COUNTRY NOTE ON NATIONAL FISHERIES MANAGEMENT SYSTEMS -- ICELAND

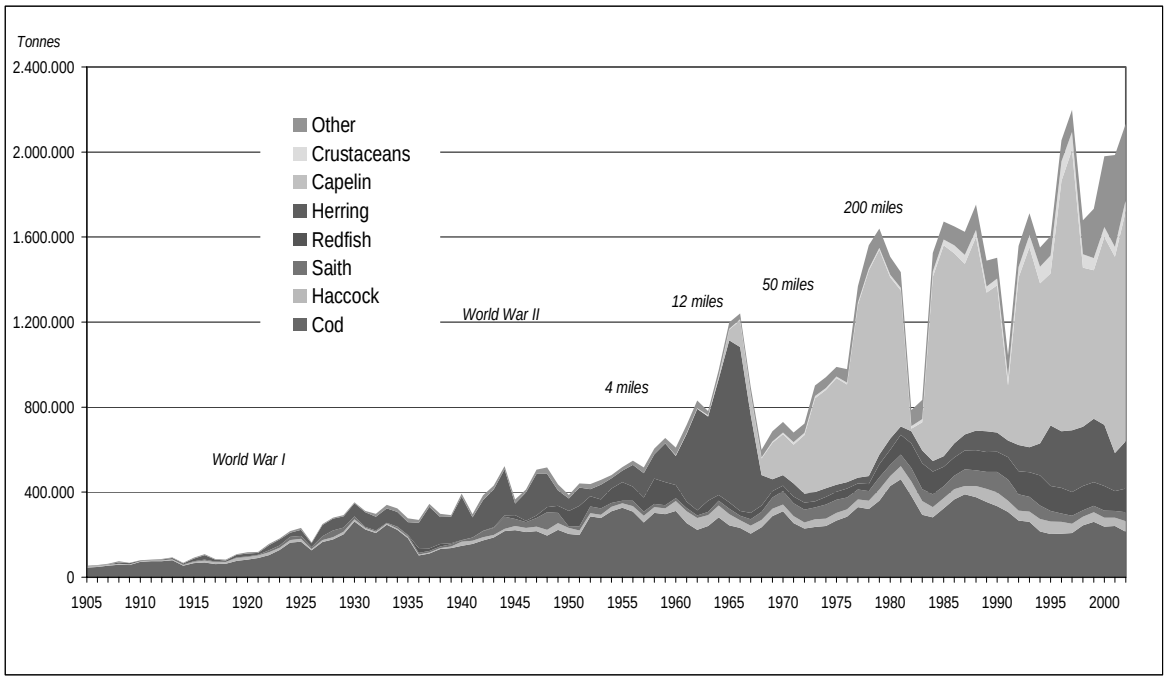
1. Introduction

1. This note describes the key features of the fisheries management system currently in operation in Iceland, its beginnings and subsequent evolution. It also provides a summary of the main economic impacts of the system. For necessary background, the note, moreover, provides basic information about the essentials of the Icelandic fisheries.

2. This note is fundamentally an update of a more extensive country note of a similar content (ICELAND 97) submitted to the Fisheries Committee in 1997. For further information on some of the material mentioned in the current note, the reader is referred to this previous country note.

Figure 1. Icelandic fish catches 1905-1997

(1000 metric tons (mt))



2. Background on the Icelandic Fisheries[1]

3. Since the beginning of the 20th Century, the Icelandic fisheries have expanded rapidly. At the outset of the Century, the fisheries were based primarily on demersal species, especially cod and haddock. During the subsequent 100 years the variety of species being exploited has greatly increased. The herring fishery, which was initiated in the last decades of the 19th century, expanded and became significant in the 1920s and 30s. Saithe became an important commercial species in the 1920s, redfish in the 1940s, shrimp and nephrops[2] in the 1960s, capelin and scallops in the 1970s, Greenland halibut in the 1980s and, most recently, blue whiting in the late 1990s. This diversification in species has been accompanied by dramatically increasing catch volumes. The quantitative development of fish catches during the 20th Century is illustrated in the following diagram.

4. Since 1905, the volume of the Icelandic catches has increased from about 50 thousand metric tonnes (mt) to the current level of some 2 million mt annually. From 1945 to 1998, the aggregate volume of catch increased by some 400% and the real catch value by 700%. Catch volumes have increased for essentially two reasons. First, extensions of the fishery jurisdiction have enabled Iceland to gradually increase its share of the demersal fisheries to almost unity. Second, new fisheries have been developed. Most important of these are the redfish, capelin and the crustacean fisheries. The value of the catch has risen faster than the volume due to rising world fish prices (until about 1990) and a more valuable composition of the catch.

5. There are some interesting trends in catch volumes discernable from Figure 1. First, most of the increase in the aggregate catch since 1945 is due to a great expansion in the pelagic fisheries.

6. Second, fluctuations in the aggregate annual catch have increased dramatically since 1945. This is entirely due to the increased share of the pelagic fisheries especially that of capelin fishery, in the aggregate harvest. The capelin fishery, which dominates the others in terms of volume, is essentially a single yearclass fishery. Hence, when this yearclass fails, which happens occasionally, the fishery has to be severely curtailed or even closed.

7. Third, the catch of demersal species exhibits a clear downward trend since the late 1980s. This is due to a poor state of some of these stocks and, consequently, very restrictive TAC for some of the demersal species, not least cod, since 1990. While decades of overfishing have undoubtedly been part of the reason for the decline of the demersal stocks, it appears that adverse environmental factors since the mid-1980s have also played a significant role in this process. Thus, for instance, in the case of cod, which has historically accounted for 2/3 of the demersal catches, the annual recruitment to the stock from 1985 until 1999 was substantially less than the mean recruitment of the previous 35 years.

8. Fourth, the crustacean and molluscs fisheries have evolved considerably during the period since 1945. Although comparatively small in terms of volume, due to the high unit value of the catch, these fisheries are significant in terms of value.

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1 For further information see Icelandic country note 1997 (ICELAND97).

2 Also referred to as Norway lobster or just lobster.

The fisheries

9. The most important Icelandic fisheries by far are the demersal fisheries. The most important demersal species are in this order: cod, haddock, redfish, Greenland halibut and saithe. In recent years (1993-2002) the average yield from the demersal fisheries has been just over 500.000 metric tonnes (mt) annually and represented about 73% of the total landed value of the Icelandic fisheries. Pelagic fisheries, based on Icelandic capelin Icelandic and Atlanto-Scandian herring and most recently blue whiting are by far the largest in terms of volume with almost 1.3 million mt annually which represents almost 70% of the total volume of the Icelandic fisheries. However, since most of these pelagic catches serve as input into relatively low value reduction (fish-meal and – fish oil) processes, the landed value of these catches is only about 14% of the total landed value of the Icelandic fisheries Crustaceans and molluscs, e.g. shrimp, nephrops, scallops and ocean quahog, fisheries account for a small volume of landings, some 65.000 mt on average (during the decade1993-2002), but, due to their high unit value, about 14% of the total value of landings from all Icelandic fisheries.

10. The relative importance of all Icelandic fisheries is illustrated in Figure 2. A more detailed numerical description is provided in Table 1:

Table 1. Icelandic fisheries: Catch and value data

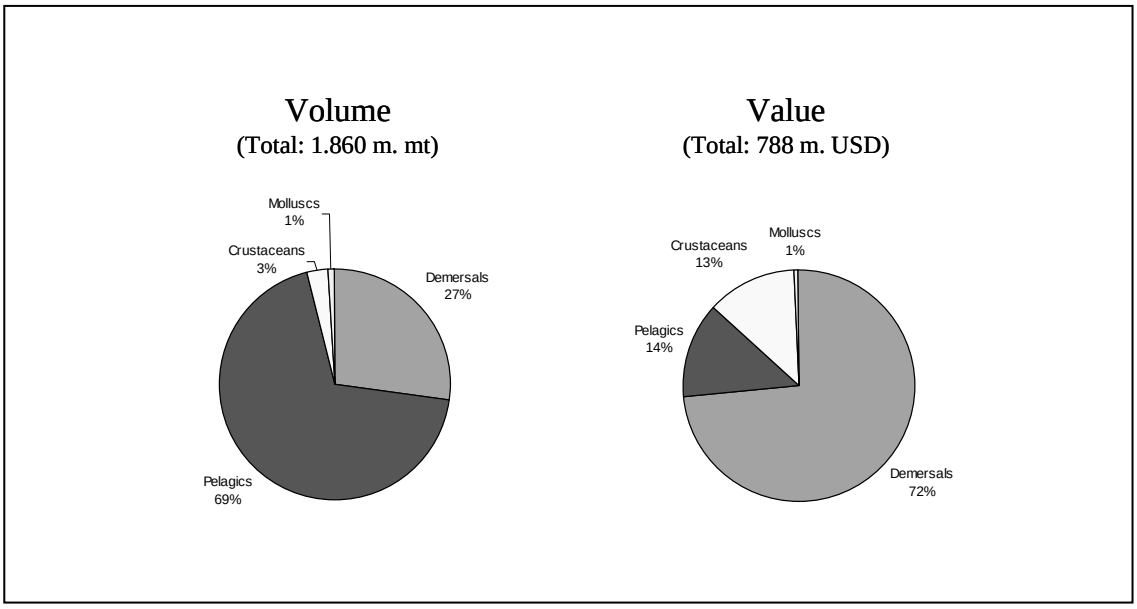
(Average 1993-2002)

	Average catch 1993-2002 (1 000 mt)	Average catch values 1993-2003 (M.USD)
Demersals	506	577
Pelagics	1 279	107
Crustaceans	60	100
Molluscs	14	5
Other	0	0
Total	1 860	788

Source: Fisheries Association, Statistics Iceland

Figure 2. Icelandic Fisheries: Relative volumes and values

(Average 1993-2002)



Source: Fisheries Association, Statistics, Iceland.

11. The cod fishery has historically been by far the most important fishery in Iceland. For most of the post World War II period it has accounted for over 50% of the total value of landings. In spite of greatly increased in pelagic catches and a prolonged period of restrictive TACs, the cod fishery remains the single most important fishery in Iceland. The following table, Table 2, provides the catch and value data for the most important species in 2002. As may be inferred from that table, the cod fishery accounted for about 37% total value of all the Icelandic fisheries in 2002. Nevertheless, in 2002, the demersal fisheries as a whole accounted for almost 74% of the total value of the fisheries.

Table 2. Icelandic fisheries: Catch and value data 2002.
Marine Reseach Institue TAC recommendation for the quota year 2002/2003 and national TAC for the quota year 2002/2003

	Catch volumes 2002 (1000 MT)	Catch values 2002 (M.USD)	Recom. TAC 2002/2003 (1000 MT)	National TAC 2002/2003 (1000 MT)
Demersals				
Cod:	213	313	179	179
Haddock:	50	78	55	55
Saithe:	42	27	35	45
Redfish:	111	104	115	115
Greenl. Halibut	19	42	23	23
Other*:	50	57	57	59
Total	485	621		
Pelagics				
Herring:				
Icel. summer sprawners	97	2	105	105
Atlanto-Scandian herring	127	3	718**	110
Capelin:	1 083	94	1 000**	1 000
Blue whiting:	286	26	600**	318
Total	1 593	168		
Crustaceans				
Shrimp:	36	45	32	32
Nephrops	2	6	1.6	1.6
Total	38	51		
Molluscs				
Scallops	5	2	4	4
Ocean quahog	12	1	31	24
Total	17	3		
Grand Total	2 133	843		

* Most important are catfish, tusk, ling and various species of redfish

** TAC for all nations engaged in harvesting

12. Regarding Table 2, it is important to realize that some of the fish stocks, most notably the capelin stock, the Atlanto-Scandian herring stock, the blue whiting stock, some redfish stocks and the Greenland halibut stock are shared with other nations. It follows that Icelandic control over these stocks is correspondingly constrained.

Main fish stocks

Cod

13. In 2002, landings of cod (*Gadus morhua*) amounted to 209 000 mt compared to about 235 000 mt in 2000 and 2001. Age groups 4 and 5 (the 1997 and 1998 year classes) were the most abundant age groups in the landings. Mean weight at age in the catches in 2002 was similar to the mean weight in 2001, around the average of the last 20 years. Maturity at age remained high as in 2001.

14. The fishable biomass of cod (4 years and older) was estimated to be 765 000 t at the beginning of January 2003 and the spawning stock 374 000 t. In the May 2002 Resources Report, the fishable and spawning stocks were estimated to be 756 000 t and 340 000 t respectively at the beginning of 2003. The difference between the estimate of spawning stock biomass between the current and last year's assessment is mainly due to higher maturity at age than expected.

15. Both fishable and spawning stock biomass have been increasing in recent years but are still at relatively low levels and relatively young cod will dominate in the catch and spawning stock biomass in coming years.

Haddock

16. In 2002, 50 000 mt of haddock (*Melanogrammus aeglefinus*) were landed, compared to 40 000 mt in 2001. The advice for the fishing year 2002/03 was 55 000 tonnes and the TAC was the same. The fishable stock (3+) is now estimated to have been 191 000 mt at the beginning of the year 2003 and the spawning stock 129 000 mt. The size of the haddock stock has been increasing rapidly since 2000 when it was at a minimum. The fishable stock and the spawning stock are now estimated to have more than doubled since the year 2000.

Saithe

17. In 2002 the landings of saithe (*Pollachius virens*) were 42 000 mt, which is about 10 000 mt more than in 1998-2001 when landings were the lowest observed since the 1940s. The fishable stock is estimated to be 214 000 t, almost 50 000 mt higher than last year's assessment, and spawning stock biomass 107 000 mt in 2003, which is slightly higher than last year. During the past few years, fishable stock size and spawning stock biomass have been at a minimum. Recruitment in 1987-1995 was well below the long-term average but estimates of recent year classes (1996-2000) indicate that recruitment has improved

Redfish

18. The situation regarding the complex relationship between various redfish stocks is still unsettled in NEAFC , although there are strong indications towards that the oceanic redfish component caught below 500 m and the deep-sea stock within the EEZ is the same stock. This makes the management of the redfish stocks mentioned difficult, but the Icelandic regulations take notice of the advice from ICES that management action should be taken to prevent a disproportionate high exploitation rate of the deeper component.

19. In 2002, 131 000 mt of pelagic redfish were caught. During the past few years, the international fleet has taken an increasing proportion of the catch from depths greater than 600 m.

20. In 2002, the combined landings of golden redfish (*Sebastes marinus*) and deep-sea redfish (*S. mentella*) in Icelandic waters were estimated to be 68 000 t.

Herring

21. About 94 000 mt of summer spawning herring (*Clupea harengus*) were caught in Icelandic waters during the herring season 2002/03. In 2002, the spawning stock was estimated to be 475 000 mt and is assumed to be 540 000 mt in 2003. The MRI recommends a TAC of 110 000 mt in the quota year 2003/2004.

22. In 2002, 127 000 mt of Atlanto-Scandian herring were landed by Icelandic vessels and combined international landings were 806 000 mt. ICES recommended a TAC of 710 000 mt for the 2003 season, of which the Icelandic share is 110 000 mt. ICES recommends a TAC of 825 000 mt for the 2004 season.

Capelin

23. In 2002/03, total international landings of capelin (*Mallotus villosus*) were 988 000 mt. Using acoustic assessments of immature capelin of the 2001 year class and estimated total abundance of the 2000 year class, TAC for the 2003/2004 season is estimated at 830 000 mt, corresponding to a preliminary TAC of 550 000 mt. This estimate will, as usual, be revised when results of acoustic surveys of the fishable stock become available in winter 2004.

The fishing fleet

24. The current fishing fleet consists of several vessel types. The official statistics (Statistics Iceland) divide the fleet into three main categories:

(i) Deep-sea trawlers

25. These are relatively large fishing vessels usually between 200 and 2 000 GT (gross tonnes) and between 130 and 300 feet in length. They are almost exclusively engaged in the demersal fisheries employing bottom and occasionally mid-water trawl. Many of these trawlers, especially the larger ones are freezer trawlers. 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 between 5 and 30 days.

(ii) Multipurpose vessels

26. The class of multipurpose vessels covers many different types of vessels and a wide size range. Multipurpose vessels cover specialized scallops draggers, longliners and purse seiners as well unspecialized vessels. They range in size from 10 GT to over 2 000 GT. The largest ones, those over 500 GT are generally specialized purse seiners or long-liners some of which have on-board freezing and processing facilities. The operating range and trip time of the multipurpose vessels also varies greatly. The smaller ones, under 200 GT, say normally undertake 1-3 day trips and range within 100 miles of their home port while the larger ones can stay out for weeks, range widely and land their catches wherever it is most convenient, even abroad.

(iii) Undecked, small vessels

27. This class of fishing vessels covers numerous vessels of sizes up to 10 GT although most are under 6 GT. Most of these vessels are technologically advanced and driven by powerful engines. They may employ handline, longline and gillnets although most of them are currently restricted to the use of the first two by the fisheries management system. Depending on the type of operation, the crew size is one to three persons. Many of the vessels in this fleet are essentially recreational vessels. Others are commercial, but since they are generally owner operated they may be regarded as artisanal.

28. Further details about the current Icelandic fishing fleet are set out in Table 3 below.

Table 3. The Icelandic Fishing Fleet - End of 2002

	Gross tonnage (1000 GT)	Number of vessels	Mean age (Years)
Deep-sea trawlers	80 718	76	22.0
Multipurpose vessels	106 300	871	19.7
Undecked vessels	4 570	988	21.5
Total	191 587	1 935	

Source: Statistics Iceland Utvegur 2002

29. In interpreting the size of the Icelandic fishing fleet, it is important to realize that not all registered fishing vessels participate in the Icelandic fisheries. Some simply lie idle. Some do not have a fishing licence in Icelandic waters but are applied on distant fishing grounds or, in the case of the undecked vessels, used as recreational vessels. Overall, as indicated in Table 4, only about 77% of the registered fishing vessels in Iceland were applied to commercial fishing in 2002.

30. The importance of the different sub-fleets in the fisheries in terms of catch volumes and values is also very uneven. Thus, in spite of their relatively large number the undecked vessels are negligible in terms of aggregate harvest volume and quite small in terms of harvest value. The multipurpose fleet dominates in harvest volume. This is because of the large volumes of the purse seine, pelagic fleet. When it comes to value, however, the deep-sea trawlers account for almost as much as the multi-purpose fleet. This is further illustrated in Table 4.

Table 4. Application and importance of vessels in the fishery

	Active vessels 2002		Harvest	
	Number	Percentage of fleet	Volume (Percentage)	Value (Percentage)
Deep-sea trawlers	76	93.4%	17.2%	42.1%
Multipurpose vessels	775	87.9%	81.7%	54.0%
Undecked vessels	668	67.0%	0.1%	3.9%
Total	1523	77.5%		

Source: Utvegur 2002

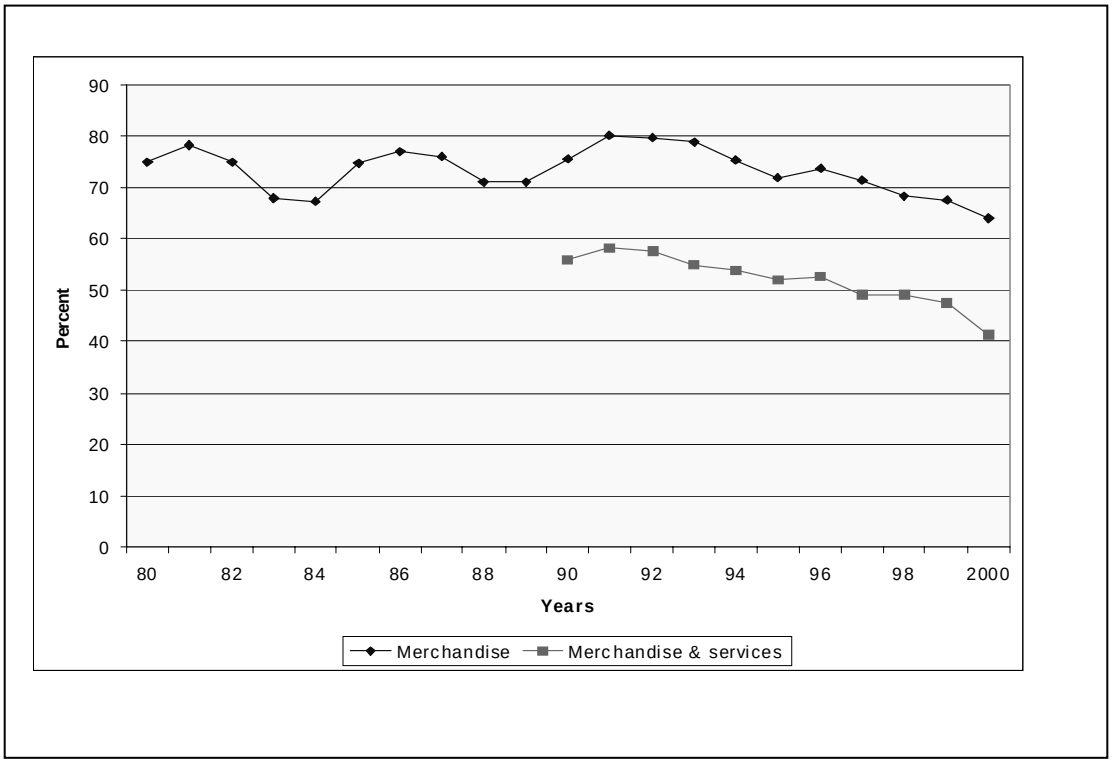
Macro-economic importance of the fisheries

31. 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. Since the early part of the 20th Century, the fishing industry has been Iceland's most important industry with its relative importance reaching a peak in the 1930s and 1940s. Since then, its relative contribution has been remarkably steady only showing a significant declining trend during the last couple of decades. This, however, is first and foremost due to the fast growth of other industries especially service and manufacture, rather than any decline in the fishing industry. In fact, the Icelandic fishing industry has continued to grow in aggregate terms to this day.

32. 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. Only recently has this contribution to exports started do decline significantly. The trend in merchandise and total export earnings is illustrated in Figure 3.

Figure 3. Contribution of Fisheries to Exports

(Percentages)

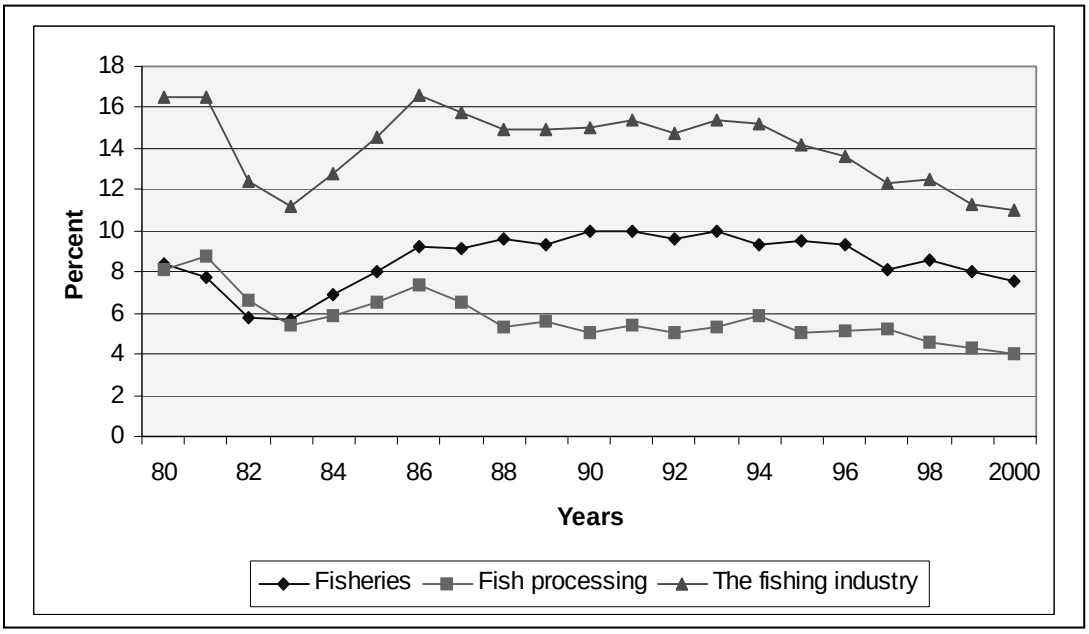


Source: National Economic Institute

33. The direct contribution of the fishing industry to the GDP, as measured by the national accounts, tells a similar story. Until the early 1990s this remained remarkably steady at around 16% of the GDP. However, since then this contribution has exhibited a declining trend to the current level of about 11%. As already mentioned, however, this is due to a remarkable growth in Iceland's other industries rather than a decline in the fishing industry as such. The direct contribution of the fishing industry to GDP is illustrated in Figure 4.

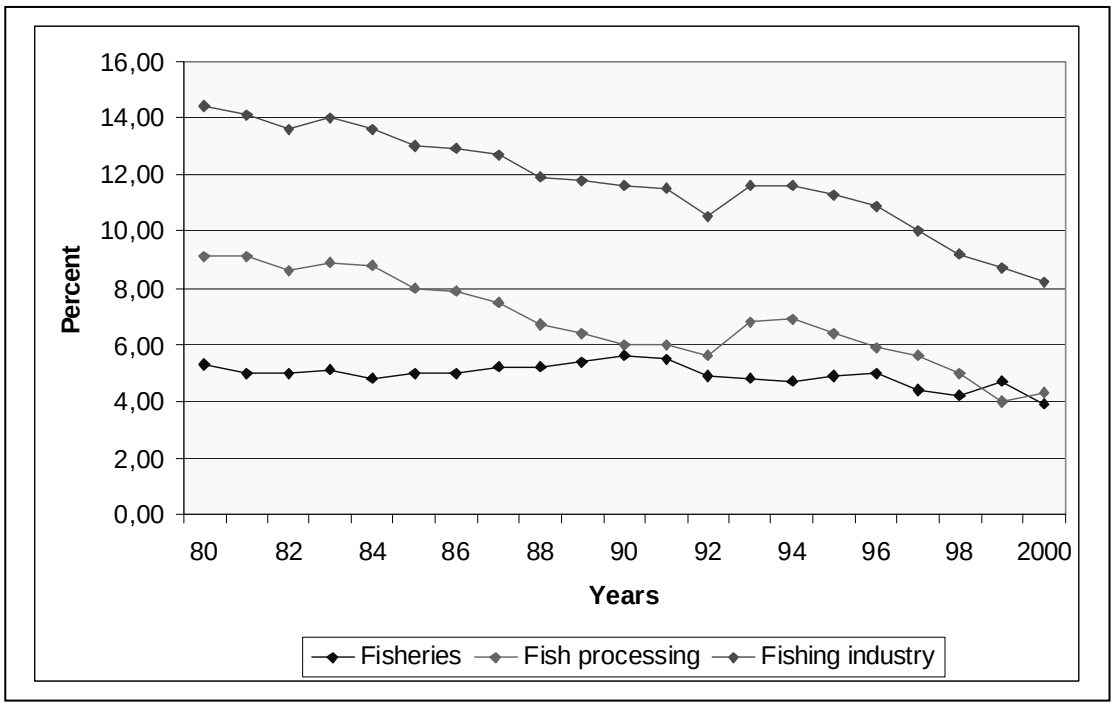
34. Iceland's fishing industry employs significantly less people than its contribution to GDP and exports might suggest. This is due to the fishing sector's relatively higher capital intensity than the average of other sectors. Moreover, the proportional employment in the fishing sector started declining sooner and has declined further than both the fishing industry's export and GDP contribution. This, of course, indicates increasing labour productivity in the fishing industry. These labour trends are illustrated in Figure 5.

Figure 4. Contribution of Fisheries to GDP
(Percentages)



Source: National Economic Institute

Figure 5. Use of Labour in the Fishing sector: Percentage of total Labour use



Source: National Economic Institute

35. 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 has been and is a major component of the discussion and formulation of Iceland's economic policy.

3. Fisheries Management in Iceland: The ITQ system

36. Iceland was among the first fishing nations in the world to adopt the Individual Transferable Quota (ITQ) - fisheries management system in her fisheries. The earliest IQ/ITQ systems came into operation in the 1970s. Since then the ITQ system has expanded in stages to comprise virtually all Icelandic fisheries. Major steps in this evolution were, however, taken in 1984 when ITQs were introduced in the demersal fisheries and in 1991 when a uniform and fairly complete ITQ system was adopted for all Icelandic fisheries.

37. Although the crucial elements of the Icelandic ITQ system were already put in place in 1984 and 1991, certain features of the system are still evolving. The basic Fisheries Management Act (l. nr. 38, 1990) has continued to feature heavily in political debate and has been subject to modifications in most years since 1991.

38. The ITQ system in Iceland was adopted in a stage-wise fashion over a period of time following a period of experimentation with various alternative fisheries management systems. Before, this period of experimentation started, however, Iceland had to gain national sovereignty over the fish stocks.

39. Most of the valuable fish stocks off Iceland reside over the continental shelf and underwater ridges, which often reach considerable distances from the shoreline. Thus, until the extension of the fisheries jurisdiction to 50 and later 200 miles in the 1970s, the fish stocks in Icelandic waters were for all practical intents and purposes international waters with foreign, mostly European, fishing fleets taking a third of total catches and half of the valuable demersal catches as late as the early 1970s. With this large foreign presence on the fishing grounds, effective management of the Icelandic fisheries turned out to be impractical.

40. With the extension of the fisheries jurisdiction to 200 miles, which became internationally recognized in 1976, this situation was radically altered. The extension meant that many, albeit not all, of the most important fish stocks off Iceland came under exclusive Icelandic control. As a result, it became possible for the Icelandic fisheries authorities to introduce new fisheries management regimes. Since then a variety of fisheries management systems have been tried in Iceland including (a) total catch quotas, (b) fishery access licenses, (c) fishing effort restrictions, (d) investment controls and vessel buy-back programs and (e) individual vessel catch quotas.

41. The Icelandic experience of the various fisheries management systems, however, has led to the adoption of the ITQ system in all fisheries that are subject to management. This progress, however, has differed substantially between the various fisheries. The chronology of the development in Icelandic fisheries management is summarized in Table 5:

Table 5. Key steps in the evolution of the fisheries management system: A chronological overview

Pre 1965	Little fisheries management. Fishing gear and area restrictions in some fisheries
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. Small vessels exempted.
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.
1991	A fairly complete uniform ITQ system in all fisheries. Small boats exemption retained.
Post 1991	Various measures to control the expansion of the small vessels fleet. Modifications of the ITQ system.

Source: Ministry of Fisheries: Fisheries laws and regulations

42. A brief account of the evolution of the ITQ fisheries management system in individual Icelandic fisheries is as follows:

The herring fishery

43. 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 summer spawning herring stock was resumed, it was obvious that the whole fleet could not participate. Hence an individual vessel quota system with limited eligibility for quotas was introduced. These vessel quotas, however, were small and in spite of no explicit permission and certain bureaucratic obstacles, informal trading of these quotas soon emerged. In 1979, by a Ministerial decree and industry support, fairly unrestricted transfers of quotas between vessels were permitted. This, incidentally is one of the first examples of an ITQ system in a ocean fishery in the world. In 1991, this vessel quota system in the herring fishery became part of the general fisheries vessel quota system.

The capelin fishery

44. 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 declining. The arguments were similar to the ones in the herring fishery previously; if the harvest had to be restricted it was most efficient to do so on with the help of individual quotas. The positive experience with the vessel quota

system in the herring fishery also proved a convincing argument for adopting the same type of system in the much more important capelin fishery. In 1986, in conjunction with increased transferability of demersal vessel quotas, capelin vessel quotas became partly transferable. In 1991, the capelin vessel quota system became a part of the general vessel quota fisheries management system.

The demersal fisheries

45. 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, due to technological progress and since the demersal fleet continued to grow[3], 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. Importantly, at this point, vessels under 10 GRT which were relatively numerous but accounted for only a small portion of the demersal catch, were exempt from the ITQ system. Initially the Althing passed legislation to this effect for one year only. In 1985, however, 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 the period. 1988-1990. In 1990, a complete, uniform individual transferable vessel quota system for all fisheries subject to quotas, the *Fisheries Management Act*, was enacted. This act became effective in 1991 and abolished i.a. the limited effort option in the demersal fisheries. Moreover, in this act, vessels between 6 and 10 GRT were incorporated in the ITQ system. However, the exemption from the ITQ system for vessels under 6 GRT was retained with the provision that if they wanted to utilize that exemption they could only use fishing gear based on "hooks and line", i.e. net fishing was forbidden.

The shrimp and scallops fisheries

46. 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 Act of 1990.

47. Since its enactment in 1990, the Fisheries Management Act has been subject to numerous but mostly minor modifications. The most important modifications relate to (i) quota transferability which has been restricted, (ii) maximum quota holdings and (iii) the small vessel exemption which has been further curtailed. Thus in 1994, it was stipulated that in order to retain their permanent quota share, vessels had to harvest 50% of their quota every second year. In 1998, it was further stipulated that only 50% of vessel's annual quota allocated could be transferred within the year. These amendments were explicitly to make

[3]. Not only did vessel owners improve existing vessels but as new entry was possible new vessels were added to the fleet.

speculative quota holdings less attractive. Also in 1998, upper bounds on company total quota holdings as well as for the various species were first imposed. This amendment was explicitly to prevent excessive concentration in the industry. Currently, this upper bound amounts to 12-35% according to species. In addition no fishing firm may control more than 12% of the assessed[4] total quota value allocated for all species. Finally, since 1990 the small vessels outside the ITQ system have been subjected to increasingly severe restrictions. Thus in 1996, they were subjected to effort restrictions in the form of limited fishing days for cod. Currently these days are limited to 21. These vessels have simultaneously been offered the option to enter a special small vessel ITQ system for cod where the number of allowable fishing days is much less restrictive. Due to these modifications, the number of small vessels on effort restrictions and outside the ITQ system has been greatly reduced.

3.1 The current ITQ fisheries management system

48. The current fisheries management system is based on Individual Transferable Quotas (ITQs) as stipulated in the *Fisheries Management Act* of 1990. The essential features of this system are as follows:

- The total allowable catch (TAC) is set by the Minister of fisheries and based on the recommendation from the Marine Research Institute (MRI)
- Fishing vessels are allocated a fixed quota share of the species subject to TAC. The combined quota share for all vessels amounts to 100% of each species. The quotas were initially allocated on the basis of catch history prior to the institution of the quota system.
- The quota share is multiplied by the TAC to give the quantity which each vessel is authorised to catch of the species concerned during the fishing year in question. This is referred to as the vessels catch quota.
- Permanent quota shares and annual catch quotas are divisible and transferable to other fishing vessels with minor restrictions.
- The allocations of quotas are subject to a fee.
- Individual Fishing Enterprises may not control in terms of cod equivalent more than the equivalent of 12% of the total quotas allocated for all species and 12 - 35% for the various species.
- All commercial fishing of stocks that are subject to management is subject to these quotas, with the exception of a subset of the small vessel fleet.

49. Currently, 19 species (and well over 30 substocks) that are found primarily within the Icelandic EEZ are subject to the ITQ system. These species account for over 97% of the value of harvest taken within the EEZ.

50. In addition, The ITQ system extends to a number of other fish stocks shared with other nations and for which there is an international sharing agreement.

51. In addition to the ITQ system, which together with the TAC imposition is the cornerstone of Iceland's fisheries management, there are a number of other measures designed to improve the sustainable yield of the stocks. There are rules concerning the type of fishing gear permitted, e.g. the minimum and maximum mesh size. Fishing with bottom trawl is generally prohibited 6-12 miles from the coast and in other areas, which serve as spawning and nursery areas. Sorting grids in fishing gear are obligatory in certain fisheries to prevent catches of juvenile fish. Extensive provisions are made for temporary closure of fishing areas to protect spawning fish from all fishing. Further to this, the Marine Research Institute has the

[4] This value is assessed using the Ministry of Fisheries value coefficients.

authority, which it uses extensively, to temporarily close fishing areas if the proportion of immature fish in the catch is deemed to exceed acceptable limits.

52. The following describes Icelandic ITQ-system in further detail:

Total Allowable Catch (TAC)

53. The Minister of Fisheries determines the Total Allowable Catch (TAC) for each species for which the Marine Research Institute feels a TAC is necessary. The TAC decision is made on the basis of recommendations from the Marine Research Institute. In recent years the Ministry of Fisheries has followed the recommendations of the Marine Research Institute quite closely. In 1995, the Government in order to promote transparency and to avoid rapid changes in TAC, elected to set the TAC for cod on the basis of a so-called *Catch Rule*. The *Catch Rule* for cod, which was revised in 2000, stipulates that the annual TAC must not exceed 25% of the fishable biomass and that changes in the TAC from year to year must not exceed 30.000 mt.

54. Currently 24 species are subject to TACs and consequently individual quotas. These include 14 demersal species the most important of which are cod, haddock, saithe, redfish, Greenland halibut and various species of flatfish; three pelagic species: herring, capelin and blue whiting as well as shrimp, lobster and scallops. These species account for over 95% of the total volume and value of the Icelandic fisheries within the EEZ and more than 97% of the value. The remainder of the catch is accounted for by a great number of domestic species many of which appear as by-catch in the demersal fisheries and are commercially negligible. The fishing pressure on most of these species is regarded as slight. The fact that these fisheries are not currently subject to TAC means that they can be pursued freely.

55. Several commercially important species are found as straddling stocks both inside and outside the EEZ or generally outside the 200 mile EEZ and in few cases in distant waters. These include for instance shrimp on the Flemish Cap, Barents sea cod, the Atlanto-Scandian herring stock, the blue whiting stock, the capelin stock and redfish. When an international agreement exists for the utilization of these species, the Icelandic share is allocated as ITQs. Even in cases where no international agreement concerning the utilization of the shared stock exists, Iceland frequently elects to impose a TAC on her vessels and allocate this TAC as ITQs.

Permanent quota shares

56. Each eligible fishing vessel is allocated a fixed quota share of the species subject to TAC. The combined quota share for all vessels amounts to 100% of each species. Each licenced fishing vessel may hold permanent quota shares in the TAC for any species subject to a TAC. The quotas were initially allocated on the basis of catch history prior to the institution of the quota system. These permanent quota shares, denominated as fractions, may be referred to as quota-shares.

Initial allocation of permanent quota shares

57. The initial allocation of quota-shares to individual vessels varies somewhat over fisheries. In the demersal, lobster and deep-sea shrimp fisheries the quota-shares were essentially based on the vessel's historical catch record during certain base years. In the demersal fisheries this usually equalled 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 quota-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 quota-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 quota-shares were initially allocated on the basis of vessel hold capacity.

Annual vessel catch quotas

58. The size of each vessel's annual[5] catch quota in a specific fishery is a simple multiple of the TAC for that fishery and the vessel's quota-share. Thus, the annual vessel catch quota is denominated in volume terms.

Divisibility and transferability

59. Both the permanent quota-shares and the annual vessel catch quotas are transferable subject to certain restrictions and perfectly divisible. Perfect divisibility means that any fraction of a given quota may be transferred.

60. Restrictions on quota transferability are relatively insignificant. Most importantly, quota-shares are transferable without any restrictions whatsoever. Transfers of annual vessel catch quotas, however, are more restricted. First, no more than 50% of the annual vessel catch quota received at the beginning of the fishing year can be transferred from a vessel. This clearly imposes a significant constraint on quota trades and speculative quota holdings. Any quantity of purchased quotas can be re-traded, however. Second, no vessel may purchase quotas that are clearly in excess of what it can reasonably harvest. Third, any vessel that does not harvest 50% of its annual vessel catch quota every second year will forfeit its permanent quota-share. Taken as a whole, the effect of these restrictions is to discourage speculative quota holdings and trades, restrict quota holdings to bona fide fishermen and to increase short term job security to fishermen and, to some extent, fish workers.

61. Apart from this, transfers of quotas are only subject to registration with the Fisheries Directorate. The particulars of the exchange are registered and listed on the Fisheries Directorate's web site.

Maximum quota holdings

62. The permanent quota-shares held by any company or individual is subject to an upper bound that ranges from 12% of the TAC for cod up to 35% of the TAC for ocean redfish. Moreover, the individual Fishing Enterprises may not control more than 12% of the value of all TACs.[6] These stipulations are explicitly to prevent what is regarded as excessive concentration in the fishing industry.

Fees

63. The annual vessel catch quotas calculated in the above-described manner were initially issued by the Ministry of Fisheries free of charge. However, according to the *Law on Fisheries Monitoring Charges* of 1989, The *Fisheries Management Act* of 1990 and the law of the *Development Fund Act* of 1994, the Fisheries Directorate is to collect a fee to pay for the cost of monitoring and enforcing the fisheries management system, contribute to fisheries research costs and to certain structural changes in the fishing sector. This fee is imposed in several parts; one part is a fishing licence fee, a second is a fee levied on the

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5 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.

6 This aggregate value is calculated in cod equivalents using species exchange rates (essentially price rations) set annually by the Ministry of Fisheries.

annual vessel catch quotas, the third is levied on fishing vessels according to their size. In total these charges amount to some 1.4% of the gross value of landings in 2002. In addition to these charges, vessel owners are required to pay a fixed daily charge for observers that may be placed on their vessels as well as providing them with food and board.

64. In 2002, the *Fisheries Management Act* was amended to include a special fisheries fee. This fee, which will become effective during the fisheries year 2004/5 is imposed on annual quota allocations but is calculated as special fee on the calculated aggregate profits of the fishing industry amounting initially to 6% of these calculated profits and increasing to 9.5% in 2009. When fully in effect, this charge could, at current operating conditions, amount to an additional 2% of the gross revenues of the fishing sector.

Exemptions from the ITQ system: Small vessels

65. In the initial ITQ legislation in the demersal fisheries in 1984, vessels under 10 GRT were exempted. The reason was that these vessels were first of all relatively numerous and, consequently, administratively cumbersome to include. Secondly, in 1984, this fleet accounted for a very small part (about 2%) of the demersal catch. In subsequent years, however, both the size of the small vessel fleet and its harvest increased rapidly and it became a matter of some urgency to put a lid on this expansion. In 1991 the exemption from the ITQ system was restricted to vessels under 6 GRT and their allowable fishing gears to hook and line. Moreover, further expansion in the number of boats was curtailed and for those vessels that did not elect to enter the ITQ system a system of limited fishing days was introduced in order to constrain their total cod catch. As this system did not prove satisfactory, a number of modifications were effected in subsequent years. In 1995, a special small boat ITQ system was introduced that issued ITQs in cod and offered more allowable fishing days than the other system. A large number of small boats elected to go for this option. However, the vessels that chose to stay in the limited fishing days system still continued to cause problems of higher than expected catches and thus t a need for further modifications in the system.

66. Currently, the small vessel fleet, i.e. vessels under 6 GRT, is on three different types of fisheries management regimes. A few dozen of them are in the normal ITQ system, several (about 500) are in a special ITQ system for small boats and the remainder (about 300) are still in a system based on limited fishing days.

67. 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 thought to be of little consequence as this activity is believed to generate negligible harvests compared to the commercial activity.

4. Experience of the ITQ system

68. The individual transferable vessel quota system in Iceland seems to have yielded considerable economic benefits. New investment in fishing capital has been reduced and the fishing fleet has contracted. In some fisheries the number of operating vessels has dropped significantly. Fishing effort has also been significantly reduced. Finally, estimates of the actual economic rents generated by the system as well as analysis of quota values strongly indicate that very substantial economic benefits are already being generated by this management system.

69. To substantiate these claims let’s briefly review the experience of Iceland’s major fisheries:

The pelagic fisheries

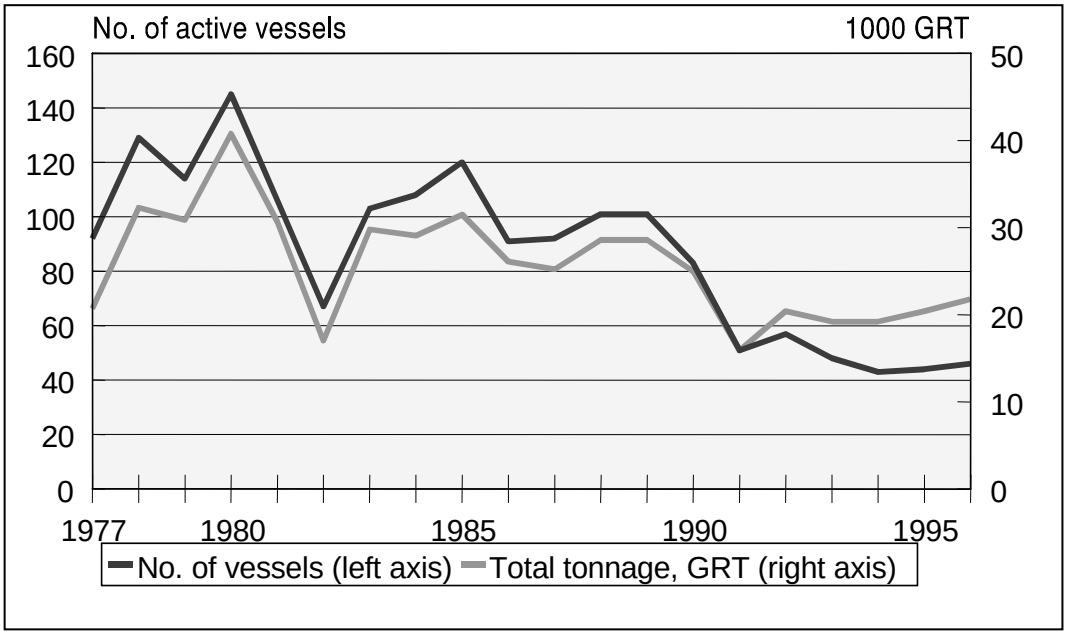
70. The pelagic fisheries are based on three species; herring, capelin and blue whiting. The predominant fishing gear has been purse seine and in recent years pelagic trawl has become an more common. To a large extent the same boats pursue all fisheries.

71. The herring fishery was subjected to IQs in 1975 and ITQs in 1979. The much larger capelin fishery came under IQs in 1980 with limited quota transferability[7] and full ITQs in 1986. So as far as the pelagic fisheries are concerned, the big change in fisheries management came in the 1980.

72. Since 1980 there has been a dramatic decline in the number of the number of fishing vessels and a smaller decline in the total tonnage (GRT) of the pelagic fleet.

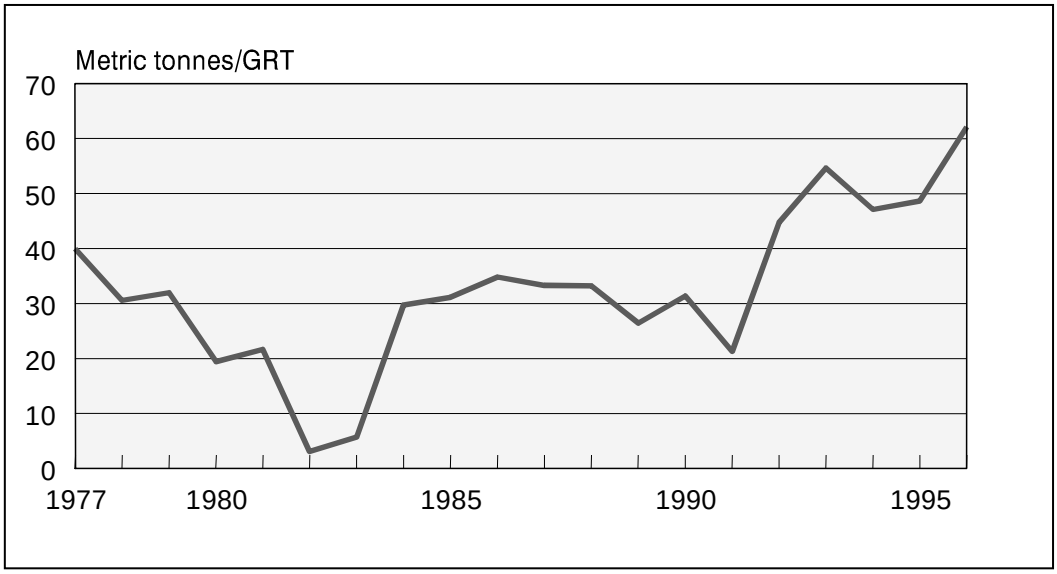
73. Due to the resumption of harvesting from the previously huge and recently recovered Atlanto-Scandian herring in the late 1990s and the emergence of the blue whiting fishery a few years later, time series data on the pelagic fisheries to the present are not comparable. However, from about 1977 to about 1996, the Icelandic pelagic fisheries were based on the Icelandic summer-spawning herring stock and capelin almost exclusively. The history of the purse seine fishing fleet during this period is illustrated in Figure 6.

Figure 6. The Pelagic Fishery: Purse Seiners Fleet Developments
(Purse seine vessels. Number counted as the maximum number active purse seiner in any one month of the year)



[7] Two vessels could combine their permanent quota shares.

Figure 7. Pelagic Fishery: Catch per Unit of Fishing Fleet
(Metric tonnes/gross registered tonne)



74. At the same period the pelagic catches increased, so there was a very substantial increase in the catch per unit of fleet (metric tonnes/GRT) as illustrated in Figure 7.

75. Now in pelagic purse seine fisheries, catch per unit of fleet is a good indicator of productivity. Hence the experience in the pelagic strongly suggests a dramatic increase in the technical efficiency in this fishery.

The demersal fisheries

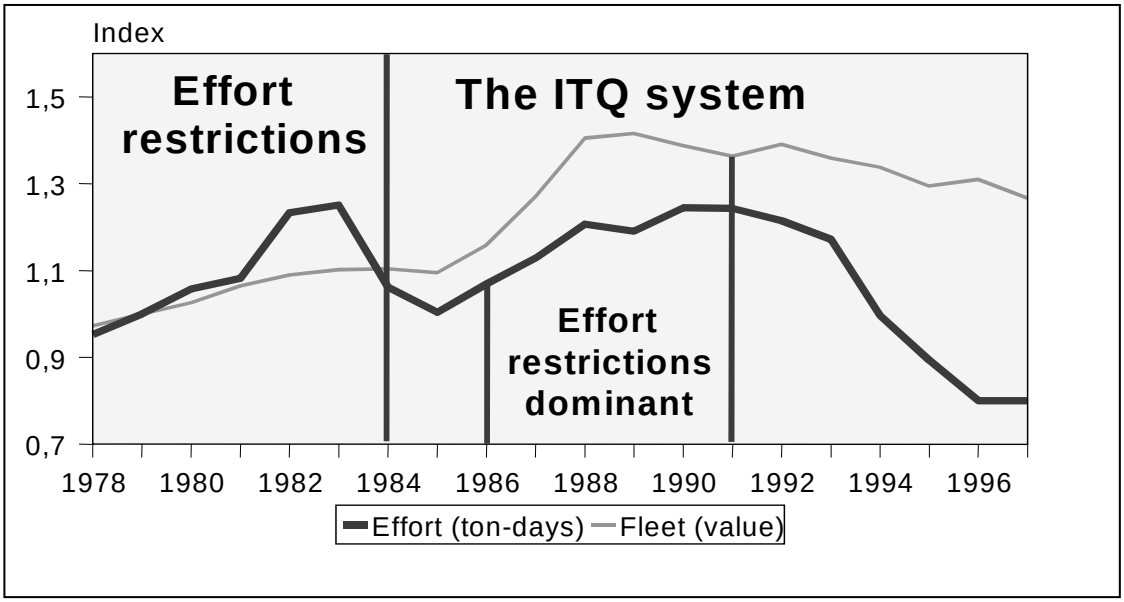
76. From 1978 to 1984, the Icelandic demersal fisheries were managed on the basis of effort restrictions in the form of limited fishing days for cod. An ITQ system was introduced in 1984. However in 1985 this was supplemented with an option to go for limited fishing days instead of a catch quota. As it turned out, a large number of vessels took this option with the result that from 1986 to 1990 more than half of the demersal catch was taken under effort restrictions rather than quota restrictions. The effort option was made less attractive in 1988 and abolished at the end of 1990. Since 1991 a fairly pure form of the ITQ system has been in operation in the Icelandic demersal fisheries.

77. The experience of this system is to a certain extent illustrated in the following Figure.[8]

78. As indicated in Figure 8, periods where the fishery was managed on the basis of effort controls — a typical direct economic restriction — corresponds to a period of increasing fleet size and fishing effort. On the other hand, the periods of the ITQ management have implied substantially reduced fishing effort and a slowly reduced fishing fleet. Thus from 1990 to 1997, under the complete ITQ system, demersal fishing effort was reduced by over 30%. A similar speedy reduction in fishing effort occurred in 1984-5 when ITQ restrictions were dominant. Thus, clearly, the ITQ system has brought the demersal fishery towards greater efficiency.

[8] Unfortunately due to alternation in statistical collection it has not been possible to obtain demersal fishing effort data beyond 1977.

Figure 8. The Evolution of the Demersal Fishing Fleet and Effort

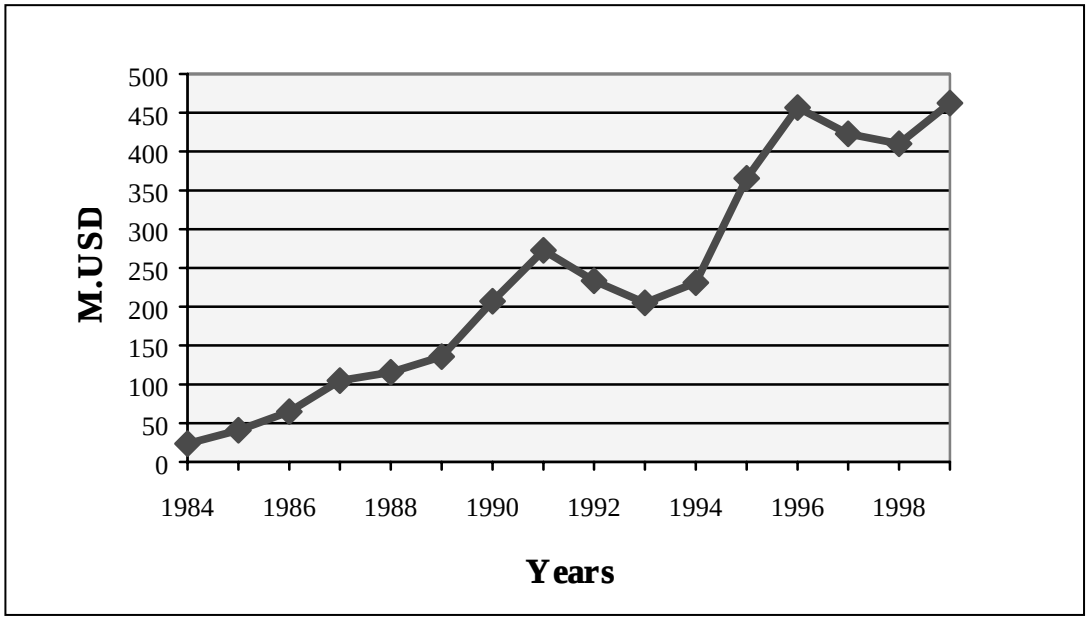


The fisheries as a whole

79. Another and more direct way to assess the efficacy of the ITQ system fisheries is to look at quota values. As the quotas are transferable, an efficient market for trading them has evolved. According to standard economic theory (see e.g. Arnason 1990), the total market value of quotas should provide us with a good measure of the net rents generated in the fishery.

80. The evolution of the annual quota values is illustrated in Figure 9. This figure, more precisely, describes the total annual rental value of quotas in all Icelandic fisheries .

Figure 9. Annual Quota Rental Values in the Icelandic Fisheries
(Million USD)



81. As shown in Figure 9, the quota valuation of the Icelandic fisheries has greatly increased from 1984 onward. It is currently about USD 450 million per annum, almost 20 times what it was in 1984. This implies two things:

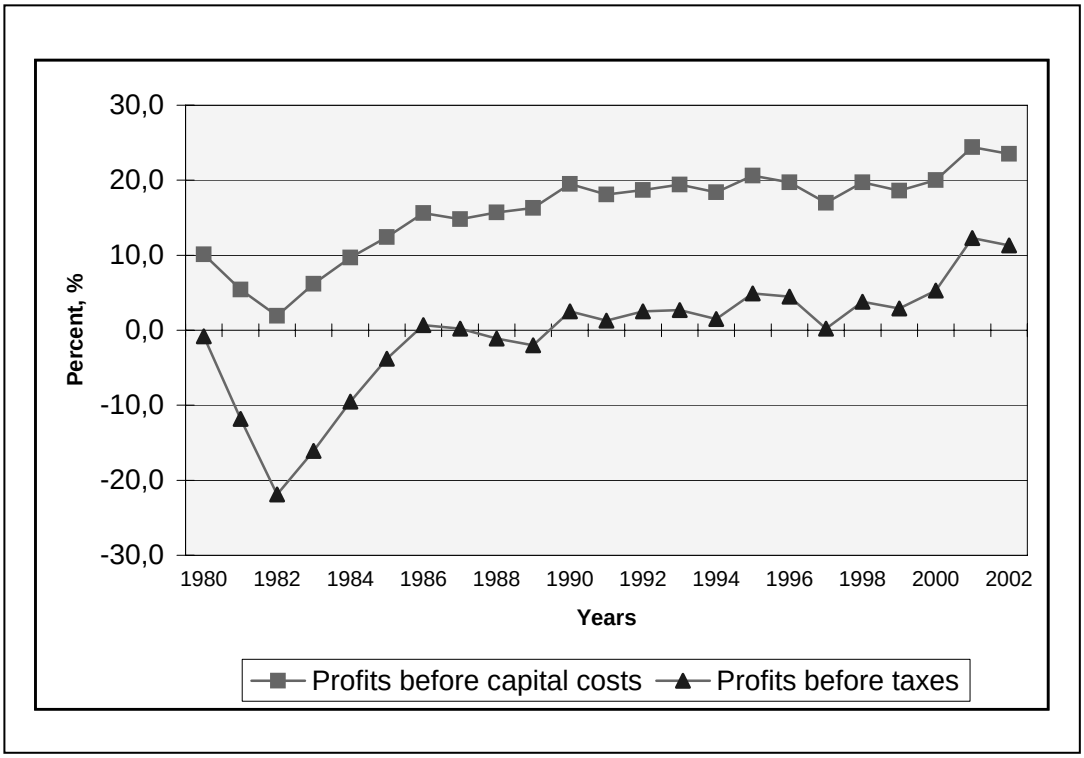
1. Since 1984, under the ITQ fisheries management system, the efficiency of the fisheries has increased dramatically.
2. Currently, the economic rents generated by the fisheries, as measured by the quota price evaluation, constitutes a substantial fraction of the average landed value.

82. These quota valuation results are confirmed by a couple of other statistics; (i) the operating results of the fishing companies and (ii) estimates of technical progress in the fishing industry.

83. Let us first look at the operating results of the fishing industry as reported by the National Economic Institute (2001 and Statistics Iceland 2003). These estimates based on the examination of the operating accounts of a sample of fishing firms indicate a fairly dramatic upward shift in the profitability of the fishing industry since the introduction of the ITQ system in 1984 and the consolidation of the system in 1991. These results are further illustrated in Figure 10.

84. A recent study (Ministry of Fisheries 1999) attempted to estimate growth in the productivity of the Icelandic fisheries between 1974 and 1995. Productivity growth is a is well known often associated with technical progress (see e.g. Grosskopf 1993). In the case of the fisheries, productivity growth or, for that matter, technical progress may stem from improved fisheries management (Arnason 2003). Thus, examination of the evolution of factor growth productivity in the Icelandic fisheries may throw light on the impact of the ITQ system.

Figure 10. Profitability in the Icelandic Fisheries
(Percent of revenues)

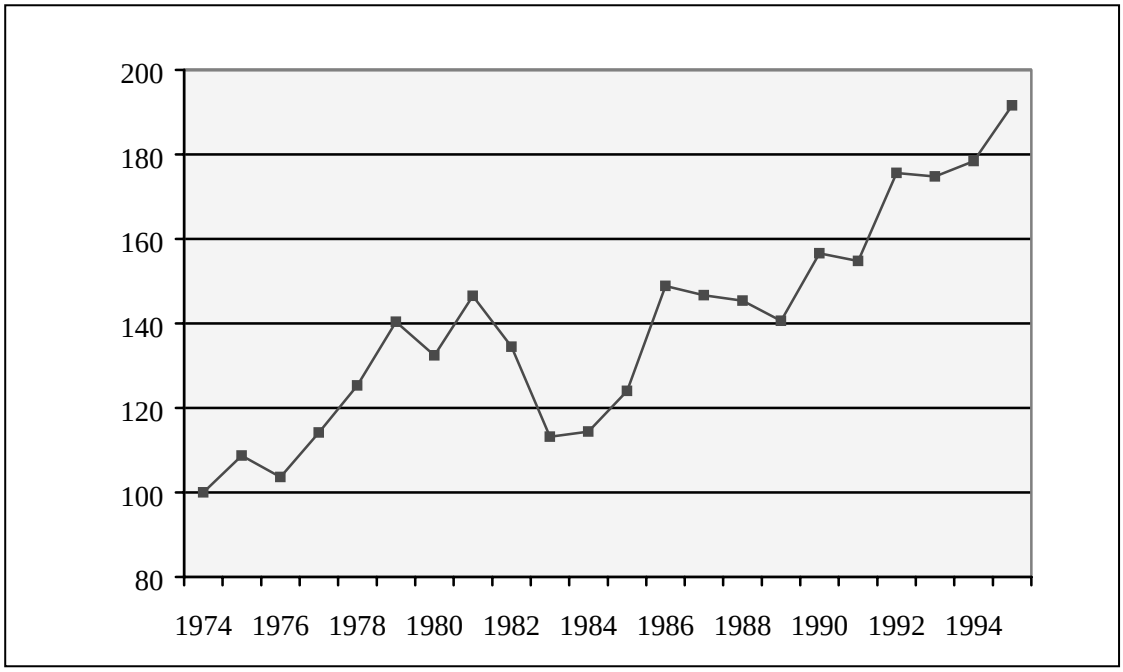


Source: National Economic Institute)

85. The path of factor productivity in the Icelandic fisheries since 1974 until 1995 is illustrated in Figure 11. In interpreting this figure it is important to keep in mind that the big steps in the evolution of the Icelandic ITQ system were taken in 1984 when the demersal fisheries were put on ITQs and in 1991when a fairly uniform ITQ system was established in all fisheries.

86. Figure 11 indicates a substantial growth in productivity in the Icelandic fisheries as measured by the total factor productivity measure (Arnason 2003). Over the data period as a whole (22 years), factor productivity has increased by over 91%. The trend rate of productivity growth has been about 3.5%, which is much (about 3 times) higher than in any other major Icelandic industry and, indeed, in most major industries abroad. Moreover, it turns out, as is actually apparent from Figure 3.6, that most of this productivity growth occurs after 1994. Indeed, in spite of the extension of the fisheries jurisdiction to 200 miles in 1976, which is probably responsible for much of the productivity growth during the first part of the period, the growth rate since 1984 is significantly higher than in this earlier period. This may be taken as added evidence of the increased economic efficiency under the ITQ system.

Figure 11. Total (three factor) productivity for the Icelandic fisheries



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