# Fisheries Policy Maker's Future Perspective to a Sustainable Society Adapting Climate Changes

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# Outline

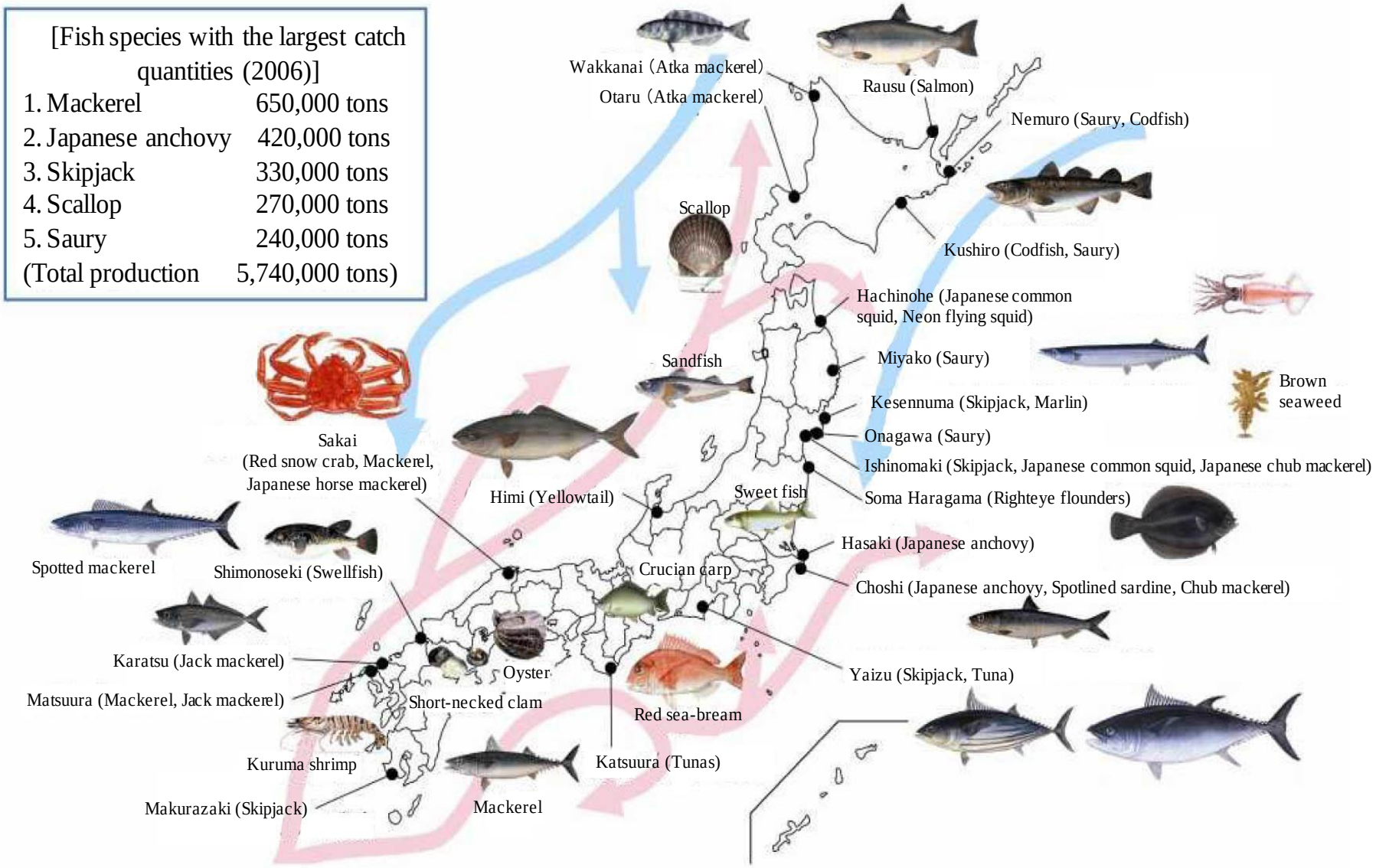
- Overview of the state of fisheries & aquaculture in Japan
- Observed and predicted effects of climate change around Japan
- Recent actions for mitigating negative impacts of climate change
- Future perspective toward a sustainable society

# Overview of the state of fisheries & aquaculture in Japan

# Various kinds of fishery products available in Japan's surrounding waters

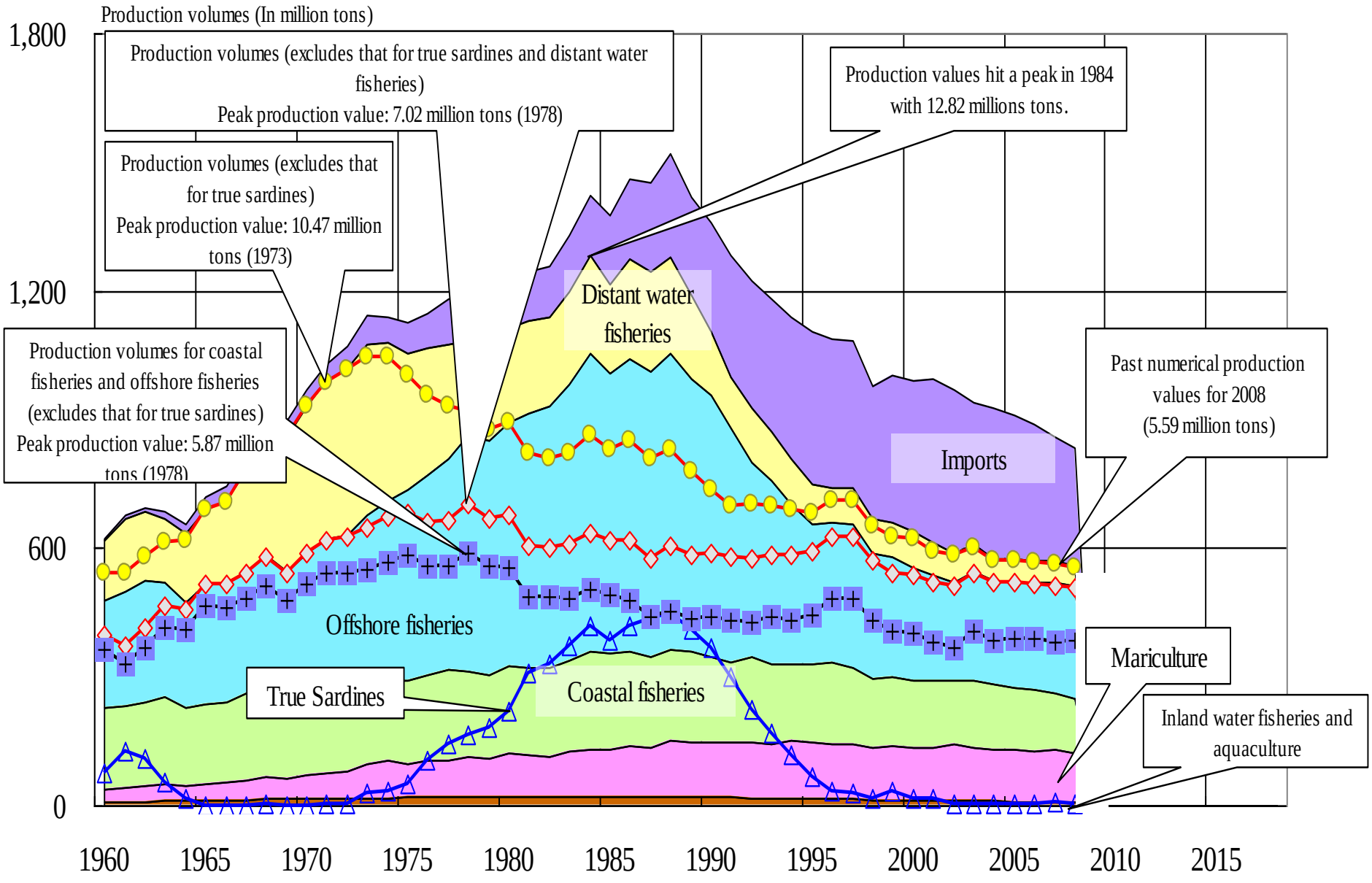
[Fish species with the largest catch quantities (2006)]

| | |
|---|---|
| 1. Mackerel | 650,000 tons |
| 2. Japanese anchovy | 420,000 tons |
| 3. Skipjack | 330,000 tons |
| 4. Scallop | 270,000 tons |
| 5. Saury | 240,000 tons |
| (Total production | 5,740,000 tons) |

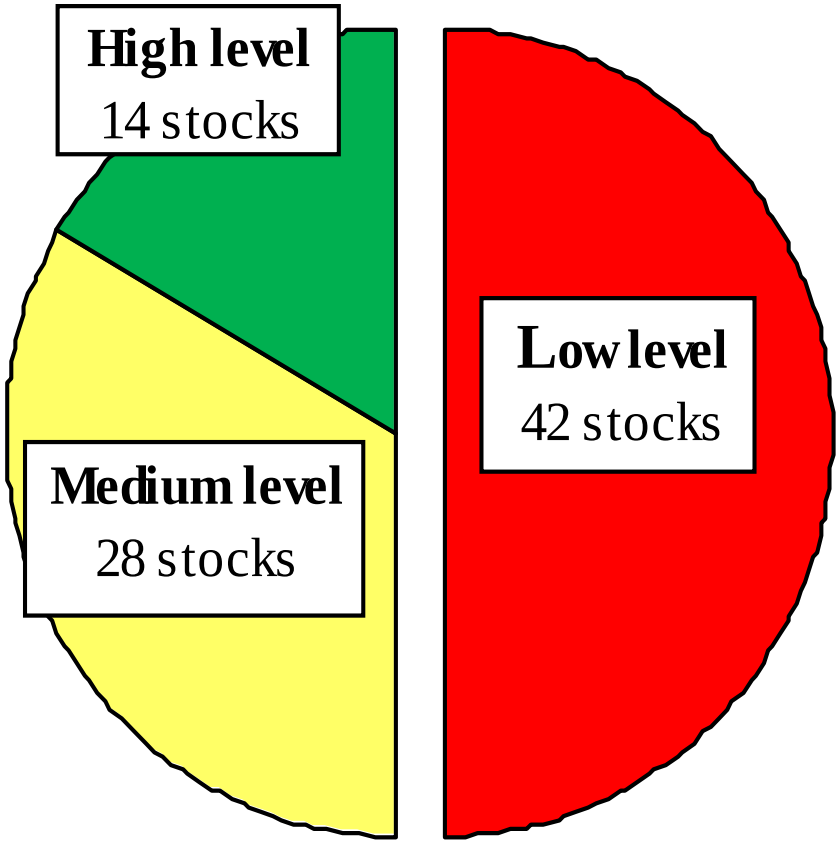



Sources: "Annual Fishery Product Distribution Statistics" and "Annual Statistics of Fishery and Aquaculture Production," Ministry of Agriculture, Forestry and Fisheries.

# Changes in Production Volumes and Production Values by Fishery Category

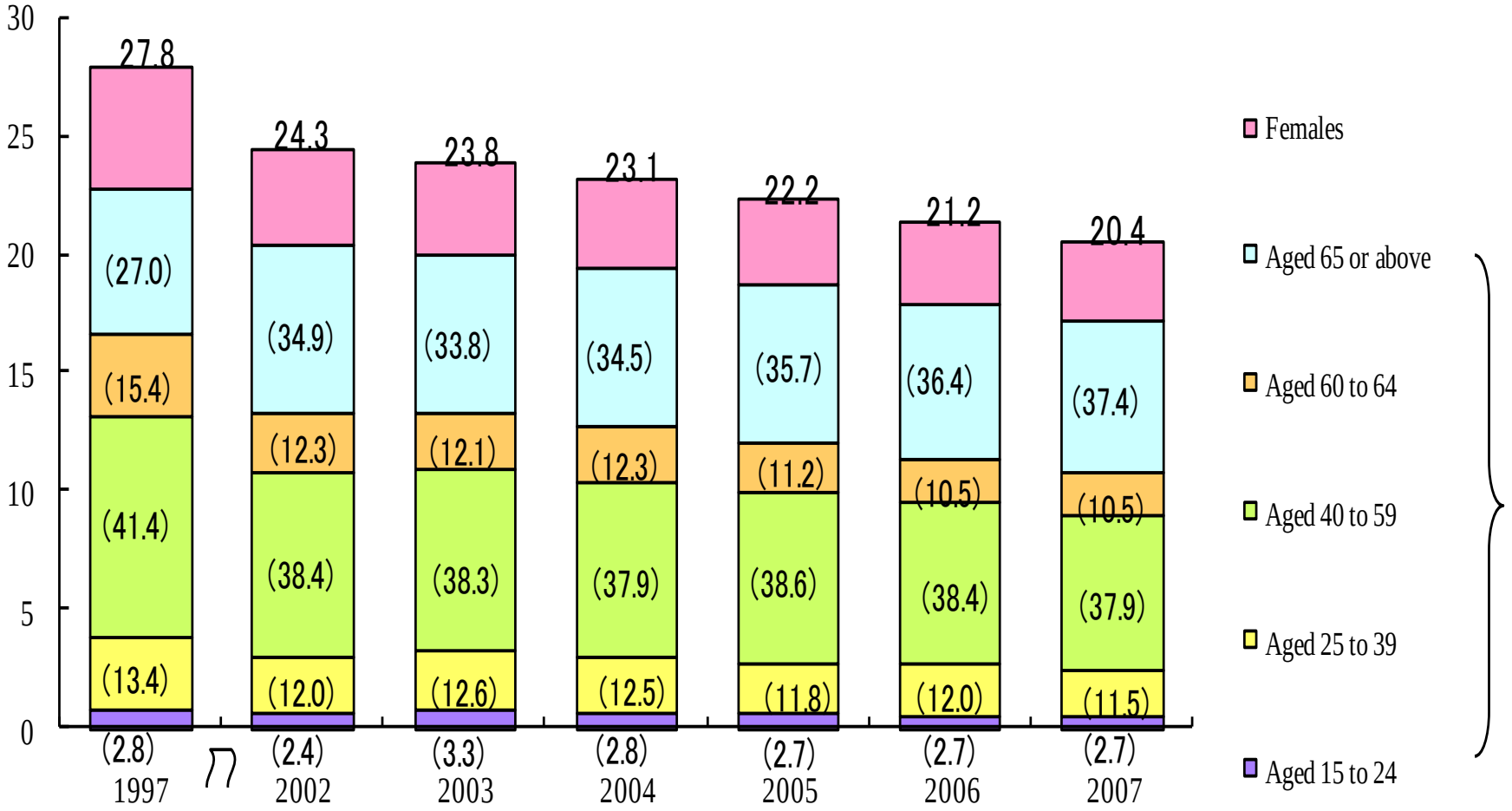


# • Fish Stock Status around Japan (2008)




| Main species or stocks | |
|---|---|
| **High** | Saury, Southern mackerel |
| **Medium** | Horse mackerel, Japanese common squid |
| **Low** | Japanese mackerel, sardine, Walley pollack |

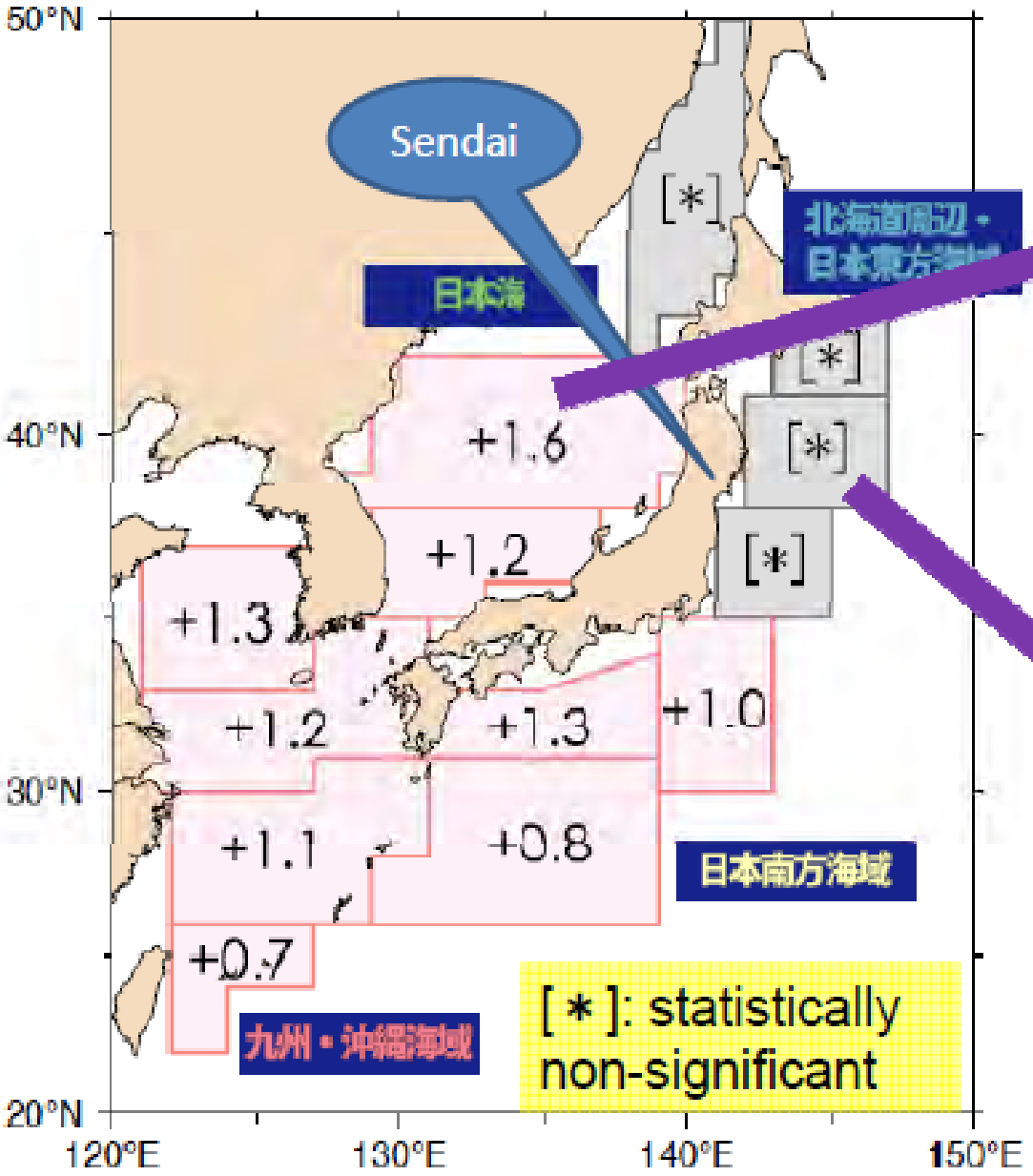
# Decline in the numbers of and aging of fishery workers are in progress

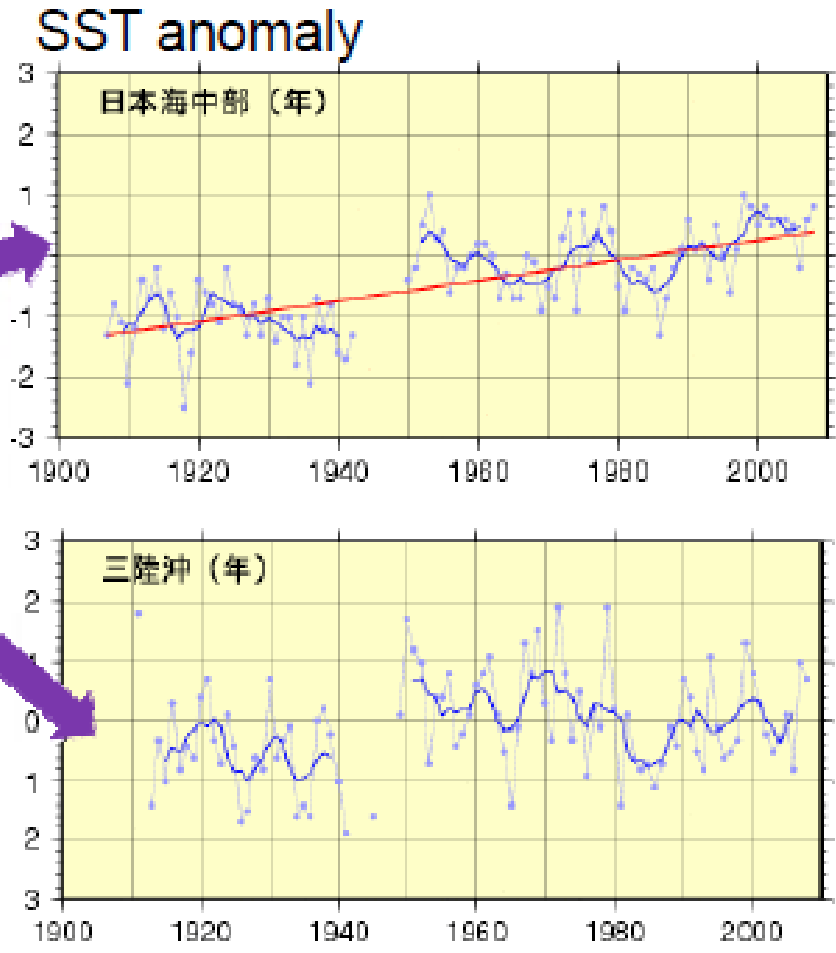


# Observed and predicted effects of climate change around Japan

# 2. Effects of SST rise (℃) since 1900 around Japan

(SST data: Meteorological Agency of Japan)




SST anomaly: decadal-scale var. + warming trend

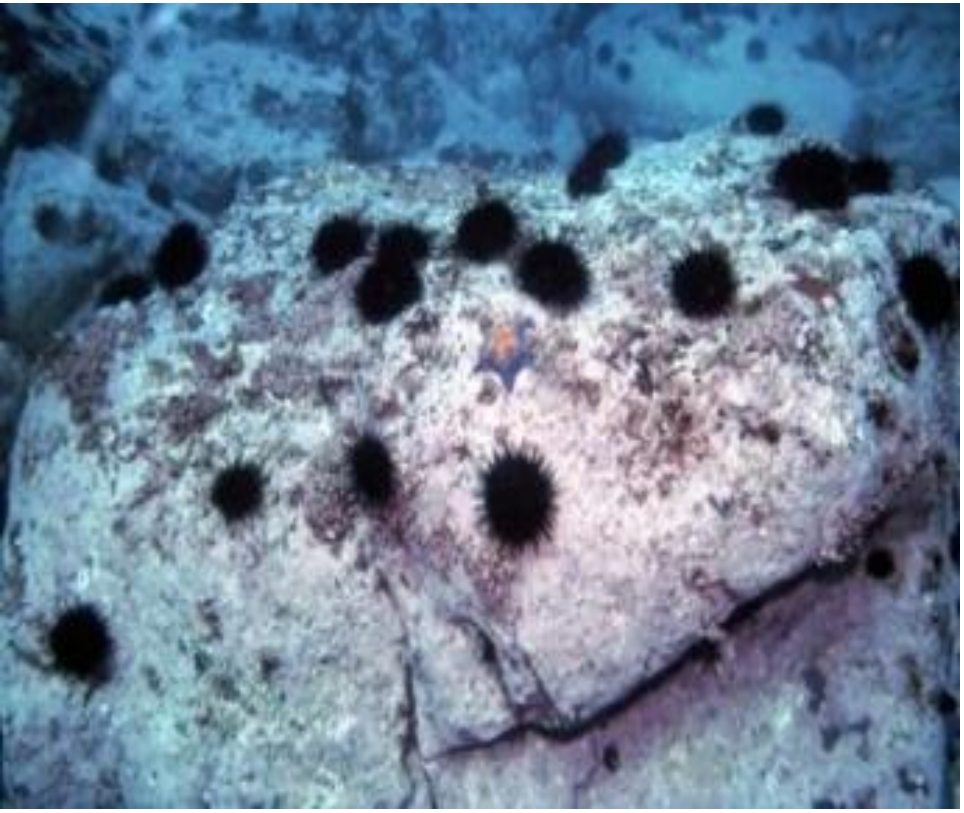
# Loss of macroalgal bed from summer to winter due to changes in species composition of macroalgae and mass predation by tropical herbivorous fishes (Yoshimura et al. 2009)

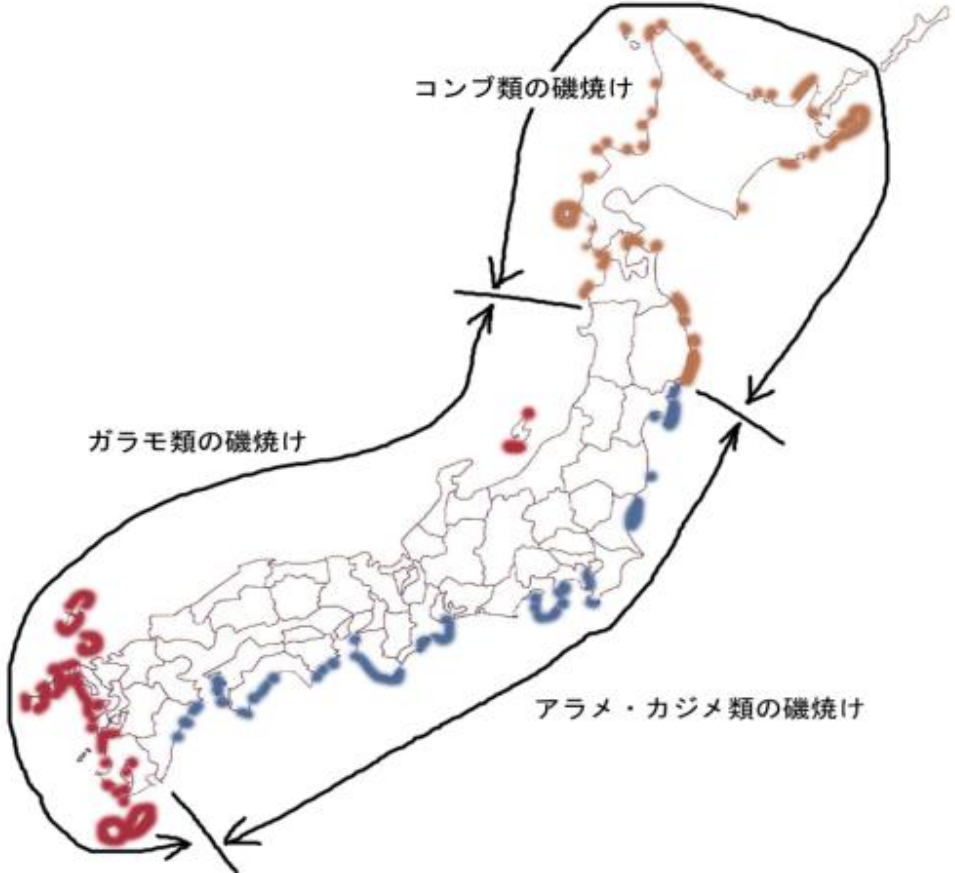
*Siganus fuscescens* and *Kyphosus bigibbus*

*Sargassum macrocarpum:* results of a cage experiment protecting from predation by fishes

Loss of macroalgal bed deteriorated nursery of many fishes and invertebrates including commercial species such as spiny lobster

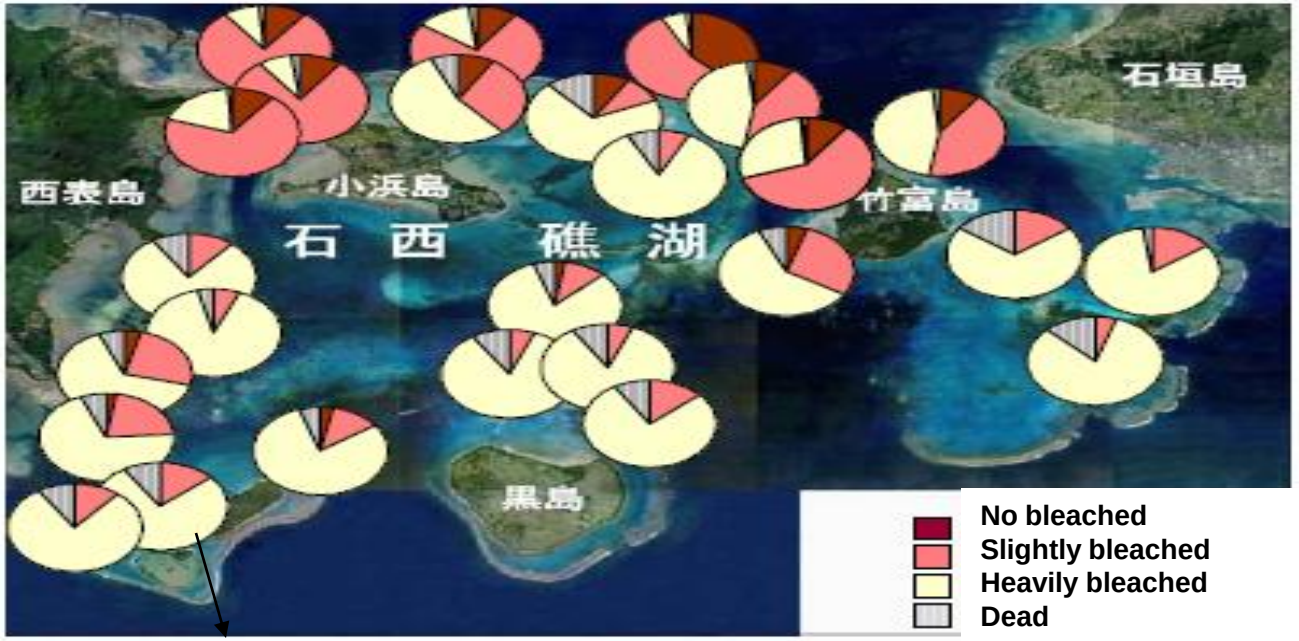
# Rocky-shore denudation!





# Coral reef bleaching!

Coral reef bleeching in Ishigaki shore-reefs, southern part of Japan, July 2007




**Bleaching coral reef in August 2007,**

**Dead coral reef in December 2007**

# ◎ Change of distribution/migration pattern

Japanese Spanish Mackerel

# Life History of Pacific Saury with Oceanographic Features


Feeding ground
in summer

Oyashio Front

Fishing ground
in autumn

Mixed water region

Migration

spawning ground
in spring & autumn

Kuroshio Extension

spawning ground
in winter

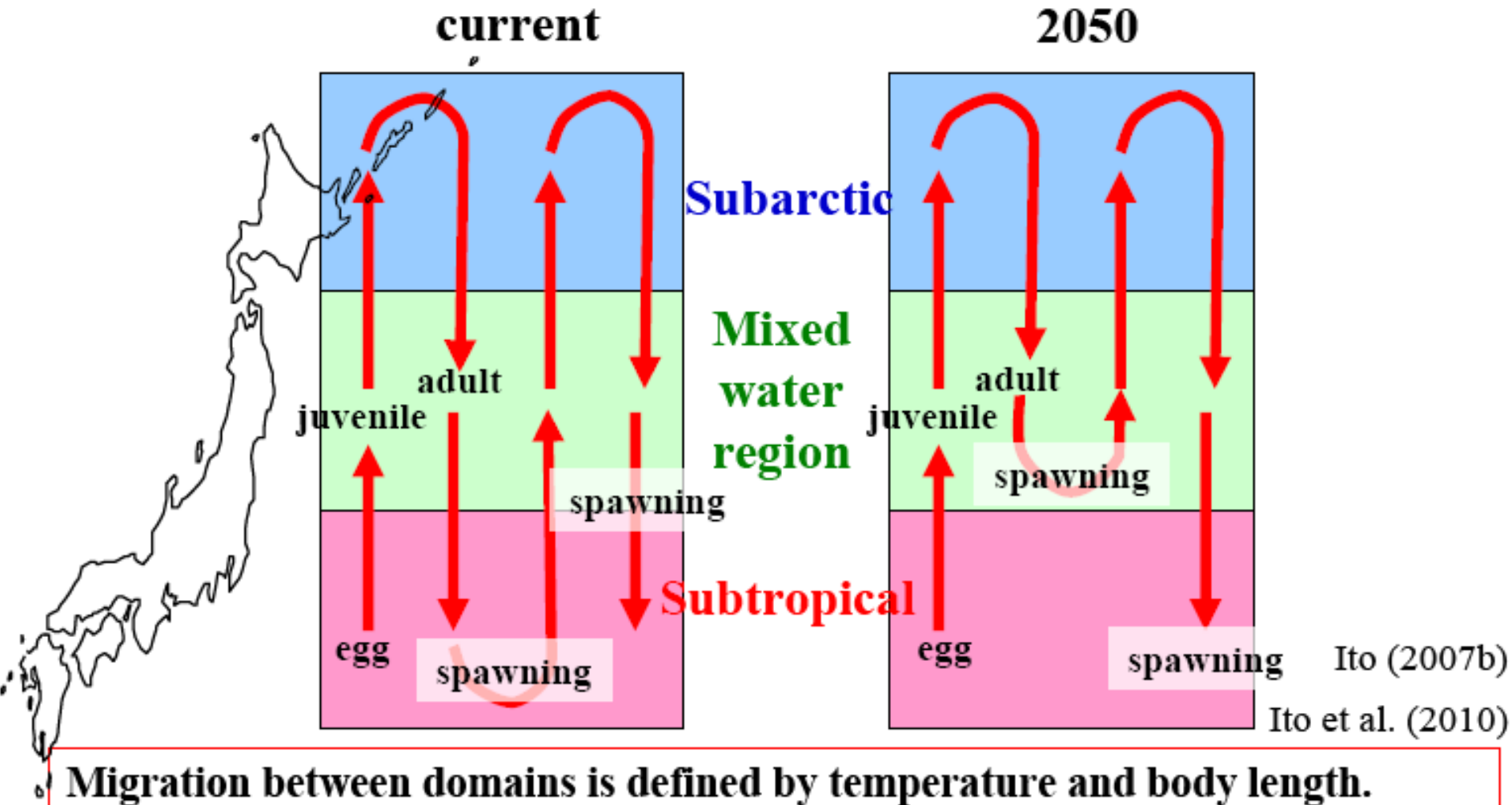
Migration

40
35
30

130 135 140 145 150 155 160 165

Ito et al. (2004a, Fish. Oceanogr.)

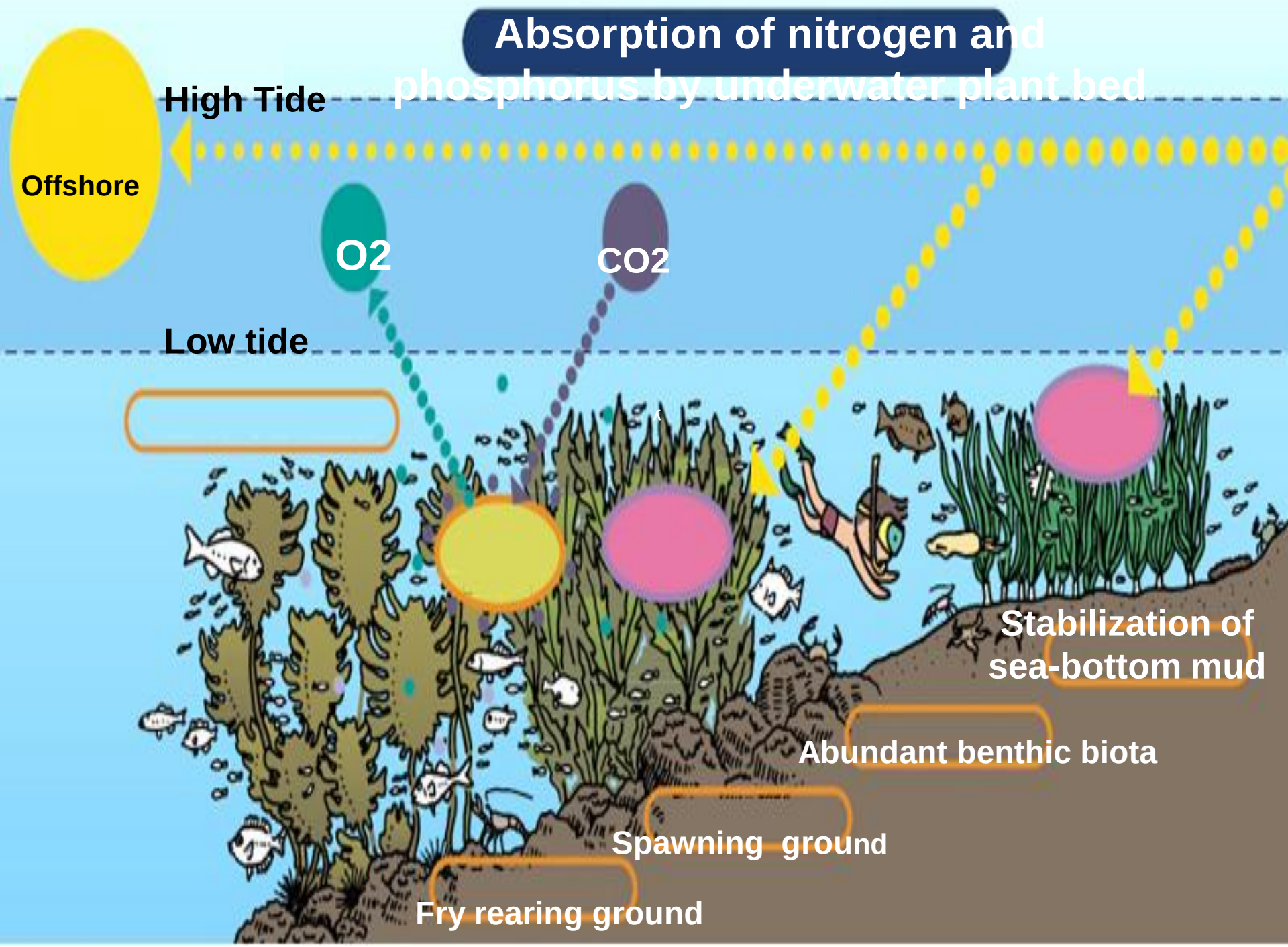
# *Pacific saury (Global warming): simple model application*




Ito (2007b)

Ito et al. (2010)

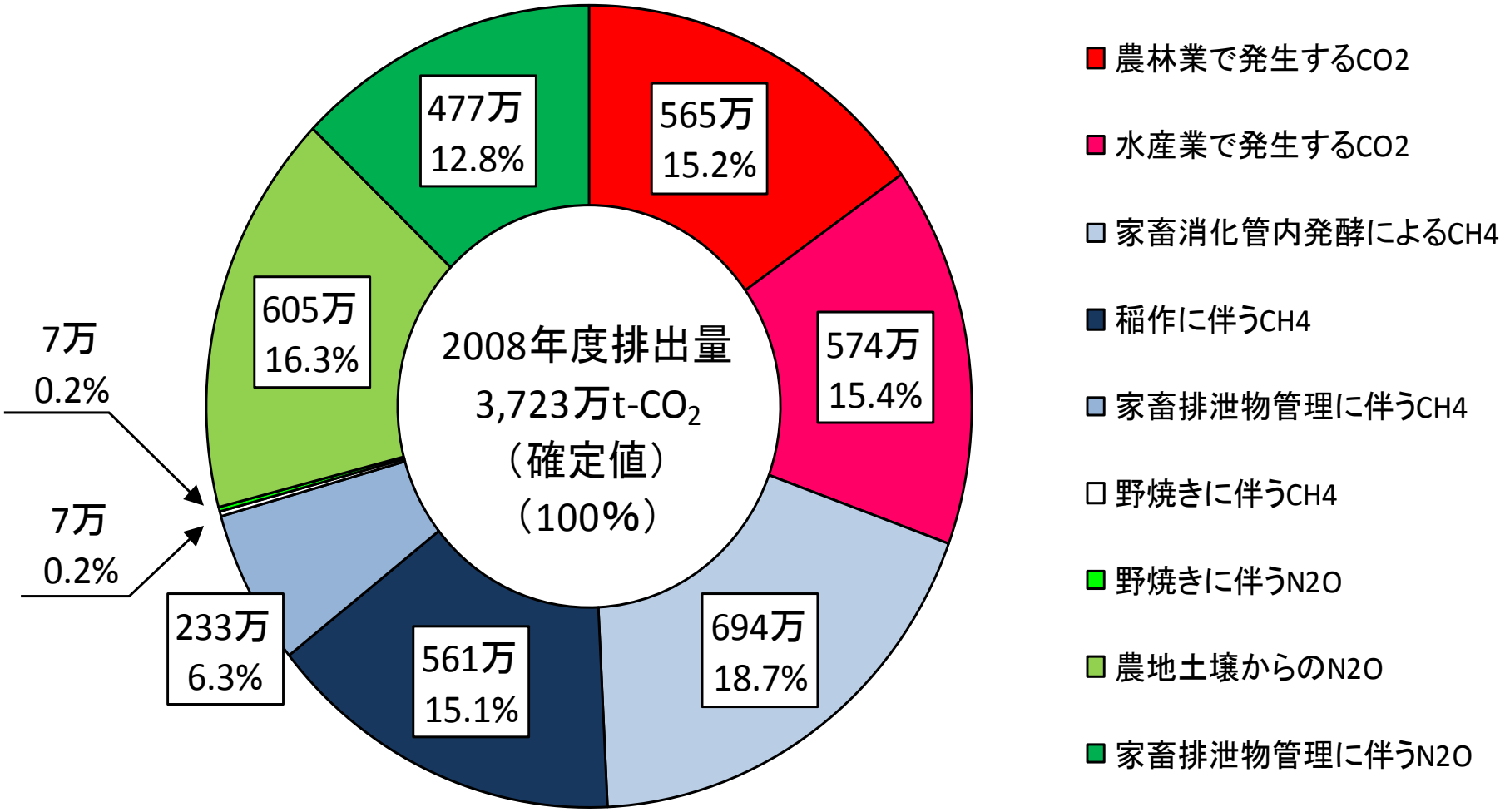
**Migration between domains is defined by temperature and body length. Under global warming situation, fish size is reduced and temperature is enough high in the mixed water region.**
**These factors prevent southward migration of saury in 1st winter and delay 2nd year migration. As a result, saury egg production is enhanced.**


Absorption of nitrogen and phosphorus by underwater plant bed
High Tide
Offshore
O2
CO2
Low tide
Stabilization of sea-bottom mud
Abundant benthic biota
Spawning ground
Fry rearing ground

# Recent actions for mitigating negative impacts of climate change

- Reduction of Co2 emission through energy-saving technology & operation

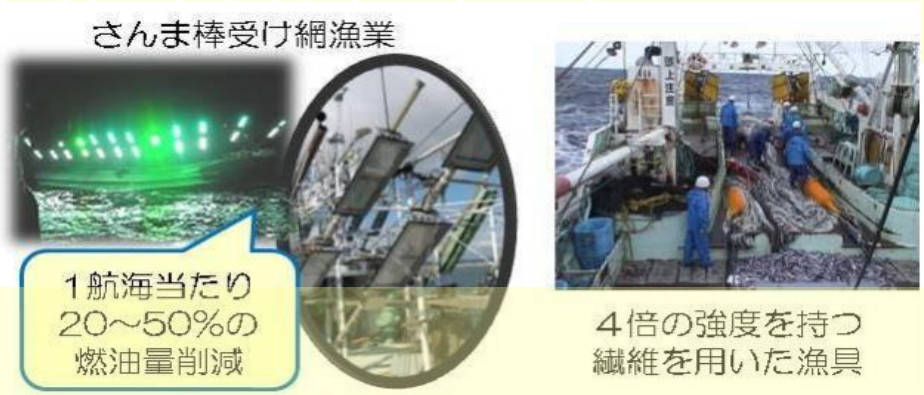
- Increase the robustness through improvement of productivity


565万
15.2%
574万
15.4%
694万
18.7%
561万
15.1%
233万
6.3%
7万
0.2%
7万
0.2%
605万
16.3%
477万
12.8%
2008年度排出量
3,723万t-CO2
（確定値）
（100%）
農林業で発生するCO2
水産業で発生するCO2
家畜消化管内発酵によるCH4
稲作に伴うCH4
家畜排泄物管理に伴うCH4
野焼きに伴うCH4
野焼きに伴うN2O
農地土壌からのN2O
家畜排泄物管理に伴うN2O

# Specific measure undertaken for reducing Co2 emission

## ◎Introduction of energy-saving technology

・LED lights for luring fish, Reinforced & lightened fishing net, Small fishing boat equipped with a hybrid electric engine etc.




## ◎Shift to energy-saving operation

・A rotation to reduce fishing capacity while keeping every incumbent in business

Ex. 4 group operation→ 3group operation while one group involving in cultivation of fishing ground

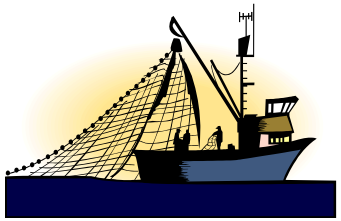
（Saga Prefecture）

Shell smashed into pieces and scattered into the sea

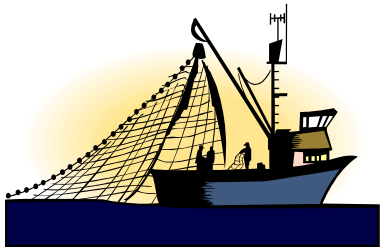
# ◎ Fishing Capacity Reduction

- Improve working and living environments
- Installation of equipment for new production
- conserving manpower by introduction of a new fishing net handling machines

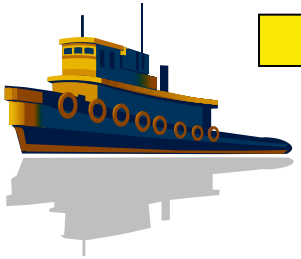
**Conventional fleet** (4 fishing boats, 52 people on board

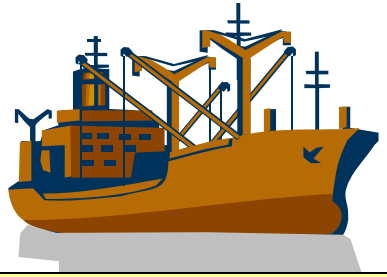


**Streamlined fleet**
(2 fishing boats, 33 people on board )



fish catching and fish carrier vessel





Fish carrier and scout vessel

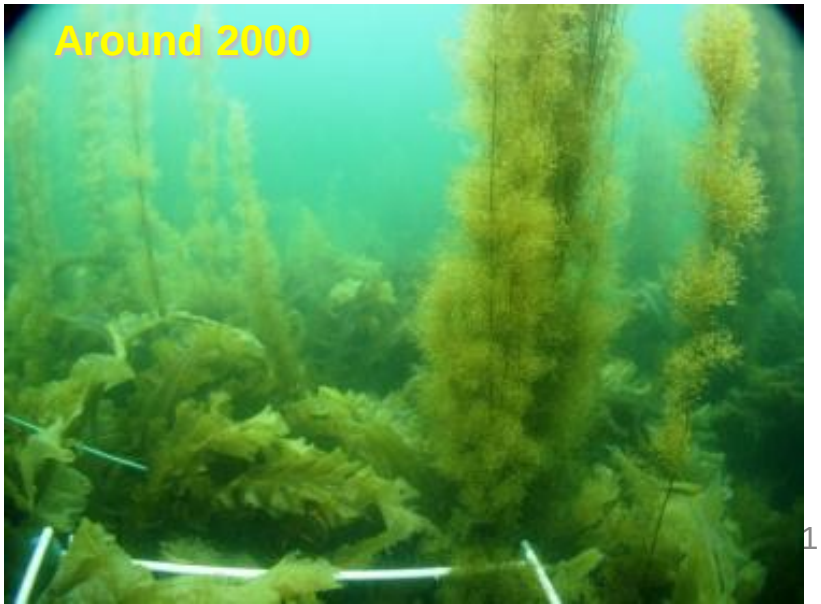
# Improving productivity in tidelands

Tilling of tidelands

Extermination of pests such as starfish and bladder moon shells

# Transform rocky-shore denudation into an undersea jungle



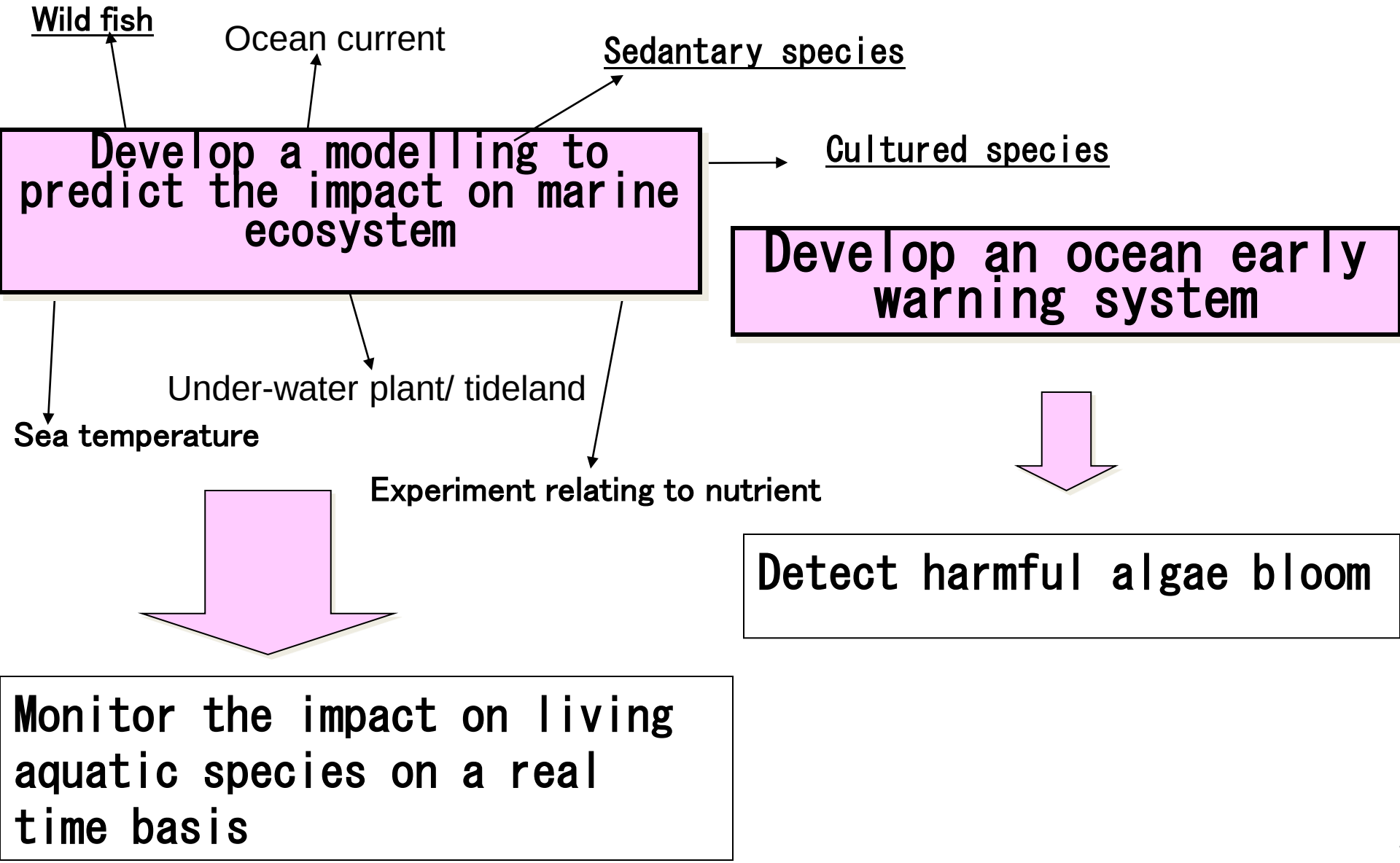



# Future Perspective

- Reducing uncertainty and building adaptive capacity to a wide range of unpredictable effect

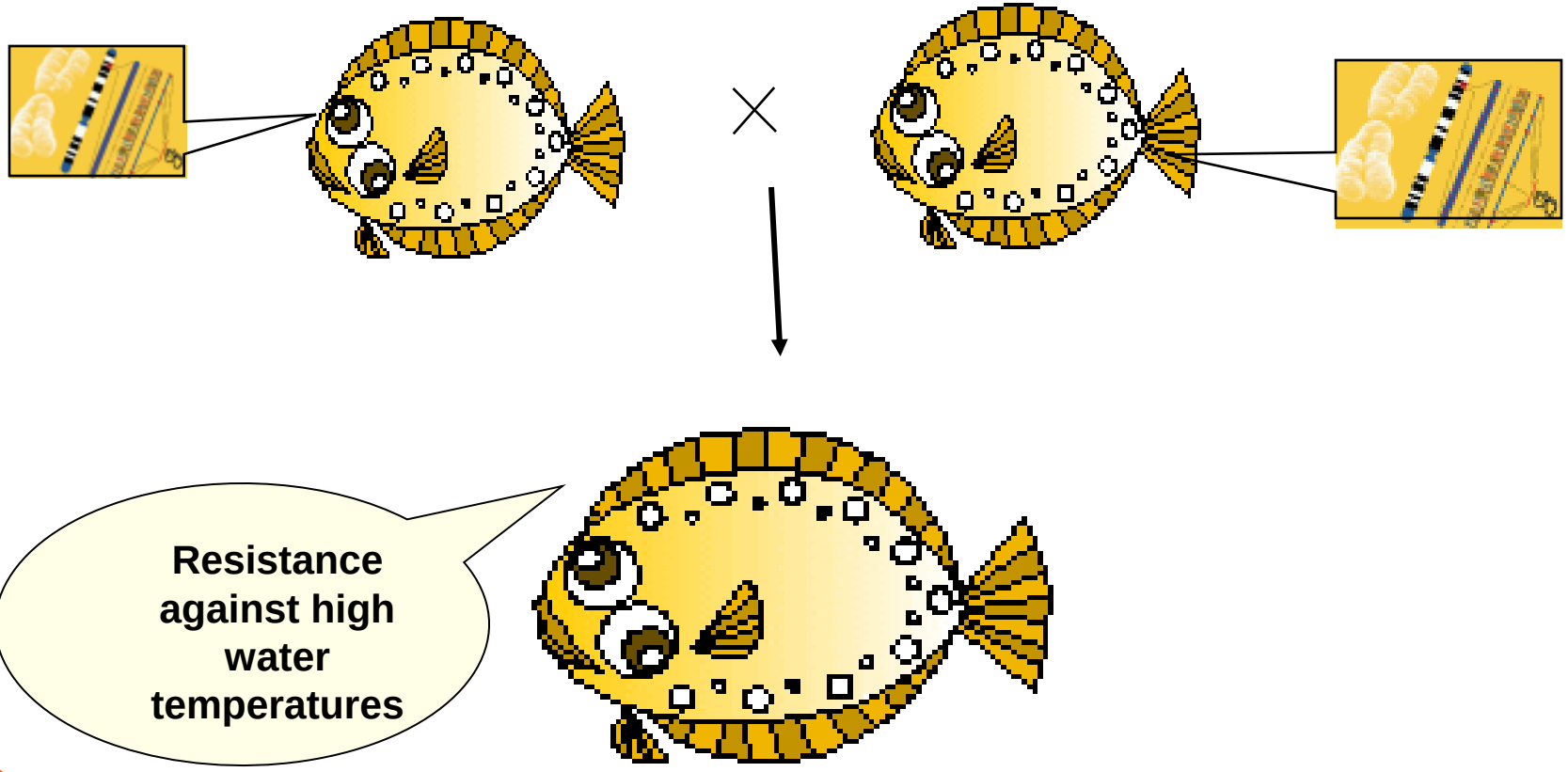
- Creating a new fishery governance?

# Research and Development of Technology for Climate Change



# Develop temperature tolerant cultured species

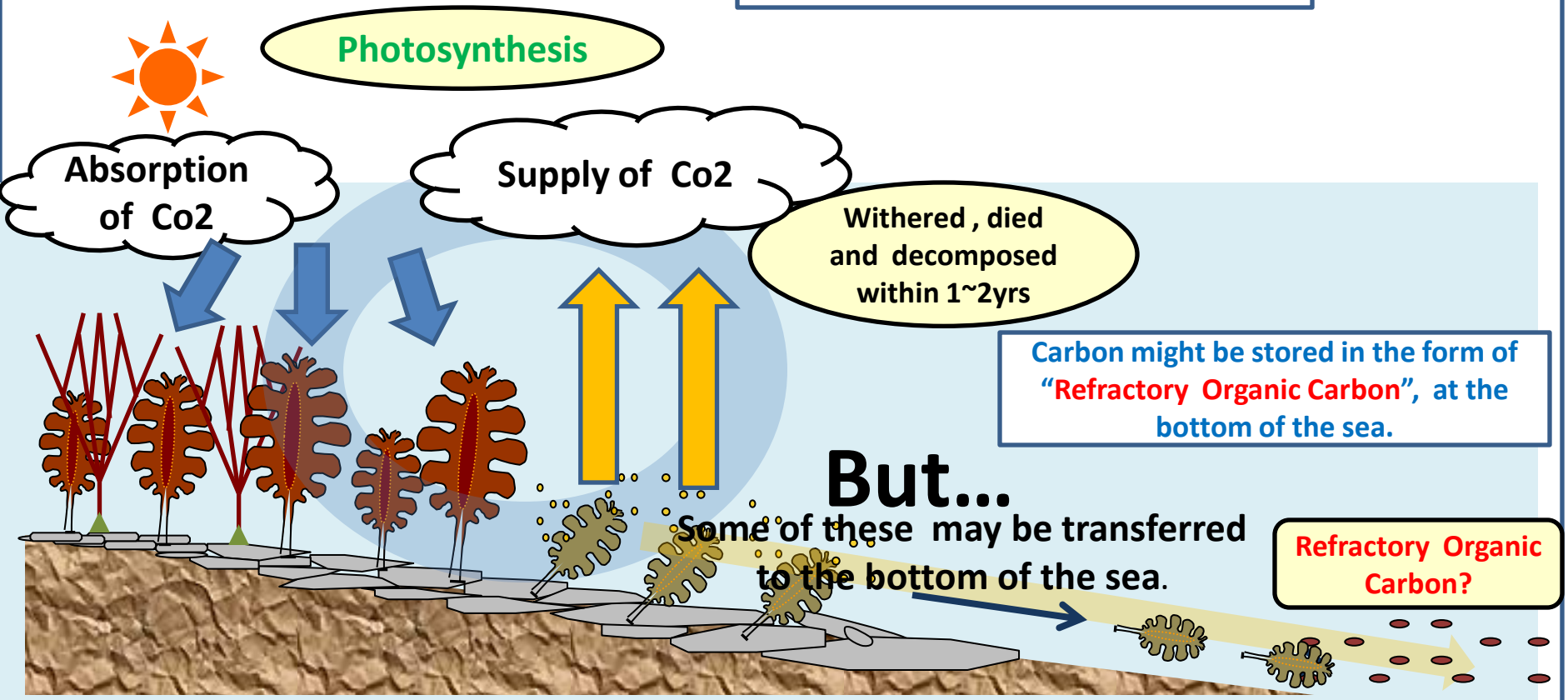
Evaluate the species adapting climate change



# Storing Co2 in the Under-water Plants

**Possibility of a source of storing Co2**

**Perhaps carbon balance within 1~2 yrs is zero(plus /minus zero)**




- Clarification of a mechanism on carbon balance.
- Quantitative assessment of **Refractory Organic Carbon** originated from under-water plants, if identified.

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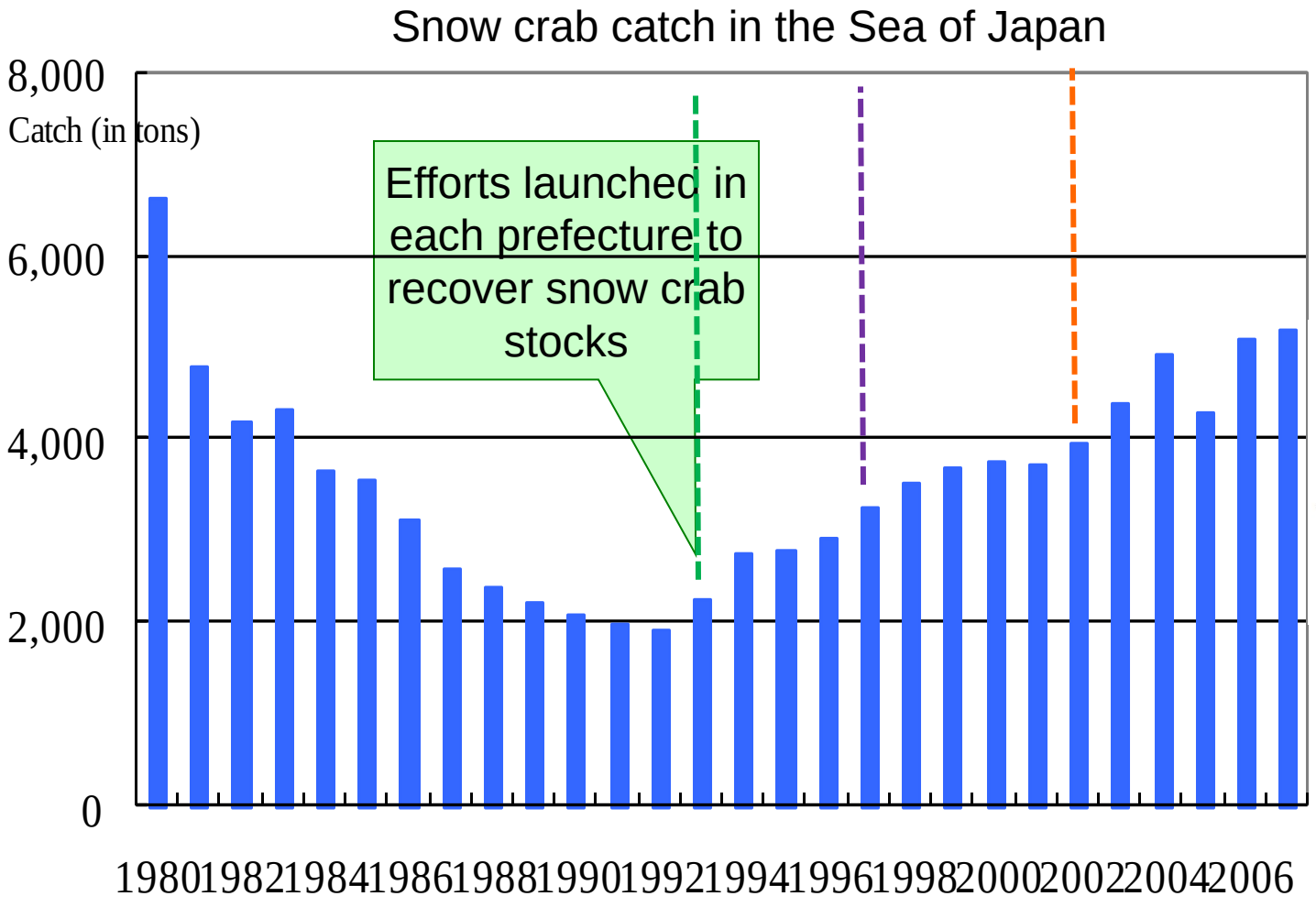
# A new fishery governance or good fishery governance?

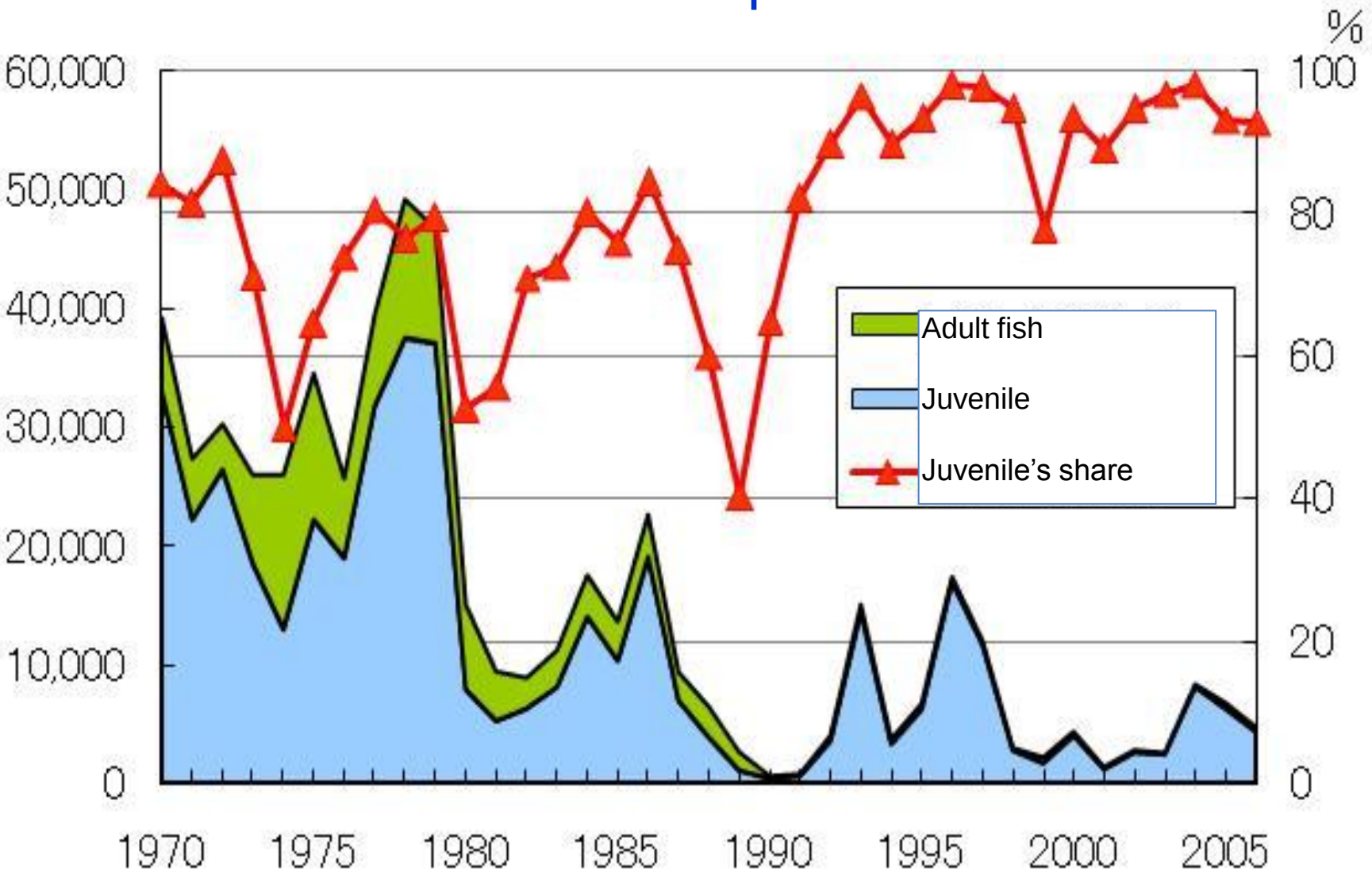
- Implementing the ecosystem approach to the fisheries (EAF)
- Increasing fish stocks
- Participatory approach
- Learning lessons from traditional knowledge or practice

# Eco Labels: linking producers and consumers to pursue sustainable fisheries

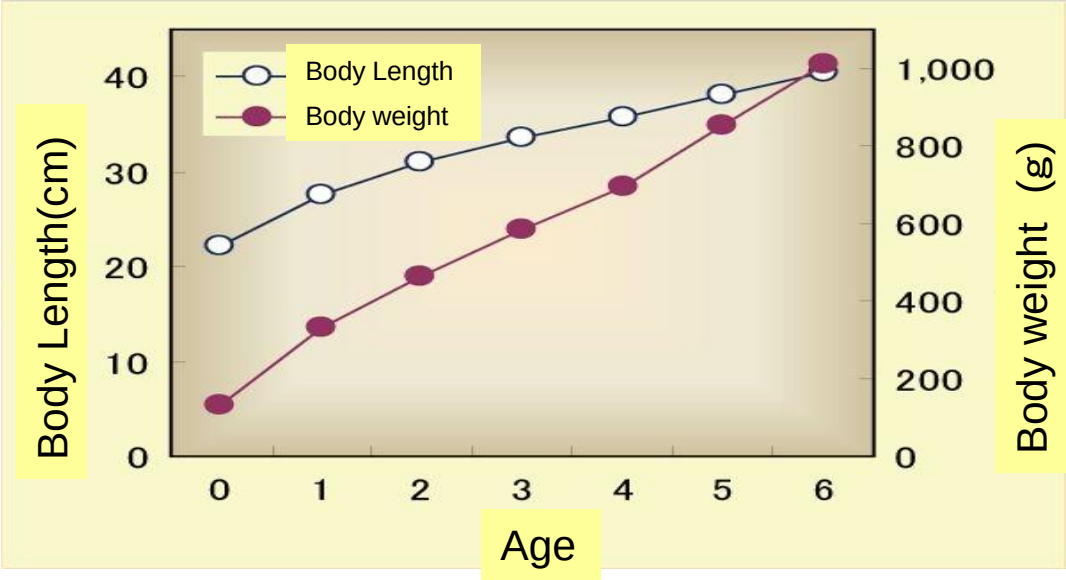


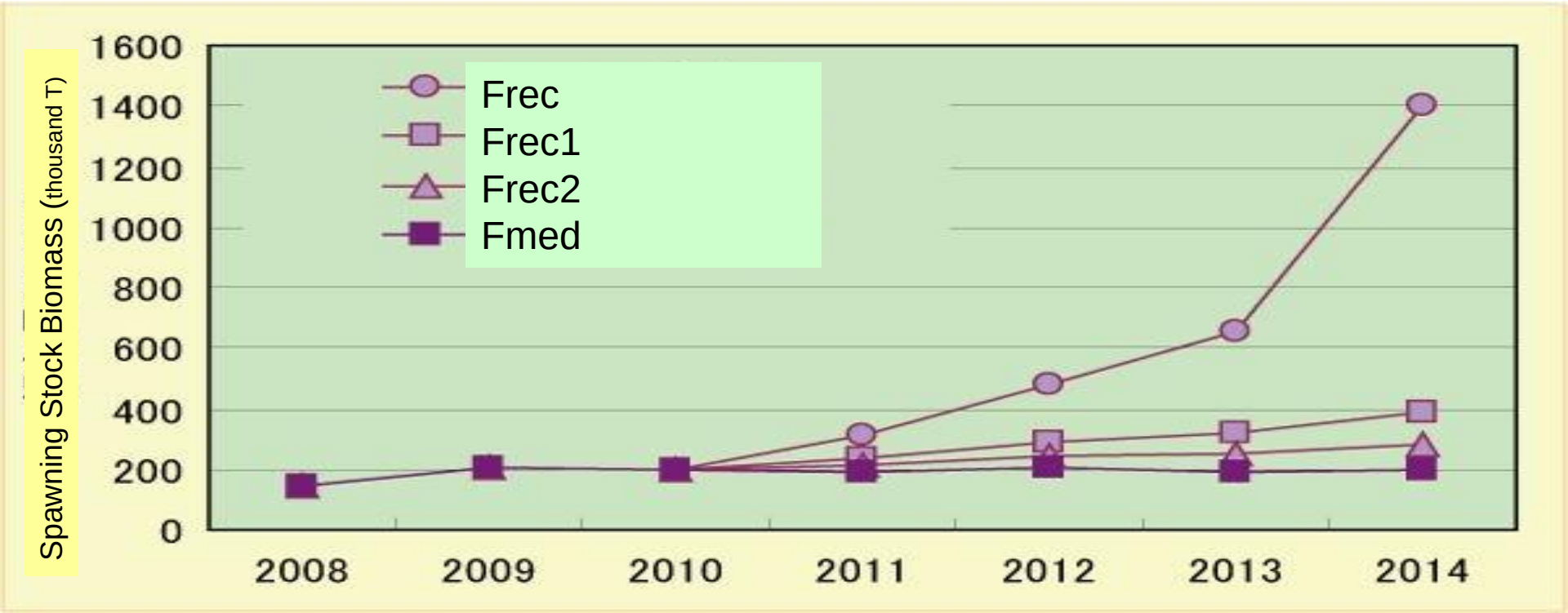
# ◎ Increasing fish stock?

## Pacific mackerel stocks expected to recover



The less juvenile we catch, the more adult fish we have.



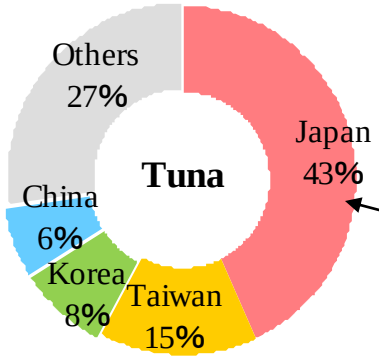
# Promotion of participatory approach for the preservation of marine environment

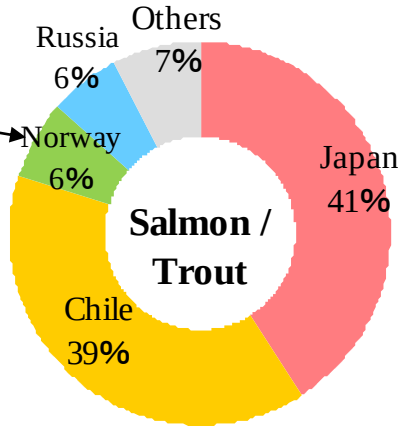
**Tokyo Bay  Eelgrass Recovery Program, organized by several NPOs**

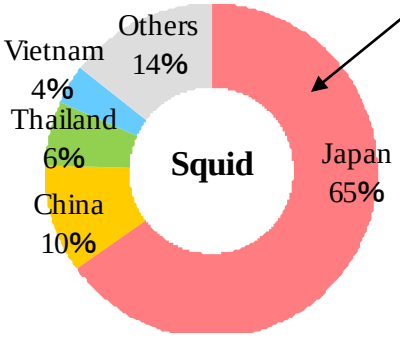
アマモの花枝採集の様子

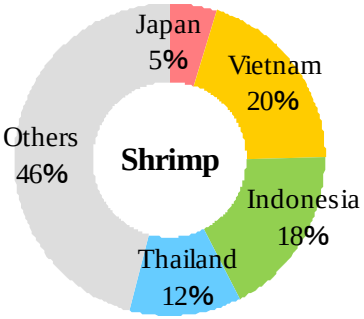
アオリイカの卵

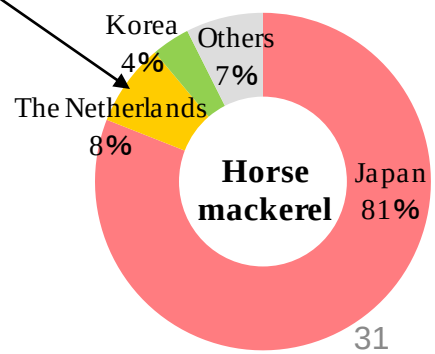
# Fishery Products imported from all over the world



# Let’s Eat fish in season!

Spring

**Bonito**

*Katsuo-no-tataki*
**(lightly roasted bonitos)**
**One dish per month**

(Seven slices per plate)

**Goes up by 1%!**

Summer

**Japanese common squid**

*Sugatayaki* **(grilled squid)**
**One serving per month**

(One squid per plate)

**Goes up by 1%!**

Fall

**Saury**

*Shioyaki*
**(grilled salted saury)**
**One dish per month**

(One large saury per dish)

**Goes up by 1%!**

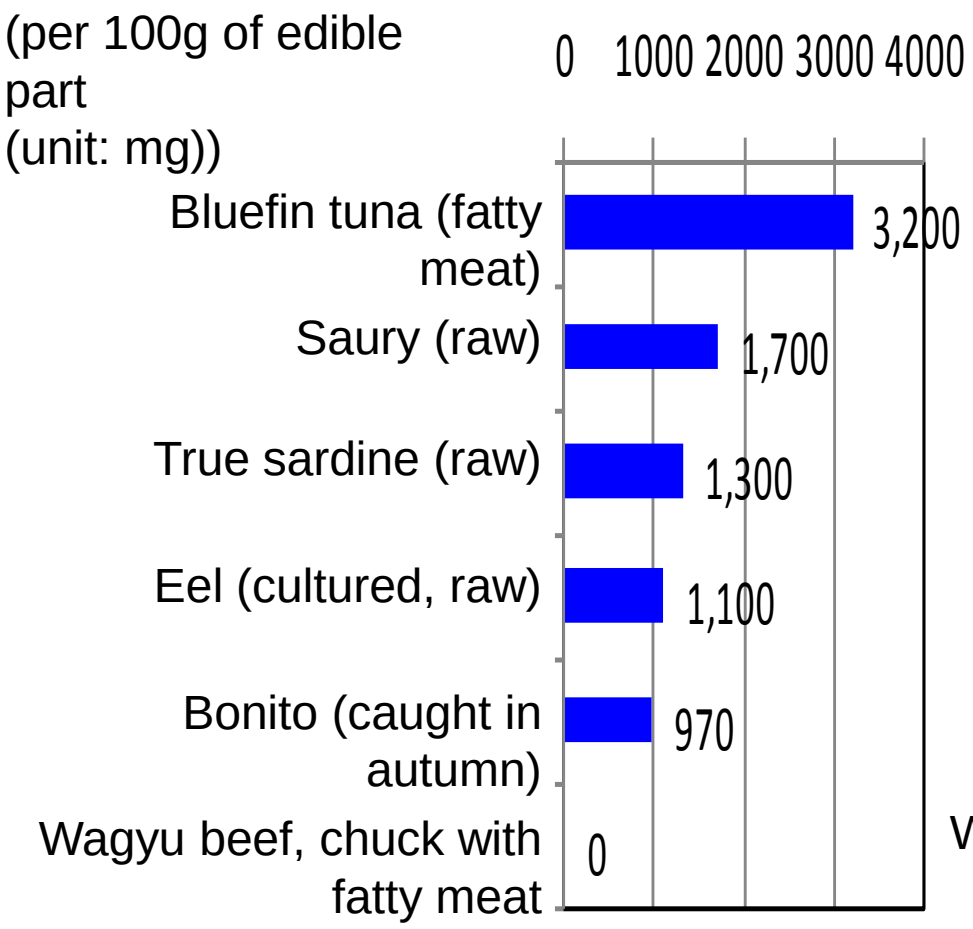
Winter

**Yellowtail**

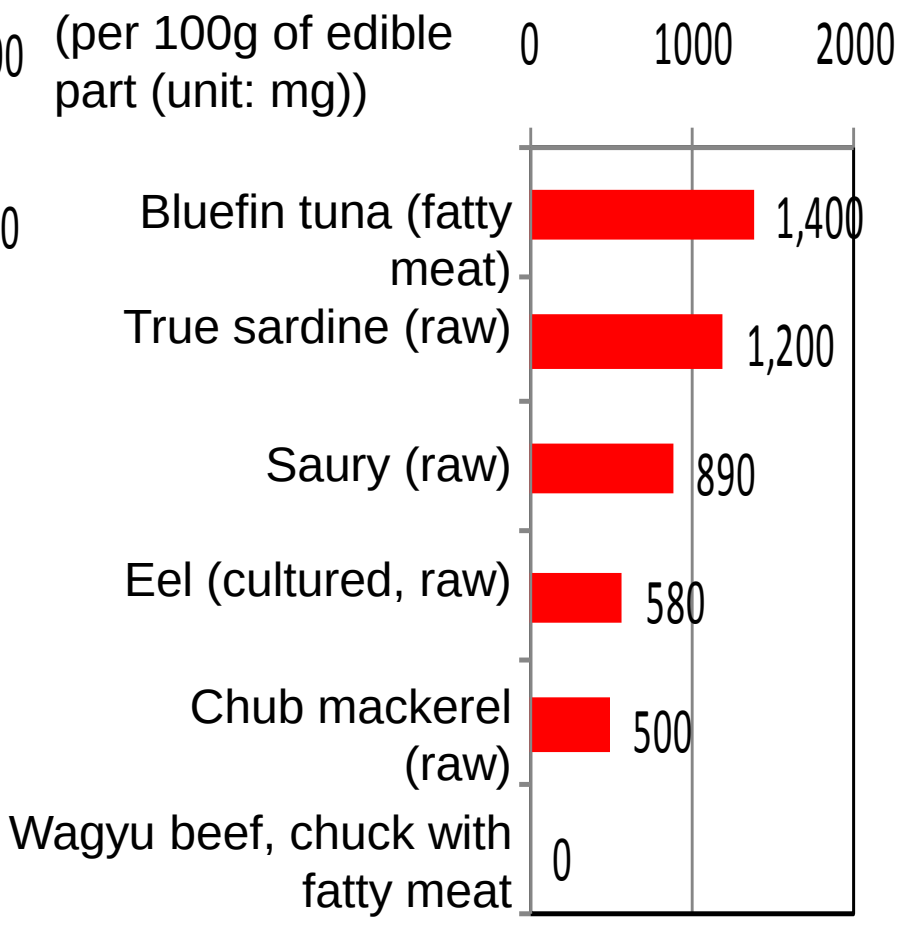
**Teriyaki fish**
**One dish per month**

**Goes up by 1%!**

## Docosahexaenoic acid (DHA）




## Eicosapentaenoic acid (EPA)



# The role that the fishing industry has in our daily lives

Our daily lives

**Fish consumption**
Eating fish

Domestic wastewater and sewage treatment

The agriculture and animal husbandry industries, etc.

Supply of nutrients

**Distribution**
Building a bridge between fish and fish consumption

Large-sized fish including tuna and salmon

The fishery industry
The only industry that is taking nutrients up from the sea to land

Seaweed

Nutrients

Shellfish

Plankton

Small-sized fish including sardines and horse mackerel

Activities under the sea

# ～Let’s go to Shimonoseki-City, Yamaguchi Prefecture, Japan! ～

**Fish-mileage→ Local production for local consumption→ Reduction of CO2**