2nd ESSAS OSM Session 7

Climate effects on fisheries in the Shiretoko World Natural Heritage, Japan

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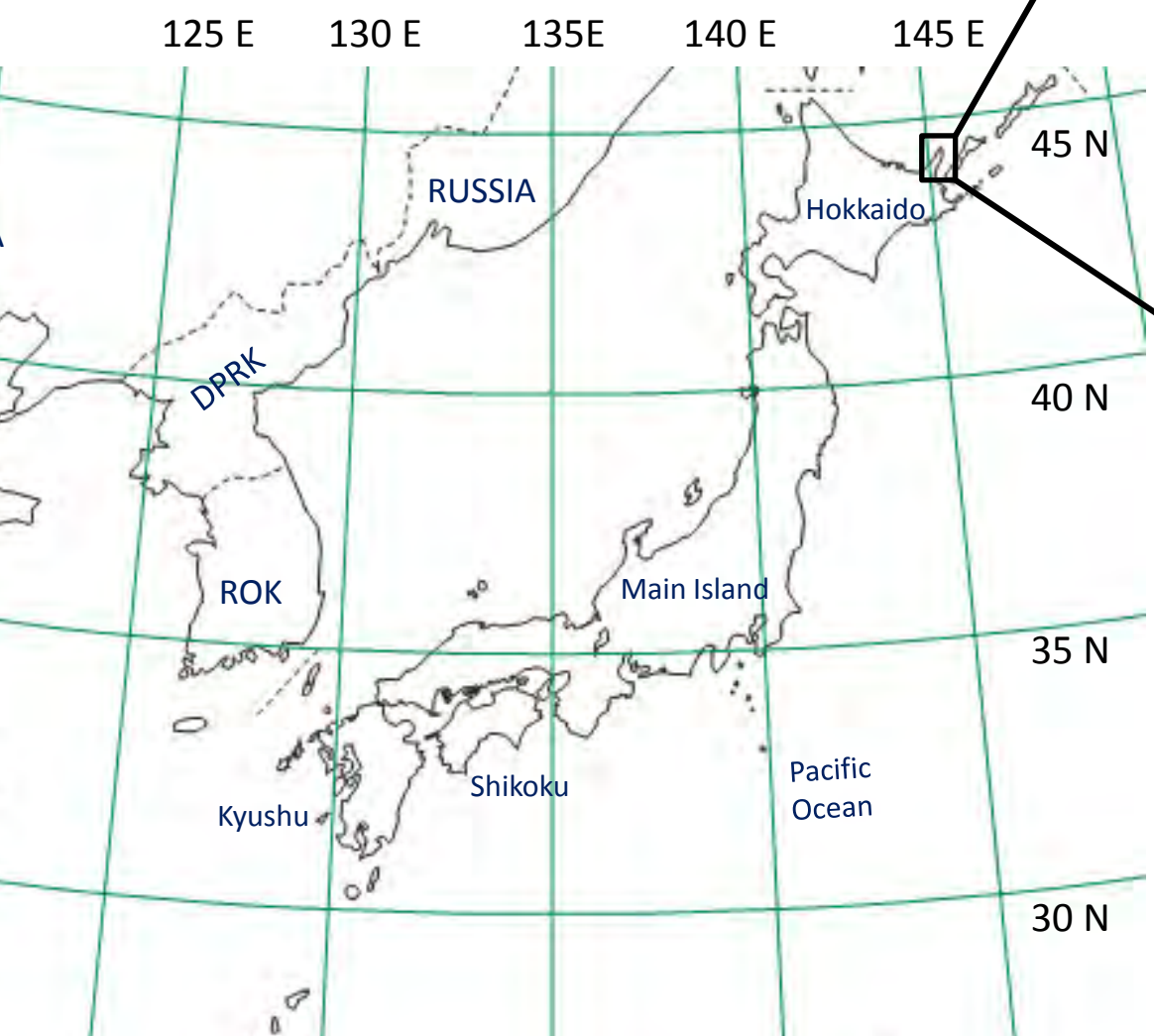
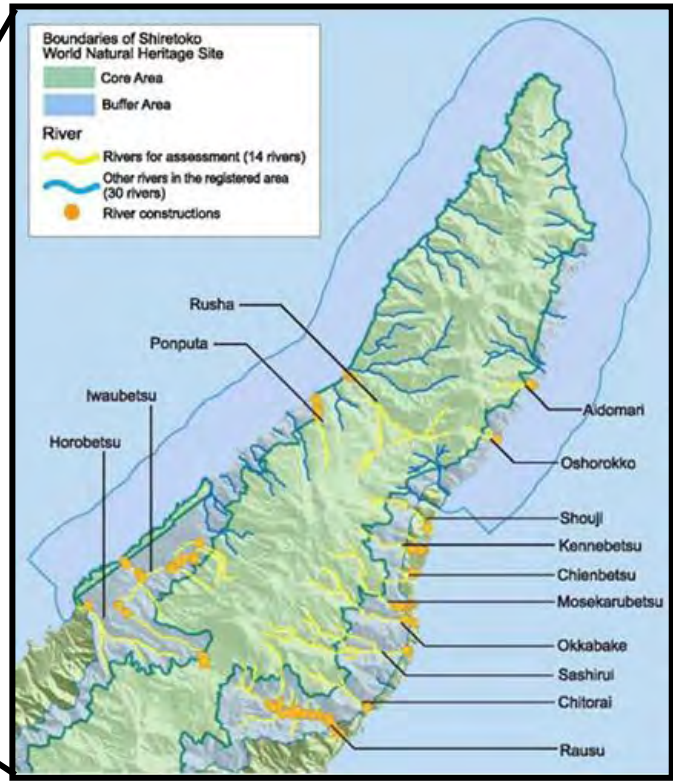


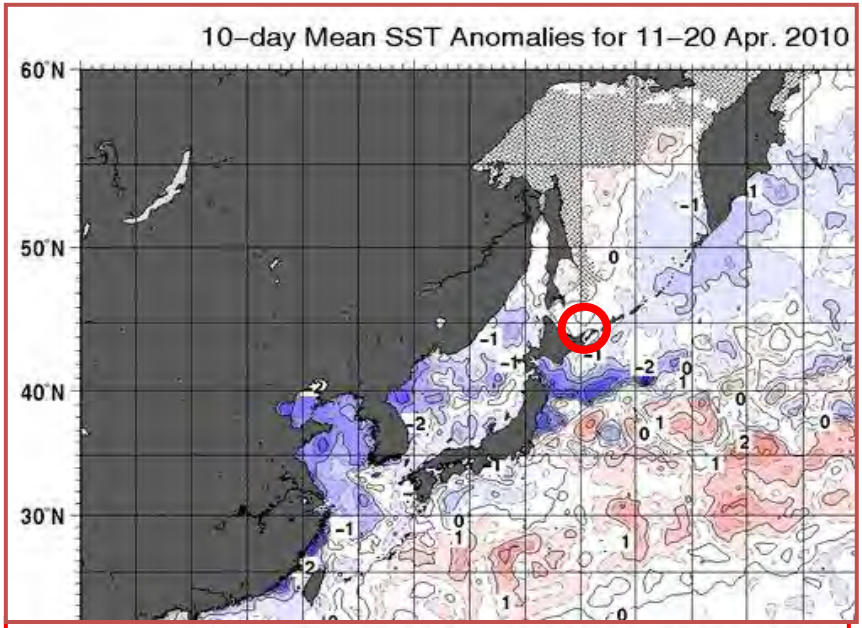


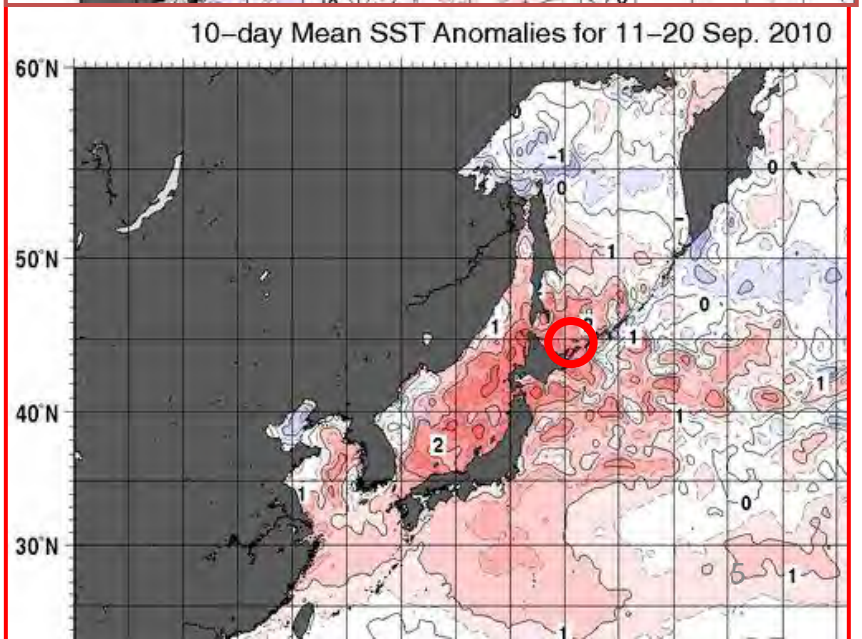
71,100 hectares (including approx. 22,400 ha of marine area).

1-1) Ecological systems in Shiretoko

- the southernmost area of the seasonal sea ice in the northern hemisphere. It is a part of LME including the Far East of Russia.

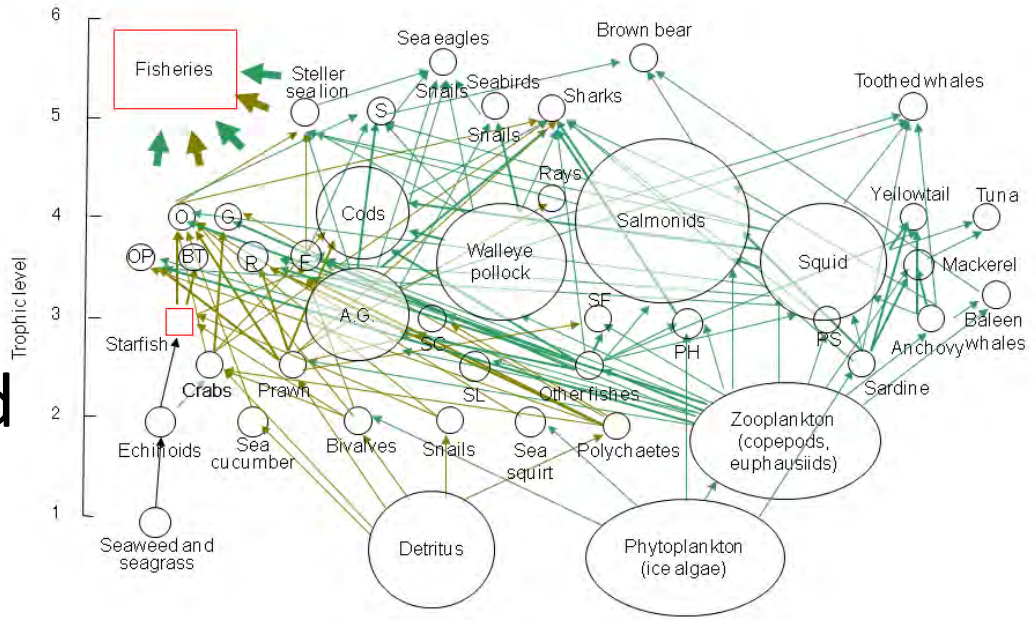
- Also, it is the northernmost area of seasonal warm current ecosystems (Soya current) . Esp. summer SST was recorded-high in 2010.





1-1) Ecological systems in Shiretoko

- Phytoplankton blooms, which are triggered by ice algae and rich nutrient salts, form the base of the marine food web.



- The marine food web is linked to the terrestrial web by the salmonids running up to the mountain.

Nakamura &Komiyama (2010)

1-2) social systems in Shiretoko

- People have been living in this area for more than 2000 years.

Shiretoko Museum (1992)

- Indigenous people, AINU, have developed rich culture based on the local ecosystem services.

Shiretoko Museum (1992)

Sankei web (2011)

1-2) 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.).

1-3) Governance of the WNH

- A management plan for the marine part of the WNH was drawn up in 2007, named “The Multiple Use Integrated Marine Management Plan for Shiretoko World Natural Heritage Site”.

- Objective of the plan: to satisfy both conservation of the ecosystem and sustainable use of resources.

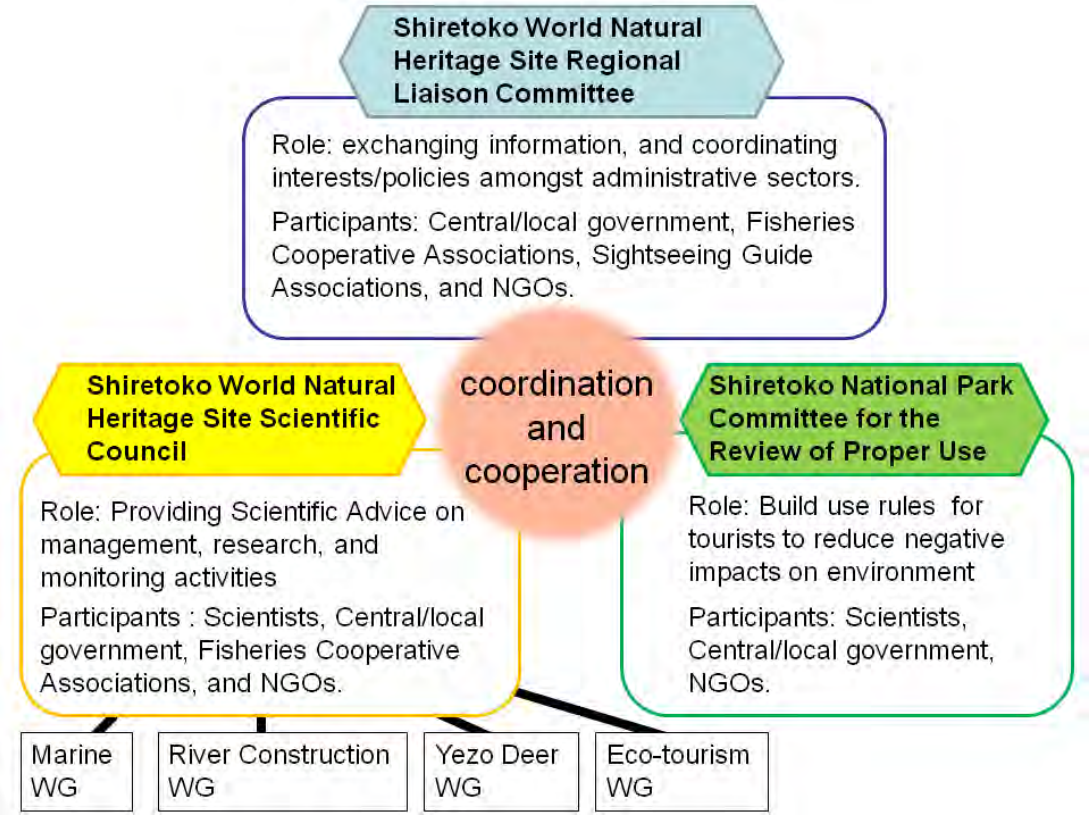
There are many agencies and legal bases relating to the WNH governance

Public Services	Legal basis	Administrative body
Fisheries management	-Fisheries Law of 1949, Fisheries Resource Protection Law of 1951, Law Concerning the Conservation and management of Marine Life Resources of 1996	-Fisheries Agency
Pollution control	-Law Relating to the Prevention of Marine and Air Pollution from Ships and Maritime Disasters of 1970, Waste Management and Public Cleansing Law of 1970, Water Pollution *Control Law of 1970*	-Coast Guard (Ministry of Land, Infrastructure, Transport and Tourism) -Ministry of Environment
Landscape conservation	-Law on the Administration and Manage-ment of National Forests of 1951, Natural Parks Law of 1957, Nature Conservation Law of 1972	-Ministry of Environment - Forestry Agency
Species protection	-Law for the Protection of Cultural Proper-ties of 1950, Law for Conservation of Endangered Species of Wild Fauna and Flora of 1992, Wildlife Protection and Appropriate Hunt-ing Law of 2002	-Ministry of Environment -Ministry of Education, Culture, Sports, Science and Technology

Makino (2011a)

1-3) Governance of the WNH

- New organization for cross-sector coordination was established.
- The SC drafted the management plan.



- For more details, please see following article.

Makino, M, Matsuda H, and Sakurai, Y (2009) *Marine Policy* 33: 207-214.

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   - 2-2) Changes, vulnerability, and policy and research needs for adaptation.

3. Conclusion

2-1) Framework for the analysis:

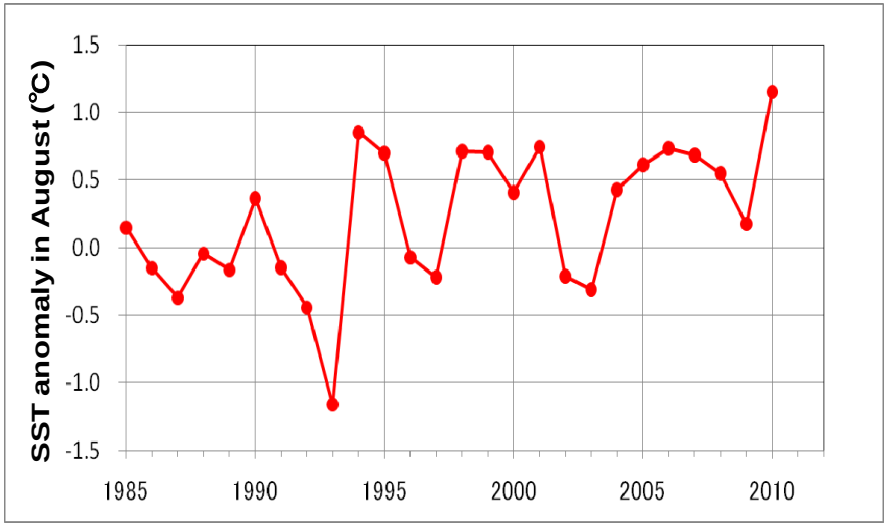
5 policy pillars in the fisheries management in Japan

Fisheries Research Agency (2009)

http://www.fra.affrc.go.jp/kseika/GDesign_FRM/FinalReport_eng.pdf

2-1) Framework for the analysis:
Time scales

- Short-term oscillations:
  1-5 years
- Medium-term fluctuations/regime shifts:
  10-20 years
- Long-term global change trend:
  50- years.



Annual change of SST anomalies in August in water around Japan (1985-2010)
(Press release , Japan Meteorological Agency, Sep. 9, 2010)

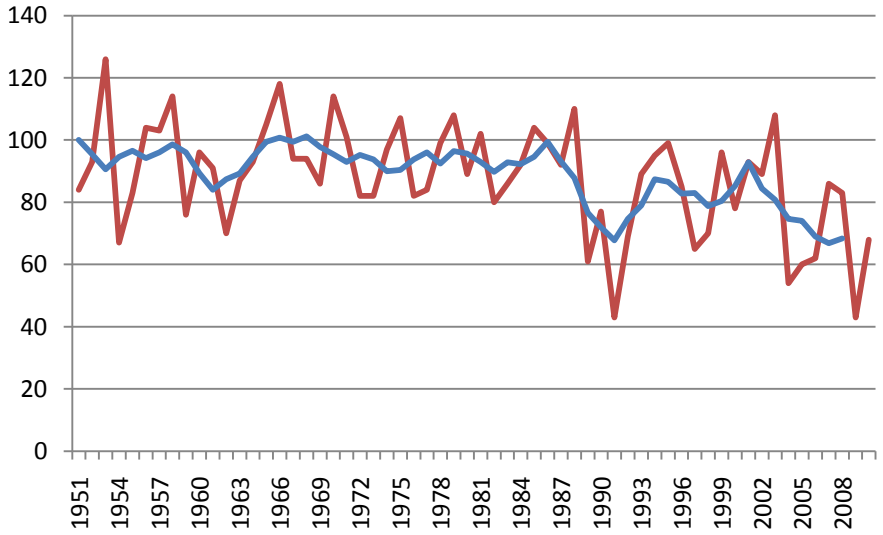
2-2) Changes, vulnerability, and policy and research needs for adaptation

A: Resource and environment

Changes and Vulnerability

- We have already discussed the ecosystem changes in the subarctic part of Japan (W-1, S-5, S-6, etc.)

- As the symbolic change, number of days covered by the sea ice is decreasing for the last 25 years.



Data source: Meteorological Agency, Japan

Vulnerable, resillient, and increasing in Shiretoko

chum salmon Kaeriyama (‘07) Kishi et al (‘10)

Walleye pollock Sakurai (‘07)

Japanese common squid Sakurai (‘07)

Pacific cod Sakurai (‘07)

Pacific saury Ito (‘07)

Pacific herring Ito (‘07)

Short-spined sea urchin

Kichiji rockfish

Yellow tail

Oni kombu (kelp)

Sea cucumber Makino (‘11)

Bluefin tuna

A: Resource and environment

Policy and research needs for adaptation

- Joint monitoring and co-research programs on the LME (including Russia) is the very base of all the measures for adaptation.

- For increasing species (common squid, herring, yellowtail, etc.), rigid and precautious resource management is important. They are not the temporary bonus, but should be the main components of the future ecosystems in medium- and long-term perspectives.

-> Hoel's and Criddle's presentations in S-7 elaborate more about this issue.

For the species to decrease…

- Majority of chum salmon harvested in Japan is the artificially hatched stocks. They have lower genetic diversity and narrower spawning period, compared to the wild stocks .
- As the counter measure, environmental restoration in the natural spawning rivers is important (Nagata 2011, Nakamura & Komiyama 2010).

B: Food security

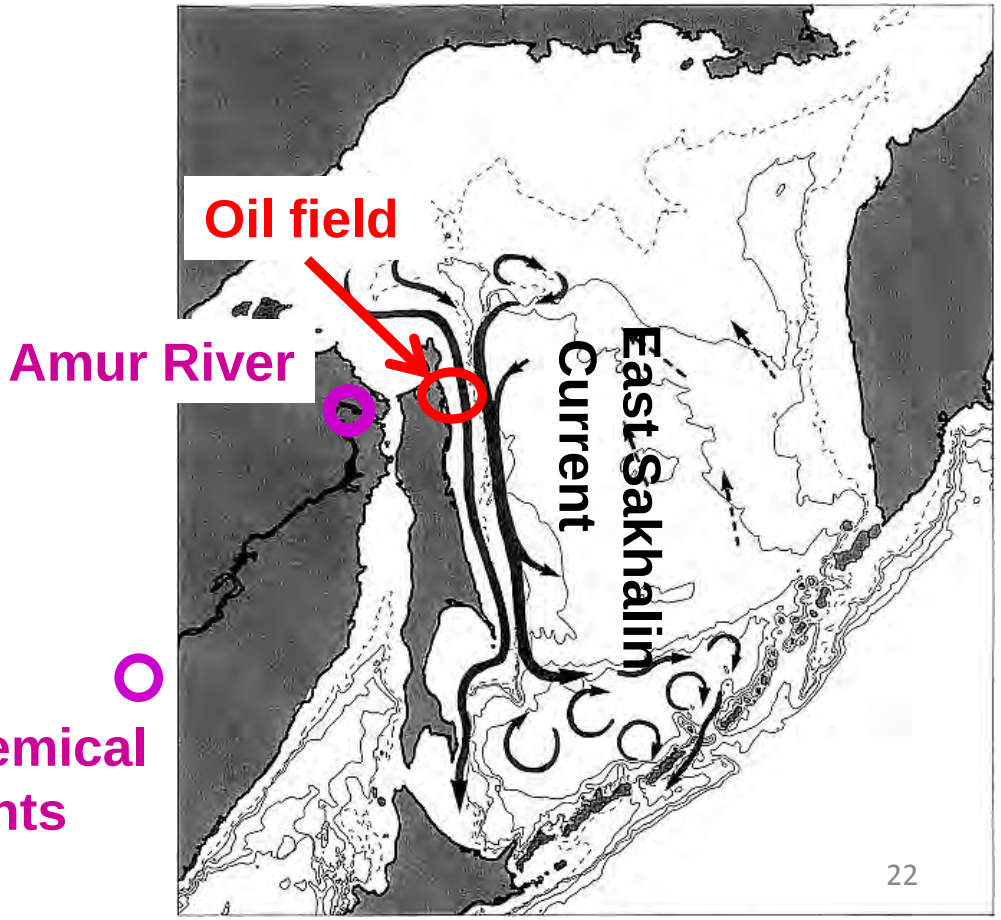
Changes and Vulnerability

- Fisheries products is the largest source of animal protein for the average Japanese (>45%).
- Hokkaido prefecture, in which Shiretoko locates, is the largest fisheries production site in Japan (>25 %).
- Under the global changes, the demand-supply relations in **the international food market will be more and more fragile** -> Strong's talk (S-7)
- The Japanese food self-sufficiency rate is quite low (40%), i.e., vulnerable (Medium/Long-term). The increase of the rate is one of the most important policy issues.

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).



B: Food provision

Policy and research needs for adaptation

- For increasing species, a social system for efficient utilization as food is required (e.g., new tech for processing, infrastructure for transporting, new recipe and market, etc.)(Medium/Long-term)

- It is especially important for highly fluctuating species such as herring, sardine, or mackerel, in order to increase the self-sufficiency rate (to be consumed by the people, not used as fertilizer or animal feeds).

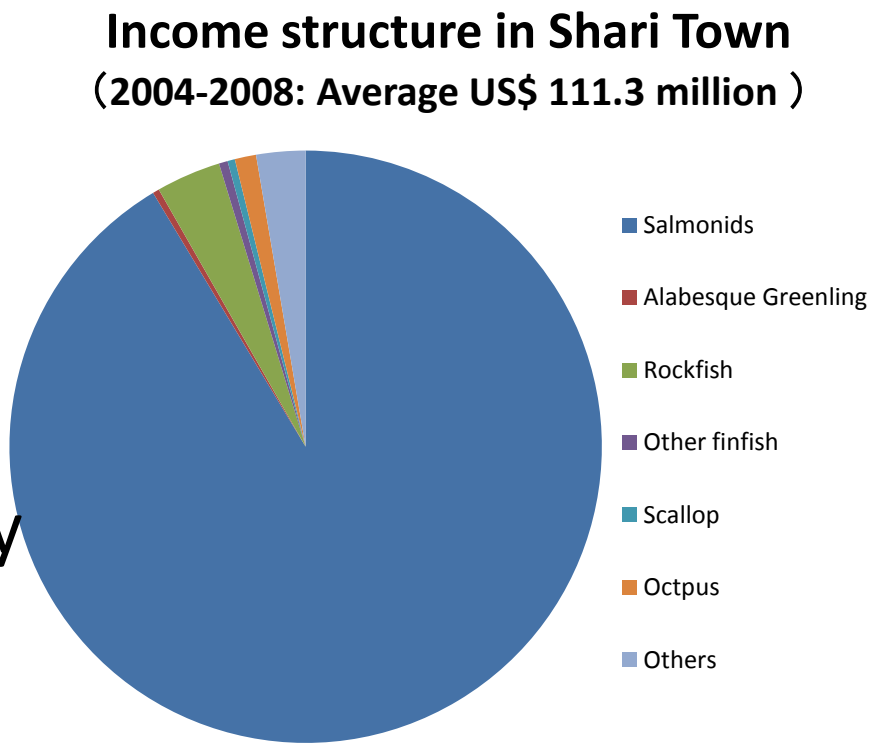
- For accidental events in the Russian Far East, a tight communication between two countries and the international contingency plan should be established (Short-term).

C: Economic development

Changes and Vulnerability

- Majority of fishers in Shiretoko are all small-scale. They are weak in financial base.

- In the western side of the area (Shari-town), more than 90 % of income is from salmonids, which is vulnerable to the CC (Long term). It is generating many jobs in the local processing sector



Source: Annual statistics report of fisheries productions

However, in the past

- Local fishers have experienced many ups and downs in fisheries resources (medium-term regime shifts)

-> Springer gives us more stories from the history (S-7)

- As the legal system for adapting to such fluctuations, fishing rights and licenses are revised every 5-10 yr.

Big increase of squid stock in 1960s in Shari

Big increase of herring stock in 1940s in Rausu

C: Economic development

Policy and research needs for adaptation

- As the short- and medium-term adaptation, flexible revision of fishing rights/licenses (5-10 yr) is important.

- Also, development of new fishing gears contributes to improve their adaptive capacity.

- Combination of target species from vulnerable and resilient species will stabilize the total income and increase the economic resilience (Makino 2011b).

- Also, for increasing species such as yellowtail or tuna, market promotion and establishment of new commercial channels are worth investing (Medium/Long-term).

- Because fishers' financial base is weak (small-scale), the organization of fishers, i.e., Fisheries Cooperative Associations, should play the main role in such activities.

-> Haynie & Pfeiffer, and Fraser's talk about fishers' responses to the CC (S-7)

D: Local and community support

Changes and Vulnerability

- It is expected the frequency and strength of storms will be going up. It would lead to more and more destructive floods.
- Also, the sea level rise increases the risk of high tide and tsunami.

Nakamura & Komiyama (2010)

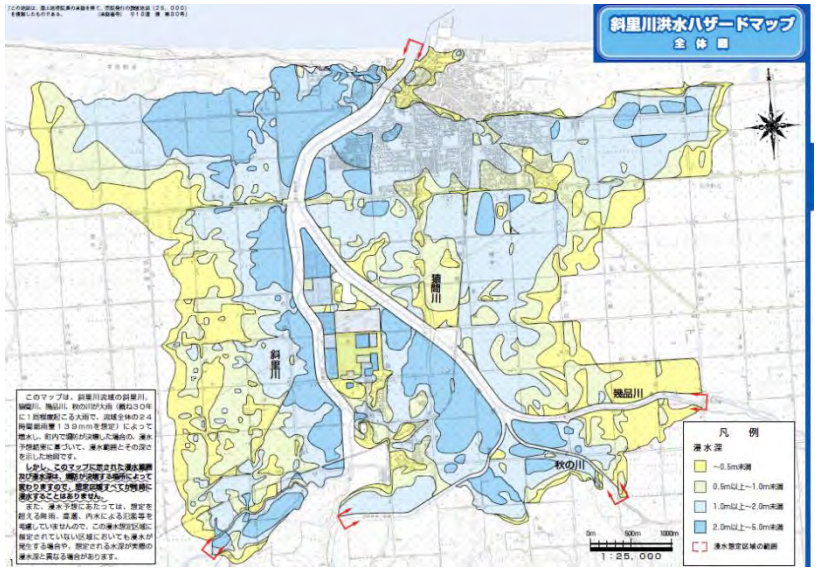
- Shiretoko area is very mountainous. Most fishers lives along the coastal line or along the livers.

- Fishing communities are highly vulnerable.

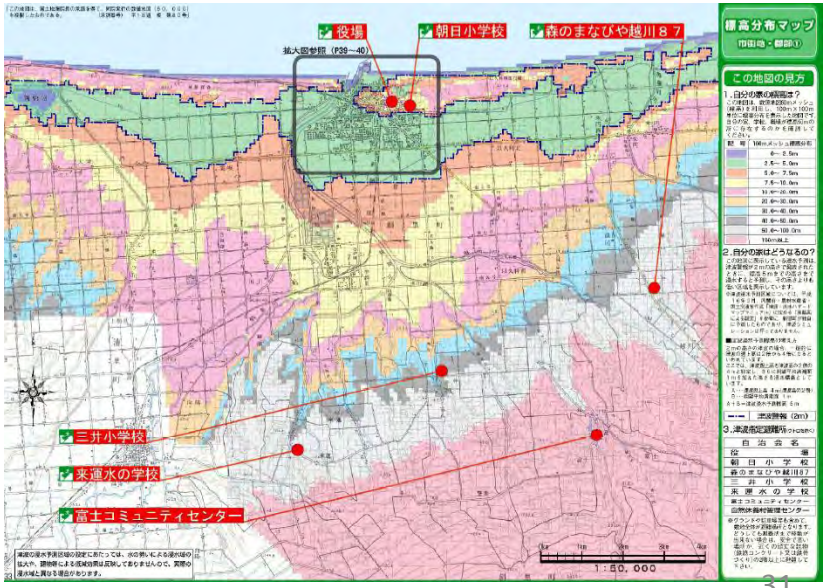
D: Local and community support

Policy and research needs for adaptation

- There are “hazard maps” and “evacuation plans” drawn up by the local government. These plans should be revised according to the climate change scenarios (medium-term).



Hazard map for flood (Shari town 2011)



Hazard map for high tide and tsunami

In the long term…

- Town and country planning should be investigated and revised to adapt to the CC.

-> New housing lands might be developed at higher altitude areas in the mountains. Or, larger and stronger breakwater constructions might be installed along the coasts and rivers. Or more artificial constructions (dams) will be installed along rivers.

- We should assess the impacts on ecosystems induced by such constructions.

E: Culture

Changes and Vulnerability

- Indigenous people, AINU, has developed local culture based on local ecosystem services.
- Salmon is "fish of god" for AINU, but it is vulnerable to the CC.

- Oni Kombu (*Laminaria diabolica Miyabe*) is the most highly valued species for the soup stock in the traditional Japanese foods.

http://www.rausu.com/recipe.html

- But it is also vulnerable to the CC.

E: Culture

Policy and researches for adaptation

- Once disappeared, culture will never revive (irreversible). Esp. indigenous cultures is important in terms of cultural diversity. They should be properly conserved.(Medium-term)

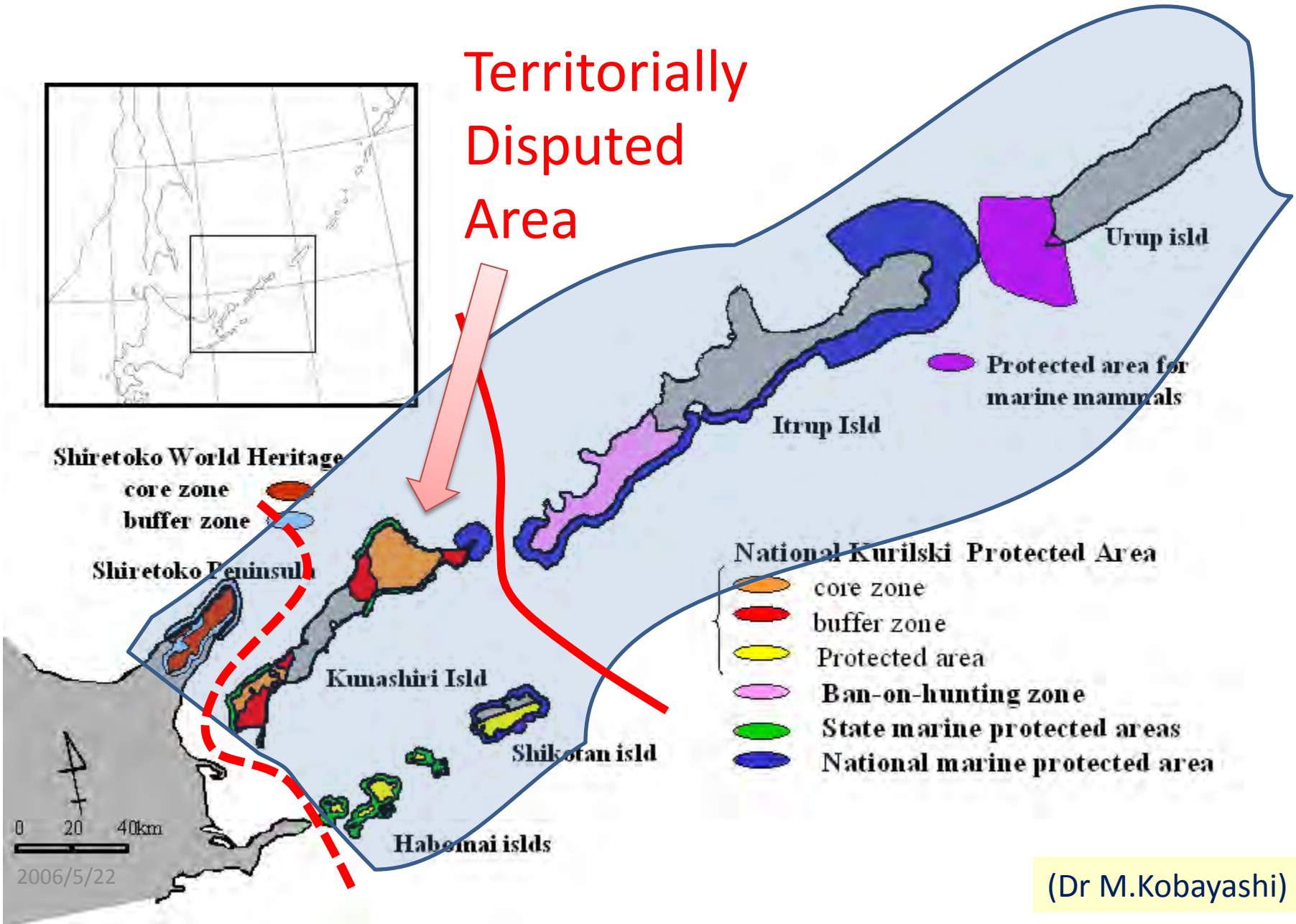
-> Fluharty on arctic indigenous people (S-7).

- There was a hunter-gatherer culture called "Okhotsk culture" in 5-9 century, covering Amur River basin, Sakhalin, and the northern Hokkaido area, i.e., the LME including Shiretoko.

Shiretoko Museum (1987)

- So, one of the long-term adaptive option is to promote a new culture based on the LME, so called "Neo-Okhotsk culture". The UNESCO Heritage Program can be a tool for such peaceful innovation (Crosby 2007).

Idea (dream) of UNESCO Peace Park



(Dr M.Kobayashi)

3. Conclusion (1/2)

- Cooperative research and monitoring at the LME scale (Russia and Japan) is the very base of all the policy measures for adaptation.

- Variety of measures should be combined, taking various social-ecological aspects of fisheries into account (resource conservation, food security, economy, community, culture).

3. Conclusion (2/2)

- However, the social resources is limited (human, financial, organizational). We need to set priorities amongst measures.

- In order to do that based on sound science, more researches on the social vulnerability assessment is required (e.g., indicators, threshold, non-market values, governance flexibility, etc.) -> Ian's talk on IMBER (S-7)

- Culture is an important part of fisheries. UNESCO Heritage Program can be a clue for creating a new peaceful culture based on LME.

Thank you very much, and see you in S-7