

Multiple Use Integrated Marine Management Plan
for Shiretoko World Natural Heritage Site
Third Term

March 2018

Ministry of the Environment, Government of Japan
and the Hokkaido Prefectural Government

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1 Introduction

(1) Background

- In this management plan, “Shiretoko” refers to the Shiretoko World Natural Heritage Site (hereinafter referred to as the “heritage site”) and its surrounding sea areas. Shiretoko is situated at the lowest latitude for the existence of the world’s seasonal sea ice in the northern hemisphere and features the interaction between a terrestrial ecosystem and a contiguous marine ecosystem with unique seasonal sea ice characteristics, as well as anadromous salmonids spawning in the rivers.
- Shiretoko is an important area for a large number of marine and terrestrial species. There are a wide variety of marine life inhabiting the area, including sea eagles and many other rare species, a large number of salmonids spawning in the rivers, and marine mammals such as Steller sea lions, and cetaceans. In addition, the area is internationally important as a habitat for globally threatened seabirds and a stopover point for migratory birds.
- In this management plan, “the waters surrounding Shiretoko” refer to the marine area of the heritage site (hereinafter referred to as the “marine area of the heritage site”) and its surrounding sea area. The waters surrounding Shiretoko have high productivity, and for many years, fisheries activities have been conducted in harmony with marine life.
- In addition, the rich natural environment has provided a basis for fostering a local culture and developing the tourism industry, as well as a place for education and research.
- Taking advantage of the opportunity of inscription on the World Heritage list as a natural heritage, an integrated marine management plan was formulated in 2007 to ensure both the conservation of the marine ecosystem and the proper use of the area for human activities, such as fisheries and marine recreation, in the future.
- Management measures were pushed ahead according to the plan, and in light of the results of the monitoring of the marine ecosystem and fisheries in Shiretoko, the second term management plan was formulated in 2013 in order to address new situations after the formulation of the initial plan, including the change in the marine environment and increased use for marine recreation.
- While management measures were pushed ahead according to the second term plan, a review was conducted in light of the results of the horizontal evaluation of monitoring and others, and the third term management plan was formulated in 2018.

(2) Objective of the Plan

- The objective of this plan is to satisfy in the marine area of the heritage site both the conservation of the marine ecosystem and the proper use of the area for human activities, including stable fisheries, through the sustainable use of living marine resources and marine recreation.

(3) Management Area

The target area of this plan is the marine area of the heritage site that extends up to 3 km from the coastline (figure 1).

Zone A: The area where strict management is pursued into the future.
Zone B: The area where both conservation of the natural environment and use for sustainable tourism and fisheries that do not diminish the value of the area of the heritage site.

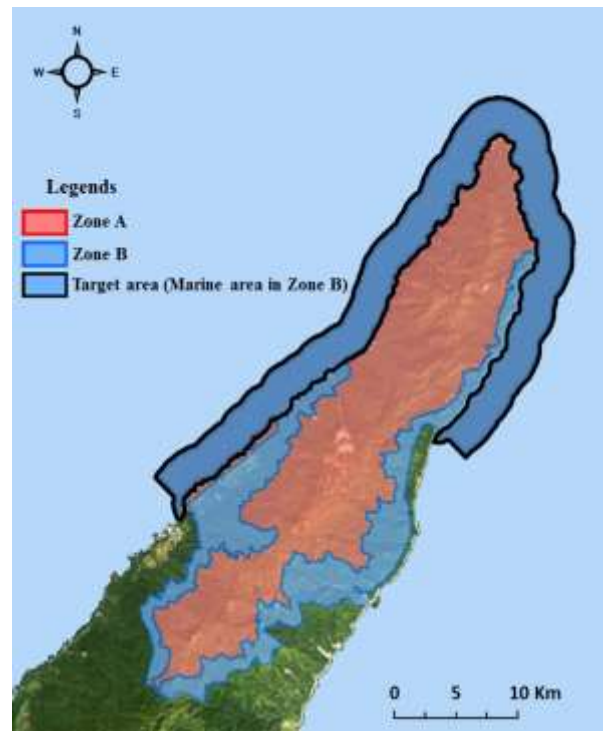


Figure 1 Management Area

2 Review of the Previous Plan

(1) Current Situation of the Waters Surrounding Shiretoko

- Between 1955 and 2004, the average temperature of the Eurasian continent in winter, which affects the formation of seasonal sea ice in the Sea of Okhotsk, rose by 2.0°C, and the temperature of the intermediate water in the western part of the Sea of Okhotsk rose by 0.68°C. The dissolved oxygen level (Note 1) of the intermediate water decreased by 0.58 mg/L between 1960 and 2004. The cause of these trends was due to the weakened formation of dense shelf water (DSW) (Note 2) from the decrease in sea ice, which declined by 9.2% in the area between the latter half of the 1970s and 2004.
- While sea ice and the water temperature vary annually, there is no significant change seen in the resources of molluscan fauna and walleye pollock in the coastal area.
- The catch of salmonids has been on a declining trend since 2010, which is attributed to changes in the marine environment.
- With regard to Steller sea lions, the population of Asian and Japanese groups of Steller sea lion, which the ones migrating to Japan belong to, has been gradually increasing since the 1990s. As for seals, it is difficult to grasp their population trend, but the population of large seals inhabiting all parts of the Sea of Okhotsk is on the increase due to the decline in seal hunting and human use.
- With regard to the linkage of conservation of the marine ecosystem with social or economic activities and its variation, the climate change effects are unknown. It is necessary to continue monitoring in the future to explore

the association with climate change.

- With regard to local industry, the Rausu side and the Shari side have a relatively high percentage of fishery-related industries and tourism-related industries, respectively. The fishery keeps a larger workforce here compared to other areas. As for tourism, use for a wide variety of recreation activities (particularly the number of foreign lodgers and the use of boats for fishing) have increased.
- Visitors to the Shiretoko Museum, Shiretoko National Park Nature Center, visitor centers, and field houses are also on the increase, which deepen visitors' understanding of the characteristics and changes in the nature and culture of Shiretoko, as well as further conservation activities for them. In addition, people from the local communities are deepening the understanding of the ecosystem in Shiretoko through various activities, including a Shiretoko Course for Citizens.

(2) Concept of the Plan and Direction for the Future

- In order to implement adaptive management (note 3) while firmly maintaining the objectives of the first and second term plans, the plan defines some species that characterize the marine ecosystem as indicator species to ensure the balance between conservation of the marine ecosystem and use for fisheries and marine recreation.
- Material circulation and network functions of biological interaction between the terrestrial ecosystem and the contiguous marine ecosystem are monitored and evaluated to protect the interaction of those ecosystems.
- The contents and their effects from the management measures implemented in the first and second terms are scientifically evaluated during the third term, and an adaptive amendment to the management measures is considered based on the evaluation result.
- The state and need for implementation of research and the prospect of implementing research in the future are considered to review the monitoring items.
- Methods of participatory monitoring for making use of information from fishers and local residents are considered.
- Methods of comprehensively evaluating multiple monitoring items for different subjects of research are considered.
- Delivering results from monitoring to the local stakeholders in an easy-to-understand and accessible way is considered.

(3) Monitoring

- It is necessary to continue monitoring in order to capture changes in sea ice extent and its variations in the ecosystems due to environmental changes, evaluate the interaction of the terrestrial and marine ecosystems, and conduct continued management of salmon resources.
- In addition to the above, monitoring of the vertical changes of water temperature and dissolved oxygen in the water off the coast of Shiretoko and the monitoring of the chlorophyll concentration in the waters surrounding Shiretoko using a satellite are considered.

(Note 1)

Dissolved oxygen: The amount of gaseous oxygen (O₂) dissolved in the water.

(Note 2)

Dense Shelf Water (DSW): Refers to the dense shelf water formed in the northern part of the Sea of Okhotsk. When sea water freezes, salt is expelled from ice and therefore the underlying water became denser than the surrounding sea water. This process drives thermohaline circulation in the Sea of Okhotsk. Active formation of DSW contributes to keep the temperature low and dissolved oxygen rich in the deeper layers in the Sea of Okhotsk. It is the source of the Northern Pacific Intermediate Water (NPIW).

(Note 3)

Adaptive management: Adaptive management is intended for 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 methods of management and use are flexibly reviewed and adjusted. These predictions and monitoring should be accompanied by a feedback function. For the review and adjustment of management and use, it is necessary that all of the parties involved share information, try to verify hypotheses based on the results of the monitoring, and decide on the direction they will take while building a consensus.

3 Basic Concept of Management

(1) Basic Policies

- The premise of the Plan is legal restrictions relating to conservation of the marine environment, marine ecosystems and fisheries, and autonomous management measures carried out by fishers based on fisheries-related laws, as well as voluntary restrictions on marine recreation.
- The Plan defines measures to conserve the marine ecosystem, strategies to maintain major living marine resources, and monitoring methods for those resources. Based on them, proper management should be promoted.
- The Plan ensures a balance between conservation of the marine ecosystem and local economic activities through ecosystem services (note 4).

(2) Overview of Marine Ecosystem and Concept of Management in Shiretoko

(Ecosystem of the heritage site)

- The marine area of the heritage site is the southernmost region of the seasonal sea ice found in the northern hemisphere and is affected by the East Sakhalin cold current and the Soya warm current. This area has a complicated marine character created by these two currents together with the intermediate cold water derived from the Sea of Okhotsk and forms the marine ecosystem where a welter of organisms migrate and live.
- The heritage site is an outstanding example of the interaction of marine and terrestrial ecosystems, including the fact that salmonids running upstream for spawning supply high volumes of marine-derived material (15% in terms of nitrogen) for the riparian forest ecosystem.
- In spring when sea ice melts, blooms of ice algae and other phytoplankton occur in Shiretoko. As shown in figure 2, diverse marine life, including a wide variety of fish, such as salmonids and walleye pollock, live in the waters surrounding Shiretoko based on a food web that starts from phytoplankton, seaweed and sea grass, and detritus.
- Anadromous salmonids return to the rivers in the area of the heritage site for spawning. Wild salmonids (including hatchery-derived chum and pink salmon that reproduce naturally in the rivers) running upstream serve as an important source of food for terrestrial mammals (e.g., brown bear) and birds of prey (e.g., Blakiston's fish-owl), and contribute to the biodiversity and the transportation of material into the terrestrial ecosystem. Among salmonids, chum and pink salmon are important as living marine resources in the region.
- In the waters surrounding Shiretoko, fisheries activities have long been carried on without having a negative impact on marine life.

BT: Bighead 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 TW: Toothed whales including Orcinus orca

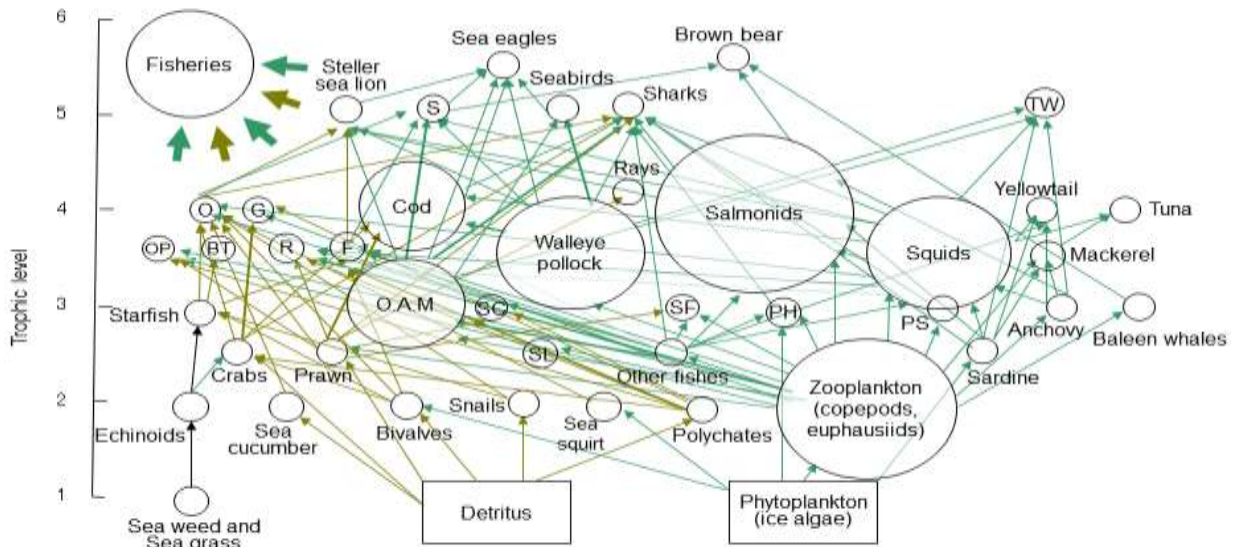


Figure 2 Food web in the Shiretoko

(Adaptive management of the Shiretoko marine ecosystem)

- In general, an ecosystem is a disturbed, uncertain, and complex system and has a structure and function reflecting the interaction between the abiotic environment and the organism.
- The management of the Shiretoko marine ecosystem, which has diverse organisms and a complex and unpredictable system, needs adaptive management.
- Therefore, based on scientific information currently available, this plan categorizes the marine ecosystem into five components as described later and defines some species that characterize the marine ecosystem in Shiretoko as indicator species, which are selected from the most important species that have a great impact on the ecosystems and endangered species constituting the food web in the waters surrounding Shiretoko, to conserve the marine environment, and to implement continuous management based on the concept of adaptive management by understanding the interaction of the marine and terrestrial ecosystems.
- Since there are limitations to adaptive management of the marine area of the heritage site by Japan, the current situation of the ecosystem in the neighboring areas of Japan and the Russian Federation should be understood, and Japan-Russia cooperation, such as information sharing, should be promoted in the field of conservation and sustainable use of the regional ecosystem.

(Linkage with the local communities)

- The rich natural environment of Shiretoko brings benefits to the local communities in various ways, including as

fishery and tourism.

- Therefore, the linkage of conservation of the marine ecosystem with economic activities and variations should be continuously focused on by understanding the social and economic dynamics related to the fishery and the tourism industry, the key industries in the region around Shiretoko.
- In order to capture the changes in the marine ecosystem in the area of the heritage site caused by social and economic activities early, the use of monitoring information provided by fishers and local residents through the Internet and other means should be considered.

(Management measures against climate change, including global warming)

- The marine ecosystem in Shiretoko is significantly affected by seasonal sea ice. The average temperature of the Eurasia continent in winter, which affects the formation of sea ice in the Sea of Okhotsk, including the marine area of the heritage site, rose by 2.0°C between 1955 and 2004, and both the number of days having sea ice coverage and the amount of sea ice inflow are on the decrease.
- Therefore, monitoring of climate change, including global warming, and management of the marine area of the heritage site should be integrated by cross checking the changes in the meteorological and oceanographic phenomena against the findings gained from indicator species that contribute to the conservation of the marine ecosystem and other various species that are vulnerable to climate change.

(Note 4)

Ecosystem services: The term referring to the blessings we gain from ecosystems involving diverse organisms for supporting our life, including food, water, and a stable climate. The ecosystem services can be categorized into four main types: *provisioning services* that provide resources such as food, water, wood, etc.; *regulating services* that are benefits obtained from climate regulation, etc.; *cultural services* that provide places for recreation, etc.; and *support services* that include production of atmospheric oxygen through photosynthesis. (Source: Japan's National Strategy 2012 - 2020)

(3) Concept of Management of Each Component in the Marine Ecosystem

a. Marine environment and production in lower trophic levels

[Current situation of the component]

- The marine environment of the waters surrounding Shiretoko is influenced by the oceanic structure of the Sea of Okhotsk (East Sakhalin cold current, intermediate cold water of the Sea of Okhotsk, seasonal sea ice). It is also affected by the Soya warm current that flows in from the Soya Straits along the coast (shallow water along the coast) and partially by warm surface water that flows in from the Pacific Ocean.
- In winter, the East Sakhalin cold current shifts southward, and then the seasonal sea ice formed in the northern part of Sea of Okhotsk covers this sea area. Blooms of ice algae occur in the sea ice by spring, and when the season of melting the sea ice comes, high volumes of ice algae in the ice are released into the water.
- From spring to early summer, the ice algae released into the seawater initiate spring blooms in the water as phytoplankton affected by higher light levels and stratification caused by warmer seawater. From summer to fall, the production mechanism in the lower trophic levels, which starts from the production of phytoplankton and lead to the reproduction of zooplankton, develops due to the coastal upwelling and vertical mixing caused by complicated ocean floor topography, tide, wind, and some other factors.
- In the intertidal and subtidal zones with high biodiversity, northern hemisphere species are predominant while southern hemisphere species also easily arrive due to the complexity of the marine structure. In addition, sea ice disturbance also affects biota development in those zones.
- The continuity of production in the lower trophic levels as described above, except in winter, leads to an increase in the biomass of zooplankton, such as copepods and krill that feed on the lower production and proliferate. This generates a diversity of marine life including both sedentary and migratory species of fish, squids, seabirds, and marine mammals, as well as the abundant biological production.

[Management strategy]

- Under the conditions mentioned above, in order to ensure balance between conservation of the marine ecosystem and sustainable fisheries based on adaptive management, it is necessary to conduct research and monitoring and understand accurately the trends and dynamics of the marine environment, marine structure, and indicator species of the marine ecosystem that provide basic data for the various analyses of the meteorological and oceanographic phenomena, and dynamics of the sea ice in the waters surrounding Shiretoko.
- It is also necessary to capture the signs of climate change, including global warming, that may be estimated from the trends and dynamics.

b. Coastal Environment

(i) Marine Pollution

[Current situation]

- Relevant laws strictly regulate the discharge of harmful substances into the waters from factories, businesses, and

ships. Thus, the marine environment in the waters surrounding Shiretoko is maintained in good quality.

[Challenges]

- There is a concern, however, that a great variety of marine contaminants from rivers flowing into the waters surrounding Shiretoko, ocean currents, and the atmosphere may threaten the life of marine life at higher trophic level as a result of biomagnification.
- The potential threat from unexpected oil spill incidents caused by oil development on Sakhalin and accidents of ships passing through the waters surrounding Shiretoko, can have a serious impact on the coastal ecosystem.

[Management strategy]

- Efforts to prevent the outflow of contaminants from the terrestrial area should be continued to conserve the marine environment of the heritage site.
- Against the marine pollution caused by unexpected oil spills, measures should be implemented quickly and accurately to protect the precious ecosystem.
- For this purpose, all the institutions concerned, including the national government, Hokkaido government, and the towns, need to cooperate and consider concrete measures to confine the damage caused by oil spills to a minimum area.

(ii) Natural Landscapes

[Current situation]

- No vehicle road exists in most of the coastal area (land area bordering the sea) within the heritage site and thus the natural coast remains intact.
- The coastal and marine areas of the heritage site are designated as Shiretoko National Park under the Natural Parks Law, where certain activities are regulated in order to conserve natural scenic beauty and biodiversity.

[Management strategy]

- Efforts to conserve the excellent scenic beauty and biodiversity should be continued based on the Natural Parks Law.

(iii) Drifting and Washed-up Debris

[Current situation]

- There are some drifting and washed-up debris observed in the marine area of the heritage area.
- The problems caused by the drifting and washed-up debris, including those of foreign origin, have become serious in recent years. Examples of the problems are deterioration of the coastal function of the environment, including the ecosystem, of scenic beauty, threats to the safe passage of ships, and damage to the fishing industry.

[Management strategy]

- The relevant agencies should work together to transmit the information concerning the alleviation of the harmful effects on the marine ecosystem caused by drifting and washed-up debris and the conservation of the coastal

environment.

- Cleaning garbage ashore on the coast in the marine area of the heritage site should be conducted regularly with the help of volunteers.

c. Fishes

[Current situation of the component]

- The number of fin-fish species observed in the waters surrounding Shiretoko has totaled 223 species from 74 families in 26 orders, of which 150 species have been identified in the marine area of the heritage site.
- A large number of fishes, including salmonids, walleye pollock, arabesque greenlings, rockfish, cods, flatfish, and cephalopods, live in the marine area of the heritage site. The area serves as a part of the migration route and spawning area for salmonids and walleye pollock that widely migrate and mainly feed on copepods and krill in the sea.
- In the waters surrounding Shiretoko, fisheries activities have long been actively conducted blessed by the rich biological production, and a historical background based on the fishing industry has developed in the region.
- For the major living marine resources, there have been strenuous efforts made to maintain a balance between the state of the resources and the total catch to realize sustainable use. For example, surveys on the trends of resources have been conducted, regulations concerning the management and use of resources have been established, and resources have been propagated through fishery-related legislation and autonomous measures implemented by fishers and their organizations based on fisheries-related laws.
- Principal capture fisheries have been continuously monitored, organized as statistical information, and published since 1935.

[Selection of the indicator species]

- The most important species include salmonids (e.g., chum, pink, and masu salmon), walleye pollock, Japanese flying squid, arabesque greenling, and Pacific cod.
- Major species used by the fishing industry include salmonids, walleye pollock, Pacific cod, arabesque greenling, and Japanese flying squid. Among them, the catches and value of landing of salmonids are predominant on the Shari side while those of salmonids, walleye pollock, and Japanese flying squid are predominant on the Rausu side.
- Therefore salmonids, walleye pollock, and Japanese flying squid are defined as indicator species because they are not only the most important fishery species that are highly abundant in catches in the marine area of the heritage site but also characteristic species connecting the marine and terrestrial ecosystems in this area.

[Management strategy]

- Proper resource management and the sustainable use of salmonids, walleye pollock, and Japanese flying squid should be promoted under the relevant laws, such as the Fisheries Law and the Fisheries Resource Protection Law, while reflecting the autonomous management efforts of the local fishers and their organizations based on the

information collected by the monitoring of the fishes and various surveys in the waters surrounding Shiretoko. (See note 5)

- Research on the network of biological interaction in the ecosystems estimated from the dynamics of the indicator species and marine-terrestrial circulation of material brought by salmonids running upstream for spawning should be conducted to maintain and restore the linkage of marine and terrestrial ecosystems.
- Analyses of the mid and long-term variations in the volume of catches and average prices of the fish species (a ratio between the value and the volume of catches) should be conducted using statistical data on volumes and the values of catches of those species (Annual Statistics on Fishery and Aquaculture Production).
- Along with the above, the distribution and catch of Japanese flying squid, which represents the indicator species in this region, should be observed to focus on the signs of climate change, including global warming.

(Note 5)

- In Japan, the sustainable use of living marine resources is promoted through a combination of official and autonomous measures. Official restrictions include catch restrictions under the Fisheries Law and the Fisheries Resource Protection Law, and management of the amount of extraction of living marine resources and fish catch efforts based on the Law Concerning Conservation and Management of Marine Life Resources, which was established when the United Nations Convention on the Law of the Sea came into effect. Autonomous resource management is conducted by fishers and fishery organizations utilizing various surveys, which aim at the responsible use of resources and stable fishery management.

d. Marine Mammals

[Current situation of the components]

- In the waters surrounding Shiretoko, 2 orders, 9 families, 22 genera, and 28 species of marine mammals have been identified, including cetaceans, such as whales, dolphins, and porpoises, and pinnipeds, such as Steller sea lions and seals.
- Those marine mammals constitute part of the higher-level predators in the marine area of the heritage site. The waters surrounding Shiretoko are used by them as a seasonal migration route and foraging.
- Killer whales, which prey on other marine mammals, such as seals, on the sea ice as an apex predator in a marine ecosystem, use the marine areas as foraging sites. They are often seen particularly in spring, drawing attention as a resource for tourism.
- Steller sea lions use this marine area with high biological productivity as a wintering ground. Seals that breed on ice (largha seals, ribbon seals, etc.) use the sea ice in this marine area for foraging and breeding.
- There is a challenge in the relationship of the seals and Steller sea lions with the fishery, which is a key industry in Hokkaido. Proper management of the migrating populations should be achieved while trying to alleviate the damage to the fishing industry.
- Therefore, efforts are being made to promote countermeasures against fishery damage caused by marine

mammals and share information on the actual state of such fishery damage by holding liaison conferences composed of the relevant agencies to address the issue.

(Steller sea lion)

[Current situation]

- From winter to spring, some groups of Steller sea lions migrate to the waters surrounding Shiretoko for wintering and foraging. They come from their breeding sites in Russian waters. These groups mainly consist of pregnant females that are important for maintaining the populations.
- The western Steller sea lion is classified as Endangered (EN) on the IUCN (International Union for Conservation of Nature) Red List because the subspecies as a whole, including ones in the marine area around Kamchatka and the Aleutian Islands, is considered to be declining in population. Among the western Steller sea lions, however, the population of those coming to Japan (the breeding sites in the Kurils, the northern part of the Sea of Okhotsk and Sakhalin) has been on a recovery trend since the 1990s, and thus the Ministry of the Environment has changed its classification on its Red List from Endangered to Near Threatened (NT) since 2012.
- Along the coasts of Hokkaido, including the waters surrounding Shiretoko, significant damage to the fishing industry by Steller sea lions, including damage to fishing gear, such as bottom gill nets and set nets, and taking caught fish from nets, is a serious problem. Consequently, since 1994, the population of Steller sea lions has been controlled within the quota for all of Hokkaido set up based on the Fisheries Law and other regulations, in addition to various countermeasures against fishery damage.
- The national government and Hokkaido government are also conducting the surveys and research to alleviate damage to the fishing industry.

[Selection of the indicator species]

- The Steller sea lion is a higher-level predator in the marine area of the heritage site.
- Also, their population is considered to be declining internationally in the long term.
- On the other hand, there is damage to the fishing industry by migrating Steller sea lions in the waters surrounding Shiretoko.
- Based on the above, the Steller sea lion is continuously defined as an indicator species.

[Management strategy]

- The population of Steller sea lions should be managed based on the results of surveys and research on their ecology, the number of migrating individuals, and the number of animals caught as bycatch, as well as based on the control quota under the Fisheries Law.

(Seals)

[Current Situation]

- Seals that breed on ice (largha seals, ribbon seals, ringed seals, and bearded seals) migrate to the waters

surrounding Shiretoko and breed and raise baby seals on the sea ice.

- They feed on a wide variety of marine animals, including Gadidae, Pleuronectidae, Cotidae, squids, and octopuses.
- Seals have been protected under the Protection and Control of Wild Birds and Mammals and Hunting Management Law (hereinafter referred to as "Wildlife Protection and Hunting Management Law") since 2003, and permission is required for their capture.

[Selection of the indicator species]

- Largha seals are a higher-level predator in the marine area of the heritage site, and the population is large. The marine area of the heritage site is an important foraging site, and the sea ice is an important breeding site.
- As largha seal pups feed on krill after being born and breastfed on sea ice, they are strongly linked to the environment where the sea ice is receding and the component of its ecosystem, i.e., their prey.
- With an increase in the number of largha seals migrating to Hokkaido, damage to the fishing industry, such as scavenging hauls, is increasing, and so it is feared that they will affect the marine ecosystem locally. Therefore, capture for control is implemented in this marine area too. There are also largha seals that are caught as bycatch through fishnets.
- Based on the above, largha seals that migrate to the waters surrounding Shiretoko are defined as an indicator species.

[Conservation management strategy]

- By cumulating findings through surveys on the state of migration and damage to the fishing industry and the committee of seals managements in Hokkaido comprising academic experts, fishers, and others, management should be conducted in accordance with the Wildlife Protection and Hunting Management Law in line with the Hokkaido seals management plan.
- It is important to conduct management considering the movement of largha seals in Russian waters that move in and out of the coast of Hokkaido, and thus cooperative research and information sharing with Russia are indispensable.

(Whales)

[Current situation]

- The marine area of the heritage site is rich with food sources of all trophic levels, and many whales with different feeding habits from zooplankton (such as krill) to marine mammals come to the area seasonally.
- The bottom topography of the west side of the Shiretoko Peninsula in the marine area of the heritage site features a gradually descending slope stretching 10 sea miles offshore, which is used by whales, including harbor porpoises that tend to live in coastal areas and Baird's beaked whales that often descend to extreme depths.
- On the Rausu side of the marine area of the heritage site, the sea bottom descends steeply from the north of Rausu Harbor and reaches to a depth of more than 2,000 m in 3 sea miles offshore from the tip of the cape. Thus, this sea area serves as a migration route for great whales including sperm whales.

- Because of the moratorium on all commercial whaling adopted by the International Whaling Commission (IWC) in 1982, all commercial whaling of great whales is banned, and small type whaling is being continued under the management of the Fisheries Agency to maintain the sustainability of the relevant resources.

[Selection of the indicator species]

- Orcinus orca observed in the marine area of the heritage site increase in number with the coming of spring, contributing to marine tourism as an important resource.
- Orcinus orca are the highest-level predator in the marine area of the heritage site as some groups prey on seals on the sea ice.
- Based on the above, Orcinus orca migrating to the marine area are defined as an indicator species.

[Conservation management strategy]

- Efforts to understand the ecology of Orcinus orca as an important resource for marine tourism and the highest-level predator of the marine ecosystem should be made through observations of their population on sightseeing boats.

e. Birds

[Current situation of the components]

- The Shiretoko Peninsula and its surrounding marine area provide a diverse habitat for birds. Here, 285 species of birds belonging to 54 families in 18 orders are identified, and more than 30% of them use the marine area.
- Among the birds identified in the Shiretoko Peninsula and its surrounding marine area, thirteen species are listed on both IUCN and Ministry of the Environment of Japan (MOEJ) red lists. They are: Japanese night heron (IUCN [EN], MOEJ [VU]) (both UCN and MOEJ are written in this order hereafter), red-crowned crane (EN, VU), Blakiston's fish-owl (EN, CR), Baikal teal (LC (Least Concern), VU), Steller's sea eagle (VU, VU), short-tailed albatross (VU, VU), Japanese murrelet (VU, VU), Japanese yellow bunting (VU, NT), white-tailed eagle (LC, VU), yellow-breasted bunting (EN, CR), Laysan albatross (NT, EN), Japanese quail (NT, VU) and long-billed murrelet (NT, DD (Data Deficient)). Among them, use the marine area as an important feeding ground. Blakiston's fish-owls also use the coast as a foraging ground.
- There are a large number of seabird colonies on the coast of the Shiretoko Peninsula.

(Seabirds)

[Current situation]

- There are many seabirds, such as spectacled guillemot, Japanese cormorant, and slaty-backed gulls living on the rocky coast of the Shiretoko Peninsula. These seabirds are protected under the Wildlife Protection and Control Law. They use the marine area of the heritage site as a major habitat, including building nests on the cliffs along the coast along the heritage site. Thus, these birds can be considered species that characterize Shiretoko's costal ecosystem.
- In recent years, human activities, such as excessive approaches to nesting areas and feeding by the tour boats for

recreational purposes in the waters surrounding Shiretoko, are affecting the behavior of seabirds, thus potentially threatening them.

- The spectacled guillemot is listed as Vulnerable (VU) on the MOEJ Red List.
- Slaty-backed gulls have significantly changed their breeding behavior in recent years by increasingly building nests on manmade structures, such as house roofs in the urban area of Rausu City, which brings negative effects to the lives of local residents.

[Selection of the indicator species]

- The spectacled guillemot is defined as an indicator species because the species is particularly affected by such recreational use of the site by humans as mentioned above and, even though locally propagating on the coasts from Hokkaido to Tohoku, its population is declining and needs careful monitoring.
- The slaty-backed gull and Japanese cormorant are also defined as indicator species because they are major seabirds breeding in large numbers in the coastal area of the heritage site.

[Conservation management strategy]

- Various surveys and collection of information, including data on the distribution of these seabirds, should be continued, proper management should be implemented in accordance with the Wildlife Protection and Hunting Management Law, and methodology for assessing the effect of autonomous rules for use of the site should be explored.
- For spectacled guillemot, management for the next generation, through which they will be wisely used with their value improved as a local resource, should be promoted by establishing cooperative relationships in the region, not just protecting them as such a resource.

(Sea Eagles)

[Current situation]

- The Shiretoko Peninsula is one of the major breeding grounds of the white-tailed eagle in Japan. Furthermore, a large number of white-tailed eagles and Steller's sea eagles migrate to the area from Russia in winter. They are designated as Domestic Endangered Species by the Law for Conservation of Endangered Species of Wild Fauna and Flora (hereinafter referred to as "the Species Conservation Law").
- Steller's sea eagle breeds only in the far eastern part of Russia. Their population is estimated to be only around 5,000 to 7,000 individuals. The Shiretoko Peninsula is their major wintering ground where once more than 2,000 birds were observed.
- More than 20 pairs of white-tailed eagles breed on the Shiretoko Peninsula every year, making the peninsula the most important breeding ground in Japan for this species. It is also an important wintering ground where up to 600 individuals, including migrating ones, are observed in winter.
- The coast of the Shiretoko Peninsula provides an important wintering and living environment for Steller's sea eagles and white-tailed eagles because it has rich food resources, such as salmonids, and there are good

contiguous forests that serve as roosts for eagles on the coastal slopes.

- On the other hand, there are incidents of eagles dying from lead poisoning caused by lead bullets left in the carcass of sika deer.

[Selection of the indicator species]

- Steller's sea eagles and white-tailed eagles are higher-level predators in the marine area of the heritage site. They also require careful monitoring from the standpoint of protecting threatened species. Therefore, they have been defined as indicator species.

[Conservation management strategy]

- Efforts should be made to understand and conserve the wintering grounds and environmental conditions for sea eagles migrating to the area of the heritage site for wintering.
- Under the Species Conservation Law, strict protection and management of sea eagles that stay and breed in the area should be implemented, including the protection of nesting areas and securing of food resources.

(4) Local Communities

[Current situation]

- The rich ecosystem of Shiretoko has served as a basis for fostering the local culture and development of the fishery and tourism as key industries, as well as providing grounds for academic research.
- In Shiretoko, registration on the UNESCO list of world heritage sites has promoted the diversification of tourism. In this context, new recreational uses of the waters surrounding Shiretoko, such as sea kayaking and scuba diving, are increasing, in addition to the conventional sightseeing and leisure cruises and angling in the waters.
- Those industries and those forms of use not only bring economic benefits and job creation to the local communities but also are regarded useful for educational purposes, including experiential learning.
- In addition, various kinds of knowledge and experience that have been accumulated for years in Shiretoko are important information sources not only for fully understanding the entire ecosystem of Shiretoko and its changes, but also for studying the linkage to people's vocations and the social impact that may be a concern in the future.

[Challenges]

- There is a concern that unregulated recreational use of the waters surrounding Shiretoko may have adverse effects on the fishery and the marine ecosystem.
- Furthermore, the waters surrounding Shiretoko and the coastal area of the peninsula are the habitat and breeding ground of seabirds and marine mammals. There is a concern that human activities, such as navigation of boats, and unregulated feeding and watching at close range may affect the survival of seabirds and marine mammals.
- For ensuring both the conservation of the marine ecosystem and management of living marine resources in the marine area of the heritage site, interests between stakeholders that use various ecosystem services have to be coordinated. Therefore, the benefits of ecosystem services to the local communities need to be evaluated in social and economic terms in order to understand those benefits.

[Management strategy]

- For fish species where the catches are significantly decreasing, the cause, whether a decrease in resources, migration, or demand, or some other reason, should be scrutinized. If a decrease in resources is the cause, the reason should be determined.
- In the case of significant movements in average fish prices, the cause should be scrutinized to explore whether there is any sign of smaller fish due to overfishing.
- The contribution of key fish species that support local fisheries should be examined from the catches to explore the stability and future outlook of fishery management.
- In order to prevent the negative impact of recreational use on the marine ecosystem and to prevent interference with the local key fishing industry, such use should be managed through rules for utilization formulated by the authorities concerned, including the national government, Hokkaido government, and relevant towns, while monitoring of the state of such use should continue, and efforts should be made to raise awareness of the rules for utilization.
- Both benefits brought to people by the marine ecosystem and the impacts that human activities have on the resource should be understood through analysis of the local communities for contributing to sustainable conservation and use of the marine ecosystem.
- In addition, monitoring results should be shared between stakeholders concerned so as to adapt to any change caused by climate change, including global warming, and the policies of the local communities and economic activities, as well as measures for responding to such change, should be organized.
- Knowledge accumulated by users of local diverse ecosystem services through vocational work and new information gained by visitors through sightseeing should be regarded as a complement to the scientific monitoring that has been conducted, and development of a system for collecting them should be considered.

4 Management Measures

(1) Marine environment and production in lower trophic levels

- To understand the marine environment and production in lower trophic levels of phytoplankton and zooplankton that support the marine ecosystem, marine surveys should be conducted on the physical, chemical, and biological environment through observation using satellites, observation buoys placed in the ocean and research vessels, and samplings of plankton using nets and bottles.
- Because the production in the lower trophic levels is directly influenced by changes in the marine environment that in turn reflect global climate change, some features of the marine environment, including the movement of sea ice in the Sea of Okhotsk, seasonal and annual changes in the East Sakhalin cold current and the Soya warm current, and behavior of the intermediate cold water in the Sea of Okhotsk, should be monitored.
- The ecosystems in intertidal and subtidal zones with particularly high biodiversity are expected to be influenced by increasing water temperature and physical disturbances, such as seasonal sea ice and bomb cyclones, more easily than those in other marine ecosystems. Therefore, monitoring of flora and fauna, as well as their quantitative changes, should be conducted on a regular basis.
- Based on these surveys, productivities of zooplankton and phytoplankton in the marine ecosystem in the waters surrounding Shiretoko should be studied, and the study should shed light on their dynamic states as a food resource to support species at higher trophic levels of the ecosystem, such as fish, their impact on the ecosystem's biodiversity.
- As these surveys are also important as monitoring of the environment in the waters surrounding Shiretoko and can serve the function of capturing the signs of climate change, including global warming, they should be continued and further developed.
- In promoting monitoring or research, the relevant administrative bodies, survey or research institutions, and local parties concerned, including fishery cooperatives, should cooperate and coordinate and should enhance the exchange of information on the observation system and the results of studies.
- Based on the results of the monitoring and research, changes in the environment of the marine area of the heritage site will be understood; furthermore, efforts for prediction of changes in the marine ecosystem should be made. All these results will be utilized for the realization of conservation of the marine ecosystem and a sustainable fishery industry.

(2) Coastal Environment

a. Marine Pollution

- Prevention of marine pollution will be implemented based on relevant legislation.
- For oil spill accidents caused by marine vessels, the regional Council for Countermeasures against Oil Spill Disasters is established on the basis of the Law Relating to the Prevention of Marine Pollution and Maritime

Disaster. In this Council, together with the institutions responsible for the environmental conservation of the coastal waters along the heritage site, concrete oil removal measures should be discussed. In the event of an accident, the institutions concerned, including the national government, Hokkaido government, and towns, should work together to collect and remove the oil quickly and adequately to conserve the marine ecosystem.

- Analysis of oil, cadmium, and other substances in the seawater and in seafloor sediment should be continued to understand the present state of marine pollution on the northeast coast of Hokkaido potentially caused by Sakhalin oil development.

b. Natural Landscapes

- The coastal area of the heritage site is designated a Special Protection Zone or Special Zones of the Shiretoko National Park under the Natural Parks Law. Within this area, certain activities are regulated in order to conserve the scenic beauty of the site.
- The marine area of the heritage site is designated as an Ordinary Zone under the Natural Parks Law. Within this area, certain activities, including land reclamation and new construction beyond a certain scale, are regulated in order to conserve the scenic beauty and biodiversity of the site.
- For the conservation of scenic beauty, regular patrols should be conducted to accurately monitor the state of the natural environment and park utilization, as well as to instruct visitors and crackdown on violations.
- In accordance with the changes in social conditions, the park area and park plan of Shiretoko National Park should be reviewed approximately every five years based on scientific knowledge and other factors.

c. Drifting and Washed-up Debris

- Information dissemination and awareness raising should be promoted regarding the current situation of and efforts made against drifting and washed-up debris in the marine area of the heritage site, making full use of websites and other media, as well as the facilities related to the heritage site, such as visitor centers.
- While collecting information on the situation of drifting and washed-up debris, regular cleaning should be conducted in cooperation and collaboration with not only the administrative agencies concerned but also other activities, including volunteer clean-up activities by local governments and NPOs, with consideration given to the natural environment.

(3) Indicator Species

- Monitoring of the following indicator species will be conducted, and continuous management based on the concept of adaptive management will be implemented. Also, a certain role should be assumed in the monitoring of climate change, including global warming, with a focus not only on the indicator species but on the dynamics of other species that have linkage in the ecosystem as a reference.

a. Salmonids

- An assessment was made on 100 artificial constructions in the rivers within the heritage site and their lower reaches as to their impact on escapement and natural spawning of wild salmonids, and 13 ones in five rivers were judged to be obstacles in need of improvement.
- In response to the assessment results, improvement of those constructions was carried out by their administrators and resulted in ascertaining that both the number of wild salmonids spawning upstream and the number of spawning redd increased.
- Wild salmonids, which convey marine-derived material to the terrestrial ecosystem, should be secured as to their escapement and natural spawning in the future, and those obstacles, such as the artificial river construction, should be avoided to the extent practicable.
- Based on legislation, including the Fisheries Law, set nets are designated as the standard marine fishing gear for salmonids, and fishing is prohibited in all rivers and near the mouths of certain rivers to protect the resources. Hatchery chum and pink salmon programs, which are carried out in certain rivers for a sustainable fishery, should also further promote the proper management and sustainable use of salmon resources.
- To verify the maintenance and protection of populations of naturally spawning salmonids, regular biological monitoring and intensive surveys on migration patterns, escapement dynamics, and spawning of salmonids should be conducted.

b. Walleye pollock

- For walleye pollock, gill net and longline fishings are conducted in the waters surrounding Shiretoko, mostly offshore of Rausu Town, with the permission of the governor of Hokkaido under the Regulation of Sea Fisheries Adjustment in Hokkaido that was established on the basis of the Fisheries Law and the Fisheries Resources Protection Law.
- Under the Law Concerning Conservation and Management of Marine Life Resources established on the basis of the United Nations Convention on the Law of the Sea, the national government and Hokkaido Prefecture set the upper limit of the catch [total allowable catch (TAC)] every year based on studies, including resource surveys and resource assessments conducted by research institutions, to control the fish catch.
- In addition to these restrictions based on these fishery laws, immature walleye pollock populations are protected by resource management agreements signed by all fishery organizations throughout Hokkaido.
- Furthermore, local fishers are implementing autonomous management measures for the protection of spawning fish, including restrictions on the period and area of fishing and on the mesh size of gill nets, with considerations given to their state of maturation and other factors.
- Proper management and sustainable use of walleye pollock resources that migrate into the marine area of the heritage site should be continued and promoted through measures based on these fishery laws and the autonomous efforts of fishery operators and organizations in the waters surrounding Shiretoko.
- Russian trawlers are catching walleye pollock from the single stock in the Nemuro Strait, which raises concerns

about the impact on living marine resources and the ecosystem of the waters. To address this concern, efforts should be continued through various conferences and networks of researchers by gathering as much information as possible on Russian resource management and other relevant issues, exchanging information on marine ecosystem conservation and other nature conservation issues, and making the necessary appeals to the Russian side.

c. Japanese flying squid

- For Japanese flying squid, set net fishing with a fishing license from the governor of Hokkaido under the Fisheries Law and fishing using a squid-jigging machine with the permission of the governor of Hokkaido under the Regulation of Sea Fisheries Adjustment in Hokkaido that was established on the basis of the Fisheries Law and the Fisheries Resources Protection Law are conducted in the waters surrounding Shiretoko, mostly in the waters off Shiretoko Peninsula and Rausu Town.
- Under the Law Concerning Conservation and Management of Marine Life Resources established on the basis of the United Nations Convention on the Law of the Sea, the national government and Hokkaido Prefecture set the upper limit of the catch [total allowable catch (TAC) every year based on the studies, including resource survey and resource assessment conducted by research institutions, to control the catch.
- In addition to these restrictions based on these fishery laws, the resource is protected by days of suspension of fishing, catch adjustments, and catch control by stopping squid fishing according to the decisions on fishing activities in the marine area offshore of Hokkaido made by the Hokkaido Squid Fishery Association.
- Japanese flying squid caught in the waters surrounding Shiretoko mainly comprise a winter-spawning group that moves up the Pacific Ocean in and after autumn and migrates into the Sea of Okhotsk through the cohort around the Northern Territories. In summer, part of the catch is an autumn-spawning cohort that migrates from the coastal area of the Sea of Okhotsk along the Soya Warm Current.
- The number of Japanese flying squid migrating to the waters surrounding Shiretoko is significantly affected by the level of success in the reproduction and participation of the winter-spawning cohort that is born between January and March in the East China Sea and moves up the Pacific Ocean and the marine environment including the coastal Okhotsk Current and warm eddies off the east and north of Hokkaido.
- It has been clarified that the catch of Japanese flying squid in the waters surrounding Shiretoko increases during the warm regime where the temperature of the waters surrounding Japan is high and decreases during the cold regime where walleye pollock are dominant in the waters. The annual change in the number of Japanese flying squid migrating to this marine area is linked to the changes in pelagic fish species, such as sardines, that respond to the changes in the marine environment of the waters surrounding Japan, including this marine area. Proper use of the resources should be promoted based on the continued monitoring of changes in the catch linked to the changes in the marine environment, and behavior prediction of the resource made by the national governments and Hokkaido Prefecture, as well as TAC set by them.

d. Steller sea lion

- Until 2012, the total number of animals to be captured in Hokkaido had been determined on the basis of the Potential Biological Removal (PBR) method focusing on conservation and restoration, and among them, the permissible capture limit of 7 to 12 animals had been allocated to the marine area of the Nemuro Strait. In response to the increase in damage caused by the animals to the fishery industry, the capture limit was increased to 15 animals in 2013.
- Since 2014/15, instead of the conservation-oriented PBR method, management of the population of Steller sea lions that migrate to the coast of the Japan Sea in Hokkaido has begun. The Nemuro Strait is separated from this management system, and the permissible capture limit of 15 animals is continued in the area in consideration of the migration conditions and damage caused by the animals to the fishery industry.
- For Steller sea lions migrating to the Nemuro Strait, research by visual observation on shore is currently conducted; however, the increase in the operation of sea animal watching boats and driving away Steller sea lions to alleviate the damage to the fishery industry has affected the number of the animals observed in recent years. The decline in number of animals observed visually on the coast of the Nemuro Strait may be caused by these factors, while the capture number of the animals has been within the set limit.
- Other than the surveys by visual observation, research using drones began after the formulation of the second term marine management plan, which is contributing to the increase in the cases of reading a brand identifying the original breeding site. Monitoring and research should be promoted to make it possible to analyze the dynamics of the original populations of Steller sea lions migrating to the marine area by a more detailed model incorporating the result of research of the breeding sites and biological information on the age structure of migrating individuals. Adaptive management based on scientific knowledge should be pushed ahead to alleviate damage to the fishing industry and to maintain the population at a healthy level.

e. Largha seal

- Capturing largha seals requires the permission of the governor of Hokkaido based on the Wildlife Protection and Hunting Management Law.
- Permission to capture wildlife is given based on the permission criteria defined in the Hokkaido Wildlife Protection Project Plan that is formulated every five years, and the capture permission in the marine area of the heritage site is also given according to the criteria.
- Long-term monitoring of the population trend of largha seals in the marine area of the heritage site, as well as surveys of damage to the fishery industry, should be continued. Also, the proper operation of the capture permission system should be ensured to promote protection and management of largha seals.

f. *Orcinus orca*

- Efforts to understand the ecology of *Orcinus orca* as an important resource for marine tourism and the highest-level predator of the marine ecosystem should be made through observation of their population on sightseeing boats.

g. Spectacled Guillemot, Slaty-backed Gull, and Japanese Cormorant

- Capturing seabirds is prohibited, in principle, based on the Wildlife Protection and Hunting Management Law. The adequate protection and management based on the law should be continued.
- Various surveys and the collection of information on the state of distribution and populations, including the state in the marine area, should be implemented, and then adequate protection and management should be promoted. For the spectacled guillemot in particular, any decrease in the breeding population should be avoided
- For use of the marine area for recreational fishing boats and sightseeing boats, any negative impact on the seabirds should be alleviated by requiring compliance with the routes that will not have an impact on the seabirds based on autonomous rules. Also, measures for evaluating the effect should be explored.
- For the spectacled guillemot, which is a resource for tourism in the heritage site, installation of decoys for restoration of breeding grounds, monitoring of the spectacled guillemot on sightseeing boats, and PR activities are implemented, aiming at the improvement of the value.
- Information gained through the activities mentioned above should be shared by institutions concerned for promoting sophisticated use of the resource for tourism.

h. Steller's sea eagle / white-tailed eagle

- Steller's sea eagle and the white-tailed eagle are designated National Endangered Species under the Species Conservation Law and Natural Monument of Japan under the Law for the Protection of Cultural Properties, and their hunting, killing or damaging, and transfer are prohibited. Strict protection and management based on these laws should be continued.
- In addition, Programmes for Rehabilitation of Natural Habitats and Maintenance of Viable Populations under the Species Conservation Law are developed for both Steller's sea eagles and white-tailed eagles. In line with these programs, various projects, including studies and monitoring of the migration routes across Hokkaido and their behavior and the rescue and rehabilitation of injured or sick birds, should be implemented. Also, the results of the surveys on nesting sites and the state of breeding should be obtained in collaboration with the researchers or others who have already been studying them continuously. Based on the examination of the results of those projects and surveys at the regular meeting of Conservation Committee for White-Tailed and Steller's Sea Eagles, adaptive protection and management measures that will contribute to increasing their populations should be implemented.
- The forests on the coastal slopes of the heritage site that provide an important wintering ground for these birds should be conserved. Also, activities for awareness raising and guidance should be conducted to warn users not

to get close to the nesting sites during the white-tailed eagle's breeding season.

- The use of lead bullets is prohibited in the hunting of large mammals to prevent the lead poisoning of Steller's sea eagles and white-tailed eagles, and thus efforts should be made to give guidance and monitor the observance of the prohibition.

(4) Local communities

a. Conservation of the marine ecosystem and regional development

- Benefits brought to the local communities by the marine ecosystem in the Shiretoko region should be understood from the trends of local industries, including the fishery and tourism, and proper management measures and development of rules should be promoted, in order to ensure the balance between conservation of the marine ecosystem and regional development.

b. Marine recreation

- Based on Conduct in the Use of the Shiretoko Peninsula Apical Region,, the request for recreational fishing boats and sightseeing boats to comply with the routes that will not have a negative impact on seabirds and marine mammals, and fishery activities, and to ensure autonomous rules should be continued. While continuing regular monitoring of recreational activities, the content of instruction will be reviewed. For the use of the marine area by powerboats or sea kayaks, instruction should be given thoroughly in cooperation and collaboration with the institutions concerned and other relevant organizations in order to avert any negative impact on seabirds, marine mammals and fishery activities.
- For other recreational use of the coastal area, such as diving and other educational activities on sea ice in winter, continuous monitoring should be implemented, and concrete policies should be discussed.

c. Climate change, including global warming, and local communities

- Vulnerability of society and the economy in the Shiretoko region to climate change should be evaluated in order to organize and share with stakeholders the basic concepts for measures needed to alleviate and adapt to climate change, and rules for the fishery and use for tourism should be reviewed according to the evaluation result.

(1) Implementation of the Plan

- In order to accomplish the plan's objectives, administrative bodies, including the Ministry of the Environment and Hokkaido Prefecture, that hold jurisdiction over various systems and measures related to Shiretoko, as well as relevant organizations, such as fishery cooperatives and research institutions, should closely cooperate to promote their respective measures for the conservation of the marine ecosystem of the heritage site and for stable fisheries. At the same time, human resources who are involved in these organizations should be developed.
- The progress of the plan, including the results of various measures, will be disclosed and shared through the reports submitted to the Shiretoko World Natural Heritage Site Scientific Council and the Shiretoko World Natural Heritage Site Regional Liaison Committee, the website of the Ministry of the Environment, the Shiretoko World Heritage Conservation Center, the Rausu Visitor Center, and other citizens course.
- For the proper promotion of this plan, the Shiretoko World Natural Heritage Site Scientific Council will provide advice as needed.

(2) Time Frame of the Plan

- The period of this plan will cover five years until the fiscal year 2022. The plan will be reviewed depending on the situation, based on the changes in Shiretoko's marine ecosystem, the results of the management measures, and other relevant information.
- After 2022, the plan will be reviewed and amended as needed approximately every five years.