

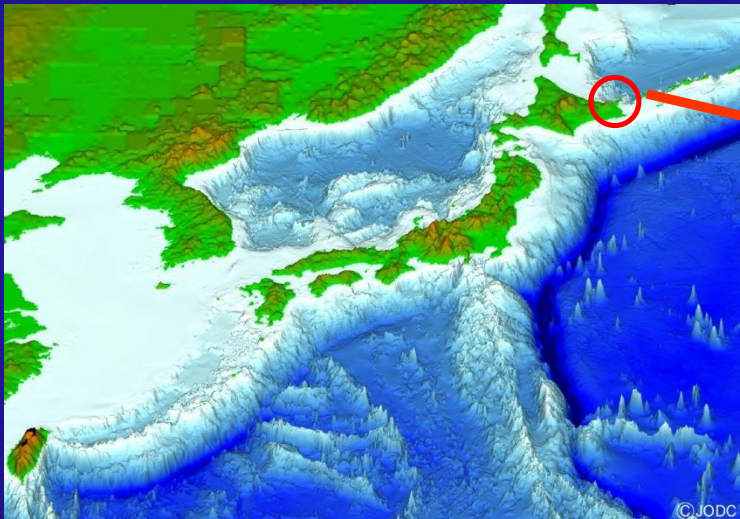
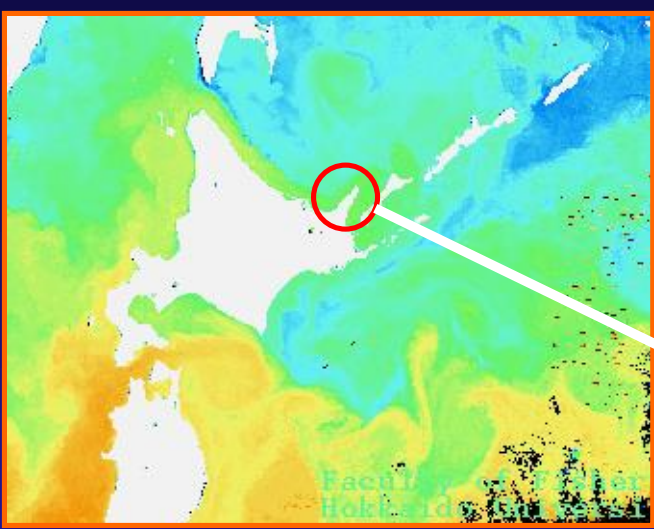
**Co-management of marine protected areas,
drawing example from Shiretoko World Natural
Heritage Site, Japan**



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UNESCO decided on July 14, 2005 to add the Shiretoko area of Hokkaido, Japan, to the World Natural Heritage list. The area covers the Shiretoko Peninsula and surrounding sea areas up to 3 kilometers off the peninsula. The Shiretoko is located in the northeast of Hokkaido.



Inscribes Shiretoko, Japan, on the World Heritage List on the basis of Natural criteria (ii) and (iv),

*Criterion (ii): Shiretoko provides an outstanding example of **the interaction of marine and terrestrial ecosystems** as well as extraordinary ecosystem productivity, largely influenced by **the formation of seasonal sea ice at the lowest latitude in the northern hemisphere.***

*Criterion (iv): **Shiretoko has particular importance for a number of marine and terrestrial species.** These include a number of endangered and endemic species, such as the Blackiston's Fish Owl and the plant species *Viola kitamiana*. **The site is globally important for a number of salmonid species and marine mammals, including the Steller's sea lion, a number of cetacian species and sea birds.***

social systems in Shiretoko

- Today, the main industries are **fisheries & tourism**.
- There are 851 households engaged in fisheries, producing 73,641 tons, US\$ 28.4 million (2006); one of the **largest fisheries production areas in Japan**
- About 20% of local households are relating to fisheries industry (incl. processing, transport, etc.).



The World Heritage Committee (UNESCO) requests;

1. Expedite development of Marine Management Plan, to be completed by 2008, to clearly identify measures for strengthening marine protection

2. Develop a Salmonid Management Plan to identify impacts of dams and strategies to address this impact



Outline

▪ Outline of the Multiple Use Integrated Marine Management Plan

▪ Physical and biological structure of the Shiretoko marine ecosystem

- Status of local-fisheries related to climate change and human impacts
- How to develop adaptive ecosystem management and co-management plan in a marine world natural heritage, Shiretoko.
- How to monitor and predict the ecosystem change related to climate change, including global warming (e.g. walleye pollock)

Outline of the Multiple Use Integrated Marine Management Plan

Ministry of the Environment
／Hokkaido Government

Basic Concept of Management

(1) Basic Policies

- To be based on legal restrictions relating to the conservation of the marine environment, marine ecosystems and fisheries, and autonomous management measures carried out by fishers, as well as voluntary restrictions on marine recreation.
- To define measures to conserve the marine ecosystem, strategies to maintain major marine living resources, monitoring methods for those resources, and policies for marine recreation; and to promote proper management.

(2) Objective of the Plan

- To satisfy both conservation of the marine ecosystem and stable fisheries through the sustainable use of marine living resources.

the conservation of marine environment and marine ecosystem

Coexistence

stable fisheries



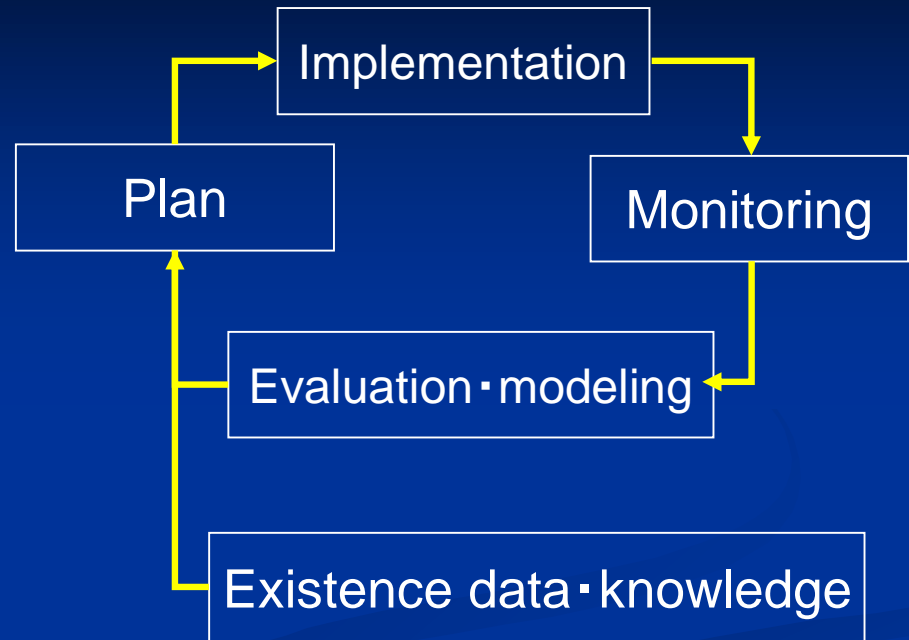
Adaptive management in Shiretoko marine ecosystem

✘ Ecosystem is

- A complex and unpredictable system
- Changing constantly and disturbed
- Open system with unclear boundary



Adaptive management



- Adaptive management is aiming the management and use of natural resources that allows maintaining the structure and function of the ecosystem. Changes in the ecosystem are predicted and monitored, and based on the results, the way of management and use are flexibly reviewed and adjusted.
- Adaptive management has already been implemented to maintain stable fisheries through the sustainable use of marine living resources. For example, restrictions on catch based on the TAC (*Total Allowable Catch*) system for walleye pollock have been implemented, and targets for escapements, eggs, and juveniles of river-specific hatchery for chum and pink salmon are forecasted.

New system
for
coordination
among
sectors

**Shiretoko World Natural
Heritage Site **Regional
Liaison Committee** (2003)**

Role: exchange information, and coordinate interests/policies amongst administrative sectors.

Participants: **Central/local governments, Sightseeing Guide Associations, NGOs, and Fisheries Cooperative Associations**

**Shiretoko World Natural
Heritage Site **Scientific
Council** (2004)**

Role: Provide Scientific Advices on management, research, and monitoring activities

Participants : **Scientists, Central/local government, Fisheries Cooperative Associations, and NGOs.**

**Shiretoko National Park
**Committee for the Review
of Proper Use** (2001)**

Role: Build use rules for tourists to reduce negative impacts on environment

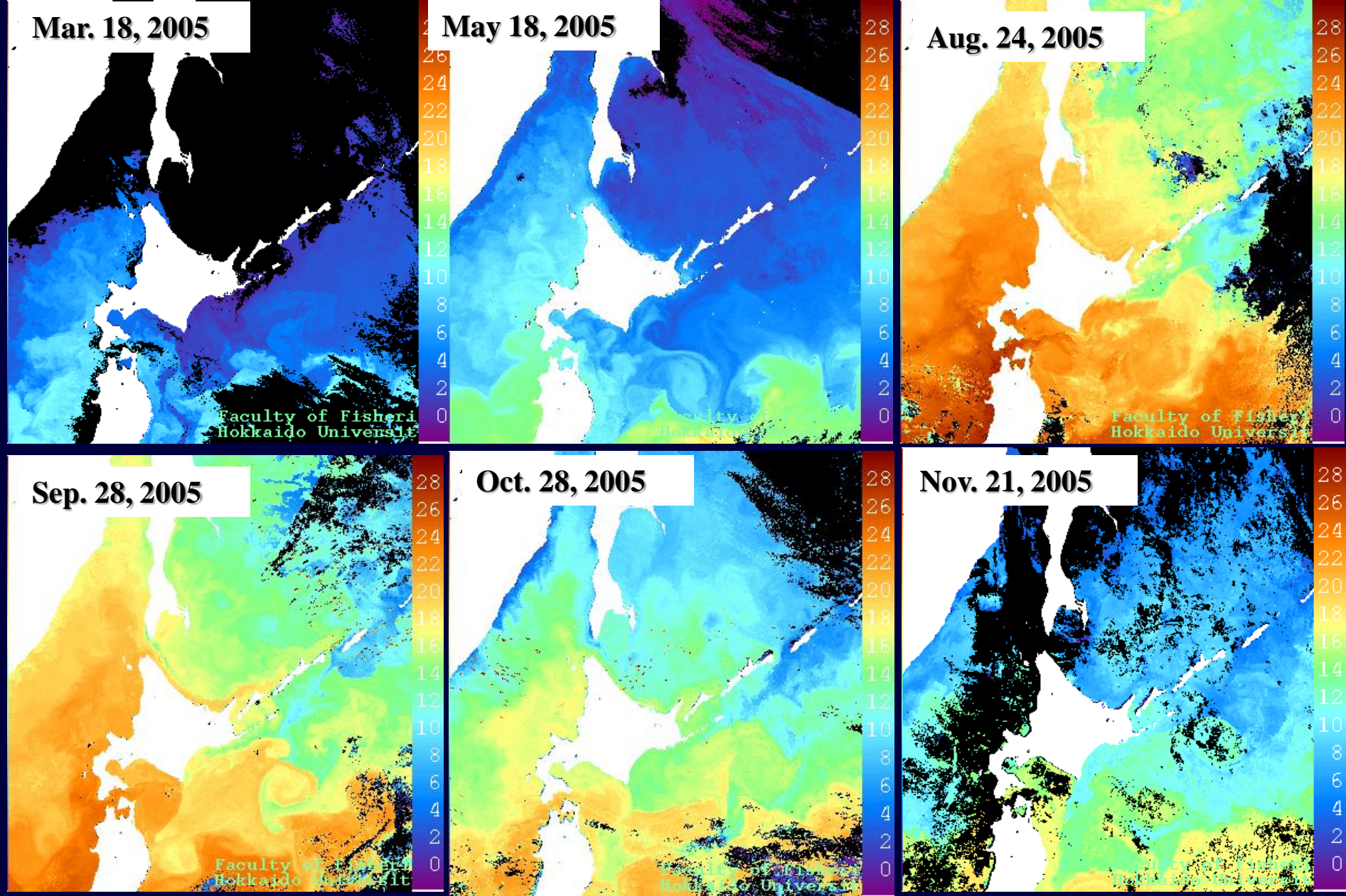
Participants: **Scientists, Central/local government, NGOs.**

**coordination
and
cooperation**

Marine
WG

River Construction
WG

Yezo Deer
WG



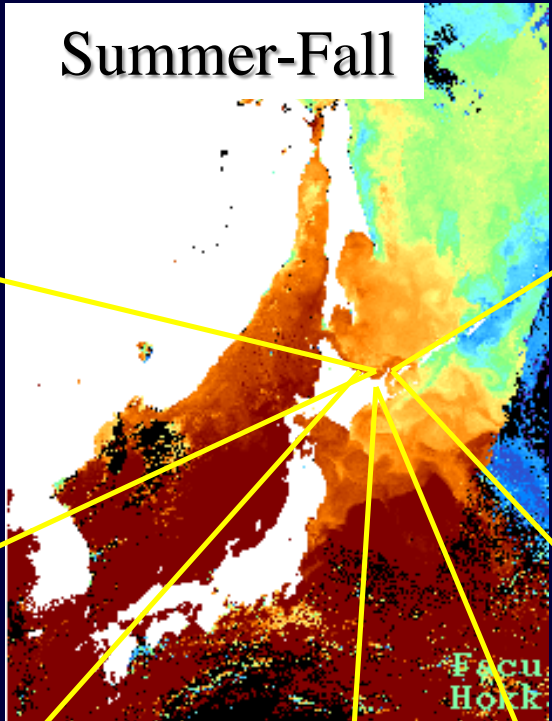
Seasonal changes in sea surface temperatures around Hokkaido, 2005 (source: Faculty of Fisheries, Hokkaido University web-page)

“Paper nautilus”



Aoigai, *Argonauta argo*

Summer-Fall



“Longfinned batfish”



Tsubameuo, *Platax orbicularis*

“Balloonfish”



Harisenbon, *Diodon holocanthus*

“Mahi-mahi”



Shiira, *Coryphaena equiselis*

“African pompano”



Itohikiazai, *Alectis ciliaris*

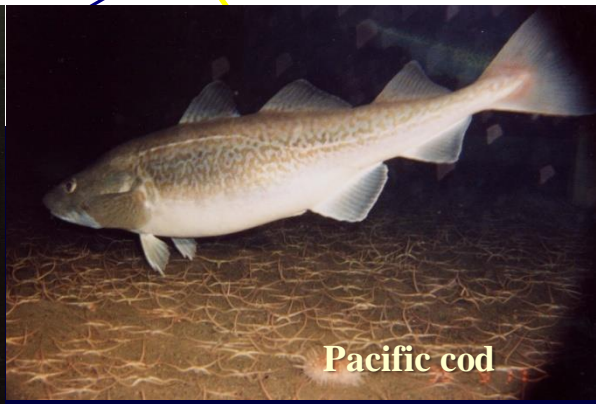
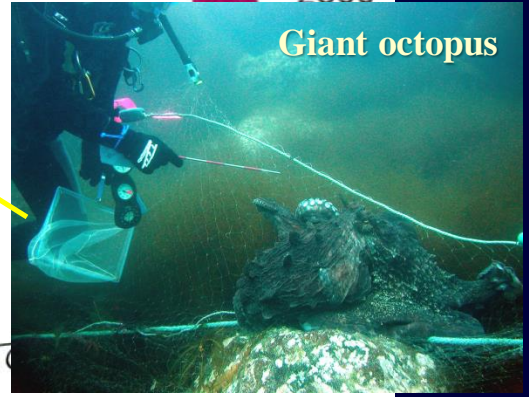
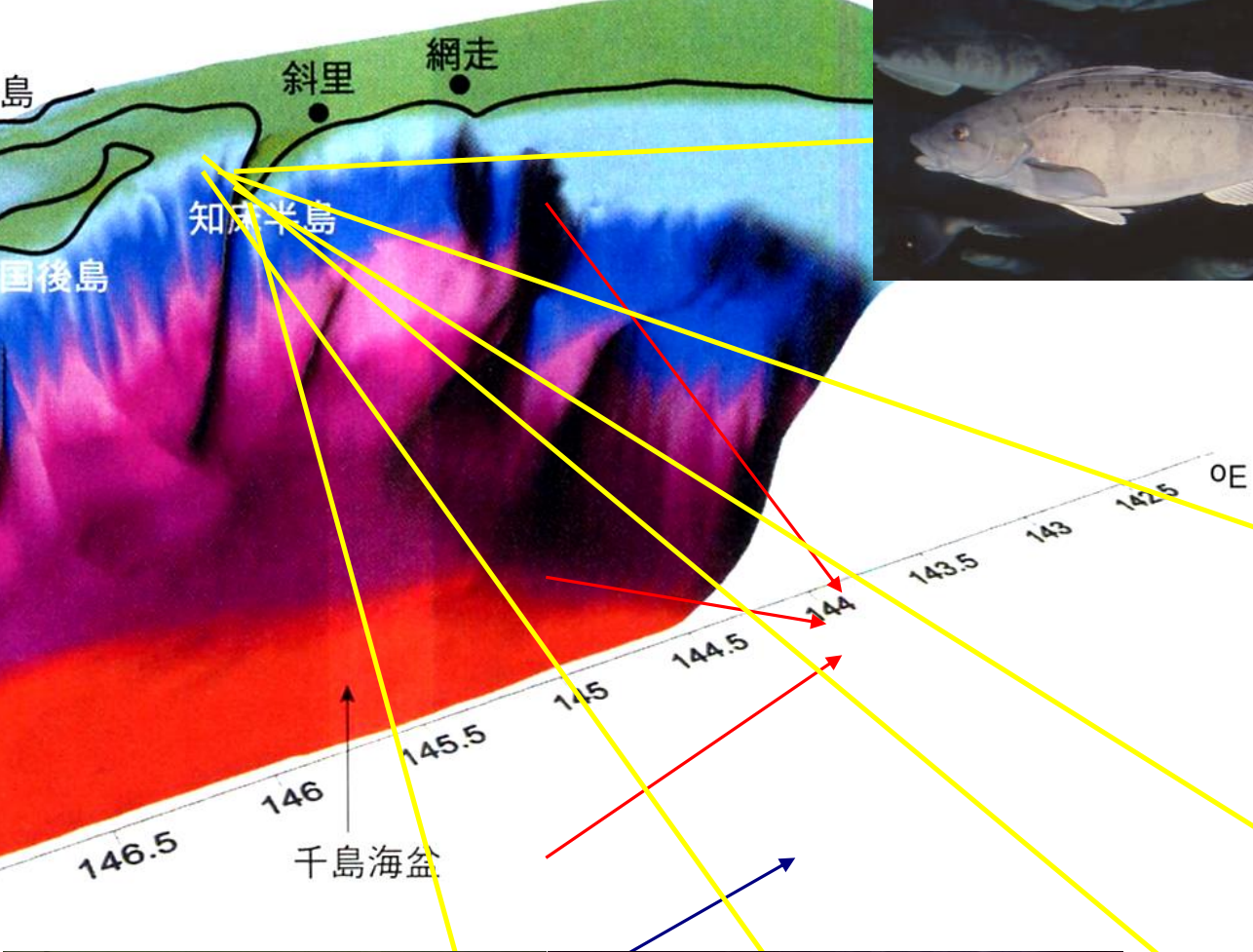


Japanese common squid

“Scrawled filefish”



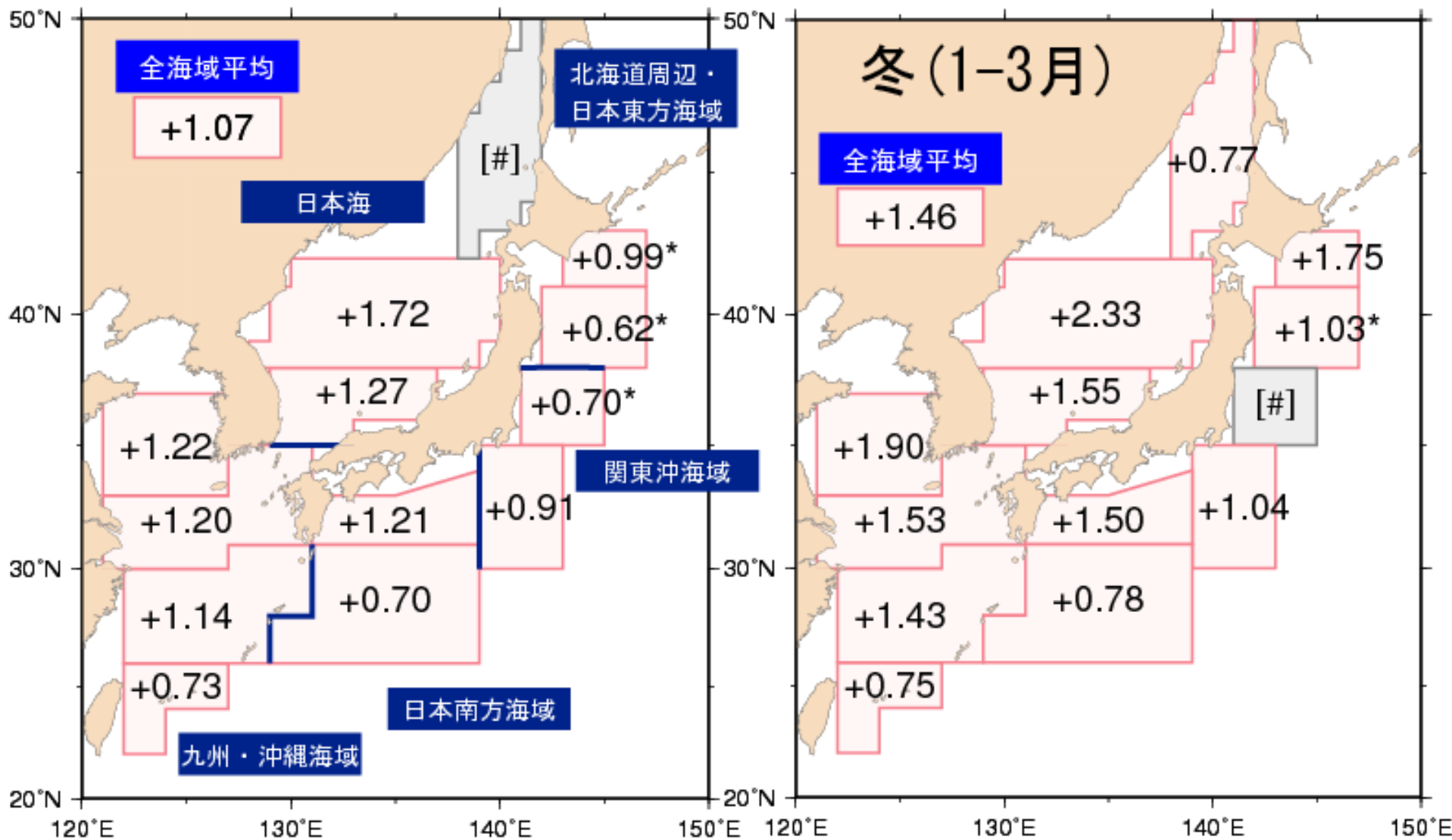
Soushihagi, *Aleterus scriptus*

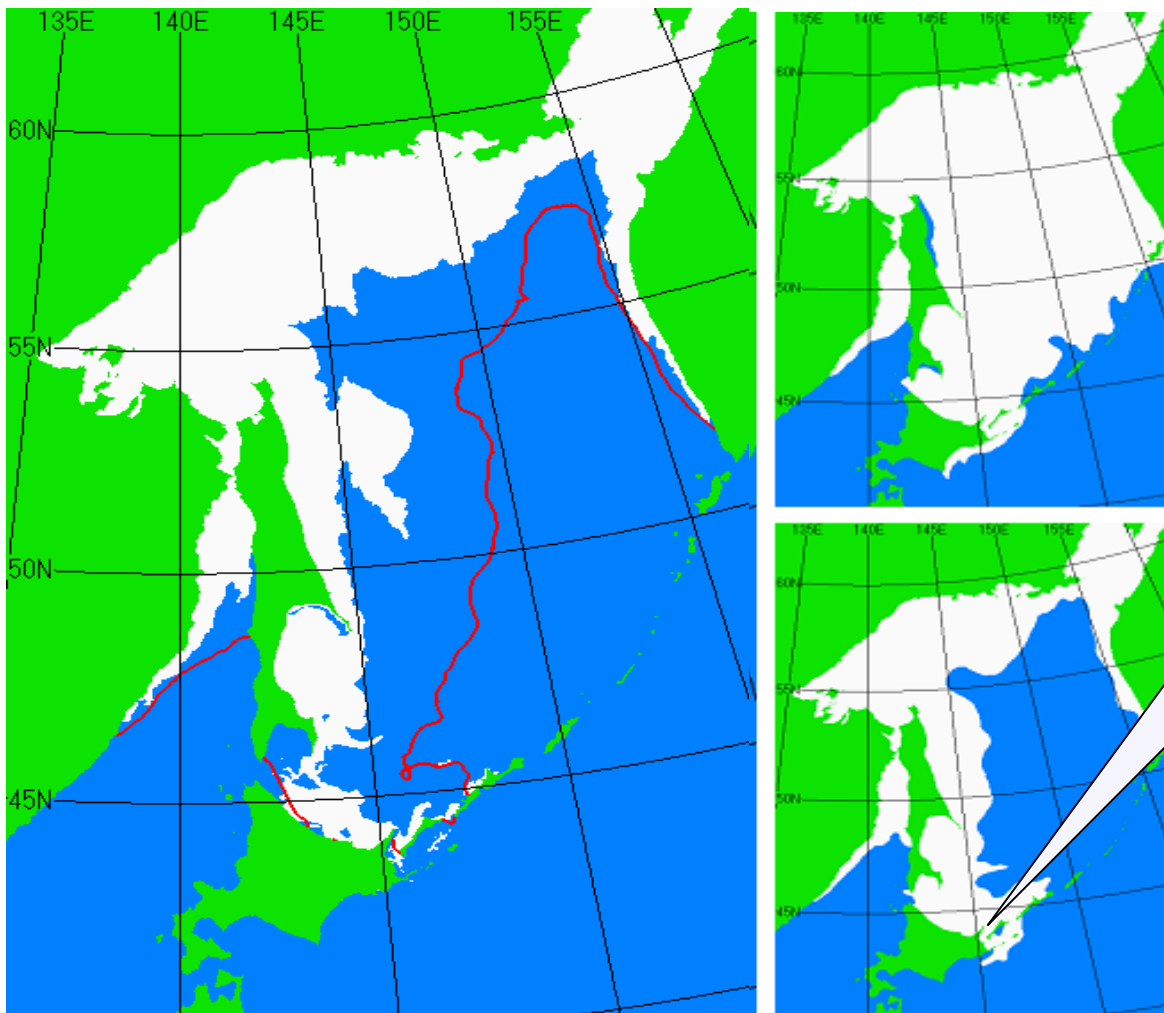


使用して

Warming trend in SST observed around Japan

JMA (2015)





Hotspot
 The Shiretoko
 World Natural
 Heritage

Figure Maximum ice cover area in each year.

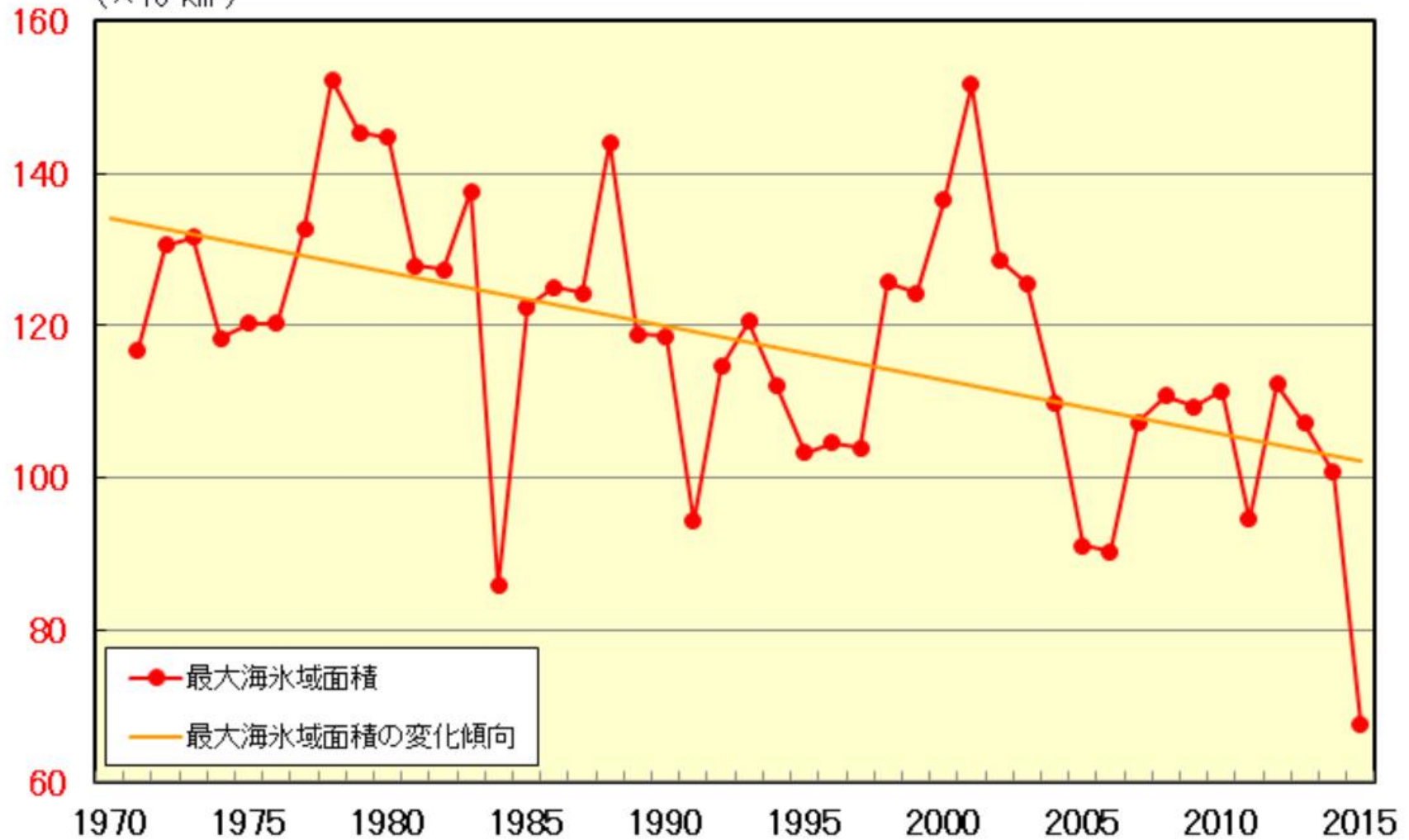
Left: March 10, 2015 . Red line denotes the edge of sea ice in normal year.

Right (upper) : Year of maximum sea ice cover, Feb. 28, 1978, 1,525 thousand km² .

Right (lower): Year of minimum sea ice cover, Feb. 25, 1984, 858.1 thousand km² .

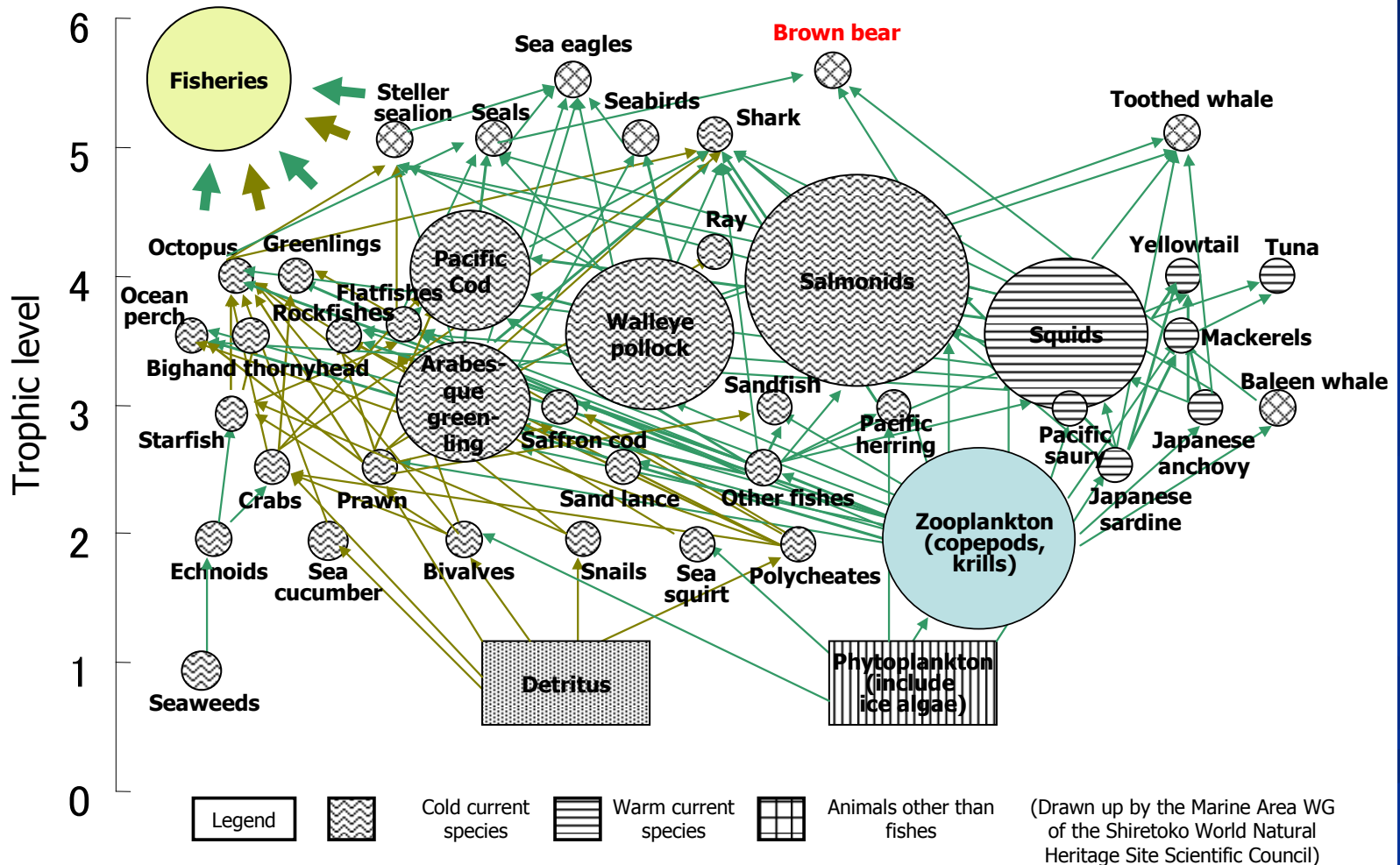
Decline trend of seasonal sea-ice in the Sea of Okhotsk

最大海氷域面積
($\times 10^4 \text{km}^2$)



オホーツク海の海氷域面積の経年変化(1971~2015年)

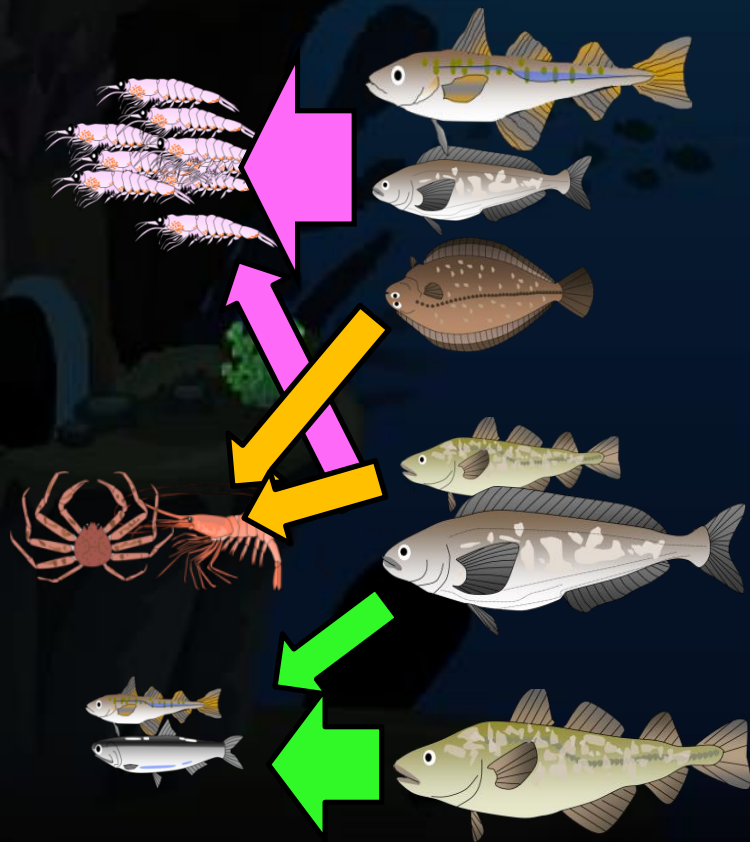
Food web in Shiretoko marine ecosystem



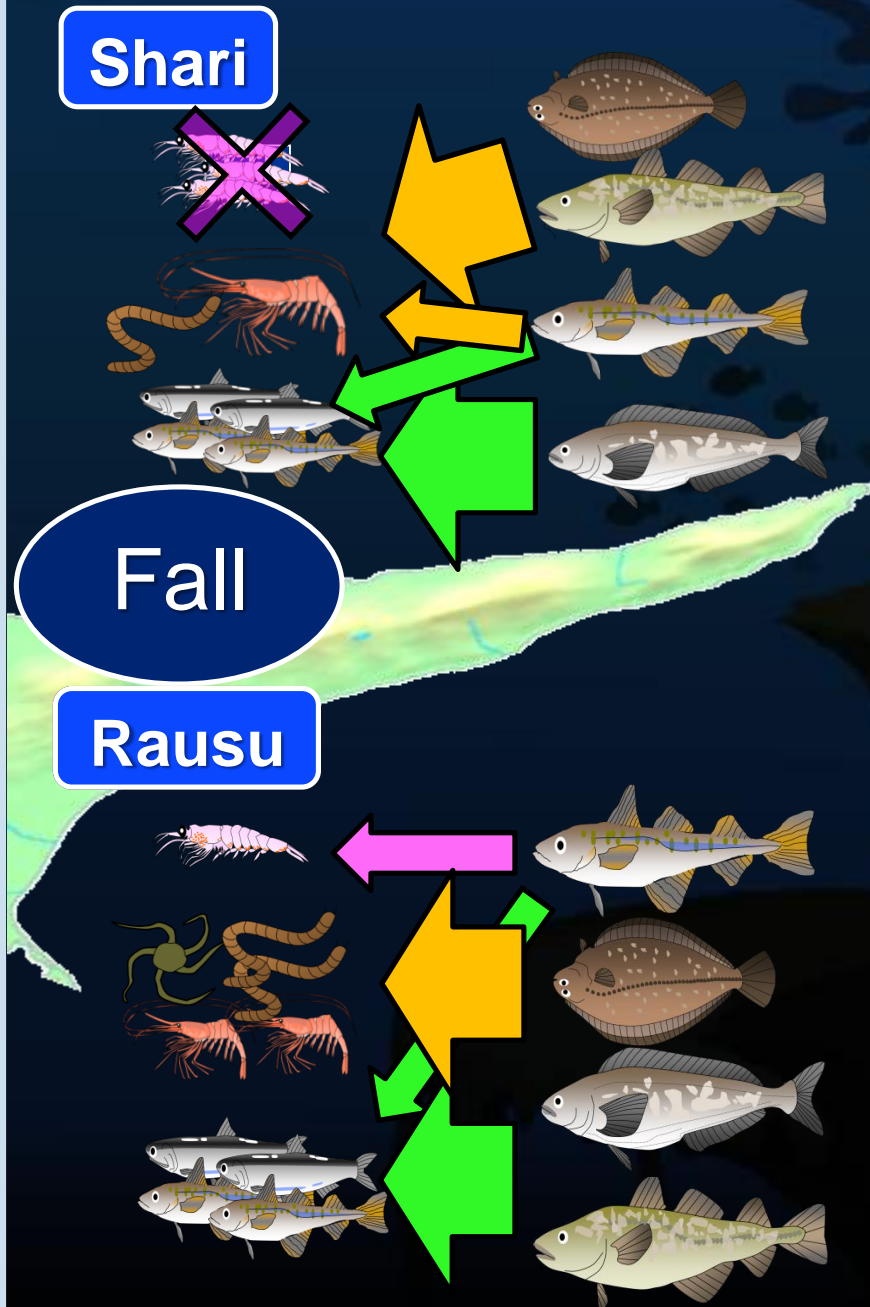
Foodweb in Shiretoko

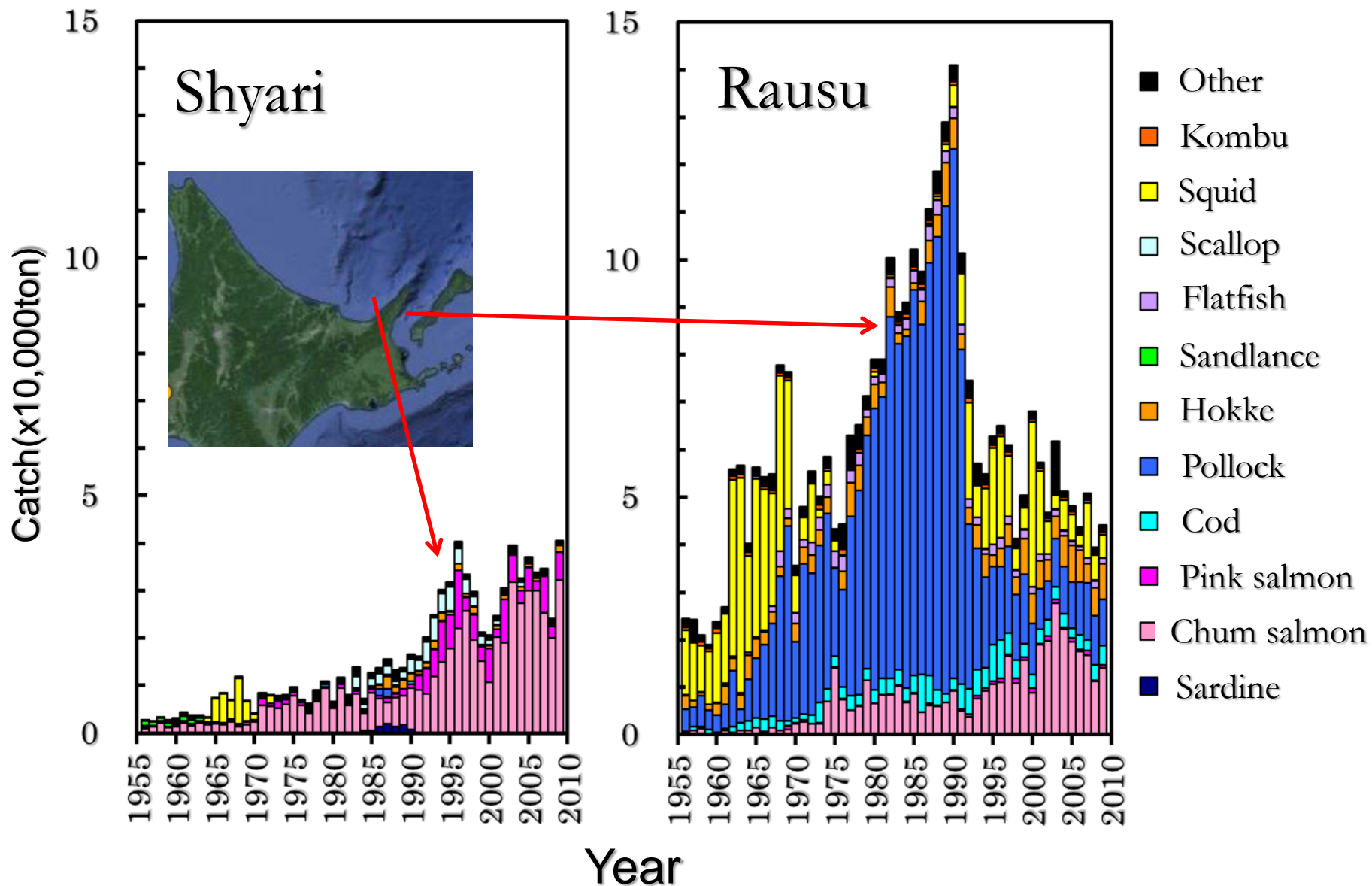
Summer

Shari
Rausu



Katoh et al. (2010)

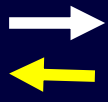




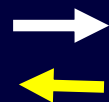
Fisheries production statistics (tons) at Shiretoko WNH, compiled by fishers org. (Torisawa, 2012)



Sardine



Mackerels



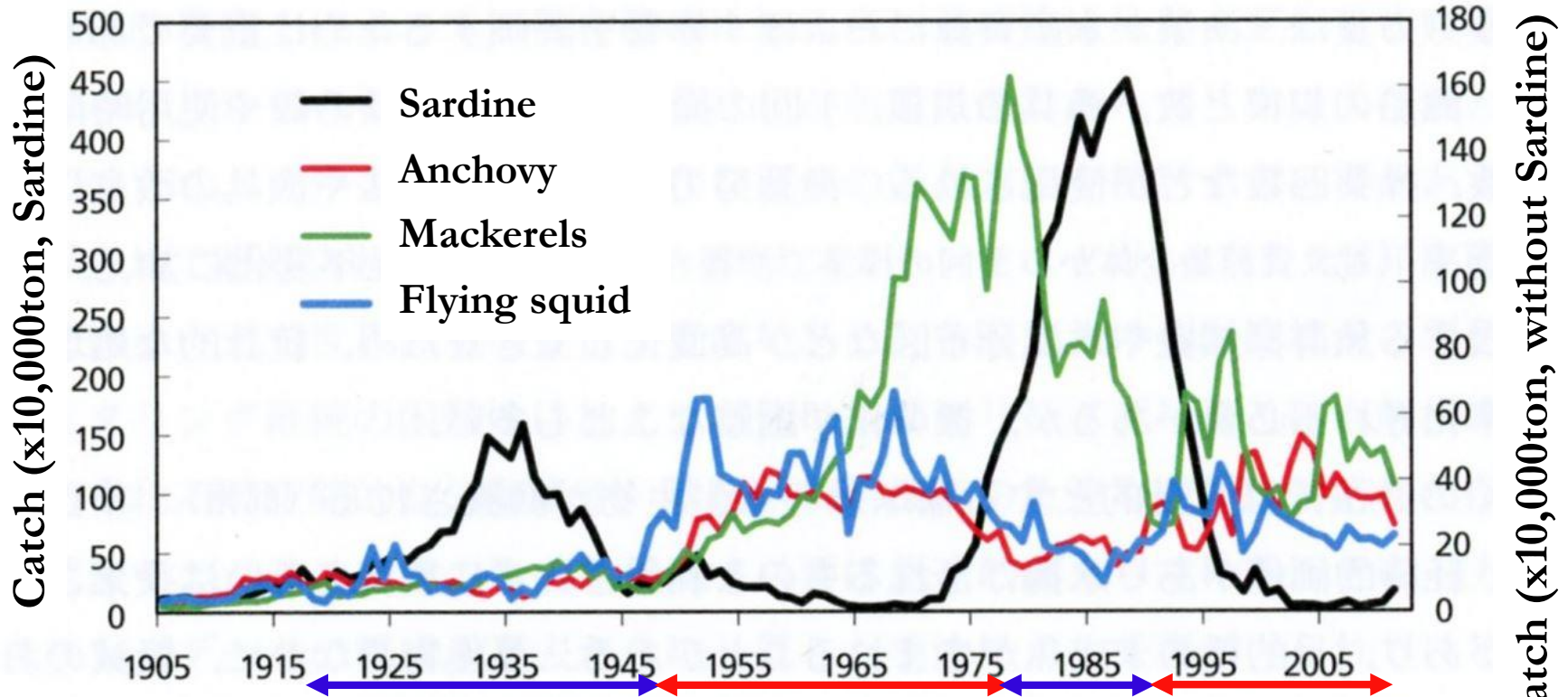
Jack mackerels



Anchovy



Flying squid



Catch fluctuations of main pelagic species for fisheries in Japan

The distribution and migration routes of *T. pacificus*

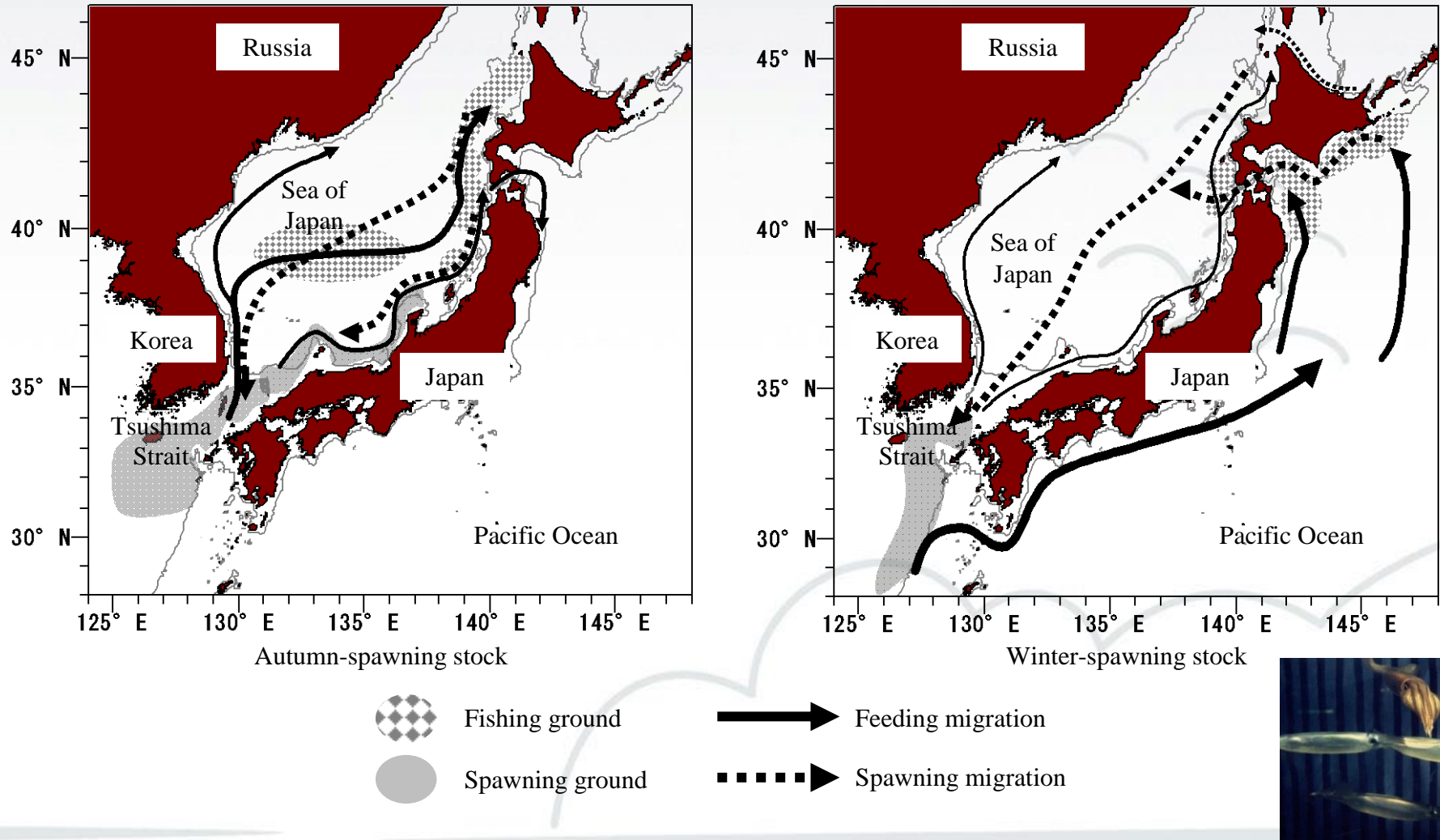


Fig. The Distribution range and migration pattern of *Todarodes pacificus* (from Kidokoro *et al.*, 2010).

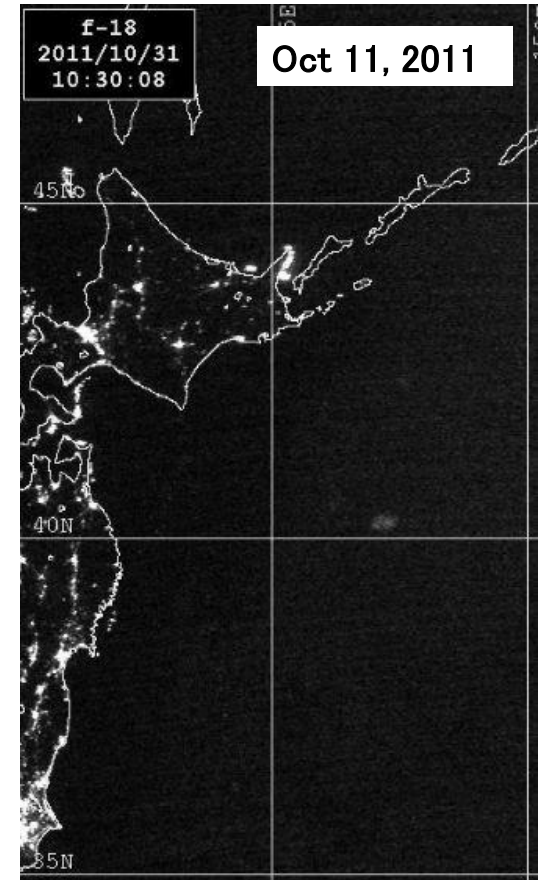
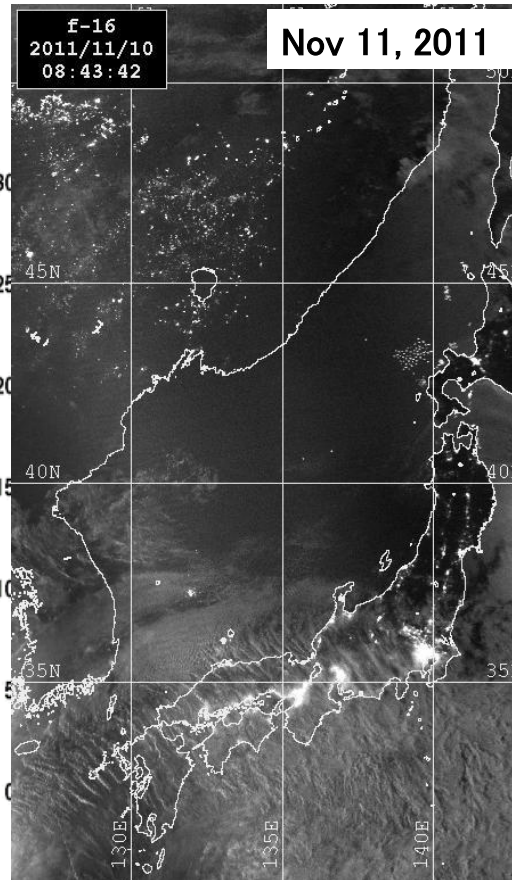
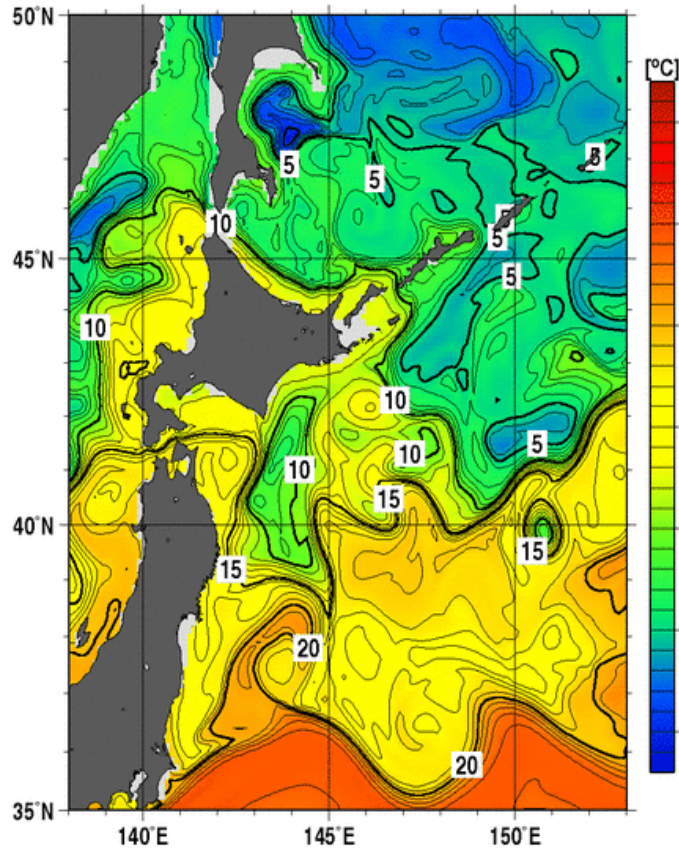
An example of the most northern squid fisheries, Nov. 08, 2011

Winter cohort migrates in water along the coast of Okohotk Sea

Temp. 50m depth

DMSP, <http://ubics6.fish.hokudai.ac.jp/DMSP/>

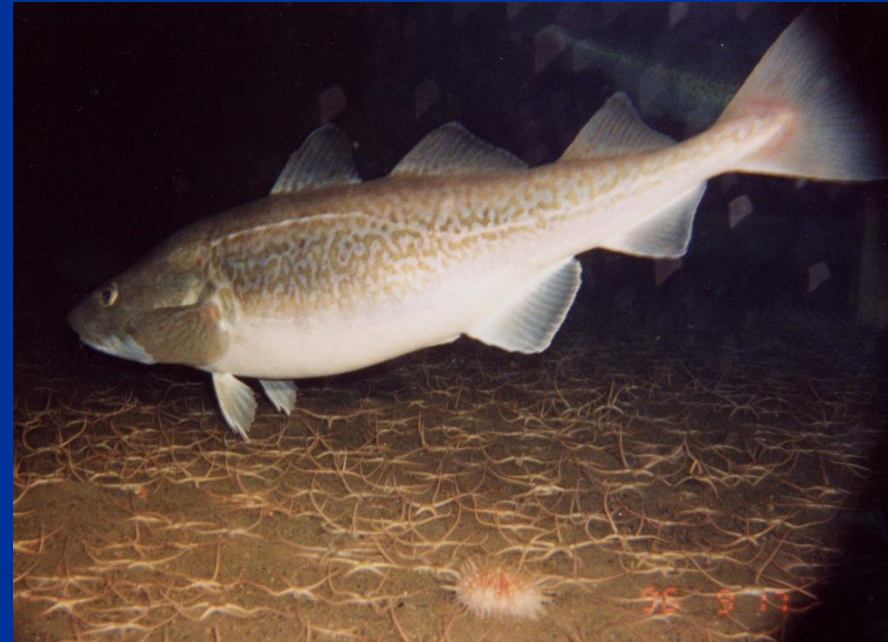
Daily 50m Temperatures 08 Nov. 2011.



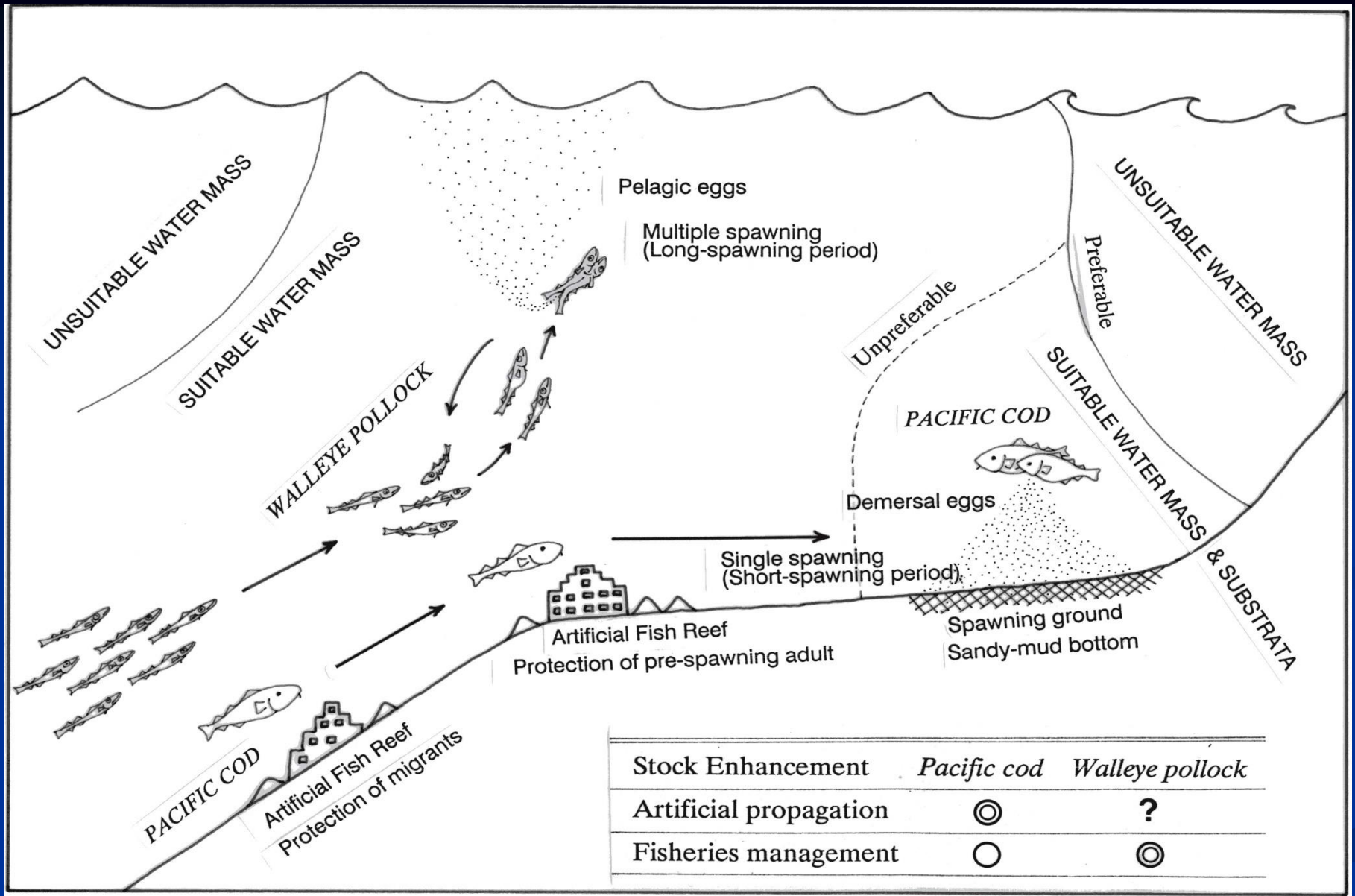
Stock fluctuations of gadid fish of Oyashio Ecosystem related to climate change and human activity



Walleye pollock



Pacific cod



Schematic illustration of artificial propagation and fisheries managements for stock enhancement of Pacific cod and walleye pollock based on the knowledge of spawning strategy and reproductive characteristics (Sakurai, 2000)

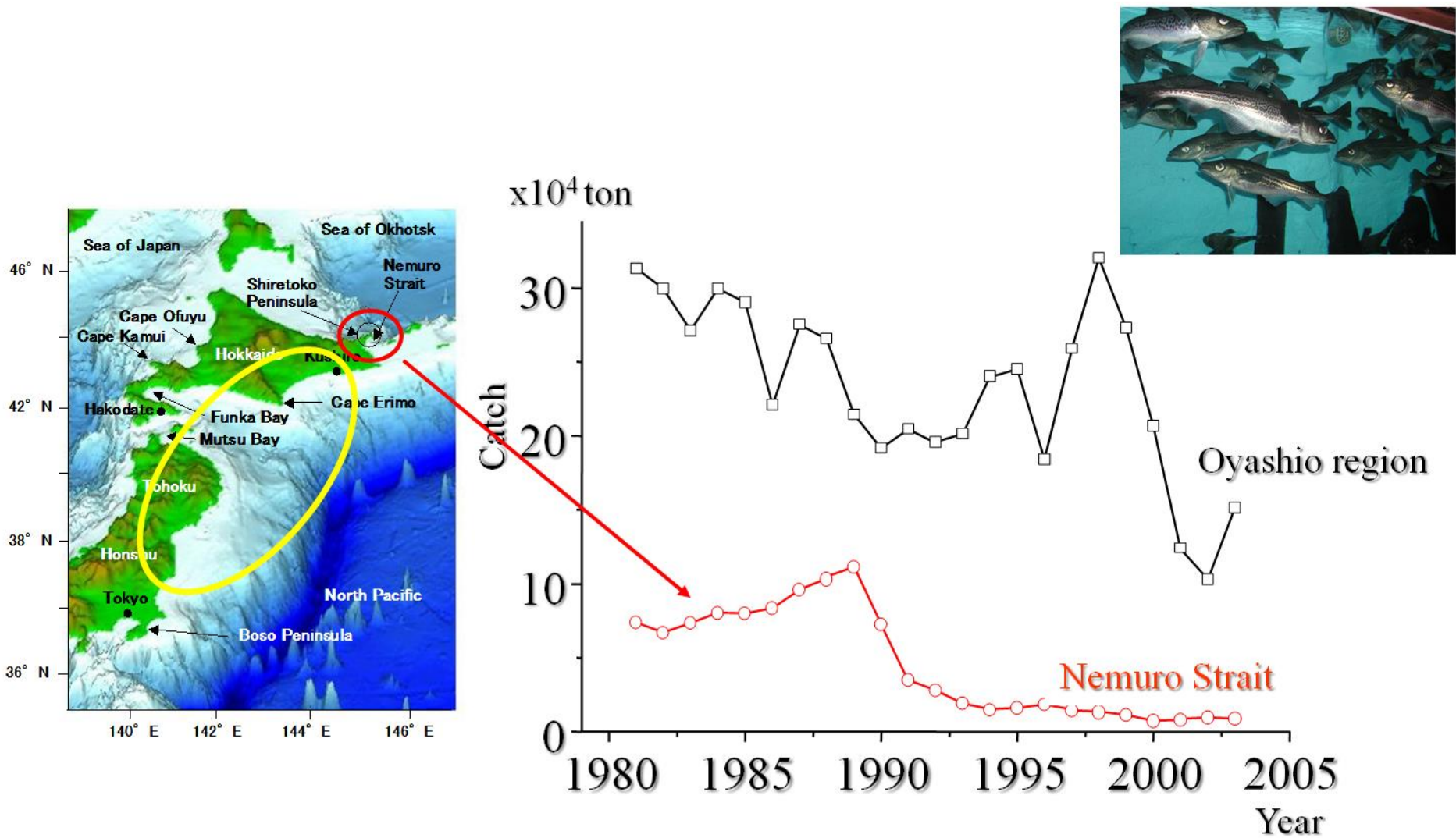
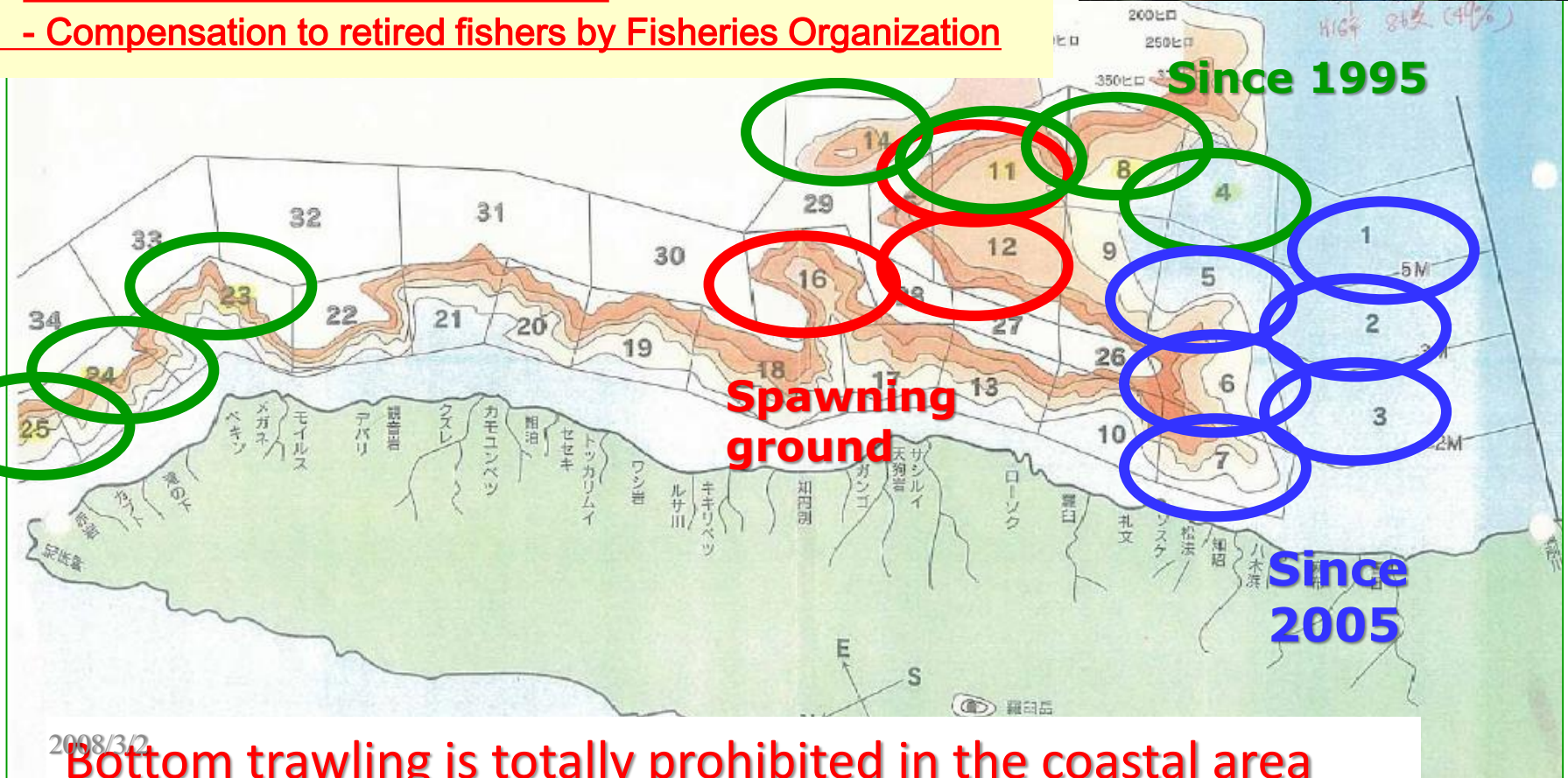


Figure Walleye pollock catches in the Oyashio region and the Nemuro Strait, northern Hokkaido.

MPA to protect walleye pollock

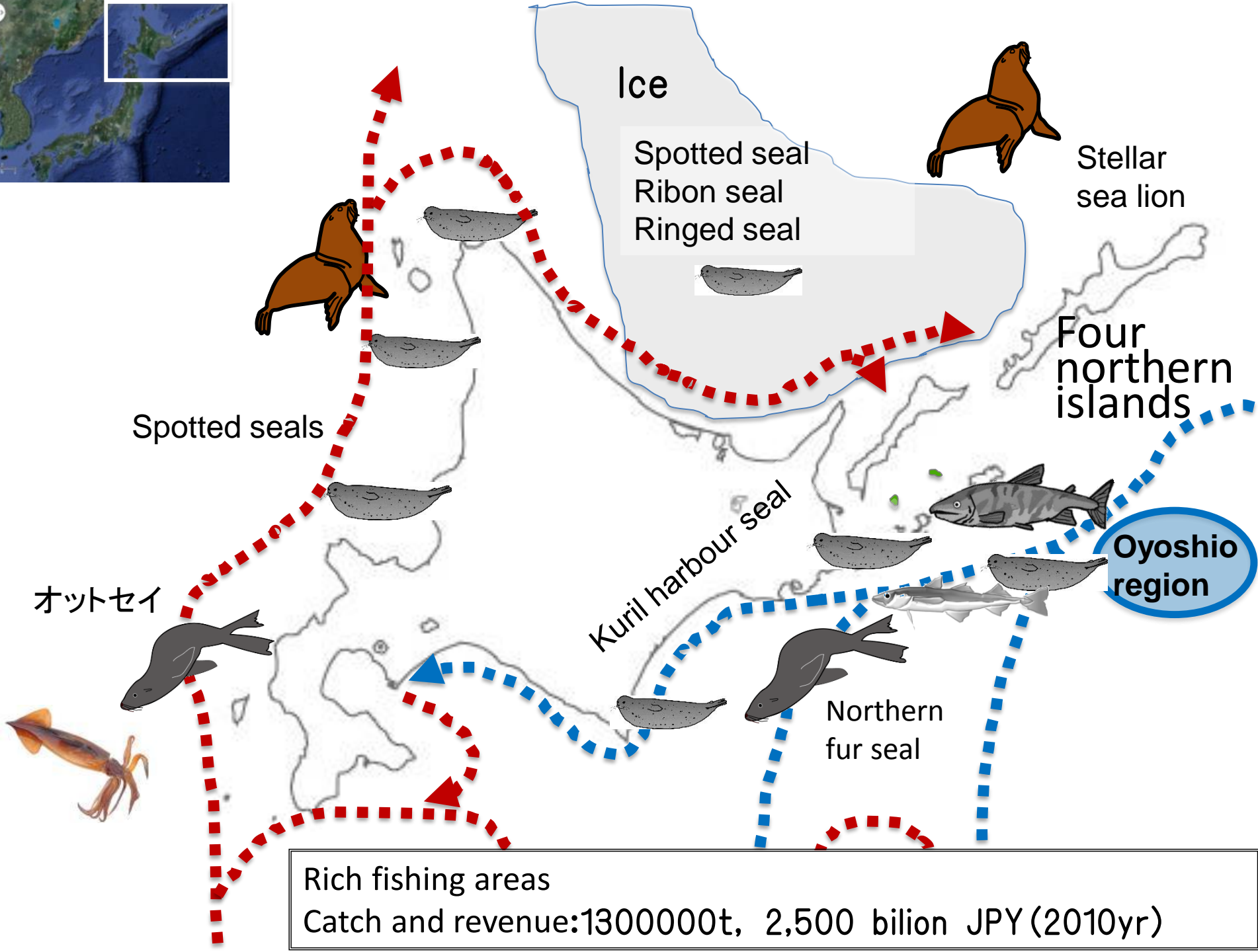
- 177 boats fished walleye pollock in 1995
- Decreased to 86 boats in 2004 (49% reduction)
 - Compensation to retired fishers by Fisheries Organization
- Fishing ban during Mar 20-end since 1995
- Fishing ban area expanded in 2005
- Decreased 46 boats in 2015
 - Compensation to retired fishers by Fisheries Organization



Stellar sea lion



(Photo by K. Hattori)



Ice

Spotted seal
Ribon seal
Ringed seal

Stellar
sea lion

Four
northern
islands

Spotted seals

Kuril harbour seal

Oyoshio
region

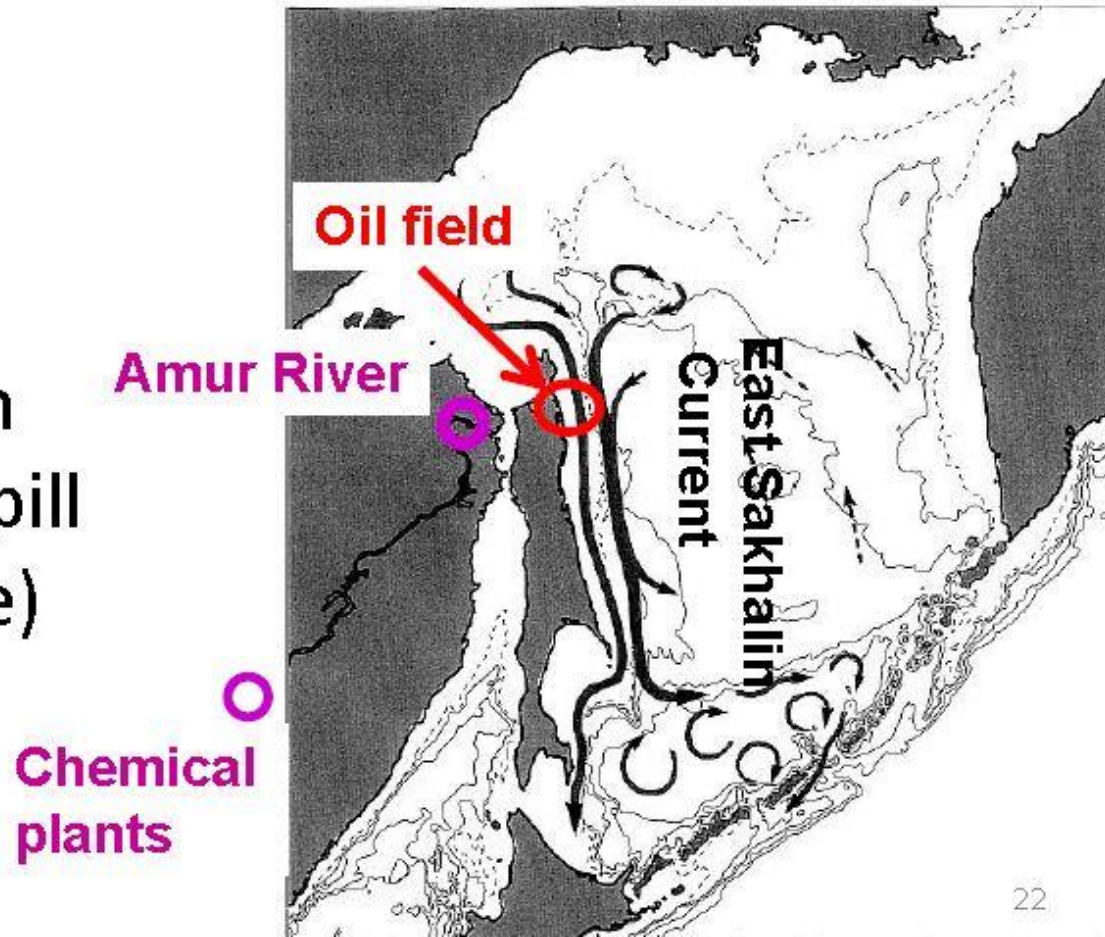
オットセイ

Northern
fur seal

Rich fishing areas
Catch and revenue: 1300000t, 2,500 bilion JPY (2010yr)

Not directly relating to the CC, but the quality of the seafood is also very important in Japan

- Because Japan experienced a tragedy of **seafood contamination** (Minamata Disease), people are very sensitive.
- **Oceanographically**, Shiretoko is a vulnerable area when some **accidents** (oil spill or chemical discharge) occur in Russian Far East (Ohshima et al. 2002).



Advantages of the Shiretoko Approach

- Due respects paid to the local fishers' knowledge and their autonomous activities;
- No exclusion of local fishers from the heritage area (they are the core of the Ecosystem approach to co-management).
- No destruction of local norms and livelihoods;
- Participation of local fishers to all the Decision/Management processes;
- No expensive measures by the government.

The deputy director of the UNESCO World Heritage Center, Mr. Kishore Rao said “this is a new model of environmental conservation under the World Heritage Program ” (Mainichi News Paper 2008).

Conclusion

- Fisheries development and ecosystem service conservation are not contradictory.
- Local fishers can play the central role in the ecosystem approach to co-management. Esp. ecosystem monitoring.
- **Responsible fishers**, that catch wide ranges of species, **are the keystone species/component** of the healthy marine ecosystems.

Thank you for your attention



Hotspot for Sooty and Short-tailed Shearwater

*Photo by H. Ueki, Off Rausu, Shiretoko,
Hokkaido, Japan*

