
WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

NATURAL SYSTEM OF WRANGEL ISLAND RESERVE (RUSSIAN FEDERATION) ID Nº 1023 Rev

Background note: The Natural System of Wrangel Island Reserve was nominated in 2000 under the name of "The Natural System of Wrangel Island Sanctuary". IUCN was able to evaluate this site in 2002 when climatic and logistical conditions were favourable to send a mission. In June 2002, just prior to the 27th session of the World Heritage Committee, the State Party withdrew this nomination to review issues associated with its boundaries, particularly in the marine area. A revised nomination document was submitted to the World Heritage Centre in February 2004. This revised nomination is essentially the same as the one proposed in 2000, thus a second field mission was not considered required. However, the boundaries of the marine component of the nominated site have been revised, including only 12 nautical miles of protected marine zone around the islands, and not 24 nautical miles as proposed in the original nomination. This evaluation report considers both the information provided in the original nomination and in the revised nomination submitted in 2004.

1. DOCUMENTATION

- i) **IUCN/WCMC Data Sheet:** 8 references
- ii) **Additional Literature Consulted:** Arctic Council (CAFF - Conservation of Arctic Flora and Fauna Working Group). 2001. **Arctic Flora and Fauna: Status and Conservation;** Talbot, S. Yurtsev, B. Murray, D. Argus, G. Bay, C. Elvebakk, A. 1999. **Atlas of Rare Endemic Vascular Plants of the Arctic.** CAFF Technical Report No. 3; Stishow, M. 2001. **Wrangel Island, the Arctic Enigma.** in Russian Conservation News, No. 25, Centre for Russian Nature Conservation; Beringia Conservation Programme (Anchorage) and WWF-US. (no date) **The Bering Sea Ecoregion.** Washington; Tishkov, A. J. Pagnan, *et al*, 2002. **A Review of Projects Concerning Biodiversity Conservation and the Use of Biological Resources in the Russian Arctic** (in prep.), UNEP and CAFF; Tishkov, A. J. Pagnan, *et al*, 2002. **A Data Base of Ecological Projects in the Russian Arctic** (in prep.) UNEP and CAFF; Pagnan, J., Legare, G. 2002. **Protected Areas of the Arctic: Conserving a Full Range of Values.** CAFF; OGP with Introduction and Environmental Overview by J. Pagnan. 2002. **Arctic Guidelines for Offshore Oil and Gas Exploration and Production.** International Arctic Research Policy Committee of USA. **Artic Research,** Volume 16, Spring/Summer 2002.
- iii) **Consultations:** 4 external reviewers. Various Government officials from the Ministry of Natural Resources in Moscow; the district administrator of the Chukotka Autonomous Area; Various staff and specialists of the Wrangel Island Zapovednik; staff from the UNESCO Moscow Office and IUCN office for Russia and the Commonwealth of Independent States.
- iv) **Field Visit:** Jeanne Pagnan and Alexei Blagovidov, July/August 2002.

2. SUMMARY OF NATURAL VALUES

2.1 Geographical Location

The Natural System of Wrangel Island Reserve is made up of Wrangel Island (7608.7 km^2), Herald Island¹ (11.3 km^2) and a marine area ($11,543 \text{ km}^2$) that comprises 12 nautical miles around each island, for a total area of $19,163 \text{ km}^2$. The Islands are located well above the

¹ sometimes written as Gerald Island due to the difference between the Russian and English alphabets

Arctic Circle at 70° N and are surrounded by the East Siberian Sea to the north and west and the Chuckchi Sea to the south and east. They lie 140 km off the northeast coast of the Chukotka mainland. Herald Island lies within the western hemisphere at 175° W whereas Wrangel Island, located from 178° E to 177° W, straddles the 180° meridian and both eastern and western hemispheres. The 180° meridian is marked only by a small pile of rocks on a hill. There is no signage.

2.2 Physical Features

Wrangel Island is mountainous with old, weathered ranges, concentrated in the lower half of the island and generally running in an east-west direction. The central "hump" is jagged and quite high (over 1000m) but gradually resolves into smoother, lower formations towards the coasts ending in the Western and Eastern Plateaux, the extensive low-lying plains of the Tundra Academy in the north and the less expansive tundra plains along the south coast. There is a variety of metamorphic, sedimentary, and shale-type rocks, with some igneous rocks indicating volcanic activity. There are also diverse geological features, including the conical, volcanic-shaped Tundra Mountain in the north, the jagged peaks of the central ridge, the softly silhouetted and heavily eroded mountains of the Mammoth range, the shale formations in the south-west and along the Unexpected River, the crumbling dun-coloured precipices of the Tundra River valley, and the fort-like sand and rust coloured structures of the north slopes. The variety and multiple-hues of these features in a relatively small geographic area, interspersed with an extensive network of valleys and river basins, is visual evidence of the island's long geological history, uninterrupted by glaciation, and is aesthetically both unusual and impressive.

The hydrographic network of Wrangel Island consists of approximately 1,400 rivers over 1km in length; five rivers over 50km long; and approximately 900 shallow lakes, mostly located in the northern portion of Wrangel Island with a total surface area of 80km². The waters of the East Siberian Sea and the Sea of Chukchi surrounding Wrangel and Herald Islands are classified as a separate chemical oceanographic region. These waters have among the lowest levels of salinity in the Arctic basin as well as a very high oxygen content and increased biogenic elements.

The terrain is not striated, which is further evidence that it was not glaciated during the most recent Quaternary Ice Age , thus confirming its uniqueness in the high Arctic. The ground is underlain with permafrost and a mosaic of tundra and steppe types co-exist in quilt-like patterns. Tundra types range from fields of dry, sparsely vegetated, rounded or shorn hummocks, (indicating an old ocean bottom), mossy hillocks, sheltered meadows with dwarf willows growing over 1 metre high, lush grasslands, numerous wet and marshy areas interspersed with tundra-ponds, various lichen dominated complexes and sections of dry, polar desert with flat, hard-packed soils and gravel.

2.3 Climate

Wrangel Island is influenced by both the Arctic and Pacific air masses. One consequence is the predominance of high winds. The Island is subjected to "cyclonic" episodes characterised by rapid circular winds. It is also an island of mists and fogs.

Average temperatures appear to be rising on Wrangel Island, extreme weather episodes have been increasing and summers are getting wetter. These observations are consistent with findings in other parts of the Arctic and are indicative of an overall Arctic warming trend. Weather conditions on Wrangel are highly variable from one location to another but are only monitored at the meteorological station at Ushakovskoe Village due to a lack of monitoring equipment to expand the meteorological network to other parts of the Reserve.

There are noticeable differences in climate between the northern, central and southern parts of the Island. The central and southern portion is warmer, with some of the valleys having semi-continental climates that support a number sub-Arctic steppe-like meadow species. This is a unique feature in the High Arctic.

According to research reports over the past several years, ice around Wrangel Island has been melting earlier in the spring and the autumn freeze-up has been occurring later. The

number of ice-free years has also been increasing each decade. The warming trend is expected to cause hardship for two of Wrangel Island's most noted species - polar bears, which travel on ice in search of prey seals, and walrus, which depend on ice as platforms to dive for molluscs, their main food. More intensive monitoring is needed to detect impacts of these ice changes to the marine environment of the site.

2.4 Biodiversity

The variety of terrain types offers a range of habitats which accounts, in part, for the higher diversity of plants and animals on Wrangel Island than in most other parts of the Arctic. Other reasons are its history and location. Wrangel Island is a vestigial part of the ancient Bering continent present during the Pleistocene era and was not glaciated during the Quaternary Ice Age. It served as a refuge for Pleistocene species, and remnant species not present elsewhere are still to be found on Wrangel. Another reason is that Wrangel Island is on the intersection of two major continental systems – Asia and North America -and has species from both.

While Wrangel Island approaches a typical tundra region, its flora is unique in terms of its species richness and number of endemic plants. Currently, 417 species and sub-species of vascular plants have been identified on the island, more than the entire Canadian Archipelago and double that of any other arctic tundra territory of comparable size. Some species are derivative of widespread continental forms, others are the result of recent hybridization and 23 are endemic. This is unmatched by any other Arctic island.

Pervailing flora include mustard, rose, buttercup and saxifrage families. Flowering plant species include pink dryads *Dryas punctata*, pasqueflowers *Pulsatilla nuttalliana*, Castillea flowers *Castilleja elegans*, and yellow poppies *Papaver* spp. There are 17 species of Arctic poppies on Wrangel Island, five of which are endemic to the island, including *Papaver gorodkovii* and *P. lapponicum*. Additionally, 331 moss species and 310 lichen species have been identified on Wrangel Island.

The island is the northernmost destination for over a hundred migratory bird and marine mammal species from both Asia and North America. Gray whales and dolphins are present. Birds are plentiful, including various shorebirds (dunlin, Common snipe, Lesser golden and Black-bellied plovers, pectoral sandpipers, red knots, and ruddy turnstones), geese, including both Snow geese and Brent geese, Snowy owls, Eider ducks, Long-tailed and Pomarine skuas (jaegers), Black, Common and Thick-billed guillemots, Glaucous gulls and kittiwakes, Sabine's gulls, Lapland longspurs, Snow buntings, White wagtails, Peregrine falcons and Gyrfalcons.

Lemming burrows are easily observed throughout the island. Both the collared and the Siberian lemmings are present and they may have evolved into separate sub-species due to their isolation, but this has not yet confirmed by scientific studies. Lemmings are the staple diet for Snowy owls, other raptors and for arctic foxes. Unlike their mainland cousins, the lemming populations on Wrangel do not experience the same fluctuating "boom/bust" population cycles; while there are cyclical declines and increases, they are far less dramatic.

According to palaeontological evidence, muskoxen and reindeer inhabited the island in the late Pleistocene and even later, but have since disappeared. Muskoxen were introduced from Canada during the 1970's and continue to inhabit the island. Reindeer were brought to Wrangel Island in the 1940's to establish a domestic reindeer industry. That practice resulted in severe localised overgrazing, destruction of ancient nesting areas and disruption of the ecological balance. There are differing opinions on whether these two ungulate species are at or beyond the carrying capacity of the island and various options on how to maintain a balance on the populations have been proposed.

The wolf is the natural predator and a small pack used to inhabit the island until the federal government ordered its destruction some years ago to favour the fledgling reindeer herding industry, now abandoned. Since this natural ecological balance was destroyed, questions facing the reserve management are whether to re-introduce wolves, to allow themselves to re-establish themselves naturally (by ice from the mainland) or whether to use some other means of intervention to keep the large ungulate populations in balance. Staff reported that

they are concerned about the negative reaction to wolf re-introduction, since it is still generally a reviled animal in many circles, despite its important ecological role and benefits.

3. COMPARISONS WITH OTHER AREAS

Udvardy (1975) classifies the Wrangel Island complex as High Arctic Tundra of the Eastern Palearctic realm. There are no other High Arctic Tundra natural World Heritage sites at present. In fact, in the existing World Heritage List, tundra and polar systems are the least common biomes.

It is, therefore, necessary to compare this site to other protected areas in the Arctic region. For the purpose of this analysis, the definition of the Arctic accepted by the Arctic Council and by IUCN in its Arctic Strategy has been applied. It divides the Arctic into four broad zones: marine; Arctic desert; tundra; and the transition timberline forest, or “forest-tundra” zone, although there are some differences among specialists as to how each zone is delineated. Since, in total, the Arctic region covers nearly 30 million km² with over 400 protected areas, this analysis is restricted to a comparison with 12 other Arctic Islands and island complexes within the marine zone, which itself encompasses nearly 15 million km².

Of the 13 Arctic islands reviewed, 11 have some level of formal protection and there are approximately 30 protected areas. Some islands such as Wrangel, the New Siberian Islands and Franz Joseph Land are over 95% protected (as IUCN Management Category I). Others such as Severnya Zemlya or Novya Zemlya have no protected areas. Of all the islands and their protected areas, Wrangel has the highest terrestrial and marine biodiversity and productivity. Summary details are provided below.

Marine Biodiversity: There is insufficient readily available data to compare the level of marine productivity and zooplankton biomass at Wrangel with all other Arctic islands. However, based on other parameters such as the high numbers of marine-dependant species, it is reasonable to conclude that other than Iceland and the Aleutians, Wrangel marine productivity and biomass exceeds all other Arctic islands with the possible exception of some coastal areas of Greenland. There is, however, insufficient data and research on the benthic environment of the Arctic islands to do a comparative analysis.

Six marine species were surveyed among the Arctic islands: Arctic charr, Bearded seal, Narwhal, Pacific walrus, Gray whale and polar bear. Of these six, five are found at Wrangel Island, the highest number at any island. Polar bears breed on ten islands, with Wrangel and Svalbard having the highest density. However, Wrangel has a far higher number of dens than Svalbard. Their breeding grounds are fully protected within protected areas on Wrangel and parts of Svalbard, but are not on Novya Zemlya or on some Canadian Islands. The Pacific walrus is found on six Arctic islands but the largest haulouts are at Wrangel, where they are fully protected. They are also protected on Svalbard, the New Siberian Islands and Franz Joseph Land but not on Novya Zemlya or Severnya Zemlya.

Terrestrial Biodiversity: Arctic land is classified according to vegetation zones and there are several systems in use. There is a strong correlation between the vegetation zonal classification and productivity. Within the various systems, only Iceland and the Aleutians have higher primary productivity than Wrangel because they both lie within more productive zones. In terms of vegetation, Wrangel is classified either as exclusively Arctic Tundra, Southern Variant, (an anomaly among the Arctic islands), or entirely Arctic desert with more than 5% biomass. Only the New Siberian Islands also fall into this latter category but they are not protected. This classification distinguishes it from Canada's Arctic islands which are classified as Arctic desert but having less than 5% biomass.

Studies have been carried out on the Arctic's rare endemic vascular plants found on only six of the islands. These rare plants occur in the highest density relative to size on Wrangel. Two islands – Wrangel and the Aleutians - have species found only on those islands. There are 21 species occurring only on Wrangel Island whereas four occur only on the Aleutians. All rare endemic vascular plant species on Wrangel are fully protected within a Category I strict nature reserve. Rare plants are also protected on the Aleutians in a Category IV protected

area. However, the rare endemic plants located on other Arctic islands fall primarily outside protected areas, especially those on Svalbard, Greenland and Ellesmere Island.

11 species of terrestrial fauna with wide Arctic distribution were surveyed for their presence on the Arctic islands. The species were Common, King and Steller's eiders, Thick-billed and Common Murre (or Guillemot), Collared and Siberian Lemming, Snow goose, Tundra reindeer, Muskoxen and Wolf. Of the 11 terrestrial fauna species surveyed, ten are found on Wrangel Island, the highest number of any Arctic island or complex. Only the King eider is not found on Wrangel. Wrangel is also the only island where both the Collared Lemming (*Groenlandicus*) and the Siberian Lemming are found. All other islands have either one or the other but not both. Wrangel is also the only Arctic island with an Asian population of the Snow Goose.

4. INTEGRITY

4.1 Boundaries

As noted above, the proposed World Heritage site, including the marine component, is under federal jurisdiction, although there is a "work-sharing" agreement with the Chukot Autonomous Area (or Okrug). The village of Ushakovskoe, (with two resident families, several border guards and eight polar station staff), a section of the surrounding land and the marine zone between the Khistchnikov River and Cape Hawaii are outside the boundaries of the nominated site and reserve and do not come under its strict provisions, including access. However, entry is controlled by a system of permits and enforced by the resident border guards.

4.2 Legal Status

The nominated site is federal property under the Ministry of Natural Resources. Under the Russian system of protected areas, the nominated site, including its terrestrial and marine component, is classified as a "Zapovednik" (IUCN Category Ia, Strict Nature Reserve). This accords it the highest level of protection and excludes practically all human activity other than for scientific purposes. The Zapovednik was established in 1976 as the Wrangel Island State Sanctuary by the State Planning Department of the USSR. At that time all buildings, structures and the reindeer herd were transferred from the Zapovednik by the Ministry of Agriculture. To provide better protection for marine mammals, and following a joint proposal by the Governor of the Chukot Autonomous Region and the State Committee for the Environment, the Reserve was extended to the Territorial Sea (out to the 12 nautical mile limit) in 1997 by federal Decree. In 1999, the Government of the Chukot Autonomous Region recommended a further 24 nautical mile extension to the marine component of the reserve; however this proposal has not been approved at the Federal level.

4.3 Management

In July, 1997, the State Committee for Environmental Protection for the Government of the Russian Federation entered into an Agreement on protected areas with the Administration of the Chukot Autonomous Area (CAA). This delegated much of the authority for the administration of protected areas (including the Wrangel State Nature Reserve) to the CAA. In accordance with that agreement, the CAA is responsible for day-to-day operations of the nominated site, administration of non-Reserve territory, participation in the selection of the Reserve Director, protection of the marine area and enforcement of the marine regulations.

Although the Zapovednik or Reserve has annual work plans, there is no comprehensive management plan for the site. The lack of long-term management planning for the Reserve is not unusual in Russia. In fact, management planning is a relatively new concept in the country and one that needs to be nurtured. Some management tools are in place. In 1992, the Reserve authorities issued: "Rules of Behaviour" for the Reserve, covering waste disposal and including prohibitions and guidelines for the protection of the polar bear, walrus, Arctic fox, lemmings, Snowy owl and other tundra birds. There is no guidance given for the protection of the flora, geological formations or cultural values. In 1997, the Federal authorities approved a set of provisions for the Reserve that describe its functions and the

roles and responsibilities of the staff and scientists. There are strict regulations concerning the marine zone where, for example, shipping is not permitted.

The staff working at the nominated site are federal employees. The senior management team consists of the Director of the Reserve appointed by the Ministry of Natural Resources and the Senior Scientist, appointed by the Director. There are approximately 27 full- and part-time Reserve staff consisting of a core of 8 full-time scientists specialising in Snowy owl, lemmings, Snow geese, ungulates, polar bear, walrus, veterinary science and archaeology, 7 technical staff, 4 rangers, and 8 administrative staff. The rangers reside full-time on Wrangel Island and carry out various tasks, including monitoring, site maintenance and maintaining a watch over the island's permanent settlement. The core staff is supplemented by a number of experts from Moscow and St. Petersburg who carry out research in hydrology, meteorology, geology, botany, palaeontology and marine mammals. The Reserve also brings in university students and scientific expeditions from time to time. There is no human resource plan for the site.

The Reserve has few vehicles, often in poor condition. The staff lacks good repair kits and replacement parts, including tyres. Vehicle and communications breakdowns are a constant challenge and create serious safety concerns at the site. The Reserve also lacks adequate technical communication facilities. Communication on, to and from the island is limited and by radio signal, when conditions permit. There is also a serious problem with management communications with the Reserve's Headquarters in Moscow. The Reserve is not only physically remote, but also quite isolated from federal authorities. This situation poses additional problems for management and coordination.

The Reserve is dependent on oil and generators for all its energy. This is extremely expensive, produces noise and air pollution and supplies cannot always be guaranteed. The Reserve staff stated that wind energy and solar powered energy cells would be a better alternative but they lack adequate funds to implement these options.

Tourism is primarily by cruise ship and subject to permits, as well as strict regulations and access criteria. Ships pull into the island and disembark passengers who roam along the shores outside the Reserve but do not enter the Reserve itself. Tourism into the Reserve is tightly controlled and includes scientific expeditions led by Reserve staff. They are a source of revenue for the Reserve and a means of promoting the Reserve's values. The facilities on the island are primitive and should the island be opened up to more visitation, facilities would have to be upgraded and great care taken to avoid disturbing the wildlife which are especially vulnerable to noise and human disturbance of any kind.

4.4 Research and Monitoring

The Senior Scientist has overall responsibility for the research and monitoring programme of the Reserve. As is the case with Russia's other Nature Reserves, research is a priority on Wrangel Island and there are currently three ongoing research programmes focused on the species for which the island provides unique habitat: Snowy owls, polar bears and Snow geese. For these species there are long data time series available. Work on other species and environmental factors are spotty and very much depend on visiting experts and their interests. For example, there is neither ongoing benthic research nor plans for any, and there has been no vegetation research or monitoring during the past two seasons. One of the reasons is that funding is very limited and the priority has been to keep the Reserve functioning rather than invest in new types of research.

The Reserve could be an important "weather vane" for climate change and to detect environmental changes and adaptations. However, climate is not monitored consistently due, in part, to the lack of automated weather monitoring equipment. There is currently no long-term monitoring plan and it is imperative that both the research and monitoring at the Reserve be improved, be more comprehensive and up to date and be maintained at high quality. The lack of comprehensive research and monitoring plans contribute to the weakness in the Reserve management programme. The Reserve monitoring programme should also be better linked to other Arctic programmes such as the circumpolar caribou/reindeer monitoring programme and migratory marine mammal monitoring in North America.

4.5 Threats and Human Impacts

According to the Reserve staff and federal authorities in Moscow, the polar station and village of Ushakovskoe with its surrounding non-Reserve buffer zone lying just outside the Reserve poses the greatest immediate threat to the Reserve. There has already been damage and the potential for more serious disturbance to the island's ecosystem and wildlife is very real. For instance, the staff at the polar station are rotational and their behaviour is not always sensitive to the vulnerabilities of the island. The Reserve rangers currently spend much of their time observing the activities at Ushakovskoe to minimise environmental damage. There are plans to close down the polar station and to move non-reserve residents off the island.

Enforcement is the main problem since the Reserve has no patrol boats and the Chukot administration enforcement capability is limited, thus unauthorised hunting and poaching is always a serious threat. Other existing or potential threats to the Reserve include activities on the Chukot mainland such as oil slicks from ice-breakers and trawlers, tourism, industrial development on the mainland and the resulting pollution especially from coal burning, chronic lack of funding, lack of adequate technical and communications equipment and weak management systems and planning.

In June 1994, Russia and the United States signed a Memorandum of Understanding for a joint oil and gas lease sale in the Chukchi Sea. The proposed lease sale area came within a short distance of Wrangel Island and surrounded Herald Island. According to federal authorities, the agreement and proposed lease sale have been cancelled. Nevertheless, the situation could change if Russia amends its policy on oil and gas exploration and exploitation. Therefore, should drilling occur in the Chukchi Sea in the future, it needs to be subject to very stringent regulations to protect the Reserve and wildlife migratory routes.

Present day human impact in the Reserve is minimal. The most serious human impacts occurred during the period of settlement prior to the establishment of the Reserve in 1976 and the signs are still visible and will remain so given the climate. During that time, all-terrain vehicles were used indiscriminately and their tracks and a few broken down vehicles are still present on parts of the tundra. The policy now is to use existing tracks and not make new ones. The earlier presence of about 100 residents in Doubtful village and at the neighbouring air strip caused great disturbance to the wildlife and terrain from, for example, noise, pollution, motorised vehicles and hunting pressure. Walrus disappeared from their traditional haul-out on Doubtful Spit during the time the village was inhabited but have recently begun hauling out again and up to 70,000 walrus now use the site.

Another impact has been debris, especially discarded oil drums, used to import the island's main energy supply. Most have now been cleared from the tundra in an ongoing clean-up programme and have been stockpiled near research stations to await removal. The current policy is to remove a drum for every one brought in. There is some unsightly debris and abandoned construction material around Doubtful and the airstrip but it poses no real problem. The Reserve is considering how to clean up the area while preserving the deserted site for its cultural values.

By far the most serious and pervasive human impact has been domestic reindeer herding which caused severe damage to the vegetation and nesting areas, especially Snow geese, which are making a slow recovery now that the herding industry has been closed down. Deserted reindeer herder shacks are now used as research stations and stopovers for reserve staff and expeditions.

A potential threat to the site is associated to an influx of too many people to the island or opening it to activities such as hunting as a means of getting additional funds. Its vulnerable wildlife are already at the upper limits of their species ranges and are unable to compete with high-powered rifles, indiscriminate use of all-terrain vehicles or the disruptive noise and bustle that accompanies most human activity.

5. ADDITIONAL INFORMATION

The nominated site has important palaeontological values. Wrangel Island was home to the last mammoths and according to the staff, tusks and skulls are regularly washed up in river basins. Staff also reported finds of the primeval bison, Prjesalski's horse, the furry rhinoceros and other species. According to the staff, there is palaeontological evidence of a large lake over 100,000 years ago near the Tundra Mountain which would provide an historical incentive for the present-day abundance of Snow geese in the area. Bones left by ancient palaeoeskimo hunters about 2400 years ago can still be observed on the island, as well as bones left in distinctive patterns by native hunters earlier this century.

It is also important to note the cultural values associated to this site. These include a palaeoeskimo site as well as several small deserted reindeer herder's settlements with artefacts intact, and also the deserted village and airfield of Doubtful in which many houses and buildings with all the previous inhabitants' personal belongings, including hand-written letters, books and other objects, are well preserved and quite undisturbed. They tell an interesting story about the inhabitants themselves and their efforts to settle in a remote and very challenging environment. Another interesting aspect of the island's cultural history is that it served as the refuge for the survivors of the great Canadian Arctic Expedition of 1914 and the harrowing journey by their leader, Robert Bartlett, to procure a rescue ship – the *King and Winge*.

6. APPLICATION OF WORLD HERITAGE CRITERIA

The Natural System of Wrangel Island Reserve has been nominated on the basis of natural criteria (ii) and (iv).

Criterion (ii): Ecological process

The nominated site is a self-contained island ecosystem and there is ample evidence that it has undergone a long evolutionary process uninterrupted by the glaciation that swept most other parts of the Arctic during the Quaternary period. The number and type of endemic plant species, the diversity within plant communities, the rapid succession and mosaic of tundra types, the presence of relatively recent mammoth tusks and skulls, the range of terrain types and geological formations in the small geographic space are all visible evidence of Wrangel's rich natural history and its unique evolutionary status within the Arctic. Furthermore, the process is continuing as can be observed in, for example, the unusually high densities and distinct behaviours of the Wrangel lemming populations in comparison with other Arctic populations or in the physical adaptations of the Wrangel Island reindeers, where they may now have evolved into a separate population from their mainland cousins. Species interaction strategies are highly-honed and on display throughout the island, especially near Snowy owl nests which act as protectorates for other species and beacons for migratory species and around fox dens. IUCN considers that the nominated site meets this criterion.

Criterion (iv): Biodiversity and threatened species

The nominated site has the highest level of biodiversity in the high Arctic. Wrangel Island is the breeding habitat of Asia's only Snow goose population which is slowly making a recovery from catastrophically low levels. The marine environment is an increasingly important feeding ground for the Gray whale migrating from Mexico (some from another World Heritage site, the Whale Sanctuary of El Vizcaino). The islands have the largest sea-bird colonies on the Chukchi Sea, are the northernmost nesting grounds for over 100 migratory bird species including several that are endangered such as the Peregrine falcon, have significant populations of resident tundra bird species interspersed with migratory Arctic and non-Arctic species and have the world's highest density of ancestral polar bear dens. Wrangel Island boasts the largest population of Pacific walrus with up to 100,000 animals congregating at any given time at one of the island's important coastal rookeries. Since Wrangel Island contains a high diversity of habitats and climates and conditions vary considerably from one location to another, total reproductive failure of a species in any given year is practically unheard of.

Given the relatively small size of the area, this is very unusual in the high Arctic. IUCN considers that the nominated site meets this criterion.

7. RECOMMENDATIONS

IUCN recommends that the Committee **inscribe** the Natural System of Wrangel Island Reserve on the World Heritage List under natural criteria (ii) and (iv).

The Committee may wish to recommend the State Party to urgently prepare a management plan and implementation strategy, supported by adequate financial resources, that incorporates *inter alia*: technical and management communications; a tourism and visitor strategy; options for alternative energy supply; transportation; a monitoring and research programme; options to preserve the site's cultural and palaeontological features; a human resources policy for the staff working at the site; and a plan to remove unwanted debris from Doubtful Village. The Committee may wish to encourage the State Party to submit, if it wishes to do so, an international technical assistance request to help undertake the actions proposed above. The Committee is advised to request the State Party to invite a mission in 2-3 years time to report on the status of the management plan and to review its implementation.

Finally the Committee may wish to encourage the State Party to consider the possibility of extending the marine component of this site a further 12 nautical miles as proposed in 1999 by the Government of the Chukot Autonomous Region. This extension would add significantly to the protection of the marine biodiversity of the Wrangel Island Reserve.