

Report from Japan

Shiretoko World Natural Heritage Area

Mitsutaku Makino, M.A., M.Phil. Ph.D.

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1. Review of management plans / strategies of the selected NEAMPAN site

1) Basic information of the National MPA Policy in Japan (related to outline 1.1)

The Marine Biodiversity Conservation Strategy in Japan

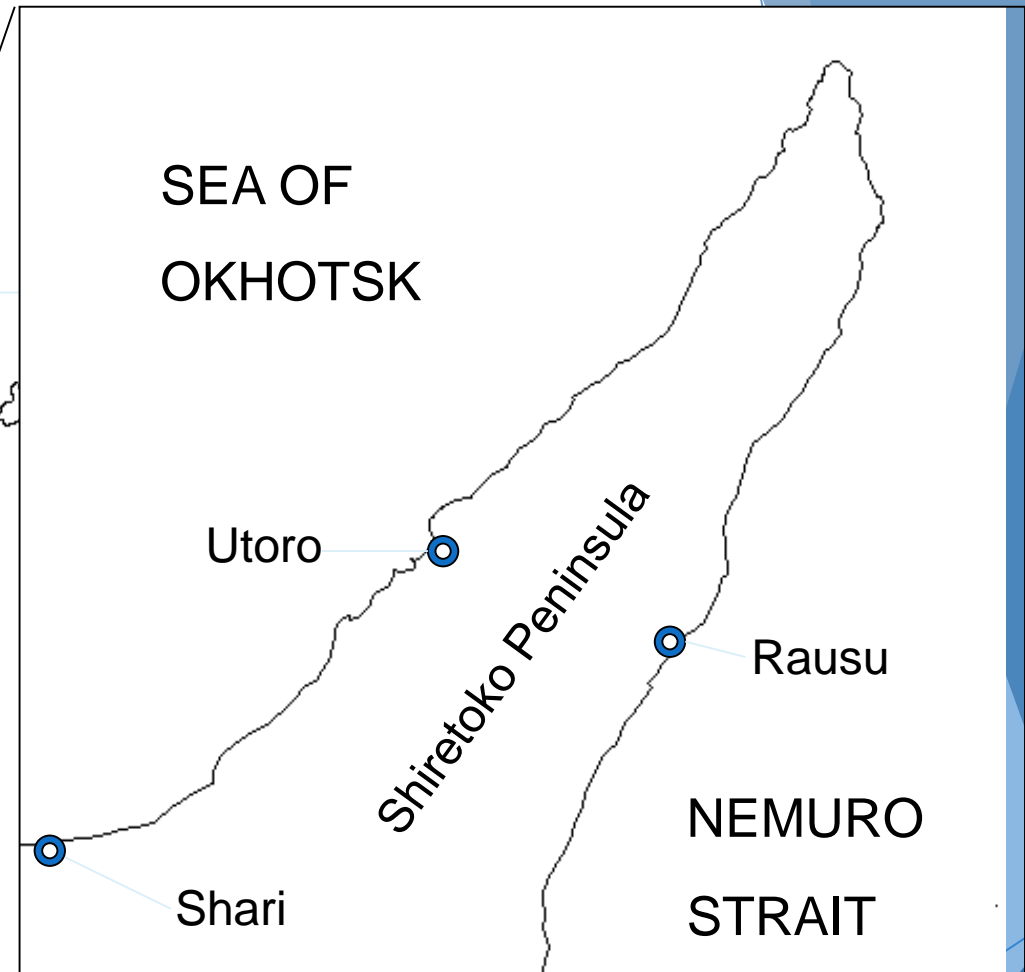
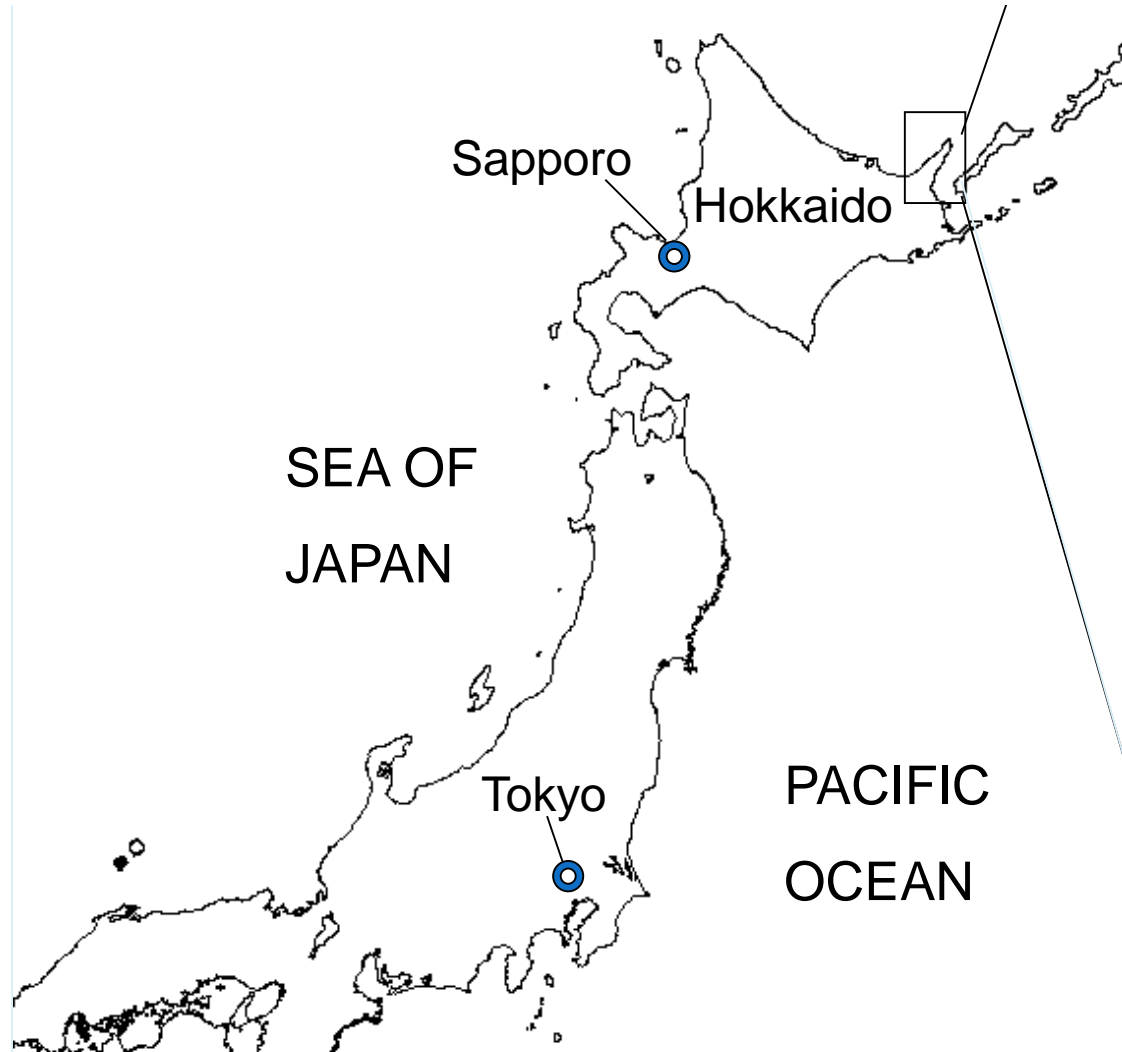
- ▶ Formulated in 2011 based on the “Basic Act on Biodiversity” (Ministry of Environment), in line with the “Basic Act on Ocean Policy” (Cabinet Office)
- ▶ Objectives:
The Strategy aims to protect the biodiversity to support the sound structure and function of marine ecosystems, and to use ecological services of the ocean, or its blessings, in a sustainable manner.
The Strategy provides a basic view and direction of measures for conservation and sustainable use of the marine biodiversity
- ▶ Definition of Marine Protected Areas (MPAs) :
Marine areas designated and managed by law or other effective means, in consideration of use modalities, aimed at the conservation of marine biodiversity supporting the sound structure and function of marine ecosystems and ensuring the sustainable use of marine ecosystem services.

Therefore, in Japan, the harmony between the biodiversity conservation and sustainable uses are the prerequisite of the marine environmental policies (No-take sanctuary is just one form of the MPAs)

1. Review of management plans / strategies of the selected NEAMPAN site

2) Basic information of the **Shiretoko WNH** (related to outline 1.1)

We have only one site listed in the NEAMPAN, the Shiretoko National Park. It is the UNESCO World Natural Heritage site



- Fisheries Production in 2016
44 thousand ton, 22 million yen
(about 1.4% of national total)
- Main species
Salmon, pollock, atka mackerel, squid, kelp,
sea urchin, etc. etc.





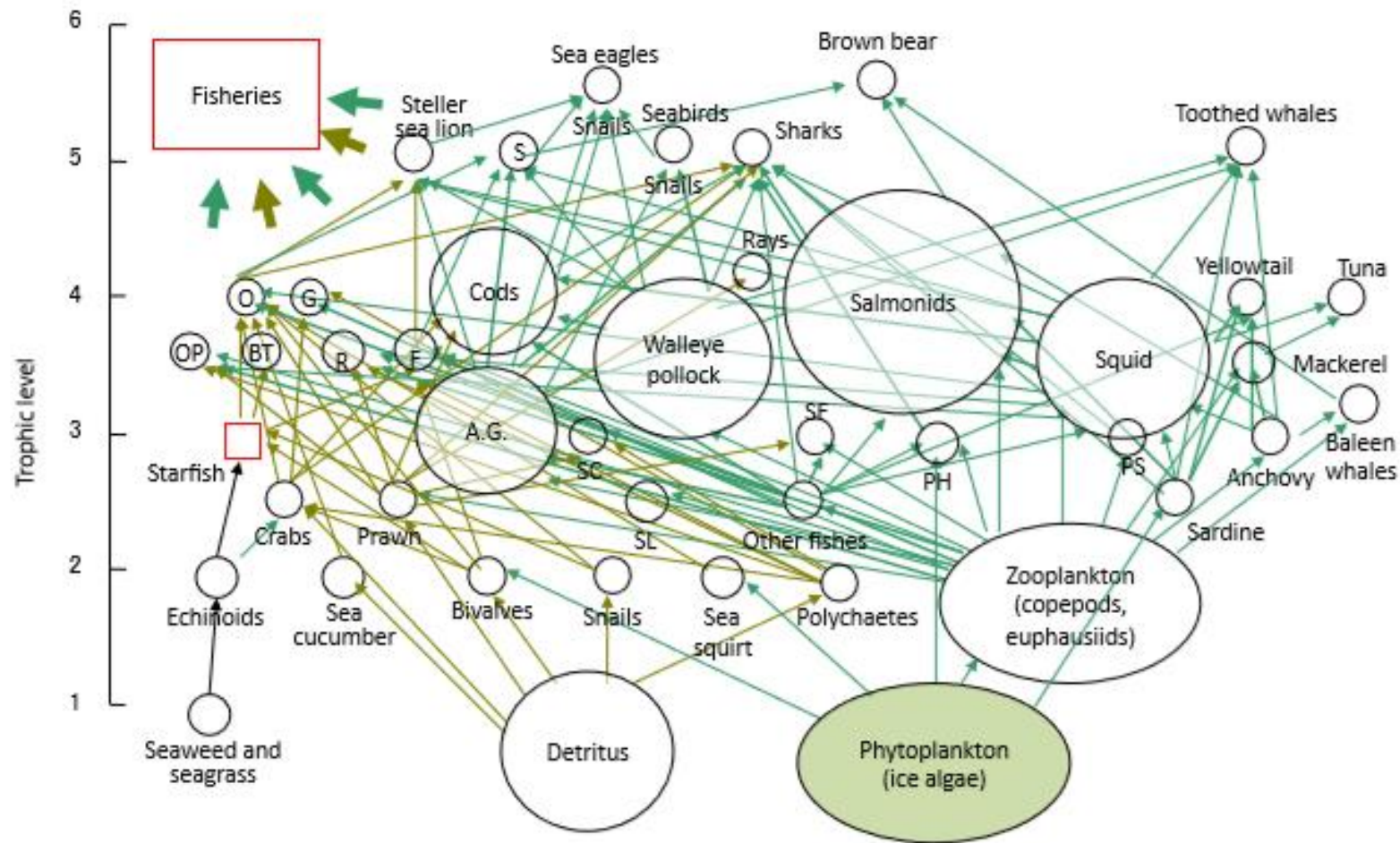
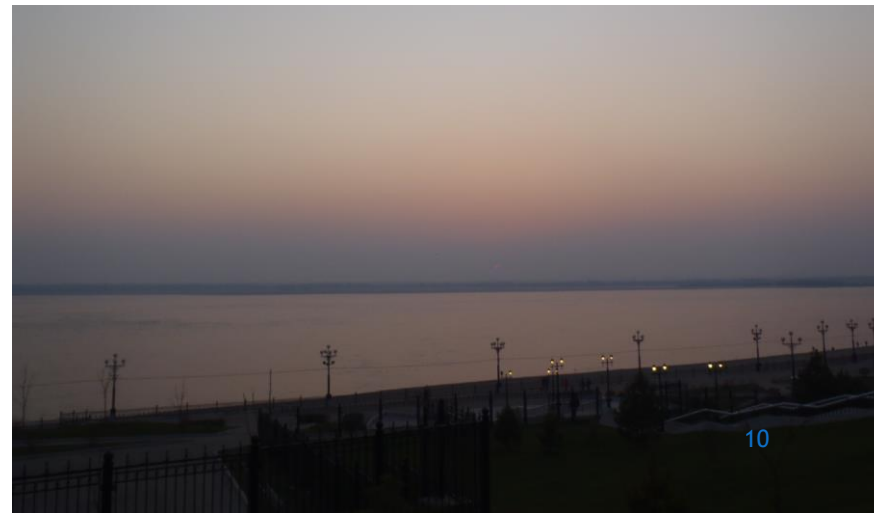
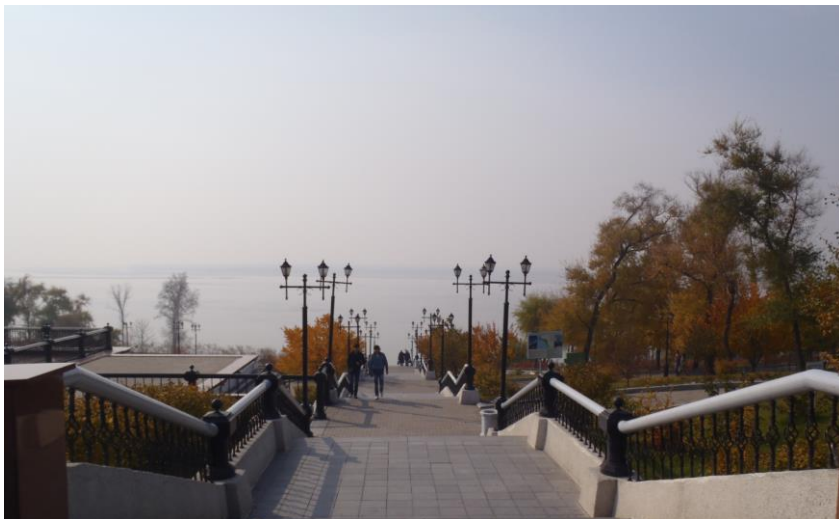
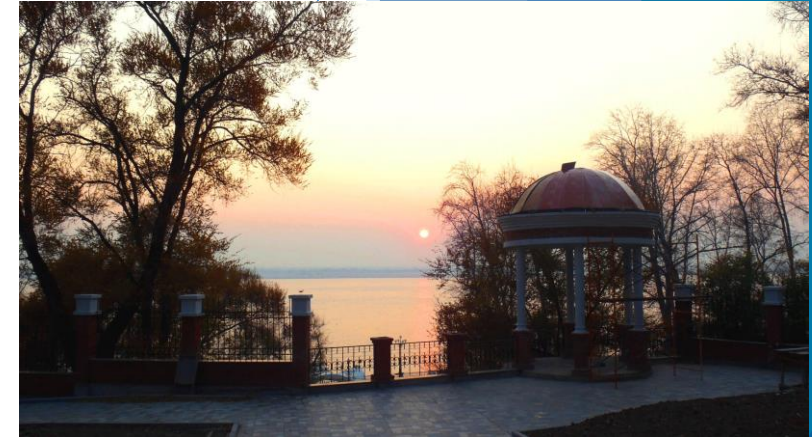
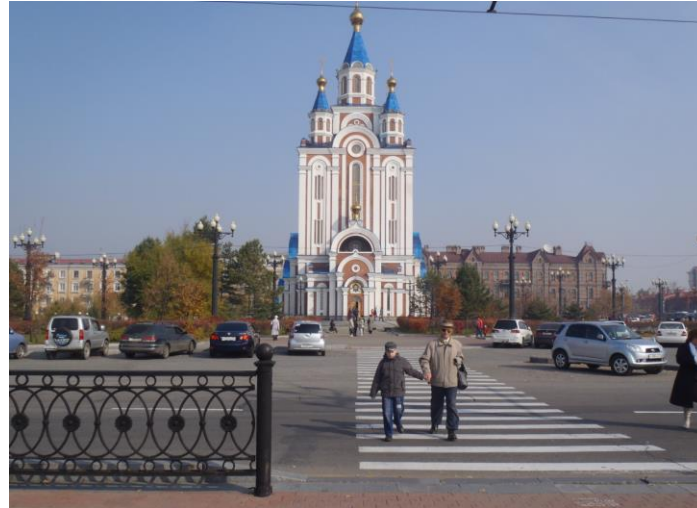
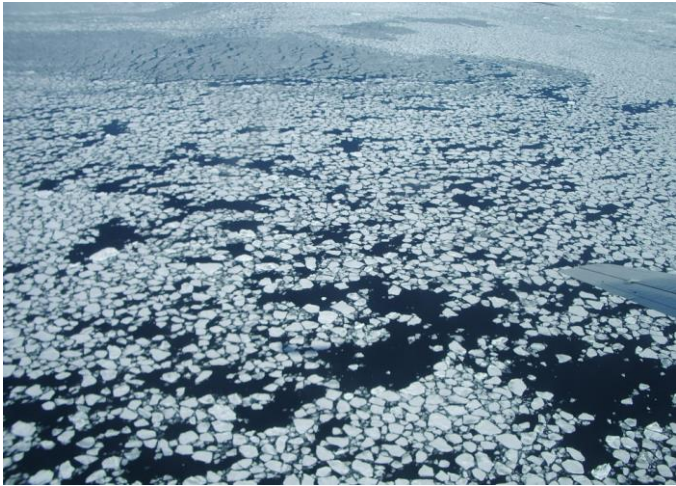
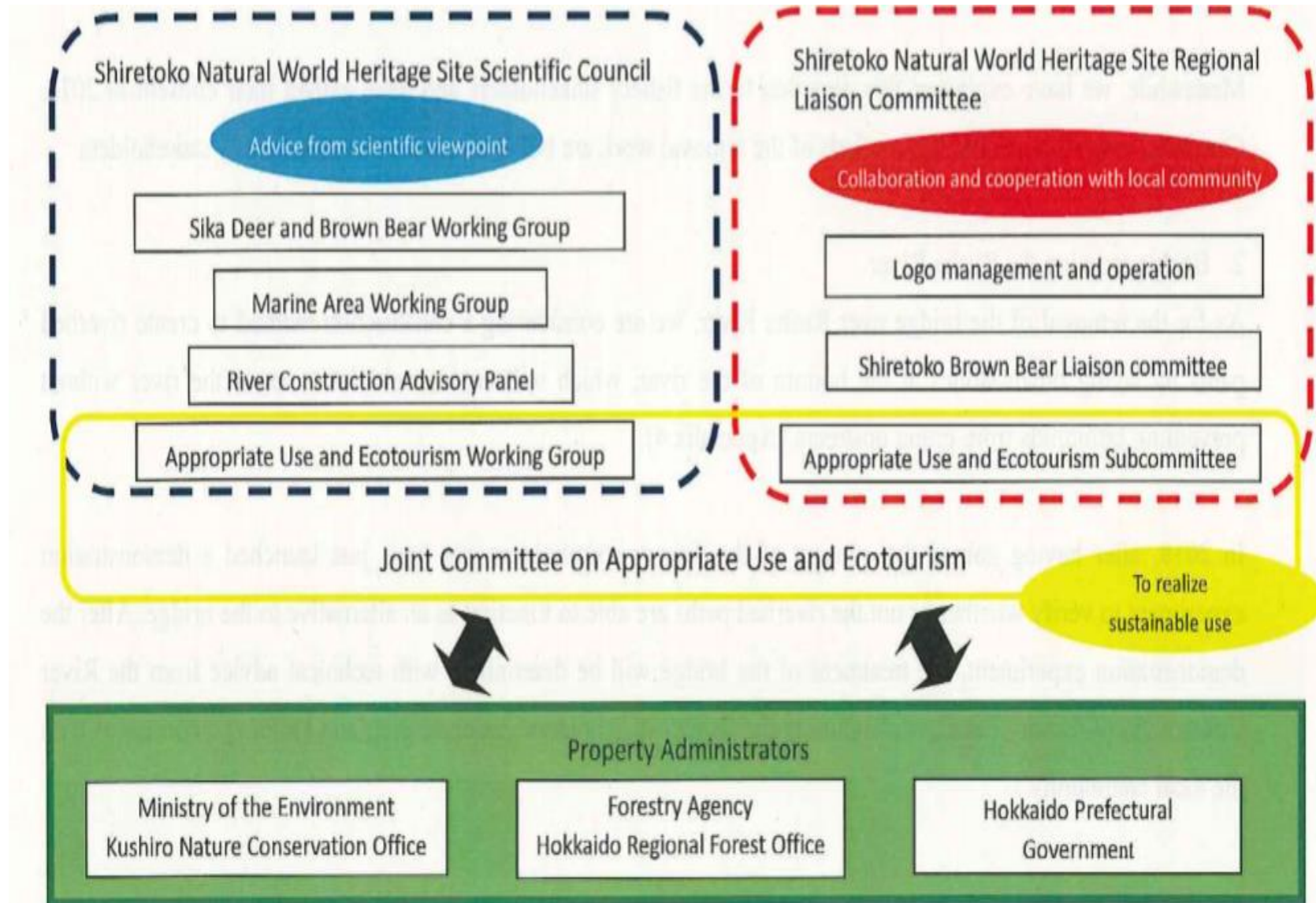


FIGURE 1. Food web in the Shiretoko World Natural Heritage (WNH) area (as depicted by the Shiretoko WNH Site Scientific Council). AG: arabesque greenling; BT: bigband thornyhead; F: flatfishes; G: greenlings; O: octopus; OP: ocean perch; PH: Pacific herring; PS: Pacific saury; R: rockfish; S: seals; SC: saffron cod; SF: sandfish; SL: sand-lance.

Sea Ice from Russia (Amur River): Important link to the Russian ecosystems



Institutional framework of the management of the Shiretoko WNH



These legal basis from various ministries are combined for the management of the World Natural Heritage site

Public services	Legal basis	Administrative authority
Fisheries management	<ul style="list-style-type: none"> -Fisheries Law of 1949 -Fisheries Resource Protection Law of 1951 -Law Concerning the Conservation and Management of Marine Life Resources of 1996 	-Fisheries Agency (Ministry of Agriculture, Forestry and Fisheries)
Pollution control	<ul style="list-style-type: none"> -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 	<ul style="list-style-type: none"> -Coast Guard (Ministry of Land, Infrastructure, Transport and Tourism) -Ministry of the Environment
Landscape conservation and material circulation	<ul style="list-style-type: none"> -Law on the Administration and Management of National Forests of 1951 -Natural Parks Law of 1957 -Nature Conservation Law of 1972 	<ul style="list-style-type: none"> -Ministry of the Environment - Forestry Agency (Ministry of Agriculture, Forestry and Fisheries)
Species protection	<ul style="list-style-type: none"> -Law for the Protection of Cultural Properties of 1950 -Law for Conservation of Endangered Species of Wild Fauna and Flora of 1992 -Wildlife Protection and Appropriate Hunting Law of 2002 	<ul style="list-style-type: none"> -Ministry of the Environment -Ministry of Education, Culture, Sports, Science and Technology

1. Review of management plans / strategies
of the selected NEAMPAN site

3) Preliminary review of the Shiretoko
WNH management plan
(related to outline 1.2-1.4)

▶ **Management Plan for the Shiretoko WNH Site of 2009** (for all the WNH site: including the land and marine areas)

▶ Objective: In preserving the value of the heritage site in good form for future generations, the Management Plan for the Shiretoko World Natural Heritage Site (the“ management plan”) was developed to appropriately conserve and manage the extremely diverse, unique, and valuable natural environment of the heritage site.

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(4) Social environment	5
(5) Protective systems	6
4 . Basic policies of management	
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(2) Viewpoint requird for management	8
5 . Management measures	
(1) Conservation of the terrestrial ecosystem and natural landscape	9
(2) Conservation of the marine areas	12
(3) Conservation of the interaction between the marine and terrestrial areas	12
(4) Appropriate utilization of natural environment	13
(5) Organization of the relevant government agencies responsible for administration of the heritagesite	15
(6) Implementation of conservation and management programs	15
(7) Research and monitoring	16
(8) Measures against impact of climate change	17
(9) Preparation of annual reports	17
(10) Information sharing and awareness programs	17
6 . Implementation of the plan and other issues	
(1) Implementation of the plan and other issues	17
(2) Programs by local governments	18
(3) Funding	18
7 .Conclusion	18



- ▶ Under the Management Plan, we have additional plan only for the marine conservation,

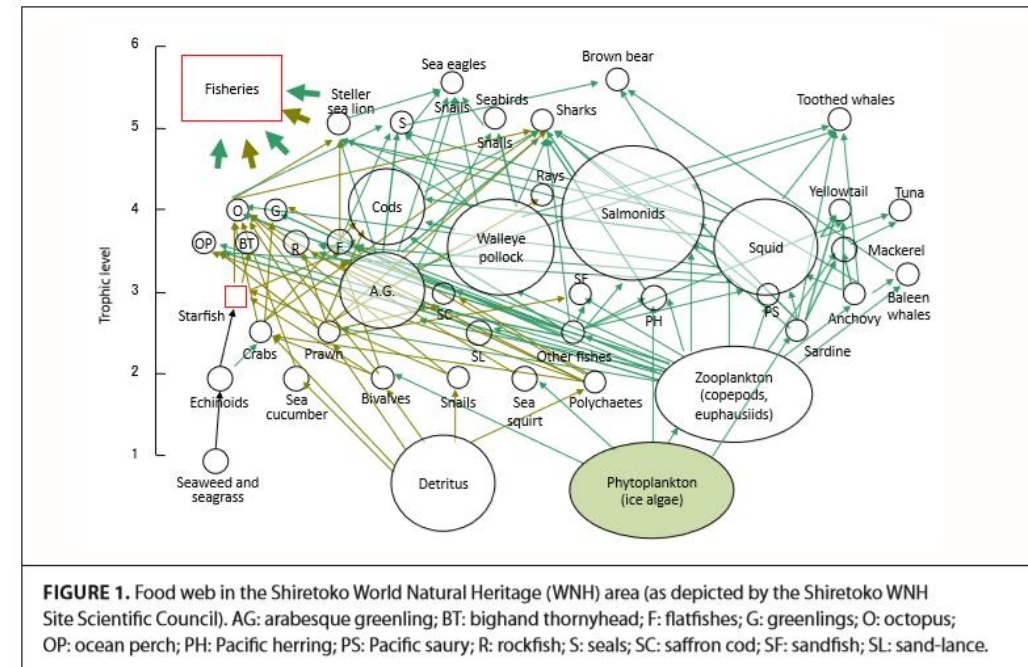
-> “The Multiple Use Integrated Marine Management Plan and Explanatory Material for Shiretoko World Natural Heritage Site”(Only for Marine Area)

- ▶ Objective: “The objective of this plan is to satisfy both of conservation of the marine ecosystem and stable fisheries through the sustainable use of marine living resources in the marine area of the heritage site”

1. Introduction	1
(1) Background	1
(2) Objective of the Plan	1
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(1) Basic Policies.....	3
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e. Spectacled Guillemot, Slaty-backed Gull, and Japanese Cormorant	23
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The objective is important

- ▶ The management objective of the *Shiretoko* WNH is NOT to go back to the original “wilderness” of centuries ago, but the balance of conservation and uses. Therefore, utilizing wide ranging species in sustainable manner is very close to the conservation of ecosystem structure and functions in this area.
- ▶ In other words, the local coastal fishery is a “keystone species”.



2. Monitoring and assessment of designated MPAs

1) Basic information of the monitoring plan

- Name of the Monitoring plan: “Long-Term Monitoring Plan for the Shiretoko World Natural Heritage Site “
- Objective : “Long-term monitoring is implemented for adaptive management of the heritage site based on scientific knowledge, within the scope of the management measures stipulated in the Management Plan for the Shiretoko World Natural Heritage Site. This Plan was formulated in order to define the monitoring items and contents required for “effective and efficient” implementation of adaptive management

2. Monitoring and assessment for the Shiretoko WNH

2) Monitoring parameters (related to outline 2.1)

- We have 3 types of Monitoring Items (parameters) under this plan
 - i) 25 Monitoring items implemented by relevant government agencies *In this case, “relevant government agencies” refers to the Ministry of the Environment, the Forestry Agency, and the Hokkaido Prefecture Government.
 - ii) 12 Monitoring items implemented in cooperation with local governments, related bodies, experts, and other government agencies besides those mentioned in i)
 - iii) 5 other surveys and research: surveys and research that does not fit the above two classifications.

(1) Monitoring items implemented by relevant government agencies

No.	Monitoring item	Evaluation item corresponding to monitoring item
1	Observation of water temperature and chlorophyll-a using satellite remote sensing	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources. VIII Impacts, or potential impacts of climate change are being tracked early.
2	Fixed-point observation of water temperature using marine observation buoys	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources. VIII Impacts, or potential impacts of climate change are being tracked early.
3	Seal habitation survey	I The productivity of a unique ecosystem is being maintained. III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources. VIII Impacts, or potential impacts of climate change are being tracked early.
4	Marine flora and fauna and habitation survey (periodic shallow-sea survey)	I The productivity of a unique ecosystem is being maintained. II The interaction between marine and terrestrial ecosystems is being maintained. III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.

5	Shellfish quantitative survey in shallow seas	<p>I The productivity of a unique ecosystem is being maintained.</p> <p>II The interaction between marine and terrestrial ecosystems is being maintained.</p>
6	Survey of spectacled guillemot, black-tailed gull, slaty-backed gull, and Japanese cormorant populations, nesting site distribution, and number of nests	<p>II The interaction between marine and terrestrial ecosystems is being maintained.</p> <p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.</p> <p>VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.</p>
7	Survey of recovery of vegetation from sika deer impact (Forestry Agency 1ha enclosure)	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
8	Survey of recovery of vegetation from sika deer impact (Ministry of the Environment enclosure at Shiretoko Cape)	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
9	Survey of sika deer browsing pressure in experimental density manipulation zones	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>

10	Wide-area vegetation survey to gauge sika deer feeding pressure	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p> <p>VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.</p> <p>VIII Impacts, or potential impacts of climate change are being tracked early.</p>
11	Periodic growth and distribution surveys of <i>Viola kitamiana</i>	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
12	Wide-area aerial count of wintering sika deer populations	<p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
13	Survey of habitation of terrestrial invertebrates (primarily insects) (including survey of alien species)	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
14	Survey of habitation of land birds	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>

15	Survey of habitation of large, medium-sized and small mammals (including survey of alien species)	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
16	Preparation of wide-area vegetation map	<p>II The interaction between marine and terrestrial ecosystems is being maintained.</p> <p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.</p>
17	Monitoring of number of salmon running upstream, spawning grounds, and number of spawning beds in rivers	<p>II The interaction between marine and terrestrial ecosystems is being maintained.</p> <p>IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.</p> <p>V Impact of river constructions has been lessened so as to maintain river ecosystems that can support salmonid species reproduction.</p>
18	Survey of habitation of freshwater fish, in particular the Dolly Varden (<i>Salvelinus malma</i>) that characterizes the freshwater fish fauna in Shiretoko (including survey of alien species)	<p>III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.</p> <p>V Impact of river constructions has been lessened so as to maintain river ecosystems that can support salmonid species reproduction.</p> <p>VIII Impacts, or potential impacts of climate change are being tracked early.</p>
19	Site utilization survey	<p>VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.</p>
20	Survey of sighting and encounters with brown bears, including any damage incurred	<p>VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.</p>

21	Meteorological observation	VIII Impacts, or potential impacts of climate change are being tracked early.
22	Survey of wintering population of sea eagles	II The interaction between marine and terrestrial ecosystems is being maintained.
23	Survey of population, breeding status, reproductive rate and number of fledglings, and food sources of Blakiston's fish-owl. Tracking of migration and distribution through tagging and attachment of transmitters. Number of dead, sick and injured and investigation of causes	III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.
24	Tracking of project implementation status through preparation of annual reports	III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.
25	Tracking of social environment through preparation of annual reports	III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.

(2) Monitoring items implemented in cooperation with local governments, related bodies, experts, and other government agencies besides those mentioned above

No.	Monitoring item	Grounds for selection *Evaluation item corresponding to monitoring item
①	Aerial observation of sea ice distribution	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources. VIII Impacts, or potential impacts of climate change are being tracked early.
②	Biological survey of ice algae	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
③	Tracking of changes in fish catches compared to Hokkaido Suisan Gensei [Statistics on Fisheries in Hokkaido]	I The productivity of a unique ecosystem is being maintained. III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
④	Ascertainment and assessment of walleye pollock stock (survey used to set total allowable catch [TAC])	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
⑤	Walleye pollock spawning survey	I The productivity of a unique ecosystem is being maintained. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
⑥	Survey of number of Steller sealions migrating to Japan seacoast, number killed due to human actions (by gender), characteristics	I The productivity of a unique ecosystem is being maintained. III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources. VIII Impacts, or potential impacts of climate change are being tracked early.

⑦	Survey of damage caused by Steller sealions	IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
⑧	Status of reproduction at white-tailed eagle nesting sites and monitoring of fledglings	II The interaction between marine and terrestrial ecosystems is being maintained. III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.
⑨	Survey of total wintering population of sea eagles throughout Hokkaido	II The interaction between marine and terrestrial ecosystems is being maintained.
⑩	Analysis of oil, cadmium, mercury, etc. in seawater	IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
⑪	Ground population count survey at major sika deer wintering grounds (including habitation surveys of other mammals)	III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List. VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.
⑫	Qualitative survey of sika deer population through observation of body weight, pregnancy rate etc. among culled and naturally deceased sika deer	VI Excessive influence of high sika deer population density on the ecosystem of the heritage site is not occurring.

(3) Other surveys and research

No.	Monitoring item	Grounds for selection *Evaluation item corresponding to monitoring item
(1)	Observation and prediction of changes in sea ice volume	*Surveys and research which provide evidence of heritage site's value by clarifying workings of site's ecosystem, or contribute to the formulation of specific external measures, are to be proactively pursued in collaboration and cooperation with local governments, related bodies, experts, and other government agencies
(2)	Capture, reproduction, population estimates, migration and distribution patterns, and damage caused by brown bears	
(3)	Survey on current status and changes to genetic diversity of salmonid species	
(4)	Survey of seasonal migration of wintering sea eagle populations and consumption of human-provided and naturally occurring food resources	
(5)	Survey of damage caused by seals	

I will bring the real data next time

▶ *Any critical gaps in monitoring parameters?*

-> **More Human Dimension parameters should be included .**

-> **Adaptation to the Climate Change is critical. So, the monitoring items about the adaptive capacity should be included.**

2. Monitoring and assessment of designated MPAs

3) Assessment of the Data in the Shiretoko WNH (related to outline 2.2)

-Under the Monitoring Plan, we have 8 Evaluation Items

to be assessed based on the Monitoring Items

- I The productivity of a unique ecosystem is being maintained.
- II The interaction between marine and terrestrial ecosystems is being maintained.
- III Biodiversity is being maintained at the same level as when the site was inscribed on the World Heritage List.
- IV Conservation of marine ecosystems within the heritage site is being balanced with stable fishing through sustainable use of fisheries resources.
- V Impact of river constructions has been lessened so as to maintain river ecosystems that can support salmonid species reproduction.
- VI Excessive influence of high sika deer (Cervus nippon yesoensis) population density on the ecosystem of the heritage site is not occurring.
- VII Recreational utilization of the site and other human activities are being balanced with conservation of the natural environment.
- VIII Impacts or potential impacts of Climate Change are being tracked early.

Why these eight Evaluation Items? How do they link to the Management Objectives?

- ▶ These evaluation items are selected based on the Criteria of the UNESCO World Natural Heritage, and the Recommendations from the IUCN (IUCN is the advisory body to UNESCO about WNH selection).
- ▶ Therefore, it is considered to be appropriate to achieve the objective of the WNH management plan:

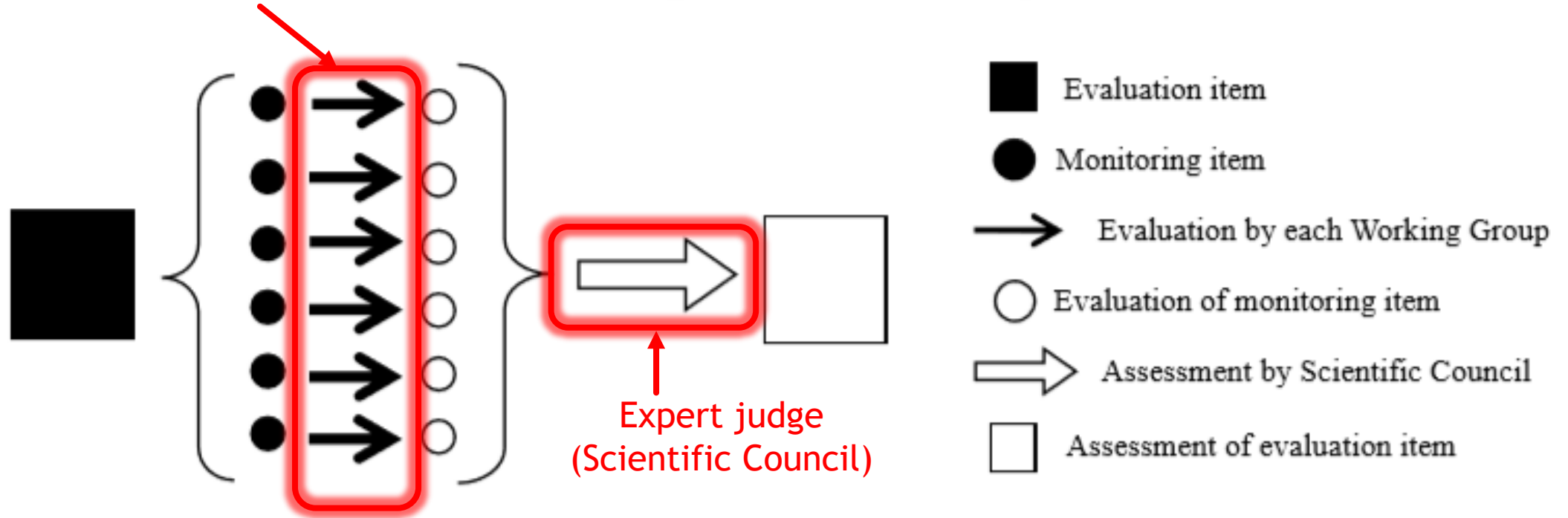
Objective: “In preserving the value of the heritage site in good form for future generations, the Management Plan for the Shiretoko World Natural Heritage Site (the “management plan”) was developed to appropriately conserve and manage the extremely diverse, unique, and valuable natural environment of the heritage site.”

Relationship between Evaluation Items and Monitoring Items

Evaluation Items	Monitoring Items
I The productivity	1, 2, 3, 4, 5, 6, ①, ②, ③, ④, ⑤, ⑥
II The interaction between marine and terrestrial ecosystems	4, 5, 6, 16, 17, 22, ⑧, ⑨
III Biodiversity	3, 4, 7, 8, 9, 10, 11, 13, 14, 15, 16, 18, 23, 24, 25, ③, ⑥, ⑧, ⑪
IV Balance of conservation and sustainable fisheries	1, 2, 3, 6, 17, ①, ②, ③, ④, ⑤, ⑥, ⑦, ⑩
V Less impacts from river constructions (e.g. dams) to salmonid species	17, 18
VI Sika deer (<i>Cervus nippon yesoensis</i>)	7, 8, 9, 10, 11, 12, 13, 14, 15, 16, ⑪, ⑫
VII Balance of conservation and recreational uses	6, 10, 19, 20, 24, 25
VIII Impacts/potential impacts of Climate Change	1,2, 3, 10, 18, 21, ①, ⑥

Expert judge
(Marine Working Group)

Schematic diagram of evaluation procedure



- I could not find the examples to show you today, but I will show them next time.

2. Monitoring and assessment for the Shiretoko WNH

4) Links between monitoring / assessment results and management (related to outline 2.3)

- *How assessment results are used for future management (e.g., for action, for planning, etc.)?*

*-> For the moment, as far as I understand, these Monitoring Items and Evaluation Items are used only for the report of the current status to UNESCO and the general public. **This is a big issue.** I think the results should be utilized to adaptively modify the management measures.*

4) Links between monitoring / assessment results and management (related to outline 2.3) Cont.

➤ *What is the institutional framework / stakeholder engagement in the monitoring and assessment of the site, and utilization of the assessment results?*

-> See slide #18. Many monitoring items are by the Ministry of Environment, Forestry Agency and the Hokkaido Prefecture (local gov.).

-> Fisheries data are collected by the Fisheries Cooperative Associations (Local org. of fishers.) and the local government. These monitoring items are used for assessing the Evaluation Item IV (Fisheries).

-> Sea ice monitoring is by the Meteorological Agency and Coast Guard.

Fisheries production statistics (tons) at Shiretoko WNH, compiled by Fishers Orgs.



**Very informative time-series data
Local fishers are playing the core role of
the marine ecosystem monitoring.
(and its very cheap)**



Other monitoring items, such as climate, sea ice, water quality, etc., are monitored by the government (role sharing).

3. Feedback of assessment results to management plans and practices

No clear feedback mechanism. This is the big issue to be tackled.

4. Case studies

*The Shiretoko World Natural Heritage Area
(This is the only one MPA site from Japan listed in the NEAMPAN)*

Thank you!!

Cost item	Amount (JPY million)	Purpose
Running costs for Scientific Council and Working Groups	17.5	Giving scientific advice on management plan
Running costs for the Committee for the Review of Proper Use and Shiretoko Eco-tourism Association	15.1	Development of strategies for suitable tourism
Research and monitoring activities	54.7	Monitoring and research into adaptive management
River improvement	284.9	Modification of river constructions
Personnel	101.8	Administrative staff at the Ministry of the Environment and Hokkaido Prefecture
Total	473.5	

Source: Makino et al. (2009)

Impacts from the Shiretoko WNH MPA to the National Policy

- ▶ **The Strategy for the Conservation of Marine Biodiversity (2011)** by the **Ministry of Environment**, formally recognized these “local and autonomous” activities, and says “Such **autonomous measures taken by the local people may become a more effective measure** in conserving and managing biodiversity than regulations based on laws, **because flexible and detailed management** by the related entities can be expected.”
- ▶ Then, **the National Biodiversity Strategy (2012)** set by the **Cabinet Office**, identified one of its 7 **Principal Perspective as “locally based activities”**.

New Fisheries Law of 2018

- ▶ It is the fishers' responsibility to explain the sustainability of their fisheries operations (fishers' accountability about the sustainable resource uses).
- ▶ In the new fishery Law Of 2018 (which was just legislated this month, and would be in effect in 2-3 years) clarifies this accountability on the fishers side.

For information:

Meeting objectives

1. To ensure the coherence of the studies
2. To share preliminary view of the study
3. To share availability of information and expected challenges in the study
4. To discuss any adjustments needed for the outline of the study

Outline 1.2 - 1.4

MPA Management policies, strategies, and plans

Monitoring and evaluation plan

Outline 3

Outline 2.3

Reflection of the assessment results in management and monitoring plans?

Outline 2.2

Monitoring parameters

Monitoring data

For example,

- Water quality
- Water temperature
- Population and habitat of target species (e.g., fish, sea birds, marine mammals)
- Tourism arrival
- Fishery data
- ...

Evaluation of data



Assessment of MPA

- Assessment criteria, e.g.,
- Maintenance of ecosystem
 - Biodiversity
 - balance of human activities (e.g., tourism, fisheries) and conservation
 - Understanding of climate change impact
 - ...

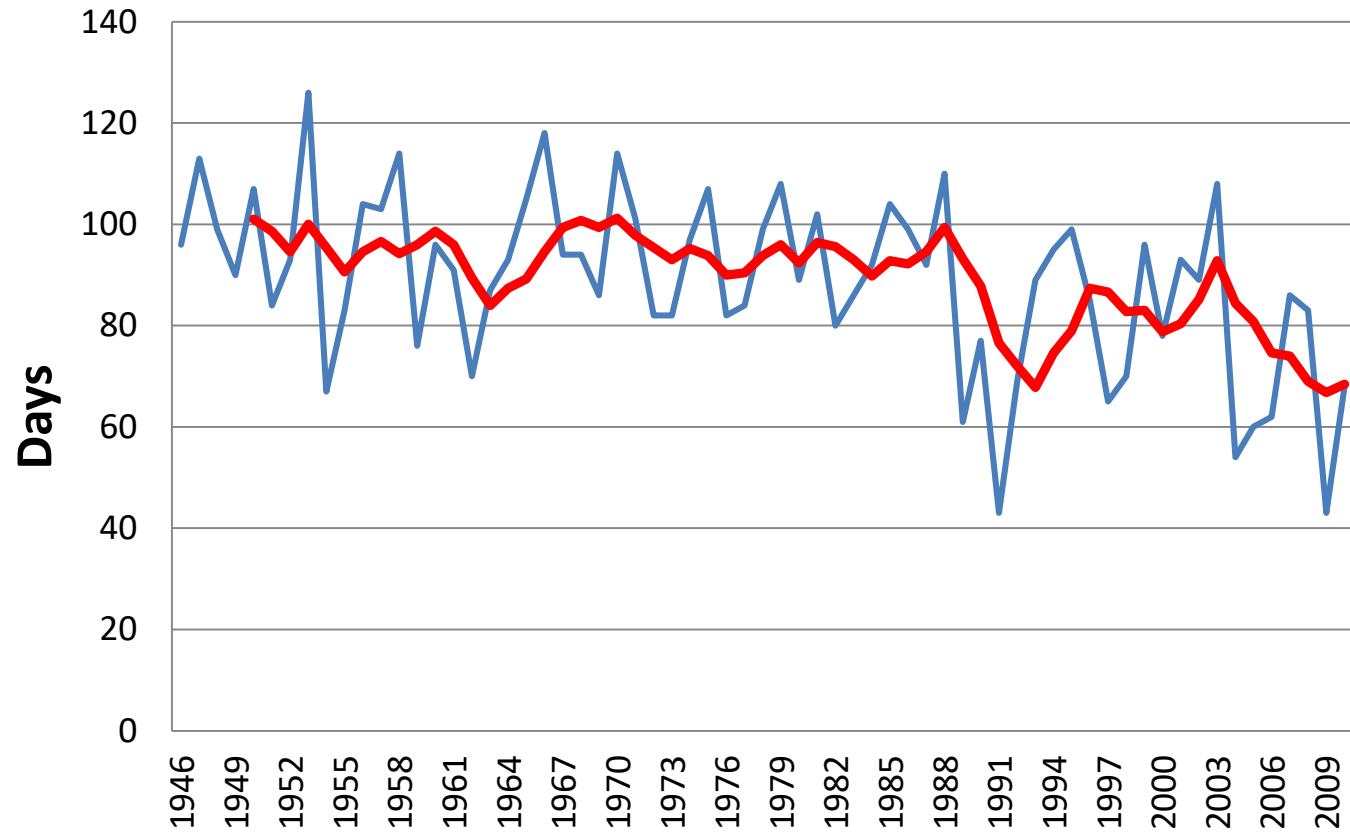
Assessment results

Outline 2.1

Outline of the study (as in the TOR)

- 1. Review of management plans / strategies of the selected NEAMPAN site**
 - 1.1 Basic information of the target MPA
 - 1.2 Background of strategic / management plan of the target MPA
 - 1.3 Objective of MPA management plan
 - 1.4 Key contents of the management plans
- 2. Monitoring and assessment of designated MPAs**
 - 2.1 Monitoring parameters
 - 2.1.1 Areas addressed by the monitoring parameters: biological, socio-economic, environmental
 - 2.1.2 Monitoring bodies and collection of data
 - 2.2 Assessment of data
 - 2.2.1 Assessment criteria and responsibilities: How and who evaluate the monitored data
 - 2.2.2 Assessment against goals and indicators: How the evaluation / assessment is made against goals / indicators identified (if any) in the strategic / management plan
 - 2.3 Links between monitoring/assessment results and management
 - 2.3.1 Use of monitoring data: How it used for assessment, how monitoring results are followed up or reflected in the future plans / strategies
 - 2.3.2 Institutional aspects: Parties involved in the management of MPAs (implementation of plans, monitoring the implementation, etc.)
- 3. Feedback of assessment results to management plans and practices**
- 4. Case studies – monitoring and assessment results and corresponding measures in the selected MPA**

Days of Sea Ice in the Shiretoko Water



Data : Meteorological Agency

減少?

大きな変化なし

増加?



シロザケ Kaeriyama ('07)
Kishi et al ('10)



スケトウダラ Sakurai ('07)



スルメ
イカ
Sakurai ('07)



マダラ Sakurai ('07)



サンマ Ito ('07)



ニシン Ito ('07)



バフン
ウニ



キチ
ジ



ブリ



オニ
コ
ンブ



ナマ
コ
Makino ('11)



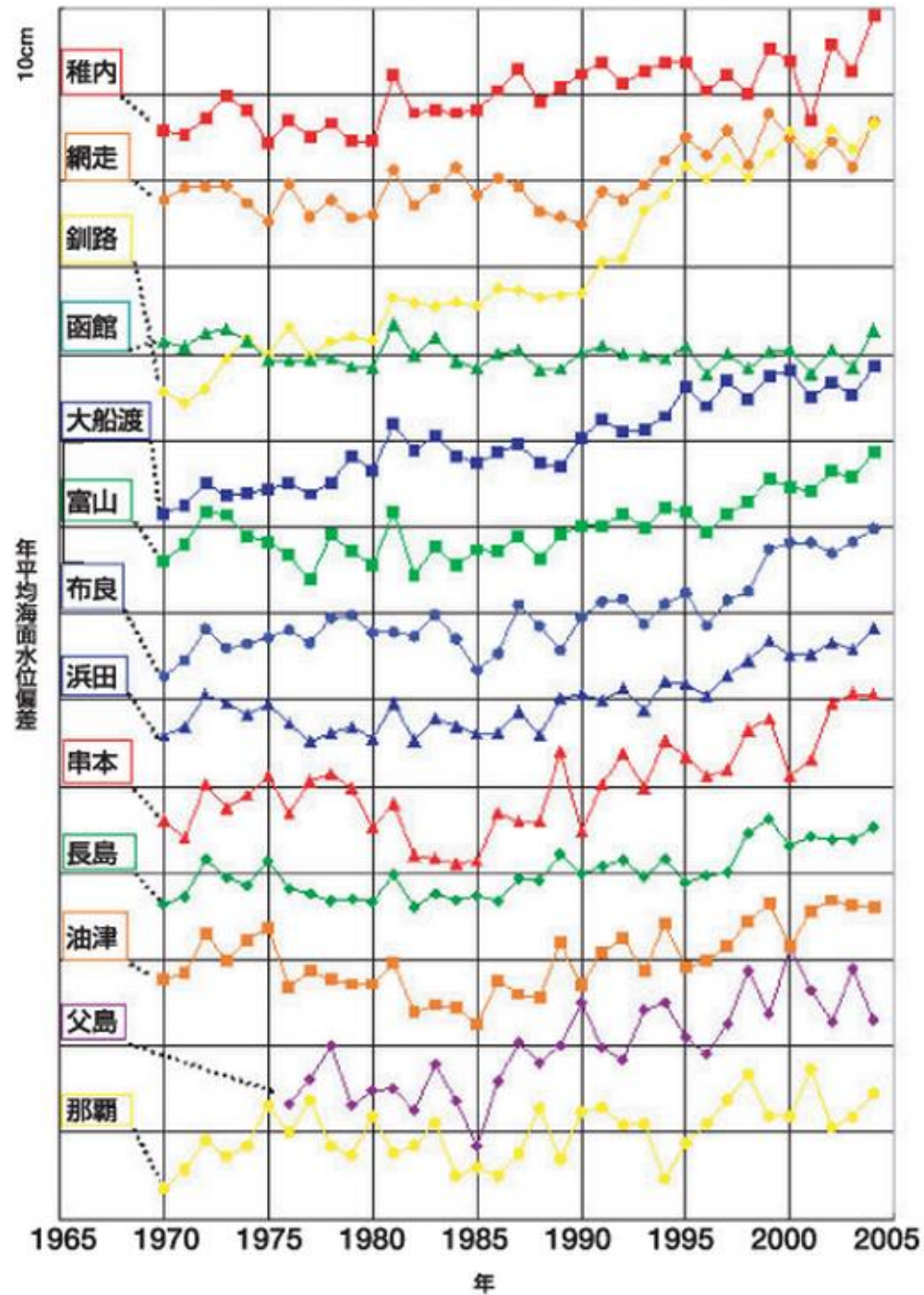
クロ
マグロ

住まいへの影響

- 台風の進路も北に移動 (Scaife et al.2011)
→北海道にも台風が来る恐れ。
- 洪水や河川氾濫の危険性は高まる



Nakamura & Komiyama (2010)



都市別の海面水位の変化

- ▶ 知床では、沿岸線か河川沿いにほとんどの町民が住んでいる。



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