	2205.80	1831.50	1673.30	1854.80	2050.30	2626.00

"TABVb"

Table VIa: Exports in value for Portugal in national currency

Unit: 10^6 PTE

SPECIES	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FRESH AND CHILLED										
Hake	6	8	15	40		40	146	429	48	13
Sardine	8	58	73	50	66	100	549	221	2208	457
Mackerels	0	1	16	38	104	257	321	179	36	45
Horse-mackerel	125	87	122	172	162	195	146	99	146	...
Gilthead seabream	30	90	94	177	...	178	125	133	94	308
Soles	148	343	478	432	...	239	183	199	130	206
FROZEN (without fillets)										
Redfish	86	508	1882	2000	1208	1259	986	629	61	491
Sardine	142	200	264	339	386	660	669	819	225	560
Cod	71	546	177	555	3123	4866	5462	2465	1075	2706
Tuna	85	81	36	22		145	506	431	643	553
Halibuts	3	10	1	72		78	82	93	129	177
Hake	18	33	277	512	3123	98	258	176	200	334
SALTED AND DRIED										
Cod salted / dried	0	6	312	494	107	102	53	115	187	72
Cod salted	176	458	14	157	1165	1384	967	736	695	941
CRUSTACEANS AND MOLLUCS										
Creb	0	88	78	103	110	128	112	106	396	20
Scallops	...	...	...	396	415	512	829	58	434	219
Shrimps	180	25	90	103		238	256	123	791	742
Octopus	273	416	406	434	1401	507	445	87	2	25
CANNED PRODUCTS										
Sardine	7067	7181	6830	6882	8871	8994	8282	7156	6470	8773
Mackerels	1503	1340	1398	1672	2015	2400	2700	2156	1801	2022
Tuna	191	547	2069	317	2986	3226	4414	3996	1497	3495
TOTAL	18369	22563	21915	24982	34950	39148	41490	35544	30274	36357

Source: INE, GEPP, DGP

Table VI: Imports in value for Portugal in national currency

Unit: 10^6 PTE

SPECIES	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FRESH AND CHILLED										
Horse-mackerel	397	1517	2327	1873	1963	2073	22596	2362	...	3616
Whiting	...	2	11	52	...	17	4	5	10	26
Salmon	...	9	17	25	...	201	15	341	329	645
Sardine	0	1	0	8	...	2	68	188	1728	913
Hake	1	10	31	109	141	103	112	180	151	700
FROZEN (without fillets)										
Plaice	31	16	169	31	...	245	257	152	132	583
Cod	27	116	498	698	...	1899	3146	6636	7771	3128
Hake	1738	2005	4495	5236	5587	7788	11519	8289	3665	9048
Tuna	958	1415	1605	1931	1739	2653	2605	1634	1593	2755
Sardine	305	151	176	331	...	288	384	222	31	35
SALTED AND DRIED										
Cod salted / dried	23745	21480	35123	36416	30396	34612	42266	30839	27333	31468
Cod salted	2773	5803	7592	10615	9329	18302	17252	19500	18530	14775
CRUSTACEANS AND MOLLUCS										
Edible crab	...	91	398	74	...	831	190	189	52	147
Squids	1286	1902	2017	1426	1318	864	1706	1137	1071	880
Shrimp	471	607	1132	1778	2083	6509	10301	10897	10672	12630
Cutlefish	153	352	283	320	504	465	768	666	1029	108
CANNED PRODUCTS										
Sardine	...	53	50	55	40	68	80	112	598	21
Tuna	...	8	17	19		35	1159	435	250	767
Molluscs / crustaceans	17	13	41	89	119	231	296	50	633	563
TOTAL	33567	38182	60831	65483	61372	86098	108182	99750	97740	114788

Source: INE, GEPP, DGP

TABLE VII - OTHER FISHERIES FOR WHICH THERE ARE SPECIFIC DATA

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
CRUSTACEAN Trawl South Continent											
Landings (mt)								786.2	598.3	547.7	529.9
Landing (10^6 PTE)								1111.0	705.6	689.4	784.2
Fleet (nº)											36
Fleet (GRT mean)	Fleet remained stable in last years										89.22
BLACK SCABBARD Sesimbra **(2)**											
Landings (mt)	613	947	2241	2593	2602	3473	3274	3978	4389	4513	3421.1
Landing (10^6 PTE)			280.1	318.2	415.0	654.7	692.8	799.2	775.5	844.4	930.2
Fleet (nº)	15	23	28	23	27	27	27	28	27	...	...
Fleet (GRT mean)	16.6	16.1	18.0	20.1	19.9	19.9	20.0	20.0	...	...	...
TUNA FISHING Azores **(3)**											
Landings (mt)	7383	7572	10814	12268	14657	8807	8634	5518	6231	10775	6666
Landing (10^6 PTE)							894.5	667.7	699.7	1187.4	835.9
Fleet (nº)	28	29	32	36	37	40	39	38	32	...	...
Fleet (GRT mean)											

(2) - Small artisanal boats which use bottom longline

(3) - "live bait" fleet. Boats with lenght between 16-31m. The recent reduction in the number is the result of the dismantling CE the older boats and the building of bigger ones
(Now the fleet is mainly composed of boats builded after 1984).

SPAIN

PART I: SYSTEM CHARACTERISTICS

Historical overview

Fisheries are important to Spain, from the point of view of both supply (production) and demand (consumption).

Spain is a country with a long seafaring tradition. Often it was Spanish fishers who first began harvesting fishery resources off the European, American and African continents. Spaniards have fished from time immemorial (some of the fisher's guilds that still exist today were founded eight centuries ago). Over all that time, regulatory mechanisms have been devised to ensure stability. However, the rate of growth has not always been steady or gradual; for instance, between 1961 and 1976 the Spanish fleet doubled in tonnage and tripled in capacity. After tremendous growth in the 1960s, the industry began to decline in the early 1970s.

This was because the higher quantity and quality of catches world-wide began to make resources scarce. Furthermore, this new situation induced some States to propose the "nationalisation" of the adjacent marine resources by extending Exclusive Economic Zones (EEZ) to 200 nautical miles. The traditional fishery states as Spain, had to face a deep crisis due to the diminishing of the resources to which they had access.

Spain's fishing industry therefore turned to a "freeze" and a subsequent scaling-down of its fishing effort. In the 1970s, the Spanish fleet fished less in other EEZs, but more in international waters and its own inshore waters. This move (in which Spain was joined by other fishing nations) increased pressure on deep-sea fisheries, thereby fostering the consolidation of multilateral regulatory structures governing international waters (NAFO, ICCAT, etc.), and on domestic resources, so that it became necessary to tighten regulations on fishery management in Spanish coastal waters.

All these factors led to a scaling-down of the fleet, as well as to technological, economic, social and legal adjustments to the new circumstances of the fishing industry world-wide. Before Spain became a EEC member state, the Spanish government had already developed restrictions and adjustments on the fishing fleets as the ones implemented by the RD.681 of March 28 1980. Afterwards, Spain's own fisheries policy, in line with the European Union's Common Fisheries Policy (CFP), was to adapt fishing activities gradually within a more regulated and closely-managed framework.

Fisheries management in Spain began in the eleventh century, under a feudal system which granted a fishing monopoly to organised guilds in exchange for the payment of a tax. Today's fisher's guilds, which between them cover the entire length of the Spanish coast, grew from these early beginnings. Since the reforms of the nineteenth century, however, they have no longer had to pay the tax that used to be imposed on the harvesting of marine resources.

Under the old regime, inshore waters were not overfished. The control system was able to overcome, albeit with difficulty and with government help, the successive crises caused by increased fishing effort in the wake of technological change (the switch from cotton to nylon nets, motorisation, etc.) and economic trends (higher demand for fresh fish as the country's major industrial centres grew in size, etc.).

From this traditional way of fishing stemmed the expansion of Spain's fishing industry, and the know-how and marketing structures vital to its industrialisation. By the late nineteenth century, Spain's industrial fleet was able to exploit deep-sea fishery resources far beyond the country's coastal waters.

The deep-sea fishing fleet expanded considerably in the 1920s and again in the 1960s, when growth was unregulated. But from the early 1970s onwards, as Spanish vessels were operating outside its waters, they had to comply with both the regulations of the new EEZ and the multilateral agreements. This meant that the Spanish government had to overhaul the entire management regime in order to adapt fishing activities to the accessible resources. With this in mind, the government departments, in collaboration with the fisheries industry, have signed agreements with 18 countries in Europe, Africa, America and Oceania.

Two major events in the 1980s determined the way in which this management regime was to develop. First, democratisation at home brought decentralisation in its wake; the authority formerly held by central government was devolved to the regions. Second, on the international front, Spain joined the EC, and this meant bringing the fishing industry and fisheries management into line with the requirements of the Common Fisheries Policy, and entering into multilateral fishing agreements through the EC.

An even more important factor affecting adjustments in fishing capacity and resource management was the introduction of quotas in the 1980s. Vessels were registered, fishing rules laid down and fishing zones established under the jurisdiction of Spain, or of other countries, or under the law of the sea. Thus national fishing activities were regulated, and activities in the more heavily exploited fisheries reduced, with a view to achieving the maximum sustainable yields.

Furthermore, a new licensing system for vessels operating outside Spanish waters effectively controlled fishing, and particularly deep-sea fishing, in other countries' waters and in international waters.

Present situation

In the beginning of 1994, the Spanish fleet comprised 18 842 vessels, directly employing 79 369 people, with a power of 1 763 445 total kW and 570 873 GRT of tonnage.

The following table shows the Spanish fleet's part in the total European Union fleet. As can be seen, Spain in 1992 accounted for 17 per cent of landings, 27 per cent of value, 20 per cent of vessels and 31 per cent of jobs in the industry.

Table 1. EU and Spanish fishing industries in 199229

	European Union	Spain	Percentage
Total motor vessels	98 957	19 451	20
Total GRT	2 016 399	644 989	32
Total kW	8 339 374	1 910 145	23
Fishers	286 800	90 000	31
Landings ('000 Tonne.)	5 369	894	17
Value (million ECU)	6 906	1 843	27

At the end of the 1980s, Spain was ranked 18th in the world with respect to landings (tonnage).

Despite its high production, Spain has a structural trade deficit as regards fishery products. With its population of almost 40 million largely favouring a Mediterranean-style diet, domestic production cannot meet demand.

Whereas average per capita consumption in the European Community in 1986 was 18.22 kg/year, the corresponding figure in Spain was 39.21 kg.

In 1992, Spain imported 831 065 t (only 25 per cent of which came from the EC) or, in value terms, Ptas 296 352 million. Exports were much lower at 306 283 t., with a total value of Ptas 72 778 million.

So, despite its considerable production capacity, Spain has a chronic negative trade balance in fishery products. Exports cover only 25 per cent of the value of imports.

Spain is present everywhere on the world market for fishery products, and it is therefore in the country's best interests to operate as transparently and efficiently as possible.

The main objectives of Spain's fishery policy are now in line with those of the European Union, as follows:

- To scale down fishing effort to a sustainable level.
- To encourage capital investment so as to keep up a modern, efficient fleet which is competitive world-wide.
- In scaling down fishing effort (redeployment), to safeguard the economic and social stability of those whose livelihood depends on the exploitation of fishery resources, and particularly those directly dependent on it. Policies here focus on compensation and economic diversification is encouraged.
- To organise the EU market in such a way as to ensure a steady supply of high-quality home-produced and imported fisheries products at competitive prices. This involves a competitive pricing policy and safeguarding future stability of production and supply by placing restrictions on catches harvested without due regard for resource sustainability.
- To diversify fisheries activities by means of market structure reforms and improvements.

29 1992 data from the EC evaluation of the POP. Estimated Holland's GRT data. Germany is considered as the former GFR.

These objectives are related to other larger political perspectives. The fishery politics are part of a global policy to accomplish an integral development of all society, but especially of the coastal communities. The orientation of this perspective is directed to insure the integral development, to harmonise it with the environment and at the same time insure the rational economic use of all of potential of the natural coastal resources. In this sense, some aspects have a special relevance, such as: to assure an harmonic development between the alternative littoral exploitations (fishing, aquaculture, tourism, transports, communications), to sustain a level of scientific research according to the global necessities, to develop professional formation which incorporates the comprehension of values such as the sustainability or the rational use of resources, but which also allows a high qualification and productivity of the labour force. They also pursue the development of an optimal level of decentralisation, between the administrations of the EU, the State and the Autonomous Communities, with a distribution of responsibilities that permits the compatibility of global management coherence with flexibility and operativeness. Last but not least, fisheries management has also to insure the supply of food in the best conditions to consumers. Among these there is not only the reduction of prices, but also the quality guarantee, the sanitary condition and the sustainability of the supply (to avoid in the long term the crisis of the capture sector).

The management structure tries to fulfill the necessities, not only those that are strictly considered as political fisheries objectives, but also those related to coherence with the other objectives. The management implementation, also takes into account of other aspects such as the cost of the application, the timing of implementation, the historical traditions, etc.

PART II: MANAGEMENT SYSTEMS AND EXPERIENCE

Policy instruments

Responsibility levels inside the country: national, regional and local institutions

Under the terms of the Spanish Constitution and the Statutes of the coastal Autonomous Communities, the regulation and management of the fishing industry are decentralised, being shared between central and regional government. The 10 Autonomous Communities with authority over fisheries are the Basque Country, Cantabria, Asturias, Galicia, Andalusia, Murcia, Valencia, Catalonia, the Balearic Islands and Canary Islands. Ultimate responsibility for marine fisheries management lies with the General Secretariat of Marine Fisheries (SGPM), part of the Spanish Ministry of Agriculture, Fisheries and Food. Strictly speaking, the Autonomous Communities manage only inshore waters (between the base line and the coast), though they also have some say in aquaculture and some other matters.

The Central Government has the following functions: planification, direction and coordination of the activities related to the marine fisheries, the structural organisation, the marine fishing activities, the environmental protection, the foment and coordination of aquaculture, the teaching of professional formation in marine fishing at the state level and the market organisation. The Central Administration can transfer part of its competencies to the Autonomous Communities

The coastal Autonomous Communities have different levels of competence in fisheries in relation with the Autonomous Statutes and their agreements with the State Administration. The situation is not homogeneous in the different Communities, but in general terms their functions are the following:

- Distribute authorisation for fishing activities, depending on the number of licenses, quotas and permissions given to them by the State Administration (SGPM). The distribution of the EU resources for reconversion follows the same procedure.

- Give the concessions for the exploitation of seaweed, mollusk, crustaceans and fish culture.

- Among the general restrictions imposed by the Central Administration, there are additional reglementations on fishing gears, apparel and equipment, on HP and GTR levels, restricted areas, fishing days, authorised size, etc.

At the local level, well before the Democratic Constitution was enacted, the fisher's guilds played an important role in the direct management of inshore fisheries. There are at present 225 guilds (with a membership of 80 000). They are empowered to exercise direct control and, under government supervision, to take supplementary corrective measures at the local level.

The control and management of deep-sea fishing is the prerogative of central government, though in close collaboration with shipowners' associations, which share responsibility for the control of their activities. Many of these associations have formed producer organisations (PO) within the framework of the EU.

Since Spain joined the EU, the formation of these producer organisations (which deal mainly with the marketing side) has been encouraged. There are currently 33 of them, 14 concerned with inshore fishing, 8 with aquaculture and 11 with deep-water fishing. They are backed by the shipowners' associations.

The guilds, gather the fishers who work on ships normally not greater than 150 GRT, in inshore fishing. They are regulated by the Act RD 670/1978, which gives them the configuration of public law corporations. They act as consultant and collaborating organisations with the public administration on themes related to the fishing activity and its distribution. In practice, coastal fisheries have the direct control of a small marine area (50 to 100 sq. N.M. by guild) near their port. In this area they can implement more restrictive control measures. Usually, regulations of this kind concern aspects such as: temporary stoppages, maximum of discharges, gear regulations (size, number, kind, etc.), market control (species or sizes forbidden), schedule and rest, etc.

The PO gather, on a voluntary basis, the fishers of a specified area or those who work on with a specific gear. Usually, these associations concern mainly industrial fisheries. In this fishery the role of Administrative control is very important (from the EU to State), to develop and implement fisheries management, but the professional organisations have some indirect participation in its application. The role of the PO is basically market control, relating to aspects such as size, price (as auxiliary organisation of the EU institutions), or quantities. Depending on the role of quantity control, the PO can agree on voluntary restrictions in captures or effort, but the Administration has the possibility to extend the regulations of each PO regarding production and commercialisation to all the fishers under its area of influence30, no matter if they are Spanish or from any other EU member State.

30 Rule EEC 3190/1982

Management of the marine resources is also based on a good knowledge of them. Research aiming to resource conservation and environmental protection is developed by the SGPM basically through the Instituto Español Oceanográfico (IEO) and other public institutions linked with it. In the field of research Spain participates in several international organisations such as the Intergovernmental Oceanographic Commission (IOC) or the International Council for the Exploration of the Sea (ICES).

Spain is committed to the CFP and has implemented concrete and specific measures to ensure that the objectives agreed at European Union level are achieved. All internal fisheries policy measures are linked with the CFP, and on the other hand, the problems of the Spanish fisheries are taken into account for the development of the CFP.

Responsibility at international leve - Spain and the EU Common Fisheries Policy

Spain joined the EC in 1986 with substantial fishing capacity and notable experience of international agreements, since it had already concluded 15 bilateral fishing agreements. Since its accession to the EC its participation in various international agreements has gradually involved Spain in Community diplomacy, in which it naturally plays an active role.

Under the auspices of the EU, Spain has also concluded a variety of fishing agreements with third countries. While these have resolved the problem of access to those countries' EEZs, some problems of the management of such access and the business side of such agreements remain.

Spain also participates in the work of various multilateral bodies, either as a member in its own right (ICCAT, CCAMLR, IWC and regional bodies belonging to the FAO) or as an EU Member State (in bodies such as NAFO, IBSFC and NASCO, which manage the exploitation of deep-water fishery resources).

Finally, Spain, as a Member of the EU, participates in managing the Community's waters, although initially it does not yet have full access since its fishing industry will not become fully incorporated in the EU until the year 2002. Recently the date of complete incorporation has been advanced to 1996. The incorporation process has entailed a major reconversion of the fishing fleet over the past few years, generally to the satisfaction of all concerned.

Management instruments

The basic management instruments used by the Administration are: TACs, licenses and technical measures. However, depending on exploitation methods and fishing zones, one or the other type of instrument usually has more relevance.

The TAC (Total Allowable Catch) has been implemented by the EC since the Haya Council in 1976. Since 1986, Spain has been participating directly in the application of this mechanism. Initially, the philosophy of this instrument was basically biological. To assure the preservation of a fish stock, a limit to possible annual catch was implemented. Every year the EU’s Administration (after considering the opinion of the experts) establishes a TAC for every regulated species. After the global TAC is established for a species and for a geographic area it is distributed among countries of the EU, and finally inside the countries each administration distributes, depending on its own criteria, the corresponding quota within the industry.

The Spanish administration does not normally distribute the annual quota, but in some cases, as the "300s fleet" the access to these catches is distributed by the means of a fishing coefficient, countervailing fishing days. In case of TAC depletion, before the conclusion of the assigned fishing days, the SGPM closes the fishery and the remaining days are lost. Spain's own internal distribution, for this fleet, is done from a historical basis to the fishers who in the past fished these species and in those areas, through the assignation of the fishing coefficients, that are allocated among the vessels according to the access coefficient given to each of them in 1986. However, the coefficient may be enlarged by the reduction of fishing vessels within a firm or association, or by buying vessels to scrap them and acquire their coefficient. Moreover, within the bimonthly fishing plans where coefficients are allocated, fishing days may also be bought from other vessels.

The licenses enable the implementation of limits to the fishing activity through a census which takes into account the gear, fishing area and species. There are many forms of licenses, for example the periodical fishing permissions. In Spain, the fishing authorisation must be registered and obtain the *rol* from the marine authorities. Both the registration and *rol* are linked to the need of a specific authorisation to change gear, because they are only given for a specific fishing gear. The licenses mean the obligation to adopt determined technical measures specific for each case (size of the mesh, size and number of fish hooks, etc.). Lately, the licenses system has been closely tied with the census and the Pluriannual Orientation Plans (POP) of the EU for the fleets reduction.

Long before joining the EC, Spanish management was based on the application of measures on effort restriction and technical measures. There are many kinds of technical restrictions on effort and technical measures, the most important are:

- The minimum size of the captured species is vital to insure the sustainability of their exploitation. This is related to the fishing gears and the commercialisation. Relative to the fishing gear this implies the need of minimum size of mesh and fish hooks.

- The identification of closed areas is needed to prevent the capture of alevins or to protect the reproductive stock. These areas can be specific for determined gears (trawl, etc.) or for all of the fishing activity (natural reserves). The closure throughout the year (either for specific gears or for all) also contribute to assure the reproduction process.

- In inshore fishing, the time limits and fishing days is another important element of effort control.

Finally, there are technical market measures. These intend to complement management objectives. The possibility of application is related to the centralisation of the markets. In the market it is possible to monitor size of species, time of work, kinds of species, quantities of discharge, etc.

The application of the former regulations is guaranteed by the Administration through control and supervision mechanisms. The Rule CEE 2847/93 contemplates the captures control through a series of documents (diary on board, discharges' declarations, sales notes, transportation documents, etc.), which are supervised by the SGPM. For the supervision at sea the SGPM has the support of the Ministry of Defense, which is complemented by an inspection personnel of its own. There is a EU program which will enable both the SGPM and the Autonomous Communities to have their own means for the supervision and control at sea. Finally, the system of sanctions is administered by the SGPM, from the Ley 53/82. The Autonomous Communities have the right to sanction within the areas of their competence.

Outcome

System characteristics

The actual application of the measures described above cannot be simple. All kinds of technical, social and consensus considerations must be taken into account. We shall attempt here to assess the extent to which measures can be implemented, the time required and the final cost.

The application of regulations may be speeded or delayed by various mechanisms (based on conventional management). It is important to explain how the industry can be brought to accept new regulations, and to describe the various procedures (on the social as well as the legal front) that can contribute to acceptance and compliance. Success depends on the pace at which regulations, once enacted, are applied.

It is important to assess the cost of implementing fisheries policies (e.g. monitoring, information, etc.). The social benefits gained by applying the regulations should be proportionate to the cost involved.

The complexity of Spain's fishing industry calls for a very wide range of regulations. Their successful application depends on the involvement, at the regional and local level, of government departments and of the fishers themselves. In other words, on a genuine sharing of responsibility: monitoring on the one hand, compliance on the other. The system therefore has to be assessed in light of the extent to which fishery regulations are complied with.

Table 2. Spanish general technical restrictions on effort

Gear	All fisheries	Additional measures in Mediterranean Sea
Trawl	minimum mesh 40 mm[31] GRT minimum 35	allowed > 50 m depth[32]
Purse seiner	minimum mesh 14 mm[33] net length 450 m GRT minimum 20	allowed > 50 m depth[34] net length 300 m
Longline	maximum cable 10 Km[35] max. fish hooks 4 000 by ship	maximum cable 7 Km[36] max. fish hooks 3 000 by ship
Surface longline for Derbio	maximum cable 25 Km.[37] max. fish hooks 10 000	
Surface longline for swordfish	maximum cable 60 Km.[38] max. fish hooks 2 000	
Gillnet *(Volanta)*	minimum mesh 90 mm[39] net length 5 Km. max. altitude 10 m.	minimum mesh 50 mm[40] net length 2 Km.
Driftnet	prohibited	net length 2,5 Km. one by ship[41]
Large-mesh seine *(Arte claro)*	minimum mesh 100 mm[42] net length 330 m. max. altitude 25 m	

Application of policy instruments

We shall consider here (b.2) the global outcome of the management instruments used by the Administration: TAC, licenses, technical measures on effort and technical measures on market. Afterwards, (b.3) we shall consider in more detail the results according to the types of fisheries in which the above mentioned instruments have been implemented.

31 Order of 30/7/1983. It regulates the fishing activity with the gear of "Bottom trawl", inside the national fishing ground in the Cantabric and Northeast Coast (BOE num 192 de 12/8/1983).

32 RD 679/1988 OF 25/6/1988, BOE num 160 of 5/7/1988.

33 RD 2349/1984 of 28/11/1984, BOE num 5 de 5/1/1985.

34 RD 2349/1984 of 28/11/1984, BOE num 5 de 5/1/1985.

35 Order of 30/7/1983. It regulates the fishing activity with gears of "longline" in the national fishing ground.. (BOE, num 193 de 13/8/1983).

36 RD 1724/1990 of 28/12, BOE num 4 de 4/1/1991.

37 Order of 18/1/1984. It regulates the fishing with the gear of "Surface longline". (BOE num. 51 de 29/2/1984).

38 Order of 18/1/1984. It regulates the fishing with the gear of "Surface longline". (BOE num. 51 de 29-II-1984).

39 Order of 30/6/1983, It regulates the maritime fishing with gears of "Gillnet". (BOE num 191 de 11/8/1983).

40 Order of 15/4/1969, It regulates the maritime fishing with gears of "Gillnet". (BOE num 22 rect 3/5/1969).

41 Order of 22/9/1990. It regulates the prohibition of the use of gears of drift and regulates the employment. (B.O.E., num 255 de 24/10/1990).

42 Order of 30/7/1983. It regulates the "Large-mesh". (BOE num 200 de 20/8/1983).

The TAC system used in the EEC's Atlantic Ocean for species such as hake, anglerfish, megrim, anchovy, Norway lobster, pollack, blue whiting and horse mackerel. Even if the TAC regime shall, in theory, facilitate the control tasks (fisheries closure when it is about to be exhausted), in practice it has shown to be greatly insufficient both for control and pursuit problems and because such a simplistic exposition not only fails to attend to the multi-specific nature of some fisheries but it also aggravates the problems of discards. For example, it is difficult not to fish beyond the assigned Spanish hake quota in area VII when in the same area megrim and Norway lobster are also being fished.

Moreover, the fact that the TACs are being fixed on a one year basis instead of longer periods of time, makes it more difficult to manage and to adopt an adequate structural policy of the sector. The actual system has only resulted in partial solutions and it has not frequently been able to prevent the aggravation of the socio-economic problems. This comes from not taking sufficiently into account the complex relationships between the resources, the structures, the markets and society itself.

In the case of the "300's fleet" fishing in EEC waters the system in place allows the most efficient vessels to function for longer periods of time thus encouraging technological renovation and the intensive use of capital. The adoption of a TAC system has not caused competitiveness problems in the medium term, but it has allowed a more gradual reconversion, which is probably not over yet, in which the effort (capital) is matched to the stock possibilities, minimising the social costs of sudden reconversion processes.

The system of licenses, is applied by the means of a fishing authorisation system through the *"Capitanias de Puerto*". In order to be allowed to fish any fishing boat must:

- be included in the 3rd list. To this end, its inscription must be accepted in a central register and in the local register of its base port.

- be accepted in a fishing census authorising it to exclusively operate with a specific fishing gear in a given fishing ground.

- Obtain a *"rol"* in the *"Capitania de Puerto*" in order to check the fulfillment of the above, also to ensure that the boat abides to the appropriate technical and legal conditions such as the state of the engine, the crew number, etc.

- Periodically be dispatched to sea before leaving the port through the appropriate inscription in the "rol".

This system of licensing has stabilised the situation and refrained the growth of effort. In addition the total census of the Spanish fishing fleet, which identifies vessels, its owner, the fishing methods and area, the vessel's characteristics (power, GRT, size, etc.) and the fishing gears for which it has authorisation, has been completed.

The implementation of an EEC system of licenses in 1995 will, with no doubt, be very positive and will complement management based on the TAC system. The pressure on catches is always due, in the end, to excessive effort and its limitation will permit a less difficult adjustment. The new instrument which has been approved by the EU (Instrumento Financiero para la Reorientación de la Pesca - IFOP) will allow a process of retirement of vessels in parallel with license implementation.

The system of licenses and authorisations has been strictly linked to the implementation of the EU's Pluriannual Orientation Plans (POP). From 1986 to 1993, the POP has enabled the retirement of part of the fleet with an approximate total of 1 400 vessels retired (223 vessels in 1993), the modernisation of 1 942 vessels (225 vessels in 1993) and the building of 842 (96 vessels in 1993). This process is viewed to continue during the following 6 years throughout the IFOP which increases considerably the funds assigned to this restructuring process: the POP (1986-1993) meant for Spain around 250 million ECU while the IFOP will mean 1 105 million ECU for the period 1994-1999.

Several types of technical measures on effort have been implemented with diverse results. Artificial reefs have served as a dissuasion method for certain gears (trawl). The greater number of inspections has risen the level of compliance of the technical measures. Fishing declarations still present some ambiguities and deficiencies and they will require a cross-check with landing declarations, sales notes etc., which have not been computerised yet.

The measures of technical control tend to be directly controlled by the administration itself when relative to the industrial fisheries, but in the case of coastal fisheries the control by the sector itself through the fishing community plays a very important role for its high efficiency. This sector is disperse in the territory and very numerous, so an exhaustive control by the administration in these fisheries is too costly.

Lastly we shall consider the complementary technical measures on markets. Since the Spanish adhesion to the EC, other species of fish have become newly regulated in the EU markets: anglerfish, megrim, derbio, ox crab, Norway lobster, hake. The control through the markets of landings and sales (together with the diaries on board and the transportation documents) will enable the control of the TAC compliance and further knowledge of the stock. Nowadays, and due to the process of international trade liberalisation (GATT agreements) and the intra-community trade (consolidation of the EU's Common Market), there is a lower control of fishing trade. Thus, in the EU uncontrolled imports from third countries is rapidly rising (especially from Eastern Europe) and the sanitary and quality controls have diminished. Consequently, there is a distortion between the control on internal catches (in the ports of EU's member States) and the permissiveness towards external production (smaller sizes, uncontrolled fishing while the EU waters are ruled by criteria of responsible fishing). This unbalanced situation makes necessary a deep restructuring of the market control measures for them to be fully operative as part of resource management.

The Spanish Administration (SGPM) is standardising in sale-places concessions "lonja" to ensure a higher rigour in the first sales process. At the same time control of trade channels has been spread to all the country, both the first sales and the intermediate agents which deal with imported products, to ensure that there is no sale of banned products, to verify the products' technical and sanitary characteristics (freshness, conservation components, freezing quality, etc.) and to assure the compliance with international fishing agreements.

Outcome of management in different fishery structures

Spanish fishing activities cover a very broad range. The distinction has already been drawn between deep-water and inshore fisheries, but each of the two categories encompasses a wide variety of methods. For the purpose of this study we can classify them in four broad typologies: inshore fisheries, fishing in EU waters, fishing in international waters and fishing in third countries' waters. In each of these groups management has had specific peculiarities which we shall separately discuss.

Inshore fisheries

The inshore fisheries account for the large majority of employment in the fishing sector. Very different types of gears are being used but among them the trawl and purse seine are specially relevant because of their productivity. Basically, the management of these fisheries is done through the system of licenses.

The results of this sector are shown in Table 3 in which the fleet dimension is considered both in 1984 and in 1992. The total catches registered by the SGPM in the landings are not separated by gear. The aggregated total catch in 1984 was 694 847 tonnes, while it decreased in 1992 to 581 801 tonnes. For the purpose of this study we have associated an estimated catch to each gear, considering that pelagics are captured by purse seine and demersals are captured by trawl. With regards to surface gear catches it is supposed that their evolution is a percentage of total catches and they are compared to an index number with base 100 in 1984. Surface gears include fishing vessels smaller than 50 GRT, which are not either trawlers, or purse seiners.

Table 3. Inshore fisheries evolution

	Years	Ships	GRT	HP	Crew	Catch
Trawl	1984	2 527	231 193	918 025	26 957	255 969
Trawl	1992	1 520	159 564	895 496	20 464	264 648
Trawl	%	-39.85%	-30.98%	-2.45%	-24.09%	+3,4%
P-Seiner	1984	2 006	94 654	457 020	25 612	438 878
P-Seiner	1992	707	32 927	256 471	13 016	317 153
P-Seiner	%	-64.76%	-65.21%	-43.88%	-46.18%	-18%
Surface	1984	12 097	61 710	452 612	34649	100
Surface	1992	14 487	91 808	789 733	61 850	84
Surface	%	19.76%	48.77%	74.48%	78.50%	-16%

We are able to evaluate the impact of the inshore fisheries management, which is managed by the SGPM, through the following indicators: Catch/HP, Catch/GRT; Catch/Ship and Catch/Crew. Table 4 shows the evaluation of those indicators in 1992, assuming base 100 in 1984.

Table 4. Evolution of productivity under the management instruments in the inshore fisheries

(Base 100 in 1984, is considered in all cases)

	Catch/Ships	Catch/GRT	Catch/HP	Catch/Crew
Trawl	172	150	107	136
Purse-Seiner	205	208	129	142
Surface	70	56	48	47

The conclusion which can be drawn from the application of management instruments is, referring to the most important types of gear, the fact that there has been a real effect on the increase in both efficiency and productivity for both trawling and purseseining fleets. They are the most efficiently regulated inshore fleets, obtaining the largest production. Instead, regulatory systems appear to have failed to correctly manage the artisanal inshore fleet, which shows an apparent productivity decrease down to a half of that obtained in 1984. Several explanations exist:

– The fleet census are much more performant now and detect fishing vessels which did not use to be "known" by the fisheries Administration.

– The existing strong control on the trawling and purse-seining fleets encourages to expand investments to less regulated fleets, which are also more difficult to control.

– The general situation of loss of employment in the Spanish State, encourages the incorporation of new crew in the small family fishing units, which had 4 crew members in 1992, up from 2 in 1984. This is a mechanism to ensure a social protection system to unemployed workers from other sectors.

– Is some cases, artisanal fleets that used to operate in third countries' waters close to Spain (Sahara for the Canary Islands, Morocco for Andalucia, etc) might have entered national fishing grounds because of increase of regulatory measures in external waters.

Whether the case, this is a long-term unsustainable situation that challengers the management systems, given that the regulation of other inshore fleets might turn ineffective if artisanal fleets continue to expand in the Spanish national fishing ground.

Spanish fisheries in the EU waters

When Spain and Portugal joined the EC, the consequence for the fishing sector was a 36% increase in ships, 70% in fishers, 20% in catch and 27% in exports. One of the most difficult aspects of this incorporation was the regulation on the access to Community waters. The Adherence Act to the EEC in 1985 included a series of transitory conditions for Spain to be able to fish in the Community waters. It established a base list of 300 Spanish vessels which were allowed to fish in Community waters and only 150 of which could fish simultaneously. Furthermore there were areas closed to the Spanish fleet, such as the North Sea or the "Irish Box". The restrictions include catches regulated by TAC. In this type of fisheries there are high seas trawl fleets and long-line fleets of more than 100 GRT and they operate in the limits of the geographic area of the North Atlantic Fisheries Committee (NEAFC).

Apart from the lists mentioned above, there were other lists of fishing vessels allowed to operate in specified fisheries. These included the rod vessels with less than 50 GRT and the tuna, derbio, sardine and anchovy fleets. From 1986 to 1992, there were 1 285 of these specialised vessels.

The Spanish TAC quota in the Community waters is a percentage, for each species and area regulated, of the total TAC established every year by the Council.

Table 5. Spanish TAC quota in EU waters

Species	**CIE Divisions**	**Spain % of TAC**
Hake (Merluza)	Vb,VI,VII,VIIIab	30.00
Anglerfish (Rape)	Vb,VI VII VIIIabd VIIIc,IX	3.85 3.67 15.23 83.33
Megrim (Gallo)	Vb,VI VII VIIIabd	11.36 30.00 55.33
Norway Lobster (Cigala)	Vb VII, VIIIab VIIIc	0.0 6.00 96.00
Pollack (Abadejo)	Vb, VI, VII VIIIab VIIIc	0.20 17.00 90.00
Anchovy (Boqueron)	VIII	90.00
Sole (Lenguado)	VIIIab VIIIcde,IX,X, Cop	2.63 37.75
Blue Whiting (Bacaladilla)	Vb,VI,VII,VIIIabd VIIIc,IX;X,C	30 000 t 8 000
Horse Mackerel (Chicharro)	Vb,VI,VII,XIV,VIIIabde,XII, VIIIc,IX	31 000 t.
Whiting (Merlan)	VIII	40.00
Plaice (Solla)	VIII, IX,X,Cop	17.14
Mackerel (Caballa)	II, Vb, VI,VII,VIIIabde,XII,XIV VIIIc,IX,X,Cop	0.01 82.41

The TAC assigned to Spain is a percentage of the total TAC established for each area except for two species which are regulated by a TAC but do not have a fixed quota; for those a fixed access to 30 000 tonnes of blue whiting and to 31 000 tonnes of horse mackerel has been assigned to Spain.

The regulation through TAC management has, in general terms, resulted in stabilised catch and the adjustment of the Spanish fleet to the catch possibilities. The trawl and long-line fleet which worked in Community waters in 1981, before the adherence to the EEC, consisted of 416 vessels. It came down to 300 in 1986 and nowadays it has been reduced to 259 vessels operative fleet (BOE num. 88, 13 April 1994). This process has enabled , from 1986 to 1992, a reduction of 14.70% of GRT and 9.89% of HP. This tendency is being maintained and it implies, in a stable TAC context, an increase in efficiency and productivity per vessel, per investment on effort (GRT, HP, etc.).

The internal readjustment of the 300's fleet (vessels larger than 100 GRT) has been mainly realised in Spain through market mechanisms. The procedure has been achieved via the transference of fishing rights between the fishing industries. In practice, the access to TAC quota is distributed under historical criteria in the form of fishing days and then it becomes possible both to "acquire" (or its accumulation within an association or firm) a vessels' fishing rights (buying it and then retiring it). The whole process has led to the reduction of the number of vessels and to an increase in the rate of use of the remaining capital. The adjustment has been smooth because those who give up fishing receive a certain compensation to renounce to their rights.

However, in the TAC system some problems which are nowadays being discussed in the EU still remain. The following are examples of these: the remaining pressure on the resources which seem to be, in some cases, still overexploited; the fact that in practice the TACs are being surpassed; the fact that even if theoretical effort is kept stable (number of fishing days, operative vessels, etc.) the fishing capacity of the fleets keeps growing because of technological changes, etc. Consequently, there is still the need to keep monitoring the management system, correcting it and improving it within the framework of the European Union's Fisheries Common Policy.

Spanish fishery in international waters

Only a very small share of fisheries are to be found in waters outside the sovereignty of any country. In these few cases, management is carried out under multilateral agreements between the different countries having fishery interests in the relevant area. In some of these organizations the individual EU Member States are party to the agreements, while the Commission acts as a mere observer. Spain participates in various international organizations of this type, such as ICCAT, CGPM, the Paris Agreement on Svalbard, etc. In other cases, such as NAFO and NEAFC, it is the EU Commission it self which is party to the Convention.

Spanish fishing vessels operating in international waters are required in every case to hold a temporary fishing permit. This applies to all vessels operating in the NAFO area, in Svalbard, to long-liners fishing for swordfish in the high seas, as well as to freezer trawlers operating in the open seas.

During 1993, nine observers were assigned to the NAFO Regulatory Area, all of which supervised compliance with the Convention terms by Spanish fishing vessels. Eleven cod-fishing pairs plus twelve freezers operated under the terms of the multilateral agreement. Twenty-four bioeconomic campaigns were carried out in the Greenland area.

During the 1993 fishing campaign (July-September), Spain assigned a fishery inspector to the Svalbard area (areas I and IIb), in order to supervise the activities of the twenty Spanish vessels fishing for cod in that region.

As regards the long-line fishery for swordfish (subject to ICCAT regulations), it is to be noted that 119 temporary permits were distributed among 46 vessels in 1993. Such permits were valid for three months in the case of vessels operating on fresh fish and six months in the case of freezer vessels.

Freezer trawlers obtained 77 temporary fishing permits for the open seas in 1993, 71 of which were for South west Atlantic waters.

As a rule, the fishing effort of Spanish fleets in these waters is subject to strict control, in order to adapt it to the limits established by the relevant multilateral organizations. This has implied a significant restriction on fishing effort. The efficiency of management policies cannot be assessed from the position of every single country which is party to the relevant agreement, but from an analysis of the overall results obtained from the regulation of an area managed by a multilateral organization. One of the main problems addressing these organizations at present lies in the presence of vessels flying the flag of countries which are no party to multilateral conventions relating to international waters, i.e., the problem of flags of convenience.

Spanish fishery in third country waters

A substantial share of Spanish fisheries are carried out in waters subject to the jurisdiction of third countries, in the framework of bilateral agreements. In these cases, it is the EU which is party to the relevant agreement, since it is the Union which negotiates, signs and supervises the bilateral fishery agreements. It is the Union rather the Member States which manages fishery agreements and makes decisions to preserve the fishing grounds obtained through the fishery agreements, to which end in such agreements measures for the conservation and management of resources are established .

Out of the 17 fishery agreement that are in force at present in Spain, 16 were signed by the EU and only one the agreement with South Africa retains its bilateral character. To operate under any of these agreements, Spanish vessels need a temporary fishing permit issued by the Spanish central Administration, besides complying with the terms and conditions established in the relevant agreement as to fishing gear, fishing period, catches, sizes, etc, and further to community regulations.

Where no fishery agreement exists shipowners can conclude a private agreement with the authorities of the country where they want to operate, but in any case they need a temporary fishing permit from the Spanish Administration.

The assessment of management in third-country waters pertains primarily to those coastal countries, which, when renegotiating the agreement, will take into consideration the results deriving from the exercise of the fishing effort agreed upon in the previous time periods. It is the responsibility of the EU to ensure, with the help of Member States, compliance with the terms and conditions of the agreements. In any case, it is not entirely realistic to consider that such agreements are based exclusively on an analysis of the state of resources, of capacities, etc., i.e., that these are the only factors influencing agreements that establish a price or counterpart to access to resources. Often, geopolitical, social or commercial considerations carry a greater weight, so that a purely economic analysis is not enough to understand such agreements.

PART III: ANALYSIS

Explanation of the outcomes

In the preceding sections we described the type and scale of fisheries management problems, of which the main ones are:

- Adjusting fishing effort to access levels which are set in light of the biological situation of the stocks, after due consideration to the economic and social impact.
- Striking a balance and ensuring fair access to resources and to markets.
- As a Member state of the EU, helping formulate the common fisheries policy with a view to harmonise and co-ordinate action on resources, markets and structures.
- Upholding the principle of Community preference.

- Reviewing management methods in light of the new instruments provided for in Council Regulation (EEC nº 3760/92), taking care not to block the competitive and efficient development of the sector, and in particular that of deep-sea fishing fleets.

- Ensuring that the Spanish Fleet, in exploiting resources in a rational and responsible manner, should not be penalised by irresponsible failure on the part of other countries' fleets (and in particular deep-sea fishing fleets) to internalise their costs.

- Reconciling fishing industry interests with integrated development of coastal areas (aquaculture, leisure pursuits, etc.).

- Safeguarding competitiveness and transparency and thus the regular supply of fisheries product markets. This means devising mechanisms:

  - to ensure competitive prices;
  - through pricing policies or administrative measures, to discourage unfair competition from industries which do not internalise resource conservation costs.

- Ensuring transparency and competitiveness as regards access not only to resources but also to the Spanish market, so as to avoid distortions prejudicial to the interests and profitability of the Spanish fishing fleet.

As regards the need to adjust fishing effort to the established levels of access, it can be said that the Spanish fishing fleet has not only put an end to its expansion but has reduced its size in order to adapt it to the fishing opportunities present in the seas where it has been operating. This reduction in the number of vessels, engine power and GRT has been made possible through the management policies employed by the Spanish State, combining various control measures in accordance with the local traditions and institutions and having in mind the Community acts and regulations.

This adjustment process has led to a more adequate pressure on resources, so that the relative efficiency of fishing vessels is enhanced and catches per unit of effort are increasing.

This process, however, has implied a decline in the number of jobs in the industry as well as a loss in existing production capital. All this has generated a certain amount of resistance, which has been overcome by policies of compensation by the Spanish or Community Administrations.

In spite of the difficulty in solving the problem of externalities generated by free-access fisheries, which implied not only the immediate destruction of employment and capital but also a structural increase in costs because of the incorporation of such exernalities into direct costs, the Spanish fishing industry has been able, as a rule, to adapt itself to the new situation and maintain its competitive capacity in both national and distant fisheries.

Both the Spanish and the Community Administrations are conscious of the need to adapt fishing activities to the existing possibilities if the survival of the industry is to be safeguarded, even when this raises problems in the short run. In this way we may explain the support for the notion of "responsible fishing" that Spain is helping to formulate in the framework of the FAO. The process of fishery regulation is considered to be both necessary and irreversible.

In this context, fisheries management is expected to improve in the near future by means of the improvement of Technical Management Measures, among which the following are to acquire greater relevance as from 1 January 1995:

- The establishment of a license regime for all Spanish fishing vessels.
- The establishment of a permit regime for certain fleets.

Theory and evidence

We analyse in this study the Spain's fisheries management regime. To sum up:

- Spain, with its long experience of managing marine resources, has been able to find ways of regulating fishing activities and improving their efficiency.

- In the early 1980s, Spain proceeded to adapt to the realities of EEZ. Structures were modified in order to promote the rational and responsible exploitation of resources, and mutually advantageous agreements with third countries, providing for regulation of access, were signed.

- Since joining the EC in 1986, Spain has striven to bring its system into line with the CFP. Spanish vessels operating in Community fishing waters now have to comply with the Plan's specific requirements.

- The Spanish fisheries management system is complex, allowing for various adaptations to suit the particularities of each fishing activity. Administrative services at various levels (Community, central, regional and local government) co-operate with representatives of the industry in setting up machinery for the sharing of responsibilities and on-going adaptation. Despite some tensions, these efforts are paying off. Better management has contributed to greater stability of fishing activities, in particular in Spain's own EEZ.

Theoretically, in order to adapt the catching possibilities of the fishery industry to resource availability it should be enough to reduce effort to an adequate level. As mentioned earlier, this has been basically achieved, with the ensuing positive effects. But at the same time, other related problems have arisen which must be duly addressed through the management instruments. Four of these problems, evidenced by the practice of Spanish fisheries, are outlined in the following paragraphs.

First of all, the continuing increase in fishing capacity, in spite of the freezing or even reduction in effort, should be mentioned. In order to understand this problem, a distinction should be drawn between fishing effort (number of vessels, number of fishing days, engine power, etc.), on the one hand, and the fishing capacity of every effort unit, on the other. Even when restricting the number of vessels, the engine power or the gross registered tonnage, all fishing fleets are still increasing their fishing capacity per effort unit owing to improvements in technology, so that pressure on resources continues to be high. This implies the need, in certain cases, to reduce effort to a level adequate to the maintenance of resources. This amount of reduction, while lower than that deriving from the previous adjustment, makes it difficult for fishers to understand the appropriateness of management policies. Fishers may increase their opposition to management when they see that, when effort is adjusted, fishery resources are not recovering as expected.

The way in which this reduction of effort is being applied in the short term is resulting in a rapid ageing of the Spanish fishing fleets, in spite of the incentives given for modernization. Even if catching capacity increases along with technological change, thus creating problems for the resources, comparatively to non-regulated fleets, the Spanish fishing fleet may loose its competitive capacity owing to its rapid obsolescence. At present, 61 per cent of the vessels of the Spanish fleet, representing 42 per cent of its GRT, are more than 20 years old, while 34 per cent of the ships, representing 11 per cent of GRT, are over 30 years old. This high degree of obsolescence, deriving from the considerable curtailment in effort in recent years, is giving rise to additional problems of great relevance, such as:

- Loss of security on board fishing vessels;

- Loss of competitivity in the face of other countries' fleets which are not subject to such a radical curtailment of effort;

- Loss in the possibilities of improving the value of fish products (due to poor hygiene, quality, etc.);

- The maintenance of obsolete techniques harmful to the environment; which increase energy costs (engines); or which bring about otherwise avoidable mortality rates (scarce selectivity of fishing gear).

Mechanisms exist, both at the national and Community levels, to try to solve the contradiction between the restriction of fishing effort and the proper modernization of fishing fleets. The present situation of obsolescence, however, requires a new approach to the problem, as envisaged in the new Community instrument (IFOP).

Spain is a large market for fish products, its trade balance in these products showing a structural deficit. Following the philosophy of GATT, in order to avoid distorting the markets, Spain, together with the EU, tends to reduce tariff protection on this market as well. Nevertheless, imbalances and inequalities can occur in the fishing industry if the following two contradictions are not solved.

The opening-up of the domestic market in these products must be accompanied by the liberalization of access to resources. Distortions are not only brought about by import duties. Distortions also occur when protection and hindrance of access to catch rights prevents competitive access to resources. The Spanish administration maintains that in equal treatment should be applied to the liberalization of both types of markets. Otherwise, the Spanish productive sector would be at a disadvantage in its own market.

The increasing regulation of fishing activities can not be applied only to certain fleets, particularly in international waters. In the framework of responsible fisheries, the various productive agents must share in the equitable absorption of externalities Distortions deriving from the behaviour of those who do not assume these costs (flags of convenience) should be compensated for in other economic ways, in order to avoid distortions and imbalances in free competition. Only in this way is it possible to guarantee the correct operation of the market, both for consumers and the fishing industry.

SWEDEN

PART I: SYSTEM CHARACTERISTICS

Characteristics of the fishing sector

Physical characteristics of the Swedish coast

Sweden has a long coastline-almost 10 000 kilometers, a shelf area of more than 150 000 square km and about 100 000 lakes with an area of some 40 000 square km. There are also many rivers. The west coast borders on the Kattegat and the Skagerrak, and the south and the east coast border on the Baltic. The Baltic Sea with its brackish water has gradually become Sweden's most important fishing area. The principal species are herring, cod and sprat, but there are also salmon, eel, flatfish, and several freshwater species. There is a much greater variety of species off the west coast than in the Baltic. Generally speaking, most Atlantic species are represented in the western waters.

The role of the fisheries sector

The Swedish fishing industry has undergone several periods of changing viability due to variations in the state of the fish stocks, the market and the development of the Law of the Sea. The fishery sector is important in Sweden, more important than the catches may suggest.

In 1994, the Swedish fisheries sector employed about 3 500 professional fishers, including part time fishers which is a reduction of about 1 000 persons in the last decade. The decrease is largely due to the increased efficiency of ships. In addition there are about 2 500 persons employed in the fish processing industry. These parts of the sector together with the wholesale and aquaculture industry constitute a workforce of around 8 000 persons. If the ancillary and supplying industries are included the fisheries sector totals approximately 10 000 employees. The fishers are dispersed all along the coastline but with concentrations to some villages of the west coast and the southern part of the Baltic Sea coast. The processing industry are concentrated to mainly three sites, one on the west coast and two in the Baltic region.

GNP/capita amounted to 167 000 SEK in 1994. The contribution from the fisheries sector (in the first trading stage) to the total GNP was about 0.05 %. Seafood was attributed to 6.6% of the total Swedish food consumption in 1994. The consumption of fish and fish products was about 30 kg (fresh weight) per inhabitant.

On a national level the fisheries sector may appear to be of modest significance. However, on a regional or local level, the socio-economic dependence on fisheries may be considerable.

The characteristic features of municipalities highly dependent on fisheries are i.a.:

- industrial monostructure, i.e. most of the industry is related to fisheries and there are few opportunities for alternative employment;

- income level below that of Sweden in general;

- unemployment rate above that of Sweden in general.

In addition some areas also suffer from disadvantages connected with the demographic situation. These areas display a population density (0-21 inh./square km) below that of Sweden in general, which involves a limited home market, higher transportation costs, a lower degree of municipal services and sometimes generally higher living costs.

The Swedish government has expressed a wish to reduce the rate of depopulation in the archipelago and the coastal areas and preserve the rural fishing village heritage. One means of achieving this is to stimulate the development of the fisheries sector, which is a traditional source of occupation among the population of the archipelago and the coastal areas.

Legal framework

Practically all stocks exploited commercially by Swedish fishers are shared with neighbouring states and the TACs and other technical regulations are determined in bilateral or multilateral negotiations. As from 1 January 1995, Sweden is a member of the European Union and will apply all relevant regulations.

The National Board of Fisheries

It should be emphasised that the overriding aim of the Swedish fishery policy is the responsible management of living resources aiming at the food supply and the general prosperity.

In Sweden fishery issues are dealt with by the Ministry of Agriculture which is i.a. mainly responsible for policy issues, overall allocation of funds and international negotiations. The National Board of Fisheries is the central government agency for all fishery matters. According to its directives it shall among other things:

- Manage living resources in a responsible manner with a view to contributing to the Swedish food supply and general prosperity.

- Contribute to the formation of an efficient fishing industry and pave the way for an adaptation to and development into a free market.

- Take part in international negotiations.

- Work towards increased and adequate fishing opportunities for the public.

- Strive for a good balance between the interests of commercial fisheries and recreational fisheries.

– Support and undertake research and development.

– In line with its responsibility for environmental conservation within the fishery sector strive to create abundant and diverse fish stocks and a responsible fishery.

The National Board of Fisheries has authorised the County Administrations to carry out some specific tasks in the implementation of the national fishery policy.

Control

The Swedish Coast Guard is responsible for the enforcement of fishery legislation. Fishery is one of the tasks entrusted to the Coast Guard. Environmental protection duties are i.a. also the responsibility of the Coast Guard.

The licence system

Fishing licence has previously not been required for Swedish vessels fishing in the Swedish fishing zone. However, only licensed fishing vessels have been entitled to apply for and obtain state aid (loans, grants etc.) as well as permission to fish in foreign fishing zones.

As from the entry into force of a new fishing act (1993:787), 1 January 1994, only licensed fishers will have the right to fish professionally. Furthermore, as from 1 September 1994, vessels of 5 metres and above may only be used in professional sea fisheries if they have been granted a vessel permit. Vessel permit may only be granted to fishers in possession of a personal fishing licence and only for vessels registered in the Swedish Shipping Register. (Fishing vessels of 5 metres and above are registered in the Shipping Register).

Resources and landings

In general terms the pelagic stocks (herring and sprat) both in the Baltic Sea and in the western waters are abundant. The demersal stocks (mainly cod) on the other hand are very weak both in the Baltic as well as in the Skagerrak and the Kattegat. In the Skagerrak-Kattegat area the state of stock as concerns nephrops is not very clear. We have here a lack of sufficient biological knowledge. The stocks of pandalus borealis (prawn) in the North Sea as well as in the Skagerrak are rather good.

Traditionally the Swedish commercial fisheries have been heavily dependant on the fisheries for herring. This is due to abundant herring stocks in the Swedish waters both in the Baltic and in the western waters. Swedish fishers have also historically fished herring in the North Sea and around Iceland. In 1962, Swedish fishers caught 129 540 tonnes of herring, 14 600 tonnes of mackerel and 10 970 tonnes of cod in the North Sea. At the end of the sixties the Swedish fishing industry had a financial crisis mainly due to weak stocks of the North Sea. The North Sea was divided into zones in 1977. In 1978, Sweden established a fishing zone in the Baltic. From than on the Swedish fishery in the North Sea has been due to very severe quota restrictions.

The market for herring both in Sweden and in other North European countries has also historically been fairly stable. Due to changing consumer preferences the demand for herring both in Sweden and other countries have gradually decreased. When the fishing for herring in the North Sea was reopened in the beginning of the eighties the supply increased gradually with dropping market prices as an immediate consequence. The Swedish fishers adjusted themselves to this changing market situation by increasing the fishing for cod. Due to a favourable biological status of the Baltic cod stocks it was possible for the Swedish fishers to rapidly increase their cod catches.

As can be seen from Table 1 below, in 1984, cod passed herring as the most valuable single species in the Swedish fishery. This positive development both as concerns the total value and the dominant position of cod culminated in 1990, when more than 50% of the total income of the Swedish fishers was attributed to the cod fishery. Due to dwindling cod stocks in the Baltic the Swedish fishery now faces great economic difficulties. In 1992, there was an income drop of about 150 million Skr (17%). The herring fishery has stabilised at around 15% av. the total value. The drop of the herring and cod fisheries has partly been offset by fishing for industrial purposes. This is however no remedy to the Swedish fishery as a whole as there are a very limited number of fishing vessels taking part in that fishery.

Table 1. Total value and the shares of herring and cod

Year	Total value, million Skr,	Of which Herring (for human consumpt.) in %, value	Of which Cod, in %, value
1983	681	36.8	31.8
1984	715	27.5	36.1
1985	713	25,0	35.7
1986	722	21.4	39.5
1987	746	15.5	42.4
1988	746	12.3	45.0
1989	749	14.9	43.9
1990	887	13.0	50.0
1991	892	15.3	45.8
1992	744	18.9	27.7
1993	740	15.2	20.5
1994	837	14.7	27.7

In 1994, Swedish fishers landed about 375 000 tonnes of fish to a value of about 837 million Skr. Herring, about 53 000 tonnes, and cod, about 27 000 tonnes, was the most important species for consumption. Next in order come Norway lobster and deep water prawn. However, a large part of the total catch, or about 270 000 tonnes, was intended for reduction purposes, that is for use in the production of fish meal, oil and animal fodder. The industrial catches consisted mainly of herring and sprat and was to a great extent caught in the Baltic Sea.

According to statistics from the FAO Sweden rated number 45 among the world's foremost fishing nations in 1990.

Freshwater fishing

In quantity, Swedish freshwater fishing is small in comparison with deep sea fishing. There is a total catch of about 2 307 tonnes of fish, estimated to value about 35 million SEK. Almost 80% of the catch is taken in the four largest lakes, that is Vänern, Vättern, Mälaren and Hjälmaren. There are about 350 freshwater fishers, but for about 100 of them fishing is only a complement to other occupations, often farming or forestry. The most important species in freshwater fishing is pike-perch. Other important species are vendace, European eel and Northern pike.

The fishing fleet

Definition of fishing vessel

In ordinance 1994: 15 (came into force 1 September 1994) of the National Board of Fisheries, "fishing vessel" is defined as: vessel used in fisheries or the handling of catches or otherwise used to assist the fishing fleet.

The fishing vessel register of the National Board of Fisheries will include all vessels of 5 metres and above that have been granted a vessel permit (i.e. are being used in professional sea fisheries). The register will not contain:

- vessels in inland fisheries,
- vessels < 5 metres in sea fisheries.

The definition of "fishing vessel" used in the past by Statistics Sweden has been: vessel registered as fishing vessel in the Swedish Register of Shipping. All fishing vessels of 5 metres and above have been registered in the Register of Shipping. As a complement to these data, Statistics Sweden has obtained additional information through questionnaires to the fishers.

Overall gross tonnage and engine capacity

In 1993, there were 1 864 registered fishing vessels > 8 metres in the Swedish fishing fleet, of which 526 vessels > 12 metres and 1 338 vessels 8-12 metres. The number of vessels 5-8 metres is only available for 1985 and 1990: 3 422 and 2 725 vessels respectively. In the tables below the development of the Swedish fishing fleet is described. As can be seen the Swedish fleet reach a peak in 1991 both measured in GT as well as in kW. Since than there has been a gradual decrease of the capacity.

Table 2. Number of registered fishing vessels, seawater and freshwater fisheries
(length in meters)

Year	5-8	8-12	12-	Total	Total 8-
1985 (freshw.)	3 422 (522)	1 286 (55)	527 (1)	5 235 (578)	1 813
1990	2 725 (175)	1 103 (53)	530 (1)	4 358 (229)	1 633
1991	2 725 (175)	1 248 (63)	557 (2)	4 530* (240)	1 805
1992	2 725 (175)	1 287 (62)	548 (2)	4 560* (239)	1 835
1993	2 725 (175)	1 338 (62)	526 (2)	4 589* (239)	1 864

* estimate

Table 3. Total gross tonnage (GT) and engine power (kW), registered fishing vessels by length groups, seawater and freshwater fisheries

	5-8 mtrs		8-12 mtrs		>12 mtrs		Total fleet	
	GT*	kW*	GT*	kW	GT*	kW	GT*	kW*
1985	4 315	6 5323	8 863	79 711	51 955	162 794	65 133	307 828
1990	3 565	6 3678	7 594	80 061	52 252	182 523	63 411	326 262
1991	3 565	6 3678	8 589	91 029	54 839	192 488	66 993	347 195
1992	3 565	6 3678	8 861	94 272	53 950	189 500	66 376	347 450
1993	3 565	6 3678	9 218	96 670	51 778	178 825	64 561	339 173

* estimate

Table 4. Total gross tonnage (GRT/GT and GT) and engine capacity, registered fishing vessels 8 metres and above, seawater and freshwater fisheries

	Total GRT (GRT/ GT)		Total GT*		Total kW		Total vessels 8 m and above		
Year	8-12 m*	12-m	8-12	12-	8-12	12-	GRT*	GT*	kW
1985	8 863	36 363	8 863	51 955	79 711	162 794	45 226	60 818	242 505
1990	7 594	44 044	7 594	52 252	80 061	182 523	51 638	59 846	262 584
1991	8 589	48 340	8 589	54 839	91 029	192 488	56 929	63 428	283 517
1992	8 861	47 510	8 861	53 950	94 272	189 500	56 371	62 811	283 772
1993	9 218	44 588	9 218	51 778	96 670	178 825	53 806	60 996	275 495

* estimate

The fishing vessels are in general owned by the active fishers themselves, normally within a family company.

Fishing harbours

In Sweden, there are about 800 harbours where landings take place from time to time. The harbours are owned either by the local government or by the fishers in the form of an economic association. The importance of the different harbours varies pending the localisation of the fisheries. For many years Karlskrona and Simrishamn on the south-coast have been of great significance due to landings of cod from the Baltic. In addition, the Swedish fishers often land their catches in Denmark.

Table 5. The 20 most important landing ports in Sweden in 1993 (1989), quantity and value

	Human consumption tonnes		Industrial purposes tonnes		Value Million SEK	
Göteborg	1 684	(1 988)	12	(1)	61.5	(27.3)
Simrishamn	5 296	(9 026)	848	(1 615)	42.2	(41.2)
Smögen	1 888	(1 819)	2	(0,3)	42.1	(33.6)
Rönnäng	6 401	(1 321)	3 324	(2 069)	34.4	(9.6)
Ängholmen	1 648	(386)	40 665	(13 276)	32.4	(8.8)
Karlskrona	2 802	(22 920)	857	(224)	27.6	(137.3)
Öckerö	2 310	(4 473)	8 934	(13 768)	27.4	(30.0)
Strömstad	1 638	(1 423)	603	(373)	23.0	(16.6)
Träslövsläge	3 886	(2 597)	2 294	(5 726)	18.9	(12.3)
Trelleborg	7 110	(3 114)	967	(549)	15.2	(11.8)
Bua	1 798	(1 746)	1 131	(2 536)	13.1	(8.7)
Lysekil	1 746	(2 604)	1 143	(1 565)	12.0	(10.3)
Nogersund	2 079	(4 949)	247	(602)	12.0	(22.2)
Glommen	1 337	(1 156)	199	(846)	10.2	(5.1)
Skillinge	4 295	(4 971)	1 085	(634)	10.1	(19.2)
Västervik	1431	(4 958)	5 016	(1 214)	9.1	(20.4)
Grebbestad	329	(304)	-	(0,2)	8.0	(8.7)
Hörviken	1 778	(1 793)	41	(45)	8.0	(10.2)
Sturkö	1 670	(4 535)	7	(91)	6.2	(13.2)
Hburgsund	216	(165)	2	(0)	6.0	(3.8)
Total 20 harbours	51 342	(76 248)	67 377	(45 134)	419.4	(536.2)
Danish harbours	20 000	(12 500)	143 000	(26 000)	221.0	(55.4)

Resources versus capacity

The TACs allocated to Sweden are, in general, not distributed among fishers in terms of vessel or fishing trip quotas. However, in the case of some stocks i.a prawn and cod, such regulations are applied on a voluntary basis by the Federation of Swedish Fishers. The National Board of Fisheries issues fishing bans when total quotas or the TACs are exhausted.

Up to 1992, Swedish fishers had not suffered under any serious prohibitions on fishing since the seventies. This is an indication that the Swedish fishing fleet has been fairly well balanced in proportion to available resources.

From 1992, and onwards a cessation of activities has been imposed on several occasions, for instance the prohibition of cod fishery in the Baltic during several months in 1993 to 1995. The deterioration of the cod stocks is a consequence of deficient management but in the Baltic also the result of environmental factors such as the salt and oxygen content of the water.

Exports/imports

In 1994, exports and imports of fish and fish products amounted to Skr 985 million and Skr 3 421 million respectively. The greatest part of the exports were canned fish but fresh fish, mainly direct landings were also important. In terms of value, exports to Denmark accounted for more than 40 per cent. The exports to the countries belonging to the European Union consisted mainly of unprocessed products but the exports to the EFTA-countries (Finland and Norway) were processed fishery products. About 40 per cent of the imports came from Norway and about 20 per cent from Denmark. Shrimp and salmon are important import products.

Fish processing industry

The Swedish fish processing industry has gradually decreased in size during the last twenty years. In 1970, there were 81 establishments but in 1991 they had decreased to only 50. During the same period more than a third of the employees had lost their jobs, leaving approximately 2 500 in 1993. The main product is different kinds of herring products. There is no doubt that this decrease can to a large extent be explained by the difficulties in the export sector, due to very unfavourable tariff conditions (on the EU-market).

PART II. MANAGEMENT SYSTEMS AND EXPERIENCE

System characteristics

In the Baltic Sea, Sweden exploits stocks which fall within the scope of the International Baltic Sea Fishery Commission (IBSFC) and it is within the framework of this body that both the TACs as well as the technical regulations are determined. The technical regulations cover a wide spectrum of regulatory measures i.a. mesh-sizes, minimum length, closed areas, closed seasons, gear restrictions. As Sweden is a member of the Commission all the relevant regulations are applied in the Swedish waters. Hardly no technical regulations are taken unilaterally by Sweden as concerns the fisheries in the open sea. However Sweden has applied a wide range of regulatory measures in the coastal waters in order to enhance the salmon stocks.

In the Skagerrak/Kattegat area the TACs, as well as the technical regulations has been determined in international negotiations with the other Parties concerned i.e. the EU and Norway. When Sweden now is a member of the EU all international negotiations are handled by the European Commission. The quantities available to the Swedish fishers are determined within the EU.

Management of the salmon stocks in the Baltic Sea

Baltic salmon has been severely decimated during the twentieth century owing to the expansion of hydroelectric power stations in the homing rivers. There used to be a natural occurrence of salmon in about 70 rivers round the Baltic Sea. Wild salmon stocks remain today in about 26 rivers (14 Swedish, 1 Swedish-Finnish, 1 Finnish and 10 in other countries).

A comprehensive compensation programme has been built up in Sweden for the damaged rivers as a replacement for the natural salmon production that has disappeared with the expansion of hydroelectric power stations. Salmon reproduction in these rivers is replaced through a programme of rearing salmon up to the size when release can take place (smolt). The rearing usually takes between two and three years. Today only one salmon in ten in the Baltic Sea is a wild salmon, while the rest are reared. Reared salmon has other genetic characteristics than those that originally were favourable in natural conditions. From having coped with river life for 1-4 years before migrating out to sea, the salmon has changed to a form partially adapted to rearing, with a modified genetic base. By artificially maintaining salmon stocks in the Baltic Sea at a constantly high level, salmon fishing has been able to continue and has even been intensified. Wild salmon is therefore caught to an equally great extent as cultivated.

Adult salmon remain in the Baltic Sea for their growth period. The longer it takes the salmon to return to natural spawning waters in the river, the more it is exploited. Estimates show that no more than a quarter of the potential production of wild salmon is utilised, which can be regarded as a waste of resources, in both the short and the long term.

Internationally determined catch quotas in the Baltic Sea, together with measures taken by the National Board of Fisheries in the form of closed seasons, closed areas, restrictions on the numbers, locations and design of the gears resulted in an increase of the wild salmon stocks from the end of the 1980s. The measures taken by the National Board was directed towards the coastal fishery where the right to fish belongs to the water-owners. These property rights have in same cases constituted an obstacle to some of the regulatory measures decided by the National Board. To a minor extent the National Board has bought the fishing-rights in some river mouths in order to create closed areas.

The situation deteriorated, however, when high mortality struck salmon stocks in 1992-93. The reason was the syndrome M-74 which has a detrimental effect on the survival rate of the juvenile salmon. This syndrome called M-74 (M=miljö, Swedish word for environment) has drastically reduced the survival of the yolk sac fries both in hatcheries and in naturally reproducing, wild stocks. There are strong reasons to believe an uptake of chemical contaminants by salmon females in the main feeding areas in the southern Baltic may be the underlying cause.

One decisive problem is that salmon is caught internationally. Even though its most important spawning rivers are in Sweden, and to some extent in Finland and the other states bordering the Baltic, it migrates to sea and can be caught as an adult all over the Baltic Sea. Swedish restrictions and efforts alone are therefore not sufficient. Swedish measures must be combined with reduced international exploitation of wild salmon in all areas. The strain on the Baltic Sea of environmental pollution is at the same time an international problem.

The International Baltic Sea Fishery Commission (IBSFC) has for some years regulated the salmon fishery in the Baltic with mesh-sizes, minimum length, closed seasons and TACs. As concerns Sweden it has been possible to keep the catches within the stipulated limits.

Outcome

The outcome of the salmon regulations in the Baltic is not very successful. The wild stocks are near extinction. The commercial catches have dropped and the tourist industry has problems in the marketing of their products due to lack of salmon in the rivers. The coastal fishers are also disappointed. The market price of salmon has dropped considerably but the reason is the increasing supply of the aquaculture sector and has nothing to do with the supply of Baltic salmon. The economy of the individuals dependent upon a good salmon stock in the Baltic is not very good although no exact figures can be presented.

Management of the pelagic fisheries

The market price of the pelagic species (herring and sprat) has been continuously weak for many years. This fact has facilitated the management. The weak consumption market has forced the larger fishing vessels to take up a fishery for industrial purposes mainly in the Baltic. As the Swedish TACs in the Baltic for these species are sufficient to allow both a fishery for consumption as well as for industrial purposes it has been possible for these larger vessels to reach profitability.

The TACs as well as the mesh-sizes have been determined in an international context and there has been no special problems in managing the stocks neither in the Baltic nor in the Skagerrak-Kattegat area.

Outcome

The outcome is good from a biological point of view. The stocks are stable and the prospects are not worrying. The market is weak but this is due to oversupply and a weak demand. The economy of the sector is very weak.

Management of the cod fishery in the Baltic Sea in 1994

In 1994, the Swedish TAC for cod in the Baltic was determined by the International Baltic Sea Fishery Commission (IBSFC) to 14 340 tonnes. After consultations and negotiations with other countries the Swedish fishers were allowed to catch altogether 12 140 tonnes in the Swedish and foreign zones of the Baltic. In addition the Swedish quota in the Kattegatt was 2 660 tonnes, in the Skagerrak 2 215 tonnes and in the North Sea, 600 tonnes.

The National Board administered the total TACs according to statistics from the log-books, which were filled in by the fishers and sent to the National Board. In addition the National Board had regulations which allowed fishery only in specific days of the week. During the whole year the Federation of Swedish Fishers enforced a voluntary quota management system based on individual quotas. The Coast Guard was as usual responsible for the control and supervision.

In Table 6 below the landings for each month and totally are shown. In this context it is to be remembered that landing statistics cannot distinguish from which quota-area the different landings originate. The statistics are based on the sales-notes submitted by the fish-buyers. In the logbook statistics the quantities as well as the relevant ICES squares are reported by the fishers.

Outcome

The state of the cod stock is unclear. In its report, dated May 1995 ACFM stated that it "is not in a position to assess the state of the stock precisely. It may be at or outside safe biological limits." ACFM continues saying "the data from the commercial fisheries in recent years are rather uncertain. This holds true for both landings, effort and biological data. The results from the catch analysis become imprecise for the most years." For the National Board it is naturally highly unsatisfactory that the knowledge is that low. It makes both the international negotiations and the contacts with the industry much more difficult than it would have been.

The tardy submission of the logbooks was during 1994 a major problem for the presentation of swift and correct catch statistics by the National Board. As can be noted there is a difference between the quantities reported by the fishers compared to the sales-notes. It can also be noted that in spite of the very severe restrictions applied the TAC was overfished.

It is clear that there must have been a lot of infringements. Unfortunately it was not possible for the Coast Guard to sue but a handful of vessels.

If the fishing-days for different categories of vessels were calculated, the trawlers were allowed to fish for 65 days and the small long-liners and netters were allowed 116 fishing-days. Naturally this has produced great economic problems in the sector. The costs of the Government for different allowances (to the vessels and the crew) were nearly 40 million Skr for the year of 1994.

Although the prices for cod are determined in an international market there is a clear tendency that a large local increase of supply leads to lower prices. For the period January-February, the median price was 7.46 Skr/kg. The corresponding price in September-October was 9.22 Skr/kg. This difference in price will mean that for every 1 000 tonnes that was caught in autumn the income of the fishers would have been strengthened by 1.76 million Skr if the increased supply had left the prices unchanged.

Table 6. Swedish catches per month according to the sales-notes (landings) compared to the logbooks

Month	Statistics Sweden (landings) l. w. tonnes	fr.w. tonnes	Val. Msek	per. kg	N B of Fisheries, logbooks (fresh weight, tonnes) Baltic	Skag	Kat	North Sea	Total
January	4 625	5 319	36 989	8.00	2 608	135	467	7	3 217
February	6 512	7 489	46 097	7.08	3 290	184	643	12	4 129
March	2 737	3 148	22 751	8.31	1 305	169	512	30	2 016
April	2 176	2 502	17 881	8.22	1 655	243	264	66	2 228
May	1 183	1 360	11 117	9.40	812	172	181	74	1 239
June	447	514	6 423	14.37	36	114	104	71	325
July	185	213	2 285	12.35	25	100	74	5	204
August	383	440	6 321	16.50	24	202	110	102	438
September	3 364	3 869	30 363	9.03	3 957	96	94	66	4 213
October	3 282	3 774	30 898	9.41	4 130	152	93	44	4 419
November	1 058	1 217	11 005	10.40	395	145	175	38	753
December	322	370	4 043	12.56	103	107	120	108	438
TOTAL	26 274	30 215	226 173		18 340	1 819	2 837	623	23 619
Rev.total	26 759	30 773	231 808						

l.w.: landed weight
fr. w.: fresh weight
Val.: Value
Source: National Board of Fisheries.

Management of the shell-fish stocks

Swedish fishers are catching pandalus borealis (prawn) in the Skagerrak but also to a minor extent in the North Sea. The trawl is the only gear used. Nephrops are fished both in the Skagerrak and the Kattegat with trawl and with cages.

The fishery for prawn are regulated by a TAC and by a minimum mesh-size. The fisher's association have had for many years a voluntary system regulating both the allowed days and the quantity caught. This voluntary regulation is per fishing vessel.

The nephrop fishery is regulated with mesh-sizes and trawling is allowed only in specific areas.

Outcome

The prawn stock is in a good state. The TAC and the voluntary restrictions have succeeded in arriving at a harvesting pattern adopted to the market and the stock. As the voluntary restrictions are rather harsh, the capital invested in the prawn-catching vessels is limited as there are no possibilities of profitability with more expensive vessels and gears. Therefore the vessels are in general rather old and naturally the work environment is not at the same level as in other fisheries. The technical development is also rather slow. The profitability is stable and positive but not very high.

The ACFM has no indication of the state of the nephrop stock. There are signs however that the stock is deteriorating. The Swedish catches are falling. The profitability is unclear.

PART III: ANALYSIS

Management of the cod fisheries in 1994

As a result of the difficulties experienced in 1994 to manage the cod-fisheries the whole statistical system has been changed. The quota management is now calculated according to the sales-notes and not to the logbooks as before. The logbooks are still used to determine the quota- areas. The collection of both the logbooks and the sales-notes have been speeded up.

The National Board of Fisheries has launched a project aiming at cross-checking sales-notes with log-books. This new system is planned to be operational at the end of 1995.

The experience shows that it is very difficult to manage a very limited quota when there is an excessive fishing capacity and when fishing are conducted in different quota-areas. It is also very costly both to the Government as well as to the society to maintain a fishing fleet, not adapted to the long-term resources. Naturally the heaviest burden for the lack of fishing opportunities rests on the individual fishers. One of the goals of the fishery policy is to have a profitable fishing-fleet that would give the fishers a reasonable income. The only way to achieve this is to have a balance between resources and capacity. In the present situation with the given cost structure the fishers are to some extent pressed to irregularities in order sustain themselves and their business activity. In the present situation, it is very difficult and costly to maintain law and order and bring a halt to the illegal landings.

UNITED KINGDOM

The UK has traditionally had a major interest in fisheries, reflecting its geographical position in the North East Atlantic. Fisheries continues to be a locally significant activity and source of employment in many coastal areas of the UK. Concentrations of fishing activity tend to occur in regions where other employment opportunities are limited.

Some 23 000 people are engaged directly in fishing in the UK, of which some three quarters are engaged full time. There are more than 9 000 licensed fishing boats, of which just over one third are above 10 metres in length. A wide variety of fishing methods is used including trawls, seine or purse seine nets, gill nets, hand lines and pots.

Some 40 species are of commercial interest in the UK of which a quarter are shellfish. However, different species vary in importance in the fisheries of different regions. There are extensive shell fisheries around the United Kingdom's coast. In addition, there is a distant water fleet which is active in the North Atlantic and at North Norway.

Fish worth some £400 million are landed in the UK, including shellfish worth £90 m. In addition, some £465 million of whitefish is imported. This is needed for the UK fish processing industry which employs, in factories and in processing fish on the dock side, about the same number of people as the catching industry.

Exports from the UK include high value shellfish but also large quantities of lower value herring and mackerel which are bought at sea by "klondykers" from Eastern European states and Russia.

There is an important fish farming industry in the UK, producing some 50 000 tonnes of fish, mainly salmon but also trout, worth in total some £150 million.

Policy framework

The UK's objective is to provide its fishers with the greatest possible fishing opportunities consistent with long term conservation of stocks.

In common with other Member States of the European Union, the United Kingdom participates in the establishment of rules and regulations under the Common Fisheries Policy. This policy regulates UK fisheries, and the UK is responsible for its enforcement within its waters. Within 6 miles of baselines, and in England and Wales only, local Sea Fisheries Committees, drawn from those with local knowledge of the fisheries concerned, make and administer, with the agreement of the Fisheries Departments concerned, bylaws to regulate and conserve stocks, mainly of shellfish. Elsewhere in the United Kingdom, these in-shore responsibilities are fulfilled by Fisheries Departments. UK quotas for fishing for various stocks are administered directly by Fisheries Departments.

Instruments used

The waters around the UK are subject to the European Union's system of Total Allowable Catches (TACs) and National Quotas. These are set annually by the Council of EU Ministers, on the basis of scientific advice, for all economically valuable stocks (TACs are set jointly with Norway for some shared stocks in the North Sea). The United Kingdom's and other Member States' shares of EU TACs is established by means of a fixed key (relative stability).

The United Kingdom has exclusive access to its own waters in the 0-6 mile zone from baselines. Limited access is provided for traditional fishing Member States of the EU in our 6-12 mile zone.

Technical conservation measures are established under European Union legislation. These control such aspects as minimum mesh sizes, minimum landing sizes, area restrictions e.g. for protection of juveniles, and impose restrictions on certain types of fishing gear. Certain specific provisions are also applied to UK fishers under national law.

All UK vessels engaged in commercial fishing operations must be licensed by the Fisheries Departments. These licences are used to regulate the fishing activity of the vessels concerned and the stocks that they may catch. Within these arrangements, fish producer organisations are responsible for managing quotas allocated to them by the Fisheries Departments and together these organisations account for more than 70 per cent of the quota species landed by the UK fleet.

Responsibility for enforcement rests with Fisheries Departments who are responsible for ensuring that EU and national legislation is observed by British, other EU and third country vessels within our 200 mile limit and, for British registered vessels, beyond it. Aerial surveillance is carried out regularly on all fishing activity at sea within British fishery limits, using five specially equipped aircraft. These operations are co-ordinated with enforcement at sea and ashore. At sea, enforcement totalling about 4 500 inspections annually is carried out by ships of the Royal Navy's Fishery Protection Squadron under the direction of Fisheries Departments, and by patrol vessels owned by the Fisheries Departments. Ashore, specialist Inspectorates covering the whole coastline carry out regular checks on landings to ensure compliance with both EU and UK regulations.

The United Kingdom is subject to European Union legislation on the structure of the fishing industry which includes matters relating to fleet size, on-shore facilities, marketing and aquaculture.

The UK participates in the European Union's agreements with neighbour fishing countries which include Norway, Greenland, Faroes and Sweden. The agreements involve reciprocal access opportunities and balanced concessions. The UK is a member of a number of international fisheries organisations.

Management issues for the future

Many fishing resources world-wide seem likely to remain under heavy pressure. Devising strategies for effective conservation and ensuring compliance with regulations will be challenging. Particular issues which seem likely to continue to concern policy makers include the search for acceptable and cost-effective ways of restraining fishing capacity and activity; the role of new technology in enforcement, and the role of economic criteria in making fisheries policy.

ICELAND

PART I: THE SETTING

The recent history of the fishing industry

The Icelandic fisheries at the beginning of the nineteenth century were primitive. They were primarily operated as a supplement to farming, the main industry, during seasons of low farming activity. The fishing fleet consisted exclusively of open row boats. The fishing gear was handline. The volume of catches was low, probably under 10 000 MT annually. The dominant fish processing method was drying. The fisheries, in short, were a part-time activity operated in much the same way as 900 years earlier when the country was settled.

The nineteenth century brought important changes in fishing and fish processing techniques. Decked sailing smacks were introduced in the first decades of the century significantly increasing both the geographical range of the fishing fleet and the duration of the fishing season. Due to shortage of financial capital, however, the adoption of sailing smacks proved a sluggish process. Nevertheless, by the end of the century, sailing smacks accounted for a third of the total catches. Also in the nineteenth century the long line was introduced greatly increasing the productivity of the fishing vessels. Partly as a result of these technological advances and partly as a result of greatly improved market opportunities, the fisheries began to emerge as an independent industry. This applied especially to the Western part of the country where rich fishing grounds were close to the shore. By the end of the century several fishing villages and towns had been established and the fishing industry had become Iceland's most important export industry.

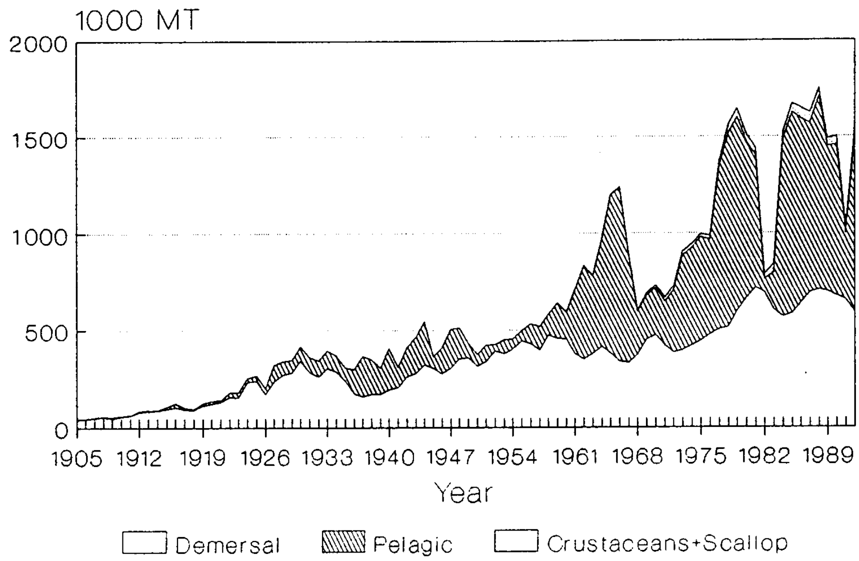
At the beginning of the twentieth century, the fishing fleet consisted entirely of sailing smacks and row boats. The first decades of the twentieth century witnessed the mechanisation of the fishing fleet. The first steam trawler arrived in 1904. Small motor boats, powered by diesel engines, were introduced at about the same time. By 1930, the fishing fleet contained some 40 steam trawlers and about 1000 motor boats[43] while sailing smacks and row boats had all but disappeared. In 1930, steam trawlers accounted for about 2/5 of the demersal catch and motor boats for most of the rest.[44] During the first decades of the twentieth century, fishing techniques were also revolutionised. The bottom trawl, Danish seine and gillnets were introduced and quickly became the dominant fishing gear while the importance of longline and in particular handline declined sharply.

[43] See Jonsson (1980).

[44] In 1930 about 1% of the total catch is attributed to row boats.

For most of their early history the Icelandic fisheries were based on the harvesting of demersal species, especially cod and haddock. The herring fishery was not initiated until the last decades of the 19th century. During the last 100 years the variety of species being exploited has greatly increased. Saithe became an important commercial species in the 1920s, redfish in the 1940s, shrimp and lobster[45] in the 1960s, capelin and scallop in the 1970s and Greenland halibut in the 1980s. This diversification in species has been accompanied by dramatically increasing catch volumes. The quantitative development of fish catches during this century is illustrated in the following diagram.

Figure 1. Icelandic fish catches 1905-1992
(1000 MT)



Until the nineteenth century, fish processing in Iceland consisted almost exclusively of stockfish production. In the early 1800s, saltfish production began to emerge. This method of fish processing yielded considerably better economic returns and soon supplanted drying as the primary fish processing method. In fact, from 1880 to the 1930s saltfish production dominated Icelandic fish processing in terms of value. This is illustrated in Figure 2, which describes the composition of the value of fish exports[46] from 1880 to 1992 by product category.

[45] Actually nephrops or Norway lobster.

[46] Due to the limited size of the domestic market and lack of significant product inventories, exports provide a good measure of production.

Figure 2. Shares of product categories in export of the fish products
(5 year average values, e.g. 1881-5 etc., except 2 year average in 1991-2)

During the last decades of the nineteenth century production of shark-liver oil and later cod-liver and herring oil became important. In the 1920s, fish-meal became a significant export commodity. Also in the early 1900s, with improved transport and conservation technologies, it became possible to export fresh fish on ice. This method of catch preservation for export soon became important especially during World War II, when traditional European markets for salted products were largely inaccessible.

Thus, during the first four decades of the 20th century, fish processing in Iceland consisted almost exclusively of the production of saltfish, fish meal and oil and iced fish. In terms of value, salted products were by far the most important. The most important markets for salted cod were in Southern Europe, especially Spain and Italy, where Icelandic saltfish competed *inter alia* with saltfish from the Labrador fishing grounds. The primary market for salted herring was in Northern Europe. England provided the main market for iced fish.

The fish freezing industry emerged in the 1930s. It expanded very rapidly during World War II when traditional European fish markets were largely inaccessible. In 1930, there were two freezing plants in Iceland. In 1940, there were 22, and by 1949, there were 80 freezing plants. This expansion of the freezing industry is reflected in the increasing share of frozen products in fish exports illustrated in Figure 2. By 1950, the freezing industry had become the most important component of the fish processing industry and has remained so since.

With the exception of the reduction sector, the fish processing industry in the pre-World-War II period employed very elementary labour intensive production techniques. The inputs consisted for the most part of labour and materials. The use of machines and fixed capital was minimal. This characteristic changed, however, with the expansion of the freezing industry. The freezing process required a good deal of fixed capital and relatively intricate machinery. In recent decades the saltfish process has also become more capital intensive.

Since World War II the main product categories have remained unchanged, i.e. frozen products, iced fish, saltfish, stockfish, fish meal and oil. The only noteworthy addition to this export mix has been canned products that have become significant especially in connection with the shrimp fishery. In the post World War II period the United States have been Iceland's most important market for fish products with Britain second. The prominence of the US market is mostly due to the export of frozen fish products. In recent years the US market has lost some of its dominance. In fact, by far the most important market area for Icelandic fish products is now the European Union[47].

The present situation

The following outlines the present state of the Icelandic fisheries and their role in the national economy. The first section briefly discusses the macro-economic importance of the fishing industry. The next section attempts to provide a summary description of the current structure of the fishing industry. The third section describes the recent development and current scope of the fisheries. The fourth section provides data on the fish stocks and their exploitation rate. The final section presents a description of the current fishing fleet.

Macro-economic Importance of the Fisheries

The nature and development of the Icelandic fisheries management cannot be understood without an appreciation of the role of the fishing industry in the national economy. For all of this century the fishing industry has been Iceland's most important industry. Its importance during the past few decades does not appear to have declined significantly.

Currently fish products are by far Iceland's most important exports. During the past two decades they have generally accounted for 70-80% of the country's merchandise exports and about half of its total export earnings. The fishing industry's direct contribution to the GDP is about 15%. The total contribution, via economic linkages and multiplier effects, is thought to be much higher, perhaps as high as 35-50%.[48] These figures should make it clear that the fishing industry is the most important industry in Iceland.

The size of the fishing industry relative to the economy as a whole means that any fisheries policy adopted has far-reaching implications for course of the macro-economy. It is a major determinant of personal income, income distribution, regional development and, of course, the GDP both in the short and long run. As a result, fisheries management is a major component of the discussion and formulation of Iceland's economic policy.

Structure of the fishing industry

The harvesting and processing sectors of the Icelandic fishing industry are characterised by numerous relatively small firms. These firms frequently exhibit a high degree of vertical integration across the harvesting and processing activities. There is little horizontal integration, however, and there are no dominant firms in harvesting and processing. The revenues of the largest firms are less than 4% of total industry revenues. The size distribution of the 200 largest firms is illustrated in the following figure. Note, that most of these firms are horizontally integrated comprising both fishing and fish processing.

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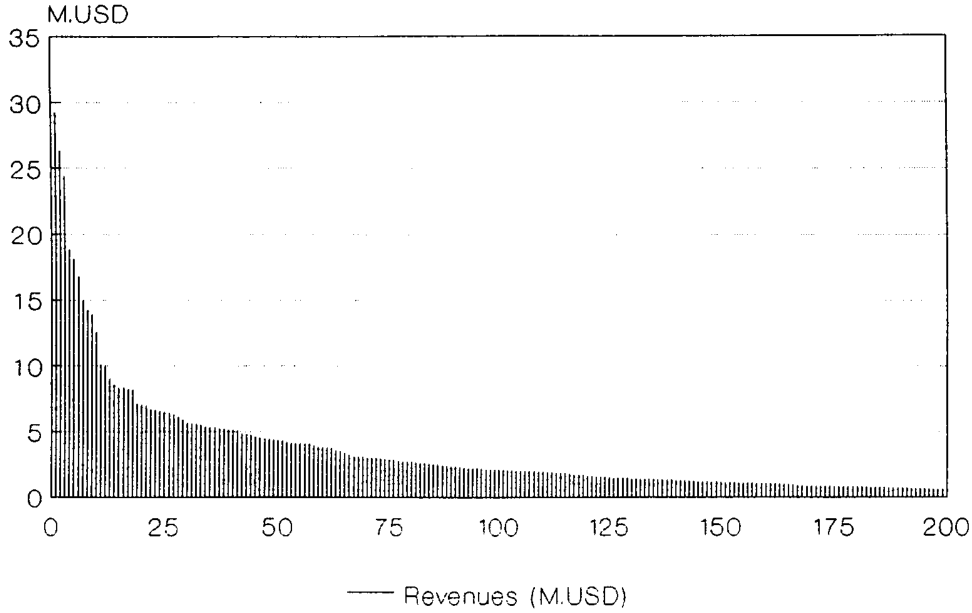
[47] Formerly the European Community.
[48] See Arnason, 1994.

Figure 3. Fishing firms: size distribution



Compare to the rest of the fishing industry, the marketing sector is dominated by a few large sales marketing organisations. These marketing organisations are not independent firms, however. They are owned by the processing firms and exist to serve the marketing needs of the processing sector.

The typical firm in the fishing industry is based in one fishing village or town. Spatial integration[49] is extremely rare. The firm operates one or more processing plants that are capable of producing at least one of the basic output categories; frozen products, saltfish, stockfish and fish meal. The firm also runs one or more fishing vessels that usually supply most of its wetfish[50] needs. Additional needs are met by purchasing fish from independent vessels usually on the basis of implicit or explicit long term contracts. In fact, in most smaller fishing towns, the fish processing firms have customarily purchased all the fish supplied by local vessels. Finally, the products are marketed by the appropriate market organisation to which the firm belongs.

This particular industrial structure appears to be the result of the wide distribution of good fishing grounds around the island on the one hand, and the geography of the land on the other. These features have led to the formation of many small fishing towns along the coastline, between which land communications are often poor. Consequently, extensive horizontal integration has been difficult while vertical integration has arisen quite naturally.

Due to this structure of the fishing industry, there is little room for market forces in the allocation of fish landings to processors. The dominant forces in the allocation of fish landings are vessel ownership, custom and lack of alternative fish purchasers.

[49] I.e., integration across geographical distances.
[50] I.e. landed catch.

This description applies to the demersal, crustacean and shellfish fisheries which together account for over 90% of the total value of the Icelandic fisheries. The reduction fisheries, based primarily on capelin, are organised somewhat differently. The capelin is harvested during its migrations from the feeding to the spawning grounds. There are 20-30 major reduction plants located along the migration route. For economic reasons, it is imperative to minimise the sailing distances from the fishing areas to the reduction plants. Therefore, it makes little sense to integrate harvesting vessels with reduction plants. Consequently, in the case of the capelin fishery, a significant fraction of the fleet is independent and there is a good deal of competition for wetfish landings.

Recently there has been some change in the traditional process for allocating landings to processors. The first wetfish floor market was established in Iceland in 1986. Since then there has been a movement toward establishing local and regional wetfish markets in several places around the country. Where these wetfish markets operate, allocation of landings to processors tend to be significantly more market-guided than before. This applies in particular to the landings of independent vessels. However, the existence of the wetfish markets also influences the allocation of the landings of vessels owned by processing plants as well as the structure of long term fish supply contracts. It remains to be seen whether the advent of wetfish markets will encourage or discourage further vertical integration across the harvesting and processing sectors.

Icelandic fishing firms are for the most part privately owned. More precisely, it appears that about 95% of the fishing industry is in private hands. Most of the public ownership in the fishing industry is held by municipalities. Private fishing firms are generally organised as limited liability companies. However, only rarely have the shares been publicly available. Recent years, however, have witnessed something of a shift in this respect. Several large fishing firms have decided to go public and raise capital by offering shares to the general public. So far, however, this trend has been limited to the largest firms.

Most fishing firms are owned by a very small group of individuals. These firms are almost invariably limited companies often with various family members listed as shareholders. Many owners elect to form separate firms for each individual plant and fishing vessel.[51] Thus, the typical fishing firm is usually a conglomerate of formally independent firms but coordinated by a single dominant owner. For this reason, the exact ownership structure of the Icelandic fishing industry is rather difficult to ascertain. The co-operative movement which has a major presence in the Icelandic fishing industry has also chosen to organise its fishing firms as limited companies. Perhaps 20% of the privately owned fishing industry is currently associated with the co-operative movement.

Municipal participation in the fishing industry has declined significantly in recent decades and is currently found primarily in less populated fishing towns and villages. It appears that municipal ownership in the fishing industry may now be about 5%. With the recent sale of the State reduction company[52], there is virtually no government participation in the fishing industry.

Many of the current fishing firms were initially formed by successful fishers in the first half of this century. These individuals often invested their earnings in fishing vessels and subsequently moved into the processing and export sector. These businesses were frequently family owned and run. Some still are. However, over the years, control and, in some cases, ownership of these firms has tended to shift from the initial families. In recent years there has been a marked trend toward a more professional management of fishing firms. This applies, in particular to the largest and, incidentally, most successful firms and represents a continuing trend toward the separation of fishing firm ownership from their management, so characteristic of modern industrial structure.

[51] Most likely for reasons of financial risk.
[52] At the end of 1993.

The fisheries

The most important Icelandic fishery by far is the demersal or groundfish fishery. In recent years this fishery has usually generated between 80% and 90% of the total wetfish value. The most important demersal species are cod, haddock, redfish and saithe. Pelagic fisheries based exclusively on capelin and herring are also very valuable, usually yielding 5-10% of the total wetfish value. Crustancean, e.g. shrimp and lobster, fisheries account for a similar percentage. In addition there is a significant scallops fishery. A more detailed numerical description of these fisheries and their relative importance is provided in the following table:

Table 1. Icelandic fisheries: catch and value data

	Average catch 1980-92 (1000 MT)	Estimated catch values* (M.USD)	Estimated MSY (1000 MT)	Estimated MSY values (M.USD)
Demersal species				
Cod:	350.9	421.4	400.0	480.4
Haddock:	52.1	78.0	60.0	89.9
Saithe:	70.2	45.7	85.0	55.3
Redfish:	97.6	115.2	95.0	112.1
Other**:	78.2	98.2	80.0	100.5
Total	649.0	758.5	720.0	838.2
Pelagic species				
Herring:	71.6	7.6	120.0	12.7
Capelin:	646.9	44.0	750.0	51.0
Total	718.5	51.6	870.0	63.7
Crustaceans				
Shrimp:	25.3	44.2	35.0	61.1
Lobster:	2.4	9.3	3.0	11.6
Total	27.7	53.5	38.0	72.7
Shellfish				
Scallop:	12.6	6.5	14.0	7.2
Grand Total	1 407.8	870.1	1 642.0	981.8

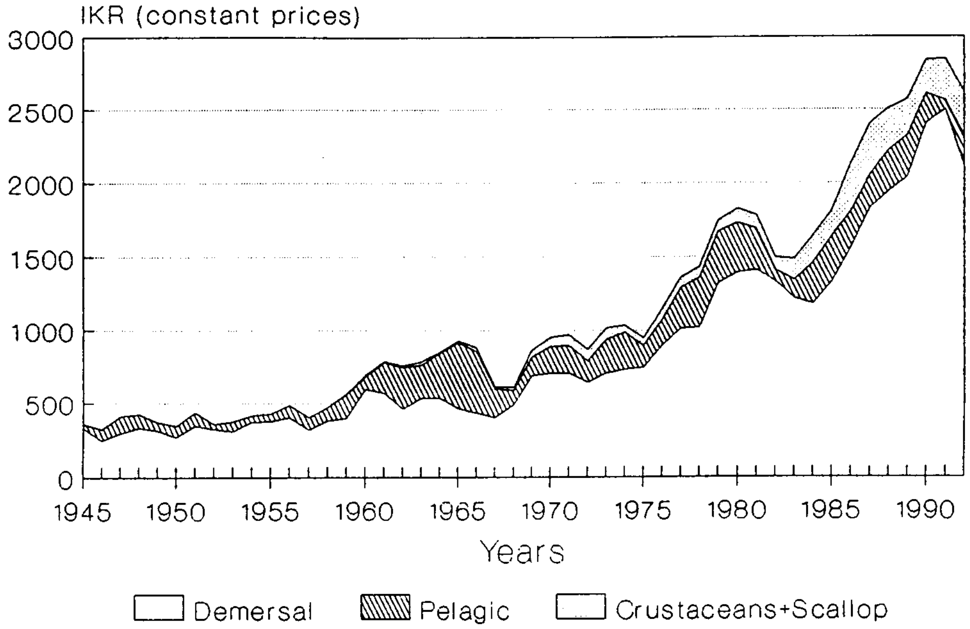
(*) At 1992 average unit catch prices and exchange rates.
(**) Mainly Greenland halibut, catfish, plaice, tusk and ling.

Table 1 lists only the Icelandic catch. Some of the fish stocks, most notably the capelin stock, are shared with other nations. A recent agreement allocates 22% of the annual TAC of capelin to Greenland and Norway. By bilateral agreements foreign catches add about 2% to the demersal catches listed in Table 1.

Since 1945, both the volume and value of the Icelandic catches have increased dramatically. From 1945 to 1988, the aggregate volume of catch increased by some 330% and the real catch value by 630%. Catch volumes have increased for essentially two reasons. First, extensions of the fishery jurisdiction have enabled Iceland to gradually increase its share in the demersal fisheries to almost unity. This factor alone accounts for roughly doubling of the demersal catch since 1945. Second, new fisheries have been developed. Most important of these are the redfish, capelin and crustacean fisheries. The value of the catch has risen faster than the volume due to rising world fish prices and a more valuable composition of the catch. Since 1945, aggregate real wetfish prices appear to have increased by some 70%.

The development of catch volumes since 1905 was illustrated in Figure 1. in the previous section. The following diagram describes the development of the catch values since 1945.

Figure 4. Development of catch values
(constant prices)



Since 1945, the share of pelagic species in the wetfish value shows a decreasing although fluctuating trend. On the other hand, the share of crustaceans and shellfish in the landed wetfish value has increased. The share of demersal species in the catch value has remained fairly constant.

Fish stocks

The increase in catch volumes described above has been reflected in a corresponding reduction in the size of the fish stocks. This holds in particular for the demersal stocks that have been subject to heavy exploitation throughout the post-War period.

When the extension of the fishery jurisdiction to 200 miles became effective in 1976, stocks sizes of all major demersal species were far below the MSY level. In spite of exclusive Icelandic management since that time, demersal stocks have not been allowed to recoup. In fact, the fishing mortality of cod, by far the most important demersal species, has been 3-4 times the optimal long run level[53]. The fishing mortality of the other major demersal species - especially haddock, redfish and Greenland halibut − is also greatly excessive and their stock sizes suboptimal. The following table gives the stock sizes and fishing mortalities for these and several other key species.

Table 2. Stock sizes and fishing mortalities

Species	Stock size (1992) (1000 MT)		Fishing mortality (Average 1986-92)	
	Current	Optimal	Current	Optimal
Demersal				
Cod	640	1 800	0.84	0.22
Haddock	185	390	0.64	0.29
Saithe	375	530	0.33	0.25
Redfish	700	1 100	0.30	0.08
Greenl. Halibut	185	300	0.44	0.26
Pelagics				
Herring	490	N/A	0.32	0.23
Crustaceans				
Lobster	14	16	0.25	0.23

Sources: Marine Research Institute (1992), Arnason (1984).

As indicated in Table 2, the exploitation of the major demersal species has been economically excessive in recent years. Excluding the saithe, demersal fishing mortality over the past few years has generally been 2-4 times the optimal level. As a consequence, stock sizes have diminished and are currently far below optimal levels. It should be pointed out, however, that in the case of cod, current low stock sizes are not wholly the result of excessive fishing pressure. The current depressed level of the cod stock is also the result of a prolonged period of poor recruitment.[54] Unfortunately the Total Allowable Catch (TAC) for cod has not been commensurately reduced. Consequently, this period of poor recruitment also serves as a partial explanation of the recent high fishing mortality of the cod stock. Among the major demersal fisheries, the saithe fishery is closest to the optimal level. The reason is that compared to the other demersals, the saithe is a low valued species and is consequently subject to less fishing pressure.

[53] The optimal weighted average fishing mortality for cod has been estimated to be in the neighborhood of 0.22. In 1989 this fishing mortality was over 0.8 which means that about 55% of all cod recruited to the fishery were caught during this year.

[54] For cod every new year class for 8 years, i.e. since 1985 has been below average. This is most unusual. The longest previous period of uninterrupted poor recruitment since 1952 was 4 years. The reason for this recruitment failure is unknown. Explanations range from adverse environmental conditions to a persistently small spawning stock. The environmental explanation is perhaps bolstered by the fact that all major North Atlantic cod stocks suffered dramatic setbacks within a short period in the latter part of the 1980s.

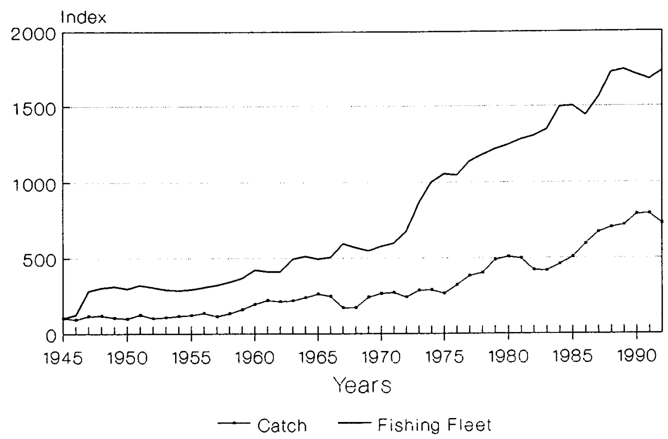
The biological management of other important commercial species has been much more successful. The capelin, crustacean and scallop fisheries have from the outset been under tight biological management. Consequently, harvesting has never been allowed to reduce the stock sizes below reasonable levels. For that reason, significant cutbacks in harvesting rates have generally not been required[55]. In all these fisheries stock sizes, harvesting rates and fishing mortalities appear close to economically optimal levels.[56]

The herring stocks have fared worse, although primarily under a previous fisheries management regime. The Atlanto-Scandian herring stock, which came under significant exploitation in the 1930s and provided very high catches in the 1960s, collapsed in 1968 and has not yielded any catch for Iceland since then.[57] The same holds for the Icelandic spring spawning herring stock that collapsed under heavy fishing pressure in 1970 and has not recovered since in spite of a complete fishing moratorium. The third herring stock, the Icelandic summer spawning herring, also collapsed due to overfishing in 1971. Since then this stock has been subject to careful management. This has been quite successful. The stock has recovered to the point of providing the yield listed in Table 1 above.

The fishing fleet

Since the end of World War II the Icelandic fishing fleet has grown very rapidly. Since 1945, the increase in the total tonnage of the fleet has been over 300%. As a great deal of technological improvements have taken place aboard fishing vessels the increase in the capital value of the fleet has been much greater or roughly 1 600%. At the same time, the value of catches has also greatly increased but significantly less so than the value of the fleet.[58] The Icelandic fisheries thus have become much more capital intensive. These trends are illustrated in the following figure.

Figure 5. Fishing fleet and catches 1945-1990
(value indices)



[55] The exception being the short-lived capelin which is subject to dramatic natural fluctuations in stock size. Thus there was a catch moratorium when the stock suffered a setback in 1982-3 and another partial one in 1991.
[56] The harvesting inputs, on the other hand, are in many cases excessive.
[57] This particular herring stock spawns off the Norway coast and used to undertake feeding migrations to Icelandic waters. Although this stock now shows clear signs of a partial recovery it has not resumed its previous migrations to Iceland.
[58] The value of the catches has increased by just over 600%.

The current fishing fleet consists of several vessel types. It is convenient, however, to divide the fleet into four main categories:

Deep-sea trawlers

These are relatively large fishing vessels usually between 200 and 1200 GRT (gross registered tonnes) and 130 and 250 feet in length. They are engaged almost exclusively in the demersal fisheries employing bottom and occasionally mid-water trawl. Due to their size, the deep sea trawlers have a wide operating range and are able to exploit practically any fishing ground off Iceland. Each trip usually lasts for about 5 to 15 days. As previously discussed a number of the deep-sea trawlers have been turned into freezer trawlers recently.

Specialised purse seiners

Usually well over 200 GRT and up to 1 000 GRT, these vessels are primarily engaged in the capelin fishery. Most also participate in other fisheries, particularly the deep sea shrimp fishery and the herring fishery. The specialised purse seiners usually follow the capelin schools over great distances and land their catches where it is most convenient.

Multipurpose vessels

The multipurpose vessels cover a wide size range. The typical multipurpose vessel is smaller than those previously discussed. Their average size is just over 100 GRT. Some, however, are quite large i.e. over 200 GRT. The multipurpose fleet is, for the most part, neither specialised with respect to fishing gear nor fishery. Most of the multipurpose fleet is designed as gillnetters or longliners although they are technically capable of employing trawl and purse seine as well. Hence the larger of these vessels can pursue any of the Icelandic fisheries discussed above. Normally, however, their operating economics exclude participation in some fisheries, in particular the very specialised capelin fishery. The geographical range of the smaller multipurpose vessels is limited and they are normally confined to one to three-day fishing trips exploiting fishing grounds relatively close to their home port.

The part time fleet

This class of fishing vessels covers numerous vessels of sizes up to 12 GRT although most are under 10 GRT. These vessels are typically operated seasonally by the owner. The larger of these vessels are normally decked while the smaller are undecked. This fleet employs handline, gillnets and longline. Depending on the fishery, the crew size is one to three persons. Some of the vessels in this fleet are essentially recreational vessels. As the smaller of the part time fleet, namely vessels under 10 GRT, were not subject to vessel quota restrictions until 1990,[59] this component of the fleet has mushroomed in recent years.

Further details about the Icelandic fishing fleet are set out in Table 3 below. It should be noted that this table does not include the undecked part of the part time fleet. This fleet probably counts between 1 500 and 1 600 vessels, most of which are below 6 GRT.

[59] For further details see Part II of this report.

Table 3. The Icelandic fishing fleet

	Number	Total tonnage (1000 GRT)	Average age (years)
Deep-sea trawlers	107	56 756	15.6
Standard	79	N/A	N/A
Freezer	28	N/A	N/A
Purse seiners	44	20 626	23.2
Multipurpose fleet	328	39 681	25.3
over 200 GRT	53	14 199	26.7
111-200 GRT	91	14 120	24.0
51-110 GRT	103	8 091	28.0
13-50 GRT	128	3 271	22.9
0-12 GRT	427	3 333	13.0
Grand Total	906	120 396	

Source: Fisheries Association of Iceland: Utvegur 1992, Sjomannaalmanak 1992.

As shown in Table 3, the average age of the fishing fleet is rather high. This reflects i.a. the effects of more restrictive fishery management measures and official efforts in recent years to halt new investment in the fishing fleet.

The importance of the different subfleets in the fisheries in terms of catch volumes and values is indicated in Table 4.

Table 4. Sub fleet shares in catch volumes and values

	Share in catch volume	Share in catch value	
	1992 %	1992 %	1982 %
Deep-sea trawlers	20.8	44.2	49.2
Standard	14.4	26.1	49.0
Freezer	6.4	18.1	0.2
Purse seiners	59.1	8.2	3.7
Multipurpose fleet	16.6	40.7	43.9
over 200 GRT	3.2	14.0	8.4
111-200 GRT	7.1	13.3	14.2
51-110 GRT	3.7	8.0	13.6
11-50 GRT	2.6	5.4	7.7
Part-time fleet	3.5	6.9	3.2
0-10 GRT, decked	1.6	3.3	2.0
0-10 GRT, open	1.9	3.6	1.2
	100.0	100.0	100.0

Source: Fisheries Association of Iceland: Utvegur 1982, 1992.

Table 4 indicates the relative importance of the various subfleets in the Icelandic fisheries. The most important in terms of catch value changes are deep-sea trawlers closely followed by the multipurpose fleet. Apart from relatively small fluctuations wrought by the very volatile capelin purse-seine fishery the aggregate share of these two subgroups of the fishing fleet in the catch value has been remarkably constant. Together they have accounted for 80-90% of the total value of the catches during the past two decades. Although, by far the largest in terms of catch volume, the purse-seine fleet is relatively unimportant in terms of catch value. It share in the total catch value has usually fluctuated between 3 and 10%. Since 1982 the part time fleet has more than doubled its share in the total catch value. Its landed value is now similar to that of the purse-seine fleet. The reason for this expansion is largely that the part time fleet has been able to exploit loopholes in the quota-based fisheries management system in the demersal fisheries introduced in 1984.[60]

PART II: FISHERIES MANAGEMENT SYSTEMS AND EXPERIENCE

The origins and evolution of the fisheries management system

Until the introduction of the vessel quota system in the demersal fisheries in 1984, the Icelandic fisheries were for the most part common property ones. Before the extension of the fisheries jurisdiction to 200 miles in 1976, the Icelandic fisheries were, for all intents and purposes, international fisheries. Large foreign fishing fleets featured prominently on the fishing grounds, taking almost half of the demersal catch. It goes without saying that the fisheries management during this period was minimal.

The extension of the fisheries jurisdiction to 200 miles all but eliminated foreign participation in the Icelandic fisheries. However, apart from the herring fishery, the initial fisheries management measures taken, consisting primarily of total quotas and closed areas, were ineffectual. A property rights fisheries management regime in the form of vessel quotas was introduced in the herring fisheries in 1976 and in the capelin fishery in 1980. These fisheries, however, only account for about 1/10 of the total value of the Icelandic fisheries. Consequently, the fundamental common property nature of the fisheries was not altered. Domestic fishers were for the most part still forced to compete for shares in the catch.

Therefore, not surprisingly, the development of the Icelandic fisheries until 1984 closely followed the path predicted for common property fisheries (see e.g. Gordon, 1954) exhibiting increasingly excessive fishing capital and effort compared to the reproductive capacity of the fish stocks. The post-war development of fishing capital and catch values before the introduction of the demersal vessel quota system in 1984 is illustrated in Figure 5 above. As the figure indicates, the value of fishing capital employed in the Icelandic fisheries increased almost by well over 1 200% from 1945-1983. Real catch values, on the other hand, only increased by 300% during the same period. Thus the growth in fishing capital exceeded the increase in catch values by a factor of more than four. This means that in 1983 the output-capital ratio in the Icelandic fisheries was less than 1/3 of the output-capital ratio in 1945.

[60] For details see Part II of this report.

This long-term decline in the economic performance of the Icelandic fisheries did not go unnoticed by the fisheries authorities. In fact, over the years, various measures were taken in an attempt to reverse this trend. However, before the extension of the exclusive fishing zone to 200 miles at the end of 1975, effective management of the fisheries, especially the demersal ones, appeared impracticable due to the presence of large foreign fleets on the fishing grounds. For this reason, fishery management prior to the extension of the fishing limits to 200 miles was limited. Only fisheries under exclusive Icelandic control such as the inshore shrimp and scallops fisheries and domestic herring fisheries were subject to meaningful management measures. Apart from those fisheries, management mainly consisted of measures for the protection of juvenile fish[61]. There was an international agreement on minimum allowable mesh sizes off Iceland but this was apparently widely ignored by foreign fishing vessels. There were restrictions on the minimum size of fish that could be legally landed in Iceland. And there were extensive areas, believed to be important nursery grounds, from which Icelandic deep-sea trawlers, Danish-seiners and purse-seiners were excluded.

With the *de facto* recognition of the exclusive 200 mile fishing zone in 1976, this situation was dramatically changed. Since that time practically all Icelandic fisheries have come under extensive management restrictions with the result that common property fisheries are now practically non-existent in Icelandic waters.

In addition to the fish stock preservation measures discussed above, the most commonly used fisheries management measures since 1965 have been:

- Overall catch quotas,
- Fishery access licences,
- Individual vessel effort restrictions,
- Individual vessel catch quotas,
- Individual processing plant quotas.

During the period since the mid-seventies there has been a clear trend towards vessel catch quotas in the management of most fisheries culminating in a uniform ITQ system in practically all fisheries since 1990. The chronology of this development is summarised in Table 5.

[61] Most of which are still in effect.

Table 5. Key steps in the evolution of the fisheries management system: A chronological overview

1965-75	Inshore shrimp and scallops fisheries. Mixture of access limitations, effort restrictions and, in the scallops fisheries, processing plant quotas.
1969	The herring fishery: Total quota.
1972	The herring fishery: A harvesting moratorium.
1976	The herring fishery: Individual vessel quotas.
1976	The demersal fisheries: Total cod quota.
1977	The demersal fisheries: Individual effort restrictions.
1979	The herring fishery: Vessel quotas made transferable.
1980	The capelin fishery: Individual vessel quotas.
1984	The demersal fisheries: Individual transferable vessel quotas.
1985	The demersal fisheries: Effort quota option introduced.
1986	The capelin fishery: Vessel quotas made transferable.
1988	A system of transferable vessel quotas in all fisheries. Effort quota option retained in demersal fisheries.
1990	A complete uniform ITQ system in all fisheries.

Source: Ministry of Fisheries: Fisheries laws and regulations.

A more detailed review of the evolution of the ITQ fisheries management system in individual Icelandic fisheries is as follows:

– The herring fishery

In 1969, due to an alarming decline in the herring stocks, an overall quota was imposed on this fishery. Since this did not halt the decline in the stocks, a complete herring moratorium was introduced in 1972. In 1975, when fishing from the Icelandic herring stocks was partly resumed, it was obvious that the whole fleet could not participate. Hence an individual vessel quota system with limited eligibility for quotas was introduced. Vessel quotas, however, were small and in 1979, by a Ministerial decree and industry support, fairly unrestricted transfers of quotas between vessels were permitted. In 1988, this vessel quota system in the herring fishery became part of the general fisheries vessel quota system.

– The capelin fishery

The capelin fishery, which became very big in the seventies, was subjected to limited entry and individual vessel quotas for licence holders in 1980 at a time when the stock was seriously threatened with exhaustion. Again the arguments were the same as in the herring fishery previously. The positive experience with the vessel quota system in the herring fishery also proved a convincing argument for adopting a similar system in the much more important capelin fishery. In 1986, in conjunction with an increasing transferability of demersal vessel quotas, capelin vessel quotas became partly transferable. In 1988, the capelin vessel quota system became a part of the general vessel quota fisheries management system.

– The demersal fisheries

Following the extension of the exclusive fishing zone to 200 miles, the major demersal fishery, the cod fishery, was subjected to an overall catch quota. The annual quotas recommended by the marine biologists soon proved quite restrictive and thus difficult to maintain. Hence, individual effort restrictions, taking the form of limited allowable fishing days for each vessel, were introduced in 1977. However, since new entry remained possible and the demersal fleet continued to grow[62], the annual allowable fishing days had to be reduced from year to year. Thus, at the beginning of the individual effort restriction regime in 1977, deep-sea trawlers were allowed to pursue the cod fishery for 323 days only. Four years later, in 1981 this number of allowable fishing days for cod had been reduced to 215 days. This system was obviously economically wasteful. Consequently, in 1984, following a sharp drop in the demersal stock and catch levels, a system of individual vessel quotas was introduced. Initially the Althing passed legislation to this effect for one year only. In 1985, due to generally favourable results of the individual quotas, the system was extended for another year. However, an important provision was added. Vessels preferring effort restrictions could opt for that arrangement in place of the individual quota restriction. This system was extended, largely unchanged for an additional two years in 1986. In 1988, the Althing passed a general vessel quota legislation for all Icelandic fisheries to be effective for 1988-1990. In 1990, a complete, uniform vessel quota system for all fisheries, the *Fisheries Management Act*, was legislated abolishing i.a. the limited effort option in the demersal fisheries as well as a few other loopholes.

- The shrimp and scallops fisheries

The inshore shrimp and scallop fisheries are relatively recent additions to the Icelandic fisheries. These fisheries were largely developed during the 1960s and 1970s and have, practically from the outset, been subject to extensive management consisting primarily of limited local entry as well as overall quotas. In recent years, there has also been a strong movement towards vessel quotas in these fisheries. With the fisheries management legislation passed in 1988, the deep-sea shrimp fishery, the only remaining significant Icelandic fishery not closely managed, was also subjected to vessel quotas. The management of the shrimp and scallops fisheries is now a part of the general ITQ system according to the general fisheries management legislation of 1990.

The current ITQ fisheries management system

Let us now turn to the description of the current fisheries management system in Iceland. Although this system was instituted at different times and in somewhat different form in the various fisheries, it was made uniform by the *Fisheries Management Act* passed in 1990.

The fisheries management system is based on Individual Transferable Quotas (ITQs) and is therefore appropriately referred to as an ITQ system. Its essential features are as follows: All fisheries are subject to vessel catch quotas. The quotas represent shares in the Total Allowable Catch (TAC). They are permanent, perfectly divisible and fairly freely transferable. They are issued subject to a small annual charge to cover enforcement costs. The ITQ system is fairly uniform across different fisheries. However, mostly for historical reasons, slight differences between fisheries exist.[63]

It should be noted that the ITQ system was superimposed on an earlier management system designed mainly for the protection of juvenile fish. This system involving certain gear, area and fish size restrictions is still largely in place. The ITQ system has not, in other words, replaced these components of the earlier fisheries management system.

[62] See Figure 5 above.
[63] This applies especially to some local shrimp and scallops fisheries.

Further details of the ITQ-system in the Icelandic fisheries are given below:

Total Allowable Catch (TAC)

The Ministry of Fisheries determines the Total Allowable Catch (TAC) for each of the most important species in the fisheries. This decision is made on the basis of recommendations from the Marine Research Institute.

In the past the Ministry of Fisheries has followed the recommendations of the Marine Research Institute quite closely. The main exception concerns the economically most important stock, the cod. In the case of cod, TACs have consistently exceeded biological recommendations. The reason appears to be based on macro-economic considerations. The cod fishery, as explained in previous chapters, plays a very substantial role in the Icelandic economy. Consequently, the Government has proved reluctant to reduce the cod TAC in accordance with the recommendations of the Marine Research Institute.

Currently ten species are subject to TACs and consequently individual quotas. They include six demersal species: cod, haddock, saithe, redfish, Greenland halibut and plaice; two pelagic species: herring and capelin, as well as shrimp, lobster and scallops. These ten species account for over 95% of the total volume of the Icelandic fisheries and well over 90% of the value. The remainder of the catch is accounted for by a great number of species many of which appear as demersal by-catch fisheries and are commercially negligible. Some of the more important of these species reside outside the 200 mile exclusive fisheries zone and, consequently, constitute international common property fisheries. The fishing pressure on many of the others is regarded as slight. The fact that these fisheries are not currently subject to TAC means that they can be pursued freely.

Permanent quota shares

Each eligible vessel is issued a permanent share in the TAC for every species for which there is a TAC. These permanent quota shares may be referred to as TAC-shares.

Initial allocation of permanent quota shares

The initial allocation of TAC-shares to individual vessels varies somewhat over fisheries. In the demersal, lobster and deep-sea shrimp fisheries the TAC-shares are normally based on the vessel's historical catch record during certain base years. In the demersal fisheries this usually equals the vessel's average share in the total catch during the 3 years prior to the introduction of the vessel quota system in 1984. There are noteworthy exceptions to this rule, however. If, for instance, the vessel in question was not operating normally during 1981-3 due e.g. to major repairs or having entered the fleet after 1981, the calculated share is adjusted upwards. Also, during the years 1985-1987, it was possible to modify the TAC-shares by temporarily opting for effort restrictions instead of vessel quotas and demonstrating high catches during this period. In the herring and inshore shrimp fisheries the initial TAC-shares were equal for all eligible vessels. Eligible vessels were generally those with a recent history of participation in the fishery. The same rule applied to the capelin fishery except that 1/3 of the TAC-shares were initially allocated on the basis of vessel hold capacity.

Annual vessel quotas

The size of each vessel's annual[64] quota in a specific fishery is a simple multiple of the TAC for that fishery and the vessel's TAC-share.

Divisibility and transferability

Both the permanent TAC-shares and the annual quotas are transferable subject to certain restrictions and perfectly divisible. Perfect divisibility means that any fraction of a given quota may be transferred.

Restrictions on quota transferability are rather insignificant. Most importantly, TAC-shares are transferable without any restrictions whatsoever. The same applies to transfers of annual quotas provided they take place within the same geographical region. Transfers of annual quotas between geographical regions are, on the other hand, subject to some conditions. These, however, do not appear to be very restrictive. Transfers of annual quotas between vessels belonging to the same fishing company are subject to no restrictions. The same applies to exchanges of equivalent quotas between unrelated vessels in different geographical regions. Other transfers of annual quotas between geographical regions are, on the other hand, subject to revision by the respective fisher's unions and the local authorities. The rationale for this stipulation is to stabilise local employment in the short run. In practice, however, it appears that few inter-regional transfers are actually blocked.

Apart from this, transfers of quotas are only subject to registration with the Ministry of Fisheries. The particulars of the exchange, including price, are not registered.

Restricted access: licences

All commercial fishing vessels must hold valid fishing licences.[65] Fishing licences, moreover, are issued only to vessels already active in the fishery in 1990 and their replacements provided they are deemed comparable in terms of fishing power. The fishing licences are not transferable.

Thus, in addition to the ITQ-system, the Icelandic fisheries are subject to restricted access. One of the impacts of a well designed ITQ system is to provide the socially appropriate incentive for disinvestment (investment) in the fishing fleet. The fishing licence stipulation clearly adds a deterrent to investment in fishing vessels.

Exemptions from the ITQ system

There are two minor exemptions from the current ITQ system in commercial fisheries, both in the demersal fisheries. The first concerns longline demersal fisheries in mid-winter. More precisely, 50% of the demersal catch of vessels employing longline during the months of November through February each winter is exempt from quota restrictions. The reason for this exception is primarily to support regional employment during this period.

[64] In some cases, e.g. the capelin fishery and some inshore shrimp fisheries, where the biological management periods are less than a year, the quota periods are correspondingly shorter.

[65] This is in addition to catch quotas.

Second, hook and line fisheries by vessels under 6 GRT may elect to be exempted from quota restrictions in which case they are subjected to limited fishing days. In addition, the total allowable catch of cod under this arrangement is restricted. In order to enforce that restriction the number of permissible fishing days may be adjusted downward.

In addition to these exceptions, the system allows a good deal of flexibility in the individual quota constraint each year. Thus, current rules allow a quota holder to exceed his annual quota for each species by 5% subject to a corresponding reduction in his quota next year. Similarly, the quota holders are allowed to postpone the harvesting of up to 20% of their annual quota until next year. Finally, it is permitted to switch up to a 5% of the annual quota[66] from one species to another within the year.

In addition to these commercial exemptions from the ITQ system, it should be noted that recreational fishing is exempt from the ITQ fisheries management system altogether. This particular exception is of very little consequence in Iceland as the recreational fishery is negligible, amounting perhaps to a few metric tonnes annually.

Quota fees

The annual vessel quotas calculated in the above-described manner were initially issued by the Ministry of Fisheries free of charge. However, according to the *Fisheries Management Act* of 1990, the Ministry of Fisheries is to collect fees for catch quotas to cover the cost of monitoring and enforcing the ITQ regulations. The law imposes an upper bound on this fee amounting to 0.4% of the estimated catch value.

Particular features

As indicated by the above description, the Icelandic ITQ system has most of the crucial features of the ideal ITQ system as discussed in the theoretical literature[67]. It is important to realise, however, that there are certain aspects of the Icelandic ITQ system that deviate from the theoretical ideal and almost certainly subtract from its economic efficiency.

First, in the Icelandic ITQ system, the ITQs are closely associated with fishing vessels. More precisely, only those that own fishing vessels with a valid fishing licence can hold quotas. In addition, the total holdings of quotas must not exceed the fishing capacity of the vessel in question.[68] The set of potential holders of ITQs is thus severely restricted. This clearly subtracts from the ability of the quota market in effecting the most economically beneficial allocation of quotas.

Second, the holders of TAC-shares must harvest at least 25% of their TAC-share every second year to retain the share. This stipulation is designed to obstruct speculative quota holdings. However, in so doing, it reduces the efficiency of the quota market and induces more vessel holdings than would be optimal.

[66] In value terms.
[67] See e.g. Arnason (1990).
[68] This particular stipulation actually seems to be loosely interpreted and enforced.

The performance of the ITQ system

The main purpose of the vessel quota system is to improve the economic efficiency of the fisheries. The Icelandic fisheries are biologically very productive and should be able to generate high economic rents. Until the adoption of the vessel quota system, however, hardly any rents were generated in the industry. In fact, in the years preceding 1984 industry profits were highly negative while the remuneration of labour was probably no higher than in the remainder of the economy.

The ITQ system was introduced at different times and in different forms in the various fisheries. Consequently, it might help to discuss the impact of the system in the most important fisheries in turn.

The herring fishery

The herring fishery off Iceland was first developed in the late nineteenth century. Initially the fishery was on a very small scale, entirely dependent on the limited fishing power of beach seines. At the beginning of the twentieth century, purse seines and drift nets were introduced with a corresponding increase in catch levels. Since then the fishery has been characterised by improving fishing technology and, until the late 1960s, increasing catch volumes. In the 1960s, with the adoption of an improved fishing technology[69], the North-Atlantic herring fisheries expanded dramatically. For several years, the Icelandic herring catches exceeded half a million MT annually representing over half of the total Icelandic marine harvest. Toward the end of the 1960s, however, the herring stocks succumbed to intense fishing pressure and the fishery off Iceland practically disappeared.[70]

Before the herring collapse in the late 1960s, the Icelandic herring fishery was based on three different stocks of herring. Far the largest was the Atlanto-Scandian herring stock that spawned off Norway and undertook annual feeding migrations across the North Atlantic to Icelandic waters. In the early 1960s this stock is believed to have been the largest single stock of fish in the North Atlantic with biomass in excess of 10 million MT. The other two herring stocks on which the Icelandic herring fishery was based were the so-called Icelandic spring-spawning herring and the Icelandic summer-spawning herring stocks.[71] Both of these stocks were confined to Icelandic waters and did not undertake wide ranging migrations. During the 1960s, all three species of herring became subject to severe overexploitation and suffered a stock collapse. The first to surrender was the Atlanto-Scandian herring which was subject to heavy international fishing pressure practically throughout the year. Subsequently, around the end of the decade the two Icelandic herring stocks suffered a similar fate.

Protected by initial fishing moratoria and subsequently tightly controlled fishing, two of these three herring stocks have partially recovered. The first to do so was the Icelandic spring-spawning herring, previously the smallest of the three stocks. This stock has now become the basis for the Icelandic herring fishery. The Atlanto-Scandian herring was slow to recover and has only recently become able to sustain commercial fisheries. Its stock size nevertheless is still far below previous levels and it has not resumed migrations to Icelandic waters. The third stock, the Icelandic spring spawning herring, although not biologically extinct, has remained below 1% of its former size and does not show any signs of a recovery in spite of a complete fishing moratorium for over 20 years.

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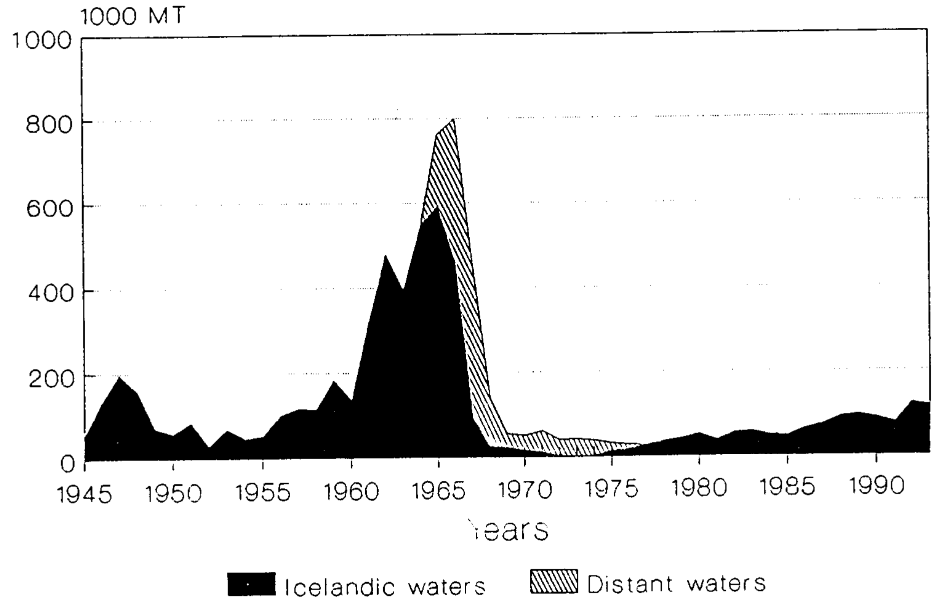
[69] Especially, improved sonar-based fish finding equipment and the adoption of new purse-seine handling technology.

[70] It should be noted, however, that part of the Icelandic herring fleet then embarked on distant water herring fishing from the North Sea herring stock.

[71] See Jakobsson (1980)

The history of the Icelandic herring fishery since 1945 is illustrated in Figure 6.

Figure 6. The Icelandic herring catch 1945-92: 1000 MT



The herring fishery in Iceland is currently based exclusively on the Icelandic summer-spawning stock. Although, as indicated in Figures 6, the annual harvest from this stock has been growing rather steadily since 1975 reaching 120 000 MT in 1992, the fishery is still of comparatively minor importance. Currently, it accounts for some 7% of total catch volumes and only about 2% of the export value of fish products.

Management

The early history of the North Atlantic herring fisheries is a textbook example of stock overexploitation and poor management. This record is only superficially explained by the well-known susceptibility of schooling pelagic species to overfishing. A more fundamental reason for the disaster is the international or high-seas nature of the fishery combined with a lack of appreciation of the population stock dynamics involved that made concerted action concerning stock preservation all but impossible. These conditions have now changed. The herring stocks in question are now largely confined to the Norwegian and Icelandic fisheries jurisdictions. Consequently, since the early 1970s, they have come under a tight and, in many respects, economically efficient fisheries management.

Until 1969 the herring fishery off Iceland, as in the North Atlantic generally, was a typical unregulated free access, competitive fishery. There were few restrictions except those set by market forces. By 1969, as the evidence that the herring stocks were being depleted mounted, it became increasingly clear that the fishery was not sustainable. Most importantly, the herring industry realised that the development were not to its advantage. Thus, in 1969 the industry agreed to the imposition of closed seasons and total quota restrictions which were reduced in 1970 and again in 1971. These measures, however, proved insufficient to halt the decline of the herring stocks. The total quota was not even reached in 1969 and 1970. In 1972, when the catches in Icelandic waters had dwindled to almost nothing, a complete herring moratorium was imposed within the Icelandic jurisdiction.[72]

It appears that three factors were mainly responsible for this decision. First, by this time it had become clear to almost everyone that the herring stocks were close to extinction. Second, because of the decline of the fishery, the vested interests connected with its continuation were weaker than before. Third, relatively attractive fishing alternatives existed for the herring fleet, namely the emerging capelin fishery off Iceland and North Sea herring fisheries for the larger vessels and lobster, shrimp and scallop fisheries for the smaller ones.

With the recovery of the Icelandic spring-spawning herring in 1975, the moratorium was partly lifted. The total allowable catch (TAC) was small, however, and it was obvious that the whole fleet could not participate. Hence an individual vessel quota system (IQs) was imposed. Eligibility for quota allocations was limited to small vessels with a history of herring fishery participation. The larger purse-seiners were excluded on the grounds that they were capable of pursuing the North-Sea herring fishery and the Icelandic capelin fishery. The individual quotas were small, however, and although the IQs were in principle non-transferable considerable interest to transfer quotas between vessels quickly emerged. Thus, in 1979, fairly unrestricted transfers of individual herring quotas were permitted. This transformed the herring IQ fisheries management system into an ITQ system. This, incidentally, may have been the first fully fledged ITQ system instituted in a significant ocean fishery.

The crucial steps in the management history of the Icelandic herring are listed in Table 6.

Table 6. Evolution of the fisheries management in the herring industry

Until 1969	No management, open fishery
1969-72	Total quotas, closed seasons
1972-75	Herring moratorium
1975-79	Individual quotas, IQs
1979-90	Individual transferable quotas, ITQs
From 1990	Part of the general ITQ system.

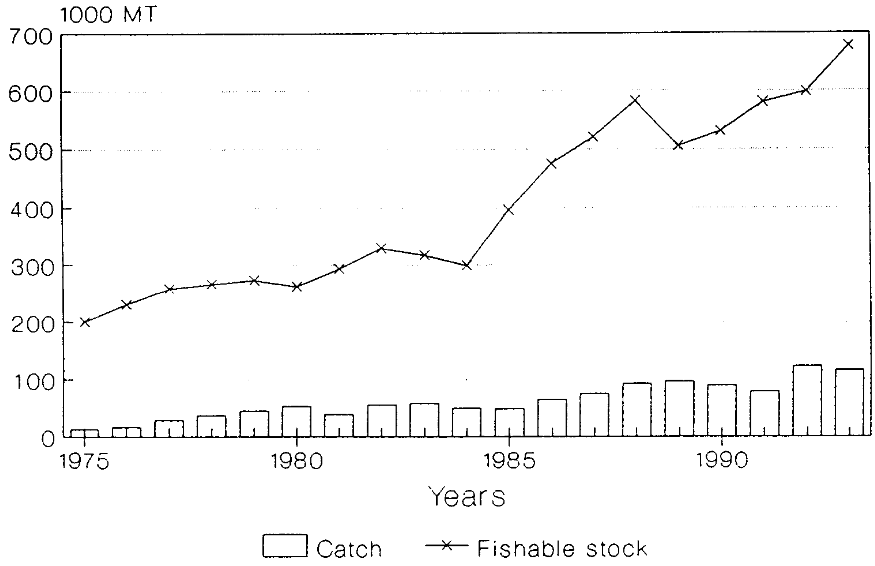
Sources: Ministry of Fisheries: Fisheries Regulations; Marine Research Institute (1980-92), Fisheries Association of Iceland: Utvegur (1977-92).

Effects of the fisheries management system

The management of the Icelandic herring stocks imposed in 1972 has been biologically successful. Admittedly, the spring-spawning herring stock has not recovered. This is not for lack of management efforts, however, as there has been a complete moratorium on fishing from this stock since 1972. The summer-spawning herring stock has, on the other hand, recovered smartly. In fact, its biomass is now similar to its pre-1960s level. At the same time the harvest from this stock has steadily increased. The path of biomass and harvest for the summer-spawning herring since 1975 is illustrated in Figure 7.

72 Distant water herring fisheries based on the North sea herring stock continued, however.

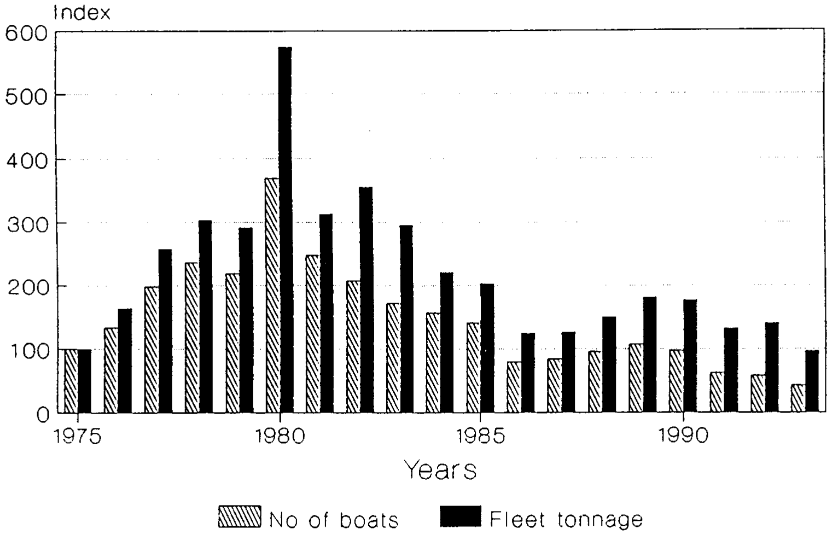
Figure 7. The Icelandic summer-spawning herring: biomass and annual catches



The economics of the herring fishery also appear to have improved significantly. The number of vessels participating in the herring fishery has been greatly reduced. In 1975, at the beginning of the IQ fisheries regime, there were about 65 vessels in the fleet. In 1992 there were only 38 vessels in the fishery. The average vessel size has substantially increased, however. As a result, the total size of the fleet in tonnage terms has not declined. In this connection two considerations should be kept in mind. First, the size of the herring fleet participating in the fishery in 1975 was artificially depressed due to restricted access to the fishery and the very small total quota allowed in that year. Second, as illustrated in Figure 7 total catches since 1975 have increased almost tenfold.

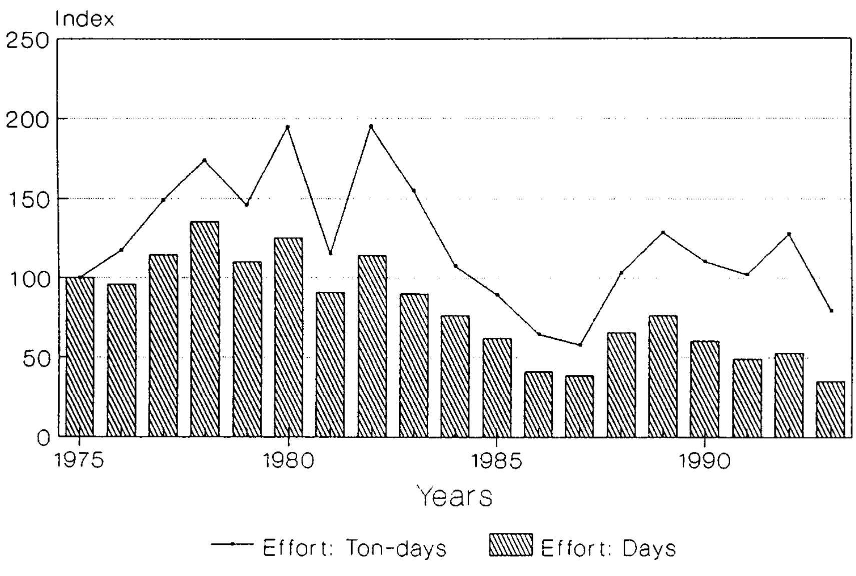
It is also important to note that, after an initial increase, the herring fleet has contracted quite dramatically since 1979. The initial expansion in the herring fleet appears to have been largely induced by the non-transferability of the quotas. Given that particular constraint, the only way eligible vessels could realise their share in the gradually improving herring fishery was by exercising their right to enter the fishery. This changed when the herring quotas were made transferable in 1979. Since then the herring fleet has contracted dramatically. These developments in the herring fleet are further illustrated in Figure 8.

Figure 8. Development of the herring fishing fleet
(participation in the Icelandic herring fishery)



Fishing effort as measured by days at sea has also decreased substantially since 1975. Fishing effort measured as ton-days at sea[73] has, on the other hand, not contracted. This is explained by larger vessels being employed in the herring fishery as discussed above. The developments in the herring fishing efforts are further illustrated in Figure 9.

Figure 9. Development of herring fishing effort



[73] The effort measure "ton-days at sea" is simply the total number of days at sea multiplied by the average tonnage of the vessel.

The data presented in Figures 7 to 9 suggest a substantial improvement in the technical efficiency of the herring fishery under the individual quota fisheries management regime system introduced in 1975. Herring catch per unit of fleet and fishing effort has clearly increased dramatically. Unfortunately, however, as the herring fleet is engaged in a variety of other fisheries during the year, no direct measures of the economics of the herring fishery are available.

In summary, there has been a dramatic increase in the herring stock since the introduction of the IQ and later the ITQ fisheries management system in 1975 and 1979. There is also clear evidence of a similar increase in the technical efficiency of the herring fishery over the same period. Catch per unit of input has greatly increased.

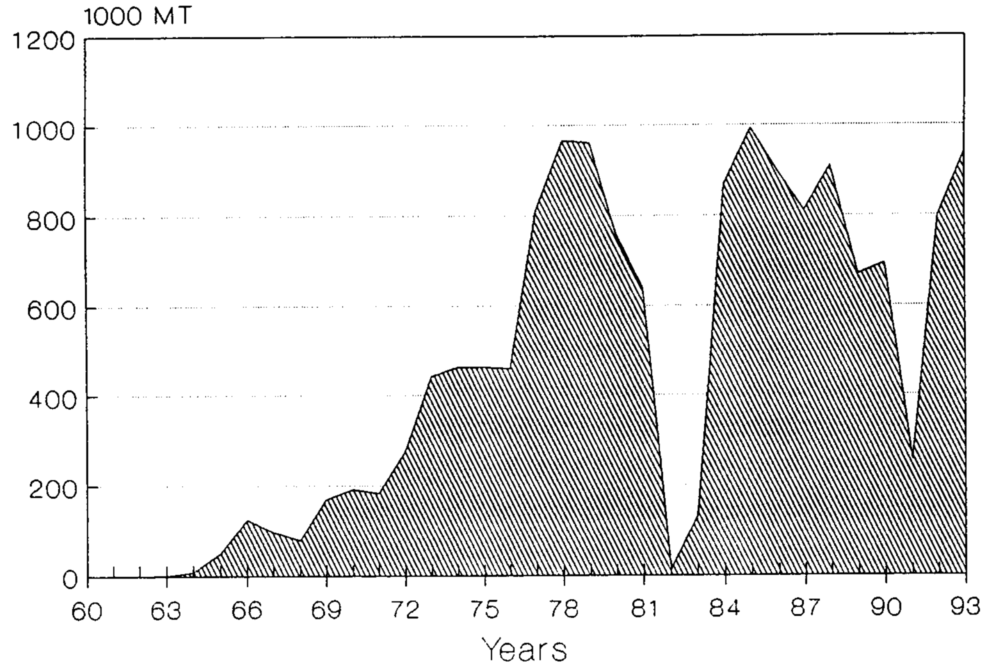
The capelin fishery

The capelin fishery is one of the most important Icelandic fisheries. It is by far the largest in terms of catch volume. In recent years the average annual catch has been in excess of 650 000 MT. This represents about 45% of the total volume of the Icelandic fish harvest. Most of the capelin catch serves as low price raw material to the reduction industry. Consequently the value of the fishery is comparatively low. In aggregate it only accounts for about 5% of the total landed value of the Icelandic catches. Capelin products account for some 8% of the total fish exports from Iceland.

Compared to most other Icelandic fisheries, the capelin fishery has a rather short history. It commenced in the mid-1960s largely as a by-product of the extensive herring fishery of the decade. As the herring, the capelin is a pelagic species which seasonally congregates into large schools that provide an opportunity for a large scale fishery employing purse seines. The capelin, however, is much smaller than the herring and is almost exclusively used for the production of fish-meal and oil. The herring fishery was largely a summer and autumn fishery while the capelin is most easily harvested during its spawning migration in winter. Therefore, with the advent of more powerful purse-seiners in the 1960s it was natural for the herring fleet to expand its activities to fishing capelin as well as herring. During the 1960s, the capelin fishery, nevertheless, remained a relatively unimportant side-activity of the herring fleet. It was not until the 1970s, after the collapse of the herring fishery, that the capelin fishery became an independent, important fishery.

The capelin is a short-lived species. It spawns only once at an age of 3-4 years and it is primarily during the spawning migration that the stock becomes fishable. The fishery, therefore, is largely based on a single cohort annually. As the cohort size fluctuates dramatically, apparently for natural reasons, the fishery itself is quite volatile. The history of the catches is illustrated in Figure 10.

Figure 10. The Icelandic capelin catch 1960-1992: 1000 MT



Management

A part of the capelin stock migrates seasonally into the Greenland and Norwegian fisheries jurisdiction. Consequently, the capelin is a shared stock. By an agreement with these two countries, Iceland determines the annual TAC which is then shared between the three countries. Iceland's share is 78% of the TAC and Greenland and Norway receive 11% each.

Initially, the capelin fishery developed as an open and unmanaged fishery. However, in the late 1970s, with annual catches approaching 1 million MT, the Ministry of Fisheries became concerned about the sustainability of the stock. Consequently, primarily in order to maintain a certain minimum spawning stock size, the capelin fishery became subject to increasingly stringent management measures from 1978 onwards. A total quota regime was imposed on the fishery in 1978 supplemented by increasingly extensive closed seasons. In 1979, a capelin licence limitation program was introduced.

These measures, however, neither proved biologically effective nor did they improve the economics of the capelin fleet. Consequently, in 1980, it was decided to allocate the TAC as individual quotas, or IQs. The arguments favouring this decision were similar to those for the herring fishery previously. The capelin stock was believed to be threatened with biological overexploitation. The capacity of the capelin fleet was felt to be excessive compared with the biological productivity of the capelin stock, giving rise to decreasing economic yields in the fishery. Finally, total quotas and closed seasons did not seem to be capable of reversing this trend. Therefore, some alternative management measures seemed necessary. The positive experience with the vessel quota system in the herring fishery proved a convincing argument for adopting a similar system in the much more important capelin fishery. The IQs were denominated as shares in the annual TAC. Their allocation was limited to vessels participating in the capelin fishery in 1979. The allocation rule was 2/3 equal and 1/3 on the basis of hold capacity. These IQs were not transferable on a temporal basis. However, they were permanently transferable in the sense that a vessel that wanted to retire from the fishery could transfer its IQ to one or more capelin vessels. Several transfers of this kind took place during the following years.

In 1986, the capelin IQs became freely transferable transforming the system into a fully fledged ITQ system. In 1990, the capelin fisheries management system became a part of the overall Icelandic fisheries management system.

Table 7. Evolution of fisheries management in the capelin fishery

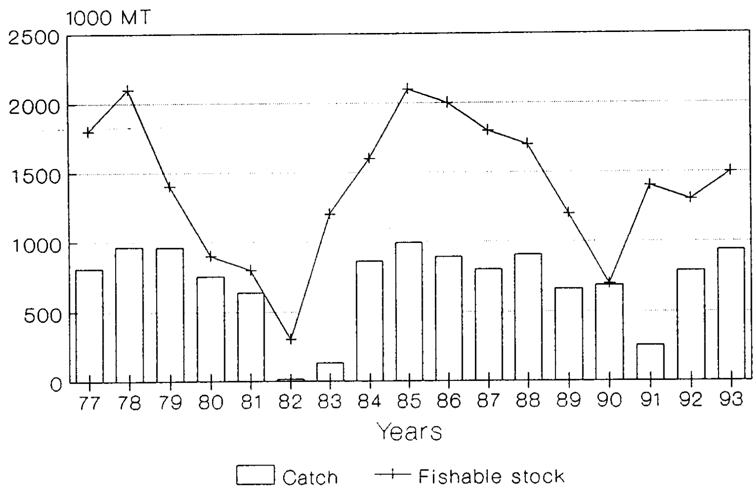
Until 1978	No management, open fishery.
1978-80	Total quota, closed seasons, restricted access.
1980-86	Individual quotas, IQs.
1986-90	Individual transferable quotas, ITQs.
From 1990	Part of the general ITQ system.

Sources: Ministry of Fisheries: Fisheries Regulations; Marine Research Institute (1980-92), Fisheries Association of Iceland: Utvegur (1977-92).

Effects of the fisheries management system

Unfortunately, no formal studies of the impact of the individual quota management system imposed on the capelin fishery in 1980 have been carried out. It is clear, however, that the capelin stock size has not been significantly affected by the IQ fisheries management. The capelin, as already mentioned, is a short-lived species highly dependent on favourable environmental conditions and, consequently, subject to severe biomass fluctuations, even in the absence of harvesting. These fluctuations have continued since 1980 as illustrated in Figure 11.

Figure 11. Capelin catch and stock size at end of the fishing season
(1000 MT)



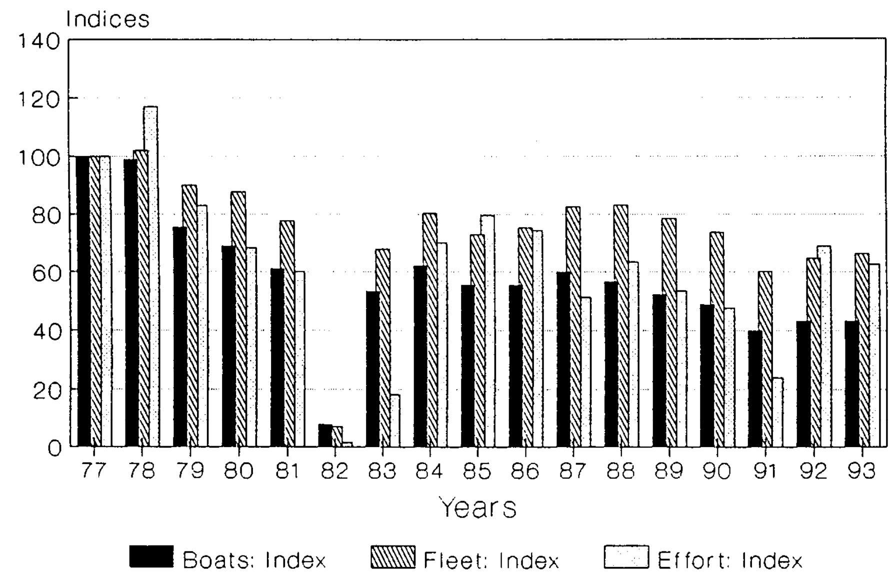
As suggested by Figure 11 there is no apparent trend in either the average stock size or catch volume during the period since 1980. In fact, on the basis of formal statistical tests, the hypothesis that there is no trend in these variables cannot be rejected.[74]

There are, on the other hand, indications of a slight declining trend in the real value of the capelin catches since 1980. This appears to be explained by a downward trend in the real price of capelin for reduction purposes although this has to some extent been counteracted by a shift in the composition of capelin landings toward higher valued products such as roe-capelin for human consumption.

The economics of the capelin fishery appear to have improved substantially. There has been a pronounced reduction in the number of capelin vessels. At the beginning of the IQ fisheries management regime in 1980 there were about 68 capelin purse-seiners in operation. At the end of 1992 there were only 39. Thus, during this period, there has been a total reduction in the number of capelin vessels by over 40%. The fleet reduction in tonnage terms has been much less as it is primarily the smaller vessels that have left the fishery. Nevertheless, from 1979 to 1992 the total tonnage of the capelin fleet has been reduced by well over 25% from about 25 800 GRT to about 18 500 GRT.

Capelin fishing effort has also contracted substantially although not as much as the fleet. This is of course readily understandable. Economic rationalisation in a previously overcapitalised fishery normally requires a reduction in the capital level and better utilisation of the remaining capital. Thus, between 1979 and 1992 total days at sea for the capelin fleet has been reduced by some 17%. These trends in fishing capital and fishing effort are illustrated in Figure 12.

Figure 12. The development of the capelin fishing fleet and effort
(Indices)



[74] The relevant test statistic is t=-0.3.

In summary: The evidence indicates a major improvement in the economic efficiency of the capelin fishery during the period since 1977. The capelin fleet and aggregate fishing effort has been substantially reduced. Aggregate catch per unit of fishing effort has also greatly improved.

Demersal fisheries

The demersal fisheries are by far the most important Icelandic fisheries, accounting for over 75% of the total value of the catch. These fisheries were subjected to an individual transferable quota system in 1984. This system was subsequently under almost continuous revision until the adoption of the uniform fisheries management system in 1990.

Most importantly, as explained above, the ITQ system in the demersal fisheries was combined with an optional limited effort system already in 1985. This option was not abolished until 1990. In the meantime a large fraction of the demersal fleet opted for limited effort rather than individual quotas with the result that between 1986 and 1990 less than half of the demersal catch was taken under the ITQ system. Some relevant data illustrating this are presented in Table 8.

Table 8. Demersal ITQs as a fraction of total demersal catch

Year	Cod	Haddock	Saithe	Redfish	Gr. Halibut
1984	0.88	1.38	1.25	1.09	1.00
1985	0.64	0.94	1.05	0.97	0.76
1986	0.32	0.51	0.52	0.37	0.29
1987	0.36	0.68	0.46	0.40	0.24
1988	0.52	0.74	0.66	0.43	0.33
1989	0.53	0.63	0.60	0.41	0.29
1990	0.49	0.58	0.54	0.39	0.46
1991**	0.96	0.97	0.94	0.95	0.94
1991/2	0.90	1.01	0.88	0.97	0.83

(*) A ratio in excess of unity indicates that total issued ITQs exceed the actual catch.
(**) The first fishing year under the new *Fisheries Management Act* of 1990, i.e. from Jan. 1 until September 1 1991.

Table 8 suggests that during 1985-89, especially in 1986-7, an ITQ system was hardly be in effect in the Icelandic demersal fisheries. The majority of the catch was taken under the limited effort option. This, however, changed with the abolition of the limited effort option which took effect in 1991. Clearly, the evidence on the performance of the ITQ system in the demersal fisheries has to be interpreted in this light.

Fishing capital and fishing effort

We have seen that one of the reasons for the dissipation of economic rents in the Icelandic fisheries has been overinvestment in fishing capital and excessive fishing effort. Therefore one of the tests of the efficacy of the vessel quota system is the development of fishing capital and aggregate fishing effort since the introduction of the system.

The trend in fishing capital and fishing effort in the demersal fisheries[75] in recent years is illustrated in the following table:

Table 9. Capital and demersal fishing effort: Indices

Year	Fishing capital*	Demersal fishing effort**
1978	0.942	0.953
1979	0.977	1.000
1980	1.000	1.058
1981	1.033	1.082
1982	1.056	1.234
1983	1.066	1.250
1984	1.067	1.061
1985	1.058	1.004
1986	1.118	1.069
1987	1.224	1.129
1988	1.353	1.207
1989	1.364	1.191
1990	1.337	1.245
1991	1.314	1.243
1992	1.358	1.215
1993	N/A	1.172

(*) Total value of the fishing fleet.
(**) Measured as ton-days at sea in the demersal fisheries only.
Source: National Economic Institute: Sogulegt Yfirlit Hagtaina 1993;
Fisheries Association of Iceland: Utvegur (1977-93).

Thus we see that the previously rapid growth in the value of aggregate harvesting capital halted abruptly in 1984 when the vessel quota system was introduced. In fact, fishing capital contracted 1984-85. This was the first time since 1969 that the value of the fishing fleet actually decreased. In the preceding 15 years this capital value had grown at an annual rate of over 6%. Thus, at this point the vessel quota system seems to have generated beneficial results.[76] In 1986, on the other hand, investment in fishing capital resumed at a high rate. This resumption of investment, should not, however, be interpreted as a failure of the vessel quota system as such. After all, the increase in value of fishing capital since the inception of the ITQ system has amounted to under 3% annually while during the preceding 15 years this annual increase was over 6%. Moreover, most of this investment can be explained by factors extraneous to that system.

First, a good deal of the investment in fishing capital from 1986 onwards has consisted of the installation of freezing equipment and the corresponding modifications of several deep-sea trawlers.[77] This part of the investment was therefore not really in fishing power but in fish processing capital employing new and profitable techniques. A second part of the investment since 1986 was in specialised trawlers for the emerging and very valuable deep-sea prawn fishery which was not subject

[75] Data on fishing effort in the pelagic and crustacean fisheries is unfortunately not available.
[76] Note, however, that the years 1982-84 were periods of heavy losses for the fishing industry. Therefore the halt in investment in 1984-5 can hardly be attributed exclusively to the vessel quota system.
[77] In 1983 there were 3 freezer trawlers. In 1990 they were 28.

to vessel quotas until 1988. Third, by the mid 1980's a significant fraction of the deep-sea trawler fleet was due for replacement. As the years 1986 and 87 were unusually profitable for the harvesting sector, many firms took the opportunity to replace their ageing vessels. Fourth, during this period there was a very significant investment in small vessels (under 12 and subsequently 10 GRT) that were not subject to the vessel quota system. Last but not least, the limited effort option in the demersal fisheries made it attractive for many vessel owners to upgrade or replace their vessels. The limited effort option was abolished in 1990 and, in fact, we see a reduction in fishing capital in that year and again in 1991.

The course of demersal fishing effort tells a similar story. As indicated in Table 9, fishing effort in the demersal fisheries, measured as ton-days at sea, dropped by some 15% in 1984, the first year of the vessel quota system. It dropped by an additional 6% in 1985. Since 1986, on the other hand, fishing effort has increased considerably. This is no doubt primarily due to the wide-spread selection of the ill-advised effort quota option within the ITQ system during 1986-1990. Another important explanation for the increase in fishing effort in 1989 and 1990 is the decline in the demersal fish stocks without a commensurate reduction in the TACs thus requiring more fishing effort to fill the catch quotas. In 1991, although exact data are not available, demersal fishing effort appears to have declined somewhat again.

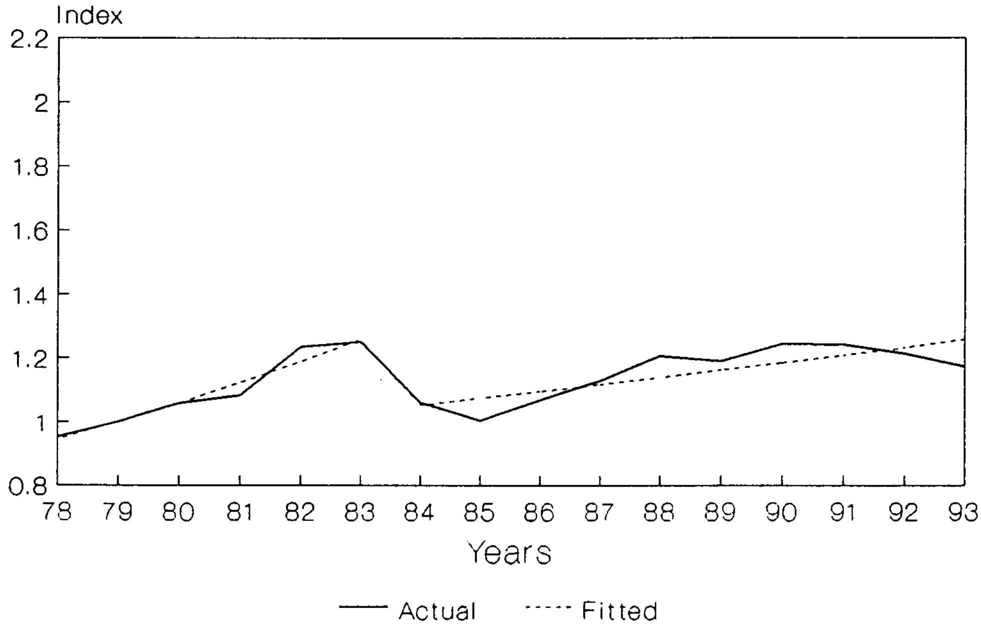
The main question, however, is not whether fishing effort has been reduced from its 1983 level. The crucial question for assessing the impact of the vessel quota system is the difference, if any, between the actual fishing effort during 1984-1990 compared to the fishing effort level that would have prevailed during the period had the vessel quota system not been introduced.

Clearly, it is not at all straightforward to predict the course of fishing effort under the earlier management regime. However, in an attempt to provide a partial answer to this question, a simplistic model to explain the path of fishing effort under the two different management regimes has been employed. Essentially, a simple trend model describing the path of fishing effort under the two management regimes was specified. Somewhat more precisely, it was hypothesised that during the 13 year period 1978-1990 fishing effort evolved over time according to the relationship:

$$e(t) = (a \times D1 + b \times D2) \times exp[(c \times D1 + c \times D2) \times t],\ t=0,1,2,...12,$$

where $e(t)$ represents fishing effort in year t and t represents the years measured from 0 to 12. $D1$ and $D2$ are dummy variables for the two management regimes. Thus $D1=1$ during the years of restricted effort (e.g. 1978-1983) and 0 thereafter. $D2=0$ in the years preceding 1984 and 1 thereafter. The coefficients a and b represent the intercepts and the coefficients c and d the growth rates of effort under the two management regimes. The fit of this model to the actual path of demersal fishing effort is illustrated in Figure 13.

Figure 13. Demersal fishing effort: actual and fitted



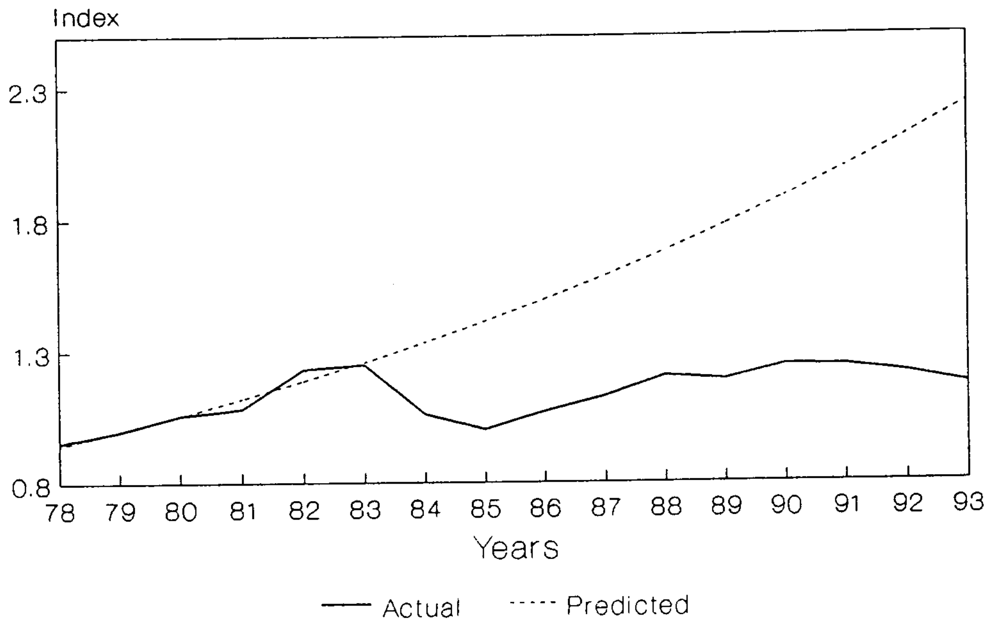
The diagram shows that the estimated relationship fits the actual one reasonably well even during the sudden drop in fishing effort at the outset of the ITQ system. Hence some confidence in the estimated relationship may be justified. More importantly, the estimated growth rate of fishing effort under the quota system appears to be a great deal lower than under the effort quota system.[78]

The hypothesis that there is no structural break in the evolution of fishing effort between the two management regimes is resoundingly rejected. The relevant test statistic is $v^2(2)=58.9$. Similarly the growth of fishing effort under the ITQ regime is significantly lower than under the previous fisheries management regime. The relevant test statistic is $v^2(1)=6.9$

Employing this estimated relationship we may predict the fishing effort assuming that the vessel quota system had not been introduced in 1984 and compare this to the actual fishing effort observed. The results of this exercise are illustrated in Figure 14.

[78] Under the effort quota system the estimated annual growth rate of fishing effort was 6% but less than 2% under the vessel quota system.

Figure 14. Predicted fishing effort assuming no vessel quota system



According to this diagram, fishing effort under the earlier effort quota system would, in all likelihood, have continued to increase at a high rate after 1983[79]. Therefore, in spite of the rise in fishing effort under the vessel quota system since 1986, there is a considerable gap between the predicted effort under the earlier management system and the actual fishing effort under the vessel quota system. According to these estimates, the vessel quota system appears to have reduced total demersal fishing effort by some 30% compared to the expected fishing effort under the previous management system. The financial benefits of this kind of an effort reduction are very substantial. In interpreting these results, however, the reader should be mindful of the extreme simplicity and mechanistic nature of the underlying model. This suggests, that the above results should be regarded as indicative only.

More direct estimates of economic benefits

Let us now turn to more direct estimates of the economic benefits generated under the vessel quota system. Unfortunately, little research has been done in this area and the available information is consequently rather meagre.

[79] Note, that the fishing effort in this context is a multiple of fleet tonnage and days at sea. The expansion of this variable is only limited by fleet profitability even if TAC's and fish stocks remain constant.

From a theoretical point of view, the economic benefits of a vessel quota system should include the following items:

– A reduction in fishing effort

Under the vessel quota system competition between vessels for a limited stock of fish is eliminated. Consequently, the fishing firms will attempt to catch their vessel quota with minimum fishing effort. It is important to realise, however, that aggregate fishing effort will not necessarily be reduced if the aggregate catch quota is excessive.[80]

– Reduced cost of fishing effort

Having secured private ownership of a certain volume of catch under the vessel quota system, the fishing firm can concentrate on taking that catch with minimal costs.

– Improved quality of the catch

Being bound by its vessel catch quotas, the fishing firms can only increase revenues by improving the quality of this catch.

In a study carried out in 1985, the National Economic Institute attempted to estimate the benefits of reduced fishing effort and improved quality of the catch in the demersal fisheries for the year 1984. The conclusion was that the benefits of reduced fishing effort amounted to some 14 M USD and improved quality of the catch to some 6 M USD. The total number, 20 M USD, is about 8.5% of the value of the demersal fisheries in that year. Unfortunately, comparable studies for later years are not available.

According to official figures on operating results in the harvesting sector, its profitability has improved significantly since 1983. In fact, the financial results of the harvesting sector in 1986 and 1991 appear to be among the best in decades. Although many factors, in addition to the fishery management regime, affect the operating results of the fishing industry this must nevertheless be regarded as an additional indication of the beneficial effects of the ITQ system.

There is yet another way to approach the problem of estimating the rents generated in the fisheries as a result of the vessel quota system. As the quotas are transferable, a market for quotas has developed. In this market, quotas are exchanged for other valuables such as money. Hence, applying standard economic theory and assuming that the market for quotas is reasonably effective, the value of the fishery should equal the total value of outstanding quotas.[81]

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[80] Given the size of the fish stocks, each aggregate quota requires certain minimum fishing effort. If the aggregate quotas are set high relative to the size of the fish stocks aggregate effort may actually increase under a vessel quota system.

[81] Notice, however, that this value will not necessarily equal bookkeeping results. Quotas will be bought on the market at a price up to their marginal variable profits. Fixed costs, e.g. those associated with harvesting capital, are irrelevant for these transactions. Therefore, a firm may buy quotas at a high price without being able to cover fixed costs.

The extent of the quota market in the demersal fisheries is described in Table 10.

Table 10. The extent of the demersal quota market

Year	Total transfers (1)	(2) %	Vessel quotas as fractions of total demersal catch %
1984	64.1	11.2	100.0
1985	81.0	19.2	76.8
1986	52.2	24.4	36.0
1987	40.1	21.1	28.1
1988	61.4	23.7	43.8
1989	72.2	29.8	42.5
1990	78.9	22.6	68.2

1. Quotas exchanged in 1000 MT.
2. Quotas exchanged as a percentage of total outstanding vessel quotas.

(*) The next complete ITQ system took effect on Jan. 1 1991.

Source: Ministry of Fisheries.

Table 10 shows that the extent of the demersal quota market is considerable. In 1984, the first year of the vessel quota system, about 11% of outstanding quotas were exchanged. Since 1986 this percentage has fluctuated between 20 and 30%. However, due to contraction in the volume of outstanding quotas resulting from the widespread use of the effort quota option, the actual quantities exchanged in 1986-88 were somewhat less than in 1984-85.

The economic rents generated in the demersal fisheries according to the quota evaluation are given in Table 11.

Table 11. Economic rents in demersal fisheries: quota price valuation

Year	Price range USD/MT Cod	Other	Total quota values M.USD All quotas	Whole fishery
1984	55-87	24-40	36-57	36-57
1985	84-126	54-72	36-53	51-72
1986	127-176	79-109	23-32	66-91
1987	206-259	104-131	35-44	104-131
1988	208-277	154-205	49-65	108-144
1989	262-349	157-209	62-83	143-189
1990	428-514	256-308	151-182	222-267
1991	680-720	450-500	331-357	345-372
1992	650-700	400-450	257-282	286-313
1993	500-550	250-300	180-203	204-231
1994	900-1050	230-270	193-226	230-269

Source: Quota traders, Utvegur.

Judging from the fourth column of Table 11, it appears that the total value of outstanding quotas evaluated at the mid-point of the price range given, was some 46 M USD in 1984 and 166 M USD in 1988. However, these numbers almost certainly underestimate the true value of demersal catch rights. The reason is that they ignore the value of the nontradable catches which are mostly taken under effort quotas. If all the demersal catch is evaluated at the vessel quota prices, we obtain the valuation in the last column of Table 11. According to this column, the economic rents generated in the demersal fisheries are very considerable and constitute a significant fraction of the gross earnings of the fisheries[82]. This suggests that substantial economic rents were already being generated.

These estimates, however, must be interpreted with great care especially during the latter part of the period. During these years, demersal catches were good and fish prices unusually high. For this reason the quota prices for 1986-90 were probably higher than would otherwise have been the case.[83] More importantly, it must be realised that one of the first effects of a reasonably complete ITQ system is to make excessive fishing capital commercially redundant. This means that its market price falls drastically, the opportunity cost of its use is reduced and the market value of catch quotas is correspondingly increased. This, however, is a short term effect, that will be reversed in the long run when the level of fishing capital reaches a new equilibrium.

How does the economic performance of the demersal vessel quota system compare with optimal economic utilisation? Comparing the above quota price valuation of fisheries rents with the maximum attainable rents according to an empirical study of the Icelandic demersal fisheries (see Arnason, 1984), it appears that the realised economic rents in 1990 were well over 50% of the maximum attainable ones. Previous reservations concerning the probable upward bias of the quota values as estimators of sustainable rents in 1990 must, however, be stressed. Nevertheless, it is clear that significant benefits have been generated by the demersal vessel quota system. As fishing effort has been reduced only slightly, this must primarily be attributed to reduced harvesting costs per unit of catch and higher quality of the catch. In fact there is ample evidence that this has occurred.

Discards

Discarding of catch or highgrading is an often cited problem with ITQ systems especially in mixed fisheries. (see e.g. Rettig, 1986 and Squires and Kirkley, 1991). The Icelandic demersal fisheries are certainly mixed fisheries. Nevertheless, there is little evidence of increased discarding under the ITQ system. According to measurements published in a recent report by a government commission (Nefnd um Motun Sjavarutvegsstefnu, 1993), demersal discards range from 1-6% of total catch volume depending on gear and vessel type. Moreover, according to this report there has been no detectable increase in discards since the introduction of the vessel quota system in 1984.

Performance of the ITQ system: summary

Versions of the ITQ fisheries management system have been in operation in Icelandic fisheries since 1979. The evidence on the performance of this system is generally favourable although somewhat inconclusive.

[82] Thus in 1990 the demersal quota values exceeded 1/4 of total earnings in the demersal fisheries.
[83] Although considerably lower than in fully efficient equilibrium.

The introduction of the ITQ system in the herring fishery appears to have produced a dramatic increase in efficiency. In the capelin fishery, the ITQ system also appears to produced economic benefits although less dramatic than in the herring fishery. In the demersal fisheries, the evidence is more mixed. On the one hand, the fishing fleet has increased and aggregate fishing effort has contracted only slightly. On the other hand, various indicators including quota values in the demersal fisheries strongly suggest that significant rents are being generated by the system.

However, when interpreting the development of the demersal fisheries since 1984, the imperfectness of the ITQ system employed during the early part of the period should be kept in mind. This applies especially to the wide-spread use of the effort quota option during 1985-90. In fact, as shown in Table 8, the fisheries management system was only partially an individual quota system in these years. For this reason, and several others forwarded above, the upward trend in harvesting capital and demersal fishing effort during this period is hardly evidence of the failure of the ITQ system.

In addition, there is no evidence that the vessel quota system has increased discarding of catch. Neither does it appear to have had an adverse impact on regional habitation. In fact, the opposite is probably closer to the truth.

PART III: ANALYSIS AND EXPLANATIONS

Conclusions

Since the late 1960s, a wide range of fisheries management instruments have been employed in the Icelandic fisheries. These include total quotas, limited access, effort restrictions, investment controls, input restrictions, gear restrictions, area closures, individual quotas (IQs) and individual transferable quotas (ITQs). Generally speaking, the experience of these fisheries management systems conforms with theoretical predictions.[84] Total quotas, limited access, effort restrictions, investment controls and the various other input restrictions have all failed to improve the economic performance of the fisheries. Only the property rights based methods, the IQ and the ITQ systems, have apparently proven capable of substantially improving the economic efficiency of the fisheries.

In the herring and capelin fisheries the beneficial effects of the property rights based fisheries management are very clear. As indicated previously, capital/output and effort/output ratios have improved drastically in these fisheries. In the demersal fisheries, on the other hand, the evidence is more ambiguous. While certain indicators of economic benefits such as quota values suggest a substantial increase in efficiency, aggregate fishing effort has been only slightly reduced and the value of fishing capital has actually increased.

How can this apparent disparity between the development of the demersal fisheries and the two pelagic fisheries under the IQ and ITQ systems be explained? A fairly obvious explanation is that the property rights based fisheries management regime has been in operation for a much longer period of time in the herring and capelin fisheries than the demersal fisheries.

[84] See e.g. Clark (1980), Arnason (1990), Hannesson (1993).

In the herring fisheries the IQ system was introduced in 1975 and the ITQ system in 1979. Thus, a property rights based fisheries management system has been in operation in this fishery for 18 years and a fully fledged ITQ system for 14 years. An IQ system was introduced in the capelin fishery in 1980 and an ITQ system in 1986. Thus, in this fishery a property-rights based system has been in operation for 14 years and a complete ITQ system for 8 years.

In the demersal fisheries, the history of property rights based management regime is much shorter. An ITQ system was introduced in 1984. However, already in 1985 this system was compromised by an limited effort option with the result that less than half of the demersal catch was taken under the ITQ restriction between 1986-90. It is really only since 1991 that a reasonably complete ITQ system has been in operation in the demersal fisheries.

It follows that the impact of an ITQ regime on the demersal fisheries cannot be inferred from the development of this fishery for the whole period since 1984. It is basically only three data years, i.e., 1984 and 1991-2, that can be used for that purpose. The numerical evidence from these years is, of course, far from sufficient to draw conclusions. Let it suffice to say that it does not contradict the hypothesis that the ITQ system is capable of greatly increasing the economic efficiency of the demersal fisheries.

It is important to realise, however, that the development towards a complete ITQ fisheries management system in Iceland has evolved more by trial and error than by design. In most countries, and Iceland is no exception, there is strong social opposition to radical changes in the institutional framework of production and employment. A great deal of this opposition seems to derive from traditional values and vested interests rather than rational arguments. Therefore, in Iceland, it was probably unavoidable from a socio-political point of view to pass through an evolutionary process during which various management methods were tried in different fisheries. The knowledge and understanding gained from these experiments were probably crucial for the eventual acceptance of the much more efficient ITQ system.

At the same time, it should be noted, that the key steps in the evolution of the ITQ system have usually only been taken in response to crises in the respective fisheries due to a sudden reduction in stock levels. Thus, individual vessel quotas were introduced in the herring fishery in 1976 following a collapse in the herring stocks and a prolonged moratorium on herring catches. Similarly, vessel quotas in the capelin fishery and the ITQ system in the demersal fisheries were introduced in the early 1980s in response to a perceived danger of a corresponding collapse in these fisheries.

This pattern reflects, above anything else, the reluctance of members of the fishing industry to accept changes in the traditional organisation of the fisheries. Only when faced with a disaster in the form of a significant fall in income due to fish stock reductions or a drop in the world market price for fish products, have the interest groups been willing to consider changes in the institutional framework of the fisheries.

The passing of the comprehensive ITQ fisheries management legislations in 1988 and even more so in 1990 constitutes a break with this pattern. For the first time, the fishing industry has agreed to a significant improvement in the fisheries management system without being threatened with the alternative of a financial disaster. This may be attributed to the potentially immense economic benefits of the vessel quota system that have now become apparent to most of the participants in the fisheries.

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JAPAN

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Introduction

This paper aims to describe how the fishery system and utilisation of fishing grounds in Japan have been carried out historically, mainly from the viewpoint of fishery management taking resource to the history of fishery system in Japan. Further, it discusses the present fishing system incorporated in the Fisheries Law from the functional and institutional aspects of fishery management and attempts to show how fishing vessels, fishing gears and fishing methods, and fishing grounds are being managed, in order to implement fishery management within the framework of this system. Further, in discussing the fishery co-management system, this paper attempts to make economic assessment of fishery management in Japan that is characterised by limited entry and input restriction, i.e. controls on catch effort.

PART I. HISTORICAL BACKGROUND AND THE PRESENT SITUATION

– Historical overview

Japanese fishery management is separated into three periods, before the Meiji Restoration (before 1868), from Meiji Restoration (1968) to the end of World War II and after the World War II.

Period before the Meiji Restoration (before 1868)

The situation of fisheries

In Japan, commercialisation of fisheries products advanced from older times in pace with the progress of fish dietary habits for the following four reasons:

– Religious reasons: Eating of animal meat was avoided as a religious taboo.

– Environmental reasons: Mountainous geographical conditions with limited pasture in Japan are not suited for livestock raising.

– Technical reasons: Catch of aquatic resources has been possible even with rudimentary fishing techniques because of abundant fishing grounds formed by the convergence of warm and cold currents in the surrounding sea.

- Economic reasons: Work load for fishing has been light because operations mainly took place in the adjacent waters. In the seventeenth century, demand for fishery products increased as a result of population increase and expansion of distribution channels (i.e. consumption increased following the urban development in Osaka and Edo [Tokyo] areas and demand expanded for the use of fertiliser in pace with the promotion of agriculture). Supply volume also expanded as a result of construction of larger fishing vessels and development of various types of fishing gear, fishing methods and new fishing grounds.

Against this background, there emerged communities exclusively engaged in fisheries, and this often caused conflicts with neighboring villages. In order to resolve these issues, feudal lords (Samurai lords) granted the exclusive right to engage in fisheries (Osumitsuki) in the coastal areas to the community as in the form of common ownership (Souyu) of the fishing ground by all fishers in the community.(1) The lords also had fishers decide by consensus the method of use of fishing grounds owned by respective communities.(2)

Situation of resource management

In this period, no motorised fishing vessels had been available. As regards the use of fishing grounds, fishing communities were authorised to exploit sedentary resources in adjacent waters on an exclusive basis. Regarding migratory resources in offshore areas that are not suited for common ownership, mutual use of such means as common fishing ground was institutionalised. These systems enable fishing ground management to a large extent.

As seen in the Osaka Bay and Biwa Lake, conservation of resources had been ensured through such measures as implementation of fisheries regulations by Han (Provinces) and other authorities, as well as religious taboos against keeping or catching (killing) of living resources, construction of a dike, and protection of some Sea-Areas. On the whole, it is assumed that, as the fishing operation had not been so effective, catch effort had not exceeded the natural reproductive capability of resources. As a result, it is considered that the sustainable use of fishery resources had been ensured. These systems formed a prototype of the present use of fishing grounds.

From Meiji Restoration (1868) to the end of World War II (3)

An outline of fishery management

- Fishery management just after the Meiji Restoration (1968-1901)

In 1868, the feudal system collapsed. The Meiji Government that replaced the old regime declared the 3-mile territorial water jurisdiction in 1870. In 1875, the Government declared its ownership of the sea and promulgated the Fishing Ground Leasing System, in which the oceans could be leased with some commissions. However, this system was scrapped in one year because the leasing policy was not clear, causing confusion among fishers. However, the authority of the government to grant the right to use the oceans through license was retained. In 1881, a government order to protect aquatic resources was issued as the harm of over-exploitation became conspicuous.

– Fishery management since the middle of the Meiji Era (Old Fishery Law 1901-1948)

Taking an overview of this period, foreign fishing technologies were introduced since the late nineteenth century to the early twentieth century. As a result, fishing capacity was boosted and fishing grounds were expanded to offshore areas. On the other hand, coastal fisheries developed as one of the bases of the regional economy. As these coastal fisheries and some of modern fishing vessels competed for the same resources and fishing grounds, reconciliation of fishery conflicts as well as protection and propagation of fishery resources became important issues.

Enforcement rules and ministry decrees were revised to cope with this changing situation. Measures taken in some fisheries included limitation on access to resources through the license system, establishment of closed areas, limitation on the size of fish to be taken, and prohibition of the catch of female crab.

Coastal fishery was modernised as well. It developed amid competition between family based fisheries and capitalised fisheries over market share and the introduction of motorised fishing vessels(4). In this period, fishing capabilities improved drastically as a result of technological development in Japan (as in the case of yellow tail set-net fisheries and salmon purse seine fisheries). However, effective fishery management that could have properly coped with this progress had not been developed.

Improvement of systems

– Improvement of administrative structure

1885: Fisheries Bureau was established within the Ministry of Agriculture and Commerce.

– Improvement of legal systems

1886: Rules concerning fishery unions were set forth with a view to maintaining an autonomous fishery order.

1901: The Fishery Law was enacted to ensure law enforcement on fisheries. This 35-article law, known as the old Fisheries Law, became Japan's first unified fisheries codes.

1902: As provisions related to enforcement of the Fisheries Law, regulations for enforcement of the Fisheries Law and regulations for fishery cooperatives were promulgated.

1910: The fisheries cooperative system was reinforced, with the fishing right regarded as a conditional property. Under this system, the fishing right was licensed, and could be inherited, transferred and loaned according to conventional practices. At the same time, orders for restriction and suspension of license could be issued when it was judged necessary for the propagation and protection of certain aquatic living resources or other purposes involving public interests.

1927: The Central Fishery Cooperative Association was established for the development of fishery cooperatives and coordination.

1933: The Fisheries Law was revised so as to enable each fishery cooperative to engage in fisheries on their own and foster and preserve aquatic living resources.

1938: Financial arrangements for fishery cooperatives were improved.

1938: The National Federation of Fishery Cooperative Association (Zengyoren) was founded with the aim to market, procure and purchase fishing products and to educate fishers in their activities.

Figure 1 shows an outline of the old Fisheries Law.

– Promotion of experiment and research

1888: Fishery research was launched by dividing the nation's sea into five subareas. Around this time, projects to establish fishery laboratories, fishery schools and fishery training centers were launched, together with educational programs, experiments and research on fisheries.

Since the end of World War II (Fishery law: 1949 to present)

Outline of fishery management

The average catch for three years from 1934 was 4 230 000 tonnes, but that in 1945 fell 48% from that level because of the severe impact of the war. The limitation on fishing operation areas immediately enforced following the Occupation brought back Japan's fishery activities to the level of the 1910s. Then the Japanese fisheries saw a remarkable recovery since then, with total catch in 1952 amounting to around 4.6 million tonnes. Since 1955, fishery catch drastically increased as a result of expansion of fishing grounds toward outer waters.

In 1953, the Special Act of the Fisheries Law was set forth, promoting construction of larger-sized fishing vessels. In the same year, trawlers in the order of 1 000 tonnes were built and fishing grounds were expanded from coastal areas to offshore and distant-water areas. Annual catch volume reached the order of 10 million tonnes in 1972. These developments were attributed to such factors as the accumulation of experience by fishers, the government's policy to boost food production to cope with the post-war food shortage, active progress and propagation of fishing technology, continued expansion of consumer market and good timing in advancing in the international fishing grounds.

Improvement of legal system

– Legal system

1949: Under the new Constitution enacted after the World War II, the old Fisheries Law was revised into a new law aimed at democratising fisheries in Japan. The new law, promulgated in 1949 and taking effect in the following year, had provisions over the fishing right, designated distant water fisheries, fishery adjustment and the Fishery Adjustment Committees.

1950: The Central Council for Fisheries Adjustment was established.

1953: The license fee system was abolished.

1962: The Fisheries Law was revised mainly in the area of fishing right system and fishery license system with a view to modernising fisheries and stabilising the fishery license system.

Details of the Fisheries Law and other legislation about fishery management are described under the Present Fishery System in Section 1.

– Establishment of national organisations to make voluntary effort concerning fishery management and resource management

National organisations were established to implement fisheries and resource management on a voluntary basis concerning tuna and skipjack fishing and trawling. The National Organisation of Tuna and Skipjack Fishing was established in 1946 and the National Organisation of Trawling was established in 1967.

The historical process leading to the present legal system is shown in Figure 2.

Present situation

An outline of the present fishery system (5)

The Fisheries Law stipulates the basic system concerning fishery production. Besides that, the following related legislation concerning fishery management have been promulgated.

Legislation related to fisheries can be largely divided into (i) the legal system stipulating various restrictive measures from the viewpoint of maintaining order in the utilisation of the sea such as conservation of resources and adjustment of fisheries; and (ii) those providing for various types of incentives and supporting measures from the viewpoint of fishery promotion including improving of fisheries productivity and enhancement of fishers' livelihood.

– Laws stipulating limiting measures

- The Law concerning Protection of Fishery Resources that provides for protection and propagation of fishery resources.
- The Law concerning Regulation on Fisheries by Foreigners that provides for restrictive measures such as prohibition of fisheries by foreigners within Japan's territorial waters and permission on port calls.
- The Law on Provisional Measures concerning Fishing Areas that provides for such restrictive measures as the establishment of 200-mile fishery zone and permission of fisheries by foreigners within that zone.
- The Fishing Vessel Law stipulating measures concerning fishing vessels such as permission for construction, registration and inspection of fishing vessels.

– Legislation stipulating various incentives and promotional measures.

As a basic law for promotion of fisheries, the Law concerning Promotion of Coastal Fisheries requires the Government to take various measures for coastal fisheries. There is following legislation based on the above Law.

- The Law concerning Fishery Promotion that provides for improvement and development of fishing grounds, propagation of fishery resources and modernisation of fishery business management.

  - The Law concerning Development and Promotion of Marine Fishery Resources that provides for measures to implement planned promotion of propagation and culture of marine living resources and development and research for such resources (revised in 1991, when the resource management agreement system was established therein).
  - The Law concerning Improvement and Development of Coastal Fishing Grounds, which provides for measures to improve coastal fishing grounds and develop projects on a planned basis as well as to promote marine ranching projects.

- The Fishing Port Law that provides for measures to improve, maintain and manage fishing ports.

  - The Fishery Cooperative Law, aimed at establishing and developing fishery cooperatives by fishers and enhancing their economic and social status, and boosting effective production of the fishery industry.

An outline of the Fishery Law

The Fishery law is aimed at instituting a basic system concerning fishery production, promoting comprehensively use of the oceans through a fishery adjusting mechanism managed by fishers themselves, boosting fishery production and promoting democratisation of fisheries.

Specifically, the Fishery law provides for three types of fisheries: fishery based on fishing right, fishery licensed by prefectural governor, and fishery licensed by the Minister of Agriculture, Forestry and Fisheries.

Fishery based on fishing right

This type of fishery is based on the traditional use of fishing grounds that had been practised in coastal areas from ancient times. This does not provide an exclusive right *per se* over sea areas, but a right to engage in fisheries based on limited conditions with regard to the fishing season, species and fishing methods. As regards the fishing right, plans are developed for utilisation of fishing grounds, based on which the Fisheries Adjustment Commission examines the eligibility of applicants through public hearings. As a result of these examinations, the Governor authorises the right in the order of priority.

In granting a license, the Sea-Area Fisheries Adjustment Commission conducts a public hearing. The fishing right is regarded as a property and land-related provisions are applied to it. Trading and loan of the right is prohibited while the inheritance right or mortgage right is granted.

There are three types of fishing rights as follows:

- Fishing right on common fisheries (Kyodo-gyogyoken) :

  This fishery is originally based on the common ownership of fishing grounds. The license is issued to fishery cooperatives, two-thirds or more whose members engage in coastal fisheries lasting for 90 days or more in the related areas. Members of the cooperative use the license on an individual basis. This type of fishery is established in almost all areas adjoining the Japanese coast. It is categorised into sea shell collecting (Type I), small-type set-net fishing (Type II), beach seine (Type III), fish attraction fishing (Type IV), and inland water fishing (Type V). In 1983, there were about 5 000 licenses. The rules for implementation of fishing rights are determined by respective fishery cooperatives. Consent of two-thirds or more of the members of cooperative (coastal fishers in the area concerned) are needed to institute, amend or abolish those rules. Members engage in fisheries in accordance with the rules for fishing right implementation, which provide for the fishing season, the area, fishing gear and methods, etc. The license is effective for 10 years.

- Fishing right on demarcated fisheries (Kukaku-gyogyoken) :

  This is the right to engage in aquaculture. The main types of these fisheries are hanging culture, cage culture, seabed sowing cultivation in inland sea areas. There were about 11 500 licenses in 1983. Seaweed culture and cage culture are classified as specific divisional fisheries. Fishery cooperatives have the first priority of access to the specific divisional fishing rights (however, the operation should not be run by fishery cooperatives but by their members). Priority then follows to enterprises run by fishers, fisheries production associations, and ordinary fishers (individuals or corporate entities). Individual fishers have priority to other divisional fishing right. The fishing right for specific divisional operation lasts for five years, with other rights extending as long as 10 years.

- Fishing right on set-net fisheries (Teichi-gyogyoken):

  There were about 18 600 licenses for salmon, and yellow tail etc. set-net fisheries in 1983. The first priority of license is given to self-supporting fishery cooperatives that satisfy requirements such as strong dependence on fisheries. The second priority is placed on corporations consisting of seven or more local fishers. Then, other candidates are considered. But priority is granted to those who belong to the local community and have previous experience.

Fishery licensed by prefectural governor

This is the type of fisheries conducted mainly on the offshore side of the area for fishing-right-based fishery. This system is aimed at protecting and propagating fishery resources, regulating and coordinating fisheries, and establishing a fishery order. As regards to the fisheries for which protection of fishery resources and adjustment of fisheries are not ensured unless the total number of fishing vessels and fishing gear is restricted, the Governor decides, on a prefectural basis, the rules for fisheries adjustment. The Governor's license is required to engage in this type of fisheries.

In the governor-licensed fisheries, there is a category called special governor-licensed fishery (medium sized purse seine fisheries, small motorised trawling, motorised trawling in Japan Inland Sea (Setonaikai), small-type salmon drift net fishing), for which the Central Government determines the upper ceiling of the number of fishing vessels licensed by the Governor in order to set upper ceiling of the overall catch effort either by prefecture or by Sea-Areas pursuant to the Fisheries Law. The total number of licenses under the special governor-licensed fisheries in 1995 was about 69 000, of which about 67 000 were small-type trawling.

Fisheries, other than the above, fall under the category of ordinary governor-licensed fishery (gill-net, dip net fishing, lift net fishing, small-type trawling, beach seine, boat seine, (small-type) purse seine nets, stake net, angling, trolling, longline fishing, basket net fisheries, diving apparatus fisheries). Fisheries of this type aggregated about 148 000 licenses in 1995, of which gill-net accounted for 61 000 and boat seine 22 000. The license period is generally three years.

Fishery licensed by the Minister of Agriculture, Forestry and Fisheries

License of this type of fisheries is issued based on the advice from the Central Fisheries Adjustment Council for 16 types of fisheries, as designated in the Government Order based on the Fisheries Law, for which it is necessary to take restrictive measures with regard to fishers and vessels used in order to propagate and protect aquatic living resources and adjust fisheries, and because it is recognised as appropriate to take unified measures in connection with the international agreements and the location of fishing grounds.

In case the number of applicants (having favorable past records) is smaller than the pre-set number of licenses, those who have achieved records in the past are given priority. Other licensees are selected, taking into consideration such factors as stability and rationalisation of business management as well as experience. In case the number of applicants with favorable past records exceeds the pre-set number of licenses, then licensees are selected based on the number of vessels applied and owned by each applicant, situation of operation and the degree of economic dependence on fisheries.

Included under this category are offshore trawling, trawl fishery west of 128 degrees 30', distant-water trawling, North Pacific longline and gill-net fishing, large- and medium-scale purse seine fishing, distant-water and offshore tuna fishing, medium-scale salmon drift net fishing, squid jigging (of over 30 tonnes), saury fishing (over 10 tonnes). As regards these fisheries, regulations concerning fishing grounds, fishing season, base port, fishing gear such as mesh size, and fishing methods are introduced not only in the terms and conditions attached to the license but also under the Ministry decrees. The license period is in principle five years (one year for specific type of fisheries). In 1993, about 2 700 fishing vessels were granted license, of which distant-water tuna fishing vessels accounted for 832 and offshore trawling 621.

Notified fisheries

This is a type of fisheries requires notification to the Minister of Agriculture, Forestry and Fisheries. It includes globe fish (fugu) longline fishing in the East China Sea and the Yellow Sea and longline fishing (other than for tuna) in the Atlantic.

Unregulated fisheries

Representative among fisheries, for which free access is allowed, is pole fishing.

Recreational fishing

This is harvesting of aquatic resources for nonprofit purposes, such as recreational angling (generally, it means angling and hand catch.) There are no clear provisions under law. The catch by recreational fishing stays at a low level of about 30 000 tonnes in 1991. But the population engaging in this type of fishery totalled 3.5 million in 1988 and, depending on some areas, their catch could account for several tens of percent of the total catch, such as in the case of red sea bream, causing conflicts with local fishers. With a view to preventing and resolving these conflicts, the Fishing Ground Adjustment Council has been established jointly by recreational fishing people, commercial fishers, and people of experience and academic standing, and also with collaboration of the Sea-Area Fisheries Adjustment Commission.

As regards inland-water recreational fishing, regulations are imposed in relation with the fishing right. The fishery cooperatives can impose rules concerning recreational fishing or the fishing fee, in accordance with the regulations developed by the fishery cooperative associations and authorised by the Governor.

Summary of this section

– An outline of the Japanese fishery management system

From an institutional point of view, the fishing right on common fishing is established closely and extensively in the coastal area within the range of several kilometers from the coast line for each fishery cooperative that belongs to those areas. Within this area and around this area, there are set-net fishery and fishing right on demarcated fishery. The area further offshore of this area pertains to governor-licensed fisheries and Minister-licensed fisheries. Figure 3 shows an outline of this system (Appendix-1).

– An outline of resource and fishery management system in Japan

- Data submission

Fishers submit such data as catch volume, catch effort, operation areas, etc. to the fishery research institutions (both governmental and prefectural) through fishery cooperative associations and administrative offices.

- The administration

The administration considers the above scientific data and socio-economic implications of fisheries, and develops fishing ground utilisation programs for fishing based on fishing right, and regulatory measures for the number of fishing vessels, operation area and fishing season, etc. for licensed fisheries, and advise the fisheries adjusting bodies accordingly.

- The fishery adjustment commissions

The fisheries adjusting commissions examine the program submitted by the Administration and recommend their own proposal.

- Fishers

Fishers apply for a permit or license in accordance with the public notice concerning the fisheries license that the Administration has formulated in response to the recommendation by the fisheries adjustment commissions. They are granted a permit or license in accordance with the order of priority and eligibility.

- Regulatory measures

At the same time, the Administration establishes detailed regulatory measures.

Agreement system on resource management

An outline

– Overview

This system was introduced following a partial amendment of the 1991 Marine Fishery Resource Development and Promotion Law. It provides that organisations of fishers can conclude an agreement regarding voluntary management of marine fishery resources in the area in question (resource management agreement) and can be so authorised by the Government to the effect that such a resource management agreement is appropriate.

Nature of the agreement

The agreement is aimed at ensuring that fishers using the same resources in the same area can coexist with stable production. This is an agreement that takes effects among parties who signed it, and those who have not taken part in the agreement are not bound by it.

The following are included in this resource management agreement:

– The areas, marine fishery resources and the types of fisheries subject to the agreement;

– The method of managing marine fishery resources;

– The effective period of resource management agreement;

– Measures to be taken when violations occur to the resource management agreement;

– Other items; participation in, and withdrawal from, the agreement, amendment and abolition of the agreement and mediation with the administrative authorities.

Objective of agreement system

Currently, voluntary catch regulations are enforced by fisher's organisations. This system is aimed at promoting such voluntary regulations by fisher's organisations by institutionalising it. In other words, it is designed to further rationalise the utilisation of marine fishery resources by complementing the governmental regulations. For this goal, the Administration extends support in improving the basis of voluntary management organisation (forum of debate) and adoption of resource management measures meeting the regional situation (making of consensus) [(6)]. Furthermore, local fishery cooperatives assume the role of the main promoter of management from legal, economic and personnel points of view (the role of staffers at fishery cooperatives in secretarial work). As regards licensed fisheries beyond local waters, fishery management on the basis of concerted effort of several fishery cooperatives on a prefectural level is necessary.

PART II. MANAGEMENT SYSTEM AND EXPERIENCE

Policy: The role of the Fisheries Law in terms of fishery management

In Japan, the number of participants in certain sectors of fisheries is largely controlled through a grant of licenses and permissions pursuant to the following systems on the basis of biological, economic and social factors: common fishery right, set-net fishery right, demarcated fishery rights in coastal fisheries; Minister-licensed fisheries in offshore and distant-water fisheries; and governor-licensed fisheries in other fisheries located between the above two.

There have been efforts to manage the total number by imposing certain limitations to new entries into fishery and enforce fishery management by controlling the fishing effort such as fishing gear, fishing method and fishing season under the initiative of fixed members.

Historically, the Japanese fishery management policy consisted of input regulations, in which the Central Government provides for limited entry and implemented specific regulations such as mesh size control and catch effort control. Further, as regards fishing based on fishing right, the Central Government issued license to fishery cooperatives and had them implement fishery management on a voluntary basis. As regards licensed fisheries, the Government intended to implement fishery management by controlling the number of licensed fishing vessels, fishing gear and fishing methods. The Fisheries Law provides for introduction of fishing grounds planning system, and develop fishing grounds programs in advance including the types of fisheries, fishing grounds and fishing season, in order to execute the input regulation according to the plans.

Results

Consideration from a view point of institutionalisation

Implementation rules determined by fishery cooperatives and voluntary management measures by fishers have been taken for the fishing based on the fishing right; common fishing right, demarcated fishing right and set-net fishing right. In addition, the following regulations have been enforced.

Among rules of prefectural fisheries adjustment rules are (1) closed area for fisheries, restriction on harvesting in protected areas, estuaries, and seaweed beds; the areas where harvesting is prohibited for specific species (sea bream, scallop, sea cucumber, rock lobster, etc); (2) closed season (to protect spawning fish and juveniles, and prevent competition among fishers); (3) restriction or prohibition on the use of particular fishing gear and fishing methods; restriction concerning fishing vessels (restriction on overall tonnage of fishing vessels is provided for from the viewpoint of regulations on catching efficiency); and (4) restriction on size (target species include abalone, littleneck clam, salmon, rock lobster, eels, and yellow tail from the viewpoint of protecting juveniles).

In licensed fisheries, the following regulations are enforced under the Ministry decrees. As regards offshore trawling since 1963, the decrees show restrictions such as prohibited areas, prohibited fishing gear and species. Regarding large - and medium - scaled purse seine fishing, the decrees have restrictions such as prohibited area, fishing gear and species. Regarding trawl fishery west of 128 degrees 30', similar restrictions have been implemented since 1965, and for distant water trawling since 1967. With regard to high seas fisheries, the Government is enforcing fishery management by regulating entry and catch effort through a licensing system.

Fisheries adjustment mechanism [7]

- The Fisheries Adjustment Commission has been established as a fisheries adjusting mechanism. Through this commission, adjustment of the fishing operation and management of fishing grounds are implemented by fishers. Fishers can express their intention by sending the representatives they have selected to this commission. There are 66 Sea-Area Adjustment Commissions in Japan - one sea area per prefecture in 27 prefectures and more than one sea areas in 13 prefectures. The commission is composed of representatives of the fishing community, academia and those representing the public interest. It coordinates in the work for formulation of fishing ground programs, granting of the fishing right and the establishment of access rights. It is designed to ensure propagation and protection of aquatic living resources, appropriate enforcement of fishing rights or access rights and the prevention or solution of conflicts over fishing grounds. Moreover, when it is deemed necessary for fishery coordination, it could advise the parties involved concerning restriction or prohibition of harvesting of aquatic living resources, restriction on the number of fishers, and restriction concerning the use of fishing grounds. These are too occasional and localised issues to institutionalise, and consent must be obtained from most parties concerned.

- Joint Sea-Area Adjustment Commission--This commission can be established, when and as appropriate, for specific purposes according to the need for the adjustment involving two or more areas. This commission can be established by the Minister of Agriculture, Forestry and Fisheries or the Governor of Prefecture, or by Sea-Area Fisheries Adjustment Commission. As the Sea-Area Fisheries Adjustment Commissions for two or more areas work jointly, the same number of members from each commission compose the Joint Sea-Area Adjustment Commission. People of experience and academic standing are included in the commission as necessary.

- The Central Fisheries Adjustment Council - This council is established by the Central Government. It is composed of representatives of fishers and representatives from the academia. The council's competence is to examine important items concerning the implementation of the Fisheries Law, including the establishment of Ministry decrees concerning designated fisheries and fisheries adjustment.

Fishery cooperatives [(8)]

Fishery cooperatives are the main promoter of management of the fishing right on common fishing and the fishing right on specific demarcated fishing. It also functions as a regional market, a purchase organisation and an economic project promoter in terms of finance. Further, the fishery cooperatives are composed of wide-ranging groups of fishers from fully-dedicated entities such as shipowner for distant-water fisheries to part-time fishers such as collectors of sea shells and seaweed or fishing people who need not depend heavily on fisheries for their livelihood. Therefore, a substantial variety is observed among fishery cooperatives.

Fisheries management in coastal fisheries in Japan is based on consultations among fishers. As the qualification to become a member of a fishery cooperative requires the resident status, the fishery cooperative plays an important role in fishery management in the regional community. In addition to the fishing grounds management based on the establishment of fishing right rules, far-reaching fishery management is being conducted by fishery cooperatives for Governor-licensed fisheries in offshore fishing grounds, a way to meet the local characteristics, besides regulations under the administrative system, using influence to union members.

As regards violations of cooperative's management rules, in-house sanction measures such as the imposition of fines and suspension of operations are taken, thereby maintaining a fisheries order. Since the awareness that fishery resources are common property of the community has taken root from ancient times, preventive measures against violations have been comfortably fit in mutual supervision among fishers and internal rules.

PART III. ANALYSIS

Results and explanation

Coastal area

In the area close to the coast, exclusive operation rights concerning fisheries is granted legally, and fishing rights are licensed on an exclusive basis. Further, the fishing right is licensed to local fishery cooperatives on a private basis. This characteristic of fishery cooperatives is taken into consideration in Japan's fishery management. Any resident can become a member of fishery cooperatives, if he or she satisfies certain requirements such as fisheries days (minimum of 90 days a year) provided in the charter of the cooperative. There is thus no limitation to joining fishery cooperatives.

On the other hand, the inheritance right is recognised for the right to execute the fishing right within the fishery cooperative. (It is easy for the heir to obtain the right, but not so for others.) This may lead to substantial restrictions on access to fishing rights to others. These characteristics of fishery cooperatives provide incentives to fishery management (i.e. leave resources to one's successors or utilise resources cautiously among limited number of right holders, etc.).

License fisheries

Governor-licensed fisheries

The authorisation for governor-licensed fisheries is renewed at an interval of three years. This may make it difficult to cope readily with the changes in resources. Further, in these license-based fisheries, fishery management is implemented by means of catch effort control, such as control of the number of licensed vessels, permitted tonnage of vessels, and fishing gear and methods as a means of fisheries adjustment. It is difficult to cope with the increase in catch effort other than the element as stipulated in this regulation (e.g. improvement of catch technology). For this reason, voluntary fishery management by fishers (co-management system), and various types of fishery management systems and organisations have been established. This system requires fishers to reinforce their effort and involves considerable risk caused by a lack of information concerning resource management. Therefore, the central and prefectural governments are extending support in the area of scientific knowledge and provision of resource management technology.

A majority view needs to be formed to implement voluntary management. In most cases, consensus is formed to satisfy local requirements, with emphasis placed on fine allocation of profit, securing of employment (to enable participation of as many fishers as possible), and sustainable utilisation of resources.

Therefore, it is necessary to take the local situation into consideration in assessing the effectiveness of fishery management.

Minister-licensed fisheries

In the fisheries licensed by the Minister of Agriculture, Forestry and Fisheries, even when a license is issued taking stock size into consideration at the time of renewal, increase in catch effort outside the regulations of license contents and annual fluctuations of resources cannot be properly coped with. For this reason, fisheries organisations take voluntary operation adjustment measures with the assistance of the Central Government on scientific information and management technology.

Analysis of license fisheries as a whole

The license system alone causes the double deterioration of fisheries business management, namely rising cost in line with the excessive equipment investment, i.e. introduction of efficient fishing methods, fishing gear and other equipment as well as the decline of resource population due to resultant excessive catch.

Further, emphasis is placed on securing catch volume due to competitive operation, and sufficient attention may not be directed to added-value of catch, such as marketing of live fish. This tends to cause declines in fish prices and to cause unfavorable labour conditions.

On the other hand, as regards to monitoring and enforcement in fishery management based on the license system, catch effort and fisheries are controlled indirectly in terms of the number, size, and horsepower of fishing vessels and fishing gear. Inspectors can focus on monitoring of unlicensed fishing vessels and the size of fishing vessels and power can be checked at the time of construction and reform of fishing vessels. Therefore, monitoring and enforcement are made relatively easily as compared with the quota system, possibly reducing costs for monitoring and enforcement[(9)].

Theory and justifications

First, issues on limited entry systems that are considered fundamental in implementing fishery management in Japan will be discussed. In concrete terms, this is the restriction on the number of fishing vessels--a method that has been historically widely implemented in Japan. However, this management system does not take into account the increase in overall catch effort as a result of transfer to fishing gear and methods having higher efficiency (other than the elements of the number of vessels) by technological innovation, as well as a result of increase in equipment per vessel, the improvement of fishing gear and the increase in the number of crews on fishing vessels. Thus, the system does not necessarily contribute to substantial reduction in the true value of the catch effort that is a means of fishery management.

Moreover, let us examine in detail the regulations in which some catch effort restrictions were added to the limited entry system. To increase further catch effort at the time of the introduction of restrictive measures is the violation of the regulation. Assuming that sanctions or penalty on violations against rules should be paid by fishers, larger amounts of the cost will be incurred by violations. If illegal effort increases after the implementation of regulations also increases the marginal cost for fishing, then, the increase of the catch effort would be stopped.

However, under this assumption, the ability of fishers to improve the catch effort in the areas where there is no restriction by regulations is underestimated. There arises an illusion that the rise in the marginal cost per unit for excessive equipment investment by fishers would not exceed the break-even point, prompted by the illusion for initial excessive profit by increase of catch effort in the areas where no restrictions yet exist for individual fisheries business entities. In this case, the same competition as in free access occurs, but even when equipment is boosted in the area outside regulations, the resources are limited and substantial increase in catch cannot be achieved, causing profit decline. As Hasegawa (1991)[(10)] stated, it will end up in "the cycle of unprofitable investment for higher efficiency and the need of restoration of balance through reduction of fishing vessels."

To change regulations into more detailed ones and strengthen enforcement in order to cope with this situation will lead to increasing costs for enforcement, but it will fall into a vicious circle in which expanding excessive investment causes increasing enforcement costs. If a system in which enforcement cost shared by fishers is built up, it will contribute to restraining excessive investment by absorbing capitals that otherwise would be used for excessive investment. If fishers violate the regulations, cost burden for enforcement by fishers will increase, creating an incentive for deterring violations.

PART IV. CONCLUDING REMARKS

In the foregoing sections, the fishery system in Japan was outlined in terms of history of fishery management and its role from the viewpoint of institutional economy.

In Japan, attempts have been made to enforce efficient fishery management by limitation of new entries based on the license and permission system. Here, fishery management is envisioned as a system based on management of fishing effort by fixed members. It is considered that these fixed members tend to have incentive to enforce self-management, leading to higher possibility to realise efficient management at a relatively small cost.

In fisheries, targeting at such stocks as seaweed, abalone, top shell, Sakhalin surf clam and little clam for which stock distribution is narrow, entry is limited by means of exclusive use right, as common fishery right and succession of the right is effectively guaranteed. Therefore, there are many cases of application of regulations of this pattern, on the expectation of realising effects by leaving management to self-management by fishers. It is necessary to promote the capabilities of these fixed members and undertake leadership education.

In fisheries on red sea bream and olive flounder for which stock distribution is relatively large, the number of licensed fishing vessels, fishing gear and methods, fishing season and body size, etc. are limited under governor-licensed fisheries. There are some cases of fishery management by voluntary fishery management organisations, although assessment of their activities is difficult.

But in sardine and mackerel fisheries for which stock distribution is extremely large, there exists regulations on the number of licensed vessels, fishing gear and methods, as in Minister-licensed fisheries. In the fisheries equipped with high-grade harvesting capabilities resulting from large-scale investment, as in the case of purse seine fisheries, there is difficulty in forming agreement on fishery management because it involves free economic activities of business enterprises. But efforts are being made to realise regulations in areas where it is relatively easy to reach agreement.

In Japanese fisheries where catching capability has highly developed, adjustment from biological, economic and social viewpoints were traditionally enforced as the sole method to implement fishery management in order to prevent over-exploitation. Such an approach has significantly affected the fishery system. The present paper discussed such an aspect. Further, as far as resource management (which is one of the objectives of fishery management) is concerned, regulating output by means of TAC and other means seems more readily understandable as compared with the input regulations, and easier to form a consensus. However, in Japan, input regulation, not easily understandable as TAC, has been practised in actual decision-making. It is based on past experience that fishers chose this input regulation (catch effort regulations) on the basis of their assessment of actual fisheries in actual life. Such a choice of fishers has been reflected in the government administration, resulting in legal systems and institutions. However, in some part of fisheries, output regulation is enforced within a system that includes access restriction.(11)

These systems are apparently aimed at solving the issue of allocations, which always come out as a problem caused by over-exploitation. The ways and means for a solution were obtained not only from the institutionalised systems but also through many confrontations and dialogues. While we can value the intention of these systems to formulate a framework for this purpose, further discussion is necessary to determine whether the role of the systems concerning fishery management may lead to the control of competition for preoccupation of resources and excessive investment.

Notes and References

(1) Fishing grounds were owned not by individuals in the community but by community itself. In the period prior to the Meiji Restoration, not only the right to use fishing grounds but also the ownership of fishing grounds had been practised.

(2) It sometimes happened that the use of fishing grounds was decided by a limited number of fishers in accordance with their rice yields. Yasuhiro Ito (1991): Fishing villages in early modern times and CHIROKU-AMIROKU System, Studies in Japanese History No. 350.

(3) These historical accounts are mostly based on Iwao Matsumoto (1977): Chronology of Fisheries in Japan in the modern times (before World War II), Suisansha, and Iwao Matsumoto (1980): Chronology of fisheries in Japan in modern times (after World War II), Suisansha.

(4) In this period, the power of public authorities was so strong that there was awareness that regulations were imposed from above. Therefore, consensus was not always made in a democratic process.

(5) Description of these systems was mainly based on the Concise Fisheries Laws, editorially supervised by the Fisheries Agency (1986) and published by Suisansha. However, as regards interpretation for actual application of the Law, the following publications were referred. The Age of Coastal Area, editorially supervised by the Fishery Promotion Division of the Fisheries Agency (1984), Chikyu-sha, and Katsunori Tanaka (1985), Fishery Laws, Statistical and Information Division, Economic Bureau, Ministry of Agriculture, Forestry and Fisheries.

(6) Yutaka Hirasawa (1992); Recent fishery management based on fisheries initiative in Japanese coastal waters. According to FAO Fisheries Report No. 474 Vol. 2, 453-464, excessive exploitation was motivated by fishers' pursuit of higher income proportionate to urban workers who enjoyed the rising wage because of high-rate economic growth in Japan in the 1960s. Not only governmental agencies, but also fishers themselves, tried to take voluntary fishery management measures through fishery cooperative associations from the mid 1970s. However, due to the fact that fishers were the main promoter of these measures, the key to success of fishery management was placed on the enhancement of income (living standards) of fishers. In this case, it seems that price maintenance thanks to the adjustment of catch amount should serve as a point of departure, from which various developments should be pursued. Further, the policy trend in Japan is a shift from increase in quantity to better quality, and fishery management matching this trend is being promoted. Details of fishery co-management will be reported in the separate Issue Paper to be prepared later.

(7) Katsuo Taya (1994) made the following remarks concerning fisheries adjustment mechanism in his personal communication.

At present, the resource management function in the fishery system is entrusted to fisheries adjustment bodies. However, although fisheries adjustment bodies played a certain role in the solution of conflicts among fishers, they failed to execute adequately the substantial resource management function. This mechanism of fisheries adjustment bodies was instituted as the main pillar of the institutional reform from the outset of the system, but did not function as a resource management mechanism.

The reasons for the inadequacy of the fisheries adjusting mechanism were as follows:

- First, members of fisheries adjusting bodies, in some cases, did not have, or wished to have, a powerful authority to exclude the fisheries business management by the decision of their commission, even though such bodies were composed of representatives of fishing community and academia.

- Second, there was no adequate scientific information on resources, which would have justified the reduction of the number of fishing vessels and the restrictions of operation. It is difficult to produce evidence for the limit on the number of fishing vessels required.

- Third, it was difficult to realise a consensus among commission members when there are conflicting interests among fishers. Representation from the fishing communities became an honorary position, and the adjusting mechanism for solving the conflict, rather than the management mechanism, became a main function of the body.

- Fourth, specific fishing communities had little awareness to protect certain resources in the period when the Japanese fisheries were trying to expand from coastal to offshore and distant-water fishing grounds. There was a tendency to solve all the business management difficulties arising from collapse of resources by expanding fishing grounds to offshore and distant water areas.

Thus, although the fisheries adjusting bodies were vested with a significant role for management, there were no social conditions that made it possible, thereby it failed to have adequate management function.

Therefore, in the 1980s when the coastal fisheries system came under review, many fishery cooperatives participated in the movement for resource management-oriented fisheries and launched fishery management on voluntary basis. Then, representatives of fishers having a strong awareness of the issue were selected, enabling the system to be effective. In other words, representatives of the fishing communities started to present their say in the commissions when the direction of fishery management is fully appreciated by the community, and then the fisheries adjusting mechanism started to function as planned originally.

(8) Ro Shoha (1993): "The role of the fishery cooperative association system in Japan: seen from the Chinese viewpoint," Fishery Management August Issue, No. 366. The author rates highly the role of fishery cooperative associations in fishery management as an "intermediate role."

Yutaka Hirasawa (1994): "Characteristics of fishery management in Japan," Study in Food Policy No. 79, Food and Agricultural Policy Research Center. Hirasawa evaluates the fishery cooperative associations system because of its significance to enable fishers to have a face-to-face opportunity of information exchange on fish prices, such as the auction as fishery cooperative associations have the role of producing a cooperated sale market.

(9) On the subject of input control, Katsunori Tanaka (1993) discussed in depth in his "Comparison of fishery system in Japan and New Zealand," Suisan Keizai Kenkyu 121-137. His argument was referred to in this paper.

(10) Akira Hasegawa (1991), Resource management-oriented fisheries (edited by Nobuo Hirayama), Seizando Shoten, pp. 2-31. The number of fishery business entities using fishing vessels declined 7.7% from 1970 to 1985, while then average total tonnage of fishing vessels increased from 2.0 tonnes to 2.7 tonnes, with engine power also rising 2.7 times. But catch volume showed little change despite substantial increase in catch intensity. The reinforcement of catch intensity has not led to increase in production, but was wasted on competition for resource shares among fishing vessels.

(11) Katsunori Tanaka (1993): "Comparison of fishery system in Japan and New Zealand," Suisan Keizai Kenkyu 121-137.

(12) Tadashi Yamamoto (1993) A fishing right to co-op as a basis for community based fisheries management. Presented paper at International Conference on Fisheries Economies, Norway.

Appendix I

Given below is an outline of types of fisheries currently practised in Japan: fishery right fishery, Governor-licensed fisheries and Minister-licensed fisheries. (The description is based on the Fisheries Agency (1984): "The Coastal Era" (Chikyusha).

1 Fishery right fishery

1-1 Common fishery right

This is the right to fish based on the common use of a certain sea surface by fishers of certain area.

The common fishery right is classified into (a) Type I common fishery (targeting at sedentary aquatic organisms and plants in adjacent coastal waters, excluding those harvesting pelagic fishes with practical fishing gear-pole-and-line, longline, etc.) and (b) from Type II to V common fishery (targeting at pelagic fishes by waiting in adjacent waters without moving to other areas). The common fishery right is established virtually throughout regions along the coast line in Japan.

1-1-1 Type I common fishery

This is shellfish and seaweed gathering targeting at sea weeds (e.g. tangle, sea mustard, and agar-agar), shell-fish (e.g. abalone, top shell, little clam, and hard clam) and sedentary aquatic organisms as designated by the Minister of Agriculture, Forestry and Fisheries (spiny lobster, mantis shrimp, sea-squirt, sea urchin, sea cucumber, octopus, northern sea prawn, Japanese glass shrimp, etc.)

1-1-2 Type II common fishery

This is the fishery harvesting migrating fishes and squid, etc. by installing fishing devices such as small-scale set net, fixed-type gill-net, fish pound and brush weir.

1-1-3 Type III common fishery

This is the stocking fishery harvesting yellow tail, using beach seine, beach seine with scare fishes (which is like the former) and pole-and-line. The fish is gathered by scattered feed.

1-1-4 Type IV common fishery

This is the fishery using special fishing method (such as fish attracting and rowed angling) which is practised in the Setonaikai Inland Sea, Mie Prefecture and other places.

1-1-5 Type V common fishery

This is the fishery conducted in the inland water such as rivers and lakes as well as closed sea surface (e.g. Kumihama Bay in Kyoto Prefecture). Fishery under this category covers operations other than those falling under the Type I common fishery right.

1-2 Demarcated fishery right

This is the fishery right to engage in culture of aquatic organisms and plants. It is classified into three sub-categories based on the demarcation method to culture target stocks in specific areas by preventing them from dispersing. This fishery right is established in the inner part of a bay where the waves are calm.

1-2-1 Type I demarcated fishery right

This is the fishery aimed at the culture of stocks by demarcating certain sea area from other areas through set up of culture facilities. These include (a) pearl culture in which the stock is cultured in the cage hung from raft, (b) oyster culture in which the stock is attached to ropes and nets, and (c) kowari-type (small cage) culture for yellow tail and sea bream.

1-2-2 Type II demarcated fishery

This is the fishery to cultivate fishes, kuruma prawn, etc. by segmenting the water surface with nets or stone fences.

1-2-3 Type III demarcated fishery

Fishery in this category covers operations other than those categorised as Type I and Type II demarcated fisheries. In other words, it is the type of fishery in which shellfish of low mobility (e.g. hard clam) is cultivated through appropriate management measures e.g. sea-bottom planting, transplantation and thinning. (culture of shellfish on the sea bed).

1-3 Set-net fishery right

This is the fishery right to engage in set net fishery. The fishery in which the site of establishment of main net is in the depth of 27 m or deeper (10 m or more in Okinawa prefecture) (excluding pound net fishery in Setonaikai Inland Sea and trap net fishery and pound net fishery in the Mutsu Bay), and set-net fishery mainly targeting at salmon in Hokkaido correspond to this type of fishery. This includes salmon set-net fishery, yellow tail set-net fishery and coarse fish net fishery.

2 Governor-licensed fishery

A license of prefectural governor is required for operating any fishery for which fishery resources cannot be protected or fishery operations adjusted unless the total number of fishing vessels or fishing gear is limited. Under this system, regulations are enforced, as appropriate, as regards the contents of license and conditions for limitation.

Governor-licensed fishery is divided into (a) legal governor-licensed fishery and (b) other fisheries.

The former is the type of fishery in which the Minister of Agriculture, Forestry and Fisheries can set, by prefecture or by area, the maximum limit of the number of fishing vessels or the upper limit of fishing vessels and horsepower than can be permitted. They consist of four classes: medium purse-seine fishery, small-type Danish seine fishery, Danish boat-seine fishery in the Setonaikai Inland Sea, and small-type salmon and trout drift net fishery.

The latter comprises gill-net fishery (fixed type gill-net, drift net, etc.), dip net (mackerel spoon dip net), lift net (stick held dip net, pocket bag, 4-boat lift net, etc.), beach seine fishery (beach seine, etc.), boat seine fishery (sea bream surrounding seine, boat seine of drawers type, coral fishing net, etc.), small-type purse seine (small-type purse seine, drift net purse seine, etc.), stake net fishery (small-type set net, etc.), angling (pole-and-line, small-type squid jigging, yellow tail stocking fishery, etc.),towing net fishery (tuna towing net fishery, etc.), longline fishery (small-type salmon longline fishery, swellfish longline fishery and sea bream longline fishery), basket net fishery, octopus pot fishery, shelter for dolphins, and fishery using diving equipment.

Table 1 in Appendix shows the basic structure of fisheries by fishery system as of November 1 1993, based on the preliminary values supplied by the 9th fishery census (published on September 1 1994). The common fishery right fishery accounted for 31% of all fishery entities, while demarcated right fishery accounted for 19%, governor-licensed fishery for 23% and Minister-licensed fishery for 0.8%.

3. Given below is a chronological sketch of principal measures taken within the framework of legal system to implement fishery management through regulations on fishing efforts[1].

1882 In Wakayama Prefecture, the use of small sailing trawl was restricted with the aim to prevent conflict with other fisheries. Wakayama was the first prefecture to take this step in Japan.

1909 The license system on trawling was established and the closed area system was introduced within the framework of enforcement regulations for steamer trawling.

1913 The closed area for trawling was expanded.

1914 A Ministry decree to prohibit the taking of marine mammals was promulgated in order to prevent poaching. Also, a Ministry decree to prohibit the taking of female crab and set limits to carapace length in king crab fishery was promulgated with the aim to protect crab stocks.

1921 Enforcement regulations on Danish seine fishery was promulgated, in which the license system and closed areas were established.

1923 Enforcement regulations on factory-type crab fishery under the license of the Minister were enforced in order to resolve the stock issue in factory-ship type crab fishery (later mothership-type crab fishery).

1929 Factory-ship salmon fishery was placed under the category of Minister-licensed fishery.

1930 Enforcement regulations on Danish seine fishery vessels were revised so as to include the permission system for new entry and strengthening of penalty in order to alleviate the conflict between expanding Danish seine fishery and coastal fisheries.

1933 Enforcement regulations on the taking of king crabs were promulgated, in which the taking of female king crab and blue king crab was prohibited and the carapace length limitation on male crabs was established.

1933 The opening day for saury fishery was instituted under the regulation.

1937 A regulation to reduce the Danish seine fishing boats by 50% was promulgated.

1937 An enforcement regulation for fishery in the Setonaikai Inland Sea was promulgated with a view to unify enforcement regulations and adjust complex fishery relations.

1946 An enforcement regulation for medium-sized bonito and tuna fishery was instituted, in which fishing vessels of 20 tonnes and over were transferred to the category requiring registration for Minister's permission.

1947 Danish seine fishery east of 130 degrees E longitude was placed under the Minister's license system in order to restrain a rapid increase of licensed vessels.

1949 A regulation on saury fishery enforcement regulation was promulgated to restrict the instalment of fish gathering lamps onboard fishing vessels of 10 tonnes or larger.

1951 Enforcement regulations concerning prohibition of fishery operations in the Setonaikai Inland Sea was promulgated.

1952 Reduction of fishing vessels was enforced for an interval of five years under the Special Law to Adjust Small-type Danish Seine Fishery in order to prevent over-exploitation and resolve the conflict with coastal line fisheries.

1954 Herring harvests by trawlers, which was causing conflict with coastal fisheries, was prohibited.

1955 Enforcement regulations on tanner crab fishery was promulgated, in which the harvesting season of tanner crab in the Sea of Japan was limited.

1969 A Ministry decree concerning squid jigging was promulgated. In 1972, a Ministry decree concerning enforcement of neptune whelk (tsubu) was enforced.

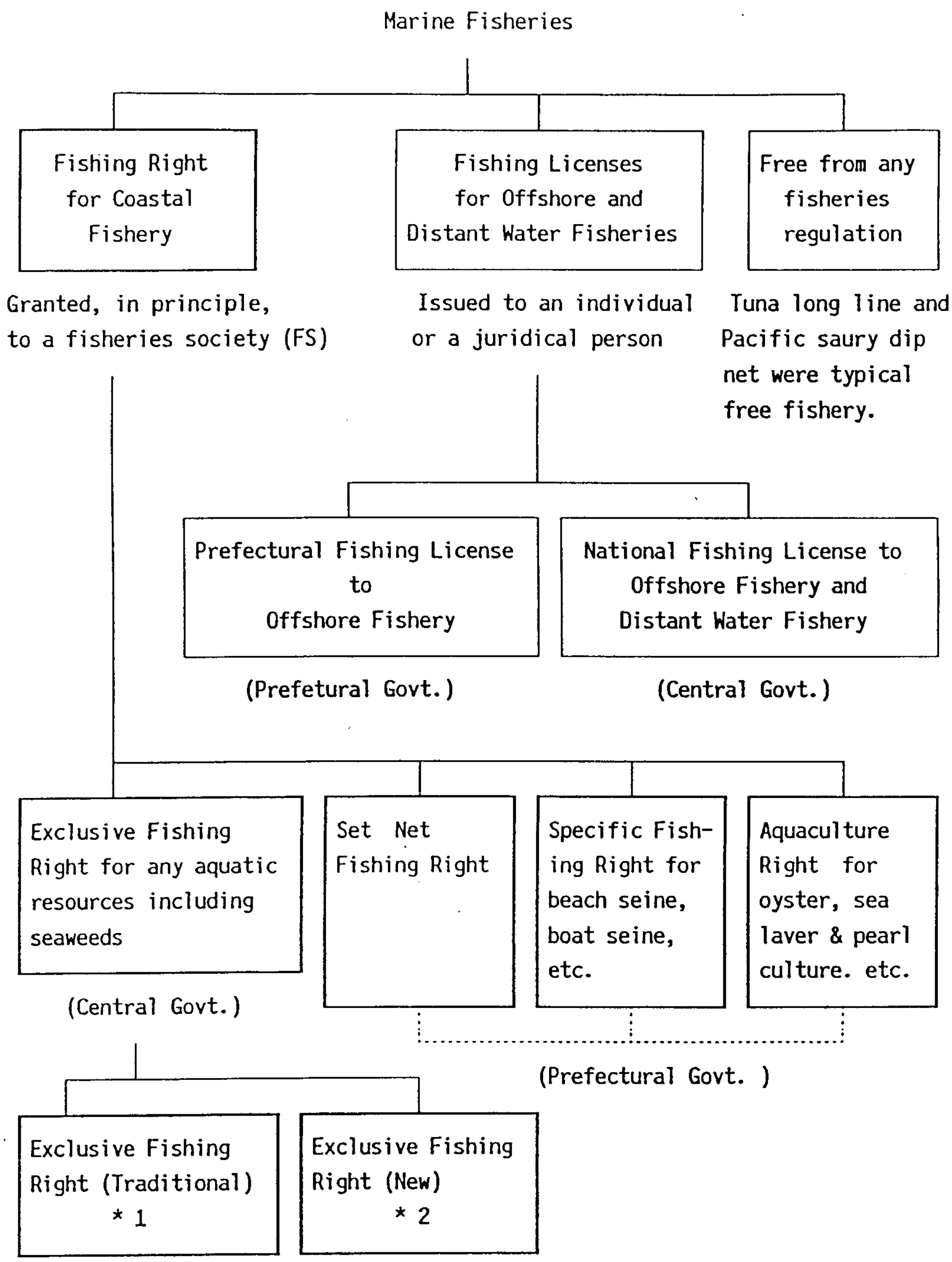
1974 A Ministry decree concerning the enforcement of drift-net fishery of marlin, etc. came into effect.

More recent instances will be presented in the issue paper as they are often conducted jointly with the stock management-oriented fishery.

Note:

(1) The above chronological account is based on Iwao Matsumoto (1977): Chronology of Fisheries in Japan in Modern Period with commentary (Pre-war years) (Suisansha) and Iwao Matsumoto (1980): Chronology of Fisheries in Japan in Modern Period with commentary (Post-war years) (Suisansha).

Figure 1. Fishery regime based on Old Fishery Law (1901-1948) (12)

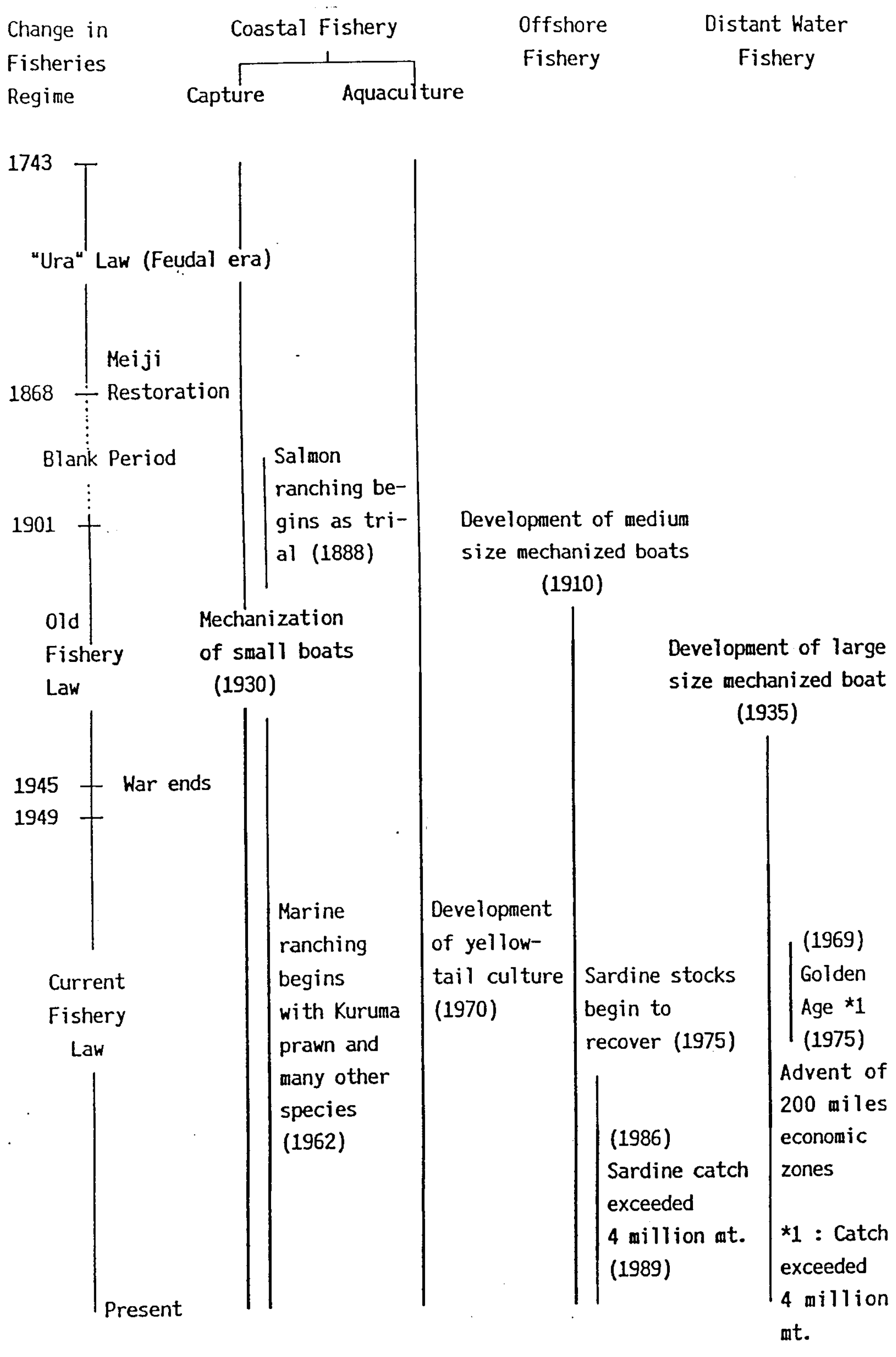


*1 : This was a right based on "Osumi-tsuki" granted by a Samurai lord.
*2 : This was a right newly granted by the Old Fishery Law.

( ) : Granting or issuing Organisation.

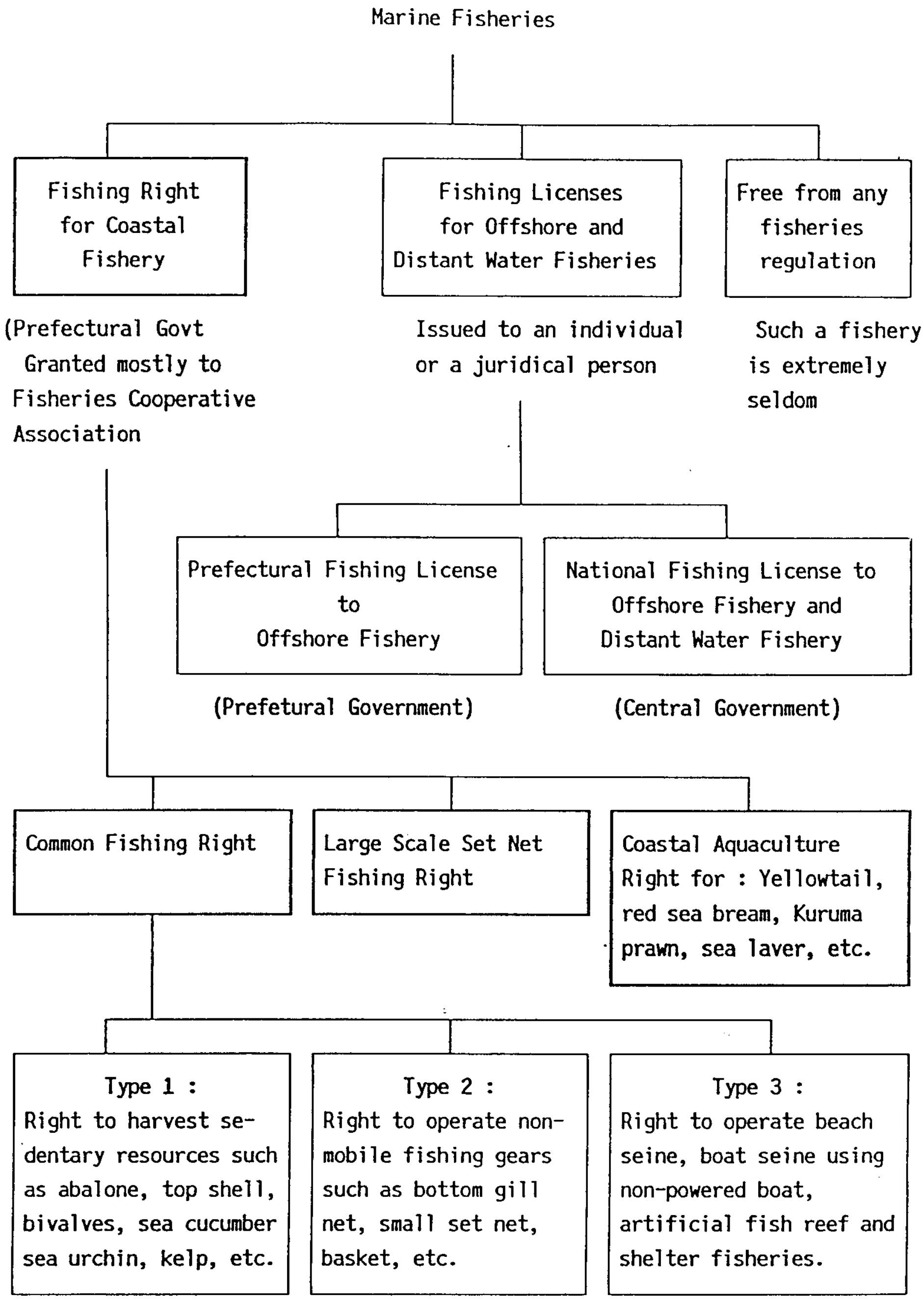
Reference: Tadashi Yamamoto (1993). A fishing right to Co-op. as a basis for community based fisheries management. Presented paper at International Conference on Fisheries Economics, Norway, May 26-28.

Figure 2. Development of marine fisheries and regulatory regimes (12)



Reference: Tadashi Yamamoto (1993). A fighing right to Co-op. as a basis for community based fisheries management. Presented paper at International Conference on Fisheries Economics, Norway, May 26-28.

Figure 3. Fishery regime based on current Fishery Law (1949 to present) (12)



( ) : Granting of issuing Organisation.

Reference: Tadashi Yamamoto (1993). A fishing right to Co-op. as a basis for community based fisheries management. Presented paper at International Conference on Fisheries Economics, Norway, May 26-28.

Basic information on constitution of fishing units in every fishing system

Fishing system	Number of entities	Number of vessels			Number of fishers working on the sea in high season		Average catch per entity
		Without motor	With onboard motor	With inboard motor	Family	Employee	
Fishery licensed by the Minister	1 338	21	84	3 121	984	39 854	54 910
Fishery licensed by prefectural governor	539	5	61	674	556	4 849	15 243
Prefectural Minister authorised fisheries	39 424	839	13 045	45 767	62 921	31 290	1 112
Fishing right fisheries							
Type 1 common fishery right	33 916	1 002	29 350	10 807	51 414	2 971	253
Other types of common fishery right	19 164	972	13 300	14 900	30 374	9 140	483
Demarcated area fishery right	32 875	8 763	39 169	29 668	66 430	36 248	2 219
Set-net fishery right	1 114	523	1 261	2 517	5 464	10 526	12 413
Unregulated fisheries right	42 185	659	11 323	38 226	51 597	4 103	334
Others	969	85	528	904	1 443	745	973
TOTAL	171 524	12 869	108 121	146 584	271 183	139 726	1 429

KOREA

CURRENT CHARACTERISTICS OF KOREAN FISHING INDUSTRY

Characteristics of the Korean waters and the fishery

The Republic of Korea is surrounded by the ocean on three sides and each coast has different characteristics. The East Sea has an abundant supply of cold water fish and due to its alternating Kuroshio warm current and Liman cold current, a variety of fish can be caught in its waters. Its coast line is simple and steep. Some parts of the fishing ground in the East Sea are shared by North Korea, Russia and Japan.

The West Sea also has a rich supply of fish again, because of its alternating warm and cold currents. A jagged coast line and well-developed continental shelf provide good conditions for the spawning and growth of fish.

The South Sea coastal area also provides good conditions for aquaculture, and its warm current enables a lot of fish to migrate within the Sea and forms a good fishing ground.

Characteristics of the fishing industry by the seas

The fish caught in the East Sea are mainly Alaska pollack, saury, plaice, squid, etc., most of which are cold current species. Squid is usually fished in the summer, and salmon species migrate to the East Sea. The main fishing methods used are trawling, jigging, long-lining and gillnet.

Yellow corvenia, hairtail, pomfret, blue crab, shrimp, shellfish and laver are the main fish from the West Sea. The main fishing methods used in the West Sea are trawling, stow net, long line and set-net.

The warm currents of the South Sea enable the prosperity of commercial fishers. The main species caught are jack mackerel, anchovy, hairtail, sardine and Spanish mackerel by trawling, gill-net, long-line and traps. On the coast developed re the aquaculture for oysters, ark shell, laver and sea mustards.

Socio-economic status of fishing industry

The fishing industry has greatly contributed to the food supply and employment of Koreans. Despite the contributions of the fishing industry, it is suffering from an outflow of fishing population, and a depletion of the fish resources. The following is a current status report of the Korean fishing industry and fishers.

Fishing population

Compared with 1992, the number of households engaged in the fishing industry in 1993 declined to 114 000, which is 1.7 per cent of the decrease recorded in 1992, and there has also been a 4.7 per cent decrease in the number of fishers, reducing the total population to 405 000. The number of both fisheries and fishers has been in decline since the mid 1970s, and the average age of the fishers has steadily increased.

Economic status of the fisheries households

The average income of fishing families in 1993 was approximately $18 000, far below that of agricultural families. Furthermore, the depletion of fish resources and increase in the fish imports have aggravated the economic status of fishing families, resulting in an increase in their debts. The average debt of fishing families in 1993 reached about $9 600, an increase of 18.1 per cent from 1992. In addition, 32.5 per cent of family fisheries household income is derived from other family owned businesses.

Status of production and fishing fleets

Fisheries production

The fisheries production of 1993 is 3 335 000 tonnes, an increase of 1.4 per cent compared with 1992.

Production by the coastal fishing industry also increased, while the production from other fisheries has decreased. This, however, is a temporary phenomena and the production from coastal fishing industry has remained unchanged since the 1980s. The trend of the deep-sea fishing industry is also one off declining productivity. Table 1 shows the amount of production by fishing industry.

Fishing fleet

The total number of fishing vessels was 87 473 (919 917 tonnes) as of 1993, with powered fishing vessels accounting for 81.6 per cent of all vessels and 98.3 per cent of total tonnes. Large fishing vessels weighing more than 50 tonnes account for 71.8 per cent of the total weight.

Coastal fishing vessels are mot commonly made of wood (79.1 per cent). However, the ratio of wooden vessels is only 22.8 per cent by weight. The composition of fishing vessels is shown in Table 2.

HISTORICAL OVERVIEW OF FISHERY RESOURCE MANAGEMENT IN KOREA

Korea implements policies that could promote the fishing industry through the management of resources. Management policies are either regulatory in nature, or oriented toward resource development.

Since the legislation of the Fishery Law of 1908, the ROK government has intervened din the fishing activities of nationals by issuing licenses, authorisation, and by other types of regulations. The Government has also, beginning in the 1960s, diversified its attention to the cultivation of the fisheries, through relevant legislation and the establishment of seedling fields and hatcheries.

Control of fishing activities by the government

Legislation of Fisheries Act

"Fishery Act (1908)": Since the beginning of the modern fishery management system, fishing activities have been classified into three categories:

- fishing by licence;
- fishing authorisation; and
- fishing by report.

After a total revision of the Law in 1911, the Fishery Act, the Fisheries Control Regulations were enacted. These regulations were thought to be in the vanguard of fishing regulations.

The Chosun Fishery Act of 1929, which replaced the Fishery Act, strengthened the concept of fishing licenses as private property.

The Chosun Fisheries Regulation Act, which provided more detailed provisions concerning fisheries management, was legislated, after being mandated by the Chosun Fishery Act. These regulations restricted the conflict among the various fishing types, and overfishing, by delimiting fishing zones.

Legislation Fisheries Resources Protection Act

The "Fisheries Resource Protection Act (1956)" was legislated to revitalise the fishing industry after the Korean War. And "Fisheries Resources Protection Act (1963)" established the main framework for the current fisheries resource management system.

The fisheries resource fostering programme can be divided into two parts: the release of fingerlings and the construction of artificial reefs. In Korea, the fingerlings release programme consists of salmon hatcheries and fingerling release. The legislation of the Fisheries Promotion Law in 1966 propelled the fingerlings release project.

Fisheries resource fostering programme

Salmon hatchery and the fingerling release programme

The release of salmon and hake fingerlings was the initiation of the fisheries resource fostering project in Korea. A record of the number of artificially hatched salmon fingerlings released, has been kept since 1910, and since the 1930s for hake.

The Government operated a salmon fingerling release project from 1957-61, and Jinhae Inland Fisheries Laboratory initiated the first phase of the five year inland waters development project in 1966.

Three provincial hatcheries were established in 1969 and in 1984. The National Salmon Hatchery was established to promote the production of the salmon fingerlings.

Fingerlings release

The establishment of the National Hatchery in 1973 propelled the fingerlings release project for other marine species and 11 national hatcheries have since been constructed.

Construction of artificial reefs

The construction of artificial reefs began in 1971 and has been regarded as a major project for the promotion of coastal fishing fishery. The government has put artificial reefs in approximately 80 000 ha of the fishing ground.

AN ANALYSIS OF THE KOREAN FISHERIES MANAGEMENT SYSTEM AND ITS EFFECTS

Management system of the fisheries resources in Korea

Basic framework of fisheries management

As has been pointed out above, fisheries resource management policies can be divided into fishing regulation policy and fisheries resource development.

These regulations are meant to preserve and appropriately manage the fisheries resources. The regulations can be classified into direct or indirect regulation and qualitative or quantitative regulation.

Based on the concept of natural resources as "public property", it is generally prohibited to exploit the fisheries resources without license, authorisation, or report from or to the government.

The Government uses the right based instrument such as license limitation for the fishing activities in order to directly control the catch effort by certain types of fishing vessels. And in accordance with Art. 4, 6, 7, 9, 10, 11 of the Fisheries Protection Law, the qualitative measures are taken, in order to regulate the fishing activities indirectly.

In the fisheries regulation programme, indirect or qualitative measures such as gear restriction and fishing ground closure are preferred to direct or quantitative measures like quota system, due to the characteristics of diversity in the species in the waters surrounding Korea.

Fisheries regulation system

There are two components of the fisheries regulation system. Among the regulation system, fishing license system and fishing report system is applied to fishery resources, while the fishing license system is for fishing grounds restriction.

The main reason for classifying the fishing types by license, authorisation and report, is to efficiently manage fishing and resources. Art. 41 of he Fishery Act stipulates the standards for licensing and reports on fishing.

There are 10 types of coastal fishing and 13 types of off-shore fishing, that require licensing by the Government. The Government also limits by indirect regulation, the number and weight of fishing vessels, the fishing season and zone for each fishing methods and species covered by Fisheries Resource Protection Act.

The main purpose of these restrictions is to both protect the fishery resources and restructure the fishing industry. Such regulation can be viewed either quantitatively or qualitatively.

Quantitative restriction

The license system for fishing, under Art. 41 of the Fishery Act, is a quantitative restriction. Fishing licenses can be divided into those from the administrator of the National Fisheries Administration and those from the governors of the province. Authorisation from the administrator is generally issued for large scale and nation-wide fishing activities, which are mostly of-shore, while the license from the governors is for small scale and local fishing activities.

The excessive issuance of the licenses, however, will reduce the effectiveness of the licensing system. To overcome this problem, the government has placed limits on the number and tonnage of fishing vessels by fishing type, but most fishing vessels still exceed the appropriate limitation.

Qualitative restriction

The government regulates fishing activities directly by placing restrictions on the fish size, gear restriction and mesh size restriction etc., in accordance with Fisheries Resources Protection Act. Some fish species are designated for a regulated fishery, and specific fishing season and fishing zone are established for those species.

Fisheries resources fostering policies

Article 6 of the Fisheries Promotion Act stipulates the following:

> "The Government shall continuously promote resource development by establishing a fisheries protection zone, ensuring appropriate utilisation and development of fisheries resources, propagation of marine fisheries, prevention of contamination, and effective utilisation of fishing grounds in order to protect the fisheries resources."

The resource development system operated by the Government is based on the above-mentioned principles. Art. 13 of the Act also stipulates government assistance for fishing ground formation and propagation facilities.

Art. 17 of the Special Law on Rural Area Development also encourages the restructuring of the fishing industry as a means to preserve and enhance fishery resources.

In accordance with the above-mentioned policies and principles, the government has constructed artificial reefs and national hatcheries. Artificial reefs have been constructed to provide spawning grounds for fish. The government has shut down artificial reefs in the coastal fishing ground as wide as 78 822 ha. 345 000 of concrete artificial reefs and 288 of old vessel artificial reefs have been shut down ever since.

Since the establishment of the Cheju Island Seedling Field in 1973, 11 more seedling fields have been established to stabilise the supply of fingerlings cultivation and release. The main purpose of the seedling field are as follows: produce, distribute and release of fingerlings. The seedling field develops techniques for the mass production of fingerlings, and at the same time performs research to discover ways to improve fish species, and instruct fishers of skills that promote the coastal fishery resources.

Fish fingerling production has increased since the 1980s due to the newly established seedling fields. The annual average fingerling production rose from 237 000 between 1976-80 to 7 555 000 during the period 1981-87 and to 70 893 000 in 1993. In addition, the species diversified, and now includes more than 10 species, including crustaceans and shellfish.

Current issues and problems

Fisheries Regulation System

Even though current policies are based on efficient management techniques, efforts to regulate the catch of individual fishers have not been entirely successful.

Current fishing harvests and the number of fishing vessels, both exceed the Maximum Sustainable Yield (MSY) limits established in 1982.

Failure to effectively control the fish harvests has resulted not only in the depletion of fish stock, but also in cut-throat competition between fishers and their companies. Despite quantitative and qualitative regulations, frequent violations indicate the need for a more vigilant monitoring system from the government authorities.

Fisheries Resource Enhancement System

The resource enhancement fostering project was established in the 1970s, and although it is still u undergoing developmental changes, this programme has expanded quite rapidly considering its relatively short period of existence.

One problem area identified by the resource enhancement project is that released fingerlings are often caught by coastal fishing vessels, and the government has taken no specific actions to prevent the coastal stow net fishing in the future.

ANALYSIS OF THE FISHERIES RESOURCE EXPLOITATION LEVEL OF THE KOREAN FISHING INDUSTRY

Exploitation level of the Korean fisheries resources

Stock assessment model

Assessment of appropriate fishing intensity by species

Thirteen off-shore fishing types and 28 species have been considered, and the information used here is from the National Fisheries Research and Development Agency and the Ministry of Agriculture, Forestry and Fisheries.

In this paper, Fmsy is for the fishing intensity and FO.1 by Gulland and Boerma (1973) is for the appropriate fishing intensity, assuming that there is no change in the number of vessels capable of fishing, it seems feasible to further raise fishing intensity.

The assessment of current fishing intensity was calculated by averaging the amount of fish caught in the best three of the last ten years (1982-91). Fishing intensity by species is shown in Table 3.

Assessment of fishing intensity of off-shore fisheries

According to the assessment by fish species, the fishing intensity in off-shore fishery is generally over the appropriate level, except for some species like squid and pomfret, s shown in Table 3. The squid population has increased recently. It is expected that additional squid harvest will not influence the status of the stock. However, considering the one year life cycle of squid, there should be careful periodic review of the status of this particular species.

Assessment of fishing intensity by fishing type

As shown in Table 4, the fishing intensity assessment by fishing type shows that the appropriate fishing intensity is exceeded. According to a fishery statistics by biological information and research results during 1970-91, appropriate fishing intensity for coastal and off-shore fishery is only 48-77 per cent of the current level. Large scale trawl, especially, has been estimated the lowest as 26 per cent.

Conclusion

Despite the given environment for diverse living marine resources, the conflict among the countries with adjacent seas and among the domestic fishing companies in the Korean waters grew more complicated. There came about the need to jointly regulate and enhance the fisheries resources since the 20th century. The implementation of the fisheries regulation policies since the early 1990s, however, was hardly effective on account of the following reasons.

First, it is difficult for the ROK Government to implement quantitative control such as quota system because of multi-species in the Korean waters. Therefore, Korea implements mainly indirect regulation system such as license system.

Second, fishing ground around the Korean peninsula is shared among the Republic of Korea, North Korea, China, Taiwan and Japan. This aroused fishing competition among those countries. Rapid increase of Chinese fishing effort since the 1980s is propelling the depletion of the fisheries resources in the waters around Korea.

The fisheries resources in the Korean waters decreased due to the above reasons. This made the fisheries matter in Korea require multilateral cooperation and made it necessary to strictly implement the monitoring system for the reasonable management of the fisheries resources.

For the effective implementation of the fisheries resource enhancement system, the Government of the Republic of Korea has encouraged the development of fishery resources by coining the motto "from fish harvest to fish cultivation", but this undertaking is still in its infancy.

Table 1. Production by fishing industry
('000 metric tonnes)

Fishing industry	1992	1993	Increase/decrease rate
Coastal and off-shore	1 295	1 526	17.8
Aquaculture	936	1 038	10.9
Inland	34	30	-11.8
Deep-sea	1 024	741	-27.6
Total	3 289	3 335	1.4

Table 2. Number of fishing vessels by fishery

	Number	Ratio (%)
Coastal and off-shore	53 163	60.8
Aquaculture	26 857	30.7
Inland	3 044	3.5
Deep-sea	628	0.7
Other	3 781	4.3
Total	87 473	100

Table 3. Assessment of fishing intensity by fish species

Species	Average catch (M/T) (1981-91)	Average by-catch (%) (1989-91)	Fmsy/Fmax (%)	F0.1/Fmax (%)
Sole (S)	14 067	1.0	73	57
Hairtail (S)	100 677	6.9	65	35
Corvenia (B)	57 297	3.9	69	54
Silver eel (S)	2 959	0.2	43	34
Mackerel (S)	117 461	8.1	75	58
Saury (B)	3 093	0.2	97	40
Black throat sea perch (S)	509	0.04	46	36
Hake (S)	1 364	0.1	27	21
Sailfin sandfish (S)	3 556	0.2	43	33
File fish (B)	153 270	10.5	63	23
Anchovy (B)	156 750	10.8	82	38
Alaska pollack (S)	11 896	0.8	74	67
Croaker (S)	2 392	0.2	75	59
Pomfret (B)	9 704	0.7	100	51
White croaker (S)	4 849	0.3	23	13
Yellow croaker (S)	1 569	0.1	35	28
Sea eel (S)	22 586	1.6	90	81
Spanish mackerel (B)	19 318	1.3	20	13
Tongue fish (S)	3 151	0.2	61	48
Horse mackerel (B)	18 868	1.3	30	17
Sardine (B)	120 000	8.3	82	63
Sea bream (B)	1 040	0.1	50	30
Yellow corvenia (B)	27 962	1.9	53	30
Skate (S)	1 620	0.1	35	27
Blue crab (S)	23 632	1.6	80	63
Large shrimp (S)	1 163	0.1	99	76
Cuttlefish (S)	12 729	0.9	26	20
Squid (S)	83 693	5.8	150	100
Total		67.0	77.4	48.3

Notes to Table 3

(S) is based on the Schaefer model by the formula as seen below:

$$Y = rB^* \frac{Bmax - B}{Bmax}$$

Y: Equilibrium catch
r: Net proportional growth rate
B: Fish population biomass
Bmax: Environmental carrying capacity

(B) is based on the Beverton and Holt model with the following formula:

$$Y = R^*W\infty^*F^*e\ \exp[-M(tc-tr)]^*\sum_{h=0}^{3} \frac{\Omega h^*e\ \exp[-hK(tc-tr)]^*[1-e\ \exp-(F+M+hK)(tc-tr)]}{(F+M+hK)}$$

M : Natural mortality coefficient
F : Fishing mortality coefficient
tc : Age at first entry to the fishery
tr : Age at first entry to the ground
W∞ : Growth coefficient by von Bertalanffy
t : Maximum age for fishing

Ωh : $\Omega^\circ = 1$, $\Omega_1 = -3$, $\Omega_2 = 3$, $\Omega_3 = -1$

Table 4. Assessment of fishing intensity by fishing type

Fishing industry	Assessment of appropriate fishing intensity (%) compared with current level
Large scale purse seine	51 - 72
Large scale trawl	26 - 66
Large scale trawl (2 boats)	41 - 61
Large scale trawl (1 boat)	40 - 55
South-west sea trawl (2 boats)	51 - 69
South-west sea trawl (1 boat)	42 - 57
East sea trawl	68 - 76
East sea boat trawl	63 - 70
Off-shore stow net	40 - 66
Off-shore trap	74 - 82
Off-shore boat trawl	38 - 82
Off-shore drifnet	45 - 87
Off-shore pole and line	100
Coastal and off-shore total	**48 - 77**

MEXICO

Introduction

Mexico enjoys international recognition as one of the countries with the greatest biological diversity and riches on the planet, particularly because of the countless endemic species of flora and fauna that inhabit or breed in its territory.

With regard to the sea, these riches and diversity are characterised by factors such as its geographical location between two of the world's most important ocean areas (the Pacific Ocean, and the Gulf of Mexico and the Caribbean Sea in the Atlantic), the length of its coastline which reaches almost 11 500 kilometers, its 3 million square kilometers of Economic Exclusion Zone (EEZ), 358 000 kilometers of continental shelf, and more than 2.9 million hectares of inland bodies of water, including 1.6 million coastal lagoons.

These geographical features, together with the marine biology phenomena that occur in its territorial waters, have favored the existence of many marine ecosystems, some of which are particularly important for domestic fishing, such as the Campeche Sound, the reef and coral systems in the Gulf of Mexico and the Caribbean, areas or zones located in the Gulf of California where such endemic species as the vaquita porpoise and the totuava can be found, or the bays and coastal lagoons along the west coast of the Baja California peninsula where gray whales come to reproduce.

In addition, the prevailing physical and climatological conditions in each region allow the development of an infinite number of species of marine flora and fauna, typical of the temperate and tropical systems that predominate in the country. From this diversity, many species have been identified and are generally classified into four groups: pelagic (or open-sea) species, deep-water species, crustaceans and mollusks, and inland-water species.

The pelagic species found in Mexico's territorial waters include tuna, sardine, swordfish, sailfish, marlin, and squid. Among the deep-water species are those generally known as scaled fish: sea bass, red snapper, seabream, flatfish, and others. Shrimp, lobster, abalone, oyster, clam, and sea-snail are all members of the group of crustaceans and mollusks found in Mexican waters.

Inland-water species number around 58 biological species, including mojarra, tilapia, trout, carp, whitebait, catfish, river-prawns, and bass.

Moving on to other matters, between 1984 and 1993, average fishery production stood at 1.3 million tonnes per annum, of which 68% was used for direct human consumption, 28% for indirect human consumption, and the remaining 4% for industrial purposes. In turn, aquacultural activities contributed 12.7% of the total value of sectoral supply. This production reached a level of 4.5 billion new pesos in 1993, and of 4.9 billion in 1994. This represents growth rates of 5.3% and 4.6%, respectively, and both increases were higher than that of the economy as a whole.

By reason of its production levels, according to the United Nations Food and Agriculture Organisation (FAO), in 1991, Mexico was among the world's top twenty fishing nations.

The most important species landed, in commercial terms, include sardine, tuna, mojarra, oyster, shrimp, shark and dogfish, octopus, and such fine-scaled species as sea bass, red snapper, and sierra.

Between 1993 and 1994, the fishing fleet comprised an average of 66 557 vessels, of which 3 228 were large craft and 63 329 were small boats. In turn, shrimpers accounted for 72% of the large-scale fleet, scale-fishers for 22%, sardine and anchoveta craft for 3%, and tuna vessels for 2.5%. The processing sector had an average of 429 plants, of which 290 were for freezing, 65 for reduction, 46 for canning, and 28 dedicated to other processes.

Mexico has traditionally maintained a surplus in its trade in fishery products. In 1994, the figure stood at around 325 million dollars, with exports worth 473 million dollars and imports for 138 million.

In Mexico, fishery activities have attained great importance, particularly as a result of their contribution to reaching national food supply, employment, and income goals, and as a generator of foreign exchange earnings.

Consequently, Mexico's fishery policy is based on the principle of responsible fishing, which has the following guiding principles: rationality in the use of natural biological resources, economic profitability, the protection of sovereignty in Economic Exclusion Zones, and respect for ecosystems and biodiversity.

Maintaining current and past supply levels of fishery and aquacultural products has necessitated the application and implementation of careful measures intended to administer the species and resources used to date, including both those that reproduce naturally in the different ecosystems and those that are cultivated.

Likewise, following the important upswing in aquacultural activities, it has been necessary to ensure the rational use of the basic resources that make the development of these activities possible -- such as water, land, aquatic flora and fauna -- and to encourage the establishment of technically and financially viable projects.

The work undertaken has allowed progress to be made in defining suitable areas of land and water, in the compatibility between using natural elements and conservation, and even in environmental improvements.

It should be pointed out that administration schemes for fishery resources found in Mexico's territorial waters have taken into consideration the different levels of development of different fisheries as well as the diversity of fishing gear and equipment representing different stages in the industry's technological development and their effects on stocks.

Basically, these measures have been aimed at establishing regulations to encourage the rational use of fishery resources: for example, by specifying the characteristics of fishing gear and equipment that can be used, the handling of closed seasons, etc. All this is supported by keen supervision of the enforcement of the provisions set down by the competent authority in order to guarantee the recovery and maintenance of stocks and to reduce by-catches of related species.

By determining the type and characteristics of nets and vessels, the kind of maneuvers, the size of the specimens that can be caught, the establishment of closed seasons, and other provisions, the fishery authorities have laid down guidelines to promote the rational use of the valuable resources available in our territorial waters.

Thus, rational use attempts to strike up a harmonious relationship between productive agents and natural resources, and government involvement tries to ensure that the authorised catch volumes, fishing gear, and techniques guarantee the sustainable long-term yield of fisheries and minimise by-catches of related species.

Elements considered in fisheries administration

Traditionally, the administrative and organisational schemes used for the exploitation, use, and conservation of live marine resources have involved the establishment of permissible catch volumes based on the criterion of maximum sustainable yields, the application of seasonal or geographical moratoria, the definition of catch areas, regulations for the use of fishing gear and equipment, setting minimum sizes for specimens caught, and, in the case of endangered species, refuge zones or ecological reserves have been set up.

Under these efforts, a very important roll in the research activities is played by the National Fisheries Institute (INP) which issues the pronouncements about the species population situation, as well as the endorsement related with quotas and size-measuring limits and catches season.

In addition, from the functional perspective, fishery administration schemes have been supported by mechanisms for controlling access that basically are regulated trough fish (permits, authorisations, licenses, and concessions) that are given in accordance whit the populations evaluations resources that are given by INP.

Similarly, at present a process to issue technical standards is underway. These are complementary to the issuing of fishing licenses, permits, and concessions and are intended to ensure administrative control over fishing and catches (fisheries information, inspection, supervision, and sanctions).

These measures consider particular conditions, be they biological (stock status, areas of movement, reproductive capacity, etc.), economic (employment and income generated, importance in comparison to other fisheries, socio-economic effects, final destination of the product, etc.), social (users, social groups involved, organisational structures, etc.), or ecological (environmental impacts, pressures on coastal resources, conflicts between different users, etc.). Other sets of conditions are also taken into account.

The regulation of exploitation activities has led to the establishment and functioning of mechanisms that provide for legal access to fishery activities and the benefits derived therefrom, whereas for the authorities they represent administrative mechanisms for determining the allocation of the natural resource with conservation, economic, and social aims.

Fisheries administration

The institutional formulation and application of schemes for administering live marine resources, including the methods and aims of their exploitation, use, and organisation, falls to the Ministry of the Environment, Natural Resources, and Fisheries (SEMARNP).

Similarly , the Office of Federal Environmental Attorney (PROFEPA) is responsible for ensuring observance of fisheries regulation provision. Under this procedure (the SEMARNP indicates the ways in which the resources are to be used, and the PROFEPA applies the sanctions provided for in law) there is a greater transparency in the management of fishery resources , since the sanctioning authority is independent of the administrative apparatus and this allows fishers to appeal if they believe the application of any provision to be unjust.

The current administrative schemes are based in legal terms on the provisions of the Fisheries Law and its Regulations (in force since June and July 1992, respectively). Their aims are the following: to guarantee the conservation, preservation, and rational use of fishery resources, and to lay down the bases for their appropriate development and administration.

Noteworthy aspects of the new legal framework include:

- Elimination of the reserved species regime for cooperative societies in commercial fishing. This opens the possibility of private investment participation in the extraction and cultivation of the species that command the highest commercial prices, such as shrimp, abalone, lobster, etc.

- The granting of concessions -- either through competitive bidding or direct adjudication for up to 20 years for extraction and 50 years for aquaculture, and extendible for a second similar period, provides long-term certainty for investors and facilitates productive agents' access to credit. In addition, the fact that they are transferable allows for the entry of new economic agents.

- Concessions are granted for commercial fishing and the cultivation of species, whereas permits, which cannot exceed a duration of 4 years, are given for commercial, development and sport fishing. Authorisations, on the other hand, are given for educational fishing, the installation of fixed gear in federal water, and for deep-sea fishing . The difference between permits and concessions lies in the amount invested and the economic prospects of the project.

- These provisions complement, in the case of aquaculture, the purpose of the amendments to Article 27, by adding to the security of land holdings the security of investments made in them.

- The Law and its Regulations make the ideas behind Responsible Fishing a reality, in that the criteria of biological rationality and economic viability are applied in granting concessions and permits; this reduces the discretionary powers of the authorities, offers prospective investors security in their investments, and promotes sustainable development among producers; all this with the due respect for both ecosystems and biodiversity.

These instruments combine the experiences and results of administrative schemes used in the past and allow them to be adopted to fit the requirements and dynamic conditions within which national fisheries policy is formulated.

The design and implementation of regulatory schemes is aimed at providing guidelines for the different aspects of fishery activities and to direct them towards achieving responsible fishing.

The aspects covered by the regulations include the following:

- Establishing permissible catch volumes per fishery, along with the allocation of catch quotas.
- Establishing minimum sizes for landed specimens.
- Determining the number of fishers, vessels, and their characteristics, along with the number and type of fishing gear and equipment allowable for use in catching a given species or group of species.
- Implementing measures to control the introduction and handling of fishery species in natural and controlled barrage lakes.
- Proposing the establishment of refuges and reserve zones, and determining seasons and areas for moratoria.
- Proposing the species of aquatic fishery flora and fauna that warrant special protection, and implementing and overseeing the corresponding programs and measures

The application of the regulatory schemes is undertaken by granting concessions, permits, and authorisations, and through inspection, supervision, and application of sanctions which, as stated before, are functions of the Office of the Federal Environmental Attorney.

Commercial fishing is that undertaken to obtain a financial benefit and concessions are only granted to Mexican citizens. The involvement of foreign investors requires observance of the terms of the Foreign Investment Law.

Development fishing is aimed at the study, scientific research, experimentation, exploration, prospecting, cultivation, development, restocking, or conservation of resources comprising water flora and fauna and their habitat, along with the training of people involved in any way with fisheries and experimentation with gear and methods for this activity.

Educational fishing is that undertaken by domestic teaching and research institutes with official recognition and authorisation to undertake teaching, research, and training programs.

It should be pointed out that the Fisheries Law updates the aforesaid administrative mechanism and, under the terms on the Federal Law on Measurements and Standardization, these instruments including Official Mexican Standards, are made more transparent since their preparation involves all productive and institutional agents concerned. The general public may play a part in their preparation and review, since they are published in the Official Journal of the Federation and a period is allotted for the reception of comments and observations, which in turn are discussed by the Working Group charged with drafting the standard.

Under this scheme, over 1993 and 1994, 12 Official Mexican Standards were published, covering the use and administration of aspects of fisheries such the following: tuna, small pelagic species, catarina clams, several species of abalone, lobster, red urchins, octopus, for the protection of the totuava and vaquita, to determine seasonal and geographical moratoria, and to establish hygiene standards for the import of live aquatic organisms.

As projected Official Mexican Standards, the following are under review: those covering the exploitation of sea-snails and oysters, regulating mullet and striped mullet fisheries, governing sport and recreational fisheries, and specifications for the protection of different species of aquatic flora and fauna.

The following section describes the main mechanisms for fisheries administration implemented in the country's main fisheries in accordance with their level of development.

Shrimp

Shrimp fishing, because of the high commercial prices commanded by its products, is the country's most important fishery activity in economic terms: it is the sector's main export product and, consequently, the largest source of foreign exchange earnings. Between 1990 and 1993, overseas sales worth an average of approximately 245 million dollars accounted for 59.3% of the sector's total income and, in terms of catches, the average production of 52.5 thousand tonnes is equal to almost 4.5% of total supply.

The main shrimp species located in Mexican territorial waters of the Golf of Mexico and Caribbean Sea are the following: the brown shrimp (Penaeus aztecus), white shrimp (Penaeus seticerus), white shrimp (Penaeus duoraru), rock shrimp (Sicyonia prebirostris), Atlantic seabob (Xipho penaeus kroyeri), botanon shrimp (Trachypenaus similis). In the Pacific Ocean, the main species are the brown shrimp (Penaeus californiensis), blue shrimp (Penaeus stylirrostris), crystal shrimp (Penaeus ebrelirrostris), and white shrimp (Penaeus vannamei).

Administrative and regulatory measures in shrimping have been put into effect through the granting of fishing permits per vessel in deep-sea fishing and, from the economic point of view, this has allowed the individual control and recording of fishery operations, of the catches made, and of the catches landed per vessel, thereby allowing the yield rates to be assessed.

Similarly, regulatory standards for the use of drag nets by the Gulf shrimping fleet have been established, thereby obliging the shrimping fleet to fit sea-turtle exclusion devices.

Finally, it is important to point out that the end of 1993 saw the publication of Official Mexican Standard (NOM) 002-PESC-1993 controlling the exploitation of shrimp species in waters of federal jurisdiction. This provision improves and updates the requirements to be met by the development of this activity in order to guarantee the preservation and optimal use of shrimp resources.

Tuna

Since 1976, the year in which Mexico established its Economic Exclusion Zone regime, tuna fishing has been one of the sector's most important activities, currently standing in second place, after sardine fishing, in terms of total production volume. Between 1990 and 1993 total tuna landings stood at an annual average of 132 500 tonnes, equal to 11% of the sector's total fishery supply. Its fleet is considered to be the most modern and to enjoy the greatest ocean-going autonomy.

Its fleet, comprising 86 vessels in 1993, is considered to be the most modern and to enjoy the greatest ocean-going autonomy. Regarding employment, a conservative estimate indicates that this fishery generates 1 600 direct jobs and around 3 000 others in the processing industry.

Actions to encourage this fishery activity necessarily included, with regard to administration, the implementation of streamlined and timely procedures intended to guarantee the immediate operational integration and programming of vessels, designing a system of permits per vessel, and establishing fishery operational standards.

In this fishery, actually it has been necessary to adopt strict measures to protect and conserve the dolphins in the Mexican East Pacific that are accidentally caught during tuna fishing operations.

Indeed, since 1976, it can be considered one of the fisheries where the greatest number of provisions have been implemented to optimise its administration, particularly with a view to reducing by-catches of dolphins. In this regard, particularly notable are the measures put into practice through the National Program for Tuna Use and Dolphin Protection which develops selective fishing methods and technologies and which has an on-board observer program present on each and every fishing trip made by the tuna fleet.

It is important to state that in 1993, with the publication of the Official Mexican Standard for regulating tuna exploitation by vessels using seine nets in territorial and international waters and by domestic vessels in the waters of other countries of the East Pacific Ocean, the set of administrative instruments was improved and adapted to the development demands of this fishery, including provisions such as bans on night-time sets and the use of explosives, the obligatory use of the reverse maneuver, and the use of equipment to release dolphins caught by accident.

Mexico considers the progress made in the rational administration of tuna resources, including the reduction in by-catches of dolphins per set from 15 to 0.6 between 1986 and 1993 (that is, a reduction in such captures in relative terms of almost 96%), to be valuable efforts undertaken by our country that should be taken into consideration by the other nations involved in this fishery in order to face the problem of its administration at the regional level in a multilateral fashion.

Worthy of note is the Inter-Governmental Agreement for Dolphin Conservation, signed by ten countries in June 1992 at La Jolla, California, United States, within the framework of the Inter-American Tropical Tuna Commission (IATTC). This agreement endorsed the establishment of a multilateral, scientific program (with the participation of governments, industrialists, and ecological groups) with a scheme for the oversight of its observance allowing the optimal use of tuna resources and protection of dolphins.

In the Gulf of Mexico, tuna fishing is currently undertaken by low-capacity longline vessels, which catch their tuna mostly by using live bait. The fleet currently comprises 35 vessels.

Management of this fishery is regulated by the issuing of permits, and the regulation is adequate thanks to the existence of monitoring program that places scientific observers on each and every fishing trip. This has allowed Mexico to contribute to the administrative and statistical information gathering efforts undertaken by the International Atlantic tuna Conservation Commission (IATCC).

Sardine

Natural sardine fishing represents a commitment to the aims of securing foodstuffs for popular consumption and for the production of basic inputs for the poultry and cattle industries.

The main species fished are the Monterrey (Sardinops sagax), Crinuda (Opisthonema oglinum), and Japanese (Etrumeus acuminatus) sardines. Mainly active in the Pacific, this fishery is most representative of the sector in volume terms. Between 1990 and 1993 , captures of this resources totalled close to 230 000 tonnes per annum, to be the third most important fishery for direct human consumption.

Sardines are considered the most dynamic of all the species found along Mexico's coast, in terms of their mobility and because oceanographic changes have a substantial impact on the geographical location of stocks. Consequently, administrative measures have basically involved the establishment of a per-boat permit system and the instrumentation of technical standards for fishery operations to which exploitation has been adapted.

With regard to standards, these administrative measures provided for the issuing of regulatory standards to set the minimum size of captured specimens for the monterrey and crinuda species, closed seasons in the eastern region of the Baja California peninsula, and operating conditions for the sardine fleet in order to protect young specimens and those of reproductive age and to ensure a quality of catches suitable for canning.

Provisions have been included to regulate access to fishing, allowing only vessels with on-board refrigeration facilities to fish for sardine, along with provisions to regulate the methods and techniques used to unload catches on the quayside.

The aims of these measures included the consolidation of the fleet's operations on the basis of production and operation programs on the vessels.

Scaled species

The development of river fishing for scaled species is of fundamental importance in the country's fisheries development policy, since it is closely linked to the aims of employment, food supply generation, and regional development. In coastal regions, the distributional characteristics of the fishery resource have a decisive influence on the geographical ordering of the fishing communities involved in primary extraction.

Furthermore, orographical features and the limited highway network in those coastal regions not only hinder inter-community exchanges; in addition, the adoption of any promotional measures for them implies the need to channel resources or facilities for the economic growth of the activity and the problem of transforming existing social and economic relations.

Likewise, the dispersion and high level of regional variation between fishing communities are elements that complicate the mechanisms for channelling resources and productive and social services, since under such conditions there is the risk of atomising them and even diverting them, thereby cancelling out their potential productivity.

The economic and social importance of scaled-fish extraction is reflected in its contribution to national fisheries production -- it is estimated to account for 40% of total production -- and in the amount of jobs and income generated in communities where fishing is the most important economic activity or even the only one.

Administrative progress in these areas has consisted of the simplification and extreme specialisation of the permit system in order to incorporate the fishers into a regime of legality, thereby facilitating the commercialisation of their products under advantageous conditions.

Bearing in mind that scale-fish extraction covers more than 270 species, seabream (Lutjanus), sea bass (Epinephelus morio), red snapper (Lutjanus campechanus), sierra (Scomberomorus maculatus), mullet (Mugil cephalus), sole (Paralichthys lethostigma), bluish streaky croaker (Micropogonias undulatos), and many others categorisation efforts have been made for administrative purposes and in order to statistically define the planning of preventive evaluation mechanisms in these fisheries.

Thus, actions have been taken to incorporate larger vessels into ocean-going fishing.

Sport fishing

Bearing in mind the riches and potential offered by coastlines and lakes for the development of sport fishing, the administrative measures brought into play in encouraging and supporting the development of this activity have basically pursued the goals of maintaining the biological equilibrium, achieving the optimal use of the species used in sport fishing along a 50-mile strip off the coast, and implementing mechanisms to prevent and, when such situations arise, resolve problems arising between the different users of these resources, such as service providers, commercial fishers, and sport fishers.

Within the framework of fisheries administration, the instrumentation of management plans as a systematic action to identify the economic or social options for the use of a fishery resource in accordance with the criteria of maximum sustainable yields, from the points of view of biology, economics, and optimal social benefit, is intended to resolve and prevent conflicts between the different users of these fishery resources.

The response has been to issue clear and objective legal provisions and standards to balance the competing interests of commercial and sport fishing. Thus, the current Law determines the exclusive sporting use of resources such as marlin (Makaira nigricans and Makaira audax), sailfish (Xhipias gladius), swordfish (Coryphanema hippurus), dolphinfish (Nematistius pectoralis), and shad (Tarpon atlanticus) in a 50-mile strip of sea along the coast; likewise, an Official Mexican Standard, establishing clear rules for the practice of sport fishing, has been issued.

This provision indicates the species reserved for sporting and recreational fishing, the fishing banks, gear and equipment that can be used, and catch quotas.

Other actions undertaken in this area include the periodic adapting of fees for sport-fishing rights and expanding the geographical and seasonal coverage for permits with the support of service providers in the sport-fishing industry, after making efforts to establish information registers to allow an understanding of the importance of sport fishing in the country.

Species requiring special protection measures

Gray whale

Although Mexico has not engaged in commercial whaling, the first administrative and protective measures for these great cetaceans date back to 1972 with the decree establishing a refuge zone in the region around the Ojo de Liebre Lagoon to the south of San Sebastián de Vizcaino Bay, on the southern Pacific coast of Baja California Sur.

In 1979, this area was extended to include the Guerrero Negro and Manuela lagoons to the south of the Bay, and in 1980, the waters of San Ignacio Lagoon in the same state were also established as a refuge zone.

At present, these areas fall into the Vizcaino Biosphere Reserve.

Vaquita, totuava, sea-lions, and seals

With regard to endemic species found in Mexican territorial waters, such as the vaquita porpoise and the totuava that mainly inhabit the Gulf of California, special protective measures have been enacted. In 1976, a ban on the capture of marine mammals was instituted, thereby protecting the vaquita and, in turn, a ban on catching totuava has been in place since 1976. Likewise, in June 1993 the Upper Gulf of California was declared a reserve zone in order to protect the habitat of these species.

The measures intended to protect these species have been updated and supplemented by the issuing of an Official Mexican Standard.

Bans on the catching of seals and sea-lions have been in force since 1930. The result of this has been a substantial recovery in stocks of these species.

Turtles

Administrative work for turtle resources has been going on since 1964, with the specific goals of conservation and protection, involving systematic research into turtle populations and stock recovery efforts; this is because ten of the eleven known species of sea-turtles can be found along Mexico's coastline.

The actions and measures adopted, in both hatching areas and the sea, have involved the undertaking of permanent labors of supervision, protection, research, and restocking in nearly 80 turtle camps and nesting beaches. Mention should be made of the fact that a total and permanent moratorium on sea-turtles has been in place since 1990.

Similarly, 1992 saw the creation of the Inter-Ministerial Commission for the Protection and Preservation of Sea-Turtles in order to coordinate actions related to these species.

Administrative actions with regard to turtles have also sought reductions in the accidental catches from which they are at risk during shrimp fishing, particularly that practised in the Gulf of Mexico and the Caribbean Sea.

In this regard, an Official Mexican Standard (NOM) was published in February 1993, obliging Mexican shrimping vessels to install turtle exclusion devices (TEDs).

Since the distribution of turtle populations covers the waters of several countries, Mexico believes that a global strategy for optimal administration and conservation requires the participation of a number of nations and coordinated multilateral efforts.

Aquaculture

In recent years, aquacultural activities have become an important alternative in supplying food and a major source of employment and income and, in general, in the socio-economic development of rural communities. This importance is reflected in its contribution of 14.4% of the domestic fishery supply over the period 1990-93.

The administrative measures applicable to the country's aquacultural potential have been oriented towards establishing a categorisation of areas suited to aquaculture and towards implementing provisions to demand its development with the lowest possible levels of environmental impact.

Final considerations

Schemes and instruments for fisheries administration face limiting factors that, in general terms, hinder the establishment of a more ordered scheme of fisheries administration and resource protection. These include the following:

- The need for a greater understanding of the real potential of certain fishery resources on a regional basis.

- The constant increase in fishery efforts in river basins and protected areas, which is a direct consequence of the growth in the population of working age who find no employment alternatives in neighboring communities and zones.

- The tendency among river fishers to concentrate on the more profitable fisheries, such as shrimp, lobster, and oyster, which permanently increases the fishing effort brought to bear on those resources.

- The need for technological progress in fishing gear and systems to allow increases in productivity levels and reductions in the negative impact on ecosystems and related species.

- The need to expand the coverage of supervisory activities on water and on land, as can be seen in the proliferation of unregulated catches.

Regardless of these limiting factors, in most instances the limit for profitable exploitation or for the regeneration or maintenance of stocks has not been surpassed. Similarly, economic deficiencies have been detected in certain products, most of which can be attributed to organisational problems in production, the use of inappropriate technologies, and reduced informational support regarding species, potential resources, fishing banks, etc.

NEW ZEALAND

Summary

This paper is New Zealand's contribution to the current OECD Study on the Economic Aspects of Fisheries Management. The paper focuses on New Zealand's experience with its Quota Management System (QMS) which applied Individual Transferable Quotas (ITQs) to the management of 32 commercial species groups of inshore and deep water fish.

Part I of the paper provides a historical overview and a brief outline of the present fisheries management instruments in New Zealand.

Part II examines some of the results of the introduction of the ITQ framework. The policy instruments and fishery characteristics for six species or species groups are then described. An attempt is made to assess economic and biological outcomes for each of the fisheries. Biological outcomes include changes in catch levels, fishing patterns and the state of the fish stocks. Economic outcomes include changes in price and port value. Information on administrative outcomes, where available, is also included. Outcomes which have been recorded for the fishing sector as a whole are then described. These include initial allocation of quota, resource rentals, enforcement costs, fleet structure, quota ownership, employment, and exports.

Part III assesses New Zealand's experience, as described in Part II, with ITQs in light of accepted economic theory. Generally New Zealand's experience concurs with the expected effects of an ITQ system. This appears to be so with regard to resource conservation, increased prices, generation of resource rent, and initial allocation difficulties. However, expected effects regarding data degradation, under-reporting of catch, and reduced employment do not appear to have been realised. Reasons for the divergence in the first two areas relate primarily to changes in the reporting system and the ability to cross check paper flows. Reduced employment has not occurred due to the substantial increases in domestic catch levels and the trend towards increased processing in New Zealand.

This paper concludes that New Zealand's experience with ITQs has been consistent with what one would expect from the application of this management instrument. Mitigation of expected adverse side effects appears to be possible. Evidence suggests that early intervention with ITQs, before the stocks are fished down to levels below which can support maximum sustainable yield, reduces the likelihood that ITQs will cause job losses attributable to rationalisation of fishing effort.

PART I: THE SETTING

Historical Overview

Introduction to the New Zealand fisheries sector

The New Zealand Exclusive Economic Zone (EEZ) is approximately 1.2 million nautical square miles. The continental shelf is relatively narrow and 72 per cent of the zone has waters more than 1 000 metres deep. Up to the 1970s, harvesting of fish focused on inshore fisheries and annual production was less than 50 000 t per annum. At that time, little was known about the potential of the deep water areas beyond the continental shelf.

Exploitation of deep water fisheries around New Zealand by foreign fleets commenced in the 1960s and expanded rapidly during the 1970s. Foreign fleets from Japan, the then Soviet Union, Korea, and Taiwan were largely responsible for the initial development of the hoki, orange roughy, oreos, southern blue whiting and squid fisheries. They also harvested pelagic and inshore species such as jack mackerel, gemfish, tunas, and barracuda which were not significantly exploited by the domestic industry at the time.

Between 1970 and 1977, yield from New Zealand fisheries increased ten fold to 500 000 t mainly due to the activities of foreign fleets. However, concerns for the sustainability of both the traditional inshore fisheries and the exploding activity offshore were growing. In 1978, New Zealand's extended its territorial sea from 3 miles to 12 miles and established a 200 mile EEZ. Initially, output from deep water fisheries fell to about half the levels harvested in 1977 as catch limits and controls on foreign fishing in the EEZ were implemented.

However, in the five years following the declaration of the EEZ, total catch increased steadily to 400 000 t of which roughly one third was taken by foreign licensed vessels, one third by New Zealand-foreign joint venture arrangements and one third by domestic vessels. In 1983, further impetus to the controlled development of deep water fisheries was given by the introduction of Deepwater Enterprise Allocations. These were prototype Individual Transferable Quotas allocated to nine New Zealand companies with harvesting and processing investments in the deep water fisheries.

The perceived success of this initiative in addressing the twin problems of over exploitation and over capitalisation through economic instruments was influential in the decision to extend ITQs to the main commercial species of fish in 1986. In 1993, total production from both wild fisheries and aquaculture totalled almost 593 000 t. This rate of increase has slowed in recent years. Although the volume of output is reaching plateau, the value of output continues to increase. Export and domestic sales have increased from NZ$913 m in 1989 to $1 322 m in 1993. Also, the seafood industry employed almost 9 900 people in 1994 in the catching and processing sectors.

With a small population of 3.4 million people, New Zealand's domestic market is about NZ$120 million per annum. The New Zealand seafood sector is therefore predominantly an export industry. In 1994, the main export markets for New Zealand seafood were Japan, the United States of America, and Australia which accounted for almost 62% of New Zealand seafood exports.

The main species in terms of value are orange roughy, spiny red rock lobster, paua (abalone), green shell mussels, snapper, ling, and hoki. Of the approximately 700 fish species in the New Zealand EEZ, around 130 are fished commercially. However, only 40 species are commercially significant and the economics of the industry are dominated by the species above.

Jurisdictional responsibilities for fisheries management

The New Zealand EEZ is surrounded by high seas except for two points at its northern and southern extremities where it abuts the Australian EEZ around Lord Howe and Macquarie Islands There is a small straddling stock of orange roughy on the Challenger Plateau at the western boundary of the EEZ and New Zealand waters are the southern limits of the migratory paths of a number of tuna species including southern bluefin, big eye, albacore and skipjack tunas. These are not large fisheries in the overall context of the New Zealand fishing sector but attract high prices and are difficult to manage because of their migratory lifestyle.

There are three tiers of Government in New Zealand: central, regional and local. Fisheries management is the preserve of central government and the Fisheries Act is administered by the Ministry of Fisheries (formerly the Ministry of Agriculture and Fisheries). The Ministry comprises a policy group of approximately 46 people and has a separate services group of 180 people engaged in fisheries enforcement activities and fisheries administration, including operation of computer systems which record and balance quota holdings and catch. The National Institute for Water and Atmospheric Research, engages approximately 150 people who conduct or support fisheries stock assessment research for the New Zealand Government.

Since 1991, New Zealand's environmental and planning law has been consolidated under the Resource Management Act which is administered mainly by Regional Councils. The Resource Management Act binds the Crown and applies within the limits of the territorial sea (12 miles). The main purpose of this legislation is to promote the sustainable management of natural and physical resources. The purpose is achieved by regulating activities through the preparation of plans, zoning, and the requirement to obtain a number of types of resource consents.

The functions specified under the Resource Management Act do not include the control of the harvesting or enhancement of populations of aquatic organisms, where the purpose of that control is to conserve, enhance, protect, allocate, or manage any fishery controlled by the Fisheries Act 1983. In practice both the Ministry of Fisheries and Regional Councils may regulate or restrict activities in the marine environment but for different purposes. For instance, both may set water quality and emission standards for a sea cage salmon farm, but the Ministry of Fisheries standards would be to protect fisheries, while the regional council would set standards to protect the environment for other uses or to preserve its natural character.

New Zealand therefore operates a dual system of authorities for activities which involve both significant effects on the marine environment and the commercial harvesting of fish. For example, a resource consent would be required by the aquaculturalist who wished to place structures in the sea or exclude other users of the marine environment from a particular area. The aquaculturalist would also have to obtain a commercial harvesting permit from the Ministry of Fisheries. As the Resource Management Act is a comparatively new piece of legislation, the operational interfaces and co-operative mechanisms applying between central and regional and government are still developing.

In jurisdictional terms, the New Zealand situation is therefore unusually simple. There are few significant high seas or international issues, fisheries management is the preserve of central government and most fisheries legislation is contained within a single act: The Fisheries Act 1983.

Legislative history

The Fisheries Act 1983 consolidated the law relating to fisheries management enacted since the Fisheries Act 1908 which in turn was a consolidation of the Oyster Fisheries Act 1866. In 1908 and over the ensuring 75 years, authority was established to apply a comprehensive range of input controls, such as limited entry licensing of vessels and fishers, closed areas, seasonal closures, minimum fish sizes, requirements to land fish at specified ports, gear and vessel controls, and the 1977 power of the Minister of Fisheries to declare "controlled fisheries" where every aspect of activity in that fishery could be regulated.

The Government also made fitful efforts to stimulate the development of a New Zealand fishing industry starting with the Fisheries Encouragement Act 1855. The export bonus payments established under this Act continued until 1906 and influenced the establishment of a small canning industry. In 1919, a scheme to provide public finance to the fishing industry was commenced but very little money was actually made available.

During the 1920s, Government policies switched from development and expansion to conservation. For the next thirty years, exporting of fish was discouraged as allegedly having adverse effects on local supply and the retail price of fish, as well as causing over-capitalisation and over-exploitation of fisheries. Licensing of vessels, fishers and fish exports provided the means of regulating effort and catch on a port by port basis. The issuing of licences was subject to the preservation of an over-riding public interest in the conservation of sea fisheries.

By the 1960s, with the appearance of foreign fishing vessels off New Zealand coasts, it was widely perceived that commercial opportunities were being forgone as a result of the licensing arrangements. Consequently, restrictive licensing was abolished in 1963 and Government guarantees were provided on loans to purchase fishing vessels from 1965. The guarantees were progressively extended over a wider range of processing and aquacultural investments during the 1970s. Initially the size of this program was very small (total loan recommendations for 1974-75 were only NZ$398 200). However, they increased rapidly and peaked at NZ$13.45 million in 1978-79 (current dollars).

The 1970s were therefore an era of substantial foreign harvesting and rapid expansion of Government subsidised domestic effort under a regime of fairly open access. Although the intention of these Government programmes was to promote the development of new deep water resources, effort in prime inshore fisheries also expanded quickly so that overfishing of those species and over-capitalisation within the inshore fishery became a serious problem by the early 1980s.

Fisheries Act 1983 and amendments

The Government response was to re-introduce restrictions on access through the declaration of controlled fisheries and moratoria on the issue of new licences in particular fisheries. This became a blanket moratorium in 1982. The following year the Fisheries Act 1983 brought together all the powers of Government to regulate fisheries using fisheries management plans. These plans were to be developed with extensive public consultation and would describe the resources involved as well as the regulatory controls which would be applied.

The purpose of the plans was to conserve, enhance, protect, allocate and manage fishery resources within New Zealand fisheries waters. The cumbersome nature of the consultation and planning process to achieve such weighty goals did not allow the pressing problems of over-fishing to be addressed in a timely manner. In fact, the bureaucratic processes of the management plans meant that none were actually introduced although considerable work was undertaken. As an immediate step to halt and reverse the expansion of effort the Fisheries Act allowed for the cancellation of permits held by "part time" fishers.

Some 2 260 licence holders (about half of all people fishing commercially in 1983) were consequently excluded from the fishery. The amount of effort removed by this action was comparatively minor although it was argued that the potential of that group to expand their effort justified the action. One result of the cancellation of part time permits (which was incontestable) was the great bitterness which it generated amongst those affected.

Some people saw the removal of part- timers from the commercial fishery in 1983-84 as a deliberate and necessary precursor to the introduction of the ITQ in 1986. However, ITQs for inshore fisheries were not seriously considered at that time and fisheries managers were anticipating the imposition of effort controls such as boat or licence buy back schemes. Further, the commercial industry refused to consider effort constraint while the “latent effort” of the part time fishers remaining in the New Zealand fishery. It is possible to conceive administrative systems which could successfully cope with approximately 4 000 fishers with catch history, although such a system may have had a simpler appeals process than the one eventually applied for the approximately 2 500 commercial fishers.

A period of intense policy debate over the most effective means of addressing the twin problems of over-fishing and over-capitalisation followed the enactment of the Fisheries Act 1983. A consensus emerged for the introduction of a rights based approach to fisheries management associated with the perceived success of the deep water quota scheme. Following a 1986 amendment to the Fisheries Act, ITQs were introduced for the major commercial species in New Zealand waters and deep-water quotas were converted to ITQs and incorporated into the same Quota Management System (QMS).

The introduction of ITQs also followed an extensive period of consultation and negotiation with commercial fishers to ensure their commitment. The systems to monitor and enforce ITQs was aided by the introduction of Goods and Service Tax at the same time. The record keeping requirements of GST ensured that the important records required for monitoring and enforcing the ITQ system would be kept by fishers.

Allocations of ITQ were based on catch history and "commitment and dependence". The resulting notional allocations were in many cases more than the estimated sustainable level of harvest from the fisheries. To reduce the Total Allowable Commercial Catches (TACCs) to sustainable levels, the Government spent NZ$45 million to buy 15 800 t of quota in 1986. In addition, some stressed fisheries received pro-rata catch history reductions which were uncompensated.

The fisheries management planning process commenced in 1983 continued while these property rights were being allocated and the tensions between the simultaneous application of a rights based approach and a planning and regulatory approach were not confronted until the first plans neared completion in 1991. In the meantime, a further amendment to the Fisheries Act in 1990 changed the status of ITQ from a fixed tonnage right to a fixed proportion of the relevant TACC. This move to proportionality entailed a transfer of the risk and cost (or benefit) of TACC changes from Government to quota holders. Protracted litigation regarding this transfer of risk led to a negotiated settlement whereby the Government agreed to pay compensation equivalent to 5 years' resource rentals.

From the inception of the QMS until 1993-94, the fishing industry was charged resource rentals. Economic rent was seen to be generated as a consequence of the secure nature of the quota property right, which allows fishers to capture the benefits of the reduced costs of fishing and favourable market movements. The Government considered that as it created this environment by giving commercial fishers exclusive access to a common property resource, it should receive a proportion of the fishers return from the fisheries resource.

In 1994 legislation was passed providing for the cost recovery of fisheries management services, fisheries research, conflict resolution, and detection of fisheries offences. Approximately NZ$34 million will be recovered from the industry to fund these services in 1994-95. Government policy is that where the costs of providing a service for industry can be clearly identified, these costs should be directly charged to the industry. As well as reducing the cost to the taxpayer, this approach provides greater transparency and hence opportunities for increased efficiencies in the provision of these services. The industry now faces the true cost of management and can alter their strategies to improve the efficiency of resource allocation. Standards and specifications for fisheries services are set by the Minister of Fisheries for the Government. The introduction of cost recovery coincided with the removal of resource rentals.

As expected, the industry is of the view that institutional reform is required in conjunction with the introduction of cost recovery to meet the objectives of the efficient delivery of services. The industry strongly favours the move to full contestability for the provision of these services.

Provision for institutional reform is included in the Fisheries Bill which was introduced into the House of Representatives in December 1994. The Bill, as it currently stands, provides the Minister of Fisheries with the power to enter into contracts for the provision of certain fisheries services. A proportion of the funds of these services, with some important exceptions (e.g. compliance, management of licensing of foreign vessels), will be recovered from the commercial fishing industry. Standards for the provision of these services will be set by the Minister in consultation with the industry.

The Fisheries Bill also:

- proposes to move all commercial fisheries into an improved QMS and provides a mechanism to allocate new ITQ on the basis of catch history;

- specifies that fisheries legislation is primarily concerned with the sustainable utilisation of the fisheries resource (i.e. it is a use statute concerned with the activity of fishing, not the management of the aquatic environment); and

- ensures that the Government meets its obligations to Maori under the Deed of Settlement (see below).

Maori Fishing Rights

There has long been some form of recognition in New Zealand law that Maori retained traditional fishing rights under the 1840 Treaty of Waitangi. However, the nature and extent of those rights was never defined. The removal of part-timers, many of whom were Maori in small communities, raised concerns. The allocation of ITQ in 1986 finally brought this issue to a head with a threatened injunction by Maori against further ITQ allocations by Government. As a consequence, ITQ allocations were halted and a series of negotiations between Maori and Government began. The outcome of the first round of negotiations was the Maori Fisheries Act 1989, in which the Government agreed to:

- buy back 10% of the existing quota (over a five-year period) for allocation and to provide assistance to facilitate the entry of Maori into, and the development by Maori of, the business and activity of fishing; and

- establish a Maori Fisheries Commission to facilitate the above mentioned.

The cost to the Government of meeting under this interim settlement was approximately NZ$130 million.

In 1992, negotiations to achieve a comprehensive settlement of Maori fisheries claims against the Crown were successfully concluded and the resulting Deed of Settlement reflected in the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992. The key components of the deed were that:

- the Government would provide approximately NZ$150 million to enable Maori to purchase a 50% share in Sealord Products Limited (one of New Zealand's largest fishing companies);

- 20% of all quota henceforth introduced into the QMS would be allocated to Maori (free of charge); and

- the Government would establish a regulatory framework which provided for Maori customary non-commercial fishing interests.

As a result of this agreement, the Government was in a position to proceed with the further introduction of species into the QMS. The legislation enabling this, the Fisheries Bill 1994, is discussed above.

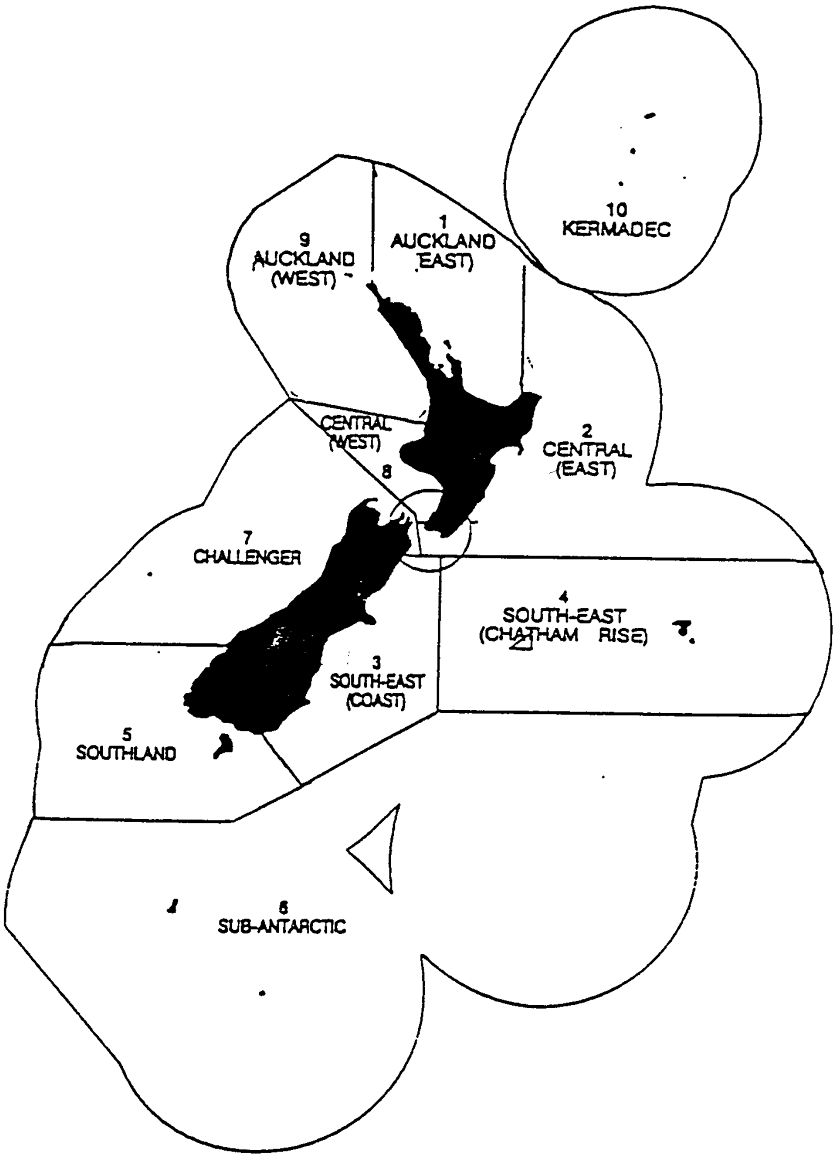
Present situation

The management of fishing activity in New Zealand waters occurs through the following controls or requirements.

Quota Management System (QMS)

This is the primary mechanism for managing commercial fisheries. It applies to 32 species groups in 10 quota management areas.

Figure 1. New Zealand quota management areas



ITQs are fully transferable apart from a range of quota aggregation restrictions, minimum holding provisions, and a restriction that holders must be New Zealand residents or companies less that 25 per cent foreign owned. The quotas are proportions of the Total Allowable Commercial Catch (TACC) for each fish stock. There are 179 TACCs.

TACCs may be set or amended annually by the Minister of Fisheries. In setting the TACCs the Minister has regard for:

- the total allowable catch (TAC), defined as the amount that can be harvested from the fishery to produce the maximum sustainable yield, as qualified by relevant factors including economic and environmental considerations, fishing patterns, the interdependence of fish stocks, and recommended regional or global standards;

- non-commercial interests in the fishery; and

- any amount determined as allowable catch for foreign fishing craft.

All QMS species must be taken against quota. Fishers are not required to hold quota as long as the have an appropriate arrangement with a quota holder. Further, catches of all QMS species must be reported.

Fishing permits

In addition to fishing against quota, fishers are required to hold fishing permits. Fishing permits are granted by the Ministry of Fisheries to any person who makes an application and who has the right to take fish as a holder of quota. Quota holders who hold the minimum amount of quota cannot be denied permits but they must abide by the permit conditions.

The permits specify conditions for the fishing activity. Conditions on permits can relate to areas, species, quantities, methods, the use or non-use of vessels and the specific vessel or types of vessels that may be used, types and amounts of fishing gear, harvesting, handling, and places where the fish may be landed. The documentation generated by the permitting system is of assistance in the Ministry of Fisheries compliance and enforcement activities.

Fishers are also required to hold a fishing permit for non-QMS species. Since September 1992, there has been a moratorium on the issuing of new permits for non-QMS species. Given Government's intention to move these fish species into the QMS, the moratorium was introduced to prevent the race-to-fish from those fishers wishing to generate a catch history and minimise the fiscal costs associated with a possible buyback of catch histories to meet obligations under the Treaty of Waitangi (Fisheries Claims) Settlement Act.

Regulations

Regulations governing commercial fishing activity also exist in the following general areas.

- minimum finfish length, weight, and net mesh size
- restrictions on taking rock lobster
- restrictions on taking and processing shellfish
- prohibition on taking and processing certain types of shellfish, finfish and marine life
- marking of fishing gear
- marking of fishing vessels
- restrictions on the use of nets
- prohibitions of certain fishing methods in certain areas
- restrictions on the use of underwater breathing apparatus
- acceptable shellfish dredge design and size
- prohibition on the use of spears
- requirement of tuna longliners to use seabird scaring devices
- requirement for satellite vessel monitoring devices to be carried on most types of vessel
- requirement for fishers and licensed fish receivers to hold and furnish records
- prohibitions on the use of explosives.

Vessel Licensing

All commercial fishers, whether of QMS or non-QMS species, must register their fishing vessels. A register of fishing vessels operating in New Zealand waters is maintained. Vessels are required to be so constructed and equipped to comply with the relevant requirements in respect of the harvesting, handling, processing, and storage of fish.

Illustration: snapper fishery

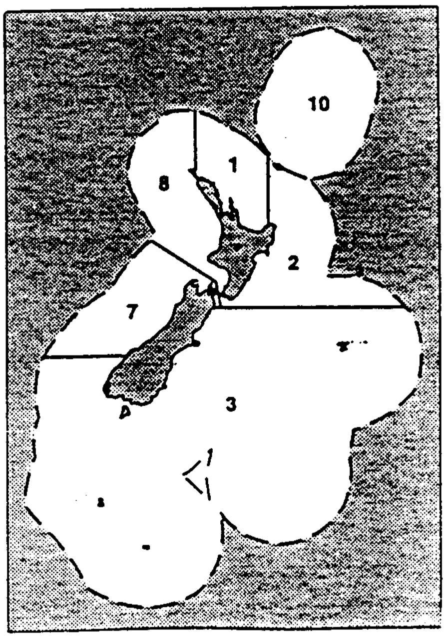
The application of these different management controls on commercial fishing can be illustrated using the snapper fishery as an example.

Snapper is managed under the QMS and method restrictions are used to regulate size of snapper able to be caught. Method restrictions for specific regions are also applied to minimise inter and intra-sector conflicts.

Output control: quota management system

The relevant snapper quota management areas are indicated in the map below:

Figure 2. Snapper quota management areas



The TACCs for each of the snapper quota management areas are as follows:

Table 1. Snapper quota management areas and TACCs 1994-95

Quota management area	TACC 1994-95 (t)
SNA 1	4 928
SNA 2	252
SNA 3	32
SNA 7	160
SNA 8	1 500
SNA 10	10

Input Controls:

– Fishers must hold a permit to fish which contains nominated landing points for fish, and provide the required information to the Ministry of Fisheries registry.

– Regulations specify minimum net mesh sizes and minimum legal sizes of fish. The table below summarises the national and regional method restrictions imposed using regulations for commercial fishers.

Table 2. Snapper input controls

Restriction coverage	Fishing method	Minimum net mesh size (mm)	Minimum legal fish size (cm)
National	All nets	100	25
Auckland and Kermadec (*)	Trawler and cod ends, set nets, drag nets	125	25

(*) Auckland and Kermadec are the areas to the north of the North Island and can be seen on Map 1 above.

Part II: MANAGEMENT SYSTEMS AND EXPERIENCE

Outcomes in specific fisheries: Hoki

Policy Instruments and the Fishery

The main fishery for hoki operates on the west coast South Island (WCSI) spawning aggregations. The hoki spawning season is concentrated from mid-July to late August in most years, but may extend from late June to early September. The spawning aggregations are found at 300-700 m depth around Hokitika Canyon and further along the WCSI. Since 1988, a large domestic fishery has developed in Cook Strait, where separate spawning aggregations of hoki occur. In addition small catches of spawning hoki have been taken from the Puysegur Bank, generally late in the season. In 1991-92 and 1992-93, a larger proportion of the catch was taken before the spawning season, mainly from the Subantarctic and the East Coast Chatham Rise areas, but catches in these areas were lower in 1993-94.

The hoki fishery was developed by Japanese and Soviet vessels in the early 1970s. Catches on the WCSI increased in 1977, but were reduced in subsequent years with the introduction of a quota limit of 20 000 t (in addition to 40 000 t for the rest of the rest of the EEZ). Hoki remained a very small fishery of up to 50 000 t before to 1986, but a TACC of 250 000 t set in 1986 saw the fishery expand to a maximum catch in 1987-88 of about 255 000 t. In 1990-91 the TACC was reduced to approximately 200 000 t. From 1986 to 1990 surimi vessels dominated the catches and took about 60% of the catch each year from the WCSI fishery. However, since 1991 the surimi component of catches has reduced and more catch has been processed to head and gut or fillet product. The hoki fishery now operates throughout the year producing higher quality fillet product from small catches.

Except for restrictions on foreign licensed vessels inside the 12-mile territorial sea and a length limit restrictions of 43 metres for vessels fishing within 25 miles in certain areas, allocated quota may be taken from any area. There is no minimum size limit for hoki, but minimum mesh sizes apply to all areas.

Table 3. Hoki (HOK 1) catch and TACCs: 1984-85 to 1993-94

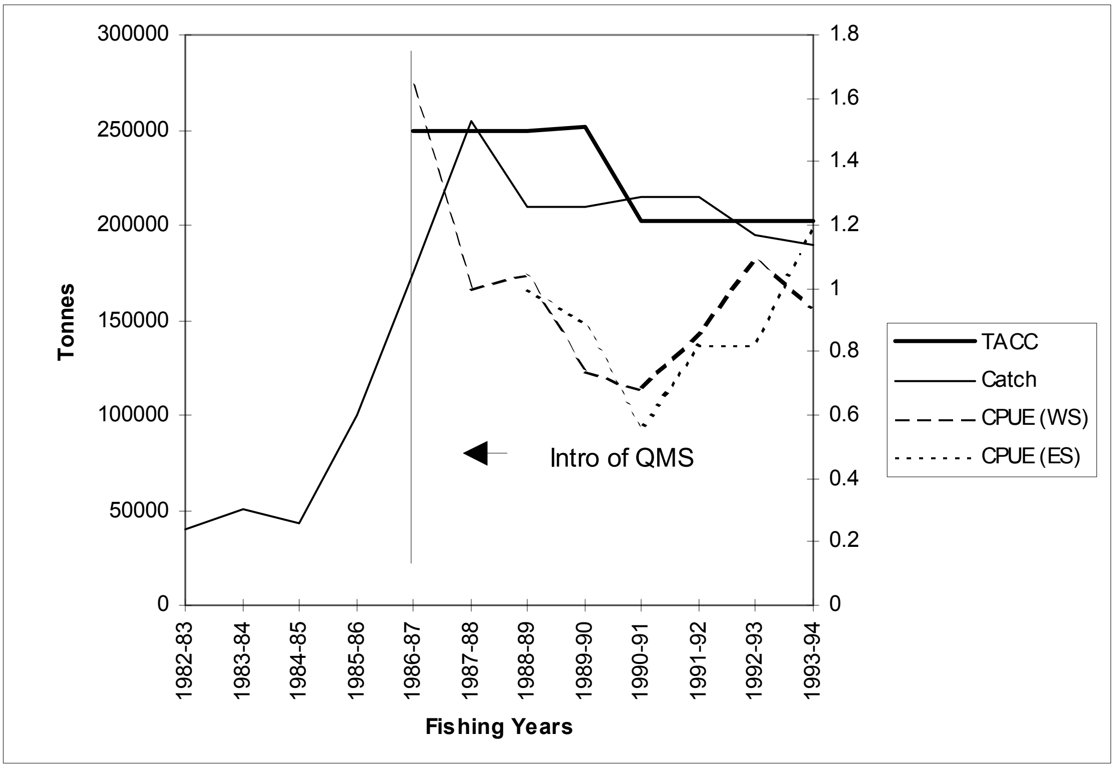
Year	HOK 1 TACC (t)	Catch (t)
1984-85		43 670
1985-86		99 623
1986-87	250 000	175 000
1987-88	250 000	255 000
1988-89	250 000	210 000
1989-90	251 884	210 000
1990-91	201 897	215 000
1991-92	201 897	215 000
1992-93	202 155	195 000
1993-94	202 155	190 000

Source: Ministry of Fisheries.

Biological Outcomes

When the species was introduced into the QMS, a TACC considerably higher than the current fishing activity was applied. Landings grew substantially in the two years following 1986. The catch grew from 99 623 t in 1985-86 to 255 000 t in 1987-88.

Figure 3. Hoki (HOK 1) catch, TACCs and CPUE : 1982-83 to 1993-94



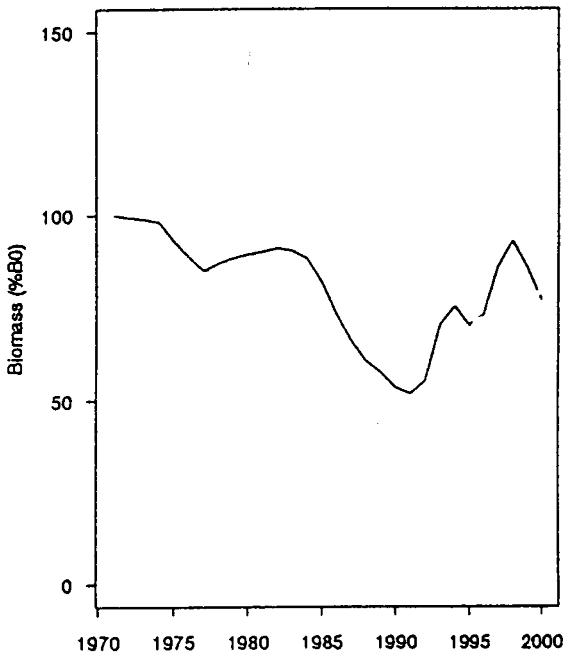
Source: Ministry of Fisheries.

In 1991 and 1992 the catch was slightly above the TACC. In 1993-94, 190 000 t was harvested from the fishery. In the above chart CPUE (WS) refers to the catch per unit effort in the west coast of the South Island hoki stock. CPUE (ES) refers to the catch per unit effort from the eastern stock At the same time that there has been a large increase in catch, the catch per unit effort (CPUE) abundance index declined. This index, which can be used as an indicator of stock abundance, decreased by over 50% from 1986-87 and 1990-91 in the WCSI stock. The index increased in 1991-92 and stayed at a similar level in 1992-93 and 1993-94.

For the eastern hoki stock, the CPUE stock abundance index showed a decline from 1988-89 to 1990-91, but has now increased to levels higher than previously recorded. The CPUE index in 1993-94 was nearly 50 per cent higher than that in 1992-93.

The figure below gives an indication of the change in the estimated biomass for the WCSI stock as a percentage of virgin biomass (Bo).

Figure 4. Hoki (HOK1) biomass for the western stock



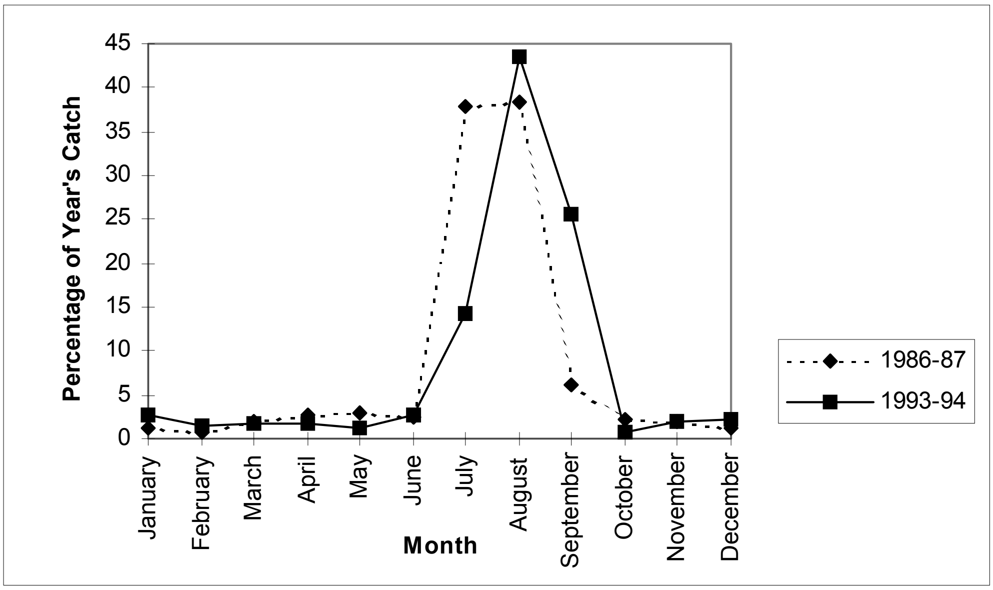
Source. Ministry of Fisheries.

Coinciding with the large growth in catch from 1984-85 to 1987-88, the biomass began to decline in size. The stock continued to decline from 1987-88 to 1989-90 but increased in the following years. The reason for this is likely to have been the strong recruitment from the 1987 and 1988 year classes. Future projections for the biomass are also optimistic, due to the strong year classes coming through from 1991 and 1992. Current research suggests that current biomass is greater than that required to support maximum sustainable yield.

Research indicates that the current biomass for the eastern stock is also greater than that required to support maximum sustainable yield although there is a higher degree of uncertainty regarding the assessment for this stock.

Trends in seasonal catch have not changed significantly since 1986 as the graph below indicates.

Figure 5. Spread of Hoki (HOK 1) catch



Source. Ministry of Fisheries.

0Although there is a year round fishery for hoki, fishing activity primarily occurs during the spawning season which takes place from June to September.

Economic outcomes

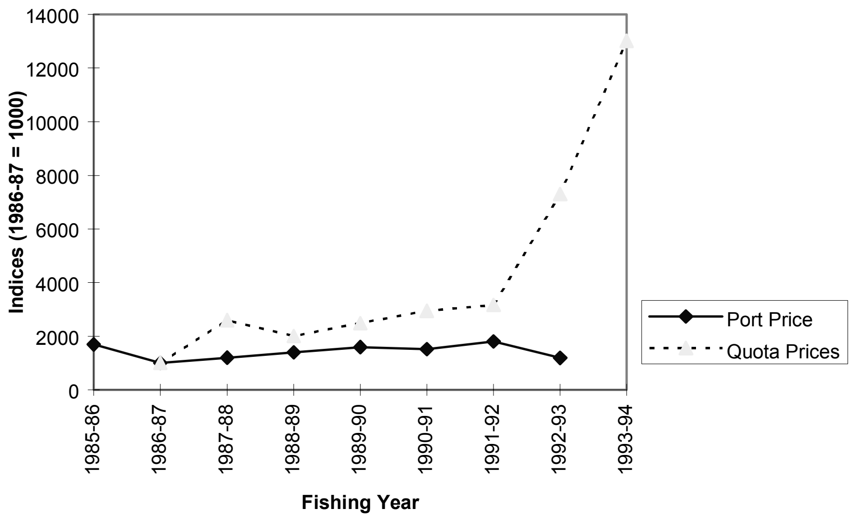
– Port value of catch

The total port value of hoki in 1992-93 was NZ$78 m, approximately 60% above the port value in 1986-87 of NZ$49 m. In real terms, the port value grew 33% between 1986-87 and 1992-93. Port value peaked in 1991-92 at NZ$129 m. In real terms, the 1991-92 value was 122% above that in 1986-87.

– Prices

The indicative port price for hoki has been variable since 1986. During this time the indicative port price has ranged between NZ$280 per tonne (1986-87) and NZ$600 per tonne (1991-92). The price has increased from NZ$280 per tonne in 1986-87 to NZ$400 per tonne in 1992-93. In real terms, the indicative port price increased by 19% over the period.

Figure 6. Hoki real port prices and quota prices: 1985-86 to 1993-94



0Source: Ministry of Fisheries.

The average trade price for hoki has increased since 1986-87. The trade price fell slightly in 1988-89, possibly due to reductions in the TACC, but has increased since then. The average trade price for quota increased from NZ$229 per tonne in 1986-87 to NZ$3 657 per tonne in 1993-94. The reasons for this increase since 1988-89 could be:

– the Government commitment to pay compensation to commercial fishers for any TACC reductions between 1989-90 and 1993-94; and

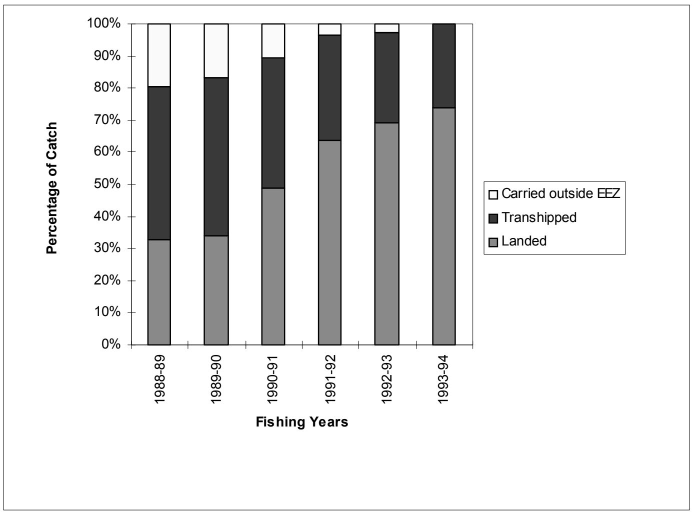
– more recently, the improved biological outlook for hoki stocks.

In real terms the average trade price for hoki quota has increased by over 1 300% between 1986-87 and 1993-94.

– Landings vs. transhipment

The trend is for an increasing proportion of the hoki catch to be landed in New Zealand for further processing or distribution. In contrast, the proportion which is transhipped or carried directly outside New Zealand's EEZ has reduced. The figure below illustrates this.

Figure 7. Hoki (HOK 1) landings and transhipments 1988-89 to 1993-94



Source: Ministry of Fisheries.

0The percentage of the catch, in volume terms, which is landed in New Zealand has increased from 33% in 1988-89 to 74% in 1993-94.

– Landed product composition

Despite the increase in landed hoki catch, the proportion of this catch which is further processed at sea has remained relatively constant in recent years. In 1989-90, 75% (47 500 t) of the total landed hoki catch (64 500 t) was further processed at sea before it was landed. 69% (97 700 t) of the total landed hoki catch (140 000 t) was further processed at sea before being landed in 1993-94.

Administrative outcomes

In 1994 the stock assessment indicated that the TACC for HOK 1 (both stocks) could be safely increased from 201 000 t to 300 000 t and kept there for at least five years with little risk to the stock assuming existing fishing patterns continue (although the state of the eastern stock is uncertain).. However, the majority of the fishing industry had misgivings about an immediate rise in the TACC because:

– such a lift would endanger overseas markets which had been carefully structured around the current level of supply;

– some fishing industry representatives felt that there was insufficient processing capacity available in New Zealand to handle such a large increase in catch;

– some fishing industry representatives were concerned that depletion of the stock to lower biomass levels would reduce the catch per trawl tow to uneconomic levels; and

– some representatives were concerned that the average size of fish would be smaller that desired because of the recent recruitment from the 1991 and 1992 year classes.

Accordingly, an increase to only 225 000 t for HOK 1 was requested. The Minister, in taking these views into account, and wishing to pursue a conservative strategy so as to not endanger the biomass, set the TACC for 1994-95 at 220 000 t. The fishing industry felt that their approach in the management of the species was indicative of the industry's maturity and shows the value of the QMS which provides a stable environment for fisheries management.

Jack mackerels

Policy instruments and the fishery

The jack mackerel fishery catches three species, the two endemic species, *Trachurus declivis* and *T. novaezelandiae*, and the self introduced *T. murphyi* (the Peruvian jack mackerel). All occur in the four fishstock areas which the EEZ is divided into for this fishery. JMA 7 and 10 are were introduced into the QMS on 1 October 1987. The remaining two of the fishstocks areas are managed outside of the QMS (JMA 1 and 3) using individual catch entitlements under a TAC.

Figure 8. Jack mackerels management areas

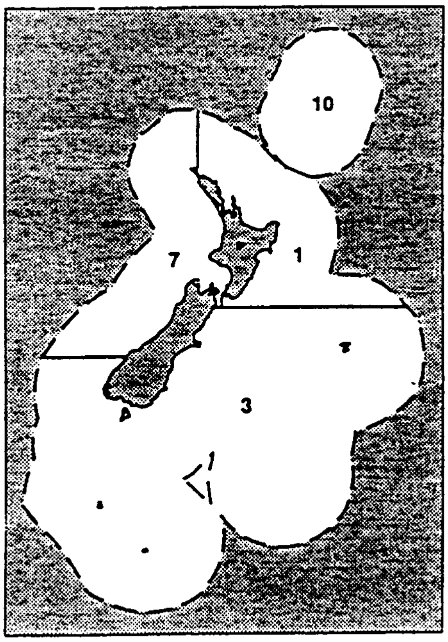


Table 4. Jack mackerels (JMA 7 and 10) catch and TACCs: 1983-84 to 1993-94

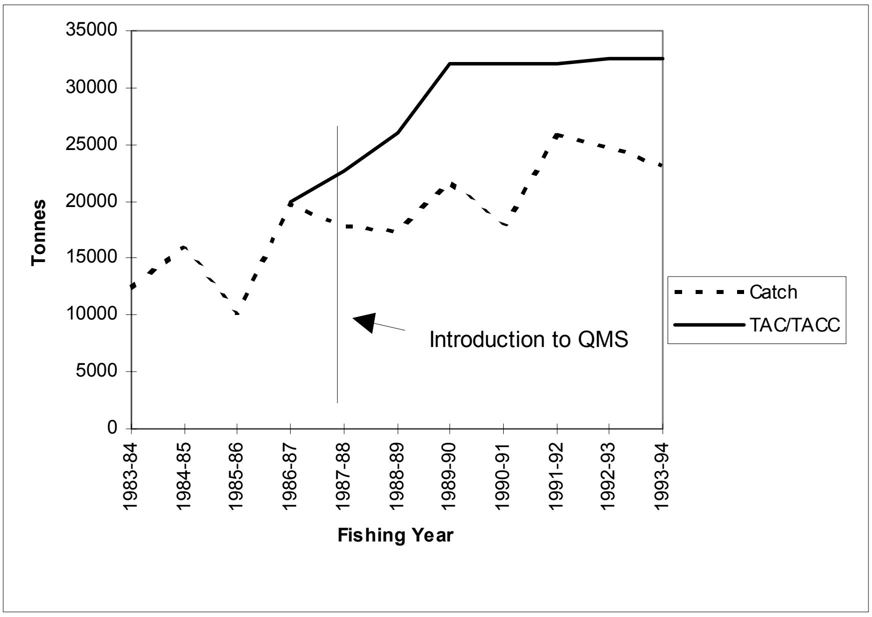
Year	Catch	TAC/TACC
1983-84	12 464	
1984-85	16 013	
1985-86	10 002	
1986-87	19 815	20 010
1987-88	17 827	22 707
1988-89	17 402	26 018
1989-90	21 776	32 037
1990-91	17 786	32 079
1991-92	25 880	32 079
1992-93	24 850	32 546
1993-94	23 140	32 546

Source: Ministry of Fisheries.

Biological outcomes for jack mackerels in the QMS

Total catch from these areas has increased since their introduction to the QMS in 1987. In 1993-94 the total catch was 23 140 t, approximately 30% above the catch levels in 1987-88. The figure below illustrates this growth in catch.

Figure 9. Jack mackerels (JMA 7 and 10) catch and TACCs 1983-84 to 1993-94



Source: Ministry of Fisheries.

Landings in JMA 7 represent the greatest proportion of total landings and are mainly taken by foreign trawlers. Landings for JMA 7 were relatively constant from 1986-87 to 1990-91, but there was a marked increase in 1991-92 which was largely sustained in 1992-93. Estimates of the biomass for 1991 were 76% and 79% of virgin biomass for *T. declivis* and *T. novaezelandiae,* respectively, so the fishery is probably still fishing down accumulated biomass. For JMA 7 recent landings are considered at levels which will allow the stock to move towards a size which will support the maximum sustainable yield. The current TACC is approximately equal to the maximum sustainable yield for *T. declivis* and *T. novaezelandiae* combined and is considered sustainable. The estimate of virgin biomass do not include do not include *T. murphyi.*

Economic outcomes for jack mackerels in the QMS

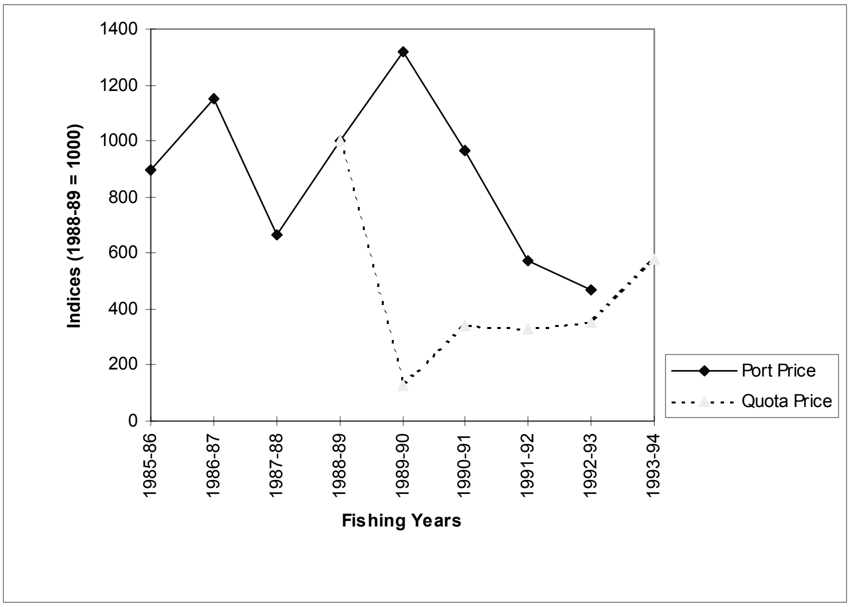
– Port value of catch

The port value of the jack mackerel catch increased slightly since its inclusion in the QMS. In 1987-88 the landed value of the catch was about NZ$2.14 m. Since then it has increased in nominal terms to approximately NZ$2.49 m in 1992-93. In real terms, the port value of the catch fell slightly over this period.

– Prices

The indicative port price for jack mackerels (from all management areas) has fallen in both nominal and real terms since the introduction of the species to the QMS. The nominal price has changed from NZ$120 per tonne in 1987-88 to NZ$100 per tonne in 1992/93. In real terms, the indicative port price fell by 29% over this period. The price peaked in 1989-90, when the nominal port price was NZ$270 per tonne.

Figure 10. Jack mackerels real port prices and quota prices 1985-86 to 1993-94



Source: Ministry of Fisheries.

The average trade price for jack mackerels quota has fallen from0 NZ$886 per tonne in 1988-89 to NZ$573 per tonne in 1993-94. In real terms, the trade price of quota fell by 42% during this period.

Administrative outcomes

Increases in TACCs for the 1994-95 fishing year for the two fishing areas encompassing the North Island were made under the condition that they be accounted for by increased catches of Peruvian jack mackerel (*T. murphyi*) only. There is currently an industry-run programme in operation to monitor the species composition of catches taken from these two management areas. Consideration is being given to separate management to prevent the over-exploitation of *T. declivis* and *T. novaezelandiae*.

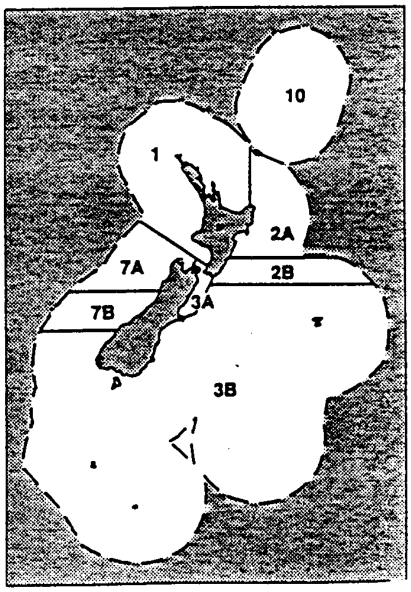
Orange roughy

To usefully examine the orange roughy fishery, specifically in the area of biological change, it is necessary look at the main fishing areas separately. Therefore, in looking at the "policy instruments and the fishery" and the "biological outcomes", the following specific fisheries will be examined:

- Chatham Rise and Southern New Zealand (ORH 3B);
- Cape Runaway to Banks Peninsula (ORH 2A, 2B, and 3A); and
- Challenger Plateau (ORH 7A).

"Economic outcomes" will be discussed in terms of the total orange roughy fishery.

Figure 11. Orange roughy quota management areas



Chatham Rise and southern New Zealand (Orh 3b)

Policy instruments and the fishery

Orange roughy are found in waters deeper than 750 m throughout the Quota Management Area 3B. Historically, the main fishery has been concentrated on the Chatham Rise with most fish taken between mid-June and mid-August. This is the period immediately before, during, and after the spawning period.

Catch limits, under the deep water quota scheme, applied to the fishery between 1981-82 and 1985-86. In 1986-87 the fishery was introduced into the QMS.

Table 5. Orange roughy chatham rise and southern New Zealand catch and TACCs: 1979-80 to 1993-94

Year	TAC/TACC (t)	Catch (t)
1979-80		11 800
1980-81		31 100
1981-82	23 000	28 200
1982-83	23 000	32 605
1983-84	30 000	32 535
1984-85	30 000	29 340
1985-86	29 865	30 075
1986-87	38 065	30 689
1987-88	38 065	24 214
1988-89	38 300	32 785
1989-90	32 787	31 669
1990-91	23 787	21 521
1991-92	23 787	23 269
1992-93	21 300	20 048
1993-94	21 300	17 136

Source: Ministry of Fisheries.

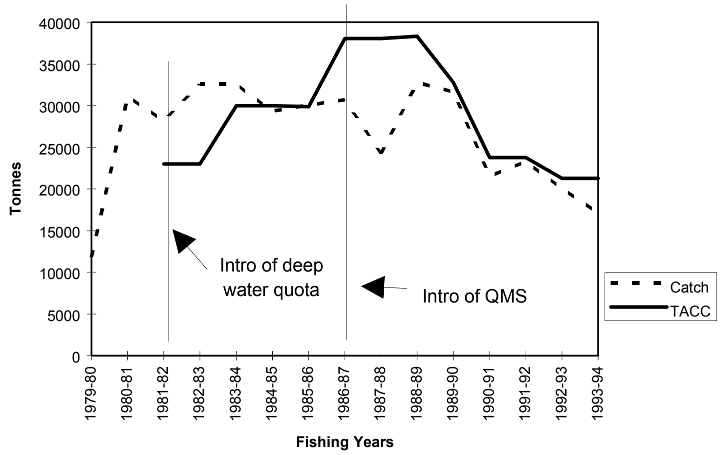
Biological outcomes

Annual orange roughy catches in this fishery averaged just over 30 000 t throughout the 1980s, and then dropped to just over 20 000 t because of a substantial quota cut in 1990-91 and a smaller reduction in 1992-93. The fishery can be divided into two areas: Chatham Rise and Puysegur Bank.

- Chatham rise

The catch per vessel day for the Chatham Rise was relatively stable at about 21 t from 1987-88 to 1992-93, but dropped to 15 t in 1993-94. Current analysis suggests that the mid season biomass for 1994-95 is 10-16% of the virgin biomass. This is estimated to be well below the level which will support the maximum sustainable yield (29% of virgin biomass).

Figure 12. Orange roughy (ORH3B): chatham rise and southern New Zealand: 1979-80 to 1993-94



Source: Ministry of Fisheries.

– Puysegur Bank

Catches in the Puysegur Bank area have been reported since the 1989-90 fishing year. Catches are generally mixed (orange roughy, oreos). Commercial catch and effort data show a marked decline in most months over the period from 1991-92 to 1993-94. These data suggest that the Puysegur stock has been substantially reduced in recent years.

Cape runaway to Banks peninsula (orh 2a, 2b, 3a)

Policy instruments and the fishery

The first reported landings between Cape Runaway and Banks Peninsula, on the east coast of the North and South Island occurred in 1981-82, with the development of the Wairarapa fishery. The Wairarapa fishery (ORH 2B) had a catch limit, as part of the deep water quota scheme, placed on it for the 1984-85 fishing year. The remaining two areas (ORH 2A and 3A) were placed under the deep water quota scheme for 1985-86. All three areas were introduced to the QMS in 1986-87.

A major change in the fishery in the northern Quota Management Area (ORH2A) of this region occurred in 1993-94 with a shift in effort from the main spawning hill on the Ritchie Bank to the hills off East Cape. Although these hills have apparently only been lightly fished in the past, during 1993-94 52% of the catch was taken from the East Cape area. This led to an agreement between industry and the Minister of Fisheries that from 1994-95, the traditionally fished area within ORH2A ("2A South") would be managed separately from the new East Cape Fishery ("2A North"). These arrangements enabled fishing effort to be increased in ORH2A North and reduced in ORH 2A South and ORH 2B.

Table 6. Orange roughy cape runaway to Banks Peninsula: total catch and TACCs 1984-85 to 1993-94

Year	TAC/TACC (t)	Catch (t)
1983-84		7 401
1984-85		8 438
1985-86	8 318	8 012
1986-87	9 242	8 705
1987-88	9 242	9 731
1988-89	10 266	9 520
1989-90	10 352	10 537
1990-91	10 352	10 001
1991-92	10 352	10 117
1992-93	10 632	9 052
1993-94	10 333	9 929

Source: Ministry of Fisheries.

Biological Outcomes

Catch levels have increased slightly since the introduction of the QMS in 1986-87. Catch increased from 8 705 t in 1986-87 to a peak of 10 537 t in 1989-90. In recent years catch has fallen slightly to 9 929 t in 1993-94. In assessing the status of the stocks it is helpful to divide the fishery into the following two areas.

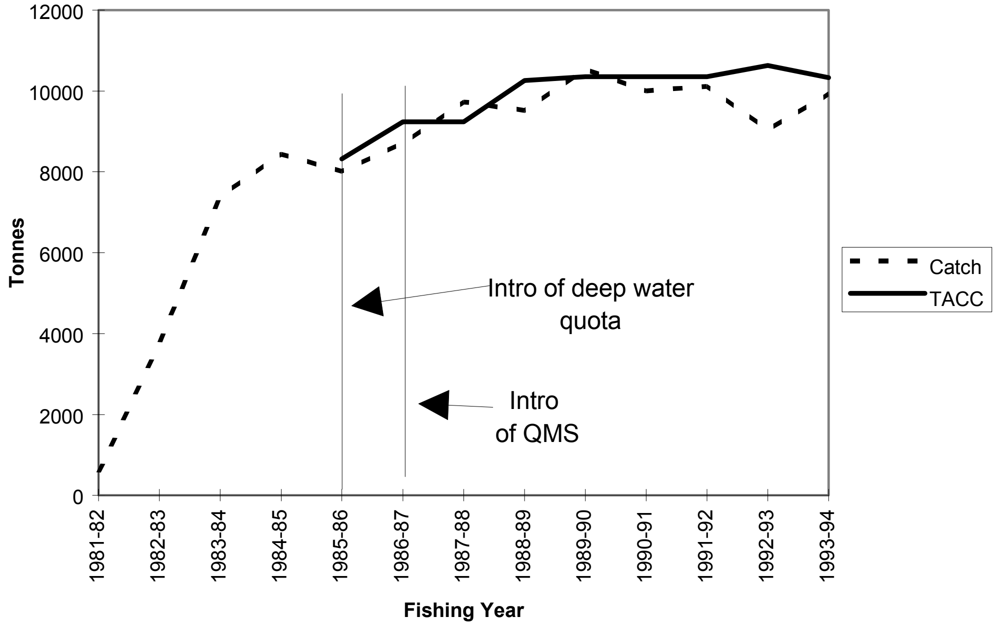
– "ORH 2A south", 2B, and 3A

Assessment of the stocks indicates that this fishery is at the end of its fishing down phase. The current catch rates are not sustainable in the long term and there is a need to lower rates of exploitation. The mid-season 1994-95 biomass estimates ranged between 28% and 36% of virgin biomass. These estimates roughly equate with the biomass which will support the maximum sustainable yield.

– "ORH 2A North"

This is a new fishery at the beginning of its fishing down phase, and the stock is moving towards the size that will support the maximum sustainable yield.

Figure 13. Orange roughy:(ORH2A,2B, and 3B): cape runaway to Banks Peninsula: 1981-82 to 1993-94



Source: Ministry of Fisheries.

Challenger plateau

Policy instruments and the fishery

This fishery occurs in the south western region of the Challenger Plateau, which is situated to the west of the South Island, and straddles the boundary of the EEZ. Fish are caught throughout the year, with most effort in winter when orange roughy form aggregations for spawning. Catch limits were imposed on the fishery in 1983-84 to 1985-86 under the deep water quota scheme. In 1986-87, the fishery was introduced into the QMS. Domestic vessels catch most of the quota.

A fishery developed outside the EEZ in 1987, with peak catches of 3 500 t in 1988-89. Catches have declined, partly on account of an undertaking between New Zealand and Australia to restrict fishing in the area, and because catches by New Zealand vessels count against quota inside the EEZ.

Table 7. Orange roughy challenger plateau catch and TACCs: 1981-82 to 1993-94

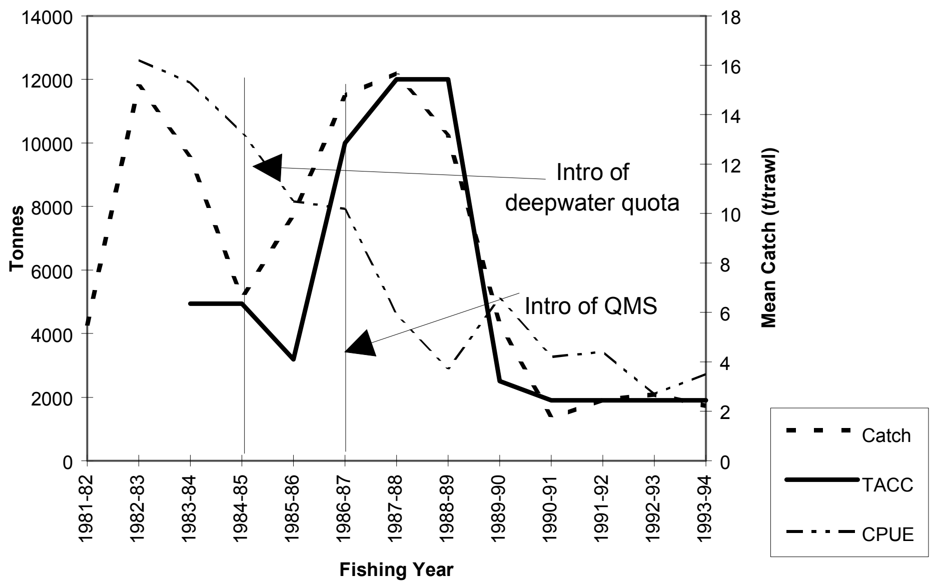
Year	TACC (t)	Catch (t)
1981-82		4 248
1982-83		11 839
1983-84	4 950	9 527
1984-85	4 950	5 117
1985-86	6 190	7 753
1986-87	10 000	11 492
1987-88	12 000	12 181
1988-89	12 000	10 241
1989-90	2 500	4 309
1990-91	1 900	1 357
1991-92	1 900	1 911
1992-93	1 900	2 087
1993-94	1 900	1 732

Source: Ministry of Fisheries.

Biological outcomes

Catch has declined substantially since the 1986. Catches have fallen because of declining abundance of fish and have been restricted by the TACC. Catches fell from 11 492 t in 1986-87 to 1 732 t in 1993-94. The figure below illustrates the extent of the decline in catch. In recent years the catch appears to have stabilised around 1 900 t.

Figure 14. Orange roughy (ORH 7A): challenger plateau: 1981-82 to 1993-94



Source: Ministry of Fisheries.

In the 1980s there was a steady decline in the CPUE, falling from 16.2 t per tow in 1982-83 to 3.7 t/tow in 1988-89. Since then however, CPUE appears to have stabilised. Commercial CPUE and research trawl survey data clearly indicate that the orange roughy stock in the south western region of the Challenger Plateau declined markedly during the 1980s. Stock size now appears to be slowly increasing. The estimate of mid-season biomass in 1994-95 is 28% of virgin biomass.

Economic outcomes for the orange roughy fishery

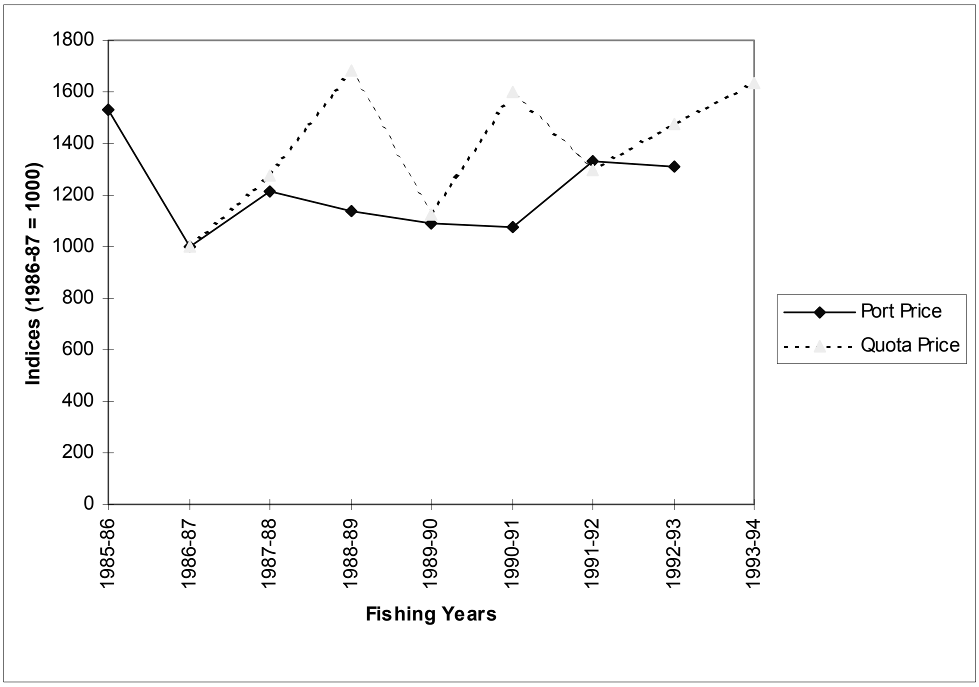
– Port value

Since 1986-87 the port value of the orange roughy catch has increased slightly. Overall the port value increased by 6% from NZ$77m in 1986-87 to NZ$81 m in 1992-93. In real terms the port value of the catch fell by 12%. With the exception of 1986-87, the decreases in value were primarily due to the drop in catch.

– Prices

The indicative port price for orange roughy has increased in nominal terms since the introduction of the QMS. In 1986-87, the indicative port price was NZ$1 588 per tonne. Since 1986-87 the price has steadily increased in nominal terms and by 1992-93 the indicative port price was NZ$2 500 per tonne. In real terms, the price increased by 31% between 1986-87 and 1992-93.

Figure 15. Orange roughy real port prices and quota prices 1985-86 to 1993-94



Source: Ministry of Fisheries.0

The average trade price for orange roughy quota has increased since 1986-87. The average trade price increased from NZ$3 380 per tonne in 1986-87 to NZ$6 775 per tonne in 1993-94. Although the price fell in 1989-90, possibly in response to TACC cuts, the fall did not continue in 1990-91 when TACCs were cut again. In real terms the average trade price for orange roughy increased by 63% between 1986-87 and 1993-94.

Administrative outcomes

Research on this species has proved to be a challenge, with uncertainty regarding its biological characteristics (e.g. age, recruitment, spawning patterns) making accurate stock assessment difficult.

Orange roughy is also one of New Zealand's most valuable seafood products. The TACC setting for this species is an example where allowing for both biological sustainability of the fish stocks and the economic wellbeing of sections of the seafood industry has been difficult. Environmental groups and industry groups have often expressed strong diverging views regarding what TACC "strategies" should be used in managing orange roughy stocks. The TACC setting process for this species has therefore often been contentious involving debates ranging from interpretation of the law (and litigation) through to the assessment of research data. In one instance, Greenpeace initiated a judicial review of a TACC decision by the Minister of Fisheries .

Snapper

The fishery

The snapper fishery is one of the largest and most valuable inshore fisheries in New Zealand. The commercial fishery, which developed last century, expanded in the 1970s with increased catches by Danish seine trawling. Following the introduction of pair trawling in most areas, landings peaked in 1978 at 18 000 t. In the 1980s an increasing proportion of the catch was taken by longlining as the Japanese "iki jime" market was developed. By the mid 1980s catches had declined to 8 500-9 000 t, and some stocks showed signs of overfishing. The fisheries had become more dependant on the recruiting year classes as stock size decreased. With the introduction of the QMS in 1986 TACCs in all stocks were set at levels intended to allow for stock rebuilding. Method restrictions are used to regulate the commercial catches of juveniles (i.e. net mesh sizes).

The 1987 National Marine Recreational Survey showed that snapper was the most important finfish species sought by recreational fishers. Snapper also form important customary fisheries for Maori, but their annual catch is not known.

The discussion below on biological outcomes will deal specifically with two Quota Management Areas: SNA1 (north east of the North Island) and SNA8 (north west of the North Island).

Table 8. Snapper catch and TACCs: 1984-85 to 1993-94

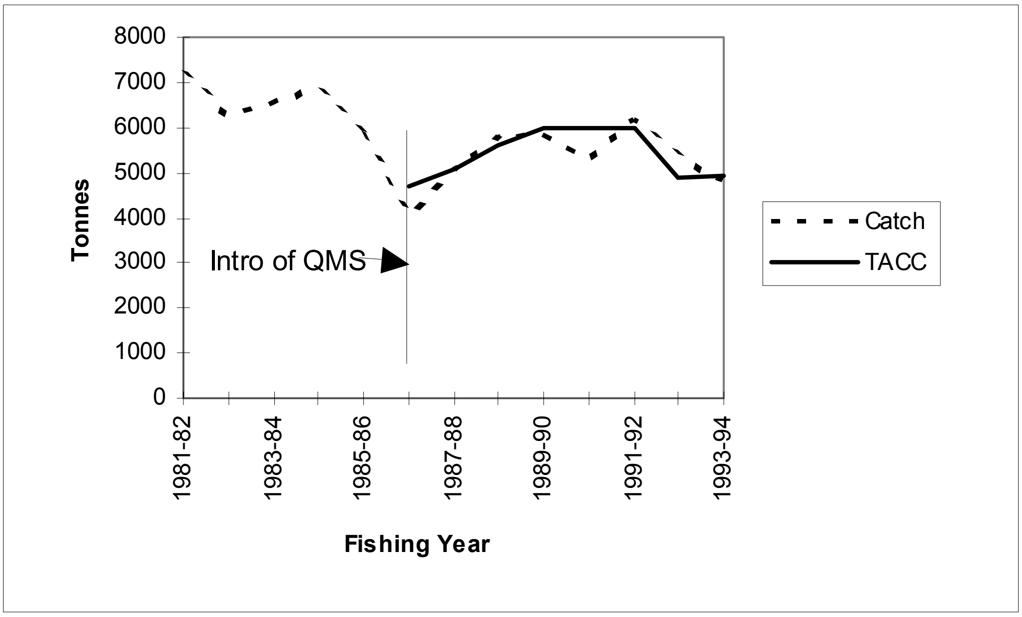
	SNA 1		SNA 8		All QMAs	
Year	TACC (t)	Catch (t)	TACC (t)	Catch (t)	TACC (t)	Catch (t)
1984-85		6 898		1546		9228
1985-86		5 876		1828		8653
1986-87	4710	4 016	1330	893	6540	5314
1987-88	5098	5 061	1383	1401	7021	6900
1988-89	5614	5 793	1508	1526	7691	7706
1989-90	5981	5 826	1594	1550	7932	8034
1990-91	6002	5 315	1594	1658	7944	7570
1991-92	6010	6 191	1594	1464	7962	8173
1992-93	4904	5 423	1500	1543	6858	7448
1993-94	4928	4 859	1500	1542	6882	6855

Source: Ministry of Fisheries.

Biological outcomes : SNA 1 (north east coast of the North Island)

As the above table indicates, the SNA 1 stock supports the largest snapper fishery. The TACC for SNA1 was originally set at 4 710 t in 1986 but rose to 6 010 t in 1992 as a result of the Quota Appeal Authority awarding further quota to appellants. This increase in quota was reversed by an 18.4% cut in the TACC which took effect in the 1992-93 fishing year.

Figure 16. Snapper (SNA1) catch and TACCs 1981-82 to 1993-94



Source: Ministry of Fisheries.

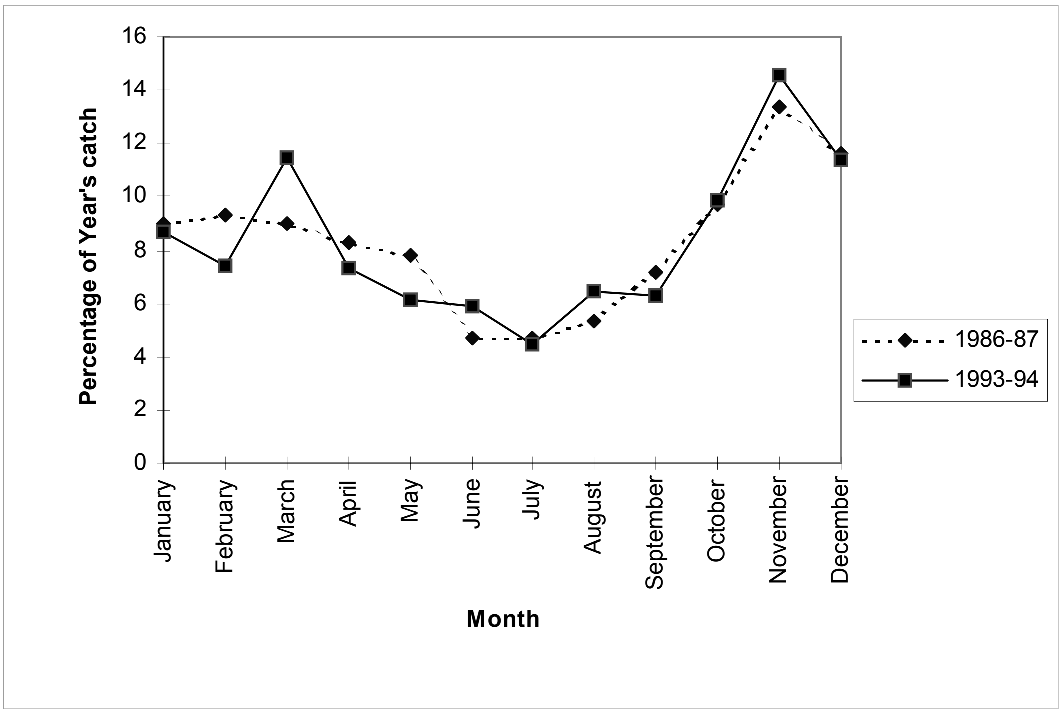
Catch fell with the introduction of the QMS in 1986. In 1986-87, catch was 4 106 t, 1 860 t below the previous year's catch. As the figure above indicates, since then catches have generally moved with the TACCs. Catch levels peaked in 1991-92 with 6 191 t, almost 54% greater than the 1986-87 level. Since 1991-92 catch levels have fallen in line with the TACC reductions. The recreational catch from this stock is substantial. On the basis of telephone and survey estimates, between 2 800-3 200 t was caught by recreational fishers in 1994.

Within SNA1 there are northern (Northland) and southern (Hauraki Gulf-Bay of Plenty) substocks. In 1994, the northern substock biomass was close to the level which will support maximum sustainable yield at 18-26% of virgin biomass. However this substock is predicted to decline at the current commercial and predicted recreational catch levels.

In the same year the southern substock biomass was 10-13% of virgin biomass, or about half the level which will support maximum sustainable yield. Based on current commercial and predicted recreational catch levels, this substock biomass is predicted to continue its decline in the short term.

The distribution of catch throughout the fishing year has not changed substantially. The figure below compares the catches for each month in 1986-87 with that in 1993-94. The distribution of catch is not significantly different between these two years, with the main fishing occurring at the beginning and end of the calendar year.

Figure 17. Snapper (SNA 1) spread of catch

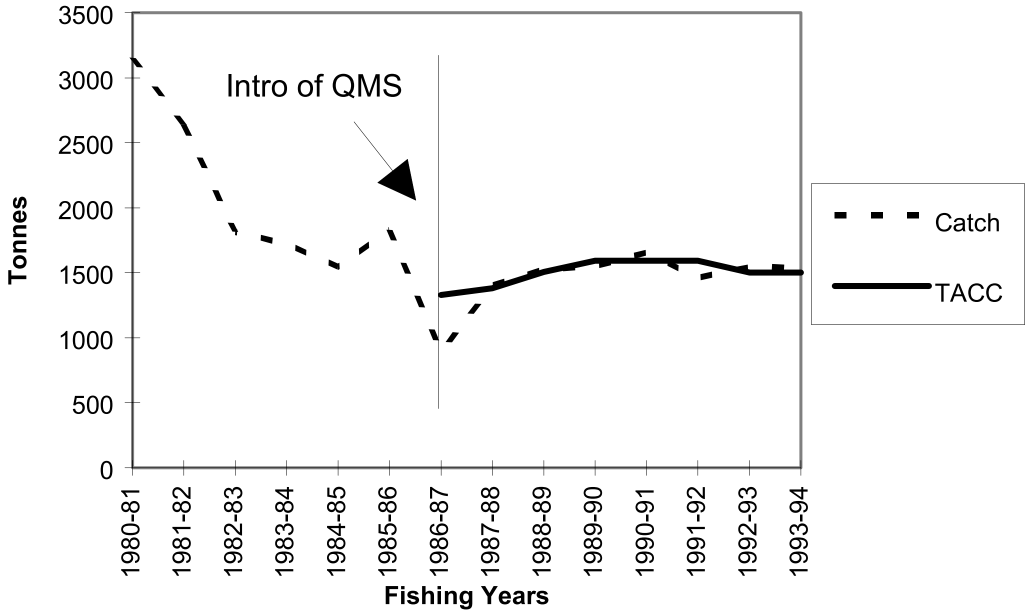


Source: Ministry of Fisheries.

Biological outcomes : SNA 8 (west coast of the North Island)

This fishery was initially capped at 1 330 t when this stock was introduced into the QMS in 1986. The TACC was increased through quota appeals to about 1 594t by the 1989-90 fishing year. The Minister of Fisheries reduced the TACC for this stock to 1 500 t for the 1992-93 fishing year.

Figure 18. Snapper (SNA8) catch and TACCs 1980-81 to 1993-94

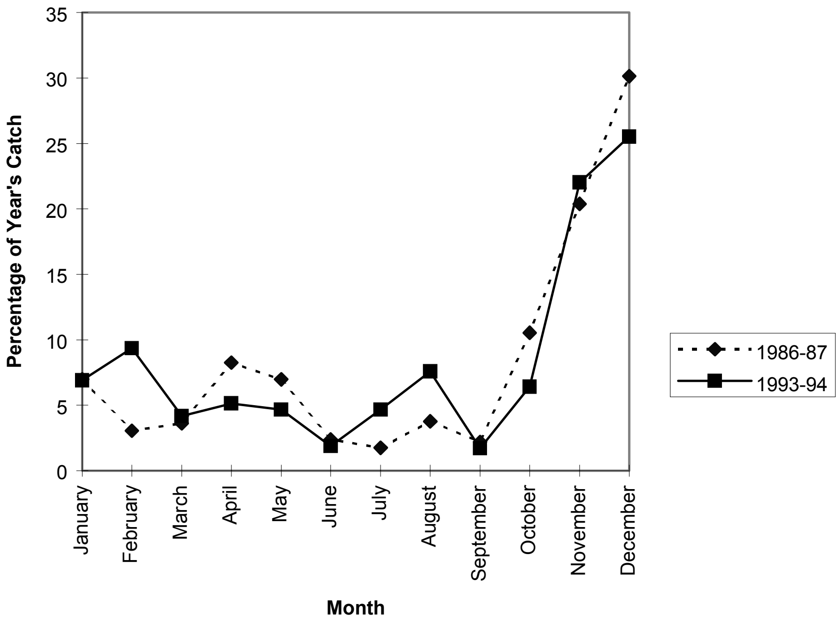


Source: Ministry of Fisheries.

Catch levels fell substantially with the introduction of the QMS. Catch dropped by 51% from 1 828 t in 1985-86 to 893 t in 1986-87. Since then catch has increased steadily and in 1993-94, it was 1 542 t, 73% above the 1986-87 level. Like SNA 1, the recreational catch from this stock is also substantial. Telephone and diary survey estimates indicate that recreational fishers took 300-420 t from this fishery in 1994.

Recent combined commercial and recreational catch levels and the current TACC are at levels which will allow the stock to move towards a biomass size which will support maximum sustainable yield. The sum of the current TACC and recreational catches appears to be sustainable in the long term.

Figure 19. Snapper (SNA 8) spread of catch



Source: Ministry of Fisheries.

0The distribution of catch throughout the fishing year has not changed substantially. The figure below compares the catches for each month in 1986-87 with that in 1993-94. The distribution of catch is not significantly different between these two years, with the main fishing occurring at the end of the calendar year.

Economic outcomes

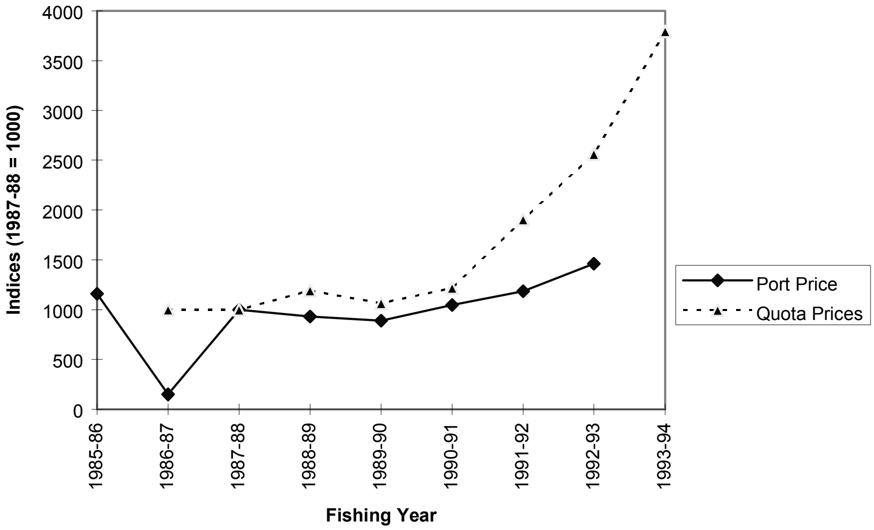
– Port value

Apart from a sharp drop in 1986-87, the port value of the snapper catch has increased steadily since the introduction of the QMS. In 1992-93, the port value of the catch was NZ$37 m, 85% above the 1987-88 value of NZ$20 m. In real terms, the port value of the snapper catch increased by 60% over this period.

– Prices

Although volume of catch fell, the sharp drop in port value in 1986-87 was primarily due to a drop in the indicative port price. Reasons for this price fall are not evident. Apart from this drop however, prices have generally trended upwards since the species was introduced to the QMS. The indicative port price in 1992-93 was $5 000 per tonne, approximately 70% above the 1987-88 price of NZ$2 940 per tonne. The real indicative port price for snapper increased by 46% over this period.

Figure 20. Snapper real port prices and quota prices: 1985-86 to 1993-94



Source: Ministry of Fisheries.

The average trade price increased from NZ$11 504 per tonne in 1986-87 to NZ$53 962 per tonne in 1993-94. The real trade price of snapper quota increased by about 280% over this period.

Rock lobster

Policy instruments and the fishery

The rock lobster fishery has one of the longest histories of commercial fishing in New Zealand, with recorded catches dating back to 1945. The fishery has two species. The red rock lobster (*Jasus edwardsii)* comprises nearly all the landings and is caught all around New Zealand. The packhorse rock lobster (*Jasus verreauxi)* is taken mainly in the north of the North Island. Three stocks are recognised but this discussion will focus on the largest, which makes up about 85 per cent of total landings, the North and South Island red rock lobster stock (NSI).

Rock Lobster was introduced into the QMS in 1990. The NSI stock is composed of Quota Management Areas 1-5 and 7-9, each with a separate TACC. The sum of the TACCs for the NSI stock was set at 3 274 t for the fishing year commencing 1 April 1990. This has been steadily reduced year by year to reach 2 383 t (including increases in individual TACCs resulting from appeals by fishers over catch histories). An additional control is a minimum legal size. In the commercial fishery this is based upon tail size width, except in one region (Otago) where at certain times of the year the limit is based on tail length. In another area (Gisborne), fishers are allowed to take males with a smaller tail size from June to August, following which the fishery is closed to commercial fishers for five months. This tradeoff allows fishers in the Gisborne area to take smaller lobsters, which are popular in the export marketplace at this time of the year, and limit any negative effect on the stocks.

Advice regarding the management of this fishery comes from a National Rock Lobster Management Group (NRLMG). This group has representatives from the Ministry of Fisheries, National Institute for Water and Atmospheric Research (fisheries scientists), the fishing industry, recreational fishing,, Maori/traditional fishing, and environmental groups. This group meets monthly and provides advice to the Minister based on stock assessments and submissions from all parties.

Table 9. North and south island rock lobster catch and TACCs: 1984-85 to 1993-94

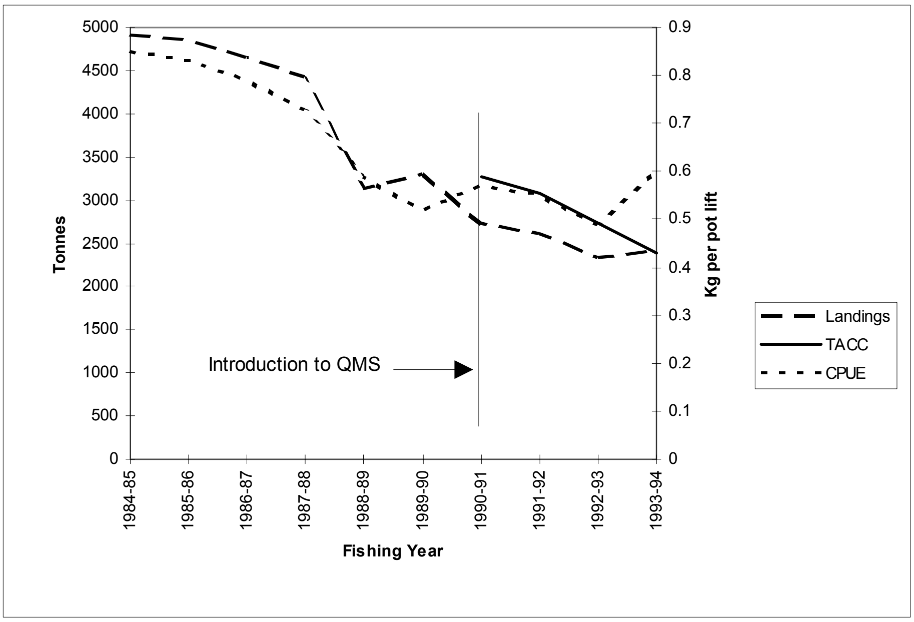
Year	Catch (t)	TACC (t)
1984-85	4 911	
1985-86	4 865	
1986-87	4 657	
1987-88	4 434	
1988-89	3 126	
1989-90	3 310	
1990-91	2 736	3 274
1991-92	2 608	3 085
1992-93	2 339	2 725
1993-94	2 426	2 383

Source: Ministry of Fisheries.

Biological Outcomes

NSI landings were relatively stable from about 1960 until the late 1980s, when landings began to decline. As indicated in Figure 22, landings fell by 44% between 1984-85 and 1990-91. Similarly, catch per unit effort (kg per pot lift) declined from 0.85 kg to 0.52 kg between 1984-85 and 1989-90.

Figure 21. North and south island rock lobster catch, TACCs and CPUE: 1984-85 to 1993-94

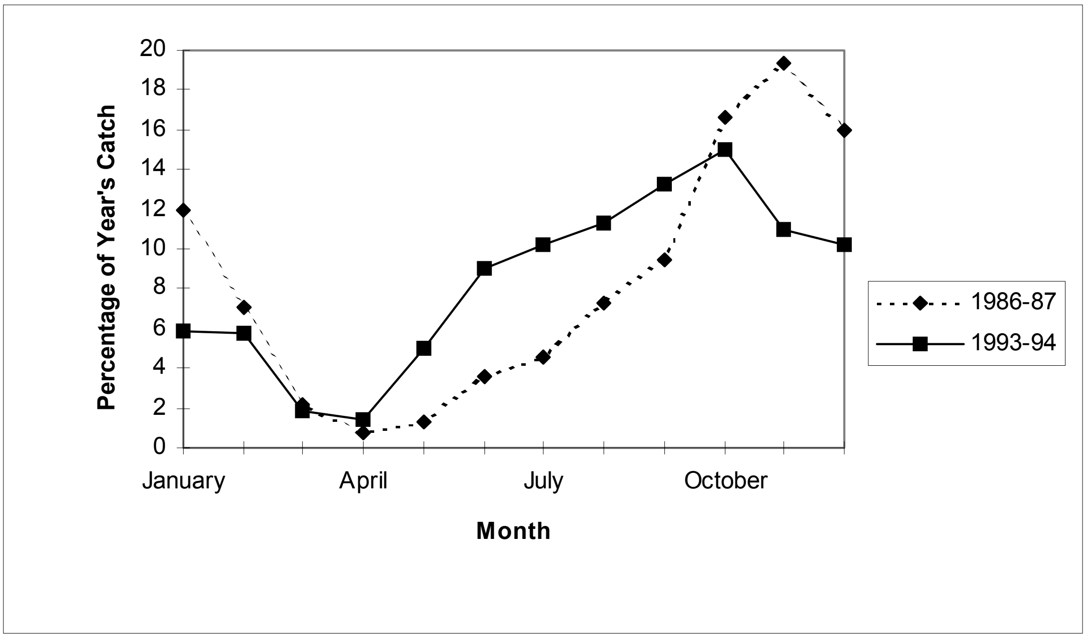


Source: Ministry of Fisheries.0

Since 1990-91, when the species was introduced to the QMS, landings and CPUE have stabilised. CPUE increased by 15% between 1989-90 and 1993-94. The 1993-94 fishing year reported landings (2 426 t) were close to those of the previous three fishing years. In 1993-94, for the first time since the Quota Management System began for rock lobsters in 1990, reported landings excluded the sum of the TACCs. In this year, all individual TACCs were fully caught or very nearly so, and reported landings for the fishing year were 44 t greater than the TACC limit, perhaps because of the 10% quota overrun provision. Increasing CPUEs and the fact that TACCs are now constraining catch in areas suggest that the stock size could be increasing.

Landing trends have changed slightly as the figure below illustrates.

Figure 22. North and south island rock lobster spread of catch



Source: Ministry of Fisheries.

0In 1993-94 the landings of rock lobster were more evenly spread across the fishing year than in 1986-87.

Economic Outcomes

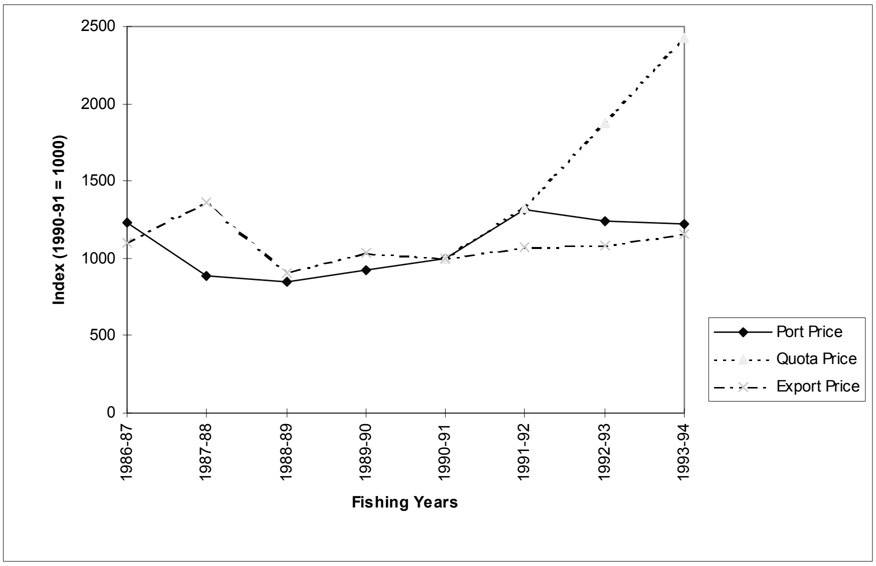
– Port value

The port value of rock lobster fell from NZ$84 m in 1986-87 to NZ$61 m in 1993-94. In real terms, the port value fell by some 44% over this period. However since 1990-91, when the species was introduced to the QMS, the port value has increased. In nominal terms, the port value of rock lobster increased from NZ$54 m in 1990-91 to NZ$61 million in 1993-94. In real terms, the port value grew by 7% over this period.

– Prices

In both nominal and real terms the landed port price for rock lobster increased between 1990-91 and 1993-94. In real terms the price increased by 23% over the period. In nominal terms, the price increased from NZ$19 600 per tonne in 1990-91 to NZ$25 000 per tonne in 1993-94. The figure below illustrates the movement in port prices as well as quota and export prices.

Figure 23. Rock lobster real indicative port prices and quota prices and nominal export prices 1986-87 to 1993-94



Source: Ministry of Fisheries.

0Quota prices for rock lobster have increased steadily since the species was introduced into the QMS. The average trade price for rock lobster quota increased from NZ$26 366 per tonne in 1990-91 to NZ$66 608 per tonne in 1993-94. Real quota trade prices increased by almost 143% over the same period.

The export price for rock lobster was relatively stable between 1986 and 1994. In 1994, the export price, after making adjustments for the direct effect on export prices of exchange rate movements, was approximately 39% above the price in 1990 of NZ$30.4/kg.

– Export value and composition

Export receipts for rock lobster have grown over the last 10 years. The most rapid growth occurred since 1990, with export receipts increasing from NZ$84 m to NZ$120 m in 1994. If these figures are adjusted to remove the direct effects of a strengthening exchange rate on price, the increase in receipts over this period is approximately 56%.

The composition of the export product also changed during this time. There has been a significant growth in the live lobster trade as the table below indicates.

Table 10. Rock lobster exports: changes in the product form

Year	Live exports (% of total $FoB receipts)	Whole, tails and processed exports (% of total $FoB receipts)
1987	15.3	84.7
1990	65.3	34.7
1992	75.6	24.4
1994	88.3	11.7

Source: Fishing Industry Board.

The growth in live rock lobster exports, which increased significantly in the late 1980s, with this trend continuing after 1990.

Administrative Outcomes

The NRLMG is proving to be an effective forum for ensuring the responsible management of the species. The management of this species is complicated in most parts of the country by a considerable degree of interaction between the commercial fishery and other users of the resource: notably recreational fishers, traditional fishers, and (in some areas) a high level of illegal take. The illegal catch can not be estimated with any degree of certainty. For the calendar year 1994, it is estimated that the total illegal take was 400 t (nearly 20% of TACC).

There is a formal contract between the Ministry of Fisheries and the Fishing Industry Board which outlines a "Rock Lobster Target Enforcement Initiative". This initiative is funded by way of a special levy on landed catch. Levy collection commenced in August 1992. The Fishing Industry Board established an Enforcement Review Committee, whose members are drawn from each of the nine Quota Management Areas, to maintain the Enforcement Initiative.

In 1993, a decision rule was agreed to by the NRLMG which provides a scientific basis on which to alter the management of any of the rock lobster sub-areas, initially based on the premise that the stock abundance must not decrease. This means that the change in the management of these sub-areas must be invoked by "triggering" this set of rules (which has been specified in advance). In December 1994, this rule indicated that the southern sub-area of the NSI stock (Otago and Fiordland) had "significantly declined in abundance from 1993 to 1994". However, subsequent analyses indicated that the expected surplus production for 1995 for this area exceeded the known total removals; therefore, the biomass for this substock was expected to increase in 1995 and no further management action was required.

OREOS

Policy Instruments and the Fishery

Commercial fisheries occur for black oreos and smooth oreos. Oreos are managed as a species group, which includes spikey oreos. The Chatham Rise (Quota Management Areas OEO 3A and OEO 4) is the main fishing area. Oreos are caught as a bycatch in the orange roughy fishery.

Along with some other deep water species the deep water allocation system was used to manage oreos between 1982-83 and 1987-88. Between 1982-83 and 1985-86, the catch limit under this system was set at 17 000 t. It was then raised to 24 000 t for two fishing years. In 1988-89, the species group was introduced into the QMS. Since then the TACC for the species has increased steadily in the last six years to 26 160 t.

Table 11. Oreos catch and TACCs: 1982-83 to 1993-94

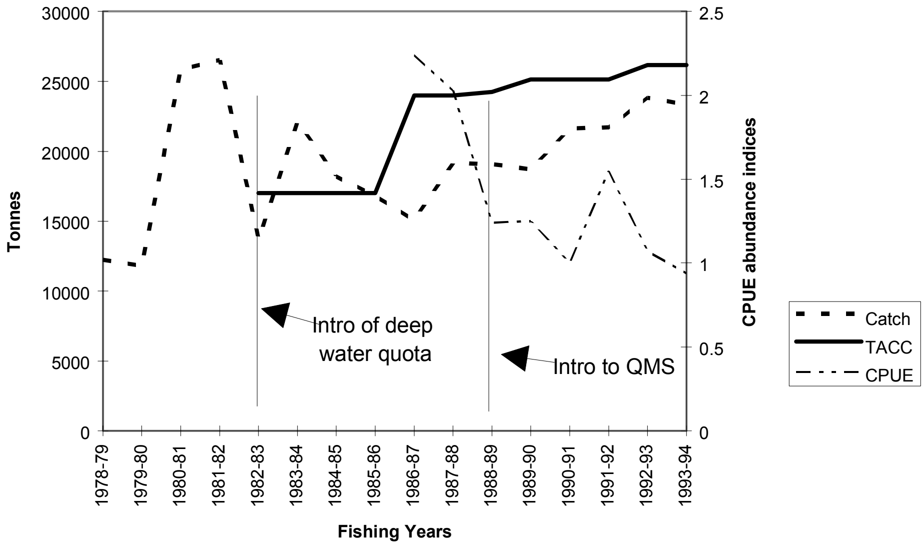
Year	TACC (t)	Catch (t)
1982-83	17 000	13 680
1983-84	17 000	22 111
1984-85	17 000	18 204
1985-86	17 000	16 820
1986-87	24 000	15 093
1987-88	24 000	19 159
1988-89	24 233	19 077
1989-90	25 139	18 703
1990-91	25 139	21 614
1991-92	25 139	21 718
1992-93	26 160	23 820
1993-94	26 160	23 318

Source: Ministry of Fisheries.

Biological Outcomes

The total landings and TACs are shown in the figure below. Total catch has exceeded the TACC for the last three seasons in the OEO 4 fishery, but the oreos catch from OEO 3A has been less than the TACC for the last two years. Catches have remained high in OEO 4 while the orange roughy fishery has declined. The by-catch of oreos relative to orange roughy in OEO 4 has increased in 1992-93 and 1993-94.

Figure 24. Oreos catch, TACCs and CPUE: 1978-79 to 1993-94



Source: Ministry of Fisheries.

As the above figure indicates, the total oreos catch fell sharply with the introduction of the deep water quota scheme in 1982-93. Catch fell from 26 500 t in 1981-82 to 13 680 t the following year. Since 1985-86 catch levels have been below the TACCs set. In recent years the total catch has begun to get close to the total TACCs. Since the inclusion of the species in the QMS, the total catch has increased by 22% from 19 077 t in 1988-89 to 23 318 t in 1993-94.

CPUE abundance indices, which for this particular species group are used as a basis for estimating the stock biomass, have declined since 1987. As a result biomass estimates declined between 1982-83 and 1993-94. It should be noted that the data used in deriving these abundance indices is variable (coefficient of variation = 49%). This variability translates into uncertain outcomes for estimates of virgin and current biomass. Nevertheless, 70% of the estimates of the current biomass for 1995-96 are less than 20% of virgin biomass.

Economic outcomes

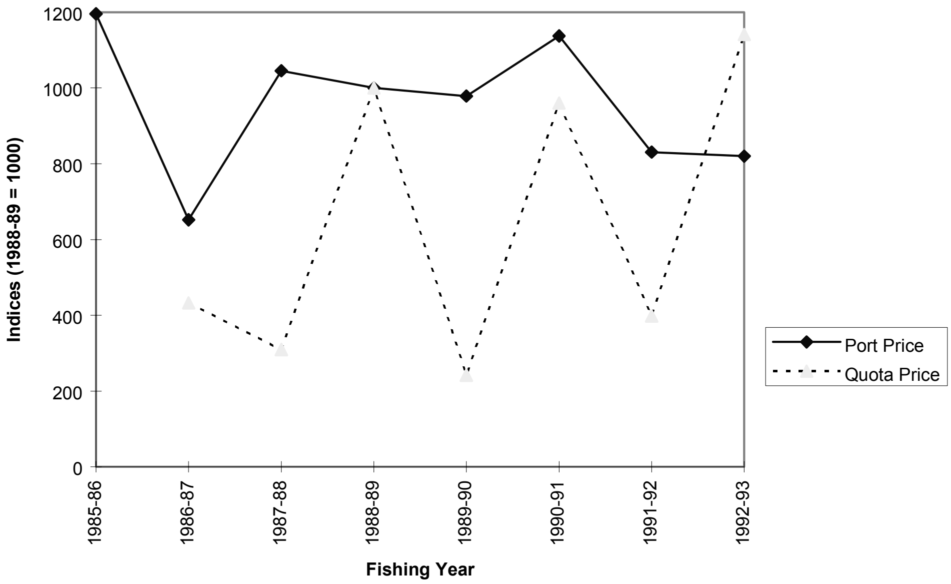
– Port value

The increase in landings described above contributed to a slight increase in landed port value of oreos since the QMS was introduced in 1988-89. In nominal terms, the landed value increased from $12.8 m in 1988-89 to $14.3 m in 1993-94. The real landed port value increased by 2.4% over this period.

– Prices

In both nominal and real terms the indicative port price for this species fell since its was introduced into the QMS. The price fell by 10% from NZ$670 per tonne in 1988-89 to NZ$600 per tonne in 1992-93. In real terms the price fell by 18% over this period.

Figure 25. Oreos real port prices and quota prices: 1985-86 to 1992-93



0Source: Ministry of Fisheries.

As the figure above indicates, the average trade price for oreos quota was variable between 1986-87 and 1993-94. During this time the trade price increased from NZ$882 per tonne to NZ$3 071 per tonne. In real terms, the trade price of oreos quota increased by almost 180%.

General outcomes

Enforcement

From 1986 onwards, QMS enforcement was based on output controls whereas non-QMS enforcement was based upon input or effort controls. The enforcement regime was therefore reorientated towards the verification of catch volumes by individual fishers and the reconciliation of that catch against the individual's quota holdings.

Surveillance

In the pre-QMS most enforcement measures were engaged in physical surveillance of fishing activities in order to detect unlicensed fishers, the use of illegal gear, and season or area transgressions. Physical surveillance continues to plays an important role in ensuring the integrity of the QMS. This surveillance is used for intelligence gathering, covert checking of product flows and random inspections of vessels, fish receivers and fish dealers. A large proportion of enforcement staff employed by the Ministry of Fisheries are Fisheries Surveillance Officers (61%). Surveillance is also carried out using satellite monitoring. Since 1 January 1994 all deep water vessels (over 43 metres) and foreign licensed fishing vessels have been required to be equipped with approved transponders.

Monitoring

Prior to the QMS, the monitoring of catch and effort information was largely for scientific purposes. Scientists were concerned that the introduction of the QMS would lead to strategic misreporting of catch and effort by commercial fishers and resentment against the presence of on-board observers. The QMS does provide incentives for fishers to overstate catch in non-QMS species and understate QMS species. However, the system of cross checks which operates through the monitoring of licensed fish receivers' records and returns deters such practices. Consequently, the fears of debasement of scientific data have not been realised.

The monitoring system is based upon the matching of the catch and landing returns supplied by fishers, the records and returns of fish purchases by receivers and the records of outgoing product from processors or dealers. The monitoring of documents associated with product flows aims to promote compliance through the retrospective examination of both physical and financial records. Goods and Services Tax requirements supplemented this monitoring. Physical surveillance of fishing activities, as mentioned above, and the application of accounting and investigation skills to detect inconsistencies in the records, provide the information to support the monitoring system.

Investigation and audit

Sophisticated investigation and audit did not feature in the pre-QMS regime. While such activities could contribute to virtually any enforcement scheme, it was the introduction of the QMS which stimulated their development in New Zealand. Investigations may be triggered by routine monitoring, surveillance or auditing. It is increasingly common for initial information to be supplied by industry informants. Since 1986, quota holders have adopted an increasingly proprietary attitude towards their quota and it is widely understood that misreporting of catch is a form of theft - not from the government - but from other quota holders.

Skills of fisheries officers

Fisheries Officers, who are employees of the Ministry of Fisheries, are the key fisheries enforcement people and they have extensive legal powers. The specialisation of roles amongst fisheries officers has changed since 1986 as the table below indicates.

Table 12. Changing roles in fisheries enforcement: employee numbers in 1986 compared to 1993

	1986	1993
Compliance Management	8	10
Fisheries Surveillance Officers	89	62
Fisheries Investigators	-	17
Investigating Accountants	-	4
Investigating Solicitors	-	4
Fisheries Intelligence Officers	-	2
Fisheries Communication Officers	-	2
Training and Development	1	1
Total	99	102

Source: Ministry of Fisheries.

Investigators employed since 1986 tend to be well qualified with backgrounds in the police, customs, Securities Commission and private enterprise. The skills of traditional compliance officers have not been superseded with the introduction of the QMS but have required supplementation. There has been a modest increase in the numbers of enforcement personnel but in real terms, the cost of compliance has declined as a percentage of the gross value of production of New Zealand fisheries.

Prosecutions

Fisheries cases are tried before a judge (not a jury) in the general criminal courts. Because compliance resources are limited, prosecution effort is mostly directed at the most serious forms of offending such as systematic misreporting involving collusion between harvesters and processors. The value represented by quota provides a strong economic incentive to circumvent legitimate means of gaining access to quota. Upon conviction, quota holders and face substantial financial penalties and may be required to forfeit quota to the Crown as part of the penalty imposed.

This means that there are both strong incentives to cheat and strong incentives to mount a very vigorous defence against prosecution if charged with a serious offence. These factors have combined to result in longer and more complex investigations followed by longer and more expensive court cases in QMS fisheries. A typical pre-QMS case would have taken one to three days; now one to eight weeks may be required. In 1995-96, \$2.6 m has been budgeted for prosecution of offences; other enforcement work has a budget of \$12 m.

Penalty Structures

When the QMS was introduced, it was recognised that detection of misreporting was likely to be more difficult than detecting violation of traditional input controls. To preserve an effective deterrent, heavy penalties (fines of up to NZ\$250 000 as well as forfeiture of property and quota upon conviction) were introduced. The main reason why heavier penalties were necessary is that quota represents a repository of the present and expected rents and there are large economic benefits available to those who can access those rents without acquiring quota. The creation and preservation of rents in fisheries therefore creates a potential target for illegal activity.

Resource Rentals

The positive quota prices indicated earlier in this section point to the existence of profit within the fishing industry. However, the proportion of this profit that is resource rent remains an issue open to debate. Resource rent in this context, means the economic surplus available to the fisher due to being granted exclusive access to the fish resource by quota. Dr Lee Anderson says (italics inserted):

> *"management (resource) rent is the residual earnings to the marginal producer after the full costs of operation, including a normal return, are subtracted from the returns from fishing. The willingness to pay for and hence the market price of quota will be related to the expected residuals to be earned. All else equal, the higher the perpetuity price or the annual lease price of quota, the higher is the management (resource) rent."*

The debate over the extent of resource rent, whether quota prices accurately reflect it, and whether Government should attempt to collect it, has been contentious. The fact that resource rent exists for fisheries in the QMS has not been seriously refuted however.

As mentioned previously, from the inception of the QMS until 1993/94, the fishing industry was charged a resource rents. Resource rentals, or royalties as they were then called, were also payable under the previous deep water quota system. From 1989-90 to 1993-94, the level of resource rentals were frozen, except changes could be made to allow for movements in the inflation rate. The chart below gives the estimated total resource rentals for the fishing years 1984-85 to 1989-90 (1986-87 figures are not available).

Table 13. Resource rentals paid by the fishing industry 1984-85 to 1989-90

	1984-85 ($m)	1985-86 ($m)	1987-88 ($m)	1988-89 ($m)	1989-90 ($m)
Inshore Fisheries:			4.8	4.3	3.3
Deep water Fisheries:	4.4	11.3	20.6	16.5	15.2
Total:	4.4	11.3	25.4	20.8	18.5

Source: NZ Fishing Industry Board.

Initial allocation of quota

With the introduction of the QMS, TACCs had to be set for inshore species, as none had existed previously. In most cases, the TACCs could only be based on catch history data and not on directed research. On the whole, the research community supported the need to set TACCs as a conservation measure, even if particular TACCs could not, at the time, be underpinned by robust scientific research. Initial allocations in the inshore fishery were granted to permit holders only, not to crew or down stream processors. Unlike the deep water allocations, which allocated quota to around nine companies, the inshore allocations involved approximately 2 500 individuals/companies.

Inshore allocations were based on catch history - the best of two out of three years - and an assessment of "commitment and dependence" on the fishery. Both of these assessments tended to build up the initial allocations beyond the recent recorded catch levels (e.g. due to allocations to individuals who were not able to fish in a particular season or, in declining fisheries, due to recognising earlier catch rates rather than the most recent catch material). Moreover, there was an appeal process, overseen by a specially established quota appeal authority, to hear cases for even further allocations.

For most species, the appeal process took between three and four years to complete. Over 2 000 appeals were heard, of which about 1 000 resulted in additional quota being allocated, and 100 resulted in reductions. Many of these reductions would have been merely the result of reallocations of quota between adjacent management areas. Generally the increase over the initial TACC was around 10%, although for snapper the increase was 36%.

Fleet structure

The numbers of vessels in the fishing fleet increase in the years following the introduction of the QMS. The table below indicates the changes in fleet structure for the entire fishing fleet. The total number of vessels increased from 2 331 in the 1986 calendar year to 3 250 in the 1988-89 fishing year. This growth occurred across all vessel sizes, although the numbers increased more substantially in the less that 15 metres in length range.

Table 14. Number of vessels by size: 1986 to 1993-94

Total vessels :	1986 2 331	1988-89 3 250	1989-90 2 997	1990-91 3 216	1991-92 3 113	1992-93 2 569	1993-94 2 768
Less than 6m	659	1 094	1 036	1 071	1 280	1 081	1 057
6m and under 9m	569	659	595	616	510	404	460
9m and under 12m	622	635	594	599	563	478	552
12m and under 15m	245	337	306	321	270	207	292
15m and under 18m	78	138	134	144	124	115	133
18m and under 21m	55	75	72	81	72	64	69
21m and under 24m	21	46	46	52	44	28	40
24m and under 27m	12	10	12	16	16	17	20
27m and under 30m	5	31	18	19	15	12	13
30m and under 33m	3	12	12	12	8	7	8
More than 33m*	62	213	172	285	211	156	124

* includes foreign chartered vessels.
Source: Ministry of Fisheries.

0Since 1988-89, the number of vessels in the fleet has fallen slightly. By 1993-94 the total number of vessels had fallen to 2 768. The drop in vessel numbers has been primarily in the 33+ in length and the 6 m to 15 m in length categories.

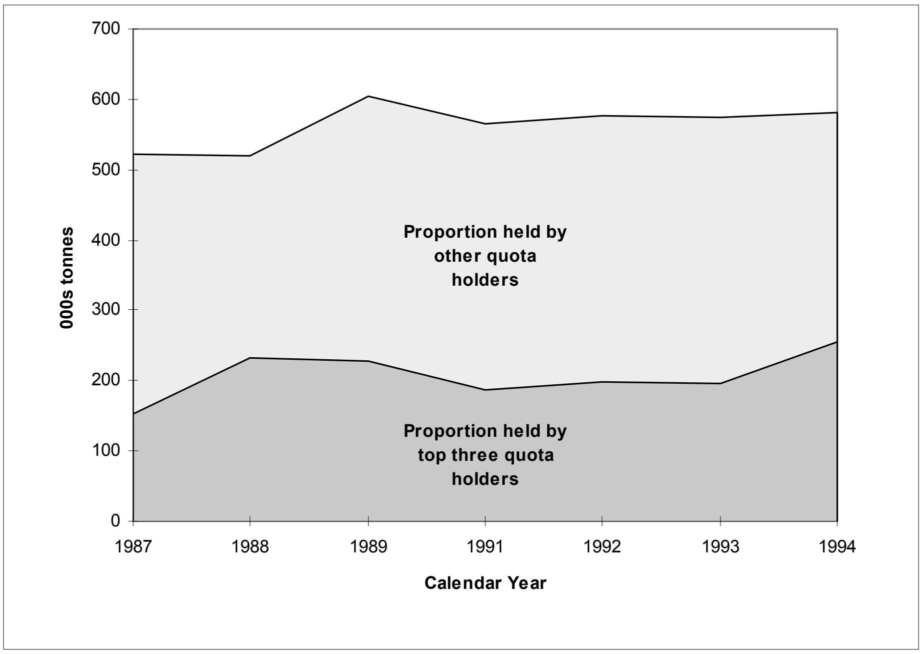
Quota ownership

Shortly after the QMS was introduced, there was a rapid change in the structure of quota ownership. Some fishers decided to sell out and take on other employment, rather than learn a new system and its reporting requirements. Others sold their quota to processors in exchange for an ongoing contract to supply fish to them. The processors were able to pool quota in order to even out fluctuations in catches over a number of fishers.

Concentration of quota ownership is limited by law. People may not hold, whether by lease, transfer or ownership:

- more than 35% of the total of quota for hoki, hake, ling, orange roughy, oreos, silver warehou, and squid;
- more than 35% of the total of quota in any management area for packhorse rock lobster;
- more than 10% of the total of quota in any management area for red rock lobster; and
- more than 20% of the total of quota in any management area for the other species in the QMS.

Figure 26. Quota concentration: 1987 to 1994



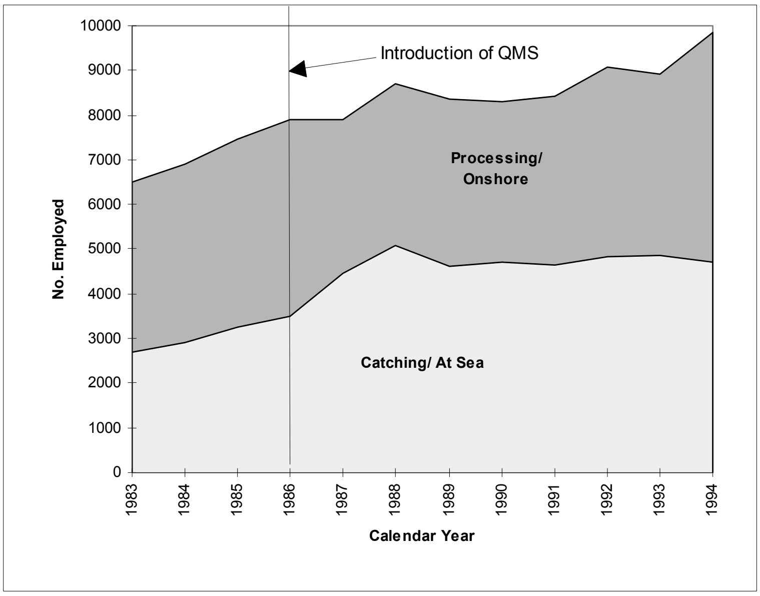
Source: Ministry of Fisheries.

0In 1987, the top three quota holders held 29% of the quota by tonnage. By 1994, the top three holders held 44%. At least in part, this concentration reflects economies of scale in fish processing, and the rationalisation of processing capacity amongst larger companies. Three large quota holding companies, who together held almost 20% of the quota in 1987, have since left the industry and sold their quota to others.

Employment

Since the introduction of the QMS, employment levels in the fishing industry have increased.

Figure 27. Employment in the fishing industry: 1983 to 1994



Source: NZ Fishing Industry Board/Statistics New Zealand.0

In 1986, it was estimated that 7 900 people were directly employed in the fishing industry. Of these, 3 500 were employed in the catching sector and 4 400 were employed in the processing sector. Since then total employment increased by 25% to 9 838 people in 1994. The catching sector increased by 34% to 4 697 and the processing sector increased by 16% to 5 137 over this period. These figures do not include foreign crew on charter vessels or in the foreign licensed fleet. Employment increases in the catching sector are within the domestic New Zealand fishing industry.

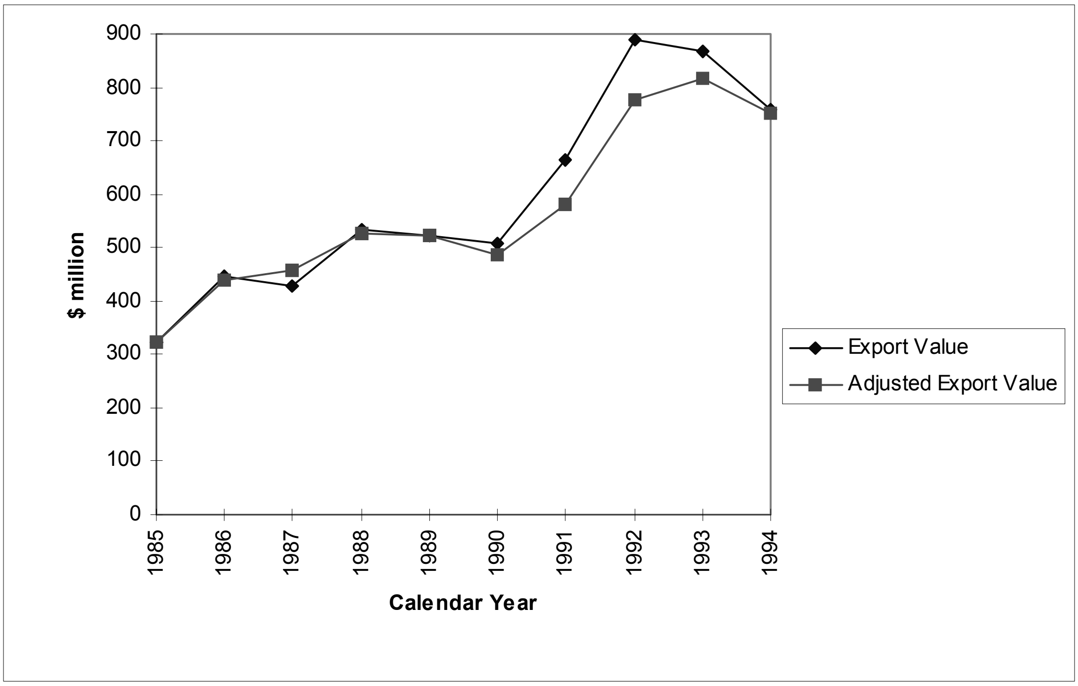
Export performance

The export performance of rock lobster has been specifically discussed above and it is useful to examine the export performance of finfish generally since the introduction of the QMS.

– Export receipts

As the figure below indicates, finfish export receipts have steadily grown since the QMS was introduced in 1986. While it is true that some valuable species were under a deep water quota system before then, the trend of increasing export returns is clear.

Figure 28. Finfish export value 1985 to 1994



Source: NZ Fishing Industry Board/ Reserve Bank of New Zealand.0

In the 1994 calendar year, export returns were $760 m, some 134% above the export receipts for the industry in 1985 of NZ$324 m. Even after taking account of the exchange rate movements, which depreciated slightly over this period, export receipts still increased by 132%.

– Export prices

The export price for finfish increased steadily between 1984 and 1987 from NZ$2.65/kg to NZ$3.93/kg. Since then however, the price has fluctuated in the NZ$3.40/kg to NZ$3.90/kg range. When the QMS was introduced in 1986, the export price was NZ$3.82/kg. In 1994, it was 4% lower at NZ$3.65/kg. If the slight appreciation in the exchange rate between 1986 and 1994 is taken into account, the export price was 3.6% lower in 1994 than in 1986.

– Export product composition

Since 1986, the most notable change has been the increase in the contribution of processed product, primarily at the expense of frozen product. The table below illustrates this change.

Table 15. Finfish export product composition 1986 to 1994

Year	Fresh (% of total $fob receipts)	Frozen (% of total $fob receipts)	Processed (% of total $fob receipts)
1986	14.3	82.2	3.5
1988	20.2	62.9	16.9
1990	13.7	79.4	6.9
1992	10.8	76.7	12.5
1994	13.4	74.4	12.2

Source: NZ Fishing Industry Board.

Fresh exports have increased from NZ$64 m to NZ$102 m between 1986 and 1994, a growth of almost 60%. Frozen exports have grown from NZ$367 m in 1986 to NZ$565 m in 1994, an increase of almost 54%. The most significant increase has however, been in processed product exports, where the value has increased by over 500% from NZ$15.4 m in 1986 to NZ$92.8 m in 1994.

Part III: THEORY AND EVIDENCE

This section discusses the evidence presented in Part II in light of what resource economics theory says are the expected effects of the use of ITQs. Each heading describes the expected effect and is followed by a discussion, based on the information presented previously, as to whether this effect has in fact occurred.

Good resource conservation

Resource economic theory suggests that ITQs are effective means of ensuring conservation of fisheries resource conservation. This view is supported by the evidence from two of the fisheries examined above hoki and jack mackerels. For the remaining species - rock lobster, oreos, snapper, orange roughy - the status of the stocks is either unknown or below the level which will support the maximum sustainable yield. In all of the fisheries examined, TACCs appear to have been effective both in constraining catch levels and, when necessary, reducing catch levels.

Three specific fisheries were identified as being under stress from a resource conservation perspective: Chatham Rise and Southern orange roughy, Challenger Plateau orange roughy, and north east North Island snapper. However, in these three cases there are external factors which suggest that the stress on the fisheries is not related to any inadequacy of the management instrument:

- With the two orange roughy fisheries, stock assessment research proved to be difficult. Understanding of the species biological characteristics (e.g. ageing, recruitment, spawning patterns) has evolved and with it the biomass modelling outcomes have changed. This uncertainty has placed management and assessment work in a difficult situation when confronted by a fishing industry wishing to protect its commercial interests in these high value fisheries. Industry has also placed more of its own resources in assessment research on orange roughy.

– With the north east coast North Island snapper, initial allocation of quota and the recognition of recreational fishing interests has created problems. The final TACC, after the allocation and appeals process was completed, was significantly above that originally intended. Although the TACC was cut as soon as possible, this higher than intended TACC would have had a negative impact upon the biomass. Recreational fishing also takes a large proportion of the catch in the fishery (about 35% of the total catch in 1994).

The level at which TACCs are set, and the difficulties in the TACC setting process, are the areas in need of closer scrutiny, rather than the ITQ instrument itself, if we are looking for the causes of these resource conservation difficulties. However, on balance, it should be noted that these three stocks remain biologically sustainable, even if they are not at the abundance necessary to produce their maximum sustainable yield.

Elimination of race to fish

Although there was recognised overcapacity in the fishing industry, it is not clear that there were race to fish problems in New Zealand fisheries before the introduction of the QMS in 1986. There were few competitive TACs at that time. Since 1986 it appears, on the basis of the four fisheries examined, that their has been little change in fishing patterns. Two snapper fisheries, hoki, and red rock lobster fisheries were examined and, of these, only with rock lobster was there a slight change in fishing patterns. The spread of fishing catch over the year in these fisheries appeared to be more driven by biological factors like spawning patterns.

Increased prices

This expected effect occurred in most of the fisheries examined. Real indicative port prices increased for hoki, orange roughy, snapper and rock lobster since the introduction of the QMS. Jack mackerels and oreos were the only species examined which experienced a decline in real indicative port price. The possible reason for the decline for jack mackerels relates to the position of these fish at the low quality end of the New Zealand market.

The export price for finfish generally has decreased slightly, while the export price for rock lobster has increased substantially since 1986. The reason for the slight decrease in the export price for finfish generally is not clear.

Increased profits and the generation of resource rent

The experience with the fisheries examined appears to support this expected effect. If positive quota prices can be used as an indication, all of the fisheries examined experienced an economic surplus since the QMS was introduced. As mentioned previously, the proportion of this which is normal return on fisheries business activity and the proportion which is resource rent has been open to debate. The absence of any form of subsidies for the New Zealand fishing industry supports the contention that the positive quota price is made up primarily of economic surplus. Nevertheless, it would be fair to say that resource rents (and hence improved profitability), whatever their extent, have been generated by the introduction of ITQs.

Greater Economic Stability and Improved Investment Climate

There is some evidence in support of this expected effect. In the rock lobster fishery there has been an increased concentration on export of live product, which requires investment in facilities and marketing channels. The confidence of guaranteed access to the resource via quota will have assisted this.

With the hoki species, there has been greater "at sea" processing, reflecting increased investment in the catching sector. Also, an increasing proportion of the hoki catch is now landed in New Zealand rather than being transhipped, reflecting increased capacity and investment in the processing sector.

The fishing industry's output since the introduction of ITQs has also grown reflecting an increased capacity in the catching and processing sectors. The employment levels have also increased, at a time when new technology is being introduced, in both sectors since 1986.

Whether this evidence is primarily a result of the introduction of ITQs is not conclusive. Stable macroeconomic conditions in the New Zealand economy, particularly since 1991, may have contributed just as much to the outcomes described above.

Initial allocation problems

The allocation of quota for the inshore fisheries when the QMS was introduced was lengthy and involved a large amount of work. Deep water allocations involved only around nine companies, whereas inshore fisheries involved thousands of individuals. Allocations were made on the basis of catch history and an assessment of "commitment and dependency". A separate appeal process, overseen by a quota appeal authority, also heard cases for further allocations of quota.

TACCs therefore tended to end up higher than was originally intended: generally 10% higher than the initial intended TACCs overall. This raising above the initial intended TACCs created some problems in placing pressure upon the sustainability of the snapper fishery (discussed above).

Under reporting and data degradation

In general, fears of under reporting and data degradation have not been realised. The monitoring system which operates enables catch and landing data, filled in by fishers, to be cross checked with licensed fish receiver records on product received. This has acted as a discouragement for the underreporting of catch and the debasement of data.

Greater enforcement costs and problems

This expected effect does not seem to have occurred. Enforcement costs have actually declined as proportion of the total value of New Zealand's total fisheries production since the introduction of the QMS in 1986.

With the introduction of ITQs, the enforcement system has changed its emphasis from being primarily on physical surveillance of fishing activity, which was consistent with input controls, to including monitoring and auditing paper flows associated with the fishing activity. Physical surveillance remains an important part of enforcement activity, but it has been supplemented by document monitoring and audit. Despite this change in emphasis the number of people employed in enforcement has only slightly increased.

The advent of enforcement information coming from within the industry has also been an interesting development. This recognition by some quota holders that the value of their quota can be adversely affected by illegal activity by their fellow quota holders. This is resulting in increased "leaks" from the industry to the authorities. Also, in the case of rock lobster, the industry has funded an enforcement initiative to reduce illegal fishing.

Reduced employment

Economic theory suggests that, because of the rationalisation of fishing effort which is expected to occur with ITQs, employment in the sector will fall. This expected effect has not occurred. Employment in both the processing and catching sectors of the fishing industry has increased since the QMS was introduced in 1986. Even if we go back to 1983, there has still been a steady increase in employment in the fishing sector. The catching sector, where we would expect rationalisation of effort to occur, experienced an increase in employment levels almost double that of the processing sector.

The most likely reason that the expected outcome did not occur is the growth in overall catch levels during this period and the greater proportion of the catch processed in New Zealand. Total catch levels grew by over 40% since 1986.

Elimination of small scale operators

Economic theory suggests that small-scale fishing operations will be eliminated under an ITQ system because quota will be traded and end up purchased and controlled by large fishing corporations. The concern is that the concentration of quota ownership that often exists at the primary buying and processing level will be vertically integrated backwards to control the harvesting sector as well.

Legal limits have been placed upon the concentration of quota ownership in the QMS fisheries. Nevertheless, quota ownership has concentrated since the introduction of the QMS in 1986. The three largest quota holding companies held almost 44% of the quota in 1994. No evidence, at a sector level, is available to suggest the extent to which this concentration of quota has resulted in a vertical integration into the harvesting sector. The fleet structure has not changed significantly although there has been an increase in the number of smaller vessels since 1986.

Notes on Calculations

In Part II of this paper, a range of figures are used. Below are description of the source and methods of deriving these figures. Lack of adequate information has meant that the methodology is not as robust as we would like.

Indicative port prices: These were obtained from New Zealand Fishing Industry Board Annual Economic Review. They are indicative only. Many firms in the fishing sector are vertically integrated and this makes identification of the actual prices difficult.

Port value: These are obtained by multiplying the indicative port price for the species by the catch levels recorded by the Ministry of Fisheries. Unfortunately, the fishing year for most species finishes on 30 September and the indicative port prices have been calculated on a calendar year basis. The price for the calendar year is therefore applied to the fishing year with which it has the most overlap. For example: the price for 1993 is multiplied by the 1992-93 fishing year catch. Allowance is made for the 31 March rock lobster fishing year.

Real indicative port value and real port price: The above values are deflated by the December quarter Consumers' Price Index in each year to arrive at these real figures.

Trade quota prices: These are taken from Ministry of Fisheries Quota Monitoring System Reports and are recorded on a fishing year basis. The prices shown are a weighted average of the quantity of quota traded at each price in each fishery. The prices include Goods and Services Tax (GST). The data also generally excludes NZ$0 value trades and where the same price is used for a package of species. Care should be used with these figures as we can never be really sure whether the sale includes other capital items e.g. plant, vessels.

Real trade quota price: The above values are deflated by the December quarter Consumers' Price Index in each year to arrive at these real figures.

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NORWAY

PART I: BACKGROUND

Historical overview

Throughout history fishery has been a major industry in Norway. Its geographical position, the long coast line together with climatic factors has made the country extremely well suited for this industry. Thus, Norway is a major European fishery nation, and has been for centuries.

The most important stocks exploited by Norwegian fishers has been cod and herring. In addition, sea and river fishing of salmon has been of some importance. In recent times, exploitation of capelin has become very important. Furthermore, aquaculture, mainly of salmon, has grown to become an important industry.

Whaling in Antarctic areas became an important Norwegian industry in the end of the nineteenth century. This activity was completely abandoned in the 1960s. Coastal exploitation of whale stocks has continued until present time, with some interruptions. Hunting of seals in the Arctic areas used to be of some importance, but is now negligible.

The fisheries are commonly divided into two broad categories - cod fisheries and herring fisheries. The first category includes cod, haddock and saithe. These are used directly to consumption. The herring category includes besides herring, also capelin and mackerel. The greater part of these stocks has traditionally been processed into oil and animal feed.

In addition to the above-mentioned species, a great number of stocks are harvested and used in consumption or processed into oil and animal feed. The increasing interest in fish consumption has led to harvesting of many species which in earlier times were considered of little interest.

For centuries, fish products have been a major export from Norway. Since medieval times, Norwegian cod has been a stable part of the weekly diet in many Catholic European countries. Cod, fished in the northern areas, dried and/or salted in south Norway, was exported in large quantities to central and even more to southern Europe. In later years, some African countries have found dried cod from Norway to be a cheap and healthy food.

Fisheries in the national economy

The role of fisheries in Norway's national economy over the years may be described in different ways. One possibility is to look at the contribution to GNP.

Table 1. Fisheries contribution to gross national product.
(per cent)

1930	5.7
1939	2.3
1950	3.7
1960	2.2
1970	1.6
1980	0.8
1989	0.5

These figures are influenced by the fact that whaling, which in earlier times was an important industry, is classified together with fisheries. Another important fact is that fisheries at all times has been the basic industry in most of the coastal counties.

Since fish products for centuries have been a major export, the share of total exports also gives an impression of the importance of the industry.

Table 2. Value of export of fish products as percentage of total exports.

1938	14.7
1950	6.2
1960	12.6
1970	7.7
1981	4.5
1990	6.0

These figures must be seen in light of the development of the export of oil and gas, which was non-existent prior to 1970 and is now by far the greatest part of Norwegian export.

To these illustrations of the role of fisheries in the national economy must be added different spillover effects of the industry. This includes industries like food processing, shipbuilding etc.

Since 1970, aquaculture of salmon has been introduced and has grown to be an important supplement to traditional fisheries, and also a major export.

Structural development

Going back in history, Norwegian fishery was initially a coastal fishery. To a great extent, fishery was combined with small-scale farming. Vessels were small, activity was based on the seasonal migration of fish, e.g. to the Lofoten area in January to April, and the activity was limited to grounds near the coast. Since 1900, great structural changes have taken place. Vessels have increased in size, have been changed from open to sheltered boats and area of operation has expanded from coastal areas to the high seas. Fishing gears have increased very much in efficiency, changing from passive to active types of gear. Moreover, the industry has become capitalised and efficiency has improved very much in this century and particularly in the last part of the century. To complete the picture, it must be added that during these changes, elements of the "old" fishing industry has been kept alive. Thus, besides a modern highly efficient fleet and modern processing plants, there still exist small-scale fisheries and small processing plant with a very simple technology. This gives an important background for understanding Norwegian fishery policies.

The structural changes described above can be illustrated by many statistical figures.

Table 3. Number of fishers

Year	Total	Sole or principal occupation
1930	101 100	67 100
1940	121 900	80 300
1950	98 300	68 100
1960	60 900	45 200
1970	43 000	31 900
1990	26 000	20 000

Thus, the great decrease in the number of fishers has been most marked after World War II. It must also be added that the increasing role of bigger vessels may have had the effect that people registered as fishers in earlier times, now are been registered as sailors. The significance of this is difficult to assess.

A somewhat similar development has taken place in the fleet. Due to classification changes it is difficult to go very long back in time.

Table 4. Registered fishing vessels

1950	34 491
1960	41 464
1970	36 201
1980	26 504
1988	20 935

The total gross tonnage has not decreased to the same extent, illustrating the increase in the average vessel size.

One particular development behind these figures has been the marked decrease in the purse seiner fleet, used in the capelin end herring fisheries. This fleet was reduced from 376 to 103 vessels between 1970 and 1989, partly as a result of government measures.

A classification of the fleet by size and type in 1989 gives the following distribution:

Table 5. Classification of fleet, 1989
(Vessels used the whole year)

Small home-based vessels (24 to 39 feet)	2 004
Coastal fleet (40 to 93 feet)	1 026
High sea fleet (above 94 feet)	318
Total	3 348

Comparing Tables 2 and 3 it is seen that most of the registered fishing vessels are not used the whole year. Furthermore, it is seen that the high sea fleet is a small part of the industry, by number. These tables also illustrates the fact that besides the development of a high sea fleet, a great number of small vessels is still an important element in the Norwegian fisheries, vessels which are not used the whole year, and owned by people combining fishery with other activities.

Catches and stock sizes

A characteristic feature of Norwegian fisheries has been the great variations in catches over the years. For instance, the catch of so-called winter herring was

Table 6. Catches of winter herring
(tonnes)

1866	111 600
1876	1 100
1886	16 700
1896	48 100
1906	99 600
1918	310 171
1928	300 642
1938	496 428
1948	819 583
1956	1 145 859
1966	460 855
1974	225

Likewise, the catch of capelin which was 2 400 000 tonnes in 1977 fell to 326 000 tonnes in 1988. For later years, these figures are influenced by quota regulations. There was a moratorium in the harvest of capelin in the years 1987 to 1990.

Also, the more stable cod fisheries have shown great variability over time. This may be illustrated by the catches of "skrei" (spawning cod), which is mainly caught in the famous Lofoten fisheries.

Table 7. Catches of spawning cod ("skrei")
(tonnes)

1920	85 941
1925	124 430
1930	176 185
1935	75 726
1940	152 562
1945	94 974
1950	108 612
1955	81 085
1960	75 024
1965	45 515
1970	107 118
1975	57 529

Also here, catches for later years are influenced by quota regulations. It seems reasonably safe to assume that these great variations in catches in historical data, foremost reflect changes in environmental factors. Variations in the participation in the last fishery mentioned above cannot explain much of the variations in catches. Only in recent times has the increased efficiency in the fisheries influenced stock sizes significantly.

Stock sizes have also shown great variability over the years. For winter herring, the stock collapsed after the golden years of the 1960s. This fishery was stopped after 1970 in an effort to build up the stock again. Capelin has since to a great extent replaced herring as basis of the oil production. The stock of capelin however, has also shown great short-term variations collapsing in 1986 and then again in 1993. It is believed that these dramatic changes in the capelin stock is caused by interactions between sea mammals, cod and herring.

Also the stock of cod has shown great variations, but less than for herring and capelin. There has been a long-term decline in the stock, but in later years attempts to increase the stock by regulations seem to have given results. The attempts at rebuilding the stocks of herring and cod will be dealt with later.

Organisation

It can generally be said that fishers throughout history have been a strong political force in Norway. In earlier times, the small-scale fishing industry meant that the large number of fishers in itself made them a dominating group in several counties. More recently, the organisation of fishers since 1926 has become an important political factor. Indeed, it may be said that the opposition from the fishery industry was the decisive factor behind Norway's negation of joining the European Community in 1972. Fisheries is also one of the main issues in the discussion on a possible membership in the European Union today.

Back in history, small-scale coastal fishers sold their catches to the local buyer, who processed it further and/or sold it. The buyer usually was a local capitalist who also took part in financing the fleet. Thus, in the large number of ports along the coast there was a tight economic dependency between the local capitalist and a number of local fishers.

This asymmetric relation may be said to be the background for the organisation of the fishers.

The organising of the fishing industry has developed along two lines. In 1926, "The Norwegian Fishermen's Association" was established. This is, in essence, a labour union, which has a strong political influence, and also takes part in discussions and decisions on fishery management, e.g. quota decisions. Later, during the 1930s, the fishers' sales organisations were established. These organisations work as a cartel and by government regulation got an exclusive right to first-hand sale of fish. These organisations obviously became very powerful and enter each year into negotiations with the buyers about the first-hand prices. Indeed, if these negotiations do not lead to an agreement, the sales organisations have the right to determine the prices.

From this it is clear that the fishery sector is an important political factor and that the government has to take this into account in it fishery policies decisions. Moreover, the fact that the fishery sector is so concentrated regionally strengthens this relation.

Management

From ancient times regulatory measures have been used in Norwegian fisheries. During most of the time these measures had a local and distributive character, e.g. reserving certain areas for specific gear. It is only in the last century that regulatory measures have been based on biological considerations. The first nationwide regulations were mainly restricted to regulations on ownership of fishing vessels and of licences to fish. Only at a later stage were regulations used explicitly to reduce fishing activity.

At times there has, throughout history, been tensions between fishers using old and new technology and different types of gear. As a consequence, trawling has been particularly subject to strong regulations. It has been argued that trawling is ecologically unsound by overexploiting young fish. Regulation of trawl fisheries has limited the area for this gear to a certain distance outside the coast, and landing of trawled fish in Norway has been restricted.

Since 1960, more explicit regulation, both of effort and catches has been put into effect. Licences, quotas and other measures have been introduced as instruments to cope with the two most pressing problems in the industry: deterioration of stocks and over-capacity. Moreover, the economic difficulty in the industry also led to rather heavy government subsidies to the industry. These subsidies have decreased very much in later years and are now practically non-existent.

A major change for Norwegian fisheries took place with the introduction of 200 miles economic zones in 1977. This gave Norway an exclusive right to the fish stocks within this area. As a consequence of the zones, Norway negotiates quotas with Russia for the northern areas, and with EU for the North Sea.

Norway's fisheries today

The most important parts of the Norwegian fishing industry today are:

- Cod fisheries (coastal and high seas)
- Herring
- Capelin
- Mackerel
- Aquaculture, mainly of salmon.

Included in the cod fisheries are also haddock and saithe. These are mainly used for consumption. Capelin is mostly used as input in oil and meal production. Herring and mackerel are used both for consumption and also processed into oil and meal. In periods of abundance of herring, most of the catches are used as input. The first-hand value of the cod fisheries was in 1992, 2 733 b. NKr, while the value of the herring was 365 m. NKr, capelin 567 500 m. NKr and mackerel was 466 m. NKr. Together these three fisheries amounted to 1 399 m. NKr.

The first-hand value of farmed salmon was in the same year 4 400 billion NKr. Thus, farmed salmon has grown to be larger than traditional fisheries, judged by first-hand value.

Fish farming has partly supplemented and partly substituted traditional fisheries, varying from one region to another.

Resources

At present, the resource situations for two of the most important species, cod and herring are better than it has been for a long time. Estimated stock of Norwegian-Atlantic cod was in 199, 2 340 m. tonnes. One has to go back to 1976 to find a slightly higher estimate. For spring-spawning herring the situation is similar. The estimated stock reached a peak in 1991 with 2 670 m. tonnes declining to 2 360 m. tonnes in 1993. To find a similar size of the stock one has to go back to the 1960s. Still, the stock is far less than it was at the peak in the 1950s of around 10 m. tonnes.

Similar situations exist for saithe and haddock. For haddock the stock in 1993 was estimated at 280 thousand tonnes, and one has to go back to 1978 to find a similar figure. Likewise, the stock of saithe was 640 thousand tonnes, the highest figure since 1976.

The important exception from this optimistic picture is capelin. The stock of capelin collapsed in 1986 after many years where capelin replaced herring as the major input to the oil and meal industry. After 1986, strong regulations took place and the stock gradually increased to a peak in 1991 of 5 830 m. tonnes. After that, the stock decreased down to 800 thousands tonnes in 1993. And in 1994, we have a situation similar to 1986 with a complete collapse of the stock.

This dramatic development of the stock of capelin is believed to be related to species interactions and is accentuated by the short life-span of the capelin. Since both cod and herring are predators for capelin the increase in the stocks of these may be on factor explaining the decrease of the stock of capelin. Furthermore, decreasing capelin stock may later influence the stocks of cod and herring.

Another aspect of this is that other species have to replace capelin as input to the oil and meal industry.

Factor input

From Tables 3 to 5 above it is seen that the number of fishers is around 20 000, of which 6 000 are part-time fishers and that only 3 000 of 20 000 vessels are used the whole year. It is also seen that vessels are generally small, with the exception of the high sea fleet.

The location of the industry is very much concentrated regionally. Four of the 19 counties had 73 per cent of the registered single-occupation fishers in 1989, of these, 48 per cent lived in the three northern counties. This means that fisheries is a fundamental factor behind the population in the northern areas. Many communities are totally dependent upon fishery and fish processing plants. Also in many small communities we still find the traditional combination of one single buyer/processor supplied by a number of small local vessels. It goes without saying that fishery policies in Norway is very much influenced by regional considerations and the aim of keeping small fishery communities alive.

The state fishery bank was earlier the major source of financing of the investment in the industry. In recent times private banks have played a much greater role, in particular in financing larger vessels in the high sea fleet.

Investment in the industry has varied much over the years. There was an investment boom between 1986 and 1989, reaching 2 506 billion NKr in 1988. After that investment fell to 561 m. NKr in 1991.

Catches

The catches of the most important species in 1992 were:

Table 8. Catches 1992

	1000 tonnes	**First-hand value Mill. NKr**
Herring, sprat	252.5	365.5
Mackerel, horse mackerel	313.0	466.0
Capelin, sandeel, Norw. pout	1065.3	567.6
Cod	213.0	1900.0
Saithe	160.0	561.0
Haddock	38.0	272.0

The gear used in the "industrial fishery" (i.e. the three first categories) were mainly trawl and purse seiners. For the latter three, the most important gear have been:

Table 9. Per cent of catch by gear, 1988

	Cod	Haddock	Saithe
Seine	0.1	-	34.9
Net	17.1	4.5	12.6
Longline	25.2	39.7	1.1
Trawl	49.5	48.3	44.9

Processing export

The processing industry in Norwegian fisheries includes a diversified set of plants. The oldest part of the industry consists of so-called conventional plants. These are often small establishments with a simple technology producing salted and dried fish and bacalao. Of newer date is canning plant including canning of herring, sprat and sardines and also more developed products based on cod fisheries. Also, the oil and meal industry has long traditions, giving rise to rather large plants by Norwegian standards. The latest development is the freezing plants which were introduced after World War II.

Of the total catches in 1992, the following table illustrates the per cent distribution of the use.

Table 10. Use of the total catches, 1992
(per cent)

Fresh	16.6
Frozen	13.9
Dried	1.5
Salted	8.1
Canned	0.3
Meal and oil	58.7
Other	0.8

The major part of Norwegian fish products are exported. The most important exports are given in the following table.

Table 11. Major Norwegian fish exports 1992
(farmed fish excluded. Mill.NKr)

Fresh fish and fillets	833
Frozen fish excl. fillets	1535
Frozen fillets	1478
Fresh and frozen herring	862
Salted fish	884
Dried fish	418
Bacalao	1769
Canned fish, caviar	716
Crustaceans etc.	817

These exports amount to a total of 9 312 m. NKr compared to a total export of fish products of 15 399 mill. NKr. Of the latter farmed fish amounted to 4 836 m. NKr.

There is little of vertical integration in the industry. Some very few enterprises combine harvesting with processing. But in general these two activities are economically separated.

Profitability

It is natural that a combination of over-capacity and strict quota regulations gives rise to low profitability in the industry. The economic outcome in the industry is usually described by two measures. The first is wage costs per man-year. The other is called "wage power" (authors transl.) which is what is left for remuneration of labour after all cost, including capital costs, are deduced from gross income. A difference between the two illustrates the profitability of capital investment in the industry.

For 1991, these two figures were:

Table 12. Overall profitability measures

	Wage costs per man-year	Wage power 1000 NKr
All fisheries	280	196
Cod fisheries	266	189
Herring fisheries	313	203

Also, other data illustrates the problem of over-capacity leading to non-coverage of capital costs. For the cod fisheries, the Directorate of fisheries has estimated over-capacity today and under different assumptions about quotas and product value. Under 1990 conditions, to cover total capital costs, the capacity of the fleet should be reduced by 56 per cent. If product value should increase by somewhat less than 50 per cent, capacity should be reduced by 32 per cent in order to cover capital costs.

One may be surprised that such high activity is carried on when capital costs are not covered. Several answers may be suggested. Earlier, the negative profitability of capital investment was covered by state subsidies to some extent. One may not yet have seen the consequences of the abandonment of subsidies. Another factor may be that, granted that variable costs are covered, it may be worthwhile to keep up the activity waiting for better times. The presumption could be that some good years will more than compensate for a string of bad years.

PART II: THE NORWEGIAN MANAGEMENT SYSTEM

Fishery policy instruments

The instruments used in fisheries policy in Norway may be classified in several ways. Firstly, some instruments are established by laws passed in the Storting (Parliament), while other measures are taken at lower levels of government. In the latter case, the background for decentralised decisions will be a law, usually formulated in a rather general way.

Three laws regulate the entry into the fishing industry:

- Act of 5 December 1917 relating to registration and marking of fishing vessels. According to this act all fishing vessels shall be entered into a special register, and marked in a prescribed way.

- Act of 20 April 1951 concerning fishing with trawl. Under this law, a licence is needed for all trawl fishing.

- The Participation act of 16 June 1972. This law regulates the right to buy and sell fishing vessels. A general dispensation is given for vessels smaller than 50 feet, and special dispensation can also be given. This law also regulates the replacement of one vessel with another, the basic condition being that such replacement does not increase the catch capacity.

Of great scope and importance is The Act of 3 June 1983 relating to salt-water fisheries. This law gives the legal basis for a great variety of instruments used in management, in practice administered by the Ministry of fisheries, the Directorate of fisheries and other decentralised authorities in the day-to-day and year-to-year policy decisions.

Overview

On the basis of the Salt Water Fisheries Act and other laws, a variety of instruments are used in Norwegian fishery management. One possible way of classifying these may be the following:

- Input regulation

  - Indirect
  - General
  - Specific

- Output regulation

Indirect input regulation

By this is meant measures which influences input of factors into the fisheries, not by direct decisions towards fishers, but by changing the economic conditions for the industry, thereby producing incentives or dis-incentives. Examples are loan possibilities and conditions in the state Fishery bank. At present official policy is to eliminate all direct and indirect subsidies through the bank. Part of the fleet is financed through this bank.

Earlier, the government, in order to reduce capacity, financed the withdrawal of vessels from certain parts of the fisheries.

To reduce the capacity in the cod-trawler fleet, Norwegian authorities in 1990 introduced a system offering the possibility of a merger between two or more licensed vessels. Provided that the other vessel(s) were withdrawn for the fishery on a permanent basis, the remaining vessel could benefit from the quota(s) of the withdrawn vessel(s) until 1994.

Direct and general input regulation

The typical example is the laws, mentioned above, regulating the possibility of owning a fishing vessel. Moreover, the ownership in itself does not give a general or specific licence to fish, nor does it give an automatic quota right.

Specific input regulation

Under this heading there is a number of different measures:

- Gear regulation
- Area regulation
- Time regulation, etc.

The use of these instruments is in most cases left to the discretion of the Directorate of fisheries. In many cases, they are combined, e.g. reserving certain gear for certain areas and/or certain periods. In other cases they are more general, like regulation of mesh size.

Output regulation

Experience has shown that input regulation is not enough to secure a sustainable use of the resources. Direct output regulation has therefore been used since the 1970s. Today most of the fisheries are regulated by quotas.

Since most stocks are shared with other countries, the determination of total TACs is based on international cooperations. The basis for the total quotas is the recommendations from the international council for marine research (ICES). Scientific input is given by member country researchers, in the case of Norway, primarily by the Institute of marine research. On this basis national quotas are negotiated between the countries concerned. For Norway, Russia, EU and Iceland are the main partners in these negotiations.

Given the national quotas, a further procedure is made to distribute these quotas within Norway. After a discussion in the so-called "Regulatory board", the Directorate of fisheries makes a proposal to the political authorities, which finally decide upon the quotas. Members of the regulatory board are organisations with economic interests in the industry, and bureaucrats. The national quotas are distributed between different gears and in some cases between individual vessels.

Recently there has been an evaluation of the national quota system, and some suggestions have been put forward to change the system. Critique of the system has included the following elements:

- The system has mainly been based on biological research. Economic considerations has played too little a role.

- The biological recommendations have mainly been based on single-species research. Multi species interactions have to be taken into account.

- Quotas have been non-tradable. It is argued that ITQs would have reduced the problem of over-capacity.

Introduction of ITQs have been contemplated, but at present the issue is closed. Other measures have to some extent been used in order to reduce capacity, e.g. paying fishers to withdraw vessels from the fishery, and merging vessel quotas on the condition of withdrawal of one vessel.

Also more specific output regulation can be made at the discretion of the Directorate of fisheries. For instance, catch of certain species can be prohibited in certain areas or in certain time periods. Such specific regulations are usually made on the basis of biological recommendations, which are based on the composition of the catches. Moreover, discards are forbidden.

To sum up this overview of regulation policies in Norway, one may say that some basic laws passed in Parliament give the legal basis for a very detailed regulation of the fishing industry. Besides, the above-mentioned relations to other fishery nations form a fundamental basis for the management of fisheries. In internal management little use is made of market mechanisms, a fact that is often criticised by economists.

The cod fisheries

The fleet in the Norwegian cod fisheries is usually divided into two groups: the coastal fleet and the high seas fleet. This corresponds fairly well to a division by length groups - the high seas fleet consisting of larger vessels, while the coastal fleet consists of smaller vessels. Ownership of the smallest coastal vessels is extent exempt from the general regulation of ownership of fishing vessels. The high seas fleet to a greater extent uses active gear (trawl), while the coastal fleet uses mainly passive gear, depending upon the wandering of the cod into coastal areas.

The regulation of the possibility to own a fishing vessel - of most relevance to the high seas fleet - is not very strict. Permits are given for a specific owner and a specific vessel. They are also given for specific stocks and specific gear. As mentioned before, ownership does not give a quota right. Permits also regulate different features of vessels e.g. length. The experience has been that attempts at regulating capacity by such measures are not very efficient, since owners have usually tried to compensate for such regulation by other unregulated features of the vessels.

Input regulation has over the years been supplemented by output regulations. As mentioned above, total TAC for the cod fisheries are negotiated between Norway and Russia on the basis of recommendations from ICES and further divided between the two countries, allowing also quotas for third countries. The further division of the total Norwegian quota is discussed in the Regulatory board, and final decisions are made by the authorities. Usually, the procedure starts by dividing it between the coastal fleet and the high seas fleet. For 1995, the figures for the cod fisheries north of 62 degrees north are:

Total Norwegian quota:	226 460 tonnes	
Of this for vessels below 28 metres:	168 460 tonnes	Total Norwegian quota

Of the group quota for these smaller vessels (corresponding to the coastal fleet) 10 000 tonnes must be caught after 1 October. This regulation has the purpose of securing raw material for the processing industry (mainly fillet production) for the whole year.

The group quotas for the two vessel size groups (over and below 28 metres) are further divided into vessel quotas. These are linked to ownership of vessel and licence to fish. Quotas themselves are not tradable, but, as mentioned above, there is a possibility of merging two quotas on the condition that one vessel is withdrawn from the fishery.

Vessel quotas are dependent upon the size of vessel. For each year a table giving the relation between vessel size and maximal quota is given by the authorities. The sum of the maximal vessel quotas is larger than the total group quota. The fishery is stopped when the group quota is taken, even if some vessels have not reached their maximal quotas. This, apparently, gives an incentive to fish the quota in shortest possible time. This competitive element may be thought to reduce the number of fishing days, thus reducing variable costs. On the other hand the use of vessel quotas may keep up a larger fleet than necessary.

To illustrate, quotas in the smaller size group are for 1995:

Table 13. Cod quotas, 1995

Length	Quota
7-8 mtr	23.0 tonnes
10-11 mtr	42.0 tonnes
15-16 mtr	109.8 tonnes
20-21 mtr	173.5 tonnes
27-28 mtr	226.4 tonnes

A similar table is given for vessels above 28 metres. Comparing quotas for the high seas fleet with the coastal fleet it will be seen that there is a digressive element in the system, intended to redistribute incomes in favour of the coastal fleet.

The use of vessel quotas and group quotas is based on considerations of the possible effects of the two systems. Group quotas may stimulate competition but may also give incentives to increase capacity. On the other hand vessel quotas may reduce competition, but also reduce efficiency.

Thus, the quota system is based on a three stage process: first national quota (negotiated with Russia), then group quotas and then finally vessel quotas. The division into the two group quotas is every year subject to much controversy.

It is generally believed that the TACs agreed upon with Russia during the last decade have contributed to the increase in stock size in later years. Figures 1 and 2 give some support to that view. However, there exist no comprehensive studies which can definitely support this view. As an experiment into this area, regressing stock size of Norwegian-Arctic cod (B) on recruitment (R) and catch (C), both with a 3-years lag gives the following result:

Table 14. Regression of stock size for cod

Multiple Rsq. = 0.3600 F = 3.0921 Sig.(F) = 0.0860

Variable	Coeff.	t	Sig.(t)
Recrut	1.5825	1.753	0.1073
Catch	-2.5254	-1.177	0.2639
Const	1679.5000	2.230	0.0476

This experiment was made on data from 1976 to 1989. The signs of the coefficients are as expected, but the level of significance is low.

Such calculations, obviously, are influenced by many uncertainties. To illustrate the uncertainty in assessing the stock size, Figure 3 gives a picture of different estimates of stock sizes in some years. Moreover, Figure 4 gives a picture of the relation between quotas and reported catch.

The system of non-tradable vessel quotas may be expected to give incentives to keep a larger fleet than what is efficient. Over-capacity thus, is considered a major problem in the cod fisheries as in many other Norwegian fisheries. The Directorate of fisheries has assessed the total over-capacity in the cod fisheries under different assumptions on the size of the total Norwegian quota. The over-capacity was estimated at 40 per cent if the total quota is 300 000 tonnes, and 20 per cent at a total quota of 400 000 tonnes. This may be compared to the 1995 quota of 226 400 tonnes. Over-capacity is present both in the trawler fleet and in the rest of the fleet, greater in the former.

Mesh size regulations are also used in the cod fisheries. As a result of negotiations with Russia, Russia uses a smaller minimum mesh size than Norway, related to a higher preference for smaller fish in Russia. Minimum size is also regulated. This, combined by a general prohibition of discards calls for other instruments in this area. The measure used is to stop fishery in an area where the per cent of fish below minimum size reaches a certain level, usually 5 to 10 per cent. The same procedure applies with regard to bycatch. Vessels are in such cases directed to other fishing grounds. The decisions in these matters are taken on a day-to-day basis by the Directorate of fisheries, based on catch reports.

Other regulations regulate the use of different gears. The most important is the general prohibition of the use of trawl within 12 nautical miles from the coast. In some coastal fisheries e.g. the Lofoten fisheries, the fishing grounds is divided into areas reserved for specific types of gear.

As a general comment, the regulations mentioned above aim partly at resource conservation and partly at distributive targets. The resistance against changing the system of non-tradable vessel quotas is mainly based on a fear of the distributive and regional consequences. A system av ITQs is expected to lead to a concentration of ownership into bigger firms, and also to a regional concentration, perhaps toward the south of Norway, reducing the traditional central role of fisheries in the Northern areas. On the other hand, a change in this direction is expected to lead to greater efficiency and realisation of more resource rent.

Expected gain from better management of the cod fisheries may be caused either by lower cost at given quotas, or by increasing stock size and quotas by better resource conservation. A recent estimate is that present value can be increased by 3 billion NKr by letting today's quota be fishes by the most efficient part of the fleet, 18 billion NKr by better resource conservation. Combining these two gives an additional gain of 2 billion NKr. This may be compared to an estimate of a present value of 14.2 billion NKr in 1989. Better resource conservation in these estimates means building up the stock from today's 1.8 million tonnes and a Norwegian TAC of 300 000 tonnes, to a stock size of 3 million tonnes and a Norwegian TAC of 475 000 tonnes. Thus, even if the resource conservation in recent years are thought to have increased the stock of Norwegian-Arctic cod, there still seems to be room for improvement (Kjelby 1993). These calculations may be viewed as partial, giving little considerations to ecological and multi-species effects.

It goes without saying that over-capacity in relation to quotas gives rise to low profitability in the fleet. Profits have been spread out very thin both by vessel size and geographically. In many cases income has not been high enough to give a remuneration to labour competitive with other industries. Moreover, since 1958, low profitability has been compensated with state support until recent years. This support reached a peak in 1980 of 2.4 billion NKr for all fisheries together, but was at the level of 600 m NKr in 1991. The support is now being abolished. It is officially recognised that state support has been a major factor behind the over-capacity in the fleet.

Another weakness of the state support system was that a major part of the support was in the form of price subsidies. This means that the greater the catch, the lager the support, a feature directly in contrast to the aim of the support system.

The market for Norwegian cod is dominated by some few sales cooperatives which have a legal right to handle all first-hand sales. Prices to fishers are differentiated by quality, and to some extent geographically. The sales cooperative negotiates prices with different sectors of the processing industry, but in case of disagreement, it has the power to fix minimum prices. The price differentiation between different use of fish as input is based on considerations on the economy of the different processing sectors. Thus, the "modern" capital intensive freezing industry has had a lower price than the conventional sector (drying and salting).

The sales cooperatives must take quotas as given. Variations in quotas and catches can be expected to influence the average price on fish, governed by the law of demand. To illustrate, average price of "Lofoten cod" (skrei) has been regressed with time and catch as explanatory variables. The former is introduced to take care of the general inflation. The calculations gave the following results:

Table 15. Regression of cod price
Multiple Rsq. = 0.8353   F = 27.8866   Sig(F) = 0.0000

Variable	Coefficient	T-value	Sig(T)
Catch	-3.5491E-05	-1.694	0.1184
Year	0.3996	3.057	0.0109
Constant	4.1962	2.117	0.0578

The estimates have the expected signs and levels of significance are reasonable good. The low demand elasticity of cod, also documented in other studies, indicates a high price flexibility, large catches giving rise to decrease in price. The calculations here is based on data from 1977 to 1990.

Profitability in the fisheries are measured in different ways. The figures mostly in use are earning power per man year, and wage compensation per man year. For the cod fisheries, below are some figures in NKr:

Table 16. Profitability in cod fisheries

Year	Earnings capacity per man year	Remuneration per man year	Income per year adult sailors
1975	43 700		
1980	91 900		
1986	218 200	222 400	146 868
1989	103 000	199 900	178 896
1992	195 900	261 200	231 408

In the table, these two indicators are compared to the average income of adult Norwegian sailors. The figures include the whole group of cod fisheries, including haddock and saithe. As seen, profitability varies very much both over time and in relation to other groups.

The difference between the two indicators above illustrates the lack of profitability in the fisheries. In the former, deduction of capital costs is made. Another comment on these figures is that they illustrate the over-capacity in the fleet.

Herring

The herring fisheries in Norway have had a rather dramatic and puzzling history. Huge quantities of herring have turned up at the coast from time to time, then disappearing, and then turning up in a different sector of the coast. One "golden age" of the winter herring fisheries was at the end of the last century. Then, catches were mainly in the south west coast. Another peak occurred in the 1950s giving enormous catches at the mid-Norwegian west coast.

In periods with average or large catches, the major part of the catches is processed into oil and meal. In years with small catches, most of the quantities are processed into different consumer products. This of course, depends on the ability to pay in different processing sectors. Moreover, besides herring, capelin has been the major input in the oil and meal industry. In the long period after the collapse of the herring stock after 1960, capelin has been the dominating input. But, as will be seen later, the stock of capelin also has undergone dramatic changes.

The herring fisheries are subject to the same general regulations as other fisheries. This includes regulations on the possibility to acquire a fishing vessel and also permits to fish. Moreover, the law regulating the salt water fisheries gives a general legitimisation to the authorities to a detailed regulation of different aspects of the fisheries. Decisions in this area are left to the Directorate of fisheries on a day-to-day or a year-to-year basis. This includes opening or closing of fisheries in certain areas, mesh size, minimum fish size, maximum bycatch, general prohibition of discarding etc.

The purse seiner fleet harvesting herring, capelin, mackerel and other inputs to the oil and meal industry is one of the very few examples of an efficient reduction of the capacity in the fishery fleet. From 1970 to 1990, the number of vessels in this part of the fleet was reduced from 279 to 100. Of these 68 were sold abroad. Between 1975 and 1990 55 vessels were scrapped under a government program financing withdrawal from the fisheries on the condition that the vessel was sunk. A similar reduction of capacity took place in the oil and meal industry, induced by the reduction in available raw material. Part of the reductions in the number of vessels was compensated by increased size of vessels.

Still, the capacity of the fleet was by 1992 estimated too high in relation to the resources. It was then estimated that the capacity of the fleet would have to be reduced by 25 per cent in order to balance the resource situation in an economic way.

Input regulations alone have not been able to cope with the dramatic changes in the stock of spring-spawning herring. Figures 6 and 7 below give an indication of these changes. At the end of the 1960s, the stock was almost extinct. It seems unlikely that the large catches in the 1950s was the sole reason for this development. Hitherto unexplained biological factors must have taken a significant part.

Moreover, there was a virtual moratorium on harvesting on this stock between 1970 and 1975, except for small and so-called "fat herring" for consumption purposes. And, as seen from the figures, gradually the stock started to recover. In the 1980s a gradual increase in catches was allowed. It is believed that the possibility to harvest small herring hampered the build-up of the stock.

Like in other fisheries, detailed output regulation is made by a combination of total TAC and individual vessel quotas. The total TAC is agreed with Russia, and based on recommendations from biologists. Agreed TACs are for 1994 377 000 tonnes (Norway) and 73 000 tonnes (Russia). These figures may be compared to the catch of 1 145 859 tonnes of "winter herring" in 1956.

The national TAC is at the outset further distributed into quotas for the trawler fleet and the purse seiner fleet, respectively. This is an arrangement comparable to the distribution of the cod TAC between the high seas fleet and the less capital intensive coastal fleet. And between the two groups in the herring fisheries, the distribution includes a distributional element in favour of the purse seiner fleet.

Within the two "herring fleet groups", individual vessel quotas are distributed according to vessel size. These quotas are approximately proportional to vessel size.

Compared to the huge profits made in the herring fisheries during the "golden" 1950s, profits, clearly, in the industry have been very low since. The decline in the allowable catches have been somewhat compensated by the aforementioned reduction in capacity. But still, over-capacity is reducing profitability. This can be illustrated by the figures below in NKr:

Table 17. Profitability in the herring fisheries

Year	Earnings capacity per man year	Remuneration per man year	Income per year adult sailors
1975	30 800		
1980	56 100		
1986	69 400	182 800	146 868
1989	185 600	297 600	178 896
1992	203 400	331 700	231 408

"Herring fisheries" in this statistic includes capelin and some other harvesting of input to the oil and meal industry.

Capelin in the Barents Sea

For many centuries, the role of capelin was to feed the so-called "capelin cod" coming into the coast of Finnmark in the spring, giving a base for the "spring cod fishery" along the Finnmark coast after the season of the Lofoten cod fisheries. It was only after 1960 the capelin stock in the Barents Sea was considered an interesting stock in itself, mainly as an input to the oil and meal industry. Since then, capelin has been an important element in this industry, and has also been subject to dramatic changes, comparable to those of herring.

The capelin fisheries are subject to the same national and international regulation as most other Norwegian fisheries i.e. international agreement on total TAC and national regulation based on the Salt Water Fisheries Act.

The dramatic development of the capelin fisheries is illustrated in Figures 8 and 9. After the decline in stock and catches in the 1970s, The Russian-Norwegian joint fisheries commission introduced regulation on total TAC, based on recommendations from ICES from 1979. Since then, however, there have been two marked cycles. By 1986, the stock of capelin in the Barents Sea broke down. This led to a moratorium on capelin fishery during the years 1987 to 1990. The stock then increased so that by 1991 it was at a level comparable to the early 1970s. The a new breakdown followed by 1994, leaving the stock almost extinct. On this background a new moratorium on capelin fishery in the Barents Sea was introduced in 1994.

The total TAC on capelin in the Barents Sea should be based on the best existing knowledge, as transmitted from the ICES. Thus, it may seem unlikely that lack of management is the reason for the failure to keep up a stable stock. Rather, it seems that it is the lack of a firm scientific basis for the regulation which is the problem. The development of the stock seems to be more governed by hitherto undisclosed natural fluctuations than by catches. In particular, researchers are today interested in the interaction between the most important stocks in the area - sea mammals, cod, herring and capelin. Sea temperature in the area is also thought to play a significant role in the ecology.

Like in the other fisheries national TAC is further distributed into vessel quotas when capelin fishery is permitted. A distributive element has been included in the system of vessel quotas, but since the capelin fishery belongs to the more capitalistic part of the Norwegian fisheries, this has not been very marked.

Statistically, the capelin fishery is classified under the herring fisheries. Thus, the figures on profitability in the section on herring above, also apply for the capelin fishery. Moreover, the capelin fishery has been dominated by the purse seiner fleet. In the absence of the possibility to harvest capelin in the Barents Sea, this fleet has exploited other stocks - capelin in other fishing grounds, herring when this has been possible etc. Thus, the breakdowns of the capelin stock in the Barents Sea have not had a comparable dramatic economic consequence for the purse seiner fleet.

Other aspects

Harvesting

Integration. There is little integration in Norwegian fisheries. The two most important examples are FRIONOR, and FINDUS. The former is an example of horizontal integration. A number of processing firms are marketing a variety of products under a joint brand name. On the basis of their total input demand, they are in a position to influence the activity of the fleet. This cooperative operates mainly in the cod and nearby fisheries.

FINDUS is a foreign owned company operating in Finnmark. It has both a processing plant and a fleet. This also mainly operates in the cod fisheries.

The herring fisheries have for a long time had a sales cartel, which has had great influence over harvesting, research and marketing. For instance, it could stop harvesting when the capacity limits of the processing plants was reached.

Safety. Historically, fisheries has been an industry with a high frequency of accidents. A government commission investigated accidents in fisheries in 1984-86 and concluded with proposals for reducing the frequency of accidents. One proposal which has been put into effect was to introduce mandatory safety courses for all fishers. Other proposals included construction details for fishery vessels, safety equipment etc. It was concluded that small expenditures in these areas would have great effect. And, furthermore, that much of the accidents could be reduced by better education.

The accident rate in the Norwegian fisheries has declined in later years, in general opinion. However, the system of accident compensation has been included in the general social security system. Thus, the statistical information has been less transparent, and moreover, economic incentives to reduce accidents have been reduced.

Gear conflicts. For centuries gear conflicts have been an issue in Norwegian fisheries, now and then giving rise even to violence. The conflict dimension has mainly been between modern and old gear. But in general, conflicts have been handled by the authorities, reserving specific areas for specific gear. An illustration is the general prohibition of trawl fishery within 12 nautical miles from the coast.

Perhaps the most important issue in this area in recent times is the possibility if conflict between fishery and the offshore oil industry. To compensate for possible damages by the oil industry on the fisheries, an "oil-fish fund has been set up". Apparently, the negative effects have been minor, even in the case of pollution.

Social aspects

As indicated above, the long run development of the Norwegian fisheries has been from a small-scale labour intensive industry, to a great degree in combination with farming, to a professionalised industry based on modern vessels and gear. But still, the old type of fishery exists in the coastal fleet. The background for the general development is cheaper and more efficient technology, and relatively more expensive labour. It is mainly in rural districts with low alternative cost of labour that the old combination and traditional fishery exist.

Tension between these two sectors is partly between the coastal and the high seas fleet, and partly between the southern and northern districts of Norway. In particular, the distribution of quotas between the high seas fleet and the coastal fleet is a regular issue of dispute.

It is sometimes argued that the system of individual vessel quotas gives rise to a kind of "quota nobility" which can be seen as ownership of a share of the fish stock. Traditional inertia in the management system may account for this.

Even if quotas are not transferable in principle, the fact that quotas are linked to specific vessels means that the price of a vessel traded, may include the value of a quota. That this is the case has been documented by research.

Administration

The administration of Norwegian fisheries is divided between the Ministry of fisheries in Oslo, and the Directorate of fisheries in Bergen. Besides, in most counties there is local fisheries advisors, financed by the government.

Ideally, the Ministry should be a political body, while the Directorate should be an expert and research organisation. In practice, the division is not that clearcut. The directorate is delegated many decision which, in principle, is of a political nature.

The size of the fisheries administration in Norway is large, by international standards. An it has increased over the years. One major factor behind this is the introduction of many detailed regulations since 1970. For 1991, it was estimated that the public expenditures for the traditional fisheries amounted to 12 per cent of the first hand value of the catches. Half of this was control activity (including the Coast guard) and the other half was advisory activity, management and research.

The Salt Water Fisheries Act gives the legal basis for inspection and control of the fisheries. This includes control of mesh size, of the composition of catches by species, size etc. Failure to adhere to the regulations is punishable by fines, confiscation of catches and withdrawal of licences and quotas.

The costs of the administration of fisheries are paid by the central government. Proposals of a "resource tax" have sometimes been put forward, but so far it has not been introduced.

Some concluding remarks

Summing up, the three major issues in the Norwegian fisheries management have been resource conservation, efficiency and distribution. As for resource conservation, it is fair to say that in the case of cod fisheries and herring, the conservation has been fairly successful. A tight regulation of TAC on cod (together with Russia) has apparently led to an increase in stock size in the last ten years. And the long-lasting moratorium of herring fisheries has led to a rebuilding of stock size. As for capelin, it seems that the biological understanding of its population dynamics is not good enough. The moratorium between 1986 and 1991, was not enough to prevent a new breakdown of the stock in 1993. It may seem that a satisfactory management of capelin must rest on a more thorough understanding of the interaction between the major species in the Barents Sea.

As an average consideration, the efficiency of the Norwegian fisheries leaves much to be desired. This is not a comment on the individual activity of the vessels. On the contrary, the fleet to a great extent consists of highly efficient vessels with modern efficient gear. The problem in this area is that of over-capacity. The over-capacity, which in some sectors has been estimated to almost 100 per cent, means that the possible resource rent in the major fisheries is dissipated. There is little of incentives to reduce capacity and costs. Some changes have been made, in particular in the sector producing input for the oil and meal industry. Introduction of ITQs have been considered, but is by now a closed issue.

Generally speaking, lack of efficiency can be seen as the costs of reaching some distributional goals. These are partly of a regional character. A more capitalistic organisation of the fisheries, including ITQs, is thought to have considerable negative regional and distributional effect. Moreover, the reduction of the state support of the fisheries, partly by international agreement, may over the next years turn the balance more in favour of efficiency more than distribution.

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POLAND

Summary

After a dramatic decrease of Polish total catch of 22 per cent in 1993 a certain stability was noted in Baltic fisheries and even some growth in deep-sea fishing resulting in a total increase of 9 per cent in 1994 (394 533 tonnes in 1994 compared to 361 448 tonnes in 1993).

The deep-sea fishing relies highly on agreements concluded with the United Kingdom (Falkland area), Canada, Norway, New Zealand and others securing access in their EEZs for Polish fishing and factory vessels. A crucial area for deep-sea fishing in the next three years is the strip of open waters in the Sea of Okhotsk. The terms of operations would be the subject of a Polish-Russian agreement corresponding to Article 116 in conjunction with Article 63, para. 2 of the UN-Convention on the Law of the Sea. Since the negotiations are pending it is difficult to predict the size of operations and the volume of catches of Alaska pollack in the said area for the next few years. The Polish Baltic fisheries was characterised by two main phenomena. The first one was the continued decline of stock of cod as a result of which 421 Polish fishing boat operators were allotted with very scant individual quotas amounting to some 15 per cent of their catch capacities. The second phenomenum constituted a low utilisation of TAC for herring and sprat which resulted from purely economic reasons. In consequence the fishers complained about the low quotas for valuable cod and low ex-vessel prices for generous quotas for herring and sprat.

Allowing for the present state of fish resources and very differentiated market conditions for particular species of fish the following measures have been devised, hoping to be enforced within 1995 and 1996. They are:

- the introduction of individual transferable quotas (ITQ); and
- limitation of fishing effort (number of fishing vessels).

In this manner the existing overcapitalisation could likely be decreased in the future and the operations could bring more economic gain.

Government action

Resource management

Poland continues to keep two distinct types of fleets with two respective kinds of operations. For this reason two different fisheries policies have been developed by the government in the last twenty years.

In the case of deep-sea fishing the main goal is to secure access to the resources in foreign EEZs or in the high seas. The main instrument for achieving the said goal are co-operation agreements or joint venture contracts. In 1994, access was secured in the Okhotsk Sea, in the New Zealand waters and - to some extent - in the Falkland area including the Arctic region. As for the open waters in the Okhotsk Sea the negotiations with the Russian Government have been pending. The disputes focus mainly on the terms of access and will hopefully be concluded by 1995. As for the catches within the Polish EEZ in the Baltic, their size is determined by the annual recommendations of the International Baltic Sea Fisheries Commission. It refers to four main species: cod, herring, sprat and salmon. Due to the dramatic decrease of biomass of cod all parties of the IBSFC including Poland were accorded with the very low total allowable catch levels (TAC) in 1993 and 1994. For Poland, it was set at a level corresponding to 15 per cent of the average annual catch received in 1980-85. Specifically, the TAC for cod in 1994 amounted to 12 660 tonnes compared to catches of 120 942 tonnes in 1981 and 63 260 tonnes in 1985. It raised several complaints by fishers which obviously could not be respected by the Government.

In contrast to cod, the TAC for herring and sprat has not been utilised; the exact figures are contained in Table 2. The reason is purely economic in nature: low prices. In the wake of the poor state of the stock of cod and its slow recovery some schemes were prepared for limiting of fishing effort combined with a compensation for temporary withdrawals from operations by specific fishing boat operators. A new law of fisheries has been worked out and submitted to the Parliament with the hopes of implementation in the first months of 1995. The individual transferable quotas (ITQ) plus effort limitations will serve as the main tools to improve the economic efficiency of Polish Baltic fisheries.

Furthermore, the recommendation of IBSFC issued in September 1994 regarding the credibility of fishery statistics is being implemented by the Government.

Financial support

Starting from 1990, no direct aid to fishers or fish processors has been provided by the Government in form of subsidies of any kind. Indirect expenses, however, are financed from national budget i.e. maintenance of fishing harbours, training of seagoing personnel and some research related to living resources.

As of 1993, fishers pay lower prices for fuel and get credit at a preferential rate of interest. The lower fuel prices correspond to the custom duties from which the fishers are exempted. The preferential interest is lower than that used in Poland although twice as big as the rate prevailing in EU countries.

Economic efficiency

In deep-sea fishing 3 enterprises utilising 42 fishing and processing trawlers received zero profit in 1994. It should be added that the profitability of operations is highly vulnerable with regards to the terms of exploitation of the resources in foreign EEZs, and in particular on the royalties agreed by both parties. Hence, zero profit achieved in 1994 does not provide an indication of the financial outcome which could occur next year. In the Baltic fisheries, 1994 was the fourth consecutive year of deterioration of the economic standing of fishers. The crucial factor in this respect was the scarcity of cod. A scheme was prepared in 1994 by the Sea Fisheries Institute in Gdynia to ameliorate the economic efficiency of Baltic fisheries. The scheme would rely on two principal instruments:

- the introduction of individual transferable quotas (ITQ);
- the flexible limitation of fishing effort.

The scheme will be discussed with the fishers's organisations before it is implemented, probably in the beginning of 1996.

Structural adjustments

There were no specific steps taken up by the Government within 1994 in reference to adjusting the Baltic fisheries to available resources or markets besides observing TAC levels and monitoring other regulations protecting the resources within safe biological limits. No specific structural changes were initiated by the Government in terms of composition of the fishing fleet due to lack of investment by the fishers. Some plans in this respect have been devised for the future.

Bilateral arrangements

In 1994 several agreements were renewed or concluded aiming to facilitate the exploitation of fish stocks by Polish distant water vessels. These are:

- Falkland's agreement for catching squids;
- Norway's access to gadoid species within annual quotas;
- Canada's agreement for purchase of hake from the fishing grounds;
- New Zealand's agreement for exploratory and commercial fishing.

Some other agreements are being negotiated. The most important one referred to the open waters of the Sea of Okhotsk is still being discussed by the Polish and Russian Governments. From the Polish standpoint the cooperation on the Okhotsk Sea should fall under Article 116 with reference to Article 63, para. 2 of the UN Convention on the Law of the Sea.

Sanitary regulations

The sanitary and quality regulations in the Polish fisheries have been adjusted within the last four years to the standards of the EU.

The Sea Fisheries Institute is involved in initiating and monitoring this procedure and is supported by funds allotted by the Polish Committee of Scientific Research. A remarkable number of Polish fish processing plants match in term of quality processing plants located in EU countries. Some others, however, are behind in this challenge. It is predicted that the entire process of upgrading the sanitary regulation may take two to four years.

Trade regime changes

In general, a liberal foreign trade policy introduced in 1990 had been continued through 1994. There are no restriction, whatsoever, in export of all kind of fish products. Likewise, no quotas or licences for imports are in force. A uniform ad valorem border tax of 5 per cent is levied on all agriculture - and industrial - commodities. In the case of fish fillets a custom fee of 15 per cent is charged; other kinds of fish products are charged with a custom fee of 10 per cent.

Exports are not subsidised in any form.

Aquaculture

Aquaculture in Poland consists of 880 producers of different size concentrating mainly on carp and trout. It covers an area of 60 000 hectares of fish ponds and lakes (excluding rivers). Over 100 producers are engaged in processing their own fish on a small scale. In 1994 the total production amounted to 52 000 tonnes deriving from all sources: ponds, lakes and rivers. Over 50 per cent of total production is sold and consumed during Christmas as a result of the Christian traditions of the country (mainly carp). It appears that the demand for inland fish in Poland is saturated. The increase of prices in 1994 compared to 1993 was negligible.

Production from capture fisheries

Fleet

The size and tonnage of the Polish fishing fleet had been in constant decline within the last several years in both areas of operations:

- distant water fisheries, mainly in North-west and North-east Pacific (FAO Statistical areas 61 and 67);

- Baltic fisheries within Polish EEZ.

In particular, the number of fishing and factory trawlers dropped from 45 to 42 in 1994. In the group of Baltic size trawlers the number increased by 7 in 1994; nonetheless the decline by 40 boats in 1993 has not been offset. Eventually, the total tonnage of Polish fishing vessels amounting to 176 132 GRT at the end of 1992 decreased to 160 663 GRT in 1993 and, in turn, to 153 373 GRT in 1994.

Likewise, the number of auxiliary vessels, operated mainly in the North Pacific area declined from 12 at the end of 1993 to 5 at the end of 1994. Their tonnage dropped dramatically from 71 262 GRT to 30 567 respectively. These vessels were sold to other shipowner outside fisheries due to lack of cargo and ability to generate profit. Some other detailed figures expressing the changes in the structure and tonnage of the fishing fleet are shown in Table 1.

It should be noted that due to very low investment propensity on the side of fishers no new vessels were ordered in 1994 in Polish or foreign shipyards. This results from the severe overcapitalisation in the Baltic fishery in terms of number of vessels, engine HP and GRT. The catch capacity in the Baltic fleet, however, is assessed to be slightly higher in 1994 than a year ago due to some improvements in the design of fishing gear and electronic fish locating outfits purchased by some fishers. The potential catch power cannot be associated directly with fishing effort. The latter, if measured in number of fishing days had declined in last year by 4 per cent. This trend has continued since the early 1980s. Very often the fishing vessels have been idle most of the year due to low catches.

Operations

Most of the Polish fishing and factory trawlers operated in the North Pacific area. In 1991, these vessels moved from the open waters of the Bering Sea to the strip of open waters of the Sea of Okhotsk continuing their operations through 1994.

Simultaneously, the discussion commenced between the Polish and Russian Government delegations as to the terms of operations and quotas the Polish trawlers can be accorded by Russian authorities. The Alaska pollack caught there is a migratory species moving through both Russian EEZ and the open, internationally accessible waters. It is expected that the negotiations will be concluded by the end of 1995 or earlier. At the moment no predictions can be made in respect of quantities the Polish vessel will catch in this area in the future. Two fishing and factory trawlers were involved in exploratory and commercial fishing within the New Zealand EEZ based on a joint venture agreement with the local company. The exploratory fishing in the high seas has continued with two vessels catching and processing Antarctic krill. A modest quantity of squids were harvested in 1994 corresponding to the agreement concluded with the United Kingdom. No special changes have been observed over the profile and catch composition of Polish Baltic fisheries. The fishers were anxious to get bigger individual quotas for cod which only amounted to 12 660 tonnes for all 421 Polish Baltic small trawlers. The tendency to exceed individual quotas for cod was observed combined with a scarce utilisation of quotas for Baltic - herring and sprat.

Results

Deep sea fishing in 1994 demonstrated slightly better output than in 1993. Most of the 271 167 tonnes of Alaska pollack caught in the Sea of Okhotsk was processed to fillets at sea and exported by the use of auxiliary vessels. However, due to big distances, expensive supply of the vessels and difficult catching conditions the cost of operations was high and three deep sea fishing companies got no profit. The Baltic catch in the Polish EEZ was in 1994 almost on the same low level as in 1993. The overall catch per unit of effort was deteriorating amounting to some 40 per cent of the figures noted in early 1980s. A slight increase, however, was noted in case of cod giving rise to hope that the stock of Baltic cod would slowly recover within next years. Meanwhile the fishers complained about the low ex-vessel prices for Baltic herring and sprat. Some of them are not able to repay debt in local banks.

Processing and marketing

Handling and distribution

Over 70 per cent of total catch was processed, and frozen at sea on the board fishing and factory trawlers. These final products have been exported to the United States and other countries located closer to fishing grounds than Poland. The pattern of export was more or less the same as in the preceding year. The prices of frozen fillets of Alaska pollack were in 1994 higher by 4 per cent than those received in 1993 on average.

In the Baltic fishery ll species were landed fresh on ice. Herring and sprat were delivered to Polish fishing harbours whereas over one half of cod was sold by the fishers straight to processors in foreign harbours (Denmark and Sweden). The prices for cod in Polish harbours were higher by some 16 per cent in 1994 compared to 1993 whereas the prices for pelagic fish increased by 8 per cent on average. Inflation amounted to 24 per cent. Fish auctions in five main fishing harbours in Poland had not been established by the end of 1994 to replace the former state owned monopolistic trade organisation "Centrala Rybna" dissolved in 1991/92. Individual's buyers organisations do not exist.

Processing

As it has been mentioned above processing and freezing at sea in deep sea fishing remained in 1994 unchanged compared to 1993. The quality of the final products met the requirements of the foreign buyers, so no significant changes on the side of the deep sea fishing companies or Government intervention, in this respect, was needed. The raw material flowing in from the Baltic fisheries was processed in the inland processing plants, the number of which have grown enormously. From 1991 to 1994 roughly 280 private processing plant of different size and profile were established beside the existing 9 state owned processing companies. Such a big inflow of investment capital resulted in a significant growth of processing capacity exceeding the supply of fish derived from local catches. In consequence, the import of frozen raw material and final products increased from 148 647 tonnes in 1992 to 154 866 tonnes in 1993 and probably by 10-12 per cent more in 1994 (the exact figures will be produced in a final version of the Review). Imports were thus almost twice as big as exports. The variety of final products widened and most of them, in terms of quality and prices, may be competitive in the foreign market.

Domestic market

The total domestic market supply in 1994 amounted to roughly 180 000 tonnes of final product, of which 82 599 tonnes came from privately owned processing companies, some 65 000 tonnes from the state-owned enterprises and the rest from foreign suppliers. Of the total supply, canned fish made up 24 per cent; marinades 22 per cent; frozen fillets 15 per cent; fresh fish 12 per cent; salted herring 11 per cent; smoked fish 11 per cent, and other products 5 per cent. The prices for fish final products increased, in average by approximately 17 per cent i.e. less than for all other food products which increased by 24 per cent (data for 10 months of 1994).

Outlook

Deep sea fishing. It is very difficult to predict the size of operations and the magnitude of catches for the next few years. The decisive factor is access to the open waters of the Sea of Okhotsk. It appears that the year 1995 will be crucial for the Russian-Polish negotiations regarding the terms of exploitation of Alaska pollack in that area. The extensive exploratory fishing on high seas may also bring some results. Deep sea fishing as a sector of Polish fisheries must soon go through serious changes, adjusting it size and terms of catch to the new requirements of other countries. Joint ventures agreements with foreign partners will constitute one of the most significant elements of transformation of the Polish deep sea fisheries.

In Baltic fisheries some first slight recovery of stocks of cod was noted giving rise to hopes of increasing catches. Regarding the prospects of better utilisation of herring and sprat, Polish catches may grow, in total, from 100 000 tonnes in 1993 to 150 000 tonnes in 1997 (75 per cent of the level achieved on average between 1980-84). Some inducements in this respect are, however, needed on the side of the Polish Government.

The new law of fisheries was conveyed to the Parliament with expectation to be implemented in March-April 1995. Corresponding to the new law, individual transferable quotas (ITQ) will be introduced in the Polish EEZ. The strict regulation of fishing effort combined with the temporary withdrawal of excessive vessels will probably be introduced starting from 1996 or 1997.

Similarly, the establishment of fish auctions is anticipated in the next years which would improve both:

– the manner of trading and handling;

– the credibility of catch statistics.

In consequence, the resources of the Baltic Sea can be exploited more rationally with more economic gain than in the past.

Table 1. Fishing fleet and fishers 1992-1994

	1992		1993		1994[a]	
	Number	Total GRT	Number	Total GRT	Number	Total GRT
Total trawlers:	508	176 132	466	160 663	470	153 373
0 - 24.9 GRT	5	109	4	93	4	93
25 - 49.9 GRT	218	8 770	207	8 347	211	8 489
50 - 99.9 GRT	41	3 379	40	3 237	40	3 237
100 - 149.9 GRT	173	18 755	153	16 404	156	16 722
150 - 249.9 GRT	18	3 212	17	3 034	17	3 034
250 - 499.9 GRT	-	-	-	-	-	-
500 - 999.9 GRT	-	-	-	-	-	-
1000 - 1999.9 GRT	6	8 748	-	-	-	-
2000 and over	47	133 159	45	129 548	42	121 798
Unknown tonnage	-	-	-	-	-	-
Total : Small motorised vessels less than 14 m LOA	781		779		783	
Total : Vessels without engines less than 14 m LOA	89		88		88	
Total : Subsidiary vessels	13	72 947	12	71 261	5	30 567
Fish carriers :						
1000 - 1999.9 GRT	1	1 686	-	-	-	-
2000 - 3999.9 GRT	4	11 065	4	11 065	2	6 471
4000 - 9999.9 GRT	8	60 196	8	60 196	3	24 096
Mothership 1000 - 9999.9 GRT	-	-	-	-	-	-
Total : Commercial fishers	14 350		12 090		11 500	
Full-time	-		-		-	
Part-time						

[a] Provisional data.

Table 2. TACs, Allocations and Catches
(metric tonnes)

	1992					
	TAC for Baltic Sea	Allocation for Polish EEZ	Transfers		Available catch	Total catch
			from others	to others		
Cod	100 000	21 100	-	-	21 100	13 315
Herring	486 000	81 000	-	-	81 000	52 864
Sprat	201 000	53 000	-	-	76 000	30 127
Atlantic Salmon	3 980	230	-	-	230	170

	1993					
	TAC for Baltic Sea	Allocation for Polish EEZ	Transfers		Avail-able catch	Total catch
			from others	to others		
Cod	40 000	8 440	-	-	8 440	8 900
Herring	650 000	112 800	7 000	1 000	118 800	50 800
Sprat	350 000	92 400	-	5 000	87 400	33 700
Atlantic Salmon	759 000[a]	42 250[a]	-	2 000[a]	40 250[a]	36 000

	1994					
	TAC for Baltic Sea	Allocation for Polish EEZ	Transfers		Available catch	Total catch
			from others	to others		
Cod	60 000	12 660	-	-	12 660	
Herring	650 000	112 800	10 000	1 000	121 800	
Sprat	700 000	184 800	-	12 000	172 800	
Atlantic Salmon	720 000[a]	37 000[a]	-	2 000[a]	35 000[a]	

a) 1993 and 1994 figures for salmon expressed in number of fish.

Table 3. Polish normal catches
(metric tonnes)

	1992	1993	1994[a)]
Total	463 390	361 448	394 533
Flatfishes nei	3 905	5 101	4 800
Atlantic cod	13 314	8 909	14 000
Saithe	1 238	937	150
Alaska pollack	297 732	235 208	271 167
Southern blue whiting	15 177	8 351	9 812
Argentine hake	24	32	-
Southern hake	69	-	-
Patagonian grenadier	1 321	258	33
Atlantic herring	52 864	50 833	41 000
European sprat	30 127	33 700	37 500
Antarctic krill	17 250	4 329	8 297
Patagonian squid	9 300	3 811	593
Argentine shortfin squid	16 932	6 421	2 390
Squid nei	2	13	-
Other	4 135	3 545	4 791

a) Provisional data.

TURKEY

Introduction

In 1991, the Ministry of Agriculture and Rural Affairs (MARA) decided to re-orient its attitude towards the development of the fisheries sector as a whole. In formulating and executing a plan for the sectorial development, the need to have access to the following information has emerged:

- to diagnose the state of the fisheries (including the potential fisheries that may be developed based on unexploited resources if any;
- to measure production and utilisation potentials;
- to identify the changes/interventions required in the exploitation, utilisation and management that must be made in order to benefit from the potentials;
- to specify technically the measures and action necessary for effecting the indicated changes;
- to make a choice among the alternatives that will achieve the identified objectives within the available financial means; and
- to formulate and execute plans to promote and implement the chosen changes.

In an effort to collect the necessary information, based on which can drawn up a development programme at the micro level, MARA has formulated a number of survey projects both in marine and inland capture fisheries and in aquaculture, that are presently being implemented. One of these surveys is the Demersal Fisheries Survey of the Marmara, Aegean and the Mediterranean Seas, which was completed in August 1993. A second survey, on the assessment of the living resources and the environment of the Black Sea is planned, for which financial resources are being sought.

While some of the survey projects are being executed and others being planned, Ministry of Agriculture and Rural Affairs was reviewing its mandated functions and responsibilities in the Fisheries Sector to ensure that the flow of information required for the administration of the sector and that the management of the resources to achieve a sustainable development will be attained. The envisaged reorganisation will involve building up an adequate institutional infrastructure to meet the administrative and technical requirements of various sub-sectors and in cooperation with the State Institute of Statistics improving the catch statistics, establishing inventories of the primary, secondary and tertiary fisheries industries and developing data centres for the storage and analysis of the relevant data for resource assessment.

Demersal fisheries

Multi-species fisheries

Like most Mediterranean fisheries, the demersal fisheries of Turkey are essentially a multi-species fishery. The response of a multi-species fishery to increased fishing effort is similar to that of a single species fishery, where growth shows a maximum sustainable yield, which marks the upper limit of the stock's production. Beyond this maximum, the average yield tends to drop fairly quickly.

The big difference between the two types of fisheries, however, is that the species composition of catches in the multi-species fishery would change as a result of the gear selectivity or the size composition of the stock will change as a result of different harvesters independently catching the same species using different gear, i.e. the trammel net fishery of red mullet. Different fisheries will spread the economic benefits obtained to different size groups of the population, and may therefore cause overfishing of economically valuable species.

With the information presently available to the fisheries administration, the possible action for the management of the multi-species trawl fishery therefore could only be:

- to improve the value of yield through selectivity of the gear to change the size composition of the species caught;

- technological improvements to the gear to catch various species during closed seasons;

- to identify spawning periods of species forming the catch and determine the closed seasons precisely to minimise losses.

For the future management action, a strategy to be followed should be:

- follow the changes inflicted on the size and species composition (age and species), in catches in order to determine the selectivity and the degree of effort to be applied;

- evaluate the data in economic terms to determine the value of catch and the cost of production;

- experimentally determine the..... to raise the production value by operating on the selectivity of he fishery taken as a whole (mesh size, gear used, time-space distribution of fishing operations). JICA Survey did lot of this study;

- determine the fishing rate corresponding to the exploitation objectives (socio-economic aspects to be considered).

Once the above information is available in adequate time series, the management strategy can be identified and monitored effectively.

Economic Aspects

For the last 20 years or so, fisheries managers in the Mediterranean area have expressed concern on the full or even over-exploitation of the demersal resources. This fact was attributed generally to lack of control of the fishing effort applied to the stocks and ever increasing demand for fresh fish and the resulting high fish prices in the region, especially during the tourist seasons, consequently high pressure was applied on the fish stocks to meet demand.

The narrow continental shelves along the Turkish coastline and rather limited trawling grounds, has caused intensive exploitation of the coastal areas which include the nursery grounds of most fish species. Trawling in shallow nursery areas normally inflict significant damage to the survival rates of the juveniles, and hence to the recruitment of young fish to the fishery. This has often resulted, in the depletion of the standing stocks to a degree that the total cost of fishing more or less equals the total earnings. In the Black Sea fisheries, this point has been reached and even gone beyond where the earnings dropped to a level where the excess fishing effort was diverted to elsewhere in Turkish waters, i.e. the Aegean and Mediterranean seas, or boats have been converted to tourism industry needs for higher economic benefits. At the beginning the deployment of the vessels and gear in other fishing areas may have solved the economic problem of the Black Sea fishers by increasing the individual earnings, at the expense of the Mediterranean fishers, until such time that the stabilisation of the yield at a low catch per unit of effort level reduced the initial profitability to an unacceptably low level, and at the same time aggravating the state of over-exploitation of the already depleted stocks.

Thus, the factors that effect the change in the equilibrium of the fishing industry in Turkey are identified as:

- the accessible resources are limited and generally overfished;
- the fishing effort and the number of fishers engaged in the fishery is not controlled, and is therefore excessive;
- the possibilities of redeploying fishers to other jobs is very limited.

Because of the highly diverse nature of the demersal fish species that constitute the fishery, the different gear used in harvesting these resources and the lack of control of the Turkish demersal fishery to exploitation, it is highly impractical to apply classical conservation measures, i.e. catch quotas.

Management Objectives and Management Model

Bearing in mind the socio-economic requirements of that part of the population engaged in demersal fisheries, the immediate Government objectives are:

- regulate the fishing rate in order to keep the stock at a high level of production;
- reduce the production costs to maximise the net profits at an identified socio-economic level;
- facilitate the application of laws and regulations to reduce the motives fishers may have for evading management measures.

In reaching these objectives:

A reliable statistical system needs to be established for accurate catch assessment, detailed inventory of existing industrial and artisanal fishing vessel and gear and fishers engaged in demersal fisheries, and regular shore and field sampling of the fish to collect the population parameters for stock assessment studies. Through annual decisions on maximum allowable catch limits, regulate the fishery by issuing licenses for an acceptable level of fishing power.

Secondly, the gear technology required to harvest the potential species of sharks, finfish and shellfish need to be developed to utilise these underutilised resources.

Thirdly, develop processing technology to market unconventional fish species in Turkey.

Pelagic fisheries

Introduction

The 80 per cent of the entire fish production of Turkey, of which the overwhelming majority consists of pelagic species, comes from the Black Sea. Due to the degraded environment and overfishing, the Black Sea fish stocks need good management. The Government understandably places great emphasis in the development models for the management of the pelagic stocks in the Black Sea. Almost all the fish stocks in the Black Sea, except the highly migratory species entering from the Sea of Marmara, are shared stocks and therefore require concerted management action by all the fishing countries of the region. The fisheries administration of the Governments of the region are presently working on the establishment of a "Black Sea Fisheries Commission" and the text of a convention for the rational exploitation of the living resources of the Black Sea.

Management Perspectives

Technical Consultation on Stock Assessment of the Black Sea of the GFCM/FAO, held in February 1993 in Ankara, Turkey, recognised that the conventional fishery management measures needed to restore depleted stocks in a healthy ecosystem will not be sufficient in the Black Sea. The environmental deficiencies will need to be corrected before there is a significant possibility that effort control measures can have full effect in population restoration. In this context, the Consultation recognised the importance of an immediate review of the management measures currently in effect in Black Sea fisheries based on which management strategies can be developed.

In the interim, the management practices will continue to be effected through closed seasons and size limits. These regulations are applied annually through the issuance of acts by the Ministry of Agriculture and Rural Affairs.

Future outlook

In Turkey, the major impediment to the application of management tools is the absence of an appropriate institutional structure and trained staff resources. The Government's reorganisation plans and staff training programme will be catering for the fisheries management needs of the sector. The scientific studies and stock assessment studies, to a great extent, are being undertaken by various academic institutions. The creation of a Black Sea Commission will require further decentralisation, with the Turkish Scientific and Technological Research Council possibly taking on the scientific coordination of the fisheries research as a whole and provide the staff and computer resources for the establishment of large data bases in fisheries and oceanography.

At this stage, it is rather premature to identify resources allocated to management issues. A number of projects are still in the implementation phase, reorganisation plans are being developed and expert needs are not yet determined. 1994 will be the year of planning for the development and management of fisheries. The Turkish contribution to the 1995 meeting of its Fishery Committee can provide better and detailed information on the subject.

UNITED STATES

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Introduction to the fisheries sector as a whole

The US has about 145 000 km of tidal shoreline. The living marine resources off this extensive shoreline support some of the world's largest, most valuable, and most varied fisheries. In 1992, US commercial fishers landed over 4.3 million metric tonnes (t) of fish with an ex-vessel value of US$3.7 billion. US$7.1 billion of fishery products were exported in 1992 and US$9.9 billion of fishery products were imported. There are substantial variations among the commercial fisheries in terms of their biological, regulatory, economic, and social characteristics.

In addition to the commercial fisheries, there are significant marine recreational fisheries. About 17 million recreational anglers spend over US$7.2 billion each year to participate in these fisheries. There are also important subsistence fisheries in the US

A broad description of the management regimes

The commercial fisheries in the US EEZ typically are managed by the Federal government under fishery management plans (FMP) developed by one or more of the eight regional management councils. The EEZ extends from the seaward boundary of each of the coastal states (usually 3 nautical miles from shore for all but two states) to 200 nautical miles from shore. The seaward boundaries of Texas, the Gulf coast of Florida, and Puerto Rico are 3 marine leagues (9 nautical miles). There were 32 FMPs by the end of 1992 and 12 of these FMPs were amended one or more times during 1992. One or more of the FMPs delegate management authority to state management agencies and for many of the FMPs, the states assist with data collection and enforcement.

The commercial fisheries that are shoreward of the EEZ, typically are managed by the adjacent state(s). For some fisheries, jurisdiction conflicts exist between the Federal and state governments or between state governments. Treaties between the US and Native American peoples or other countries affect the management of some fisheries.

There are few management instruments or combinations of instruments that have not been used in one or more of the US fisheries. Regulated open access management is often used; however, license limitation and individual transferable quota management regimes are used in some fisheries. Quotas are used to control catch in some but not all of the open access fisheries. Indirect controls such as mesh size regulations, seasons, and minimum legal sizes, are used in place of quotas in some fisheries and in some fisheries they are used in addition to quotas.

The objectives of fishery management vary among the fisheries. The Magnuson Fishery Conservation and Management Act of 1976 established the authority of the Federal government to manage the fisheries within the US EEZ. The Act and the FMPs developed under the authority of the Act include a mixture of biological, economic, and social objectives. The objectives often are to some degree mutually exclusive; therefore, the weights given to the various objectives are important in understanding why specific management decisions were made. The same is true for most fisheries managed by states.

The number and diversity of the US fisheries preclude a description of each fishery. What follows are descriptions of the Alaska groundfish fishery and several Atlantic coast fisheries. Although these are important fisheries with major differences, their descriptions provide only limited examples of the diversity of the US fisheries.

The Alaska groundfish fishery

The Alaska groundfish fishery has become an important component of the US fishing industry. In 1992 the total catch in this fishery exceeded 2 million t, the ex-vessel value of the catch was US$675 million, the value of the resulting processed products was US$1.4 billion, and the exports of these products exceeded US$1 billion. This fishery accounted for 46% of the catch and 18% of the ex-vessel value of the US commercial fisheries as a whole in 1992. The groundfish fishery accounted for the largest share of the ex-vessel value of all commercial fisheries off Alaska in 1992 (41.4%), while the salmon (Oncorhynchus spp.) fishery was second with US$544.4 million or 33.4% of the total for Alaska fisheries.

Walleye (Alaska) pollock (Theragra chalcogramma) has been the dominant species in the commercial groundfish catch. The pollock catch in 1992 totalled 1.4 million t and accounted for about 70% of the total groundfish catch. The next major species, Pacific cod (Gadus macrocephalus), had a catch of 250 700 t in 1992, comprising over 12% of the 1992 catch. The catch of flatfish, which includes yellowfin sole (Pleuronectes asper), rock sole (Pleuronectes bilineatus), and arrowtooth flounder (Atheresthes stomias) was 235 200 t in 1992. Other important species are sablefish (Anoplopoma fimbria), rockfish (Sebastes and Sebastolobus spp.), and Atka mackerel (Pleurogrammus monopterygius).

Total annual catch has been relatively stable. From 1984 through 1992, it ranged between 1.7 million t and 2.1 million t and in eight out of nine years the catch was within 10% of 2.0 million t. However, the distribution of catch among the foreign, joint venture, and domestic fisheries changed dramatically. For many years prior to 1982, foreign distant water fleets took over 90% of the annual catch and they accounted for over 50% of the catch in 1985. From 1986 through 1988, the joint venture fishery, in which domestic fishing vessels delivered catch directly to foreign processing vessels, accounted for over 66% of the catch. The catch accounted for by the domestic fishery increased from 38.1% of the total in 1988, to 71.8% in 1989, and to 93% in 1990 and has been 100% since 1991. Foreign and joint venture fishing ended in 1987 and 1990, respectively.

These redistributions of catch among the foreign, joint venture, and domestic fisheries have been the result of the Magnuson Fishery Conservation and Management Act of 1976 in which the US claimed management authority for fishery resources in what has since become the US EEZ. The Act established eight regional management councils as advisory bodies. The North Pacific Fishery Management Council (NPFMC) is the regional council for the fisheries off Alaska. The harvesting and processing sectors of the industry are well represented on the NPFMC. Currently, with the exception of the one Federal and three state fishery agency members, the council members are linked closely to the industry. The Act specifies the number of NPFMC members from each of three states, Oregon, Washington, and Alaska. A simple majority of the voting members are from Alaska. The councils develop fishery management plans for fisheries within the US EEZ and recommended changes to those plans. A council's recommendations with respect to developing and amending fishery management plans and regulations are submitted to the Secretary of Commerce for review and approval. The council and secretarial review processes include substantial public input and political scrutiny. Although much of that input is from those involved in harvesting and processing fish, scientist, including economists and other social scientists, are also involved. The Secretary can approve, disapprove, or partially disapprove council recommendations, but typically does not otherwise implement or change fishery regulations.

A principal objective of the Act and the NPFMC was to replace the foreign fishery with a domestic fishery. The NPFMC recommended and the Secretary approved a variety of management measures that were successful in meeting this objective. Although there is extensive direct and indirect foreign investment in both the harvesting and processing sectors of the Alaska groundfish industry and although foreign interests exert control through these investments and through the heavy dependence of this fishery on export markets, it is now considered to be a domestic industry.

Trawl, longline and other hook and line, and pot gear are the principal gear types used in the domestic Alaska groundfish fishery. Annual catch for virtually every gear group, area, and species increased dramatically from 1982 to 1990. In the last four years, the catch by trawl gear has averaged 93.6% of the total catch, while the catch by longline and other hook and line gear accounted for 5.6%. Most species are harvested predominately by one type of gear, which typically accounts for 90% or more of the catch. The one exception is Pacific cod, where in 1992, 48% was taken with trawls, 42% with hook and line gear, and 10% with pots.

Catch for at-sea processing has been the largest and fastest growing component of catch. It increased from 239 400 t in 1987 to 1.4 million t in 1992. The catch for onshore processing increased from 167 900 t in 1987 to 604 000 t in 1992. The relative catch of these two types of operations varies by area and by species. In the Bering Sea and Aleutian Islands region, catch for at-sea processing exceeds that taken for onshore processing for each species. The opposite is true in the Gulf of Alaska, with the exceptions of rockfish and flatfish. Because the shore-based processors have received a product mix with a larger proportion of higher priced species, including sablefish, the dominance of catch for at-sea processing is less when it is measured in terms of ex-vessel value.

The vessels that participate in this fishery range is length from less than 15 meters (m) to more than 150 m and include catcher boats, catcher/processors, and motherships. Their owners range from small independent fishers to large corporations. The groundfish processors are as heterogeneous as the vessels in terms of size and the nature of their operations. Although the majority of the participants in the Alaska groundfish industry are not residents of Alaska, the industry provides important employment and income opportunities for residents of Alaska coastal communities. In many of these communities, the fishing industry is an important component of the base sector of the local economy.

The groundfish fisheries in the US EEZ waters off Alaska are managed under two fishery management plans (FMP); one for the Bering Sea/Aleutian Islands area (BSAI), and the second for the Gulf of Alaska (GOA). These FMPs were developed by the NPFMC under the Magnuson Fishery Conservation and Management Act. The BSAI and GOA FMPs were approved by the Secretary of Commerce and became effective in 1982 and 1978, respectively. The Alaska groundfish fishery is a regulated open access fishery. Quotas are established annually by species or species group and area. Some quotas are subdivided by season or gear type. The quotas, that often have been conservative, typically have been successful in preventing over fishing and most of the groundfish stocks are considered healthy.

Amendment 33 to the GOAFMP and Amendment 29 to the BSAI FMP are currently being developed by the NPFMC. Many of the amendments addressed allocation issues.

As noted above, the NPFMC recommended and the Secretary approved a variety of management measures that were intended to redistribute catch from the foreign fishery to the joint venture fishery and then to the domestic fishery. These measures provided incentives for the expansion of domestic harvesting and processing capacity. The incentives included separate apportionment of each quota for the foreign, joint venture, and domestic fisheries and apportionment rules that gave the highest priority to the domestic fishery and the lowest priority to the foreign fishery. In principal, the domestic fishery was given as much of each quota as it was expected to use, the joint venture fishery was given as much of the residual as it was expected to use, and any remainder was apportioned to the foreign fishery. The joint venture and foreign quotas were subdivided by nation and the apportionment by nation came to be determined in part by each nation's expected contribution toward the development of the domestic fishery. The implementation of this allocation priority often was controversial because various components of the domestic fishing industry had conflicting interests in different components of the foreign groundfish fishery.

Another dominant allocation issue has been the bycatch of salmon, crab, halibut, and herring in the groundfish fishery. Because the fishing gears used in the groundfish fishery were not perfectly selective, species other than groundfish were taken as bycatch in the groundfish fishery. This use of salmon, crab, halibut, and herring in the foreign groundfish fishery reduced catch in the fully exploited domestic salmon, crab, halibut, and herring fisheries.

To assure that the groundfish fleets had no incentive to target on these high priced species, retention of these species in the groundfish fisheries was prohibited. Any salmon, crab, halibut, or herring taken in the groundfish fishery was to be returned to the sea with a minimum of damage. These became referred to as prohibited species. The prohibition on retention did eliminate covert targeting on these species but because the discard mortality rates often were between 50% and 100%, the prohibition did not prevent this bycatch from having adverse effects on domestic salmon, crab, halibut, and herring fisheries. Due to the magnitude of the foreign groundfish fisheries, even relatively low bycatch rates resulted in enough bycatch mortality that the domestic salmon, crab, halibut, and herring fishers and processors insisted that this bycatch be reduced. The regulatory response included prohibited species catch (PSC) quotas, gear restrictions, time/area closures, and reduced quotas for some groundfish species. The PSC quotas were apportioned by nation and once a nation had taken its quota for an area, the groundfish fishery was closed to that nation in that area for the remainder of the calendar year. The groundfish quotas and the PSC quotas were monitored using data provided by at-sea observers and by the foreign fishing vessels.

As the joint venture fishery developed and as its bycatch mortality increased, it became subject to similar bycatch management regulations. The domestic fishery became fully subject to similar regulations in 1990 when an observer program was implemented for the domestic fishery. Prior to that, bycatch in the domestic groundfish fishery was controlled principally by reducing groundfish catch. A bycatch management measure that was implemented only for the domestic groundfish trawl fishery is the vessel incentive program. Under this program, bycatch rate standards are established by fishery and a vessel that exceeds the standard for a month is subject to civil penalties. The fisheries are defined in terms of the target species and the bycatch rates by vessel are estimated using at-sea observer data. The small vessels that are not required to have observers are exempt from the program. The effectiveness of the program has been limited severely by the difficulty of demonstrating that the bycatch rate of a vessel did in fact exceed a standard. As a whole, the bycatch management measures have tended to reduce the bycatch of prohibited species; however, the costs of these measures, including foregone groundfish catch, may have exceeded substantially the benefits of reducing bycatch. The bycatch management measures that have been used and the resulting tradeoffs between costs to the groundfish fishery and benefits to the salmon, crab, halibut, and herring fisheries are in part a product of the differences in representation on the NPFMC for different user groups.

The success of incentives to increase the capacity of the domestic fishery eventually resulted in allocation conflicts among competing user groups within the domestic groundfish fishery. There have been relatively dynamic coalitions of user groups. At different times or for different species, the groups have been defined by type of gear, port of landings, mode of operations, product form, and residency. In the mid-1980s, the Gulf of Alaska sablefish quota was apportioned by gear types to protect the longline fleet. This was followed by sablefish quotas by gear in the Bering Sea/Aleutian Islands area, separate quotas for catch taken for at-sea and onshore processing for pollock and Pacific cod, pollock and sablefish community development quotas for groups of coastal Native communities in Western Alaska, and cod allocations by gear type in the Bering Sea/Aleutian Islands area.

In addition to these management actions that directly apportioned catch among competing user groups, many of the other management actions that were taken were intended, at least in part, to alter the distribution of catch among competing user groups. The use of biological justifications for an action that may be motivated principally for allocation reasons can obscure the objectives of a regulatory action. In response to the allocation problems and the other problems that are typical of a regulated open access fishery, an ITQ program has been approved, but not yet implemented, for the fixed gear halibut and sablefish fisheries, an ITQ and license limitation programs are being considered for the rest of the groundfish fishery, and a vessel moratorium for the Alaska groundfish fishery was recommended by the NPFMC but not yet approved by the Secretary.

The full utilisation of groundfish catch also became a management issue. This issue is closely related to the issues of bycatch management and allocating quotas among competing users or uses. This issue addresses the utilisation of both catch and bycatch in the groundfish fishery. The fishing gear used in the groundfish fishery is not perfectly selective; therefore, it results in the bycatch of the prohibited nongroundfish species and the bycatch of groundfish which is also discarded. Some of the groundfish discards are required by fishery regulations. For example, once the fishery for a species is closed for the remainder of the year, the amount of that species that may be retained by vessels targeting on other species is limited and catch above the limit is discarded. Other groundfish is discarded because it is not of the desired species, size, sex, or quality. In 1992, groundfish discards exceeded 300 000 t or 15% of the total groundfish catch. Although the NPFMC has only considered groundfish bycatch in choosing among alternative management measures that principally addressed other issues and has not recommended management measure that focus on groundfish bycatch, the NPFMC has demonstrated its intent to address directly groundfish bycatch.

The other aspect of full utilisation addresses the way in which retained catch is used. In 1991, regulations were implemented that prohibited pollock catch from being used exclusively for roe. Under these regulations, roe could only be produced as an ancillary product associated with the production of products such as fillets, blocks, and surimi. During the NPFMC's most recent discussions of full utilisation, some suggested that meal and oil alone are not acceptable uses of groundfish bycatch.

The interactions of fisheries with marine mammals and seabirds have become a major concern due to recent sharp declines in some marine mammal and seabird populations. A number of management actions have been taken to decrease the probability that the groundfish fishery will have adverse effects on the populations of specific marine mammals. These actions include time/area closures, seasonal apportionment of some groundfish quotas, and reductions in some quotas. Due in part to the specifics of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), economic considerations have had a limited role in evaluating what fishery regulations were established to protect marine mammals.

This overview of the management of the Alaska groundfish fishery is intended to identify some important fishery management issues for this fishery and for the US national team to address as part of the study on the economic aspects of the management of living marine resources.