Sea ice, with the Shiretoko mountain range in the background
photo by Shiretoko Nature Foundation

2. Justification for Inscription

2a. Statement of significance

2b. Comparative analysis with other World Heritage sites

2c. Criteria under which inscription is proposed and justification

2d. Integrity

2a. Statement of significance

Shiretoko is an outstanding example of an integrated ecosystem displaying the interrelationship between a terrestrial ecosystem and a contiguous marine ecosystem with unique seasonal sea ice characteristics. Shiretoko maintains pristine forests in the terrestrial ecosystem while its marine ecosystem is greatly diverse and rich. Many steep rivers connect these two ecosystems. The sea ice is the origin of the dynamic link between the ecosystems of the sea, rivers and forests.

Sea ice provides a suitable habitat for a group of phytoplankton called ice algae. When the ice melts, ice algae and other phytoplankton proliferate explosively ("blooms"). Shiretoko Peninsula lies at the lowest latitude among the world's seasonal sea ice areas, and because the ice melts earlier, blooms of phytoplankton occur earlier in spring than other sea ice areas. These earlier blooms bring abundant zooplankton. Many fishes such as salmon and cod feed upon the abundant planktons and, in turn, become an important food source for the terrestrial animals. The blooms of phytoplankton support the abundance and diversity of the marine life in Shiretoko.

Also on land, Shiretoko contains a diverse fauna and flora because the complex topography and the differences in weather conditions between the east and west sides of the Shiretoko Peninsula create a variety of habitats. Various types of virgin vegetation cover from the coastline to the mountain peaks, including *Viola kitamiana* which is endemic to the Shiretoko Peninsula. The density of brown bear *Ursus arctos* population is among the highest in the world due to the abundance of food and diverse habitats. Further, Shiretoko is an important breeding or wintering site for globally threatened bird species such as Blakiston's fish-owl *Ketupa blakistoni* (listed as "Endangered" on IUCN Red List of threatened species: EN, IUCN Red List), Steller's sea eagle *Haliaeetus pelagicus* ("Vulnerable" on IUCN Red List: VU, IUCN Red List) and white-tailed eagle *H. albicilla* ("Lower Risk" on IUCN Red List: LR, IUCN Red List). All these animals are vitally dependent upon both the marine and terrestrial ecosystems.

Sea ice, with the Shiretoko mountain range in the background photo by MURATA Ryosuke

Brown bear *Ursus arctos*
photo by KURASAWA Eiichi

Shiretoko features a unique composition and distribution of species such as the coexistence of northern and southern species. Northern species such as the brown bear and southern species such as the sika deer *Cervus nippon* share the habitat on land. While in the ocean, fishes and seaweeds are mixture of a wide variety of northern and southern species, reflecting the effect of the Soya Current which is the only warm current in the Sea of Okhotsk.

Shiretoko has outstanding natural beauty with its landscape and seascape changing dramatically with the four seasons. Especially, the sea ice scenery is always changing in winter, and the diverse forests cover the area with beautiful colors in autumn. High sea cliffs and various wildlife species add aesthetic attractions to the site. Shiretoko also has superlative natural phenomena, like the volcanic peak of Mt. Iou which is world renowned for erupting large amounts of highly pure molten sulfur.

2b. Comparative analysis with other World Heritage sites

Shiretoko is one of the few areas in Japan where a virgin natural coastal and forest environment has been preserved. The area includes one of the Japan's five Wilderness Areas (IUCN category Ia protected area) that are designated to preserve virgin nature in Japan. Located within the nominated site, the Onnebetsudake Wilderness Area is the largest Wilderness Area in Japan and it has been extensively studied in various scientific fields. In addition, most of the terrestrial part of the nominated site is designated as the Shiretoko Forest Ecosystem Reserve (IUCN category Ib protected area) and approximately 90 percent of the land area is covered by natural vegetation. The high proportion of virgin forest is equal to the level in the Shirakami-sanchi World Heritage Area. Further, most of the nominated site including marine area is conserved as Shiretoko National Park (IUCN category II protected area).

Yakushima World Natural Heritage site
photo by JWRC

There are two natural World Heritage sites in Japan, Yakushima and Shirakami-sanchi. Yakushima was inscribed under criteria (ii) and (iii) for its warm-temperate evergreen forest ecosystem, especially its ancient sugi (Japanese cedar) and its magnificent natural landscape, while Shirakami-sanchi was inscribed under criterion (ii) for its virgin beech forest ecosystem. However, unlike these two properties, the nominated site is situated within the Udvardy's "Manchu-Japan mixed forest" biogeographic province, and it features more northern species and is unique because of its marine ecosystem influenced by sea ice.

Shirakami-Sanchi World Natural Heritage site
photo by JWRC

From the global point of view, there are 11 other natural World Heritage sites (nine in the Palaearctic Realm, two in the Nearctic Realm) that lie within the same "Temperate broad-leaved forests or woodlands, and subpolar deciduous thickets" biome of Udvardy. However, the nominated site is characterized by a unique natural environment which is maintained by the interaction of both the sea and forest; among the above 11 sites, only two sites in Russia–Sikhote-Alin and the Volcanoes of Kamchatka–comprise both forests and coasts. In addition, at similar latitudes as the nominated site, three other natural World Heritage sites

Table 2-1 World Natural Heritage sites containing forests and coasts in higher latitudes

Country	Site Name	Year of Inscription	Criteria	Latitude	Altitude (m)	Area size (ha)
Russia	Central Sikhote-Alin	2001	N(iv)	44°48' - 47°18'N	0-1,900	406,200
Russia	Volcanoes of Kamchatka	1996/2001	N(i), (ii), (iii), (iv)	52° - 56°N	0-3,621	3,670,000
U.S.A.	Redwood National Park	1980	N(ii), (iii)	41° 04' - 41°49'N	0-950	56,900
Canada/ U.S.A.	Kluane/Wrangell-St Elias/ Glacier Bay/Tatshenshini-Alsek	1979/1992/1994	N(ii), (iii), (iv)	58° 10' - 62°45'N	0-5,950	9,839,100
New Zealand	Te Wahipounamu - South-West New Zealand	1986/1990	N(i), (ii), (iii), (iv)	43° 00' - 46° 30'S	0-3,764	2,600,000

Shiretoko: Latitude 43° 56' 58'' - 44° 21' 08'' N (centered on 44° N), Altitude 0 - 1,661m. Area size 56,100 ha

contain both forests and coasts. These total of five sites are situated in Russia (two sites), North America (two sites) and Oceania (one site) (Table 2-1). Although the nominated site is smaller in scale compared to the other listed sites, the diversity of the species in the Shiretoko area is comparable or superior to other sites and the ecosystem is outstandingly distinctive.

The Central Sikhote-Alin is the only World Natural Heritage site that is located in the same "Manchu-Japan mixed forest" biogeographic province. This site is characterized by its diverse Ussuri taiga ecosystem which is the most important habitat for the endangered Amur tiger. Compared to the Central Sikhote-Alin, the mixed forest of the nominated site has a higher volume of deciduous broad-leaved trees. The Central Sikhote-Alin also includes coastal forests and a small marine zone of 2,900 hectares extending out one kilometer from the coastline, however, there is no sea ice along the Sikhote-Alin coastal region. In the nominated Shiretoko site, there are 28 species of marine mammals and more than 200 species of marine fishes recorded and the marine ecosystem is far more diverse than the Central Sikhote-Alin. In addition, the nominated site offers clear evidence of the interaction between the forest ecosystems and the ocean.

The Volcanoes of Kamchatka site was inscribed on the list for its wide variety of volcanic phenomena as well as its biodiversity. The site contains a diverse range of wildlife and especially the variety of salmonid fish exceeds the level found in the nominated site. However, Shiretoko has 35 species of terrestrial mammals and 264 species of birds compared to the 33 species and 145 species recorded in the Volcanoes of Kamchatka. Therefore, the number and diversity of birds at the nominated site exceed the Volcanoes of Kamchatka. In addition, there are some concerns that in Kamchatka, volcanic matter is contaminating the rivers where salmon spawn. The Kamchatka Peninsula is also located at the eastern margin of the Sea of Okhotsk but sea ice rarely approaches its western coastline because of the current of warmer waters. Seasonal ice is formed by the special conditions of the Sea of Okhotsk and the east coast of the Kamchatka Peninsula (where the World Heritage site faces) usually does not have sea ice.

The latitude of the nominated site is the lowest in the world among seasonal sea ice areas and the ecosystem with sea ice together with southern species is not observed in Volcanoes of Kamchatka.

The Redwood National Park is forested area situated along the Pacific Coast of North America. With high annual rainfall, the park is characterized by virgin temperate rainforests mainly consisting of gigantic conifers. Its climate and vegetation is very different from the nominated site. In addition, Redwood National Park is not influenced by sea ice.

Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek is situated in much higher latitudes and includes the widest range of altitudes among the five world heritage sites mentioned here. The site is a mountainous region containing tundra, forests, glaciers and a long coastline. Similar to the Volcanoes of Kamchatka, the fauna and flora mainly consists of northern species and there is less diversity in mammal and bird species in this site. Therefore, with regard to biota, it is different from that of the nominated site which contains southern as well as northern species. This site has glaciers and icebergs, but does not have periodic sea ice, and its marine ecosystem is not influenced by sea ice.

Lastly, the Te Wahipounamu-South-West New Zealand in the southern hemisphere contains impressive fjord landscapes formed by glaciers which extended to the sea; it also has a high proportion of endemic plant, bird and reptile species. The unique Gondwana biota of this site is completely different from that of Shiretoko. In addition, as there is no sea ice along the Fiordland coast, it is not comparable to the nominated site.

As indicated by the above comparisons, because of its unique topographical condition and geographical location, the nominated site is quite different from other World Heritage sites in similar mountainous maritime environments and latitudes. It is a unique natural environment, an outstanding and precious area in the world.

2c. Criteria under which inscription is proposed and justification

The nominated site meets criteria (ii), (iii) and (iv) for the inclusion of natural properties in the World Heritage List set out in the Operational Guidelines 44(a) as indicated below:

Criterion (ii)

Shiretoko is an outstanding example of an ecosystem with high levels of biological activity facilitated by seasonal sea ice and of the interaction among sea, rivers and forests.

Sea ice accelerates the nutritional circulation in the ocean and provides a stable temperature and ample light, creating a suitable habitat for ice algae (a group of phytoplankton mainly consisting of diatoms). Because Shiretoko is located at the lowest latitude in the world where seasonal sea ice occurs, the ice melts earlier than other sea ice areas, and blooms of phytoplankton occur earlier and create a longer period of food supply for the marine wildlife. This food resource plays an important role in the

A flock of short-tailed shearwater *Puffinus tenuirostris* photo by Shiretoko Museum

life cycle of the marine wildlife in the nominated site. For example, the peak spawning season for walleye pollack *Theragra chalcogramma* is from March to May and the fry hatch one month later. This coincides with the bloom of phytoplankton and the corresponding increase of zooplankton. The fry feed and grow upon the rich food source (zooplankton) supplied by the sea ice during an important phase of their life cycle. Spring is also the season for chum salmon *Oncorhynchus keta* fry to swim downstream into the open sea and they feed upon zooplankton abundant during this period. It has been observed that the fry follow the melting sea ice to higher latitudes as they feed upon this food resource. Seals, such as the larga seal *Phoca largha*, mate and give birth on the sea ice along the coastal waters of the Shiretoko Peninsula. The pups that are weaned in spring utilize the high levels of zooplankton which appear during the ice melting period. A large number of seabirds such as the short-tailed shearwater *Puffinus tenuirostris*, and whales, arrive in the waters surrounding the Shiretoko Peninsula to feed upon the abundant zooplankton during spring and summer. Therefore, the sea ice provides an abundant and nutritious food resource for these animals. As these facts indicate, the nominated site represents a rich marine ecosystem which reflects the characteristics of the seasonal sea ice area.

There are about 44 small and large rivers in the nominated site that link the forest and sea. Seventy percent of the fish species in the rivers of the nominated site need to spend a part of their life stage in the ocean and therefore, are dependent on an environment that is seamlessly linked to the sea. In addition, established riparian forest provides a favorable habitat for fish such as dolly varden *Salvelinus malma*. The salmon and trout that swim upstream to spawn are a food source for fish-eating birds such as Blakiston's fish-owl and terrestrial mammals such as brown bears and red foxes *Vulpes vulpes schrencki*. The river ecosystem in the nominated site provides a habitat for fish species that require a link to the sea and also plays an important role in the circulation of substances between the two separate ecosystems in the sea and forest.

Marine ecosystem with great biological diversity along the coast of the Shiretoko Peninsula photo by KURASAWA Eiichi

The virgin forest provides a diverse habitat and abundant food source for a large number of wildlife. The food source of the brown bear of Shiretoko is one of the examples of the linkage between the sea, rivers and forests. In addition, the virgin forests play a role in supporting the rich marine ecosystem by supplying nutrients to the rivers and by preventing soil erosion.

As described above, the nominated site represents an interactive ecosystem that consists of bountiful sea and forests that are linked by rivers. The nutrients supplied by the sea ice results in blooms of phytoplankton which are the base of a dynamic food chain that integrates the ecosystems of the sea, river and forest. The nominated site is an outstanding example that represents the mechanism and importance of such integrated ecosystems, and therefore fulfills criterion (ii).

Criterion (iii)

The nominated site has a range of natural landscapes that vary with each season. In winter, the sea changes her face dramatically. The blue ocean can change into a white ice field overnight, or soft flakes of floating ice turned into a vast solid ice field, and vice versa. On land, there are bands of different vegetation from the coastal vegetation on the shore to the mountain peaks. In autumn, the forest becomes a colorful mosaic of changing deciduous broad-leaved trees interspersed with evergreen conifers.

Along the unique and scenic coastline, there are sea cliffs and curious rock formations that are the result of volcanic activities, erosion by sea ice and other factors. Over the extensive passage of time from prehistoric days to today, sea cliffs of rare beauty more than 100 meters high have been created by waves and sea ice erosion. Curious rock formations created by uneven erosion form a unique coastline. The Ainu

Shiretoko-goko lakes and Shiretoko mountain range photo by MACHIDA Yasuyoshi

The beautiful colors of the leaves of the Shiretoko mountain range photo by ISII Eiji

people who once inhabited the nominated site made use of these rocks as landmarks while they fished on boats. The rocks were also used as places to pray to their gods for good catches and safety. As a result, many Ainu place names still remain for these locations.

Another natural attraction of the nominated site is the opportunity to view various species of wildlife throughout the year. For example, seals and other marine mammals can be observed when the sea is covered with ice. In summer, many colonies of seabirds can be observed on the sea cliffs. In autumn, visitors can watch schools of salmon and trout swimming upstream and the brown bears that catch them.

Mt. Iou extrudes large amounts of highly pure molten sulfur and unique natural phenomena have been observed there. Since the 1800s, there have been at least four eruptions and the most recent one was in 1936. Although there have been no eruptions since then, various volcanic activities such as fumaroles and hot springs can still be observed and the former sulfur-mining site is a historic relic of those days.

Accordingly, the nominated site is an area of incomparable natural beauty and therefore, meets criterion (iii).

Alpine meadow on Mt.Iou: *Primula cuneifolia* and *Geum pentapetalum*
photo by Ministry of the Environment

Criterion (iv)

The Shiretoko Peninsula juts out into the Sea of Okhotsk and the Shiretoko mountain range runs along the center of the peninsula. This results in differences in precipitation and temperature between the east and west sides of the peninsula that create a diverse range of natural environments within the nominated site. From the coastline to the mountain peaks 1,600 meters high, there is a clear vertical distribution of plants ranging through coastal vegetation, mixed forest, Erman's birch *Betula ermanii* forest to Japanese stone pine *Pinus pumila* zone – all of which are habitats and breeding grounds for many types of wildlife.

For example, Shiretoko has one of the highest population densities of brown bears in the world. Brown bears feed upon herbaceous plants growing on the coastal slopes in spring and upon tall herbaceous plants and ants in summer. In autumn, they consume the bounty of the forest including nuts such as acorns and seeds of Japanese stone pine. The bountiful sea is also another important food source during this season as the bears catch the salmon and trout that swim upstream to spawn. There are more than 90 varieties of food items for the bears. This is more than double the 40 varieties available for the inland brown bear of North America. These diverse food resources as well as diverse habitats support their high density.

There are many species of birds inhabiting the coastal area of the nominated site. The well-developed sea cliffs on the Sea of Okhotsk side of the peninsula are covered with colonies of seabirds. In particular, the number of Japanese cormorant *Phalacrocorax capillatus* nests has been known to reach 690, which is one of the largest in the Far East. The nominated site is also an important stopover point for migratory birds and several thousands of short-tailed shearwaters can be seen during migration.

Further, although Shiretoko is geographically located in the temperate zone, the sea is seasonally covered by ice and this peculiarity results in a unique coexistence of northern and southern species.

Among the terrestrial flora, the alpine flora is mainly based on northern species that arrived via the Kuril Islands or Sakhalin during the ice age. But the forest flora consists primarily of southern species such as Katsura tree *Cercidiphyllum japonicum* (LR, IUCN Red List). Terrestrial mammals include northern species such as the brown bear and southern species such as the sika deer.

The marine ecosystem around Shiretoko also contains both northern and southern species due to the warm Soya Current in the summer and the cold East Sakhalin Current in the winter. For example, there are various southern as well as northern species of seaweed. The marine fishes consist mainly of northern species such as halibut *Hippoglossus stenolepis* and wolffish *Anarhichas orientalis*; however, there are a number of southern species typical of tropical and subtropical oceans such as balloon porcupinefish *Diodon holocanthus*, striped beakperch *Oplegnathus fasciatus* and ocean sunfish *Mola mola*. Therefore, the marine fauna and flora of Shiretoko is unique among those in the Sea of Okhotsk.

Shiretoko is an essential breeding and/or wintering habitats for a number of globally threatened bird species.

The Blakiston's fish-owl is one of the largest owls in the world. For a subspecies of Blakiston's fish-owl, *Ketupa blakistoni blakistoni*, Shiretoko is an essential breeding site. There are only some 200 individuals of this subspecies in the world and more than half of the total population is found in the Hokkaido area around the Shiretoko Peninsula. The virgin forest of Shiretoko provides giant trees with cavities that serve as nesting places, and this forest and river habitat of Shiretoko ensures the survival of *Ketupa blakistoni blakistoni*.

Blakiston's fish-owl *Ketupa blakistoni blakistoni*
photo by ISII Eiji

Having a limited distribution, the Steller's sea eagle is an internationally threatened species with a global population of approximately 5,000. More than 2,000 Steller's sea eagles winter at the Shiretoko Peninsula where the nominated site locates. The Shiretoko Peninsula is the largest wintering site for Steller's sea eagles, large enough to enable more than half of the global population to pass the severe winters.

Recently, breeding behavior and juvenile birds of long-billed murrelet *Brachyramphus marmoratus perdix*, a subspecies of marbled murrelet *B. marmoratus* (VU, IUCN Red List), have been observed at the nominated site, which suggests that the bird is now breeding in this area. This species usually spends its life on the ocean but nests in the treetops of tall inland forests. The breeding of this species is a good indicator of the well-maintained forests as well as marine environment. There have only been sparse reports of its breeding sites in Sakhalin and Kuril Islands and it is assumed that the total population is declining. Therefore, it is highly probable that the well-protected virgin forest in Shiretoko is a precious breeding site for this species.

Steller's sea eagle *Haliaeetus pelagicus* photo by Ministry of the Environment

Returning salmon photo by Ministry of the Environment

Therefore, the nominated site contains the most important and significant natural habitats for in-situ conservation of this biological diversity, and meets criterion (iv).

2d. Integrity

As described below, the nominated site fulfills the conditions of integrity (Operational Guidelines 44(b) (ii) to (vii)) for the inclusion of natural properties in the World Heritage List.

In the ocean surrounding the nominated site, the marine ecosystem reflects the characteristics of the seasonal sea ice and is highly productive. While on land from the coastline to the mountain peaks, there are bands of different vegetation covering the area and they are maintained in pristine condition. Many steep rivers play a key role in linking the marine and terrestrial ecosystems.

Although about half of the rivers in Shiretoko Peninsula have small dams along their flow, that are required to prevent the earth and sand from flowing down, only nine of 44 rivers (20.5%) in the nominated site, mainly along Rausu river, have artificial modification. The impact of these constructions on salmon is not clear yet, and is going to be investigated.

Each of the above ecosystems is an essential element of the whole integrated ecosystem processes linking the forest, river and sea. In addition, all of the protected terrestrial and marine ecosystems are of sufficient size (48,700 ha and 7,400 ha respectively) to ensure the long-term conservation of the ecosystem and the biological diversity they contain. The nominated site embraces all of the above areas and therefore, fulfills the condition of integrity 44 (b)(ii).

Approximately 90 percent of the terrestrial part of the nominated site is covered by natural vegetation and the site is essential in the long-term preservation of the aesthetic value of the Shiretoko Peninsula. Because the site includes ocean, coast, forest and mountains that are essential for maintaining the beauty of the Shiretoko Peninsula, it fulfills the condition of integrity 44(b)(iii).

The nominated site is an extremely important breeding site for the globally threatened Blakiston's fish-owl and white-tailed eagle as well as a wintering site for Steller's sea eagle. It is also a highly concentrated habitat and breeding sites for seabirds such as the Japanese cormorant and slaty-backed gull *Larus schistisagus*. Because of these characteristics, BirdLife International has identified Shiretoko as a candidate area for Important Bird Areas (IBA) of Asia, which is under preparation. In addition, the World Wild Fund for Nature (WWF) has recognized "Okhotsk Sea (Ecoregion 204)" which includes the nominated site as one of the richest North Temperate marine ecosystems in the world. It has been designated as one of the "Global 200", the global ranking of the Earth's most biologically outstanding habitats. These facts confirm that the nominated site contains habitats for maintaining the most diverse fauna and flora characteristic of the maritime North Pacific and therefore, the site fulfills the condition of integrity 44(b)(iv).

The terrestrial component of the nominated site is properly managed under plans such as the conservation plan for the Wilderness Area and the park plan for the National Park. The marine component of the site is managed under the park plan for the National Park, which controls large-scale developments in the area but allows sustainable fisheries activities.

To ensure adequate and efficient conservation and management of Shiretoko as well as sustainable use of some natural resources, a regional liaison committee was established in October 2003 for the purpose of facilitating co-ordination among multiple management agencies. The members of the committee are Ministry of the Environment, Forestry Agency, Hokkaido prefecture, Shari town and Rausu town, and fishermen's associations and tourism associations as observers. An integrated management plan for the nominated site was discussed in the committee, and was finalized in December 2003. Therefore, the nominated site fulfills the condition of integrity 44(b)(v).

Sea cliffs photo by Ministry of the Environment

The nominated site has adequate long-term protection through domestic legislation covering multiple protected areas (i.e. Onnebetsudake Wilderness Area, Shiretoko National Park, Shiretoko Forest Ecosystem Reserve and Shiretoko National Wildlife Protection Area). These protected areas fulfill the spatial requirements for the nominated site. Therefore, the nominated site fulfills the condition of integrity 44(b)(vi).

As described above, the nominated site contains an integrated ecosystem consisting of terrestrial, marine and river ecosystems and it is one of the most important sites for the conservation of the biological diversity of maritime temperate North Asia. Therefore, the site fulfills the condition of integrity 44(b)(vii).

Integrated ecosystem in *Shiretoko*