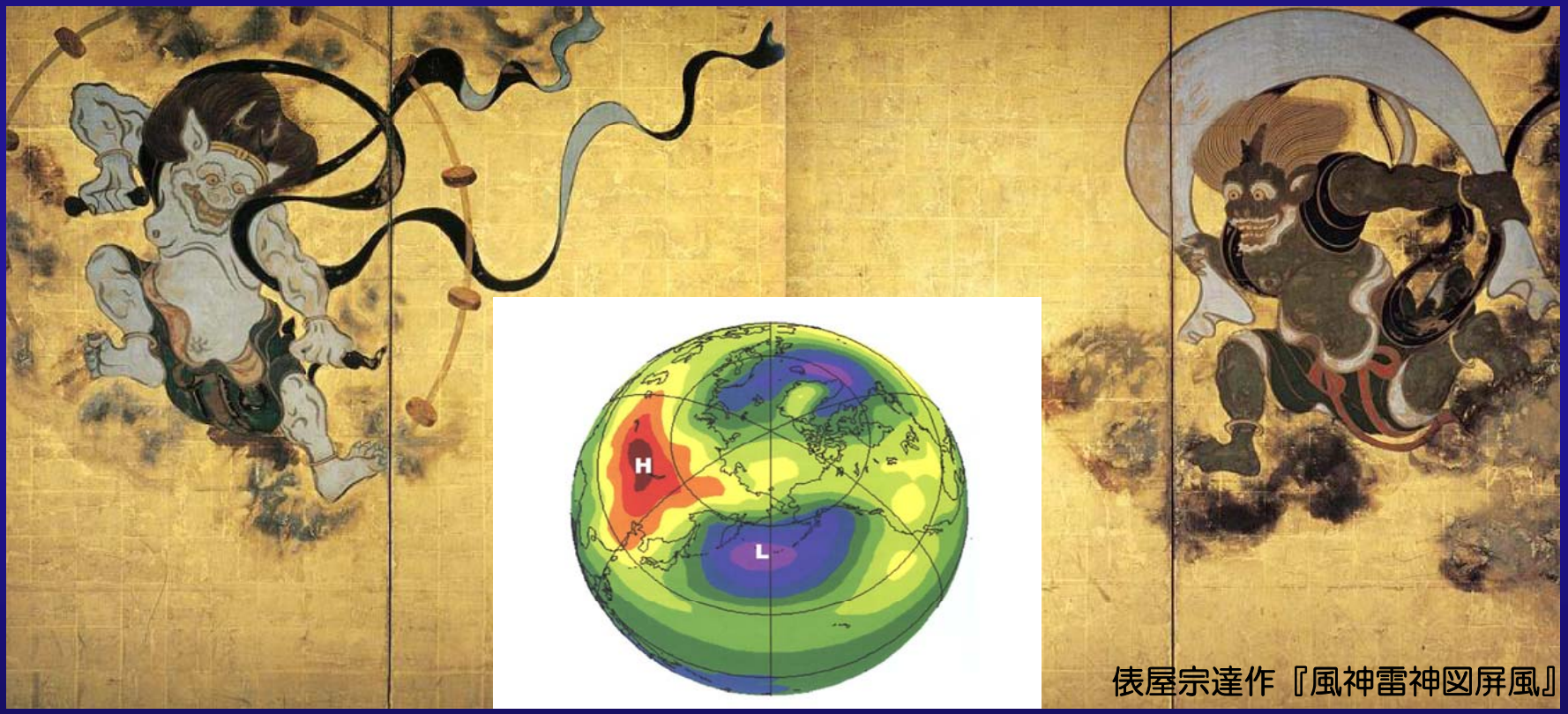
Ocean ecosystem conservation and seafood security for future generation： A case study of ecosystem approach to fisheries and the adaptive management of the Shiretoko World Natural Heritage Site



俵屋宗達作『風神雷神図屏風』

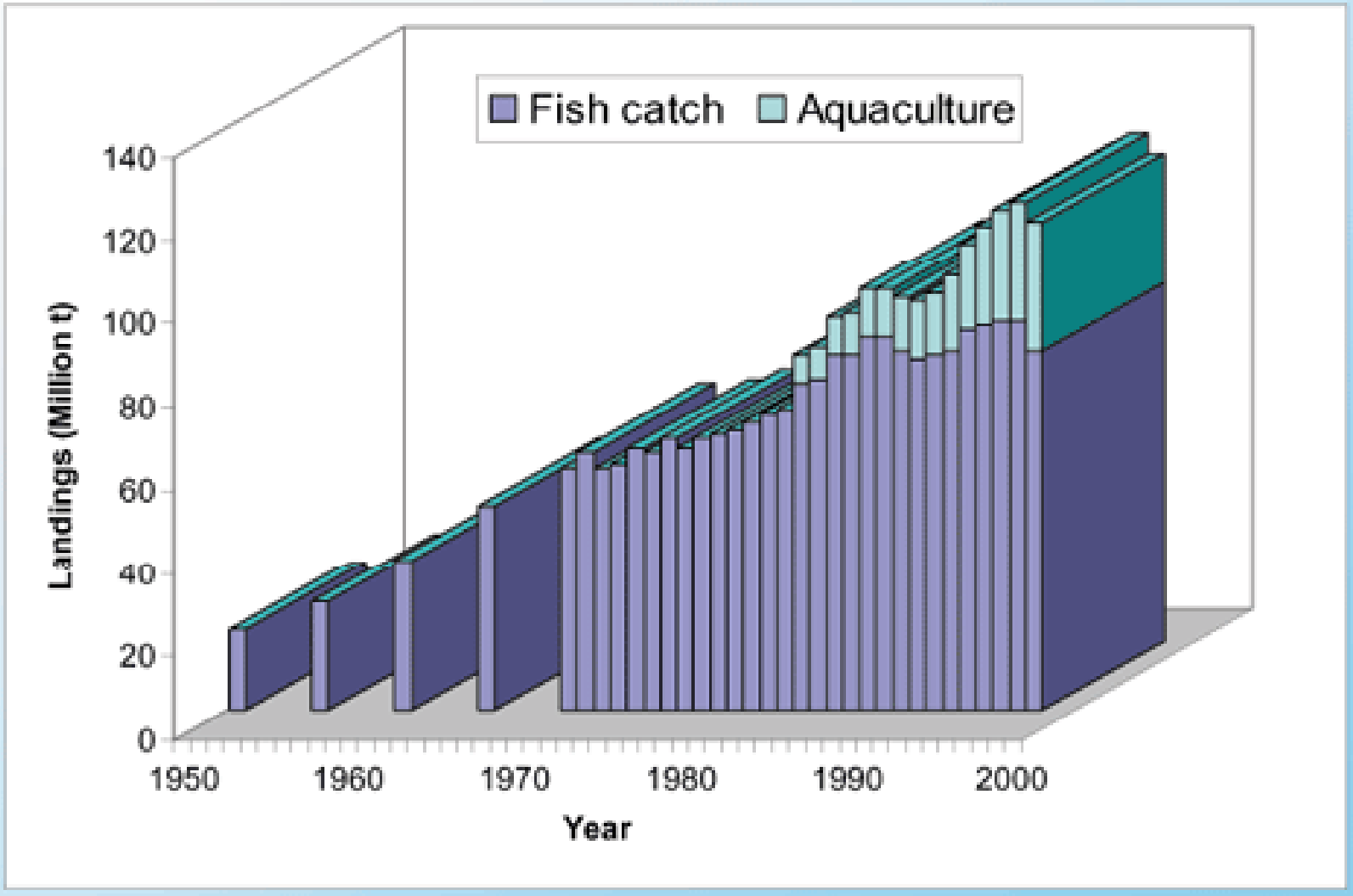
Yasunori SAKURAI & Mitsutaku MAKINO

Faculty of Fisheries Sciences, Hokkaido University

National Research Institute of Fisheries Science, Fisheries Research Agency

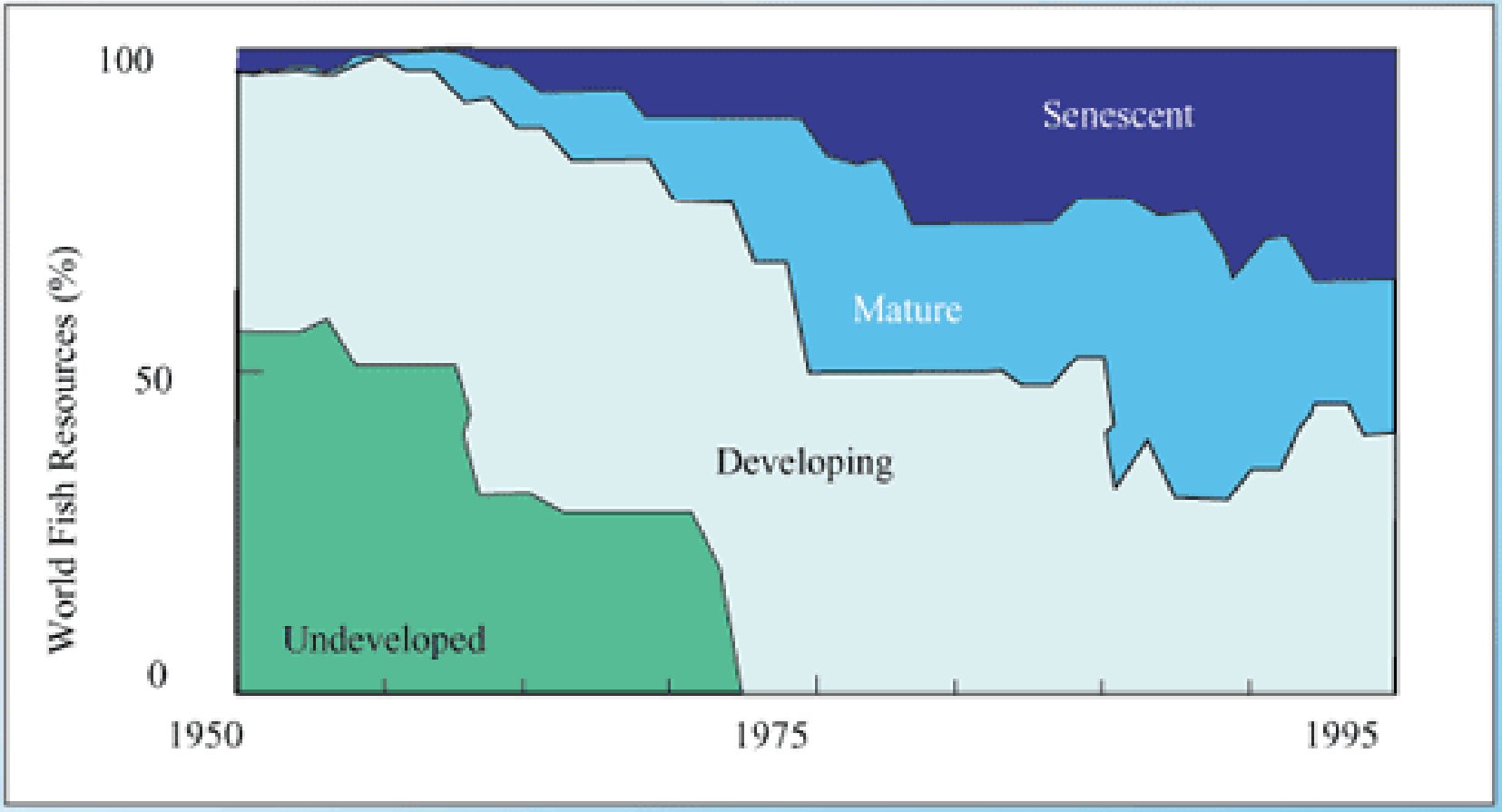

Human activity (Fisheries)
Climate change(Global warming)
Ecosystem change
How to secure seafood security for future generation
(Photo by Mr. Atsushi Matsuoka)

GLOBAL FISHERY YIELD



FAO 2000

World Fish Resources



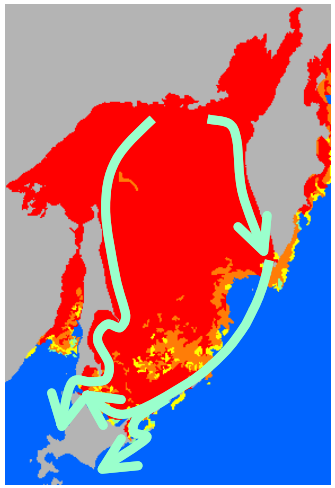
Granger and Garcia 1996. FAO Tech. Paper 359

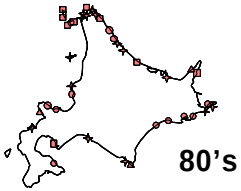
Long-Term Changes in the Gulf of Alaska Marine Ecosystem

Photographs from small net trawl surveys NMFS, Kodiak Alaska (Paul Anderson)

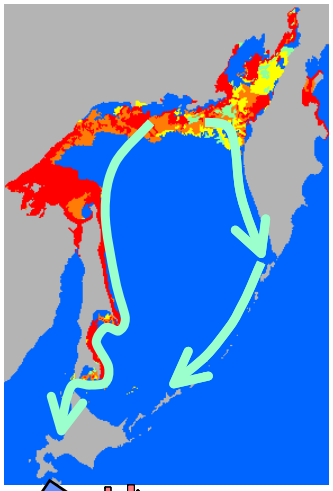
Feeding migration for wintering

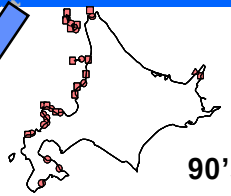
【Cold regime phase, 1970-80s】





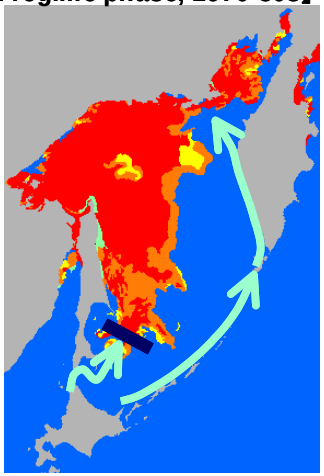
【Warm regime phase, after 1990s】



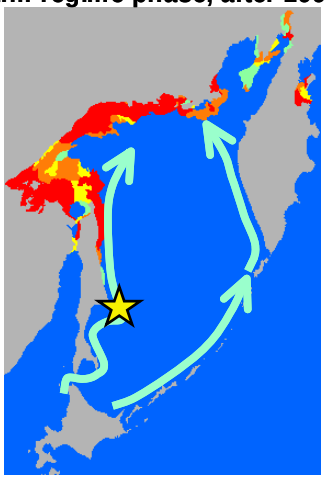


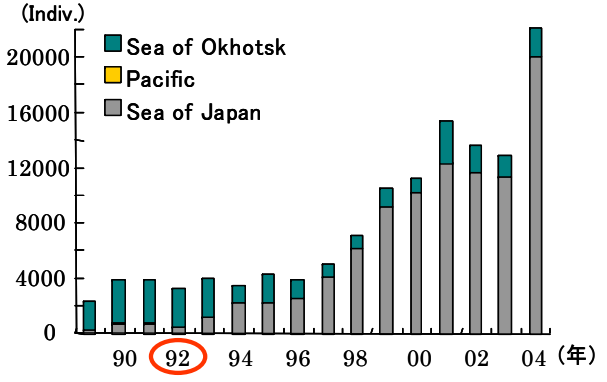
Northward migration for breeding

【Cold regime phase, 1970-80s】



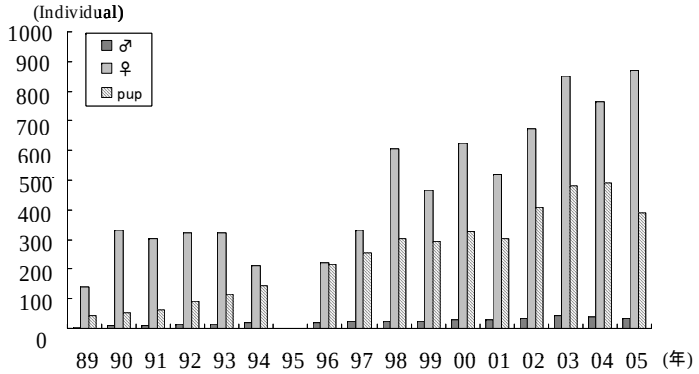
【Warm regime phase, after 1990s】





Accumlative sighting number of SSL

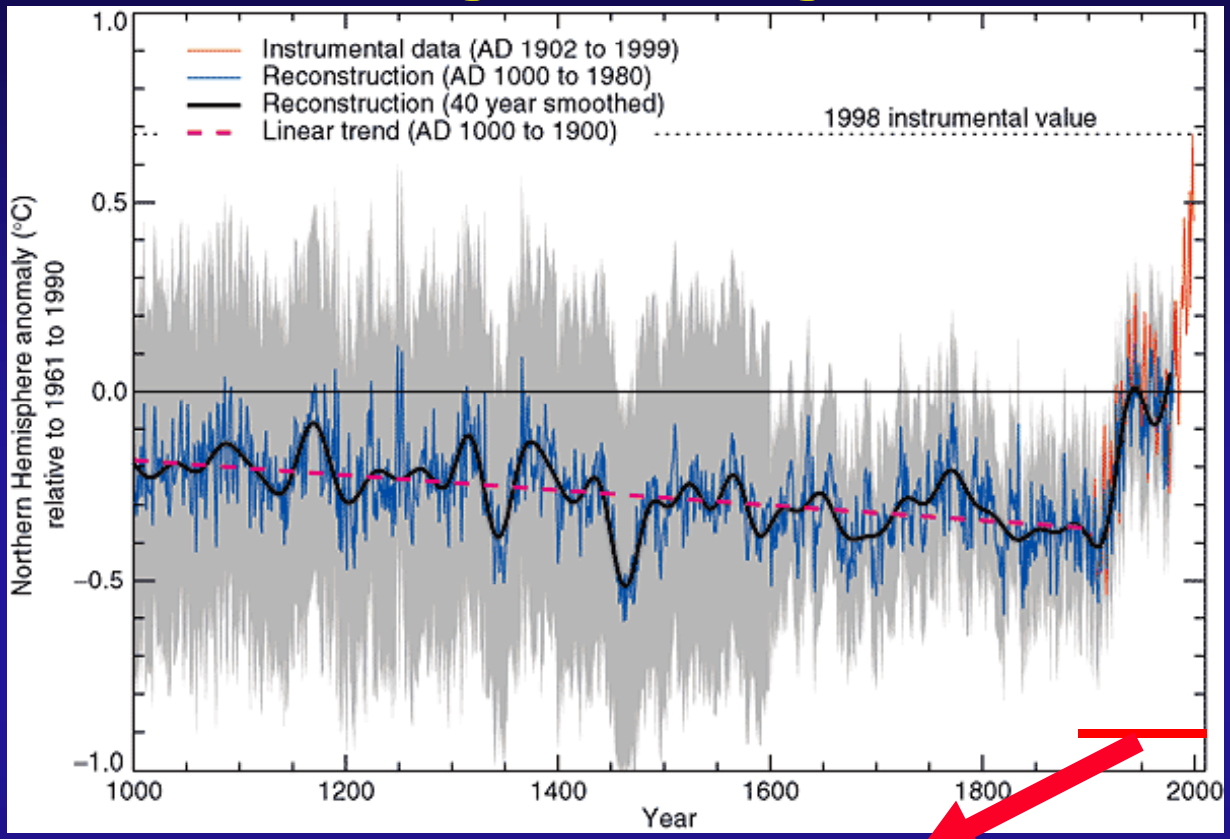
(Data from Hokkaido)

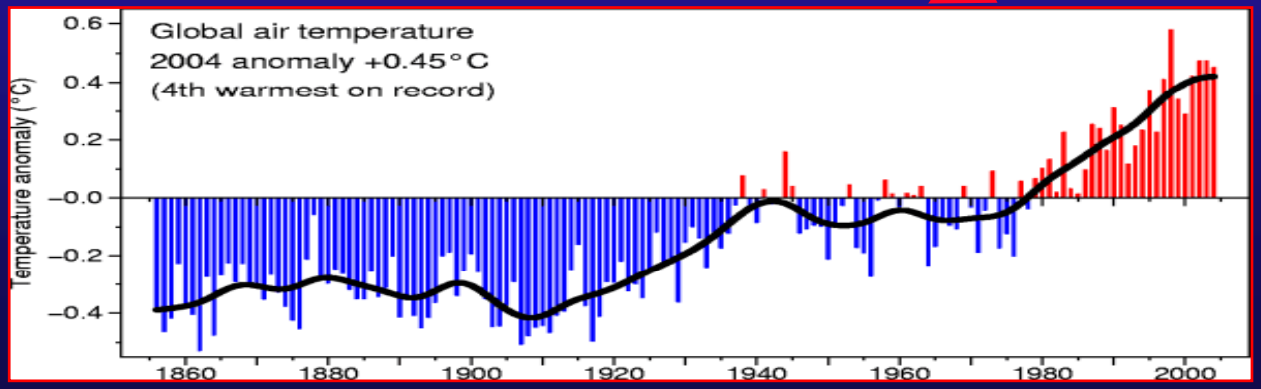


Number of SSL at the Tyuleny Isd.

(Kuzin, 2006)

Global warming during 20th Century



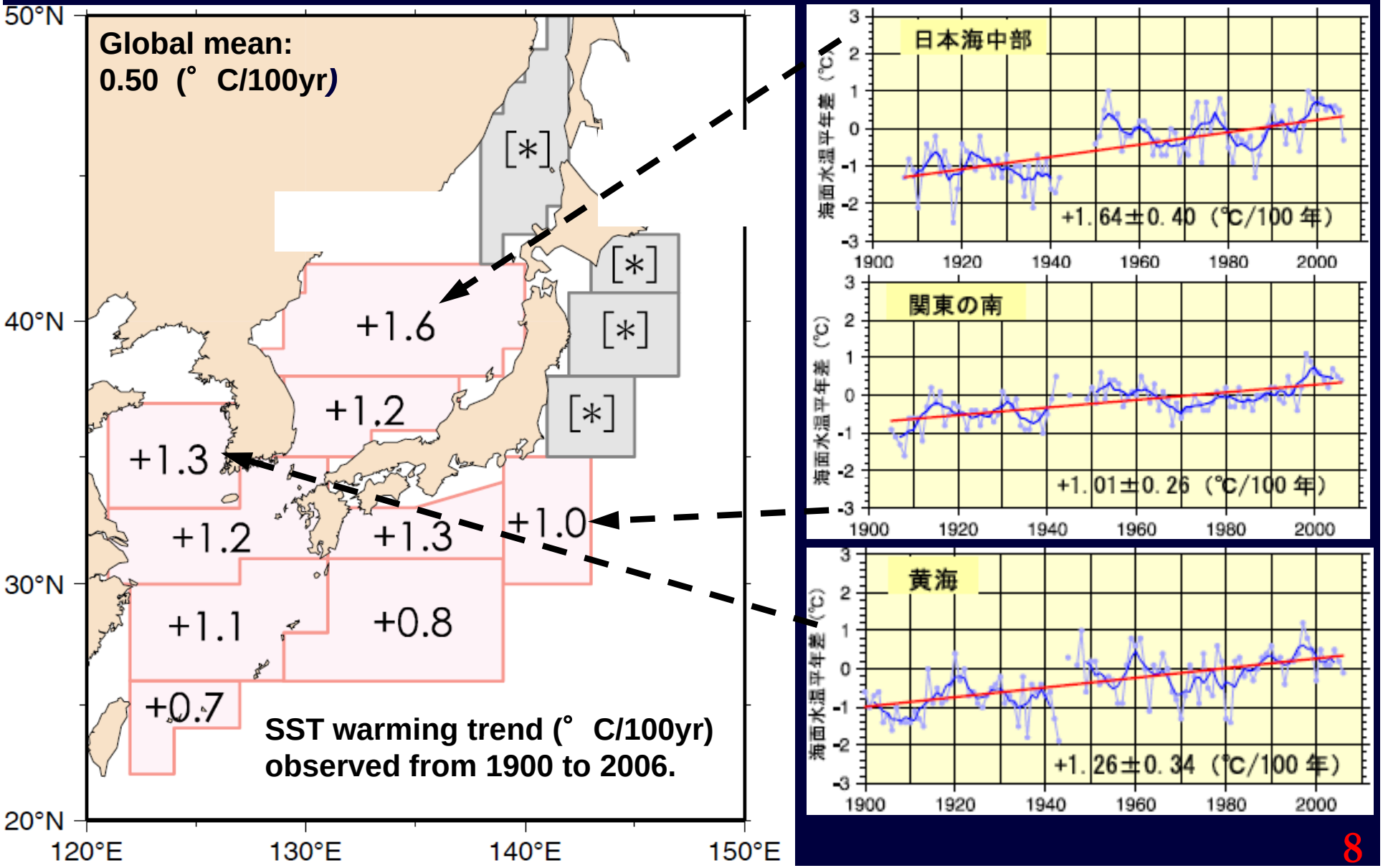


http://www.cru.uea.ac.uk/cru/info/warming/

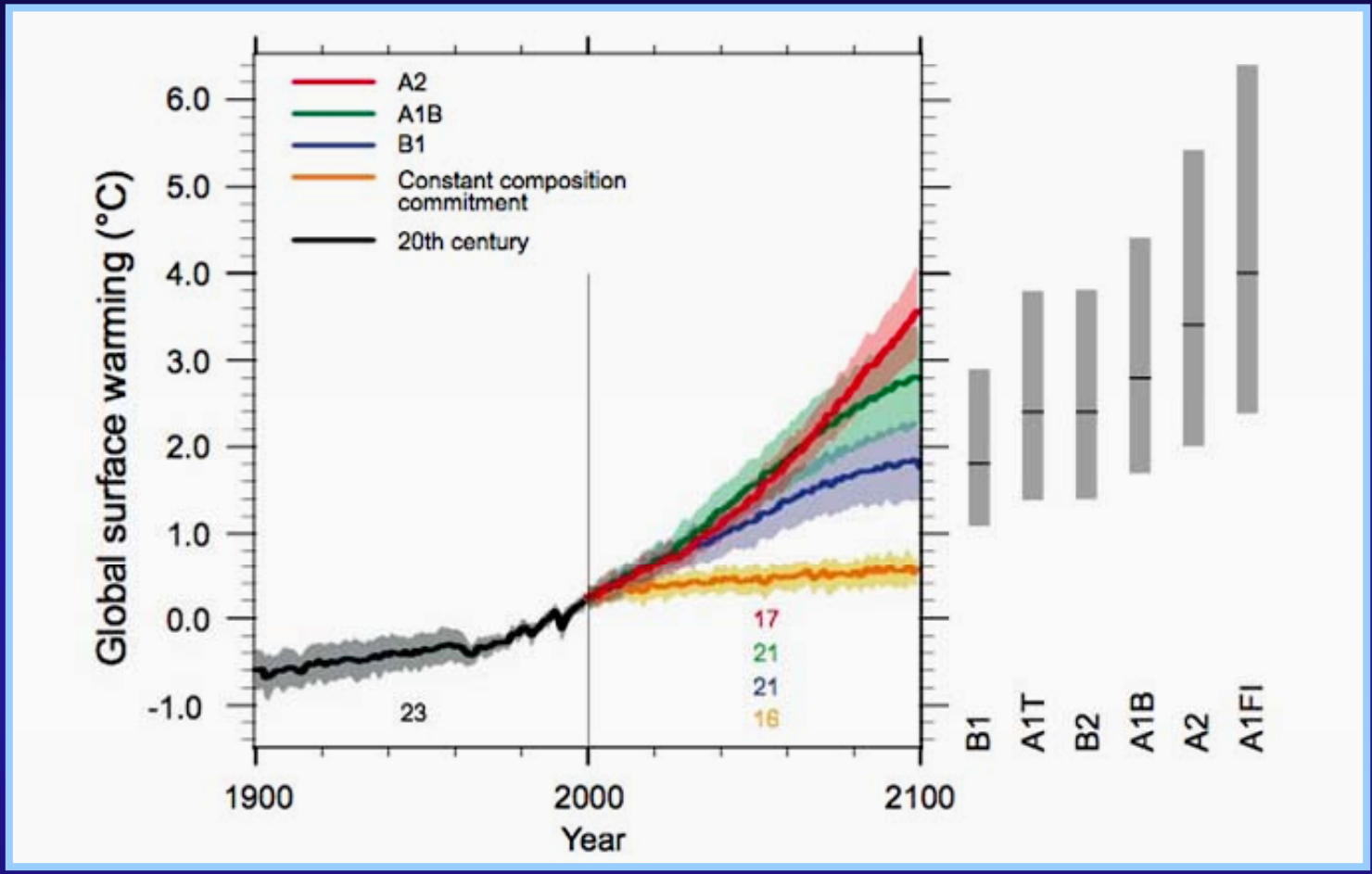
Warming trend in SST observed around Japan

JMA (2007)

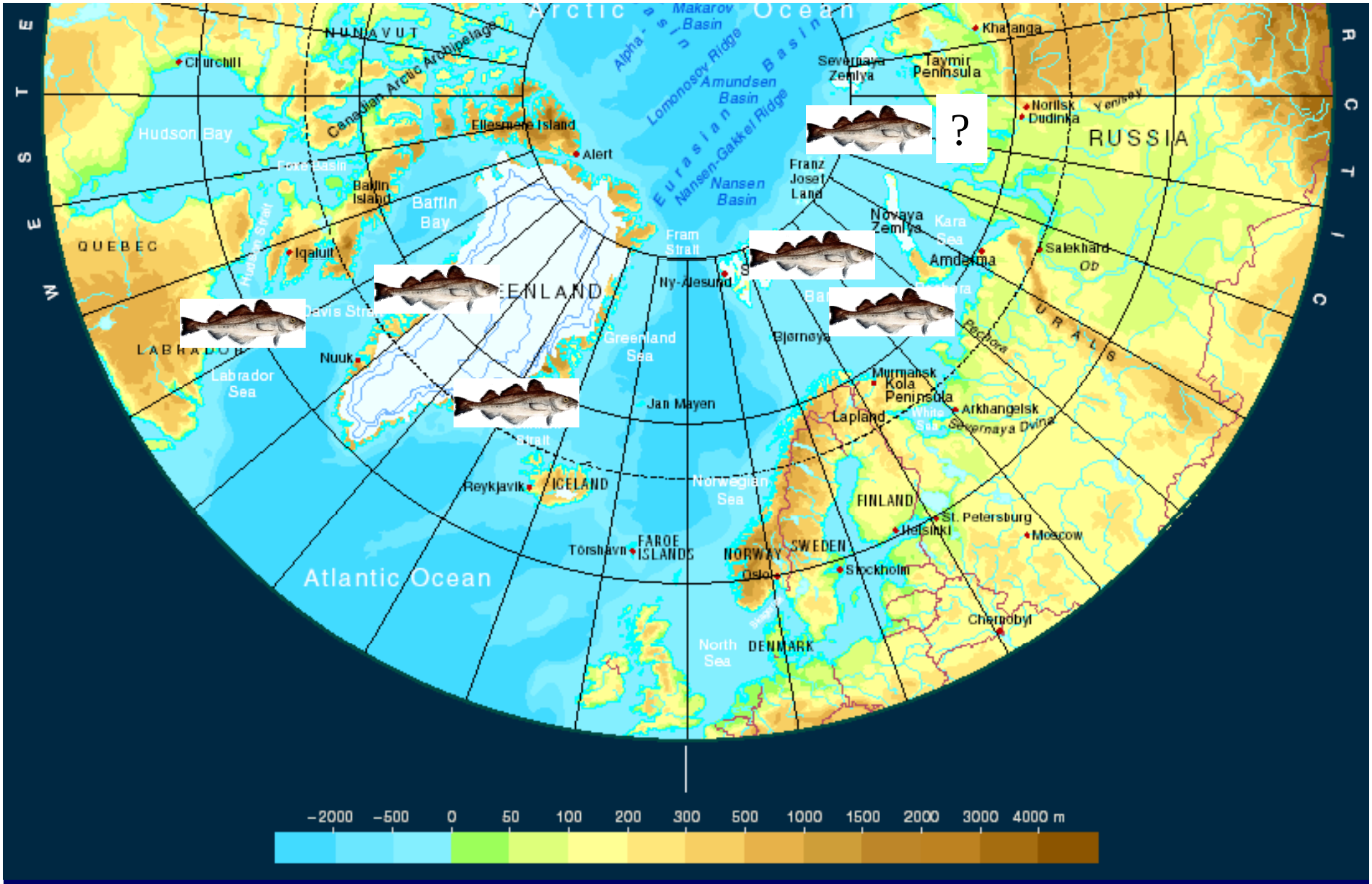
M. Nakamura



IPCC WG1 AR4 highlights

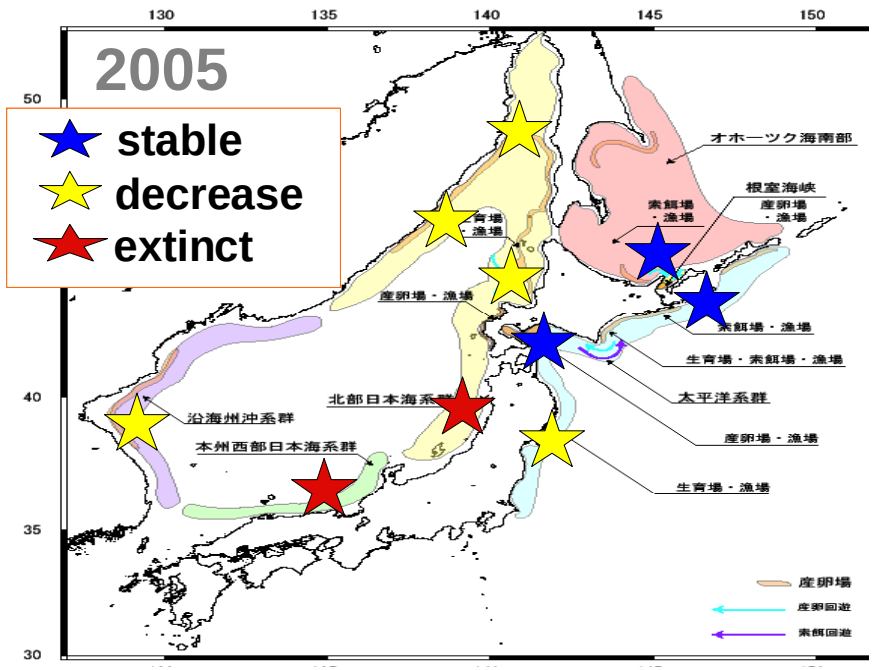


- For the next two decades, a warming of about 0.2° C per decade is projected for a range of SRES emission scenarios.
- Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1° C per decade would be expected.
- Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.



Northward Expansion of Atlantic cod

Drinkwater(2008)


2005
stable
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オホーツク海南部
根室海峡
索餌場・漁場
産卵場・漁場
生育場・漁場
産卵場・漁場
索餌場・漁場
生育場・索餌場・漁場
太平洋系群
産卵場・漁場
北部日本海系群
沿海州沖系群
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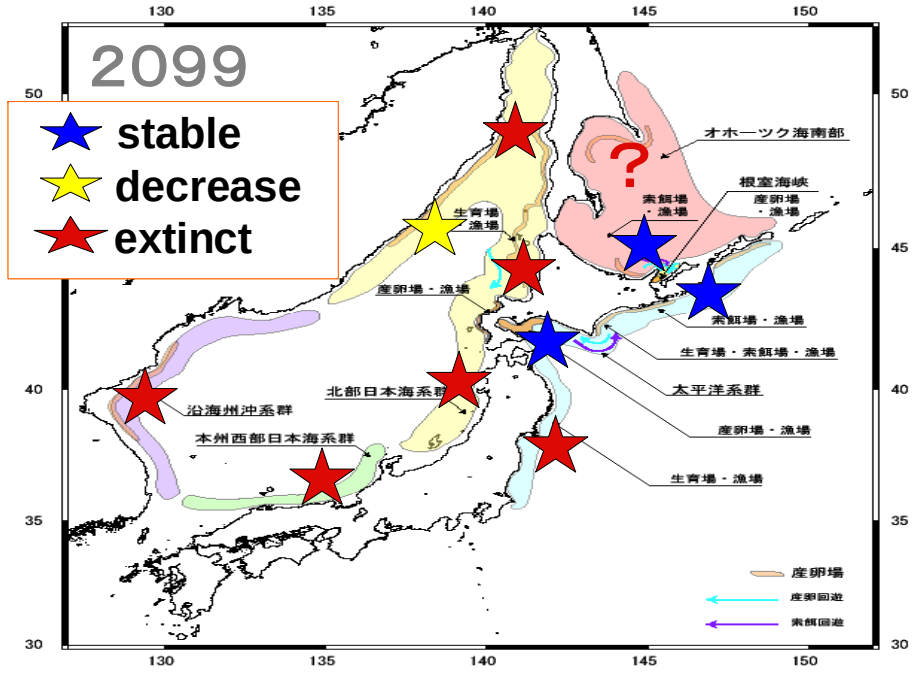
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北部日本海系群
沿海州沖系群
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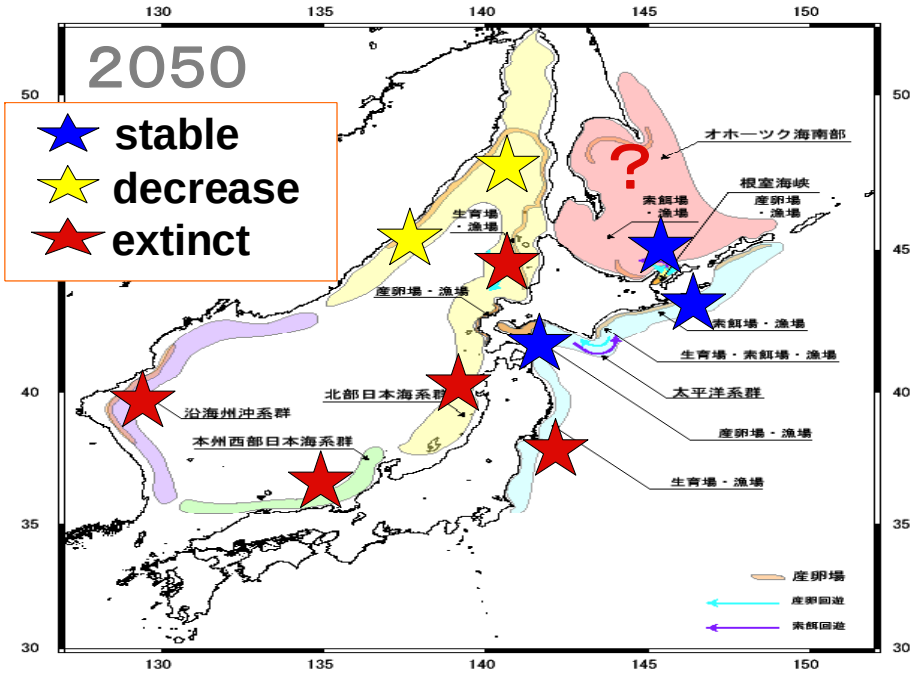
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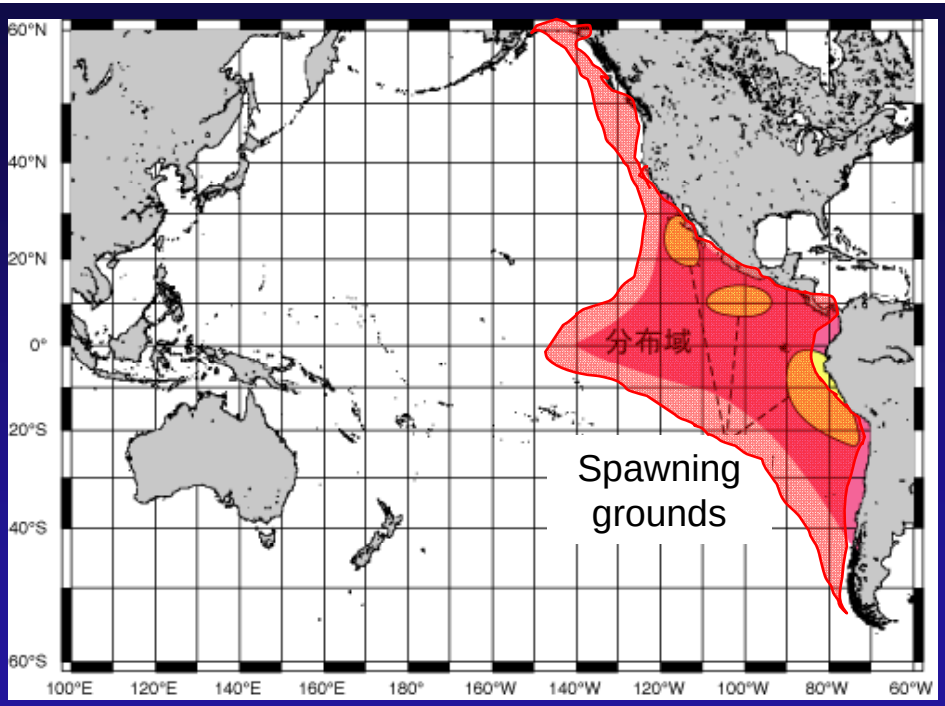
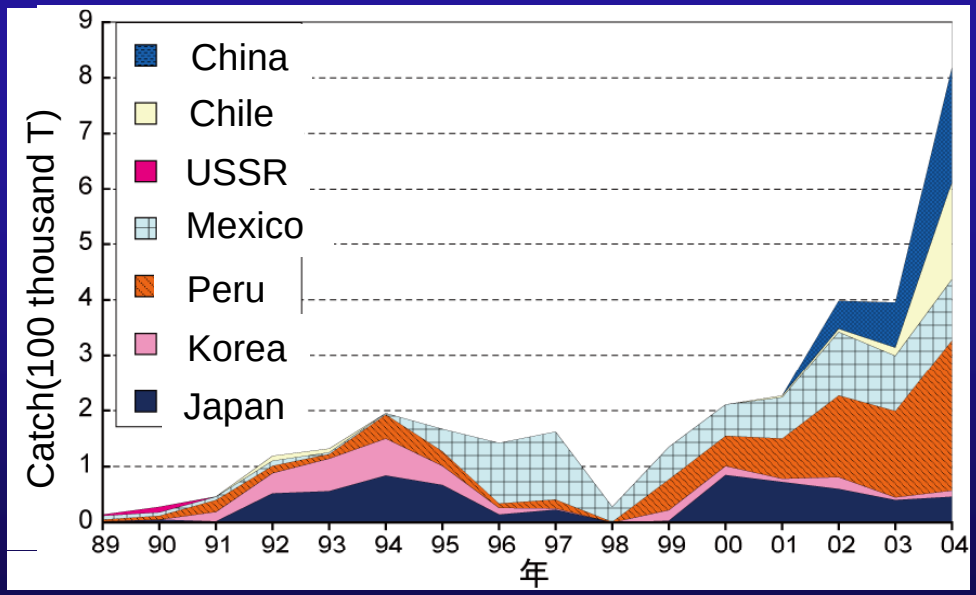
本州西部日本海系群
生育場・漁場
産卵場
産卵回遊
索餌回遊


Walleye pollock

(after Pauly and Maclean, 2003)

Ripe females of Jumbo squid,
Dosidicus gigas

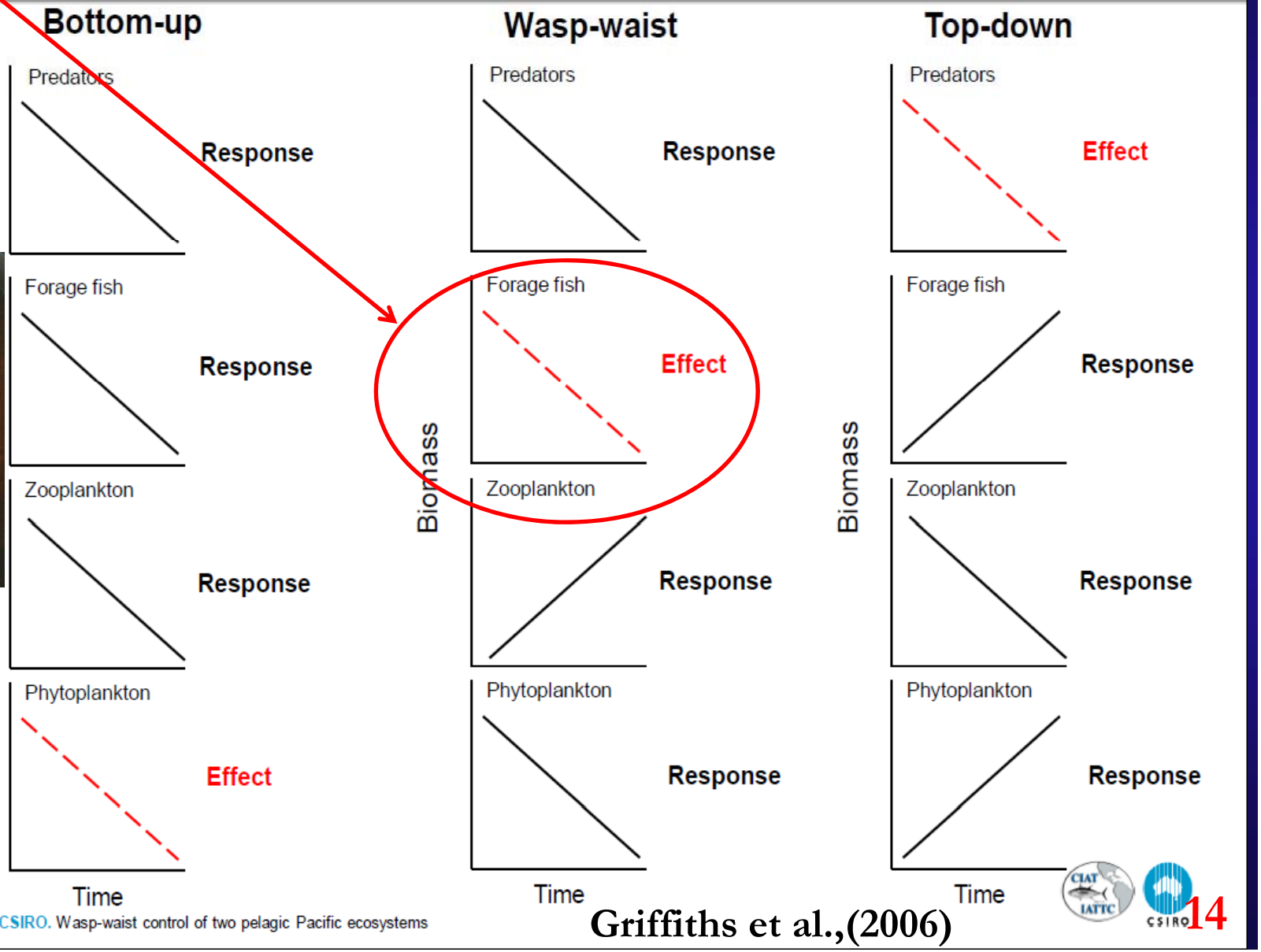




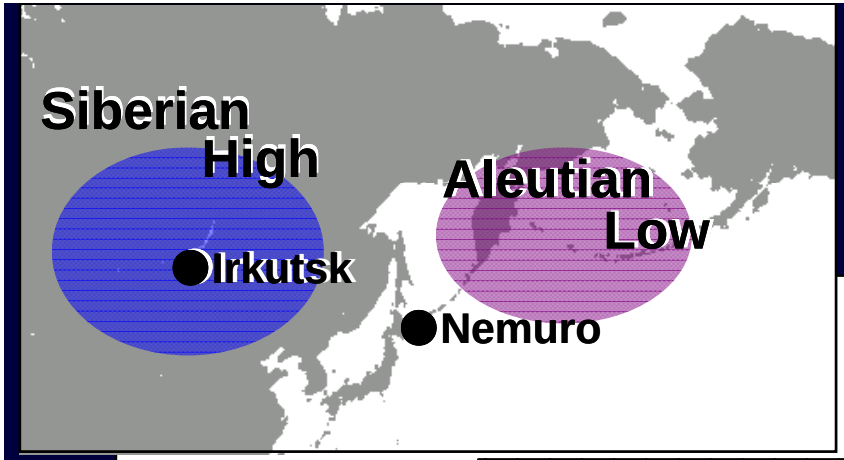
Catch trends of Jumbo squid

Fisheries Agency & Fishries Agency of Japan (2006)

Oceanic squid is a key species in bottom-up, top-down, and 'wasp-waist' controlled marine ecosystem



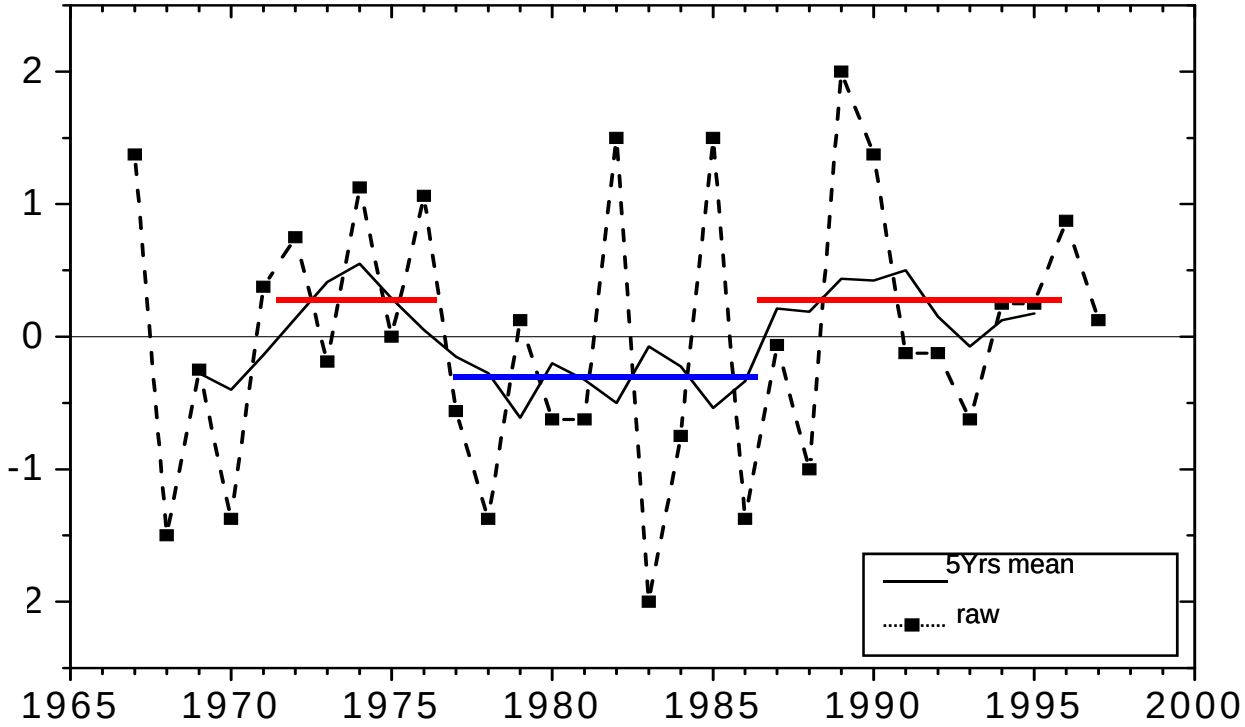
Griffiths et al.,(2006)



Regime Shift

weak

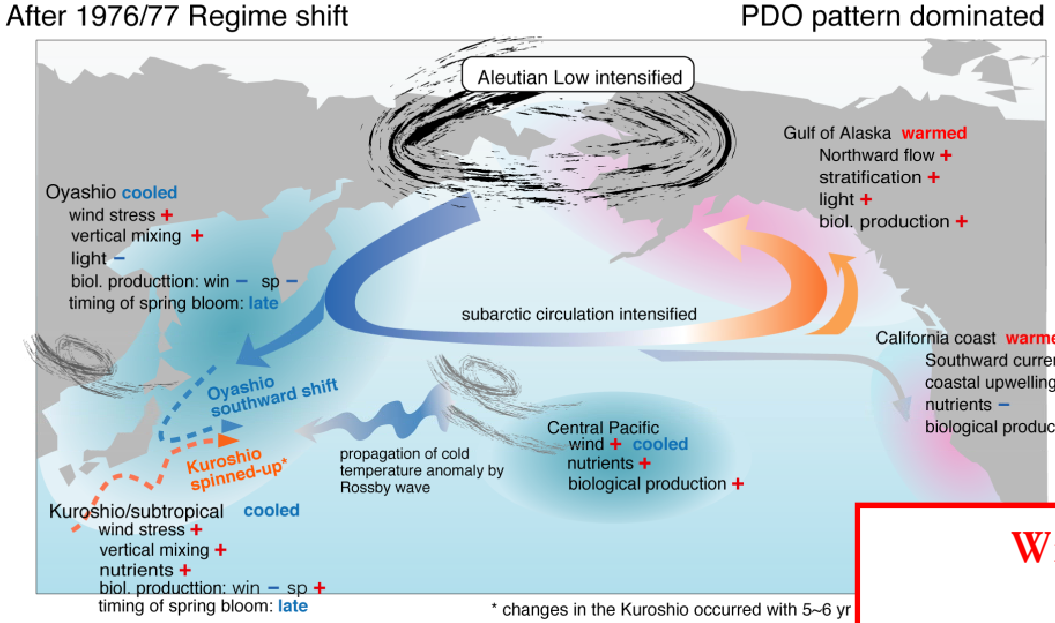
strong



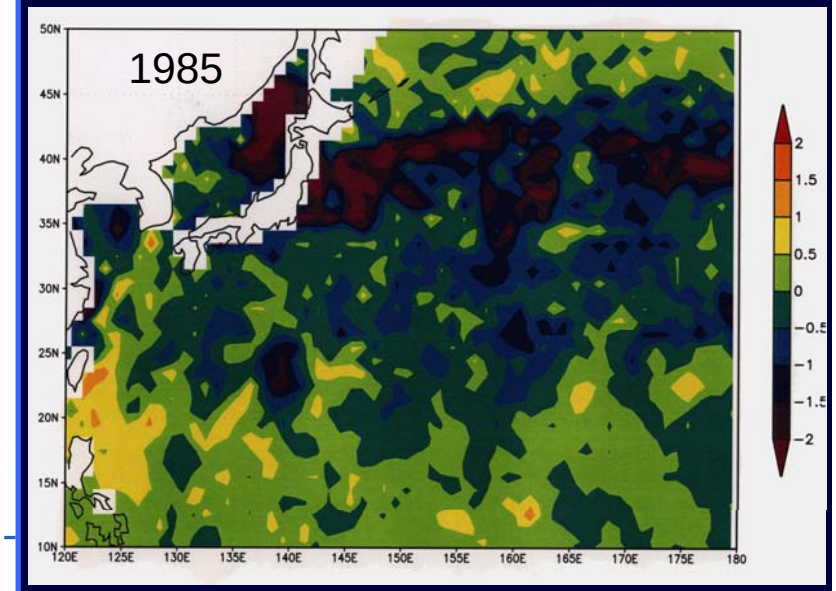
Annual change of Aleutian low pressure index.

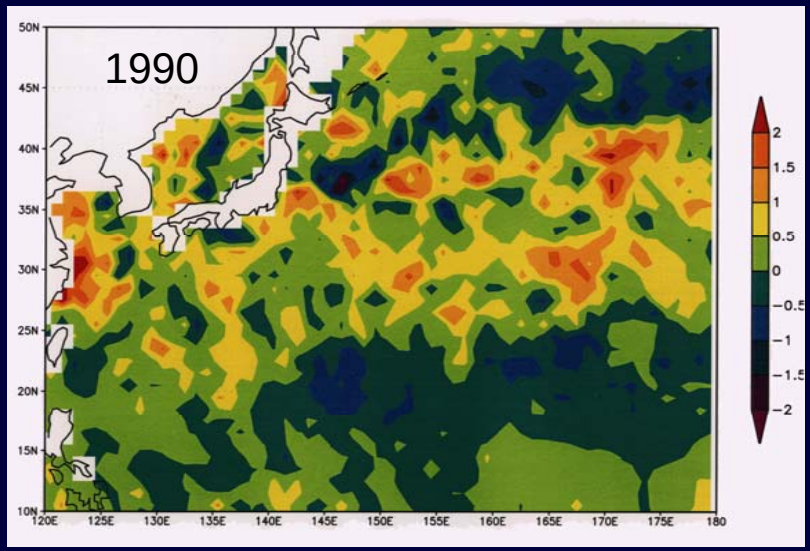
(Nakamura and Honda, 2002)

Wintertime climate and winter-spring production: 1976/77RS

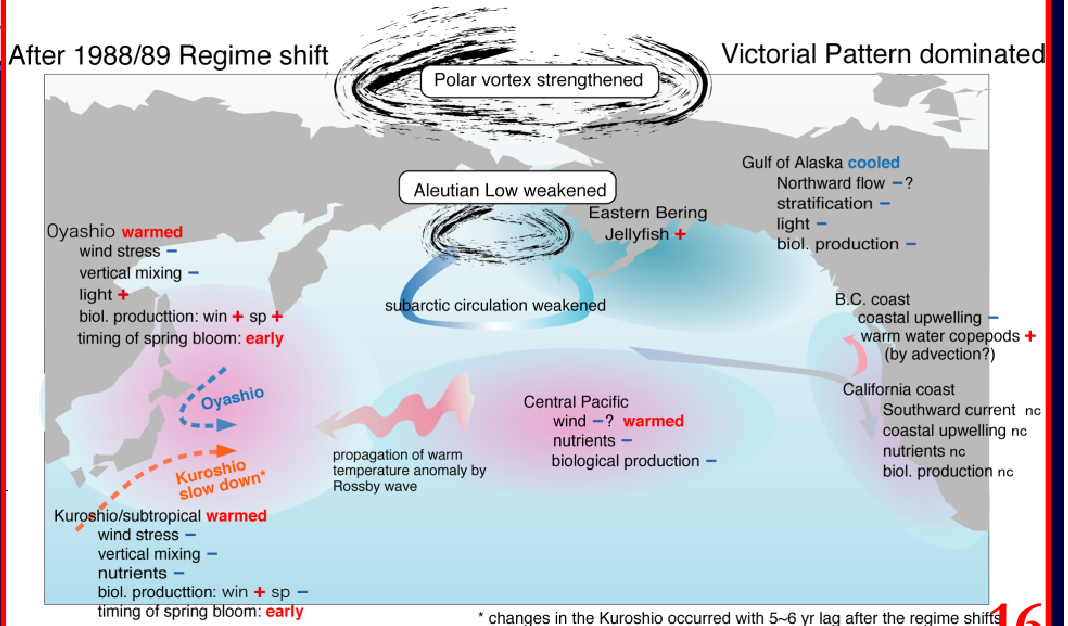


(modified from Chavez et al 2003. * information of the western N

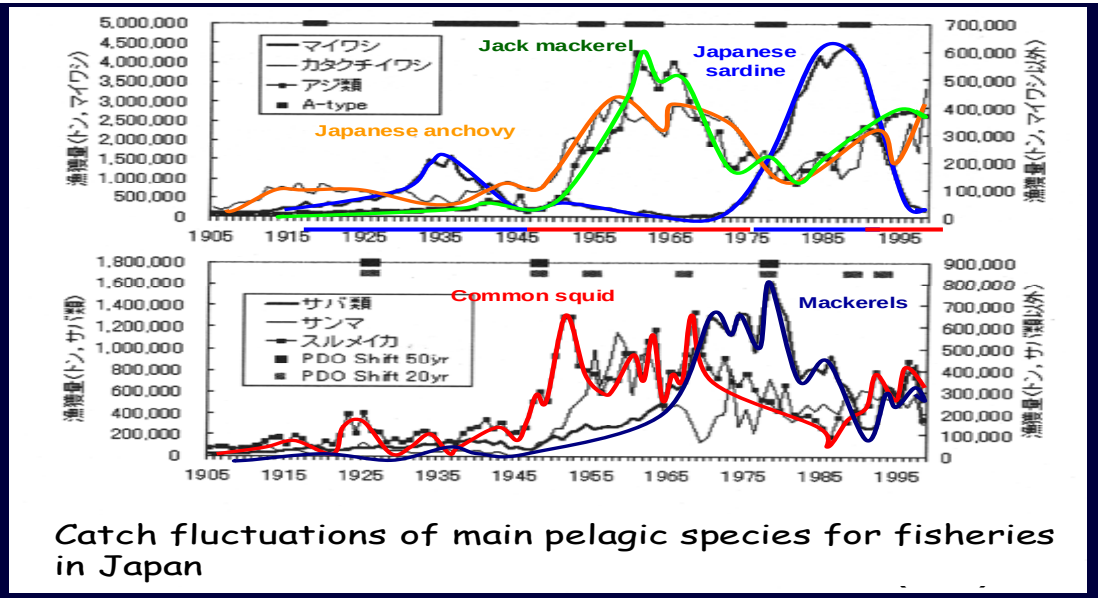




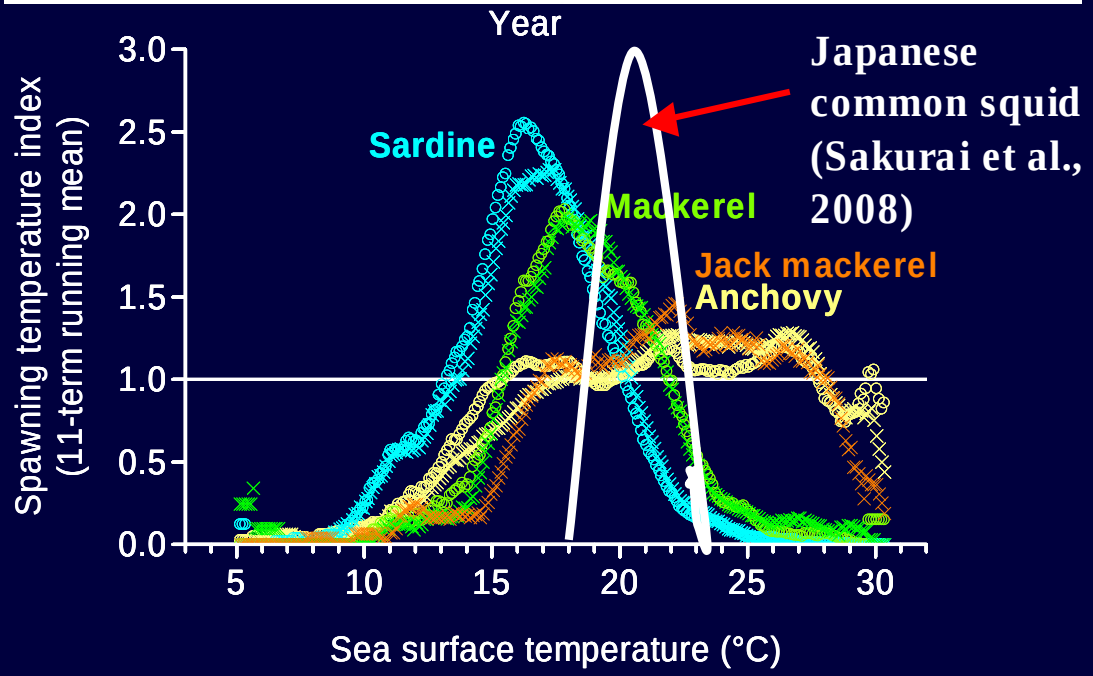
Wintertime climate and winter-spring production: 1988/89RS



(Fig by Chiba based on various sources)



Catch fluctuations of main pelagic species for fisheries in Japan



Anchovy

Sardine

Mackerel

Jack mackerel

Similarities and differences in spawning temperature patterns represent those in the long-term population dynamics patterns. (After Takasuka, 2006)

Ecosystem Approach for Sustainable Fisheries Management

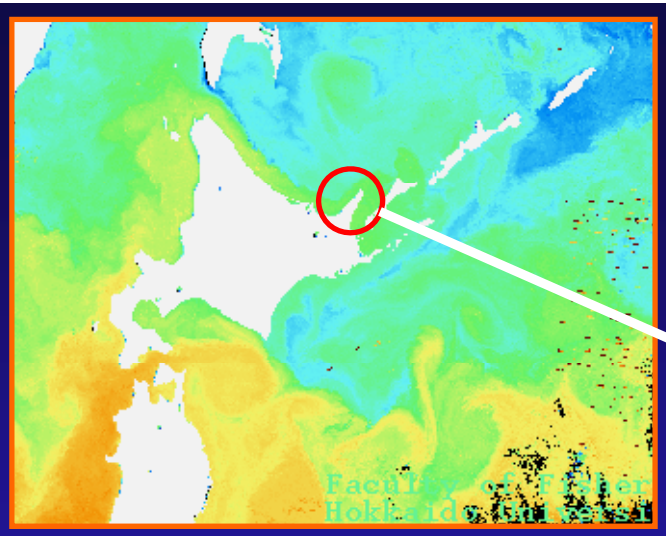
1. The world fisheries catch are hence significantly impacted by human exploitation and increasingly affected by climate variability and change.

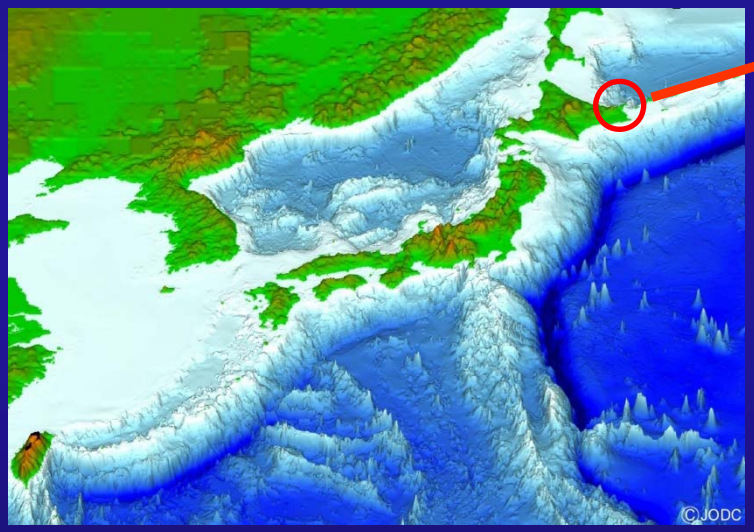
2. For long-term sustainable utilization of marine resources, fisher's awareness change regarding the EAF and adaptive fisheries management may be needed.

3. Adaptive management predicts and monitors changes in the ecosystem and subsequently reviews and adjusts the management and use of natural resources (Matsuda et al., 2009).

4. Such predictions and monitoring are best accompanied by feedback controls, such as the verification of hypotheses based on the results of monitoring in order to review and modify management activities.

A case study of ecosystem approach to fisheries and the adaptive management of the Shiretoko World Natural Heritage Site





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.

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 of the Multiple Use Integrated Marine Management Plan

Ministry of the Environment
／Hokkaido Government

1. Introduction

(1) Background

- Shiretoko is featured by the significant interaction between marine and terrestrial ecosystems.
- There are a wide variety of marine life inhabiting, including sea eagles and many other rare species, a large number of salmonids, and marine mammals such as Steller sealions.
- In the waters surrounding Shiretoko, fisheries activities have long been carried on without giving the negative impact on the marine life.
- Taking advantage of the opportunity of inscription on the World Heritage list as a natural heritage, **it was decided to formulate an integrated marine management plan in order to keep ensuring both the conservation of marine ecosystem and the proper use of the area for human activities in the future.**

(2) Objective of the Plan

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

Conservation of marine environment and marine ecosystem

Coexistence

Sustainable fisheries

2. 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.

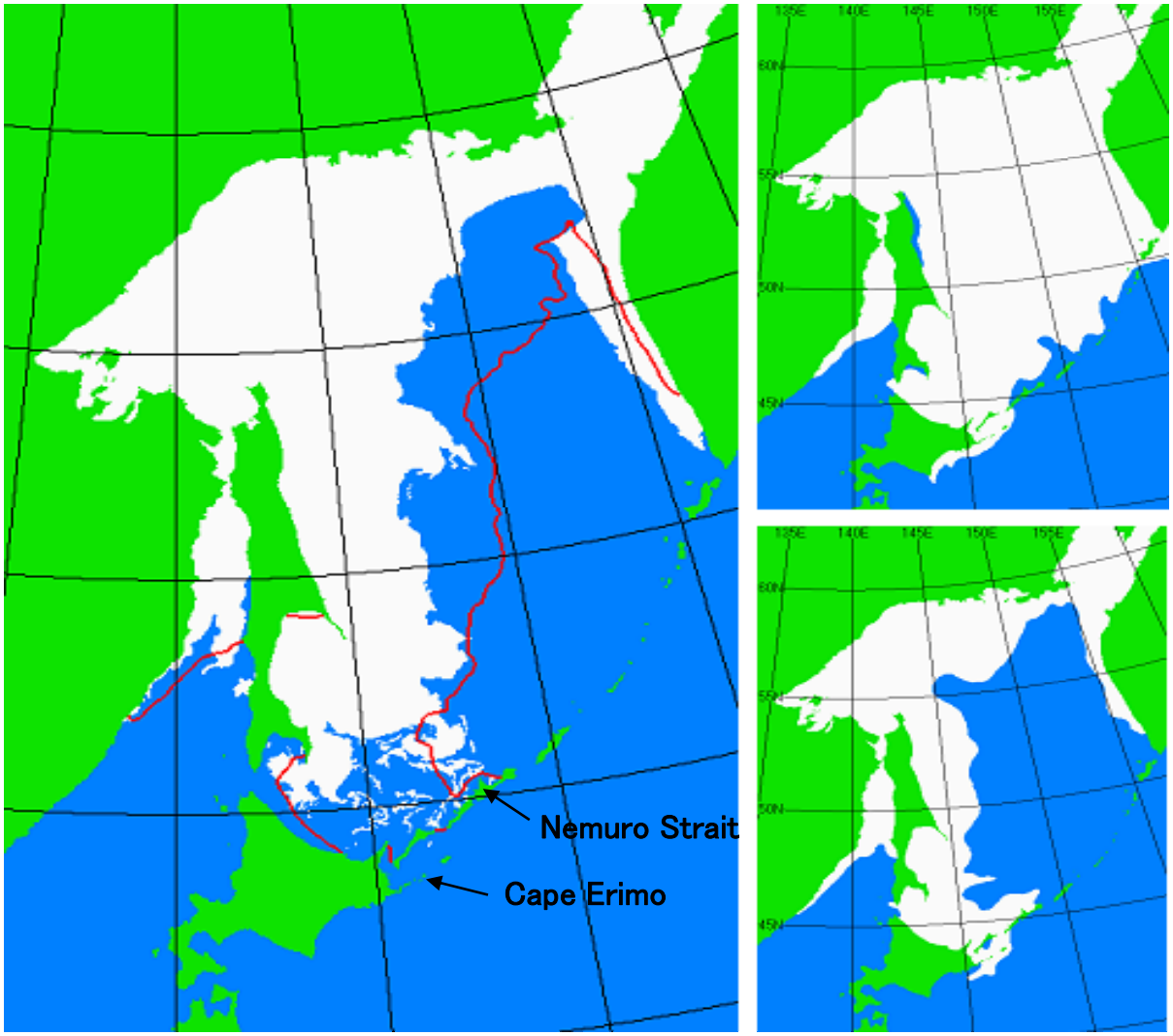


Figure Maximum ice cover area in each year.
Left: March 10, 2006, 903 thousand km^2 . Red line denotes the edge of sea ice in normal year.
Right (upper) : Year of maximum sea ice cover, Feb. 28, 1978, 1,525 thousand km^2 .
Right (lower): Year of minimum sea ice cover, Feb. 25, 1984, 858.1 thousand km^2 .

（JMA, http://www.data.kishou.go.jp/kaiyou/shindan/rinji/2006_no1/nh_snow_time_series.html）

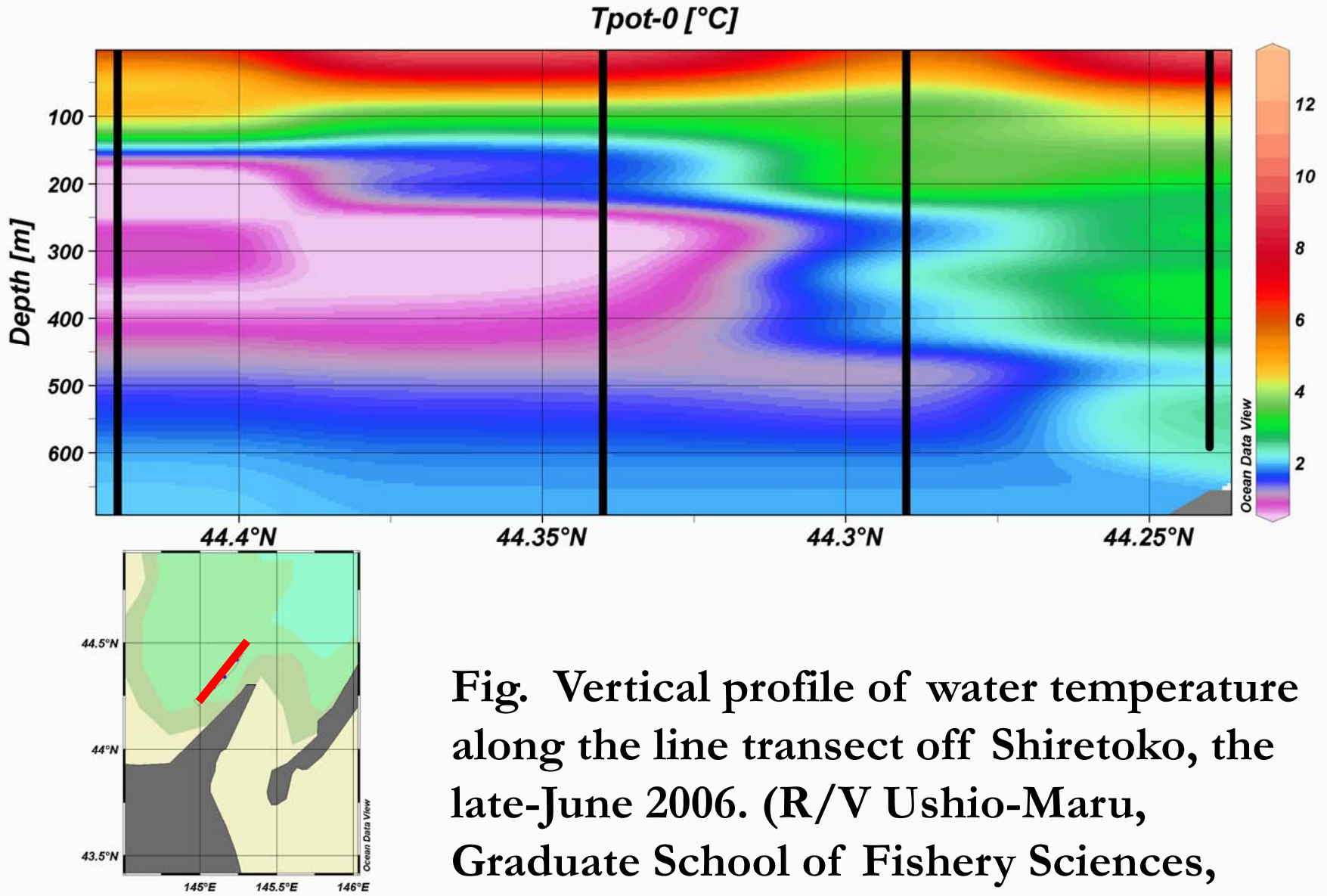
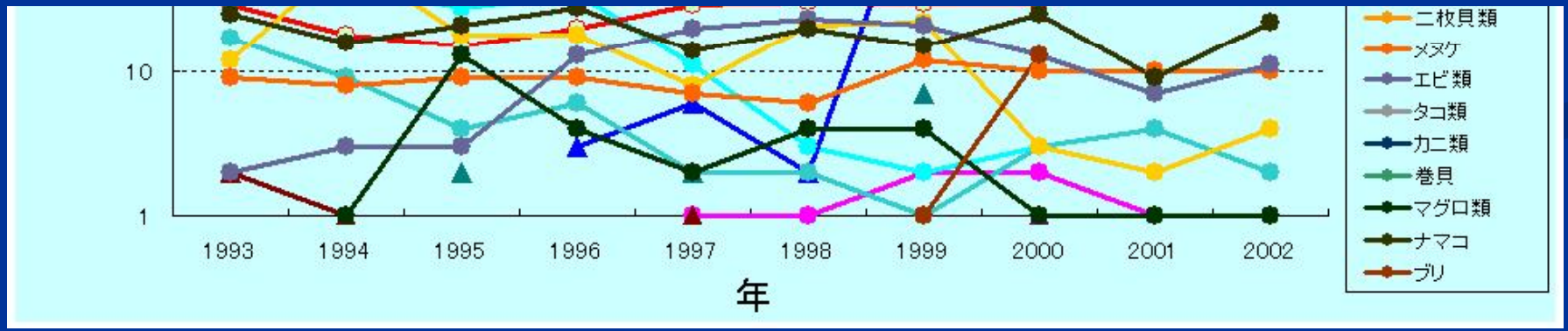


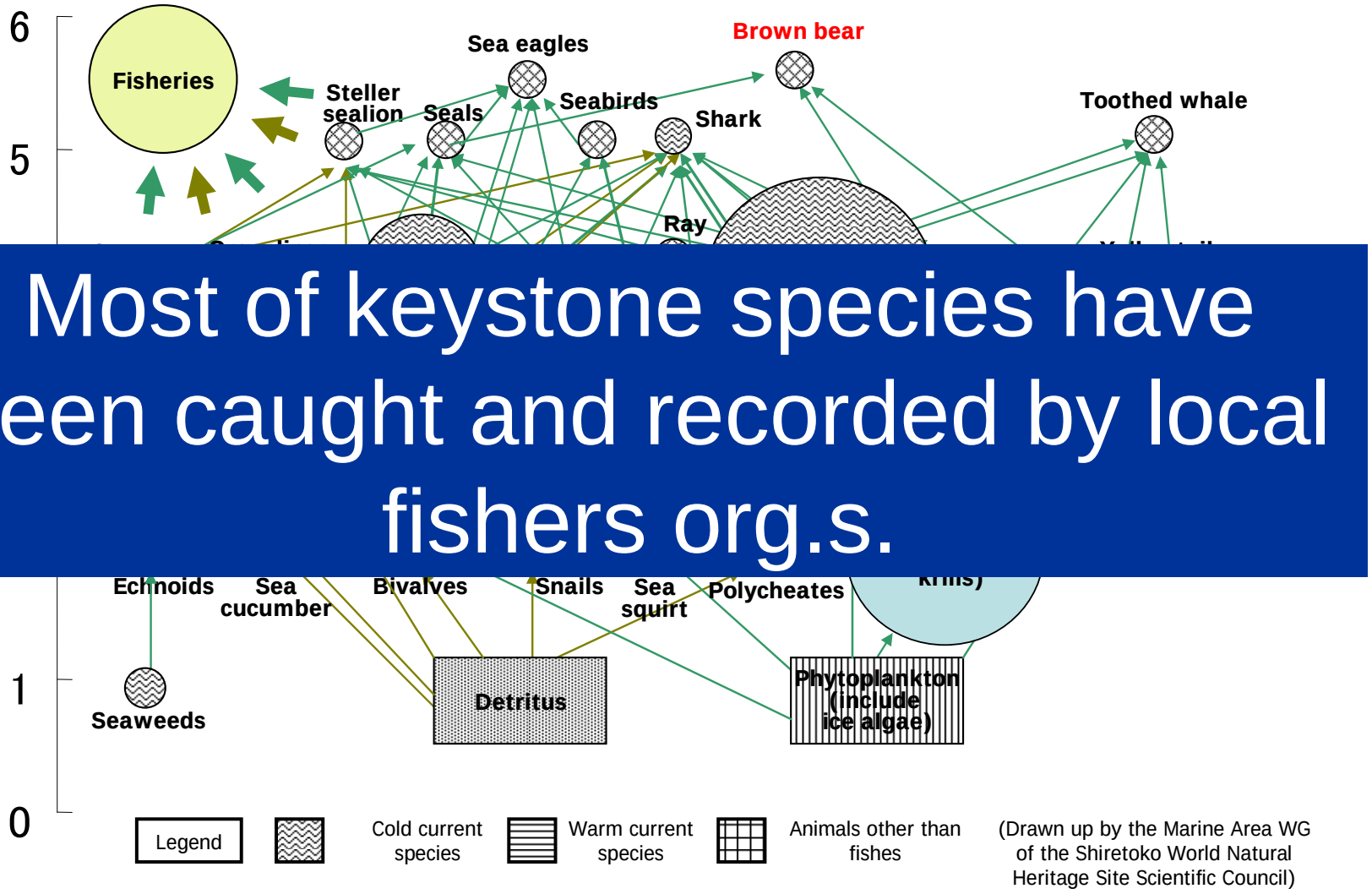
Fig. Vertical profile of water temperature along the line transect off Shiretoko, the late-June 2006. (R/V Ushio-Maru, Graduate School of Fishery Sciences, Hokkaido University)

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

Very informative time-series data for monitoring the changes in ecosystem structure/functions

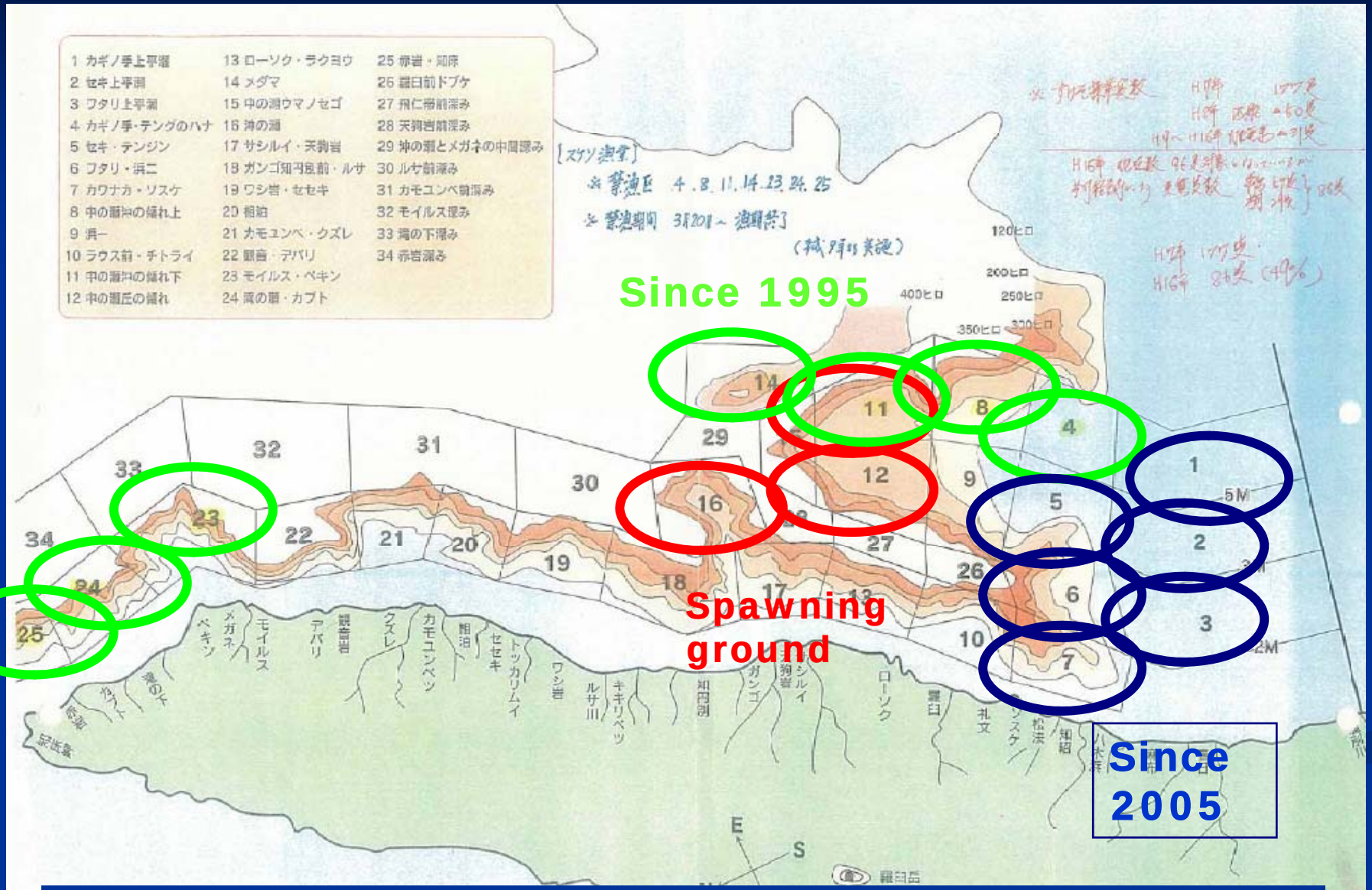


Food web in Shiretoko marine ecosystem



Most of keystone species have been caught and recorded by local fishers org.s.

Voluntary MPAs by fishers to protect Walleye pollock



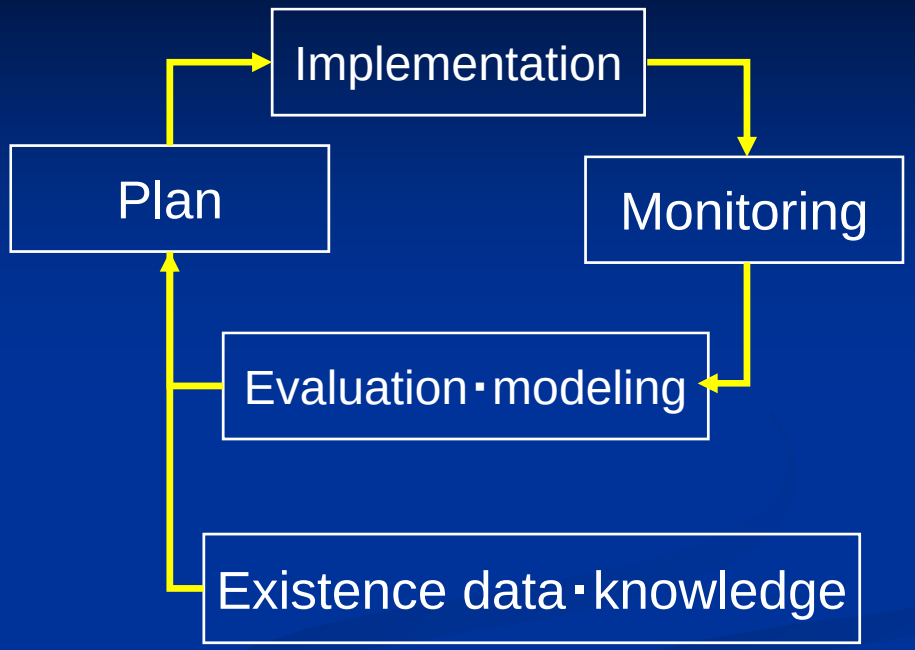
Bottom trawlings are totally banned at the coastal area

② Adaptive management in Shiretoko marine ecosystem

※Ecosystems

- 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.

coordination and cooperation

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.

- Marine WG
- River Construction WG
- Yezo Deer WG

How much did the government have to pay？(in FY 2006)

Cost item	Amount (1000 yen)
Running costs for Scientific Council	17,548
Running costs for the Review Committee and Eco-tourism Association	15,120
Research and monitoring	54,731
River improvement	284,927
Personnel	101,778
Total	470 million

（Makino et al. 2009）

- It corresponds to about 2 % of the fisheries production value in this area. VERY CHEAP!

Advantages of the Shiretoko Approach

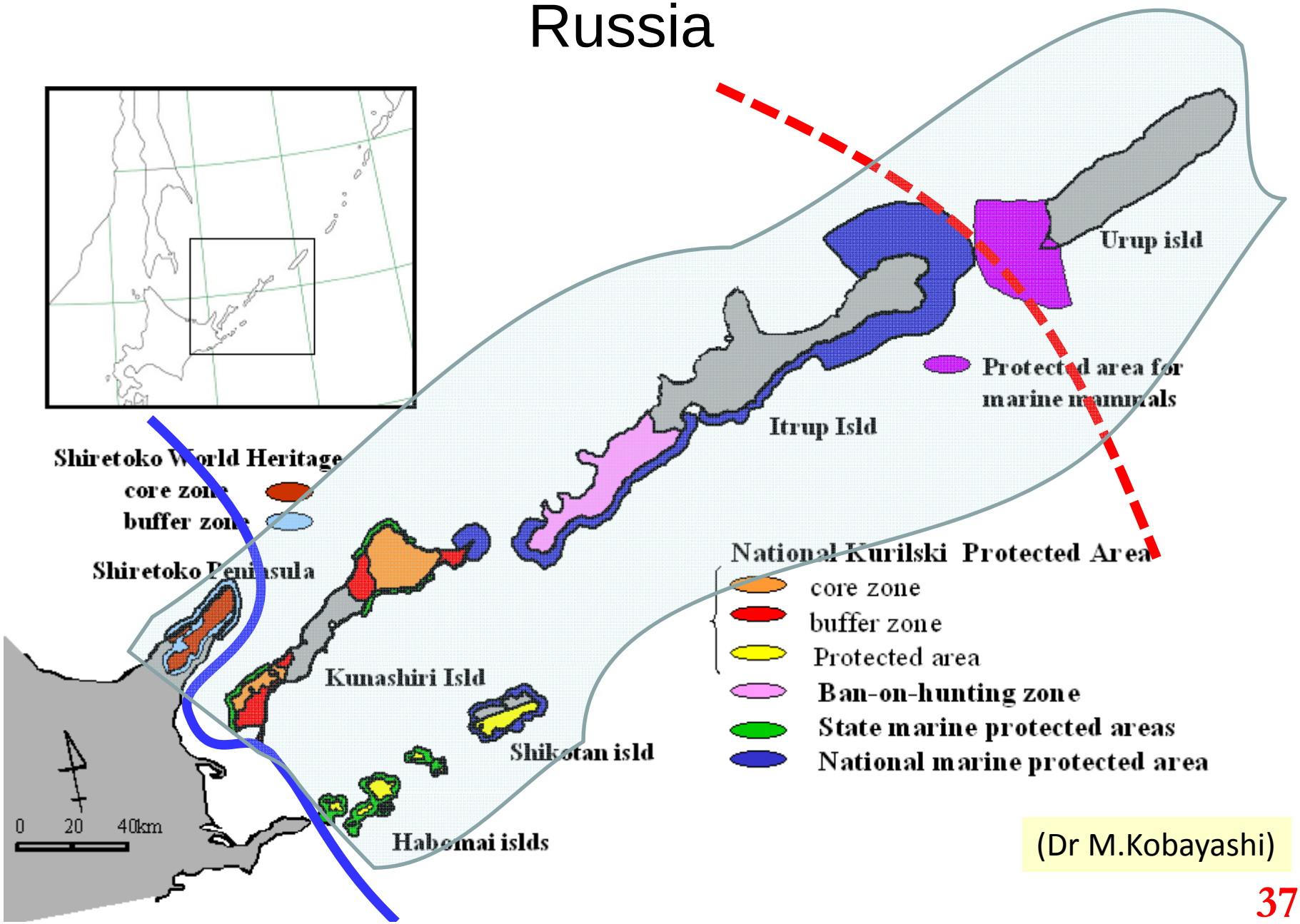
- Due respects paid to the local fishers' knowledge and their autonomous activities;
- No exclusion of local fishers from the heritage area (they are the core of the Ecosystem approach to co-management).
- No destruction of local norms and livelihoods;
- Participation of local fishers to all the D/M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

Present protected areas in Japan and Russia



(Dr M.Kobayashi)


Thank you for your attention
Photo by Haruuna Ueki, Off Rausu