WETLANDS IN RUSSIA

Volume 4
Wetlands in Northeastern Russia

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Foreword

Inland wetlands and water bodies, together with the marine littoral zone, constitute a key type of natural ecosystems in Russia, and perform a multifunctional role in biospheric processes and in human life.

Adequate protection of wetland ecosystems is indispensable for supplying pure water, maintaining a healthy environment, obtaining necessary biological products, and conserving biodiversity.

Russian wetlands are protected under several federal laws – "On Environmental Protection", "On Wildlife Conservation", "On Specially Protected Natural Areas", "On Environmental Impact Assessment" – as well as the Water and Forest Codes.

The current situation in Russia is characterized by poor implementation of existing laws, including those on wetland conservation. Those wetlands designated as being of international importance under the Ramsar Convention are in a somewhat better position. In 35 Russian wetlands awarded Ramsar status (total area 10.3 million ha), human activities are regulated by relevant legal documents adopted by the regional administrations. Certain Ramsar sites encompass nature reserves and sanctuaries, which gives rise to a comprehensive system of protected natural areas.

As current experience demonstrates, the designation of a wetland as a Ramsar site is in itself an advantage and has a positive effect. It serves to psychologically motivate decision makers, business circles, and the general public to search for a reasonable compromise that would reconcile the interests of economic development of a given territory and the conservation of its natural ecosystems. According to Article 97 of the pending new Land Code, valuable wetlands are regarded as "lands allotted for the protection of nature" and both strong constraints may be imposed on any activity likely to disturb their environment and incentives introduced to encourage their sustainable development.

There is little doubt that further extension of the network of wetland areas protected under the Ramsar Convention would promote the environmental safety of the country. In its turn, a sound approach to achieving this goal should be based on an inventory of the wetlands and an assessment of their value. Such information allows individual sites to be ranked in terms of international, national, and regional importance and provides a basis for their designation on the Ramsar List.

The inventory of wetlands in Russia little by little takes on the form of a programmed activity. Three volumes of the "*Wetlands in Russia*" series were issued within a short time span – 1998-2000 – to summarize available data on the current state of wetlands of international importance and a large number of others that needed to be given the same status. Regionalizing the territory of the country with regard to the location of its wetlands constitutes the common conceptual basis for their inventory and protection.

This fourth volume of the series marks a qualitatively new stage in the inventory, which is the preparation of detailed reports on the state of wetlands in different regions of the country, with this volume covering Northeastern Russia in particular.

The author is Alexander V. Andreev, who is a professor of biology and professional ecologist well-known both in this country and abroad. An analysis of information from a variety of sources, including satellite imagery, allowed him to highlight the current status of wetlands located in the study area, to identify the most valuable ones, and to conduct a thoroughly comprehensive inventory. Due to the work of A.V.Andreev and his co-workers, Northeastern Russia, which was formerly the least surveyed region of the country, has quickly become one whose natural features are well known and understood. The researchers deserve major credit for their efforts, especially when taking into consideration the severe natural conditions and inaccessibility of the area.

The information presented in this volume can be used by the regional administrations and environmental protection agencies in the managerial decision-making process and in particular in designating wetlands of international and regional importance.

It is hoped that this inventory report will provide a basis for regular study and detailed inventory of wetlands in other regions of Russia and publication of their results.

V.G.Krivenko

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Winner of the Ramsar Wetland Conservation Award

Introduction

The northeastern extremity of the Asian continent is predominantly a mountainous country. Its wetlands are situated in intermontane depressions and wide river valleys, maritime plains and seacoasts. The territory of the region extends for approximately 2,300 km from southwest to northeast along the axis of the Arctic-Pacific watershed and covers a total area of *c.* 1,300,000 km^2. It is bounded by mountains of the Verkhoynsk Range in the southwest and the marginal seas of the Arctic and Pacific Oceans in the north and east, with a 300 km gap formed by the intrusion of the Koryak Highlands. The region borders the vast Primorskaya Lowland of Yakutia in the west and northwest and the Kolyma Highlands and the northern coast of the Sea of Okhotsk in the south and southeast. The majority of this territory lies within the boundaries of two administrative regions of the Russian Federation, the Chukot Autonomous Area and the Magadan Region. Only the Lower Kolyma River is located in the Nizhnekolymsk District of the Republic of Sakha (Yakutia), while the Kolyma headwaters (the Kulu River) belong to the Khabarovsk Territory.

Because the warm Pacific currents have little effect on the mainland areas of northeastern Asia, they have a severe subarctic climate with mean annual temperatures below freezing and a predominance of permafrost, which only becomes more intermittent in the southern reaches of the region.

Centres of glaciation occurred in the mountains of northeastern Asia during the glacial periods, but they were never large nor did sheet glaciation develop as in western Eurasia and Canada. This accounts for the continuous evolution of East Asian biotas and the development of a few unique plant formations, such as phenomenally cold-resistant light-needle taiga forests, coastal stone birch forests, Beringian tundra with shrub pine tapestry, hypoarctic lacustrine-palustrine, and alass complexes. Beringia served as an area of exchange between the flora and fauna of the Old and New Worlds. The mountains of the Sea of Okhotsk catchment area harboured refugia of mesophilic floras and centres of cold-resistant plant speciation. Active mountain-forming processes were responsible for the highly irregular outline of the Far East seacoast formed by the alternation of extensive stretches of stone cliffs, vast beaches, gravel spits, inlets, and lagoons.

Similar to the entire cryolithozone of Siberia, the wetlands in the northern areas of the Russian Far East with their extensive estuaries, intertidal flats, and shallow sea inlets represent the most productive portions of the landscape suitable for establishing permanent settlements and temporary camps for fishermen and hunters. Such places have since long been used for this purpose and one can still uncover numerous archaeological remains of ancient dwellings and implements there. Even now the traditional economy and lifestyle of the indigenous peoples continue to be based on the use of the wetlands, and they prefer to settle near the mouths of rivers, narrow straits, sea spits, and lagoons.

The collection of wetland information was begun bearing in mind the paramount importance of these areas for the management and conservation of natural resources in the northern regions of the Russian Far East (Andrejew, 1988). This volume includes the results of field surveys conducted by the author at field research stations set up by the Institute of Biological Problems of the North (the Middle Omolon River, 1977; Lower Kolyma tundras, 1978-1986; Markovo, 1988; Ust-Chaun, 1988, etc.) and during expeditions to other regions of Northeastern Russia. In addition, materials published in departmental and local editions virtually inaccessible to the majority of readers are included. Much valuable data were provided by my colleagues from the Institute of Biological Problems of the North.

Materials for this volume have been collected since 1991, when the Wetlands of the Eastern Palaearctic scientific society was established (1991-1996). The work was supported by the Magadan Regional Committee for Nature Protection and (in 1994-1995) by a grant from the International Waterfowl and Wetlands Research Bureau (IWRB, renamed Wetlands International in 1997). The descriptions for four model sites were prepared during this period (Kolyma Delta, Avtotkul, Nakhatandzhinskaya Tundra, and Chukcha Lake), and a method was developed for producing electronic landscape maps. Black and white 1:1,000,000 satellite images served as the primary material, and a Land-6 software packet designed by D.V.Dobrynin and Yu.Plotnikov was used to analyze them.

In subsequent years, data on the wetlands of northeastern Asia were collected concurrently while conducting other field studies. This work was supported at various stages by the World Wide Fund for Nature (WWF) (1994: Babushkin Bay, Yamskiye Islands, preparation of materials for publication); the Japanese Association for Wild Geese Protection (JAWGP) (1992-1995: Avtotkul and Lower Chukochya River); the Deutsche Ornithologische Gesellschaft (DOG) (1995-1998: Nakhatandzhinskaya Tundra, Odyan Bay, Malkachan); grants from the Russian Academy of Sciences

(Program «Biodiversity») (1996-1997: Balygychan, Koni Peninsula); and grants from the Russian Foundation for Fundamental Research (1999: the Inya and Kava Rivers) and the Magadan Regional Committee for Nature Protection (1999: Talan Island, Motykleisky Bay).

When preparing the manuscript, the author took advantage of valuable advice and comments provided by I.A.Chereshnev and G.I.Atrashkevich (Chaun Bay landscapes, parasitary systems). I.V.Dorogoy prepared the basic materials concerning Nolde Bay, Uelen Lagoon, Koolen Lake, and Olskaya Lagoon and provided data on birds sighted in different parts of the Chukot Peninsula. M.B.Skopets kindly offered extensive information on fish biology in the Koolen', Ekityki, El'gytytkin, Chistoye, Jack London, Nyarka, and other lakes. K.V.Regel identified all collected sea and freshwater invertebrates and added many new data not found in the author's field journals. O.A.Mochalova presented valuable information on the flora of several sites of the Okhotsk Sea catchment. Contributors to the primary description of model areas include A.V.Krechmar and I.A.Zasypkina on the Kavinskaya Basin and A.V.Kondratyev, A.N.Reimers, D.V.Dobrynin, M.G.Khoreva, and E.Yu.Golubova on Avtotkul, the Nakhatandzhinskaya Tundra, the Kolyma Delta, and Talan Island. I.A.Chereshnev, G.I.Agaltsov, A.V.Alfimov, and S.V.Zadalsky proposed important amendments to the manuscript. The author is grateful to all his colleagues and sponsors for their assistance and support rendered during many years of work and preparation of the manuscript for publication.

GENERAL CHARACTERISTIC OF WETLANDS AND THEIR LOCATION IN NORTHERN ADMINISTRATIVE REGIONS OF THE RUSSIAN FAR EAST

For the purpose of describing the natural conditions of northern Asia, the western border of its "Extreme Northeast" is assumed to run across the Kolyma-Indigirka Interfluve. Being somewhat arbitrary, the choice of this boundary is nonetheless convenient for practical purposes. This line is easy to draw on the map since it actually coincides with the frontier between the Kolyma and Indigirka districts of Yakutia. In the north and east, the region being considered is naturally limited by the coastline of the marginal seas of the Arctic and Pacific Oceans. Its southeastern and southwestern boundaries are also arbitrary, following the administrative frontiers of the Koryak Autonomous Area and the Khabarovsk Territory respectively. The overwhelming majority of wetlands described in this volume lie within the bounds of Magadan Region and Chukot Autonomous Area. The exceptions are the Lower Kolyma River (Republic of Sakha) and the Upper Inya River (Khabarovsk Territory). These two regions harbour a few unique sites that have until recently been easier to reach from Magadan than from Yakutsk and Khabarovsk, which accounts for their inclusion in our study. Just the opposite, extensive areas covered with lakes and mires along the middle course of the Kolyma River are beyond the scope of this volume even though they appear to meet criteria applicable to other sites of interest. The problem is that the wetlands of the Kolyma-Indigirka Plain covering tens of thousands of square kilometres are very difficult of access and remain virtually unexplored except for a few small areas. This, therefore, precludes designating representative sites in the Verkhnekolymsky and Srednekolymsky districts of Yakutia, which remains a task for the future.

In accordance with the classification for wetlands adopted by the Contracting Parties of the Ramsar Convention, each site described below can be referred to in one of the categories listed in Table 1 (see next Section). However, it is more convenient to give the general characteristic of the wetlands of Northeastern Russia proceeding from the specific physical features of the individual areas. A total of seven large groups of wetlands can be singled out within the northeastern extremity of the Asian continent:

— *Lakes and wetlands in watershed areas.* The main interfluve of the Asian continent extends in an uneven line for thousands of kilometres from southwest to northeast. At its southern limit lies Lake Baikal, while Lake Koolen lies at its northern boundary. Intermontane depressions of the extreme northeastern portion of this area are occupied by a chain of sloping saddles, passes, glacial cirques, trough valleys, and fluvioglacial plains with wetlands fed from the headwaters of rivers flowing to the Arctic or Pacific Oceans. Wetlands on subsidiary watersheds are less common and smaller but nonetheless remain an integral element of the mountain landscape. Each individual site has a number of specific features, and large oligotrophic lakes support unique biotas. Usually, such sites are located in the subalpine belt some 1,000 m a.s.l. and surrounded by mountain tundra, scrubland or sparse taiga forest. Generally speaking, the watershed areas of northeastern Asia have a harsh climate and are as a rule difficult of access and virtually unexplored by biologists. This group comprises the following sites considered in the present volume: Ilirneiskiye Lakes (Section 2.1), Jack London Lake (Section 2.5), Lake Koolen (Section 3.8), Lake Elgygytkin (Section 4.5), Elikchanskiye Lakes (Section 5.11), and Khal-Degi Lake (Section 5.12).

— *Inland valleys and intermontane depressions in the taiga zone.* This group includes valleys in the upper and middle river courses of northeastern Asia belonging to the right bank of the Kolyma Basin. These braided riverbeds form floodplains with numerous islets, shingle spits, willow brushwood, deciduous and coniferous forests. Terraces above the floodplains feature a complex of oxbow water bodies with alternating stands of larch trees and open spaces occupied by spirea scrub, foothill mires and mire complexes. The latter are as a rule carpeted with low-growing birch and tussock-forming sedges interspersed with peatlands abounding in thermokarst lakes and creeks. River valleys have a relatively small area in mountain taiga landscapes; for this reason, they constitute a quantitatively minor fraction of all wetlands occurring in the region covered by this volume. Nevertheless, they form a more or less dense network that spreads over large areas, integrating them into a frame of northern taiga ecosystems. These valleys serve an important role as generators of a favourable microclimate in the summer and account for almost the entire biotic potential of the area. In the winter, they are paramount for the survival of birds and mammals. Therefore, the role of mountain taiga valleys in the maintenance of ecological balance and productivity of local ecosystems can scarcely be exaggerated. At the same time, a variety of economic activities are concentrated in the same valleys, where they

are used as permanent transport routes, winter roadways, and airfields, with established settlements, overhead power lines, timber and mining enterprises. As a result, the natural features of the valleys are profoundly affected by human impact. Besides being highly vulnerable to damage, the valleys are the least protected: they undergo a deeper anthropogenic transformation than any other component of the landscape while they are more poorly covered by specially protected natural areas than elsewhere. The river valleys and upper reaches of watercourses are seriously damaged as a result of industrial production of gold from alluvial stream deposits. The basins of many tributaries of the Upper Kolyma River are strongly transformed or completely destroyed, and large portions of river valleys have long ago lost their natural aspect. Fortunately, rather extensive areas of river valleys in the northern part of the region remain virtually undamaged. This group of wetlands includes the Middle Omolon River (Section 2.3) and Balygychanskaya Basin (Section 2.4).

— *Valleys of salmon rivers on the northern Okhotsk macroslope.* Rivers draining the southern part of the Kolyma Highlands are relatively short. In the southern and northern parts of the region they are no longer than 250-350 and 100-150 km respectively. The Inya, Taui, Yana, Arman, Ola, Yama, and Gzhiga Rivers have the best developed valleys. In the middle course of these rivers, they resemble typical inland valleys in terms of topography and vegetation patterns. However, their biotic potential is much higher, partly by virtue of a milder climate but largely due to a huge mass of organic matter brought in during the migrations and spawning of Pacific salmon. The lower reaches of these rivers intersect the area of latitudinal inversion of vegetation zones. Close to the coast of the Sea of Okhotsk, the boundary of taiga landscapes lies north of the maritime tundra belt; not infrequently, they adjoin mountain tundra at sea level. Valleys of large rivers important for salmon extend in a meridianal direction and dissect the maritime tundra belt by wooded extensions, thus superimposing a peculiar "keyboard" pattern on the complex mosaic of the local landscape, with sharply delineated contours of alternating forested and non-forested areas. The latter appear tundra-like with their thermokarst lakes, sedge-tussock surfaces, and dense growth of high shrubs. Large-scale salmon fishing is practiced on all the rivers in the northern part of the Sea of Okhotsk catchment. However, signs of depletion in the fish stock are thus far apparent only on the Taui River, in proximity to the city of Magadan. Over-harvesting in its lower reaches (for the commercial production of salmon roe) and at spawning beds (to collect material for fish hatcheries) has resulted in a decrease in the breeding area of Steller's Sea Eagle (*Haliaeetus pelagicus*), an increase of Slaty-backed Gull (*Larus schistisagus*) colonies, and a decline of the seal population in the estuary. Sites included in this group are Lake Chistoye (Section 5.6) and the Kavinskaya Basin (Section 5.10).

— *Lacustrine-palustrine plains of the northern taiga zone.* The lake and forest landscape occupies vast areas on the Middle Kolyma River and lower reaches of its main tributaries, the Omolon, the Bolshoy Anyui and Maly Anyui. This peculiar natural complex has formed as a result of the thermal erosion of glacial deposits of the yedoma complex of northeastern Yakutia. Round and paddle-shaped lakes fill deep hollows in the relief; therefore, steep shores form a major part of their perimeter. As a rule, the lakes are deep (5-10 m) and interconnected by grassy rivulets. Drained lake depressions are first occupied by shrub-meadow associations, but become subject to waterlogging and the secondary effects of thermokarst activity as permafrost develops. Forested plains with a large number of lakes give home to rich hypoarctic flora and fauna. Specifically, they provide breeding and moulting grounds to dabbling and diving ducks. The majority of lakes are of commercial fishing (Wide-nosed Whitefish, Peled) or hunting (Muskrat) value. Wooded interlake areas and alasses serve as grazing areas in the winter for reindeer and Yakut horses respectively. The Omolon-Anyui Interfluvial Area is described in the present volume (Section 2.2) as a representative site of this group.

— *Lacustrine-palustrine plains, lagoons, and watercourses in the coastal areas of Siberia, the Bering and Okhotsk Seas.* This group of sites encompasses vast plain areas of typical and maritime tundra with coastal lagoons, inlets, and spits around the perimeter of a huge peninsula of northeastern Asia. All these landforms are relatively young (Middle Pleistocene-Holocene) and have a common (largely alluvial) origin. The severe subarctic climate and the effects of permafrost collectively account for the intense thermokarst activity. The area has a gently rolling relief, with depressions occupied as a rule by lakes or alasses 0.5-2.5 m in depth. The latter give rise to hummock-hollow complexes subject to cyclic thermokarst processes. The plains are dissected by valleys of meandering rivers, with oxbows, low ridges, and wet depressions occupying areas elevated slightly above the floodplain. Mosses, lichens, sedges, cottongrasses, shrubs of the heath family, and low-growing willows predominate in the vegetation cover. These plainlands provide home to breeding shorebirds, moulting areas for Arctic geese, and summer pastures for reindeer. Lake systems and river estuaries serve as feeding grounds for coregonids and chars. Intertidal mud and sand flats are regularly visited by migratory waders and other water birds. The group under consideration includes a majority of sites described in this volume, viz. the lower reaches of the

Kolyma River (Sections 1.1, 1.2, 1.3), Chaun Bay (Sections 1.4 and 1.5), Arctic coast of the Chukot Peninsula (Sections 1.6, 1.7, 3.1, 3.3-3.7, 4.1-4.3), and maritime lowlands in the northern part of the Sea of Okhotsk Catchment (Sections 5.1, 5.3-5.5, 5.7, and 5.8).

— *Wetlands of the Middle Anadyr River.* In its middle and lower course, the Anadyr is an important salmon river possessing a hypertrophic floodplain overgrown with willow thickets and flanked by ridges supporting Japanese stone pine stands, terraces and sloping foothills with a large number of lakes and alasses. The landscapes of the Anadyr Valley and its wetlands are very peculiar and difficult to refer to any of the above groups. Indeed, each landscape features all specific traits of these groups in a variety of combinations. These original landscapes occupy tens of thousands of square kilometres, which provides an additional argument in favour of categorizing them into a separate group. Its most representative site is Markovskaya Basin (Section 4.4) whose detailed description gives an idea of the characteristics of other sites of this group.

— *Rocky coasts and offshore islands.* This group of wetlands comprises coastal areas with seabird colonies and an adjacent strip of open sea characterized by high biological productivity of planktonic and benthic communities. The volume contains detailed descriptions of Kolyuchin Island (Section 3.2), the Yamskiye Islands (Section 5.2), and Talan Island (Section 5.9). In addition, it includes checklists of the most important seabird colonies in coastal habitats of the eastern Arctic sector (Sections 1.8 and 3.9) and Far East seas (Sections 4.6 and 5.13).

We deemed it reasonable to organize the inventory of wetland sites in terms of their association with sea and river basins. The structure of individual Sections conforms to the Information Sheet developed for the description of Ramsar sites, with minor variations depending on the amount of data available. The exception is the description of seabird colonies, which takes into consideration that each large colony is unique (even if by virtue of size alone) and deserves to be given a special conservation status. Detailed descriptions of individual colonies and their natural conditions would largely overlap one another. To avoid overlapping, only the most interesting localities are characterized in detail, whereas the majority of the remaining ones are included in the checklists closing the respective Sections.

Today, most economic and environmental decisions relevant to wetland use and conservation are taken by district administrations. They are entitled to confer primary protected area status on individual sites, and many territories described below have already been identified and designated at this level for the purpose of management plans. The information presented in this volume may be useful for a more ample substantiation of the locally established protected status of a given site and its redesignation as wetlands of national or international importance. On the other hand, this information may be used to identify new sites worthy of special attention and provide them protected area status. It appears that within the next few decades the understanding of the value of wetlands at the local administrative level will be a key factor for the success of their conservation and sustainable development. In this context, the identification and description of wetland sites are the first steps to be taken based on an enhanced level of ecological culture (especially in areas of intense industrial developments) and closer cooperation among environmentalists, decision makers and the lay public (especially in regions of traditional nature use). Mutually acceptable decisions and compromise will be sooner or later found in each concrete case. With this in mind, the author refrains from making far-reaching recommendations for modifying longstanding traditions of nature use in the selected territories and current conservation measures at variance with the requirements for completing the Information Sheet for the description of Ramsar sites. To follow this line of reasoning, it seems appropriate to begin with a succinct review of the natural features and general location of wetlands within the boundaries of the administrative regions of Northeastern Russia *(Fig. I)*.

Northeastern Yakutia

The **Nizhnekolymsky District** encompasses a section of the Lower Kolyma River approximately 250 km in length from the Evseiskiye Islands in the south to the East Siberian Sea coast in the north. The northern limit of larch taiga on the district's territory extends far to the north along the right bank of the Kolyma River. The largest tributaries, the Omolon and the Anyui, join the Kolyma from the southeast, flowing through spurs of the Yukagir Plateau, Kuriinsky Ridge, and North Anyui Range. The confluence of these tributaries from the right with the Kolyma Valley gives rise to extensive wetlands. On the left side, the Kolyma Valley borders the Kolyma-Indigirka Lowland, which extends for 350-500 km westward. The lowland is treeless in the north, but in the south it is covered with open larch taiga with numerous thermokarst lakes on watersheds and valleys of slow-flowing rivers. In other words, over 90% of the territory of the Nizhnekolymsky District is occupied by vast wetlands of different origin.

The district is experiencing an economic crisis caused by a break of inter-regional economic links in the early 1990s. The Zelyony Mys seaport in the upper Kolyma Delta was for a few decades a shipping point for western Chukotka and the Lower Kolyma. It has now lost its importance in much the same way as have bases of Arctic aviation and hydrographic service, building organizations, and motor depots. However, coal delivered to the port by lighters from Zyryanka has maintained its significance. In winter a network of ice roadways along the Kolyma riverbed and the Arctic coast connect the administrative centre of the district (Chersky) with settlements in the middle and upper reaches of the Kolyma River and western Chukotka and with faktoriyas (local trading and procurement posts) and settlements of the Nizhnekolymsky Ulus (Pokhodsk, Kolymskoye, Andryushkino). In the past, these settlements were affiliated with the Nizhnekolymsky Sovkhoz (state-operated estate or farm), but later became independent and eventually converted into reindeer farms and commercial cooperatives for fishermen and hunters. The Chaigurgino Wildlife Refuge (Russian "zakaznik") was long ago established in the Kolyma Delta. In addition, the Omolonsky and Alazeisky areas were designated in 1983. There are botanical monuments in the localities of Rogovatka and Pokhodskaya yedoma.

Four sites representing the landscape diversity of the Kolyma Lowland in the Nizhnekolymsky District have been identified and included in the present inventory. These are the Lower Chukochya River, Kolyma Delta, Khalerchinskaya Tundra, and Omolon-Anyui Interfluvial Area.

Chukot Autonomous Area

The **Bilibinsky District** occupies a territory of 173,200 km^2 in the western part of the Chukot Autonomous Area. Its southern boundary is formed by the Middle Omolon River and cuts off a portion of the river valley almost 400 km in length. The northern boundary is the shoreline of the East Siberian Sea approximately 250 km in length. The southern part of the district is covered with northern taiga and valley forests. In the north they become sparse and are replaced by low-mountain tundra. Rivers flow fast and form well-developed floodplains with many islands, thick willow growth, Korean willow (chosenia) and poplar groves. The wetlands of the district are concentrated in the Omolon, Maly Anyui, and Bolshoy Anyui river valleys and in intermontane depressions intersected by these watercourses (Ulyaganskaya Depression, Omolon-Oloy Interfluve, Lower Kuriya and Kur'yachan Rivers, and the entire left side of the Omolon Valley below Oloichan). The majority of local wetlands are represented by wooded bogs with willow shrubs and hummocks, slow-flowing creeks, oxbows, and thermokarst lakes. The Bolshoy Anyui Basin is distinguished for its damp forested plains in the lower reaches of the Penzhenka River and yedoma hollows with numerous lakes in the interfluvial areas between the Yarovaya, Ovrazhiya, Bolshoy Anyui and Maly Anyui Rivers. Equally remarkable is the Monni Valley that joins the Bolshoy Anyui in its middle course, where many hollows and hydrographic outlets blocked by lava fields from the ancient Anyui volcano are filled with oligotrophic lakes. The beautiful mountain Ilirneskiye and Tytyl lakes (all of mountain glacial origin) are located in the upper reaches of the Maly Anyui River. Areas lying north of the Maly Anyui are treeless and dominated by the mountain tundra landscape of the North Anyui Highlands. The coast of the East Siberian Sea is largely occupied by a hummocky tundra plainland intersected by numerous rivers. The largest of these rivers, the Rauchua, forms a delta plain with an extensive network of channels and thermokarst lakes.

The Bilibinsky District is an industrially developed area with rich mineral deposits, a large number of mines, and a network of seasonal roadways. An ore-dressing complex and nuclear Power plant are located in Bilibino, the administrative centre of the district. A few mixed Chukchi and Even reindeer farms are based in the villages of Keperveem, Anyuisk, Ostrovnoye, and Omolon. A system of winter roads connects Bilibino to Chersky, Pevek, and Omolon. During the navigation period, barges deliver fuel oil and commodities to the village of Omolon from Seimchan and Zyryanka.

The Omolonsky Nature Refuge occupies an area of 1,600 km^2 in the middle course of the Omolon River. Three sites of representative wetlands have been identified and included in the present inventory, viz. the Lower Rauchua River, Ilirneiskiye Lakes, and part of the valley of the Middle Omolon River covered by the refuge.

The **Chaunsky District** in the northern part of the Chukot Autonomous Area occupies a territory of 58,100 km^2. The entire territory lies in the tundra zone, and wetlands cover a large area of its northern quarters. The southern part is a mountain system, with elevations from 1,400 to 1,700 m a.s.l. formed by the Ilirneisky, Rauchua, and North Anyui Ranges. Chaun Bay is enclosed by a broad ring of hummocky mires and tundra plains with a large number of lakes. There are plots of maritime and delta plains on Kyttyk and Aion Islands, in the lower reaches of the Lelyuveem, Chaun-Palyavaam, and Ichuveem Rivers. Maritime lowlands extend eastward from Chaun Bay along the Arctic coast as far as Nolde Bay and the Lower Pegtymel River. The Chaun-Anadyr watershed area in the southern part of the Chaunsky District harbours a unique mountain lake, Elgygytkin. Rocky stretches of the Arctic coast (Cape Shelagsky, Cape Chayachy) are occupied by seabird colonies.

The Chaunsky District is an industrial zone. Pevek, its administrative centre, is an important transport junction along the Northern Sea Route. A network of winter roadways links it to inland areas of the Chukotka Peninsula. In the past, large goldfields and tin and tungsten deposits (Valkumey, Krasnoarmeisky, and Komsomolsky) were developed; today, however, many mining sites are closed. The mountain tundra is a traditional area for reindeer husbandry, with its centres at Aion and Rytkuchi. Fisheries for char (*Salvelinus spp*.) harvesting during migration to spawning areas are located at the mouths of rivers emptying into the Chaun Bay.

The Tyyukul Game Reserve covers an area of 2,000 km^2 in the lower reaches of the Ichuveem River. In addition, there are a few nature monuments set up to safeguard the floristic diversity of the territory (Anyuisky, Aionsky, Rautansky, Pineiveemsky, Rauchuagytkin).

Three sites of representative wetlands have been identified and included in the present inventory, viz. Kyttyk Peninsula, common delta plain of the Chaun, Palyavaam, and Pucheveem Rivers, and Nolde Bay.

The **Shmidtovsky District** is situated in the northern part of the Chukot Autonomous Area. Its total area is 71,000 km^2, which includes Wrangel Island (7,600 km^2) and the mainland portion (63,400 km^2). The stretch of coastline between Nolde Bay and the mouth of the Amguema is about 425 km long. The predominant landscapes are those of mountain tundra and narrow brushwood valleys. The southern part of the territory is intersected by mountain chains elevated 1,500-1,800 m a.s.l. (Ekvyvatapsky, Pegtymelsky, Palyavaamsky, and Chantalsky Ridges). Maritime lowlands with numerous thermokarst lakes, lagoons, and sea spits occupy the Arctic coast. The most interesting of these lies in the lower reaches of the Palyavaam, Kuekvun, and Ekviatap Rivers, near Alkakinamanka (Billings Cape), Rypilgyn, Kyanygtokunmankyn, Akatan, and Tonkergynpilgyn Lagoons). Intermontane depressions south of these wetlands also contain portions of tundra plainland with many lakes. The most important are those in the middle course of the Pegtymel (Kuvet) River and along the Chantalveergyn River (Amguema Basin).

The shoreline of Wrangel Island is about 375 km. Stretches of tundra lowlands occupy the south-western (Cape Blossom) and northern parts of the island. There are large seabird colonies at Cape Uering and Gerald Island.

Mys Shmidta is the administrative centre of the district. Former mining areas (Polyarny, Leningradsky, and Plamenny) are now used as reindeer pastures. The villages of Billings and Ryrkaipiy are centres of reindeer husbandry. Residents of the coastal area harvest sea mammals, Walruses (*Odobenus rosmarus*) and Seals (*Phoca spp*.). The district has a few archaeological and nature monuments (Palyavaam, Telekaiskaya roshcha, Pegtymel), besides the Wrangel Strict Nature Reserve.

Three representative sites identified in the Shmidtovsky District are included in the present inventory. These are areas adjacent to Nolde Bay with the delta plain of the Pegtymel River, Cape Billings tundras, and the Lower Amguema River.

The **Iultinsky District** has an area of some 73,000 km^2. Its northern borders look on the Arctic coast and the southern ones are largely formed by the shoreline of Kresta Bay (Bering Sea). The entire territory lies in the tundra zone. In

the middle it is crossed by the Iskaten Range, which rises to 1,500 m a.s.l.

The coastline of the Chukchi Sea that makes up the eastern and northeastern boundaries of the Iultinsky District is about 200 km long and is occupied by maritime landscapes and lakes of the Vankaremskaya Lowland dissected by the Amguema, Ekugvaam, Vankarem, Kymyneiveem, and Linatkhyrvuvaam river valleys. The coastline is formed by pebble and sand spits and flats that separate the sea from a string of large brackish lagoons (Amguema, Ukouge, Nutauge, Vankarem, Pyngopylgyn, and Kunergvyn). Kolyuchin Island harbours large seabird colonies. The Iultinsky District also includes coastal stretches of the Anadyr Gulf and Kresta Bay totalling roughly 350 km (from Seutakan and Echkachek Bay).

Large wetlands lie east of Kresta Bay (Konerginskaya tundra). They are dominated by Beringian hummocky uplands with thermokarst lakes and sinkholes. The coastline is noteworthy for precipitous terraces and shingle spits; one of them, the Meechkyn Spit, is 75 km in length. It was formerly occupied by breeding and moulting sites of Black Brant (*Branta bernicla nigricans*). The lower reaches of rivers emptying into Kresta Bay provide spawning grounds for Pacific Salmon (*Oncorhynchus spp*.); the largest are located in the Seutakan River Basin. Glacial cirques in the upper reaches of the Amguema River and other inland valleys are filled with mountain lakes. Lake Ekityki (67°51'N, 179°30'E) is the most remarkable, being over 20 km long, 2 km wide, and more than 100 m deep. The lake is populated by Wide-nosed Whitefish (*Coregonus nasus*), Arctic Grayling (*Thymallus arcticus*), Burbot (*Lota lota natio leuptura*) and two non-migratory forms of char (*Salvelinus spp*.).

A notable wetland site exists on the Verkhneamguemskaya Plain. A few large Walrus breeding grounds occur along the Bering Sea coast of the Iultinsky District (Kitovaya, Meechkyn, and Erulya Spits).

The Iultinsky District, with its centre at Egvekinot, was one of the most developed industrial regions of Chukotka until the 1990s. The former Iultin mine extracted tin, gold, and tungsten but is no longer operative. The reindeer-based economy is centred in the settlements of Amguema and Konergino. Fishing and hunting marine mammals (including whales) continue in the coastal zone. There are no protected areas in the district with the exception of a small site in the floodplain of the Amguema designated as a nature monument.

Two sites of interest have been identified and described in the Iultinsky District, the Lower Amguema River with the Ukouge Lagoon and Kolyuchin Island.

The **Chukotsky District** occupies the northeastern extremity of the Asian continent also called the Daurkin Peninsula (from Kolyuchinskaya Bay to Lavrentiya Bay). Its territory is dominated by rocky ridges and tundra highlands with a total area of 30,700 km^2. The 150 km long and 700-900 m high Genkanyi Range divides the district into its western and eastern parts. Vast wet plainlands adjoin Kolyuchinskaya Bay, Mechigmen Bay, Ioniveem River valley, and Uelen Lagoons.

The Chukchi Sea coastline that bounds the district's territory is 580 km in length (300 km of Kolyuchinskaya Bay and 280 km of the northern coast). It is actually much longer if one takes into consideration the total shoreline of large lagoons, shingle spits, and inlets (Neshkan, Enurmino, Inchoun, and Uelen). Large lagoons are absent along the Bering Sea coast; instead, there are many deep inlets and fjords (Pouten, Lavrentiya, Mechigmen), and the coastline is almost 370 km in length. Seabird colonies are located at rocky capes of the Chukchi Sea (Serdtse-Kamen', Seshan, Inchoun) and on Ratmanov Island. The inland territory of the district contains large lakes of tectonic origin (Ioni, Koolen) and hydrothermal veins (Gil'mimliveem, Mechigmen, Lorino, Dezhnevo, and Neshkan). The Chegitun River valley is worthy of special note as featuring limestone canyons, original flora, breeding sites for predatory birds, and spawning areas for Pacific chars. The shallow waters surrounding the peninsula are rich in benthic crustaceans that provide abundant summer food for Gray Whales. In the summer and autumn period, Walrus rookeries are formed on Idlidlya Island, Capes Serdtse-Kamen', Seshan, Uten, Inchoun, Dezhnev, Nunyamo, Kriguigun, and on Ratmanov Island.

The Chukotsky District has practically no industry. The main economic sectors are harvesting of marine-coastal resources and unsustainable seasonal reindeer herding. The settlement of Lavrentiya is the administrative centre and transport focus of the district, with most economic activity concentrated in coastal settlements of the indigenous peoples (Neshkino, Enurmino, Uelen, Lorino) who earn their income by trapping Arctic Fox (*Alopes lagopus*) and hunting Walruses, Bearded (*Erignatus barbatus*) and other (*Phoca spp*.) Seals, and the Gray (*Eschrichtius gibbosus*) and Beluga (*Delphinapterus leucas*) whales. They also fish for Pacific Cod (*Eleginus gracilis*) and char (*Salvelinus spp*.).

Traces of old Eskimo habitation are frequently found along the seacoast; the remains are protected as historical and cultural monuments. In addition, there are a few nature monuments (Gil'mimliveemskiye and Kukunskiye Hot Springs, Chegitun River canyon).

Seven noteworthy sites have been identified in the Chukotsky District and have been included in the present inventory. These are Belyaka Spit, the southern part of the Kolyuchinskaya Bay, Ioni Lake, the Lower Chegitun River, Uelen Lagoon, Lake Koolen, and Mechigmen Bay.

The **Providensky District** occupies the southern part of the Chukotka Peninsula, covering an area of 26,800 km^2. The landscape is predominately mountainous. Wetlands occupy intermontane depressions (Ulyuveemskaya, Kurupkinskaya, and Erguveemskaya) or adjoin inlets, sea and brackish lagoons (Getlyanen, Gytgykuiym, Istikhed, Kivak, and Imtuk).

The Istikhed Lagoon is inhabited by endemic "Chukchi Char" (*Salvelinus alpinus*). The freshwater Lake Achchen is worthy of special note. It has developed from a lagoon and plays an important role in the replenishment of the local fish stock. Its ichthyofauna is composed of 17 species and includes an isolated char population. The southern section of the Chukotka Peninsula coast (including the coastline of Arakamchechen and Ittygran Islands) is approximately 850 km in length. One quarter of the coastline is formed by gravel spits and beaches and the remaining part by rugged shores with rock capes, deep inlets and fjords (Penkigney, Rumilet, Tkachen, and Provideniya Bays). There are a few mountain lakes in the inland part of the district, with Mezhgornoye and Pichkhynmyitkin being the largest ones. Several hot springs (Kivak, Chaplino, Penkigney, and Arakamchechen) are situated in the southern part of the district.

Many stretches of the rocky coast are used by seabirds to establish their colonies. The largest are found on Cape Khalyustkin (near Getlyanen Lagoon), Cape Stoletiya (near Sireniki), Cape Chirikov, and Nuneangan Island. Gray Whales regularly come to feed in the Senyavin Straits, close to the Sireniksky Coast and Cape Bering. Walrus haul-outs occur on the Rudder Spit as well Arakamchechen and Nuneangan Islands in summer and autumn.

The permanent Sirenikovskaya Polynya that extends from Provideniya Bay to Cape Bering is a winter home for numerous Long-tailed Ducks (*Clangula hyemalis*), Pacific Eiders (*Somateria molissima v.-nigrum*), King Eiders (*Somateria spectabilis*), Spectacled Eiders (*Somateria fischeri*), and gulls including Ross' Gull (*Rhodostethia rosea*). Certain places lie along the migration route of the Snow Goose (*Chen hyperboreus*) (Arakamchechen Island) and Sandhill Crane (*Grus canadensis*) (Enmylenskaya tundra).

The economy of the district largely rests on traditional modes of nature use, such as hunting sea mammals from boats (Gray and Beluga Whales, Walruses, Seals), fishing (Humpback, Chum and Sockeye Salmon, chars, cods), and reindeer grazing. The primary centres of economic activity are Novoye Chaplino, Yanrakynnot, Sireniki, Nunlingran, and Enmelen. Port Provideniya, the administrative centre of the district, is described as "the largest Russian port in the Western Hemisphere". American tourists are brought here from Nome "to get acquainted with Russia". The port began to lose its importance since the early 1990s with the decrease of transport activity on the North-East Passage "warming of the political climate" in the northern Pacific.

The south-eastern coast of the Chukotka Peninsula is a part of a large area dominated by ancient Beringian and more recent Eskimo cultural traditions; many archaeological sites and monuments of this culture still exist in the district.

The territory adjacent to the Senyavin Straits, Arakamchechen and Ittygran Islands has been given protected area status (Beringiysky Park of the Chukot Autonomous Area). Walrus rookeries are strictly protected, as are the Kivakskiye, Senyavinskiye, and Chaplinskiye hot springs and Lake Achchen, with all these features designated as nature monuments.

A single representative site, the Senyavin Straits area, has been identified and described in the mountainous territory of the Providensky District.

The **Anadyrsky District** encompasses practically the entire catchment of the Anadyr River. It is the largest administrative district of the Chukot Autonomous area (250,000 km^2 or one-third of the total area). Its eastern border is formed by the 325 km long Bering Sea coastline. In the north and northwest, the Anadyr River and its tributaries drain along the slopes of the Anadyr Plateau and the Pekul'neisky Range. Southern tributaries along the right bank of the Anadyr (e.g. the Mayn River) rise on the offshoots of the Koryak Highlands. Opalyonnaya Mountain west of the village of Markovo is the northeasternmost point to which the larch taiga extends in Asia. Woody willow stands, band-type chosenia, and poplar forests penetrate farther eastward along river valleys. Foothill and watershed areas are overgrown with Manchurian alder (*Dushekia fruticosa*) bushes and shrub pine (*Pinus pumila*) thickets.

The Anadyr Valley is divided into two parts: a plain extending for 450-500 km in a sublatitudinal direction from Onemen Bay on the east to the vicinity of Markovo on the west and mountainous country lying above the spurs of the Shchyuchiy Range. Specific wetland landscapes with an abundance of lakes dominate the Anadyr Valley, where they cover tens of thousands of square kilometres and give rise to a peculiar zonal phenomenon. Wetland diversity is especially high in the Markovskaya (Sredne-

anadyrskaya) Lowland and the Mayn-Anadyr Interfluvial Area. In its lower reaches, the Anadyr threads its way through the Anadyrskaya Lowland and opens out into the sea as a large estuary (Onemen and Kanchalansky Bays, Anadyrsky Liman) joined by the Kanchalan and Velikaya Rivers that drain the northern and southern parts of the Anadyrskaya Lowland. The easternmost part of the district (coasts of the Anadyr Gulf and Kresta Bay) is occupied by a large area of tundra plains (the so-called Uelkalskaya Tundra). There is only one large lake in the Anadyrsky District (Lake Krasneno 458 km^2 in size). It is situated at the northern offshoots of the Koryak Highlands (foothills of the Rarytkin Range) and connected with the Anadyr River by a few channels. The low-lying coasts of the Anadyr Gulf and Anadyrsky Liman (estuary) have many shingle spits and intertidal silt flats and are flanked by terraces. The small rocky Alyumka Island at the head of the Anadyrsky Liman is occupied by a colony of Herring Gulls (*Larus argentatus*) and Horned Puffins (*Fratercula corniculata*). A 15 km long pebble spit called Russkaya Koshka and Klinkovstrema Bay near the outlet of the Anadyrsky Liman provides moulting sites for geese and harbours a walrus haul-out site.

The economy of the Anadyrsky District is based on the development of mineral deposits (coal, gold), reindeer herding, and the use of biological resources (fishing and hunting). Geological explorations are underway in the north-eastern part of the Kanchalan River Basin (Valunisty Goldfield) and on the right bank of the Belaya River (the Arakveem deposit). Alluvial gold-bearing deposits are developed in the foothill area of the Bel'skiye Mountains (Otrozhny) and in the headwaters of the Mayn River. Industrial exploitation of several gas and oilfields began in the Anadyrskaya Lowland. In the early 1990s the annual catch of the Chum Salmon (*Oncorhynchus keta*) amounted to 500 tons. In addition, almost 250 tons of other fish was caught. The largest reindeer farms are located in the villages of Tavaivaam, Ust-Belaya, Vaegi, Kanchalan, Snezhny, and Markovo. Part of the territory of the district (Mayn-Anadyr Interfluve) is included within protected areas, such as the Lebediny State Wildlife Refuge and two similar sites of local importance: the Ust-Tanyurer and Tundrovy wildlife refuges. There are a few botanical monuments (Markovo, Tanyurer, Vaegi, and Belaya) in the valleys of the Anadyr River and its tributaries and along the Kanchalan and Velikaya Rivers.

Three representative sites have been identified within the Anadyrsky District and included in this inventory. They are a part of the Markovskaya Basin, Lake Elgygytkin, and the Upper Kanchalan River.

The **Beringovsky District** occupies the south-eastern part of the Chukot Autonomous Area. With an area of 37,900 km^2, it is smaller than many other districts, but it encompasses a rather large stretch of the Asian Bering Sea coast (almost 600 km). Its territory lies in a zone of plainland and mountain shrub tundra. Peripheral portions of the district include the south-eastern extremity of the Anadyrskaya Lowland with the Gek Spit, the south-eastern side of the Anadyrsky Liman, and the Avtotkul and Tumanskaya river valleys. A string of large lakes of a lagoon type (Tymna, Glubokaya, Keingypilgyn, and Yuzhnaya Lagoons) are found along the coast, where pebble and sand spits have lengthened parallel to the shoreline and hence cut off the sea. The Mainopyl'ginsky Range, which is about 250 km long and 1,000-1,600 m high, extends to the Bering Sea coast giving rise to rocky capes, inlets, and fjords (Lakhtina, Amaam, and Orianda Lagoons). Its south-eastern extremity (Cape Navarin) gives home to large seabird colonies and a walrus rookery. There is the mountain Lake Mainits at the northern edge of the range, which is famous for its scenic splendour and spawning beds for the Sockeye Salmon (*Oncorhynchus nerka*).

The coastal area south and west of Cape Navarin is an old-age maritime plain dissected by mountain streams and low-lying terrains in the vicinity of sea lagoons (Kaipylgin, Pekulney, Vaamocka, Khatyrka, and Mallen). Other plainland areas with thermokarst lakes and hummocky fields stretch along the middle and lower course of the Khatyrka River. Mountain hollows of the Khatyrka Basin are filled with glacial lakes (the largest ones are Imyney-Gytkin and Molgytkin).

Until 1990, the development of the large Beringovskoye coal deposit played a leading role in the economy of the Beringovsky District. High-quality coal was used locally and exported to other Russian Far East regions (Kamchatka, Sakhalin, the Khabarovsk Territory, and Primoriye) and abroad (South Korea). Exploratory drilling revealed geological structures in the coastal areas economically attractive in terms of gas and oil extraction. Today, however, the economy is centred on the traditional use of natural resources (reindeer herding, fishing, sea mammal and fur-hunting). The villages of Alkatvaam, Meinopylgino, and Khatyrka are the main centres of economic activity. Two wildlife refuges of regional importance were set up in the district, Avtotkul (2,500 km^2) and Tumansky (4,000 km^2).

A single representative site, the Lower Avtotkul River, has been identified and described in the Beringovsky District. Vast wetlands and coastal inlets lying south of the Anadyrsky Liman (Tymna, Glubokaya, Mainopylgino, Pekulney, Khatyrka) remain to be surveyed.

Magadan Region

The **Susumansky District** occupies an area of 47,000 km^2 in the northwest of Magadan Region. Its administrative centre is Susuman. A major part of the area is formed by the Verkhnekolymsky Highlands. Also, there are a few plainland areas in the valleys of the Khinike, Berelekh, Omulyovka, and Yasachnaya Rivers. The watershed area separating the Burkand'ya (left tributary to the Berelekh) and the Omulyovka river basins is occupied by an intermontane glaciofluvial plain elevated 900-1,000 m a.s.l. with large water bodies of up to 10 km in length (Malyk, Momontai, Ui, and Darpir Lakes) and by a highland plateau with lakes and mires. Many glacial lakes are located in the valleys between the smaller Cherge and Okhandya mountain ranges. The Berelekh Valley is formed by a multilevel floodplain and lacustrine-palustrine complexes. All mountain rivers flow into the Kolyma. Many river basins are dominated by man-made landscapes resulting from the gold mining industry. The main settlements include the city of Susuman (administrative centre of the district) and the villages of Burkandiya, Kadykchan, and Adygalakh. The transport system consists of the Magadan Highway and its branches leading to numerous mineral deposits and mining sites. The catchment area of the Upper Khinike River (right tributary to the Ayan-Yuryakh River) has been designated as a wildlife refuge (Khinike) covering a total area of 3,700 km^2. There is a small botanical reserve covering 31 ha (Taskansky) in the upper reaches of the Taskan River (left tributary of the Kolyma) set up to protect relict plant communities occupying carbonate rock outcrops.

None of the wetlands of the Susumansky District is listed in the inventory due to its predominantly mountain landscape and the lack of relevant data about its water bodies.

The **Yagodninsky District** has an area of 30,000 km^2 and occupies the central part of the Magadan Region. The district is largely a mountainous country dominated by south-eastern offshoots of the Chersky Range. The main watercourse of the district is the Kolyma River that rushes here through what looks like a narrow fault cutting across the area's bedrock. The river is dammed for hydroelectric power, and the lower portion of the reservoir lies within the boundaries of the Yagodninsky District. The shores of the reservoir are steep and support no wetlands. Natural wetlands occupy the Taskanskaya Depression, a small low-lying area with a poorly developed floodplain and rather few lakes. They also occur on the Kolyma River floodplains at the Bochapcha confluence. Other floodplain wetlands are situated on the Middle Omulyovka and Yasachnaya Rivers and the glaciofluvial plain extending towards Jack London Lake.

The main settlements include Yagodnoye (administrative centre), Sinegoriye, Debin, Orotukan, and Burkhala. The ecosystems of small and medium-size rivers and the adjoining areas are seriously disturbed by gold extraction and related mining operations. Other impacts include regulation of water flow by the dam that holds the reservoir of the Kolymskaya hydroelectric station and transformation of Kolyma River terraces for increasing agricultural production. The transport network is formed by numerous roadways leading to mining sites and the associated settlements from the Magadan Highway. Jack London Lake and its catchment have been designated as a nature park. There is a botanical reserve near Aborigen Peak set up to protect relict mountain flora.

The inventory includes a single site in the Yagodinsky District, Jack London Lake.

The **Srednekansky District** in the southern part of the Magadan Region has an area of 92,000 km^2. It is crossed by southern stretches of the Middle Kolyma River and its numerous tributaries stemming from its right bank that are separated from one another by the mountain ridges of the Kolyma Highlands (Omsukchansky, Korkodonsky and Konginsky). The intermontane depressions and river valleys contain many wetlands, most of which occupy the wide Kolyma Valley and plainlands along its tributaries (Buyunda, Bylygychan, Sugoy, and Korkodon). Numerous secondary tributaries also have well-developed floodplains and wet terraces. The northeastern part of the district is occupied by the valley of the largest Kolyma tributary, the Omolon River, and the Kedon, Monakova, and Namyndykan Rivers that join it after they drain down the slopes of the Yukagir Plateau and Konginsky and Kedonsky ranges. In the northern part of the district, the Kolyma becomes a gentle river flowing through a generally flat-bottomed valley. Wetlands are best represented in the Seimchano-Buyundinskaya Depression and within a section of the Kolyma Valley between Suksukan and Balygychan.

The main populated centres are Seimchan (the district's main settlement) and Ust-Srednekan. The northern part of the district is a reindeer husbandry area. Human impact is manifest by large-scale transformation of river valleys through geological exploration and industrial exploitation of local goldfields (Srednekan, Glukhariny, Korkodon, and Bulun), timber cutting (Lower Korkodon, Sugoy,

Balygychan, and Buyundy), frequent and extensive forest fires, regulation of river runoff by the dam of the Kolymskaya hydroelectric power station, and agricultural activity along extensive stretches of the Seimchanskaya Plain. The motor road connecting Seimchan and Magadan and a relatively dense network of unpaved summer and winter roadways constitutes the transport structure. The Seimchan Department of the Magadansky State Reserve and the left part of the Omolonsky Wildlife Refuge are situated inside the district.

Two sites, the Suksukan-Balygychanskaya Basin and the floodplain encompassing the left side of the Middle Omolon River, have been identified and included in the inventory.

The **Omsukchansky District** occupies a territory measuring 60,000 km^2 in the central part of the Magadan Region. Its southern portion supports an inland watershed area separating rivers that flow to the southeast and empty into Shelikhov Bay (Propashchaya, Viliga, Kananyga) from the basins of right-hand tributaries of the Kolyma on the north and west. The territory is occupied by plainlands of the Upper Buyunda, Sugoy, and Korkodon Rivers and a few forested lacustrine basins of glacial origin (Verkhnekorkodonskaya, Verkhnesugoyskaya, and Verkhnekupkinskaya). Lake water surface covers approximately 5% of the total area.

The grand slope of northern Okhotia supports several glaciofluvial and lacustrine-palustrine plains of the so-called Prishelekhovskaya area (Viliginskaya, Kalalaginskaya, and Kananyginskaya). Lake coverage amounts to 10% of the total area of district.

The Omsukchansky District has a well-developed industry. A large gold and silver ore-dressing plant is based at the Dukatsky deposit. The main settlements include Omsukchan (administrative centre), Dukat, Galimyi, and Merenga. There are several reindeer farms in the district. Human impact is especially manifested in the vicinity of Omsukchan and Dukat around a few minor gold, silver, and tin deposits in the mountainous part of the district and coal mines near the village of Galimyi. Forest resources are undermined by large-scale clear-cuts and fires. The main transport artery is the northeastern branch of the Magadan Highway (Omsukchansky tract) and a network of winter roads. There are no specially protected areas in the district.

The Severo-Evensky District lies in the northeastern part of the Magadan Region and covers an area of 102,000 km^2. The southern part of the territory extends as far as the Sea of Okhotsk, while the northern part encompasses the catchment area of the Upper Omolon River. A large part of the district is occupied by offshoots of the Kolyma Range (Gydan) drained by small and medium-size rivers and streams. Wetlands of different origin also cover a large area. Low-lying stretches of the main watershed (Omolon-Gizhiga and Omolon-Nayakhan Interfluvial Areas), as well as depressions along the middle course of the Omolon River, support glacial and glaciofluvial plains. These are the Khulichanskaya Depression below the confluence of the Kegali (total lake area comprises 10% of the total area) and the Verkhnekedonskaya and Verkhneomolonskaya depressions with thermokarst lakes and mire complexes (lake coverage 15%). Another group of wetlands belongs to the Sea of Okhotsk Catchment. The total area of lakes on the Gizhiginskaya Valley, Gizhiginskaya Bay coast, and Verkhneparenskaya and Tavatumskaya plains amounts to 20% of the territory. The 40 m deep subalpine Lake Nyarka (800 m a.s.l.) makes a notable landscape feature in the proximity to the continental watershed area (67°34'N, 157°27'E). The lake appears to have formerly lain in the Kolyma Basin and was only recently incorporated in the drainage of the Nayakhan River. It is inhabited by both Arctic fish species (Round Whitefish, Burbot, and Arctic Char) and Pacific species such as the Dolly Varden Trout (*Salvelinus malma)* and Sockeye Salmon (*Oncorhynchus nerka)*.

The coastline of the Severo-Evensky District is approximately 675 km in length and has numerous intertidal flats, small inlets, skerries, lagoons, capes, reefs, and isolated rocks. Deep bays with low-lying shores and shingle spits (Gizhiginsky, Varkhalamsky, and Naykhansky) occur along the shoreline sector confined between Chaibukha and Viliga. Large tidal variations (6-8 m) account for the presence of extensive intertidal flats. Coastal and offshore rocks host large seabird colonies. There are three sites with hot springs on the Tavatumskaya Plain (Nayakhansky, Tavatumsky, and Shirokinsky) with water temperatures from +25 to +61°C.

Adverse human impact is relatively small. The district has no permanent motor roads. Water routes and seasonal roadways are used to supply settlements and industrial sites. The main settlements are Severo-Evensk (administrative centre of the district), Gizhiga, Chaibukha, Garmanda, and Topolovka. A joint Russian-American venture, the Kubaka mine, is situated on the Avlandya River, a small tributary to the Omolon. In the 1990s it produced gold from bedrock deposits with an annual output of 9 tons. Fishing (salmon, herring) and reindeer husbandry are the sectors next in importance in the district's economy.

The Taigonos Wildlife Refuge established on the territory of the Severo-Evensky District has an area of 4,000 km^2. Localities of hydrothermal activity (Tavatumsky and Shirokinsky hot springs) have been designated nature monuments. There are small botanical reserves on the Upper

Omolon and Avlandya Rivers to safeguard the diversity of specific Kolyma, Chukotka, and Okhotsk floras in the area of their interpenetration. The list of archaeological monuments includes about 70 sites of Neolithic hunters found in the district.

Coastal and plainland ecosystems of the Severo-Evensky District remain virtually unexplored and no site within its bounds can be at present included in the wetland inventory.

The **Tenkinsky District** occupies the central part of the Magadan Region. Its 36,000 km^2 territory is dominated by mountain landscapes with narrow river valleys that lack well-developed floodplain complexes. Large floodplains abundant with islands occur only in the Kolyma Valley above the confluence of the Chubukulakh River. The upper half of the reservoir of the Kolymskaya hydroelectric power station lies on the territory of the Tenkinsky District. The only plain portion of the district is elevated 900-1,000 m a.s.l. and features a system of mountain lakes. The largest is Lake Elgen'ya; a river of the same name with a narrow glacial valley empties into the Kolymskoye reservoir. The area is dissected by relatively narrow valleys of large right tributaries to the Kolyma River (Kulu, Bokhapcha, and Detrin).

The majority of small and medium-size valleys are modified by the development of gold-bearing deposits. Tailing dumps reminiscent of glacial moraines stretch the entire area. As a rule, the majority of such modified surfaces fail to be recultivated. They are here and there overgrown with willow and larch thickets interspersed with strings of closed water bodies. A 40-60 year period of vegetative succession ends in the formation of small wetland complexes surrounded by meadows and brushwood. The most seriously transformed valleys are those of the Tenke and Detrina Rivers, as well as the Kolyma River valley in the vicinity of the village of Vetrenny. Forest resources are greatly depleted by fires and clear-cutting (for building barracks, construction of mine support systems, and firewood). At most, 15% of primary forests is preserved, largely sparse larch stands on moist mountain spurs. Certain sites on the floodplain terraces of the Kulu, Detrin, Khatynnakh, and Kolyma Rivers have been converted into agricultural lands. In the past, mountain tundras of the Tenkinsky District were used as rangelands for small reindeer herds (up to 7,000 animals). Moreover, cattle and horse herds collectively numbering up to 10,000 animals were kept in the Kolyma Valley (no more than 200 of them remained in there by the year 2000). The main settlements include Ust-Omchug (administrative centre of the district), Omchak, and Kulu. Many other settlements were abandoned or fell into ruin during the economic crisis of the 1990s. The transport system consists of the Tenkinskaya ring road (extension of the Magadan Highway) and numerous unpaved and seasonal roadways connecting mining sites and associated settlements.

The **Khasynsky District** in the central part of Magadan Region is a relatively small (19,000 km^2) mountain country lacking in large river valleys. The main wetlands occupy the Verkhnebuyundinskaya Depression and areas in the locality of Elikchanskiye Lakes. The former site is a gently rolling terrigenous plain dissected by small rivers and patterned in the lower part by a small number of thermokarst lakes. The Buyunda and other rivers are typical mountain water courses with narrow valleys and plainland stretches abundant with islands. The chain of Elikchanskiye Lakes occupies the sloping watershed between the Yama and Maltan Rivers (in the Sea of Okhotsk and Kolyma Catchments respectively). The Buyunda headwaters with their thermal mineral springs gave rise to the Talaya resort. Mountain tundras in the upper reaches of the Buyunda and Yama Rivers were formerly exploited as reindeer pastures; today, the reindeer economy in the Khasynsky District is ruined. The floodplain terraces above the Khasyn River are sown to fodder grasses. The aspect of certain small and medium-sized valleys is modified as a result of goldfield developments. The main transport artery is the Magadan Highway; it is supplemented by an extensive network of subsidiary roads. The largest populated centres include Khasyn, Talaya, Atka, and Palatka (administrative centre of the district). Many settlements were abandoned in the period of economic crisis of the 1990s. The Atkinsky Wildlife Refuge, which is approximately 1,230 km^2 in size, covers the mountain ridges in the upper reaches of the Yama River. Elikchanskiye Lakes and the surrounding area are designated to the inventory as an important wetland site.

The **Olsky District** in the southern part of Magadan Region has an area of 76,000 km^2. It is the southernmost and the most densely populated territory of Magadan Region allowing free access to the seacoast. The total length of the district shoreline amounts to 1,450 km.

Practically all territory of the Olsky District (excepting the Verkhnebuyundinskaya Depression) belongs to the Sea of Okhotsk Catchment. A large portion is occupied by intermontane depressions and maritime plains. The majority of wetlands are concentrated in the Yamsko-Tauiskaya Depression, a large sublatitudinal basin about 300 km in length, and on maritime plains along the Sea of Okhotsk coast. In the north, the Yamsko-Tauiskaya Depression is

bounded by ridges of the Kolyma Highlands drained by numerous rivers, with the primary ones being the Chelomdzha, Yana, Arman', Ola, Siglan, Yama, and Malkachan. The Kava-Tauiskaya Plain in the western part of the Olsky District is of glaciofluvial and lacustrine-alluvial origin. The area supports complex river floodplains and thermokarst mire massifs with numerous small and several large lakes (the most notable of them is Lake Chukcha). Lakes of the Kava-Tauiskaya Plain occupy up to 40% of the total area. Terrigenous plains with hummock-hollow or tussocky mire complexes and a small number of thermokarst lakes occupy the Taui-Yana and Oira-Arman Interfluvial Areas. The Olskaya Lowland, dotted with a large number of thermokarst lakes, is situated east of the city of Magadan and it includes the Ola and Lankovaya river valleys. The Yamskaya Lowland lies farther eastward. It incorporates the mosaic floodplain landscapes of the Yama Valley and a system of terrigenous and maritime plains with lake coverage of approximately 20%. Many mountain terrains retain traces of ancient glaciation in the form of morainic ridges and glacial lakes. The most interesting of these water bodies is Lake Kisi, which acts as home to a non-migratory population of the Sockeye Salmon, and Lake Mak-Mak, which is inhabited by the resident race of Arctic Char (Neiva). There are Lake Chistoye, which fills a large intermontane depression in the Ola River Basin, and the shallow Lake Glukhoye, which was formed from a former foothill lagoon in the lower reaches of the Oira River. Also, there are two thermal mineral springs (Berendzhinsky and Motykleisky) at the sides of the Shelting and Motykleisky Bays (water temperature +30-35°C). Unique oases of thermophilic flora are found in the vicinity of these sites. Unfortunately, their original aspect has been severely distorted by attempts to organize the commercial extraction and sale of bottled mineral water.

The seacoast of the Olsky District is a rugged area much dissected by deeply cut bays and inlets (Sheltinga, Motykleisky, Amakhtonsky, Nagaeva, Odyan, Zabiyaka, Babushkin, Kekurny, and Malkachansky). As the tide ebbs, large areas of intertidal silt, sand, and gravel flats become exposed at the head portions of these inlets. River estuaries give rise to extensive spits and beaches enclosing lagoons and inner water bodies (Oirinskaya, Armanskaya, Ol'skaya, Srednyaya, and Iretskaya). The Gulf of Tauisk and the adjoining shelf area are the most productive portions not only of the Sea of Okhotsk but also of the entire northern Pacific. They attract large schools of feeding young Herring (*Clupea spp*.), Capelin (*Mallotus spp*.), Smelt (*Osmerus spp., Hypomesus spp*.), and Pacific Salmon (*Oncorhynchus spp*.). A string of small and large islands in the coastal zone (Talan, Umara, Matykil, and Atykan) is of primary importance for colonial seabirds.

Mining is of minor importance in the economy of the Olsky District, but it has a well-developed transport and administrative infrastructure (ports, airfields, oil reservoirs, electric power facilities, and communication service). Freshwater fishing for salmon and char as well as saltwater fishing for herring, cod, and Walleye (*Theragra chalcogramma*) and shellfish harvesting (crabs, gastropod molluscs) provide the most important food for the population of the district. Forest cutting in the Yana and Taui river valleys was a key sector of the district's economy in the past but has lost its importance because the commercially valuable forest resources have been exhausted. Small-scale reindeer herding still exists in the eastern part of the district, with its centre at Takhtoyamsk, but is extinct in the western part (the village of Tauisk) after the early 1990s. Taken together, high human population density and activity account for the vast burned and waste areas within the Olsky District. At the same time, many settlements have been either depopulated or totally abandoned as a result of economic depression in the early 1990s. The largest settlements are the city of Magadan (capital of the region), Ola (district centre), Sokol (airport), Arman, Tauisk, Balagannoye, Talon, Yamsk, and Takhtoyamsk.

The majority of specially protected natural areas of the Magadan Region are concentrated in the Olsky District. They include three parts of the Magadan State Nature Reserve (Kava-Chelomdzhinsky, Koni-Piyaginsky, and Yamsky) and a few wildlife refuges (Kavinsky, Bugurchan, and Malkachansky). Talan Island has been designated a nature monument. Traces of activity by ancient hunters, fishermen, and gatherers are still apparent at many sites along the coastline. The most interesting of these have been found on Cape Alevin and on the shores of Tokareva and Babushkin Bays.

The territory of the Olsky District is relatively well explored, which allowed for the identification and inclusion in the inventory of 10 sites, viz. Malkachanskaya Tundra, Yamskiye Islands, Nakhatandzhinskaya Tundra, Babushkin Bay, Odyan Bay, Lake Chistoye, Olskaya Lagoon, Talan Island, Motykleisky Bay, and Kavinskaya Basin.

Khabarovsk Territory

The **Okhotsky District**, with an area of approximately 170,000 km^2, occupies the northern part of the Khabarovsk Territory where it borders the Magadan Region and Yakutia. It is a largely mountainous region lying at the junction of the northern Dshugdzhur Range and south-eastern spurs of the Verkhoyansk Range. Crossed by the main continental watershed area, the territory is intersected by the largest tributaries of the Aldan (the Yudoma and Maya Rivers), whereas a few other large rivers flow into the Sea of Okhotsk (Uliya, Urak, Okhota, Kukhtuy, Ulbeya, and Inya). Inland plains and maritime lowlands occupy about 2.5% of the total district territory. The largest wetlands are located in intermontane depressions in the upper reaches of the Yudoma and Kukhtuy Rivers, in the lower reaches of the Okhota and Kukhtuy Rivers, and also in the interfluvial area that separates them. The coastline of the Okhotsky District is rather regular and extends for about 530 km. It is interrupted by a chain of elongated seaside lagoons with sand-pebble spits and eelgrass (*Zostera sp*.) meadows. The largest lagoons form at the mouths of the Inya (25 km), Ulbeya (10 km), Kukhtuy (12 km), Urak (12 km), and Tolmot (7 km). They play a key role in the life of many migratory shorebirds. Worthy of special attention is the large Lake Tungir between Inya and Okhotsk, which was formed from a lagoon. Rocky stretches of coast are relatively short. There is a sole large seabird colony found at Loshadinaya Bay. Many waterbirds pass through Lake Tungir and Eirineiskaya Bay during migrations. Congregations of migration swans occur on the upper streams of the Kava River.

The economy of the Okhotsky District is centred on the fishing industry, including commercial and subsistence harvesting of salmon, and the development of gold-bearing alluvial deposits. The advent of foreign anglers and sport hunters in the mid 1990s seemed to revitalize the economy of the district, but their activity soon declined. Even reindeer farms located in the forested headwater areas of certain mountain rivers encounter great difficulties caused by the long economic depression and administrative chaos that befell the district at the break of the 21st century.

There are a few wildlife refuges of local importance in the Okhotsky District. The largest one is situated on the Lisyansky Peninsula and upper reaches of the Kava River. The inventory contains the description of a unique system of several Alpine-type lakes located at the main watershed in the upper reaches of the Inya River and close to the north-eastern boundary of the district.

CLASSIFICATION, LIST OF WETLANDS AND THEIR LOCATION

According to the classification adopted by the Contracting Parties of the Ramsar Convention, the wetlands of Northeastern Russia are categorized into the following types:

Marine/coastal

— permanent shallow marine waters less than six metres deep at low tide; includes sea bays and straits (A);
— marine subtidal aquatic beds and shallows; includes kelp beds and sea-grass beds (B);
— rocky marine shores; includes rocky offshore islands and sea cliffs (D);
— sand, shingle or pebble spits (E);
— estuaries and deltas (F);
— intertidal mud and sand flats (G);
— marine terraces; includes marshes, salt meadows, and mires (H);
— coastal brackish/saline lagoons with at least one connection to the sea (J);
— coastal freshwater lagoons (K).

Inland wetlands

— permanent inland deltas (L);
— permanent rivers/streams/creeks (M);
— permanent freshwater lakes (over 8 ha); includes large oxbow lakes (O);
— permanent freshwater and hummocky marshes and swamps, as a rule with manifestations of thermokarst activity (Tp);
— non-forested peatlands (U);
— tundra wetlands; includes temporary waters from snowmelt (Vt);
— geothermal wetlands (Zg).

Man-made wetlands

— water-storage areas; includes reservoirs (6);
— excavations; includes mining pools (7).

Information on individual wetlands also contains national classification codes and Ramsar Convention criteria applied to the designation of Ramsar sites (see Annexes 1-3).

The list of wetlands in Northeastern Russia includes 37 sites representative of the peculiar and unique wetlands of northeastern Asia (Table 1). These sites are described in respective Chapters below.

Table 1.

List of wetlands in Northeastern Russia covered by inventory

No.	*Name of the site*	*Region*	*Administrative district*	*Classification codes*	*No. in Fig. II (p. 54)*
1	East Siberian Sea Catchment				
1.1	Lower Chukochya River*	Yakutia	Nizne-Kolymsky	A,F,M,O,Q,Vt	3
1.2	Kolyma Delta*	Yakutia	Nizne-Kolymsky	A,F,M,O,Q,Vt	1
1.3	Khalerchinskaya Tundra*	Yakutia	Nizne-Kolymsky	M,O,Vt	2
1.4	Lower Rauchua River and Kyttyk Peninsula*	Chukotka	Bilibinsky	A,F,G,H,M,O,Q, Vt	5
1.5	Ust-Chaun*	Chukotka	Chaunsky	A,E,F,G,M,O,Vt	8
1.6	Nolde Bay	Chukotka	Chaunsky-Shmidtovsky	A,E,F,M,Vt	9
1.7	Billings Cape*	Chukotka	Shmidtovsky	E,F,H,J.M.O,Vt	12

2	Kolyma River Catchment				
2.1	Ilirneiskiye Lakes	Chukotka	Bilibinsky	M,O	6
2.2	Omolon-Anyui Interfluvial Area*	Yakutia	Nizne-Kolymsky	M,O	4
2.3	Middle Omolon River*	Magadan	Bilibinsky-Srednekansky	M,O,Tp	7
2.4	Balygychanskaya Basin*	Magadan	Srednekansky	M,O,Tp	51
2.5	Jack London Lake	Magadan	Yagodninsky	O	55
3	Chukchi Sea Catchment				
3.1	Lower Amguema River and Ukouge Lagoon*	Chukotka	Shmidtovsky-Iultinsky	F,J,M,O,Vt	14
3.2	Kolyuchin Island	Chukotka	Iultinsky	D	16
3.3	Belyaka Spit*	Chukotka	Chukotsky	E,H,Q,Vt	16
3.4	Kolyuchinskaya Bay (southern part)*	Chukotka	Chukotsky	J.M,Vt	16
3.5	Ioni Lake	Chukotka	Chukotsky	O,Vt	22
3.6	Lower Chegitun River	Chukotka	Chukotsky	J,M	17
3.7	Uelen and Inchoun Lagoons	Chukotka	Chukotsky	E,F,J	18,19
3.8	Koolen Lake	Chukotka	Chukotsky	O	20
4	Bering Sea Catchment				
4.1	Mechigmen Bay*	Chukotka	Chukotsky-Providensky	A,E,F,G,H,O,Vt,Zg	23
4.2	Senyavin Straits*	Chukotka	Providensky	A,D,E,M,Vt,Zg	25
4.3	Lower Avtotkul River*	Chukotka	Beringovsky	A,E,F,G,V,O,Q,Vt	32
4.4	Markovskaya Basin*	Chukotka	Anadyrsky	L,M,O,Vt,W	29
4.5	Elgygytkin Lake*	Chukotka	Anadysrky	O	11
5	Sea of Okhotsk Catchment				
5.1	Malkachanskaya Tundra*	Magadan	Ol'sky	A,B,E,F,G,H,M,O,Tp,Vt	38
5.2	Yamskiye Islands*	Magadan	Ol'sky	D	40
5.3	Nakhatandzhinskaya Tundra*	Magadan	Ol'sky	A,B,F,G,O,Vt	41
5.4	Babushkin Bay*	Magadan	Ol'sky	A,B,E,G	42
5.5	Odyan Bay	Magadan	Ol'sky	A,B,D,E	44
5.6	Chistoye Lake	Magadan	Ol'sky	O	44

5.7	Olskaya Lagoon*	Magadan	Ol'sky	A,B,E,F,G	45
5.8	Motykleisky Bay	Magadan	Ol'sky	A,B,D,G,Zg	47
5.9	Talan Island*	Magadan	Ol'sky	A,D,E	48
5.10	Kavinskaya Basin and Chukcha Lake*	Magadan	Ol'sky	M,O,Tp	49
5.11	Elikchanskiye Lakes	Magadan	Khasynsky	O	56
5.12	Khal-Degi Lakes	Khabarovsk	Okhotsky	M,O	57

** Site recommended for designation to the Ramsar List of Wetlands of International Importance.*

It is noteworthy that data on many almost inaccessible areas are either scarce or absent. Of special interest are such sites as Teyukul, the northern part of Wrangel Island and Vankaremskiye Lagoons in the Arctic basin; the Getlyanen and Achchen Lagoons, Konerginskaya Tundra, Klinkovstrema Bay, Lake Krasneno, Kanchalan River, Glubokaya, Mainopylgino, and Khatyrka Lagoons in the northern Bering Sea Catchment; Gizhiginsky Bay, Iretskaya Lagoon, Lower Yama River, Siglan Bay, Amakhtonsky Bay, Igadzhinskiye Mires, Inskaya Lagoon, and Eirineiskaya Bay in the Sea of Okhotsk Catchment; and the Buyundinskaya Depression in the middle course of the Kolyma River. The location of wetlands and territories of interest for further surveys in the northern part of the Russian Far East is shown in *Fig. II*.

WETLAND INVENTORY

1. East Siberian Sea Catchment

1.1. Lower Chukochya River

Geographical coordinates: 70°06'17"N, 159°32'12"E (Chukochya faktoriya).

Elevation: Alluvial and marine terraces – 1.0-5.0 m, loess-glacial plain – 30-44 m a.s.l.

Area: *c.* 450 km^2.

Overview:

Wetland complex in the lower reaches of a tundra river with adjacent stretches of alass-lake plains and polygonal mires at the southern limit of Arctic tundras; staging, breeding, and moulting areas for many species of Arctic birds and feeding grounds for a variety of whitefishes and related species.

Wetland type:

By international classification – A, F, M, O, Q, Vt; by national classification – 1.3.1, 2.5.1.1 (estuary and valley of a tundra river with the adjacent lacustrine-palustrine plain).

Ramsar Criteria: 1, 2, 3, 7.

Justification for the application of selected criteria:

Characteristic wetland complex along the East Siberian Sea coast representing the entire spectrum of landscape diversity of the Primorskaya Lowland in northeastern Yakutia. It comprises stretches of virtually intact ancient loess-glacial plains, a dynamic complex of alass-lake topography on seaside and riverside terraces, and a lacustrine-palustrine plain of the Alazeiskaya Tundra. The area supports high diversity and abundance of Arctic geese, ducks, and waders during migration, breeding and moulting seasons. It is also important for feeding and migrations of commercially valuable coregonid fishes.

General location:

In northeastern Yakutia 100 km west of the Kolyma Delta and 165 km northwest of the village of Chersky, centre of the Nizhnekolymsky Administrative District.

Physical features:

The site comprises several geological surfaces, the lowest (0-2 m) being the Chukochya River valley and the marine terrace at the left side of the estuary. It is occupied by polygonal sedge swamps, tundra grass (*Dupontia sp.*) meadows, brackish lakes, and shallow channels with highly variable water level.

Further northwest extends the elevated surface of the Chukochya-Alazeya Interfluvial Area, a plain lying 5-15 m a.s.l. with large lakes and even larger alass depressions. The primary landscape of this loess plain has been completely modified by water erosion and retains only isolated gently sloping hills (known under the vernacular name: "yedomki"). There are relatively few lakes on the Alazeiskaya Tundra; instead, it features former lake depressions of a circular outline occupied by ridged polygon mires.

The right side of the Chukochya Valley is formed by a slope of the old loess-glacial plain (15-40 m a.s.l.) extending south-eastward and markedly reworked by lake-forming thermokarst activity. Its primary aspect is better preserved in the Chukochya-Kon'kovaya Interfluvial Area than elsewhere. Characteristic of this peculiar landscape are deep lake-filled hollows, ice cliffs, narrow isthmuses between lakes, and relatively small alass depressions with polygonal mires and secondary thermokarst lakes. The primary relief is preserved as gently rolling surfaces alternating with precipitous and ravined lake depressions and connected to one another and to the Chukochya Valley by narrow grassy drains ("viski"). This plain extends as far as Cape Chukochy on the East Siberian Sea coast, a many-kilometre precipitous shoreline with icy outcrops and muddy patches emerging from water and littered with the remains of "mammoth fauna" that thaw out of the ice.

Yedomas are composed of sediments rich in organic matter (grass roots, horsetail stems) undergoing microbial degradation in late summer responsible for the elevated temperature of the tundra soil surface in early winter (S.A.Zimov, personal communication).

The estuary is shallow (0.5-1.5 m) and deepens only in the narrow fairway portion (4-6 m). The bottom sediments consist of soft silty aleurolite slush (called "nyasha" by lo-

cal inhabitants). The water level undergoes tidal variations caused by alternating onshore and offshore winds. It is markedly lowered by southerly winds while northwestern winds raise the water level by 0.7-1.0 m.

The Chukochya River flows from large lakes of the Srednekolymsky Administrative District in the forest zone (the largest of which is Lake Oler). The river valley is more than 700 km long and has a catchment area of 19,800 km^2.

Yedomas are overlain by tundra gley soils. Soils in lake depressions are predominantly of tundra-marsh and peaty-gley types, while those along the seashores are marsh tundra soils (Perfilieva & Rykova, 1985).

The area has a severe Arctic climate with frequent, strong northern winds. The mean annual temperature is –13°C. The mean monthly temperature is –32°C in January and +6.5°C in July. The air temperature often drops below freezing even in the warmest season. Annual precipitation is about 250 mm. Northerly winds of 5-7 m/s are common in the summertime. There are sometimes gale-force northeastern winds. The ice on the Lower Chukochya River breaks up in late June and freezes again in October. In April, the ice cover on the lakes may be as thick as 1.5-1.7 m; patches of open water near shore are first seen only in early June. On larger lakes, ice persists until mid July, and they freeze over in the third or fourth week of September. In midsummer, lake surface water is heated up to +10-12°C. The landfast ice is formed in mid October with coastal polynyas appearing in early or mid June, but floating ice is regularly seen in the western part of the Kolyma Bay, East Siberian Sea. In the summertime, air masses from the sea regularly bring in a haze or mist, and moist snowstorms occur once or twice every month excepting July.

The Chukochya River flows slow and widely meanders on the plain. Its banks are miry and locally precipitous. Some of its sections spread lake-like, giving rise to 0.5-2.0 km long bodies of quiet water. There are no rapids, but large and deep pools ("ulova") are scoured out of the river channel as it bends, some of them by a circular motion of the water. There is approximately 2.3 km of shoreline per square kilometre in the valley, with almost half of its total length formed by lakeshores. Low floodplain terraces support numerous oxbow lakes, some of which are affected by thermokarst processes. The estimated lake density in the Chukochya River valley is 69 per 100 km^2.

Lakes of the Chukochya Valley are 2-5 km in diameter and up to 12 m deep; they are round in shape and have clear, transparent water. Most of them appear to have been partly drained since the relief of the surrounding alasses descends by steps toward them. Lakeshores are permanently undercut by water, their dislocated mass slides down or falls freely under the wave action. Disintegration of lake shores sooner or later causes a dramatic drop in water level and catastrophic drying of the affected water body. The resulting hollow or "pogreb" in the local dialect ("cellar" in English) is eventually overgrown with bright green vegetation (*Arctophyla fulva, Senecio palustris*), thaws early in the spring, and attracts many birds and mammals. Such places are fairly rare and are all known to resident hunters as sites with a high rate of harvest. The destructive processes described in the preceding lines affect not only ancient deposits of the loess-glacial valley but also the younger Holocene sediments of river floodplains. Some places along the seacoasts (Maly Chukochy and Krestovsky capes) undergo wave abrasion at a rate of tens of metres per year. These processes are widespread as a characteristic consequence of climatic changes in the Siberian Arctic during interglacial periods. Modification of the plain relief is most intense in the lower reaches of the Chukochya River. It is virtually complete in other parts of the Primorskaya Lowland. It may be expected that thermokarst activity at the Chukochya-Kon'kovaya Interfluve will proceed at a higher rate in the decades to come by virtue of global warming.

Ecological features:

The low marine terrace supports salt meadows whose vegetation is dominated by such pioneer species as *Carex subspathacea, Puccinellia phryganodes, Cochlearia arctica*, and *Stellaria humifusa*. Higher levels are occupied by small wet moss-dominated spots with *Eriophorum scheuchzeri* and *Carex concolor*. Numerous potholes and small saline pools are covered with mare's tail (*Hippuris vulgaris*) and inhabited by notostracans (Notostraca). Maritime lakes provide major moulting grounds for geese and ducks. They are also used to establish breeding colonies by Black Brant (*Branta bernicla nigricans*), Spectacled Eider (*Somateria fischeri*), and Herring Gull (*Larus argentatus*).

Plains of the Alazeya-Chukochya Interfluvial Area abounding in lakes and alasses are largely occupied by polygonal moss-lichen tundras with sedge and cottongrass (*Carex concolor, Eriophorum polystachion* and *E.vaginatum*). Sedge-cottongrass marshlands are autochthonous habitat for Siberian Lemming (*Lemmus sibiricus*), a biome-forming species of plainland tundras in Yakutia. Elevations are occupied by the dwarf shrub math grown by *Dryas punctata*, dwarfy willows (*Salix sphenophylla, S.reticulata, S.reptans, S. pulchra*), and low-bush cowberry (*Vaccinium vitis-idaea*). Other characteristic plants include graminoids with prevalence of *Carex lugens, Agrostis latifolia*, and *Calamagrostis holmii*. This habitat provides a home for Collared Lemming (*Dicrostonyx torquatus*), one more key species of the tundra ecosystem. Riverbanks as

well as lakeshores and shallows are overgrown with pendent grass (*Arctophyla fulva*). The maritime portion of this area is exploited by breeding Arctic Foxes (*Alopex lagopus*), feeding Wild Reindeer, and moulting Arctic Geese. Snowdrifts accumulated in ravines and precipitous lakeshores persist well into the summer season and feed picturesque snowbed communities of *Arctophila fulva*, *Oxyria digyna, Bistrota ellipticus*, *Valeriana capitata, Parnassia kotzebuei, Saxifraga nivalis*, and *S.rivularis*. The vegetation cover of dry baydjarakhs is dominated by *Artemisia tilesii, Descurainia sophioides*, and *Tripleurospermum tetragonospermum*. Grassy plots with *Poa alpigena* and *Alopecurus aplinus* occur in smaller ravines. Lake and riverside precipices are frequently used by such birds of prey as the Peregrine (*Falco peregrinus*) and Rough-legged Buzzard (*Buteo lagopus*) as nesting sites.

The vegetation of riverside slopes is composed of horsetail (*Equisetum arvense*), grasses (*Poa arctica* and *Alopecurus alpinus*), and forbs (*Polemonium boreale* and *Castilleja rubra*), with the marginal growth of subarctic willows (*Salix glauca* and *S.pulchra*). Terraces above the floodplain further from the Chukochya River are occupied by watery sedge-cottongrass and moss-dominated glades.

The yedoma surface is frost-cracked tundra with medallions 1-1.5 m in size, grassy swamps, lakes, and pools in depressions containing dark water and overgrown with sedges and cottongrass. Medallions have patchy vegetation composed of mosses, lichens, dwarf shrubs (*Vaccinium uliginosum, V.vitis-ideae, Empetrum nigrum, Salix polaris*), and herbs (*Dryas punctata, Diapensia obovata, Hierochloe alpina*). Where alass depressions merge into one another, the yedoma surface is wedged as distinct well-drained portions of land covered with xerophytic vegetation of *Delphinium chamissonis, Lychnis sibiricus,* and *Artemisia borealis*. The soil cover of these plots gives home to carabids (*Carabus truncaticollis* and *Pterostichus sp.*). They are frequently used by Arctic Foxes to burrow dens or "to lie cubs" in the local language; hence their vernacular name "kladbishcha" in Russian ("cemeteries" in English).

The flora of nearshore shallows and low clay terraces ("laidy") of the lakes consists of pendent-grass (*Arctophyla fulva)* and tundra grass (*Dupontia sp.*), cottongrass and sedges. Wet riverside meadows remain bright green as long as late August when the adjacent mounds and swamps are already coloured yellow and brown. Shores of the lakes and narrow channels are covered with *Hippuris lanceolata* and *Ranunculus gmelinii*; water moss (*Drepanocladus exannulatus*) grows deep in the water. Lacustrine zooplankton is represented by cladocerans (*Eurycercus lammelatus, Daphnia pulex*), copepods (*Eurytemora spp., Heterocope spp.*), and branchiopods (*Polyartemia spp.*). The usual components of zoobenthos are small molluscs (*Sibirenauta elongata*), amphipods (*Sinurella jacutana*), notostracans (*Lepidurus arcticus*), caddisfly larvae (*Trichoptera spp.*), dipterans (*Chironomidae*), and oligochaetes.

Only deep undrained lakes with precipitous shores are inhabited by the endemic char (*Salvelinus czerskii*) (called "lenok" by residents).

Noteworthy flora:

The vegetation cover of Chukochya tundras is dominated by Arctic species (*c.* 60%). It is distinctive for the abundant growth of decumbent and woody stemmed willows (*Salix polaris, S.reticulata, S.sphenophylla*, *S.reptans*). Lower sites are occupied by sedge-sphagnum mires with the predominance of *Carex concolor*. Equally characteristic is the presence of longstanding snow patches with the associated herbaceous communities and tussocks of *Eriophorum vaginatum* that spreads from the south. Lichens are less abundant because they have since long been extensively consumed by domestic reindeer herds (Perfilieva and Rykova, 1985). Rare species include *Parnassia rosea* listed in the Red Data Book of Yakutia (1987).

Noteworthy fauna:

Fish

The Lower Chukochya River Basin provides feeding grounds for the commercially important stock of Siberian coregonids that includes Wide-nosed Whitefish (*Coregonus nasus*), Muksun (*C.muksun*), Arctic Cisco (*C.autumnalis*), and Siberian Whitefish (*C.lavaretus pidschian*). The non-migratory Least Cisco (*C.sardinella orientalis*) occurs in Lake Bolshoye Morskoye and the endemic Chersky's Char in yedoma lakes. Certain individuals of the Wide-nosed Whitefish weigh up to 5.5-6.5 kg.

Birds

The lower valley and estuary of the Chukochya River as well as tundra lakes inhabited by char are frequented by Pacific Diver (*Gavia pacifica*) and Yellow-billed Diver (*G. adamsii*).

The same habitats are used by a small number of breeding Bewick's Swans (*Cygnus bewickii*), Black Brants (*Branta bernicla nigricans*), and Snow Geese (*Chen hyperboreus*) that winter along the western coast of Canada and USA (Andreev, 1997). Breeding Bean Geese (*Anser fabalis serrirostris*) and White-fronted Geese (*A. albifrons*) are less common. Snow Geese as a rule and Been Geese rather frequently place their nests in close proximity to the nesting sites of Peregrines and Rough-legged Buzzards. Arctic geese still come to moult to the

lakes on the left side of the Chukochya Estuary and farther north to the lakes in the vicinity of the Enyumchuveem River.

The most common breeding ducks include Long-tailed Duck (*Clangula hyemalis*), Spectacled Eider, Greater Scaup (*Aythya marila*), Common Teal (*Anas crecca*) and Pintail (*A. acuta*). Eiders move to their moulting grounds along the seashore in early August. The Spectacled Eider flies north-westward and Steller's Eider (*Polysticta stelleri*) is bound for the southeast. In August and September, large numbers of Pintails appear on the lakes of the Alazeiskaya Tundra.

Breeding Peregrines and Rough-legged Buzzards are frequently sighted on lake and riverside precipices that are also visited by Goshawk (*Accipiter gentilis*) and Merlin (*Falco columbarius*) during autumn passage (Krechmar *et al*., 1991). The breeding range of Willow Grouse (*Lagopus lagopus*) is extended to the Emaskoveem River, but in the Lower Chukochya River this bird occurs only in winter.

The Sandhill Crane (*Grus canadensis*) prefers the yedoma landscape for breeding. A few pairs of Siberian White Crane (*G.leucogeranus*) inhabit the large watery alasses of the Alazeiskaya Tundra (e.g. near Ilirgytkin and Maloye Morskoye lakes).

The most common waders include the Black-bellied Plover (*Pluvialis squatarola*), Pacific Golden Plover (*P. fulva*), Red-necked Phalarope (*Phalaropus lobatus*), Grey Phalarope (*Ph. fulicarius*), Little Stint (*Calidris minutus*), Temminck's Stint (*C.temminckii*), Curlew Sandpiper (*C.ferruginea*), Pectoral Sandpiper (*C.melanotos*), and Bar-tailed Godwit (*Limosa lapponica*). Less common breeding waders are the Ringed Plover (*Charadrius hiaticula*), Dotterel (*Eudromias morinellus*), Spotted Redshank (*Tringa erythropus*), Ruddy Turnstone (*Arenaria interpres*), Ruff (*Philomachus pugnax*), Common Snipe (*Gallinago gallinago*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Occasionally, Wimbrel (*Numenius phaeopus*) comes from the mountainous right side of the Kolyma River and Sharp-tailed Sandpiper (*Calidris acuminata*) from southern quarters of the Chukochya River valley (Dorogoy, 1988).

The Lower Chukochya River provides breeding grounds for the Long-tailed Skua (*Stercorarius longicaudus*) and Arctic Skua (*S.parasiticus*). The Pomarine Skua (*S.pomarinus*) is sometimes very abundant both during the breeding season (if the lemming number is high) and as a vagrant. Ross' Gull breeds in the Chukochya Valley. Mixed colonies of Herring Gull (*Larus argentatus*) and Glaucous Gull (*L.hyperboreus*) are scattered over tundra lakes and alass depressions spaced 10-12 km apart. The Arctic Tern (*Sterna paradisaea*) breeds in the area in small numbers.

The Snowy Owl (*Nyctea scandiaca*) is a regular breeding bird in years when lemming numbers increase to peak. It chooses to nest both in the Chukochya Valley and in the alasses of the Alazeiskaya Tundra. The nesting density amounts to 3 pairs per 10 km^2.

Mammals

The coastal waters of the East Siberian Sea harbour Ringed Seals (*Phoca hispida*) and the much rarer Beluga Whale (*Delphinapterus leucas*). The area encompasses migrating routes of the Sundrun Reindeer population. The herds travel southeast along the shoreline until early August and thereafter move in the opposite direction (northwestward). The most common mammalian species include the Arctic Fox (*Alopex lagopus*), Siberian Lemming (*Lemmus sibiricus*), and Collared Lemming. The Narrow-skulled Vole (*Microtus gregalis*), Wolf (*Canis lupus*), Red Fox (*Vulpes vulpes*), Wolverine (*Gulo gulo*), and Ermine (*Mustela erminea*) are not so common. Forest mammals such as Sable (*Martes zibellina*), Lynx (*Lynx lynx*), Brown Bear (*Ursus arctos*), and Elk (*Alces alces*) are rare visitors to the area. Horses of the local Yakut breed put to grass at reindeer pastures can also be regarded as an integral element of the site's landscape. The horses are extensively used by reindeer herders in the summer but moved thereafter to the Kolyma Valley to stay throughout winter.

Social and cultural values:

In the 1980s and 1990s, a few organized groups of fishermen used to work for the Nizhnekolymsky fishery factory in different parts of the Lower Chukochya River (Chukochya faktoriya and the Krestovaya, Gal'gavaam, Ermaskoveem, Levinskaya fishers). Species of commercial value include Wide-nosed Whitefish, Arctic Cisco, Muksun, and Lake Char. Fish was frozen in ice and transported by helicopter to Chersky. The Chukochya faktoriya was for a long time the centre of economic, social, and cultural activities of nomadic reindeer herders who used to bring their herds to this place by midsummer. The post had a shop, storehouse, and cinema unit. It served as a base for a commercial cooperative of fishermen and fox trappers. In the past, Ringed Seals were hunted in the mouth of the Chukochya River. Until the mid 1970s, transportation strongly depended on sledges pulled by reindeer or dogs. In the 1980s, they were replaced by Buran snowmobiles and MI-8 helicopters. Today, however, traditional means of transportation tend to be popular again. Clay outcrops on Cape Maly Chukochy are an important source of "mammoth-bone" for local bone carvers.

Current land use:

The Kolyma-Alazeya Interfluvial Area is traditionally used not only for reindeer grazing but also for hunting and fishing. The borderline between reindeer herds of Kolyma (managed by "kolymchane" and western Chukchi) and Alazeya (managed by the Even and Yukagir) lies west of the Chukochya River. The coastal area is used by Russian hunters. Part of the territory is included within the Chaigurgino Wildlife Refuge ("zakaznik"). Small-scale commercial fishing is practiced in the Chukochya mouth and some lakes. Alasses are used as reindeer pastures. Areas in the vicinity of the Chukochya faktoriya are still of interest for birdwatchers and tourists from abroad. Shooting waterfowl during spring migrations is popular among local hunters, who make hides and put geese silhouettes at the "cellars".

Conservation measures taken:

A large part of the site is protected under the Chaigurgino Wildlife Refuge administered by the Ministry of Environmental Protection, Republic of Sakha (Yakutia). It is proposed that the area be designated a wetland of international importance in accordance with the Ramsar Convention criteria.

Current scientific research and facilities:

Throughout the 1960s and 1970s, the area was surveyed by zoologists and botanists of the Institute of Biology, Yakut Branch of the USSR Academy of Sciences. The survey was continued from 1981 to 1995 by theriologists and ornithologists of the Institute of Biological Problems of the North in Magadan. A precipice of the Malaya Chukochya channel exhibits an outcrop of fundamental importance for Quaternary geology. Since the 1970s and up until recently it has been used to carry out a comprehensive cryogeological survey.

Current recreation and tourism:

In 1992-1997 the Chukochya faktoriya was annually visited by birdwatchers from Europe. In subsequent years, this activity ceased because of high travel expenses and poor organization at the local level.

Jurisdiction:

Administration of Nizhnekolymsky Ulus (district) of the Republic of Sakha (Yakutia).

1.2. Kolyma Delta

Geographical coordinates: The site lies within a quadrangle with coordinates 60°50'N, 159°55'E – 69°40'N, 161°05'E – 69°05'N, 161°05'E – 69°15'N, 159°30'E; coordinates of the central part: 69°28'N, 160°30'E.

Elevation: 0-62 m a.s.l., with the primary part of the area lying at 2-4 m a.s.l.

Area: 6,500 km^2.

Overview:

The site comprises the foredelta of the Kolyma River with intertidal mud and sand flats, alluvial islands with residual rocks, numerous channels and thermokarst lakes including Lake Nerpichiye, the largest one in Yakutia. Interlake areas are occupied by polygonal bogs and hillocky tundra. The northern part of the area is a low plainland with patches of maritime tundra, salt meadows, and heaps of driftwood. Further south, this landscape is replaced by hypoarctic tundra with polygonal bogs, palsas, numerous thermokarst lakes, channels, and narrow grassy drains ("viski") lined with thick willow growth over drained banks. A distinctive feature of the area is a system of large shallow-water lakes connected to the Kolyma River in the south and to the Kolyma Bay in the north. The water level in these lakes varies considerably and they support extensive plantations of pendent grass (*Arctophyla fulva*).

Wetland type:

By international classification – A, F, M, O, Q, Vt; by national classification – 1.1.1, 1.3.2, 2.5.1.1, 3.7.2 (sea gulf with a coastal lowland, juvenile delta plain, and adjacent lacustrine-alluvial areas in the tundra zone).

Ramsar Criteria: 1, 2, 3, 4, 7.

Justification for the application of selected criteria:

High population density of Bewick's Swan (*Cygnus bewickii*) in the breeding and moulting periods, large numbers of breeding birds of prey, divers, waders, and Ross' Gull (*Rhodostethia rosea*). A key area for several rare and valuable subarctic waterside birds of eastern Asia during autumn migration and breeding seasons. Feeding grounds for whitefishes and related species and their seasonal migration routes to and from spawning areas.

General location:

The site lies at the northeastern periphery of the vast Primorskaya Lowland of Yakutia and encompasses the western part of the Kolyma Delta (Gabyshevsky Island,

Pokhodskaya (Zemlyanaya) Kolyma, Poperechnaya, Yurtennaya, Pokhodskaya, and Rybnaya Channels) and the lake-studded marshland extending westward through the Kolyma-Kon'kovaya Interfluvial Area. The site is bounded by the Chukochya Channel on the east, the Kon'kovaya River in the west, Kolyma Bay of the East Siberian Sea in the north, and a terrace forming a steep bluff of the Khalerchinckaya lacustrine-alluvial plain in the south. The southern boundary of the site runs 42 km NNW of the village of Chersky, administrative centre of Nizhnekolymsky Ulus (district), Yakutia.

Physical features:

Geological and geomorphological features

The accumulative plain of the Lower Kolyma River makes up the northeastern periphery of the vast Primorskaya Lowland, whose 300 km long Kolyma-Alazeya Interfluvial Area is referred to as the Kolyma Lowland. Within the site borders, the Kolyma Lowland is formed by loose alluvial and marine sediments as thick as 400 m. The Primorskaya Lowland was formed by the effects of contrasting variations of types of climate in the Upper Quaternary and Holocene in the absence of sheet glaciation (Severnaya Yakutia..., 1960). The eastern part of the Kolyma Delta is bounded by mountain chains of the North Anyui Highlands from which spurs extend to the delta plain, giving rise to several elevated sites (Kamennaya and Pokhodskaya yedomas, Stolbik). A few geomorphological levels are distinguished within the area:

1. Residual rocks 12-50 m in height (Pokhodskaya and Kamennaya yedomas, Stolbik) – Mesozoic granodiorite intrusions in clayey schists covered with recent thin organogenic sediments and overlain by the soil layer. These landforms are edged by stone cliffs. They are the main structure-forming elements of the contemporary delta around which new surfaces are formed.

2. Khalerchinskaya Tundra occupies the southern portion of the site. It is a Late Quaternary plain of lacustrine and alluvial origin lying 15-20 m a.s.l. and made up of riverine sands interspersed with peat and eolian deposits. The surface is substantially reworked by cryogenic processes. There are numerous horseshoe- and delta-shaped lakes formed by thermokarst and thermoerosive processes as well as pingos (hydrolaccoliths), peat-covered ice-cored hills up to 50 m in height rising above waterlogged alass depressions and frequently enclosed in a ring of small thermokarst lakes. Well-drained lake depressions are occupied by polygonal moss-lichen bogs. Watershed lakes of the Khalerchinskaya Tundra differ from those in other permafrost areas by the triangular shape of their deep portion and light, absolutely transparent even if standing water. The majority of these lakes are stagnant; they are fed predominantly by snowmelt.

3. The rear-delta surface elevated 5-6 m a.s.l. dates back to the early Holocene when seawater greatly influenced delta- and riverbed-forming processes that eventually gave rise to a number of lakes, such as Nerpichiye and Chukochiye. Apart from lakes, the plain contains minor watershed surfaces substantially reworked by thermokarst activity, hydromorphic depressions, and lacustrine-palustrine complexes resulting from current thermokarst processes. All these landforms are arranged parallel to the shoreline of ancient lagoons. Larger lakes are rich in nutrients due to their alternating input with incoming seawater and river runoff. Most lakes are shallow (1.2-2.0 m), their south-facing shores are covered with accumulated peat-sapropel sedimentary deposits giving rise to a fringe of pendent grass and horsetail growth. Large secondary thermokarst lakes (Laidosskoye, Kotel'nicheskoye, Ubienskoye) are situated along old runoff troughs of the Kolyma River and connected to one another and to Lake Nerpichiye by deep channels having steep banks and ice at the bottom (many species of fish come to these lakes to feed and channels serve as their migration routes).

4. The recently-formed deltaic-alluvial plain is about 500-1,000 year old and elevated 1.5-2.0 m a.s.l. It is peculiar for highly polymorphic granulometric properties of the underlying deposits and a variety of thermokarst processes that developed after the riverbed had been formed. The plain features secondary thermokarst mire complexes and confluent paddle-shaped lakes. Interlake areas are occupied by polygonal mires, palsas, and alass potholes overgrown with cottongrass. Manchurian alder thickets develop on pingos while *Salix pulchra* grows along polygon ridges.

5. The present delta plain is subdivided into middle- and low-level surfaces (0.7-1.2 m and 0.2-0.5 m respectively) as well as a surface below 0.2 m represented by intertidal mud and sand flats, sandy bars, and shallows. The mid-level surface exhibits early signs of the freeze-thaw cycle, i.e., primary polygonal cracks, point thermokarst phenomena, thermokarst eroded oxbows, etc. Terrace margins are covered with *Dupontia sp., Salix alaxensis,* and *Parrya sp.* while wet depressions give rise to arctophyla fields. The surface is dissected by shallow hollows and streams. At its lower portions, tidal fluctuations of the seawater level contribute to the formation of primary coastal plains. Characteristic features of such places are waterlogged ground, a network of parallel lagoons and bars, and pioneer growth of halophytes. The foredelta landscape is diversified by the presence of huge heaps of driftwood. The surface is intersected by shallow runoff troughs and extends seaward to turn into sea shoals. Conversely, the network of deeper hollows (creeks) is well-developed in

the western part of the delta featuring numerous thermokarst pools of varying shape. As a rule, these pools are not very deep, contain brackish water, and have low shores and a soft bottom free from macrophytes.

Climate and hydrology

The area has a severe climate with short summers and long winters. The frostless period is roughly 55 days, the sum of positive temperatures is 800-900°C. Weather conditions are determined by incoming Arctic air-masses in the summertime and by the East Siberian anticyclone in the winter. The mean air temperature in January is –34°C and in July +9°C. The highest temperature of up to +20°C is recorded in early and mid July. Prevalent in the summer are relatively dry and cool northerly winds (NW, N, NE) of 3-7 m/s with an air temperature from 0°C to +7°C. By late summer, the air temperature rises due to the influx of relatively warm water-masses brought in from the south through river channels. The average annual precipitation is *c.* 150 mm, largely in the form of snow. The cloudy weather prevails with frequent fog in June and July due to intense evaporation from vast intertidal silt and sand deltaic flats. There are hardly 10-14 clear days during the three summer months with calm weather and light southerly wind. At best, such weather persists for two consecutive days and passes to a prolonged period of violent storms.

The Kolyma River flows 2,198 km and has a catchment area of 665,000 km^2; the average annual flow exceeds 130 km^3. The ice on delta watercourses breaks up in the first ten days or in the middle of June and is immediately followed by a flood. Water in the river freezes in early October. Summer flooding in August or September is caused by monsoon rains in the upper part of the Kolyma Basin that adjoins the Sea of Okhotsk Catchment. Catastrophic spring floods in the Kolyma lower reaches occur roughly every 7-10 years, with river water covering the entire delta plain. In midsummer, the water level in the delta and the adjoining catchment area is subject to 1-1.5 m tidal variations.

The Kolyma River carries highly turbid water. In contrast, lake water is clear in calm weather; it is either fresh or slightly acid (pH 5.6-6.7). Methane is produced at the lake floor year-round; the gas accumulates in large amounts under the ice by the end of winter.

Soils

The microrelief of the delta plain is dictated by permafrost that plays a key role in soil formation. During the summertime, the active soil layer is 15-35 cm thick. Saline sulphate-chloride soils are best developed in the maritime area. A large part of the site is dominated by peat and peat-marsh soils characteristic of ridged polygonal mires and thermokarst depressions (50%). Another group is represented by the soil-permafrost complex comprising peaty-gley-humic soils that underlie sedge tussocks and frozen ridges (30%). Tundra gley and gley-humic soils develop in small areas of interlake hillocky relief (10%). Marsh soils (10%) occur in a 10-15 km wide strip of the maritime tundra (Elovskaya, 1979).

Ecological features:

The Lower Kolyma River lies at the junction of a few large geographic zones. The Arctic Ocean coast, the delta and valley of the largest Siberian River, north-western offshoots of the Anyui Range, the eastern periphery of a large tundra plain, and the northern limit of larch taiga forests extending far to the north under the shelter of mountain ranges are brought very close together in this area. A bird's-eye view of the Kolyma Delta shows a characteristically yellow colour of the tundra attributable to the predominance of sedges and cottongrass over mosses and dwarf shrubs. The narrow strip of the Arctic coast gives rise to a maritime salt marsh complex dominated by halophytes: *Carex subspathacea, Puccinellia phryganodes,* and *Stellaria humifusa*; this vegetation lends a rusty tone to the ground surface. High tundra of the marine terrace is occupied by small plots of *Carex subspathacea* with admixtures of *Dupontia fisherii*, *Carex glareosa, Calamagrostis deschampsioides*, and *Cochlearia arctica*.

Maritime areas are covered by a network of small (50-200 m in diameter), round, shallow (40-60 m) lakes with silty bottoms and an abundant growth of *Hippuris vulgaris*. These lakes are inhabited by small crustaceans, such as branchiopods (*Polyarthemia sp., Branchynecta sp*.), cladocerans (*Daphnia spp.*), and copepods (*Euritemora spp., Cyclops spp.*), as well as notostracans (*Lepidurus arcticus*) and numerous mosquito larvae (Chironomidae). Molluscs do not normally occur in these lakes.

These areas are favoured by breeding Bewick's Swans. Lying south of the strip of maritime meadows are plainlands occupied by lakes, alasses, and ridged polygonal bogs. Interlake spaces and riverside slopes account for 52% of the total Kolyma Delta area. The water surface makes up about 42% of the total, 2/3 being lakes and 1/3 channels. On average, there are 20 lakes per square kilometre of delta plain. The total length of shoreline is 10 km/km^2. The polygonal patterning is produced by frost cracks, ridges, and rectangular potholes measuring 8-12 x 10-15 m. At highly wet and cool sites, e.g. between Lake Nerpichiye and Chukochya Channel, polygons may be as large as 25-50 m in diameter with 1.5-2.0 m high ridges and 1 m or wider frost cracks.

The vegetation cover of polygons is a function of moisture. Sometimes, it is dominated by *Carex concolor* or *Eriophorum scheuchzeri*; these species can intermix with mosses and characteristic *Saxifraga hirculus*. Ridges are covered with *Salix pulchra, Betula exilis, Vacinium vitis-idaea* and *Rubus chamaemorus*.

In the southern part of the delta plain, ridges of the polygonal relief are overgrown with *Duschekia fruticosa* and *Salix pulchra* (Andreev & Perfilieva, 1980). Lake depressions are favourable for *Eriophorum polystachion* and *Arctophyla fulva* covering large areas. Thermokarst and oxbow lakes of the Kolyma Delta are bordered by the growth of *Arctophyla fulva*, *Equisetum fluviatile*, *Menyanthes trifoliata*, and *Sparganium hyperboreum*. Submerged and bottom vegetation consists of *Ranunculus gmelinii, Btrachium trichophyllum, Potamogeton perfoliatus, P.alpinus*, and aggregates of hydrophilic mosses (*Drepanocladus sp.*).

Lakes of the Kolyma Delta have been formed as a result of thermokarst activity; they are 2-4 m deep, relatively young and oligotrophic, with shores steeply descending below the water level. The lakes are inhabited by numerous small crustaceans (*Daphnia sp., Cladocera sp.*) and coregonids (Peled, Cisco, and Wide-nosed Whitefish). Large watercourses are lined with willow thickets (*Salix, boganidensis*, *S.lanata, S.glauca,* and *S.pulchra*), and their banks are occupied by wet meadows dominated by *Poa arctica, Equisetum arvense, Alopecurus alpinus* and by tussocky marshes with *Carex juncella*.

Autumn is a time of massive movements of East Siberian whitefishes upstream along the Kolyma Delta channels and the Kon'kovaya River to their spawning beds. The migration involves Inconnu (*Stenodus leucichthys nelma*), Least Cisco (*Coregonus sardinella*), Muksun (*C.muksun*), and Arctic Cisco (*C.autumnalis*). Of special interest is a system of giant thermokarst lakes in the western part of the area connected into a single chain by channels. This system receives part of runoff brought by the Kolyma River and some smaller rivers draining southern areas of the Khalerchinskaya Tundra. The system comprises Lakes Bolshoye Pokhodskoye, Maloye Pokhodskoye, Nerpichiye, Laidosskoye, Krugloye, Chukochiye, Ubienskoye, Kotel'nicheskoye, and Osenevannoye along with Pokhodskaya, Nerpichiya, Morskaya, Rybnaya, and Rel'khoveem Channels ("viski"). The depth of the lakes does not exceed 1.5-2.0 m even in periods of high water level. In July and August, the recession of water from the shores of these lakes exposes a broad nearshore area of silty ground called "laida". Both the shores and shallow-water areas are bordered by a wide fringe of *Senecio palustris* and *Arctophyla fulva*, with the latter spreading over progressively larger areas. The great abundance of chironomid larvae in the benthic fauna is another characteristic feature of these lakes. A large number of chironomids emerge on warm windless days between 25 June and 20 July. Channels interconnecting the lakes are deep (2-4 m), with ice at the bottom and almost vertically plunging banks. In midsummer, their water becomes grey in colour by virtue of highly abundant diatoms and zooplankton. Stems of arctophyla are densely populated by molluscs (*Anisus acronicus* and *Physa sp.*). In spring, large schools of whitefishes and related species enter the lakes for feeding.

Pokhodskaya yedoma is hillocky tundra with the vegetation cover composed of *Diapensia obovata, Betula exilis, Ledum decumbens, Salix reticulata, Hierochloe alpina, Poa arctica*, and other species. Depressions are occupied by hummocky tundra dominated by *Eriophorum vaginatum* and *Calamagrostis holmii*. Unlike areas lying south of the Kolyma Valley, Manchurian alder thickets (*Duschekia fruticosa*) are poorly developed in the delta. Willow growth (*Salix lanata, S.pulchra*) is confined to channel banks. A peculiar aspect of the landscape is emphasized by the presence of large heaps of driftwood. Numerous logs lie at the bottom of many lakes, some of which are located rather far from the sea. This suggests that such lakes originate from coastal lagoons and that the plain was recently inundated by seawater.

The general uplift of the area manifests itself in a number of other features, such as intensive growth of arctophyla on running-water lakes, drying up of channels that connect water bodies and their transformation into marshy isthmuses. Also, characteristic features of the deltaic hydrological regime include alternation of upstream and downstream currents (produced by the reciprocal exchange of river and seawater depending on its relative levels) and extensive pondweed growth (*Potamogeton alpina*) in shallow channels during midsummer.

Noteworthy flora:

The site comprises two botanically valuable areas, the Rogovatskaya Sopka and Pokhodskaya yedoma, that harbour isolated microthermic and hemimacrophytic communities with relicts of Pleistocene tundra-steppe vegetation, such as *Carex supina subsp.spaniocarpa* and *Arabidopsis bursifolia*. Silty margins of the Pokhodskaya yedoma exhibit patches of *Rhodiola integrifolia* (Perfilieva *et al*. 1991). *Chrysosplenium tetr*and*rum*, endemic *Stellaria kolymensis* and rare species of the genus *Oxytropis (O.mertensiana, O.ochotensis)* occur in delta habitats. The area between Lakes Pokhodskoye and Nerpichiye is famous for its rich fields of cloudberry (*Rubus chamaemorus*); in

autumn it is regularly visited by villagers to pick berries. In the wintertime, the southern part of the area is used as a rangeland for domestic reindeer. Arctophyla is also a valuable animal fodder, but its resources remain virtually unexploited.

Noteworthy fauna:

Birds

The importance of the site for migrating birds: the Kolyma Delta lies at a crossroad of migration routes of many water birds. Also, it is a section of flyways and stopover area for Pacific Diver (*Gavia pacifica*), Red-throated Diver (*G. stellata*), Yellow-billed Diver (*G. adamsii*), Tundra Bean Goose (*Anser fabalis serirostris*), White-fronted Goose (*A. albifrons*), Black Brant (*Branta bernicla nigricans*), and many sea ducks, of which Spectacled Eider (*Somateria fischeri*) and Steller's Eider (*Polysticta stelleri*) are most numerous. Also common are Sandhill Crane (*Grus canadensis*) and Arctic waders, such as Pectoral Sandpiper (*Calidris melanotos*), Short-billed Dowitcher (*Limnodromus scolopaceus*), Temminck's Stint (*Calidris temminckii*), Red-necked Phalarope (*Phalaropus lobatus*), and Grey Phalarope (*Ph. fulicarius*).

The importance of the site for breeding birds: the Kolyma Delta and certain parts of the Kolyma-Kon'kovaya Interfluvial Area are major feeding grounds for Bewick's Swans. Their total number amounts to almost 5,000 and the nesting density to 0.5-1.0 pairs/km^2. The breeding success is as a rule high. Geese are rare breeders in the area. It harbours small colonies of Black Brant (*Branta bernicla nigricans*). The most common ducks include Long-tailed Duck (*Clangula hyemalis*), Spectacled Eider (*Somateria fischeri*), King Eider (*S. spectabilis*), and Greater Scaup (*Aythya marila*). Small lake islands provide breeding sites for Glaucous Gull (*Larus hyperboreus*) and Herring Gull (*L. argentatus*). Also there are a few colonies of Ross' Gull. Long-tailed Skua (*Stercorarius longicaudus*), Pectoral Sandpiper, Temminck' Stint, Spotted Redshank (*Tringa erythropus*), Ruff (*Phylomachus pugnax*), Red-throated Pipit (*Anthus cervinus*), Redpoll (*Acanthis flammea*), and Lapland Longspur (*Calcarius lapponicus*) become very common in the summer. Birds of prey sighted at the Pokhodskaya yedoma include Gyrfalcon (*Falco rusticolus*), Peregrine (*F. peregrinus*), and Rough-legged Buzzard (*Buteo lagopus*). All four diver species are equally common on tundra lakes.

List of the most important breeding habitats:

— maritime meadows – Bewick's Swan, Black Brant, Spectacled Eider, Little Stint (*Calidris minutus*);
— alass depressions with secondary thermokarst lakes – Bewick's Swan, Ross' Gull, Spectacled Eider;
— interlake hummocky relief – Long-tailed Duck, Pintail (*Anas acuta*);
— lakeshores and channel banks – Bewick's Swan, King Eider, Pintail, Baikal Teal (*Anas formosa*), Willow Grouse (*Lagopus lagopus*), Arctic Skua (*Stercorarius parasiticus*), Temminck's Stint;
— polygonal tundra – Pectoral Sandpiper, White-fronted Goose, Ruff;
— rocky precipices – Gyrfalcon and Peregrine.

The importance of the site for moulting birds:

In the past, moulting geese were common on the lakes of Pokhodskaya yedoma. However, they disappeared from the delta with the advent of motorboats and frequent helicopter flights. Today, small groups of moulting geese can be seen on Lake Kotel'nicheskoye and in the lower reaches of the Kon'kovaya River. Lakes in the area bordering the Pokhodskaya yedoma attract Bewick's Swans that congregate in large groups during the moulting season. Hundreds of Greater Scaups gather on Lake Laidosskoye for moulting. Lake Nerpichiye is used for the same purpose by Long-tailed Duck and Red-breasted Merganser (*Mergus serrator*). Shallow waters of the Kolyma Bay close to the delta provide moulting grounds for Long-tailed Duck and Steller's Eider (thousands of birds).

The importance of the site for wintering birds:

Only Snowy Owl (*Nyctea scandiaca*), Willow Grouse, Rock Ptarmigan (*Lagopus mutus*), and sometimes Gyrfalcon occur in the area in the winter time.

Check-list of bird species:

Red-throated Diver (*Gavia stellata*) – common species on floodplain lakes in the southern part of the Kolyma Delta.

White-billed Diver (*Gavia adamsii*) – usual breeding bird throughout the site. It is most common in the "chironomid lakes" area where feeding young coregonids abound. Birds breeding in the maritime area feed in the open sea.

Black-throated Diver (*Gavia arctica*) – breeding birds occur in the southern part of the area where they are sighted as frequently as the Pacific Diver.

Pacific Diver (*Gavia pacifica*) – regular breeding species especially in the maritime area and in the Kolyma Delta. It favours mid-sized lakes rich in fish. Birds breeding on maritime lakes fly to the sea for feeding.

Red-necked Grebe (*Podiceps griseigena*) – the species occurs in small numbers on oxbow lakes in the southern part of the site.

Whooper Swan (*Cygnus cygnus*) – breeds in the Kolyma River valley south of the delta plain and on the lakes located on the right side of the Kolyma River occupied by wooded uplands. Some Whoopers visit the delta. Recently, they have been sighted nesting in the mid-course of the Kon'kovaya River.

Bewick's Swan (*Cygnus bewickii*) – the most common water bird at the site. The total number in the Nizhnekolymsky Administrative District is estimated at 5,000. Nesting density is 0.5-1.0 pairs per km^2. The number of single birds gathering to moult in the vicinity of the Pokhodskaya yedoma amounts to 1,500. Clutch size is 4-5 eggs, brood size 3-4. Satellite tracking has demonstrated that birds breeding in the Niznekolymsky District have their winter quarters in Japan. Spring passage follows via Sakhalin, the Sea of Okhotsk, and the Eirineiskaya Bay-Kava River Basin wherefrom the birds are bound for the Upper Kolyma River.

White-fronted Goose (*Anser albifrons*) – breeding birds are rather few in the Kolyma Delta. Nests and broods were seen at Pokhodskaya yedoma, near Lake Nerpichiye and in the Kon'kovaya River valley. Clutch size is 5 eggs, brood size 4-5. Moulting grounds are situated northwest of the Chukochya River.

Lesser White-fronted Goose (*Anser erythropus*) – rare spring migrant at the Pokhodskaya yedoma. Isolated moulting sites have been reported to exist northwest of the Chukochya River. Broods were sighted on the Kon'kovaya River. Local hunters reported to have shot birds ringed at the wintering grounds in China (Lake Poyang).

Bean Goose (*Anser fabalis*) – formerly a very common bird in the Kolyma Delta. At present, it is a regular migrant through the Pokhodskaya yedoma, where certain pairs still stay to nest. Major breeding grounds are the Kon'kovaya, Chukochya, and Oler River valleys. The nesting population density is 1 pair/km^2. Clutch size 4-6 eggs, brood size 3-5. Moulting occurs on the lakes close to the mouth of the Enyumchuveem River (2,000-3,000 birds) and in the lower reaches of the Malaya Kuropatochiya River (over 5,000 birds). Tracking colour-marked individuals has demonstrated that Bean Geese winter on the Korean Peninsula and in China but avoid Japan. The flyway crosses the Kava Basin and the Lower Amur River.

Snow Goose (*Chen hyperboreus*) – the bird yearly occurs in the Kolyma Valley during spring migrations. In the past, the birds were regularly shot by local hunters on the Evseiskiye Islands. Breeding colonies are normally located close to the breeding sites of the Peregrine Falcon and Snowy Owl (Andreev, Dorogoy, 1987). Groups of up to 50 moulting birds were found on lakes close to the Enyumcheveem River. Observation of marked individuals and satellite tracking (1994) have demonstrated that autumn migration follows through the lower reaches of the Maly Anyui River to Billings Cape and farther to the Yukon mouth and Vancouver.

Black Brant (*Branta bernicla*) – formerly a representative species of maritime landscapes. At present, the bird is rare. Small flocks can be seen at the Pokhodskaya yedoma. Breeding colonies are located on small islands in thermokarst lakes. Single nests are found at coastal meadows. Small groups of moulting birds were sighted at the mouth of the Kon'kovaya River.

Common Teal (*Anas crecca*) – very common breeding bird of the shrub-dominated tundra in the southern part of the site.

Baikal Teal (*Anas formosa*) – uncommon as a breeding bird that keeps to small river channels in the southern part of the area.

Wigeon (*Anas penelope*) – small groups occur in the summertime along the Kon'kovaya River where the birds have their moulting sites.

Pintail (*Anas acuta*) – a most common breeding bird in the Kolyma Delta and the adjacent tundra habitats. It usually occurs at shrub-dominated floodplains along river channels. Some drakes choose to moult on deltaic lakes, but most of them migrate south along the Kolyma Valley to stay undisturbed at sedge-covered silty banks of small tributaries. Some of the shot birds were ringed on the wintering grounds in Japan.

Northern Shoveler (*Anas clypeata*) – rather rare breeding species found on floodplain lakes in the Kon'kovaya Valley.

Spectacled Eider (*Somateria fisheri*) – nests and broods were seen in the vicinity of several lakes of the delta plain, near the Relkhoveem Channel, and in the lower reaches of the Kon'kovaya River. The species becomes more common toward the northwest. Pre-moulting congregations of male eiders occur on maritime brackish lakes. Massive north-westward migration of females along the Arctic coast takes place in late July and early August.

King Eider (*Somateria spectabilis*) – characteristic breeding bird favouring thermokarst lakes in the south-western part of the area. Trichopteran larvae constitute a major food for King Eiders in the breeding season.

Steller's Eider (*Polysticta stelleri*) – uncommon breeding bird of the Khalerchinskaya Tundra occupying maritime portions of the Kolyma Delta. The birds are very common during spring migrations and are highly valued as a catch by local hunters (eiders are fat, fly low and in dense flocks). In early August, females migrate along the shoreline to the south-east.

Greater Scaup (*Aythya marila*) – the numbers of both breeding and moulting birds are small. Every year, males congregate for moulting (up to 500 birds) on Lake Laidosskoye in the western part of the area.

White-winged Scoter (*Melanitta degl*and*i*) – small flocks of male scoters can be seen on Lakes Bolshoye Pokhodskoye and Nerpichiye during spring and summer migrations. White-

winged Scoter is a regular breeding species in the hypoarctic shrub zone and larch-dominated wetlands.

Long-tailed Duck (*Clangula hyemalis*) – the most common breeding and moulting diving duck in the area. The birds are numerous on the lakes of the Khalerchinskaya Tundra. Large congregations of moulting males stay in nearshore waters of the Kolyma Bay between the Kon'kovaya mouth and the Chukochya Channel.

Red-breasted Merganser (*Mergus serrator*) – rare pairs and broods of this species occur on the lakes of Khalerchinskaya Tundra. Every year, tens of males come to Lake Nerpichiye to moult.

White-tailed Eagle (*Haliaeetus albicilla*) – some time ago, one nest was found on the ground at the mouth of the Kon'kovaya River. The Kolyma Delta is sometimes visited by young birds.

Rough-legged Buzzard (*Buteo lagopus*) – usual breeding bird at the Pokhodskaya yedoma and on precipitous banks of the Kon'kovaya River. The birds normally have 3-4 nestlings, but only 1 or 2 survive.

Gyrfalcon (*Falco rusticolus*) – the birds (largely young ones) are seen every year along the Kon'kovaya River. Until 1986, Gyrfalcons regularly nested at the Pokhodskaya yedoma. Today, a few nests are known on the right side of the Kolyma River.

Peregrine Falcon (*Falco peregrinus*) – a breeding site on Stolbik Island is known to exist for quite some time. After 1987, the birds have regularly nested at the Pokhodskaya yedoma. In 1994, this area was used by 7 pairs, of which four were breeders. The clutches contained 4 eggs each.

Sandhill Crane (*Grus canadensis*) – Sandhill Cranes migrate northwest along the Arctic coast of Siberia, and the flyway intersects the Kolyma Delta. The number of birds in the Lower Kolyma tundra increased steadily throughout the 1970s and 1980s, and the secular spreading of the species is believed to continue. In the early 1990s, it reached the Indigirka River. The breeding population density in the Kon'kovaya-Chukochya Interfluvial Area is currently as high as 1.0 pair/km^2. It is somewhat lower (less than 0.2 pair/km^2) in the Kolyma Delta and Khalerchinskaya Tundra.

Black-bellied Plover (*Pluvialis squatarola*) – common breeding bird of hillocky tundra.

Pacific Golden Plover (*Pluvialis fulva*) – common breeding species occupying sedge-cottongrass tundras on the slopes of Pokhodskaya yedoma and well-drained riverbanks.

Wood Sandpiper (*Tringa glareola*) – common breeding species of deltaic hummocky fields.

Spotted Redshank (*Tringa erythropus*) – common breeding bird of dwarf-shrub tundras in the southern part of the delta.

Red-necked Phalarope (*Phalaropus lobatus*) – common breeding bird. In the summertime, Phalaropes are widespread on maritime lakes where thousands of wandering birds keep together.

Grey Phalarope (*Phalaropus fulicarius*) – very common during spring and autumn migrations but relatively rare breeding bird.

Ruddy Turnstone (*Arenaria interpres*) – rare migrant in the area.

Ruff (*Philomachus pugnax*) – common breeding bird all over the site.

Little Stint (*Calidris minutus*) – breeding birds occur on the maritime tundra in the north-western part of the Kolyma Delta. Migrating flocks appear on the maritime tundra in early August.

Temminck's Stint (*Calidris temminckii*) – common breeding bird in the Kolyma Delta and at high lake shores.

Curlew Sandpiper (*Calidris ferruginea*) – the bird sometimes occurs in the maritime zone during migration. Breeding sites are found in the Khalerchinskaya tundra.

Dunlin (*Calidris alpina*) – common bird of sedge-lichen tundras, where it occurs as a breeding and migrating species.

Sharp-tailed Sandpiper (*Calidris acuminata*) – common visitor to seashore habitats and the Kolyma Delta during migration. The main breeding grounds lie in the northwest.

Pectoral Sandpiper (*Calidris melanotos*) – common bird during migration seasons. It breeds in large numbers in shrub-dominated wet alasses.

Common Snipe (*Gallinago gallinago*) – characteristic breeding bird of wet interlake areas and shrub thickets along channel banks in the southern part of the area.

Whimbrel (*Numenius phaeopus*) – rare visitor entering the Kolyma Delta from the east. It is a common breeding bird at treeless spurs of the Anyui Range.

Bar-tailed Godwit (*Limosa lapponica*) – the bird occurs in the maritime zone during spring passage. Regularly, but not frequently nests in the Khalerchinskaya Tundra.

Short-billed Dowitcher (*Limnodromus scolopaceus*) – most common breeding bird of polygonal bogs in the Kolyma Delta.

Arctic Skua (*Stercorarius parasiticus*) – characteristic passage migrant and breeding species favouring wet lake shores.

Long-tailed Skua (*Stercorarius longicaudus*) – characteristic migrating and breeding species of drained tundra plots. In years of poor reproductive success, the birds gather in large nomadic flocks that wander over the maritime tundra.

Pomarine Skua (*Stercorarius pomarinus*) – the bird nests on the maritime tundra when lemming numbers increase to peak. In the absence of readily available prey, the birds congregate in large flocks wandering across the coastal lowlands.

Herring Gull (*Larus argentatus*) – very common species breeding on tundra lakes and delta plains. It forms monospecific colonies of up to 15-20 pairs or shares nesting sites with Glaucous and Ross' Gulls.

Glaucous Gull (*Larus hyperboreus*) – pairs establish isolated nests or breed in mixed colonies with Herring Gull.

Black-headed Gull (*Larus ridibundus*) – this species has rela-

tively recently become a common breeding bird of shrub-dominated floodplains in the southern part of the Kolyma Delta. Its visits to northern areas have become increasingly frequent.

Ross' Gull (*Rhodostethia rosea*) – characteristic breeding and migrating species in the Kolyma Delta. Breeding colonies (2-15 pairs) are located in the areas called Gorla and Stanovaya and also on Lake Maloye Pokhodskoye. The birds arrive at their breeding sites from the southeast following the Omolon and Anyui River valleys. The well-apparent northerly migration takes place in mid July. At this time, hundreds of adult birds appear on delta lakes.

Sabine's Gull (*Xema sabini*) – single birds can sometimes be seen in different parts of the delta during spring migration. In 1990, a small breeding colony (*c*. 10 pairs) was found 5 km north of the Pokhodskaya yedoma.

Arctic Tern (*Sterna paradisaea*) – the most common breeding species on tundra water bodies. It frequently establishes nests in colonies of Ross' Gull.

Snowy Owl (*Nyctea scandiaca*) – largely occurs in the winter, sightings in the summertime are rare in the Kolyma Delta. Breeding birds were seen only west of the Kon'kovaya River.

Short-eared Owl (*Asio flammeus*) – common breeding bird in thick shrubbery along river channels and in alasses.

The importance of the site for rare species:

Rare breeding birds of the Kolyma Delta include birds of prey such as Gyrfalcon, Peregrine, and Golden Eagle (*Aquila chrysaetos*). Osprey (*Pandion haliaetus*) is an even rarer breeding species. In the past, the White-tailed Eagle was listed as a breeding bird. There are breeding colonies of Ross's Gull and Sabine's Gull. Rare migrating birds are Sharp-tailed Sandpiper, Black Brant, and Lesser White-fronted Goose. Siberian White Crane (*Grus leucogeranus*) not infrequently visits the area in the spring.

The importance of the site as an area inhabited by economically valuable and rare terrestrial mammals:

The site remains an important trapping territory, and Arctic Foxes (*Alopex lagopus*) are caught for their pelts. From time to time, Polar Bears (*Ursus maritimus*) appear to dig their dens in the snow on Stolbik Island. In the past, Ringed Seals (*Phoca hispida*) were hunted in the Kolyma Bay. Herds of Sundrun Wild Reindeer (*Rangifer tarandus*) are known to visit the lower reaches of the Kon'kovaya River.

Social and cultural values:

The site is a part of the territory traditionally used by the native people ("kolymchane" – specific ethnocultural community of native Russian residents in the area regarded as a northern minority group).

They have hunting areas along the seacoast, each with a line of deadfalls (traps with driftwood logs), fisheries on river channels and beaches, meadows used for hay and pasture, and areas supplying berries. The western part of the site is used by herders (western Chukchi) to run reindeer in spring and autumn.

Land tenure/ownership:

The land is state-owned (federal property) as a part of the Chaigurgino State Wildlife Refuge ("zakaznik").

Current land use:

In 1960-1990, lakes and channels of the Kolyma Delta were important for commercial fishing. In the mid 1980s, the annual catch amounted to 400-500 tonnes, with Least Cisco accounting for almost 2/3 of the total. By 1995, catches decreased to less than 50 tonnes, hardly sufficient to meet local requirements. Traffic on river channels was very important before the early 1990s (Chersky was a shipping point for goldfield development in western Chukotka); today, water traffic is practically nonexistent. Numerous prospecting teams (topographers, geologists, and cryopedologists) worked in the area throughout the 1980s. Pokhodskaya yedoma was a traditional area of substantial subsistence harvest of waterfowl and their eggs in the spring. The disturbance of the local fauna was markedly reduced after the area had been designated as nature refuge.

Conservation measures taken:

The site lies rather far from human settlements and people are rare visitors to its territory. It is included within a protected area of the Chaigurgino State Wildlife Refuge. Formally, patrolling and guarding of the area are the responsibility of a ranger who has a checkpoint at the northern edge of Pokhodskaya yedoma.

Conservation measures proposed but not yet implemented:

Some features of the Kolyma Delta refer it to areas of global importance for environmental protection. It needs to be designated to the Ramsar List together with several other sites of the Primorskaya Lowland in Yakutia.

Current scientific research and facilities:

The area has been thoroughly surveyed by soil scientists and cryopedologists (Elovskaya *et al*., 1979), botanists (Andreev and Perfilieva, 1980), and ornithologists (Krechmar *et al*., 1991). A field research station of the Pacific Institute of Geography of the Russian Academy of Sciences is based at the village of Chersky. The area is

readily accessible for specialists in the summer, but research may be hampered by the high cost of air fares.

Current recreation and tourism:

In 1990-1997, the area was annually visited by 2-3 groups of birdwatchers. In subsequent years, this activity ceased because of high travel and service expenses and the widespread practice of extortion at the local level.

Jurisdiction:

Administration of Nizhnekolymsky Ulus (district), Pokhodsky Nasleg, Republic of Sakha (Yakutia).

Management authority:

Ministry of Environmental Protection of the Republic of Sakha (Yakutia).

1.3. Khalerchinskaya Tundra

Geographical coordinates: 69°24'21"N, 158°36'34"E (Malaya Kon'kovaya mouth); 69°06'25"N, 160°42'03"E (Rogovatka); 68°39'30"N, 159°57'23" (upland extremity of Karetovskaya yedoma near Mondozolov's lodge); 69°07'38"N, 158°10'47"E (mouth of the Bolshaya Kon'kovaya Valley).

Elevation: 15-25 m a.s.l., with certain points up to 50 m (Segodnya ice-cored hill).

Area: *c.* 3,600 km^2.

Overview:

Wet alluvial-eolian surface formed during the Sartan period and composed of glacial sands, with a large number of lakes in the central part and alass depressions with secondary thermokarst phenomena at the periphery. A large wetland complex of paramount importance for hypoarctic and southern tundra water bird fauna.

Wetland type:

By international classification – M, O, Vt; by national classification – 2.5.1.1 (river valleys on non-forested lowlands), 3.7.2.1 (lacustrine-palustrine systems in the tundra zone).

Ramsar Criteria: 1, 3, 4, 5.

Justification for the application of selected criteria:

Lacustrine-alluvial plain with moss-lichen tundra habitats and numerous lakes. The area supports a highly diverse and abundant hypoarctic avifaunal complex with a great variety of water birds. It provides breeding sites for two endemic species of East Siberian tundra, the Ross' Gull (*Rhodostethia rosea*) and the Sharp-tailed Sandpiper (*Calidris acuminata*).

General location:

The site extends for about 80 km from SE to NW and for almost 40 km from SW to NE. It lies at the watershed separating the Stadukhinskaya Channel and the Bolshaya Kon'kovaya River in the sublatitudinal bend of the Kolyma River, north of the villages of Kolymskoye and Nizhnekolymsk and west of Chersky. The northern extremity of the site is wedged into the Kolyma delta plain giving rise to precipitous capes. On the east and south, it is bounded by the Kolyma Valley and forested edges of the Karetovskaya yedoma; in the northwest, the site adjoins the Bolshaya Kon'kovaya Valley. The central portion of Khalerchinskaya Tundra (Golyavino faktoriya) is located 50 km from the village of Kolymskoye and 80 km from Chersky.

Physical features:

Khalerchinskaya Tundra is a plain with numerous lakes and alasses formed by light-yellow alluvial sands of the Sartan Age some 25,000 years ago. Permafrost thickness is 500-600 m. The surface undergoes strong modification by thermokarst and eolian processes.

Almost the entire ancient surface is buried beneath bodies of water; its fragments are retained in the form of drained margins of small valleys and at isthmuses between lakes where they emerge on south-facing precipitous shores. The primary surface accounts for roughly 11% of the tundra area. It bears small knobs or hummocks and is devoid of expressed polygonal patterns. Another characteristic feature of this area is the presence of sand dunes at elevations and in dry lacustrine basins. Systems of grassy run-off channels flowing to the north, northwest, and west serve to remove excess water from the surface of the Khalerchinsky "dome". The local landscape is diversified by a large number of ice-cored hills overlain by a peat carpet (pingo, or "bulgunnyakh").

Almost half of the Khalerchinskaya Tundra is occupied by wet interlake areas and shallow alass depressions. About one quarter of its area presents with wet lakeshore meadows while interlake isthmuses support polygonal bogs with a groundcover of reddish brown Sphagnum, greyish Cladonia, and other fruticose lichens. Peat-covered areas have numerous pools 0.2-0.5 m in depth and small lakes (known as "badrany" among the residents). These water

bodies warm up well in the summertime and give rise to abundant sedge growth and rich invertebrate fauna.

The Khalerchinskaya Tundra is distinctive for an abundance of water. Large lakes occupy about 38% of its area. Lake water surface in the central part of Khalerchinskaya Tundra lies at *c*. 27 m a.s.l. The lakes are of two types: large and deep, with clear water ("Khalerchinskiye" lakes) and small, shallow water bodies with dark peaty water ("alass" lakes). The lakes of the Khalerchinskaya Tundra are from 1-2 to 3-6 km in diameter, circular, dumbbell or propeller-shaped. There are 20 such lakes per 100 km^2 on average, with a shoreline of approximately 1.4 km/km^2 in the central part of the Khalerchinskaya Tundra. These lakes account for almost 90% of lake water surface. Lakes in the southern part of the area are as a rule deeper (5-6 m); their deep-water portions surrounded by shallows have a triangular form, with the base of the triangle oriented from west to east, presumably parallel to sea bars and lagoons of the ancient delta. Khalerchinskiye lakes are drained in different degrees and connected to one another and to river valleys by grassy "viski", sometimes almost unnoticeable and sometimes impassable narrow channels.

Certain lakes are completely dry, giving place to alasses with moss fields, secondary thermokarst phenomena, and pingos. Alass lakes are formed as a result of thermokarst activity or confluence of polygonal pools and "badrany". They are usually arranged in a circular chain within one depression, and their shores are highly irregular in outline.

"Bulgunnyakhs" as a rule rise in the central part of alass depressions. Most of them are 15-20 m high dome-shaped hills with a base 150-200 m in diameter. They are overlain by a discontinuous peat layer overgrown with Labrador tea, dwarf birch and willow shrubs. After a long period of growth, the hill undergoes degradation caused by thermokarst activity; thawing of the ice core leads to the collapse of its peaty roof, and the resulting pit is filled with a circular-shaped lake. Sometimes, the process cycles, and thus the "calderra" created as a result serves as a basis for the formation of a new ice-cored hill. The tops of the hills are frequently used by ruffs as lekking sites.

The Khalerchinskaya Tundra is drained by 35-50 km long meandering rivers that cut small valleys of their own that possess all the characteristic features of the floodplain relief, i.e., terraces, secondary thermokarst lakes, small islands, and oxbow pools. In the mid-course, the connecting of deep pools by short rapid streams causes them to resemble beads on a string. The valleys of the Vankhotveem, Entourgiveem, Virveem, Ekhameskhveem, Relkhosveem, and Rogovatka Rivers are most beautiful. Their dry banks can be used to walk on the tundra, avoiding waterlogged and hummocky passes.

The Bolshaya Kon'kovaya River is almost 400 km in length. Its headwaters rise in the vicinity of Lake Dulba, a large forest lake in Srednekolymsky Ulus (district). The upper part of the river valley cuts through a massif of yedoma sediments. Within the site, the river runs along the borderline between two geological surfaces, Late Quaternary one on the right side of the valley (Khalerchinskaya Tundra) and Middle Quaternary on the left (Chukochinskaya yedoma). The river looks like a winding channel with slow water and a series of deep pools ("ulova"). The meandering index is 2.5-3. About 20% of the total area is occupied by lakes and oxbow pools. Shoreline in the area is some 2.3 km/km^2, with riverbanks accounting for half of this length.

The site has a harsh Arctic climate. The mean annual air temperature recorded by the nearest meteorological station in the village of Kolymskoye is -13.4°C, with temperatures in January averaging -34°C and in July +7.8°C. Clear, cold weather with icy winds blowing from the south persists throughout the winter period. In the summertime, northerly winds prevail, daily bringing in fog from the sea in early summer. Cyclic changes of weather are a characteristic feature of the summer period. Each cycle is 6-8 days long: 1-2 days of cold stormy winds carrying mist and precipitation from northern quarters, 3-4 days of "temperate" weather with weak northerly winds and low clouds, and 1-2 days of calm, clear weather. Thereafter, the cycle repeats itself.

The period from late June until mid August is the most favourable for the tundra life. Snow melt occurs in late May. The ice cover on lakes disappears by the third or fourth week of June. Dwarf shrubs start growing in mid June. By the end of summer, the upper layer of the tundra peaty soil thaws down to the depth of 35-40 cm and that of sand dunes to 1.5-2.0 m. First snow falls around 20 September, and lakes are icebound by September 25-30. Life on the tundra remains almost at a standstill for the next 8 months.

The annual precipitation in the Khalerchinskaya Tundra is around 225 mm, with half of this falling as snow. Therefore, snowmelt is a major source from which the tundra lakes are fed. The water level in local lakes and channels is relatively constant. Readily visible through the water are sites of emitting hot-bed gases rising as bubbles from a different depth. They are responsible for the appearance of characteristically round holes in the lake ice ("produshiny") with the coming of spring. Alass lakes of the Lower Kolyma River are believed to make an important contribution to the emission of hot-bed gases into the Earth's atmosphere (Semiletov *et al*., 1994). Lakeshores facing southeast are subject to wave abrasion. Smaller water bodies, i.e., polygonal pools and "badrany" dry out by midsummer.

Ecological features:

Small knobs on the primary surface of Khalerchinskaya Tundra are overgrown with *Betula exilis, Ledum decumbens, Aconogonon tripterocarpum, Dryas punctata,* and *Diapensia obovata*.

The vegetation cover at exposed elevated spots is subject to degradation by wind action. As a result, small dune areas are formed, a characteristic feature of Khalerchinskaya Tundra. The neighbouring sites are covered with sand dust in the winter. This provokes an early snowmelt in the spring leading to the appearance of "oases" that attract Willow Grouse and Sandhill Crane. In the summertime, the warm and drained substrate gives rise to spectacular herbaceous vegetation composed of *Thymus sibiricus, Campanula middendorfii, Chenopodium album, Arctous alpina, Dryas punctata,* and *Empetrum nigrum*; other characteristic species include *Armeria scabra, Lychnis sibirica, Dianthus repens, Polemonium boreale, Papaver lapponicum*, and *Koeleria asiatica*.

The depression formerly occupied by Lake Pnogytkin on the left side of the Kon'kovaya River, 10 km south of the Stanovaya faktoriya, harbours a sandy desert plot measuring 10 km^2. Sand hills are interspersed with residual lacustrine peat deposits containing fish bones. They support the growth of lime-grass (*Leymus interior*) and *Tripleurospermum hookeri*.

Water-filled polygonal cracks and pits overgrown with *Carex chordorrhiza* are inhabited by rich invertebrate fauna, including daphnias, molluscs, and oligochaetes. Peat mounds on the "block tundra" are 1 m high and covered with *Betula exilis, Salix pulchra*, and *Ledum decumbens*. *Rubus chamaemorus, Andromedae polifolia, Vaccinium uliginosum*, and *Comarum palustre* occur in moss-dominated depressions.

The youngest portions of alasses show sedge-sphagnum hollows overgrown with *Pedicularis sudetica* and *Saxifraga hirculus* and small peat mounds covered with *Betula exilis, Salix pulchra*, and *Ledum decumbens*. Moss cushions give home to numerous tipulid larvae and oligochaetes.

The nearshore shallows of the Khalerchinskiye lakes are lined with a narrow strip of arctophyla growth. Long peat ridges 40-50 cm in height separate shallow lagoons ("kaltusy") from the remaining lake surface.

These lagoons are 0.2-0.4 m deep, with an icy bottom covered by a 15-20 cm thick reddish silt layer. In July, their surface water temperature rises to +17-20°C. Polygons are overgrown with *Carex concolor*, with *Pedicularis sudetica* and *Eriophorum polystachion* occupying the driest sites. Narrow drains connect "kaltusy" to deeper portions of the lakes, which accounts for the presence of fish fry in shallow lagoons, such as Nine-spined Stickleback (*Pungitius pungitius*) and Peled (*Coregonus peled*); benthos is dominated by caddisflies (*Trichoptera spp.*). The bottom ground of the Khalerchinskiye lakes is largely silt with cushions of water moss (*Drepanoclaudus sp.*). Lake zooplankton and benthos are composed of copepods (*Hetertocope borealis*), cladocerans (*Chidorus sp.*), ostracods (*Candona ssp.*), branchiopods (*Branchinecta paludosa*), mysids (*Mysis relicta*), daphnias, and amphipods. The nearshore fields of arctophyla give home to numerous molluscs (*Siberinauta sp., Sphaera sp., Valva sp., Anisus sp.*) and coelenterates (*Hydra sp.*). In August and September, shallows are inhabited by numerous notostracans (*Lepidurus arcticus*) and amphipods (*Gammarus lacustris*). Coleopterans (*Dytiscidae*) and dipterans (*Chironomidae, Tipuludae*) are also very common. Chironomid larvae are abundant at the floor of shallow secondary thermokarst pools. Large lakes are inhabited by Northern Pike (*Esox lucius*) and Peled. Sculpin (*Cottus sp.*) and Nine-spined Stickleback occur in shallow water.

Small grassy drains are fringed with *Caltha arctica, Petasites frigidus*, and *Ranunculus gmelinii*. In the spring, they are used by Nine-spined Stickleback (*Pungitius pungitius*) to reach spawning sites. Arctic Grayling (*Thymallus arcticus*) occurs in their deeper sections. The sloping banks of the Bolshaya Kon'kovaya River are occupied by horsetail and grass-forb meadows and lined with willow shrubs (*Salix boganidensis, S.glauca*). The wet surface of the riverside terrace is patterned by a network of polygonal cracks and sedge-dominated patches with an abundant growth of *Salix pulchra*. Dry margins are overgrown with *Dryas* and *Diapensia*.

Noteworthy flora:

The site is located in the moss-lichen tundra subzone. The vegetation cover is dominated by leafy mosses, fruticose lichens, hydrophilic sedges, and cottongrass. A few rare species are found in the southern part of the Khalerchinskaya Tundra (*Chrysosplenium tetrandrum, Papaver czekanowskii*, and Beringian endemic *Pedicularis pennellii*). *Pulsatilla vernalis* and *Rosa acicularis* penetrate from the forest zone. Spectacular herbaceous vegetation develops on dunes at the height of summer. The vegetation cover of the Khalerchinskaya Tundra provides excellent food for reindeer year round and is of special value in transitional seasons, i.e., early spring and late autumn. Cladonia covers vast areas that surround sloping margins of alasses and attract reindeer in early winter; with the coming of summer, the animals turn over to feeding on opening buds of *Salix pulchra* and flowering *Eriophorum vaginatum* as their basic diet. In search of this highly nutritious green fodder,

herdsmen drive their herds to the north with the progress of summer. Reindeer also greatly benefit from the unlimited resource of arctophyla at lake edges that permits them to substantially gain weight by late summer. This accounts for the high marketable value of Khargin reindeer raised on the rangelands of the Lower Kolyma River.

Noteworthy fauna:

Fish

Fishing for anadromous coregonid fishes, Least Cisco (*Coregonus sardinella*), Muksun (*C.muksun*), and Arctic Cisco (*C.autumnalis*), is practiced in the lower reaches of the Bolshaya Kon'kovaya River.

Lakes are inhabited by Siberian Whitefish (*C.lavaretus pidschian*), Peled (*C.peled*), and Wide-nosed Whitefish (*C. nasus*). Arctic Grayling (*Thymallus arcticus pallasi*) has its spawning grounds in the upper reaches of the Bolshaya Kon'kovaya River.

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) occurs over the entire area of the Khalerchinskaya Tundra. It breeds in early June, and eggs are hatched in small floodplain water bodies, "badrany", and polygonal pools. The area is supposed to lie at the northern limit of this species' range in northeastern Asia.

Birds

Black-throated Diver (*Gavia arctica*) and White-billed Diver (*G.adamsii*) are regular inhabitants of the Khalerchinckiye lakes. The former species is most common in the southern part of the area, where virtually each lake harbours a pair of Black-throated Divers. Northerly habitats are dominated by Pacific Diver (*G. pacifica*). Certain floodplain lakes of the Bolshaya Kon'kovaya River provide breeding sites for rare Red-necked Grebe (*Podiceps griseigena*).

Bewick's Swan (*Cygnus bewickii*) nests sporadically on lake shores in the southern part of the site and is more common at its northern boundary. A breeding area of Bean Goose (*Anser fabalis serrirostris*) is located in the Bolshaya Kon'kovaya River valley. It is shared by Lesser White-fronted Goose (*A.erythropus*). The majority of White-fronted Geese (*A.albifrons*) visit the Khalerchinskaya Tundra during seasonal migrations and local autumn movements. The most common ducks on the Khalerchinskaya Tundra are Common Teal (*Anas crecca*), Pintail (*A.acuta*), Greater Scaup (*Aythya marila*), Long-tailed Duck (*Clangula hyemalis*), and King Eider (*Somateria spectabilis*). Baikal Teal (*Anas formosa*), Northern Shoveler (*A.clypeata*), and Steller's Eider (*Polysticta stelleri*) are irregular breeders.

The valley of the Bolshaya Kon'kovaya River is regularly visited by Goshawk (*Accipiter gentilis*), Merlin (*Falco columbarius*), and Gyrfalcon (*F.rusticolus*). The latter stays on the tundra as long as it can prey on Willow Grouse (*Lagopus lagopus*) that gather in flocks in the autumn. The Grouse chooses to nest on the banks of small tundra channels but prefers the shrubby vegetation that develops in the valley of the Bolshaya Kon'kovaya River.

Until the 1980s, Sandhill Crane (*Grus canadensis*) was an accidental spring passage migrant in the central part of the Khalerchinskaya Tundra, although it was more common in the north and west of the area (Chukochya River valley). Since the 1990s, this species has been frequently sighted in the alass-lake landscape of the Khalerchinskaya Tundra and is presently considered to be a regular inhabitant.

Taken together, Pacific Golden Plover (*Pluvialis fulva*), Pectoral Sandpiper (*Calidris melanotos*), and Short-billed Dowitcher (*Lymnodromus scolopaceus*) make up a basic triad of watershed wader fauna. Widespread, even if less abundant, are Black-bellied Plover (*Pluvialis squatarola*), Spotted Redshank (*Tringa erythropus*), and Ruff (*Philomachus pugnax*). Temminck's Stint (*Calidris temminckii*) is common in river valleys while Red-necked Phalarope (*Phalaropus lobatus*) and Grey Phalarope (*Ph.fulicarius*) occur in sedge-moss alasses. Dunlin (*Calidris alpina*) and sometimes Sharp-tailed Sandpiper (*C.acuminata*) establish nests on sedge-lichen spots. Hummocky surfaces and low willow stands of river valleys are populated by Common Snipe (*Gallinago gallinago*), Pintail Snipe (*G.stenura*), and Jack Snipe (*Lymnocryptes minimus*); the latter species does not disperse farther eastward. Broad-billed Sandpiper (*Limicola falcinellus*) is a regular breeding bird in wet alasses while Bar-tailed Godwit (*Limosa lapponica*) is more frequent in elevated terrains.

Arctic Skua (*Stercorarius parasiticus*) and Long-tailed Skua (*S.longicaudus*) regularly place their nests close to alass lakes and on riverbanks. Some alasses harbour small colonies of Herring Gulls (*Larus argentatus*) and Glaucous Gulls (*L.hyperboreus*). Ross' Gulls (*Rhodostethia rosea*) occur in large numbers during spring migration and regularly nest in wet alasses adjacent to large lakes of the Khalerchinskaya Tundra. A few long-standing colonies are known to exist in the Kon'kovaya Valley (Andreev, 1985). Arctic Tern (*Sterna paradisaea*) usually nests in the same colonies.

Snowy Owl (*Nyctea scandiaca*) is common on Khalerchinskaya Tundra from September to May. Once every 3-4 years it breeds in the valley of the Bolshaya Kon'kovaya River. Short-eared Owl (*Asio flammeus*) is

another common inhabitant of shrub-dominated alasses and river valleys.

The most common passerines are Red-throated Pipit (*Anthus cervinus*), Bluethroat (*Luscinia svecica*), Willow Warbler (*Phylloscopus trochilus*), Lapland Bunting (*Calcarius lapponicus*), and Arctic Redpoll (*Acantis hornemanni exilipes*).

Mammals

Local mammalian fauna includes an appreciable proportion of taiga zone elements. Laxmann's Shrew (*Sorex caecutiens*) occurs in river valleys. The Bolshaya Kon'kovaya valley habitats are occupied by Northern Red-backed Vole (*Clethrionomys rutilis*) and Varying Hare (*Lepus timidus*). Muskrat (*Ondatra zibethica*), an introduced species now well-established on forest lakes in the taiga zone of the Kolyma Basin, appears in tundra habitats in the periods of dispersion. Brown Bears (*Ursus arctos*) are rather frequent vagrant visitors. Other carnivores include Weasel (*Mustela nivalis*), Ermine (*M.erminea*), and Arctic Fox (*Alopex lagopus*). Wolves (*Canis lupus*) arrive with reindeer herds. Elks (*Alces alces*) can be seen in river valleys. Narrow-skulled Vole (*Microtus gregalis*) and Siberian Lemming (*Lemmus sibiricus*) are common inhabitants of alasses on the Khalerchinskaya Tundra.

Social and cultural values:

The lower reaches of the Kolyma River appear to be an area where ancient hunters chased reindeer on foot. Archaeological remains of implements from the Upper Palaeolithic period have been found in the southern and north-western outskirts of the Khalerchinskaya Tundra. Stone tools and pottery date back 3,000 to 4,000 years (Kistenyov, 1980). In the middle of the 19th century, rich pastures attracted the reindeer-herding Chukchi to this area, and their activities promoted the development of the territory (Maidel, 1867). The site lies very close to the Kolyma River valley and is rather frequently visited by residents on the way to their herds and back. The unique toponymy of the Khalerchinskaya Tundra, with numerous place-names of Yukagir, Even, Chukchi, Yakut, and Russian origin, reflects the different stages of evolution of the Lower Kolyma community, which is polyethnic in structure and preserves some original cultural traits. The name of the area itself is derived from the Yukagir word "khalarkha" (the gull or the gull's tundra). The toponymic peculiarity of the territory is illustrated by a set of placenames from different languages that lie within one day's walk from one another, e.g. Vankhotveem Channel, Segodnya "bulgunnyakh", and Lake Chokurdakh.

Land tenure/ownership:

Traditional land use is practiced by "kolymchane" in the southern part of the area and by "pokhodchane" in its northern portion.

Current land use:

The area is used for grazing, herding, and driving reindeer in early winter and early spring. Some fishing occurs on tundra lakes. The northern periphery of the site is protected as a part of the Chaigurgino State Wildlife Refuge. Traditional spring meetings and festivals of herdsmen and their families are held in the central and western parts of the Khalerchinskaya Tundra (as a rule where intense migration of geese occurs).

Factors adversely affecting the site's ecological character:

Off-road traffic in the summer season was long ago prohibited on the Khalerchinskaya Tundra, though it is permitted in the Chukotka tundras. In winter, tractors are used to deliver firewood to the temporary camps of reindeer herdsmen. This saves the vegetation cover of the Khalerchinskaya Tundra, which has been seriously destroyed only in small areas of overgrazed pastures. In the summertime, the area is virtually free from people, and natural processes develop unobstructed.

Conservation measures taken:

The use of tracked vehicles is prohibited in the Khalerchinskaya Tundra. The northern part of the site lies within the bounds of the Chaigurgino Reserve.

Conservation measures proposed but not yet implemented:

It is recommended that the area be designated as a wetland of international importance.

Current scientific research and facilities:

Since the second half of the 1970s, the Khalerchinskaya Tundra has been extensively surveyed by specialists from the Department of Geocryolithology, Moscow State University; Pacific Institute of Geography and Institute of Biological Problems of the North, Far East Branch of the Russian Academy of Sciences; Institute of History, Yakut Branch of the Russian Academy of Sciences. The area is readily accessible by virtue of its proximity to the Chersky airport. Also, it is within easy reach by motorboat, snowmobile, reindeer and dog-hauled sledge, as season permits, starting from the villages of Pokhodsk and Kolymskoye.

Jurisdiction:
Administration of Nizhnekolymsky Ulus (district), Republic of Sakha (Yakutia).

Management authority:
Administration of Nizhnekolymsky Ulus (district) of the Republic of Sakha (Yakutia); administrations of the Kolymskoye and Pokhodsk settlements; administration of the Chaigurgino State Wildlife Refuge.

1.4. Lower Rauchua River and Kyttyk Peninsula

Geographical coordinates: 69°18'14"N, 166°36'15"E (mouth of the Rauchua River).

Elevation: 0-20 m a.s.l.

Area: *c.* 250 km^2.

Overview:
Part of a lake tundra area along the East Siberian Sea coast between the Rauchua mouth and Maly Chaunsky Strait that separates Aion Island from the mainland. An important breeding area for Bewick's Swan, Pacific and Spectacled Eiders.

Wetland type:
By international classification – A, F, G, H, M, O, Q, Vt; by national classification – 1.1.1.2, 3.1, 2.5.1.1, 3.7.2.1 (lower part of a tundra river, flat lacustrine-alluvial tundra, plainland on the Arctic coast of Siberia).

Ramsar Criteria: 1, 2.

Justification for the application of selected criteria:
Representative portion of a lacustrine-palustrine tundra plain at the eastern limit of loess-glacial (yedoma) lowlands of northeastern Yakutia that supports rich breeding populations of Bewick's Swan (*Cygnus bewickii*), Spectacled Eider (*Somateria fischeri*), and Pacific Eider (*Somateria molissima v.nigrum*).

General location:
The site lies between the Kolyma Delta and Chaun Bay on the territories of the Bilibinsky and Chaunsky administrative districts, Chukot Autonomous Area. The Rauchua mouth is 145 km from the village of Pevek and 145 km from Bilibino.

Physical features:
The area comprises the plain of the Rauchua Delta and lacustrine-alluvial plains of Kyttyk Peninsula. The base of the peninsula is 70 km long and oriented sublatitudinally from the Emykkyviyan Delta in the east to the mouth of the Ergyveem River that falls into the Rauchua River 15 km upstream from its mouth.

The site is bounded by the Lower Rauchua River on the west, the Chaun Bay coast and Maly Chaunsky Strait (minimum width 2 km) on the east, and slopes of the Nagleinyn Range (863 m a.s.l.) on the south.

A few geological surfaces are distinguished within the site. One is a low marine terrace of recent origin, 1 m a.s.l., 2-4 km in width, and incorporating a strip of intertidal sand flats, maritime water meadows, and saline pools.

The medium-level surface lays 5 m a.s.l. (river valley level) and is fragmented by a large number of channels, oxbow pools, and primary thermokarst lakes. Willow brushwood develops in the Rauchua River valley some 10 km from the seacoast.

The high-level surface (15-50 m a.s.l.) is formed by a residual Middle Pleistocene plain with a complex of lakes and alasses. In the northeastern part of the site, this plain extends to the seacoast, where it forms steep precipices. The plainland of the Kyttyk Peninsula is reminiscent of the yedoma landscape of the Kolyma Lowland but consists of sea sands that emerge at the surface in the northern part of Aion Island adjoining the site from the northeast. Lakes of this plain are large (500-1000 m) and relatively deep (8-12 m); they are round in shape and have steep, elevated shores. The lakes are populated by Arctic Char, Lake Cisco, and Nine-spined Stickleback. The invertebrate fauna is represented by amphipods (*Gammarus sp.*) and caddisflies. Arctic Char is heavily infected with Acanthocephalan worms (*Echinorhychus salmonis*) (G.I.Atrashkevich, personal communication). This elevated surface is deeply cut by rivers of which the Eyukuul, Koz'mina, Urtykul, Rakvezan, and Emykkyvian are the largest. Each river forms its own valley with marshy terraces and thermokarst oxbow lakes.

The site has a severe Arctic climate. According to the records of the Rauchua weather station, the mean annual air temperature is –10.6°C, mean temperature in January is –26°C and in July +7.6°C. The mean annual precipitation is around 140 mm. Northern winds prevail at the seacoast. Snow melts in late May and falls in early October.

Hydrological features:

The Rauchua or Bolshaya Baranikha River flows from the northern slopes of the Anyui Range and runs through Lake Rauchuvagytkyn. Its total length is approximately 320 km, with the upper and middle course being that of an upland tundra river having numerous shingle spits, rapids, and willow stands on channel banks and islands. Its lower reaches lie on the maritime plain with numerous lagoons and thermokarst lakes, creeks, and salt meadows between them. The coastal waters of the East Siberian Sea are 1.5-5 m deep. Tidal fluctuations of the seawater level vary from 1 to 1.5 m.

Aion Island is separated from the Kyttyk Peninsula by the shallow Maly Chaunsky Strait with extensive intertidal silt flats and sand spits. Debris washed ashore in the northern part of the strait contains brown algae (*Laminaria sp.*). The shoreline of the peninsula facing Aion Island features a network of brackish thermokarst lakes interspersed with salt marshes.

Noteworthy flora:

Yurtsev (1974) described about 200 species of vascular plants within an area of *c.* 100 km^2. The local flora (plant diversity within a 100 km^2 plot) comprises steppe, boreal, Arctic, and arctoalpine species including such endemic ones as *Artemisia fulva, Oxytropis sverdrupii, Lychnis sibirica subsp.villosula, Tataxacum leucocarpum,* and *Potentilla nudicaulis*. *Ranunculus sabinii* and *Phippsia concinna* occur here at the eastern limit of their natural habitat.

Noteworthy fauna:

Fish

Pacific salmonids – Humpback Salmon (*Oncorhynchus gorbuscha*) and Chum Salmon (*O.keta*) – and anadromous chars – Dolly Varden Trout (*Salvelinus malma*) and Taranets' Char (*S. taranetzi*) – are known to enter the Rauchua River and occur in its lower reaches. Deep thermoerosional lakes are homes to non-migratory Arctic Char (*S. alpinus*). Also, the lower course of the river and the adjacent lakes are inhabited by a variety of coregonid species, such as Least Cisco (*Coregonus sardinella*), Wide-nosed Whitefish (*C.nasus*), Arctic Cisco (*C.autuminalis*), Siberian Whitefish (*C.lavaretus pidschian*), as well as Arctic Grayling (*Thymallus arcticus pallasi*), Asian Rainbow Smelt (*Osmerus eperlanus dentex*), Capelin (*Mallotus villosus*), and Common Minnow (*Phoxinus phoxinus*). Nine-spined Stickleback (*Pungitius pungitius*) is very common in lakes (Chereshnev, 1986). The fish stock of the Lower Rauchua River is seriously depleted through many years of overharvesting.

Birds

The site is considered to be the eastern limit of the Kolyma fauna. Terek Sandpiper (*Xenus cinereus*), Brown Shrike (*Lanius cristatus*), and Scarlet Rosefinch (*Carpodacus erythrina*) are known to occur here.

The most common bird species are Yellow-billed Diver (*Gavia adamsii*), Black-throated Diver (*G.arctica*), and Pacific Diver (*G.pacifica*). The two latter species occur at a 3:1 ratio (Krechmar *et al*., 1991). Also, the area is home to Bewick's Swan, White-fronted Goose (*Anser albifrons*), Greater Scaup (*Aythya marila*), Pacific Eider (*Somateria molissima v.nigrum*), Long-tailed Duck (*Clangula hyemalis*), Sandhill Crane (*Grus canadensis*), and Willow Grouse (*Lagopus lagopus*). Baikal Teal (*Anas formosa*) is a breeding species (Krechmar *et al.*, 1991). Bean Goose (*Anser fabalis serrirostris*) was a usual breeding bird on Aion Island and Kyttyk Peninsula in the 1950s (Lebedev & Filin, 1959) but is rare now. These birds are known to concentrate in the midcourse of the Rauchua and Konevaam Rivers (Krechmar *et al*., 1991). Based on the results of aerial counts in June 1993, the population of Bewick's Swan on the Kyttyk Peninsula is estimated at 300 birds, that of Pacific Eider at roughly 3,000, and that of Spectacled Eider at 2,000 (Hodges and Eldridge, 1994). Flocks of Steller's Eider congregate in the Maly Chaunsky Strait for moulting (Lebedev & Filin, 1959).

Charadriiform fauna is similar to that of the Lower Kolyma River. The most common species are Ringed Plover (*Charadrius hiaticula*), Pectoral Sandpiper (*Calidris melanotos*), Temminck's Stint (*C. temminckii*), Ruff (*Philomachus pugnax*), Short-billed Dowitcher (*Limnodromus scolopaceus*), Red-necked Phalarope (*Phalaropus lobatus*) and Grey Phalarope (*Ph. fulicarius*). Other sighted birds include Black-bellied Plover (*Pluvialis squatarola*) and Ruddy Turnstone (*Arenaria interpres*). Buff-breasted Sandpiper (*Tryngithes subruficollis*), an American species also found on Wrangel Island and the Arctic coast of the Chukotka Peninsula, was reported as seen on Aion Island (Stishov & Maryukhnich, 1988; Dorogoy, 1997). Herring Gull (*Larus argentatus*) is the most abundant species of the gulls. Sabine's Gull (*L. sabini*) is known to nest on Aion Island. Arctic Tern (*Sterna paradisaea*) is a very common bird on tundra lakes, while Skua numbers undergo marked annual variations. Peregrine Falcon (*Falco peregrinus*) is frequently sighted in the lower reaches of the Rauchua River. Upstream, river cliffs are occupied by breeding Gyrfalcon (*Falco rusticolus*) and House Martin (*Delichon urbica*).

Social and cultural values:

A few Neolithic dwellings occupied by ancient hunters have been excavated on Aion Island. Remains of an old

village formerly inhabited by sea-mammal hunters have been found on the western side of the island as well (Dikov, 1977). The northeasternmost Russian Orthodox Church mission was located at the mouth of the Bolshaya Baranikha River in 1840-1850 (Maidel, 1867). It was run by the priest Argentov, who became the first to report observations of birds of the "Zalensky Krai", i.e., the Arctic coast of Siberia. The complex of Middle Pleistocene outcrops along the shoreline of the Maly Chaunsky Strait is a famous paleontological site fabulously rich in skeletal remains of fossil animals.

Conservation measures taken:

A local nature reserve was set up in the Lower Rauchua River, and the Aionsky Botanical Monument on the Aion Island was established in 1983. The latter protects the relict steppe-tundra vegetation and endemic plant species. It is proposed that the area be designated a wetland of international importance.

Jurisdiction:

Administrations of the Bilibinsky and Chaunsky districts of the Chukot Autonomous Area.

1.5. Ust-Chaun

Geographical coordinates: 68°46'46"N, 170°32'21"E (Chaunskaya Biological Station).

Elevation: 0-6 m a.s.l.

Area: *c.* 250 km^2.

Overview:

Maritime lacustrine-alluvial plain in the delta of a few confluent tundra rivers emptying into the southern part of Chaun Bay, East Siberian Sea. Typical landscapes of maritime, moss-lichen, and shrub tundras of western Beringia. Breeding and staging area of Arctic water birds, seasonal migrating routes of Pacific chars (*Salvelinus spp.*).

Wetland type:

By international classification – A, E, F, G, M, O, Vt; by national classification – 1.2.1.3, 1.3.1, 2.5.1.1, 3.7.2.1 (maritime plains, estuary of a tundra river with the adjacent lake marshland).

Ramsar Criteria: 1, 3, 8.

Justification for the application of selected criteria:

Typical landscape of Holocene plains with thermokarst lakes on the East Arctic coast, breeding grounds for Spectacled Eider (*Somateria fischeri*) and Bewick's Swan *(Cygnus bewickii)*, stopover area for Arctic geese, and migrating routes of Pacific chars to and from their spawning habitats.

General location:

The site is formed by the common delta of the Chaun, Palyavaam, and Pucheveem Rivers and the common mouth of the Lelyuveem and the Olvergyrgyvaam lying to the west (all in the Chaunsky Administrative District of the Chukot Autonomous Area). A biological station of the Institute of Biological Problems of the North (leased by the local administration since 1995) is located on Aiopechan Island, the central one in the delta complex. It is 105 km from Pevek (administrative centre of the district) and 15 km from the village of Rytkuchi.

Physical features:

The site occupies the northern extremity of a non-forested plain of lacustrine and alluvial origin dating to the Holocene period. The plain extends for about 100 km from south to north and for 60 km from west to east. It is bounded by northern slopes of the Anadyr Plateau on the south and by the Chaun Bay coast on the north. The southern part of the area is dominated by the Neitlin mountain (670 m). Permafrost conditions are widespread throughout the area and influence its topography and wildlife in a variety of ways.

The site includes a low marine terrace (0-3 m) that extends seaward towards a broad (1-2 km) band of silt and sand shallows and small stretches of intertidal sand flats. A 100-500 m wide area of the terrace is overgrown with halophilic sedges and grasses. It has no hummocks, and its entire surface is actually a network of shallow (less than 70 cm deep) lakes with numerous small islands and shores highly irregular in outline. When the sea level is high, saline water penetrates deep into the delta, which accounts for the spread of salt meadows almost 10 km upstream from river mouths.

A more elevated surface (3-7 m a.s.l.) is formed by an alluvial delta plain that lies slightly above the marine terrace from which it is separated by a band of driftwood accumulated at its base. The river terrace is lowest (*c.* 3 m) in its western part and becomes higher in the south, where it

lies 5-7 m above sea level. Its surface is reworked by thermokarst activity and contains many lakes, oxbows, potholes, alass depressions, and peat mounds – some of which are very large in size. The delta plain adjoins sloping foothills of the Neitlin massif elevated 12-16 m above sea level.

The foothill area is dominated by the gently rolling relief with lake basins, deep channels, and ravinous rivers. The lakes are shallow and round in shape. Areas between them are occupied by hummocky fields and subarctic shrubbery. The soil layer is composed mainly of tundra gley and peat. The tops of rolling hills are covered with a suprapermafrost layer of cryogenic gley soil. Low-lying portions of the relief contain residual cryogenic boggy soil.

The site has a severe Arctic climate despite the warming effect of the mountains surrounding the Chaunskaya Lowland. The mean annual air temperature in the village of Rytkychi is -12.8°C. Temperatures in January and July average -31.4°C and +9.5°C respectively, but frosts occur and snow falls any time during the year. In winter, the weather is dictated by the Siberian anticyclone; prevalent western and north-western winds periodically change direction to give way to southern ones. The mean wind speed in the winter is 5-7 m/s, but violent snowstorms with wind speeds increasing to a peak of 20-40 m/s are not infrequent. In summer, moderate northern and northeastern winds prevail. From time to time, the unvarying weather pattern is interrupted by the notorious "Chaunskiye yuzhaki", southern hurricane winds coming from the Anadyr Plateau. Equally surprising are moist snowstorms from the Arctic Ocean coming down on the blooming tundra. The mean annual precipitation is 251 mm. The snow cover is established in late September. It is very uneven and can be as deep as 30-40 cm by the end of the winter season. With the coming of spring, the snow cover surface becomes as hard as a wooden board. Snowmelt occurs in late May and early June. Spring weather is cold and moist, with frequent returns of light frost ("otzimki"). Winter winds blow off snow from exposed surfaces and deposit dust at dry spots in the littoral zone, riverside precipices, elevations, and lake edges. This accounts for early snowmelt at such sites in the spring. Sea ice in Chaun Bay persists until mid July, which markedly slows down the development of biological processes on the maritime tundra and is responsible for frequent sea fog in early summer.

Hydrological features:

On the whole, rivers draining the Chaunskaya Lowland are not very long, varying from 160 km (Lelyuveem) to 220 km (Chaun) in length. Their upper course is that of mountain streams, with a fast current, many branches and rapids, and a braided floodplain overgrown with brushwood. The rivers flow much slower through the lowland, meandering and forming vast pools, estuaries, and channels connecting one to another. The water level in the lower reaches depends on the height of the tides, which varies from 0.5 to 1.0 m. Northern winds slow down the river flow, giving rise to a counter-current. The non-inundated portion of the delta plain is a monotonous wet surface with a ridged polygonal microrelief, a large number of primary thermokarst lakes, thermokarst oxbows, oxbow pools, and sedge-moss mires at the floor of alass depressions.

All lakes are categorized into two types in terms of depth: "shallow" (up to 1.5 m) and "deep" (*c*. 2.5-3 m). Their area varies considerably regardless of type. Lakes of the former type freeze to the floor, while the deepest parts of the latter lakes do not. In the winter, the ice cover on the lakes may be as thick as 2 metres.

The floating of ice in the lower reaches of the rivers flowing through the Chaunskaya Lowland occurs on 7-15 June. The ice cover on large lakes disappears in late June or early July, but nearshore areas of open water can be seen 2-3 weeks earlier. The water level in rivers sometimes increases in summer months (August), but summer floods are not as catastrophic as they are in tributaries of the Kolyma River or in the Sea of Okhotsk Catchment. Rivers become icebound in mid October while tundra lakes are covered with ice from early October.

Ecological features:

The marine terrace is a patchy surface formed by a network of numerous small and large water bodies with wet spaces between them, shallow streams, and low dry ridges. Interlake areas are overgrown with sedges (*Carex subspathaecea, C.glareosa, C.rariflora*) and grasses (*Calamagrostis deschampsioides, Dupontia psilosantha*). The shoreline of the lakes is fringed with *Arctophila fulva* and *Eriophorum scheuchzeri* and nearshore shallows are grown by *Hippuris vulgaris*, *Ranunculus palasii, Utricularia minor,* and *Sparganium hyperboreum* (Galanin, 1980). The aquatic fauna is dominated by chironomid larvae; plankton contains numerous daphnias and less branchipods (*Branchynecta sp.*). In the summer season, the lake water surface is frequently covered with a layer of filamentous green algae. *Mesidota entomon* is a common inhabitant of intertidal mud and sand flats and also occurs upstream of river mouths.

Lakes on the delta plain are of the same origin (thermokarst phenomena) but differ in terms of biotic characteristics. Their major portion is shallow (less than 1.5 m) and freezes to the floor in winter. The bottom is covered by a layer of peat and other organic matter, and the shallows

are occupied by a profuse growth of arctophyla, horsetail, and buttercup. The plankton of small water bodies is dominated by copepods (Cyclopodia: *Cyclops sibiricus, Acantocyclops sp., Diacyclops sp.*, and calanoids: *Arctocalanus sp., Hesperodiaptomus sp.*), daphnias (*Daphnia cf.pulex*), and other crustaceans. In the course of the summer season, each species is replaced successively by another as its bloom reaches the peak (Streletskaya, 1983). Amphipods of the genus Stygobromus (*Synurella, Gammaridae*) are abundant in all water bodies with stagnant water. Other groups are represented by branchiopods (Polyartemia, Branchinecta) and notostracans (*Lepidurus arcticus*); caddisfly (Trichoptera) and mosquito (Chironomidae) larvae abound at the bottom. Gastropod molluscs are represented by characteristic species of the genera *Cincinna, Sibirinauta, Physa, Anisus, Lymnaea* and bivalve molluscs by species of the genera *Pisidium*, *Sphaerium*, and *Euglesi*a. Freshwater tundra lakes and pools provide home to the endemic water louse (*Asellus tshaunensis*).

Deeper water bodies (2.5-3 m in depth) that do not freeze to the floor usually have a water surface free from vegetation. Macrophytes (*Arctophila fulva, Menyanthes trifoliata*, and *Carex spp.*) make up rather a narrow fringe outlining rugged and steep shores. The shores are occupied by wet meadows with *Comarum palustre, Valeriana capitata, Pedicularis labradorica,* and *P.capitata*. *Cyclops sp.* and *Leptodiaptomus sp.* are the major components of zooplankton that also includes *Gammarus lacustris*. Nine-spined Stickleback (*Pungitius pungitius*) and Freshwater Smelt (*Hypomesus olidus ssp.*) remain in these lakes for the winter. Large coastal water bodies are round in shape and have transparent water and light silty bottoms. Their shores are fringed with Arctophyla, the zooplankton contains crustaceans of the genus *Cyzicus* (Kondratyev & Zadorina, 1992).

Oxbow lakes support the growth of *Callitriche palustris, Potamogeton filiformis,* and *Myriophyllum spicatum*. Characteristic species of their zooplankton include *Cyclops sp., Leptodiaptomus sp., Heterocope sp.*, rotifer *Kellicota ovum*, and *Cypria cf.kolymensis*. The latter species becomes especially abundant in late June when it is the staple food for coregonid fishes and Nine-spined Stickleback. At the same time, it is an intermediate host of many bird cestodes and spiny-headed worms, fish parasites.

A substantial part of the area is occupied by "dry lakes", i.e., flat alass depressions at the bottom of completely drained water bodies. Ridged polygonal bogs interspersed with grass meadow spots form in these depressions. Their vegetation cover varies depending on the time of water discharge and the proximity to a river. The majority of depressions are dominated by sedges (*Carex concolor*), cottongrasses (*Eriophorum polystachion, E.russeolum*), and grasses (*Calamagrostis holmii, Poa arctica*). Common herbs include *Comarum palustre* and louseworts. In the spring, the depressions of former lakes are flooded by snowmelt and attract many migratory water birds.

Interlake areas are occupied by hillocky tundra and polygonal mires overgrown with hypoarctic plants, such as *Ledum decumbens, Empetrum sp.,* And*romeda polifolia, Arctous alpina, Betula exilis, Salix fuscescens, Carex rariflora, C.capitata, Eriophorum polystachion*, and *E.medium*. Brushwood of *Duschekia fruticosa, Salix boganidensis,* and *S.pulchra* grows on riverbanks and floodplains. Also, there are riverside plots with horsetails (*Equisetum arvense*) and grasses (*Leymus interior, Festuca rubra, Arctagrostis arundinacea*). Herbaceous vegetation comprises *Astragalus alpinus, Castilleja rubra, Bistorta vivipara, Tanacetum boreale, Stellaria fischeriana*, and *Valeriana capitata* (Galanin, 1980). Foothill areas are dominated by sedge-brush associations.

Ecosystems of the Chaunskaya Lowland include a variety of parasitic forms. The site is the sole subarctic area where long-term in-depth studies of major aspects of biology and morphology of bird and fish helminths (especially tapeworms, flukes, and spiny-headed worms) have been carried out. Such studies were based at the Chaunskaya biological station. The lifecycles of many species have been discovered here (Atrashkevich, 1979, 1999).

Noteworthy flora:

The site occupies the western periphery of the Chukot floristic province. The local flora (100 km^2) comprises 252 species of vascular plants (Yurtsev, 1974). Worthy of note are such rare plants of the Chaun Bay coast and the neighbouring valleys as *Suaeda arctica, Hedinia tibetica, Plantago canescence*, and *Helictotrichon krylovii* (Berkutenko, 1987). West of the site (Pineiveem River Basin), the richest refugia of steppe and steppe-tundra floras of the ancient Beringia have been found (Yurtsev *et al*., 1985).

Noteworthy fauna:

Fish

Eighteen fish species are known to occur in the Chaun-Palyavaam-Pucheveem river system (Chereshnev, 1996). Most important commercially are anadromous forms, such as Dolly Varden Trout (*Salvelinus malma*), Least Cisco (*Coregonus sardinella*), and Asian Rainbow Smelt (*Osmerus eperlanus dentex*), as well as freshwater species including Wide-nosed Whitefish (*Coregonus nasus*), Si-

berian Whitefish (*C.lavaretus pidschian*), Arctic Grayling (*Thymallus arcticus pallasi*), and Burbot (*Lota lota natio leuptura*). Chaun Char is a large fish, with some individuals weighing 7-12 kg. Only a few tundra lakes (oxbow and thermokarst-oxbow ones) give home to commercially important fish, but Freshwater Smelt (*Hypomesus olidus ssp.*) and Nine-spined Stickleback (*Pungitius pungitius*) have been reported to live in water bodies that do not freeze to the bottom, and Common Minnow (*Phoxinus phoxinus*) and Spotted Sculpin (*Cottus poecilopus*) have been reported in rivers, channels, and oxbow lakes. Humpback Salmon (*Oncorhynchus gorbuscha*), Chum Salmon (*O.keta*), Taranets' Char (*Salvelinus taranetzi*), as well as Inconnu (*Stenodus leucichthys nelma*) and Arctic Cisco (*Coregonus autumnalis*) are regular, although rare visitors to local rivers. Arctic Flounder (*Liopsetta glacialis)* and Horned Sculpin occur in the zone where seawaters meet and mix with freshwaters.

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) occurs over the site. It inhabits shrub-dominated tundra of flat interfluves and low-lying near-delta tundra excepting its narrow coastal strip.

Birds

The Chaun Delta plain and its valleys provide home to 75 breeding bird species. More than half of them are widespread shorebirds.

The importance of the site for migrating birds:

During the spring passage, the majority of migrants (geese, ducks, and waders) are bound from the southeast to the northwest. The area is remarkable for the concomitant reverse passage from the Kolyma Delta wherefrom Bewick's Swan, Ruff (*Philomachus pugnax*), and Ross' Gull (*Rhodostethia rosea*) come (Krechmar *et al*., 1991). Lesser White-fronted Goose (*Anser erythropus*) was common during spring migrations in the 1970s when it was estimated to be at least as common as White-fronted Goose (*A. albifrons*). Thereafter, this bird virtually disappeared, as it did almost everywhere within its former range. The Bean Goose (*A. fabalis*) was a common migrant through the Chaunskaya Lowland in the past but has become rare since the 1980s. Black Brant occurs in large number on maritime "laidy" during spring and especially fall migrations (Krechmar *et al*., 1991). Steller's Eider (*Polysticta stelleri*) is sometimes very abundant during spring migration; in some years, however, it is totally absent. During autumn migration in late August, White-winged Scoter (*Melanitta deglandi*) passes on to the south along the Chaun and Pucheveema River valleys (Krechmar *et al*., 1991).

The importance of the site for breeding birds:

The most common breeding bird species in the area are Red-throated Diver (*Gavia stellata*), Black-throated Diver (*G.arctica*), and Pacific Diver (*G.pacifica*). The two latter species occur at a ratio of 5-20:1 (Krechmar *et al*., 1991). The White-bellied Diver (*G.adamsii*) is a regular but not frequent breeding bird. The Chaunskaya Lowland forms the eastern limit of the breeding range of Bewick's Swan. Up to 300 these birds can be seen here each summer. A 10-15 km wide maritime area gives home to 25-50 breeding pairs and 150-200 non-breeders. In the spring, the birds come from the west, i.e., from the Kolyma Basin (Krechmar *et al*., 1991).

Tundras of the Chaunskaya Lowland provide favourable conditions for the White-fronted Goose, but the abundance of this species has declined dramatically since the mid 1970s both in Ust-Chaun and other northern areas of the Far East (Andreev, 1997). Pintail (*Anas acuta*) is the most common dabbling duck. Breeding birds are most frequently sighted in rear-delta areas with low shrub vegetation. Broods appear in August, and adult birds coming from southern regions gather in large flocks at approximately the same time. Thereafter, the Pintail becomes a most noticeable bird on the maritime tundra. Common Teal (*Anas crecca*) is less common on the maritime tundra of the Chaunskaya Lowland, but its numbers increase substantially in its southern part. In the early 1990s, Baikal Teal (*A.formosa*) was equally common in shrub tundra habitats but declined to the rare bird status thereafter. The same is true of the Lesser White-fronted Goose.

Breeding Spectacled Eider (*Somateria fischeri*) and King Eider (*S.spectabilis*) are highly abundant at the site. The former species keeps to a 10 km wide area of deltaic tundra and frequently occupies islands in the midst of shallow lakes, where it establishes colonies jointly with big gulls, thus seeking protection from predators. King Eiders behave differently because they choose to breed in a narrow coastal strip where their nests are scattered over wet shores or small islands of shallow thermokarst lakes (Kondratyev & Zadorina, 1992). Pacific Eider (*Somateria molissima v.-nigrum*) is a common breeding species in the northern (Kyttyk) and eastern (Tyyukul, Apapelgyno) parts of the Chaunskaya Lowland; however, it is very rare in river deltas. Greater Scaup (*Aythya marila*) and Long-tailed Duck (*Clangula hyemalis*) are the most common diving ducks breeding at the site (density up to 15 nests per square kilometre). The same species gather in moulting flocks on delta lakes. Rarer breeders are Black Brant (*Branta bernicla nigricans*), Northern Shoveler (*Anas clypeata*) and Black-winged Scoter (*Melanitta americana*). Harlequin Duck

(*Histrionicus histrionicus*) and Red-breasted Merganser (*Mergus serrator*) are rather common in the headwaters of local rivers.

Birds of prey are represented by common Rough-legged Buzzard (*Buteo lagopus*) nesting on the mountain spurs and rolling surface that flank the Chaunskaya Lowland. It also frequents high river precipices and even low-lying areas. Regular visitors are White-tailed Eagle (*Haliaeetus albicilla*), Goshawk (*Accipiter gentilis*), Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*F. rusticolus*), and Merlin (*F. columbarius*). Willow Grouse (*Lagopus lagopus*) is common on riverbanks and dry lakeshores, becoming numerous in the southern part of the Chaunskaya Lowland occupied by the shrub-dominated tundra. Rock Ptarmigan (*L. mutus*) occurs on the slopes of the Neitlin mountain massif. The widespread Sandhill Crane (*Grus canadensis*) is known to have long since been a well-established species on the Chaunskaya Lowland with a breeding density of up to 0.5 pairs/km^2.

The most common waders are those of southern tundras and maritime areas; these are Black-bellied Plover (*Pluvialis squatarola*), Pacific Golden Plover (*P. fulva*), Red-necked Phalarope (*Phalaropus lobatus*), Grey Phalarope (*Ph.fulicarius*), Ruddy Turnstone (*Arenaria interpres*), Temminck's Stint (*Calidris temminckii*), Dunlin (*C. alpina*), Pectoral Sandpiper (*C.melanotos*), Common Snipe (*Gallinago gallinago*), and Short-billed Dowitcher (*Lymnodromus scolopaceus*). Sharp-tailed Sandpiper (*Calidris acuminata*), an autochthonous species of the Yakut tundra, can be seen breeding in some years. Less common, but regularly breeding waders include Ruff (*Philomachus pugnax*), Ringed Plover (*Charadrius hiaticula*), Wood Sandpiper (*Tringa glareola*), and Little Stint (*Calidris minutus*). Red-necked Stint (*C. ruficollis*), Curlew Sandpiper (*C.ferruginea*), Great Knot (*C.tenuirostris*), and Bar-tailed Godwit (*Limosa lapponica*) have been found in the foothill area of Neitlin Mountain.

Long-tailed Skua (Stercorarius longicaudus) is a common breeding species. Arctic Skua (*S.parasiticus*) is less common, while Pomarine Skua (*S.pomarinus*) occurs only as a vagrant. A predominant gull species is Herring Gull (*Larus argentatus*), which makes its colonies on the maritime tundra that it shares with Glaucous Gull (*L. hyperboreus*). Ross's Gull arrives at the Chaun Delta in the spring and remains here to breed every 2 or 3 years. Maritime habitats are also used by breeding Sabine's Gull (*Xema sabini*) and Arctic Tern (*Sterna paradisaea*).

Snowy Owl (*Nyctea scandiaca*) is a regular nomadic species. In some years it places nests at elevated delta sites and enjoys high breeding success. Short-eared Owl (*Asio flammeus*) is an irregular breeder.

The most characteristic passerine birds include White Wagtail (*Motacilla alba*) and Yellow Wagtail (*M.flava*), Red-throated Pipit (*Anthus cervinus*), Willow Warbler (*Phylloscopus trochilus*), Lapland Longspur (*Calcarius lapponicus*), and Arctic Redpoll (*Acanthis hornemanni exilipes*). Bluethroat (*Luscinia svecica*) and Little Bunting (*Emberiza pusilla*) inhabit shrub vegetation along riverbanks, Sand Martin (*Riparia riparia*) occupies riverside precipices, and Snow Bunting (*Plectrophenax nivalis*) occurs in the foothill area of the Neitlin Mountain.

Mammals

All mammals characteristic of northern tundra areas of the Russian Far East have been recorded on the site (a total of 24 species). The most common ones are Tundra Shrew (*Sorex tundrensis*), Laxmann's Shrew (*S. caecutiens*), and Masked Shrew (*S.cinereus*), Siberian Lemming (*Lemmus sibiricus*), and Collared Lemming (*Dicrostonyx torquatus*), Arctic Ground Squirrel (*Citellus parryi*), Tundra Vole (*Microtus oeconomus*), Northern Red-backed Vole (*Clethrionomys rutilis*), Grey Red-backed Vole (*C.rufocanus*), and Montane Vole (*Articola macrotis*), Varying Hare (*Lepus timidus*), Northern Pika (*Ochotona hyperborea*), and Wild Reindeer (*Rangifer tarandus*). Carnivores include Weasel (*Mustela nivalis*), Ermine (*M.erminea*), Wolverine (*Gulo gulo*), and Wolf (*Canis lupus*) that tend to follow reindeer herds. Also frequent are Red Fox (*Vulpes vulpes*) and Brown Bear (*Ursus arctos*) while Arctic Fox (*Alopex lagopus*) makes an integral element of the local landscape. From time to time, the Chaunskaya Lowland is visited by forest species, such as Elk (*Alces alces*), Lynx (*Lynx lynx*), and Sable (*Martes zibellina*). The coastal area is inhabited by Ringed Seal (*Phoca hispida*), Bearded Seal (*Erignathus barbatus*), and very rarely by Walrus (*Odobenus rosmarus*).

Social and cultural values:

The site is a fishing and hunting area for people based at the village of Rytkuchi. Autumn fishing for the anadromous char has declined and lost its importance. In 1970-1975, research carried out at the biological station in the Chaun Delta organized by the Institute of Biological Problems of the North of the Far East Division of the Russian Academy of Sciences was focused on an in-depth investigation into the lifecycles of helminths in the tundra habitats of northeastern Asia. In addition, a large number of botanical, theriological, ornithological, ichthyological, entomological, and soil studies were performed.

Land tenure/ownership:

The landowner is the administration of the Chaunsky District, Pevek Sovkhoz.

Current land use:

In the past, Arctic Foxes were taken using deadfalls and iron traps. Also of importance was fishing for anadromous char and coregonids (Least Cisco), with the catch partly used as bait for trapping foxes and partly sold to the local commercial cooperative. The present-day Chaunsky spawning stock of Dolly Varden Trout (the largest form within the species' range) is seriously depleted by overfishing. In winter, the Chaunskaya Lowland serves as a pasture for reindeer herds.

Factors adversely affecting the site's ecological character:

At present, there is no serious threat to the site. Potentially adverse factors include disturbance of breeding birds and illegal hunting in migration seasons. However, the area is rarely visited by people. It is indirectly affected by mining activities. One source of adverse effects may be the winter motor road connecting Pevek to Baranikha that runs across the site. More projects for building new road links have been instituted, one to connect the settlement of Bilibino and the nearby nuclear power plant to port Pevek and another to link Pevek and Anadyr.

Conservation measures taken:

The central part of the site is protected as the Ust-Chaun Wildlife Refuge of local significance. The sanctuary is intended to safeguard the breeding habitats of Bewick's Swan and Spectacled Eider.

Conservation measures proposed but not yet implemented:

It has been proposed to organize a strict nature reserve (Russian "zapovednik") and wildlife refuge ("zakaznik") by merging isolated protected sites (including the Tyyukuul sanctuary that is currently of little value) into a single area extending from the south-eastern part of the Chaun Bay to the Lower Lelyuveem River. It is suggested that the area be designated a wetland of international importance.

Current scientific research and facilities:

By virtue of proximity to the port of Pevek and the long-term activity of the Chaunskaya biological station, areas on the southern coast of the Chaun Bay have been comprehensively surveyed by soil scientists, zoologists, botanists, and especially hydrobiologists (helminthologists) (Biologicheskiye statsionary..., 1986). Today, the station is leased by the local administration for recreation purposes.

Jurisdiction:

Administration of the Chaunsky District of the Chukot Autonomous Area.

1.6. Nolde Bay

Geographical coordinates: 69°49'31"N, 173°20'29"E.

Elevation: 0-50 m a.s.l.

Area: *c.*1,000 km^2.

Overview:

A relatively large bay on the coast of the East Siberian Sea bounded by the Aachim Peninsula on the north and northeast. The surrounding mainland has the gently rolling relief occupied by hummocky tundra with an extensive network of small thermokarst lakes and river channels. In the east, the bay borders an alluvial plain formed by the Pegtymel Delta.

Wetland type:

By international classification – A, E, F, M, Vt; by national classification – 1.2.1.1, 1.2.3.3, 1.3.2, 3.7.2.1 (shallow sea bay with adjoining areas of lake-dominated tundra and delta plain of a medium-size tundra river).

General location:

The site is located at the boundary between the Chaunsky and Shmidtovsky districts of the Chukot Autonomous Area. It lies 120 km southeast of Cape Shelagsky, 115 km from port of Pevek, and 300 km from the village of Mys Shmidta. The area is bounded by the Keveem Delta in the south, Perkaion Peninsula in the west, and Aachim Peninsula in the north and northeast. In the east, the site borders a delta plain formed by the large tundra river Pegtymel.

Physical features:

Geology and geomorphology

Nolde Bay is an inlet of the East Siberian Sea 1.5-2.5 m in depth that extends for 15 km from southeast to northwest. The bay is 7 km wide in the transverse direction. The rolling hills flanking the bay on the west and southeast are composed of Triassic sandstones and schists. Maximum elevation is 302.8 m a.s.l. (Perkaion Mountain). West of Cape Perkaion, deposits of the Triassic Period are gradually substituted by Paleozoic sediments that emerge near

Cape Kiber. In the area surrounding Nolde Bay, tectonic movements have resulted in the superposition of old rock strata over younger sediments. The delta of the small Keveem River is underlain with alluvial deposits and opens out into the bay from the south. Aachim Peninsula is located north and northeast of the Bay. Its surface is that of an eolian plain elevated 15-35 m a.s.l., with a total area of approximately 150 km^2. The plain is largely composed of sand and sandy loam. The Pegtymel Delta lies east of the Aachim Peninsula. This river is over 300 km long, and the area of its delta is roughly 250 km^2. The younger part of the delta forms an alluvial sand terrace lying 0.5-0.8 m above the water level. Older delta banks are elevated 2.0-2.5 m and dismembered by a network of thermokarst lakes and creeks. Ecological features of the Pegtymel River valley and delta remain to be clarified.

The site has a harsh Arctic climate. The mean monthly air temperature varies from -24.9 to -28.2°C during the period between December and March with an absolute minimum of -45°C (records of Cape Shelagsky and Val'karkay weather stations). Gale-force winds and snowstorms are frequent in the winter (for a total of 69 days on average). The air temperature in the Nolde Bay area drops below freezing regardless of the season. Fog is usual in the summer (mean 78 foggy days). Strong winds blow unceasingly, and calm sunny weather seldom persists for more than one day. The mean air temperature is +1.7°C in June, +3.2°C in July, and +2.7°C in August. The snow cover usually sets in late September but sometimes a month or so earlier.

Coastal polynya forms in mid June. The sea is free from ice from July until September, but floating ice may come to the shore any time of the year. Not infrequently, the edge of the pack ice belt is 40-60 km offshore.

Ecological features:

The water area of Nolde Bay is separated from the coastal escarpment by a narrow gravel beach and patches of maritime lowland. The area is dominated by salt meadows on silty ground and sand and silt shallows with sand ridges above them overgrown with sparse herbaceous vegetation and numerous heaps of driftwood.

The western and southern parts of the area are dominated by hilly tundra with tussocks formed by moss-sedge-cottongrass vegetation (largely *Carex lugens* and *Eriophorum vaginatum*). Low-lying places are filled with small, but rather deep thermokarst water bodies. Maritime shingle stretches are occupied by ericoid tundra with a predominance of *Dryas punctata* and *Cassiope tetragona* (Dorogoy, 1990).

The Aachim Peninsula features a complex of gently sloping sand hills with sparse vegetation, sandy rolling surface with baydjarakhs, and dunes with strings of shallow hollows filled with small pools. Elevated landforms support well-drained polygonal tundra with dwarf shrub-grass vegetation. Alass depressions are occupied by wet tussocky fields and polygonal bogs (Stishov, 1993).

The most important bird habitats include moss-sedge-cottongrass hummock tundra with a network of small thermokarst lakes. They provide breeding sites for the majority of local anseriforms, waders, and passerines. Seashore precipices in the western part of the bay are occupied by breeding Rough-legged Buzzards (*Buteo lagopus*), Glaucous Gulls (*Larus hyperboreus*), and perhaps Peregrines (*Falco peregrinus*). Small baydjarakhs are preferred breeding sites of Snowy Owls (*Nyctea scandiaca*).

Noteworthy flora:

In terms of geobotanical zonation, the area is referred to the northern belt of subarctic tundras (Aleksandrova, 1977). The flora of the Nolde Bay area comprises approximately 100 species of vascular plants (Kozhevnikov, 1989), but a detailed study of its composition remains to be conducted.

Noteworthy fauna:

Birds

The importance of the site for breeding birds.

A total of 46 bird species belonging to 8 orders have been found in the Nolde Bay area (Dorogoy, 1990; Stishov, 1993).

The site is a breeding area for 3 diver species: Yellow-billed Diver (*Gavia adamsii*), Black-throated Diver (*G.arctica*), and Pacific Diver (G.pacifica).

Of the 12 species of anseriform birds, Pacific Eider (*Somateria molissima v.-nigrum*) and Long-tailed Duck (*Clangula hyemalis*) are the most common breeding birds. Large congregations of Long-tailed Ducks have been seen in the Nolde Bay during the moulting period (Kondratyev, 1988). Less common breeders are Common Teal (*Anas crecca*), Wigeon (*A.penelope*), Pintail (*A. acuta*), Steller's Eider (*Polysticta stelleri*), and King Eider (*Somateria spectabilis*). Passage migrants include Bewick's Swan (*Cygnus bewickii*), White-fronted Goose (*Anser albifrons*), Bean Goose (*A.fabalis*), and Black Brant (*Branta bernicla nigricans*). Of these, only the White-fronted Goose occurs in an appreciable number, while the remaining species are rather unusual visitors. There is a documented case of Snow Goose (*Chen hyperboreus*) breeding. Also, the Pegtymel Delta is reported to be used by Snow Geese as a stopover area during autumn passage (Kondratyev, 1988).

Breeding of predatory birds has been documented for the Rough-legged Buzzard alone; certain pairs place their

nests on coastal precipices in the western part of the bay. The same sites are visited by Peregrines during the summer period, but no nests have been found thus far. The same is true of White-tailed Eagle (*Haliaeetus albicilla*) and Gyrfalcon (*Falco rusticolus*).

Rock Ptarmigan (*Lagopus mutus*) and Sandhill Crane (*Grus canadensis*) are seen on the site in small numbers during the breeding season.

The site is a home to 16 species of waders. The most common breeding species are Red-necked Phalarope (*Phalaropus lobatus*), Ruddy Turnstone (*Arenaria interpres*), and Dunlin (*Calidris alpina*); less frequent are Black-bellied Plover (*Pluvialis squatarola*), Ringed Plover (*Charadrius hiaticula*), Dotterel (*Eudromias morinellus*), Grey Phalarope (*Phalaropus fulicarius*), Little Stint (*Calidris minutus*), Temminck's Stint (*C.temminckii*), and Pectoral Sandpiper (*C.melanotos*). Pacific Golden Plover (*Pluvialis fulva*), Knot (*Calidris canutus*), and Short-billed Dowitcher (*Lymnodromus scolopaceus*) allegedly breed in the area since they occur here in the summertime. Ruff (*Philomachus pugnax*) and Buff-breasted Sandpiper (*Tryngithes subruficollis*) were sighted on the Aachim Peninsula. Red-necked Stint (*Calidris ruficollis*) is a rare passage migrant.

Larger gulls, Herring Gull (*Larus argentatus*) and Glaucous Gull (*L. hyperboreus*), are regular breeding birds. Pomarine Skua (*Stercorarius pomarinus*) becomes a very common breeding bird in years of high lemming density. The abundance of Long-tailed Skua (*Stercorarius longicaudus*) and Arctic Tern (*Sterna paradisaea*) nesting on shingle beaches is not very large but stable.

The record-breaking population density of Snowy Owl is registered in lemming peak years.

Lapland Longspur (*Calcarius lapponicus*) and Snow Bunting (*Plectrophenax nivalis*) are the two most numerous birds of the four passerine species found on the site. Two others, White Wagtail (*Motacilla alba*) and Arctic Redpoll (*Acanthis hornemanni exilipes*), are much less abundant.

The importance of the site as an area inhabited by economically valuable and rare birds:

The nesting density of commercially important anseriform birds, with the exception of Long-tailed Ducks and Eiders, is not very high in the area adjacent to Nolde Bay (Perkaion Peninsula). However, it is the only mainland area east of the Kolyma River where breeding of Steller's Eider, Snow Goose, and Little Stint has been documented. The delta plains of the Pegtymel River are important for autumn staging of Snow Geese (Baranyuk & Takekava, 1998). Irregular breeding of Knot and Peregrine cannot be excluded.

Mammals

Two lemming species occur on the site, Brown Lemming (*Lemmus trimucronatus*) and Collared Lemming (*Dicrostonyx torquatus*). Other rodents include Tundra Vole (*Microtus oeconomus*), Varying Hare (*Lepus timidus*), and Northern Pika (*Ochotona hyperborea*). Arctic Fox (*Alopex lagopus*) occurs in small numbers. Polar Bear (*Ursus maritimus*), Ringed Seal (*Phoca hispida*), and Walrus (*Odobenus rosmarus*) can be seen along the seacoast.

Social and cultural values:

The lower Pegtymel River is remarkable for a few Neolithic sites and a unique concentration of petroglyphs dating back some 1,500-3,000 years (Dikov, 1977). This area has been designated as a nature monument.

Jurisdiction:

Administrations of the Chaunsky and Shmidtovsky Districts of the Chukot Autonomous Area.

1.7. Billings Cape

Geographical coordinates: 69°52'29"N, 176°05'E.

Elevation: 0-4 m a.s.l.

Area: *c.* 700 km^2.

Overview:

Sea spit of the East Siberian Sea coast, a system of lagoons, lakes, maritime marshes, and a lacustrine-alluvial plain in the lower reaches of the Kuul'innykey and Keikul Rivers. An important staging area for migrating Snow Geese (*Chen hyperboreus*) of the Asian population.

Wetland type:

By international classification – E, F, H, J, M, O, Vt; by national classification – 1.2.5.2, 1.3.1., 3.7.2.1 (coastal lagoons, river estuaries with the surrounding lacustrine-alluvial plains of the tundra zone).

Ramsar Criteria: 5.

Justification for the application of selected criteria:

Satellite tracking studies have confirmed the role of the site as a staging area during the autumn migration of Snow Geese (around 100,000 birds) breeding on Wrangel Island.

General location:

The site is situated in the coastal area of the East Siberian Sea between the mouth of the Pegtymel River (65 km) and Leningradsky (114 km) on the territory of the Shmidtovsky District of the Chukot Autonomous Area. It lies 215 km from the settlement of Mys Shmidta.

Climate:

The climate is a very severe Arctic one, with strong winds and frequent mists. The mean annual air temperature is –12.7°C, with the mean temperatures in January and July –25.9 and +2.5°C respectively. Annual precipitation is 254 mm. The site is remarkable for an unprecedented large number of foggy days (123 per year). The edge of the pack ice is not far offshore.

Ecological features:

The site is included in the Ramsar Shadow List of internationally important wetlands based on the results of satellite tracking (Takekawa, 1990). The study has shown that geese breeding on Wrangel Island stay at the site for 10-14 days during autumn migration in late August and early September. Their favourite stopover area is the tundra plain in the middle course of the Kuul'innykey and Keikul Rivers with the Val'karkynmangkak Lagoon adjoining them from the north and lying 5-20 km from the seacoast (Baranyuk & Takekawa, 1988). Moreover, interviews with residents give evidence of massive spring migration of the White Goose across the area (Kondratyev, 1988).

Conservation measures taken:

The site has not yet been designated a protected natural area even though its characteristics are consistent with the provisions specified in the "Important Bird Areas of Russia" program and meet the Ramsar criteria. It should be given protected status after a relevant additional survey.

Jurisdiction:

Administration of the Shmidtovsky District of the Chukot Autonomous Area.

1.8. Seabird Colonies on the East Siberian Sea Coast (from Kolyma Delta to Cape Yakan)

The north-western coast of the Chukot Autonomous Area extends for almost 925 km from Cape Medvezhiy to Cape Yakan. There are seven sites occupied by seabird colonies along the shoreline. Most colonies are actually small and sparse groups of nests established at precipitous rocky capes of the Arctic coast of the Chukotka Peninsula and Wrangel Island. The estimated seabird population in the area totals 70,000 individuals. The largest colonies are located in the western part of Wrangel Island and on Cape Yakan. They are formed by 6 species, including Pelagic Cormorant (*Phalacrocorax pelagicus*), Glaucous Gull (*Larus hyperboreus*), Herring Gull (*L. argentatus*), Kittiwake (*Rissa tridactyla*), Brunnich's Guillemot (*Uria lomiva*), Black Guillemot (*Cepphus grylle*), and Horned Puffin (*Fratercula corniculata*).

Kargyn (69°12'N, 168°48'E) – isolated residual cliff 2.8 km offshore the western coast of Chaun Bay, 40 km south of Aion Island; a colony of roughly 750 pairs of Kittiwake (Kondratyev, 1986).

Cape Kittivarken (69°58'N, 170°33'E) – rocky seashore in the eastern part of Chaun Bay, 30 km from the town of Pevek, populated by Pelagic Cormorants (5-6 pairs) and Kittiwakes (about 4,000 pairs) (Kondratyev, 1986).

Cape Shelagsky (70°06'N, 170°36'E) – sparse seabird colony at the rocks flanking Chaun Bay on the east, 45 km from Pevek; the colony is formed by 12 pairs of Pelagic Cormorants, a few pairs of large gulls, and 25 pairs of Black Guillemots (Kondratyev, 1977).

Cape Kiber (69°55'N, 172°45'E) – rocky Arctic coast near the eastern boundary of the Chaunsky Administrative District; sparse colony composed of breeding Pelagic Cormorants, Glaucous Gulls, Herring Gulls (50 pairs), and Black Guillemots (10 pairs) (Kondratyev, 1986).

Shalaurova Island (69°58'N, 172°46'E) – 80 m high island located 1.5 km north of Cape Kiber and populated largely by Kittiwake (2,500 pairs) and Brunnich's Guillemot (500 pairs); the latter species has been breeding on the island since the late 1997s. Other species include Pelagic Cormorant, Herring Gull, and Black Guillemot, each represented by a few pairs (Kondratyev, 1986).

Cape Ptichy Bazar (71°04'N, 178°38'E) – the main breeding site of seabirds at the western extremity of Wrangel Island surrounded by minor colonies scattered over limestone precipices and residual rocks along the shoreline. The breeding species include Pelagic Cormorant, Glaucous Gull, Kittiwake, Brunnich's Guillemot, Black Guillemot, and a few pairs of Horned Puffin. The total estimated seabird population is about 50,000 birds. Kittiwake is the dominant species; Brunnich's Guillemot is the subdominant one (Stishov *et al*., 1991).

Cape Yakan (69°35'N, 177°30'E) – a 40-50 m high rocky precipice and the adjacent beach portion located 140

km from the village of Mys Shmidta. The site harbours a compact colony formed by Kittiwake (from 1,000 to 8,000 pairs), Glaucous Gull (40 pairs), and Black Guillemot (15-20 pairs). A pair of Peregrines was reported to have been nesting in the colony in 1999 (Kondratyev, 1986; Dorogoy, 1999).

Fig. I. Administrative division of continental Northeastern Russia. The black dots indicate centres of administrative districts.

Administrative districts of the Republic of Sakha (Yakutia) with their centres indicated in parentheses:
1 – Nizhnekolymsky (Chersky), 2 – Srednekolymsky (Srednekolymsk), 3 – Verkhnekolymsky (Zyryanka).

Administrative districts of the Chukot Autonomous Area with their centres indicated in parentheses:
4 – Bilibinsky (Bilibino), 5 – Chaunsky (Pevek), 6 – Shmidtovsky (Mys Shmidta), 7 – Anadyrsky (Anadyar), 8 – Iultinsky (Egvekinot), 9 – Chukotsky (Lavrentiya), 10 – Providensky (Provideniya), 11 – Beringovsky (Beringovsky).

Administrative districts of the Magadan Region with their centres indicated in parentheses:
12 – Susumansky (Susuman), 13 – Srednekansy (Srednekan), 14 – Omsukchansky (Omsukchan), 15 – Severoevensky (Severoevensk), 16 – Yagodninsky (Yagodnoye), 17 – Tenkinsky (Ust-Omchug), 18 – Khasynsky (Palatka), 19 – Olsky (Magadan).

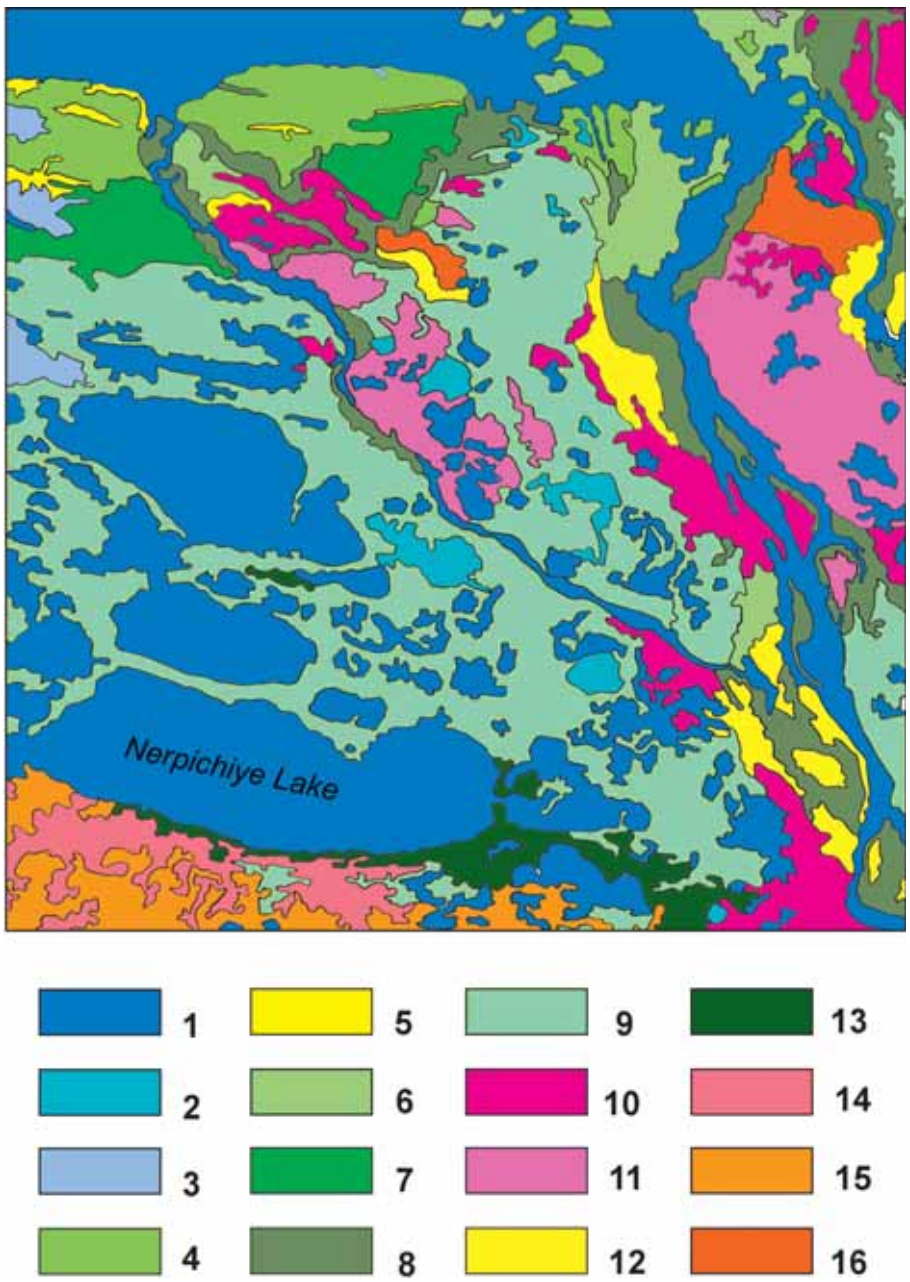
Administrative districts of the Khabarovsk Territory with their centres indicated in parentheses:
– Okhotsky (Okhotsk).

Fig. II. Distribution of wetlands in the northern region of the Russian Far East: 1 – Kolyma Delta, 2 – Khalerchinskaya Tundra, 3 – Chukochya River, 4 – Omolon-Anuyi Interfluvial Area, 5 – Rauchua River – Kyttyk Peninsula – Aion Island, 6 – Ilirneiskiye Lakes, 7 – Middle Omolon River, 8 – Ust-Chaun, 9 – Nolde Bay – Pegtymel River, 10 – Teyukul nature sanctuary, 11 – Lake Elgygytkin, 12 – Billings Cape, 13 Wrangel Island, 14 – Amguema River, 15 – Vankaremskaya Lowland, 16 – Kolyuchinskaya Bay, 17 – Chegitun River, 18 – Inchoun Lagoon, 19 Uelen Lagoon, 20 – Lake Koolen, 21 – Ratmanov Island, 22 – Lake Ioni, 23 – Mechigmen Bay, 24 – Getlyanen Lagoon, 25 – Senyavin Straits, 26 – Achchen Lagoon, 27 – Konerginskaya Tundra, 28 – Russkaya Koshka (former Klinkovstrem), 29 – Markovskaya Basin, 30 – Lake Krasneno, 31 – Ust-Tanyurer, 32 – Avtotkul River, 33 – Tymna and Glubokaya Lagoons, 34 – Mainopylgino Lagoon, 35 – Khatyrka River, 36 Gizhiga, 37 – Iretskaya Lagoon, 38 – Malkachan, 39 – Yama River, 40 – Yamskiye Islands, 41 – Nakhatandzhinskaya Tundra, 42 – Babushkin Bay, 43 – Siglan Bay, 44 – Odyan Bay, 45 – Olskaya Lagoon, 46 – Amakhtonsky Bay, 47 – Motykleisky Bay, 48 – Talan Island, 49 – Kavinskaya Basin, 50 – Iganjinskiye Mires, 51 – Balygychanskaya Basin, 52 – Buyundinskaya Basin, 53 – Inya River valley, 54 – Erineiskaya Bay, 55 – Jack London Lake, 56 – Elikchanskiye Lakes, 57 – Khal-Degi Lake.

The Lower Chukochya Valley *(A.V.Andreev)*.

Yellow-billed Diver *(A.V.Andreev)*.

A newly-formed alass in the Chukochya River valley *(A.V.Andreev)*.



Landscape structure of the Kolyma Delta: 1 – water surfaces (water bodies deeper than 1 m), 2 – water bodies less than 1 m deep, 3 – complexes of flats and plant-choked lagoons, 4 – intertidal flats and young delta portions, 5 – sea bars and accumulation of driftwood, 6 – coastal shallows, 7 – young maritime plains with manifestations of thermokarst activity, 8 – river shallows and drying channels, 9 – automorphic delta sites with manifestations of thermokarst activity, 10 – primary surfaces with manifestations of thermokarst activity, 11 – primary alasses formed on alluvial plains, 12 – low-lying floodplains, 13 – sedge-hollow complexes in rear parts of the modern delta, 14 – wet peatlands with cottongrass associations, 15 – Khalerchinskaya Tundra, 16 – bedrock outcrops. Scale: a 60x60 km site is depicted.

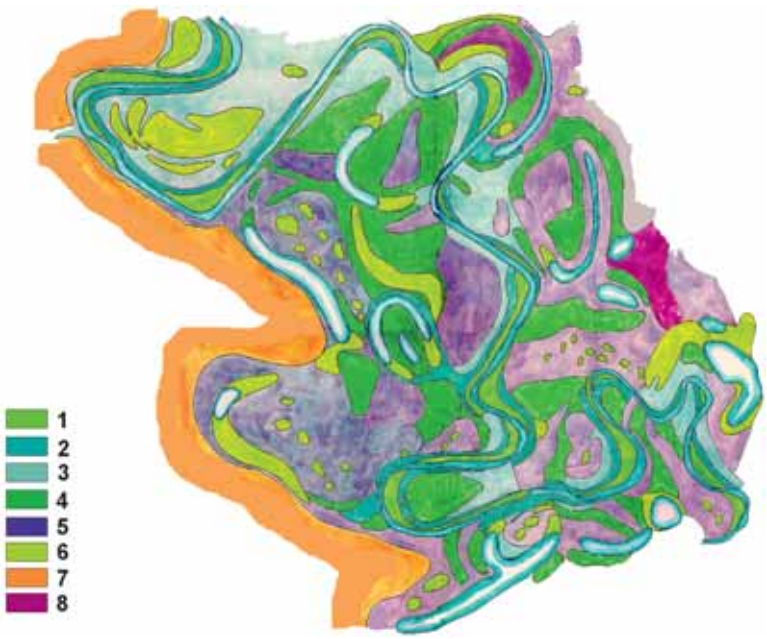
Kolyma Delta plain in mid July. White spots – groups of Bewick's Swan *(A.V.Andreev)*.

Bewick's Swan on its nest *(A.V.Andreev)*.

Sabine's Gull *(G.I.Atrashkevich)*.

The Lower Kolyma River *(A.V.Andreev)*.

Kon'kovaya River valley *(A.V.Andreev)*.



Landscape structure of the Kon'kovaya River: 1 – riverside horsetail and grass-herb associations with scattered shrubs of *Salix kolymensis*, 2 – *Salix glauca* thickets, 3 – sparse growth of *Salix glauca* and *Salix pulchra*, 4 – ridges occupied by Dryas-Vaccinium associations, 5 – polygonal terraces with isolated groups of *Salix pulchra* shrubs, 6 – sedge-cottongrass meadows, 7 – yedoma landscapes, 8 – polygonal swamps. Scale: a 1x1 km site in the lower reaches of the Malaya Kon'kovaya River is depicted.

Rauchua River *(G.I.Atrashkevich)*.

Landscape of Aion Island *(I.V.Dorogoy).*

Chaunskaya Plain *(G.I.Atrashkevich)* .

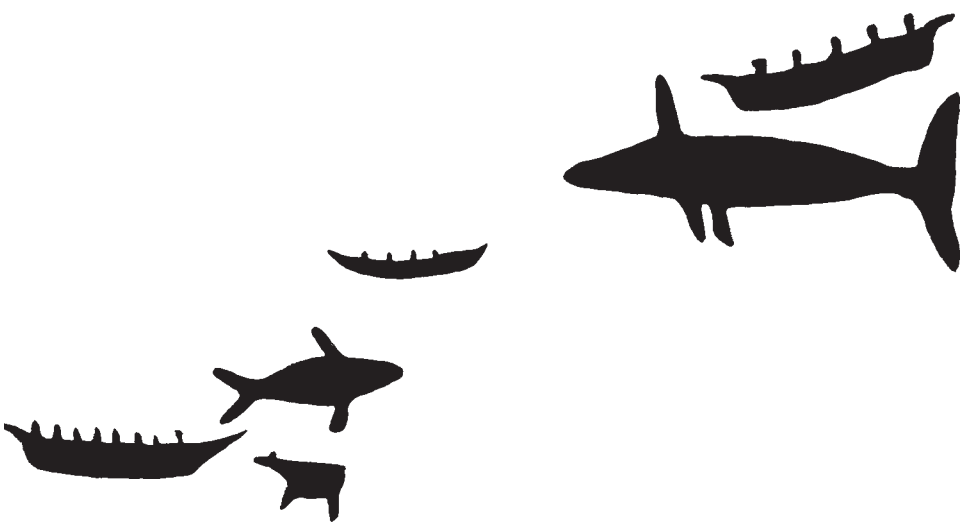
Cape Maly Chukochiy *(A.V.Andreev)*.

Thermokarst lake *(G.I.Atrashkevich)*.

Banks of the Pucheveem River *(G.I.Atrashkevich)*.

Cape Kiber *(I.V.Dorogoy)*.

Nolde Bay shores *(I.V.Dorogoy)*.



Pegtymel petroglyph *(Dikov, 1977)*.

2. Kolyma River Catchment

2.1. Ilirneiskiye Lakes

Geographical coordinates: 67°22'32"N, 168°25'44"E (Illirneiveem River mouth).

Elevation: 420-445 m a.s.l.

Area: 200 km^2, including lake surfaces totalling 52 km^2.

Overview:

Mountain glacial lakes at the northern forest limit (North Anyui Range).

Wetland type:

By international classification – O, M; by national classification – 3.8.1.4 (mountain glacial oligotrophic lakes in the northern taiga zone and highlands of western Chukotka).

General location:

The lakes make up a part of the Maly (Sukhoy) Anyui River Basin on the territory of the Bilibinsky Administrative District of the Chukot Autonomous Area. The nearest settlement (Ilirnei) is 13 km from the site. The site lies 112 km from Bilibino, administrative centre of the district.

Physical features:

The system of lakes and watercourses incorporates two large lakes glacial and tectonic in origin, the channel connecting them, and a number of small lakes, rivers, and streams. The site has an Alpine-type relief with elevations from 1,200 to 1,400 m a.s.l. and the Mountain of Two Cirques as its highest point (1,786 m). Ilirneiskiye Lakes are linked to the Maly Anyui River by a channel 13.2 km in length. The Upper Ilirnei Lake is 10 km long, with a width varying from 2 to 4.5 km. The total water area is 21.7 km^2. There is a mountainous island in the southern part of the lake as high as 240 m. A few rivers empty into the lake, the largest being the Pravy Ilirneiveem. A channel of the same name connects the Upper and Lower Ilirnei Lakes. The latter lake has an area of 28.3 km^2 and is 32 m deep. The lakeshores are mostly steep, but the 8 km long and 4 km wide trough link is a wet lowland.

The depression between the lakes is underlain with fluvioglacial deposits of Middle Quaternary time. The surrounding fold mountains are built up from Upper Triassic sandstones with granite intrusions of the Late Cretaceous Period. The general aspect of the site is that of an Alpine-type terrain with glacial corries and rather a dense network of small watercourses that feed the lakes. Morainic hollows north of Lower Ilirnei Lake are filled with numerous small lakes and rivulets.

The mean annual precipitation of Ilirnei is 256 mm. The snow cover sets in late September, and its mean depth is 48 cm. Water bodies become icebound in the first half of October and free of ice in late June or early July. Westerly winds prevail during the winter period. The average annual wind speed is 2.6 m/s, with the highest speed being 24 m/s. Eastern winds blow in the summer.

Ecological features:

Lakeshores and lower mountain slopes flanking the valley support tracts of sparse larch forest with shrub pine in the understory and lichen-covered ground. The timberline lies at 700 m. Tilted wet surfaces and saddles at higher altitudes are occupied by stretches of moss-lichen and grassy tundras interrupted by accumulations of rocky debris ("kurumniki"). The groundcover is dominated by subshrub and dwarf willow growth, Labrador tea, and blueberry.

Upper Lake Ilirnei has steep shores and a sand-pebble floor in its nearshore portions. The shores of Lower Ilirnei Lake are sloping and covered by larch forest, its bottom layered with sand and gravel, and the northern part has sandy and silty shallows. Both major lakes are oligotrophic. The benthic fauna includes chironomid and caddisfly larvae and bivalve molluscs. The fish population is dominated by Pigmy Whitefish (*Prosopium cylindraceum*), Siberian Whitefish (*Coregonus lavaretus pidschian*), Wide-nosed Whitefish (*C.nasus*), Peled (*C.peled*), Arctic Grayling (*Thymallus arcticus pallasi*), and Burbot (*Lota lota natio leuptura*) (Postnikov, 1963).

Noteworthy fauna:

Birds

Common Teal (*Anas crecca*) is a common species in the mountain river valleys going upstream to an altitude of 600 m. Wigeon (*A. penelope*) and Pintail (*A.acuta*) are regular inhabitants of lake depressions and lower river reaches. Morainic ridges are populated by Long-tailed Duck. Harlequin Duck (*Histrionicus histrionicus*) sometimes occurs along mountain streams, while Red-breasted Merganser (*Mergus serrator*) is rather common on lakes. Gyrfalcon (*Falco rusticolus*) and Golden Eagle (*Aquila chrysaetos*)

have their breeding sites on the Pravy Ilirneiveem River. Willow Grouse (*Lagopus lagopus*) and Rock Ptarmigan (*L.mutus*) choose to nest on mountain slopes and foothill surfaces.

Waders are represented by 22 species. Regular breeding species include Dotterel (*Eudromias morinellus*), Wood Sandpiper (*Tringa glareola*), Whimbrel (*Numenius phaeopus*), Ruff (*Philomachus pugnax*), Common Sandpiper (*Actitis hypoleucos*), and Grey-tailed Tattler (*Heteroscelus brevipes*). Spotted Redshank (*Tringa erythropus*), Terek Sandpiper (*Xenus cinereus*), Red-necked Phalarope (*Phalaropus lobatus*), Common Snipe (*Gallinago gallinago*), and Great Knot (*Calidris tenuirostris*) are less common. Knot (*Calidris canutus*) and Bar-tailed Godwit (*Limosa lapponica*) are allegedly breeding species (Artyukhov, 1984, 1986).

Arctic Tern (*Sterna paradisaea*) is common along lakeshores, whereas Long-tailed Skua (*Stercorarius longicaudus*), Mew Gull (*Larus canus*), Herring Gull (*L. argentatus*), and Common Tern (*Sterna hirundo*) occur in small numbers in this habitat.

Passerine birds are largely represented by northern taiga and mountain tundra species. The most common breeding species are White Wagtail (*Motacilla alba*), Wheatear (*Oenanthe oenanthe*), Little Bunting (*Emberiza pusilla*), Rustic Bunting (*E.rustica*), Arctic Redpoll (*Acanthis hornemanni exilipes*), Scarlet Rosefinch (*Carpodacus erythrinus*), Naumann's Thrush (*Turdus naumanni*), Nutcracker (*Nucifraga caryocatactes*), and Siberian Jay (*Perisoreus infaustus*). Other passerines include Chiffchaff Warbler (*Phylloscopus collybita*), Arctic Warbler (*Ph.borealis*), Yellow-browed Warbler (*Ph.inornatus*), House Martin (*Delichon urbica*), Stonechat (*Saxicola torquata*), Siberian Accentor (*Prunella montanella*), Pechora Pipit (*Anthus gustavi*), Olive-backed Pipit (*A.hodgsoni*), Buff-bellied Pipit (*A.rubescens*), Red-breasted Flycatcher (*Ficedula parva*), Brambling (*Fringilla montifringilla*), Great Grey Shrike (*Lanius excubitor*), Brown Shrike (*L.cristatus*), Yellow Wagtail (*Motacilla flava*), Siberian Tit (*Parus cinctus*), Siberian Rubythroat (*Luscinia calliope*), Lapland Longspur (*Calcarius lapponicus*), Pallas's Reed Bunting (*Emberiza pallasi*), Pine Grosbeak (*Pinicola enucleator*), and Raven (*Corvus corax*) (Artyukhov, 1990).

The site lies on migrating routes of White-fronted Goose (*Anser albifrons*), Bean Goose (*A.fabalis*), Snow Goose (*Chen hyperboreus*), Pacific Golden Plover (*Pluvialis fulva*), Ruddy Turnstone (*Arenaria interpres*), Greenshank (*Tringa nebularia*), Grey Phalarope (*Phalaropus fulicarius*), Temminck's Stint (*Calidris temminckii*), Dunlin (*C.alpina*), and Ross' Gull (*Rhodostethia rosea*) (Artyukhov, 1986, 1990).

Jurisdiction:

Administration of the Bilibinsky District of the Chukot Autonomous Area.

2.2. Omolon-Anyui Interfluvial Area

Geographical coordinates: 68°43'51"N, 158°41'45"E (village of Kolymskoye); 68°30'34"N, 160°56'51'E (village of Nizhnekolymsk); 68°16'03'N, 160°53'21"E (Bayokov's lodge); 68°06'52"N, 158°31'10"E (Pervy Kamen' in the Omolon Valley)

Elevation: The surface of yedoma lies at 50-70 m a.s.l., lake surfaces at 25-35 m, water surface of the Kolyma River (near Nizhnekolymsk) at 7 m.

Area: *c.* 4,500 km^2.

Overview:

Lacustrine-yedoma plain in the wooded area of the Lower Kolyma River and adjacent portions of the large valleys of the Omolon, Kolyma, and Bolshoy Anyui Rivers. Typical landscapes of the forested lake country in northern Yakutia, a well-developed system of river tributaries, migration routes and feeding grounds for Siberian Sturgeon and Whitefishes, stopover areas for migratory Arctic birds.

Wetland type:

By international classification – M, O; by national classification – 2.5.1.1; 3.7.2.2 (valleys and lower reaches of forest-tundra rivers, cryogenic lacustrine basins of the northern taiga zone).

Ramsar Criteria: 1, 3.

Justification for the application of selected criteria:

Representative landscapes of accumulative cryogenic plains of northeastern Yakutia. Breeding area for water birds at the northern limit of taiga forests, concentrations of migrating birds during spring and autumn migrations. Feeding, spawning, and transit areas for coregonid fishes.

General location:

The area lies on the right side of the Kolyma River and is bordered on the west, north, and east by the valleys of other large rivers. In the south, the site gradually descends to the foothill area of the Kur'insky Range. The village of Kolymskoye is situated at the north-western periphery of the site. The majority of the site is included within the protected area of the Chaigurgino Wildlife Refuge. The site is located 55-115 km from the village of Chersky, administrative centre of Nizhnekolymsky Ulus (district) of the Republic of Sakha (Yakutia).

Physical features:

The site is bounded by the Omolon River valley on the west, the Kolyma River on the north, and the valley adjacent to the mouth of the Bolshoy Anyui on the east. The southern boundary of the site runs across the mountain slopes flanking the Anyui Lowland and covered with a thick layer of loose sediment.

Three geomorphological levels are distinguished. The most elevated surface is represented by yedoma of the Middle Pleistocene period, the intermediate level is formed by Holocene alass deposits, and the lowest one by modern riverine alluvial deposits. The primary loess-glacial plain is well preserved under the shelter of larch taiga and a carpet of moss-brush vegetation. However, this protective cover is permanently destroyed by water erosion. The site has cryogenic gley soils characteristic of the northern taiga zone. Lakes formed by filling collapsed sinkholes have steep and rugged shores with numerous capes and inlets, baydjarakhs, and landslide products. Most lakes are deep (8-12 m), poorly drained, and interconnected by small, sometimes virtually unnoticeable channels ("viski") through which runoff occurs and both fish and invertebrates have access to the lakes. Some lacustrine basins contain little or no water; on the whole, however, thermokarst activity at the Omolon-Anyui Interfluve is much lower compared with the non-forested plains of the Kolyma-Anyui Interfluvial Area. In summer, the water temperature in the lakes is as high as +18-22°C. The ice cover is usually established in early October and becomes 150-170 cm thick by spring. The site is intersected by several deeply cut and winding rivulets, e.g., Timkinskaya and Lakeevskaya.

The site occupies the lower reaches of the 2,200 km long course of the Kolyma River. The riverbed near Duvanny Yar (precipice) is almost 3 km wide and has many silt spits and isles. After the flooding subsides, the shallow stretches of riverbed (rapids) are 1.5-2 m deep, while the depth of its deeps amounts to 5-8 m. The river's rate of flow is 0.4-0.5 m/s. Water remains turbid and yellowish in colour even in the post-flooding period due to the permanent washing away of a lighter materiel of yedoma precipices and earth banks. The riverside terrace is 8-10 m high. The floodplain and islands have numerous deep oxbows and thermokarst lakes usually surrounded by areas of tussock-forming sedges, thick Manchurian alder scrub (*Duschekia fruticosa*), and open larch stands at elevated places. The sides of banks support willow thickets (*Salix lanata, S.boganidensis*) that pass to bluegrass and horsetail meadows downslope.

The permanent destruction of the yedoma by river water is a characteristic feature of the site. This process is especially active during flooding. Some 20 km below the confluence of the Omolon, the right side of the Kolyma River exposes a giant (50 m high and almost 10 km long) outcrop of ice veins and wedges (Duvanny Yar). The outcrop is of paramount importance from the standpoint of Quaternary geology since it contains strata rich in the skeletal remains of fossilized animals ("mammoth fauna") dating to Middle Pleistocene time. Continuous wave erosion equally affects the shoreline of all more or less big lakes of the area and leads to the thawing of ice wedges and landslides that bring large masses of earth, together with the trees growing on them, down into the water – the so-called "drunken forest", which can be seen along the shoreline of many large lakes of the area.

Spring ice floating on the Kolyma River starts around May 28 (in the vicinity of the village of Kolymskoye). Water temperature in the summertime is +13-18°C and sometimes rises to +23°C. The river is navigable for about 125 days of the year. The annual flow of the Kolyma and its tributaries is highly irregular; almost 90% of the total falls within 3.5-4 summer months. The flow is highest in the first ten days of June. Once in 9-12 years, catastrophic spring floods occur, with river water covering the adjacent terraces, high islands, and their water bodies. Another flooding (smaller one) is related to monsoon rains falling in the second half of August and early September at the Okhotsk-Kolyma Watershed area. Ice covers the river around the 15th of October and is 160-180 thick by the spring.

Many floodplain lakes are connected to the Kolyma River by deep channels with variable flow. The water level in such lakes (called "ayan" by residents) varies with that in the river. The largest tributaries of the Kolyma River, the Omolon (1,150 km) and the Bolshoy Anyui (*c.* 700 km), flow relatively fast (3-5 m/s) even in their lower reaches.

The area has a cold climate of the subarctic type with certain elements of continental climate. The meteorological station in the village of Kolymskoye documented a mean annual temperature of –13.4°C, with the mean temperature in January –34.8°C (absolute minimum –59°C) and in July

+10.0°C. The snow cover sets in late September or early October and is 45-50 cm deep by March-April. Cold southerly winds prevail in winter.

Ecological features:

Elevated portions of land between lakes in the Omolon-Anyui Interfluvial area are covered by sparse larch forest with dwarf birch (*Betula exilis*) and willows (*Salix bebbiana, S.krylovii*) in the understory and low-bush crowberry (*Vaccinium vitis-idaea*) and blueberry (*V.uliginosum*) in the groundcover. Shrub pine does not grow in this terrain. Larch needles come out in the first ten days of June and fall off in early September. The soil is covered with an evenly thick carpet of mosses and lichens.

The nearshore shallows of yedoma lakes are overgrown with horsetail (*Equisetum fluviatile*), sedges (*Carex rhynchophysa, C.rostrata, C.vesicata*), and pendent grass (*Arctophyla fulva*). *Potamogeton perfoliatus, Myriophyllum spicatum*, and water mosses (*Calliergon giganteum, Drepanoclaudus sp.*) grow in water that is light-yellow in colour. Floating rafts of Buckbean (*Menyanthes trifoliata*) occur locally. Zoobenthos is remarkable for the abundance of molluscs. Their most common groups are represented by *Sphaerum westerlindii* and other small bivalves (*Pisidiidae*), as well as various brachiopods (*Lymnaea spp., Anisus spp., Acroloxus sp,* and *Kolymamnicola kolymensis*). Other abundant invertebrate species include amphipods (*Gammarus lacustris*), leeches (*Hirudiena*), and limnophilic insects (*Odonata, Heteroptera, Trichoptera, Coleoptera*, and *Diptera: Chironomidae*). Zooplankton is dominated by cladocerans and copepods (*Poliphemus pediculus, Daphnia spp., Bosmina spp., Heterocope sp., Eurytemora sp., Diaptominae, Cyclopidae*).

Winter blizzards blow off snow from exposed surfaces and deposit silt and sand at floodplain islets. This accounts for early snowmelt, formation of water pools, and the growth of vegetation at such places. Banks of small winding channels and flooded lakes ("ayany") lined with a strip of brushwood and hummocks also thaw early in spring. Such snow-free spots are frequently visited by flocks of geese, ducks, waders, and cranes to rest during migration. In the summertime, channel banks are overgrown with *Equisetum arvense, Allium strictum*, and *Rubus arcticus* and lined with willow (*Salix boganidensis, S.lanata*) and shrubby Manchurian alder (*Duschekia fruticosa*) stands.

The nearshore areas of open water in the Kolyma River and floodplain lakes first appear in the third or fourth weeks of May. In the Omolon River, they are formed even earlier (in late April). Such leads, as well as shallow water, attract a large number of passage migrants, including divers, ducks, waders, and gulls. Often the birds stay in the Kolyma Valley waiting for watershed lakes to open and thus afford access to the breeding sites.

Noteworthy fauna:

Fish

A total of 28 fish species occur in the Lower Kolyma River (Novikov, 1966). They include, among others, Arctic Brook Lamprey (*Lampetra japonica kessleri*), Siberian Sturgeon (*Accipiter baeri*), various ciscos (*Coregonus spp.),* Northern Pike (*Esox lucius*), Common Minnow (*Phoxinus phoxinus*), Burbot (*Lota lota leuptura*), Perch (*Perca fluviatilis*), Long-nosed Sucker (*Catostomus catostomus*), Dace (*Leuciscus leuciscus baicalensis*), and Ruffe (*Acerina cernua*). The main channel of the Kolyma River serves as a migration route for spawning schools of Least Cisco (*Coregonus sardinella*) or "sel'dyatka" in the local language, one of the most important subsistence staples for many generations of Kolyma residents. Other commercially harvested fishes are Wide-nosed Whitefish (*Coregonus nasus*), Siberian Whitefish (*C. lavaretus pidschian*), and Inconnu (*Stenodus leucichthys nelma*). Yedoma lakes are inhabited by Nine-spined Stickleback (*Pungitius pungitius*), Peled (*Coregonus peled*), and Lake Minnow (*Phoxinus percnurus*). Rapid side streams of the Omolon and Bolshoy Anyui Rivers give home to rheophilic species, such as Lenok (*Brachymystax lenok*), Arctic Grayling (*Thymallus arcticus pallasi*), Round Whitefish (*Prosopium cylindraceus*), and Spotted Sculpin (*Cottus poecilopus*).

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) regularly occurs over the entire area.

Birds

The bird fauna of open larch stands comprises relatively few species of the northern taiga zone. Black-billed Capercaillie (*Tetrao parvirostris*), Great Grey Owl (*Strix nebulosa*), Hawk Owl (*Surnia ulula*), Siberian Tit (*Parus cinctus*), and Siberian Jay (*Perisoreus infaustus*) are among the most common resident species. Merlin (Falco columbarius), Cuckoo (*Cuculus canorus*), Naumann's Thrush (*Turdus naumanni*), Yellow-browed Warbler (*Phylloscopus inornatus*), Little Bunting (*Emberiza pusilla*), Arctic Redpoll (*Acanthis hornemanni exelipes*), and Scarlet Rosefinch (*Carpodacus erythrinus*) are most abundant in the breeding season.

Mammals

Common mammals inhabiting sparse larch stands on the right side of the Kolyma River include Laxmann's Shrew (*Sorex caecutiens*), Wood Lemming (*Myopus schisticolor*),

Northern Red-backed Vole (*Clethrionomys rutilus*), Varying Hare (*Lepus timidus*), Northern Pika (*Ochotona hyperborea*), Red Squirrel (*Sciurus vulgaris*), Wolf (*Canis lupus*), Red Fox (*Vulpes vulpes*), and Ermine (*Mustela erminea*). Lake depressions and riverbanks support populations of Narrow-skulled Vole (*Microtus gregalis*), Tundra Vole (*M.oeconomus*), and Muskrat (*Ondatra zibethica*). The latter species is trapped as being of commercial value. Until the appearance of domesticated reindeer herds in the middle of the 19th century, the lower reaches of the Kolyma River served as rangelands for migrating Wild Reindeer (*Rangifer tarandus*) that used to cross the Omolon and Anyui Rivers at approximately the same places during their seasonal movements. At those times, there was massive killing of the animals at one such place (the village of Derevnya in the lower Omolon reaches). Today, the entire area is exploited as winter pastures for domestic reindeer. The Omolon and Anyui Valleys give home to Elk (*Alces alces*), Wolverine (*Gulo gulo*), Eurasian Otter (*Lutra lutra*), Sable (*Martes zibellina*), and Lynx (*Lynx lynx*).

Social and cultural values:

The settlement of Nizhnekolymsk and the surrounding area played an important role in the development and spread of traditional modes of nature use and an original culture of so-called "old Russian residents" ("kolymshchiki"). Nizhnekolymsk was one of the chief centres of early Russian colonization in Siberia (17th and 18th centuries) and the northeastern stronghold of colonial penetration into remote regions of the Asian continent. It witnessed all the more or less important episodes of Russia's eastward expansion. Until the 1870s, the valleys of the Kolyma and both Anyui Rivers served as trade routes between Siberia and Anadyr and were equally important to carrying on the administration of newly acquired territories.

Today, the Kolyma River is a major traffic artery for the entire district of Lower Kolyma. The river section between Zyryanka and Chersky is navigable for almost four months. In the winter, the icebound river and its tributaries are used as roadways to supply the local population with fuel and general cargo. Numerous fisheries and ice cellars to store the catch are situated along the banks of the Kolyma. The outcrop of Duvanny Yar is of primary importance for Quaternary geology as it contains the skeletal remains of fossilized animals dating to the Middle Pleistocene period. Also, it serves as a source of materials for museum collections and handicrafts (especially bone carving). The western part of the site lies within the bounds of the Omolon section of the Chaigurgino Wildlife Refuge.

Current land use:

The area has been long used for fishing and hunting. At present, harvesting of fish and game is handled as a cooperative venture by several groups based at different sites along watercourses (Mys Timkina, Lakeevskaya, Duvanny, Derevnya, etc.).

Factors adversely affecting the site's ecological character:

Throughout the 1980s, exploratory drilling for gas and oil was conducted on the site. From time to time forest fires occur, and the majority of burned areas remain unforested.

Conservation measures taken:

The western part of the area lies within the bounds of the Omolon section of the Chaigurgino Wildlife Refuge .

Jurisdiction:

Administration of Nizhnekolymsky Ulus (district) of the Republic of Sakha (Yakutia).

2.3. Middle Omolon River

Geographical coordinates: 66°03'40"N, 159°07'46"E (mouth of Proshchalny Creek).

Elevation: 150-180 m a.s.l.

Area: *c.* 350 km^2.

Overview:

Braided riverbed and floodplain of the largest mountain river in northeastern Asia; lacustrine-palustrine complexes on floodplain terraces; typical flora and fauna of inland parts of the region; staging areas of migrating Arctic birds.

Wetland type:

By international classification – M, O, Tp; by national classification – 2.5.2 (valley in the middle course of a large mountain river).

Ramsar Criteria: 1.

Justification for the application of selected criteria:

Typical portion of a vast river floodplain bordered by terraces with lakes and wetlands and the surrounding mountain taiga landscape of northeastern Asia.

General location:

The site lies at the boundary between the Srednekansky District of the Magadan Region and the Bilibinsky District of the Chukot Autonomous Area, in the middle course of the Omolon River between the mouths of its left-bank tributaries, the Namyndykan and Maustakh. The nearest settlement is Omolon (100 km). Administrative district centres are situated 450 km (Seimchan), 400 km (Bilibino, Omsukchan), and 335 km (Chersky) from the site.

Physical features:

The Omolon Basin encompasses the central part of the highland region of northeastern Asia. It lies in the zone of folded Mesozoic bedrock resting on the residual Omolon massif of the Siberian Platform (Egorova, 1983). The complex relief of the area results from a variety of geological processes by which abundant and varied sediments were deposited and volcanogenic landforms created.

The Omolon River has worked out a well-developed floodplain and a wide valley in its middle course. Its left (western) side is formed by the gently rolling surface of the Yukagir Plateau while the right side of the valley is flanked by the offshoots of the Ush-Urekchen Range. The Middle Omolon Valley is about 5 km wide, with the highest elevations of the surrounding mountains at 700-900 m a.s.l. and 400-600 m above valley level.

The river flows in a winding and meandering course, giving rise to a complex system of side-channels, backwaters, lake-like pools, and rapids. As a rule, the left-bank branches of the Omolon are connected to the main riverbed by smaller channels. The riverbed is about 500 m wide with a mean flow rate of 7-9 m/s. A major fraction of the total runoff is filtered through a thick layer of alluvial sediments that contributes to the thawing of underlying permafrost, thus having little effect on soil processes and plant life in the active soil layer.

A few types of alluvial terraces are distinguishable in the floodplain. Three geomorphological levels are usually represented: low floodplain yearly inundated by spring floods, mid-floodplain inundated every 3-5 years, and high floodplain inundated every 7-10 years. Above these levels lies a non-inundated terrace occupied by a wet plain with hummocky spots, stunted birch moors, isolated larch groves, oxbows overgrown with newly developing vegetation, and thermokarst oxbow lakes.

Watery areas of the Omolon Valley are underlain with cryogenic taiga soil and peat-gley boggy soils. Sandy and sandy-loam turf soils as thick as 50-90 cm develop in permafrost-free portions of the floodplain.

The 1,150 km long Omolon is the largest tributary of the Kolyma River. Its valley extends in a submeridional direction and forms the shortest link between the northern part of the Okhotsk Sea coast and the Kolyma Lowland (850 km along the 158° meridian). The headwaters of the Omolon River rise at the alluvial-glacial slopes of the Verkhnesugoiskaya Depression. Its largest tributaries are the Avlandya, Kedon, and Oloy Rivers.

The area has a most pronounced continental subarctic climate. The site lies at the northeastern periphery of the zone dominated by the Siberian anticyclone, with extremely cold winters and very hot summers. The mean annual temperature is –12.8 °C. January temperatures average –39.2°C with an absolute minimum of –61°C, while July temperatures are +13.1°C (absolute maximum +34°C). Winter temperature inversions are frequent in mountain valleys (a roughly +2°C increase per 100 m). In addition, there are very cold downslope winds ("khiusy"). The average annual precipitation is generally 240 mm, with two-thirds of this amount falling as rain and drizzle. The snow cover is loose and even; it is established in mid October and can be 120 cm deep by the end of winter. Snow melting occurs in mid May. The growing period for vegetation is about 100 days.

River stretches with slow-moving water are covered with ice in the third or fourth weeks of October. In winter, both the main riverbed of the Omolon and its side streams have many leads or thin ice cover where underbed water rises to the surface. The ice breaks up and spring flooding occurs between 20 and 25 May. High water level persists until late May or early June. Summer flooding falls as a rule in the second half of August.

In the winter and after a stable water level is established in late July, water in the Omolon River is absolutely transparent. It is whitish in colour during spring and brownish in autumn floods. The flow rate in the river deeps is 5-7 m/s. Lakes of the floodplain terrace contain yellowish or dark water. Many water bodies in the floodplain are connected to the river by underbed runoff channels; as a rule, they carry cold and clear water the level of which is highly variable. Floods destroy many river spits and isles but concomitantly give rise to as many new ones. The fairway frequently changes direction while strong river flows undercut banks and cause large landmasses to collapse together with patches of floodplain forest, jamming the course of side channels or running aground at river spits. Heaps of dead logs and other debris that accumulate at the bends of rivers (so-called "zalomy") may be very dangerous for boat travellers.

Ecological features:

The low-level floodplains are gently sloping barren sand and pebble areas with heaps of driftwood and random patches of pioneer vegetation. Gravelly spots strongly heated by the sun give rise to single shrubs of Korean willow (*Chosenia arbutifolia*), while interspersing wet strips of sand support dense brushes of *Salix schwerinii* and *S.boganidensis* and small scattered areas of grassland or herbaceous vegetation. The most common grasses and forbs in the groundcover of such areas are *Calamagrostis langsdorffii, Bromopsis pumpelliana, Poa arctica, Dianthus repens, Chamaenerion latifolium,* and *Castilleja rubra*. The flowering plants in the early summer are represented by *Corydalis sibirica* and *Papaver microcarpum*. Silty substrates provide favourable conditions for the development of horsetail-grass associations dominated by *Equisetum arvense, Arctophila fulva, Alopecurus alpinus, Carex rostrata, Allium schoenoprasum,* and *Ranunculus gmelinii*. In winter, the willow growth attracts Moose (*Alces alces*), Varying Hare (*Lepus timidus*), and Willow Grouse (*Lagopus lagopus*).

The mid-floodplain level is continuously enlarged by virtue of the ongoing deposit of particulate matter suspended in river water by plant stems and the accumulation of organic material. These processes constitute the initial stage of alluvial soil formation. Groves of 10-15 m high willow and chosenia look like forest stands. The understory includes poplar (*Populus suaveolens*), shrubby alder (*Duschekia fruticosa*), sometimes larch and mesophilic willows (*Salix saxatilis, S.bebbiana*), while the rich groundcover consists of *Calamagrostis langsdorffii, Galium boreale, Cacalia hastata, Pentaphylloides fruticosa, Artemisia tilesii, Hedysarum hedisaroides, Pulsatilla davurica, Aster sibiricus*, and *Sanguisorba officinalis*. In waterlogged hollows, these species are supplemented by *Comarum palustre* and *Carex lugens*. The undergrowth consists of black and red currant (*Ribes dikuscha, R.triste, Rubus sachalinensis*), and prickly rose (*Rosa acicularis*). These berry-rich stands attract broods of Hazel Grouse (*Tetrastes bonasia*). Floodplain islands 2-5 km in length support 200-500 m strips of forest-like vegetation. Its mosaic distribution is manifest as a suite of isolated wooded tracts that are arch-, band- or paddle-shaped in outline. Floodplain areas are difficult to walk on since they are intersected by numerous channels and hollows and abound in small water bodies and parapets of accumulated driftwood. Insular systems are characterized by highly dynamic developmental patterns, and many of them are predestined to be sooner or later destroyed by the action of floods that "trigger" new cycles of plant succession. Collectively, continuous "rejuvenation" of the vegetation cover on floodplain islands and the absence of permafrost effects on their soil processes make these areas a most productive and least monotonous portion of the mountain taiga landscape.

Transition from the middle to high floodplain level with its abundant willow growth creates the most favourable hydrothermal and biocenotic conditions. The high-level area is not affected by forest fires, and its floral and faunal diversity is higher than elsewhere. Chosenia and willow growth is depressed on the high floodplain. Instead, birch (*Betula platyphylla*), poplar (*Populus suaveolens*), and larch (*Larix cajanderii*) stands predominate. The lower tier is composed of shrub pine (*Pinus pumila*), while wet glades are occupied by arborescent willows (*Salix pseudopentandra, S.rorida*) and shrubby spirea (*Spiraea salicifolia*). The groundcover is dominated by lichens, mosses, crowberry (*Empetrum nigrum*), low-bush cowberry (*Vaccinium vitis-idaea*), wintergreen (*Pyrola incarnata*), and dwarf birch (*Betula divaricata*). However, the thaw of permafrost here is not as deep as in the mid-floodplain. As a result, the productivity of forest communities that occupy high floodplain terraces is significantly lower. At a distance from the floodplain, thick larch woods undergo fragmentation and turn into stretches of sparse forest at elevations with blueberry and dwarf birch in the underwood. The high plainland has many oxbows, thermokarst lakes, patches of sedge tussocks, cottongrass swamps, spirea and willow growth (*Salix myrtilloides, S.krylovii, S.pulchra*). Large areas of floodplain terraces are affected and transformed by fires. Lakes are overgrown with horsetail (*Equisetum fluviatile*), bur reed (*Sparganium hyperboreum*), sedges (*Carex podocarpa, C.rostrata, C.concolor*), pendent grass (*Arctophila fulva*), and other hydrophilic plants (*Cicuta virosa, Menyanthes trifoliata, Utricularia vulgaris, Potamogeton perfoliatus, P.compresus,* and *P.sibiricus*). Such lakes serve as a key breeding habitat for water birds while their rich vegetation attracts Moose in the summer. For example, as many as 12-15 (up to 28) Moose happen to gather at a relatively small lake nearby the mouth of Proshchalny Creek in July and August (Chernyavsky and Domnich 1989)

Noteworthy flora:

The list of vascular plants found at the site includes 550 species (Khoryakov 1978). Shrub pine (*Pinus pumila*) is a habitat-forming species in the subalpine belt and in larch forests on mountain slopes. Floodplains with numerous islands are occupied by dense chosenia and poplar groves, relicts of the Tertiary Arctic flora, that thrive due to the thawing of permafrost beneath the riverbed. Under the canopy of these forests many other relict plants have been

preserved, such as *Impatiens noli-tangere, Anthriscus sylvestris var.nemorosa*, *Trientalis europaea*, and *Tanacetum vulgare*. At some sites, the forests have a well developed understory of berry-bearing shrubs (*Ribes dikuscha* and *Rosa acicularis*).

Stone cliffs and the slopes of riverbanks are occupied by steppe communities with xerophilous grasses (*Festuca kolymensis, Elytrigia jacutorum,* endemic *Helictotrichon krylovii*) and sedges (*Carex pediformis*). Colourful herbaceous vegetation is formed by *Phlox sibirica, Veronica incana, Alyssum obovatum, Campanula langsdorffiana, Dracocephalum palmatum, Potentilla arenosa*, and *P. nivea*. Shingle-strewn summits are occupied by picturesque Dicentra-covered glades (*Dicentraperegrina*) while Dryas (*Dryas punctata*) and Lapland Cassiope (*Cassiope tetragona*) are characteristic species of the Alpine tundra vegetation.

Moist places are occupied by *Naumburgia thyrsiflora, Myriophyllum verticillatum*, and *Pedicularis kolymensis*. Found in the moss-dominated groundcover of larch stands are rare *Trollius chartosepalus* and *Rhododendron aureum* that appears to occur here at the northern limit of its range.

Noteworthy fauna:

Fish

Common fish species of the Omolon River and its side channels include Lenok (*Brachymystax lenok*), Arctic Grayling (*Thymallus arcticus palasi*), Round Whitefish (*Prosopium cylindraceus*), Long-nosed Sucker (*Catostomus catostomus*), and Spotted Sculpin (*Cottus poecilopus*). Wide-nosed Whitefish (*Coregonus nasus*) and Inconnu (*Stenodus leucichthys nelma*) occur in the autumn. Lakes on the high floodplain terrace are inhabited by Goldfish (*Carassius auratus gibilio*) and Lake Minnow (*Phoxinus percnurus*).

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) is a common species in high floodplain habitats (Dokuchayev *et al*., 1984).

Birds

The local avifauna comprises 100 breeding species (Krechmar *et al*., 1978). Resident in the Omolon Valley are the species that form the "core" of the East Siberian boreal fauna: Black-billed Capercaillie (*Tetrao parvirostris*) (especially numerous along the Pyat'kovende or Pyatkovskaya River); Hazel Grouse (*Tetrastes bonasia*), Great Grey Owl (*Strix nebulosa*), Hawk Owl (*Surnia ulula*), Black Woodpecker (*Dryocopus martius*), Three-toed Woodpecker (*Picoides tridactylus*), Siberian Tit (*Parus cinctus*), Willow Tit (*P. montanus*), Siberian Jay (*Perisoreus infaustus*) and Nutcracker (*Nucifraga caryocatactes*). During the breeding season forest lakes are inhabited by Smew (*Mergus albellus*), while Goldeneye (*Bucephala clangula*), Osprey (*Pandion haliaetus*), Goshawk (*Accipiter gentilis*), and White-tailed eagle (*Haliaeetus albicilla*) keep closer to the river. Floodplain forests give home to Oriental Cuckoo (*Cuculus saturatus*), Arctic Warbler (*Phylloscopus borealis*), Red-flanked Bluetail (*Tarsiger cyanurus*), Rustic Bunting (*Emberiza rustica*), and Scarlet Rosefinch (*Carpodacus erythrinus*).

The sides of mountain streams serve as breeding sites for Grey-tailed Tattler (*Heteroscelus brevipes*), Harlequin Duck (*Histrionicus histrionicus*), and Siberian Rubythroat (*Luscinia calliope*). Mountain slopes and saddles provide breeding habitats for Great Knot (*Calidris tenuirostris*), Wimbrel (*Numenius phaeopus*), and Long-tailed Skua (*Stercorarius longicaudus*).

Frequently seen on the riverbed are Red-breasted Merganser (*Mergus serrator*), Common Tern (*Sterna hirundo*), Ringed Plover (*Charadrius hiaticula*), and Terek Sandpiper (*Xenus cinereus*). Lesser White-fronted Goose (*Anser erythropus*) nests on sandy islands. Black-throated Diver (*Gavia arctica*) and Red-throated Diver (*G.stellata*) are common inhabitants of lakes and bogs on the left bank. Other water birds recorded at the site include Red-necked Grebe (*Podiceps griseigena*), Whooper Swan (*Cygnus cygnus*), Bean Goose (*Anser fabalis middendorffii*), Pintail (*Anas acuta*), Common Teal (*A.crecca*), Baikal Teal (*A.formosa*), Wigeon (*A.penelope*), Greater Scaup (*Aythya marila*), and Tufted Duck (*A.fuligula*). Merlin (*Falco columbarius*), Wood Sandpiper (*Tringa glareola*), Greenshank (*T.nebularia*), Common Snipe (*Gallinago gallinago*), and Mew Gull (*Larus canus*) occur in forest-tundra habitats. The most common passerine birds include Yellow Wagtail (*Motacilla flava*), Pechora Pipit (*Anthus gustavi*), Stonechat (*Saxicola torquata*), and Pallas's Reed Bunting (*Emberiza pallasi*). Willow Grouse (*Lagopus lagopus*) and Short-eared Owl (*Asio flammeus*) are found on terrace wetlands. In the winter, floodplains and their islands are visited by Gyrfalcon (*Falco rusticolus*) and Rock Ptarmigan (*Lagopus mutus*).

Bean Goose (*Anser fabalis serrirostris*), White-fronted Goose (*A. albifrons*), Ross' Gull (*Rhodostethia rosea*), Ruff (*Philomachus pugnax*), and Red-necked Phalarope (*Phalaropus lobatus*) are usual spring migrants through the Omolon Valley.

Mammals

The local theriofauna is composed of 25 species. Forested floodplains give home to five Shrew species, viz.

Laxmann's Shrew (*Sorex caecutians*), East Siberian Shrew (*S. isodon*), Flat-skulled Shrew (*S. roboratus*), Tundra Shrew (*S. tundrensis*), and Least Shrew (*S. minutissimus*) (Dokuchaev *et al*., 1990). Newly formed floodplain habitats are populated by Varying Hare (*Lepus timidus*) and Northern Pika (*Ochotona hyperborea*). Tree stands in older floodplains provide home to Flying Squirrel (*Pteromys volans*), Chipmunk (*Tamias sibiricus*), Large-toothed Red-backed Vole (*Clethrionomys rufocanus*), Northern Red-backed Vole (*C. rutilis*), Wood Lemming (*Myopus schisticolor*), and Tundra Vole (*Microtus oeconomus*). Carnivores include Weasel (*Mustela nivalis*), Ermine (*M.erminea*), Sable (*Martes zibellina*), Eurasian Otter (*Lutra lutra*), Wolverine (*Gulo gulo*), Red Fox (*Vulpes vulpes*), Wolf (*Canis lupus*), and Brown Bear (*Ursus arctos*). Elk (*Alces alces*) finds optimal conditions in the Omolon Valley, and its population density in these quarters is exceptionally high (Chernyavsky & Domnich, 1989). Wild Reindeer (*Rangifer tarandus*) occurs in the mountains bordering the valley. American Mink (*Mustela vision*) was introduced into several places of the Omolon Valley in the 1960s and became wild in the area.

Social and cultural values:

Traditionally, the area was a part of the territory dominated by the Yukagir culture, although it had never been as important for the aboriginal population as the Lower Omolon River with its rich spawning grounds of Wide-nosed Whitefish and reindeer river passages. At a later time, the area was exploited by the Kedon and Beryozovka Evens who still have pastures in the upper reaches of the Monakova and Namyndykan Rivers. In 1970-1980, the Omolon Valley was broken into plots allotted to professional hunters, employees of the Omolonsky Sovkhoz. Large-scale fur-trapping of carnivores (Sable, Wolverine, and Otter) provided income for some of the local population, and subsistence poaching of Moose was widespread. Every year in mid June, river transport workers conducted the so-called "Omolon operation", moving loaded barges from the village of Zyryanka to Omolon and back (sometimes with an intermediate stop for winter). Since the 1970s, the area was subjected to extensive poaching by residents and employees of the Mandrikovo Mine (180 km below the site) who sent up large groups of motorboats to shoot Moose. It resulted in a catastrophic decline of the Moose population. To put an end to this illegal activity, the Hunting and Game Management Department of the Magadan Region designated the Omolonsky Nature Refuge in 1980. It still exists (partly operated by the administration of the Chukot Autonomous Area).

Land tenure/ownership:

State-owned (Goslesfond) and allotted for traditional land use.

Current land use:

A joint Russian-American venture, the Kubaka mine for the production of gold ore from vein deposits, is situated in the upper Omolon reaches (the Avlandya River). There is another gold mine, Mandrikovo, downstream of the Omolon which now is curtailing production. Reindeer pastures of the former Omolonsky Sovkhoz are now owned by private farms. Rassokha Evens continue to graze their reindeer and conduct subsistence hunting on the Yukagir Plateau and in the valleys of left tributaries to the Omolon River (Kedon, Namyndykan, and Monakova).

Factors adversely affecting the site's ecological character:

Illegal Moose shooting was practiced on a large scale throughout the 1970s and 1980s. The poachers benefited from the low cost of petrol and technical means, such as Vikhr outboard motors, Krym duralumin boats, and Buran snowmobiles. Harvesting and recreation activities of the local population were a frequent cause of forest fires (the most devastating ones occurred in 1973). Since the early 1990s, commercial harvesting teams have used heavy Ural trucks for their movement in the wintertime. Under current economic conditions, human impact on the natural area becomes less severe, and there is every reason to believe that the depleted Moose stock in the environs of the Omolonsky field research station is gradually restored.

Conservation measures taken:

The site is protected as a part of the Omolonsky Nature Refuge set up in 1980.

Conservation measures proposed but not yet implemented:

The Chukot Committee for Nature Protection proposed organizing a nature park on the right side of the Omolon River between the Oloy and the Karbaschan.

Current scientific research and facilities:

In 1971-1984, zoological and ornithological surveys based at the Institute of Biological Problems of the North's Omolonsky field research station were carried out in the area (Krechmar *et al*., 1978; Chernyavsky & Domnich, 1989). The site lies rather far from large populated centres and permanent transport routes. It can be accessed either by boat from the village of Omolon or by air from Omsukchan and Seimchan. The administration of the

Chukot Autonomous Area zealously controls access of research groups to the site. To avoid misunderstanding, they are advised to keep to the left side of the Omolon River that belongs to the Magadan Region.

Jurisdiction:
Administrations of the Bilibinsky District of the Chukot Autonomous Area and the Srednekansky District of the Magadan Region.

2.4. Balygychanskaya Basin

Geographical coordinates: 63є47'13"N, 153є36'44"E (Namankanskiye Lakes)

Elevation: 140-160 m a.s.l.

Area: *c.* 500 km^2.

Overview:
A stretch of the Middle Kolyma River in the northern taiga zone with floodplains abounding in islands, terraces and foothill plains; a large variety of floodplain, oxbow, oxbow-thermokarst, and thermokarst water bodies.

Wetland type:
By international classification – M, O, Tp; by national classification – 2.5.1.1, 3.7.1.1, 3.8.1.3 (part of the Kolyma riverbed having a well-developed floodplain with numerous islands and the surrounding lacustrine-palustrine plains).

Ramsar Criteria: 1

Justification for the application of selected criteria:
A stretch of the Middle Kolyma River representing the entire spectrum of wetlands found in the region. It includes the riverbed under which the permafrost layer thaws, floodplain abounding in islands and braided channels, riverside terraces with a variety of oxbow and thermokarst water bodies, tussocky swamps, and spirea-carpeted areas. Breeding grounds of bird species representing the avifauna of northern taiga wetlands; congregations of water birds during seasonal migrations.

General location:
The site lies within the bounds of the Srednekansky Administrative District of the Magadan Region, and occupies a part of the Kolyma Valley between the mouth of the small Maly Suksukan River and the Balygychan River, a large right-hand tributary to the Kolyma. It is located 125 km (by river) from Seimchan, administrative centre of the district.

Physical and ecological features of the site:
The site occupies a large intermontane depression formed by Jurassic schist folds and covered with lacustrine and riverine deposits of Middle Quaternary time. The depression has an area of roughly 450 km^2. It is flanked by the northern spurs of the Suksukansky Range on the south and southern slopes of the Polyarny Range on the north. The surrounding uplands present with smooth contours and have isolated summits from 350 to 930 m a.s.l. (e.g. Tolkun-Khaya Mountain). The site is divided into two parts by the extensive Kolyma floodplain and intersected by several of its small tributaries. Part of the floodplain and the left-side terrace of the Kolyma River are controlled by the Seimchan Division of the Magadan Nature Reserve.

The area has a most pronounced continental subarctic climate. The winter lasts from mid October through early May. Lakes freeze in the beginning of October, and the Kolyma River is icebound as early as mid October. The mean annual air temperature according to records of the Balygychan weather station is -12.2 єC. The mean January temperature is -39.5єC, with an absolute minimum of -64єC. Permafrost occurs on the entire area excepting the floodplain. The snow cover is 55-65 cm deep. Ice breaks up on the Kolyma River between 16 and 29 May. Spring flooding ends in mid June. Floods in late summer are caused by rains. Summer weather is mainly dry and hot. The frostless period is about 10 weeks long. The mean air temperature in July is +15.6єC, with an absolute maximum of +35єC. The river water temperature in July and August may be +18-20єC, lake water is warmed up to +20-22єC. The mean annual precipitation is 286 mm, with about half of this amount falling as snow. After the Kolyma River had been dammed for hydroelectric power around 410 km upstream, the climate of the site became somewhat milder. Rangers of the Magadan Nature Reserve have noticed that since the late 1980s periodic winter dumpings result in cracks and holes in the river ice. Equally frequent are fog, hoar-frost, and water spreading and freezing over the ice surface. At the same time, the amplitude of summer floods decreased.

The floodplain within the boundaries of the site is up to 6 km wide. It exhibits a few levels, the lowest of which is formed by silt and sand or sand and shingle spits supporting low brushwood of willow (*Salix schwerinii, S.udensis, S.pseudopentandra*), Korean willow (*Chosenia arbutifolia*), and poplar (*Populus suaveolens*). Wet portions of the lower floodplain are grass-forb meadows with the predominance of *Calamagrostis langsdorffii,*

Alopecurus alpinus, Deschampsia sukatschewii, Poa palustris, P.pratensis, and *Iris setosa*. Large amounts of driftwood are accumulated at the bends of rivers and the tips of spits.

Islands of the middle floodplain level are vegetated with groves of wooded willows and chosenia aged 30-60 years with admixtures of poplar and larch in the underwood. The understory is composed of black currant (*Ribes dikuscha*) and thick herbaceous vegetation dominated by *Calamagrostis spp., Veratrum oxysepalum*, and *Cacalia hastate.*

Islands of the high floodplain level have a thick layer of the alluvial and soddy soils on which thriving forest vegetation develops. Trees are 20-22 m high. The age of chosenia is almost 120 years, and poplar and larch are 50-70 year old. The understory is constituted by deciduous trees (*Salix rorida, Betula platyphylla, Sorbus sibirics,* and *Padus asiatica*) and bushes (*Rosa acicularis, Ribes triste, R.dikuscha,* and *Swida alba*). Chosenia gradually disappears at patches of older floodplain, giving place to larch and poplar. Low-lying areas and banks of old channels are overgrown with tussock-forming sedges. At any stage of this vegetative succession, the entire island or its part can be washed away, redeposited, or substituted by newly-formed islets and spits. This process accounts for the fragmentation and patchy pattern of the floodplain landscape.

Terraces above the floodplain and its peripheral portions where riverbed-forming processes lose their strength and extent have a much less diversified aspect. Their soils are largely of the peaty-gley type. Marginal portions of the floodplain are dominated by mature and old larch forests. Cryogenic phenomena become progressively more pronounced with increasing distance from the permafrost thawing zone under the riverbed.

Larch forests and willow groves (*Salix saxatilis*) become thinner where they cover ridges at the margins of floodplains. Such areas abound with densely vegetated river channels, oxbow lakes, spirea growth, and non-forested watery hummock mires. Their vegetation cover mainly consists of sedges (*Carex lugens, C.appendiculata, C.eleusinoides, C.limosa*), spirea (*Spiraea beauverdiana*), and cloudberry (*Rubus chamaemorus*). Gently sloping elevations exhibit traces of past and recent forest fires.

Oxbow lakes are hundreds of meters long, 25-30 m wide, and around 2-3 m deep. The majority of them have dark peaty water. Oxbows have steep, moist shores separated from open water by a narrow fringe of *Carex limosa, C.rhynchophysa, Comarum palustre*, and *Utricularia vulgaris*. Submerged vegetation includes *Sparganium hyperboreum, S.angustifolium, Potamogeton pusillus, P.perfoliatum,* and *Callitriche palustris*. The bottom is covered by a thick layer of organic matter. Plankton is dominated by small copepods (*Cyclopidae, Diaptomidae*) and Cladocerans (*Holopedium sp.*). Lake floor and macrophytes are inhabited by prosobranchial gastropods (*Cincinna sp., Bitiniidae*), small bivalves (*Pisidiidae*), and larvae of limnophilic insects (*Trichoptera, Odonata, Hemiptera, Diptera*, etc.).

The forest belt with lakes on the upper river terrace is about 3-5 km in width, but its older portions are gradually replaced by treeless relief forms, such as high hummock topography, peat ridges, low birch growth, moss potholes, and willow thickets (*Salix hastata*, *S.krylovii, S.myrtilloides*) around thermokarst lakes. At the periphery of the valley, they adjoin rolling foothills that are, however, difficult to access because on the way there one must cross many deep, slow-flowing creeks up to 10 m in width.

A few large bodies of water are concentrated on the eastern (Namankanskiye Lakes) and western (Bylyktakhskiye Lakes) parts of the site. All these lakes are lined with a narrow fringe of *Equisetum fluviatile, Naumburgia thyrsiflora, Menyanthes trifoliata,* and *Hippuris vulgaris*. Deeper places are overgrown with *Nuphar pumila* and *Nymphaea tetragona*. Characteristic inhabitants of these water bodies are freshwater polychaetes (*Manayunkia sp.*) and various fouling organisms. The latter include freshwater sponges (*Spongilla sp.*), hydras (*Hydra sp.*), and moss animals (*Bryozoa*). Also very common are pond snails (*Lymnaea spp.*), prosobranchial molluscs (*Cincinna spp.*), annelids (*Oligochaeta, Hirudinea*), and larvae of aquatic insects: dragonflies (*Odonata*), water boatmen (*Corixidae*), lacewings (*Megaloptera*), and beetles (*Dytiscidae*).

Mountain slopes are covered with sparse larch forests with admixtures of shrub pine, shrubby alder, and dwarf birch (*Betula divaricata*). The groundcover is composed of usual northern taiga forms, such as Labrador tea (*Ledum decumbens*) and blueberry (*Vaccinium uliginosum*). Wild prickly rose (*Rosa acicularis*) and spirea (*Spiraea salicifolia*) occur on river terraces while juniper (*Juniperus sibirica*), aspen (*Populus tremula*), and sweet-scented currant (*Ribes fragrans*) occupy dry hillsides.

Noteworthy flora:

The list of vascular plants found in the Seimchan division of the Magadan Nature Reserve includes 307 species belonging to 51 families (Berkutenko *et al*., 1990). The ten leading families are *Graminaceae* (34 species), *Cyperaceae* (33 species), *Ranunculaceae, Rosaceae*, *Compositae* (19 species each), *Cruciferae* (18 species), *Salicaceae*, *Caryophyllaceae* (17 species each), *Saxifragaceae* (12

species), and *Ericaceae* (11 species). Duckweed (*Lemna major*) is a rare species normally found at the limit of its natural habitat 600 km southeast of the site (headwaters of the Kava River). Other rare plant species are *Cypripedium guttatum* and *Scutellaria regeliana*.

Noteworthy fauna:

Fish

Common inhabitants of the Kolyma River and its channels include Northern Pike (*Esox lucius*), Long-nosed Sucker (*Catostomus catostomus*), Common Minnow (*Phoxinus phoxinus*), Bearded Stone Loach (*Nemacheilus barbatulus*), and Burbot (*Lota lota natio leuptura*). Less common are Inconnu (*Stenodus leicichthys nelma*) and Ruffe (*Acerina cernua*). Lenok (*Brachymystax lenok*) and Arctic Grayling (*Thymallus arcticus palasii*) occur in rapid stretches of the river and its tributaries. Large thermokarst lakes are inhabited by Goldfish (*Carassius auratus gibilio*) and oxbow lakes by Perch (*Pecra fluviatilis*) and Lake Minnow (*Phoxinus percnurus*) (Skopets, 1985).

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) occurs in swamp larch forests and Siberian Wood Frog (*Rana amurensis*) on hummocky surfaces surrounding oxbow lakes.

Birds

The site is remarkable for a high population density of birds of prey during the breeding season, especially that of Sparrowhawk (*Accipiter nisus*) and Hen Harrier (*Curcus cyaneus*). River floodplains and oxbow lakes provide breeding sites for Black-throated Diver (Gavia arctica), Red-throated Diver (*G.stellata*), Red-necked Grebe (*Podiceps griseigena*), Whooper Swan (*Cygnus cygnus*), Common Teal (*Anas crecca*), Pintail (*A.acuta*), Wigeon (*A.penelope*), Greater Scaup (*Aythya marila*), Tufted Duck (*A.fuligula*), White-winged Scoter (*Melanitta deglandi*), and Goldeneye (*Bucephala clangula*). Bean Geese (*Anser fabalis middendorffii*) tend to concentrate in the lower reaches of the Balygychan River. The Namankanskiye Lakes support the breeding population of Long-tailed Duck (*Clangula hyemalis*) that occurs here far beyond the southern boundary of its primary range. Black-headed Gulls (*Larus ridibundus*) also breed in large numbers on the lakes, while Common Terns (*Sterna hirundo*) are less abundant.

Common Sandpiper (*Actitis hypoleucos*) and Greenshank (*Tringa nebularia*) keep to the riverbed. Hen Harrier, Willow Grouse (*Lagopus lagopus*), Hawk Owl (*Surnia ulula*), Common Snipe (*Gallinago gallinago*), Brown Shrike (*Lanius cristatus*), Stonechat (*Saxicola torquata*), Yellow Wagtail (*Motacilla flava*), Waxwing (*Bombycilla garrulus*), and Little Bunting (*Emberiza pusilla*) are common birds of riverside terraces. Floodplain forests are inhabited by Sparrowhawk, Hobby (*Falco subbuteo*), Hazel Grouse (*Tetrastes bonasia*), Red-flanked Bluetail (*Tarsiger cyanurus*), and Willow Tit (*Parus montanus*). Osprey (*Pandion haliaetus*) is an uncommon breeder. Black-billed Capercaillie (*Tetrao parvirostris*) occurs in mountain taiga.

Mammals

Northern Pika (*Ochotona hyperborea*) is the most common mammalian species in the Kolyma Valley. Its density is especially high on river terraces and burned hillside areas. Arctic Ground Squirrel (*Citellus parryi*) occurs on mountain slopes and Chipmunk (*Tamias sibiricus*) in floodplain and mountain taiga. A relatively high population density of Elk (*Alces alces*) is maintained at protected territories. Also common are Sable (*Martes zibellina*), Otter (*Lutra lutra*), and Brown Bear (*Ursus arctos*).

Social and cultural values:

The Kolyma River is navigable from June until September and provides a link approximately 500 km in length between the settlements of Seimchan and Zyryanka. Floodplain islands below Seimchan are covered all over with the dense growth of black currant (*Ribes dikuscha*). This plant is locally known under the vernacular name of "Kolyma grapes", and residents gather its fruits in large amount for subsistence throughout the first half of August. Small-scale net-fishing is carried out on the Kolyma, and the basins of its tributaries serve as winter hunting grounds for local sable trappers. Floodplains are used for the harvesting of hay, and the Lower Balygychan River used to be a traditional habitation area of Yakut cattle breeders. Wildfowl shooting on water bodies of the Suksukan-Balygchanskaya Basin is very popular among local villagers.

Land tenure/ownership:

The area on the left side of the Kolyma River belongs to the Magadan State Nature Reserve while that on the right side is owned by the state (Goslesfond).

Current land use:

The right side of the Kolyma River and the valleys of its tributaries are used by local trappers based at Seimchan and Balygychan.

Conservation measures taken:

A large part of the site is protected as the Magadan State Nature Reserve.

Jurisdiction:
Administration of the Srednekansky District of the Magadan Region.

Management authority:
Administration of the Magadan State Nature Reserve (left side of the Kolyma River).

2.5. Jack London Lake

Geographical coordinates: 62є05'19"N, 149є29'34"E.

Elevation: From 780 m a.s.l. (Lake Tantsuyushchikh Khariusov) to 805 m a.s.l. (Jack London Lake).

Area: *c.* 35 km^2,including the water surface of Jack London Lake (14.4 km^2).

Overview:
Aesthetically valuable mountain landscape featuring a group of oligotrophic lakes of glacial origin in the basin of the Upper Kolyma River; habitats of a few rare plant and animal species.

Wetland type:
By international classification – O; by national classification – 3.8.1.4 (Alpine oligotrophic lakes).

General location:
The lake lies amongst the northeastern slopes of the Bolshoy Annachag Ridge (Yagodninsky District of the Magadan Region). The distance in a straight line from the nearest settlement (the village of Yagodnoye) is 49 km (56 km by road).

Physical and ecological features of the site:
Jack London Lake and a few associated water bodies of a smaller size occupy an intermontane basin between the northeastern slopes of the Bolshoy Annachag Ridge (a chain of the Chersky Range system). Its highest point is Aborigen Peak (2,286 m a.s.l.). The area is supposed to have experienced at least three episodes of mountain glaciation during the Quaternary Period which accounts for a large diversity of water bodies on this area.

Mountain slopes to an altitude of 900-1,100 m a.s.l. as well as morainic hills are covered with sparse larch forests, with open spaces occupied by spots of shrub pine or lichens. Northern slopes are subject to solifluction but support moss stunted larch stands interrupted by glades of low-growing birch and patches of sedge-moss tapestry. Mountain tundras and gravelly deserts lie above the tree line and the shrub pine belt. In many intermontane depressions, snow accumulates as deep drifts in sheltered spots and remains there until the next year.

The central element of the local hydrographic system is Jack London Lake (a large water body 8.7 km in length and 1.6-3.5 km in width). It was given its name by the geologist P.I.Skornyakov in 1932 (Leontiev & Novikova, 1989). The Variantov Channel connects Jack London Lake with Lake Tantsuyushchikh Khariusov (Lake of Dancing Greylink). The two bodies of water are 53 and 22 m deep respectively. On the south, Jack London Lake is limited by morainic fields having a rolling relief and dotted with minor lakes (the so-called "Stoozyorka"). Each of these numerous lakes is only tens of metres in size and up to 15 m deep, with many of them producing no runoff.

Jack London Lake is fed by several large creeks (Nevedomy, Studyony, Purga) flowing into it from the southwest along trough valleys. Nevedomy Creek gives rise to a string of seven mountain lakes located from 1,600 to 816 m a.s.l. The 23 km long Kyuel-Sien Channel connects the lakes to the Kolyma River.

The area has a continental climate slightly moderated by its location in the Alpine zone. Winter lasts from October until May. In calm winter weather, temperature inversions are not infrequent in the mountains (up to +3.6єC per 100 m) (Alfimov, 1985). The mean air temperature in January is -33.8 єC, and the mean depth of the snow cover 0.5-0.6 m. Snow varies in depth; it can be 1-5 cm thick on gravelly plateaus and 40-60 cm in the depression filled with Jack London Lake. Snow melts in late April-early May. The ice cover on the lake sets in early October and breaks up in the middle or end of June. The summer is cool with the mean temperature in July +12єC. Air temperature never rises above +18-20єC even in hot summer days. The annual precipitation amounts to 350 mm.

As a rule, morainic lakes are filled with dark water and lined with a fringe of nearshore vegetation; their shores are high and steep. Flat portions of the shores are occupied by willow growth (*Salix pulchra*). Margins of sandy terraces are strengthened by bluegrass (*Poa sp.*) and sedge (*Carex lugens*) carpets. Certain morainic lakes and creeks emptying into Jack London Lakes have wide floodplains with willow thickets (*Salix krylovii, S.myrtilloides, S.saxatilis*) and a groundcover of blueberry (*Vaccinium uliginosum*), dwarf birch (*Betula divaricata*), and spirea (*Spiraea beauverdiana*) (Egorova, 1980; Dokuchaeva, 1980).

Algae of Jack London Lake are represented by ancient forms. As many as 426 species of unicellular algae have been reported to occur in this water body (Kuzmin *et al.*, 1989). The algal flora (217 species) is most diverse in the shallow part of the lake where planktonic forms predominate (64.2%). *Bacillariophyta* are especially abundant (297 species). They are followed (in order of dominance) by *Chlorophyta* (56 species), *Chrysophita* (36), and *Xanthophyta* (11). On the whole, the algal flora is characterized as cold-loving, including a high proportion of boreal and northern Alpine forms. Microalgae actively reproduce under the ice cover from March until May, which leads to a high abundance of zooplankton in the summer.

Zooplankton is dominated by copepods (*Cyclops scutifer, Eucyclops sp., Acanthocyclops sp.,* and *Calanus sp.*) and rotifers (*Kylicotia longispins, Canochilus unicornis*). Peak density seasons of planktonic crustaceans fall on the spring and shortly before freezing.

Lakes are inhabited by Bearded Stone Loach (*Nemacheilus barbatulus*) and Spotted Sculpin (*Cottus poecilopus*); they also harbour isolated populations of Arctic Grayling (*Thymallus arcticis pallasi*). The rapidly growing graylings of Jack London Lake feasting on planktonic crustaceans are very fat and weigh up to 1 kg by the age of 10 years. This population is unique in more than one aspect. The fish spawn not only in streams but also in the lake, using the nearshore sand and gravel substrate to lay their eggs. The spawning beds are largely located close to the south-western mountainous side of the lake and at the mouths of the Purga, Studyony, and Nevedomy creeks (where the latter enters Nevidimka and Sosednee lakes). Graylings that occur in Lake Tantsuyushchikh Khariusov grow slower and are consequently much smaller (500-600 g). Dwarf graylings (60 g) inhabit some mountain water courses (M.B.Skopets, personal communication).

Social and cultural values:

Local lakes are very popular as places of outdoor recreation among residents of the settlement of Yagodnoye and the neighbouring mining sites. Magnificent landscapes of glacial valleys and rocky crests of mountain ranges reflected in dark lake water, taiga forests on hillsides, and golden beaches leave no one indifferent and induce a lyrical mood in the observer as evidenced by the local toponymy.

Factors adversely affecting the site's ecological character:

The site lies in the centre of a gold-producing area in the vicinity of the settlement of Yagodnoye and is a popular location for recreation activity. Adverse effects of recreational pressure manifest themselves as trampling of lichen patches, damage to vegetation cover by off-road vehicles, frequent forest fires, tree cutting for firewood and temporary shelters. Prior to the shutdown of the Sibik-Tyellakh mine located 12 km south of the site, the lake area was easy to access both from the north and the south. Overfishing resulted in a considerable decline of the Arctic Grayling population. Deleterious human impact on lake ecosystems decreased after the reservoir of the Kolymskaya hydroelectric power station was created in the mid 1980s and the economic depression of the 1990s befell the region. Nevertheless, conservation of the peculiar landscapes of the site and its unique grayling stock remains a matter of concern and requires implementation of special protective measures.

Conservation measures taken:

Jack London Lake has been given protected area status by the authorities of the Yagodninsky District and is designated a nature refuge. The establishment of a nature park is in order.

Current scientific research and facilities:

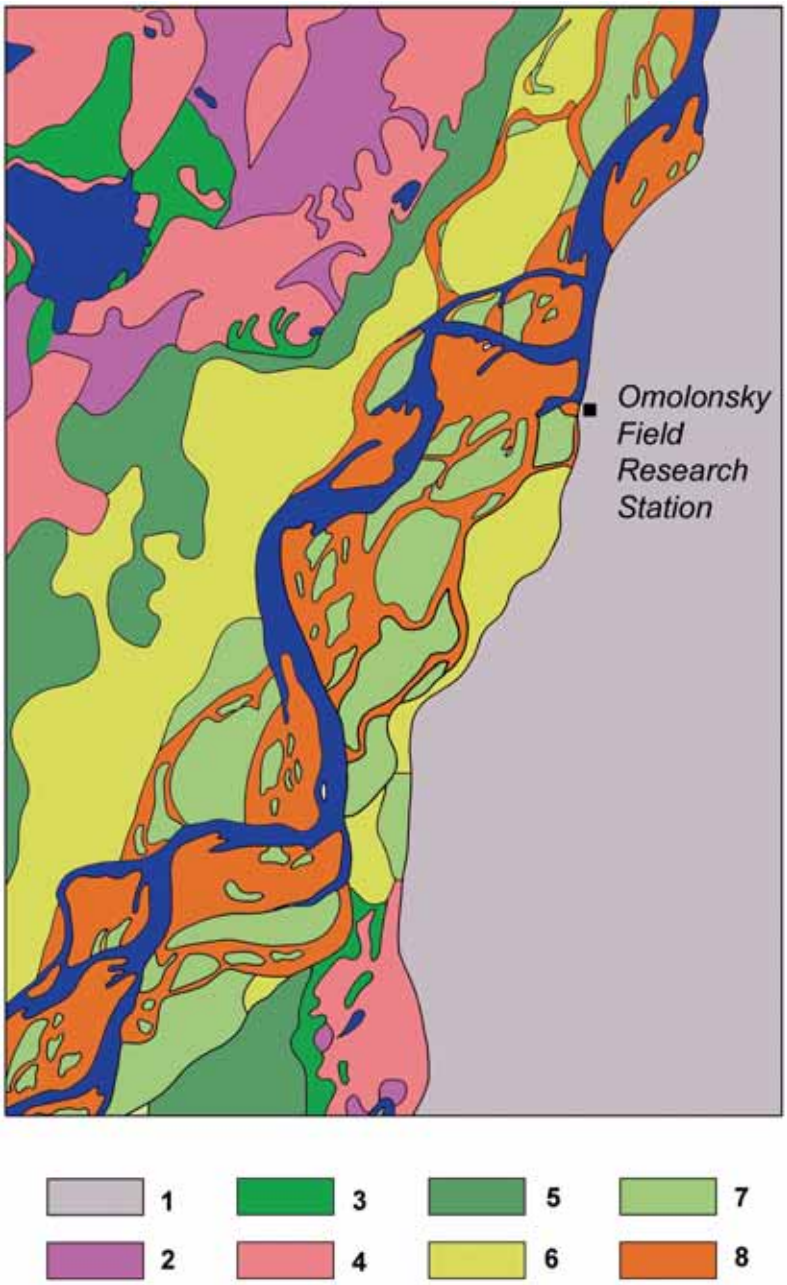
A weather station belonging to the Kolymsky Hydrometeorological Service is situated on one of the small islands in the north-western part of Jack London Lake. The Aborigen biological research station, which was set up by the Institute of Biological Problems of the North, was based 15 km south of the lake between 1974 and 1994. Due to this, the site was comprehensively explored by a multidisciplinary team of researchers (Aborigen Biological Station, 1993).

Jurisdiction:

Administration of the Yagodninsky District of the Magadan Region.

Omolon-Anyui Interfluvial Area in late March *(A.V.Andreev)*.

Water hemlock *(Cicuta virosa) (A.V.Andreev)*.



Landscape structure of the Middle Omolon River: 1 – mountain landscapes on the right side of the river (spurs of the Ush-Urekchen Range), 2 – open tussocky larch stands scattered on flat surfaces, 3 – open lichen-cowberry and dwarf birch-blueberry larch stands on elevated surfaces, 4 – hummock and oxbow mires in depressions, 5 – waterlogged dwarf shrub-moss larch forests, 6 – heath larch forests on old floodplains, 7 – floodplain willow stands and poplar-chosenia groves, 8 – bare shingle areas (based on materials of G.N.Egorova, 1983). Scale: a 10x7 km site is depicted.

Kolyma floodplain in the vicinity of Zamkovaya Mountain *(A.V.Andreev)*.

Namankanskiye Lakes *(A.V.Andreev)*.

3. Chukchi Sea Catchment

3.1. Lower Amguema River and Ukouge Lagoon

Geographical coordinates: 68°00'44"N, 171°30'16"W (Amguema mouth).

Elevation: 0-20 m a.s.l.

Area: *c.* 1,400 km^2.

Overview:

The lower reaches and estuary of a large tundra river with the adjacent lacustrine-alluvial plains, maritime marshes and lagoons of the Chukchi Sea. Important breeding and moulting areas of water birds in western Beringia.

Wetland type:

By international classification – F, J, M, O, Vt; by national classification – 1.2.3.3, 1.2.5.1, 1.3.1, 2.5.1.1, 3.7.2.1 (estuary of a large tundra river and the surrounding lacustrine-alluvial plains).

Ramsar Criteria: 1, 3, 7.

Justification for the application of selected criteria:

The westernmost breeding site of Spoon-billed Sandpiper (*Eurynorhynchus pygmaeus*) and moulting area of Emperor Goose (*Philacte canagica*). Both species are autochthons of the Beringian biota. An endemic narrow-range dwarfed form of Alaska Blackfish, *Dallia pectoralis admirabilis*, occurs in local rivers.

General location:

The site is situated in the lower reaches of the Amguema River at the junction of Shmidtovsky and Iultinsky Administrative Districts of the Chukot Autonomous Area. The distance between the mouth of the Amguema River and the nearest populated centre (Vankarem) is 81 km. The mouth lays 112 and 228 km from the settlements of Mys Shmidta and Egvekinot respectively.

Physical features:

The Amguema River rises from the southern spurs of the Palayavaamsky Range. Its basin extends for about 500 km along the boundary between the Mesozoic folding area and the Okhotsk-Chukot volcanogenic belt.

The Upper Amguema river rushes through canyons and rapids. Its middle stretch traverses the Amguema Depression, an intermontane plain enclosed by sloping foothills 300-400 m high. The Lower Amguema broadens out to form the Vankaremskaya Lowland, a vast lacustrine-alluvial plain intersected by numerous rivers and encircled by large sea lagoons (Nutauge, Vankarem, Pyngopilgin, and Repetingupylgin). These lagoons are cut off from the Chukchi Sea by a chain of narrow shingle spits lengthened parallel to the coastline. The total length of the spits is approximately 100 km. The Amguema River empties into a vast shallow-water bay, Amguema Lagoon, separated from the open sea by the Dva Pilota Spit. Amguema Lagoon lies 20 km west of the Ukouge Lagoon with an area of about 40 km^2 and 10 km east of Tyngurginpilkhyn Lagoon.

The Amguema and Ukouge Lagoons are spaced by an elevated tundra plain (10-50 m a.s.l.) with a large number of lakes, polygonal and hummocky tundra. The lacustrine-alluvial landscape also occurs west of Amguema Lagoon, but it occupies a relatively smaller area and grades into a gently rolling surface (Tanenagin) drained by the Anurerkul River. The Amguema Valley has a well-developed floodplain and river terrace. The delta plain is patterned by a dense network of channels and young thermokarst lakes. Upstream from the delta, the low floodplain is formed by vast sand and shingle spits of alluvial origin. The tundra plain supports numerous thermokarst lakes some of which are large (1-3 km^2) and deep (5-7 m). Terraces along the upper course of the Amguema are dotted with deep oxbow lakes 3-4 m in depth.

Elevated and well-drained portions of the valley have metamorphic pale and sod soils. Gley cryozems and organogenic soils occur in wet and low-lying places, while alluvial soils are widespread at low and middle floodplain levels (Mazhitova, 1993).

The site lies close to the eastern periphery of severe Arctic climate zone of the Siberian coast, with elements of the cold oceanic climate characteristic of the eastern Chukotka Peninsula. This accounts for very high humidity, a short, cool summer, and a snowy winter (Alfimov, Mikhailov, 1993). According to data from the Amguema meteorological station (southern part of the site), air temperatures in January and July average –24°C and +9.9°C respectively. The snow cover sets in early October and melts by the end of May.

The flow regime of the Amguema River is characterized by spring flooding and a few temporary rises in the water level during late summer caused by rain. Ice break and drift followed by spring flooding occur in June. The

volume of flow is maximum in the summer months and negligible from January until April. The temperature of river water in July can be as high as +13°C. The river freezes in early October.

Ecological features:

Spit edges facing the mainland and the shores of lagoons are occupied by marshes with *Carex subspathacea, Calamagrostis deschampsioides,* and alkali grass (*Puccinellia tenella,* and *P.phryganodes*). The marshes are cut by a dense network of channels and shallow thermokarst water bodies. The slightly rolling tundra plain between the Lower Amguema River and Ukouge Lagoon is occupied by the hummock tundra dominated by *Eriophorum vaginatum, Carex lugens*, and *Calamagrostis holmii*. Drained lacustrine basins elevated 2-5 m a.s.l. give rise to polygonal sedge-cottongrass bogs with a moss carpet overgrown with dwarf birch and willow, Labrador tea, and blueberry. Higher localities are occupied by dwarf tundra maths with Dryas and lichens or dwarf shrubs, grass, and forbs. River floodplains support dense willow growth (*Salix alaxensis, S.krylovii, S.boganidensis,* and *S.pulchra*). Willow thickets and snowbed meadows develop at slope bases (Kozhevnikov, 1989).

Benthic communities of lakes and rivers are dominated by chironomids (*Chironomidae,* 31 species) and tipulids (*Tipulidae*). Caddisflies (*Trichoptera*) are represented by 3 species, stoneflies (*Plecoptera*) by 4, mayflies (*Epheneroptera*) by 5, and oligochaetes by 6 species (Samokhvalov, Morev, 1993). Lakes around the middle course of the Amguema River are inhabited by amphipods (*Gammarus lacustris*). Water louse (*Asellus sp*.) is found only in maritime lakes. All water bodies more than 3 m deep are populated by commercially important fish species. Shallower lakes give home to Nine-spined Stickleback (*Pungitius pungitius*) and a dwarf subspecies of Alaska Blackfish, *Dallia pectoralis admirabilis*. The absence of river runoff in the winter is a frequent cause of mass fish mortality attributable to a severe deficiency of dissolved oxygen.

Noteworthy flora

The local floras (100 km^2) of the Lower Amguema River include from 190 to 320 species of vascular plants. The ranges of very many inland (western) and oceanic (eastern) floristic elements overlap in this area (Yurtsev, 1974). Foothill areas are distinguished for the presence of cryoxerophytic associations that represent isolated sites of steppe vegetation. They retain many Beringian endemics, such as *Androsace semiperennis, Primula beringensis, Erigeron compositus, Helictotrichon krylovii, Astragalus pseudoadsurgens*, and *Artemisia arctisibirica* (Yurtsev *et al*., 1985).

Noteworthy fauna

Fish

The Amguema Basin is distinguished from all other hydrographic systems of the Chukotka Peninsula by the highest diversity of freshwater ichthyofauna, with 16 species of 10 families and 1 lamprey species (Arctic Brook Lamprey *Lampetra japonica kessleri*). The most characteristic species are the endemic dwarfed form of Alaska Blackfish and Pygmy Whitefish (*Prosopium coulteri*) not encountered in any other place of Eurasia. Such a high diversity of fish is due to the fact that the basin served as a main refuge for Beringian freshwater fauna during episodes of Pleistocene glaciation (Chereshnev, 1986). The Amguema provides spawning beds for two Pacific salmonids, Chum (*Oncorhynchus keta*) and Humpback Salmon (*O.gorbuscha*), and for anadromous chars: Dolly Varden (*Salvelinis malma*) and Taranets' Char (*S.taranetzi*). Lakes of the Amguema Basin give home to various forms of non-migratory Arctic Char (*Salvelinus alpinus s.l.*). Sockeye (*Oncorhynchus nerka*), Chinook (*O.tschawytscha*), and Coho (*O.kisutch*) also enter the Amguema River. North Siberian coregonids are represented by Wide-nosed Whitefish (*Coregonus nasus*) weighing up to 3 kg, anadromous and non-migratory forms of Least Cisco (*C.sardinella*), and Round Whitefish (*Prosopium cylindraceus*). Other common species are Arctic Grayling (*Thymallus arcticus pallasi*) and Burbot (*Lota lota natio leuptura*). Non-commercial species include Common Minnow (*Phoxinus phoxinus*), Nine-spined Stickleback (*Pungitius pungitius*), and Slimy Sculpin (*Cottus cognatus*). Asian Rainbow Smelt (*Osmerus eperlanus dentex*) occurs in the Amguema Lagoon (Chereshnev, 1996).

Amphibians

Larvae of the Siberian Newt (*Salamandrella keyserlingii*) have been found in floodplain lakes near the mouth of the Ekityki River. It is supposed to be the northeasternmost record of this species (G.I.Atrashkevich, personal communication).

Birds

A comprehensive ornithological survey of the Amguema Basin has revealed the occurrence of 78 bird species representing 8 orders (Portenko, 1973; Dorogoy, 1993). Tundra plains in the lower reaches of the river provide breeding grounds for all four species of diver, viz. Red-throated Diver (*Gavia stellata*), Yellow-billed Diver (*G.adamsii*), Black-throated Diver (*G.arctica*), and Pacific

Diver (*G.pacifica*). Breeding Pacific Divers are twice as common as Black-throated Divers. All geese are rare. White-fronted Goose (*Anser albifrons*), Bean Goose (*A. fabalis serrirostris*), and Black Brant (*Branta bernicla nigricans*) were usual breeding birds in the Amguema Basin in the past, but only few of them can be found breeding on the tundra plain now or passing the area during migration. Ukouge Lagoon makes the north-western boundary of the breeding range of Emperor Goose (*Philacte canagica*) (Kishchinsky, 1988). Large congregations of these birds were found on moulting grounds in this area in the late 1980s (Kondratyev, 1988). A few tens of breeding pairs were sighted on water bodies of the Vankaremskaya Lowland during the 1993 aerial survey (Hodges & Eldridge, 1994).

The Lower Amguema River lies on the flyway of Snow Geese (*Chen hyperboreus*) breeding on Wrangel island. The most common breeding ducks include Long-tailed Duck (*Clangula hyemalis*), Pacific Eider (*Somateria mollissima v.-nigrum*), King Eider (*S.spectabilis*), and Greater Scaup (*Aythya marila*). Pintail (*Anas acuta*) is common during post-breeding movements. Spectacled Eider (*Somateria fischeri*) and Steller's Eider (*Polysticta stelleri*) are passage migrants. Breeding Peregrines and Rough-legged Buzzards are frequently sighted on riverside precipices. Willow Grouse (*Lagopus lagopus*) occurs in large numbers in river valley scrublands and Sandhill Crane (*Grus canadensis*) on the tundra plain.

The most common representatives of the charadriiform fauna include Ringed Plover (*Charadrius hiaticula*), Red-necked Stint (*Calidris ruficollis*), Pectoral Sandpiper (*C. melanotos*), Temminck's Stint (*C.temminckii*), Dunlin (*C.alpina*), Short-billed Dowitcher (*Limnodromus scolopaceus*), Red-necked Phalarope (*Phalaropus lobatus*), and Grey Phalarope (*Ph. fulicarius*). Curlew Sandpiper (*Calidris ferruginea*) is a rare breeding species. Beringian waders, Western Sandpiper (*C. mauri*) and Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) have been sighted on the Lower Amguema River and Ukouge Lagoon (Portenko, 1972). The Pomarine Skua (*Stercorarius pomarinus*) is sometimes very abundant during breeding seasons, but other Skuas are rare. Herring Gull (*Larus argentatus*), Glaucous Gull (*L.hyperboreus*), and Arctic Tern (*Sterna paradisaea*) are breeding birds around the mouth of the Amguema. The most characteristic passerine birds include White Wagtail (*Motacilla alba*) and Yellow Wagtail (*M.flava*), Red-throated Pipit (*Anthus cervinus*), Arctic Warbler (*Phylloscopus borealis*), Lapland Longspur (*Calcarius lapponicus*), Arctic Redpoll (*Acanthis hornemanni exilipes*), Bluethroat (*Luscinia svecica*), and Snow Bunting (*Plectrophenax nivalis*) (Dorogoy, 1993).

Mammals

The list of mammalian species reported from the Amguema River Basin is rather short. It includes a total of 22 species representing 5 orders, viz. Insectivores (3 species), Lagomorpha (2), Rodentia (7), Carnivores (8), and Artiodactyla (2) (Chernyavsky, 1984; Krechmar, 1993). The lower reaches of the Amguema River are inhabited by Arctic Fox (*Alopex lagopus*), Siberian Lemming (*Lemmus sibiricus*), Collared Lemming (*Dicrostonyx torquatus*), Tundra Vole (*Microtus oeconomus*), Varying Hare (*Lepus timidus*), Arctic Ground Squirrel (*Citellus parryi*), and Brown Bear (*Ursus arctos*). From time to time, female Polar Bears (*U. maritimus*) are reported to come to the Amguema Basin in search of a denning place.

Social and cultural values

Remains of almost 20 Neolithic dwellings and burial sites have been discovered along the middle course of the Amguema River. Traces of the northernmost habitation of ancient hunters have been found on the Lower Amguema River (Cape Epark), where they probably laid in wait for reindeer herds crossing the valley (Dikov, 1977). Nowadays, the rolling tundra surface in the middle and lower reaches of the Amguema are used to graze domestic reindeer by herders of the Omvaan joint-stock company.

In 1989 a detailed survey of the Amguema Basin was undertaken by specialists of the Institute of Biological Problems of the North for the purpose of ecological assessment in connection with the then-projected Amguemskaya hydroelectric power station. Today, this is the best explored river basin of Eastern Chukotka.

Factors adversely affecting the site's ecological character:

In the past, the Amguema Valley served as a transport route connecting Egvekinot and the Iultin tin-tungsten mine. A project was developed to construct a hydroelectric power plant on the Middle Amguema River. However, after the fall of world tungsten prices in the early 1990s coincident with the general economic depression on Chukotka, the mine was closed and the plans for the construction of the power station and industrial developments in the area had to be abandoned, seemingly forever. The stock of Dolly Varden in the river is seriously depleted through many years of over-fishing, while the anadromous form of Taranets' Char is virtually extinct (Skopets, 1993). Arctic Char is currently the main fish commercially harvested in local lakes, but its population in many sites has drastically declined.

Conservation measures:
The site has no protected area status, despite a peculiar combination of many typical and unique natural features in the area. Additional studies are needed to develop recommendations for its designation to the Ramsar List.

Jurisdiction:
Administrations of the Shmidtovsky and Iultinsky Districts of the Chukot Autonomous Area.

3.2. Kolyuchin Island

Geographical coordinates: 67°27'27"N, 174°46'28"W (top of the island).

Elevation: 187.9 m a.s.l. (the highest point of the island).

Area: *c.* 4 km^2.

Overview:
Offshore rocky island in the Chukchi Sea with large seabird colonies.

Wetland type:
By international classification – D; by national classification 1.4.1.1 (rocky island in the shelf zone of the Chukchi Sea).

General location:
The island is situated in the Chukchi Sea 50 km northeast of the mouth of Kolyuchinskaya Bay. It is separated from the mainland by the narrow Sergievsky Strait. The distance from the nearest settlement, Nutepelmen, is 14.2 km. The island is included in the Iultinsky Administrative District of the Chukot Autonomous Area. It lies 235 km from the district centre (Egvekinot), while the distance in a straight line from the mainland across Sergievsky Strait is 11.3 km.

Physical features:
Kolyuchin Island is a residual landform composed of Early Cretaceous granites, granodiorites, and gneisses. It is 4.3 km in length and 1.5 km in width. The top of the island is an uneven boulder-strewn plateau inclined to the south with alternating screes and patchy tundra; low-lying areas are wet and give rise to grass and herb vegetation. The northeastern side of the island is formed by stone cliffs 40-100 m high that plunge down directly into deep water. The south-western side facing the mainland is also rather steep and extends seaward as 10-15 m high ledges alternating with accumulations of large loose stones and rock debris.

The surrounding sea area is icebound almost year round. The depth of the Sergievsky Strait varies from 13 to 19 m. The sea gradually becomes deeper northward of the island (up to 25-30 m).

The climate is a maritime subarctic one, with frequent storms and fog from the sea. The mean annual air temperature is –9.5°C, with temperatures in January and July averaging –23.2 and +5.8°C respectively. For most of the year (9 months and more), the sea is icebound and the island is surrounded by ice hummocks. Snow begins to melt at the end of May. Movements of landfast ice take place in late June.

Noteworthy fauna:

Birds

The size and composition of seabird colonies

Seabird colonies on Kolyuchin Island are formed by 8 species. Both their abundance and reproductive success depend on the ice conditions and vary significantly from year to year. Colonial birds, Kittiwakes (*Rissa tridactyla*) and Guillemots, lay eggs as late as the middle of July. The total number of guillemots breeding on Kolyuchin Island amounts to 15,000 individuals. The most dominant is Brunnich's Guillemot (*Uria lomiva*). Common Guillemot (*U. aalge*) is less common; it appeared on the island only between 1974 and 1985 and is becoming progressively more abundant. In 1994 the numbers of the two guillemot species were roughly identical (I.V.Dorogoy, in press). Their breeding success varies considerably in different years but is never very high (Kondratyev *et al*., 1987). Kittwakes are next to guillemots in terms of abundance. Their number varies from 7,000 to 10,000 individuals. They are followed by Horned Puffin (*Fratercula corniculata*) with 500-1,000 individuals, Black Guillemot (*Cepphus grylle*) with up to 300, Pelagic Cormorant (*Phalacrocorax pelagicus*) with 250-800, and Tufted Puffin (*Lunda cirrhata*) with around 100. Seabirds share nesting sites with such large gulls as Glaucous Gull (*Larus hyperboreus*) numbering from 20 to 100 pairs and a few pairs of Herring Gulls (*L.argentatus*). The Glaucous Gulls prey on the clutches of the guillemots and thus cause appreciable damage to their population (Kondratyev *et al*., 1987).

Other birds

Certain birds of the Chukchi tundra choose to breed on Kolyuchin Island besides colonial seabirds. Baird's Sandpiper

(*Calidris bairdii*), Red-throated Pipit (*Anthus cervinus*), and Snow Bunting (*Plectrophenax nivalis*) occur on the plateau at the top of the island. White Wagtail (*Motacilla alba*), Yellow Wagtail (*M.flava*), and Wheatear (*Oenanthe oenanthe*) place their nests on the shoreline cliffs. Peregrine Falcon (*Falco peregrinus*) and Raven (*Corvus corax*) also establish nests on the island in some years (Krechmar *et al*., 1978). Wandering flocks of Short-tailed Shearwater (*Puffinus tenuirostris*) were reported to visit the island (Portenko, 1973).

Mammals

In the summer, Walruses (*Odobenus rosmarus*) can be seen near the rocky cliffs at the northeastern side of the island.

Social and cultural values:

Remains of ancient dwellings and artefacts of the old Beringian culture dating roughly over 1,200 years have been found on the northern extremity of the island. An ancient burial site lies on the slope above this place (Dikov, 1977). A polar station that serviced shipping and navigation on the Northern Sea Route existed on the island between 1943 and 1992.

Jurisdiction:

Administration of the Iultinsky District of the Chukot Autonomous Area.

3.3. Belyaka Spit

Geographical coordinates: 67°02'24"N, 174°11'15"W (lighthouse at the western tip of the spit).

Elevation: 0-10 m a.s.l.

Area: *c.* 720 km^2.

Overview:

A sea spit at the entrance to Kolyuchinskaya Bay, the surrounding Chukchi Sea area, and portions of the lacustrine-thermokarst plain east of the spit including the Pilkhykay Lagoon near Cape Dzhenretlen.

Wetland type:

By international classification – E, H, Q, Vt; by national classification – 1.4.2.3, 1.4.2.5, 3.7.2.1 (sand and shingle spit at the Arctic coast with the surrounding shallow-water lagoons and lacustrine-alluvial plains).

Ramsar Criteria: 1, 2, 3, 7.

Justification for the application of selected criteria:

Belyaka Spit is a breeding area for an appreciable number of Spoon-billed Sandpipers (*Eurynorhynchus pygmeus*) and Emperor Geese (*Philacte canagica*); the latter species is a Beringian endemic having a fragmented or narrowing range. Diving ducks gather in large amounts on Kolyuchinskaya Bay for moulting. Lakes on the eastern side of Kolyuchinskaya Bay and Pilkhykay Lagoon are inhabited by the endemic Pilkhykay Blackfish (*Dallia pectoralis delicatissima*).

General location:

The site lies on the Chukchi Sea coast within the bounds of the Chukotsky Administrative District of the Chukot Autonomous Area. Its is 53 km from the nearest settlement (Nutepelmen), 205 km from the district centre (Lavrentiya), and 229 km from the village of Egvekinot.

Physical features:

Belyaka Spit isolates Kolyuchinskaya Bay from the Chukchi Sea. The northern and eastern parts of the site are formed by Upper and Middle Quaternary deposits. On the east and southeast, the Upper Quaternary plain borders flattened low-mountain massifs of Archean schists and Late Cretaceous granites (Cape Dzhenretlen) (Vas'kovsky, 1963).

The outer (northern) edge of the spit is a stretch of open beach backed by a high sandy ridge that separates it from the adjacent dry crowberry (*Empetrum nigrum*) tundra. The spit is roughly 20 km long and 3-5.5 km wide; it is elevated 4-6 m a.s.l. In the western part of Kolyuchinskaya Bay, the spit ends in a series of monotonous submeridional sandy flats and islets (Serykh Gusey Islands within the bounds of the Shmidtovsky Administrative District). With the distance from the surf along shingle beaches, they give way to flat, turfy surfaces. Plainland stretches of Belyaka Spit are intersected by chains of sand dunes and moist depressions. Moreover, the 18 km long Belyaka Lagoon extending from the west divides the spit into two parts, northern and southern. The rear spit portion is occupied by water meadows with spots of polygonal tundra and thermokarst lakes. Large freshwater lakes as long as 2 km are situated in the broader (western) part of the spit. The entire area is dotted with tens of small, brackish pools. Interlake spaces are hummock surfaces interspersed with dry ridges covered with Dryas and low shrubs. Halophytic marshes form maritime "laidas" (Kondratyev, 1974).

In the east, the base of the spit is formed by the eastern shore of Kolyuchinskaya Bay (Chapatchen Bay). Here gently sloping hills pass directly to coastal flats and beaches. Elevated sites support patchy tundra with lichen and herbaceous vegetation while gentle slopes present with a hummock surface and hollows are occupied by polygonal bogs or oval thermokarst lakes about 1 km in diameter.

The site has a moist and cold subarctic climate, with long windy winters and cool humid summers. Based on records of the Kolyuchin meteorological station, the mean annual temperature is -9.5°C. The mean temperature in January is -23.2°C, with an absolute minimum of -35°C. July temperature averages +6°C, with an absolute maximum of +25°C. The mean annual wind speed is 6-7 m/s; it can be as high as 35 metres per second during storms. The annual precipitation is roughly 300 mm. The spring season is prolonged and cold, and the summer is cool and humid with frequent mists. Snow drifts long remain in hollows. The first nearshore areas of open water on lakes can be seen in early June; the lakes freeze in the end of September.

Ecological features:

Sand and shingle coastal beaches accumulate heaps of driftwood. Silty spots give rise to halophytic vegetation. Lagoon-like brackish shallow pools of the maritime area are mud-bottomed and overgrown with mare's tail, *Hippuris vulgaris*. Areas between them are occupied by *Carex subspathacea* and *Dupontia psilosantha*. Chains of dune ridges at elevations are strengthened by lime grass (*Leymus villosissimus*).

On the eastern shore of Kolyuchinskaya Bay, gently sloping hills pass directly to coastal spits and beaches. The vegetation cover of flattened tundra plots consists of wet *Eriophorum vaginatum-Carex atrofusca* associations. Snow beds remaining in creek valleys and lake basins following winter give rise to spectacular nival meadows of *Carex nesophila, Salix chanissonis, S.polaris, Saxifraga hyperborea, Primula tschuktschorum*, etc. (Yurtsev, 1974).

Creeks are fringed with shrubs of *Betula exilis* and subnival vegetation composed of *Salix pulchra*, *Baeothryon cespitosum, Beckwithia chamissonis, Saxifraga calycina,* etc. The vegetation cover in lake-filled basins is represented by arctophyla and sedges interspersed with polygonal tundra spots overgrown with sphagnum and *Carex lugens*.

Elevated forms of the relief support patchy tundra with fruticose lichens (*Cetraria, Cladonia*), small shrubs (*Ledum decumbens, Cassiope tetragona, Rhododendron camtschaticum, Loiseleuria procumbens, Salix phlebophylla, Diapensia obovata*), and herbaceous vegetation (*Dryas punctata, Oxytropis spp., Astragalus alpinus*).

Noteworthy fauna:

Fish

The local endemic subspecies, Pilkhykay Blackfish, found only around Kolyuchinskaya Bay, occurs in shallow lakes south of the Pilkhykay Lagoon.

Birds

According to L.A.Portenko (1973), the site makes up the boundary between the ornithogeographic complexes of western and eastern Chukotka (in the light of the currently available data, the boundary should be drawn along the Amguema River). L.A.Portenko based his inference on the fact that the King Eider (*Somateria spectabilis*) does not breed nor does the White-fronted Goose (*Anser albifrons*) penetrate further east than Kolyuchinskaya Bay; on the other hand, many representatives of the Beringian avifaunal complex, such as Baird's Sandpiper (*Calidris bairdii*), Rock Sandpiper (*C. ptilocnemis*), Spoon-billed Sandpiper and Emperor Goose, do not go too far to the west.

The avifauna of the site lists over 90 species including 60 breeding ones (Krechmar *et al*., 1978). The Red-throated Diver (*Gavia stellata*) is the most common diver in the area, with a breeding population density of 3 pairs/10 km^2 (I.V.Dorogoy, in press). Breeding Pacific Diver (*G. pacifica*) and White-billed Diver (*G. adamsii*) are less common, while Black-throated Diver (*G. arctica*) is rare. Pelagic Cormorant (*Phalacrocorax pelagicus*) breeds in small numbers on Cape Dzhenretlen. White-fronted Goose sometimes occurs on the maritime tundra and along rivers flowing into the bay. Emperor Goose is a common bird on Belyaka Spit. About 200 individuals of this species were sighted in the northern part of the spit in June 1994; some of them were breeding pairs (I.V.Dorogoy, in press). Black Brant (*Branta bernicla nigricans*) sometimes nests in Herring Gull colonies (Tomkovich & Soloviev, 1987).

Pintail (*Anas acuta*) breeds on the tundra in the northern part of Kolyuchinskaya Bay, but the species is never as abundant here as it is farther west and south. The most common birds at the site are Long-tailed Duck (*Clangula hyemalis*) and Pacific Eider (*Somateria mollissima v.-nigrum*). Belyaka Spit is distinguished for the high population density of the latter species (Krechmar *et al*., 1978; Hodges and Eldgridge, 1984). Sandhill Crane (*Grus canadensis*) is a common inhabitant of the hummocky brush tundra.

The most common waders include Black-bellied Plover (*Pluvialis squatarola*), Ringed Plover (*Charadrius hiaticula*), Ruddy Turnstone (*Arenaria interpres*), Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*), Dunlin (*Calidris alpina*), Western Sandpiper (*C.mauri*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Less com-

mon but regular are Little Stint (*Calidris minutus*), Temminck's Stint (*C.temminckii*), Rock Sandpiper (*C.ptilocnemis*), Knot (*C.canutus*), and Little Stint (*C.minutus*). Grey Phalarope (*Phalaropus fulicarius*) occurs on the surrounding mainland tundra whereas Rednecked Phalarope (*Ph. lobatus*) is much less common. Pectoral Sandpiper (*Calidris melanotos*) and Ruff (*Philomachus pugnax*) are rare and irregular breeders (Kondratyev, 1982). Breeding of the North-American Semipalmated Sandpiper (*Calidris pusillus*) on the Belyaka Spit was documented for the first time in Asia (Tomkovich & Soloviev, 1987). Other charadriiforms regularly sighted on the spit in the breeding season, even if in small numbers, include Long-tailed Skua (*Stercorarius longicaudus*), Arctic Skua (*S.parasiticus*), and Pomarine Skua (*S.pomarinus*). There are two breeding colonies formed by several tens of Herring Gull (*Larus argentatus*) and Arctic Tern (*Sterna paradisaea*) pairs.

The most characteristic passerine birds include Wheatear (*Oenanthe oenanthe*), White Wagtail (*Motacilla alba*), Arctic Warbler (*Phylloscopus borealis*), Lapland Longspur (*Calcarius lapponicus*), Arctic Redpoll (*Acanthis hornemanni exilipes*), and Snow Bunting (*Plectrophenax nivalis*).

Moulting Long-tailed Ducks and Emperor Geese congregate on the open water of Kolyuchinskaya Bay (Krechmar *et al*., 1978). Migrating birds pass along Belyaka Spit and across the mouth of Kolyuchinskaya Bay, with the spring passage being less intense than summer and fall movements. Spring migrations in the maritime zone involve Sandhill Crane and Pectoral Sandpiper. In the summer, Emperor Geese fly across the Belyaka Spit to their moulting area on the lagoons of the Vankaremskaya Lowland. In certain summer seasons, drakes of Steller's Eider (*Polysticta stelleri*) migrate through the mouth of Kolyuchinskaya Bay. Massive eastward migration of male King Eiders occurs in late June (Krechmar *et al*., 1978). Participants of the autumn passage through Belyaka Spit are Sandhill Crane, Snow Goose (*Chen hyperboreus*), and Black Brant bound for the southeast. Ross' Gulls (*Rhodostrthis rosea*) move in the same direction along the Chukchi Sea coastline in late summer and autumn.

Social and cultural values:

The site lies in a zone of ancient culture of Beringian sea-mammal hunters. Remains of an old Eskimo dwelling have been found on Belyaka Spit. Cape Dzhenretlen is an archaeological site where artefacts of the ancient Beringian culture have been excavated (Dikov, 1977). Also, the site is of historical value as the wintering place of the Swedish expedition led by A.Nordenskjold aboard the Vega in 1878-1879.

Conservation measures taken:

Breeding sites of many birds at Belyaka Spit are protected by the Zemlya Golubykh Gusey (Blue Geese Land) Local Wildlife Refuge. The natural conditions of the site meet the criteria of the Important Bird Areas program. It also deserves a higher protective status consistent with Ramsar Convention criteria.

Jurisdiction:

Administration of the Chukotsky District of the Chukot Autonomous Area.

3.4. Kolyuchinskaya Bay (southern part)

Geographical coordinates: 66°13'33"N, 174°00'21"W (Ionivaam River mouth).

Elevation: 0-50 m a.s.l.

Area: *c.* 1,200 km^2.

Overview:

Vast shallows in the southern part of Kolyuchinskaya Bay, with adjacent portions of glaciolacustrine plains and young deltas of several tundra rivers (Kalgarvyvaam, Penvelvaam, Ionivaam, Ulyuvaam).

Wetland type:

By international classification – J, M, Vt; by national classification – 1.2.1.3, 1.3.2, 3.7.2.1 (shallow-water portion of a large sea bay, deltaic and lacustrine-alluvial plains in the Beringian hummock tundra zone).

Ramsar Criteria: 1, 2, 6.

Justification for the application of selected criteria:

Extensive area of intact wetlands; important breeding area for diving ducks and waders, large congregations of moulting Emperor Geese (*Philacte canagica*) and Black Brants (*Branta bernicla nigricans*).

General location:

The site occupies the territory of the Chukotsky Administrative District of the Chukot Autonomous Area.

Nuteyikvin Peninsula lies 93 km from the nearest settlement (Nutepelmen) and 155 km from the district centre (Lavrentiya).

Physical and ecological features of the site:

Kolyuichinskaya Bay runs 90 km inland across the Arctic coast of the Chukot Peninsula, with its middle part approximately 40 km wide. The southern shore of the bay is a glacial plain of the Middle Quaternary broken up by river valleys of the Holocene period and deltas of recent origin. Further southward, the plain extends to a gently rolling topography made of Triassic and Cretaceous sandstones. The elevated bases of the hills give rise to small tundra rivers flowing for 50-60 km.

The largest watercourse is the Ionivaam River with a length of 150 km. It rises in the Anaachkhen Mountains, and its middle course drains the intermontane basin filled by Lake Ioni. Kolyuchinskaya Bay extends southward into two prongs, Kuetkuiym and Ionivaamkuiym Bays, separated by the Nuteyikvin Peninsula. At the south-western side of Kolyuchinskaya Bay, hill bases come very close to beaches and spits. Elevated portions of the relief are occupied by patchy coarse gravel tundra. Well-developed deltaic complexes present with coastal shallows, salt meadows, and numerous thermokarst lakes exist at the mouths of rivers.

The site has a maritime Arctic climate. Tundra lakes freeze in early October. The snow cover sets in at approximately the same time. Landfast ice forms in mid October. Snowstorms are common in winter. The mean air temperature in January is -23°C. Spring comes in mid or late May. The summer is cool and humid, with the mean temperature in July +6°C. On calm, clear days, the air temperature can rise to +18-20°C, but such weather lasts no longer than 12 hours in succession. Cold, moist air and sea winds are much more typical of the site.

Noteworthy fauna:

Fish

The shallow waters of Kolyuchinskaya Bay and lower reaches of the rivers emptying into it are populated by Pacific salmonids, such as Humpback Salmon (*Oncorhynchus gorbuscha*) and Chinook (*O.tschawytscha*) and by Chars, viz. Dolly Varden (*Salvelinus malma*) and Taranets' Char (*S.taranetzi*). Other fish include Least Cisco (*Coregonus sardinella*) and Asian Rainbow Smelt (*Osmerus eperlanus dentex*), while the freshwater ichthyofauna is represented by Wide-nosed Whitefish (*Coregonus nasus*), Siberian Whitefish (*C.lavaretus pidschian*), Arctic Grayling (*Thymallus arcticus*), Freshwater Smelt (*Hypomesus olidus*), Burbot (*Lota lota natio leuptura*), Nine-spined Stickleback (*Pungitius pungitius*), and Slimy Sculpin (*Cottus cognatus*) (Chereshnev, 1996). Pilkhykay Blackfish (*Dallia pectoralis delicatissima*), a local endemic of the Kolyuchinskaya Bay area, inhabits water bodies in the upper reaches of the Kalkheurervaam River (Chereshnev, 1998).

Birds

The importance of the site for breeding and moulting birds:

Black-throated Diver (*Gavia arctica*) and Pacific Diver (*G.pacifica*) are common birds at the site, whereas Red-throated Diver (*G.stellata*) is relatively rare. Ranges of Bewick's Swan (*Cygnus bewickii*) and Whistling Swan (*C.columbianus*) overlap on the site (Kishchinsky *et al*., 1975). A small number of White-fronted Geese (*Anser albifrons*) breed on the tundra surrounding the southern part of Kolyuchinskaya Bay. Moulting geese sometimes form large congregations. In the 1970s almost 3,500 Snow Geese (*Chen hyperboreum*) used to come for moulting at the sides of Kolyuchinskaya Bay (Krechmar *et al*., 1978). An aerial study undertaken in July and August 1992 has demonstrated the presence of almost 2,000 Emperor Geese and as many as 1,500 Black Brants (Eldridge *et al*., 1993). The most common breeding species on the tundra around Koluchinskaya Bay are Pintail (*Anas acuta*), Long-tailed Duck (*Clangula hyemalis*), and Pacific Eider (*Somateria mollissima v.-nigrum*). Red-breasted Merganser (*Mergus serrator*) keeps on riverbeds, while Willow Grouse (*Lagopus lagopus*) and Sandhill Crane (*Grus canadensis*) are spread over river valleys. The most characteristic breeding waders include Pacific Golden Plover (*Pluvialis fulva*), Dotterel (*Eudromias morinellus*), Red-necked Stint (*Calidris ruficollis*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) is a relatively rare breeder at the sides of lagoons. Kittlitz's Murrelet (*Brachyramphus brevirostris*) frequently occurs in the southern part of Kolyuchinskaya Bay and is supposed to nest in the surrounding mountains (Krechmar *et al*., 1978). Herring Gull (*Larus argentatus*) forms small colonies. The most common passerine birds include Wheatear (*Oenanthe oenanthe*), Bluethroat (*Luscinia svecica*), Arctic Warbler (*Phylloscopus borealis*), Yellow Wagtail (*Motacilla flava*), Red-throated Pipit (*Anthus cervinus*), Arctic Redpoll (*Acanthis hornemanni exilipes*), Lapland Longspur (*Calcarius lapponicus*), and Snow Bunting (*Plectrophenax nivalis*).

The importance of the site for migrating birds:

The valley of the Ionivaam River and the western side of Kolyuchinskaya Bay form a sector of flyway for Snow Goose

during both spring and autumn passage. Emperor Goose migrates across the site towards the Mechigmen Bay in the end of August. The flyway of King Eider (*Somateria spectabilis*) crosses the Ionivaam River valley during its autumn passage towards the Kurupka River (Konyukhov, 1998).

Conservation measures proposed but not yet implemented:

The site satisfies the criteria of the Ramsar Convention and deserves to be granted specially protected area status.

Jurisdiction:

Administration of the Chukotsky District of Chukot Autonomous Area.

3.5. Ioni Lake

Geographical coordinates: 65°52'32"N, 173°45'31"W (head of the Yuniyveem Channel).

Elevation: 38 m a.s.l.

Area: *c.* 30 km^2.

Overview:

Large intermontane lake in the central watershed part of Daurkin Peninsula separating Kolyuchinskaya Bay (the Chukchi Sea Catchment) and Mechigmen Bay (the Bering Sea Catchment).

Wetland type:

By international classification – O, Vt; by national classification 3.7.2.1, 3.8.1.4 (large oligotrophic lake in the mountain tundra landscape and the adjacent plainlands with thermokarst water bodies).

General location:

The lake is situated on the territory of the Chukotsky Administrative District of the Chukot Autonomous Area. It occupies the central part of the Kolyuchinsko-Mechigmensky tectonic bend and belongs to the Ionivaam River Basin. The lake is connected to the river by the 6 km long Yuniyveem Channel. It is 102 km from the nearest settlement (Lorino) and 123 km from the district centre (Lavrentiya).

Physical and ecological features of the site:

Lake Ioni fills a swampy intermontane hollow enclosed between the Ioni (702 m a.s.l.) and Gilmimliney (665 m a.s.l.) mountain massifs. The hollow is a part of the larger Kolyuchinsko-Mechigmenskaya Depression that separates the bedrock structures of the Okhotsk-Chukot volcanogenic belt from the elevated topography of Daurkin Peninsula that dates from the Paleozoic and lies north of the site. The oval-shaped Lake Ioni stretches for a length of 9.8 km from southwest to northeast and is around 3 km in width. The lake is enclosed by gently sloping shores. Its eastern side adjoins a hummocky wetland with numerous shallow thermokarst water bodies whose sand and gravel bottoms are devoid of any aquatic vegetation. The surrounding mountains give rise to a few creeks feeding the lake.

The Yuniyveem Channel flowing out from the southwestern extremity of the lake connects it to the Ionivaam River that opens into Kolyuchinskaya Bay. The river crosses a marsh-ridden plain abounding in oxbows and thermokarst lakes. The ice cover on Lake Ioni sets in early or mid September and decays in late June.

Noteworthy fauna:

Fish

Lake Ioni is reputed to be a "char lake". It is a winter habitat of anadromous Dolly Varden Trout (*Salvelinus malma*) that weigh as much as 3 kg. The ichthyofauna of the lake also includes Alaska Grayling (*Thymallus arcticus signifer*), Wide-nosed Whitefish (*Coregonus nasus*), and Burbot (*Lota lota natio leuptura*). Alaska Blackfish (*Dallia pectoralis*) inhabits shallow thermokarst lakes with peaty shores scattered around Lake Ioni and over the valley of the Ionivaam River (Postnikov, 1965; Chereshnev, 1996).

Birds

The site is dominated by monotonous hummock tundra and gravelly screes of little value for breeding birds. However, the so-called Kolyuchinsko-Mechigmensky corridor appears to acquire greater importance during the migration seasons of many waterside birds. Unfortunately, regular ornithological studies have never been performed in this area. There is only scant information on the bird fauna of neighbouring territories obtained by direct observation and satellite tracking (Takekawa, 1991). The available data give evidence that Lake Ioni lies on the flyway of certain trans-Beringian migrants, such as Snow Goose (*Chen hyperboreus*), Emperor Goose (*Philacte canagica*), and Sandhill Crane (*Grus canadensis*).

Social and cultural values:

A road for tracked vehicles leads to the lake from the village of Lorino. The small-scale fishing practiced on the lake since 1958 has had a deleterious effect on the local population of Dolly Varden. Reindeer herds graze on the site.

Jurisdiction:

Administration of the Chukotsky District of the Chukot Autonomous Area.

3.6. Lower Chegitun River

Geographical coordinates: 66°33'48"N, 171°04'43"W (Chegitun River mouth).

Elevation: 0-30 m a.s.l.

Area: *c.* 50 km^2.

Overview:

The lower stretch (canyon) of a mountain tundra river with its estuary and adjacent sea lagoon in the eastern part of the Chukot Peninsula. Refugia of relict and endemic Beringian floras; spawning grounds of Dolly Varden Trout (*Salvelinus malma*); habitat of Bering Cisco (*Coregonus laurettae*), a North American species rare on the Asian continent.

Wetland type:

By international classification – J, M; by national classification 1.2.5.1, 1.3.1, 2.5.2 (lower reaches of a mountain-tundra river with estuary and sea lagoon).

General location:

The valley of the Chegitun River is situated within the Chukotsky Administrative District of the Chukot Autonomous Area. The mouth of the river lies at the intersection of the northern coastline of the Chukot Peninsula with the Arctic Circle. It is 45 km from the nearest settlement (the village of Enurmino), 71 km from Uelen, and 103 km from the village of Lavrentiya (district centre).

Physical features:

The Chegitun River rises in the northern slopes of the Genkanyi Range and flows north-westward for about 130 km. Its lower course crosses a low-mountain area with elevations of 250-340 m a.s.l. composed of Ordovician and Lower Devonian limestone and shale. Long stretches of the valley look like shallow canyons and ravines with outcrops of light-yellow bedrock. The estuary formed by the Chegitun River is about 500 m wide and opens into a small lagoon connected to the open sea by a narrow strait. The lagoon is inhabited by a variety of amphipods (*Gammarus spp., Anizogammarus sp., Paralibrotus sp., Nototropis sp., Paratemisio sp.,* etc.), euphausiids (*Euphausiidae*), isopods (*Mesidotea entomon*), and polychaetes.

In the period of fall stormy weather, the Chegitun estuary is dammed by a pebble bar through which the river runoff penetrates almost unobstructed, but fish access to and escape from the river is impeded until the spring flood destroys the bar. In the summer the river mouth is not infrequently blocked by drift ice. Wide slow-water stretches of large Chegitun tributaries (the Tanatap and Koatapvaam Rivers) do not freeze due to the thermal effect of inflowing groundwater, which creates favourable conditions for the wintering stock of Dolly Varden .

Mountain slopes and terrace edges are occupied by shrub tundra with patches of bare gravel-surfaced ground. Characteristic species of the tundra vegetation include *Rhododendron camtschaticum, Dryas ajanensis subsp.ochotensis, Carex nesophila*, and *Luzula beringensis*. Wet sloping hillsides give rise to sedge-cottongrass associations with tussocks of *Carex lugens* and *C.holostoma* interspersed, scattered groups of willows (*Salix polaris* and *S.pulchra*), and spots of herbaceous cover dominated by *Tofieldia pusilla*, *Bekwithia chamissonis, Saxifraga calycina*, etc. Water meadows of the eastern Chukotka have diverse and abundant vegetation including boreal species (e.g. *Galium boreale* and *Rubus arcticus*). River terraces and floodplains are covered with a growth of willows with the predominance of *Salix alaxensis* and *S.lanata*. Many small hollows harbour subnival vegetation (*Loiseleuria procumbens, Diapensia obovata Phyllodoce caerulea*, and *Salix chamissonis* (Yurtsev, 1974). Waterlogged spots in river valleys have a relatively small area. Also, oxbows and thermokarst lakes are rather few.

The site has a maritime Arctic climate. The mean annual air temperature is around -9°C, with temperatures in January and July averaging -11°C and +5°C respectively. The annual precipitation is roughly 350 mm.

Noteworthy flora:

The Chegitun River Basin, bordered by limestone hills, terrigenous, marine, and glacial deposits, occupies an ancient plant speciation area. It is also considered to be the dispersion crossroads of Beringian biotas. This accounts

for the great diversity of the local vegetation. The site forms the western limit of natural habitat for many Beringian-American species. Local floras (100 km^2) of the Middle and Lower Chegitun River include from 300 to 330 species of vascular plants (Yurtsev, 1974). Canyons of the Chegitun River give home to various groups of cryoxerophitic plants, isolated habitats of certain continental Asian and American species, meadows dominated by species of willow, and patches of diverse calcephytic tundras. Isolated localities harbour a variety of rare species, such as *Kobresia filifolia, Carex macrogyna, Cnidium cnidiifolium, Potentilla anachoretica, P.rubricaulis, Salix brachycarpa subsp. niphoclada, Neotorularia humilis, Hedysarum mackenzii, Festuca auriculata, Poa abbreviata, Puccinellia angustata, Braya thorild-wulffii*, etc. The Chegitun River Basin is the only place where endemic *Arabidopsis tschuktschorum* and *A.bursifolia var.beringensis* have been found (Yurtsev *et al*., 1985). Moreover, the basin is one of two areas on the Asian continent where the North American Balsam Poplar (*Populus balsamifera*) is known to occur (Katenin, 1993).

Noteworthy fauna:

Fish

The lagoon and estuary of the Chegitun River are inhabited by Bering Cisco (*Coregonus laurettae*) that is absent or a rare occurrence in other water bodies of the Asian part of Beringia (Chereshnev *et al*., 1989). The river provides important spawning grounds for a large stock of Dolly Varden that is of great value for the local economy (Chereshnev *et al*., 1989). Humpback Salmon (*Oncorhynchus gorbuscha*), as well as some other Pacific salmonids, viz. Chum (*O.keta*), Chinook (*O.tschawytscha*), Sockeye (*O.nerka*), and Taranets' Char (*Salvelinus taranetzi*), also use the Chegitun River for spawning. Asian Rainbow Smelt (*Osmerus eperlanus dentex*), Freshwater Smelt (*Hypomesus olidus*), and Capelin (*Mallotus villosus*) inhabit the lagoon while Alaska Grayling (*Thymallus arcticus signifer*) and Slimy Sculpin (*Cottus cognatus*) occur in the river. Nine-spined Stickleback (*Pungitius pungitius*) is found in lakes along the upper course of the Chegitun River (Chereshnev, 1996).

Birds

A total of 43 bird species have been recorded in the lower and middle reaches of the Chegitun River. Twenty-five of them breed in the area, and 11 more birds are alleged breeders (Streveler, 1991). The most common water birds include Pintail (*Anas acuta*) and Long-tailed Duck (*Clangula hyemalis*). Also common are moulting White-fronted Goose (*Anser albifrons*), breeding Greater Scaup (*Aythya marila*), and Red-breasted Merganser (*Mergus serrator*). Emperor Goose (*Philacte canagica*) and Common Teal (*Anas crecca*) are rare. Rough-legged Buzzard (*Buteo lagopus*) is the most frequently seen bird of prey. Gyrfalcon (*Falco ruficolus*), Peregrine (*F.peregrinus*), and even Golden Eagle (*Aquila chrysaetos*) are breeding birds. The latter species does not occur in any other area of eastern Chukotka. Breeding of White-tailed Eagle (*Haliaeetus albicilla*) was recorded along the middle course of the Chegitun River in 1992 (A.E.Katenin, personal communication). Willow Grouse (*Lagopus lagopus*) and Sandhill Crane (*Grus canadensis*) are widespread over river valleys and foothill areas. Western Sandpiper (*Calidris mauri*) is the most common wader in terms of abundance, followed by Pacific Golden Plover (*Pluvialis fulva*) and Little Stint (*Calidris minutus*). Other breeding waders include Ringed Plover (*Charadrius hiaticula*), Red-necked Stint (*Calidris ruficollis*), and Baird's Sandpiper (*C.bairdii*). Long-tailed Skua (*Stercorarius longicaudus*) and Herring Gull (*Larus argentatus*) are the most common birds in tundra habitats. Short-eared Owl (*Asio flammeus*) is a rare breeding species. The site supports a rather diverse passerine fauna, whose main representatives are Yellow Wagtail (*Motacila flava*), Pechora Pipit (*Anthus gustavi*), Arctic Warbler (*Phylloscopus borealis*), and Arctic Redpoll (*Acanthis hornemanni exilipes*). Less abundant passerine species include Wheatear (*Oenanthe oenanthe*), Bluethroat (*Luscinia svecica*), Lapland Bunting (*Calcarius lapponicus*), Snow Bunting (*Plectrophenax nivalis*), and Raven (*Corvus corax*). Gray-cheeked Thrush (*Catharus minimus*), White Wagtail (*Motacilla alba*), and Water Pipit (*Anthus rubescens*) are even less common but characteristic species at the site.

Mammals

The site is inhabited by Arctic Ground Squirrel (*Citellus parryi*), Northern Pika (*Ochotona hyperborea*), and Varying Hare (*Lepus timidus*). Carnivores are represented by Wolf (*Canis lupus*), Red Fox (*Vulpes vulpes*), Arctic Fox (*Alopex lagopus*), Brown Bear (*Ursus arctos*), Ermine (*Mustela erminea*), and Wolverine (*Gulo gulo*). In the past, Wild Reindeer (*Rangifer tarandus*) was a common occurrence; later it was forced out by herds of domestic reindeer. Bighorn Sheep (*Ovis nivicola*) is common in the upper reaches of the Chegitun River.

Social and cultural values:

A few ancient Eskimo burial sites were excavated in the lower reaches of the Chegitun River containing remains of harpoons and other tools dated from the Punuk period (Dikov, 1977). The Chegitun River Basin experiences neg-

ligible human impact. A small Eskimo settlement existed at the mouth of the river in the past. Today, a few teams of Inchoun fishermen catch Dolly Varden in the river. Mountain tundras along its middle and upper course are used as rangelands by reindeer herders based at the village of Uelen. The river valley, with its peculiar and rough landscape features, presents one of the most beautiful sites on eastern Chukotka that has avoided serious modification by human activities.

Conservation measures taken:

In 1983 the limestone-walled canyons along the Chegitun River were designated the Chegitunsky Nature Monument with the purpose of safeguarding the local endemic and relict floras.

Jurisdiction:

Administration of the Chukotsky District of the Chukot Autonomous Area.

3.7. Uelen and Inchoun Lagoons

Geographical coordinates: 66°09'20"N, 169°48'W (Uusenvaam River mouth).

Elevation: 0-20 m a.s.l.

Area: *c.* 600 km^2.

Overview:

Relatively small marine lagoons on the Arctic coast of Chukotka cut off from the open sea by shingle spits; low-lying seashores with an alternation of thermokarst lakes and sand-pebble ridges; moulting and staging areas for migratory water birds (sea ducks, geese); breeding grounds for rare wader species (e.g. Spoon-billed Sandpiper *Eurynorhynchus pygmeus*).

Wetland type:

By international classification – E, F, J; by national classification – 1.2.5.1, 3.7.2.1 (shallow lagoons of the Chukchi Sea bordered by sand and shingle spits with the adjacent maritime lacustrine-alluvial lowlands).

General location:

The site occupies the territory of the Chukotsky Administrative District of the Chukot Autonomous Area. The south-western side of Uelen Lagoon is formed by the mouth of the Uusenvaam River and its southern and eastern sides by the base of Chukotsky Nos Peninsula. The Inchoun Lagoon cuts 16 km inland and is bordered from the south by the delta of the Uttyvaam River. Both lagoons are separated from the Chukchi Sea by sand and shingle spits. There is a settlement of the same name at the northern side of Inchoun Lagoon. The village of Uelen is situated on the eastern side of Uelen Lagoon. The two settlements are spaced 27 km apart. Uelen lies 84.5 km from Lavrentiya, the administrative centre of the district (115 km by sea).

Physical features:

Uelen Lagoon lies in the midst of an accumulative plain featuring flat-topped and gently sloping surfaces complicated by a variety of landforms that owe their origin to erosive processes and the effects of permafrost. The relief in the immediate proximity to the lagoons is characterized by well-developed spits and swells.

The climate of the site is of the marine subarctic type. The mean monthly air temperature in the period from December to March varies from -21.6 to -17.8°C, with an absolute minimum of -45°C. The area is characterized by an enhanced annual precipitation amounting to 400 mm. Frosts occur as early as the second half of October, when the permanent snow cover is established. Strong winds contribute to the redistribution of snow during the winter and its accumulation in low-lying places where snowdrifts can be as thick as a few metres. Northerly winds prevail throughout the winter season. On average, a total of 74 days with snowstorms occur during the seven months of winter. The spring comes in the second or third week of May, but the snow cover finally disappears completely a month later. The period of daily air temperatures above freezing begins in the middle of June and lasts on average 66 days. Fog is very common (mean 80 days during a year), with misty weather largely occurring in the summer. Air temperatures in June, July, and August average +1,9, +5.5, and +5.3°C respectively.

Ecological features:

The area surrounding the Uelen Lagoon is occupied by northern hypoarctic tundra of the maritime type (Yurtsev, 1974). The zonal vegetation is represented by associations of tussock-forming sedges and cottongrasses. Such tundra communities occur over a relatively small area of a well-drained rolling topography elevated 20-30 m a.s.l. Also, sedge-cottongrass tussocks are well developed on turfed-over sand ridges close to the lagoons and seacoast.

On the whole, the landscape is neither picturesque nor diverse; indeed, the groundcover of the site is dominated by tussock-forming cottongrass, *Eriophorum vaginatum,* interspersed with lichens, mosses, sedges, and dwarf shrubs (Derviz-Sokolova, 1964).

The monotonous appearance of the sedge-cottongrass tussock tundra is broken only by manifestations of cryogenic activity in the form of hollows, runoff troughs, waterlogged depressions, and low-lying beds of tundra creeks. Lowland portions of the maritime landscape, sloping watershed areas, and wide river valleys are occupied by the moss-herb tundra. A high moisture level at such places promotes the development of sphagnum cushions and dense herbaceous vegetation with a dominating admixture of sedges (*Carex stans, C.limosa*), cottongrass (*Eriophorum polystachion*), and willow (*Salix arctica*). Polygonal swamps and hummock-hollow complexes are well-developed locally. The area is rich in thermokarst lakes that are especially numerous in lower river reaches and along oxbow-connecting channels. Depressions in river valleys are occupied by willow thickets of *Salix alaxensis* and *S.krylovii.*

The low shores of the sea and lagoons, as well as the deltaic portion of the Uusenvaam River, are occupied by maritime salt meadows with a thick carpet of *Carex subspathacea* and *Dupontia fischerii*. The meadows are intersected by shingle spits and sea bars overgrown with lime grass.

The most important breeding habitats: The vast area of maritime halophytic meadows provide optimal breeding sites for the majority of diver and anseriform species, including Yellow-billed Diver (*Gavia adamsii*), Whistling Swan (*Cygnus columbianus*), and Emperor Goose (*Philacte canagica*). Other breeding birds in this habitat are waders, such as Grey Phalarope (*Phalaropus fulicarius*), Red-necked Phalarope (*Ph. lobatus*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Moss-herb tundras that occupy low-lying portions of maritime plains and flat watershed areas are inhabited by a variety of waders and passerine birds. Pacific Eider (*Somateria mollissima v.-nigrum*), Ringed Plover (*Charadrius hiaticula*), Glaucous Gull (*Larus hyperboreus*), and Arctic Tern (*Sterna paradisaea*) place their nests on sea and river pebble spits. As well, a small group of birds is in one way or another associated with manmade landscapes. This group includes Pacific Eider, Wheatear (*Oenanthe oenanthe*), White Wagtail (*Motacilla alba*), Arctic Redpoll (*Acanthis hornemanni exilipes*), and Snow Bunting (*Plectrophenax nivalis*).

Noteworthy fauna:

Fish

The ichthyofauna of the Inchoun and Koolenvaam river basins consists of 18 freshwater and anadromous species. The lagoons are visited by Pacific salmonids, including Chum Salmon (*Oncorhynchus keta*), Humpback (*O.gorbuscha*), Chinook (*O.tschawytscha*), Coho (*O.kisutch*), and Sockeye (*O.nerka*). Chars are represented by Dolly Varden (*Salvelinus malma*) and Taranets' Char (*S.taranetzi*), and ciscos by Bering Cisco (*Coregonus laurettae*) and Least Cisco (*C.sardinella*). Freshwater bodies are inhabited by Alaska Grayling (*Thymallus arcticus signifer*) and Alaska Blackfish (*Dallia pectoralis*) (Chereshnev, 1996).

Birds

A total of 95 bird species have been recorded in the vicinity of Uelen and Inchoun Lagoons (Portenko, 1972, 1973; Tomkovich & Sorokin, 1983; Dorogoy, 1991). The most common diver is Pacific Diver (*Gavia pacifica*), while Red-throated Diver (*G.stellata*) and Yellow-billed Diver (*G.adamsii*) are less abundant but very regular inhabitants of the site. Black-throated Diver (*G.arctica*) is a rare bird.

The anseriforms are represented by 18 species, of which Pacific Eider and Long-tailed Duck are the most common. Whistling Swan (*Cygnus columbianus*) breeds at the site in small number, whereas Emperor Goose (*Philacte canagica*) regularly occurs during both breeding and migration seasons. Snow Goose (*Chen hyperboreus*) and Black Brant (*Branta bernicla nigricans*) are frequent passage migrants, but "Asian grey geese", i.e., White-fronted Goose (*Anser albifrons*) and Bean Goose (*A.fabalis*), are accidental visitors. Pintail (*Anas acuta*) and Common Teal (*A.crecca*) are the only dabbling ducks sometimes breeding at the site. Wigeon (*A.penelope*) and Northern Shoveler (*A.clypeata*) are migrating species. Steller's Eider (*Polysticta stelleri*), King Eider (*Somateria spectabilis*), Spectacled Eider (*S. fischeri*), and Pacific Eider are common passage migrants. The latter species breeds in large numbers in the vicinity of the lagoons. Other breeding sea ducks are Long-tailed Duck and Red-breasted Merganser (*Mergus serrator*). Greater Scaup (*Aythya marila*) and White-winged Scoter (*Melanitta deglandi*) are accidental visitors.

Among raptors, breeding has been documented for Peregrine Falcon (*Falco peregrinus*) alone. Other birds of this group, e.g. Rough-legged Buzzard (*Buteo lagopus*), Golden Eagle (*Aquila chrysaetos*), and Gyrfalcon (*Falco ruficolus*), can be seen around Uelen Lagoon only during post-breeding movements. Certain Gyrfalcons come to the site from Alaska. Hummocky tundra scrublands provide habitats for Willow Grouse (*Lagopus lagopus*) and Sandhill Crane (*Grus canadensis*).

Eastern Chukotka is the area where ranges of certain Asian and North American waders overlap. The fauna of Arctic waders is especially rich in the vicinity of Uelen Lagoon. It is first of all true of Calidrine sandpipers (*Calidris spp.*). The most common breeding species include Pacific Golden Plover (*Pluvialis fulva*), Grey Phalarope (*Phalaropus fulicarius*), Ruddy Turnstone (*Arenaria interpres*), Rock Sandpiper (*Calidris ptilocnemis*), Western Sandpiper (*C.mauri*), Red-necked Stint (*C.ruficollis*), Baird's Sandpiper *C.bairdii*), and Dunlin (*C.alpina*). Less abundant breeding species are Ringed Plover (*Charadrius hiaticula*), Red-necked Phalarope (*Phalaropus lobatus*), Ruff (*Phylomachus pugnax*), Little Stint (*Calidrius minutus*), Temminck's Stint (*C.temminckii*), Pectoral Sandpiper (*C.melanotos*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Grey Plover (*Pluvialis squatarola*) and Dotterel (*Eudromias morinellus*) are rare breeding species.

Breeding skuas and gulls are represented by Long-tailed Skua (*Stercorarius longicaudus*), Herring Gull (*Larus argentatus*), and Glaucous Gull (*L.hyperboreus*). Less abundant are Pomarine Skua (*Stercorarius pomarinus*), Arctic Skua (*S.parasiticus*), and Arctic Tern (*Sterna paradisaea*). Sea spits and lagoons are regularly visited by Kittiwakes (*Rissa tridactyla*) and (in the autumn) by nomadic Ross's Gull (*Rhodostethia rosea*).

Alcids occur in seabird colonies in the vicinity of the site. They include Pigeon Guillemot (*Cepphus columba*), Brunnich's Guillemot (*Uria lomiva*), Common Guillemot (*U.aalge*), Crested Auklet (*Aethia cristatella*), Least Auklet (*Ae.pusilla*), Parakeet Auklet (*Cyclorhynchus psittacula*), Horned Puffin (*Fratercula corniculata*), and Tufted Puffin (*Lunda cirrhata*).

The most characteristic passerine birds on the site are Yellow Wagtail (*Motacila flava*), Red-throated Pipit (*Anthus cervinus*), Wheatear (*Oenanthe oenanthe*), and Lapland Bunting (*Calcarius lapponicus*). Other regular breeders include White Wagtail (*Motacilla alba*), Pechora Pipit (*Anthus gustavi*), Arctic Redpoll (*Acanthis hornemanni exilipes*), Raven (*Corvus corax*), and Snow Bunting (*Plectrophenax nivalis*). The latter species is especially abundant during spring migration.

The importance of the site for migrating birds:

The Bering Strait and its coasts are among the most important bird migration areas in the northern hemisphere. During seasonal passage, Uelen Lagoon is visited by numerous sea ducks (all Eider species and Long-tailed Duck) and geese that winter in the western hemisphere – Black Brant, Emperor Goose, and Snow Goose. The latter is frequently seen on hillside patches of thawed ground in the vicinity of the village of Inchoun during spring passage. Pintail is a common migrating dabbling duck, while Pacific Golden Plover and both Phalarope species prevail among waders.

The importance of the site as an area inhabited by economically valuable birds and mammals:

Common Eider and Long-tailed Duck are regular breeders and very abundant migrants at the area adjacent to Uelen Lagoon. In some years the same is true of Pintail. Some North American birds are regular or accidental visitors of the site. These are Spotted Sandpiper (*Actitis macularia*), Semipalmated Sandpiper (*Calidris pusillus*), Eastern Fox Sparrow (*Passerella iliaca*), and Savannah Sparrow (*Ammodramus sandwichensis*). Commercially important mammals include Arctic Fox (*Alopex lagopus*) and Red Fox (*Vulpes vulpes*). Brown Bear (*Ursus arctos*) visits the site in the summer, and Polar Bear (*U. maritimus*) visits in winter. Seasonal breeding grounds are formed by Walruses (*Odobenus rosmarus*) on sea spits.

Jurisdiction:

Administration of the Chukotsky District of the Chukot Autonomous Area.

3.8. Lake Koolen

Geographical coordinates: 65°59'04"N, 170°58'47"W (head of the Koolenvaam River).

Elevation: 42 m a.s.l.

Area: *c.* 20 km^2.

Overview:

Scenic lake of tectonic origin dammed by a morainic ridge and connected to the Chukchi Sea Catchment by the Koolenvaam River flowing into Uelen Lagoon.

Wetland type:

By international classification – O; by national classification 3.8.1.4 (oligotrophic lake of tectonic origin in the mountains of eastern Chukotka).

General location:

Lake Koolen is situated in the mountains of the eastern part of the Chukotka Peninsula, on the territory of the Chukotsky Administrative District of the Chukot Autonomous Area. The distance from the nearest populated centre (Lavrentiya) is 44 km. The distance in a straight line to the

seacoast (head of Lavrentiya Bay) is 13 km. The site lies 65 km from the village of Uelen (by sea).

Physical and ecological features of the site:

Lake Koolen is a deep water body about 15 km in length, with a maximum width of 1.5 km. It fills a tectonic hollow transformed by later glacial activity at the northern side of the Ainan Range that separates the lake from the Bering Sea coast (Pouten Bay). The surrounding mountains are built of Archean gneisses, crystalline schists, and amphibolites. Their summits rise to elevations of 700-900 m a.s.l. (Mountain Yttyvyt 939 m).

The lake is lengthened in a sublatitudinal direction. Its western part is up to 100 m deep. The lake receives almost 20 small creeks of which most dry up in the summer. Only two major permanent creeks emptying into the western part of the lake (Endoyguem and Gytgykoymavaam) form relatively broad valleys covered with shrub vegetation. The lake gives rise to the Koolenvaam River, called Uusenvaam in its lower reaches. The total length of this water course is 41 km.

Portions of the hilly shrub-herb tundra at the head of the Koolenvaam River are of primary importance for breeding birds. This area abounds in thermokarst lakes and provides favourable breeding sites to divers, anseriforms, and charadriiforms. Bedrock outcrops at the western extremity of the lake are occupied by breeding Gyrfalcon (*Falco rusticolus*). Willow thickets in creek valleys opening into the western part of the lake make up a preferred habitat of Gray-cheeked Thrush (*Catharus minimus*) and some other passerine birds.

The continentality of the climate is clearly seen in the lake basin. The number of calm, sunny days is relatively large. In summer, fog is not as frequent over the lake basin as it is at the nearest seacoast and winds are not as strong in the winter. According to records of the meteorological station in Lavrentiya Bay the mean monthly air temperature in the period from December to March varies from –15.9 to –18.4°C, with an absolute minimum of –43°C. The mean duration of the frostless period is 73 days. Mean monthly temperatures below freezing persist from the 20th of October until about May 11. The mean air temperature in June is +3.9°C and in August +7.3°C. The permanent snow cover sets in the first ten days of October and disappears in late May. Snow drifts in intermontane hollows persist until mid July.

Noteworthy flora:

Territories in the immediate proximity to Lake Koolen are gently rolling plains occupied by shrub-herb tundra with a predominance of *Salix polaris, S.pulchra, Dryas punctata* and a variety of herbs (*Saxifraga punctata, S. hirculus, S.cernua, Pedicularis sudetica*, and *P.langsdorffii*). Wet spots are dominated by hummocky moss-sedge-cottongrass tundra with a prevalence of *Carex lugens* and *Eriophorum polystachion*. Valleys of large creeks at the western side of the lake are overgrown with willow thickets as high as 3-3.5 m with scattered Manchurian alder shrubs (*Duschekia fruticosa*). Most mountain slopes have practically no vascular plants in their groundcover, which largely consists of lichens (*Cetraria spp., Cladonia spp., Thamnolia spp.*).

Noteworthy fauna:

Invertebrates

The zooplankton of Lake Koolen is dominated by *Cyclops scutifera* and *Eudiaptomus sp.*

Fish

The Uusuenvaam-Koolen river-lake system provides spawning grounds to Pacific salmonids, such as Chum Salmon (*Oncorhynchus keta*), Humpback (*O.gorbuscha*), Chinook (*O.tschawytscha*), Coho (*O.kisutch*), and Sockeye (*O.nerka*). Chars are represented by Dolly Varden (*Salvelinus malma*) and Taranets' Char (*S.taranetzi*), ciscos by Bering Cisco (*Coregonus laurettae*) and Least Cisco (*C.sardinella*). Other species include Alaska Grayling (*Thymallus arcticus signifer*), Alaska Blackfish (*Dallia pectoralis*), Burbot (*Lota lota natio leuptura*), and Slimy Sculpin (*Cottus cognatus*) (Skopets, 1991; Chereshnev, 1996).

Birds

A total of 62 bird species have been recorded in the vicinity of Lake Koolen (Portenko, 1972, 1973; Tomkovich & Sorokin, 1983; Dorogoy, 1991). The most common divers are Pacific Diver (*Gavia pacifica*) and Red-throated Diver (*G.stellata*), whereas White-billed Diver (*G.adamsii*) and Black-throated Diver (*G.arctica*) are rare breeding birds. Big water birds are represented by Emperor Goose (*Philacte canagica*) alone, which regularly nests along the Middle Koolenvaam River. Another water bird breeding at the site in a smaller number is Snow Goose (*Chen hyperboreus*). Black Brant (*Branta bernicla nigricans*), Canada Goose (*B. canadensis minima*), White-fronted Goose (*Anser albifrons*), and Bean Goose (*A.fabalis*) are accidental visitors. The most abundant ducks include Pacific Eider (*Somateria mollissima v.-nigrum*), Pintail (*Anas acuta*), and Long-tailed Duck (*Clangula hyemalis*). Greater Scaup (*Aythya marila*) and Red-breasted Merganser (*Mergus serrator*) are less frequent breeders. Sreller's Eider (*Polysticta stelleri*), King Eider (*Somateria spectabilis*), Spectacled Eider (*S. fischeri*), and Black-winged Scoter (*Melanitta americana*) are rare accidental visitors.

Breeding by birds of prey at the site has been documented for Gyrfalcon (*Falco rusticolus*) alone. Peregrine Falcon (*F. peregrinus*) and Rough-legged Buzzard (*Buteo lagopus*) sometimes visit the lake basin (the former breeds in the lower reaches of the Koolenvaam River). Willow Grouse (*Lagopus lagopus*) and Sandhill Crane (*Grus canadensis*) are as common at the site as over the entire Chukotka Peninsula.

The most characteristic wader species at the site are Pacific Golden Plover (*Pluvialis fulva*), Ringed Plover (*Charadrius hiaticula*), Red-necked Phalarope (*Phalaropus lobatus*), Grey Phalarope (*Ph. fulicarius*), and Western Sandpiper (*Calidris mauri*). Lesser Sand Plover (*Charadrius mongolus*) is a rare breeder at the site that forms the northeastern limit of its geographic range. Ruddy Turnstone (*Arenaria interpres*), Red-necked Stint (*Calidris ruficollis*), Baird's Sandpiper (*C.bairdii*), Dunlin (*C.alpina*), Temminck's Stint (*C.temminckii*), Pectoral Sandpiper (*C.melanotos*), Knot (*C.canutus*), and Short-billed Dowitcher (*Limnodromus scolopaceus*) have their breeding sites at the western side of Lake Koolen. Occasional visitors include Lesser Yellowlegs (*Tringa flavipes*), Terek Sandpiper (*Xenus cinereus*), Great Knot (*Calidris tenuirostris*), and Common Snipe (*Gallinago gallinago*).

Breeding skuas are represented by Long-tailed Skua (*Stercorarius longicaudus*) and Arctic Skua (*S.parasiticus*), the former very common and the latter relatively rare. Herring Gull (*Larus argentatus*) is a less common breeder, while Pomarine Skua (*Stercorarius pomarinus*), Glaucous Gull (*Larus hyperboreus*), and Arctic Tern (*Sterna paradisaea*) visit the site but fail to breed within its boundaries.

Snowy Owl (*Nyctea scandica*) sometimes breeds at the site, while records of Short-eared Owl (*Asio flammeus*) remain to be clarified.

The most numerous passerine birds are Yellow Wagtail (*Motacila flava*), Bluethroat (*Luscinia svecica*), Red-throated Pipit (*Anthus cervinus*), Lapland Bunting (*Calcarius lapponicus*), Arctic Redpoll (*Acanthis hornemanni exilipes*), and Snow Bunting (*Plectrophenax nivalis*). Grey-cheeked Thrush (*Catharus minimus*) is common on shrub-dominated floodplains at the western side of Lake Koolen. Less frequently seen passerines include White Wagtail (*Motacilla alba*), Pechora Pipit (*Anthus gustavi*), Wheatear (*Oenanthe oenanthe*), Dusky Thrush (*Turdus eunomus*), Arctic Warbler (*Phylloscopus borealis*), and Raven (*Corvus corax*).

The role of the region as a moulting site: only small groups of moulting Eiders and Long-tailed Ducks have been observed in the central part of the lake in the summer months.

Mammals

The site is inhabited by American Ground Squirrel (*Citellus parryi*), Arctic Fox (*Alopex lagopus*), and Brown Bear (*Ursus arctos*). Wolverine (*Gulo gulo*) occurs as a rare visitor.

Jurisdiction:

Administration of the Chukotsky District of the Chukot Autonomous Area.

3.9. Seabird Colonies on the Chukchi Sea Coast (from Cape Yakan to Cape Dezhnev)

The coastline of the Chukotka Peninsula from Cape Yakan to Cape Dezhnev extends for 930 km. There are 15 sites inhabited by seabirds on the coast and islands of the Asian part of the Chukchi Sea.

Colonies are formed by 10 bird species, viz. Pelagic Cormorant (*Phalacrocorax pelagicus*), Glaucous Gull (*Larus hyperboreus*), Herring Gull (*L. argentatus*), Kittiwake (*Rissa tridactyla*), Brunnich's Guillemot (*Uria lomiva*), Common Guillemot (*U. aalge*), Horned Puffin (*Fratercula corniculata*), Black Guillemot (*Cepphus grylle*), Pigeon Guillemot (*C. columba*), and Tufted Puffin (*Lunda cirrhata*). The total number of seabirds in the colonies is estimated at approximately 130,000. The largest colonies are situated in the eastern part of Wrangel Island and on Gerald and Kolyuchin islands. Mainland colonies are known to exist only near Cape Ingkugur. Colonies are protected on Wrangel and Gerald islands, which are designated as strict nature reserve and difficult to access.

Cape Uering (71°14'N, 177°27'W) – colonies occur on the cliffs north and south of the easternmost point of Wrangel Island. The total number of breeding birds amounts to 200,000 individuals. The dominant species is Brunnich's Guillemot (*c.* 25,000 pairs); it is followed by Kittiwake and Black Guillemot (500-1,000 pairs). Other breeding birds are Pelagic Cormorant, Glaucous Gull (about 1,000 pairs), Horned Puffin, and Tufted Puffin (Velizhanin, 1978; Stishov *et al*., 1991).

Gerald Island (71°22'N, 165°43'W) – an almost 226 m high rocky island, 11.5 km in length and 2.7 km in width, situated in the northern part of the Chukchi Sea 65 km from Wrangel Island. Colonies are formed by

Pelagic Cormorant, Glaucous Gull, Kittiwake, Common, Brunnich's, and Black Guillemots. Brunnich's and Black Guillemots predominate. The total number of birds is estimated at 90,000-120,000 individuals. (Velizhanin, 1978; Stishov *et al*., 1991).

Cape Vankarem (67°50'N, 175°45'W) – low cliffs and large boulders 2 km from the village of Vankarem occupied by scattered pairs of Black Guillemot (15 pairs) and a few pairs of large gulls (Kondratyev, 1997).

Cape Onman (67°40'N, 175°15'W) – granite precipices 70-80 m in height situated 30 km southeast of Vankarem with a small breeding colony of Pelagic Cormorants, large gulls, Black Guillemot, and Horned Puffin (Kondratyev, 1997).

Cape Keleneut (67°35'N, 175°15'W) – a stretch of coastal rocks south-west of Vankarem with a small colony of Pelagic Cormorant (5-6 pairs), large gulls, Black Guillemot (10 pairs), and Horned Puffin (10 pairs) (Kondratyev, 1997).

Kolyuchin Island (67°27'N, 174°37'W) – offshore island north of Kolyuchinskaya Bay (12 km from the mainland). Large colonies of seabirds, including Pelagic Cormorant, large gulls, Kittiwake, Brunnich's and Common Guillemots, Horned Puffin, and Tufted Puffin. The total number of birds is estimated at 15,000-18,000 individuals (See Section 3.2).

Cape Taetgyn (66°35'N, 174°15'W) – low rocky precipices at the rear of Kolyuchinskaya Bay occupied by Herring Gulls (100 pairs) (Kondratyev, 1997).

Cape Dzhenretlen (60°07'N, 173°40'W) – rocky cape 30 km from Cape Heshkan inhabited by single pairs of Pelagic Cormorant, large gulls, Black Guillemot, and Pigeon Guillemot (Kondratyev, 1997).

Idlildlya Island (67°04'N, 172°47'W) – rocky islet 1.8 km from the Neshkan Lagoon and 8 km from the village of Neshkan. Colonies of large gulls (30-40 pairs) and Kittiwakes (800 pairs), single pairs of Brunnich's and Common Guillemots, and Horned Puffin (Kondratyev, 1997).

Cape Serdtse-Kamen' (66°55'N, 171°45'W) – rocky cape on the Arctic coast of Chukotka 11 km from the village of Enurmino supporting a small colony of Glaucous Gull (60 pairs), Pelagic Cormorant, and Horned Puffin (a few pairs) (Kondratyev, 1997).

Cape Inkigur (66°45'N, 171°20'W) – rocky cape 25 km northwest of the Chegitun' River mouth with colonies of Pelagic Cormorant (180 pairs), large gulls (30 pairs), Kittiwake (600 pairs), Brunnich's and Common Guillemots (3,000 pairs), Pigeon Guillemot (35 pairs), Horned Puffin (35 pairs) and Tufted Puffin (25 pairs) (Kondratyev, 1997).

Cape Kipetlen (66°38'N, 171°10'W) – rocky precipices 5 km northwest of the Chegitun river estuary populated with Brunnich's and Common Guillemots (3,200 pairs) and several pairs of Pelagic Cormorant, Glaucous Gull, Black Guillemot, Horned Puffin and Tufted Puffin (Kondratyev, 1997).

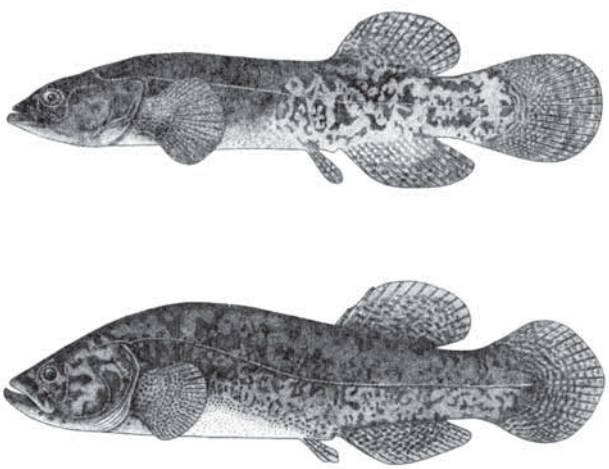
Cape Volnisty (66°30'N, 170°45'W) – rocky cape 10 km southeast of the mouth of the Chegitun' River inhabited by Pelagic Cormorant (36 pairs), Glaucous Gull (100 pairs), Brunnich's and Common Guillemots (220 pairs), Kittiwake (120 pairs), Pigeon Guillemot (20 pairs) (Kondratyev, 1997).

Cape Inchoun (66°18'N, 170°15'W) – rocky cape 4 km southeast of the village of Inchoun with a small colony of Kittiwake (50 pairs) and isolated nests of Pelagic Cormorant, Glaucous Gull, Brunnich's and Common Guillemots, Pigeon Guillemot, Horned Puffin, and Tufted Puffin (Kondratyev, 1997).

Cape Kekurny (66°15'N, 170°11'W) – rocky precipices 6 km southeast of the village of Inchoun with colonies of Pelagic Cormorant (120 pairs), Glaucous Gull (30 pairs), Kittiwake (35 pairs), Pigeon Guillemot (35 pairs), Horned Puffin (15 pairs), and isolated nests of Herring Gull, Tufted Puffin, and Brunnich's and Common Guillemots (Kondratyev, 1997).

Lake in the lower reaches of the Amguema River *(G.I.Atrashkevich)*.

Spoon-billed Sandpiper *(A.V.Krechmar)*.



Amguema Blackfish *(drawn by I.A.Chereshnev)*.

Belyaka Spit *(A.V.Krechmar)*.

Coast of the Chukchi Sea near Uelen *(A.V.*And*reev)*.

Mouth of the Ioniveem River *(A.V.*And*reev)*.

Black Brants *(A.V.Krechmar)*.

4. Bering Sea Catchment

4.1. Mechigmen Bay

Geographical coordinates: 65°28'45"N, 171°05'22"W (northern tip of Mechigmen Spit).

Elevation: 0-50 m a.s.l.

Area: *c.* 1,500 km^2.

Overview:

Large sea gulf with adjacent lacustrine-alluvial plains and lower reaches of rivers emptying into the bay; staging and breeding areas for waders and other water birds, including Spoon-billed Sandpiper; habitats for an endemic form of Three-spined Stickleback (*Gasterosteus aculeatus*) adapted to hot springs.

Wetland type:

By international classification – A, E, F, G, H, Q, Vt, Zg; by national classification – 1.2.1.3, 1.2.3, 2.5.1.1, 3.7.2.1 (shallow sea gulf with vast intertidal silt flats and the adjacent portions of delta and lacustrine-thermokarst plains; localities of hydrothermal activity).

Ramsar Criteria: 1, 3, 5, 7.

Justification for the application of selected criteria:

The site exhibits the entire spectrum of wetlands characteristic of the Asiatic part of Beringia, including intertidal flats, brackish marshes, delta and lacustrine-alluvial plains. The area provides staging, breeding, and moulting grounds for a considerable number of water birds, such as Snow Goose (*Chen hyperboreus*), Emperor Goose (*Philacte canagica*), and Eiders (*Somateria spp*.). The Igelkhveem River Basin is home to a unique population of Three-spined Stickleback that live in hot springs.

General location:

The site lies within the boundaries of the Chukotsky Administrative District of the Chukot Autonomous Area. The nearest populated place is the village of Lorino on the eastern boundary of the site. The distance from the district centre (settlement of Lavrentiya) is 31 km.

Physical and ecological features of the site:

The site is situated at the south-eastern periphery of the Kolyuchinsko-Mechigmensky tectonic bend. Maritime plains are formed by marine sediments of the Upper Quaternary Period and the surrounding mountains by older deposits (Mesozoic andesites, Triassic schists, Upper Cretaceous sandstones, and Mesozoic effusive rocks). The mountains are 400-600 m high and lie at different distances from the bay. Mechigmen Bay is separated from the Bering Sea by two pebble spits, Raupelyan (17 km) and Mechigmen (13 km), spaced apart by a 500 m wide strait. The bay is 33-35 km long and 6-9 m deep (southern portion). The water level is subject to tidal variations of approximately 1 m. There is a rocky islet, Ilir, in the southern part of the bay (height 55 m, length 3.5 km, width 1.8 km). Also, this part receives a few small rivers, of which the largest (Utaap) extends for 60 km to the southwest.

The area is virtually unexplored by ecologists. The catchment area of the northern part of Mechigmen Bay is approximately 6,000 km^2. A few relatively large rivers empty at the head of the bay (Tepengeveem, Ieniveem, Vytkhrgyveem, and Igelkhveem). The largest of these, the Igelkhveem River, flows for about 150 km from the north. The lower reaches of these rivers form vast lacustrine-alluvial plains that occupy about 700 km^2 in the northern part of the site and roughly 150 km^2 in its southern part. As the tide ebbs, large areas of intertidal silt flats become exposed along the shoreline. Vast areas of wet sedge-cottongrass swamps and marshes are a characteristic landscape feature at the northern side of the bay.

Gil'mimliney Thermal Mineral Springs, the largest ones in northeastern Asia, are situated in the Igelkhveem River Basin 30 km northwest of Mechigmen Bay. They produce water (+85°C) with a high content of sodium and chlorides at an estimated output level of 80 l/s (Zelenkevich, 1963). The absence of permafrost in the vicinity of hot springs has facilitated the formation of a large microclimatic oasis with a rich relict thermophilic flora.

The site has a marine subarctic climate. The mean annual air temperature is –6.6°C. Mechigmen Bay becomes icebound since late October. The mean temperature in January is –17.5°C. The ice breaks up in mid June. Mean July temperature is +6,6°C.

Noteworthy flora:

The maritime plains surrounding Mechigmen Bay are covered with a sedge-cottongrass hummocky topography and moss tundra. Wet meadows with *Carex subspathacea* and *Dupontia fischeri* occur along the shoreline. Elevated places are dominated by mountain lichen and heath tun-

dras. Highlands are stone deserts, while river valleys give rise to dense willow thickets (*Salix alaxensis*).

The unique thermophilic flora is concentrated in the vicinity of the Gil'mimliney hydrotherms. Boreal-oceanic forms found nowhere else on the Chukot Peninsula make up an appreciable fraction of this vegetation. They include *Gymnocarpium dryopteris, Botrychium lanceolatum, Ruppia maritima, Puccinellia hauptiana, Bolboschoenus planiculmis, Chenopodium glaucum, Juncus filiformis, Tillaea aquatica*, etc, (Yurtsev, 1981).

Noteworthy fauna:

Fish

Water bodies in the area around the Mechigmen Bay are inhabited by 15 species of fish (Chereshnev, 1996). The bay itself is home to Pacific salmon (*Oncorhynchus spp.*), Dolly Varden (*Salvelinus malma*), and Capelin (*Mallotus villosus*). The inhabitants of lakes in the lower reaches of the Ieniveem River include Alaska Blackfish (*Dallia pectoralis*), Arctic Grayling (*Thymallus arcticus pallasi*), Burbot (*Lota lota natio leptura*), and Nine-spined Stickleback (*Pungitius pungitius*). Taranets' Char (*Salvelinus taranetzi*) and Least Cisco (*Coregonus sardinella*) occur in the lower reaches of the Utaap River.

An isolated population of relic Three-spined Stickleback inhabits hydrotherms with a temperature from +25 to +45°C in the Upper Gil'mimliveem River (Igel'khveem Basin). The fish is morphologically different from the typical form of anadromous Three-spined Stickleback entering the lower section of the Igel'khveem and Mechigmen Bay. The water of the hydrothermal pools resembles seawater in terms of chemical composition, but it is hot and saturated with dissolved hydrogen sulphide. The "thermoresistant" stickleback population was automatically isolated by a waterfall on the Gil'mimliveem River created during marine transgressions of the Middle Pleistocene period (Chereshnev, 1983).

Birds

Tundra habitats in the vicinity of Mechigmen Bay are regularly visited by migrating Snow Geese. In spring, the birds gather at thawed patches around hot springs. The southern part of the bay provides moulting sites for a small number of Emperor Goose and Black Brant (*Branta bernicla nigricans*). In the past, these birds were much more abundant, and residents caught them with nets (Portenko, 1973; Konyukhov, 1998). The seaward side of the bay and its waters are a moulting area for many eiders: Pacific Eider (*Somateria mollissima v.-nigrum*), Spectacled Eider (*S.fischeri*), and King Eider (*S.spectabilis*). The latter species is the most common.

Numerous waders place their nests on the shores of lakes and sea lagoons. Most characteristic are Baird's Sandpiper (*Calidris bairdii*), Rock Sandpiper (*C.ptilocnemis*), and Western Sandpiper (*C.mauri*). Rare Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) also breeds in this area.

Social and cultural values:

The environs of Mechigmen Bay lie within the core range of traditional Eskimo cultures. A large settlement of sea-hunters (Masik) existed until recently at the southern base of Mechigmen Spit.

4.2. Senyavin Straits

Geographical coordinates: 64°36'33"N, 172°20'48"W (Ittygran Island).

Elevation: 0-613 m a.s.l. (Mountain Athos on Arakamchechen Island).

Area: *c.* 1,200 km^2.

Overview:

Offshore islands, straits, and fjords near the south-eastern extremity of the Chukot Peninsula; rookeries of Walrus (*Odobenus rosmarus*); seabird colonies; part of a transcontinental migration route for birds; feeding grounds for Gray Whale (*Eschrichtius gibbosus*); monuments of the ancient Eskimo culture; one of the most attractive scenic sites of Chukotka.

Wetland type:

By international classification – A, D, E, M, Vt, Zg; by national classification – 1.1.2.1, 1.2.2, 2.5.2, 3.7.2.1 (rocky seacoasts, sea straits, mountain streams, stretches of maritime lacustrine-palustrine plains in the tundra zone; hydrotherms).

Ramsar Criteria: 1, 2, 3, 4.

Justification for the application of selected criteria:

The Senyavin Straits are important for transcontinental migrants and colonial seabirds and provide feeding and staging grounds for sea mammals such as Gray Whale, Beluga Whale (*Delphinapterus leucas*), and Pacific Walrus; Arakamchechen and Yttygran Islands harbours a rich Arctic flora of vascular plants.

General location:

The straits and the archipelago are located off the southeastern extremity of Daurkin Peninsula (Providensky Administrative District of the Chukot Autonomous Area). The distance from the nearest settlement is 27 km (between the lighthouse on Arakamchechen Island and the village of Yanrakynnot), while the distance in a straight from the district centre (Provideniya) is 65 km (135 km by sea).

Physical features:

The site is situated in the centre of the Beringian sector of the Arctic and has a long history of complicated and contrasting geomorphological changes. When the Arctic shelf repeatedly became exposed during sea regressions, the site proved to be an inner portion of the vast Beringian land bridge with a pronounced continental climate and tundra-steppe landscape. In periods of marine transgressions, a maritime climate prevailed over the entire area (as it does now), and the shallow Bering Strait connected the Pacific Ocean to the Arctic basin. The Beringian land experienced no sheet glaciation, but witnessed the development of mountain and valley glaciers and featured a variety of relief forms, such as peaked mountains, plateaus, intermontane depressions, treeless plains, deep fjords, shallow-water lagoons, and sea spits.

The site lies in the area of high tectonic activity and is therefore characterized by the mosaic composition of alluvial and magmatic rocks. Paleozoic sandstones and schists, limestones, marbles, acid and basic intrusions (Late Cretaceous granites and gneisses) occur locally. A characteristic feature of the site is the so-called "keyboard" pattern superimposed on the landscape in the form of alternating horsts (peninsulas) and grabens (bays) coupled to frequent manifestations of residual volcanic activity (hydrothermal veins).

The site encompasses Senyavin Strait (named by F.P.Litke after the sloop Senyavin in 1828), adjacent fjords (Rumilet, Aboleshev, and Penkigney Bays), two large islands (Arakamchechen and Ittygran), and a few smaller ones. The coastline arcs westward, giving place to the islands. It is cut by numerous bays and inlets. The site extends for almost 60 km from north to south (between Cape Kivak and the village of Yanrakynnot) and for about 55 km from west to east (between Cape Kiginin on Arakamchechen Island and the Pestsovaya River emptying into the Penkigney Bay). The total length of the coastline (including that of the mainland and islands) is more than 315 km. The islands vary in size from 1 km^2 (Nuneangan Rock) to 17 and 35 km^2 (Ittygran and Arakamchechen respectively). The highest point of the site is Mount Athos (613 m a.s.l.) on Arakamchechen Island. The shores of the straits are largely steep, with screes and taluses; some stretches have gravelly spits.

The width of the straits varies from 1.7 (Chechekuiym Strait) to 9 km (between Arakamchechen and Yanrakynnot). The nearshore waters are usually 30-40 m deep (up to 90 m in Penkigney Bay). The average interval between consecutive high tides is about 12 hours, and the tidal range is roughly 1.0-1.5 m.

The site has two small hot springs with water containing large amounts of sodium and chlorides. One of them, Senyavinsky, with a water temperature of approximately +80°C is located in the Klyuchevaya River valley (Aboleshev Bay) some 1.5 km from the seacoast. The other, Arakamchechensky, with a water temperature of +31°C is in the mountainous portion of Arakamchechen Island (Zelenkevich, 1963).

The site has a cool but relatively mild oceanic climate. The difference between seasonal temperatures does not exceed 40°C. According to the records of the nearest weather station (Provideniya Bay), the mean annual air temperature is –4.9°C. The mean temperature in January is –15.2°C, with an absolute minimum of –42°C, and the mean temperature in July is +7.7°C (maximum +21°C). The period with air temperatures above zero is 68 days. Frequent mists and gales occur in summer, while snowstorms and movements of sea ice are usual in the winter. Contrasting aspects of the local climate depend on the location of mountains, wind direction, and frequency of sea fog. The annual rate of precipitation is approximately 530 mm, which falls mostly as snow. The stable snow cover persists as long as 248 days.

There is a current of Arctic water from the north along the western shore of the Bering Strait. The ice cover sets in December but is frequently broken during stormy weather. The ice fields and debris are dispersed by the currents. A stationary polynya beyond the landfast ice belt is regularly formed in wintertime by northerly winds. The ice breaks up in mid June. Drift ice from the Chukchi Sea arrives in the end of June and July.

Ecological features:

Sheltered portions of river valleys broadening into coastal bays (e.g. Penkigney Bay) give rise to the high willow and Manchurian alder brushwood alternating with lush grassy spots. The valley floors are covered with low-shrub tundra. On hillsides, gravelly patches alternate with tundra meadows and subnival vegetation near remaining snow beds. Coastal areas are covered with a sedge-cottongrass hummocky surface and carpet of dwarf willows.

Arakamchechen Island is for the most part a mountainous area. Its upper slopes are stone tundra, while gen-

tly inclined slope bases support moss-shrub tundra associations. In the low-lying eastern part of the island, sedge-tussock tundras with dish-lakes are widespread, with the latter inhabited by Alaska Blackfish (*Dallia pectoralis*).

A few rocky islets (Nuneangan, Kynkay, Achikinkan, and Merkinkan) are occupied by seabird colonies. The largest of these is located on Nuneangan Island (13,000-37,000 individuals).

Plant and animal life in the littoral zone of the Senyavin Straits is relatively poor. Only amphipods (*Gammaroideae*), the favourite food of Gray Whales, are abundant in the layer near the bottom. Sea urchins of the genus *Strongylocentrotus* are found in Penkigney Bay.

Noteworthy flora:

The site was a centre of evolution of cold-resistant elements of the Beringian flora. Over 550 species of vascular plants have been described from the area, whereas other "concrete" floras of eastern Chukotkavary vary in abundance from 310 to 450 species per 100 km^2.

Ten Beringian endemics have been found on the mainland coast and islands of the Senyavin Straits (*Cryptantha spiculifera, Cardamine sphenophylla, Pucciphippsia czukczorum, Oxytropis deflexa, Rumex krausei, Artemisia senjavinensis, Claytoniella vasilievii, Smelowskia porsildii, Taraxacum soczavae,* and *Campanula tschuktschorum*). The Senyavin Straits area is an Asian refuge of 16 North American species. They include *Populus balsamifera, Viburnum edule, Primula egalikensis, Phlox alaskensis, Hedysarum mackenzii*, *Elymus alaskanus, Dryas punctata subsp.alaskensis, Dodecatheon frigidum*, etc. (Yurtsev, 1974).

The shores of the Senyavin Straits are the eastern limit of natural habitat for certain Asiatic plants, such as *Astragalus schelichovii, Claytonia arctica, Ermania parryoides, Rhodiola rosea*, etc. *Puccinellia alaskana, Saxifraga bracteata*, and *Cochlearia oblongifolia* occur only in seabird colonies (Yurtsev, 1974).

A rich relict flora exists in the vicinity of the Senyavin hot springs, where the favourable microclimatic conditions account for the presence of many boreal species. These are *Mentha arvensis, Eleocharis kamtschatica, Juncus bufonius, Carex cryptocarpa, Phegopteris connectilis, Athyrium distentifolium*, etc. Relict *Boschniakia rossica, Ribes triste,* and *Trientalis europaea* occur are found within tall-shrub communities (Yurtsev, 1974).

Noteworthy fauna:

Fish

Lakes on Arakamchechen Island are inhabited by Alaska Blackfish and Nine-spined Stickleback (*Pugnitius pugnitius*). Small rivers and streams are entered by Humpback Salmon (*Oncorhynchus gorbuscha*), Sockeye (*O.nekra*), Dolly Varden (*Salvelinus malma*), and Taranets' Char (*S.taranetzi*). Lake Istikhed near the district administrative centre of Provideniya harbours an endemic form of Arctic Char (*S.alpinus andriashevi*) (Chereshnev, 1996).

Birds

A total of 13 seabird colonies have been reported to exist on the rocky coasts of bays and islands (Bogoslovskaya *et al*., 1988). The largest of these are found on Nuneangan Island (up to 37,000 birds of 9 species), Cape Amago-Mel'got of Ittygran Island (c. 11,000 birds), and Cape Makoguvan on Arakamchechen Island (*c.* 12,000 birds). Most colonies are dominated by Common Guillemot (*Uria aalge*) and Kittiwake (*Rissa tridactyla*). Regular but less numerous species include Pelagic Cormorant (*Phalacrocorax pelagicus*), Glaucous Gull (*Larus hyperboreus*), Herring Gull (*L. argentatus*), Pigeon Guillemot (*Cepphus columba*), Horned Puffin (*Fratercula corniculata*), and Tufted Puffin (*Lunda cirrhata*).

The surrounding mountains in all probability provide breeding sites for Kittlitz Murrelet (*Brachyramphus brevirostris*) (Konyukhov & Zubakin, 1988). Waders find favourable conditions along the shoreline of bays and lagoons and on the mountain tundra. The most characteristic species are Pacific Golden Plover (*Puvialis fulva*), Ringed Plover (*Charadrius hiaticula*), Dotterel (*Eudromias morinellus*), Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*), Red-necked Stint (*Calidris ruficollis*), Baird's Sandpiper (*C. bairdii*), Dunlin (*C.alpina*), Rock Sandpiper (*C.ptilocnemis*), and Western Sandpiper (*C.mauri*) (Dorogoy, 1997).

Large numbers of eiders, Pacific Eider (*Somateria mollissima v.-nigrum*) and King Eider (*S.spectabilis*), gather to moult in Senayvin Straits. Thousands of birds of the latter species were estimated to congregate here (Konyukhov, 1998). Arakamchechen Island is passed by Snow Goose (*Chen hyperboreus*) and Sandhill Crane (*Grus canadensis*) during their migration towards Alaska. Also, the island serves as a stopover site for a small number of migrating Emperor Geese (*Philacte canagica*) (Konyukhov, 1998). The Asian coast of the Bering Sea parallels a flyway for certain waders, including Phalaropes (*Phalaropus spp*.) and sea ducks such as Long-tailed Duck (*Clangula hyemalis*) and Eiders. Massive migration of Short-tailed Shearwater (*Puffinus tenuirostris*) occurs through the Senyavin Straits in August and September.

Mammals

The Senyavin Straits provide feeding grounds for Gray Whales and a small number of Beluga Whales. Killer Whale

(*Orcinus orca*) and Bowhead Whale (*Balaena mysticetus*) are accidental visitors to the Senyavin Straits. There is a Walrus rookery at the seaside of Arakamchechen Island that attracts up to 50,000 animals in August and September. Another rookery is formed on Nuneangran Island.

Social and cultural values:

The great abundance and diversity of sea mammals and birds provided a basis for developing a unique culture that has thrived on the coasts of the Bering Strait since ancient times, with hunting sea-mammals as its key element. Numerous monuments of this culture found in the coastal areas of Chukotka date to different periods, from ancient Beringian (3,000-4,000 years ago) to the recent Eskimo one (100-500 years ago). The archipelago of the Senyavin Straits occurs in the central part of this cultural range, forming a unique natural and cultural complex (Bogoslovskaya *et al*., 1979). At least 17 archaeological sites have been identified in the area featuring remains of the ancient Eskimo culture, such as dwellings, burial places, fortification, and sacred objects. One of the most remarkable examples is the Kitovaya Alleya (Whale Ally) Sanctuary on Ittygran Island, which is built up of skulls, mandibles, and ribs of Bowhead whales (Arutyunov *et al*., 1982).

Current land use:

The site is a part of the territory of traditional nature use practiced by the native population (Eskimo) now living in the villages of Novoye Chaplino and Yanrakynnot. There is small-scale whaling in the Senyavin Straits (mostly Gray and Beluga Whales) along with Walrus hunting in the sea. Walrus rookeries are strictly protected.

Conservation measures taken:

Arakamchechen Island has been designated a nature monument. The site as a whole is incorporated in the Beringiysky Nature Park that was set up by the administration of Chukot Autonomous Area.

Conservation measures proposed but not yet implemented:

Granting a higher (international) protected status to selected areas of the site (Andreev, 1991).

Current scientific research and facilities:

The area has been comprehensively surveyed by geomorphologists, botanists, zoologists, ethnographers, and archaeologists (Bogoslovskaya *et al*., 1979).

Current recreation and tourism:

In the mid 1990s cruise vessels of international tourist companies began to visit the inshore waters of the Providensky District.

Jurisdiction:

Administration of the Providensky District of the Chukot Autonomous Area.

4.3. Lower Avtotkul' River

Geographical coordinates: 63°45'-64°25'N, 177°20'-178°35'E (Avtotkul' Wildlife Refuge).

Elevation: 0-40 m a.s.l.

Area: *c.* 4,000 km^2.

Overview:

Complex of maritime plains and gently rolling uplands in the subarctic tundra zone with a predominance of hummocky tundra, alass depressions, and thermokarst lakes in watershed areas. Characteristic features include river valleys with numerous lakes, maritime water meadows with brackish pools, freshened coastal bays and lagoons with intertidal silt flats and spits. An important breeding and moulting area for water birds and their pre-migration concentration in the autumn; breeding and moulting grounds for certain rare species.

Wetland type:

By international classification – A, E, F, G, V, O, Q, Vt; by national classification – 1.2.1.2, 1.3.1, 2.5.1.1, 3.7.2.1 (shallow sea bay, estuary, and lower stretch of a river in the tundra zone).

Ramsar Criteria: 1, 2, 3, 5, 6.

Justification for the application of selected criteria:

Characteristic sector of the Asiatic coast of the Bering Sea providing breeding sites for a few endemic bird species, such as Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) and Emperor Goose (*Philacte canagica*). The local population of Emperor Goose accounts for more than 1% of the total Asian population. Breeding and moulting grounds for White-fronted Goose (*Anser albifrons*), Black Brant (*Branta bernicla nigricans*), and ducks, Pintail (*Anas acuta*) and Greater Scaup (*Aythya marila*).

General location:

The site lies within the boundaries of the Beringovsky Administrative District of the Chukot Autonomous Area, in the interfluvial areas separating the Lower Avtotkul', Tumanskaya, and Tretiya Rechka river systems in the south-eastern side of Anadyrsky Liman (Anadyr estuary). The distance from the nearest populated centre (the city of Anadyr) is 50 km.

Physical features:

Geological and geomorphological features

The site acquired its present-day aspect during the Quaternary Period under an influence of consecutive interglacial marine transgressions that resulted in the build-up of several terraces. Far from the coast, marine sediments come in contact with glaciofluvial outwash deposits. The surface of marine terraces is cut by alluvial river valleys. The site is formed by homogeneous sand, clay loam and pebble deposits of marine and glaciofluvial origin. In Holocene times the landscapes were created under effect of exogenous processes, in the first place permafrost thawing. The oldest and highest level of the maritime plain (20-40 m) dates back to the Kazantsevian interstadial. This surface underwent the most pronounced effect of thermoerosive processes manifested as an alternation of linearly eroded residual rolling hills and poorly apparent thermokarst phenomena. Low-lying portions of the relief support groups of thermokarst lakes and alasses; small tundra creeks flow down runoff troughs.

The lower (8-10 m) plainland surface is made up of marine sediments. It was created during the Karginian interstadial and occupies a proportionally large area. The surface features gently sloping linear ridges interspersed with numerous alasses of various age and polygonal tundra plots. Another characteristic feature is a stepwise arrangement of numerous lakes and runoff troughs with slow streams.

The third (3-4 m high) geomorphic level is represented by a tilted sinuous marine terrace of the Early Holocene. Landscape patterns that developed at those times are still preserved along the coastline. Specifically, lakes and pools are arranged in chains lengthened parallel to the shoreline of Anadyr estuary. The largest lakes and alass basins stretch along the rear edge of this terrace.

The fourth level is a 2-3 m high alluvial marine terrace variably subject to tidal influence. The terrace includes slightly elevated areas with shallow lakes and a littoral zone with a silt-clay loam floor dissected by a network of ditch-like creeks. Morphologically, this surface consists of accumulated stretches of shore modified by wave abrasion, spits, beaches, islets, and depressions with lagoon-like lakes separated from the sea by sand and shingle bars.

The lowest level is formed by a modern alluvial plain lying 1-3 m a.s.l. Seaside parts of this surface are subject to the action of nautical and wind-borne tides. Elevated sites are dotted with a network of creeks, thermokarst lakes and small river deltas.

Climate and hydrology

The site has a severe climate typical of the tundra zone. Based on the records of the meteorological station in the city of Anadyr, the mean annual temperature is -7.7°C, with mean temperature in July +10.5°C. The frostless period lasts 81 day. Characteristic features of the local climate are due to the maritime location of the site. A relatively short period of sunny weather falls at the end of May, when mean daily temperatures are above zero and the snow cover melts. In summer, permanently blowing strong onshore winds (the mean wind speed in July 6 m/s) bring in sea fog and drizzle. Cold snaps and snowfalls are not infrequent in June and July. Late frosts occur until the end of June and the first autumn frosts come as early as mid August. The period of mean daily temperatures below freezing starts from about 26 September. The stable snow cover sets in from 11 October.

The local thermal regime accounts for widespread low-temperature permafrost, excessively moist ground, and the development of a modern cryogenic process. The mean annual temperature of the upper permafrost layer is –3-5°C. The site abounds in epigenetic frozen ground with modern ice wedges. Their active formation and accumulation of ice on the one hand and thermokarst processes on the other are responsible for the presence of numerous lakes, polygonal swamps, and wet alass depressions.

Recent marine terraces are occupied by brackish lagoon-like lakes 0.3-0.5 m in depth, with abrasion playing a key role in the formation of their shores. Lakes of lagoon-thermokarst and thermokarst origin are found at higher elevations, while the oldest surfaces contain only thermokarst lakes, which can be large (over 1 km in diameter) but are never deeper than 0.7-1.5 m. Oxbow-thermokarst lakes 1.5-2.0 m in depth are formed in river valleys. Ancient lakes are virtually absent because the area was reworked many times by cryogenic processes.

Rivers of the site are slow, typical of flat country. In their lower reaches, the great influx of tidal water twice daily produces a counter-current. Anadyrsky Liman is characterized by a regular tidal regime of a semidiurnal type, and the difference between sea level at high and low tides is up to 1.5 m. Small rivers and creeks of the coastal zone look like canals, and water masses involved in the counter-current exceed their normal flow volume. Ice breaks on these watercourses in mid June and sets in October. The

rivers are primarily fed by snowmelt; therefore, the maximum flow occurs at flood time, i.e. in late June.

Soils

Soils of the site are formed under conditions of low temperature and excess moisture of the seasonally thawed active layer. Soil formation is a low-intensity process, and the soil profile is poorly stratified. Soils have a negative mean annual temperature similar to that of the air. Hummock surfaces of ancient marine terraces are dominated by tundra gley soils. Juvenile terraces give rise to peaty-gley acid soils (pH 4.0-5.0) unsaturated with the absorbing soil complexes. Alasses have impoverished damp and boggy peat soils.

Residual alluvial soils occur on old floodplains and alluvial soddy soils on modern floodplains. Maritime water meadows are underlain with marsh soils or silt flats exhibiting poorly developed soil-forming processes.

Physical and chemical characteristics of water

Water in freshwater thermokarst lakes is brown in colour and saturated with humic acids. Brackish lakes of lagoon-thermokarst origin are characterized by high chloride levels in their water. Rivers are turbid because large amounts of suspended particulate material are brought in with the tidal flux.

Ecological features:

A large part of the area is occupied by hummocky tundra over gently rolling ridges vegetated with low shrubs, sedge-cottongrass and lichen-moss communities dominated by *Eriophorum vaginatum*. Such areas account for 30% of the land surface. Equally widespread (30%), are polygonized hillocky swamps in depressions covered with creeping shrubs and lichens. Stretches of nival meadows with forb-cottongrass and shrub vegetation stretch out along the base of rolling hills (1%), most notably scattered cushions of *Rhododendron aureum* and brushes of *Salix alaxensis*. An appreciable portion of the area (up to 20%) is occupied by lake and alass pans with sphagnum bogs, sparse shrub-grass communities and shallow water-bodies fringed with swards of sedges and pendent grass (*Artcophila fulva*).

The maritime zone is of roughly the same total area (20%) and characterized by a large number of shallow, brackish water bodies with numerous islets and vegetation dominated by mare's tail (*Hippuris sp*.) Halophytic meadows of *Carex subspathacea* and *Puccinellia phryganodes* are dissected by deep creeks fringed with lime-grass (*Elymus sp*.) and sedge *Carex cryptocarpa*. Low riverbanks periodically inundated by tides are also occupied by halophytic meadows. Elevated places in the maritime zone are overgrown with dry crowberry tundra.

Riverside strips of herbaceous vegetation and interlake areas are overgrown with groups of Manchurian alder shrubs (*Duschekia fruticosa*). On the whole, lakes and mires occupy almost half of the area. Upstream of the zone subjected to tidal action, the river water is transparent, providing favourable conditions for fish-eating birds, divers, and grebes.

Major components of the invertebrate fauna include chironomid larvae (family *Chironomidae*), caddisflies (*Trichoptera*), and a variety of crustacean species (*Gammaridae, Anostraca, Phyllopoda,* and *Cladocera*).

Noteworthy flora:

Maritime meadow associations are formed by sedge (*Carex subspathacea*) and alkali grass (*Puccinellia phryganodes*). Depressions are occupied by mare's tail (*Hippuris tetraphylla*), and the shores of brackish pools are overgrown with bright green spots of *Carex mackenzii.*

Wetland complexes in the hummock tundra zone with tussock-forming *Eriophorum vaginatum* and *Eriophorum polystachion* in depressions filled with temporary spring pools provide the most important habitats for many birds. In particular, dense marginal growth of pendent grass makes up the main source of food for White-fronted Geese in the late spring and summer.

The shoreline fringe lining many water bodies is several metres wide and consists primarily of horsetails (*Equisetum arvense*) and sedges (*Carex cryptocarpa*). This band-type vegetation is of primary importance for feeding geese during the summer season. Blueberry fields (*Vaccinium uliginosum*) in interhill depressions and floodplains are equally important for White-fronted Geese as a food source since mid August.

Noteworthy fauna:

Fish

Asian Rainbow Smelt (*Osmerus eperlanus dentex*) and Nine-spined Stickleback (*Pungitius pungitius*) live in the deep floodplain lakes. Also, Three-spined Stickleback (*Gasterosteus aculeatus*), Dolly Varden (*Salvelinus malma*), Humpback Salmon (*Oncorhynchus gorbuscha*), Chum (*O.keta*), Least Cisco (*Coregonus sardinella*), and Siberian Whitefish (*C.lavaretus pidschian*) enter the local rivers.

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) occurs here at the eastern limit of its natural habitat.

Sea mammals

Beluga Whales (*Delphinapterus leucas*) travel upstream the Avtotkul River during spawning migration of Least Cisco and can be seen as far as 40 km from the sea. Harbour Porpoise (*Phocaena phocaena*) also goes 10 km upstream the Avtotkul in August and September. The same is true of Ringed Seal (*Phoca hispida*), Common Seal (*Phoca largha*), and Bearded Seal (*Erignatus barbatus*), which prey on migrating Humpback and Chum Salmon.

Birds

The importance of the site for migrating birds:

The Lower Avtotkul River is a migratory destination for large numbers of anseriform birds. Flocks of Lesser White-fronted Goose (*Anser erythropus*) and single pairs of Snow Goose (*Chen hyperboreus*) have been reported from the site, as well as sporadic sightings of Whooper Swan (*Cygnus cygnus*). The site is an important stopover area for the following migratory waders in the spring, summer, and autumn: Knot (*Calidris canutus*), Red-necked Stint (*C.ruficollis*), Dunlin (*C.alpina*), and Red-necked Phalarope (*Phalaropus lobatus*). The two latter species form congregations of up to 2,000 birds. Migrating flocks of Pintail cross the site in a sublatitudinal direction as they travel from the Anadyr Valley to Alaska.

The importance of the site for breeding birds:

Long-tailed Duck (*Clangula hyemalis*) is the most common diving duck, with a breeding population density of 1 nest/km^2. Greater Scaup is next in abundance (0.25 nests/km^2) and occurs in all types of wetlands. Pacific Eider (*Somateria mollissima v.-nigrum*) is the most common sea duck within a narrow coastal strip and on the shores of lagoons. King Eider (*S. spectabilis*) occurs on both saline and freshwater lakes within a zone of Anadyrsky Liman 10 km wide, with a breeding population density of 0.5 nests/km^2. A total of 100 pairs are supposed to nest in the lower reaches of the Avtotkul River. At a distance from the coast, King Eider is substituted by Black-winged Scoter (*Melanitta americana*) at approximately the same nest density. Dabbling ducks are less common at the site, but the density of Pintail, the most dominant species, amounts to 1 nest/km^2.

The site is home to four species of geese, of which the most common, White-fronted Goose, places its nests on hummocky watersheds, marshy valleys, and maritime tundras at a density of 1/km^2. A total of 200 pairs of this species have been estimated to breed at the site (Kondratyev, 1993). Bean Goose (*Anser fabalis serrirostris*) is a rarer occurrence. This species favours watershed tundra with alass hollows, sedge-fringed streams, sphagnum spots, and patches of nival vegetation. The breeding population density does not exceed 0.025 nests/km^2. Emperor Goose inhabits a narrow strip of maritime tundra with meadows and shallow brackish pools. During the breeding season, the birds spread over a broader area of up to 8-10 km at a density of 0.1-0.5 nests/km^2. After hatching, broods move to the seaside. The total breeding population of Emperor Goose on the Lower Avtotkul River is estimated at 200 pairs: however, it tended to decrease during the period between 1991 and 1994. Black Brant occurs only in the maritime area, making small colonies on islets of brackish lakes. The largest of these colonies is located on the Strela Spit, where these geese share a breeding site with large gulls. Both the number of breeding pairs and the overall reproductive success vary substantially from year to year (from 20 to 100 nests). A total of 500 pairs of Black Brant are supposed to nest within the boundaries of the site. Whooper Swans sometimes establish their nests on the lakes of the Upper Avtotkul River.

The site attracts many Sandhill Cranes. Their breeding density amounts to 1 nest/km^2, with the total number of birds and their breeding success invariably high. Pacific Diver (*Gavia pacifica*), Red-throated Diver (*G. stellata*), and Red-necked Grebe (*Podiceps griseigena*) are common inhabitants of tundra lakes. Watershed areas give home to many waders, such as Red-necked Phalarope (*Phalaropus lobatus*), Dunlin (*Calidris alpina*), and Short-billed Dowitcher (*Limnodromus scolopaceus*). Spoon-billed Sandpiper is known to nest on the maritime tundra and at the Zemlya Geka Spit, but its total number is not very high. Breeding by Aleutian Tern (*Sterna aleutica*) has also been documented.

The most important breeding habitats:

Hummocky surface and shrubland around thermokarst lakes – for dabbling and diving ducks; islets on freshwater and brackish lakes, lagoons, and estuaries (both vegetated and non-vegetated) – for Black Brant and Pacific Eider; hummocky hill slopes and gently rolling surfaces – for White-fronted Goose; elevated sites on the inundated maritime tundra with a sparse cover of lime-grass *Leymus sp.* – for Emperor Goose and King Eider; brushwood in alass depressions of river valleys and low-lying spots amongst the rolling topography for – Sandhill Crane.

The importance of the site for moulting birds:

The site is of paramount importance as a moulting area for all dabbling and diving ducks, geese, swans, and many shorebird species. The majority of these birds concentrate in the maritime area with its brackish water bodies, numerous islets and channels of variable flow and water level. These habitats attract large flocks of male Pintails, Wigeons

(*Anas penelope*), and Northern Shovelers (*A.clypeata*). They share this moulting area with White-fronted Geese, Emperor Geese, and Black Brants. It is also regularly visited by pairs of swans and small flocks of Lesser White-fronted Goose. The total number of individual waterfowl species moulting in the maritime zone of the site is estimated as follows: 2,000-3,000 male Pintails, 2,000-3,000 male Wigeons, about 500 Shovelers, up to 1,000 Emperor Geese, and 1,100 Black Brants.

The post-breeding period brings together almost 4,000 Red-necked Phalaropes on maritime lakes and up to 20,000 Greater Scaups on vast lagoons connected to the Bering Sea in the western part of the site. Large freshwater lakes are used by moulting female diving ducks (Long-tailed Duck, King Eider). In some years the total number of White-fronted Geese amounts to 3,000.

The importance of the site for rare species:

The site provides home to the Emperor Goose, Black Brant, Spoon-billed Sandpiper, and Aleutian Tern. The maritime area abounding in waders regularly attracts Peregrine Falcons (*Falco peregrinus*).

Check-list of species present

Red-throated Diver (*Gavia stellata*) – regularly nests over the entire floodplain area abounding in lakes and mires.

Yellow-billed Diver (*Gavia adamsii*) – occurs periodically during the period of salmon migration in the Middle Avtotkul River.

Black-throated Diver (*Gavia arctica*) – rare breeding bird in the southern part of the site.

Pacific Diver (*Gavia pacifica*) – most common of the four diver species regularly breeding at the site.

Slavonian Grebe (*Podiceps auritus*) – a rare visitor to the area.

Red-necked Grebe (*Podiceps griseigena*) – regularly nests in the Avtotkul Valley where it is frequently seen feeding on stretches of clear river water.

Whooper Swan (*Cygnus cygnus*) – breeds in small numbers in the upper reaches of the Avtotkul River. Regular sightings of single pairs on the maritime tundra have been reported.

Bewick' Swan (*Cygnus bewickii*) – vagrant pairs regularly occur on maritime lakes and lagoons.

White-fronted Goose (*Anser albifrons*) – most common breeding species of goose, with a total number (breeding and moulting birds) estimated at more than 3,000 individuals. Satellite tracking and observation of colour-marked individuals have demonstrated that White-fronted Geese from Anadyr winter in China, Korea, and Japan.

Lesser White-fronted Goose (*Anser erythropus*) – rare spring and summer migrant (in groups of up to 20 birds) that probably breeds in the upper reaches of the Avtotkul River.

Bean Goose (*Anser fabalis*) – breeds in small numbers on the watershed tundra and meadows bordering water bodies.

Snow Goose (*Chen hyperboreus*) – yearly occurs in small numbers during spring migrations. In 1993, eighty young birds were released at the site as part of a Russian-Japanese project designed to restore winter quarters of Snow Goose in Asia. In subsequent years, some of these birds were found to breed in the Velikaya River valley.

Emperor Goose (*Philacte canagica*) – characteristic breeding species of the maritime tundra. Both the total number and reproductive success tend to decrease. In the period from 1991 to 1994, the total number at the site was estimated at 1,200-1,300 birds.

Black Brant (*Branta bernicla*) – characteristic bird of maritime landscapes, with breeding colonies established on small lake islets and sea spits. Moulting birds concentrate at the shores of Anadyrsky Liman. The total number is about 1,500 individuals. Tracking of colour-marked birds has shown that they move to winter in Mexico (Gulf of California).

Mallard (*Anas platyrhynchos*) – an accidental visit was documented in June 1994.

Common Teal (*Anas crecca*) – breeds in small numbers in the Avtotkul River valley.

Wigeon (*Anas penelope*) – single pairs occur in the spring, but their breeding at the site remains to be confirmed. At least 2,000 males gather for moulting on the shores of Anadyrsky Liman close to the mouth of the Avtotkul River.

American Wigeon (*Anas americana*) – accidental males can be seen during spring migrations.

Pintail (*Anas acuta*) – very common breeding and moulting bird on watershed and floodplain lakes. Post-moulting migration of males towards Alaska occurs in mid August.

Northern Shoveler (*Anas clypeata*) – breeding is not confirmed, but several hundred drakes are known to moult on brackish lakes in the maritime area.

Pacific Eider (*Somateria mollissima*) – locally abundant species breeding and moulting at the shores of Anadyrsky Liman and Bering Sea lagoons.

Spectacled Eider (*Somateria fisheri*) – a pair of these ducks and, later, their brood were sighted on freshwater pools of the maritime zone in 1994.

King Eider (*Somateria spectabilis*) – breeding and moulting birds occur in small numbers at the southern limit of their natural habitat.

Tufted Duck (*Aythya marila*) – rare visitor of the site in the spring, although the birds are common breeders in the Beringian forest-tundra further to the west.

Greater Scaup (*Aythya marila*) – characteristic breeding species in the Avtotkul Valley, with congregations of up to 20,000 moulting birds found on the shores of large Bering Sea lagoons southeast of the Lower Avtotkul River.

White-winged Scoter (*Melanitta deglandi*) – single birds occur yearly during spring and summer migrations.

Black-winged Scoter (*Melanitta americana*) – common breeding and moulting species of inland freshwater lakes.

Harlequin Duck (*Histrionicus histrionicus*) – single birds are yearly sighted along the Avtotkul River.

Long-tailed Duck (*Clangula hyemalis*) – most common breeding and moulting diving duck in all types of tundra habitats.

Red-breasted Merganser (*Mergus serrator*) – single pairs regularly occur on the Avtotkul River during spring spawning migration of Nine-spined Stickleback. Breeding remains to be confirmed.

Gyrfalcon (*Falco rusticolus*) – vagrant birds are regularly seen at the site in midsummer.

Peregrine Falcon (*Falco peregrinus*) – periodic sightings in summer and during autumn migrations have been reported.

White-tailed Eagle (*Haliaeetus albicilla*) – occasional sightings in summer.

Sandhill Crane (*Grus canadensis*) – common breeding bird characterized by high population density, with the total number of breeding pairs estimated at 4,000.

Black-bellied Plover (*Pluvialis squatarola*) – uncommon breeding bird on the maritime tundra of Anadyrsky Liman.

Pacific Golden Plover (*Pluvialis fulva*) – uncommon breeding species occupying watershed tundra habitats.

Ringed Plover (*Charadrius hiaticula*) – the bird breeds in small numbers on shingle spits along the Avtotkul riverbed.

Lesser Sand Plover (*Charadrius mongolus*) – an accidental visiting pair was sighted on maritime water meadows in the period of summer migration of more common waders.

Wood Sandpiper (*Tringa glareola*) – breeds in small numbers on the shrub-dominated tundra of the Middle Avtotkul River.

Spotted Redshank (*Tringa erythropus*) – uncommon breeder on the elevated sites in shrub tundra.

Red-necked Phalarope (*Phalaropus lobatus*) – common breeding bird. Phalaropes are widespread on maritime lakes in summer.

Grey Phalarope (*Phalaropus fulicarius*) – very common during spring migrations but relatively rare breeding bird and summer migrant.

Ruddy Turnstone (*Arenaria interpres*) – common spring migrant, but less frequent in the breeding season, when it is confined to sea spits.

Ruff (*Philomachus pugnax*) – common breeding bird on the sedge-moss tundra.

Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) – uncommon, though very characteristic inhabitant keeping to the mouths of tundra rivers bordering intertidal flats and well-drained ridges with crowberry tundra. One or two pairs have been reported to breed at the mouths of the Nikitikha and Gabuzovka Rivers. Breeding birds also occur on the Zemlya Geka Spit. Mixed flocks of Spoon-billed Sandpiper and Red-necked Stint are sometimes seen during migration.

Red-necked Stint (*Calidris ruficollis*) – occurs in a small number of intertidal silt flats and sand spits of the seacoast in summer. They become more common in August.

Temminck's Stint (*Calidris temminckii*) – uncommon but characteristic breeding bird on dry banks of the Avtotkul River and tundra lakes.

Western Sandpiper (*Calidris mauri*) – single birds occur in Dunlin flocks on coastal and river flats in summer.

Curlew Sandpiper (*Calidris ferruginea*) – sometimes occurs in the maritime zone during spring migrations.

Dunlin (*Calidris alpina*) – most common bird in the breeding season and during summer movements on the maritime tundra and river shallows.

Pectoral Sandpiper (*Calidris melanotos*) – occurs in the maritime zone during spring migration.

Knot (*Calidris canutus*) – regular summer and autumn migrant on the Anadyrsky Liman coast.

Common Snipe (*Gallinago gallinago*) – characteristic breeding bird of interlake hummock areas and shrub thickets along riverbeds.

Whimbrel (*Numenius phaeopus*) – rare visitor during spring passage.

Bar-tailed Godwit (*Limosa lapponica*) – occurs in maritime habitats during spring migrations.

Short-billed Dowitcher (*Limnodromus scolopaceus*) – uncommon breeder but numerous autumn migrant. Flocks are most frequently seen in the maritime area in summer, and in autumn largely keep to dried-out inland water bodies.

Arctic Skua (*Stercorarius parasiticus*) – characteristic breeding species favouring wet depressions near lakes.

Long-tailed Skua (*Stercorarius longicaudus*) – most common breeding species of hummock tundra.

Pomarine Skua (*Stercorarius pomarinus*) – sometimes occurs along the coastline during spring passage.

Herring Gull (*Larus argentatus*) – very common species breeding both on tundra lakes and in coastal habitats. The birds either establish isolated nests or join in colonies of 20-30 pairs.

Glaucous Gull (*Larus hyperboreus*) – large breeding colonies are situated on the islets of Bering Sea lagoons and at the Strela Spit in the Avtotkul estuary (*c.* 200 pairs).

Kittiwake (*Rissa tridactyla*) – single birds visit the Lower Avtotkul River in midsummer.

Sabine's Gull (*Xema sabini*) – characteristic bird of the maritime tundra.

Arctic Tern (*Sterna paradisaea*) – most common breeding species on the Avtotkul tundra.

Aleutian Tern (*Sterna aleutica*) – there are two colonies on gravelly spots of the Zemlya Geka Spit.

Common Guillemot (*Uria aalge*) – regularly seen feeding in the estuary and middle course of the Avtotkul River in summer.

The importance of the site as an area inhabited by economically valuable birds and terrestrial mammals:

The number of Willow Grouse (*Lagopus lagopus*) and Varying Hare (*Lepus timidus*) is not very high. On the contrary, Arctic Fox (*Alopex lagopus*) occurs in large numbers (the population density amounts to 0.25 dens/km^2). In the absence of other readily available prey (microtine rodents), Arctic Fox causes appreciable damage to the White-fronted and Emperor Geese populations.

Social and cultural values:

The Upper Avtotkul and other rivers provide spawning sites for Pacific Salmon, Humpbacks and Chums . Fishing camps are situated at the Zemlya Geka Spit and at the entrance to the Tymna and Glubokaya Lagoons. A field research station organized by the Institute of Biological Problems of the North was based on the Lower Avtotkul River between 1991 and 1994. It focused on ecological studies of North Asiatic geese. The site is a traditional calving area for domestic reindeer driven here in the spring by herders based at the village of Al'katvaam (Beringovsky Administrative District). It also provides pastures for reindeer herds from the Anadyrsky District in summer.

Current land use:

The site is a part of the Avtotkul Wildlife Refuge ("zakaznik") set up to protect waterfowl habitats. Until 1991, prospecting for gas and oil took place on the site. Abandoned drilling rigs and heaps of metal barrels are still found here and there. The territory of the refuge is crossed by traditional routes along which herds of domestic reindeer are driven both in winter (by herders of the Beringinsky Administrative District) and in summer (by Anadyr herders). Wintertime is also a hunting season for the residents of Al'katvaam, who harvest Arctic Foxes with traps and deadfalls. The harvesting rate has decreased significantly in recent due to a lack of proper technical means, high petrol costs, and low current demand for pelts. Large-scale mining operations for commercial oil and gas extraction are projected in the vicinity of Bering Sea lagoons as well as the development of the Verkhne-Echinskoye oil deposit at the Avtotkul-Echinku Interfluve in the Velikaya River Basin. This would require building a road to connect the deposit and the city of Anadyr (constructed in the early 2000s).

Factors adversely affecting the site's ecological character:

Herding and fishing activities have only a localized effect on the natural features of the site and do not seem set to expand in the near future. Reindeer herds arrive at the site in mid July when most water birds have already hatched their young. Therefore, damage inflicted on breeding populations is relatively small. Herding on the territory of the refuge is formally prohibited until 15 August, but this constraint does not actually apply to the fixed traditional paths of domestic herds. With the site being the last refuge for the formerly large populations of Anadyr geese, full-scale oil development would be a major risk factor that could lead to the eventual extinction of these birds in the region.

Conservation measures taken:

The site is still beyond the sphere of conflicting interests of different land users. As of 2003, protected area status was the only conservation measure taken at the site, which means closure of hunting and a prohibition on any form of economic activity during the summer season. Specifically, reindeer grazing is prohibited from 1 May to 15 August. Exploratory drilling for oil, reindeer grazing, and trapping of Arctic Fox are permitted in winter. Wardens from the Hunting and Game Management Department of Chukot Autonomous Area inspect the territory from time to time, especially during spring hunting seasons.

Conservation measures proposed but not yet implemented:

The site meets criteria of the Ramsar Convention in more than one respect. Hence, it deserves a higher protected status. Moreover, the area under protection needs to be enlarged to incorporate selected portions of Bering Sea lagoons. Reindeer grazing may be just as well allowed in summer provided it does not affect the maritime area until July 15. Flights of planes and helicopters at altitudes below 500 m should be prohibited over colonies of Black Brant and moulting areas of Emperor Goose (Strela Spit).

Current scientific research and facilities:

L.A.Portenko was the first ornithologist to visit the coast of the Anadyr Gulf and Zemlya Geka Spit in 1931 (Portenko, 1939). In 1991 a field research station was established in the Avtotkul lower reaches by the Institute of Biological Problems of the North to study waterfowl biology, with a focus on geese populations. Aerial surveys and colour marking of geese were performed during the period from 1991 to 1994. In the course of these studies, breeding of King Eider south of the Bering Strait was documented for the first time (Kondratyev & Sokolov, 1993). The site, remarkable for a high abundance of several species of

goose, has no analogues on the Chukotka Peninsula (Kondratyev, 1991; Kondratyev, 1993). Banding recoveries have demonstrated migration of Emperor Goose and Black Brant to wintering quarters in North America (Ward *et al*., 1994) and White-fronted Goose to Southeast Asia. Also, breeding White-fronted Geese were found in South Korea; a few geese with satellite transmitters were tracked along their flyway to China. Only geese from moulting congregations in the Lower Avtotkul River were shown to winter in Japan (Kurechi *et al*., 1994). An experiment on the reintroduction of Snow Goose into the ecosystem of the East Asian inland tundra was carried out on the site (Andreev *et al*., 1994).

Current recreation and tourism:

Taken together, the remoteness of the site from populated centres and its severe climate do not encourage visitors, except perhaps for the spring wildfowl shooting. During this period, the territory is under the formal control of the Hunting and Game Management Department based at Anadyr.

Jurisdiction:

Administrations of Chukot Autonomous Area and its Beringovsky District.

Management authority:

Hunting and Game Management Department, Anadyr, Chukot Autonomous Area.

4.4. Markovskaya Basin

Geographical coordinates: 65°08'26"N, 171°03'03"E (Ubienka mouth).

Elevation: 12-35 m a.s.l.

Area: *c.* 3,500 km^2.

Overview:

Lacustrine-alluvial valley of the Middle Anadyr River traversed by an amply-developed floodplain; characteristic landscapes of the Beringian tundra and hypoarctic wetland complexes at the northeastern extremity of the Asian continent. Breeding and staging area for substantial numbers of water birds.

Wetland type:

By international classification – L, M, O, Vt, W; by national classification – 2.5.1.1 and 3.7.2.1 (plainland with a large river and surrounding portions of a Middle Quaternary lacustrine-alluvial plain and hypertrophic floodplain).

Ramsar Criteria: 1, 4, 5, 8.

Justification for the application of selected criteria:

Representative hypoarctic landscapes of Asiatic Beringia. The site encompasses the full diversity of floodplain and valley habitats of the Beringian shrub-dominated tundra ("kedrotundra"). The most important refuge of breeding ducks in northeastern Asia. Peculiar ornithological complex incorporating boreal, forest-tundra, and tundra components of Palaearctic, Beringian, and North-American origin. Stopover area for many Arctic migrants. The most important spawning grounds of Anadyr Chum Salmon and non-migratory fish (coregonids, Grayling, Pike, etc.).

General location:

The site encompasses a 100 km long stretch of the Anadyr River from the locality of Krepost' to the mouth of the Mayn River, as well as the adjacent plains on the Mayn-Anadyr Interfluvial Area and the left side of the Anadyr. The area is approximately 50 km wide and lies within the bounds of the Anadyrsky Administrative District of the Chukot Autonomous Area. The centre of the site (the Ubienka River mouth) is 56 km from the nearest populated place (the settlement of Markovo) and 308 km from the city of Anadyr.

Physical features:

The Anadyr River flows for a total of 1,150 km. The mountainous section of the river gradually opens out into the extensive Markovskaya Depression lying between offshoots of the Shchyuchiy Range on the north and the Russkiye Mountains and Algansky Ridge on the south. The depression has a slightly rolling relief elevated 10-15 m above the Anadyr floodplain; it is built up of 400-500 m thick frozen alluvial sands and clay loams of Middle-Quaternary time. In the east, the plain is flanked by a chain of the Ust-Bel'skiye Mountains and southern spurs of the Pekulney Range. The plainland stretch of the river forms an inner delta with a few beds and many meandering channels that collectively make up a peculiar riverine landscape.

Ancient plain portions occupy an area between the Shchyuchiy Range and the Anadyr floodplain. The primary surface is unaffected by floods but extensively eroded by deeply cut river channels. A large area of this surface is substituted by stretches of floodplains of the Anadyr and its tributaries (Ubienka, Nichekveem, Chivmyveem, Krestovaya, and Chineiveem). Isolated residual fragments

of the old plain are also found on the right side of the Anadyr upstream from the Mayn confluence.

Morphologically, the ancient plain is a rolling surface with water bodies, flat-bottomed depressions, and alasses. Numerous and rather shallow thermokarst lakes are usually from 0.01 to 4 km^2 in size, although some of them are as large as 35 km^2, e.g. Lisii, Utinoye, and Maiorovskoye lakes. Where the ancient surface is deeply cut by the Anadyr riverbed, icy precipices overhang the bright green floodplain and pass to the ochre-brownish plainland.

The floodplain landscape along the Middle Anadyr River is unusually well-developed and may be compared only with that of the Amur Valley below Khabarovsk. An extensive network of bending and braided channels, oxbows, and pools supports a dense cover of spirea, blueberry, and willows; a coppice of tall willows occupies a substantial part of the site.

The site lies in a zone of temperate continental subarctic climate greatly influenced by the proximity to the Bering Sea in the summer and Siberian anticyclone in the winter. Continentality explains much of the variation in mean temperature between seasons. The mean air temperature in the coldest month (January) is -28.4°C, with an absolute minimum of -60°C; while the warmest month is July (+13.4°C, absolute maximum +32°C). The mean annual temperature is -9.2°C. The period of mean monthly temperatures above freezing is about 130 days long. Mean annual precipitation is 334 mm, with more than half of this amount falling in the form of rain and drizzle. Cold, clear weather prevails in the winter, but heavy snowstorms with wind speeds of up to 40 m/s sometimes occur. The snow cover is established by mid October and can be as deep as 1-1.5 m by the end of winter. Redistribution of snow by the wind results in its accumulating in floodplain localities and its layer thinning and compacting at exposed elevated sites. The snow cover persists for a total of 233 days and melts in the middle of May. Summer weather is mainly calm and cloudless.

The Anadyr derives a great deal of its water from snowmelt. Hence, a major part of its flow volume (57%) occurs during spring floods. The seasonal runoff is highly nonuniform, with almost 90% the annual total falling in the period from June to September. Islands of the Anadyr floodplain are inundated twice a year (mid to late June and middle August-September). Spring flooding is especially violent, with the level of the river at this time rising by 6-8 m and water covering the surface of the valley for many kilometres, leaving exposed only islets of willow thickest and patches of shrub pine forest-tundra.

At low water, the Anadyr floodplain looks like a dense network of meandering channels, backwaters, oxbows, and lake-filled hollows. Lakes freeze in late September or early October, and the river freezes in mid October. Ice breaks up in late May-early July on the Anadyr and in the first half of June on floodplain lakes.

Ecological features:

The meridional gradient of the Anadyr Valley is a peculiar alternation of interpenetrating components of a few zonal and landscape belts, such as mountain tundra and northern taiga at riverheads, shrub pine tundra along middle river courses, and maritime tundra in their lower reaches. It is as if these landscapes were threaded on an intrazonal string of floodplain habitats. Moreover, the Anadyr is the largest salmon river in the northern part of the Russian Far East. Taken together, these features account for the diverse and original nature of the site.

The peculiarity of its landscape is due first of all to the presence of non-inundated sloping mounds, i.e., residual landforms of an ancient plain, covered with shrub pine (*Pinus pumila*) and surrounded by flooded willow thickets. The flattened surface on the periphery of the floodplain forms a high non-inundated terrace with characteristic "kedrotundra" landscapes. Islets of shrub pine and Manchurian alder (*Dushekia fruticosa*) overgrow elevated portions of the plain, while its low-lying localities are dominated by hummocky and polygonal sedge-sphagnum bogs. Shrub pine is intermixed with satellite lower shrubs, such as *Betula exilis, B.divaricata, Spiraea beauverdiana, Ledum decumbens, Vaccinium uliginosum, Empetrum nigrum, Vaccinium vitis-idaea,* and *Arctous alpina*, with various grasses (*Calamagrostis lapponica, Arctagrostis latifolia*), and sedges (*Carex quasivaginata, C.pallida, C.lugens*) (Belikovich, 1990). Such places provide major habitats for breeding waders and other water birds. Thermokarst lakes and alass hollows develop inside bigger hills.

Thermokarst lakes of the primary surface are circular in shape and 0.5-2.5 m deep. Two or three such lakes not infrequently merge into one, giving rise to a water body having a characteristic shape of a two or three-bladed propeller. Such water bodies have sand or peat floors and sloping shores lined with a fringe of horsetail, pendent grass, and sedges (*Carex limosa, C.rotundata*). Some lakes exhibit mats of floating vegetation formed by *Comarum palustre* and *Menyanthes trifoliata*. Margins of lacustrine basins are overgrown with shrub pine and Manchurian alder. Lakes are inhabited by a variety of planktonic crustaceans (*Polyartemia, Euricercus, Bythotrephes,* and *Lepidurus*). Also, they are peculiar for the presence of archaic and thermophilic diatom genera (Kharitonov, 1983) while bottom-dwelling organisms are dominated by chironomids (Kondratyev, 1989).

If the lake's water has discharged and its bottom lies above the flood level, it becomes overgrown with herbaceous vegetation interspersed with patches of willow thickets and residual or newly-formed thermokarst pools. Such habitats support an especially diverse population of breeding birds.

Periodically flooded alass depressions have their floors covered with silt and a growth of pendent grass, horsetail, and *Tephroseris palustris*. In winter, sand and dust are blown away from precipitous lake shores and deposited over depressed surfaces, which accounts for the early spring snow melt in inundated alass basins. Oases formed in this way (warm, calm, and sheltered) attract a large number of migrating birds.

The lower and middle levels of the floodplain, as well as banks of the channels, are occupied by almost impenetrable thickets of arborescent willows (*Salix schwerinii, S.udensis*) and arborescent ("black") alder (*Alnus hirsuta*). The 8-12 m high willows are 15-20 cm in diameter. The channels are lined with a thick growth of prickly rose (*Rosa acicularis*) and red currant (*Ribes triste*). The groundcover is dominated by grasses (*Alopecurus aequalis, Calamagrostis langsdorffii, Deschampsia sukatschewii, Poa pratensis*) and forbs (*Rubus arcticus, Caltha membranacea, Thalictrum kemense, Ranunculus repens, R.gmelini,* etc.). Elevations in the centre of floodplain islands are occupied by blueberry fields. Willow brushwood becomes thinner in low-lying localities at a distance from riverbanks, giving place to patches of tussock-forming sedges that are especially well developed at the junction of floodplain and "kedrotundra" areas.

Floodplain lakes are usually not deep (1.5-2 m). A narrow strip of *Equisetum fluviatilis, Arctophila fulva,* and *Hippuris vulgaris* separate them from the sedge-covered hummocky shores. Pondweed (*Potamogeton perfoliatus*),arrowhead (*Sagittaria sagittifolia*), and bur reed (*Sparganium hyperboreum*) thrive in oxbow lakes that have a rich fauna of gastropods (*Valvata*), caddisflies (*Limnephilidae, Phruganeidae*), water boatmen (*Corixa*), and Bryozoans (*Cristatella*) (Kondratyev, 1988).

Lakes connected to the river by channels dry out either partly or completely in summer. The exposed portions of the riverbed are overgrown with *Equisetum fluviatilis, E.arvense, Tephroseris palustris, Arctophyla fulva*, and *Rumex aquaticus*. This vegetation attracts broods of White-fronted Goose (*Anser albifrons*) and Wigeon (*Anas penelope*).

Rivers flowing down the spurs of the Shchyuchiy Range are fast, have branching beds, clear water, and numerous spits and rapids. Islands of the floodplain are overgrown with groves of poplar (*Populus suaveolens*) and Korean willow (*Chosenia arbutifolia*) with admixtures of mountain ash (*Sorbus asiatica*) and black alder (*Alnus hirsuta*). Arboreous willows grow on silt-laden spots. Rapid stretches sometimes remain unfrozen throughout winter; in colder years they are the first to be free from ice in the spring.

Noteworthy flora:

Roseroot (*Rhodiola rosea*) occurs in the Anadyr Valley together with *Rhododendron aureum* and *Primula cuneifolia* that here reach the northeastern limit of their natural habitat. Moreover, Far Eastern and Beringian endemics (*Oxytropis kamtschatica* and *Cardamine victoris*), as well as plants of American origin (e.g. *Astragalus polaris*), are found in the valley.

Noteworthy fauna:

Fish

The list of fish inhabiting the Anadyr Basin consists of 31 species. Chum Salmon (*Oncorhynchus keta*) travelling to the Anadyr headwaters for spawning is the most valuable fish both ecologically and economically. The Middle Anadyr River provides a home to Least Cisco (*Coregonus sardinella*), Wide-nosed Whitefish (*Coregonus nasus*), Siberian Whitefish (*C.lavaretus pidschian*), Inconnu (*Stenodus leucichthys nelma*), and Kamchatka Grayling (*Thymallus arcticus mertensi*). Floodplain lakes and channels maintain a thriving Northern Pike (*Esox lucius*) population.

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) is a common occurrence in the Anadyr Valley.

Birds

The Middle Anadyr River is a home to 106 species of breeding birds. Collectively, they make up an original complex of northern taiga and hypoarctic forms supplemented by a certain number of tundra and subalpine ones (Portenko, 1939; Krechmar *et al*., 1991).

Red-throated Diver (*Gavia stellata*) is the most common shorebird, followed by Black-throated Diver (*G.arctica*). Red-necked Grebe (*Podiceps auritus*) and Slavonian Grebe (*P.griseigena*) are almost equally widespread.

The fauna of other waterfowl is very diverse and consists of 24 species, including 17 breeding ones. The Whooper Swan (*Cygnus cygnus*) nests in alass depressions, and White-fronted Goose in "kedrotundra".

The birds also occur along the Middle Anadyr River in the moulting season. In the early 1990s, White-fronted Geese made up aggregations of up to 500 individuals, while Whoopers gathered in groups of 32 birds (Eldridge *et al*.,

1992). Lesser White-fronted Goose (*Anser erythropus*) is a rare breeding and moulting bird at the site. Passage migrants include a tundra-dwelling subspecies of Bean Goose (*Anser fabalis serrirostris*), while its taiga counterpart (*A.f.middendorfii*) comes to the site in small numbers for moulting.

Wigeon is most common among dabbling ducks and quantitatively accounts for 60-80% of their total population. Common Teal (*Anas crecca*) and Pintail (*A.acuta*) occur in large numbers, whereas Northern Shoveler (*A.clypeata*) is an infrequent breeding bird. Greater Scaup (*Aythya marila*), Black-winged Scoter (*Melanitta americana*), and Long-tailed Duck (*Clangula hyemalis*) are the most common diving ducks.

Tufted Duck (*Aythya fuligula*) and White-winged Scoter (*Melanitta deglandi*) are less frequent. Harlequin Duck (*Histrionicus histrionicus*), Goldeneye (*Bucephala clangula*), Smew (*Mergus albellus*), Red-breasted Merganser (*M.serrator*), and Goosander (*M.merganser*) occur in the valleys of mountain streams flowing into the Anadyr River. Migrating Baikal Teal (*Anas formosa*) and Pacific Eider (*Somateria mollissima v.-nigrum*) can be seen in the Anadyr Valley along with a smaller number of Mallard (*Anas platyrhynchos*), Gadwall (*A.strepera*), and American Wigeon (*A.americana*).

White-tailed Eagle (*Haliaeetus albicilla*) and Goshawk (*Accipiter gentilis*) are the most frequently seen birds of prey. The former nests in floodplain shrubbery at an approximate density of 1 pair/1,000km^2. The nesting density of the latter species is one order of magnitude higher (1 pair/100 km^2); most individuals are represented by the white form. Foothills provide breeding sites for Rough-legged Buzzard (*Buteo lagopus*) and Peregrine Falcon (*Falco peregrinus*). Other birds of prey, viz. Golden Eagle (*Aquila chrysaetos*), Merlin (*Falco columbarius*), and Gyrfalcon (*F.rusticolus*), pass the site during migrations.

Rock Ptarmigan (*Lagopus mutus*) is a winter inhabitant of the Anadyr Valley. Willow Grouse (*L.lagopus*) concentrate in the valley in large numbers, coming here for the winter from the surrounding "kedrotundra" and mountain slopes that are the breeding habitats of this species. Sandhill Crane (*Grus canadensis*) is widespread over the site, with the birds arriving in the Markovskaya Basin from the northeast, i.e., from the Bering Strait.

Waders are represented by 22 species, including 16 breeding ones and 6 passage migrants. The most typical birds of this group are Wood Sandpiper (*Tringa glareola*) and Terek Sandpiper (*Xenus cinereus*).

Also common are Greenshank (*Tringa nebularia*) and Common Snipe (*Gallinago gallinago*). Temminck's Stint (*Calidris temminckii*) is a rare breeder. Characteristic species of "ketotundra" include Whimbrel (*Numenius phaeopus*), Spotted Redshank (*Tringa erythropus*), and Red-necked Phalarope (*Phalaropus lobatus*). Ruff (*Philomachus pugnax*), Dunlin (*Calidris alpina*), Pacific Golden Plover (*Pluvialis fulva*), Short-billed Dowitcher (*Lymnodromus scolopaceus*), and Black-tailed Godwit (*Limosa limosa*) are somewhat less common. Valleys of mountain streams are inhabited by Common Sandpiper (*Actitis hypoleucos*) and Ringed Plover (*Charadrius hiaticula*). Great Knot (*Calidris tenuirostris*) nests at the tops of Gorelye Mountains (Portenko, 1939). Arctic and mountain-dwelling species occur during migrations and include Gray-tailed Tattler (*Heteroscleus brevipes*), Grey Phalarope (*Phalaropus fulicarius*), Ruddy Turnstone (*Arenaria interpres*), Red-necked Stint (*Calidris ruficollis*), Curlew Sandpiper (*C.ferruginea*), and Pectoral Sandpiper (*C.melanotos*).

Other charadriifom breeders of "kedrotundra" are Arctic Tern (*Sterna paradisaea*) and Long-tailed Skua (*Stercorarius longicaudus*). Arctic Skua (*S.parasiticus*) sometimes places its nests on the lakeshores. Floodplain habitats are used by breeding Mew Gull (*Larus canus*), Herring Gull (*L. argentatus*), and Common Tern (*Sterna hirundo*). Pomarine Skua (*Stereorarius pomarinus*), Glaucous Gull (*Larus hyperboreus*), and Ross' Gull (*Rhodostethia rosea*) occur only as migrants or vagrants.

Willow stands on the floodplain provide a home for Three-toed Woodpecker (*Picoides tridactylus*) and Oriental Cuckoo (*Cuculus saturatus*). Hawk Owl (*Surnia ulula*) and Snowy Owl (*Nyctea scandiaca*) appear only during their fall-winter movements.

Passerine birds of the Middle Anadyr River are represented by 34 species. Floodplain scrub forests provide home to Yellow Wagtail (*Motacilla alba*), Arctic Warbler (*Phylloscopus borealis*), Red-breasted Flycatcher (*Ficedula parva*), Willow Tit (*Parus montanus*), Rustic Bunting (*Emberiza rustica*), Scarlet Rosefinch (*Carpodacus erythrinus*), Gray-cheeked Thrush (*Catharus minimus*) and Magpie (*Pica pica*). The presence of the two latter species is considered to be a peculiar feature of the avifaunal complex of the Sredneanadyrskaya Plain. Characteristic birds of "kedrotundra" habitats are Red-throated Pipit (*Anthus cervinus*), Willow Warbler (*Phylloscopus trochilus*), Little Bunting (*Emberiza pusilla*), Pine Grosbeak (*Pinicola enucleator*), and Redpoll (*Acanthis flammea*). The dense vegetation of marginal floodplain portions provide nesting sites for Pechora Pipit (*Anthus gustavi*), Brown Shrike (*Lanius cristatus*), Siberian Accentor (*Prunella montanella*), Siberian Rubythroat (*Luscinia calliope*), Bluethroat (*L.svecica*), Naumann's Thrush (*Turdus naumanni*), Pallas's Reed Bunting (*Emberiza pallasi*), Brambling (*Fringilla montifringilla*) and Raven (*Corvus*

corax). Nests of the latter species located on floodplain islands are spaced 15-20 km apart. Sand Martin (*Riparia riparia*) makes its nests in collapsing channel banks (Krechmar *et al*., 1991).

Mammals

The mammalian fauna comprises 30 species. The following are common in the valley of the Middle Anadyr River: Laxmann's Shrew (*Sorex caecutiens*), Large-toothed Siberian Shrew (*S.daphaenodon*), Tundra Shrew (*S.tundrensis*), Varying Hare (*Lepus timidus*), Arctic Ground Squirrel (*Citellus parryi*), Tundra Vole (*Microtus oeconomus*), Northern Red-backed Vole (*Clethrionomys rutilis*), Grey Red-backed Vole (*C.rufocanus*), and Northern Pika (*Ochotona hyperborea*). Carnivores include Ermine (*Mustela erminea*), Wolverine (*Gulo gulo*), Wolf (*Canis lupus*), Red Fox (*Vulpes vulpes*), Eurasian Otter (*Lutra lutra*), and Brown Bear (*Ursus arctos*). The Alaska subspecies of Elk (*Alces alces buturlini*) and Wild Reindeer (*Rangifer tarandus*) are also rather common at the site.

Social and cultural values:

The site is a part of the area traditionally used by the native people ("markovchane" – specific ethnocultural community of Russian residents in the Anadyr Valley).

Current land use:

Commercial fishing takes place in the area adjacent to the Lebediny Wildlife Refuge. During the navigation period, the Anadyr River serves as a transport route for barges delivering fuel oil and general cargo to the residents of Markovo (the Yary shipping point near the locality of Krepost').

Conservation measures taken:

The Lebediny Regional Wildlife Refuge established in 1976 was given a higher protected status in 1983 and is now considered to be of federal importance. The refuge is designed to protect breeding populations of water birds. It is proposed that the area be designated a wetland of international importance in accordance with the Ramsar Convention criteria.

Current scientific research and facilities:

A biological station organized by the Institute of Biological Problems of the North of the Far East Division of the Russian Academy of Sciences existed on the territory of the Lebediny Wildlife Refuge throughout 1975-1990.

Jurisdiction:

Administration of the Anadyrsky District of the Chukot Autonomous Area.

Management authority:

Head office of the Lebediny Wildlife Refuge, Markovo, Chukot Autonomous Area.

4.5. Lake Elgygytkin

Geographical coordinates: 67°26'24"N, 172°10'04"E.

Elevation: 489.5 m a.s.l.

Area: *c.* 250 km^2, including lake water surface (117.5 km^2).

Overview:

Large and very deep (173 m) highly oligotrophic water body in the tundra zone of Chukotka with a unique ecosystem that includes endemic forms of diatom algae, invertebrates, and fish. The catchment area provides breeding grounds for many shorebirds and birds of prey, Gyrfalcon (*Falco rusticolus*) in particular.

Wetland type:

By international classification – O; by national classification 3.8.1.4 (oligotrophic water body in the mountain tundra).

Ramsar Criteria: 1, 3, 7.

Justification for the application of selected criteria:

A tundra water body unique in terms of the species composition of its biota, which includes a relict form of Boganid Char (*Salvelinus boganidae*), endemic Smallmouth Char (*S. elgyticus*), and monotypic endemic Longfin Char (*Salvethymus svetovidovi*).

General location:

Lake Elgygytkin (Chukchi for "White Lake" or "Lake of Permanent Ice") lies in the central part of the Anadyr Plateau close to the primary watershed of the Akademika Obrucheva Mountains. Rivers flowing to the north (Ugatkyn, Mecherynnet, and Maly Chaun) empty into Chaun Bay on the East Siberian Sea. Rivers running westward (Maly Anyui) belong to the Kolyma Basin, while those flowing toward the west and south (Enmyvaam, Yurumkuveem) feed the Anadyr River. The lake is situated

on the territory of the Anadyrsky Administrative District of the Chukot Autonomous Area, not far from the boundary that separates it from the Chaunsky District. It is 220 km from the nearest settlement (Ust-Belaya), 386 km from the district centre (the city of Anadyr), and 262 km from Pevek.

Physical features:

The rounded hollow of Lake Elgygytkin is situated in the north-western part of the Anadyr Plateau on the eastern slopes of the Akademika Obrucheva Mountains. This tectonically active zone lies at the junction of the Malo-Chaunsky volcanic and tectonic graben and structures of the Okhotsk-Chukotsk volcanogenic belt (Bely, 1999). The lake basin is surrounded on the north, west, and southwest by fragmented and flat-topped upland massifs made up of Cretaceous lavas and tuffs with their highest points lying at altitudes of 600 to 1,000 m a.s.l. Slopes of the lake-filled hollow are steep, with screes of large loose boulders (Glushkova, 1993).

Two main hypotheses have been put forward in an attempt to explain the origin of Lake Elgygytkin, one attributing it to a meteorite impact and the other to the effect of endogenous factors (Bely, 1993). The meteorite hypothesis is attractive because of its apparent simplicity; however, it is inconsistent with the geological structure of the area. The difference in the age between the deformed bedrock forming the hollow appears to be more in line with the latter hypothesis.

The modern lake basin is about 15 km in diameter. It is encircled by a ring of low mountains and hills 150-200 m in height. The foothill surface has been transformed by solifluction into a series of terraces drained by numerous creeks, with the largest, Lagerny, on the eastern side of the lake.

The lake has a maximum depth of 173 m and a water surface of almost 11.5 km in diameter. A nearshore shallow 10 m deep and about 1 km wide has evolved in its eastern part. Beyond this zone, the depth increases sharply as the lake floor descends at an angle of 20-40° to points 120-140 m below the water surface. The floor of the lake hollow, which is delineated by 140 and 160 m isobaths, makes up an irregular quadrangular area some 8 km on each side. The sediment layer at the bottom is as thick as 500 m. The south-eastern part of the lake gives rise to the Enmyvaam River, which flows for 250 km to join the Belaya River in the Anadyr Basin.

The lake is lined with pebble beaches that vary in width from 4-5 to 50-100 m. The beaches gradually changes into a slightly tilted surface of a foothill plain, but here and there gives way to 3-15 m high precipices coming close to the water's edge. The mountains surrounding Lake Elgygytkin are rather low, with elongated foothills. No traces of valley or mountain glaciation have been found in the lake-filled hollow.

The depression dates from the Late Pleistocene, meaning it is almost 3.5-4 million years old. At an early stage of its formation, the lake was connected to the Maly Anyui River Basin, from which it was inhabited by the ancestors of modern chars that now live in the lake. Later, runoff waters from the lake broke through to the Anadyr Basin (Bely, 1993; Chereshnev & Skopets, 1993).

The Enmyvaam Valley is 2.3 km wide at the river's head, with a channel width of 40-60 m and a depth of 0.8-1.0 m. The low-lying floodplain is as wide as 1 km, has no vegetation, and is dissected by numerous streams. The higher floodplain surface is tundra, with many waterlogged hollows and thermokarst lakes arranged in chains along the base of hill slopes.

The site has a harsh oceanic climate with low air temperatures, mists, and highly variable weather conditions. The arrival of air masses from the Anadyr Basin in the south are associated with the effects of continentality. Northerly winds from the Chaunskaya Lowland bring in cool, cloudy weather in summer and snowstorms in winter. The storms are sometimes very strong and cause a redistribution of snow that accumulates in hollows and depressions. According to the local meteorological station (Enmuveem), mean monthly temperatures in the period from December until March vary between –20° and –27°C (absolute minimum –61°C). The air temperature does not fall below zero for a total of 50 days. Temperatures of +10-15°C are recorded in summer.

Hydrological features:

The volume of water mass in the lake amounts to almost 15 km^3. The lake freezes at the end of September, with the ice cover in May as thick as 2.5 m (Glushkova, 1999). Intense thawing of ice takes place in the second or third weeks of June. The lake is free of ice for 1.5-2.0 months at most. The water temperature near shore is +6-7°C in summer, remaining stable (about +2°C) at a depth of more than 50 m. Long-term cooling in the winter and frequent winds preclude the development of water temperature stratification in summer. Lake Elgygytkin is one of the coldest freshwater bodies inhabited by fish. Its water (under the ice cover) is transparent to a depth of 35 m and is very poorly mineralized. Approximately 40 small creeks empty into the lake. Runoff occurs through the Emyvaam River.

Ecological features:

The shores of the lake, lacustrine terraces, and slopes of the surrounding mountains support an intricate vegetation mosaic of different types of mountain tundra, with a

cover of *Dryas sp*. and lichens, low-growing willows, sedges and cottongrasses or meadow and nival vegetation.

Areas with running water (river and stream valleys, lake and oxbow sides) give rise to groups of willows (*Salix krylovii, S.alaxensis, S.tschuktschorum, S.saxatilis*), while low-lying sites are occupied by *Deschampsia cespitosa*, sedges (*Carex eleusinoides, C.williamsii, C.fuliginosa, C.podocapra*), and forbs (*Stellaria fisheriana, Draba pilosa, Lagotis glauca*). Mountain plants such as *Eremogone tschuktschorum, Tephroseris jacutica,* and *Douglasia ochotensis* grow on gravelly and sandy stretches on the shores of the lake.

The lacustrine terrace is dry lichen tundra with a vegetation cover dominated by *Alectoria nigricans* and patches of herbaceous vegetation composed of *Arctagrostis arundinacea*, *Lagotis minor, Bistorta elliptica, Saussurea tilesii, Carex podocarpa, Saxifraga nelsoniana, Cassiope tetragona, Ledum decumbens, Dryas octopetala, Empetrum nigrum, Rhododendron parvifolium*, etc.).

The sloping foothills support lichen tundra communities with admixtures of cushion plants (*Dryas sp.*) or Arctic heather (*Cassiope* sp.) supplemented by *Tephroseris heterophylla, Ermania parryoides, Silene stenophylla, Astragalus tugarinovii, Arnica frigida, Crepis nana, Potentilla elegans, Douglasia ochotensis,* etc.

Inclined terraces subjected to solifluction show wide runoff troughs and snow beds feeding rich meadow and small-shrub vegetation that forms a dense cover of *Anemonidium richardsonii, Chrysosplenium wrightii, Carex lugens, C.podocarpa, Dryas punctata, Festuca brachyphylla, Poa arctica, Luzula nivalis, Phippsia algida, Minuartia macrocarpa, M.biflora, Pedicularis oederi, Veratrum oxysepalum, Bistorta elliptica, Ranunculus sulphureus, R.pygmaeus, Delphinium chamissonis, Achoriphragma nudicaule, Koenigia islandica, Aconitum delphinifolium, Salix reticulata, S.polaris, S.saxatilis, Corydalis arctica, Claytonia acutifolia, Saxifraga hirculus, S.hyperborea, Artemisia arctica*, and many other plants.

Intermontane depressions and saddles support wet patches of sedge tussocks admixed with *Eriophorum vaginatum, Pedicularis pennellii, Carex vaginata, Hierochloe pauciflora, Salix fuscescens, Tephroseris atropurpurea, Luzula wahlenbergii*, etc.

Mountain summits exposed to wind action are covered with a carpet of forbs and willows, including *Salix phlebophylla, Pedicularis lanata, Artemisia furcata, Potentilla elegans, P.uniflora, Minuartia arctica, Eremogene capillaris*, etc. (Kozhevnikov, 1993).

The nearshore area of the lake is free from macrophytes. The algal flora is dominated by 309 species of diatoms (Kharitonov, 1993), the list of which includes many endemic and ancient forms. Interestingly, Lake Elgygytkin shares almost 70% of its diatom diversity with Lake Baikal. *Cyclotella ocellata* is the sole dominant species of local phytoplankton. A most conspicuous biological feature of the lake is a profuse development of the periphytic alga *Stephanodiscus dubius,* which is rare in other water bodies of northern Asia. At times of excessive growth, this alga produces "microphyte fields" floating on shallow water in the form of surface films or spots. Production of planktonic diatoms provides a basis for food chains supporting the entire lake ecosystem that can therefore be referred to as an "oceanic" one.

Zooplankton consists largely of copepods (genus *Cyclops*) that include a few endemic species (Streletskaya, 1990) and small (perhaps also endemic) amphipods (family *Gammaridae*).

Almost 90-100% of the chars inhabiting the lake are infested with endoparasites whose larvae develop in the copepod's body. They include cestodes (*Eubotrium salvelinum*, *Diphyllobotrium ditremum, D.dendriticum*) and nematodes (*Philonema cf.oncorhynchi*). Also, all three char species are infested with parasitic copepods (*Salminicola sp.*). Lake Elgygytkin is considered to be the largest natural stronghold of diphyllobothriasis on the Chukotka Peninsula despite its low water temperature and the relatively simple organization of its ecosystem (Artashkevich & Orlovskaya, 1993).

Noteworthy flora:

Portions of relict oceanic tundras amongst zonal subarctic landscapes are preserved in the vicinity of Lake Elgygytkin. The flora of the site consists of 249 species of vascular plants representing 108 genera and 38 families. Most of them spread during the Pleistocene period across the Bering Land Bridge that united Siberia and Alaska. In terms of diversity, the five leading families include *Poaceae* (29 species), *Cyperaceae* (24), *Asteraceae* (25), *Saxifragaceae* (20), and *Caryophyllaceae* (19). The most abundant vegetation develops on the humic soils of moist portions of terraces undergoing solifluction and wide runoff troughs (Kozhevnikov, 1993).

The local flora includes as many as 100 rare species. The favourable thermal regime of rocky walls facilitates survival of several relict forms, such as *Potentilla multifida* and *Carex spaniocarpa*.

Noteworthy fauna:

Fish

Lake Elgygytkin came to be widely renowned throughout the 1980s for the discovery of two endemic chars, *Salvelinus elgyticus* and *Salvethymus svetovidovi*, the lat-

ter being a new species and genus of salmonid fishes (Chereshnev & Skopets, 1990). Moreover, the lake is home to an isolated population of Boganid Char that was seriously depleted by over-harvesting in 1970s. Besides these resident species, Lake Elgygytkin is known to be visited by Kamchatka Grayling (*Thymallus arcticus mertensi*) and Slimy Sculpin (*Cottus cognatus*). Chum Salmon (*Oncorhynchus keta*), Round Whitefish (*Prosopium cylindraceum*), and Cisco (*Coregonus anaulorum*) have been reported to enter the lake in unusually hot summer seasons, e.g. in 1991 (Chereshnev & Skopets, 1993).

Before the onset of uncontrolled harvesting, Boganid Chars weighing up to 15 kg lived in the lake. However, the biggest 23-year-old individuals caught in the 1980s were only 82 cm in length and weighed less than 7 kg. After a ban on fishing was imposed and remained in force throughout 1986-1991, the fish again increased in size. Commercial fishing was resumed in 1991. Boganid Char largely occurs on nearshore shallows within several hundred metres from the water's edge at a depth of 1-5 m.

Salvelinus elgyticus is a small stenophagous fish (16-24 cm in length and 30-114 g in weight) that feeds on selected planktonic organisms. During the day, the fish stays at a depth of 40-80 m but comes closer to the shore at night, its movements related primarily to the corresponding vertical movements of zooplankton. Spawning beds of *S. elgyticus* are located in the southern part of the lake (1.5-3 m deep) where the fish gather in large schools in September.

Salvethymus svetovidovi is an autochthonous species of Lake Elgygytkin, in fact its earliest immigrant, which is believed to be closest to the common ancestor of all species of the genus Salvelinus. This stenobathic planktivorous fish populates underwater slopes and hollows, but concentrates at a depth of 50-100 m. It is a slow-moving and slow-growing animal (adults aged 14-30 years are only 16-33 cm long and weigh from 34 to 400 g). The fish has a prolonged reproductive period, and spawning occurs from June to September. Its spawning grounds are yet undiscovered.

Birds

A total of 44 species belonging to 8 orders have been recorded in the vicinity of Lake Elgygytkin and the upper reaches of the Enmyvaam River. The majority of breeding birds occur on mountain tundra of different types. There is only one diver species, Black-throated Diver (*Gavia arctica*). Other water birds are represented by a small number of Bean Goose (*Anser fabalis*), Pintail (*Anas acuta*), Long-tailed Duck (*Clangula hyemalis*), and Red-Breasted Merganser (*Mergus serrator*). Only Pintail and Long-tailed Duck appear to nest in the vicinity of Lake Elgygytkin. Rough-legged Buzzard (*Buteo lagopus*) is an irregular breeder at the site, while Golden Eagle (*Aquila chrysaetos*) and Merlin (*Falco columbarius*) are accidental vagrants. Rock Ptarmigan (*Lagopus mutus*) occurs in small numbers, and Sandhill Crane (*Grus canadensis*) is a rare breeding species. Charadriiforms are quantitatively the most common birds in the lake basin. Characteristic species include Pacific Golden Plover (*Pluvialis fulva*), Ringed Plover (*Charadrius hiaticula*), which nests on shingle beaches and river spits, Red-necked Stint (*Calidris ruficollis*), and Dunlin (*C.alpina*). Rare breeders are Mongolian Plover (*Charadrius mongolus*), which is allegedly represented by an isolated population (Berman & Dorogoy, 1993), Dotterel (*Eudromias morinellus*), Grey-tailed Tattler (*Heteroscelus brevipes*), Red-necked Phalarope (*Phalaropus lobatus*), Ruddy Turnstone (*Arenaria interpres*), Ruff (*Philomachus pugnax*), and Knot (*Calidris canutus*).

Arctic Skua (*Stercorarius parasiticus*) breeds irregularly, while Long-tailed Skua (*S. longicaudus*) and Herring Gull (*Larus argentatus*) are very common, with the latter frequently placing its nests on riverside precipices. Similar precipices in river valleys in the eastern part of the lake basin are occupied by breeding Gyrfalcon (*Falco rusticolus*) and Raven (*Corvus corax*). Seasonal movements bring in Glaucous Gull (*Larus hyperboreus*), Arctic Tern (*Sterna paradisaea*), and Snowy Owl (*Nyctea scandiaca*). The most common passerine birds include White Wagtail (*Motacilla alba*), Red-throated Pipit (*Anthus cervinus*), Lapland Longspur (*Calcarius lapponicus*), Arctic Redpoll (*Acanthis hornemanni exilipes*), and Snow Bunting (*Plectrophenax nivalis*). Other characteristic but rarely breeding birds are Shore Lark (*Eremophila alpestris*), Bluethroat (*Luscinia svecica*), Yellow Wagtail (*Motacilla flava*), Wheatear (*Oenanthe oenanthe*), and Raven.

Mammals

Lake Elgygytkin lies on the migration route of Wild Reindeer (*Rangifer tarandus*) that belong to the Chukotkan population currently estimated at 20,000-25,000 individuals. The animals can be seen year round in the lake basin, which they use for feeding and calving (Chernyavsky & Krechmar, 1993). This makes the site attractive for big carnivores such as Brown Bear (*Ursus arctos*) and Wolf (*Canis lupus*). Other common predators in the vicinity are the Arctic Fox (*Alopex lagopus*), Red Fox (*Vulpes vulpes*), and Wolverine (*Gulo gulo*).

Social and cultural values:

The remains of habitation of Neolithic reindeer hunters have been found at the south-eastern side of the lake. These people ("elgygytkintsy") appear to have fished here

for subsistence some 4,000 years ago. This Paleoasiatic culture produced thin-walled pottery, three-edged darts and arrowheads, and "figure stones" replicating animals (Kiriyak, 1993).

Lake Elgygytkin is a unique water body because it originated from a combination of very rare geological events. The entire 3,000,000-year history of Pleistocene passage in western Beringia is written in the 500 m thick sediment layer deposited at the lake bottom. The site provides a rare example of a high-latitude ecosystem containing a small number of components based on the photosynthetic activity of microscopic algae that formed in a highly oligotrophic water body millions of years ago and that has been steadily self-maintained until the present.

The lake, with its cobalt-blue water in a frame of beryllium-green shallows, greatly impressed S.V.Obruchev, who first saw it from a plane in 1933. Indeed, the lake and the strikingly scenic landscapes surrounding it make one of the best sights on Chukotka and leave no one who happens to visit these quarters indifferent. This is how the site is described by the geologist V.F.Bely, who studies processes that run for many millions of years: "The modest but expressive and constantly varying colours of the mountains and the deep blue of the water bring about an acute feeling of inimitable moments of eternity".

Current land use:

The lake was exempt from economic activity before the 1950s. A house for fishermen, stables, and a landing strip for small An-2 aircraft were constructed in the early 1960s. Uncontrolled Boganid Char fishing caused a dramatic decline in its local population by the 1980s, while frequent visits by prospecting teams of geologists and commercial hunters resulted in gross disfigurement in many places along the bank of the lake. The territory's natural resources have been developed by the Ekos commercial cooperative since 1991, which will hardly change the situation for the better (Bely & Chereshnev, 1993).

Factors adversely affecting the site's ecological character:

Major risk factors include commercial char fishing, water pollution from oil slicks, the use of motorboats and tracked vehicles.

Conservation measures taken:

In 1983, Lake Elgygytkin was designated a nature monument by the administration of the Magadan Region. At present, it retains its protected status as a nature monument of importance for the Chukot Autonomous Area.

Conservation measures proposed but not yet implemented:

It is recommended that the lake and its catchment area be designated as a strict nature reserve or incorporated into a representative zone in the form of a nature park.

Jurisdiction:

Administration of the Anadyrsky District of the Chukot Autonomous Area.

4.6. Seabird colonies on the Bering Sea coast (from Cape Dezhnev to Cape Navarin)

Thirty-five sites with seabird colonies have been discovered along the 2,150 km long Pacific coast of Chukotka Peninsula. The colonies are formed by 16 species, including Fulmar (*Fulmarus glacialis*), Pelagic Cormorant (*Phalacrocorax pelagicus*), Glaucous Gull (*Larus hyperboreus*), Herring Gull (*L.argentatus*), Slaty-backed Gull (*L.schistisagus*), Kittiwake (*Rissa tridactyla*), Brunnich's Guillemot (*Uria lomiva*), Common Guillemot (*U. aalge*), Horned Puffin (*Fratercula corniculata*), Black Guillemot (*Cepphus grylle*), Pigeon Guillemot (*C. columba*), Parakeet Auklet (*Cyclorhynchus psittacula*), Crested Auklet (*Aethia cristatella*), Least Auklet (*A.pusilla*), and Tufted Puffin (*Lunda cirrhata*). The total number of colonial seabirds in the north-western part of the Bering Sea is estimated to be at least 5,000,000 individuals. It should be kept in mind that the Koryak coast remains virtually unexplored in this respect. The largest colonies are found on Ratmanov Island (over 4,000,000 individuals), Cape Khalyuskin (36,000), Nuneangan Island (40,000), Cape Stoletiya (100,000), and a stretch of seacoast near Cape Navarin (over 600,000).

Cape Dezhnev (66°04'N, 169°40'W) – rock walls at the eastern extremity of the Asian mainland providing home to small breeding populations of Pelagic Cormorant, Glaucous Gull, Herring Gull, Black Guillemot, Horned Puffin, Pigeon Guillemot, Parakeet Auklet, and Tufted Puffin. Kittiwakes, Common and Brunnich's Guillemots are represented by a substantially larger number of individuals (1,500, 1,000, and 500 respectively) (Kondratyev, 1997).

Cape Naukan (66 °00'N, 169°20'W) – small rocky cape not far from Cape Dezhnev occupied by a small number of Pelagic Cormorants (40 pairs), Glaucous Gulls

(25 pairs), Pigeon Guillemots (a few tens of pairs), Parakeet Auklets, and Horned Puffins. Kittiwakes are more numerous (1,000 pairs), similar to Common and Brunnich's Guillemots (Dorogoy, 1995).

Ratmanov Island (65°46'N, 169°03'W) – rocky island of the Diomede Archipelago in the Bering Strait (35 km from Cape Peek and 88 km from the village of Lavrentiya). The island measures 8.7 km from north to south and extends for 4.7 km from west to east, with its highest point rising to 505 m a.s.l. It has a precipitous shoreline with screes of large loose boulders and a narrow beach strip flanked by steep cliffs. There is a weather station and frontier post. The island harbours one of the largest Chukotka seabird colonies, composed of 11 species and totalling 4,000,000 individuals or more. Breeding birds include Pelagic Cormorant (270 pairs), Glaucous Gull (230 pairs), Kittiwake (1,700 pairs), Brunnich's Guillemot and Common Guillemot (total of 6,500 pairs), Pigeon Guillemot (700 pairs), Parakeet Auklet (30,000 pairs), Crested Auklet (500,000 pairs), Least Auklet (up to 1,000,000 pairs), Horned Puffin (2,000 pairs), and Tufted Puffin (350 pairs) (Zubakin *et al*., 1992). There is a large Walrus breeding ground on the island. Mass migrations of Gray Whale (*Eschrichtius gibbosus*) take place in the surrounding seawaters. The site meets the criteria of the Ramsar Convention.

Cape Leimin (65°55'N, 170°15'W) – rocky cape in the Bering Sea 52 km northwest of the village of Lavrentiya. Seven species of breeding birds total approximately 7,000-8,000 individuals and include Pacific Cormorant, Glaucous Gull, Kittiwake, Common and Brunnich's Guillemots, Parakeet Auklet, and Tufted Puffin (Kondratyev, 1997).

Cape Litke (65°48'N, 170°29'W) – rocky cape near Puoten Bay on the Bering Sea 33.6 km northwest of the village of Lavrentiya. The number of breeding birds totals approximately 5,000 individuals and includes Pacific Cormorant, Glaucous Gull, Herring Gull, Kittiwake, Common, Brunnich's and Pigeon Guillemots, and Horned Puffin (Dorogoy, 1995; Kondratyev, 1997).

Cape Nunyamo (65°37'N, 170°38'W) – cape at the northern extremity of Lavrentiya Bay (eastern Chukotka) 20 km from the village of Lavrentiya. A small colony is formed by Pacific Cormorants, large gulls, and Kittiwakes. Parakeet Auklet, Horned and Tufted Puffins are present in low numbers (Kondratyev, 1997).

Bennet Island (65°46'N, 171°15'W) – islet in the innermost part of Lavrentiya Bay with a colony of Pacific Cormorants (90 pairs) and large gulls (mainly Glaucous Gull, 25 pairs) (Kondratyev, 1997).

Cape Kriguygun (65°30'N, 171°05'W) – rocky cape in the Bering Sea 12 km south of the village of Lavrentiya. A small colony of some 1,000 breeding birds includes Fulmars, Kittiwakes, Parakeet Auklets, Horned and Tufted Puffins (Kondratyev, 1997).

Cape Khalyuskin (65°30'N, 171°05'W) – high rocky cape in the Bering Strait 20 km south of Mechigmen Bay. There is a large population of Pacific Cormorant (750-1,000 pairs), Kittiwake (1,500-2,200 pairs), Brunnich's and Common Guillemots (7,000-14,000 pairs). Herring Gulls, Pigeon Guillemots (75-125 pairs), and Horned and Tufted Puffins are present in smaller numbers (Bogoslovskaya *et al*., 1988).

Merkinkan Island (64°49'N, 172°47'W) – islet in Penkigney Bay 17 km southwest of Yanrakynnot. The colony contains 1,500 birds, including Pacific Cormorants, large gulls, Kittiwakes (150 pairs), Pigeon Guillemots (25 pairs), Parakeet Auklet, Horned Puffins (up to 350 pairs), and Tufted Puffins (150 pairs) (Bogoslovskaya *et al*., 1988).

Achinkinkan Island (64°54'N, 172°32'W) – islet in Penkigney Bay. The colony contains 1,300 birds, including Pacific Cormorants, large gulls, Kittiwakes (180-300 pairs), Pigeon Guillemots (40 pairs), Horned Puffins (up to 180-500 pairs), and Tufted Puffins (150-250 pairs) (Bogoslovskaya *et al*., 1988).

Arakamchechen Island (64°45'N, 172°30'W) – island with rocky capes (Kuguvan, Makoguvan) in the Senyavin Strait. Breeding birds include Pacific Cormorants (500-600 pairs), Glaucous Gulls (50-100 pairs), Herring Gulls (45-80 pairs), Kittiwakes (500-700 pairs), Brunnich's and Common Guillemots (up to 5,000 pairs), Common Guillemots (50-150 pairs), Horned Puffins (150 pairs), and Tufted Puffins (up to 100 pairs) (Bogoslovskaya *et al*., 1988).

Kynkai Island (64°05'N, 172°45'W) – islet in the Senyavin Strait 2.7 km from the south-western tip of Arakamchechen Island. The local seabird colony contains a total of 2,000 birds, including Pacific Cormorants, large gulls, Kittiwakes (150-350 pairs), Pigeon Guillemots, Horned Puffins (500 pairs), and Tufted Puffins (250 pairs) (Bogoslovskaya *et al*., 1988).

Ittygran Island (64°35'N, 172°30'W) – island with rocky capes (Navak, Konovak, Amago-Mel'got, Skalisty, Sygrak) in the archipelago of the Senyavin Straits. The colonies are formed by Pacific Cormorants (390 pairs), large gulls (650 pairs), Kittiwakes (500-800 pairs), Brunnich's and Common Guillemots (a total of 2,600-7,800 pairs), Pigeon Guillemots (180 pairs), Horned Puffins (90 pairs), and Tufted Puffins (45 pairs) (Bogoslovskaya *et al*., 1988).

Nuneangan Island (64°35'N, 172°18'W) – rocky islet at the exit from the Senyavin Straits lying 5 km east of Ittygran Island in a rather shallow and highly productive sea area that is frequented by feeding Gray and Bowhead Whales. The seabird colony is formed by almost 40,000 seabirds of 8 species. The most dominant are Brunnich's and Common Guillemots (a total of 4,000-13,000 pairs), Pacific Cormorants (500-1,400 pairs), and Kittiwakes (1,500-4,000 pairs). Less abundant breeding species include Horned Puffin (200 pairs), large gulls (250 pairs), Tufted Puffin and Pigeon Guillemot (150 pairs each) (Bogoslovskaya *et al*., 1988).

Cape Mertens (64°32'N, 172°25'W) – rocky cape in the east of the Chukot Peninsula at the exit from the Senyavin Straits. Breeding colonies include Pacific Cormorants (350-600 pairs), large gulls (15-20 pairs), Kittiwakes (75 pairs), Brunnich's and Common Guillemots (a total of 200 pairs), and Pigeon Guillemot (25-75 pairs). Horned and Tufted Puffins occur in smaller numbers (Bogoslovskaya *et al*., 1988).

Cape Chukotsky (64°50'N, 173°10'W) – cape at the eastern entrance to Provideniya Bay in the south-eastern part of the Chukot Peninsula. A small seabird colony (around 1,000 individuals) made up of Fulmar, Pacific Cormorant, Kittiwake, Brunnich's and Common Guillemots, Tufted Puffins, and Pigeon Guillemot (Kondratyev, 1997).

Cape Stoletiya (64°20'N, 173°37'W) – rocky cape at the western exit from Provideniya Bay with one of the largest seabird colonies in the south-eastern part of Chukotka. Breeding birds include Fulmar (1,000 pairs), Pelagic Cormorant (100 pairs), Glaucous and Herring Gulls, Kittiwake, Brunnich's and Common Guillemots (a total of 5,000-10,000 pairs), Pigeon Guillemot (several hundred pairs), Parakeet Auklet (100 pairs), Crested Auklet (5,000 pairs), Least Auklet (several hundred pairs), Horned Puffin (100 pairs), and Tufted Puffin. Kittlitz's Murrelet (*Branchyramphus brevirostris*) occurs in the surrounding waters (Dorogoy, 1995).

Cape Lesovsky (64°20'N, 173°32'W) – a colony of 500-1,000 pairs of Fulmar, Pacific Cormorant, Kittiwake, Pigeon Guillemots (several hundred pairs), Horned Puffin (100 pairs), Brunnich's and Common Guillemots (a total of 5,000-10,800 pairs) (Dorogoy, 1995).

Sirenikovskoye coast (64°23'N, 173°56'W) – rocky cliffs near the village of Sireniki. The colony is made up of Fulmar (1,000-1,500 pairs), Pigeon Guillemot (several hundred pairs), Least Auklet (a few tens of pairs), Crested Auklet (5,000 pairs), and Tufted Puffin (Dorogoy, 1995).

Cape Kekilin (64°50'N, 173°56'W) – steep precipices 200-300 m in height extending for almost 8 km along the coast of Preobrazheniya Bay 6.5 km from the village of Nunlingran. The breeding sites bring together 11 seabird species dominated by Brunnich's Guillemot (several thousand pairs). Other breeders include Fulmar (10-20 pairs), Kittiwake (several thousand pairs), Pigeon Guillemots (several thousand pairs), Crested Auklet, Horned Puffin and Tufted Puffin (Dorogoy, 1992, 1995).

Cape Enmelen (64°56'N, 175°50'W) – rocky cape in the Gulf of Anadyr 7 km from the village of Enmelen. Colonies totalling about 9,000 seabirds are formed by Fulmar, Pacific Cormorant, Glaucous and Herring Gulls, Kittiwake, Brunnich's and Common Guillemots, Horned and Tufted Puffins (Kondratyev, 1997).

Cape Bering (65°00'N, 175°55'W) – rocky coast at the south-eastern extremity of the Chukot Peninsula. Seabird colonies contain up to 8,000 individuals. Breeding species include Fulmar, Pacific Cormorant, Glaucous and Herring Gulls, Kittiwake, Brunnich's and Common Guillemots, Parakeet Auklet, Horned and Tufted Puffins (Kondratyev, 1997).

Cape Chirikov (65°15'N, 175°56'W) – rocky coast of the Anadyr Gulf 28 km north of the village of Enmelen. Colonies are formed by Fulmar, Pacific Cormorant, Glaucous and Herring Gulls, Brunnich's and Common Guillemots, Parakeet Auklet, Pigeon Guillemot, Horned and Tufted Puffins (Kondratyev, 1997).

Meechkyn Spit (65°28'N, 178°45'E) – western tip of a 100-700 m wide sea spit extending for 80 km at the eastern entrance to Krest Bay. There is a colony of large gulls (Glaucous and Herring Gulls) totalling 180-200 pairs (Smirnov, 1999).

Alyumka Island (64°40'N, 177°37'E) – rocky islet at the head of Anadyrsky Liman close to the fairway. There is a breeding colony of Herring Gull (100-150 pairs), Kittiwake (150 pairs) Horned Puffin and Tufted Puffin (Velizhanin, 1987; Galanin & Zaiko, 1998).

Strela Spit (64°13'N, 178°02'E) – pebble spit in the south-eastern corner of Anadyrsky Liman supporting a mixed colony of large gulls and Black Brants (*Branta bernicla nigricans*). There are 150-160 pairs of Glaucous Gull, 23-30 nests of Herring Gull, and 100-150 nests of Black Brant (Kondratyev, 1992).

Cape Barykov (63°02'N, 179°27'E) – rock walls 5 km from the port of Beringovsky. Seabird colonies are dominated by Kittiwake. Other breeding species include Pacific Cormorant, large gulls, Common and Brunnich's Guillemots, Horned Puffins, and Parakeet Auklet (Galanin & Zaiko, 1998).

Cape Ginter (63°03'N, 179°24'E) – 50-100 m high rocky coastal stretches extending for almost 12 km in the vicinity of the port of Beringovsky. Seabird colonies are formed by nine species and dominated by Kittiwakes and Guillemots (tens of thousands of birds). Other breeding species include Pacific Cormorant, Horned Puffin, Tufted Puffin, and sometimes Slaty-backed Gull (Dorogoy, 1992).

Cape Otvesny (62°45'N, 179°37'E) – rocky coast of the Bering Sea 65 km southeast of the port of Beringovsky. Seabird colonies are dominated by Common and Brunnich's Guillemots (a total of roughly 600,000 individuals). The number of large gulls, Horned Puffins, and Pacific Cormorants is insignificant (Galanin & Zaiko, 1998).

Cape Faddey (62°39'N, 179°37'E) – rocky cape 46 km from the port of Beringovsky. Seabird colonies on the shore of Utinaya Lagoon north of Cape Faddey are dominated by Kittiwake. Other breeding species include Pacific Cormorants, large gulls, Common and Brunnich's Guillemots, Horned Puffins, and Parakeet Auklets (Galanin & Zaiko, 1998).

Cape Navarin (62°17'N, 179°08'E) – rocky coastal stretches in the southern part of the Beringovsky Administrative District. The composition of seabird colonies remains unknown.

5. Sea of Okhotsk Catchment

5.1. Malkachanskaya Tundra

Geographical coordinates: 59°51'59"N, 154°11'44"E (Malkachan River mouth).

Elevation: 0-15 m a.s.l.

Area: *c.* 650 km^2.

Overview:

Delta of a small salmon river with adjacent portions of river valley, treeless lacustrine-alluvial plain, and extensive marine shallows with shingle spits, sand bars, and mudflats.

Wetland type:

By international classification – A, B, E, F, G, H, M, O, Tp, Vt; by national classification – 1.2.1.3, 1.2.3.1, 1.3.2, 1.4.2.3, 3.7.2.1 (lower reaches and delta of a small salmon river with a large shallow sea bay and the adjacent portions of a lacustrine-alluvial plain).

Ramsar Criteria: 1, 2, 4, 5, 6, 8.

Justification for the application of selected criteria:

Breeding area for many water birds, including globally threatened species: Nordmann's Greenshank (*Tringa guttifer*) and Steller's Sea Eagle (*Haliaeetus pelagicus*). Stopover sites for migrating Arctic geese and waders, feeding and spawning grounds for salmonid fishes, large congregations of marine mammals.

General location:

The site adjoins Shelikhov Bay 50 km north of the Piyagin Peninsula on the territory of the Olsky Administrative District of the Magadan Region. The distance from the nearest populated centre (Yamsk) is 32 km, while the distance in a straight line from the city of Magadan is 194 km (530 km by sea).

Physical features:

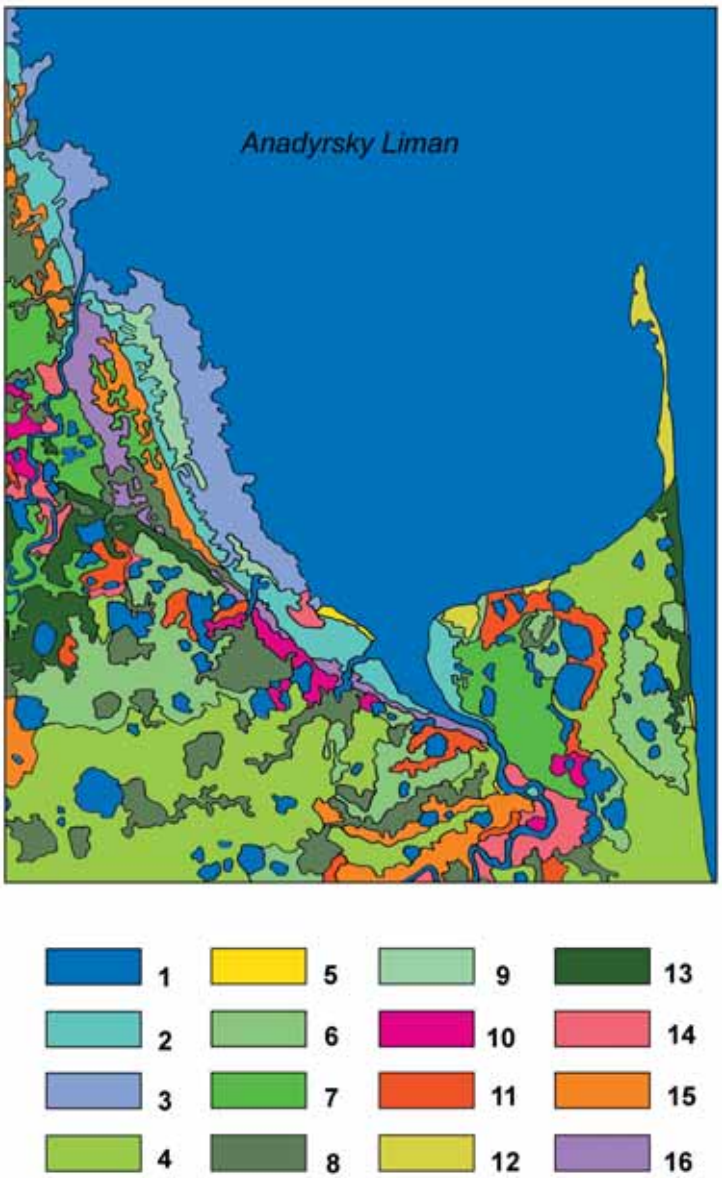
The area encompasses a few geologically different surfaces. On the north, it borders a small mountain massif, with Iretskaya Mountain as its highest summit (895 m). The massif is formed by Lower Cretaceous granites and juts out into Shelikhov Bay as the rocky Cape Iretsky that in turn grades into the Malkachanskaya Spit. The spit is a 6 km stretch of shingle-formed ground extending southwards and varying from 50 to 250 m in width. Its northern end is cut by small bays and inlets and intersected by a narrow strait that turns the southern part of the spit into an island.

A small delta plain of the Malkachan and Khobota Rivers is elevated 1.0-1.5 m a.s.l. and covers an area of approximately 3 km^2. The delta is limited on the southwest by a vast non-forested plain formed during the Miocene period from marine sands that now fill the entire watershed area between the Yama and Malkachan Rivers. The topographic projection of the Malkachanskaya Plain depicts it as an isosceles triangle some 8 km on each side. This surface is elevated 12-22 m, severely waterlogged, and dotted with numerous lakes. It is drained by several small rivers (Gelsichan, Elge) and gives rise to a few low but extended precipices as it levels off to Malkachansky Bay.

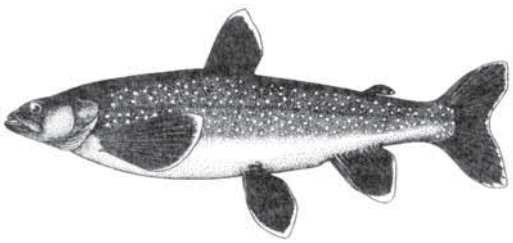
Taken together, the Iretsky mountain massif, Malkachanskaya Spit, and the northern part of the Malkachanskaya Plain make up the shore of the shallow Malkachansky Bay. The bay is characterized by an irregular tidal regime of a diurnal type, and the difference between the sea level at high and low tides is up to 4 m. As the tide ebbs, large stretches of intertidal silt and sand flats with a total area of up to 75 km^2 are exposed.

The Malkachan River rises at the southern slopes of the Kolymsky Range some 55-60 km from Shelikhov Bay. Its total length from the confluence of the Khovan', Elge, and Bebe Rivers is 31 km. The Malkachan River has a well-developed floodplain divided into a large number of islands. The flow rate is about 5 km/hour.

The site has a marine cool, humid subarctic climate. The mean air temperature is −5.2°C, which is lower than in the city of Magadan although summer weather is generally warmer. According to the records of the Yamsk meteorological station, mean air temperatures in January and July are −20.5 and +12°C respectively. August is normally warmer than July. The absolute minimum temperature is −50°C, and the maximum at the seashore is about +25°C. Total annual precipitation is 500-520 mm. Snow cover is established in mid October and disappears in the second half of May. Snow blown away by strong winds from some places accumulates in others, e.g. in sheltered hollows and under precipices. Sea fog is frequent in early summer. Southwestern winds prevail in July and August. The ice cover in Malkachansky Bay breaks up in mid June, which is about



Gilmimliveemsky Hot Spring *(A.V.Andreev)*.



Long-fin Char *Salvethymus svetovidovi* endemic to Lake Elgygytkin *(drawn by I.A.Chereshnev)*.

Landscape structure of the Lower Avtokul' River site: 1 – waters deeper than 1 m, 2 – lower level flats (littoral), 3 – upper level flats (bars and terraces), 4 – maritime plains, 5 – sand spits, 6 – ancient thermokarst depressions, 7 – maritime plains reworked by thermokarst activity, 8 – lacustrine-palustrian complexes of young terraces and alasses, 9 – mid-level flats with creeks and deltas, 10 – second marine terrace, 11 – residual old maritime plains, 12 – drained portions of sea spits, 13 – drained surfaces of steep terrace slopes, 14 – floodplains with manifestations of thermokarst activity, 15 – young marine terraces with creeks and mires, 16 – lagoon-bar-mire complex. Scale: a 50x40 km site is depicted.

Tundra on the shore of Anadyrsky Liman. The fence, made by the Game Warden Myachin, is to protect duck nests from Arctic Fox predators. *(A.V.Andreev).*

Maritime tundra in the lower reaches of the Avtotkul River *(A.V.Andreev).*

Shoreline of Lake Elgygytkin *(I.V.Dorogoy)*.

Periphery of the Anadyr River floodplain *(A.V.Andreev)*.

Hummock topography of the Markovskaya Basin *(A.V.Andrev)*.

Cape Kriguigun *(A.V.Andreev)*.

the time when floating ice is carried out from Shelikhov Bay. Lakes of the Malkachanskaya Tundra are icebound from early October and free of ice in early June.

Ecological features:

Shallow zones and intertidal flats of Malkachansky Bay are formed by sand and silt sediments and shingle bars. The sea floor at the head of the bay is occupied by extensive beds of eelgrass (*Zostera marina*), and the sublittoral zone supports an excessive growth of brown algae (genera *Cystoseira* and *Chorda*). Desalinated waters of the littoral zone are home to a large variety of bristle-bearing worms (*Goniadidae, Spionidae, Capitellidae,* and *Arenicolidae*) and bivalve molluscs (*Liocyma fluctuosa, Macoma baltica, Mytilus trossulus*). Characteristic gastropods include *Littorina spp., Falsicimbula curilensis*, and *Margarites ochotensis*. The most abundant crustaceans are mysids (*Neomysis spp.*), cumaceans (*Lamprops koroensis*), amphipods (*Calliopiidae, Anisogammaridae, Dogielinotidae,* and *Corophiidae*), isopods (*Idotea spinosa*) and decapods (*Crangon septemspinosa* and *Pagurus muddendorfii*). Numerous starfish (*Evasterias retifera*) that feed on mussels occur further from the shore. Shallow-water eelgrass beds provide favourable conditions for the growth and development of young salmonids, Starry Flounder (*Pleuronectes stellatus*), Alligator Fish (*Podothecus veternus*), and Lord (*Hemilepidotus papilio*).

Sea spits and sand-pebble beaches exhibit heaps of driftwood and spots of sparse vegetation composed of *Mertensia maritima, Honckenya peploides, Lathyrus maritimus, Leymus mollis, Rhodiola integrifolia, Ligusticum scoticum, Stellaria ruscifolia,* and *Senecio pseudoarnica*. Characteristic birds of sea spits are represented by Pacific Eider (*Somateria mollissima v.-nigrum*), Oystercatcher (*Haematopus ostralegus*), Ringed Plover (*Charadrius hiaticula*), Common Tern (*Sterna hirundo*), and Aleutian Turn (*S.aleutica*). Seals haul out on sand bars that become exposed at low tide in the southern part of Malkachansky Bay.

A delta plain dissected by small channels and lakes gives rise to salt meadows formed by alkali grass (*Puccinellia phryganodes*), sedges (*Carex subspathacea, C.glareosa, C.ramenskii*), buttercups (*Halerpestes sarmentosa* and *Ranunculus gmelinii*), *Potentilla egedii, Triglochin asiaticum,* and *Hippuris tetraphylla*. Water bodies are populated by Three-spined Stickleback (*Gasterosteus aculeatus*).

The floodplain of the Malkachan River is covered with deciduous forests composed of woody willows (*Salix shwerini, S.udensis, S.rorida*), stunted poplars (*Populus suaveolens*), and Korean willow (*Chosenia arbutifolia*). Forest vegetation of portions of floodplain lying further upstream is composed of birch (*Betula platyphylla*), bird-cherry tree (*Padus asiatica*), mountain ash (*Sorbus asiatica*), and "black" alder (*Alnus hirsuta*). The understory includes honeysuckle (*Lonicera edulis*), prickly rose (*Rosa acicularis*), and spirea (*Spiraea beauverdiana*). Meadow vegetation on non-forested stretches along the river consists of *Pentaphylloides fruticosa, Calamagrostis langsdorffii, Aconitum ajanense, Iris setosa, Fritillaria camschatcensis*, and *Chamaenerion latifolium*. Riverside willow scrub has a groundcover of *Equisetum sylvaticum* and such herbs as *Cacalia hastata, Geranium erianthum*, etc.

The Malkachanskaya Tundra is a monotonous plain with tracts of larch forest and sloping elevations covered with shrub pine (*Pinus pumila*) thickets and shrubs of slanting Manchurian alder (*Duschekia fruticosa*) interspersed with a lichen-crowberry tapestry and spots covered by Labrador tea (*Ledum palustre*) and blueberry (*Vaccinium uliginosum*). Interlake depressions are occupied by tussock-forming sedges (*Carex cryptocarpa*), dwarf birch (*Betula divaricata*), cloudberry (*Rubus chamaemorus*), iris, and other meadow vegetation.

Tundra water bodies are not very deep and have low shores and a bottom layer of silt and sand or peat and organic debris. Mats of floating vegetation formed by moss and sedges admixed with *Naumburgia thyrsiflora, Parnassia palustris, Drosera rotundifolia, D.anglica, Utricularia vulgaris, Menyanthes trifoliata, Cicuta virosa*, and *Comarum palustre* can be seen close to lake shores. Moreover, the lakes are lined with a fringe of pendent grass (*Arctophyla fulva*). Plankton is dominated by copepods and benthos by larvae of amphibiotic insects (*Odonata, Coleoptera, Trichoptera,* and *Chironomidae*). Gastropods are represented by the genus *Anisus* and bivalve molluscs by the family *Pisidiidae*. Water louse (*Asellus hilgendorfii*) is a characteristic species of local lakes. Small tundra pools are spawning habitats of Siberian Newt (*Salamandrella keyserlingii*).

Forest lakes and oxbows have dark peaty water. They are overgrown with water lily (*Nymphaea tetragona*), pondweeds (*Potamogeton perfoliatus, P.berchtoldii, P.gramineus*), and bur reed (*Sparganium hyperboreum*), all giving home to numerous cladocerans, water lice, pisidiids, oligochaetes, and insect larvae. Freshwater polychaetes (*Manayunkia sp.*), sponges (*Spongilla sp.*), and hydras (*Hydra sp.*) attach themselves to submerged vegetation and the branches of trees lying at the bottom of many forest lakes.

A noticeable feature of the site is Lake Tyneryndya, which is situated at the head of the Elge River (right-side tributary of the Malkachan) some 33 km from the sea. The

lake is 4 m deep and has a diameter of 1.5 km, with a sand bottom that supports a thick growth of pondweeds, water lily, and bur reed. The lake is inhabited by large freshwater clam (*Anodonta sp.*), East Siberian Char (*Salvelinus leucomaenis*), and a resident dwarfy form of coho (*Oncorhynchus kisutch*). The latter is called "adapted coho" by local fishermen and herders, who usually harvest it in late winter.

Mountain slopes and the depressions between them are occupied by thickets of shrub pine, Manchurian alder, groves of stone birch, and dwarf-shrub mat of *Salix khokhriakovii, Dicentra peregrina, Dryas ajanensis, Rhododendron camtschaticum, Loiseleuria procumbens,* and *Diapensia obovata.*

Noteworthy fauna:

Fish

Three-spined Stickleback (*Gasterosteus aculeatus*) is a common inhabitant of the Malkachan River. Humpback Salmon (*Oncorhynchus gorbuscha*), Chum (*O.keta*), and Coho (*O.kisutch*) enter the river during their migration to spawning sites located 5-25 km upstream. The headwaters of the Malkachan River are used as spawning grounds by Dolly Varden (*Salvelinus malma*), East Siberian Char (*S.leucomaenis*), and Levanidov's Char (*S.levanidovi*) – endemic to Shelikhov Bay. Arctic Grayling (*Thymallus arcticus pallasi*) and Spotted Sculpin (*Cottus poecilopus*) occur in the slow reaches and rapids of the Malkachan River. Malkachansky Bay is home to Starry Flounder, Pacific Cod (*Eleginus glacilis*), Asian Rainbow Smelt (*Osmerus eperlanus dentex*), Japanese Smelt (*Hypomesus japonicus*), Far East Capelin (*Mallotus villosus*), and other fish species.

Birds

About 100 species of birds are known to breed on the site. Seventy-one species pass the site during migrations, and a few more occur as accidental visitors (Andreev & Kondratyev, 2001).

Red-throated Diver (*Gavia stellata*) and Black-throated Diver (*G.arctica*) are common breeding birds on tundra and forest lakes and in Malkachansky Bay. Slavonian Grebe (*Podiceps auritus*) and Red-necked Grebe (*P.griseigena*) are less frequent but regular breeding birds on the same lakes.

The site provides a home to 5-10 pairs of Whooper Swan (*Cygnus cygnus*) and a score of non-breeding swans that stay at the site during the summer season. Rather rare Bean Goose (*Anser fabalis middendorfii*) and probably Lesser White-fronted Goose breed in the upper reaches of the Malkachan River.

Pintail (*Anas acuta*), Greater Scaup (*Aythya marila*), Black-winged Scoter (*Melanitta americana*), and Long-tailed Duck (*Clangula hyemalis*) are the most widespread duck species. Common Teal (*Anas crecca*), Red-breasted Merganser (*Mergus serrator*), and Smew (*M.albellus*) are frequently seen on the riverbed and its floodplain. There is a small breeding colony of Pacific Eider on the Malkachanskaya Spit.

Birds of prey are represented by Osprey (*Pandion haliaetus*), which nests along the southern boundary of the Malkachan River valley, and Steller's sea Eagle, with five pairs of the latter species known to have nested within a 30 km stretch of the valley in 1997. Peregrine Falcon (*Falco peregrinus*) nests on the cliffs of Cape Iretsky.

Willow Grouse (*Lagopus lagopus*) is a very common bird on the Malkachanskaya Tundra. Black-billed Capercaillie (*Tetrao parvirostris*) occurs in the river valley and forested foothill area. A total of 37 wader species have been recorded within the site's borders, with 14 of these breeding birds. Oystercatcher and Ringed Plover regularly occur on sand and shingle beaches. Plainlands with lakes and mires provide breeding habitats to Pacific Golden Plover (*Pluvialis fulva*), Wood Sandpiper (*Tringa glareola*), Red-necked Phalarope (*Phalaropus lobatus*), Dunlin (*Calidris alpina*), and Black-tailed Godwit (*Limosa limosa*). Common Sandpiper (*Actitis hypoleucos*) and Greenshank (*Tringa nebularia*) are widespread over the river valley. Vast forested peatlands are breeding habitats for infrequent Far Eastern Curlew (*Numenius madagascariensis*). Nordmann's Greenshank, a critically endangered endemic species of the Sea of Okhotsk coastland, has been found nesting in the Malkachan Delta.

The most common passage migrants on the shores of Malkachansky Bay are Grey-tailed Tattler (*Heteroscleus brevipes*), Red-necked Stint (*Calidris ruficollis*), Great Knot (*C.tenuirostris*), Whimbrel (*Numenius phaeopus*), and Bar-tailed Godwit (*Limosa lapponica*).

Mew Gull (*Larus canus*) makes up small colonies in the Malakachan River valley. Breeding colonies of Slaty-backed Gull (*L. schistisagus*) and a few large colonies of Common Tern can be found on Cape Iretsky and the Malkachanskaya Spit. Aleutian Tern nests on the mainland side of Malkachansky Bay.

Cape Iretsky supports small seabird colonies, namely 10-15 pairs of Spectacled Guillemot (*Cepphus carbo*) and a few tens of pairs of Horned Puffin (*Fratercula corniculata*) and Tufted Puffin (*Lunda cirrhata*). The most characteristic passerine birds of the Malkachanskaya Tundra include Sky Lark (*Alauda arvensis*), Yellow-headed Wagtail (*Motacilla taivana*), Red-throated Pipit (*Anthus cervinus*), and Lapland Longspur (*Calcarius lapponicus*).

Migrating waders such as Red-necked Stint, Great Knot, and Whimbrel, together with terns and other water birds, concentrate on the intertidal flats of Malkachansky Bay. The adjacent plainland with lakes and wooded bogs provides an important staging area for Arctic geese that stay here for 7-10 days between September 10 and 25. At least 50,000 birds arriving from Taigonos Peninsula and Penzhinskaya Bay supposedly visit this area.

Mammals

Small terrestrial mammals inhabiting the site include Laxmann's Shrew (*Sorex caecutiens*), Large-toothed Siberian Shrew (*S.daphaenodon*), and Least Shrew (*S.minutissimus*), Tundra Vole (*Microtus oeconomus*), Northern Red-Vole (*Clethrionomys rutilis*), Grey Red-backed Vole (*C.rufocanus*), and Chipmunk (*Tamias sibiricus*). Carnivores include Ermine (*Mustela erminea*), Sable (*Martes zibellina*), Red Fox (*Vulpes vulpes*), and Brown Bear (*Ursus arctos*). Ungulates are represented by Elk (*Alces alces*). Seals haul out on intertidal sand islets of the Malkachansky Bay, forming congregations of up to 2,000 Common Seals (*Phoca largha*), several hundred Ringed Seals (*Ph. hispida ochotensis*), and about 100 Bearded Seals (*Erignatus barbatus*).

Social and cultural values:

Traces of habitation of Neolithic fishermen and hunters have been found close to the mouths of the Malkachan and Khobota Rivers. Artefacts of ancient cultures (arrow and dart heads) are preserved the on terraces of the Malkachanskaya Tundra. A "post station" existed at the mouth of the Malkachan River when the Russian-American Telegraph Company worked in the region in the 1860s and then later right up until the 1970s. Communication between Okhotsk and Gizhiga was maintained using sled dogs. During the time a border-patrol outpost operated in the village of Brokhovo throughout the 1960s and 1990s, personnel were sent to the Malkachan River to catch Humpback Salmon during their spawning runs. Large forested areas in the Malkachan Basin were clear-cut during a period of intensive development of state-supported reindeer husbandry in the settlement of Yamsk in the 1960s. Moreover, they were seriously damaged by frequent fires throughout the 1940s and 1970s. At present, Takhtoyamck commercial hunters periodically harvest Bearded Seals at their breeding sites in Malkachansky Bay. The Malkachanskaya Tundra was also a popular area for sport hunting. Up until 1990, scheduled flights of An-2 aircraft afforded easy access to the village of Yamsk.

Current land use:

Today, commercial fishing for salmon is carried out at the mouth of the Malkachan River. The autumn catch of Dolly Varden in the upper reaches of the Malkachan amounts to several quintals. Fur-trapping in winter is popular among local enthusiasts. As in earlier times, the site is crossed by a snowmobile route that connects the villages of Yamsk and Takhtoyamsk, and the heart of the wildlife refuge attracts poachers during geese migrations.

Conservation measures taken:

An area of the Malkachanskaya Tundra has been designated a wildlife refuge of regional importance, but the efficiency of protective measures need to be significantly improved.

Conservation measures proposed but not yet implemented:

Taken together, the natural features of the site characterize it as a most valuable wetland complex on the northern coast of the Sea of Okhotsk. It deserves a higher protected status and designation to the Ramsar List.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.2. Yamskiye Islands

Geographical coordinates: 59°19'35"N, 155°32'37"E (Matykil Island).

Elevation: 0-384 m a.s.l. (Atykan Island) – 697 m a.s.l. (Matykil Island).

Area: *c.* 400 km^2.

Overview:

Archipelago in the southern part of Shelikhov Bay comprising two large and a few small rocky islands. The islands are situated in a zone of strong sea currents and host the largest seabird colonies of the Sea of Okhotsk.

Wetland type:

By international classification – D; by national classification 1.4.2.4 (archipelago including a group of rocky islands in a highly productive zone of the Sea of Okhotsk).

Ramsar Criteria: 4, 5.

Justification for the application of selected criteria:

The Yamskiye Islands provide home to a total of 10 million colonial seabirds. These are the largest colonies in Asia and comprise a significant portion of the populations of Fulmar Auklet (*Fulmarus glacialis*), Least Auklet (*Aethia pusilla*) and Crested Auklets (*Ae.cristatella*) in the Sea of Okhotsk.

General location:

The Yamskiye Islands are situated in the south-eastern part of Shelikhov Bay 7-19 km from Piyagin Island in the offshore zone of the Olsky Administrative District of the Magadan Region. Matykil and Atykan islands are spaced 11.4 km apart. The distance between Matykil and the nearest populated centre (Yamsk) is 85 km, and it is 270 km (375 km by sea) in a straight line from the city of Magadan.

Physical features:

Yamskoy Archipelago includes two large islands, Matykil and Atykan, and three smaller ones (Baran, Khatemal'yu, and Kokontse). The islands lie in the midst of Shelikhov Bay 10-20 km east of Piyagin Island. The surrounding seawaters are 50-70 m deep. The sea bottom is steeply tilted south-eastward, making up a hollow along which cold up-welling water brings rich nutrients from the deep-shelf basin to the surface.

Isolated rocks of Early Cretaceous granodiorites rise abruptly from the sea as forbidding sharply serrated peaks and crests. Only Matykil Island can be more or less safely accessed from the sea, owing to the presence of a few shingle beaches 150-300 m in length and 30-50 m in width that are not flooded by tides and storm surges. There is a small cove on the northern side of the island sheltered from northeastern winds by a rocky cape that, weather permitting, can be used as one of a few suitable places for relatively "dry" landing. Matykil Island is a high dart-shaped rocky ridge with a narrow tip looking south-westward. The island is 5.7 km long, and its northern part is 2.1 km wide. It has an area of roughly 11 km^2 and a maximum height of 697 m a.s.l.

The rugged northern coast of the island is a stretch of sharp-edged serrated cliffs, their slopes deeply cut with vertical cracks and crevasses and rock debris accumulated at their base. The surf on the northern shore diverges in unusual might. The sea at the southern side of the island is calmer, and the rocks exhibit a better developed vegetation cover.

Second in size is Atykan Island, which is actually a small replica of Matykil but has practically no beaches on which to land. It is a sharply serrated rocky crest rising to an elevation of 384 m, with sheer walls and steep scree slopes. The axial spine extends from northwest to southeast, and its slopes are occupied by grass and moss-herb communities. There is a deep spacious grotto at the southern extremity of the island and an automatic (broken and unattended) lighthouse nearby.

The sea around the Yamskiye Islands is covered with drifting ice for at least 9 months of the year and is thus closed to navigation throughout this period. The area is equally unsafe in summer due to its strong tidal currents, sharply contrasted relief on the sea bottom, and chaotic wind squalls. The level of the sea is subject to 7-8 m tidal variations, and the speed of its currents is 7-9 knots (up to 15 km/hour), i.e., higher than in many mountain streams on the mainland. Navigation under these conditions requires mastery and caution. Many ships fail to resist local current forces even in calm weather; therefore, sailors try to avoid these waters.

Moreover, calm weather is rare in the area, and the atmospheric pressure and other meteorological conditions are subject to sudden changes. The tops of the islands are often shrouded in fog, and squally winds rush forth from the ravines of Matykil Island even on clear days. Wind speeds in stormy weather can be as high as 25-35 m/s. Air temperature in the summer varies from +7° to +12°C, and the seawater is never warmer than +8°C.

Ecological features:

The slopes of Matykil Island are covered up to 500-600 m by turf grasses (*Calamagrostis langsdorffii, Poa spp.*), with admixtures of nitrification-resistant forbs such as *Urtica angustifolia, Oxyria digyna, Stellaria ruscifolia, Saxifraga nelsoniana, Cochlearia arctica, Ligusticum scoticum*, etc. (Khoreva, 2001). Dense cushions of roseroot (*Rhodiola rosea*) thrive on sheer cliffs that are extensively fertilized by "nitrate rain" and frequently used by Fulmars to place their nests.

There is a small plateau close to the top of the island. Its flat portions support shrub-lichen tundra with creeping shrub pine (*Pinus pumila*), juniper (*Juniperus sibirica*), prostrate willows (*Salix arctica*), dwarf birch (*Betula exilis*), and sweet mountain ash (*Sorbus sambucifolia*). The groundcover is composed of lichens (*Tamnolia vermicularis*), heath (*Ledum decumbens, Rhododendron aureum, R.kamtschaticum, Phyllodoce caerulea, Loiseleuria procumbens*), and herbaceous vegetation (*Anemonastrum sibiricum, Aconogonon tripterocarpum*).

Even on the surf-beaten northern beach of Matykil Island, the rock ledge steeply descends to below the water level at an angle of 40°. Unlike the nearest mainland coast, the nearshore waters of the island are lacking in kelp. Hollows and loose stones in the intertidal zone provide shelter to communities of sponges (*Halichondria panicea*) and hydroid polyps (*Tecaphora, Atecata*) with associated sea spiders (*Pantopoda*) and water mites (*Acarina*). Barnacles (*Semibalanus balanoides*) attach themselves to boulders unaffected by the action of the surf, while gravelly spots are occupied by highly diverse communities of nemertine worms (*Enopla*). The most characteristic molluscs include *Schizoplax brandtii, Littorina spp., Margarites helicina, Nucella freycinetti*, and dense clusters of young mussels (*Mytilus trossulus*). The remaining aquatic fauna is represented by small polychaetes (*Eteone flava, Exogone gemnifera, Cirrhatulus sp., Spirorbis spp.*) and oligochaetes (*Lumbricillus sp.*), various amphipods (*Calliopius laeviusculus, Carinogammarus makarovi, Parallorchestes ochotensis, Ischirocerus spp.*), hermit crab (*Pagurus middendorfii*), and a small number of echinoderms, viz. sea cucumbers (*Chiridota tauensis*) and young *Eupentacta vegae*, serpent stars (*Ophiopholis aculeata, Ophiura maculata*), and small starfish (*Leptasterias ochotensis*).

The Yamskiye Islands are situated in an area of the Sea of Okhotsk distinguished for unusually high biological productivity of aquatic ecosystems, with Shelikhov Bay regarded as the most productive area of the entire world ocean (Shuntov, 1985). The principal biomass products in the Yamskoy up-welling region are diatoms (*Chaetoceros, Thalassiosira,* and *Coscinodiscus*). Primary production is in excess of 1,000 mg/m^3 (against a level in the Sea of Okhotsk below 200 mg/m^3) (Smirnova, 1959). Accordingly, the total biomass of zooplankter is equally large. The zooplankton is dominated by euphausiid crustaceans of the genus Thisanoessus (*Euphausiidae*) and copepods (*Calanus glacialis*) (Lubny-Gertsik, 1959). Highly abundant in the early summer is the *Limacina helicina* pteropod gastropod, the density of which in the water column amounts to 200 individuals/m^3.

Noteworthy fauna:

Birds

The Yamskiye Islands provide a home to 12 species of colonial seabirds. Their total number on Matykil Island is estimated in the range of 7-10 million. On Atykan Island there are no less than 200,000 birds, with nearly 80,000 on Baran Island, 50,000 on Khatemal'yu Island, and 15,000 on Kokontse Island (Velizhanin, 1975, 1977; Kondratyev *et al*., 1993; Golubova & Pleshchenko, 1997). These are the lowest figures selected from substantially conflicting estimates reported by individual observers.

Fulmar (*Fulmarus glacialis*) is the most noticeable bird in the colonies hosted by Matykil and Atykan islands. The majority of Fulmars are represented by White Morph. Pairs are spaced 1-1.5 m apart, which gives the cliff walls a speckled appearance when viewed from the sea. Flocks of feeding Fulmars can be seen in the open sea as far as 20 km from the islands. The Fulmar population on Matykil Island is estimated at about 20,000 pairs, with at least 15,000 on Atykan Island, 2,000 on Baran Island, and 1,500 on Khatemal'yu.

Pelagic Cormorant (*Phalacrocorax pelagicus*) – Approximately 150 pairs establish their nests on Yamskiye Islands.

Slaty-backed Gull (*Larus schistisagus*) – Like Pelagic Cormorant, not very abundant on the islands (100-150 pairs).

Kittiwake (*Rissa tridactyla*) – Forms relatively small colonies on the perimeter of Matykil and Atykan islands (8,000 and 4,000 pairs respectively) and the cliffs of Baran and Khatemal'yu islands (2,000 pairs each).

Brunnich's Guillemot (*Uria lomiva*) and Common Guillemot (*Uria aalge*) – Breed in mixed colonies, the largest of which occupies the northern side of Matykil Island. All these colonies are located below an absolute height of 200 m. A total of 45,000 of these guillemots breed on Matykil, with the latter species accounting for 75% of this number. Atykan Island is home to approximately 25,000 pairs of Brunnich's and Common Guillemots, and Baran and Khatemal'yu islands are home to 20,000 pairs each.

Spectacled Guillemot (*Cepphus carbo*) – Nests among large boulders of scree slopes around the entire perimeter of Matykil Island, where its total number is estimated at 1,000 pairs. A few more pairs are known to breed on Atykan Island.

Tufted Puffin (*Lunda cirrhata*) – The largest colony of this bird is on Baran Island (around 15,000 pairs). Approximately 1,500 pairs nest on, and a small number are found on Matykil and Kokontse islands (150 pairs each).

Horned Puffin (*Fratercula corniculata*) – Approximately 8,000 pairs nest on Matykil Island and much fewer on Atykan Island.

Least Auklet (*Aethia pusilla*) – Finds optimal breeding conditions on Matykil Island, with its nests scattered among the scree along virtually the entire vertical profile of the island. It is the most common seabird species on Matykil, with an estimated number of 3-5 million pairs. Perhaps another 1 to 1.5 millions use Atykan Island as a breeding area.

Crested Auklet (*Aethia cristatella*) – Breeds on the scree slopes of Matykil Island together with Least Auklet, but the latter species is ten times as abundant as the former in these mixed colonies (Kondratyev *et al*., 1993). At variance with these

data, E.Yu.Golubova (in press) reports the ratio of Crested to Least Auklets as 2:1 (July 1977). Based on these figures, the total number of Crested Auklet breeding on Matykil Island is tentatively estimated at 300,000 pairs.

Whiskered Auklet (*Aethia pygmaea*) – A.G.Velizhanin in 1974 counted 1,000 pairs of these birds on Matykil Island and about the same number on Atykan. Later observers could not confirm these data.

Parakeet Auklet (*Cyclorhynchus psittacula*) – Occupies the scree slopes along the entire perimeter of Matykil Island from base to top. The total number of birds is arbitrarily estimated at 75,000-100,000 pairs.

Besides seabirds, Matykil Island is home to some passerines, including White Wagtail (*Motacilla alba*), Siberian Rubythroat (*Luscinia calliope*), and Raven (*Corvus corax*). Flocks of Harlequin Duck (*Histrionicus histrionicus*) occur near reefs and on large boulders.

Mammals

The mountain tundra at the top of Matykil Island is inhabited by Northern Red-backed Vole (*Clethrionomys rutilus*). The eastern and southern beaches collectively make up a breeding site of Steller's Sea Lion (*Eumetopias jubatus*), the only one in the northern part of the Sea of Okhotsk. The number of these animals has remained relatively stable (800-900 individuals) during recent decades, with an average reproductive rate of 200-250 young per year (Zadal'sky, 1997).

Social and cultural values:

Prior to conferring protected area status to the Piyagin Peninsula coast and Yamsk Archipelago as parts of the Magadan State Nature Reserve (1982), the islands were frequented by teams of sea-mammal hunters from the village of Yamsk, which prospered in the 1960s. Steller's Sea Lions were killed to feed sled dogs, and Arctic Foxes were bred in captivity.

Current land use:

The islands have been visited several times by biologists since 1982 (in 1983, 1988, 1994, and 1997). The lay public avoids this area, but the rich resources of commercially valuable fish in the northern part of the Sea of Okhotsk attract many fishing vessels. As a result, the beaches of Matykil Island are covered with trash and fragments of drift nets. Seabirds and Steller's Sea Lions not infrequently become entangled in the latter and die.

Conservation measures taken:

In 1982, Yamskoy Archipelago was designated a part of the Magadan State Nature Reserve.

Conservation measures proposed but not yet implemented:

No special conservation measures have been taken to safeguard the wildlife of the Yamskiye Islands, but they are well defended due to their remoteness and the difficulty of navigating in their vicinity.

Current scientific research and facilities:

Drinking water and a limited amount of firewood can be found on Matykil Island, but there is no convenient anchorage. At times boat landings can be dangerous. Stones often fall down on the narrow beaches, the risk of which greatly increases in wet weather. A helicopter can land at the top of the island. Landing on Atykan Island from the sea is fairly dangerous. Baran, Kokontse, and Khatemal'yu islands are practically inaccessible.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

Management authority:

Administration of the Magadan State Nature Reserve.

5.3. Nakhatandzhinskaya Tundra

Geographical coordinates: 59°55'- 59°19'N, 153°40' – 154°40'E.

Elevation: 0-50 m a.s.l. within the plainland; up to 150 m in the foothill area and along the seacoast and up to 1,000 m in the mountainous peripheral zone.

Area: *c.* 750 km^2.

Overview:

A low-lying isthmus at the base of the Piaygin Peninsula and a depression with lakes and mires in the southwestern part of the Yamskaya Lowland. The site encompasses a large variety of habitats intrinsic to maritime areas, sloping tundra, river valleys, wetlands, and Beringian forest-tundra. The area is important for breeding, moulting, and staging of water birds especially sea ducks.

Wetland type:

By international classification – A, B, F, G, O, Vt; by national classification – 1.2.1.3, 3.7.2.1. (shallow sea bays, lakes and mires on a lowland isthmus).

Ramsar Criteria: 1, 4, 5.

Justification for the application of selected criteria:

Characteristic spectrum of habitats in the north of the Sea of Okhotsk Catchment. Authentic combination of plainland, maritime, and subalpine landscapes; stopover sites of Arctic geese, moulting areas for sea ducks.

General location:

The Nakhatandzhinsky Isthmus lies between Shkiperov Bay in the south and Perevolochny Bay in the north of the territory of the Olsky Administrative District of the Magadan Region. It is about 30 km from the nearest populated settlement (Yamsk) and 190 km from the city of Magadan.

Physical features:

Geology and geomorphology

The site encompasses a set of habitats developed on a terraced maritime plain on the shores of Shkiperov and Perevolochny Bays, a Quaternary fluvioglacial plain elevated 30-40 m a.s.l. at the isthmus separating these bays (substantially modified by cryogenic processes), and the foothill margins of this plain. Modern development of the lithogenic base of the area proceeds under conditions of insular permafrost. On the surface this process manifests itself as degradation of underground ice without further thermokarst lake formation.

The maritime plain is represented by two terraces of the Upper Pleistocene period and a modern alluviomarine surface. Remains of the Middle Pleistocene maritime terrace are preserved on the right side of the Yama River. The terrace, which is elevated 25-35 m a.s.l., is composed of sand, sandy loam, and pebble-gravelly sediments and lacustrine-boggy clay loams. The terrace supports groups of large, stable, and partly drained lakes and alass depressions. It is waterlogged and fragmented by a network of shallow thermokarst water bodies.

The 7-12 m high maritime terrace is situated in the lower reaches of the Perevolochnaya, Davygychan, and Ustiye Rivers. It is formed by sand-pebble sediments dating back to the Karginian interstadial and incorporates remnants of lagoon, spit, and bar deposits. The terrace is in close contact with diluvial-proluvial fans. The majority of it is occupied by transitional mires, whereas hummock-hollow complexes locally develop over concentrations of frozen finely dispersed sediments especially along valley train margins. This terrace includes the area of Bolshiye and Yamskiye lakes underlain with ancient lagoon-derived sediments that were later reworked by thermokarst processes. Drained surfaces and peat mounds bear clusters of shrub pine.

The alluviomarine terrace is 4-6 m high, having been formed by sandy-loam deposits. This surface is relatively young, dating to the Holocene period. Its peculiar features are water bodies arranged in a chain parallel to the ancient shoreline and transverse channels through which tidal waters enter and leave. During fall tides and storm surges, the terrace is inundated by lagoon waters; therefore, wet maritime meadows are the predominant type of vegetation developing on the terrace.

The surface of the younger, still developing marine terrace is subdivided into an area influenced by the action of tidal flows and wind-borne variations in the water level and an extensive silt-sand littoral zone that is exposed during periods of low tide and occupies up to 70 and 30% of the total area of Perevolochny and Shkiperov Bays respectively.

The accumulative fluvioglacial plain, which is elevated 35-40 m a.s.l., occupies a major part of the Nakhatandzhinsky Isthmus. It is built up from pebble, sand, and gravel deposits and looks like a gently sloping or rolling surface with a few large lakes and numerous smaller thermokarst water bodies, damp runoff troughs, and grassy rivulets. The surface exhibits small palsas, contours of former alass basins, and residual ridges of an old polygonal network. Its drained portions are occupied by a hillocky topography, areas of shrub and patchy tundra. The transitional zone between the watery plain and stone hill slopes features creep terraces overlain by a peat layer many metres thick that supports a dense growth of shrub pine over rocky ridges alternating with wet hummocky fields, larch-grown ridges, and spirea moors.

The Nakhatandzha and Shkiperova Rivers emptying into Shkiperov Bay are typical mountain rivers along their entire length, from head to mouth. The rivers abound with shingle spits and floodplain islets overgrown with willow thickets intermixed with shrubs of Manchurian alder and groups of larch and stone birch trees. The Perevolochnaya River is the largest watercourse in the area (around 30 km). It is a slow, meandering lowland river with dark water flowing into the bay of the same name. The river has formed an alluvial terrace of sandy-loam and sand-pebble deposits elevated 4-8 m above the surface of the water that supports a system of oxbow-thermokarst lakes, hummocky patches, and riparian willow galleries lining the rivers. In the lower reaches of the Perevolochnaya, Ustiye, and Poperechnaya

Rivers, an influx of tidal water produces a counter-current that reaches as far upstream as 8-12 km.

Slopes flanking Shkiperov Bay are occupied by different types of mesophilic tundra underlain with stone and diluvial substrates. Steep slope portions at the heads of mountain rivers are covered with shrub pine, whereas flattened watery sites support sparse larch stands, groves of stone birch, and patches of suboceanic heath dominated by *Phyllodoce caerulea* and *Rhododendron aureum*.

Climate and hydrology

Despite its location in comparatively southerly latitudes, the site has a cold subarctic climate. Winters are milder than inland (the mean air temperature in January is -20.3°C, with an absolute minimum of -51°C), but summers are cooler because of constantly blowing south-easterly breezes that bring in cold and moist air masses generated by the cold Piyaginskoye current. Especially strong winds and fog frequently occur in Shkiperov Bay. Moreover, ice floes can be seen in Babushkin Bay as late as early July. Taken together, these conditions account for a mean yearly temperature of -5.2°C. August is the warmest month (+12.1°C). The mean duration of the frostless period is 110 days, and the sum of effective positive temperatures is only 538°C. The transition to daily temperatures above freezing occurs around 22 May, but ground frosts persist until approximately 10 June. The autumn transition to daily temperatures below zero is observed around 12-15 October. Calm and clear weather normally prevails from mid September to early October.

Mean annual precipitation is around 500 mm, with approximately half this amount falling as snow. The snow cover accumulates unevenly, with its depth varying from 0.4-0.7 m on the maritime plain to 1.2-2.0 m in intermontane depressions. Snow melts in the middle of May, and the lake ice cover breaks up at the end of May. Weather conditions are highly variable from early July until mid August, when fog, wind, rains, and drizzle are frequent and heavy floods develop on mountain rivers and streams.

Despite the generally rigorous climate, the site has a few microclimatic oases in intermontane hollows of the Piyaginskiye and Yamskiye mountains where relatively high ridges shelter them against the action of sea breezes.

Unlike water bodies in the Arctic tundra, the lakes and oxbows of the Nakhatandzhinskaya Tundra are not underlain with permafrost. For this reason, their water is rapidly heated to +15-20°C on sunny days, which greatly promotes the development of macrophytes and invertebrates.

The seawater temperature at the end of summer remains below +7°C, but the nearshore zone is very rich in plankton. The northern and southern parts of the site differ in terms of tidal range. Perevolochny Bay has a tidal regime of a roughly diurnal type reaching amplitudes of up to 4-6 m. Shkiperov Bay is characterized by an irregular tidal regime of a semidiurnal type and a tidal range of 4-5 m. In either case, tide ebbs expose extensive intertidal silt and sand flats totalling 90 km^2 in Perevolony Bay and up to 6 km^2 in Shkiperov Bay.

Soils

Climate type is responsible for the development of limited permafrost areas within the Nakhatandzhinskaya Lowland with a temperature from 0 to -1°C present only under the cover of a very thick peat layer and finely dispersed ground. The Yamskaya Lowland has cryogenic gley, peaty-gley, peat-gley, and boggy soils.

Ecological features:

The area lies at the junction of the Penzhinsko-Koryaksky (tundra) and Northern Okhotsk (northern taiga) biogeographic regions. Babushkin Bay and the mouth of Shkiperov Bay have rocky shores that steeply descend below the water level. The adjacent waters have a rich invertebrate fauna. By early summer their surface layer contains large concentrations of pteropod molluscs (*Limacina helicina*) and the larvae of barnacles (*Balanus sp.*), shrimps (families *Hippolythidae* and *Pandalidae*), crabs (family *Lithodidae*), and various amphipods. The high abundance of these plankters attracts fish, seabirds, and marine mammals. Essential numbers of Common Seals (*Phoca largha*), Ringed Seals (*Phoca hispida*), and Bearded Seals (*Erignatus barbatus*) occur in Shkiperov Bay. In summer, whales can be seen not far from this bay, including Gray (*Eschrichtius gibbosus*), Bowhead (*Balaena mysticetus*), and Killer (*Orcinus orca*) Whales. The site hosts small populations of colonial seabirds. North of the isthmus, sea life is not so rich. The shore of Perevalochny Bay is monotonous lowland with an isolated elevation in its eastern part (Sedlo Mountain 369 m a.s.l.). The littoral zone is a stretch of muddy flats many kilometres long that remains exposed for 8-10 hours a day.

The Nakhatandzhinsky Isthmus is fringed on the northeast and southwest with a strip of maritime meadows and silt-sand littoral zone respectively. The shallow area at the head of Shkiperov Bay is occupied by extensive beds of eelgrass (*Zostera marina*). Deeper sites are dominated by brown algae (*Laminaria sp.* and *Alaria sp.*). Eelgrass beds provide home to colonies of bivalve (*Mytilus trossulus, Lyocima fluctuosa*), and various gastropod molluscs (*Littorina sp., Epheria sp.*), as well as crustaceans (*Idothea ochotensis, Eogamarus makarovii, Caprella spp*.). Sand patches of riverbeds and periodically exposed flats are in-

habited by amphipods (*Alarchestes moskwitini*), while *Eogamarus sp., Lamprops beringii (Cumacea)*, mysids (*Mysis sp.*), and fish larvae predominate in the shallow parts of the bay.

Coastal portions of the Nakhatandzhinskaya Lowland are largely occupied by meadow associations dominated by *Leymus villosissimus* and *Calamagrostis langsdorffii; Carex ramenskii, Hippuris tetraphylla*, and *Carex subspathacea* develop along the shores and shallows of brackish water bodies.

Shkiperov Bay is surrounded by gravelly tundra with numerous boulders scattered over a tapestry of stunted *Salix khokhriakovii* and shrub pine interspersed with plots of tussock-forming cottongrasses and sedges amongst which *Carex lugens* predominates. Wet hollows give rise to shrubby Manchurian alder (*Duschekia fruticosa*) vegetation. These tundra habitats are populated by Northern Pika (*Ochotona hyperborea*), Mongolian Plover (*Charadrius mongolus*), and Buff-bellied Pipit (*Anthus rubescens*).

The southern part of the Nakhatandzhinsky Isthmus is dominated by mesophilic sedge-cottongrass hummocky topography with small patches of gravelly tundra overgrown with *Dryas ajanensis* and *Rhododendron camtschaticum*. Gently sloping ridges are dissected by runoff channels that link lake basins to river valleys. Shallow thermokarst lakes are fringed with floating mats of moss and sedges with admixtures of *Menyanthes trifoliata, Comarum palustre*, and *Cicuta virosa*. Spots dominated by cottongrass are frequented by many Arctic birds, such as Dunlin (*Calidris alpina*), Red-Throated Pipit (*Anthus cervinus*), and Lapland Longspur (*Calcaruis lapponicus*). Drier places are favoured by Sky Lark (*Alauda arvensis*), while hypoarctic species, viz, Wood Sandpiper (*Tringa glareola*), Common Snipe (*Gallinago gallinago*), Yellow-headed Wagtail (*Motacilla taivana*), Lanceolated Warbler (*Locustella lanceolata*), and Siberian Rubythroat (*Luscinia calliope*), keep to low-lying localities and creek valleys.

As one moves away from the seacoast, a sedge-cottongrass tussocky topography with lakes and their waterlogged margins gives way to complex hummock mires. Foothill outwash deposits are occupied by high peat mounds and ridges overgrown with impassable thickets of shrub pine that alternate with band-type moss mires. As these moss-dominated stretches extend to the plainland, they broaden while mounds and ridges undergo fragmentation into little islets, thus giving rise to a peculiar landscape of "peat knobs" that often reach 5 to 7 m in height and can sometimes be tens of metres long. In the axial portion of the isthmus, this landscape is transformed into flat-topped hillock-hollow-pool complexes with large thermokarst lakes. The vegetation cover of the hillocks is constituted by shrub pine, Labrador tea (*Ledum palustre*), and rhododendron (*Rhododendron aureum*). Waterlogged areas are dominated by green mosses, sphagnum, sedge (*Carex rariflora*), cottongrass (*Eriophorum polystachion*), and cranberry (*Oxycoccus microcarpus*). The wettest portions are occupied by *Comarum palustre*. Thermokarst lakes are lined with *Carex cryptocarpa* and *Arctophyla fulva*. The shallow areas of large and small bodies of water give rise to a dense growth of *Menyanthes trifoliata*. Many thermokarst lakes are enclosed by low ridges overgrown with *Calamagrostis langsdorffii, Salix alaxensis*, and *Spiraea beauverdiana*. Here and there, shrub pine-covered mounds come directly into contact with water.

Small tundra lakes and pools as deep as 0.5 m abound in short-lived zooplankter dominated by small crustaceans (*Cladocera, Copepoda,* and *Anostraca*), numerous larvae of beetles (*Coleoptera*), and water bugs (*Hemiptera*).

Deeper (1.5 m) and larger (up to 1 km) lakes are inhabited by benthic turbellaria and oligochaetes, numerous molluscs of the genus *Anisus*, water louse (*Asellus sp.*), trichopteran and chironomid larvae, water bugs, and dragonfly and beetle larvae. The water column abounds with planktonic crustaceans (*Cladocera, Copepoda,* and *Anostraca*). The quantitatively rich ichthyofauna is represented by Nine-spined Stickleback (*Pungitius pungitius*), young Dolly Varden (*Salvelinus malma*) and East Siberian Char (*S.leucomaenis*). Floating mossy mats give home to numerous molluscs, oligochaetes, and water lice.

Oxbow lakes are rather deep (2 m and more) and highly irregular in outline, developing a nearshore mat of floating vegetation and a sedge fringe running around their perimeters. These water bodies are noticeable for a highly diverse and abundant malacofauna dominated by gastropods of the genus *Valvata* and *Kolymamnicola kolymensis,* with *Anisus spp*. almost as equally common. Other molluscs include species of the family *Lymneidae* and bivalves (*Pisidiidae*). The lakes are populated by numerous larvae of dragonflies (*Aeschna sp., Leucorrhinia sp.*), beetles, caddisflies, chironomids, and water bugs, as well as Nine-spined Stickleback.

Rivers of the site originate in the mountains. Their upper and middle courses are fast streams with stone beds, small broadened stretches, and rapids lined with willows (*Salix alaxensis, S.pulchra, S.pseudopentandra*) and extensive growths of shrub pine and Manchurian alder alternating with blueberry (*Vaccinium uliginosum*) and spirea fields. Mountain slopes are covered with sparse larch stands and groves of stone birch (*Betula lanata*). Groves of poplar and Korean willow are found in the upper reaches of the Vtoraya Shkiperova River. Lower stretches of rivers carry dark water through vast lake-like pools between precipi-

tous shores. Spawning migrations of Nine-spined Stickleback occur in the second half of June. In early July, schools of Pacific salmon and char enter the majority of the rivers. The most common fish species in this period are Humpback Salmon (*Oncorhynchus gorbuscha*), Chum (*O.keta*), Dolly Varden (*Salvelinus malma*), and East Siberian Char (*S.leucomaenis*). There are spawning sites of Asian Rainbow Smelt (*Osmerus eperlanus dentex*) in the lower sections of the Kharda River with slow-flowing water.

Noteworthy flora:

Rare plant species *Platanthera tipuloides* and *Cacalia auriculata* have been found on sphagnum bogs and in riparian black alder stands respectively. The presence of *Oxalis acetosella* along the middle course of Khrustalny Creek flowing into Shkiperov Bay was documented for the first time in northeastern Siberia. Other noteworthy plants include endemics of the north okhotskian flora (*Salix khokhriakovii, Corydalis magadanica, Saxifraga derbekii, Oxytropis evenorum,* and *Magadanica victoris*) and relict species, such as *Carex ktausipali, Streptopus amplexifolius, Ranunculus eschscholtzii, Cardamine pedata, Saxifraga insularis, Cassiope lycopodioides*, and *Pennellianthus frutescens.*

Noteworthy fauna:

Birds

The importance of the site for migrating birds:

The Nakhatandzhinskaya Lowland lies at the crossroads of spring and autumn migration routes for Arctic geese, dabbling ducks, and waders that pass the site bound northeast and southwest respectively.

A notably high biological productivity of freshwater lakes of the Nakhatandzhinsky Isthmus, its rich grass and sedge diversity, the abundance of berries on wetland plains and boggy foothills along with close proximity to intertidal mudflats make the site a key area at the northern section of the East Palaearctic Flyway. Its importance in this capacity has been confirmed by observations of geese migrations. Similar data on other bird groups are scarce and fragmentary.

Spring passage for Arctic geese occurs with short stopovers. Autumn staging takes more time. The site is visited most frequently by White-fronted Goose (*Anser albifrons*), Bean Goose (*A.fabalis*), and probably Lesser White-fronted Goose (*A.erythropus*). During fall migrations, the geese are known to congregate on the maritime portion of the Yamskaya Lowland as far as 10-15 km from the seacoast. They arrive there from Parapol Dale and Kamchatka. Thereafter, some of the migrants head westward along the northern coast of the Sea of Okhotsk while others fly overseas on their way to northern Sakhalin and the mouth of the Amur River (total distance approximately 900 km). The geese arrive in early September and stay until the beginning of October. Passage peaks between 18 and 25 September. Flocks of various waders cross the site during their summer-fall movements heading southwest. Whimbrel (*Numenius phaeopus*) is the most numerous migrant among waders. Tens of thousands of these birds are known to pass the site. The passage takes place from the beginning through approximately the third week of August, at which time the birds feed on the blueberry and crowberry fields of the Nakhatandzha Lowland. Other common migrants on the Nakhatandzhinskaya Tundra are Terek Sandpiper (*Xenus cinereus*), Red-necked Stint (*Calidris ruficollis*), Mongolian Plover (*Charadrius mongolus*), and Great Knot (*Calidris tenuirostris*). Large congregations of Short-tailed Shearwater (*Puffinus tenuirostris*) numbering thousands of birds wander over Babushkin Bay in August and September.

The importance of the site for breeding birds:

Pintail (*Anas acuta*) is the most common dabbling duck at the site. However, similar to other dabbling ducks, its breeding population is not very large (density in the freshwater wetlands is about 1 nest/km^2). Pintail is somewhat more numerous in the southern part of the lowland, where it nests in the coastal habitats of Perevolochny Bay. Other frequently sighted dabbling ducks include Common Teal (*Anas crecca*), which keeps to small rivers and creeks lined with Manchurian alder, and Wigeon (*A. penelope*), which prefers maritime meadows with brackish pools. Greater Scaup (*Aythya marila*) is the most common diving duck breeding in all the habitats provided by wetland complexes, including seaside lakes. Long-tailed Duck (*Clangula hyemalis*) is the dominant breeding duck of tundra habitats in proximity to thermokarst lakes. Black-winged Scoter (*Melanitta americana*) is a common bird in the central and northern parts of the site that prefers localities with thermokarst lakes lined with shrub pine. Pacific Eider (*Somateria mollissima v.-nigrum*) nests in the southern part of the lowland within a 10 km wide maritime band occupied by sedge-cottongrass hummock tundra.

The site is equally important for breeding Red-throated (*Gavia stellata*) and Black-throated (*G.arctica*) Divers, which are common breeding birds on thermokarst lakes, and Red-necked Grebe (*Podiceps griseigena*), which occupy oxbow lakes. Tundra and coastal habitats give home to Dunlin (sedge-cottongrass tussocks), Long-toed Stint (*Calidris subminuta*) (wet delta glades), Common Snape (*Gallinago gallinago*) (hummocky topography over the entire lowland area), Mongolian Plover (gravelly tundra),

and Wood Sandpiper (wet "kedrotrundra"). Willow Grouse (*Lagopus lagopus*) densely occupy wooded foothill bogs. There is a seabird colony at the southern entrance to Shkiperov Bay composed of Slaty-backed Gull (*Larus schistisagus*), Pelagic Cormorant (*Phalacrocorax pelagicus*), and Tufted Puffin (*Lunda cirrhata*).

List of the most important breeding habitats:

- sedge hummock tundra on the coast of Shkiperov Bay (Pacific Eider, Long-tailed Duck, Dunlin);
- knobs and mounds covered with shrub pine in the flat-topped hillock-hollow-pool landscape in the northern part of the lowland (Long-tailed Duck, Black-winged Scoter);
- oxbow lakes lined with floating mats of *Comarum palustre* and *Menyanthes trifoliata*, tall willows and Manchurian alder stands (Greater Scaup, dabbling ducks, Red-necked Grebe);
- rocky marine shores (colonial seabirds).

The importance of the site for moulting birds:

The Nakhatandzhinskaya Tundra is a key moulting area for all species of dabbling and diving ducks, geese, and many waders. Certain lakes harbour congregations (up to 100 individuals) of female Black-winged Scoter and Long-tailed Duck together with Greater Scaup and Tufted Duck (*Aythya fuligula*) of either sex. Single moulting Smews (*Mergus albellus*) have been sighted. The area of Bolshiye Lakes is a moulting site for Bean Goose (*Anser fabalis middendorfii*) that supposedly brings together a few dozen of these birds. Moulting Harlequin Ducks are known to flock along the shoreline of Babushkin and Shkiperov Bays.

The importance of the site for wintering:

Small flocks of Pacific Eider and Goosander (*Mergus merganser*) appear in polynyas filled with crushed ice as early as March. Other sea ducks may be present in polynyas throughout winter.

Annotated check-list of birds:

Red-throated Diver (*Gavia stellata*) – regularly breeding bird on lowland rivers and lakes.

Black-throated Diver (*Gavia arctica*) – breeding bird on the lakes of the Nakhatandzhinskaya Tundra.

Horned Grebe *(Podicesps auritus)* – sometimes occurs on small lakes (an allegedly breeding species).

Red-necked Grebe (*Podiceps griseigena*) – in early June occurs on the leads among drifting ice in Babushkin Bay and breeds on oxbow lakes.

Short-tailed Shearwater (*Puffinus tenuirostris*) – nomadic birds occur in Babushkin and Shkiperov Bays in July through September; congregations of this transequatorial migrant are highly mobile and involve tens of thousands of birds.

Pelagic Cormorant (*Phalacrocorax pelagicus*) – about 100 pairs have their nests on the southern cape at the entrance to Shkiperov Bay.

White-fronted Goose (*Anser albifrons*) – very common passage migrant that supposedly uses the Nakhatandzhinskaya Tundra as a moulting area in some years. Tens of thousand of birds fly across the site during fall migration.

Lesser White-fronted Goose (*Anser erythropus*) – rare migrating species.

Bean Goose (*Anser fabalis*) – very common migrant (*A.f.serrirostris*) and infrequent moulting bird (*A.f.middendorfii*); thousands of these geese pass the site in August and September.

Mallard (*Anas platyrhynchos*) – common breeding species in the environs of the city of Magadan. Accidental vagrants have been reported from the Nakhatandzhinskaya Tundra.

Common Teal (*Anas crecca*) – uncommon breeding species.

Wigeon (*Anas penelope*) – breeding and moulting bird on selected lakes in the northern part of the site.

Pintail (*Anas acuta*) – a most common breeding and moulting bird of the Nakhatandzhinskaya Tundra; estimated number reaches *c.* 1,000 individuals.

Pacific Eider (*Somateria mollissima v.-nigrum*) – characteristic of maritime tundra and coasts with shallow lagoons. Breeding pairs are scattered over hummocky tundra and hill slopes overgrown with shrub pine. Flocks of males totalling almost 100 birds occur in Shkiperov Bay until the end of June, later moving towards Perevolochny Bay where they allegedly moult.

Tufted Duck (*Aythya fuligula*) – flocks of moulting birds occur on the lakes of the Nakhatandzhinskaya Tundra; likely breeding species.

Greater Scaup (*Aythya marila*) – characteristic breeding and frequent moulting bird over the entire site area, with the total number roughly estimated at 1,000. Moulting birds also are known to congregate on Kalach Lake.

Black-winged Scoter (*Melanitta americana*) – characteristic breeding and moulting species on freshwater lakes of the site, with the total number roughly estimated at 1,000 birds.

Harlequin Duck (*Histrionicus histrionicus*) – breeds in the upper reaches of all rivers of the Nakhatandzhinskaya Tundra. Single birds and broods are regularly seen along water courses during summer. Hundreds of moulting drakes gather on the coasts of Babushkin and Shkiperov Bays in July and August.

Long-tailed Duck (*Clangula hyemalis*) – the most common breeding and moulting diving duck of the Nakhatandzhinskaya Tundra, totalling about 3,000 birds.

Red-breasted Merganser (*Mergus serrator*) – individual pairs regularly occur on rivers during spring spawning migrations

of Nine-spined Stickleback. The birds have their nesting sites in the upper and middle parts of water courses.

Goosander (*Mergus merganser*) – nests in tree holes at the forested headwaters of local rivers, with feeding birds occurring in the lower reaches of the same rivers.

Smew (*Mergus albellus*) – moulting birds rather frequently occur on the lakes of the Yamskaya Lowland. Nesting sites are largely located along the middle course of the Yama and Malkachan Rivers.

Osprey (*Pandion haliaetus*) – nests have been found on the floodplains of the Yama and Malkachan Rivers (northern part of the Yamskaya Lowland). Single birds are reported to visit the Nakhatandzhinskaya Tundra.

Steller's Sea Eagle (*Haliaeetus pelagicus*) – common breeding bird on the shores of Babushkin Bay and Piyagin Peninsula. Single birds occur on the Nakhatandzhinskaya Tundra in the summer season. Spawning migration of Pacific salmon brings together up to ten birds on the intertidal flats of Shkiperov Bay.

White-tailed Eagle (*Haliaeetus albicilla*) – young birds are known to visit the Nakhatandzhinskaya Lowland in summer.

Rough-legged Buzzard (*Buteo lagopus*) – breeds in the subalpine belt of the Yamskiye and Piyaginskiye Mountains. Migrating birds appear at the site in August.

Hobby (*Falco subbuteo*) – breeds in rocky terrains of Yamskiye Mountains and sometimes visits the shrubwood foothills of the Nakhatandzhinsky Isthmus.

Peregrine Falcon (*Falco peregrinus*) – sometimes places nests on the rocky coast of Piyagin Peninsula. The birds are regularly sighted at the shores of Shkiperov and Babushkin Bays in summer and during autumn migrations.

Pacific Golden Plover (*Pluvialis fulva*) – uncommon breeding species occupying hummocky tundra habitats in the vicinity of Shkiperov Bay.

Mongolian Plover (*Charadrius mongolus*) – a regular breeding species on the gently sloping portions of gravelly tundra in the vicinity of Shkiperov Bay.

Red-necked Phalarope (*Phalaropus lobatus*) – occasionally sighted on freshwater bodies in summer. It is also common in Babushkin Bay in spring, summer (since July), and autumn.

Red-necked Stint (*Calidris ruficollis*) – a common migrating species that occurs on intertidal silt and sand flats in mid August.

Temminck's Stint (*Calidris temminckii*) – occurs during autumn migrations; breeding remains to be confirmed.

Dunlin (*Calidris alpina*) – the most common breeding wader over the entire area of the Nakhatandzhinsky Isthmus. It is also very common during the summer-fall passage.

Knot (*Calidris canutus*) – regular summer and autumn migrant at the seacoast.

Great Knot (*Calidris tenuirostris*) – common passage migrant at the seacoast; the very first flocks of post-breeding females are formed in early July; intense migration of males and young birds starts in mid August.

Long-toed Stint (*Calidris subminuta*) – characteristic species of the site that largely occurs on maritime meadows bordering the mouths of rivers, watery sedge hollows oriented along foothills, and strip bogs.

Wood Sandpiper (*Tringa glareola*) – the most common bird of the plainland "kedrotundra"; nests are found in floodplain habitats and hummocky areas separating lakes.

Greenshank (*Tringa nebularia*) – characteristic bird of open riverbanks at the Nakhatandzhinskaya Lowland.

Grey-tailed Tattler (*Heteroscelus brevipes*) – does not breed within the Nakhatandzhinskaya Lowland itself but occurs at the heads of mountain rivers and seacoasts during autumn migrations (early September).

Terek Sandpiper (*Xenus cinereus*) – a very common wader during summer migrations.

Common Snipe (*Gallinago gallinago*) – characteristic breeding bird of plain tundra areas, although less numerous than other breeding waders.

Whimbrel (*Numenius phaeopus*) – can be seen during spring and autumn passage. They become especially numerous in mid August on tundra and foothill wetlands where they feed in blueberry and crowberry fields.

Far Eastern Curlew (*Numenius madagascariensis*) – rare bird breeding on wooded bogs surrounding the Yamskaya Lowland.

Arctic Skua (*Stercorarius parasiticus*) – vagrants occur on the lowland tundra during the summertime.

Long-tailed Skua (*Stercorarius longicaudus*) – sometimes occurs at the site in the summer.

Glaucous Gull (*Larus hyperboreus*) – young birds occur in the maritime part of the lowland during the summer season. Adults appear in August or September.

Slaty-backed Gull (*Larus schistisagus*) – a most common bird at the seacoast. About 200 pairs make up a breeding colony on the cliffs at the southern entrance to Shkiperov Bay. Single birds occur on tundra water bodies throughout the summer season. They gather in large flocks as soon as their staple food becomes available (Nine-spined Sticklebacks and salmons on their spawning runs).

Mew Gull (*Larus canus*) – rare in coastal habitats during the summer season but becomes more common towards the end of it in the lower stretches of salmon rivers.

Black-headed Gull (*Larus ridibundus*) – non-breeding visitor to the site. Migrating flocks appear in late July. The birds become numerous in the lower reaches of local rivers in August.

Kittiwake (*Rissa tridactyla*) – small flocks are regularly seen feeding in the Shkiperov Bay.

Common Tern (*Sterna hirundo*) – occurs in the northern part of the lowland and probably breeds on oxbow lakes in the Perevolochnaya River valley.

Spectacled Guillemot (*Cepphus carbo*) – a few pairs place their nests near reefs that encircle Shkiperov Bay.

Brunnich's Guillemot (*Uria lomiva*) – single birds and small flocks are a common occurrence in the seaward part of Shkiperov Bay.

Common Guillemot (*Uria aalge*) – uncommon visitor to Babushkin Bay.

Marbled Murrelet (*Branchyramphus marmoratus*) – single birds occur at the entrance to Shkiperov Bay.

Kittlitz's Murrelet (*Branchyramphus brevirostris*) – single birds occur in the Babushkin Bay.

Horned Puffin (*Fratercula corniculata*) – breeds on the coast of Babushkin Bay.

Tufted Puffin (*Lunda cirrhata*) – small breeding colonies occur along Babushkin Bay coastline.

The importance of the site for rare species:

The coasts of Babushkin Bay and the Piyagin Peninsula provide breeding sites for birds of prey such as Steller's Sea Eagle, Osprey, and Peregrine Falcon.

The importance of the site as an area inhabited by economically valuable birds and terrestrial mammals:

The plain of the Nakhatandzhinsky Isthmus and the flanking foothills are inhabited by Ermine (*Mustela erminea*), Wolverine (*Gulo gulo*), Red Fox (*Vulpes vulpes*), Sable (*Martes zibellina*), and Eurasian Otter (*Lutra lutra*) that are trapped by local villagers. Other hunted (mostly illegally) animals include ungulates, such as Elk (*Alces alces*) and Bighorn Sheep (*Ovis nivicola*), and carnivores, primarily Brown Bear (*Ursus arctos*). Northern Pika (*Ochotona hyperborea*) is the most common Lagomorpha species, whereas the number of Varying Hare (*Lepus timidus*) is not very high.

Colonies of Arctic Ground Squirrel (*Citellus parryi*) are found on south-facing slopes of Babushkina Mountain not far from Shkiperov Bay. This Beringian species reaches the south-western limit of its natural habitat in Asia at the site. Black-capped Marmot (*Marmota camtschatica*) occurs around Babushkin and Shkiperov Bays. Wetlands in the foothill area of the Piyagin Mountains provide favourable conditions for Willow Grouse, whose population density in the breeding season amounts to 10-15 pairs/km^2.

Social and cultural values:

During spring and autumn hunting seasons, the Yamskaya Lowland is a traditional area of wildfowl shooting by residents of the village of Yamsk and hunters coming from Magadan. However, hunting pressure has declined over the past years, due mostly to the exorbitant cost of air fares for short-term visitors and of ammunition for the local inhabitants. Perevolochny Bay is a popular winter fishing location for Pacific Cod (*Eleginus gracilis*) and Asian Rainbow Smelt (*Osmerus eperlanus dentex*).

Land tenure/ownership:

Lands owned by the state (Goszemfond and Goslesfond) are managed and exploited by the Administration of the Olsky District of the Magadan Region and other major land users. The southern part of the site has been held until recently on long-term lease by the Even reindeer concern, Oyari. The village of Yamsk is being rapidly depopulated and impoverished, whereas some other settlements (Brokhovo) are totally abandoned. Certain localities are allotted to fishing and other harvesting cooperatives. Streams at the south-eastern side of Shkiperov Bay are assigned to gold-prospecting parties for placer mining, and geologic reconnaissance is carried out at the northern side of the bay, where rich deposits of copper have been discovered.

Current land use:

In the past, the Nakhatandzhinskaya Tundra provided rangelands for almost 3,000 domestic reindeer. The area continued to be used for grazing small herds until the mid 1990s. Thereafter, the herds were dispersed and eventually destroyed by the crews of small vessels that frequented the area for salmon fishing. Small number of Brown Bear and Bighorn Sheep are killed in the Yamskiye Mountains, and seals are harvested at the seashore. In summer, fishing for Humpback and Chum Salmon is practiced in Shkiperov Bay and the rivers flowing into it. Also small-scale smelt fishing takes place on the Kharda River. Selected sites along the Poperechnaya and Perevolochnaya Rivers are traditionally used for shooting geese during autumn migration. Red Fox, Sable, and Ermine are trapped in winter.

Factors adversely affecting the site's ecological character:

The headwaters of the Nakhatandzha River can be turned into a copper-mining area for developing rich deposits of this metal that were discovered here in the 1980s. In 1995, small-scale mining operations were initiated on the eastern coast of Shkiperov Bay for recovering alluvial gold. Since then, the number of prospecting parties and their activity has increased constantly, as has their adverse impact on the ecosystems of the Piyagin Peninsula.

Conservation measures proposed but not yet implemented:

It is recommended that an integrated system of small seasonal nature reserves be established to cover the area between the lower reaches of the Malkachan River and Cape

Babuskin to ensure the protection of moulting ducks, migrating waders and other water birds. Regular environmental monitoring is needed as a guide for preventing damage that can be inflicted on the natural features of the site by the activities of gold-producing and geological reconnaissance parties.

Current scientific research and facilities:

The northern side of Babushkin Bay was surveyed by A.A.Kishchinsky in 1964. A comprehensive survey of the Nakhatandzhinskaya Lowland was undertaken in 1994 and 1995 by the Far East Division of the Russian Academy of Sciences' Institute of Biological Problems of the North. However, the site has limited accessibility despite its relatively small distance from the administrative centre of the region (190 km) by virtue of the high cost of air fares and navigation limitations at sea.

Current recreation and tourism:

The site is a traditional area for shooting wildfowl during autumn migration for Magadan-based hunters who arrive either by ship or by helicopter.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.4. Babushkin Bay

Geographical coordinates: 59°12'42"N, 153°22'47"E (Srednyaya Lagoon).

Elevation: 0-15 m a.s.l.

Area: *c.* 300 km^2.

Overview:

The coast and inlets of a large sea bay; breeding grounds for shorebirds and colonial seabirds; congregations of moulting ducks; feeding grounds for Gray Whale (*Eschrichtius gibbosus*).

Wetland type:

By international classification – A, B, E, G; by national classification – 1.1.1.2, 1.1.2.2, 1.2.1.3, 1.2.3.2 (seashore cut by deep inlets with highly productive littoral and sublittoral zones and intertidal flats).

Ramsar Criteria: 1, 3, 4.

Justification for the application of selected criteria:

Typical, virtually intact portion of the Sea of Okhotsk coast washed by the Piyaginskoye current; moulting area for numerous sea ducks. The adjacent sea bay provides feeding grounds for Gray and Bowhead (*Balaena mysticetus*) Whales.

General location:

The site lies in the middle of the Koni-Piyaginsky projection of the Sea of Okhotsk coast on the territory of the Olsky Administrative District of the Magadan Region. The distance from the nearest populated settlement (the village of Yamsk) is 56 km, while the distance in a straight line from the city of Magadan is 151 km (250 km by sea).

Physical features:

The bay is named after a nearby mountain summit (Mountain Babushkina, 1,023 m a.s.l.), where, according to local legends a Koryak shamaness was buried (Leontiev & Novikova, 1989). The north-western side of the bay is formed by rolling foothills of the Eguya mountain massif. Its shores are made up of Early Cretaceous gabbros and granodiorites. The rugged coastline is interrupted by numerous rocky capes (Bratiev, Astronomichesky, etc.), skerries, and inlets (with the largest being Astronomicheskaya Inlet). The rocky coast becomes smoother in the northern part of the bay, where it grades into low rolling hills and shingle beaches. The head of the bay is formed by the Srednyaya Lagoon, which is separated from the bay by a narrow pebble spit 6 km in length.

Gently sloping mountains flanking Astronomicheskaya Inlet and Srednyaya Lagoon are occupied by sedge hummock vegetation. The tree line lies 3-5 km from the sea. Srednyaya Lagoon receives three small rivers (Buksendya, Srednyaya, and Maldek), each only 25 km in length. The low-lying interfluvial area separating the Buksendya and Srednyaya Rivers (15 km^2) is hummocky tundra dotted with thermokarst lakes.

Babushkin Bay is 25-40 m deep and has an irregular tidal regime of a semidiurnal type with amplitudes of 4.5-5.0 m. As the tide ebbs, it exposes a vast shingle-boulder littoral zone inside the inlets, which gives rise to rapid currents and standing waves (suloi) at the exit from Srednaya Lagoon.

Despite being the southernmost portion of Magadan Region, the Koni-Piyaginsky projection is subject to the action of the cold Piaginskoye current. Hence its rigorous marine climate of the subarctic type. The mean annual air temperature is -3.8°C. Spring comes to the maritime tun-

dra by the end of May. Snowdrifts in hollows and low-lying places persist until late July and early August. The ice cover in Babushkin Bay breaks up and is carried away in mid June, but the arrival of warm weather is delayed until the ice totally disappears from Penzhina and Shelikhov Bays 1-2 weeks later. North-easterly gales are not infrequent in Babushkin Bay and are most devastating during the period when drift ice passes Piyagin Peninsula. According to the Cape Bratiev meteorological station, July and August are the warmest months (the mean temperature in July is +11.5°C). At this time, south-western winds prevail. In early August, sunny weather is often replaced by storms. By the end of July, water in the bay is heated to +10-11°C and in shallow-water inlets to +15-16°C. The first 7-10 days of September are usually clear, but this "Indian summer" often ends in snowstorms in the middle of September. The snow cover sets in early October, but the bay freezes only at the end of December or early January. Winters are windy and snowy. The mean air temperature in January is –20.5°C.

Ecological features:

The maritime zone is for the most part hummocky tundra dominated by *Carex lugens* and *Eriophorum vaginatum*, with patches of hypoarctic creeping shrubs such as *Betula exilis, Ledum decumbens, Vaccinium uligunosum*, and *Empetrum sibiricum*. Mossified spots are overgrown with *Carex rariflora, Oxycocus microcarpus*, and And*romeda polifolia*. The shores of small thermokarst lakes that freeze to the bottom each winter are occupied by larger sedges (*Carex cryptocarpa, C.rhynchophysa, C.concolor*) and pendent grass (*Arctophyla fulva*). The most common hydrophilic species include *Hippuris vulgaris, Comarum palustre, Ranunculus pallasii, Menyanthes trifoliata,* and *Utricularia macrorhiza.* Zoobenthos is dominated by insect larvae (*Trichoptera, Chironomidae, Coleoptera, Odonata*), bivalves (*Pisididae*), gastropods (*Anisus borealis*), isopods (*Asellus hilgendorfi*), and ostracods.

Dry spots on the slopes of coastal hills support ericoid and lichen gravelly tundra. Their shrubby vegetation consists of *Rhododendron lapponicum, Loiseleuria procumbens, Arctous alpina, Cassiope lycopodioides, Vaccinium vitis-idaea,* and *Empetrum sibiricum. Achoriphragma nudicaule* is a characteristic species of these plant communities. The lichen cover is constituted by genera *Cladonia, Cetraria, Stereocaulon,* and *Alectoria*. Patches of shrub pine (*Pinus pumila*) and shrubby Manchurian alder (*Duschekia fruticosa*) with single shrub-size wind-distorted larches appear at a distance from the seashore. The vegetation cover displays picturesque spots of *Dryas ajanensis, Phyllodoce caerulea,* and *Rhododendron aureum.* Chamisso's willow (*Salix chamissonis*) occupies watery foothill biotopes near gradually thawing snowpacks.

Shingle spits of Srednyaya Lagoon are covered with small patches of wet grassland formed by reed bent grass (*Calamagrostis langsdorffii*) in between heaps of driftwood and lovely herbaceous vegetation composed of *Iris setosa, Bistorta elliptica, Aconitum delphinifolium, Potentilla fragiformis, Geranium erianthum, Chamaepericlymenum suecicum*, and other forbs.

Srednyaya Lagoon, which is freshened by river runoff, is characterized by variable salinity patterns. A major part of its bottom is occupied by eelgrass beds (*Zostera marina*), while brown algae thrive in areas of enhanced salinity. Freshwater portions of the lagoon are inhabited by small polychaetes (*Spionidae*) and *Abarenicola pacifica*. Eelgrass communities are populated by numerous gastropods (*Littorina spp., Falsicingula kurilensis*) and bivalves (*Turtonia minuta, Liocyma fluctuosa, Mytilus trossulus*), with mussels of record size (with shell lengths up to 10 cm) occurring here. The most common crustaceans include amphipods (*Eogammarus tiuschovi, Lacustogammarus aestuariorum,* and *Lagunogammarus setosus*) and numerous isopods (*Idothea ochotensis*). Helmet Crab (*Telmessus cheiragonus*), mysids (*Neomysis awatschensis*), and various shrimps (*Spirontocaris spp., Hetarius spp.*) dwell just about everywhere in deeper regions. Decaying remains of eelgrass washed ashore give home to sea fleas (*Traskorchestia ochotensis*) and small isopods (*Detonella sachalina*). This food-rich debris attracts many waders.

The littoral zone adjacent to open stretches of the bay coast exhibits numerous sand-silt and shingle-boulder flats (the former largely in the inner part of inlets and the latter along the shoreline and near capes). There are rocky reefs in the eastern part of the bay. The seaward edge of the shingle spit that separates Srednyaya Lagoon from the rest of the bay is characterized by an almost complete absence of invertebrates in the littoral zone. The sublittoral zone is inhabited by numerous amphipods (*Anonyx gurjanovae, Atylus colligni, Anisogammarus puggetensis, Eogammarus schmidti*, etc.) and cumaceans (*Lamprops spp.*), important staple foods for Harlequin Ducks and Gray Whales.

The entrance to Astronomicheskaya Inlet is remarkable for an extensive growth of kelp (genus *Laminaria*), with individual plants possessing thalli measuring 4.5 x 0.8 m. The littoral zone at the head of the inlet gives rise to meadows of eelgrass and sea lettuce (*Ulva fenestrata*) of striking size. They are inhabited by gastropods (*Littorina squalida*) and associated hermit crabs (*Pagurus spp.*). Numerous scattered boulders are used by starfish (*Leptasteria sp.*) to lay their eggs. Silt bottom portions are inhabited by large bivalves (*Musculus laevigatus*), widespread

Phascalosoma japonica, and sea cucumbers (*Chiridota sp.*). Some spots are occupied by attached polychaetes (*Chone teres*). Plankton is dominated by mysids (*Neomysis mirabilis*) that move as dense schools towards the edge of the tidal current.

Intertidal flats with scattered boulders harbour a rich invertebrate fauna. Numerous barnacles (*Semibalanus balanoides*) and juvenile mussels (*Mytilus trossilus*) occur in dense clusters attached to the stones. The lower level of the littoral zone is occupied by various red (*Rhodophyta*) and brown (*Fucus spp., Lessonia laminarioides*) algae, *Bryozoa* and hydroids (*Hydrozoa*) whose aggregations provide home to polychaetes (*Sillidae*) and crustaceans representing such groups as *Copepoda (Harpacticoida), Heteropoda (Gammaroidea, Caprellidea),* and *Decapoda (Hyppolytidae)*. Numerous amphipods (*Parallorchestes ochotensis*) are a staple food of Harlequin Ducks and a source of their infestation with specific cestodes (*Lateriporus aecophilus* and *Microsomacanthus spp.*). Some boulders are covered with sea anemones (genus *Actinia*) and gastropods (*Littorina squalida, Colysella cassis, Nucella freycinetti, Margarites helicina*, and *Buccinum ampullaceum*). Lower sublittoral levels are occupied by large brown algae (*Alaria, Laminaria, Cystoseria,* etc.), their rhizoids providing shelter to thriving populations of sea urchins (*Strongylocentrotus spp.*), starfishes (*Leptasterias spp., Henricia tumida*), and sea cucumbers (*Cucumaria vegae*).

Sea plankton is dominated by diatoms (*Thalassiosira*), copepods (*Calanoida*), and sometimes cyprid-like larvae of barnacles. Other plankters include a small number of pteropod molluscs (*Limacina helicina*).

Noteworthy fauna:

Fish

Eelgrass communities of Srednyaya Lagoon provide habitat to Alligator Fish (*Podothecus veternus*) and serve as a transit area for Dolly Varden (*Salvelinus malma*), East Siberian Char (*S.leucomaenis*), and endemic Levanidov's Char (*S.levanidovi*). Humpback Salmon (*Oncorhynchus gorbuscha*) enters the Srednyaya River for spawning. Pacific Sleeper Shark (*Somniosus pacificus*) sometimes approaches the northern shore of Babushkin Bay.

Birds

A total of 118 bird species have been recorded on Babushkin Bay and in its vicinity, including 65 breeding ones. Red-throated Diver (*Gavia stellata*) and Whooper Swan (*Cygnus cygnus*) inhabit thermokarst lakes. White-fronted Goose (*Anser albifrons*) and Bean Goose (*A.fabalis*) visit Srednyaya Lagoon during spring and autumn migrations. The coastal habitats of Babushkin Bay provide the most favourable conditions for Harlequin Ducks, which place their nests in dense thickets of shrub pine at the foot of slopes, guide their broods along shingle spits, and gather to moult near small coves and reefs. Congregations of other diving ducks on Babushkin Bay include White-winged Scoter (*Melanitta deglandi*), Goldeneye (*Bucephala clangula*), and Goosander (*Mergus merganser*).

Five or six pairs of Steller's Sea Eagle (*Haliaeetus pelagicus*) nest on the coasts of Astronomicheskaya Inlet and Srednyaya Lagoon, while Rough-legged Buzzard (*Buteo lagopus*) and Merlin (*Falco columbarius*) make their nests in the mountains along the Maldek River.

The most characteristic breeding waders at the site are Pacific Golden Plover (*Pluvialis fulva*) and Far Eastern Curlew (*Numenius madagascariensis*), which occur on the hummock tundra. Dunlin (*Calidris alpina*) and Long-toed Stint (*C.subminuta*) are common in delta habitats, while Mongolian Plover (*Charadrius mongolus*) prefers gravelly uplands. The most common passage migrants include Grey-tailed Tattler (*Heteroscelus brevipes*), Red-necked Phalarope (*Phalaropus lobatus*), Great Knot (*Calidris tenuirostris*), Whimbrel (*Numenius phaeopus*), and Red-necked Stint (*Calidris ruficollis*). Nomadic Long-tailed Skua (*Stercorarius longicaudus*) and Short-tailed Shearwater (*Puffinus tenuirostris*) wander over the bay.

Slaty-backed Gull (*Larus schistisagus*) is most numerous among the gull species. Others include Glaucous Gull (*Larus hyperboreus*), Mew Gull (*L. canus*), Black-headed Gull (*L. ridibundus*), and Kittiwake (*Rissa tridactyla*).

A few pairs of Marbled Murrelet (*Branchyramphus marmoratus*) occur near Astronomicheskaya Inlet, and a nest of Kittlitz's Murrelet (*B. brevirostris*) has been found in the mountains adjacent to Srednyaya Lagoon (Andreev & Golubova, 1995).

Passerine birds of the hummocky tundra habitats include Sky Lark (*Alauda arvensis*), Red-throated Pipit (*Anthus cervinus*), and Lapland Longspur Bunting (*Calcarius lapponicus*). Siberian Rubythroat (*Luscinia calliope*) and Dusky Warbler (*Phylloscopus fuscatus*) are the most common birds of maritime scrublands. White Wagtail (*Motacilla alba*) and Grey Wagtail (*M.cinerea*) occur on riverbanks, while the slopes of nearby mountains are frequented by Buff-bellied Pipit (*Anthus rubescens*).

Mammals

Babushkin Bay is a relatively safe place that attracts Gray and Bowhead Whales in the summer season due to an abundance of food. Numerous Common Seals (*Phoca largha*) haul out on its shores. The surrounding mountains are inhabited by Red Fox (*Vulpes vulpes*), Brown Bear

(*Ursus arctos*), and Bighorn Sheep (*Ovis nivicola*). Black-capped Marmot (*Marmota camtschatica*) is a common occurrence on coastal precipices, while Northern Pika (*Ochotona hyperborea*) and Chipmunk (*Tamias sibiricus*) dwell on hillsides and scree slopes.

Social and cultural values:

The coasts of Babushkin Bay lie in a zone of ancient Koryak culture. Remains of dwellings dating back to the 13th or 14th centuries can be seen near Astronomicheskaya Inlet, at the entrance to Srednyaya Lagoon, and in other places.

Throughout the 1970 and 1980s, a herd of domestic reindeer was kept near Srednyaya Lagoon until the animals ran wild and were exterminated by poachers in 1997-1999.

The Mys Bratieva weather station is situated in the south-western part of the site.

Current land use:

A fishing team from Magadan is based on the coast of Srednyaya Lagoon during salmon season. Prospecting for gold and copper deposits is underway at the headwaters of the Srednyaya and Maldek Rivers. During storms coming from the southwest, Cape Bratiev often provides safe anchorage for trawlers that harvest crabs and whelks (*Buccinidae*) in Shelikhov Bay. In the early 1990s, illegal bear hunting from motorboats and small vessels was practiced on a large scale, stimulated by high prices for the bear's gallbladder at the time. In 1993-1998, foreign sport hunters were brought to this area to hunt bears and bighorns along the coast and in the adjacent mountains.

Conservation measures proposed but not yet implemented:

Seasonal reserves in Nemek Cove, Astronomicheskaya Inlet, and Srednyaya Lagoon need to be established for protecting breeding and moulting sites of diving ducks and sublittoral feeding areas of Gray Whale.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.5. Odyan Bay and Umara Island

Geographical coordinates: 59°09'00"N, 154°46'22"E (Umara Island).

Elevation: 0-90 m a.s.l.

Area: *c.* 600 km^2.

Overview:

Sheltered sea inlet on the eastern coast of the Gulf of Tauisk in the Sea of Okhotsk. An area of consistently high productivity of pelagic ecosystems; large seabird colonies; high population density of Steller's Sea Eagle (*Haliaeetus pelagicus*) and Marbled Murrelet (*Branchyramphus marmoratus*) during breeding seasons; concentration of diving ducks at moulting grounds.

Wetland type:

By international classification – A, B, D, E; by national classification – 1.1.2.2, 1.2.3.2, 1.4.1.1 (sea bay with rocky cliffs, reefs, and islets).

General location:

The site is situated on the territory of the Olsky Administrative District of the Magadan Region and occupies the eastern part of the Gulf of Tauisk in the Sea of Okhotsk. Umara Island is located at the south-westernmost point of the site. Umara Island lies 53 km from the nearest population point (the settlement of Ola) and 67.5 km from the city of Magadan (Gertner Bay).

Physical features:

Odyan Bay runs deep inland across the coastline in the eastern part of the Gulf of Tauisk in the Sea of Okhotsk. The steep shores of the bay are made up of Jurassic and Cretaceous sandstones with admixtures of Neogene deposits in the vicinity of Melkovodnaya Bay. The southern stretch of coast is flanked by north-facing slopes of mountain ridges that extend from the Koni Peninsula to reach the sea sometimes in a line of imposing rock cliffs, sometimes as broad maritime terraces. In the north, the Bering and Nerpichiy capes jut out into the bay. Its easternmost part, Melkovodnaya Bay, is lined with high precipices that are in some places crumbling and in other places overgrown with larch forest. The depth of Melkovodnaya Bay is 10-15 m, while it is approximately 25 m in the central part of Odyan Bay. The tidal range is 4.5-5.0 m. The tidal regime is of an irregular semidiurnal type. As the tide ebbs, it exposes extensive boulder-strewn and sand intertidal flats along the southern shore of Melkovodnaya Bay and the northern shore of Odyan Bay (Nerpichiya Bay).

A few important salmon rivers (Umara, Orokholindzha, Kal'kuty, Bogurchan, and Okurchan) flow into the south-

ern part of Odyan Bay. These rivers originate in glacial lakes and cirques located in the axial part of the Koni Peninsula. They are rapid, have clear water, and form braided floodplains built up from rock debris and large pebbles. Wet river terraces and foothills are covered with lush herbaceous meadows and stone birch groves. The hollow between the Boguchan River and Melkovodnaya Bay is filled with the large Lake Zelyonoye.

There is the small rocky Umara Island at the mouth of the river of the same name. At low tide, the island is connected with the mainland by a narrow sand and shingle isthmus around 1,000 m in length. The island is 92 m high, approximately 500 m long, and 200 m wide, with a projected area of roughly 20 ha. The northern (seaward) face of the island makes up a line of steep cliffs, while its eastern and western sides are smoother and support thick herbaceous and shrubby vegetation. The island hosts large breeding colonies of seabirds.

The steep rocky coast in the north of Odyan Bay that runs from Cape Bering to Cape Nerpichiy is cut by small inlets, skerries, narrow passages, and creeks visited by spawning Humpback Salmon.

The steep ridges of the Koni Peninsula are up to 1,500 m high that shelter Odyan Bay from winds generated by the cold Piyaginskoye current. The climatic conditions of Melkovodnaya Bay are less rigorous than they are at the southern side of the Koni Peninsula. Fog is rarer here, and there are more clear days. According to the records of the Melkovodnaya weather station, the annual air temperature averages -5.6°C, with a mean temperature in January of –20.7°C and an absolute minimum of -45°C. Winds blowing north-eastward and averaging a speed of 6-8 m/s prevail in winter. The stable snow cover sets in mid October. Starting from November, large ice fields develop in valley bottoms. The bay is icebound by mid December and begins to open again only in the middle of May. Annual precipitation averages 540 mm. Large snowpacks remain in the mountain cirques of the Koni Peninsula throughout summer; therefore, the rivers flowing to Odyan Bay are always deep. Spring flooding occurs in early summer (late May and June). Mean summer air temperatures are moderately high, viz. +6.4°C in June, +11°C in July, and +10.6°C in August. The river water temperature in July and August is as high as +10-12°C. Water in the bay is heated to +12-15°C in August (Chernyavsky & Radchenko, 1994). In summer, strong south-westerly breezes blow over the bay late in the afternoon.

Ecological features:

There are stationary fields of high mesoplankton density in the seaward part of Odyan Bay. The mesoplankton is dominated by *Metridia ochotensis* and *Calanus glacialis* (Afanasiev *et al*., 1994).

The sublittoral zone in the southern part of Odyan Bay gives rise to an abundant growth of kelp largely composed of *Cystoseira crassipes, Lessonia gurjanovae*, and *Alaria marginata*. More shallow places are occupied by *Fucus evanescens*, while green algae (*Ulva sp., Monostroma sp.*) predominate on intertidal sand-shingle flats. The sandy and stony substrate, which overlain by a layer of silt, is densely populated by big bivalves (*Mya sp.*). Sand-silt flats are inhabited by attached polychaetes (*Chone teros, Abarenicola pacifica,* and a few species of the family *Capitellidae*). Large loose stones are occupied by crust-like communities of barnacles (*Semibalanus balanoides*) and mussels (*Mytilus trossulus*). Stone bottom spots in Melkovodnaya Bay are favoured by gastropods (*Littorina sp., Colisella sp., Nucella sp.*). Seaward portions of the bay, including rocky Umara Island, abound with echinoderms such as starfishes (*Leptasterias spp., Evasterias retifera*), sea urchins (*Strongylocentrotus sp.*), and sea cucumbers (*Eupentacta vagae, Cucumaria sp.*). Equally common are decapods (*Pandalus goniurus*) and crabs (*Paralithodes brevipes, P.platypus*).

Shingle sea spits and maritime terraces are occupied by rich water meadows dominated by *Calamagrostis langsdorffii, Ftitilaria camtschatcensis, Geranium erianthum, Lathyrus maritimus,* and *Iris setosa*. Wet foothills and floodplain terraces are covered by picturesque herbaceous vegetation with groves of stone birch (*Betula lanata*) and groups of mountain ash (*Sorbus sambucifolia*) shrubs. Remarkable plants of the Koni meadows are *Iris setosa, Clematis fusca,* and *Corydalis arctica*. Elevated portions of the terraces and hill bases are overgrown with thickets of shrub pine (*Pinus pumila*). Mountain slopes are covered by larch and stone birch forests, with an understory composed of shrubs such as Manchurian alder (*Duschekia fruticosa*), mountain ash (*Sorbus sambucifolia*), and Chamisso's honeysuckle (*Lonicera chamissoi*). Groves of woody willows (*Salix udensis, S.schwerinii*) and Korean willow (*Chosenia arbutifolia*) are found on floodplains. The mountain tundra of the Koni Peninsula is dominated by dwarfy shrubs of the heath family, including *Phyllodoce caerulea, Loiseleuria procumbens, Rhododendron aureum*, and *R.camtschaticum*. Highlands feature Alpine landscapes with morainic ridges, trough valleys, glacial cirques and lakes.

Lake Zelyonoye lies in the south-eastern part of the site close to Melkovodnaya Bay at 50 m a.s.l. The waterlogged lake basin is covered with sparse larch stands with an undergrowth of stone birch and shrub pine. Treeless portions of lake shores are covered with Sphagnum cush-

ions overgrown with round-leafed sundew (*Drosera rotundifolia*), bog cranberry (*Oxycoccos microcarpus*), and small yellow-water crowfoot (*Ranunculus gmelinii*). The lake bottom is overlain by a thick layer of peat deposits but here and there exhibits patches of sand and pebble. Blooms of filamentous algae occur in midsummer when copepods and amphipods (*Gammarus lacustris*) become equally abundant. The latter are heavily infested with helminth larvae (cestodes and spiny-headed worms). Benthos is dominated by chironomid and caddisfly larvae, but molluscs are virtually absent.

Noteworthy flora:

The flora of the Koni Peninsula is one of the richest in northeastern Asia. It includes 540 species of vascular plants representing 69 families (Mochalova, 1999). The largest number of plants belong to the families *Poacea* (64 species), *Cyperacea* (51), *Asteracea* (42), *Ranunculacea* (33), *Caryophyllacea* (28), and *Rosacea* (28). The flora is dominated by boreal and arcto-alpine plants circumpolar in distribution. A group of north okhotskian endemics consists of 16 species. The ranges of 28 other species cover the Okhotsk-Kamchatka region, including such restricted-range endemics as *Salix magadanensis, Corydalis magadanica, Potentilla rupifraga, Saxifraga derbekii*, and *Taraxacum magadanicum*. A large fraction of the flora is constituted by relict species of Arcto-Tertiary, Pliocene, and Pleistocene origin. The vegetation of wet foothill meadows includes *Filipendula palmata, Maianthemum dilatatum, Dactylorhiza aristata, Anemonoides debilis, Clematis fusca, Adoxa moschatellina, Melica nutans,* and *Impatiens noli-tangere,* with the same species found under the canopy of stone birch groves. Mountain tundra gives home to *Selaginella rupestris, Dicentra peregrina, Patrinia sibirica, Ermania parryoides, Dracocephalum palmatum,* and *Pennellianthus frutescens*. *Vahlodea atropurpurea* and *Pteridium aquilinum* occur only on the Koni Peninsula. The northern coast of Odyan Bay hosts a small refuge of mesophilic flora with marsh-dwelling herbs, such as *Athyrium filix-femina, Huperzia selago, Stellaria irrigua, Cardamine regeliana, Viola sacchalinensis,* and *Pyrola minor* (Khokhryakov, 1979). The same author (Khokhryakov, 1984) has found the endemic milk vetch *Astragalus boreomarinus* on the shores of Odyan Bay.

Noteworthy fauna:

Fish

Five far eastern species of salmon enter the rivers flowing into Odyan Bay, the most common of which is Humpback Salmon (*Oncorhynchus gorbuscha*). Regular visitors to the bay include Chum Salmon (*O.keta*) and Coho (*O.kisutsch*), while Sockeye (*O.nerka*) and Chinook (*O.tschawytscha*) are less frequent. Dolly Varden (*Salvelinus malma*) and East Siberian Char (*S.leucomainis*) enter the same rivers in the spawning season.

The presence of more than 100 species of selfish has been documented in the Gulf of Tauisk (Chereshnev *et al*., 1999). Among pelagic and benthic forms, Pacific Herring (*Clupea pallasi*), Capelin (*Mallotus villosus*), Saffron Cod (*Eleginus gracilis*), Pacific Cod (*Gadus macrocephalus*), Walleye (*Theragra chalcogramma*), Pacific Ocean Perch (*Sebastes alutus*), and White-spotted Greenling (*Hexagrammos stelleri*) are the most common and commercially important. Other taxa are represented by various sculpins, including Lord (*Hemilepidotus sp*.), Flathead Sculpin (*Megallocotus sp*.), Sea Sculpin (*Myoxocephalus spp*.), etc., Eelpout (*Zoarces elongatus*), Cockscomb (*Alectrias alectrolophus*), Bering Wolf-fish (*Anarhichas orientalis*), Gunnels (family *Pholidae*), Pacific Sand Lance (*Ammodytes hexapterus*), Starry Flounder (*Platichthys stellatus*), and Eelpout (*Hadropareia spp.*).

Birds

The importance of the site for migrating birds:

Odyan Bay lies at the flyway of fall migrations of Arctic Geese. Flocks of Bean Geese (*Anser fabalis*) frequently stay overnight at flattened tops of Koni mountains. The outline of the shores of Melkovodnaya Bay and Lake Zelyonoye, as well as their prevailing biotopes, suggests their potential as staging posts for Sandpipers and diving ducks respectively. However, no special observations of their movements have been conducted during migration seasons.

The importance of the site for breeding birds:

Middendorff's Grasshopper Warbler (*Locustella ochotensis*), Pine Grosbeak (*Pinicola enucleator*), Pallas Leaf Warbler (*Phylloscopus proregulus*), and Stonechat (*Saxicola torquata*) are the most common inhabitants of grasslands and shrubby vegetation occupying marine terraces adjacent to Odyan Bay. The neighbouring mountain slopes provide home to Hazel Grouse (*Tetrastes bonasia*). Harlequin Duck (*Histrionicus histrionicus*) occurs on riverbeds.

Umara Island supports breeding colonies of almost 15,000 seabirds represented here by 9 species. The most abundant of these are Tufted Puffin (*Lunda cirrhata*) (2,000-2,500 pairs), Kittiwake (*Rissa tridactyla*) (1,000-2,000 pairs), and Slaty-backed Gull (*Larus schistisagus*) (1,000-1,200 pairs).

A local colony of Pelagic Cormorant (*Phalacrocorax pelagicus*) totals about 600 pairs, while colonies of

Brunnich's Guillemot (*Uria lomiva*) and Spectacled Guillemot (*Cepphus carbo*) total 150-500 pairs and up to 300 pairs respectively. Less abundant are Parakeet Auklet (*Cyclorhynchus psittacula*) with 30-100 pairs and Horned Puffin (*Fratercula corniculata*) with 10-25 pairs. In the past, Steller's Sea Eagle (*Haliaeetus pelagicus*) was a breeding bird on Umara Island. The northern side of Odyan Bay is occupied by a few large colonies of Slaty-backed Gulls totalling 2,500 pairs (Golubova & Pleshchenko, 1997). The breeding success of colonial seabirds on Umara Island is invariably higher than in other parts of the Gulf of Tauisk (Golubova, 2001).

Large congregations of Marbled Murrelet are found on the Orokholindzha River and in the vicinity of Rechnoy Bay. No other Murrelet concentration of a comparable size has been observed along the entire Sea of Okhotsk coast between the settlements of Okhotsk and Takhtoyamsk.

Mammals

Brown Bears (*Ursus arctos*) are very common along the coastline and on the mountain slopes of the Odyan Bay. The record density of this animal is due to a most favourable combination of shrub pine stands, Alpine meadows, intertidal habitats, and salmon spawning rivers. Elk (*Alces alces*) is a rare visitor to river valleys. Highlands of the Koni Peninsula are inhabited by Bighorn Sheep (*Ovis nivalis*) and host colonies of Black-capped Marmot (*Marmota camtschatica*). Common Seals (*Phoca largha*) haul out on stone banks at mouths of rivers, and Killer Whales (*Orcinus orca*) enter Odyan Bay from time to time.

Social and cultural values:

The shores of Odyan Bay appear to have been inhabited in the past by coastal hunters and gatherers. Traces of their settlements can be seen at the mouths of the Bogurchan, Orokholindzha, and Khindzha Rivers. Cultural layers exposed at riversides exhibit accumulated kitchen debris consisting of alternating strata of fish skeletons, mussel shells, seal bones, and a variety of artefacts of the Koryak culture dating back 700-1000 years. The Dalstroy administration, which for many years developed the territory, used to send prisoners to cut timber in the valleys of the Bogurchan, Orokholindzha, and Khindzha Rivers and established fisheries at their mouths. In later years, a fish factory was built on the Bogurchan River that was shut down after the advent of processing ships. Almost 1,000 tons of fish are taken from Odyan Bay in "humpback years" (seasons of massive Humpback Salmon migration). Other commercially important fish include Saffron Cod (in winter), Herring, and Capelin. Crabs are harvested in the spring.

Current land use:

Odyan Bay is an important herring and crab fishing area. There are salmon fisheries at the mouths of the Bogurchan, Orokholindzha, and Khindzha Rivers and in 2-3 locations at the northern side of Odyan Bay. The Pacific Institute of Fishery and Oceanography conducts salmon-breeding experiments on the Kal'kuty River. A protected area of the Magadan State Nature Reserve in waters offshore the Koni Peninsula is rich in Halibut. The reserve has no means for controlling unauthorized access to its sea buffer zone, and its protective regime is frequently violated, especially in August and September.

Conservation measures taken:

The northern coast of the Koni Peninsula and its 2,000 m wide offshore belt is controlled by the Olsky Department of the Magadan State Nature Reserve. The territory adjacent to this area from the east (between the Khindzha and Siglan Rivers) has been designated a wildlife refuge for the protection of Brown Bear and Bighorn Sheep.

Current scientific research and facilities:

In summer, Odyan Bay is accessible by motorboats and small vessels from the village of Ola and from Magadan. A winter roadway runs across Melkovodnaya Bay from Ola to Cape Kiras on Siglan Bay, where a radio relay station is located.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

Management authority:

Administration of the Magadan State Nature Reserve (western part of the Koni Peninsula), Hunting and Game Management Department of the Magadan Regional Administration (eastern part of the site).

5.6. Lake Chistoye

Geographical coordinates: 59°33'39"N, 151°45'20"E.

Elevation: 91 m a.s.l.

Area: *c.* 40.5 km^2 (water surface); 96 km^2 (total area including adjacent wetlands and river network).

Overview:

Large lake in an intermontane depression bordering the northeastern side of the Gulf of Tauisk in the Sea of Okhotsk. Highly diverse aquatic flora; staging post for migrating Arctic geese and diving ducks; unique populations of Arctic Char (*Salvelinus alpinus*), Arctic Grayling (*Thymallus acrcticus pallasi*), and East Siberian Char (*Salvelinus leucomaenis*).

Wetland type:

By international classification – O; by national classification 3.8.1.3 (large mesotrophic lake with adjacent portions of river valleys and lacustrine-palustrine depressions).

General location:

Lake Chistoye is situated in the Lankovskaya River Basin (left tributary of the Ola River) with which it is connected by the 15 km long Olachan (Belaya) Channel. The site is a part of the territory of the Olsky Administrative District of the Magadan Region. It lies 45 km by boat from the settlement of Ola (distance in a straight line is 25 km). There is a 30 km long route for off-road vehicles that connects the village of Atargan (Olskaya Lagoon) to the lake. The distance from the city of Magadan is 56 km in a straight line.

Physical features:

Lake Chistoye lies in the centre of a small intermontane depression, an extension of the Olskaya Lowland. It is a gently rolling plain spreading from southwest to northeast for approximately 60 km. Its width varies from 16 to 20 km. The plain is formed by terrigenous deposits of the Middle Pleistocene Age. On the north and south, the depression is flanked by mountain ranges as high as 600-900 m a.s.l. On the east and west, it extends to the Gulf of Tauisk coast and the Olskaya Lowland across sloping mountain saddles.

The lake is oval in outline, with its largest diameter running 9 km north-south and its smaller diameter roughly 6 km east-west. The shoreline is largely straight or slightly curved. The shore is rugged, with small bays and inlets only in the south-western corner of the lake.

The area around the lake is dissected by a large number of small rivers and creeks feeding the water body. The southern and northeastern parts of the site harbour a system of thermokarst lakes. Other manifestations of cryogenic activity are noticeable in the microrelief of hillock fields and solifluction terraces. Here and there, coal strata containing the fossilized remains of coniferous plants (*Picea sp*.) are exposed along the lake shores.

The mean depth of the lake is 5-6 m, with the maximum depth 8.5 m. The bottom is covered with grey silt, and much of its area is occupied by sand and fine-pebble shallows 0.7-1.0 m in depth. The lake water is dark and clear (visibility 1-2 m) and has a neutral or slightly acid reaction (pH 6.8-7.4).

The site has a marine subarctic climate. Fog is common in early summer. The ice cover sets in mid October and breaks up in early or mid June. In August, lake water can be +14°C.

Ecological features:

Zooplankton of Lake Chistoye consists of *Copepoda* (up to 19,000/m^3), *Cladocera* (2,400/ m^3), and *Rotatoria* (up to 2,500/ m^3) (Degteva, 1965). Benthos biomass averages 6-10 g/ m^2 (Grishin, 1983). It is dominated by molluscs (5-8 g/ m^2), chironomids (1.2-1.7 g/ m^2), gammarids (0.5 g/ m^2), and oligochaetes (0.1-0.2 g/ m^2). *Anodonta beringiana* and *Lymnea spp*. are the most common mollusc species. Other characteristic species include water louse (*Asellus sp.*) and mussel shrimps (*Ostracoda*). Large aggregations of small fish washed ashore during stormy weather attract flocks of gulls and terns.

The abundance of copepods accounts for a diverse fauna of parasitic worms in the ecosystem of Lake Chistoye. The highest infestation rate is documented for Dolly Varden (tapeworms of the genus *Diphyllobotrium*) and East Siberian Char (cavitary nematodes of the genus *Philonema* and intestinal cestodes *Eubotrium salvelini*) (G.I.Atrashkevich, in press).

Shores of the lake are occupied by hummock-hollow mire complexes and sparse, mostly burnt larch stands. The vegetation cover is formed by typical species of seasonally thawed frozen peatlands, such as *Carex globularis, Ledum decumbens, Vaccinium uliginosum, V. vitis-idaea, Empetrum nigrum,* and *Rubus chamemorus*.

Noteworthy flora:

The local terrestrial flora is relatively poor and has no specific features. It is constituted by approximately 150 species of vascular plants representing the northern boreal

complex. On the contrary, the diversity of hydrophilic plants is very high. Lake Chistoye is considered to be one of the largest refuges of relict hydrophilic flora. Shallows in the north-western part of the lake are known to harbour a rare Asian species of maritime quillwort (*Isoetes maritima*) and a variety of pondweed species that includes *Potamogeton gramineus, P.pusillus, P.berchtoldii*, and *P.natans* with the predominance of *Potamogeton perfoliatus* and *P.tenuifolius*. Autumnal water starwart, (*Callitriche hermaphroditica*) and water buttercup (*Batrachium sp*.) thrive in the water column. Pendent grass (*Arctophyla fulva*) sward develops on lake margins. Shallows and inlets are occupied by *Nuphar pumila, Nymphaea tetragona, Saggitaria natans, Eleocharis acicularis,* and *Sparganium hyperboreum*.

Swampy shores are overgrown with *Carex vesicata, C.rhynchophysa, C.cryptocarpa, C.rariflora, Myriophyllum verticillatum, Hippuris vulgaris, Naumburgia thrysiflora, Menyanthes trifoliata, Comarum palustre, Cicuta* virosa, and *Ranunculus pallasii*. Coastal pools are fringed with *Thacla natans, Caltha sibirica, C.arctica, Polygonum amphibium, Drosera rotundifolia, Smilacina trifolia, Parnassia palustris, Saxifraga hurculus, S.hieracifolia, Eriophorum russeolum,* and *E.humile.*

Noteworthy fauna:

Fish

Before Okhotskrybvod (fishery enforcement agency) initiated experiments on the replenishment of coregonid breeding stocks in the watercourses of the Magadan Region, the ichthyofauna of Lake Chistoye had been composed of 8 aboriginal species. It included, in particular, a unique population of large East Siberian Grayling, with individual fishes weighing over 2 kilograms. In addition, the lake provided home to both ordinary and dwarf forms of sedentary Dolly Varden (*Salvelinus malma*) and sedentary East Siberian Char that spawns in the rivulets emptying into the lake. Other inhabitants of the lake are Freshwater Smelt (*Hypomesus olidus*), Spotted Sculpin (*Cottus poecilopus*), Common Minnow (*Phoxinus phoxinus*), Three-spined Stickleback (*Gasterosteus aculeatus*), Nine-spined Stickleback (*Pungitius pungitius*), and Lamprey (*Lethenteron japonicum*). Pacific salmonids appear in the spawning season, including Humpback Salmon (*Oncorhynchus gorbuscha*), Chum (*O.keta*), Coho (*O.kisutch*), and Sockeye (*O.nerka*). Two white-fish species were introduced into the lake in the 1990s: Wide-nosed Whitefish (*Coregonus nasus*) and Peled (*C.peled*).

Birds

The following birds occur and probably breed on the lake and in the surrounding terrains: Black-throated Diver (*Gavia arctica*) and dabbling and diving ducks that include Common Teal (*Anas crecca*), Greater Scaup (*Aythya marila*), Tufted Duck (*A.fuligula*), White-winged Scoter (*Melanitta deglandi*), and Goldeneye (*Bucephala clangula*). Terek Sandpiper (*Xenus cinereus*), Greenshank (*Tringa nebularia*), Black-headed Gull (*Larus ridibundus*), and Common Tern (*Sterna hirundo*) can be sighted on the shores of the lake. Records of fledgling Marbled Murrelets (*Brachyramphus marmoratus*) on Chistoye Lake provide evidence that the bird nests at the site (G.I.Atrashkevich, personal communication). Flocks of Greater Scaup and Black-headed Gull appear in July and August. Forested ridges and birch-dominated moorlands provide breeding sites for Black-billed Capercaillie (*Tetrao pervirostris*) and Willow Grouse (*Lagopus lagopus*). Diving ducks stay on the lake during autumn migrations while flocks of Arctic geese use the surrounding area to stopover in the same season.

Social and cultural values:

The site is a part of the Olsky game management area owned by the Magadan Regional Hunting Society. It is therefore frequented by sport hunters that shoot wildfowl during periods of migration. An experimental station of Okhotskrybvod once situated on the lake was largely engaged in introducing Peled into natural ecosystems.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.7. Olskaya Lagoon

Geographical coordinates: 59°34’43"N, 151°23’15"E (centre of the lagoon).

Elevation: 0-4 m a.s.l.

Area: *c.* 30 km^2.

Overview:

Shallow sea bay at the mouth of a salmon river, with large intertidal flats exposed during low water that attract many waterside birds in the periods of their seasonal migration.

Wetland type:

By international classification – A, B, E, F, G; by national classification – 1.2.1.3, 1.2.3.1, 1.3.1 (estuary of a salmon river and the adjacent sea bay with areas of silt and sand intertidal flats and eelgrass meadows).

Ramsar Criteria: 1, 2, 4, 5, 7.

Justification for the application of selected criteria:

The most important stopover site for migrating species using the East Palaearctic flyway that supports over 20,000 waders and other water birds; staging area of several globally endangered species; feeding grounds for salmonids.

General location:

The site adjoins the mouth of the Ola River on the territory of the Olsky Administrative District of the Magadan Region. The village of Ola, the district centre, extends to the shoreline of Olskaya Lagoon. The spit separating Olskaya Lagoon from the Gulf of Tauisk is occupied by the abandoned settlement of Atargan. The site is connected to the regional centre of Magadan by a highway (35 km).

Physical features:

The area surrounding Olskaya Lagoon is formed by continental deposits of Neogene and Quaternary periods. Both the bed of the lagoon and its shores are built up of marine deposits and pebble conglomerates.

Intertidal flats are very silty. The lagoon is trapezoid in shape, with a broad base about 8 km in length facing the open sea. The northern shore of the lagoon lies 5 km from its mouth. The lagoon is separated from the Gulf of Tauisk by a chain of sandy and gravelly islets (Uira, Uratamlyan, Etyrgen, Siyakal, and Sikulun) interspaced with narrow straits and channels (Novoye Ustie, Maloye Ustie, and Bolshoye Ustie).

The tidal regime is of a semidiurnal type (12.7 hours) with a range from 0.3 to 2.8 m. Low tides expose a large part of the lagoon floor. A few creeks emptying into the eastern part of the lagoon (Adykchan, Atargan, etc.) and the Ola River flowing into it from the west are too small to affect the salinity of lagoon water. As a result, Olskaya Lagoon is a saltwater sea bay with a marine benthic fauna. In midsummer, the water is heated to +13-15°C.

The climate of the site is of a marine subarctic type. Air humidity is high both in summer and winter seasons (mean 72%). Cool, windy weather prevails. There are as many as 31 days (on average) with snowstorms during winter. The mean air temperature in the period from December to March varies from –13.5 to –19.3°C, with an absolute minimum of -47°C. Winter comes in the last third of October when stable snow cover sets in. The lagoon is icebound from November. The ice cover breaks up and is carried out from the lagoon in the middle of May. The mean duration of the frostless period is 99 days. Mean annual precipitation is 315 mm. Sea fog is frequent in summer, especially in August (mean number of misty days is 44).

Ecological features:

Seawaters in the proximity of Olskaya Lagoon are unusually rich in mesoplankton that attracts large fish schools (Afanasiev *et al*., 1994). During high tides, the lagoon looks like a large sea bay 4-8 m in depth separated from the Gulf of Tauisk by elevated pebble spits. As the tide ebbs, a large part of the lagoon floor becomes exposed, showing a network of 2-4 m deep channels interesting it from different directions.

About one third of the area of the lagoon is occupied by eelgrass meadows (*Zostera marina*) that are frequented by migrating ducks. The southern part of the lagoon shows sand and sandy-pebble flats during low tides with mussel (*Mytilus trossulus*) and barnacle (*Semibalanus balanoides*) beds. Waders concentrate at these sites during their seasonal migrations. The number of molluscs (*Liocyma fluctuosa, Macoma baltica, Littorina kasatka*), crustaceans (*Spinulogammarus ochotensis, Digielinotus moskvitini*), and polychaetes (*Nereis vexillosa, Chone teres, Pygospio elegans*) increases in the autumn. Intertidal silt flats and eelgrass mats in the northern part of the lagoon abound in polychaetes (*Abarenicola pacifica, Marenzelleria arctica*), molluscs (*Littorina spp., Falsicingula sp., Macoma baltica*), and crustaceans (*Eogammarus tiushovi, Locustogammarus locustoides, Crangon septemspinosa, Neomysis awatschensis,* etc.). Large sublittoral bivalves (*Macoma calacrea, Megangulus luteus, Mactromeris polynyma* and *Siliqua alta*) occur closer to the mouth of the river. Very common Starry Flounder (*Platichthys stellatus*) comes to the area to feed on young molluscs. Portions of the littoral zone at the seaward side of sand spits are inhabited by large gastropod molluscs (*Cryptonatica jantostoma*) and shrimps (*Crangon septemspinosa*). Both species are harvested by the local inhabitants. Sea fleas (*Traskorchestia ochotensis* and *T.ditmari*) occur in very large number in the supralittoral zone.

The vegetation cover on the shores of Olskaya Lagoon is formed by halophytic meadows with a predominance of *Carex subspathacea, Puccinellia phryganodes*, and *Ranunculus gmelinii*. More elevated portions are occupied by maritime meadows of low-growing grasses and forbs, such as *Carex gmelinii, C.ramenskii, Ranunculus reptans,*

Sanguisorba officinalis, etc. Shingle stretches along the coastline are covered with maritime herbaceous vegetation, with a predominance of *Leymus mollis, Mertensia maritima,* and *Senecio pseudoarnica*.

The northern part of Olskaya Lagoon is lined by drained larch stands with an understory of shrub pine, crowberry tapestry and low-bush groundcover that also includes *Arctous alpina, Vaccinium vitis-idaea*, and *Hedysarum hedysaroides*. A few rare species (*Halerpestes sarmentosa, Spergullaria salina*, and *Caragana jubata*) have been found in the vicinity of Cape Atargan in the south-eastern part of the lagoon.

Noteworthy fauna:

Fish

The most common fish species in Olskaya Lagoon are Three-spined Stickleback (*Gasterosteus aculeatus*), Pacific Herring (*Clupea pallasi*), Saffron Cod (*Eleginus gracilis*), Capelin (*Mallotus villosus*), Starry Flounder (*Platichthys stellatus*), Asian Rainbow Smelt (*Osmerus eperlanus dentex*), Humpback Salmon (*Oncorhynchus gorbuscha*), Chum Salmon (*O.keta*), Dolly Varden (*Salvelinus malma*), and various Sculpins (family *Cottidae*).

Birds

A total of 132 bird species are known to occur at the site. Recent observations have added several new species to the list of birds of the Magadan Region. These are Little Egret (*Egretta garzetta*), Black-winged Stilt (*Himantopus himantopus*), Redshank (*Tringa totanus*), and Western Sandpiper (*Calidris mauri*).

Olskaya Lagoon is one of the most important staging areas on the East Palaearctic flyway. The majority of migrating birds are ducks and waders.

Red-throated Diver (*Gavia stellata*) is a breeding species on the site. Black-throated Diver (*G. arctica*) is a common passage migrant, while Yellow-billed Diver (*G.adamsii*) is much less frequent.

Whooper Swan (*Cygnuss cygnus*) and Bewick's Swan (*C.bewickii*) occur in small number during migrations. Large flocks of White-fronted Goose (*Anser albifrons*) and Bean Goose (*A.fabalis*) use Olskaya Lagoon as a staging area. Lesser White-fronted Goose (*A.erythropus*), Snow Goose (*Chen hyperboreus*), and Black Brant (*Branta bernica nigricans*) are less common migrants. The most common migrating ducks include Mallard (*Anas platyrhynchos*), Common Teal (*A.crecca*), Shoveler (*A.clyepata*), and Wigeon (*A.penelope*), while Baikal Teal (*A.formosa*), Falcated Duck (*A.falcata*), and Garganey (*A.querquedula*) are sighted regularly but less frequently. Common sea duck species are represented by Greater Scaup (*Aythya marila*), Tufted Duck (*A.fuligula*), White-winged Scoter (*Melanitta deglandi*), Black-winged Scoter (*M.americana*), Harlequin Duck (*Histrionicus histrionicus*), Long-tailed Duck (*Clangula hyemalis*), and Red-breasted Merganser (*Mergus serrator*). Goldeneye (*Bucephala clangula*), Smew (*Mergus albellus*), and Goosander (*M. merganser*) occur in small number.

Osprey (*Pandion haliaetus*) is a regular visitor of the Olskaya Lagoon area. Young Steller's Sea Eagles (*Haliaeetus pelagicus*) appear in the spawning season of Pacific salmonids. Regular sightings of Osprey, Gashawk (*Accipiter gentilis*), Buzzard (*Buteo buteo*), Kestrel (*Falco tinnunculus*), Merlin (*Falco columbarius*), and Hobby (*F.subbuteo*) suggest their breeding in the vicinity of Olskaya Lagoon. Hen Harrier (*Circus cyaneus*) and Peregrine Falcon (*Falco peregrinus*) are passage migrants at the site, and Gyrfalcon (*F. rusticolus*) visits it in the late autumn and winter.

Willow Grouse (*Lagopus lagopus*) and Hazel Grouse (*Tetrastes bonsia*) are common inhabitants of wooded bogs and mountain forests.

The most abundant migrating waders include Mongolian Plover (*Charadrius mongolus*), Wood Sandpiper (*Tringa glareola*), Grey-tailed Tattler (*Heteroscelus brevipes*), Red-necked Phalarope (*Phalaropus lobatus*), and Red-necked Stint (*Calidris ruficollis*). Breeding waders are Long-toed Stint (*C. subminuta*), Common Sandpiper (*Actitis hypoleucos*), Common Snipe (*Gallinago gallinago*), and Greenshank (*Tringa nebularia*). Great Knot (*Calidris tenuirostris*), Dunlin (*C.alpina*), Long-toed Stint, Terek Sandpiper (*Xenus cinereus*), and Whimbrel (*Numenius phaeopus*) are regular, sometimes numerous passage migrants in autumn. Frequent spring visitors include Bar-tailed Godwit (*Limosa lapponica*). Pacific Golden Plover (*Pluvialis fulva*), Black-bellied Plover (*P. squatarola*), Ringed Plover (*Charadrius hiaticula*), Ruddy Turnstone (*Arenaria interpres*), Ruff (*Philomachus pugnax*) and Temminck's Stint (*Calidris temminckii*) are regular but less common birds in the vicinity of Olskaya Lagoon. Certain North Siberian, Far Eastern, and even North American species occur infrequently but need to be mentioned here to complete the picture of seasonal migrations on the Sea of Okhotsk coast. These are Oystercatcher (*Haematopus ostralegus*), Green Sandpiper (*Tringa ochropus*), Spotted Redshank (*T.erythropus*), Spotted Greenshank (*T.guttifer*), Spoon-billed Sandpiper (*Eurynorhynchos pygmeus*), Curlew Sandpiper (*Calidris ferruginea*), Pectoral Sandpiper (*C.melanotos*), Sharp-tailed Sandpiper (*C.acuminata*), Sanderling (*C.alba*), Knot (*C.canutus*), Far Eastern Curlew (*Numenius madagascariensis*), Black-tailed Godwit (*Limosa limosa*), and Short-billed Dowitcher (*Lymnodromus scolopaceus*).

Numerous Mew Gulls (*Larus canus*), Herring Gulls (*L.argentatus*), Slaty-backed Gulls (*L.schistisagus*), Glaucous Gulls (*L.hyperboreus*), Black-headed Gulls (*L.ridibundus*), and Kittiwakes (*Rissa trudactyla*) gather during the spawning season of Pacific salmons, with the latter species breeding around the Gulf of Tauisk. Ross's Gull (*Rhodostethia rosea*) visits the site during spring passage. Common Tern (*Sterna hirundo*) nests on the spits that separate Olskaya Lagoon from the Gulf of Tauisk. Marbled Murrelet (*Brachyramphus marmoratus*) is supposed to breed in the hills surrounding the lagoon.

Sparse swampy woodlands and maritime areas adjacent to the lagoon give home to Oriental Cuckoo (*Cuculus saturatus*), Hawk Owl (*Surnia ulula*), Short-eared Owl (*Asio flammeus*), Black Woodpecker (*Dryocopus martius*), and Three-toed Woodpecker (*Picoides tridactylus*). Sky Lark (*Alauda arvensis*) and Carrion Crow (*Corvus corone*) are the most common passerine birds in the area. Also common are Yellow-headed Wagtail (*Motacilla taivana*), Olive-backed Pipit (*Anthus hodgsoni*), Stonechat (*Saxicola* torquata), Arctic Warbler (*Phylloscopus borealis*), Palass's Warbler (*Ph.proregulus*), Willow Tit (*Parus montanus*), and Brambling (*Fringilla montifringilla*). Regular nomadic species sighted during autumn migrations include White Wagtail (*Motacilla alba*), Red-throated Pipit (*Anthus cervinus*), Naumann's Thrush (*Turdus naumanni*), Lapland Longspur (*Calcarius lapponicus*), Snow Bunting (*Plectrophenax nivalis*), and Redpoll (*Acanthis flammea*).

The importance of the site for rare species:

Such globally threatened species as Lesser White-fronted Goose, Baikal Teal, Steller's Sea Eagle, Spotted Greenshank, and Spoon-billed Sandpiper occur on the site. Yellow-billed Diver, Whooper Swan, Bewick's Swan, Black Brant, Snow Goose, Peregrine Falcon, Ross's Gull, and Marbled Murrelet are listed in the Red Data Book of the Russian Federation and that of particular regions.

Social and cultural values:

The old Russian village of Ola lies on the coast of Olskaya Lagoon. In the late 19th and early 20th centuries, it was the starting point of the trade route leading to the upper reaches of the Kolyma River across the Okhotsk-Kolyma watershed area ("Kalinnikov's path"). Ruins of a fishing settlement that was populated throughout 1940-1980 can be seen on the Atargan Spit.

Current land use:

Fishing teams work at the mouth of the Ola River during the spawning season of Humpback Salmon. Olskaya Spit is a popular area for flatfish and salmon sport fishing. Commercial harvesting of Smelt and Saffron Cod takes place in winter and of Capelin in spring. Shrimps and gastropod molluscs are collected in the intertidal zone exposed at low tide. The area adjacent to Olskaya Lagoon provides shooting grounds for local wildfowl hunters.

Conservation measures proposed but not yet implemented:

It is proposed that measures be taken to exclude disturbing birds in spring, including a total ban on hunting on the site during this season.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.8. Motykleisky Bay

Geographical coordinates: 59°27'12"N, 148°58'46"E (Cape Motykleisky inside the bay).

Elevation: 0-20 m a.s.l.

Area: *c.* 500 km^2.

Overview:

A bay in the northern part of the Sea of Okhotsk with extensive intertidal sand and silt flats and a rocky littoral zone; breeding grounds for Steller's Sea Eagle (*Haliaeetus pelagicus*) and Marbled Murrelet (*Branchyramphus marmoratus*); congregations of moulting sea ducks, migrating waders, and other water birds; oasis of thermophilic flora in the vicinity of hot springs.

Wetland type:

By international classification – A, B, D, G, Zg; by national classification – 1.2.1.3, 1.2.3.1 (sea bay with an extensive littoral zone; localities of hydrothermal activity).

General location:

The site is on the territory of the Olsky Administrative District of the Magadan Region and occupies the western side of the Gulf of Tauisk in the Sea of Okhotsk. It is 45 km by sea from the nearest settlement (Balagannoye) and 117 km from the city of Magadan.

Physical features:

Motykleisky Bay is actually the westernmost part of the Gulf of Tauisk. Its outside portion faces southeast. Its southern shore is formed by the Khmitievsky Peninsula that was built up from Early Cretaceous granodiorites and elevated 400-538 m a.s.l. (Tokarev Mountain). The bay is sheltered from the north by the Onatsevich Peninsula, which features flat tops of effusive tuff rocks rising to an elevation of 500-600 m a.s.l. and dating to the Upper Cretaceous period.

The upper part of the bay is bounded by a low-lying terrain that makes up a broad marshy isthmus between Motykleisky and Amakhtonsky Bays. The underlying volcanic rocks of the isthmus are overlain with thick continental deposits of the Late Pliocene period genetically similar to those of the Kava-Chelomdzhinskaya Plain whose southeastern extension they form. This part of the bay receives a few small creeks having waterlogged banks. The western side of the bay is made up of volcanogenic rocks that support a gently rolling terrain dissected by small river valleys, the largest being the Motykleika River valley that cuts 40-45 km deep between the surrounding hills.

The southern part of the site lies at the junction of different rock strata and is remarkable for frequent manifestations of hydrothermal activity (e.g. Motykleisky Hot Spring, 59°19'N, 148°37'E). Its water, produced at an estimated output level of 4.5 l/s, is rich in calcium and chlorides and has a temperature of +25-35°C (Zelenkevich, 1963). Another hot spring is located west of this location (59°24'N, 148°03'E) in the valley of Berendzha Creek flowing into Shelting Bay.

Motykleisky Bay runs 35 km inland. Cape Stanyukovich on the south and Cape Onatsevich on the north, which shape the mouth of the bay, are spaced 18 km apart. The northern coast of the bay is mountainous, with boulder-strewn beaches, reefs, offshore islets, and partly submerged bars obstructing water passage. The shore of the Khmitievsky Peninsula is also elevated but gradually lowers towards the head of the bay giving place to a gently rolling terrain; it further grades into beaches and spits as it descends to sea level. At the head of the bay, the shoreline is formed by soft silty slush (called "nyasha») that passes to a marshy plain farther inland.

The outer (eastern) part of the bay is some 5-15 m deep. It features a weak stationary south-westerly current overpowered by considerable tidal movements. The western and eastern parts of the bay are shallow (1-2 m). A tidal range of 4.2-5.0 m is responsible for the periodic occurrence of extensive intertidal sand and silt flats totalling 25 km^2 at the head of the bay and almost 15 km^2 at its western side.

Tokarev Bay deserves special mention. It is actually a small inlet on the northern shore of the Khmitievsky Peninsula containing practically no water at low tides. Its highly productive littoral zone with a silty-sand and pebble floor is exposed over an area of almost 4 km^2.

The site has a maritime, moderately cool climate. Fog is less frequent than in the neighbouring Amakhtonsky Bay. The nearest weather station (Balagannoye) records a mean annual air temperature of –5.3°C and precipitation of 553 mm. Winters are long, cold, and windy. Snowfall begins in early October. The winter season lasts about 7 months, from mid October until the middle of May. January temperatures average –24.1°C, with an absolute minimum of –52°C. The ice cover on creeks and rivers thickens throughout winter due to water frequently spreading and freezing over its surface. North-easterly winds prevail in winter. In November-December and March-April, strong cyclonic winds often bring in relatively warm air (–5-11°C) and heavy snowfall. Landfast ice forms in November and can be 100-120 cm thick by the beginning of spring. In the outer part of the bay, the ice cover is now and again broken by strong winds and carried away into the sea. Spring comes in late April and early May and may last as long as the end of May or early June when the bay is altogether free of ice floes. Summers are moist and cool. The mean air temperature in July is +12.9°C. Periods of relatively stable clear weather fall in mid to late July and early September. Westerly winds averaging 4 m/s prevail in summer. Storms coming from the south that bring in monsoon rains are common in July and August. During this period, water in Motykleisky Bay can be as warm as +15°C. In summer, strong south-westerly breezes blow over the seaward part of the bay late in the afternoon.

Ecological features:

Mountain tops and slopes are carpeted with shrub pine thickets (*Pinus pumila*) alternating with poorly vegetated patches of gravel tundra, boulder screes, and stretches of Manchurian alder growth (*Duschekia fruticosa*). The lower portions of mountain slopes and coastal cliffs are covered with singular stone birch forests (*Betula lanata*) with a mountain ash (*Sorbus sambucifolia*) understory, rhododendron glades, and spots of herbaceous vegetation. Mountain saddles support moss and cottongrass bogs with cushions of *Saxifraga spp*. and *Rhododendron aureum*.

Mountain foothills and coastal sloping hills are occupied by sparse larch stands interspersed with hummocky fields and moss glades. The groundcover is dominated by Middendorff's birch (*Betula divaricata*), Labrador tea (*Ledum decumbens*), leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda polifolia*), cloud-

berry (*Rubus chamaemorus*), and cranberry (*Oxycoccus palustris*).

Groves of Korean willow (*Chosenia arbutifolia*) and woody willow (*Salix udensis*) occur in river valleys, where they are interspersed with openings of thick herbaceous vegetation. Sedge-dominated meadows occupy a strip of land between wooded bogs and intertidal mudflats at the head of the bay.

Many kilometres of intertidal flats give rise to spacious eelgrass meadows (*Zostera marina*). The shoreline is covered with heaps of decaying sea grass, with boulders here and there emerging from the remains.

This organic matter undergoes microbial decomposition and provides abounding reproduction of marine saprophagous invertebrates, such as oligochaetes, amphipods (*Traskorchestia ochotensis*), and isopods (*Detonella sp.*).

The muddy silt substrate of intertidal eelgrass beds is inhabited by numerous borrowing bivalves (*Liocyma fluctuosa, Macoma baltica*), sand worms (*Abarenicola)* and peanut worms (*Phascolosoma sp.*). Also, the green biomass of eelgrass leaves give home to a variety of shrimp species that includes *Pandalus goniurus, Hetatrius sp.* and *Crangon septemspinosa.* They share this habitat with gastropod molluscs (*Littornia spp., Falsicingula kurilensis*) and isopods (*Idotea sp*.). Crabs (*Thelmessus cheirogonus*) survive low tides in small littoral pools.

Further from shore, boulders are covered with crust-like assemblages of barnacles (*Semibalanus balanoides, Ichtamalus dalli*), and cracks and fissures within the rocks are populated by mussels (*Mytilus trussulus*). The lower littoral zone is occupied by a virtually lifeless belt of brown algae (*Fucus*) followed further seaward by an abundance of gastropods (*Littorina spp., Nucells freicinetti*), chaetons (*Schizoplax brandtii*), and numerous crustaceans (*Isopoda, Amphipoda*) associated with a profuse growth of red algae. This area also gives home to a small hermit crab (*Pagurus middendorfii*) that occupies empty shells of *Littorina spp*., starfishes (*Leptasterias ochotensis, Evasterias retifera*), and sea urchins (*Strongylocentrotus sp*.). All variants of littoral communities of the Sea of Okhotsk coast are represented in Tokarev Bay, with the richest of these communities developing on the sand and stone substrate.

Large hermit crabs (*Pagurus pubescens*) occur in the sublittoral, various amphipods (*Gammaridae)* in the surf zone, and crabs of commercial value (*Paralithodes brevipes* and *P.platypus*) at a depth of more than 5 m. The latter makes regular migrations with the tidal currents that move water to and fro through the strait connecting Tokarev and Motykleisky Bays. The two species are commercially harvested along the rocky shores of the Khmitievsky Peninsula.

Motykleisky Bay is considered to be one of the most productive aquatic ecosystems of the Sea of Okhotsk. In spring, its outer part becomes an area of unusually high phytoplankton biomass production amounting to 12 g/m^3. The mesoplankton concentration is proportionally high (up to 3.5 g/m^3). Phytoplankton is dominated by diatoms (*Chaetoceros spp., Coscinodiscus sp., Thalassiotrix sp.*) and mesoplankton by copepods (*Metridia ochotensis, Acartia longiremis*) and euphausiid larvae (*Thysanoessa raschii*) (Afanasiev *et al*., 1994). The latter absolutely predominate in macroplankton, but their maximum numbers are recorded in the pelagic zone of the Sea of Okhotsk, a few tens of kilometres south of Motykliesky Bay where hydrological conditions are more stable and freshening effect of river runoff fades.

Noteworthy flora:

The typical landscape on the northern coast of the Sea of Okhotsk is a mosaic of birch groves, rhododendron glades, shrub pine thickets, pebble screes, and isolated rocks. The cooling effect of the Piyaginskoye current that is so apparent on the Koni Peninsula and near Magadan is less pronounced in the surroundings of Motykleisky Bay. As a result, they host a few plant species normally found in more southerly quarters. These include *Myrica tomentosa*, which does not occur further north, and *Dactylorhiza aristata, Baeothryon alpinum, Bromopsis canadensis*, and *Lonicera chamissoi*, which are uncommon elsewhere. Hydrothermal activity also contributes to the peculiar aspect of the local flora. Hot springs support the refugia of certain boreal species, such as *Botrychium robustum, Equisetum komarovii*, and *Senecio cannabifolius,* which are generally rare in the northern regions of the Far East (Khokhryakov, 1979).

Noteworthy fauna:

Fish

Motykleisky Bay provides feeding grounds for salmonid smolts. Humpback (*Oncorhynchus gorbuscha*) and Coho (*O.kisutsch*) annually travel upstream the Motykleika River to their spawning beds.

Birds

At least 12 pairs of Steller's Sea Eagles are known to have their nests around Motykleisky Bay. Most of them are located close to breeding colonies of Slaty-backed Gulls (*Larus schistisagus*), which provide a staple food for the eagles in spring. Marbled Murrelets concentrate in the inlets of the Onatsevich Peninsula. The importance of the site for moulting and migrating shorebirds remains to be

revealed. Habitats on the northern side of the bay appear to be suitable for sea ducks and waders.

Mammals

A large rookery of Common Seal (*Phoca largha*) exists on a stone bar near Cape Stanyukovich. Inlets of Cape Onatsevich are reported to be visited by Killer Whale (*Orcinus orca*). Wild Reindeer (*Rangifer tarandus*) and Bighorn Sheep (*Ovis nivicola*) occur in the mountains of the Khmitievsky Peninsula.

Social and cultural values:

Archaeological sites at Cape Motykleisky (Onatsevich Peninsula) and on the shores of Tokarev Bay preserve traces of the Tokarevskaya (ancient Koryak) culture that dates back 1,500-2,000 years (Lebedintsev, 1992). A team from the Tauisky Sovkhoz (state-operated estate) harvested seals in Motykleisky Bay during autumn seasons between the 1950s and 1970s. The bay is also a traditional area for commercial fishing focused on Humpback and Coho Salmon. The Motykleisky Hot Spring is a tourist attraction. It was also of interest as a source of water for retail sale in the city of Magadan throughout the 1960s. An attempt to revive this trade in the early 1990s was commercially unsuccessful and resulted in serious damage to the surroundings of the spring. A research station of the Pacific Institute of Fishery and Oceanography located at the mouth of the Maller River conducts studies on the spawning biology of salmonid fishes. A telephone line that formerly maintained communication between Magadan and Khabarovsk runs along the western coast of the bay. The line is no longer used for its original purpose but has become popular among local and commercial hunters, who benefited from a number of comfortable houses scattered along the line that had been originally been constructed for technical service. A small settlement of several indigenous families is located at the mouth of the Motykleika River; its residents practice a traditional subsistence economy based on catching and salting fish.

Land tenure/ownership:

Lands along the lower Motykleika River are allocated for the revival and development of a traditional lifestyle by the indigenous people.

Current land use:

A popular wildfowl shooting area lies at the head of Motykleisky Bay. It is most often visited by residents of the village of Balagannoye in autumn. Salmon and cisco fishing takes place at the mouth of the Motykleika and in small inlets on the Onatsevich Peninsula. Crabs are harvested near Cape Stanyukovich.

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.9. Talan Island

Geographical coordinates: 59°18’58"N, 149°04’20"E.

Elevation: 0-220 m a.s.l.

Area: *c.* 25 km^2 (island and offshore waters).

Overview:

A rocky island at the junction of Motykleisky Bay and Gulf of Tauisk; highly productive shelf zone, characteristic communities of the stone littoral; largest seabird colonies in the Gulf of Tauisk.

Wetland type:

By international classification – A, D, E; by national classification – 1.1.2.2, 1.4.2.4 (rocky island in a productive shelf zone in the northern part of the Sea of Okhotsk).

Ramsar Criteria: 3, 5, 6.

Justification for the application of selected criteria:

The island hosts one of the largest seabird colonies in the Sea of Okhotsk. Composed of 12 species, it numbers over 1 million breeding birds.

General location:

Talan Island is situated in the western part of the Gulf of Tauisk not far from the mouth of Motykleisky Bay. The island is separated from the mainland (Khmitievsky Peninsula, Cape Stanyukovich) by a 7 km wide strait. Spafarieva Island lies south of Talan, and the two islands are spaced apart by the 11 km wide Likhachev Strait. The site is a part of the territory of the Olsky Administrative District of the Magadan Region. It is 40 km from the nearest settlement (Balagannoye) and 100 km by sea from the city of Magadan.

Physical features:

The island appears as an isolated rock of Late Cretaceous origin formed by granodiorites with an irregular oval

outline. The top of the island is shaped by a sloping plateau lying at an altitude of 180-200 m. The island extends from southeast to northwest and measures 2 km in length and 1.2 km in width.

The southern, western, and eastern sides of the island are formed by partly vegetated steep scree slopes and by vertical cliffs with great accumulations of large fallen rocks and reefs at their base. The southern side shows especially high rocky walls (120-150 m). Their surf-beaten edge is shaped by small inlets, stony grottoes, and reefs.

The island lowers towards its north-western side, levelling off to a turfed-over terrace measuring about 8 ha and harbouring two small freshwater lakes (of which one dries up by July). The terrace lays 6-8 m a.s.l. and descends to the sea as a pebble beach 30-50 m in width. The beach forms the northern tip of the island and a sort of a small inlet. Both the beach and the littoral zone are strewn with sea-rounded boulders light-grey or almost white in colour. The base of the terrace is lined with heaps of driftwood washed over during many years. On the north, the island is semicircled by a rock-bottom surf-beaten littoral 150-200 m in width extending for about 4.2 kilometres.

The meteorological station on Spafariev Island reports a mean annual air temperature of -2.3°C. January is the coldest month (mean temperature -15.8°C, absolute minimum -40°C). Northerly winds of 5.4 m/s prevail in winter. The island is covered with snow from mid October until the middle of May. Summer winds blow mainly from the south. There are prominent diurnal weather cycles. Strong south-westerly breezes often cause large waves in the Likhachyov Strait in the afternoon. At this time of day, the top of the island is usually enveloped in fog. Stormy winds blowing from Motykleisky Bay prevail at night. Periods of calm weather are interrupted several times during the summer by storms of 3 to 4 days in duration. August is the warmest month, with a mean air temperature of +10.6°C.

Hydrological features:

Talan Island lies in the zone of a stationary sublatitudinal current having a speed of approximately 1.5 km/hr that carries away water from the Gulf of Tauisk to the west. More powerful tidal currents with an amplitude of 4.5-5 m are superimposed on this weak current, coming and going at regular intervals of roughly 12.7 hours.

Landfast ice forms in the Gulf of Tauisk in mid December and disappears in mid May and early June. With due caution, it is possible to reach the island across the strait on foot or skis. The ice cover breaks up from late April to mid May depending on the frequency and strength of spring storms. In their absence, the ice cover may persist until the middle of June, even though such cases are actually very rare (the summer of 1999 was an example).

In August, the surface water in the Likhachev Strait warms up to +12-14°C. At depths of more than 20 m, water temperature is invariably 0°C. In summer, the surface waters of Motykleisky Bay and Likhachyov Strait are freshened to a salinity of 27-30% by the runoff of rivers emptying into the Gulf of Tauisk.

Waters offshore Talan Island are 40-60 m deep. The even bottom is covered with sand and silt. Rock debris and water-rounded boulders are scattered over the sea floor only nearby the island. There is no safe anchorage near the island.

Ecological features:

Talan Island is situated in one of the most productive zones of the Sea of Okhotsk. The rate of biomass production is especially high at the mouth of Motykleisky Bay, which is slightly freshened by the Taui River and constantly enriched with nutrients brought in with stationary, cyclonic, and tidal currents. Moreover, the offshore waters of Talan Island are extensively nourished by bird excrements from May until September. Phytoplankton is absolutely dominated by diatom algae (*Bacillariophyta*) represented primarily by the neritic boreal genera *Chaetoceros, Coscinodiscus,* and *Thalassiosira*. In spring, the primary production rate in Motykleisky Bay approximates a record level of 12 g/m^3 (Afanasiev *et al*., 1994).

Zooplankton in the waters surrounding Talan Island consists of Arctic copepods, with *Pseudocalanus minutus* being a predominant form in the open sea and *Acartia longiremis* occurring closer to the shore (together with larvae of *Polychaeta, Decapoda, Echinodermata*, and *Cirripedia*). A common species is cold-water euphausiid *Thyssanoessa raschii*. Amphipods (*Parathemisto japonica* and various gammarid species), isopods, molluscs (*Limacina helicina*), and arrow worms (*Parasagitta elegans*) are less abundant (Pinchuk, 1992). Scyphozoid jellyfish (*Aurelia limbata*) is highly abundant in autumn. The mesoplankton biomass at the junction of the waters of Motykleisky Bay and the Gulf of Tauisk is very high, amounting to 3.5 g/ m^3. An area of maximum macroplankton density absolutely dominated by euphausiids lies 15-20 km south of the island (Afanasiev *et al*., 1994). Its littoral zone abounds with green (*Ulva fenestrata*), brown (*Laminaria spp., Alaria esculenta, Ilea fasciata, Fucus inflatus*), and red (*Porphyra variegata, Gloiopeltis furcata, Kallymenia reniformis, Polysiphonia subulifera*) algae (Semiryakova, 1992).

The rock-bottomed littoral zone of Talan Island is inhabited by 62 species of aquatic invertebrates representing

34 orders and 19 classes (Il'ichyov & Ryazantseva, 1992). The most remarkable of these organisms are sea anemones (*Epiactis lewisii, Metridium senile fimbriatum*), polychaetes (*Onufis sp., Clycinde sp.*), peanut worms (*Phascolosoma margaritacea, Sipunculidae*), cirripedes (*Semibalanus balanoides*), isopods (*Idotea ochotensis, Carinogammarus makarovi*), and decapods (hermit crabs *Pagurus middendorffii*). Typical though less common are gastropods (*Acmea pallida, Nucella sp., Littorina spp.*) and bivalves (*Mya japonica, Mytilus trossulus*), Bryozoans (*Hippothoa hyalina*), and echinoderms that include starfish (*Leptasteria sp.*), sea urchins (*Strongylocentrotus sp.*), and sea cucumbers (*Cucumaria vegae*). The western side of the island has the richest invertebrate fauna.

Noteworthy flora:

The terrestrial flora of Talan Island includes 112 species of vascular plants. It is relatively impoverished because of excessive soil nitrification. Turf-covered sea-facing slopes are layered with a thick carpet of reed bent grass (*Calamagrostis langsdorffii*) that shelters the nest burrows of Tufted Puffins. Steep walls and cliffs support dense beds of shield fern (*Dryopteris dilatata*), and rocks are covered with roseroot (*Rhodiola rosea*) and *Hylotelephium cyaneum*.

The vegetation cover of the plateau at the top of the island is a poor replica of the mainland tundra that occupy the coastal slopes with their patches of shrub pine, sedge-dominated grassland areas, stretches of shrubbery, and stone ridges. Thickets of shrub pine provide shelter for associations of club moss (*Lycopodium annotinum*), dwarf birch (*Betula divaricata*), and rhododendron (*Rhododendron aureum*). Open portions of the plateau are occupied by *Rhododendron camtschaticum, Empetrum nigrum, Phyllodoce caerulea, Arctous alpina, Vaccinium vitis-idaea,* and *Diapensia obovata*. Moss and sedge-dominated spots are overgrown with *Salix sphenophylla, Aconogonon tripterocarpum, Claytonia acutifolia, Rubus chamaemorus, Vaccinium uliginosum,* and *Pedicularis labradorica.*

The vegetation cover of northern maritime terraces and sloping hillsides consists of grasses (*Hierochloe alpina, Trisetum sibiricum, Poa spp.*), sedges (*Carex cinera, C.cryptocarpa, C.gmelinii*), several liliaceae (*Veratrum oxysepalum, Fritillaria camschatcensis, Iris setosa*), spirea (*Spiraea beauverdiana*), and a variety of forbs (*Geranium erianthum, Chamaenerion angustifolium, Chamaepericlymenum suecicum*, *Cacalia hastata*, etc.). Shingle beach edges are occupied by *Leymus mollis* and *Senecio pseudoarnica. Mertensia maritima* and *Lathyrus maritimus*, characteristic species of mainland communities, are practically absent on the island.

Noteworthy fauna:

Fish

The coastal waters of the Gulf of Tauisk give home to 111 fish species belonging to 77 genera and 29 families, including a few endemic and previously unknown ones (Chereshnev *et al.*, 1999). The littoral zone of Talan Island is inhabited by 32 species of 19 families (Kondratyev, 1993), the most common of which are young Pacific Herring (*Clupea pallasi*), Capelin (*Mallotus villosus*), Pacific Cod (*Gadus macrocephalus*), young Walleye (*Theragra chalcogramma*), Pacific Ocean Perch (*Sebastes alutus*), Cockscomb (*Alectrias alectrolophus*), Pacific Sand Lance (*Ammodytes hexapterus*), Greenlings (*Hexagrammos spp.*), Starry Flounder (*Platichthys stellatus*), Eelpout (*Hadropareia middendorfii*), Sea Sculpin (*Myoxocephalus stelleri*), and Fringed Sculpin (*Procottus minutus*). Herring, Capelin, Walleye, and Sand Lance are staple foods of fish-eating alcids.

Birds

The list of Talan's birds include 147 species (Kondratyev *et al.*, 1993). The majority of these are passage migrants or accidental visitors arriving from the Khmitievsky Peninsula.

The importance of the site for breeding birds:

The breeding avifauna consists of 21 species, with 12 being colonial seabirds. The status of the 10 most common of these is reviewed below.

Pelagic Cormorant (*Phalacrocorax pelagicus*). Approximately 100-150 pairs of these birds regularly breed on Talan Island.

Slaty-backed Gull (*Larus schistisagus*). One of the most noticeable birds in the colonies of Talan Island, even though their total number is not very large (about 600 pairs).

Kittiwake (*Rissa tridactyla*). The island's colony of Kittiwakes is the largest one in the northern part of the Sea of Okhotsk. In the 1980s and early 1990s, it totalled about 20,000 pairs. Since then, their number and breeding success has tended to gradually decrease. The largest Kittiwake communities are located in the southern part of the island.

Brunnich's Guillemot (*Uria lomiva*) and Common Guillemot (*U. aalge*). These two species make up mixed colonies, with the largest ones occupying rocky walls at the southern side of Talan Island. The former species accounts for 3/4 of the joint Guillemot population (around 15,000-17,000 birds), the latter one for the remaining quarter (7,000-8,000 pairs). The majority of Guillemots establish their nests on rocky walls at the southern side of the island.

Spectacled Guillemot (*Cepphus carbo*). Uncommon (20-50 pairs), but characteristic bird that nests in rock crevices at the southern side of the island.

Ancient Murrelet (*Synthliboramphus antiquus*). Talan Island appears to host one of the largest colonies of these birds in the Sea of Okhotsk. Their number is estimated at 10,000-12,000 pairs. Breeding pairs occupy steep heath-dominated slopes. The largest density of nest burrows is found on the western slope of the island.

Crested Auklet (*Aethia cristatella*). The most numerous breeding species on Talan Island. According to different estimates, the total number of these birds ranges from 350,000 to 700,000 pairs. Moreover, it varies from year to year. The largest, "multi-storey" colonies of Crested Auklet occupy scree slopes at the eastern side of the island that face the Gulf of Tauisk. Flocks of feeding Auklets can be seen in the sea tens of miles from the island. Coming back in the evening, the birds exhibit impressive chaotic flight patterns over the island ("swarming").

Parakeet Auklet (*Cyclorhynchus psittacula*). Small groups of these breeding Auklets are scattered on the perimeter of the island and along its entire vertical profile, from its base to the plateau at the top. The size of the breeding population is roughly estimated at 12,000-15,000 pairs.

Horned Puffin (*Fratercula corniculata*). Places its nests among stone blocks and in crevices of coastal rocks along the entire vertical profile of the island. The breeding population is estimated at 40,000-50,000 pairs. Feeding grounds are the offshore waters of Talan Island and the Likhachyov Strait.

Tufted Puffin (*Lunda cirrhata*). The second most abundant seabird of the insular ecosystem (about 70,000 pairs). Nests are established at any place where the turf layer is thick enough to dig a nest burrow. The birds fly to feed in open areas of Motylkeisky Bay and the Gulf of Tauisk.

Two or three pairs of Steller's Sea Eagle (*Haliaeetus pelagicus*), one or two pairs of Peregrines (*Falco peregrinus*) and a few pairs of Raven (*Corvus corax*) regularly breed on the island. Local seabird colonies provide them with an inexhaustible food resource. The island is also frequently visited by Sea Eagles breeding on the shores of Motykleisky Bay.

A few species of small passerines breed on Talan Island. Terrace meadows give home to Middendorff's Grasshopper Warbler (*Locustella ochotensis*), pebble beaches to White Wagtail (*Motacilla alba*), and thickets of shrub pine close to the top of the island to Dusky Leaf Warbler (*Phylloscopus fuscatus*) and Siberian Rubythroat (*Luscinia calliope*). Lapland Longspur (*Calcarius lapponicus*) sometimes chooses tundra patches on the plateau at the top of the island as its breeding habitat.

The importance of the site for migrating birds:

In spring, the flyway for many waders, gulls, and other water birds runs along the Likhachev Strait towards the head of the Gulf of Tauisk. Talan Island serves as an important stopover post for large flocks of waders and passerines during their spring and autumn passages. In periods of seasonal migrations, the island is visited by Short-tailed Shearwater (*Puffinus glacialis*), Whooper Swan (*Cygnus cygnus*), Bewick's Swan (*C.bewickii*), Wood Sandpiper (*Tringa glareola*), Grey-tailed Tattler (*Heteroscleus brevipes*), Red-necked Phalarope (*Phalaropus lobatus*), Olive-backed Pipit (*Anthus hodgsoni*), Bluethroat (*Luscinia svecica*), Red-throated Pipit (*Anthus cervinus*), Naumann's Thrush (*Turdus naumanni*), Snow Bunting (*Plectrophenax nivalis*), Common Redpoll (*Acanthis flammea*), Arctic Redpoll (*A. hornemanni exilipes*), and Rustic Bunting (*Emberiza rustica*).

Mammals

Talan Island is populated by North Red-backed Vole (*Clethrionomys rutilis*), Tundra Vole (*Microtus oeconomus*), Ermine (*Mustela erminea*), and Red Fox (*Vulpes vulpes*) represented by the blue and red morphs. In late spring, the island is sometimes visited by Brown Bear (*Ursus arctos*). Once in a while Killer Whale (*Orcinus orca*), Fur Seal (*Callorhinus ursinus*), Steller's Sea Lion (*Eumetopias jubatus*), and Common Seal (*Phoca largha*) show in its offshore waters.

Social and cultural values:

In the remote past, inhabitants of the coast of Motykleisky Bay used to summer on Talan Island. Their main settlement was located in Tokarev Bay (the southern part of Motykleisky Bay). Soil profiles at the northern terrace of Talan Island exhibit a cultural layer as thick as 10-15 cm exposed from under a 20-30 cm turf cover. This layer contains artefacts such as stone tools and fragments of flat-bottomed pottery attributed to the Tokarevskaya culture of ancient hunters dating back 2,000-2,500 years and to the younger Koryak culture dating back 700-900 years (Lebedintsev, 1992).

Current land use:

Before the site was designated as a nature monument, residents of the village of Balagannoye and crews of commercial vessels collected bird eggs on Talan Island, gathered cloudberry, harvested hay, and caught crabs, flatfish, and perch in its waters. Throughout the 1950s and 1980s, a large fish-meal plant producing salt herring was in operation on Spafariev Island, which is located not far from Talan. This larger island also hosts a weather station and a lighthouse owned by the Pacific Fleet. Commercial crab and salmon fishing is carried out in the Likhachev Strait and

Motykleisky Bay. In the past, an organized group of professional hunters regularly harvested seals at their breeding grounds on Cape Stanyukovich.

Biologists never visited Talan Island until 1986. An ornithological field station of the Far East Division of the Russian Academy of Sciences' Institute of Biological Problems of the North was established here in 1987. Since then, a continuous monitoring program focused on the reproductive success of seabird colonies and case studies on the biology of selected species has been carried out. The well-being of colonies is an important indicator of the state of coastal and shelf ecosystems. The very presence of biologists on the island ensures protection of its biota from raids of independent poachers.

Conservation measures taken:

The Administration of the Magadan Region designated Talan Island as a "state nature monument of republican importance" by a decision dated July 10, 1991. The reserve encompasses the island itself and its offshore waters. Implementation of the protective regime is entrusted to the personnel of the ornithological station.

Conservation measures proposed but not yet implemented:

Continuation of monitoring the insular ecosystem, designation as a site of international importance under the Ramsar Convention.

Current scientific research and facilities:

Talan Island is one of the largest and most readily accessible seabird colonies in the Russian Far East. A series of studies on biodiversity and functioning of the insular ecosystem have been conducted here (Kondratyev, 1997).

Jurisdiction:

Administration of the Olsky District of the Magadan Region.

5.10. Kavinskaya Basin and Chukcha Lake

Geographical coordinates: 59°35'N, 147°30'E (head of the Chukcha River).

Elevation: 36-50 m a.s.l.

Area: *c.* 625 km^2.

Overview:

Low-lying gently inclined river valley with numerous oxbow and oxbow-thermokarst lakes; breeding grounds for many water birds, including an isolated (southernmost of the Eurasian mainland) population of White-fronted Goose (*Anser albifrons*).

Wetland type:

By international classification – M, O, W; by national classification – 2.5.1.1, 3.7.2.2, 3.8.1.3 (valley of a plainland river with the adjacent lacustrine-palustrine landscapes).

Ramsar Criteria: 1, 2, 3, 6.

General location:

The Kavinskaya Lowland makes up the southwesternmost portion of Magadan Region (Olsky Administrative District). The site encompasses the basin of the Chukcha River (a right-side tributary of the Kava River) and large lakes of Chukcha, Maloye Chukcha, and Bezymyannoye, as well as their catchment areas. The site is bounded by the Kava River and the gently rolling Burgali terrain on the north and by the northern foothills of the Chutkavar Range on the south. It is 100 km by boat from the nearest populated point (the village of Talon) and 190 km in a straight line from the city of Magadan.

Physical features:

Geological and geomorphological features

The site encompasses terrains of different origin, largely of the Upper Quaternary period. They form the westernmost part of the Kava-Tauiskaya Plain. The Kava flows for 306 km from its headwaters until it joins the Chelomdza River. Throughout the majority of its course, the Kava River drains the Kava-Tauiskaya forest-tundra plain with its many lakes that extends for 120 km from west to east and for 40-60 km from north to south. The plain is widest in the vicinity of Lake Chukcha. It is surrounded by mountains 600-1,200 m high on the north, east, and west and separated from the Sea of Okhotsk in the south by a narrow ridge of the Chutkavar Mountains rising to an elevation of 900-1,000 m. The south-eastern extension of these mountains descends to give way to a low-lying non-forested isthmus about 10 km in width that connects the Kavinskaya Basin to the coastal area of Shelting Bay. This narrow neck allows for the unobstructed passage of cold air masses and fog from the sea to the Kavinskaya Plain.

A major part of the site is occupied by a modern lacustrine-alluvial plain on which patchy permafrost degrada-

tion contributes to the enrichment of water bodies with silt and peat and to the spread of hydrophilic plants throughout the lakes. The flat lake-studded surface of the plain is a product of recent modification of the old glaciofluvial plain of the Middle Quaternary (Zyryansk) period composed of thick sand deposits. The prime plain appears in isolated elevations of gently rolling topography, sometimes knobby or terrace-like, rising above waterlogged hollows. These residual elevations are covered with dense thickets of shrub pine and dwarf birch scrub, with some tops exhibiting sand dunes. Low-lying areas support a loose network of lakes, marshes, and hummock fields. Surfaces overlying degraded permafrost are occupied by raised peatlands with numerous lakes.

The catchment area of Lake Chukcha is connected to the Kava River Basin by the Chukcha River, which has a well-developed valley with a two-level floodplain. The glaciofluvial terrace descends to the river as a sequence of steep slopes 2-3 m in height each. The floodplain has a dense network of channels, oxbows, and pools of stagnant water. The depth of the Chukcha River in periods of high water ranges from 1.5-3.5 m in slow-flowing stretches to 30-40 cm at rapids. Oxbow lakes are normally oval or curved in shape, primarily from 50 to 500 m long and no more than 100 m wide. Their low shores are occupied by sedge tussocks (*Carex lugens, C.appendiculata*), and bottom sediments are up to 70 cm thick. The depth of oxbow lakes varies with that of the river, and some of them can be completely dry. Oxbow-thermokarst lakes occurring at higher terrace levels are round or oval in shape, with their water surfaces ranging from 0.05 to 0.1 km^2, depths of up to 1.5 m, and dark-brown water.

The majority of rivers flowing across the site are narrow, deep-cut, winding, and gentle channels carrying dark water and giving rise to small stretches of low floodplain.

Lake Chukcha is oval in outline, with an area of 13.5 km^2 (5.5 x 3.5 km) and a total shoreline of 15 km. It fills a basin of glaciofluvial origin with a sand and silt bottom and a maximum depth of 3.7 m. It is a running-water body fed by snowmelt and rains. Water temperature in summer rises to +20-24°C.

The left side of the Chukcha River valley and the western shore of Lake Chukcha preserve a portion of an older (Neogene) planed surface underlain with sands and giving rise to a markedly broken and gently rolling residual relief with a network of small lakes.

Climate and hydrology

Despite its southerly location, the site has a climate characteristic of tundra and forest-tundra zones with long winters, prolonged springs, and cool summers. The mean annual air temperature in the Kava Basin is -6.1°C. The coastal ridges (Chutkavar Mountains) shelter the Kava-Tauiskaya Plain from sea winds which accounts for manifestations of a continental climate. They are most prominent in winter (the mean temperature in January is -29°C); whereas in summer the cooling effect of the sea prevails. The transition to mean daily temperatures above freezing takes place around 9 May, with snowmelt most intense between May 10 and 20. Drifting of ice on the Kava River occurs around 15-20 May. The mean temperature in July is +11.5°C. In summer, monsoon winds frequently bring sea fog to the Kava Valley. Annual precipitation amounts to 650 mm, with 2/3 coming in the form of rain and drizzle. July and August are the rainiest months. In autumn, the transition to mean daily temperatures below freezing occurs around 22-26 September. Ice on the Kava River sets in the first half of October. The ice cover in March and April is up to 1 m thick. The river remains icebound from late-October until mid May. The snow cover is established during the last ten days of September and can be as thick as 70-80 cm by the spring. It is rather even due to weak winter winds.

During periods of low tide, the Kava River flows at a speed of 0.3-0.5 m/s. Water in both the river and the lakes warms up to +24°C. Water rises 2.5-3 m during spring flooding in the middle course of the Chukcha River. The upper reaches of the site's hydrological system, including the basin of Chukcha Lake, are characterized by a higher degree of stability.

Ecological features:

Roughly 35-40% of the site is either treeless palustrine areas or sparse larch forests and unrecovered burnt stands. Small isolated stands of mature larch forest with an undergrowth of shrub pine occupy well-drained shores of lakes and rivers and account for only 10% of the total area. In its middle reaches the Kava River lacks the braided floodplain characteristic of other rivers of northeastern Siberia. Nor does it give rise to pebble spits and groves of Korean willow and poplar. A few islets and river terraces are composed of sand and covered with larch forests with white birch (*Betula platyphylla*) and black alder (*Alnus hirsuta*) in the lower story or occupied by spirea-carex associations (*Spiraea salicifolia, Carex lugens*) with groups of willow shrubbery (*Salix boganidensis, S.myrtilloides, S.saxatilis*) around oxbow hollows. About 15% of the area is covered with low hills and residues of the ancient plain. They are either devoid of vegetation or, more frequently, support thickets of shrub pine or sparse larch stands. Floodplains occupy up to 15% of the total site area and are dominated by sedge tussocks (*Carex lugens, C.appendiculata, C.lapponica, C.rhynchophysa, C.vesicata*) overgrown with

shrub willows, dwarf birch, and spiraea. These patches are frequently inundated during moderate flooding. The shores of water bodies are occupied by sedges and *Comarum palustre* locally admixed with *Sagttaria natans* and *Ceratophyllum demersum*. Pondweeds and bur reed thrive in the water column, and floating rafts of water moss and *Menyanthes trifoliata* are equally well developed. The total area of water bodies does not exceed 10-15% of the total even in periods of high water. In midsummer, lake-like stretches of the Kava River 1.2-1.5 m in depth are densely overgrown with pondweeds.

Plankton of oxbow and oxbow-thermokarst lakes is dominated by lower crustaceans, such as branchiopods (*Branchiopoda*), including clamp shrimps (*Conchostraca*). The most characteristic benthic invertebrates are water boatman (*Corixidae*), water mites, oligochaetes, chironomids, and the larvae of dragonflies (*Aeschnidae, Corduliidae,* and *Lestidae*), beetles, and caddisflies (*Phryganeidae* and *Limnephyllidae*). Caddisflies make the largest contribution to the high abundance and biomass of aquatic invertebrates in the spring period.

Nine-spined Stickleback (*Pungitius pungitius*) and Lake Minnow (*Phoxinus percnurus*) are the most common fish species. The largest body of water at the site is Lake Chukcha, which is significant for its constantly running water. The vegetative period in the lake lasts 4.5 months, from the middle of May until early October. Its bottom sediments largely consist of sand and silt (35 and 38% respectively). Almost 13% of the bottom is vegetated by pondweeds (*Potamogeton pusillus, P.perfoliatus*) and mare's tail (*Hyppuris vulgaris*). The nearshore fringe consists of sedge (*Carex rhynchophysa*) and horsetail (*Equisetum fluviatile*). Lake plankton is dominated by rotifers (*Rotatoria*) and benthos by molluscs (*Anisus sp., Limnaea sp., Valvata sp., Pisidium sp.* and large bivalve *Anadonta beringiana*). Other important components are chironomids, oligochaetes, and caddisflies. The trichopteran fauna is especially diverse, with *Agrypnia obsoleta* and species of the families *Phryganeidae* and *Limnephillidae* the highest in abundance. The lake provides home to numerous turbellaria, leeches, water lice, and water mites. In August, the total invertebrate biomass of Chukcha Lake amounts to 34 g/ m^2. The ichthyofauna is composed of Arctic Grayling (*Thymallus arcticus mertensi*), East Siberian Char (*Salvelinus leucomainis*), Three-spined Stickleback (*Gasterosteus aculeatus*), Nine-spined Stickleback (*Pungitius pungitius*), a sedentary form of Delta Smelt (*Hypomesus transpacificus*), and Two-lobed Gobby (*Cottogobius bilobatus*). Spawning beds of a "summer" race of Chum Salmon (*Oncorhynchus keta*) are located at the upper reaches of the Chukcha River and its tributaries.

The benthic fauna of the Chukcha River is rich in molluscs and chironomid larvae. Stretches of rapids provide habitats to rheophilic and lithophilic species of ephemerides (*Paraleptophlebia lunata, Ephemerella ignita*, *Caenis horaria*), molluscs (*Bithynia sp.*), and caddisflies (*Limnophilus nigriceps, Goera tungusensis*).

Noteworthy flora:

The Kava Basin is remarkable for its highly diverse hydrophilic flora that includes, in particular, *Potamogeton alpinus, P.maackianus, P.perfoliatus, Sparganium angustifolium, S.hyperboreum,* and *Sagittaria natans.* Moreover, many its species are rare in other northern regions of the Russian Far East, viz. *Iris laevigata*, *Calla palustris*, *Dactylorhiza aristata, Coeloglossum viride, Listera cordata*, *Platanthera tipuloides*, *Nymphaea tetragona, Nuphar pumila*, *Ceratophyllum demersum, Batrachium circinatum, B.trichophyllum, Myriophyllum verticullatum, Utricularia macrorhiza, U.minor,* and *Lobelia sessilifolia.*

Noteworthy fauna:

The most common fish species in the Kava River Basin are Dolly Varden (*Salvelinus malma*), East Siberian Char (*Salvelinus leucomainis*), Common Minnow (*Phoxinus phoxinus*), Nine-spined Stickleback (*Pungitius pungitius*), and Spotted Sculpin (*Cottus poecilopus*). "Summer" Chum Salmon (*Oncorhynchus keta*) travels upstream towards the Kava headwaters in mid and late June. The fish has its spawning beds in the upper reaches of the Kava and Kedrovaya Rivers. The spawning migration of Humpback Salmon takes place later. Water bodies along the middle course of the Kava River are inhabited by Lake Minnow (*Phoxinus percnurus*). Another characteristic feature of ichthyofauna of the Kava Basin is the presence of a large Kamchatka subspecies of Grayling (*Thymallus arcticus mertensi*) (Skopets & Prokopiev, 1990). Only the East Siberian form of this fish occurs in other rivers flowing into the Gulf of Tauisk.

Amphibians

Siberian Newt (*Salamandrella keyserlingii*) occurs in floodplain habitats of the Middle Kava River. Siberian Wood Frog (*Rana amurensis*), which is common in the lower reaches of the Kava and in the valley of the Taui River, has never been found on the floodplain of the Chukcha River.

Birds

The importance of the site for migrating birds:

The site lies at a crossroads of migration routes for

many birds breeding in the tundra, forest-tundra, and continental regions of the northern Far East. Spring migrations start in late April and last until early June, with autumn migrations occurring from the second half of August until early October. In spring, the majority of migrants are bound northeast, with some of them flying straight to the north. In autumn, the birds travel in the reverse direction. The migrants disperse on rather a broad front along the Chukcha Valley and across a low hilly watershed between the Burgali and Khayandzha Rivers. Generally speaking, migrations of water birds are not very intense, with hundreds of birds of a given species passing the site each day. Swans are the most noticeable migrants. In some years Whooper Swan (*Cygnus cygnus*) and Bewick's Swan (*C.bewickii*) stay on lake shores for 1-2 days to rest and feed. Congregations from tens to hundreds of birds are formed at such stopovers. Migrating geese do not usually stop at the site. Pre-migrating flocks of Greater Scaup (*Aythya marila*) and Tufted Duck (*A.fuligula*) regularly visit floodplain lakes and pools in autumn. Such flocks sometimes contain 200-300 individuals. Other species of migrating diving ducks are less abundant, a likely reason being they choose to fly over the sea, and some of them, e.g. Long-tailed Duck (*Clangula hyemalis*), have not been seen at the site at all in autumn. The passage of dabbling ducks, waders, and gulls is inappreciable (Krechmar *et al*., 1997).

The importance of the site for breeding birds:

Two goose species are known to nest in the valley of the Chukcha River: White-fronted Goose (*Anser albifrons*) and Bean Goose (*A.fabalis middendorffii*). A total of 20-30 pairs of the former species are supposed to annually breed in the Chukcha River Basin (*c.* 100 km^2). Breeding of the latter species is even less frequent in the area (not more than 7-10 pairs). Whooper Swan nests regularly but in small number (4-5 pairs), with 10-15 non-breeders summering on local lakes.

Wigeon (*Anas penelope*) and Common Teal (*A.crecca*) are the two most abundant dabbling ducks. The breeding density of either species is 3-4 nests/m^2. Pintail (*A.acuta*) is rather common as well but occurs less frequently (breeding density 2 nests/km^2). Mallard (*A. platyrhynchos*) is a regularly breeding species, having a population density of 0.3-1.0 nests/km^2 in favourable habitats; its numbers are tending to increase. Greater Scaup, Tufted Duck, and Black-winged Scoter (*Melanitta americana*) are the most common diving ducks, with a breeding density for each species of 0.5-2.0 nests/km^2. Rare but regular breeders are Goldeneye (*Bucephala clangula*), Smew (*Mergus albellus*), Red-breasted Merganser (*M.serrator*), and Goosander (*M.merganser*). These birds choose to nest along the banks of the Chukcha River and its tributaries (Krechmar *et al*., 1997).

Other water birds known to occur in the Chukcha River Basin include Red-throated Diver (*Gavia stellata*) and Black-throated Diver (*G.arctica*) that can be seen on almost any lake suitable for nesting. Slavonian Grebe (*Podiceps auritus*) and Red-necked Grebe (*P.griseigena*) are also rather common, similar to Mew Gull (*Larus canus*) and (locally) Common Tern (*Sterna hirundo*). The most characteristic wader species is Greenshank (*Tringa nebularia*). Other common waders include Wood Sandpiper (*Tringa glareola*), Common Sandpiper (*Actitis hypoleucos*), Common Snipe (*Gallinago gallinago*), Whimbrel (*Numenius phaeopus*), and Black-tailed Godwit (*Limosa limosa*). Far Eastern Curlew (*Numenius madagascariensis*) sometimes places its nests on extensive mires. Birds of prey sighted in the Kava Basin include Osprey (*Pandion haliaetus*) and Steller's Sea Eagle (*Haliaeetus pelagicus*). One pair of Sea Eagle and at least three pairs of Osprey have been reported to breed in the Chukcha River Basin (Krechmar *et al*., 1997).

List of the most important breeding habitats:

– plant-grown oxbow lakes adjacent to well-drained ridges not inundated by floods; breeding habitat of Greater Scaup, Tufted Duck, Northern Shoveler (*Anas clypeata*), Slavonian Grebe, Red-necked Grebe, Black-throated Diver;
– thermokarst and oxbow lakes on floodplain terraces lined with a fringe of sedge growth, with adjacent mires of different types; breeding habitat of Whooper Swan, White-fronted Goose, Pintail, Common Teal, Wigeon (*Anas penelope*), Black-winged Scoter, Greenshank, Common Sandpiper;
– densely vegetated wet meadows at the bottom of old-age alass basins; breeding habitat of Red-throated Diver, Greater Scaup, Tufted Duck, Slavonian Grebe;
– meandering taiga rivers and channels with hollow trees along the banks; breeding habitat of Goldeneye and Goosander.

The importance of the site for moulting birds:

The site does not normally gather very large congregations of moulting ducks and geese. The exception is Chukcha Lake itself, where mixed flocks of Greater Scaup and Tufted Duck (50-100 birds), White-fronted and Bean Geese (20-30) concentrate in some years. Small groups of Bean Geese are sometimes seen along tributaries to the Chukcha River (Krechmar *et al*., 1997).

Check-list of birds (A.V.Krechmar, in press):

Red-throated Diver (*Gavia stellata*). Common on all water bodies, including very small ones and on lakes of the high floodplain and watershed areas.

Black-throated Diver (*Gavia arctica*). Usual breeding bird on large and middle-sized water bodies of different origin.

Slavonian Grebe (*Podiceps auritus*). Sometimes nests on small plant-choked lakes of river floodplains.

Red-necked Grebe (*Podiceps griseigena*). Relatively rare but regular breeding species on water bodies of different sizes in floodplains and flat interfluvial areas; the preferred breeding habitat is provided by middle-sized lakes with mats of floating vegetation lined with a strip of sedge growth.

Eurasian Bittern (*Botaurus stellaris*). Sightings of this species have been recorded since 1983 in "The Chronicles of Nature" kept at the Magadan State Nature Reserve. It was identified from a sonogram in June 1996 as an alleged breeding bird (Krechmar, 1998).

Whooper Swan (*Cygnus cygnus*). Very common migrating species; four or five pairs annually establish their nests near non-inundated lakes; non-breeders are regularly sighted on other water bodies. Many birds concentrate on the bed of the Kava River during fall passage in September.

Bewick' Swan (*Cygnus bewickii*). Abundant during spring passage in the middle of May.

White-fronted Goose (*Anser albifrons*). Occurs during migrating, breeding, and moulting periods. Favourite habitats are the shores and nearshore flats of shallow lakes, sometimes sloping riverbanks.

Bean Goose (*Anser fabalis serrirostris*). Regular passage migrant that never occurs in large number at the site.

Bean Goose (*Anser fabalis middendorffii*). Common, though not very abundant migrating and breeding species in the Kava Basin; many moulting birds occur in the upper reaches of the Kava River.

Mallard (*Anas platyrhynchos*). Common migrating and breeding species whose numbers tend to be increasing.

Common Teal (*Anas crecca*). Very common breeding and migrating bird of the Kava Basin; occurs in a variety of habitats but prefers river floodplains.

Baikal Teal (*Anas formosa*). Uncommon as a breeding bird, this Teal is more or less regularly sighted during seasonal migrations.

Falcated Duck (*Anas falcata*). Rare and irregular breeder in the Kava Basin rarely seen in the migration season.

Wigeon (*Anas penelope*). Common breeding and migrating species keeping to river floodplains and adjacent habitats.

Pintail (*Anas acuta*). Very common breeding bird, next to Wigeon and Common Teal in terms of abundance. Preferred habitats include shallow floodplain water bodies. The bird is the most common duck species during seasonal migrations.

Garganey (*Anas querquedula*). Rare and irregular breeding bird in the Kava Basin occasionally recorded during seasonal migrations of water birds.

Northern Shoveler (*Anas clypeata*). Rather rare breeding bird in floodplain habitats.

Tufted Duck (*Aythya fuligula*). Very common breeding and moulting bird also abundant during the spring passage.

Greater Scaup (*Aythya marila*). Common breeding bird on a variety of water bodies; it is as abundant as Tufted Duck during seasonal migrations.

Black-winged Scoter (*Melanitta americana*). Common breeder inhabiting relatively large water bodies; it is less common during seasonal migrations.

White-winged Scoter (*Melanitta deglandi*). A rare bird during spring passage; absent in the breeding season.

Harlequin Duck (*Histrionicus histrionicus*). A rare visitor in spring and early summer; probably breeds in the upper reaches of the Chukcha River and its tributaries.

Long-tailed Duck (*Clangula hyemalis*). Rather rare bird during seasonal migrations, absent in the breeding season.

Goldeneye (*Bucephala clangula*). Common bird nesting in the holes of larch trees (especially those chiselled by Black Woodpecker) along riverbanks.

Smew (*Mergus albellus*). Rather common breeder at the site that places its nests in tree holes along river and oxbow banks.

Red-breasted Merganser (*Mergus serrator*). Common breeding bird whose broods are most frequently seen on rivers and their channels, sometimes on large lakes.

Goosander (*Mergus merganser*). Rare breeder, much less common than the previous species.

Osprey (*Pandion haliaetus*). Common breeder at the site that establishes its nesting territories on river floodplains and on the shores of larger lakes; feeds on Grayling and East Siberian Char; its numbers are tending to increase gradually.

White-tailed eagle (*Haliaeetus albicilla*). Does not breed at the site; only accidental vagrants can be seen.

Steller's Sea Eagle (*Haliaeetus pelagicus*). A few pairs regularly breed in the Kava Basin; every year, at least one pair nests in the valley of the Chukcha River.

Goshawk (*Accipiter gentilis*). Nomadic birds frequently seen at the site in August and September; their breeding remains to be documented.

Sparrow Hawk (*Acipiter nisus*). Does not breed at the site but can be encountered during post-breeding movements.

Rough-legged Buzzard (*Buteo lagopus*). Regular spring and autumn migrant.

Golden Eagle (*Aquila chrysaetos*). A breeding pair is known to live at the southern side of Chukcha Lake. Other eagles visit the site in the autumn to prey on migrating water birds.

Hen Harrier (*Circus cyaneus*). Regularly seen during seasonal migrations.

Merlin (*Falco columbarius*). Has been sighted only during seasonal migrations; its breeding at the site remains to be confirmed.

Hobby (*Falco subbuteo*). Common breeding species in isolated larch massifs on mires.

Gyrfalcon (*Falco rusticolus*). Rare visitor during seasonal movements.

Peregrine Falcon (*Falco peregrinus*). Regular visitor to the site during seasonal migrations; most often sighted in autumn.

Willow Grouse (*Lagopus lagopus*). Common breeding species of river terraces in some years; in winter, the bird lives in the floodplain willow scrub of Kava Basin.

Black-billed Capercaillie (*Tetrao parvirostris*). Rare breeder in isolated larch forests on river terraces.

Pacific Golden Plover (*Pluvialis fulva*). Certain pairs stay for a short time on the treeless mires of the Kava Basin during spring passage; sightings in breeding seasons have never been reported.

Ringed Plover (*Charadrius hiaticula*). Rare spring migrant.

Wood Sandpiper (*Tringa glareola*). Common breeding species on moors and hummocky bogs; less abundant in floodplain habitats.

Greenshank (*Tringa nebularia*). Most common of all waders known to occur in the Kava Basin; its favourite habitats are river floodplains; the bird is less abundant at lake shores.

Terek Sandpiper (*Xenus cinereus*). Common breeder in floodplain habitats.

Red-necked Phalarope (*Phalaropus lobatus*). Rare visitor to the site during spring passage (May).

Ruddy Turnstone (*Arenaria interpres*). Rare birds have been reported to cross the site during spring passage (May).

Red-necked Stint (*Calidris ruficollis*). Migrating flocks are regularly seen on sand flats of lakes and rivers during the autumn passage in the second half of August and September.

Common Snipe (*Gallinago gallinago*). Characteristic breeding bird of hummocky floodplains and watery mires.

Pintail Snipe (*Gallinago stenura*). Rare seasonal passage migrant in the Kava Basin.

Far Eastern Curlew (*Numenius madagascariensis*). Rare breeder on extensive wooded bogs that occupy floodplain terraces of the Kava Basin.

Whimbrel (*Numenius phaeopus*). Sometimes places its nests on dry ridges overgrown with shrub pine; the number of fall passage migrants is not very high.

Black-tailed Godwit (*Limosa limosa*). Common breeding bird in floodplain habitats and on hummock mires.

Mew Gull (*Larus canus*). Isolated pairs regularly come to breed in floodplain habitats of Kava Basin; the birds make no colonies.

Herring Gull (*Larus argentatus*). Rare summer visitor to the site.

Slaty-backed Gull (*Larus schistisagus*). Does not breed in the Kava Basin but arrives in large numbers in July and August when spawning migrations of salmons are in progress.

Glaucous Gull (*Larus hyperboreus*). Single immature birds can be regularly seen in aggregations of Slaty-backed and Herring Gulls at the time of salmon migration.

Black-headed Gull (*Larus ridibundus*). Migrating flocks of these birds numbering up to 50 and more individuals are regularly seen on large lake shallows in late May and in August-September; breeding of this species in the Kava Basin can not be excluded.

Common Tern (*Sterna hirundo*). Occurs in some years in large numbers on river floodplains; however, only isolated pairs remain to breed in the Kava Basin and do not gather in colonies.

Common Cuckoo (*Cuculus canorus*). The two-note call of this bird can be heard in forest and floodplain habitats of the Kava Basin in early summer (June).

Oriental Cuckoo (*Cuculus saturatus*). Common bird regularly heard throughout June and July; preferred habitats are floodplains and adjacent areas.

Hawk Owl (*Surnia ulula*). Rare and irregular breeder in sparse larch forests of the Kava Basin; also, the bird can be seen during post-breeding movements.

Short-eared Owl (*Asio flammeus*). Regular visitor to the site during seasonal movements; the bird remains to breed in the Kava Basin in years with a high abundance of readily available prey (mouse-like rodents).

Pacific Swift (*Apus pacificus*). In some years frequently occurs in the Chukcha River valley during summer.

Wryneck (*Jynx torquilla*). Rare but regular breeding at the edges of open forest stands on the periphery of treeless mires.

Black Woodpecker (*Dryocopus martius*). Common breeding bird in some years, but altogether absent in others. It establishes nests in the holes of high larch trees along oxbow and riverbanks.

Lesser Spotted Woodpecker (*Dendrocopus minor*). Sedentary bird becomes very abundant at the site in some years.

Three-toed Woodpecker (*Picoides tridactylus*). Rather rare breeder in forest habitats but more abundant during post-breeding movements in August and September.

Sky Lark (*Alauda arvensis*). Regular passage migrant in spring; some birds sometimes remain to breed at the site.

Yellow-headed Wagtail (*Motacilla taivana*). One of the most common passerine species at the site; its preferred habitats are wet bushlands and sparse larch stands; the bird is equally abundant during seasonal migrations.

Grey Wagtail (*Motacilla cinerea*). Common breeding bird in the Kava Basin; it inhabits riverside precipices nesting between the roots of undermined trees.

White Wagtail (*Motacilla alba*). Abundant during spring passage; in the breeding season, it occurs only close to settlements or isolated man-made constructions.

Olive-backed Pipit (*Anthus hodgsoni*). Sometimes nests on wooded bogs.

Red-throated Pipit (*Anthus cervinus*). Common passage migrant in spring; absent throughout the breeding season.

Brown Shrike (*Lanius cristatus*). Rather common inhabitant of small forested patches along river, oxbow, and lake precipices.

Waxwing (*Bombycilla garrulus*). Sometimes occurs during post-breeding movements over the site in August and September.

Siberian Accentor (*Prunella montanella*). Sometimes occurs at the site during post-breeding movements and autumn migrations.

Siberian Rubythroat (*Luscinia calliope*). Common breeder of floodplains and adjacent terrains; numbers vary markedly from year to year.

Stone Chat (*Saxicola torquata*). Very common species in some years inhabiting hummock mires, low thickets of birch, and old burnt areas.

Naumann's Thrush (*Turdus naumanni*). Common during spring and especially autumn post-breeding movements; many birds come to feed on blueberry fields of the Kava Basin.

Middendorff's Warbler (*Locustella ochotensis*). Common but not very abundant bird of low floodplain shrubbery and heath glades along oxbow and riverbanks.

Dusky Warbler (*Phylloscopus fuscatus*). Common bird at the edges of sparse tree stands and in floodplain habitats.

Red-breasted Flycatch (*Ficedula parva*). Regular but not very common breeder in wooded habitats; also occurs in floodplain willow thickets.

Willow Tit (*Parus montanus*). Common inhabitant of floodplain willow scrub during the breeding season; post-breeding flocks frequently visit isolated larch stands and dense thickets of shrub pine.

Eurasian Nuthatch (*Sitta europaea*). Common breeding bird in larch groves and forested floodplains.

Little Bunting (*Emberiza pusilla*). Common during seasonal migrations; breeding within the boundaries of the site is very likely but needs to be confirmed.

Rustic Bunting (*Emberiza rustica*). Has been sighted at the site only during seasonal migrations.

Yellow-breasted Bunting (*Emberiza aureola*). Very common breeding species in scattered shrubs and isolated coppices growing on floodplains and mires.

Lapland Longspur (*Calcarius lapponicus*). Occurs at the site during seasonal migrations.

Snow Bunting (*Plectrophenax nivalis*). Occurs only during seasonal migrations; the birds appear with the first thawed patches in April and May.

Brambling (*Fringilla montifringilla*). Common breeding bird in small isolated larch stands.

Scarlet Rosefinch (*Carpodacus erythrinus*). Regular but not very abundant breeder at the site; large flocks pass the site in late May and early June.

Pine Grosbeak (*Pinicola enucleator*). In some years the bird places its nests in thickets of Japanese stone pine at the slopes of hills that rise above mire complexes.

Common Bullfinch (*Pyrrhula pyrrhula*). Vagrant flocks occur at the site in May and June.

Redpoll (*Acanthis flammea*). Very abundant breeding species in years of profuse larch seed production; otherwise, can be seen only during seasonal movements.

Siberian Jay (*Perisoreus infaustus*). Rare breeding species irregularly found in small isolated larch stands.

Nutcracker (*Nucifraga caryocatactes*). Common breeding bird at the site that most frequently occurs in habitats adjacent to river floodplains. In August and September, it can be encountered in any place overgrown with shrub pine.

Carrion Crow (*Corvus corone*). Common breeding species in sparse larch stands, especially along the banks of rivers, oxbows, and lakes. Crow predation on eggs of water birds causes appreciable damage to their populations.

Raven (*Corvus corax*). A few pairs are known to annually breed and winter within the boundaries of the site.

The importance of the site for rare species:

The following rare or protected bird species have been recorded on the site during breeding and/or migration seasons: Whooper Swan, Bewick's Swan, Bean Goose, Baikal Teal, Osprey, Golden Eagle, Steller's Sea Eagle, Gyrfalcon, Peregrine, and Far Eastern Curlew.

The importance of the site as an area inhabited by economically valuable and rare terrestrial mammals:

The site harbours almost 10% of the Kava population of White-fronted Goose, the southernmost continental population of Eurasia. The Kava Basin is paramount for the conservation of this population. Moreover, from 1,000 to 2,000 pairs of dabbling ducks have their breeding grounds in the middle and upper reaches of the Kava River. They include Wigeon, Pintail, Common Teal, and Mallard, which are important game birds. In addition, there are a number of commercially valuable fur-bearing mammals, such as introduced American Mink (*Mustela vison*), Ermine (*M.erminea*), Sable (*Martes zibellina*), Wolverine (*Gulo gulo*), and Red Fox (*Vulpes vulpes*). Other big game such as Brown Bear (*Ursus arctos*), Elk (*Alces alces*), and Wild Reindeer (*Rangifer tarandus*) are regular inhabitants of the site. The Chutkavar Mountains at the southern boundary of the Kava Basin host a local population of Bighorn Sheep (*Ovis nivicola*).

Social and cultural values:

Spawning beds of "summer" Chum Salmon located in the Kava Basin are believed to make an important contribution to the biodiversity of the Sea of Okhotsk. Chukcha Lake hosts a specific population of East Siberian Char. The Chukcha River provides feeding grounds for schools of East Siberian Char and the Kamchatka subspecies of Arctic Grayling. At present, this fish stock is unexploited commercially within the boundaries of the site and therefore contributes to the overall productivity of the Taui River. The site has no resident human population although Even reindeer herdsmen appear to have visited this area in the past, as evidenced by the very place name "Chukcha" – supposedly used by the Russians instead of the Even word "dyukcha" which stands for a pyramid of firewood (Leontiev & Novikova, 1989). An ornithological field station of the Far East Division of the Russian Academy of Sciences' Institute of Biological Problems of the North was established on the Chukcha River in 1991 to perform monitoring programs and case studies on bird biology.

Land tenure/ownership:

Today, the land is owned by the state, and the Kavinskaya Dolina Regional Wildlife Refuge located on its territory is assigned the task of safeguarding the breeding grounds of water birds.

Current land use:

In winter, a professional team of 3-4 hunters kill Elks and trap Sable, Red Fox, and Ermine. A reduced abundance of fur-bearing carnivores has had a positive effect on the breeding success of water birds, but Elk had become practically extinct in the Kava Basin by the year of 2000.

Conservation measures taken:

The site is a part of the Kavinskaya Dolina Regional Wildlife Refuge. It has no roadways for tracked vehicles or other motor transport. Travel by motorboat upstream along the Kava River is the only way to penetrate the area. Access through the lower reaches of the river, which is a part of the Magadan State Nature Reserve, is controlled by wardens of the reserve. Due to this, practically no accidental travellers can visit the site in summer.

Conservation measures proposed but not yet implemented:

Today, the site is fairly well protected against unwanted impacts. One more guard post needs to be established in the future on the coast of Shelting Bay. It is proposed that the area be designated a wetland of international importance under the Ramsar Convention.

Current scientific research and facilities:

The ichthyofauna of the Chukcha River has been studied by specialists of the Pacific Institute of Fishery and Oceanography, the Institute of Biological Problems of the North, and Okhotskrybvod. Ornithological observations based at the local field research station have been carried out in the area adjacent to the middle course of the Chukcha River since 1991. In summer, the site is accessible by motorboat, in winter by off-road vehicles and snowmobiles. It lies about 100 km from the nearest motor road.

Current recreation and tourism:

Tourist access to the Kavinskaya Dolina Regional Wildlife Refuge and the state nature reserve is controlled by personnel of the latter.

Jurisdiction:

Administration of the Magadan Region.

Management authority:

Hunting and Game Management Department of the Magadan Regional Administration.

5.11. Elikchanskiye Lakes

Geographical coordinates: 60°43'17"N, 151°53'53"E (head of the Yama River).

Elevation: 800 m a.s.l.

Area: *c.* 12 km^2.

Overview:

Cascade of several scenic glacial lakes at the main watershed of the Kolyma Highlands. The lakes lying in the middle of the shortest flyway from the Kolyma River Basin to the Sea of Okhotsk coast are used by diving ducks and gulls during seasonal migrations.

Wetland type:

By international classification – O; by national classification 3.8.1.4 (a system of oligotrophic lakes in a mountain terrain).

General location:

The lakes are situated in the Okhotsk-Kolyma Interfluvial Area 2-5 km from the Kolyma Highway on the territory of the Khasynsky Administrative District of the Magadan Region. The distance is 20 km from the nearest settlement (Atka), 103 km by road from the district centre (Palatka), and 180 km from the city of Magadan.

Physical and ecological features of the site:

The lakes lie in a wide valley between offshoots of the Maimadzhiksky Range in the central part of the Kolyma Highlands. The valley is oriented from northwest to southeast. The cascade consists of three large lakes and a few smaller ones lengthened in a chain along a wide intermontane depression that connects the upper reaches of the Yama River (the Sea of Okhotsk Catchment) to the headwaters of the Maltan River (Kolyma Basin). The Elikchen River, which flows through the westernmost lake, joins the Maltan River of the Kolyma Basin. Two lakes, Srednee and Grand, situated east of the previous one feed the upper reaches of the Yama River. The total length of the lake-filled hollow is about 12 km, and its width is 2.5-3 km. The valley is flanked by hillsides and offshoots of the surrounding mountains, the absolute height of which ranges from 1,000 to 1,400 m.

The site extends to the timberline, trailing off to the mountain tundra belt. The slopes are covered with sparse larch forest with shrub pine to an elevation of about 1,100 to 1,300 m a.s.l. The lakes are separated from one another by morainic ridges that also form selected portions of their shores. The ridges support sparse larch stands with a thick growth of *Rhododendron parvifolium*, which greatly contributes to the characteristic aspect of the local landscape.

The lake occupying the "Kolyma slope" of the watershed is not very deep (2-4 m); its sand and gravel bottom with patches of silt sediments is overgrown with pondweeds (*Potamogeton perfoliatus, P.berchtoldii*) and burreeds (*Sparganium hyperboreum, S.emersum*). Nearshore mats of floating vegetation are dominated by *Menyanthes trifoliata* and *Cicuta virosa*.

Lakes on the "Okhotsk slope" are much deeper. The depth of Lake Srednee is almost 10 m; it has a sand and silt bottom with large stones scattered over it and a fringe of sedge and pendent grass growth along its perimeter. The shallower southern part of the lake is overgrown with pondweeds (*Potamogeton perfoliatus, P.berchtoldii*) at the end of summer. The largest of the lakes, Lake Grand, is 4.3 km long and 1.5 km wide, with a total shoreline length of 11 km and a water surface area of 3.73 km^2. Shores are sometimes very steep, with screes and stretches of coarse gravel interspersed with waterlogged areas. The southern part of the lake is bordered by a low forested terrace. The bottom is covered with sand, pebble, and boulders. The north-western part of the lake is the deepest area (20-23 m), while the south-eastern portion is shallow. The lake has transparent water high in ammonium nitrogen, which promotes the growth of phytoplankton. On the other hand, some silt sediments contain large amounts of hydrogen sulphide. Anoxic conditions existing in the lake from time to time trigger episodes of mass fish mortality both in winter and summer seasons. Moreover, the lake water has a high background level of lead due to its annual input of around 100 kg. Lake Grand is a typical oligotrophic water body with abundant plankton dominated by diatoms *Tabellaria fenestrata* with an admixture of golden and blue-green algae. The bottom vegetation is represented by *Potamogeton pusillus* and *P.perfoliatus,* and the shores are lined with mare's tail and large sedges.

Zooplankton consists of copepods (43% with the predominance of *Cyclops scutifer*), cladocerans (42% with the highest abundance of *Daphnia cristata, Holopedium gibberum, Bosmina longirostris*), and rotifers. Zooplankton density in Lake Grand is 836 organisms/km^2 or 3.9 g/km^2 if expressed as weight. Its dominant forms include molluscs (*Lymnaea atkaensis, Anisus spp.*), which account for 58% of the total, as well as chironomids (25%) and oligochaetes (10%). Caddisflies, leeches (*Hirudinea*), and black flies (*Simuliidae*) are abundant locally. These figures characterize zooplankton composition in midsummer; it varies considerably with depth and season (Zasypkina, 1986).

Fish parasites include all species of worms whose life cycle involves copepods as intermediate hosts. Trematodes of the genus *Phyllodistomum* appear to be the most important of these since they infest 100% of adult Arctic Chars (G.I.Atrashkevich, personal communication).

Atmospheric precipitation, groundwater, and terrigenous runoff are the main sources from which the Elikchanskiye Lakes are fed. Shallow water is heated to +16°C, deep water to +8-12°C. The ice cover sets in early October and is gone in early June.

The site has a continental climate. The mean annual air temperature is -12°C, and the mean annual precipitation is 293 mm. Temperatures average -32°C in January and can drop to a minimum of -55°C during the period from December to February. In winter, water flowing out from the lakes freezes at a lower level, giving rise to large build-ups of ice. Piercing cold winds incessantly blow down intermontane valleys. The summer is also cool. The mean temperature in July is +10.6°C, but can be as high as +25°C in some very warm days.

Noteworthy fauna:

Fish

The lakes belonging to the Kolyma River Basin are inhabited by Arctic Grayling (*Thymallus arcticus pallasi*), Nine-spined Stickleback (*Pungitius pungitius*), Spotted Sculpin (*Cottus poecilopus*), Long-nosed Sucker (*Catostomus catostomus*), and very abundant and unusually large Common Minnow (*Phoxinus phoxinus*).

The lakes lying on the Okhotsk side of the watershed give home to a local population of Arctic Char (*Salvelinus alpinus*) composed of two forms, large-sized and dwarfed. Large chars weigh from 700 to 2,400 g, start spawning at the age of 4-5 years, and feed on fish. The dwarfed form weighs 30-150 g, matures into a fertile spawning individual by the age of 2 years, and feeds on plankton and benthos. Other species include Arctic Grayling (*Thymallus arcticus palasssi*), very abundant Nine-spined Stickleback (*Pungitius pungitius*), Common Minnow (*Phoxinus phoxinus*), and unusually big (up to 20 cm in length) Spotted Sculpin (*Cottus poecilopus*).

Birds

Resident hunters report regular massive migrations of diving ducks across the site. Small flocks of Ross's Gulls are sighted from time to time in spring. Osprey (*Pandion haliaetus*) breeds in the surroundings of the lakes. In winter, Brown Dipper (*Cinclus pallasi*) occurs at spots of open water at the head of the Yama River.

Social and cultural values:

The Elikchanskiye Lakes lie on the path leading to the camps of reindeer herders that were traditionally located in the upper reaches of the Yama River (all their activities practically ceased by the mid 1990s). Large-scale timber logging was carried out on the site by the Dalstroy Corporation throughout the 1940s and 1950s. Cleared areas and portions of the Yama River floodplain are overgrown with honeysuckle (*Lonicera edulis*). Its berries are extensively gathered for subsistence by the local populace. The site ranks as a popular area for fishing and other forms of outdoor recreational activities among residents of the village of Atka, the majority of whom are engaged in maintaining the Kolyma Highway. It is also a major stopover for truck drivers carrying loads of fuel and general cargo. A Pioneer (children's scouting organization) camp and a comfortable recreational facility existed in the area in the 1970s and 1980s. Another popular pastime among local and visiting tourists is whitewater rafting down the Yama River starting from the ice build-up below Lake Grand.

Current land use:

Okhotskrybvod (fish-breeding enterprise) carries out experiments on replenishing Peled (*Coregonus peled*) stocks in the Elikchanskiye Lakes, with a view to enhancing their value for sport fishing.

Conservation measures taken:

River valleys north of Lake Grand have been designated as the Atkinsky Wildlife Refuge by the regional Hunting and Game Management Department. The main protected feature is Bighorn Sheep (*Ovis nivicola*).

Jurisdiction:

Administration of the Khasynsky District of the Magadan Region.

5.12. Khal-Degi Lakes

Geographical coordinates: 61°39'25"N, 145°50'16"E.

Elevation: 950-980 m a.s.l.

Area: *c.* 200 km^2.

Overview:

A system of deep mountain glacial lakes at the main continental watershed in the upper reaches of the Kulu and Inya Rivers. Habitats of endemic populations of Arctic Char (*Salvelinus alpinus*) and non-migratory stock of Sockeye Salmon (*Oncorhynchus nerka*); extensive spawning area for migrating Sockeye Salmon; stopovers of migrating water birds.

Wetland type:

By international classification – M, O; by national classification 3.7.1.3 (a system of oligotrophic lakes in a subalpine landscape at the head of a large salmon river belonging to the Sea of Okhotsk Catchment).

General location:

The site occupies the northeastern part of the Okhotsky Administrative District of the Khabarovsk Territory. The distance is 96 km from the nearest settlement (Uschan faktoriya), 258 km from the village of Inya, and 293 km from Okhotsk (district centre).

Physical and ecological features of the site:

The site is situated at the south-eastern extremity of

the Verkhoyansk mountain country (Suntar-Khayata range), at its junction with the Kolyma Highlands. The neighbouring mountain chains are built of Triassic bedrock containing granite intrusions of the Late Cretaceous period. The Khal-Degi lake-river system occupies a wide itermontane depression intersected by morainic ridges. The system encompasses over 40 water bodies of different size connected by river channels at either side of the continental watershed. Lakes in the northern part of the site belong to the Kolyma River Basin. They fill deep gaps among morainic ridges, contain dark water, and have sand and pebble bottoms. Their shores are covered with mossified larch forests or dwarf birch moors ("yernik") over old burnt areas. Lakes in the southern part of the site belong to the Sea of Okhotsk Catchment. The largest of these are the scenic Khaddy and Khal-Degi lakes (3.25 and 8.75 km^2 respectively). These deep lakes (25-30 m) give rise to the Nonna River. Many hollows between morainic ridges are filled with smaller lakes connected to one another and to larger water bodies by creeks and channels.

Large lakes have sand and pebble bottoms with patches of silt sediments. Shallows are overgrown with pondweed (*Potamogeton perfoliatus*) and mare's tail (*Hippuris vulgaris*), and water mosses that form floating mats. The shores are separated from the water's edge by a narrow stretch of pebble beach that steeply descends below the water level. Locally, the lakes are lined with a sparse growth of pendent grass (*Arctophyla fulva*) and a fringe of large sedges. Floating marsh marigold (*Thacla natans*) is a characteristic plant of lake shores and channels. The invertebrate fauna of Lake Khaddy includes large gastropod molluscs (*Lymnaea sp.*), small molluscs (*Anisus sp.*), and caddisflies of the genus *Apatania*.

Mountain slopes come very close to the lakes. They are covered with sparse larch forests with shrub pine in the undergrowth. A thick growth of *Rhododendron parvifolium* at morainic ridges and the presence of rare cinquefoil species *Sorbaria pallasii* collectively account for the peculiar aspect of the local vegetation. Many rock screes are overgrown with currant bushes (*Ribes odoratum* and *R.fragrans*).

The lakes are fed by a few small rivers. In winter, the largest of these (Khel River and Pravaya Khaddy River) give rise to large ice fields that persist well into the summer season. Lake water is clear and light-yellow in colour. Channels connecting individual lakes abound in water but have many rapids. The lowest-lying lake of the system, Etergen (Even "ant"), is round in shape and has a long inlet in its western part (at the mouth of the Khel River). The lake is 15 m deep and contains water of a bluish colour. A layer of deposits on the northern shore of the lake gives rise to large cold springs (+5°C). This part of the lake is a spawning area for migratory (autumn) Sockeye Salmon. The rich and specific ecosystem of the lake is maintained by a high autochthonous production of macrophytes and an input of considerable quantities of allochthonous organic matter brought by large numbers of anadromous salmonids.

The site has a subarctic mountain climate. Based on the records of the Kulu meteorological station, the mean annual air temperature is -13.3°C. The snow cover sets in late September, and most lakes freeze in mid September. Winter weather is largely clear and cold. Ice cover on rivers thickens throughout winter as their water periodically spreads and freezes over its surface. The mean temperature in January is -36.8°C. The snow melts in the middle of May, and the ice cover on the lakes disappears by the middle of June. The mean air temperature in summer is +9.5°C in June, +12.9°C in July, and +9.3°C in August. Shallow waters of larger lakes have a temperature of +15-17°C by mid June. In summer, atmospheric processes in the vicinity of the Suntar-Khayata Range generate stormy winds, thunderstorms, and momentary showers that largely occur late in the afternoon. In addition, in periods of clear weather over lake basins, strong southerly breezes blow in the daytime but fall off at night.

Noteworthy fauna:

Fish

Larger lakes connected to the Kulu River (Kolyma Basin) are inhabited by Northern Pike (*Esox lucius*), while smaller lakes are inhabited by Common Minnow (*Phoxinus phoxinus*). Lakes connected to the Sea of Okhotsk are populated by Sockeye Salmon, sedentary Arctic Char, small but abundant East Siberian Grayling (*Thymallus arcticus pallasi*), and Spotted Sculpin (*Cottus poecilopus*) (Volobuev & Rogatnykh, 1998). Sockeye Salmon is represented by two forms. The larger, anadromous type weighs up to 3 kg and comes to spawn in several schools from July to October. The smaller (dwarfed) form is sedentary and weighs only some 200 g. Dwarf males are actively involved in the reproduction of the migratory form. The latter has its main spawning beds along the southern shore of Khel-Degi Lake. Arctic Char is also represented by two different forms, large (up to 6 kg), which feeds on Spotted Sculpin, and a dwarfed (about 180 g), which feeds on plankton and benthos. Chars and graylings are infested by intestinal trematodes of the genus *Azygia* that are absent in the river basins of the Sea of Okhotsk Catchment situated east of the Khal-Degi Lakes area.

Birds

Black-throated Diver (*Gavia arctica*), a common bird at the site, places its nests on pebble beaches of the lakes

very close the water's edge. A small number of Whooper Swans (*Cygnus cygnus*) occur on Khaddy Lake. Its shores provide nesting sites to Greater Scaup (*Aythya marila*) and White-winged Scoter (*Melanitta deglandi*). Forest pools are frequently visited by Common Teal (*Anas crecca*). The Inya River valley creates the shortest connection between the Sea of Okhotsk coast and the upper reaches of the Kolyma River. According to local reindeer herders, Khal-Degi Lakes are frequented by many diving ducks during autumn passage. In the spring, migrating Arctic geese fly across the site. Greenshank (*Tringa nebularia*) is a most common wader on lake shores and adjacent coppice forests. Ringed Plover (*Charadrius hiaticula*) and Grey-tailed Tattler (*Heteroscleus brevipes*) occur at bare accumulations of ice that persist on riverbeds well into summer, while Common Sandpiper (*Actitis hypoleucos*) chooses to keep to small channels. Islets in the middle of Khal-Degi Lake support two small colonies of Herring Gull (*Larus argentatus*) constituted by 12-15 pairs each. Forest habitats, thickets of low-growing birch, and burnt areas provide nesting sites for Black-billed Capercaillie (*Tetrao parvirostris*) and Willow Grouse (*Lagopus lagopus*). Siberian Jay (*Perisoreus infaustus*), Stonechat (*Saxicola torquata*), Olive-backed Pipit (*Anthus hodgsoni*), Siberian Tit (*Parus cinctus*), Willow Tit (*P. montanus*) and Little Bunting (*Emberiza pusilla*) are the most common species representing the avifauna of mountain larch forests and sparsely forested bogs. Grey Wagtail (*Motacilla cinerea*) and White Wagtail (*M.alba*) can be seen along the banks of all creeks and channels.

Mammals

Wolf (*Canis lupus*), Wolverine (*Gulo gulo*), Wild Reindeer (*Rangifer tarandus*), and Bighorn Sheep (*Ovis nivicola*) are common inhabitants of the surrounding mountain tundra. Isolated peaks are occupied by colonies of Black-capped Marmot (*Marmota camtschatica*). Rock screes are populated by Northern Pika (*Ochotona hyperborea*). Small mammals include Red-backed Voles (*Clethrionomys spp.*), Chipmunk (*Tamias sibiricus*), and Red Squirrel (*Sciurus vulgaris*). The numbers of the latter species has markedly declined during the last 20 years, supposedly because that of the Sable (*Martes zibellina*) has been progressively increasing. The Brown Bear (*Ursus arctos*) occurs infrequently on the site.

Social and cultural values:

Until the early 1990s, Khal-Degi Lakes was a popular recreational and fishing area highly used by residents of mining settlements scattered over the territory of the Tenkinsky Administrative District of the Magadan Region. The area was accessible by truck, tracked vehicle, and helicopter. Illegal fishing for Sockeye Salmon was a thriving activity in the autumn and for Arctic Char in the winter. This practice is still underway, even if on a smaller scale. Analysis of the age and sex composition of the local Sockeye population has shown that it is seriously depleted (Volobuev & Rogatnykh, 1998). In the 1970s and 1980s, the site was the starting point of a tourist route of national importance. Tourists were delivered from the city of Okhotsk by helicopter and thereafter travelled by raft downstream to reach their destination at the village of Inya.

Land tenure/ownership:

The lakes and the surrounding area are owned by the Inya Evens, who have united in the traditional aboriginal economy of Uschan.

Current land use:

Residents of the village of Uschan use the site as a reindeer pastureland and hunting grounds. Visitors from mining settlements of the Magadan Region carry out illegal fishing and kill Elks and Reindeer (mostly domestic ones) in winter.

Jurisdiction:

Administration of the Okhotsky District of the Khabarovsk Territory.

5.13. Seabird colonies on the Sea of Okhotsk coast (from Cape Iretsky to Shilkan Bay)

The coastline of Magadan Region and the northern part of the Khabarovsk Territory totals about 2,150 km. The northern part of Shelikhov Bay, the Taigonos Peninsula, and Gizhiginskaya Bay host large seabird colonies numbering hundreds of thousands of individuals and remains poorly surveyed (Mendenhall, 1994). Colonies along the southern stretch of the coast, from Cape Iretsky to Shilkan Bay, extending for roughly 1,700 km are much better known (Golubova & Pleshchenko, 1997). As many as 150 coastal and 12 insular seabird colonies have been described in this sector.

The majority of coastal colonies are formed by communities of Slaty-backed Gull (*Larus schistisagus*), each composed of 20 to 500 pairs. There is a single big colony in Loshadinaya Bay. Indeed, all truly large colonies are situated on the Yamskiye Islands and Talan Island. The total

seabird population in this part of the Sea of Okhotsk is estimated at 11 million and encompasses the following 15 species: Fulmar (*Fulmarus glacialis*), Pelagic Cormorant (*Phalacrocorax pelagicus*), Kittiwake (*Rissa tridactyla*), Slaty-backed Gull (*Larus schistisagus*), Spectacled Guillemot (*Cepphus carbo*), Brunnich's Guillemot (*Uria lomiva*), Common Guillemot (*U. aalge*), Marbled Murrelet (*Brachyramphus marmoratus*), Kittlitz's Murrelet (*B.brevirostris*), Ancient Murrelet (*Synthliboramphus antiquus*), Horned Puffin (*Fratercula corniculata*), Parakeet Auklet (*Cyclorhynchus psittacula*), Crested Auklet (*Aethia cristatella*), Least Auklet (*Ae.pusilla*), and Tufted Puffin (*Lunda cirrhata*).

The below list includes only those colonies that number over 1,000 breeding birds. They are found in 14 localities.

Yamskiye Islands (59°19'N, 155°32'E) – a rocky archipelago lying 18 km east of the Piyagin Peninsula that hosts the largest seabird colonies in the Sea of Okhotsk, amounting to 10 million or more individuals. The islands give home to a considerable fraction of the Okhotsk populations of Fulmar. (See Section 5.2 for a detailed description).

Cape Bligan (58°50'N, 151°40'E) – rocky walls at the southern side of the Koni Peninsula between capes Alevina and Zabiyaka. Pelagic Cormorant, Slaty-backed Gull (1,200 pairs), and Tufted Puffin (2,600 pairs) are the main breeding birds. The area is controlled by the Ola Department of the Magadan State Nature Reserve.

Cape Skalisty (59°09'N, 151°25'E) – rock precipices and reefs at the northern side of the Koni Peninsula between capes Taran and Plosky with breeding colonies of Kittiwake and Slaty-backed Gull (2,500 and 800 pairs respectively). The area is controlled by the Olskoye Forestry Service of the Magadan State Nature Reserve.

Umara Island (59°09'N, 151°46'E) – a small rock islet in Odyan Bay connected with the mainland at low tide. Home to almost 15,000 breeding seabirds of nine species. (See Section 5.5 for a more detailed description).

Cape Nerpichiy (59°16'N, 152°08'E) – rocky walls at the northern shore of Odyan Bay with a large colony of Slaty-backed Gull (1,300 pairs).

Cape Bering (59°17'N, 151°43'E) – rock cape at the northern entrance to Odyan Bay with a large colony of Slaty-backed Gull (700 pairs) and Pelagic Cormorant.

Cape Rechnoy (59°24'N, 151°41'E) – rock cape at the eastern side of the Gulf of Tauisk with a large colony of Slaty-backed Gull (1,000 pairs) and Pelagic Cormorant.

Cape Kharbiz (59°30'N, 151°30'E) – rock cape at the northeastern side to the Gulf of Tauisk not far from the Olskaya Lagoon with a large colony of Slaty-backed Gull (1,000 pairs) and Pelagic Cormorant.

Tri Brata Islands (59°28'N, 150°57'E) – rock islets in the southern part of Gertner Bay close to the city of Magadan with a joint colony of Slaty-backed Gull (1,000), Kittiwake (1,000 pairs), Guillemots (500 pairs), and Tufted Puffin (50 pairs).

Cape Ostrovnoy (59°30'N, 150°30'E) – rock cape at the northern entrance to Nagaev Bay 16 km from the city of Magadan with one of the largest colonies of Spectacled Guillemot (500 pairs) that also includes Slaty-backed Gull (500 pairs), Kittiwake (250 pairs), Pelagic Cormorant, Horned Puffin, and Tufted Puffin.

Shelikan Island (59°35'N, 149°08'E) – rock island rising to an elevation of 50 m in the Amakhtonsky Bay not far from the mouth of the Taui River. The island hosts the largest colony of Slaty-backed Gull (up to 3,000 pairs) and breeding communities of Pelagic Cormorant (100 pairs), Kittiwake (1,000 pairs), Horned Puffin, and Tufted Puffin. In the past, the slopes of the island were covered with forests of larch and stone birch with shrub pine in the lower story. Rapid growth in the colony of Slaty-backed Gulls throughout the 1990s resulted in the essential disappearance of vegetation on the island.

Talan Island (59°18'N, 149°04'E) – rock island at the western side of the Gulf of Tauisk separated from the mainland by a straight 7 km in width. Seabird colonies of the island total over 1 million birds of 12 species, with Crested Auklet the markedly dominant species. The island is remarkable for a large colony of Ancient Murrelet. (See Section 5.9 for a detailed description).

Cape Moskvitin (59°15'N, 147°47'E) – rock walls at the western entrance to Shelting Bay with a large breeding colony of Spectacled Guillemot (500 pairs), Tufted Puffin (300 pairs), and Horned Puffin (100 pairs).

Loshadinaya Bay (59°24'N, 145°39'E) – rock precipices, reefs, and small offshore islets at the western entrance to Loshadinaya Bay with breeding colonies of Common and Brunnich's Guillemots and Kittiwake (with a few thousands of pairs of each species).

Submerged meadows in the Malkachansky Bay *(A.V.Andreev)*.

Nordmann's Greenshank *(W.Forstmier)*.

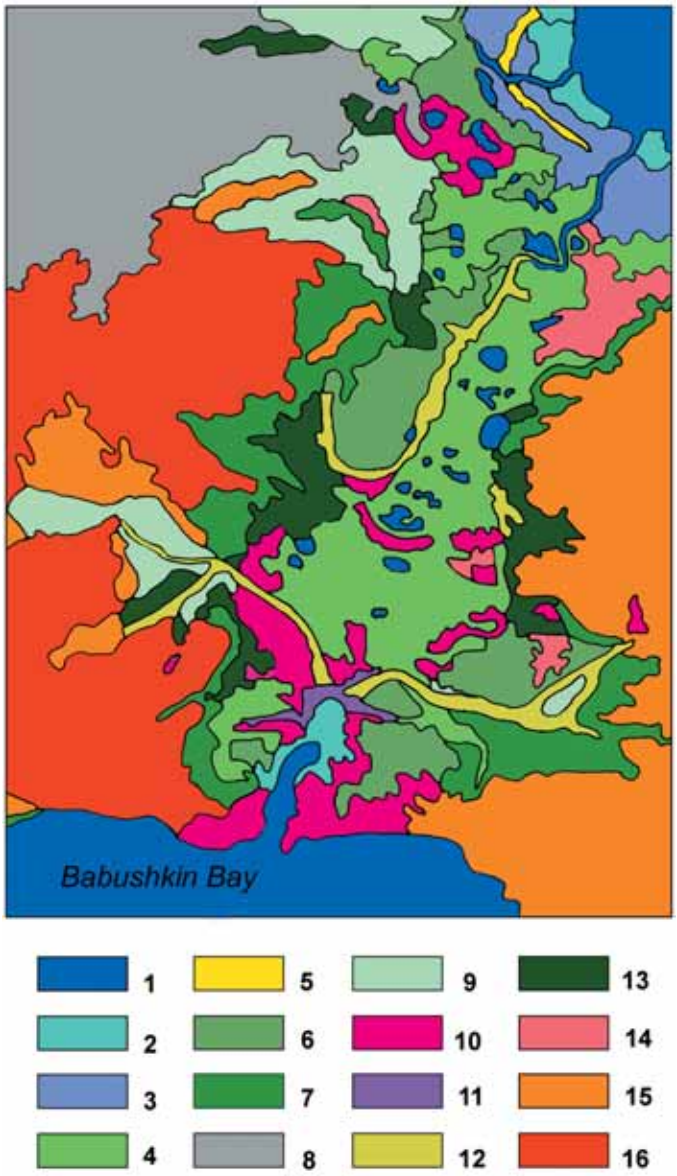
Seal rookery on the Malkachanskaya Spit *(A.V.Andreev)*.

Lake on the Malkachanskaya Tundra *(W.Forstmier)*.

Cushions of roseroot *Rhodiola rosea* on rocky slopes of Matykil Island *(F.Hafner)*.

Steller's Sea Lions *(F.Hafner)*.

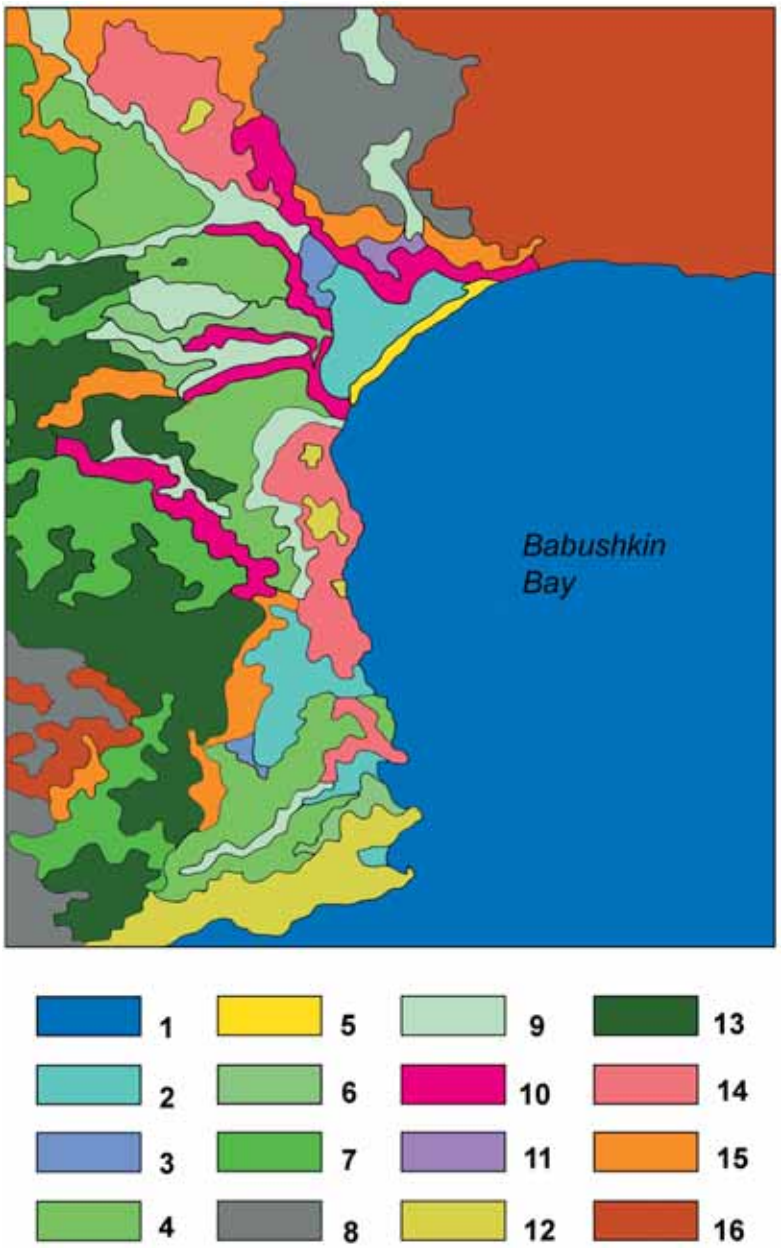
Khatemal'yu Island *(A.V.Andreev)*.



Landscapes of the Nakhatandzhinskaya Tundra: 1 – waters deeper than 1 m, 2 – intertidal flats, shallow-water eelgrass beds, mid-level littoral, 3 – low-level maritime plains with salt meadows, 4 – lacustrine-palustrian tundra, 5 – ancient sea bars, 6 – tussock-forming sedge/cottongrass associations, 7 – gravelly "kedrotundra", 8 – Yamskaya Lowland, 9 – sparse larch stands with the undergrowth of Japanese stone pine, 10 – gravelly *Dryas-Erica* tundra, 11 – estuarine-deltaic plains, 12 – floodplain complexes, 13 – creep terraces of slope bases, 14 – wet "kedrotundra", 15 – rocks overgrown with Japanese stone pine with patches of mountain tundra, 16 – treeless summits with stretches of gravelly tundra. Scale: a 60x30 km site is depicted.

Nakhatandzhinskaya Tundra *(A.V.Andreev)*.

Babushkin Bay *(A.V.Andreev)*.



Landscapes of Babushkin Bay: 1 – water surface, 2 – intertidal flats, shallows, littoral zone, 3 – deltas and estuaries, 4 – gravelly tundra with *Dryas*-dominated communities and patches of sedge growth, 5 – sea spits, 6 – plainland hummocky tundra with lakes and mires, 7 – moss larch forests with shrub birch, 8 – rocks with mountain tundra patches, 9 – floodplain-valley complexes, 10 – dry *Dryas* tundra, 11 – cottongrass tundra, 12 – residues the old peneplain surface, 13 – mountain taiga with the undergrowth of Japanese stone pine, 14 – gravelly tundra at the base of the old-age peneplain, 15 – hillside communities dominated by Japanese stone pine, 16 – treeless summits with stretches of gravelly tundra. Scale: a 28x24 km site is depicted.

Astronomicheskaya Bay at low tide *(A.V.Andreev)*.

Melkovodnaya Bay *(A.V.Andreev)*.

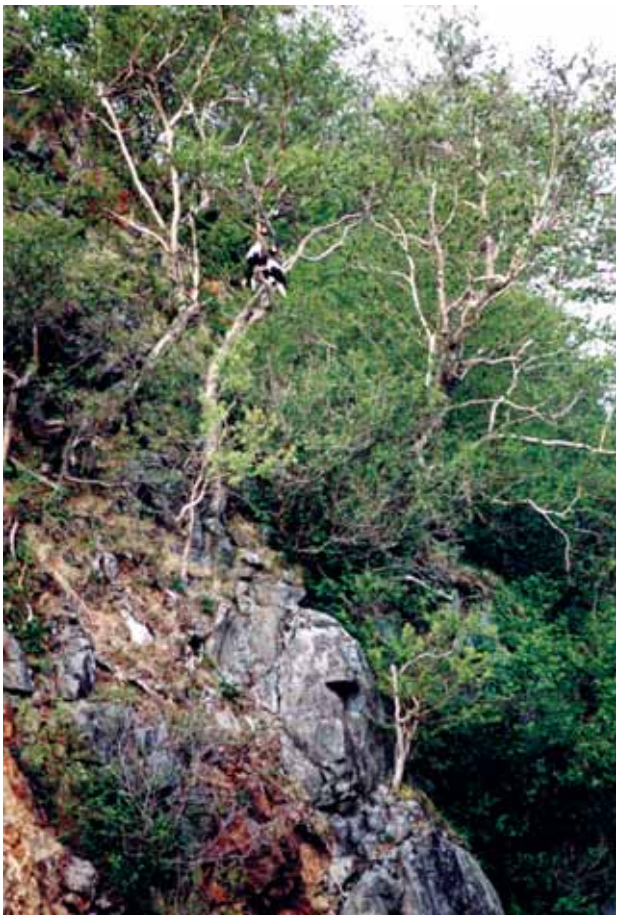
Mouth of the Orokholinja River *(A.V.Andreev)*.

Umara Island *(A.V.Andreev)*.

Lake Chistoye *(A.V.Andreev)*.

Spatterdock (*Nuphar pumila*) *(A.V.Andreev)*.

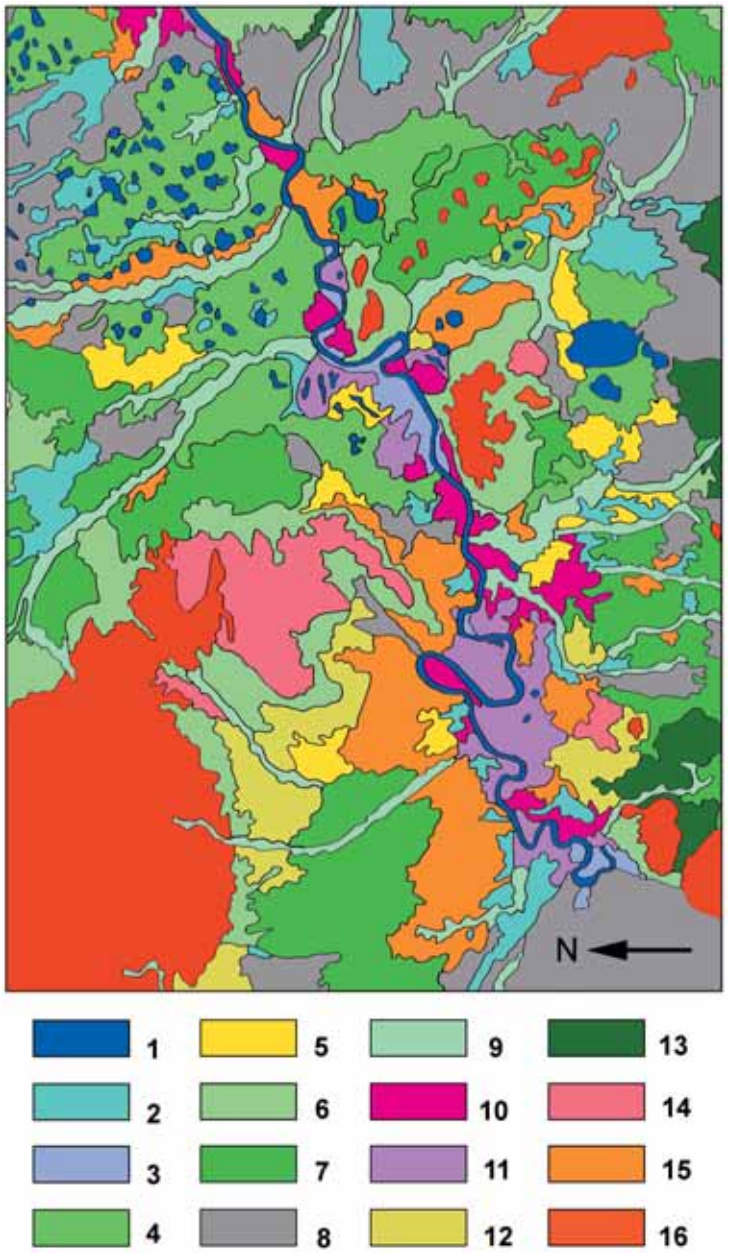
Head of Motykleisky Bay *(A.V.Andreev)*.



Stone birch forest on the shore of Motykleisky Bay *(A.V.Andreev)*.

Likhachyov Strait *(A.V.Andreev)*.

Valley of the Kava River *(A.V.Andreev)*.



Landscapes of the Kavinskaya Basin: 1 – lakes and rivers, 2 – depressions with manifestations of thermokarst activity, 3 – young floodplains, 4 – mires with lakes and open forests, 5 – dry mires, 6 – foothill pebble beds, 7 – rolling topography with sedge mires without open water, 8 – swampy sparse woodlands without lakes, 9 creek and river valleys, 10 – elevated floodplain sites, 11 – old floodplains, 12 – shrub-dominated mires at residual plain structures, 13 – mountain larch taiga with the undergrowth of Japanese stone pine, 14 – burnt areas of different age, 15 – sphagnum larch forests with lakes on floodplain terraces, 16 – treeless summits with a carpet of Japanese stone pine. Scale: a 70x50 km site is depicted.

The Chukcha River lined with a fringe of iris *(Iris laevigata) (A.V.Andreev)*.

Elikchanskiye Lakes *(G.I.Atrashkevich)*.

Lake Khaddy *(A.V.Andreev)*.

Cape at the entrance to Loshadinaya Bay *(A.V.Andreev)*.

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Annex 1

Wetland Types

The codes are based upon the **Ramsar Classification System for Wetland Type** as approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

Marine/Coastal Wetlands

A — **Permanent shallow marine waters** in most cases less than six metres deep at low tide; includes sea bays and straits.
B — **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
C — **Coral reefs**.
D — **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
E — **Sand, shingle** or **pebble shores;** includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
F — **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.
G — **Intertidal mud**, **sand** or **salt flats**.
H — **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwa ter marshes.
I — **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J — **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K — **Coastal freshwater lagoons**; includes freshwater delta lagoons.
Zk(a)— **Karst and other subterranean hydrological systems**, marine/coastal

Inland Wetlands

L — **Permanent inland deltas**.
M — **Permanent rivers/streams/creeks**; includes waterfalls.
N — **Seasonal/intermittent/irregular rivers/streams/creeks**.
O — **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.
P — **Seasonal/intermittent freshwater lakes** (over 8 ha); includes floodplain lakes.
Q — **Permanent saline/brackish/alkaline lakes**.
R — **Seasonal/intermittent saline/brackish/alkaline lakes and flats**.
Sp — **Permanent saline/brackish/alkaline marshes/pools**.
Ss — **Seasonal/intermittent saline/brackish/alkaline marshes/pools**.
Tp — **Permanent freshwater marshes/pools**; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
Ts — **Seasonal/intermittent freshwater marshes/pools** on inorganic soils; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U — **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.
Va — **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.
Vt — **Tundra wetlands**; includes tundra pools, temporary waters from snowmelt.
W — **Shrub-dominated wetlands**; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
Xf — **Freshwater, tree-dominated wetlands**; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
Xp — **Forested peatlands**; peatswamp forests.
Y — **Freshwater springs; oases**.
Zg — **Geothermal wetlands**
Zk(b) — **Karst and other subterranean hydrological systems**, inland

Note: "**floodplain**" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

1 — **Aquaculture** (e.g., fish/shrimp) **ponds**
2 — **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3 — **Irrigated land**; includes irrigation channels and rice fields.
4 — **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).
5 — **Salt exploitation sites**; salt pans, salines, etc.
6 — **Water storage areas**; reservoirs/barrages/dams/impoundments (generally over 8 ha).
7 — **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.
8 — **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.
9 — **Canals and drainage channels, ditches.**
Zk(c)— **Karst and other subterranean hydrological systems**, human-made

Annex 2

Criteria for Identifying Wetlands of International Importance

Adopted by the 7th Meeting of the Conference of the Contracting Parties (1999), superseding earlier Criteria adopted by the 4th and 6th Meetings of the COP (1990 and 1996)

Group A of the Criteria. Sites containing representative, rare or unique wetland types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria. Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Specific criteria based on fish

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Annex 3

WETLAND CLASSIFICATION FOR THE PURPOSE OF NATIONAL WETLAND INVENTORY *

Region	Wetland type	Wetland classification	Wetland group
1. Marine	1. Open marine shallows	1. Intertidal	1. Rocky 2. Sandy
		2. Subtidal	1. Rocky 2. Sandy
	2. Bays and straits	1. Exposed at low tide (mudflats)	1. Sandy 2. Silty 3. Silty with sandy ridges
		2. Deepwater bays	
		3. Shallow bays	1. Submerged beds of flowering plants and Charophyta 2. Submerged beds of other algae 3. Bare bottom
		4. Freshwater bays	1. Submerged beds of flowering plants and Charophyta 2. Submerged beds of other algae 3. Beds of emergent vegetation 4. Bare bottom
		5. Lagoons	1. Saline 2. Freshwater
	3. River mouths	1. Estuaries 2. Deltas	
	4. Coastal	1. Small islands	1. Rocky 2. Not rocky
		2. Mainland coasts, shores of large islands	1. Palustrine 2. Sandy 3. Shingle beaches 4. Rocky 5. Flat lowlands flooded at high water and onshore gales
2. Valleys	5. Rivers and their valleys	1. Lowlands	1. Palustrine with a developed system of oxbows and channels 2. Ditto, forested 3. Palustrine with an undeveloped system of oxbows and channels 4. Ditto, forested 5. Inland and dry deltas
		2. Mountains	
		3. Streams	1. Palustrine 2. Forested 3. Tundra

* - *V.G.Krivenko* and *V.G.Vinogradov (1996), based on classification by Yu.A.Isakov (1968)*

	6. Reservoirs	1. Lowland with stable water level	
		2. Lowland with sharp changes in water level	1. Regular seasonal fluctuations in water level 2. Frequent sporadic fluctuations in water level
		3. Mountain	
3. Watersheds and closed drainage regions	7. Lake groups	1. Stable	1. Eutrophic 2. Mesotrophic 3. Oligotrophic 4. Complex
		2. Cryogenic	1. Tundra 2. Taiga-palustrine
		3. Unstable, arid regions	1. Freshwater 2. Saline 3. Complex
	8. Individual lakes	1. Stable	1. Saline 2. Brackish 3. Freshwater eutrophic 4. Oligotrophic 5. Distrophic
		2. With variable water level	1. Saline 2. Brackish 3. Freshwater 4. Variable salinity
	9. Болота Mires	1. Fens, carrs and transitional	1. With open water 2. Without open water
		2. Raised bogs	1. With open water 2. Without open water
	10. Seasonal water bodies		1. Tundra 2. Forested 3. Palustrine 4. Steppe 5. Desert
	11. Man-made water bodies	1. Ponds	1. Fishponds 2. Agricultural 3. Water mills 4. Flooded gravel pits
		2. Irrigation systems	1. Rice-fields 2. Drainage systems 3. Irrigation sewage disposal fields 4. Filtration lakes