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Species composition and distribution of macrobenthos in the intertidal zone of Kunashir Island (South Kurile Islands), Russia

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Abstract  Characteristics of vertical distribution, species composition and biogeographical structure of macrobenthos of the intertidal communities of Kunashir Island (South Kurile Islands) are described. In the rocky and bouldery intertidal zones, communities dominated by barnacle Chthamalus dalli and a gastropod species Littorina sitkana with the poor species composition of the macrobenthos are typical for the upper intertidal subzone. The middle intertidal subzone is occupied by fucoid assemblages. The dense beds of laminarian algae dominate in the lower intertidal subzone with the total macrobenthic biomass up to 100 kg wet wt m⁻². On wave-exposed sandy beaches formed by clean sand, populations of the macrobenthic organisms are very poor, and macrophytes and the other attached forms are absent. The communities dominated by eelgrass Zostera japonica and a gastropod species Batillaria cumingii are found only in the sandy intertidal zones of the southern coast of Kunashir Island, in Izmeny Bay. Reduction of species richness and increase of biomass of macrobenthos have been recorded from 1963 to 1991 in Izmeny Bay, and it is due to the fact that this area has been exposed to anthropogenic impact. At least, 563 species of macrobenthos are found in the intertidal zone of Kunashir Island. Pacific low-boreal and Pacific wide-boreal species are dominant. Warm-water species are more abundant in the intertidal zones of Izmeny Bay and on the Sea of Okhotsk coast as compared to those on the Pacific coast of Kunashir Island. It is probably associated with the flow patterns of the Soya Warm Current. Species composition and distribution of the intertidal macrobenthos of Kunashir Island are typical for the low-boreal intertidal zone with irregular diurnal and semi-diurnal tides. The intertidal zones of Kunashir Island and neighboring Shikotan Island have similar species composition and distribution patterns of the macrobenthic communities.

Keywords: South Kurile Islands, intertidal zone, macrobenthos, community, species composition, distribution, biogeographical composition, long-term changes.

Introduction

Kunashir Island is the southernmost island of the Greater Kurile Ridge. Its coastline is weakly indented, especially on the Sea of Okhotsk side, and the Pacific coast is exposed to wave action stronger than the western coast of Kunashir Island. Sandy beaches are dominant on the south and southeastern coasts, whereas the northern coast is rocky and occasionally has bouldery-pebbly shores.

The intertidal zone is the area between the high and low tide marks. The boundary position between the
two main habitats of life (air and water) is a unique feature of the intertidal zone, also defined as the amphibiotic zone. Organisms that live in this zone experience daily and seasonal fluctuations of temperature and changes in salinity and moisture and they must be able to tolerate extreme environmental changes.

The intertidal zones of Kunashir Island were intensively investigated under the leadership of Oleg G. Kussakin by the expeditions of Leningrad State University (at present, Saint Petersburg State University), Zoological Institute and Botanical Institute (at present, V.L. Komarov Botanical Institute) of the Russian Academy of Sciences. In summer of 1951, in summer and winter of 1954, and in winter of 1955, flora and fauna of the intertidal zones of Sernovodskaya, Alekhina, Yuzhno-Kurilskaya, Golovnina, and Izmeny bays were examined (Kussakin, 1956, 1957), but quantitative data were not obtained at that time. During summer months of 1963 and 1964, quantitative samplings were carried out in the same bays, as a rule, along the same transects of 1951, 1954, and 1955, and in addition to that, the intertidal investigations were conducted in
Sernaya Bay. On the basis of these results, quantitative data on distribution of the intertidal macrobenthos were obtained (Kussakin and Tarakanova, 1977). In autumn of 1987 and in spring of 1988, species composition and distribution patterns of macrobenthic communities were investigated in the intertidal zone of the Goryachiy Plyazh (Hot Beach) where shallow-water gasohydrothermal vents occur (Kostina, 1991) (Fig. 1; Table 1).

The latest coastal expedition on Kunashir Island was carried out in 1991 by personnel of the Laboratory of Chorology of the Institute of Marine Biology of the Far Eastern Branch of the Russian Academy of Sciences (at present, A.V. Zhirmunsky Institute of Marine Biology, National Scientific Center of Marine Biology, Far Eastern Branch, Russian Academy of Sciences). The intertidal zones of Pervukhina Bay, Cape Rogacheva and at Cape Kruglyy, not examined earlier, were investigated. In Yuzhno-Kurilskaya Bay, the sampling was carried out in a few kilometers south of the locations of previous studies. In Izmeny Bay, survey was conducted at one of the locations studied in 1963.

In the present paper, the species composition and distribution of macrobenthos in the intertidal zones of Kunashir Island is given on the results of the latest expedition in 1991. The distribution patterns of macrobenthos all over the intertidal zones of Kunashir Island are described by the summarized information of 1951–1988 and 1991. A biogeographical analysis of the intertidal biota has also been undertaken. A quantitative comparison of macrobenthos is carried out between the 1963 and 1991 in one and the same site of Izmeny Bay. Features of the intertidal biota of Kunashir Island are briefly compared to that of the neighboring Shikotan Island.

**Materials and Methods**

**Field survey**

Sampling was carried out at low tides in the intertidal zones of Kunashir Island, in July–August 1991. Samples had to be collected according to the methods used in chorological investigation in the intertidal zones (Kussakin and Kostina, 1996; Ivanova et al., 2001). Belt transects laid perpendicularly to the coastline between 0 m depth and level of the highest tide were used to estimate the distribution and species composition of macrobenthos in the intertidal communities (Handbook of Biodiversity Methods, 2005). Belt transects were performed on the western coast of Kunashir Island, on a reef in the northern part of Pervukhina Bay (location 1) and on a reef 1 km southward of Cape Kruglyy (location 2); on the southern coast, on a beach, in 1.5 km eastward of Golovnino Village in Izmeny Bay (location 10); on the eastern coast, on a small nameless cape in central part of Yuzhno-Kurilskaya Bay, 5 km southwesterly of Cape Zavodskoy (location 19) and in the tide pool on Cape Rogacheva (location 23) (Fig. 1; Table 1). The length of transect lines depended on the width and slope of the intertidal zones. The total length of transect was about 25 m on the sandy intertidal zone in Izmeny Bay, while on hard substrata, for instance, on reef in Pervukhina Bay, the transect line was not more 15 m lengths.

The shore along each transect was divided into three subzones, namely the upper, middle and lower subzones. Subdivision of the intertidal zones was conducted according to the principles of Vaillant (Vaillant, 1891). Because ice appears on the Kunashir Island coast in November, which can cause death of a portion of the intertidal biota, the estimations of sea levels and corresponding intertidal subzones were performed for tidal ranges from May to October. The boundaries of the upper, middle, and lower subzones are determined by the high water spring tides, high water neap tides, low water neap tides, and low water spring tides, respectively. Irregular diurnal and semi-diurnal tides are characteristic of Kunashir Island. The tides reach 1.8 m in Izmeny Bay, and in Yuzhno-Kurilskaya Bay, the highest tides are about 1.65 m.

Each intertidal subzone is characterized by own communities. The distribution of species in the intertidal communities was provisionally estimated by eye. The types of communities were distinguished and named by.
dominant (frequently belt-forming) species of macrobenthos (see Plates 1–11). For example, the *Littorina sitkana* community means an assemblage of macrobenthos dominated by a gastropod species *Littorina sitkana*; the *Chthamalus dalli* + *Littorina sitkana* community – dominated by two species with similar values of biomass, barnacle *Chthamalus dalli* and a gastropod species *Littorina sitkana*; the *Fucus evanescens* community – dominated by the brown alga *Fucus evanescens*, etc.

Quadrates of metal frames were randomly placed within each of the three intertidal subzones (upper, middle, and lower subzones) and within the boundaries of the distinguished communities along each transect. We chose two or three samples (quadrates) from each community. Quadrates of 100 and 250 cm² were put on soft sediments, and those of 100, 250, and 500 cm² were put on the rocky reefs. When organisms were small and exhibited nearly uniform distribution, we used smaller frames, as opposed to samplings in the communities of individuals with fairly large body size or species that were rarely distributed and not so common. On hard substrata, macrobenthos had to be collected by scraping in quadrates, until all organisms were removed from the surface of substratum. On soft sediments, the upper layer of sediment (approximately 10 cm thick) was being gotten out from quadrate. To remove sediments from the macrobenthic samples, we used a set of six 200 mm diameter aluminium soil sieves with mesh sizes 10 mm, 7 mm, 5 mm, 3 mm, 2 mm and 1 mm. Samples were sieved over 1 mm mesh size *in situ*.

Not all species were quantified. Qualitative samples of macrobenthos were taken outside the quadrates, but, as a rule, within the boundaries of the distinguished communities. Some species had to be collected outside the boundaries of communities, but included in the list of macrobenthos of the intertidal zone of Kunashir Island (see Appendix). Plants and animals had to be collected by hands in these samples. This method was used for determining presence/absence of species without definition of their density and biomass. Some species are rare, and all species of macrobenthos cannot get in quadrates. Besides, it wasn’t always possible to quantify macrobenthos within some microhabitats, for instance, such as crevices, holes or under boulders. On the other hand, some species dwell in association with other species as epibionts, and it wasn’t always possible to quantify them. Therefore we attempted to survey species composition of the intertidal macrobenthos as far as possible more fully, using the quantitative and qualitative samples (see Plate 14).

Each quantitative or qualitative sample was recorded separately. All the taxonomic groups of macrobenthos were registered. Specimens from the quantitative samples, after drying on a filter paper, weighed using pharmaceutical scales accurate to 10 mg; large seaweeds and seagrasses were weighed on a technical balance accurate to 1 g. The data obtained were extrapolated for 1 m². The biomasses presented in the paper, including shells of mollusks and the other skeletal structures of animals, are provided as wet weights. Some dominant species was identified in the field works. The collected material was fixed in 75% alcohol or 4% formalin and taken to the laboratory for identification. In 1991, 5 transects were performed, 68 quantitative and 6 qualitative samples of macrobenthos had to be collected in the intertidal zones of Kunashir Island, and also 147 specimens of algae and seagrasses had to be preserved on herbarium sheets.

**Data analysis**

The description of vertical distribution and species composition of the intertidal macrobenthos in Pervukhina Bay, on reef 1 km southward of Cape Krugly and on beach 1.5 km eastward of Golovninino Village in Izmeny Bay, in central part of Yuzhno-Kurilskaya Bay, and on Cape Rogacheva was conducted by the quantitative and qualitative samples collected in 1991. Besides, a general conclusion about the distribution and species composition of the intertidal macrobenthos all over Kunashir Island were made on a basis of the materials of expeditions in 1951, 1954, 1955 (qualitative samples) (Kussakin, 1956, 1957), 1963, 1964 (quantitative samples) (Kussakin and Tarakanova, 1977), 1987, 1988 (Kostina, 1991), and 1991 (present data) (quantitative and qualitative samples).

A general list of species found on all locations studied of Kunashir Island was compiled by the results of qualitative and quantitative sampling of expeditions in 1951, 1954, 1955, 1963, 1964, 1987, 1988, and 1991 to represent composition of the intertidal biota of Kunashir Island as a whole and also to determine the
biogeographical composition of macrobenthos (see Appendix). Our records (expedition of 1991), early published literature data on expedition of 1951–1988 (Kussakin, 1956, 1957; Kussakin and Tarakanova, 1977; Kostina, 1991), and as well as reference to the macrophytic and macrofauna species of these expeditions (Zinova and Perestenko, 1974; Kussakin, 1975) not mentioned in previous publications were used to put together the list of the macrobenthic plants and animals of the intertidal zone of Kunashir Island. Besides, literature data on various groups of animals were also used to clarify the taxonomic position and the geographical area within which species can be found: Porifera (Khodakovskaya, 2003, 2005), Hydrozoa (Antsulevich, 1992; Sheiko, 2009), Actiniaria (Sanamyan and Sanamyan, 2009), Polychaeta (Buzhinskaja, 2013), Sipuncula (Morozov and Adrianov, 2002), Pantopoda, Leptostraca, and Mysida (Petryashev et al., 2004), Cirripedia (Sessilia) (Poltarukha et al., 2006), Amphipoda (Vassilenko, 2006; Budnikova and Bezrukov, 2008; Labay, 2013), Cumacea (Tzareva et al., 2013), Decapoda (Hayashi and Kim, 1999; Komai, 1999; Asakura and Watanabe, 2005; Kim et al., 2006; Marin, 2014), Isopoda (Golovan and Malyutina, 2010), Mollusca on the whole (Kantor and Sysoev, 2005), Gastropoda (Chernyshev and Chernova, 2005; Gulbin, 2009a, b, 2010a, b), Bivalvia (Lutaenko and Noseworthy, 2012), Bryozoa (Dick et al., 2005; Grischenko and Foster, 2012), Asterioidea (Shin, 1995; Byrne et al., 1997), Holothuroidea (Stepanov et al., 2012; Panina and Stepanov, 2013), Ascidiacea (Lejeusne et al., 2011). Additionally, check-lists of species and some monographs on the fauna and flora of the Russian Far Eastern seas and adjacent waters were used to clarify the species’ biogeography and taxonomy (Kussakin et al., 1997; Fauna and Ecosystems…, 2004; Illustrated Keys…, 2009, 2010, 2012; Check-List of Species…, 2013). Moreover, concerning the systematics, nomenclature, and detailed distribution of algae and seagrasses, we follow M. D. Guiry and G. M. Guiry (2016), and about classification and distribution of fishes, we follow R. Froese and D. Pauly (2016).

Biogeographical characteristics are given for each organisms of the species rank on a base of the patterns of the species distribution in geographic space. For the eastern and western coasts, the data of 1951–1964 and ones of 1987–1991 (only 1991 for western coast) are represented separately (see Appendix), since changes of the biogeographical composition of macrobenthos could take place for 30–40 years. Unfortunately, on the southern coast, only single transect was done in 1991, and 20 transects were performed from 1951 to 1964 (Table 1). Besides, 187 species were found from 1951 to 1964, and only 27 species were found in 1991 (polychaete Alitta brandti, a gastropod species Cerithiopsis stejnegeri, and fish Opisthochetus ocellatus had not been detected during previous surveys). Therefore, we combined biogeographical data of 1951–1964 with those of 1991 for Izmeny Bay.

In the present paper, we use biogeographical terminology widely accepted in Russian biogeographical literature (Kussakin, 1975, 1990; Lutaenko, 1993; Kafanov and Kudryashov, 2000; and others). The temperate waters of the Northern Hemisphere are called boreal, and those of the Southern Hemisphere – notal.

1. Pacific species:

A. Low-boreal species are limited in their southward distribution by a line of Wonsan (North Korea) – Sado Island and Cape Inubo (western and eastern coasts of Honshu, respectively) – Point Conception (California) and in their northward distribution by Cape Patience (Cape Terpeniya, the east-central Sakhalin Island) – Ekateriny Strait (between Iturup and Kunashir islands) on the Asian coast and at Strait of Juan de Fuca (Puget Sound, Washington) on the American coast (amphi-Pacific species are distributed in low-boreal waters of both the Asian and American coasts).

B. High-boreal species are distributed mainly from a line of Cape Patience – Ekateriny Strait – Strait of Juan de Fuca to Bering Strait.

C. Widespread boreal species are distributed mainly from a line of Wonsan – Sado Island and Cape Inubo – Point Conception to Bering Strait, i.e., inhabit the Pacific low-boreal and high-boreal waters.

D. Subtropical-boreal species are distributed mainly from the northern part of Taiwan, Kyushu Island, Yellow Sea, and the southern part of the Korean Peninsula on the Asian coast and from the southern part of the
Baja California Peninsula on the American coast to Bering Strait. Subtropical-low-boreal species are limited in their northward distribution by low-boreal waters.

2. Species of the Northern Hemisphere:
A. Amphi-boreal species are distributed in both the Pacific and Atlantic temperate waters (on the eastern coast of the Atlantic Ocean, the boreal species are limited in their southward distribution mainly by the southern part of English Channel, but frequently including the Bay of Biscay and the western coast the Iberian Peninsula up to the Strait of Gibraltar, and in their northward distribution by Cape Kanin Nos (Barents Sea) and the western coast of Spitsbergen; on the western coast of the Atlantic Ocean, the boreal species spread from Cape Hatteras (North Carolina) to Davis Strait and Denmark Strait).
B. Boreal-arctic species inhabit the Pacific and/or Atlantic temperate waters and the Arctic seas.
C. Subtropical-boreal/low-boreal species are distributed in the subtropical and boreal/low-boreal waters both of the Pacific and Atlantic oceans (Atlantic subtropical species spread mainly from South Carolina, the northwestern Africa (mainly Morocco), and the Mediterranean Sea to the southern boundary of the Atlantic boreal waters, at the same time, there is not definite the northern boundary of the distribution of Atlantic low-boreal species on the American coast, and on the European coast, these species spread approximately from the southwestern part of the Iberian Peninsula to English Channel).

3. Worldwide distributed species:
A. Tropical-boreal/low-boreal and tropical-subtropical species are distributed from the tropic waters of World Ocean (Indo-Pacific, tropical eastern Pacific (from the southern tip of the Baja California Peninsula in the north to the northern Peru in the south), and tropical Atlantic (in the western Atlantic, these species distribute from Florida and Gulf of Mexico through Caribbean and along the South America’s Atlantic coast to Cape Frio (Rio de Janeiro state), and in the eastern Atlantic, they extend along the African coast from Cape Blanco (Mauritania) to the Tigres Peninsula (Angola)) to the boreal/low-boreal/subtropical waters of the Pacific and/or Atlantic oceans.
B. Subtropical/tropical-boreal-Arctic species are distributed from the subtropical or tropical waters to the Arctic seas.
C. Anti-tropical species are distributed mainly in the temperate waters (partly in subtropical waters) of the Northern and Southern hemispheres and the polar regions, but show a geographical delimitation of the distribution pattern in tropical regions (also known as bipolar species).
D. Notal-tropical-boreal/low-boreal/subtropical species are distributed from the temperate waters of the Southern Hemisphere to boreal/low-boreal/subtropical waters of the Northern Hemisphere (in the northward, temperate waters of the Southern Hemisphere are limited mainly by the southern part of South America, the southernmost part of Australia, and New Zealand).
E. Species of almost world-wide distribution are called panoceanic (cosmopolitan) species for animals and multizonal species for plants.

A cluster analysis was carried out in order to group 23 sampling locations of Kunashir Island having similar the species composition of the intertidal macrobenthos. Hierarchical cluster analysis was performed using the StatSoft STATISTICA 6.0 (the clustering is based on Euclidean distance with using Ward’s method). Qualitative data (lists of species) have been used (namely presence/absence of species in each of 23 locations) from 1951 to 1991 to construct a dendrogram. Study of the intertidal macrobenthos of Kunashir Island was carried out during 40 years, but each of 22 locations (1–9 and 11–23) has been investigated in a certain year or at least within 12–13 years (Table 1). Whereas in 1.5 km eastward of Golovnino Village (Izmeny Bay), the intertidal investigations were conducted in 1991 at one of the same location studied in 1951–1963 (location 10), therefore, in this location, the species compositions of macrobenthos of 1951–1963 and one of 1991 were used separately for cluster analysis (10a – 1951–1963 and 10b – 1991; see Fig. 3), since changes of the composition of the intertidal biota could occur for 30–40 years.
Results

Rocky intertidal zone

A reef southward of Cape Kruglyy (location 2) is an indented flat rocky platform with a slight slope. The coast is weakly protected and exposed to almost permanent wave action. The vertical stratification of communities is well marked.

The upper intertidal subzone: communities found in this subzone tend to exhibit a uniform species composition. There are community dominated by a gastropod species Littorina sitkana and community dominated by barnacle Chthamalus dalli (Table 2). Algae are not typical for these communities. The upper part of this subzone and partially supratidal zone are occupied by the L. sitkana belt. The Littorina biomass makes up to 99% of the total macrobenthic biomass, and this sea snail is the most numerous species (more than 90 thousand individuals m$^{-2}$). The following animals are also found in the community: species of gastropods Falsicingula kurilensis and Lottia pelta, an isopod species Gnorimosphaeroma noblei, and barnacle Ch. dalli. Immediately below the L. sitkana belt, the upper subzone is occupied by the Ch. dalli community with a low total biomass of macrobenthos (up to 240 g wet wt m$^{-2}$) including Ch. dalli itself and other species (species of gastropods Nucella heyseana, L. sitkana, Lottia persona, and others).

The belt-forming community dominated by the red alga Gloiopeltis furcata is found on the boundary between the upper and middle subzones. F. kurilensis and L. sitkana are the most abundant animals (Table 3).

The middle intertidal subzone: fucoids are dominant in this subzone. The Silvetia babingtonii community forms its own belt. Dominant species makes up about 95% of the total macrobenthic biomass (Table 4). Littorina sitkana dominates among animals in the community. In the Fucus evanescens + Silvetia babingtonii community, biomasses of the dominant and subdominant species make up to 90% of the total macrobenthic biomass. As well as in the Gloiopeltis furcata community, L. sitkana and Falsicingula kurilensis are dominant among animals. A gastropod species Nassarius fraterculus and the amphipod species Apohyale bassargini, Ampithoe kussakini, and Spasskogammarus spasskii frequently occur.

Besides, the community dominated by the brown alga Analipus japonicus can be found in the upper part of the middle intertidal subzone, in which species composition is very poor. Dominant species makes up to 95% of the total macrobenthic biomass (Table 4).

In the belt-forming community dominated by the calcareous red alga Corallina pilulifera, the other algae are not found (Table 6). Species of gastropods F. kurilensis, N. fraterculus, and L. sitkana, and also the amphipod species A. kussakini and Parallorchestes ochotensis are abundant. Dominant species makes up to 80% of the total macrobenthic biomass.

A community dominated by the red alga Neorhodomela aculeata is one of the most diverse communities in the middle subzone. Apart from N. fraterculus, F. kurilensis, L. sitkana, and P. ochotensis, the hermit crab Pagurus middendorffii frequently occurs. Sargassum miyabei, Neorhodomela munita, and C. pilulifera are almost equally represented among algae (Table 6).

A community dominated by the green alga Chaetomorpha moniligera can be frequently found in the middle subzone. The total biomass of macrobenthos is quite low (up to 560 g wet wt m$^{-2}$), and species of gastropods (F. kurilensis, Nucella heyseana, Nassarius fraterculus, and L. sitkana) are abundant in the community (Table 8).

In sites, on the boundary between the middle and lower subzones, where rocks are splited by spaces filled with sand, the community dominated by the surfgrass Phyllospadix iwatensis occurs with insignificant the total biomass of macrobenthos (up to 800 g wet wt m$^{-2}$) (Table 10). Polychaetes and some species of gastropods are more abundant groups of macrobenthos in the grass habitat. The diverse polychaetes (Chone teres, Nereis vexillosa, Naineris jacutica, Glycine armigera, Capitella capitata, Harmothoe imbricata, and others) dwell in rhizomes and roots of Phyllospadix. Species of gastropods N. fraterculus, N. heyseana, Lottia
person, Mitrella burchardi, Cryptonatica hirasei, and Homalopoma sangarense are conspicuous inhabitants of the Phyllospadix bed. Also small fish Alectrias electrolophus frequently occurs in the tide puddles.

The lower intertidal subzone: the belt-forming communities dominated by the brown algae Sargassum miyabei and Sargassum thunbergii with rather rich species composition of macrobenthos are typical for this subzone (Table 11). The S. miyabei biomass makes up about 60% of the total macrobenthic biomass, whereas biomasses of accompanying species of the red algae – Neorhodomela aculeata and Mastocarpus pacificus – amount about 30% of the total biomass. Species of gastropods Nassarius fraterculus, Falsicingula kurilensis, Littorina sitkana, Homalopoma sangarense, and Pusilina plicosa, and the amphipod species Ampithoe kussakini and Apohyale bassargini, the isopod species Idotea ochotensis and Holotelson tuberculatus are frequently found in the community. In the S. thunbergii community, the dominant species makes up more than 95% of the total macrobenthic biomass. The species composition in the community is slightly different from that in the S. miyabei community. The amphipod species A. bassargini, Ischyrocerus sp., and Caprella cristibrachium, and a gastropod species F. kurilensis are the most numerous here.

Rocky-bouldery intertidal zone

A reef in Pervukhina Bay (location 1) is a flat rocky platform with scattered boulders under a high precipice. The coast is exposed to wave action. The vertical stratification of the communities is well marked.

The upper intertidal subzone: the settlements of Chthamalus and Littorina are rarefied, and they do not always form a continuous belt. The Littorina sitkana community occupies the sides of boulders. The biomass of Littorina is very low (45 g wet wt m$^{-2}$). The Chthamalus dalli community is situated just below the Littorina belt and also characterized by low value of the macrobenthic biomass (up to 200 g wet wt m$^{-2}$) (Table 2).

The middle intertidal subzone: the upper part of this subzone is occupied by the Silvetia babingtonii and Fucus evanescens communities with the rare patches of the green algae Cladophora opaca, Chaetomorpha moniligera, and Ulva lactuca. These communities are characterized by lower values of biomasses (up to 3390 g wet wt m$^{-2}$) than those on the rocky reef southward of Cape Kruglyy, although S. babingtonii and F. evanescens also make up about 95% of the total biomass of macrobenthos (Table 4). Species of gastropods Falsicingula kurilensis and Littorina sitkana, a bivalve mollusk Turtonia minuta and an amphipod species Ampithoe kussakini are the most numerous in the fucoid communities.

The red and green algae communities occur below the fucoids. Communities dominated by the red algae Laurencia nipponica, Chondrus pinmulfatus and Mastocarpus pacificus are found on Kunashir Island only on the reef in the Pervukhina Bay. In the latter community, biomass of the calcareous red alga Corallina pilulifera is about a third of the M. pacificus biomass (Table 6).

The Neorhodomela aculeata community is widespread on Kunashir Island. Species composition of the community is fairly diverse, but sea anemone Cnidopus japonicus, the hermit crab Pagurus middendorffii, an isopod species Idotea ochotensis, and the amphipod species Ampithoe sp. and Caprella sp. mainly prevail among animals, and the red alga Rhodomela sachalinensis is abundant among macrophytes (Table 6).

Communities dominated by the green algae Ulva lactuca and Cladophora opaca + Chaetomorpha sp. are usually situated below the N. aculeata community. In the Ulva community, algae Mazzaella japonica, Sargassum miyabei, and germs of Saccharina sp. dominate, whereas in the Cladophora community, U. lactuca prevails. The most abundant invertebrates of the communities are species of gastropods Lottia persona and F. kurilensis, and an amphipod species A. kussakini (Table 8).

On the boundary between the middle and lower subzones, where reef is split by spaces filled with sand, thickets of Phyllospadix iwatensis spread out (Table 10). Among macrophytes, only the red alga C. pilulifera occurs, and species composition of animals is very diverse in this belt-forming community. However, biomass of animal species does not exceed 4% of the total macrobenthic biomass. Numerous species of polychaetes (Chone teres, Nereis vexillosa, Naineris jacutica, Nereis zonata, and others) dwell in roots and rhizomes of Phyllospadix. Species of gastropods Nucella heyseana, Epheria turrita, Halconchona minor, Mitrella burchardi,
and some others, species of bivalves Protophaca euglypta, Mysella kurilensis litoralis, and Turtonia minuta, the isopod species I. ochotensis, Holotelson tuberculatus, Gnorimosphaeroma noblei, and Cleantiella isopus, the amphipod species Pontogena sp., Pontogena kondakovi, and others, sea urchin Strongylacentrotus intermedius, sea anemone C. japonicus, the hermit crab P. midendorffii, chiton Boreochiton granulatus, and the many other groups of invertebrates also can be found in the Phyllospadix beds.

The lower intertidal subzone: in the upper part of this subzone, the Sargassum miyabei and Scytosiphon lomentaria belt-forming communities with almost equal the total macrobenthic biomass (about 4500 g wet wt m$^{-2}$) occur (Table 11). The thalli of Sargassum provide habitats for a diverse fauna (species of gastropods Falsicingula kurilensis, Pasilina plicosa, and Volutharpa ampullacea, the helmet crab Telmessus cheiragonus, the amphipod species Ampithoe kussakini, Ampithoe sp., and Apohyale bassargini, and species of bivalves Turtonia minuta and Protophaca euglypta, and others). Among macrophytes, only the red alga Neorhodomela aculeata and the brown alga Sargassum thunbergii are found in the Sargassum community. While in the S. lomentaria community, there are many different species of algae (the green alga Ulva lactuca, the brown algae S. miyabei, Costaria costata, Chordaria flagelliformis, Saundersella simplex, and Ralfsia fungiformis, and the red algae Tichocarpus crinitus, Laurencia nipponica, Lomentaria hakodatensis, Palmaria stenogona, and Polysiphonia morrowii, and many others), although, on the whole, macrobenthos is poorer in species composition as compared to the S. miyabei community.

The community dominated by the brown macroalga Saccharina sp. forms a distinct belt just below the Sargassum and Scytosiphon belts on the side towards the open sea. Biomass of Saccharina makes up more than 99% of the total macrobenthic biomass. Only several species of animals are found, and a gastropod species F. kurilensis, an amphipod species Ampithoe volki, and polychaete Typosyllis sp. are frequently recorded in the community (Table 11).

Bouldery-sandy intertidal zone

A cape in Yuzhno-Kurilskaya Bay (location 19) is a site of scattered boulders and rocky blocks among the sand. The coast is weakly protected from wave action. The vertical distribution of the communities exhibits insignificant stratification, and patchy distribution of macrobenthos is typical for this intertidal zone. Macrobenthos is represented by a rich infauna of soft-sediment habitats, and population of hard substrata is slightly poorer than that in the rocky and rocky-bouldery intertidal zones.

The upper intertidal subzone: the barnacle community dominated by Chthamalus dalli + Semibalanus cariosus is found on the rocky blocks and boulders (Table 2). The community is characterized by fairly high biomass of macrobenthos (3425 g wet wt m$^{-2}$). Species of gastropods Littorina sitkana and Nucella heyseana, polychaete Typosyllis adamanteus, insect larvae, and other invertebrates are found, but plants are absent in the barnacle community.

The boundary between the upper and the middle subzones is occupied by the Gloiopeletis furcata + Chthamalus dalli community. A numerous amphipod species Corophium sp. and a gastropod species L. sitkana are frequently observed here (Table 3).

The middle intertidal subzone: communities dominated by the brown algae Silvetia babingtonii, Fucus evanescens, and Analipus japonicus are found on the sides of the rocky blocks and boulders. The dominant species make up not less than 90% of the macrobenthic biomass. The communities have different species compositions, but comprise only a few species. In the Silvetia community, Chthamalus dalli, Littorina sitkana, and an amphipod species Apohyale bassargini prevail. In the Fucus community, L. sitkana and an isopod species Gnorimosphaeroma noblei predominate. In the Analipus community, a gastropod species Nucella heyseana, and small specimens of polychaetes and amphipods are abundant (Table 5).

The Corallina pilulifera community can be found on the broad horizontal surfaces of boulders and rocky blocks. Biomass of the dominant species makes up about 95% of the total macrobenthic biomass. Polychaete Nereis pelagica, a gastropod species Falsicingula kurilensis, an isopod species Synidotea lata, the helmet crab Telmessus cheiragonus, and others invertebrates are abundant in the community (Table 7).
Communities dominated by the red algae Tichocarpus crinitus, Odonthalia corymbifera, and Palmaria marginicrassa are found on Kunashir Island only in the Yuzhno-Kurilskaya Bay. Young germs of Saccharina sp. are quite a few in these red algal communities. Sponge Halichondria panicea usually occurs on the boulders and the red algae and makes up about 35% of the total biomass in the O. corymbifera community. Fauna is fairly diverse in the T. crinitus community and the O. corymbifera community. Hydroids Abietinaria filicina and Eudendrium vaginatum, the amphipod species Caprella sp. and Caprella cristibrachium, the helmet crab T. cheiragonus, and other groups of invertebrates are abundant in thickets of algae. Only a few species of animals are found in the P. marginicrassa community, however (Table 7).

Among communities of the red algae, there is the Mazzaella parksii community with fairly high species richness. Species of gastropods Lottia persona, F. kurilensis, and L. sitkana, hydroid Obelia longissima, polychaete N. pelagica, an amphipod species A. bassargini, species of bivalves Panomya sp., Musculus laevigatus, and Turtonia minuta mainly prevail. Among algae, only C. pilulifera is observed (Table 7).

Communities dominated by the green algae can be found in spaces between patches of the red algae. In the Blidingia minima community, macrobenthos is poor (only the brown alga Analipus japonicus and barnacle Ch. dalli can be frequently found). In the Chaetomorpha melagonium community and the Ulva lactuca community, fauna also represents by a few species (Table 8).

Colonies of hydroid Abietinaria filicina are anchored to the surfaces of boulders and rocky blocks shaded from sunlight. Only young germs of Saccharina sp. occur in the Abietinaria filicina community among macrophytes (Table 9). Among animals, a gastropod species Lottia pelta, ascidians, bryozoans Cryptosula zavjalovenisis and Celleporella hyalina, sea anemone Cnidopus japonicus, and polychaete N. pelagica are dominated. Besides A. filicina, hydroids Abietinaria thuiairoides, H. lucium, Eudendrium vaginatum, Sertularia robusta, Campanularia volubilis, and others can be found in this community. Numerous sedentary polychaetes Sabellidae are found attached to the undersides of boulders in the tide puddles. In this community, polychaete Naineris jactuca and sea anemone Oulactis orientalis are dominated, and plants are absent.

On the boundary between the middle and lower subzones, Phyllospadix iwatensis forms the dense beds on the sand among the rocky blocks and boulders (Table 10). Most animals inhabit rhizomes and roots of Phyllospadix. Sea anemone O. orientalis, polychaetes N. jactuca, Chone teres, Eudistylia suavis, Nereis vexillosa, and Pseudopotamilla occelata, species of gastropods N. heyseana and L. sitkana, and the helmet crab T. cheiragonus prevail quantitatively.

The lower intertidal subzone: the Saccharina sp. belt stretches in this subzone. The total biomass of the Saccharina community is more than 100 kg wet wt m$^{-2}$, and the dominant species makes up more than 99% of the community biomass (Table 11). Polychaetes (Nereis pelagica, Chone sp., and others), sea spiders, hydroids Eudendrium vaginatum and Campanularia volubilis are found in holdfasts of Saccharina, whereas amphipods (Parallorchestes ochotensis, Apohyale bassargini, and others) inhabit thalli of the alga.

Sandy intertidal zone

A beach in Izmeny Bay (location 10) is protected from a strong wave action. Species diversity is poorer as compared to that in the many other areas studied. At the Golovino Village, the intertidal zone is exposed to domestic sewage and wastewater from seafood processing.

The upper intertidal subzone: macrobenthos is not found here.

The middle intertidal subzone: it is occupied by the belt-forming community dominated by a gastropod species Batillaria cumingii. This community includes only several animal species, and the dominant species makes up about 90% of the macrobenthic biomass (Table 12).

The lower intertidal subzone: areas from the lowest part of the middle to the upper part of the lower intertidal subzones are occupied by the belt-forming community dominated by the eelgrass Zostera japonica. Macrobenthos is fairly rich. Infaunal bivalve mollusk Ruditas philippinarum, polychaetes Nereis vexillosa and Abarenicola pacifica, and also epifaunal sea snails Batillaria cumingii and Nassarius fraterculus are the most abundant in the Zostera beds (Table 12). Eelgrass beds also provide shelter for shallow-water fish.
Opisthocentrus ocellatus.

The Zostera marina belt is widespread in the lower part of the lower subzone. R. philippinarum is dominated by biomass among animals (Table 12). Polychaetes (Alitta brandti, Naineris jacutica, Glycinde armigera, Chone sp., Nereis pelagica, and others), which are found burrowing into sand or dwelling in roots of eelgrass, prevail in the species composition of the Z. marina community. On leaves of Zostera, species of gastropods Lirularia iridescens, Cerithiopsis stejnegeri, and Pusilina plicosa dwell, and B. cumingii and Nassarius multigranosus live on the sand flat.

Tide pool

Cape Rogacheva (location 23): the middle subzone: on a flat reef, there is a tide pool about 20 m diameter and about 30 cm depth, separated from the open sea by a rocky terrace and protected from a strong wave action. The vertical stratification of communities is observed only on the walls of the tide pool, whereas the communities may exhibit a patchy distribution on a bottom of the tide pool.

At the level of boundary of transition of the walls of the tide pool into the top part of reef, the belt-forming community dominated by Littorina sitkana and the Chthamalus dalli + Littorina sitkana community occur (Table 13). Species composition of animals composes of a few species, and algae are not found in these communities. The red alga Gloiopeltis furcata community is situated along the edge of the tide pool, below belts of Littorina and Chthamalus.

A belt of fucoids with more diverse species composition than in communities of top of the tide pool is situated below the G. furcata community, on the walls of the pool and scattered boulders along the pool’s walls. In the Silvetia babingtonii community with the rare patches of Fucus evanescens, biomass of algae is many times higher than the animal biomass, and the dominant species makes up more than 97% of the total biomass of macrobenthos (Table 14). Just below the S. babingtonii community, the Fucus evanescens community occurs. Macrobenthic species of the communities are diverse (species of gastropods L. sitkana, Nucella freycinetii, Lottia persona, Mitrella burchardi, and others, an amphipod species Apohyale bassargini, barnacle Ch. dalli, a bivalve mollusk Mytilus trossulus kussakini, the hermit crab Pagurus middendorfii, the isopod species Gnorimosphaeroma noblei and Idotea ochotensis, and other invertebrates). L. sitkana dominates among animals. A community dominated by the brown alga Analipus japonicus occurs below the fucoid belt.

Macrobenthos with mix of various species is typical for the bottom of the tide pool. Seagrasses, the red and green algae are dominant. A total projective cover of bottom by Corallina and Phyllospadix estimated visually is up to 90%. The calcareous red alga Corallina pilulifera community forms a dense carpet on the bottom of the pool. Corallina makes up about 95% of the total macrobenthic biomass (Table 15). In addition to quantitatively recorded species, the red algae Halosaccion hydrophorum and Corallina officinalis, the brown alga Leathesia marina, the green alga Ulva lactuca, and others are also found in the Corallina community. The animal biomass is almost twenty times less than the plant biomass. Mollusks Falsicingula kurilensis and Littorina sitkana are the most numerous dwellers. The Phyllospadix iwatensis community is typical for sites of the sand accumulation on the rocky substratum. The dominant species makes up about 95% of the total macrobenthic biomass (Table 15). Animals are diverse, but many species have a low biomass in this community. Both infaunal animals (polychaetes Naineris jacutica, Nereis pelagica, Lumbrineris japonica, and others, sipunculid worm Phascolosoma (Physcosoma) agassizii, species of nemerteans Tubulanus punctatus, and a bivalve mollusk Protothaca euglypta) and epifaunal forms (the helmet crab Telmessus cheiragonus, the hermit crabs Pagurus middendorfii, Pagurus hirsutiusculus, and Pagurus brachiomastus, the wrinkled crab Dermaturnus manditii and the king crab Paralithodes brevipes, species of gastropods Mitrella burchardi, Buccinum mirandum mirandum, and others, sea anemone Cnidopus japonicus, sponge Halichondria panicea, chiton Boreochiton granulatus, Pantopoda, and many other invertebrates) can be found in this community.

The red algae communities Neodilsea yendoana, Pterosiphonia bipinnata, Neorhodomela aculeata + Neorhodomela oregona, and Mazzaella parksi exhibit patchy distributions. In the communities, flora is composed of only several species, whereas fauna is very diverse (Table 16). In the N. yendoana community,
an isopod species *Idotea ochotensis*, an amphipod species *Apohyale bassargini*, and the hermit crab *Pagurus middendorfii* are frequently found. In the *P. bipinnata* community, barnacle *Chthamalus dalli*, polychaete *N. pelagica*, an isopod species *Cliamenella fraudatrix*, the amphipod species *A. bassargini* and *Pontogeneia* sp. are the most numerous species. Dominance of *Pontogeneia* sp. and mollusks *Littorina sitkana* and *Nucella heyseana* is typical for the *N. aculeata + N. oregona* community, whereas *A. bassargini* and mollusks *Hiatella arctica*, *L. sitkana*, and *Falsicingula kurilensis* prevail in the *M. parksi* community. *Chaetomorpha linum* and *Chaetomorpha melagonium* are dominant species in the communities of the green algae. Though the total biomasses are different in the communities, species compositions of macrobenthos are almost identical. Abundant animal species include *L. sitkana*, *A. bassargini*, and *F. kurilensis* (Table 16). On the seaside of the tide pool, at the edge of the terrace, *Alaria ochotensis* forms the dense beds. Macrobenthos of this belt-forming community is rather diverse in species composition (Table 11). Barnacles *Semibalanus cariosus* and *Chthamalus dalli*, species of gastropods *Nucella freycinetii*, *Lottia pelta*, and *Littorina sitkana*, species of bivalves *Mytilus trossulus kussakini* and *Hiatella arctica*, an amphipod species *Parallorchestes ochotensis*, and polychaete *Nereis pelagica* are the most abundant animals in the community. Many the red algae species (*Pterosiphonia bipinnata*, *Mazzaella parksii*, *M. japonica*, *Constantinea subulifera*, *Neoptilota asplenioides*, *Mastocarpus pacificus*, *Masudaphycus irregularis*, *Odonthalia annae*, and others) vegetate on the seaside of the rock reef.

**Discussion**

**Biogeographical composition of macrobenthos**

In the intertidal zones of Kunashir Island, 164 plant and 399 animal species are found. Red algae dominate among plants, and polychaetes, species of gastropods, and the amphipod species prevail among animals. Biogeographical composition of macrobenthos is typical for low-boreal subregion of the Pacific boreal region. Low-boreal and widespread boreal species are mainly dominant (on the eastern coast – 18 and 46% (1951–1964), 15 and 48% (1987–1991), respectively; on the western coast – 22 and 42% (1951–1964), 22 and 48% (1991), respectively; on the southern coast – 24 and 32% (1951–1991), respectively). After the mid-20th century, the proportions of cold-water species (boreal-Arctic and high-boreal species) of the total number of species found on the eastern and western coasts of Kunashir Island declined as compared to those of 1991 by 3–4%, that can be attributed to the consequences of global warming. At the same time, percentage of warm-water species (low-boreal species and species distributed from tropical or subtropical regions to low-boreal waters) decreased by 5% on the eastern coast. It should be noted increase of amount of geographically widespread species (species are able to tolerate a wide range of temperature conditions) by 4–8% on both the eastern and western coasts of Kunashir Island (Fig. 2).

Biogeographical structure of macrobenthos on various coasts of Kunashir Island is somewhat different. Warm-water species are more abundant in the intertidal zones of Izmeny Bay and the Sea of Okhotsk coast as compared to those of the Pacific coast of Kunashir Island (low-boreal and tropical/subtropical-low-boreal species make up in sum 28 (1951–1964) and 23% (1987–1991) of the total number of species found on the eastern coast, 33 (1951–1964) and 32% (1991) – on the western coast, and 42% (1951–1991) – on the southern coast of Kunashir Island). This fact is related to the circulation of waters of the Soya Warm Current (SWC). Flows of SWC distribute off the Sea of Japan through La Pérouse/Soya Strait in the south part of the Sea of Okhotsk, flowing southeastward along the Hokkaido coast and South Kurile Islands with a maximum influx during summer and a minimum influx during winter (Takizawa, 1982; Ohshima et al., 2001; Matsuyama et al., 2006), giving warm-water features to the intertidal biota of Kunashir Island, especially its southern and western coasts (Bobkov, 2004). One minor branch of SWC flows near Cape Shiretoko through Kunashirskiy/Nemuro Strait and Izmeny Strait/Notsuke Channel out to the Pacific Ocean, but does not pass in
Yuzhno-Kurilskiy/Southern Kuril Strait. The other minor branch, passing through Ekateriny Strait/Kunashiri Channel, fills only the most northern part of Yuzhno-Kurilskiy Strait and also enters the Pacific Ocean. Perhaps this could explain why SWC may have no significant environmental impact on the biogeographical composition of the intertidal macrobenthos on the Pacific coast of Kunashir Island.

**Figure 2.** Biogeographical structures of macrobenthos in the intertidal zones of Kunashir Island. 1 – relatively cold-water high-boreal and boreal-Arctic species, 2 – widespread boreal species and species common in both subtropical and boreal waters, 3 – low-boreal species, 4 – widespread species, 5 – subtropical-low-boreal, tropical-low-boreal, and tropical-subtropical species. The branches of the Soya Warm Current are shown by arrows; the total number species are shown in the center of the circles.
The summer sea surface temperature (SST) is important factor determining distribution of marine organisms on the shelf of the Kurile Islands, including the intertidal zone. During winter, latitudinal gradients of the SST are smoothed, and the February isotherms of −1...1°C of SST pass throughout the entire Kurile Ridge, from the south to north (Atlas of Sakhalin Region, 1967), so, in winter, the temperature conditions of the South Kurile Islands are approximately equal with those of the North Kurile Islands. In July–October, the SWC becomes fully developed and approaches the South Kurile Islands, whereas during the other months, the SWC is weak. Besides, in winter, Yuzhno-Kurilskiy Strait is filled with cold waters of the Sea of Okhotsk and Oyashio Current (Takizawa, 1982; Bobkov, 2004). Thus, changes in the proportion of cold- and warm-water species take place in accordance with variations of the long-term mean SST in the intertidal zones of the Kurile Islands during a warm season (Kussakin, 1975, 1976). The maximal number of warm-water species had been found in Izmeny Bay (42% in total, see Fig. 2), that conforms to peculiarities of hydrological conditions of the area (SST reaches 27°C in August), while not more than 33 and 28% warm-water species inhabit the western and eastern coasts of Kunashir Island, respectively. The number of cold-water species (boreal-Arctic and high-boreal species) is not very different on the coasts and makes up to 8, 9, and 11% on the southern, western and eastern coasts of Kunashir Island, respectively.

Occurrence of a large number of warm-water sea stars (Aphelasterias japonica, Lethasterias fuscus, Distolasterias elegans, Lysastrosoma anthosticta, and others) is a peculiar feature of the western coast of Kunashir Island (see Appendix). The other warm-water species of animals, such as the isopod species Dynoides dentisinus and Tylos granuliferus, species of bivalves Decorifer matusimanus and Teredo navalis, and sea cucumber Apostichopus japonicus are also found only here. Among warm-water algae, tropical-low-boreal the belt-forming species Sargassum thunbergii occurs only in the intertidal zones of the western coast of Kunashir Island. The maximal number of species of subtropical- and tropical-low-boreal complexes is found on the southern coast, in the Izmeny Bay intertidal zone. The brown algae of Sargassaceae, Sargassum pallidum and Stephanocystis hakodatensis, the hippolytid shrimps Eualus leptognathus and Spirontocaris ochotensis mororani, the isopod species Paranthura japonica and Cymodoce japonica, mollusks Notoacmea concinna, N. schrenckii, Littorina brevicula, Macoma incongrua, and Nuttallia obscurata, and sea star Asterina pectinifera are found only in Izmeny Bay. Some of species are the dominant species in communities, for instance, subtropical-low-boreal Batillaria cumingii, on the southern coast Kunashir Island.

Among Decapoda, Isopoda, Echinodermata, and Mollusca, the number of warm-water species (subtropical-, tropical-low-boreal, and low-boreal species) is about 50% (see Appendix), because these more or less motile invertebrates probably can overwinter migrating from the intertidal zone to deeper water. Warm-water species are absent altogether among Bryozoa, and there are very few of these species among Porifera, Hydrozoa, and also macrophytes, i.e., sessile organisms. Kunashir Island probably is the northern border of distribution of many warm-water intertidal species of macrobenthos in the Far Eastern Seas (Kussakin, 1956).

**Distribution of macrobenthos**

On Kunashir Island, the vertical distribution pattern of macrobenthos is typical for that of a low-boreal intertidal zone with a maximum tidal range about 1.5–1.8 m. As a rule, poor, almost devoid of vegetation, communities dominated by Chthamalus dalli and Littorina sitkana, sometimes having a belt-like distribution pattern, are typical for the upper subzone of the rocky and bouldery intertidal zones. The Gloiopeltis furcata community can be found on the boundary of the upper and middle subzones.

Fucoid assemblages develop in the middle subzone. The upper part of this subzone is occupied by the Silvetia babingtonii community, often forming a belt, and below it, patches of the Fucus evanescens community are found. The F. evanescens community does not form its own belt, in contrast to the S. babingtonii community. The macrobenthic biomass in the communities can reach more than 25 kg wet wt m$^{-2}$. The other algal communities can be found in the lower part of the middle intertidal subzone. The Corallina
Macrobenthos in the Intertidal Zone of Kunashir Island

*Pilulifera* community often occurs in the puddles of residual tidal water and on the bottom of the tide pools. The diverse communities dominated by the red algae (*Neorhodomela aculeata*, *Mazzella parksi*, *Laurencia niponica*, *Chondrus pinnulatus*, *Mastocarpus pacificus*, *Tichocarpus crinitus*, *Odonthalia corymbifera*, *Palmaria marginacrasssa*, and others) and the green algae (*Chaetomorpha moniliger*, *Ch. melagonium*, *Ulva lactuca*, *Cladophora opaca*, *Blidingia minima*, and others) form mosaics of patches among of fucoids and *Corallina*. The *Anatifus japonicus* community is also typical for the middle intertidal subzone. The *Phyllospadix iwatensis* community, with a diverse animal population due to a large number of infaunal forms, occurs in sites where rocky bottom is split by spaces filled with sand or inhabits soft-sediment substrata between boulders. The *C. pilulifera* and *Ph. iwatensis* thickets are also extended to the lower intertidal subzone.

In 1951, on the rocky sites of the eastern coast of Kunashir Island, the belt-forming community dominated by the red alga *Neosiphonia japonica* was distinguished in the lower part of the upper intertidal subzone and in the middle intertidal subzone, and the belt-forming community dominated by the brown alga *Chordaria chordaeformis* was observed in the middle intertidal subzone and in the upper part of the lower intertidal zone. At the same time, only patches of the *Ch. chordaeformis* community or some small solitary bushes of the alga were seen on the rocky surfaces of the western coast of Kunashir Island (Kussakin, 1956, 1977).

Large laminarian algae, especially *Alaria ochotensis* and *Saccharina* sp., form the dense beds in both the lower intertidal subzones and subtidal fringe, mainly on the eastern coast of Kunashir Island. In these communities, the total macrobenthic biomass can reach 100 kg wet wt m$^{-2}$. At the same time, communities dominated by the brown algae *Sargassum miyabei*, *S. thunbergii*, and *Scyotosiphon lomentaria* with rather high species richness prevail in the intertidal zones of the western coast of Kunashir Island. In 1963–1964, in the lower intertidal subzone, the belt-forming community dominated by *Neorhodomela aculeata* + *Phyllospadix iwatensis* was observed on rocks split by spaces filled with sand, on coast of Sea of Okhotsk, and the *Arthrothamnus bifidus* + *Odonthalia floccosa* belt was found in the bouldery intertidal zone, on the Pacific coast of Kunashir Island (Kussakin and Tarakanova, 1977). In some areas, where the rocky and bouldery intertidal zones undergo the abrasive effects of winter ice, and perennial species cannot survive (including brown macroalgae of Laminariales), in summer, an annual green alga *Acrosiphonia duriuscula* develops (Kussakin et al., 1974; Kussakin and Tarakanova, 1977). In the lower subzone of the bouldery intertidal zone, the communities are often distributed in a form of patches, and, on the whole, the vertical stratification of the communities is less marked, than in the rocky subzone, although, the dominant species of the lower intertidal communities are basically similar on both rocks and boulders.

The sandy intertidal zone differs from the rocky and bouldery intertidal sites by the macrobenthic composition and distribution. On sandy beaches exposed to wave action and composed of clean, perfectly sorted sand, communities are usually poor, macrophytes and the other attached forms are absent. The upper part of such beaches and supratidal zone are inhabited by the amphipods, mainly by Talitridae, a mysid *Analipus japonicus*, polychaete *Abarenicola pacifica*, nemerteans, and others), but its biomass reaches 1 kg m$^{-2}$, mainly due to development of mollusk *S. sachalinensis*. Fauna of silted-sandy beaches of the western and eastern coasts of Kunashir Island is like that of the sandy intertidal zone (Kussakin, 1956; Kussakin and Tarakanova, 1977). In the silted-sandy and sandy intertidal zones of Izmeny Bay, there are the communities dominated by *Zostera japonica* and *Batillaria cumingii*, which are not found in the other locations of Kunashir Island.

In the tide pools, a belt distribution of communities is observed only on the walls of the pools, whereas a patchy distribution of communities is typical for the bottom of the these pools. The tide pools are characterized by a high level of biodiversity of macrobenthos due to development of a complex of organisms, which is typical in both the lower intertidal subzone and subtidal zone (diverse red algae, brown algae of Laminariales and Sargassaceae, surfgrass *Phyllospadix iwatensis*, sponges *Halichondria panicea* and...
Sycettusa nemurensis, hydroids Abietinaria inconstans, A. filicina, Eudendrium vaginatum, Sertularella spinosa, and Sertularia similis, sea slug Coryphella athadona, bryozoans Tricellaria ternata and Celleporella hyalina, sea stars Asterina pectinifera, Aphetelastias japonica, Leptasterias (Eoleptasterias) kussakini, and L. (E.) similispinis, sea urchin Strongylocentrotus intermedius, and others invertebrates, diverse ascidians and fishes).

In areas of gasohydrothermal vents, there are some changes in the qualitative and quantitative composition of the intertidal macrobenthos as compared to other areas of Kunashir Island. The intertidal macrobenthos of the Goryachiy Plyazh is under the influence of the thermal springs of Mendeleeva Volcano. The springs are observed among the rocks, boulders, and sand as the seeps of a hot water (up to 80°C) containing hydrogen sulfide. The macrobenthos is absent in the sites directly influenced by high temperature (above 40°C) and impoverished in the vicinity of the gasohydrothermal vents and seeping volcanic waters. Two tide pools up to 1.5 m depth with seeps of volcanic fluid and a sulfuric acid stream are on the Goryachiy Plyazh. In one of the pools (sea water temperature is 5°C in March and 25°C in October), there are only a few species of macrobenthos: algae Chaetomorpha melagonium covering with thick layer of diatoms, and Fucus evanescens, barnacles Semibalanus cariosus and Chthamalus dalli, sea anemone Diadumene lineata, and the isopod species Synidotea lata and Tecticeps glaber. But a population density of D. lineata reaches above 2000 individuals m⁻². In the others areas of Kunashir Island, D. lineata is not found. In the tide pool with the sea water temperature from 25°C to 60°C in different seasons, macrobenthos is absent, and only the algal-bacterial mats covered the walls of the pool are near hydrothermal vents (see Plates 12, 13). In the stream-bed, only the solitary algae F. evanescens and Ulva prolifera dwell. At the same time, there are no marked changes of the intertidal communities in the sites of volcanic springs characterized by the sea water temperature below 10–15°C and, in general, the species composition and distribution of the intertidal biota are ordinary for the rocky intertidal zones of Kunashir Island (Kostina, 1991).

**Long-term changes of macrobenthos in Izmeny Bay**

In 1991, survey of the intertidal zone was carried out in Izmeny Bay in 1.5 km eastward of Golovino Village in one of the same transect as in 1963. In 1963, most of the middle intertidal subzone was occupied by the belt-forming community dominated by a bivalve mollusk Ruditapes philippinarum with biomass of the dominant species 114 g wet wt m⁻², and species of gastropods Batillaria cumingii and Neptunea arthritica, and a bivalve mollusk Macoma incongrua were the subdominant species (about 60–85 g wet wt m⁻²). In 1991, B. cumingii became the dominant species of the community (445.6 g wet wt m⁻²), and biomass of R. philippinarum reduced seven times as compared to 1963 (15.6 g wet wt m⁻²). Besides, a reduction of species richness took place in this community (in 1963 – 11 species, in 1991 – 5). In 1991, biomass of macrobenthos increased to a third of that observed in the 1963 in this community (329.0 g wet wt m⁻² and 503.6 g wet wt m⁻² in 1963 and 1991, respectively). Polychaetes Abarenicola pacifica and Hediste japonica were found in this community only in 1991.

In 1963, 26 macrobenthic species were found in the Zostera japonica belt-forming community, whereas in 1991 there were only 20 species. Besides, the brown alga Chordaria sp., the amphipod species Allorchestes malleolus, Ampithoe sp., and Lepidepecreum sp., an isopod species Gnirimosphaeroma noblei, gastropod species Falsicingula kuriensis, and a bivalve mollusk Turtonia minuta were found only in 1991. Biomass of macrobenthos increased in this community in 1991 as compared to 1963 (1280.5 g wet wt m⁻² and 1942.1 g wet wt m⁻² in 1963 and 1991, respectively).

In both 1963 and 1991, 15 plant and animal species were found in the Zostera marina belt-forming community. However, there were only six mutual species: eelgrass Z. marina, species of gastropods Batillaria cumingii and Nassarius multigranosus, a bivalve mollusk Macoma incongrua, and polychaetes Nereis vexillosa and Abarenicola pacifica. Some species of polychaetes (Alitta brandti, Naineris jacutica, Glycine armigera, Chone sp., and Nereis pelagica) and two species of gastropods (Cerithiopsis stejnegeri and Pusillina plicosa) were found only in 1991. Biomass of macrobenthos increased a little bit in this community (2384.0 g wet wt m⁻² and 2808.3 g wet wt m⁻² in 1963 and 1991, respectively).
The intertidal zone is exposed to wastewater from seafood processing and domestic sewage near Golovnino Village. Over 30 years, the quantitative and qualitative changes of the intertidal biota took place in this area. After 1963, the species richness of macrobenthos reduced, and changes in the species composition of communities occurred, whereas the total macrobenthic biomass increased in the communities. It fully conforms to the observed earlier tendency on the other South Kurile Islands, when eutrophication of biotopes takes place and increase of the total macrobenthic biomass is observed, and at the same time, species richness steadily declines under the effect of weak and moderate organic pollutions (Kussakin and Tsurpalo, 1999).

Figure 3. Dendrogram of similarity in the macrobenthic species composition between studied intertidal locations of Kunashir Island. Group A – southern coast: subgroup I includes beach eastward of Golovnino Village (10a – 1951–1963, 10b – 1991) and the northern part of Veslovskoe Lake (11); subgroup II includes Cape Veslo (14) and eastern coast of Veslovskiy Peninsula (15); subgroup III includes Cape Paltusov (7), beach eastward of Cape Paltusov (8), beach westward of Golovnino Village (9), Veslovskoe Lake (12), and western coast of Veslovskiy Peninsula (13). Group B – western (W) and eastern (E) coasts: subgroup I includes Golovnina Bay (21 – Cape Yuzhno-Kurilskiy and 22 – Cape Sukacheva); subgroup II includes Sernaya Bay (3) and Alekhina Bay (4 – boulders, 5 – rocks, and 6 – rocky blocks and boulders); subgroup III includes Sernovodskaya Bay (16 – Cape Chetverikova and 17 – Cape Vodopadnyy) and northeastern part of Yuzhno-Kurilskaya Bay (20); subgroup IV includes Goryachiy Plyazh (18), central part of Yuzhno-Kurilskaya Bay (19), and Cape Rogacheva (23); subgroup V includes Pervukhina Bay (1) and reef southward of Cape Kruglyy (2).
Comparative remarks

The sampling locations of the Kunashir Island intertidal zones are combined in two major groups by similarity of the macrobenthic species composition. The first major group (group A) comprises all locations of the silted-sandy and sandy intertidal zones in Izmeny Bay on the southern coast of Kunashir Island. Locations of the western and eastern coasts characterized mainly by the intertidal zones of hard substrata are combined in the second major group (group B) (Fig. 3).

Group A is further divided into three distinct subgroups. Subgroup I includes locations of the most inner part of Izmeny Bay (1.5 km eastward of Golovnino Village and the northernmost part of Veslovskoe Lake (lagoon) on Veslovskiy Peninsula). These sites are characterized by a weak wave action, silted sand covered gravel, admixute of H$_2$S in the sand, seawater freshening, and very wide belt dominated by eelgrasses Zostera japonica and Z. marina with a rather rich composition of animals and plants in the lower part of middle intertidal subzone and lower intertidal subzone. On beach, 1.5 km eastward of Golovnino Village, the macrobenthic species compositions of 1951–1963 and that of 1991 are combined together, although the species richness of macrobenthos reduced in 1991 as compared to 1963.

In locations westward of Golovnino Village up to the Cape Paltusov and on the western coast of Veslovskiy Peninsula, including most part of Veslovskoe Lake, i.e., towards the westernmost and southernmost coasts of Izmeny Bay (subgroup III), the seagrass communities gradually disappear in the intertidal zone and spread in the upper subtidal zone probably due to increasing wave action, decreasing silting of sands, and various other factors affecting the intertidal biota. However, settlements of Zostera can be found in lagoon of Cape Paltusov and Veslovskoe Lake (Kussakin, 1956; Kussakin and Tarakanova, 1977). In locations of subgroups I and III, macrobenthos is not found in most of the upper intertidal subzone, only associations dominated by the gastropod species Batillaria cumingii and Littorina sitkana, and barnacle Chthamalus dalli sometimes occur. Westward of Golovnino Village and on the southwestern coast of Veslovskiy Peninsula, where the Zostera belt spreads in the upper subtidal zone, community dominated by the green alga Ulva linza can be found in the middle intertidal subzone and the upper part of the lower intertidal subzone.

Locations of subgroup II (Cape Veslo and eastern coast of Veslovskiy Peninsula) are wave-exposed sandy beaches composed of clean sand, sometimes with admixute of gravel. The macrobenthic species composition is poor and uniform here. These locations are wholly devoid of any intertidal macrophytes and inhabited by mainly motile small crustaceans (the mysid, isopod, and amphipod species) and polychaetes, dwelling, as a rule, in the supratidal zone (Kussakin, 1956; Kussakin and Tarakanova, 1977).

Group B includes the eastern and western coasts of Kunashir Island often exposed to wave action (especially eastern coast). Communities dominated by Chthamalus dalli and Littorina sitkana are typical for the upper intertidal subzone, and communities dominated by fucoid algae (Silvetia babingtonii and Fucus evanescens) and the brown alga Analipus japonicus prevail in the middle intertidal subzone on the eastern and western coasts. Five subgroups characterized by certain species compositions of macrobenthos can be distinguished within group B. Locations of subgroup I are entrance rocky capes of Golovnina Bay on the eastern coast of Kunashir Island. However, entrance capes of Sernovodskaya Bay (Cape Vodopadnyy and Cape Chetverikova), also located on the eastern coast of Kunashir Island, are combined with the northeastern part of Yuzhno-Kurilskaya Bay (subgroup III), because at Cape Vodopadnyy and in the northeastern part of Yuzhno-Kurilskaya Bay, sampling was carried out in the bouldery intertidal zones with underlying sand. In locations of subgroups I and III, the belt-forming communities dominated by the red alga Corallina pilulifera and seagrass Phyllospadix iwatensis are widespread throughout the lower intertidal subzones, and laminarian algae are poorly developed. Moreover, sedentary and sessile forms (many species of mollusks (Littorina sitkana, L. squalida, Falsicingula kuriensis, Nassarius fraterculus, Buccinum mirandum mirandum, and others), tube-building polychaete worms (Circeis spirlillum, Eudistylia suavis, and others), sea anemones (Oulactis orientalis and Charisea saxicola), and others) predominate on the rocky reefs in Golovnina Bay (Cape Yuzhno-Kurilskiy and Cape Sukacheva) and on Cape Chetverikova (Sernovodskaya Bay). At Cape
Vodopadnyy of Sernovodskaya Bay and in the northeastern part of Yuzhno-Kurilskaya Bay, there are both animals inhabiting boulders (chiton *Mopalia schrencki*, polychaetes *Lepidonotus squamatus* and *Harmothoe imbricata*, shield limpet *Lottia pelta*, crude whelk *Buccinum percrassum*, sea snail *Mitrella burchardi*, a bivalve mollusk *Prothaca euglypta*, sponge *Halichondria panicea*, and diverse sea anemones) and infaunal invertebrates, as a rule, polychaetes (many species of *Nereis*, *Cirratulus cirratus*, *Capitella capitata*, *Eulalia viridis*, *Autolytus cateriniae*, and *Proceraea prismatic*) (Kussakin and Tarakanova, 1977).

Subgroup IV comprises various locations of the Pacific coast of Kunashir Island (disposed close to each other, rocky intertidal zone of Goryachiy Plyazh and blocky-bouldery intertidal zone of central part of Yuzhno-Kurilskaya Bay, and also tide pool on rocky reef of Cape Rogacheva) probably due to the fact that they are inhabited by organisms characteristic mainly for hard substrata. Besides, unlike subgroups I and III, laminarian algae, mainly *Alaria ochotensis* and *Saccharina* sp., form extensive belts in the lower intertidal subzones of locations of subgroup IV.

Subgroup II comprises all the sampling locations of Alekhina and Sernaya bays disposed close to each other on the western coast of Kunashir Island and characterized mainly by hard substrata in the upper part of the intertidal zone and spread of sands in the lower part of the intertidal zone. Besides, this area is under the influence of solfataric-hydrothermal springs of the Golovnina Volcano (Alekhinskaya groups of thermal springs), some of which issue on the Sea of Okhotsk coast of Kunashir Island (Zharkov, 2014). Subgroup V includes rocky reef of Pervukhina Bay and reef southward of Cape Kruglyy on the western coast of Kunashir Island. In the lower intertidal subzones, the belt dominated by large laminarian algae is almost absent on the western coast of Kunashir Island, with the exception of some locations (for example, in Pervukhina Bay). The lower intertidal subzone of Alekhina and Sernaya bays are occupied by the red alga *Neorhodomela aculeata* community (Kussakin and Tarakanova, 1977), and the communities dominated by the brown algae *Sargassum miyabei*, *S. thunbergii*, and *Scytosiphon lomentaria* are widespread in Pervukhina Bay and on the reef southward of Cape Kruglyy.

The intertidal biota of Kunashir Island has many common features with that of the neighboring Shikotan Island by composition and patterns of distribution of the macrobenthic communities. The maximal similarity can be observed between the eastern coast of Kunashir Island and the northwestern coast of Shikotan Island, however, some distinctions can be made between patterns of macrobenthic communities of these islands. So, the belt-forming community dominated by the brown algae *Chordaria chordaeformis* do not occurs on Shikotan Island. The brown alga *Saundersella simplex*, that is epiphyte on *Ch. chordaeformis*, *Scytosiphon lomentaria*, and *Analipus japonicus*, common on the Sea of Okhotsk coast of Kunashir Island, was not found on Shikotan Island, but also it was observed neither on the Pacific coast of Kunashir Island nor in Izmeny Bay. The brown seaweed *Fucus evanescens* often forms dense belts on the coasts of Shikotan Island with a weak wave exposure, whereas in similar biotopes of Kunashir Island, *Fucus* shows patchy distribution pattern. Contrariwise, the *Silvetia babingtonii* belt-forming community is more distributed on Kunashir Island than on Shikotan Island. The soft crab *Hapalogaster grebnitzkii* is frequently found in the rocky intertidal zone of Shikotan Island and is not found on Kunashir Island, while porcelain crab *Pachycheles stevensii*, rock crab *Cancer gibbosulus*, and an isopod species *Cleantiella isopus* are found on hard substrata of Kunashir Island and are not found on Shikotan Island (Kussakin, 1956, 1977).

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Table 1. Sampling locations in the intertidal zones of Kunashir Island.

| N  | Location                                           | Latitude, N°  | Longitude, E°  | Substratum                                                                 | Month (or season), year                                      | Number of transects |
|----|----------------------------------------------------|---------------|---------------|---------------------------------------------------------------------------|-------------------------------------------------------------|---------------------|
| 1  | Northern part of Pervukhina Bay                    | 44.074647     | 145.745755    | Rocky reef with scattered boulders                                       | July 1991                                                   | 1                   |
| 2  | 1 km southward of Cape Krugly                       | 43.996992     | 145.650139    | Rocky reef                                                                | July 1991                                                   | 1                   |
| 3  | Northern part of Sernaya Bay                        | 43.955560     | 145.591243    | Rocky reef; sand in the lower part of the intertidal zone                | Summer 1964 (Kussakin, Tarakanova, 1977)                    | 1                   |
| 4  | Northern part of Alekhina Bay                       | 43.921864     | 145.533807    | Boulders; sand in the lower part of the intertidal zone                  | June–August 1951, December 1954, Summer 1964 (Kussakin, 1957; Kussakin, Tarakanova, 1977) | 1                   |
| 5  | Northern part of Alekhina Bay                       | 43.919628     | 145.528356    | Rocky reef; boulders in the upper part and sand in the lower part of the intertidal zone | June–August 1951, Summer 1964 (Kussakin, 1957; Kussakin, Tarakanova, 1977) | 1                   |
| 6  | Nameless cape in the southern part of Alekhina Bay  | 43.912284     | 145.509677    | Rocky blocks and boulders                                                | June–August 1951 (Kussakin, 1957)                          | 1                   |
| 7  | Cape Paltusov                                       | 43.723973     | 145.443117    | Sandy-silted beaches                                                     | June–August 1951 (Kussakin, 1956, 1957)                    | 3                   |
| 8  | 3.5 km eastward of Cape Paltusov, Izmeny Bay        | 43.729067     | 145.474101    | Gravelly beach with admixture of sand and shell; silted sand in the lower part of the intertidal zone | June–August 1951 (Kussakin, 1957)                          | 2                   |
| 9  | 0.5 km westward of Golovnino Village in Izmeny Bay  | 43.735021     | 145.510750    | Sandy beach; silted sand in the lower part of the intertidal zone        | June–August 1951, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977) | 1                   |
| 10 | 1.5 km eastward of Golovnino Village in Izmeny Bay  | 43.732680     | 145.542164    | Sandy beach with admixture of shell, gravel and silt                    | June–August 1951, December 1954, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977), July 1991 | 2 (1951–1963) and 1 (1991) |
| 11 | Northern part of Veslovskoe Lake (lagoon) on Veslovskiy Peninsula, Izmeny Bay | 43.730994 | 145.550695 | Sand with admixture shell in the upper part, silted sand in the middle part, and silted sand with admixture of shell and gravel in the lower part of the intertidal zone | June–August 1951, December 1954, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977) | 4                   |
| 12 | Head of Veslovskoe Lake (lagoon) on Veslovskiy Peninsula, Izmeny Bay | 43.701971 | 145.549391 | Silt, occasional silted sand                                              | June–August 1951, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977) | 1                   |
| N   | Location                                                                 | Latitude, N° | Longitude, E° | Substratum                                              | Month (or season), year                                                                                       | Number of transects |
|-----|--------------------------------------------------------------------------|--------------|---------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------|
| 13  | Western coast of Veslovskiy Peninsula, Izmeny Bay                        | 43.683971    | 145.536205    | Sandy beach with admixture of gravel and shell          | June–August 1951, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977)                           | 3                   |
| 14  | Cape Veslo                                                              | 43.653363    | 145.544831    | Sandy beach; sand with admixture of gravel in the lower part of the intertidal zone | June–August 1951 (Kussakin, 1956, 1957)                                                                      | 2                   |
| 15  | Eastern coast of Veslovskiy Peninsula, Yuzhno-Kurilskiy Strait           | 43.709665    | 145.559433    | Sandy beach; gravel in the lower part of the intertidal zone | June–August 1951 (Kussakin, 1956, 1957)                                                                      | 2                   |
| 16  | Sernovodskaya Bay, Cape Chetverikova                                    | 43.884122    | 145.623848    | Rocky reef                                             |                                                 | 1                   |
| 17  | Sernovodskaya Bay, Cape Vodopadnyy                                      | 43.907625    | 145.669853    | Sandy beach with the rare boulders                     | June–August 1951, Summer 1964 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977)                           | 1                   |
| 18  | Nameless Plyazh (Hot Beach)                                             | 43.992298    | 145.798745    | Rocky reef with scattered boulders                      | October 1987, March 1988 (Kostina, 1991)                                                                     | 1                   |
| 19  | Nameless cape in central part of Yuzhno-Kurilskaya Bay, 5 km southwesterly of Cape Zavodskoy | 44.015185    | 145.813708    | Rocky blocks and boulders on sandy beach               | July 1991                                                                                                    | 1                   |
| 20  | Northeastern part of Yuzhno-Kurilskaya Bay                              | 44.028451    | 145.854392    | Scattered boulders on the silted sand with admixture of shell | June–August 1951, January 1955, Summer 1963 (Kussakin, 1956, 1957; Kussakin, Tarakanova, 1977)               | 3                   |
| 21  | Golovnina Bay, Cape Yuzhno-Kurilskiy                                    | 44.021152    | 145.877268    | Rocky reef                                             | June–August 1951, July, December 1954, January 1955, Summer 1963 (Kussakin, 1957; Kussakin, Tarakanova, 1977) | 3                   |
| 22  | Golovnina Bay, Cape Sukacheva                                          | 44.070554    | 145.874329    | Rocky reef                                             | June–August 1951, Summer 1963 (Kussakin, 1957; Kussakin, Tarakanova, 1977)                                 | 2                   |
| 23  | Cape Rogacheva                                                          | 44.183787    | 146.045066    | Rocky reef                                             | August 1991                                                                                                  | 1                   |
Table 2. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos in the upper intertidal subzone on the rocky, rocky-bouldery, and blocky-bouldery substrata.

| Taxa                       | Taxonomic group* | Pervukhina Bay (location 1) | Cape Kruglyy (location 2) | Yuzhno-Kurilskaya Bay (location 19) |
|----------------------------|------------------|-----------------------------|---------------------------|-------------------------------------|
|                            | N    | B    | N    | B    | N    | B    | N    | B    | N    | B    |
| ANIMALS                    |      |      |      |      |      |      |      |      |      |      |
| Littorina sitkana          | Ga   | 6700 | 45.0 | 5200 | 30.8 | 91700| 5260.0| 5800 | 27.0 | 5750 | 76.5 |
| Chthamalus dalli           | Ci   | –    | –    | 5700 | 170.0| 900  | 10.0  | 5400 | 125.0 |       |      |
| Semibalanus cariosus       | Ci   | –    | –    | –    | –    | –    | –    | –    | –    | 300  | 895.0|
| Nucella heyeana            | Ga   | –    | –    | –    | –    | –    | –    | –    | –    | 100  | 70.0 |
| Falsiclingula kurilensis   | Ga   | +    | +    | –    | –    | 2100 | 15.0 | –    | –    | 50   | 0.4  |
| Lottia personna            | Ga   | –    | –    | –    | –    | –    | –    | –    | 300  | 15.0 | –    |
| Lottia pelta               | Ga   | –    | –    | –    | –    | 100  | 7.0  | –    | –    | –    | –    |
| Gnorimosphaeroma noblei    | Is   | –    | –    | –    | –    | 800  | 7.0  | –    | –    | –    | –    |
| Serpulidae                 | Po   | –    | –    | –    | –    | –    | –    | 5.2  | –    |       |      |
| Insecta (larvae)           | In   | –    | –    | –    | –    | –    | –    | –    | –    | 600  | 5.0  |
| Polychaeta                 | Po   | –    | –    | –    | –    | –    | –    | –    | –    | 150  | 4.0  |
| Typosyllis adamanteus      | Po   | –    | –    | –    | –    | –    | –    | –    | –    | 50   | 1.5  |
| Clamenella fraudatrix      | Is   | –    | –    | –    | –    | –    | 200  | 0.2  | –    | –    |      |
| Amphipoda                  | Am   | –    | –    | –    | –    | –    | –    | –    | –    | 50   | 0.1  |
| Total biomass              |      | 45.0 | 200.8| 5299.0| 242.4| 3425.0|      |      |      |      |      |

*See Tables 2–16: Och – Ochrophyta, Rh – Rhodophyta, Ch – Chlorophyta, Tra – Tracheophyta, Hy – Hydrozoa, Ac – Actiniaria, Ne – Nemertea, Po – Polychaeta, Si – Sipuncula, Pa – Pantopoda, Ci – Cirripedia, Am – Amphipoda, Cu – Cumacea, De – Decapoda, Is – Isopoda, Le – Leptostraca, In – Insecta, Pol – Polyplacophora, Ga – Gastropoda, Bli – Bivalvia, Bry – Bryozoa, As – Asciidiacea. The sign “+” designates species found within the limits of a considered community, but their abundance is not registered; the sign “–” means that species is not found.
Table 3. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos on the boundary between the upper and middle intertidal subzones, on the rocky and blocky-bouldery substrata. Abbreviations of taxonomic groups as in Table 2.

| Taxa                     | Taxonomic group | Cape Kruglyy (location 2) | Yuzhno-Kurilskaya Bay (location 19) |
|--------------------------|----------------|--------------------------|-------------------------------------|
|                          |                | N  | B  | N   | B  |
| **PLANTS**               |                |    |    |     |    |
| Gloiopeltis furcata      | Rh             | 805.0 |   | 1184.0 |   |
| Analipus japonicus       | Och            |   | –  | 140.0 |   |
| Total biomass of plants  |                | 805.0 |   | 1324.0 |   |
| **ANIMALS**              |                |    |    |     |    |
| Chthamalus dalli         | Ci             |   | –  | –    | 14880 | 928.0 |
| Falsicungula kurilensis  | Ga             | 44700 | 195.0 | 40 | 0.2 |
| Littorina sitkana        | Ga             | 8200 | 110.0 | 840 | 2.0 |
| Lottia persona           | Ga             | 200 | 15.0 | –    | –    |
| Nucella heyseana         | Ga             | 100 | 7.0 | –    | –    |
| Apohyale bassargini      | Am             | 900 | 3.0 | –    | –    |
| Nassarius fraterculus    | Ga             | 100 | 2.0 | –    | –    |
| Corophium sp.            | Am             | –  | –  | 2120 | 2.0 |
| Ampithoe kussakini       | Am             | 100 | 1.8 | –    | –    |
| Turtonia minuta          | Bi             | –  | –  | 40   | 0.3 |
| Pontogeneia sp.          | Am             | 200 | 0.2 | –    | –    |
| Total biomass of animals |                | 334.0 |   | 932.5 |   |
| Total biomass            |                | 1139.0 |   | 2256.5 |   |
Table 4. Density (N, individuals m\(^{-2}\)) and biomass (B, g wet wt m\(^{-2}\)) of macrobenthos in the middle intertidal subzone on the rocky and rocky-bouldery substrata in the brown algae communities. Abbreviations of taxonomic groups as in Table 2.

| Taxa                          | Taxonomic group | Pervukhina Bay (location 1) | Silvetia babingtonii belt | Fucus evanescens patches | Cape Kruglyy (location 2) | Silvetia babingtonii belt | Fucus evanescens + Silvetia babingtonii patches | Analipus japonicus patches |
|-------------------------------|-----------------|-----------------------------|---------------------------|--------------------------|---------------------------|---------------------------|--------------------------------|---------------------------------|
| PLANTS                        |                 |                             |                           |                          |                           |                           |                                  |                                 |
| Fucus evanescens             | Och             | 71.6                        | 3232.0                    |                           |                           | 10440.0                   |                                  |                                 |
| Silvetia babingtonii         | Och             | 1508.0                      |                            |                           |                           | 5512.8                    | 5680.0                           |                                 |
| Analipus japonicus           | Och             |                            |                            |                           |                           |                           |                                  |                                 |
| Cladophora opaca             | Ch              | 21.6                        | 76.8                      |                           |                           |                           |                                  |                                 |
| Chaetomorpha moniligeria     | Ch              |                            |                            |                           |                           |                           |                                  |                                 |
| Corallina pilulifera         | Rh              |                            |                            |                           |                           |                           | 8.8                              |                                 |
| Ulva lactuca                 | Ch              | 4.0                         | 5.2                       |                           |                           |                           |                                  |                                 |
|                             |                 |                             |                           |                           |                           |                           |                                  |                                 |
| Total biomass of plants      |                 |                             |                            |                           |                           |                            | 16128.8                          | 820.0                           |
| ANIMALS                      |                 |                             |                           |                          |                           |                           |                                  |                                 |
| Littorina sitkana            | Ga              | 440                         | 3.2                       | 520                       | 6.0                       | 1840                      | 280.0                           | 41120                           | 1388.8                           | 1000                           | 24.0                           |
| Falsicina kurilensis         | Ga              | 1680                        | 5.2                       | 6920                      | 22.0                      | 160                       | 0.4                             | 119240                          | 428.8                           | 3100                           | 10.0                           |
| Nassarius fruteculus         | Ga              |                            |                            |                           | 120                       | 12.0                      | 36.8                            | 1320                            | 66.0                             |                                 |
| Nuceella heyseana            | Ga              |                            |                            |                           |                           |                           | 8.8                             | 40                              | 32.0                             |                                 |
| Serpulidae                   | Po              |                            |                            |                           |                           |                           |                                  |                                 |
| Lottia pelta                 | Ga              |                            |                            |                           |                           |                           |                                  |                                 |
| Lottia persona               | Ga              |                            |                            |                           |                           |                           |                                  |                                 |
| Chthamalus dalli             | Ci              |                            |                            |                           |                           |                           |                                  |                                 |
| Apohyale bassargini          | Am              |                            |                            |                           |                           |                           |                                  |                                 |
| Amphiope kussakinii          | Am              |                            |                            |                           |                           |                           |                                  |                                 |
| Turtonia minuta              | Bi              | 360                         | 1.2                       | 320                       | 0.8                       |                           |                                  |                                 |
| Spasskogammarus spasskii     | Am              |                            |                            |                           |                           |                           |                                  |                                 |
| Clamenella fraudatrix        | Is              |                            |                            |                           |                           |                           |                                  |                                 |
| Lottia ochracea              | Ga              | 40                          | 0.4                       |                           |                           |                           |                                  |                                 |
| Parallorchestes ochotentosis | Am              |                            |                            |                           |                           |                           |                                  |                                 |
| Allorchestes malleolus       | Am              |                            |                            |                           |                           |                           |                                  |                                 |
|                             |                 |                             |                           |                           |                           |                           |                                  |                                 |
| Total biomass of animals     |                 |                             |                           |                           |                           |                           |                                  |                                 |
| Total biomass                |                 |                             |                           |                           |                           |                           |                                  |                                 |
Table 5. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos in the middle intertidal subzone on the blocky-bouldery substratum in the brown algae communities. Abbreviations of taxonomic groups as in Table 2.

| Taxa                        | Taxonomic group | Yuzhno-Kurilskaya Bay (location 19) |       |       |       |       |
|-----------------------------|----------------|------------------------------------|-------|-------|-------|-------|
|                             |                | Silvetia babingtonii               | N     | B     | N     | B     |
| PLANTS                      |                | belt                               |       |       |       |       |
| Silvetia babingtonii        | Och            | 25080.0                            |       |       |       |       |
| Fucus evanescens            | Och            | –                                 |       | 16264.0 |       |       |
| Analipus japonicus          | Och            | –                                 |       | –     |       | 1400.0 |
| Total biomass of plants     |                | 25080.0                            |       | 16264.0 |       | 1400.0 |
| ANIMALS                     |                |                                    |       |       |       |       |
| Chthamalus dalli            | Ci             | 4640                               | 224.0 | –     | –     | –     |
| Nucella heyseana            | Ga             | +                                 | +     | +     | +     | 100   | 158.0 |
| Littorina sikana            | Ga             | 280                                | 18.0  | 160   | 2.4   | –     | –     |
| Apohyale bassargini         | Am             | 440                                | 18.0  | –     | –     | 100   | 0.5   |
| Nereis pelagica             | Po             | –                                 | –     | –     | –     | 300   | 12.4  |
| Amphipoda                   | Am             | –                                 | –     | 120   | 4.8   | –     | –     |
| Typosyllis adamanus         | Po             | –                                 | –     | –     | –     | 300   | 4.8   |
| Polychaeta                  | Po             | 80                                 | 3.2   | –     | –     | –     | –     |
| Corophium sp.               | Am             | –                                 | –     | –     | –     | 1600  | 2.0   |
| Gnorimosphaeroma noblei     | Is             | –                                 | –     | 160   | 0.4   | –     | –     |
| Ansola angustata            | Ga             | 40                                 | 0.2   | –     | –     | –     | –     |
| Halocynthia minor           | Ga             | –                                 | –     | 80    | 0.2   | –     | –     |
| Total biomass of animals    |                | 263.4                              | 7.8   | 177.7 |
| Total biomass               |                | 25343.4                            | 16271.8 | 1577.7 |
Table 6. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos in the middle intertidal subzone on the rocky and rocky-bouldery substrata in the red algae communities. Abbreviations of taxonomic groups as in Table 2.

| Taxa                          | Taxonomic group | Pervukhina Bay (location 1) | Cape Kruglyy (location 2) |
|-------------------------------|-----------------|-----------------------------|---------------------------|
|                               |                 | Neorhodomela aculeata patches | Laurencia nipponica patches | Chondrus pinnulatus patches | Mastocarpus pacificus patches | Corallina pilulifera belt | Neorhodomela aculeata patches |
|                               |                 | N  | B  | N  | B  | N  | B  | N  | B  |
| PLANTS                        |                 |    |    |    |    |    |    |    |    |
| Laurencia nipponica           | Rh              |    |    | 3024 |    |    |    |    |    |
| Chondrus pinnulatus           | Rh              |    | 2888 |    |    |    |    |    |    |
| Neorhodomela aculeata         | Rh              | 2748 |    |    |    |    |    |    |    |
| Corallina pilulifera          | Rh              | 14  |    |    |    | 114 | 1530 |    |    |
| Mastocarpus pacificus         | Rh              |    |    |    |    | 309 |    |    |    |
| Rhodoma sachalinensis         | Rh              | 780 |    |    |    |    |    |    |    |
| Sargassum miyabei             | Och             | 144 | 94.4 | 15.2 |    |    |    |    | 211 |
| Neorhodomela munita           | Rh              |    |    |    |    |    |    | 149.5 |    |
| Ulva lactuca                  | Ch              |    | 122.4 |    |    |    |    |    |    |
| Neorhodomela oregena          | Rh              |    | 100.4 |    |    | 6.4 |    |    |    |
| Sphacelaria rigida           | Och             |    | 76 |    |    |    |    |    |    |
| Lithophyllum tumidulum        | Rh              |    | 56 |    |    |    |    |    |    |
| Punctaria parataxia          | Och             |    | 56 |    |    |    |    |    |    |
| Phyllospadix iwatensis        | Tra             |    | 16 |    |    |    |    |    |    |
| Cladophora opaca             | Ch              |    |    |    |    | 3.2 |    |    |    |
| **Total biomass of plants**  |                 | 3686 | 3529.2 | 2919.2 | 433.2 | 1530 | 1474.5 |    |    |
| ANIMALS                      |                 |    |    |    |    |    |    |    |    |
| Falsicingula kurilensis      | Ga              | 80  | 0.3 | 360 | 1.2 |    | 2040 |    | 6  |
| Nassarius fraterculus        | Ga              |    |    |    |    |    | 2400 | 97 | 820 |
| Littorina sitiaka            | Ga              | 480 | 2.9 |    |    |    | 5400 | 95 | 240 |
| Crinopus japonicus           | Ac              | 80  | 36  |    |    |    |    |    |    |
| Pagurus midualiordfii        | De              | 80  | 24.4 |    |    |    |    |    | 140 |
| Ampithoe kussakini           | Am              | 80  | 0.5 |    |    |    | 40  | 0.1 | 2200 |
| Nucella heyseaena            | Ga              |    |    |    |    |    |    |    | 120 |
| Paralarorchestes ochotensis  | Am              | 80  | 0.3 |    |    |    | 120 | 0.4 | 1500 |
| Idotea ochotensis            | Is              | 760 | 8   | 40  | 0.4 |    |    |    |    |
| Taxa                  | Taxonomic group | Pervukhina Bay (location 1) | Cape Krugly (location 2) |
|----------------------|----------------|-----------------------------|-------------------------|
|                      |                | Neorhodomela aculeata patches | Laurencia nipponica patches | Chondrus pinnulatus patches | Mastocarpus pacificus patches | Corallina pilulifera belt | Neorhodomela aculeata patches |
|                      |                | N | B | N | B | N | B | N | B | N | B |
| Polychaeta           | Po             | - | - | - | - | - | - | - | - | 300 | 8 |
| Amphipoda            | Am             | - | - | - | - | 400 | 4.8 | - | - | - | - |
| Ampithoe sp.         | Am             | 1080 | 4 | 120 | 0.1 | - | - | 80 | 0.4 | - | - |
| Caprella sp.         | Am             | 1120 | 1.7 | 40 | 0.3 | 640 | 3.2 | - | - | - | - |
| Actiniaria           | Ac             | - | - | - | - | 40 | 2.8 | - | - | - | - |
| Lottia pelta         | Ga             | - | - | - | - | - | - | - | - | 20 | 2.4 |
| Pontogeneia sp.      | Am             | 400 | 0.8 | 680 | 1.6 | - | - | - | - | 200 | 1.3 |
| Orchomene sp.        | Am             | - | - | - | - | - | - | - | - | - | - |
| Schizoplas brandii   | Pol            | - | - | - | - | 40 | 0.4 | - | - | 100 | 1 |
| Telmessus cheiranus  | De             | - | - | - | - | - | - | - | - | 20 | 1 |
| Ampithoe lacertosa   | Am             | 120 | 0.9 | - | - | - | - | - | - | 100 | 0.8 |
| Turtonia minuta      | Bi             | 120 | 0.4 | 160 | 0.8 | - | - | 160 | 0.8 | - | - |
| Corophium sp.        | Am             | - | - | - | - | - | - | - | - | 100 | 0.8 |
| Caprella irregularis | Am             | 120 | 0.6 | - | - | - | - | - | - | - | - |
| Caprella cristibrachium | Am         | - | - | 240 | 0.5 | - | - | - | - | 140 | 0.4 |
| Cianemella fraudatrix| Is             | - | - | - | - | - | - | - | - | 100 | 0.5 |
| Caprella bipinosa    | Am             | - | - | - | - | - | - | - | - | 50 | 0.2 |
| Nereis zonata        | Po             | - | - | - | - | - | - | - | - | 60 | 0.2 |
| Holotelson tuberculatus | Is           | - | - | - | - | - | - | - | - | 20 | 0.2 |
| Ischyrocerus cristatus | Am       | - | - | - | - | - | - | - | - | 120 | 0.2 |
| Pleusymtes sp.       | Am             | - | - | - | - | - | - | - | - | 100 | 0.2 |
| Atylus ekmani        | Am             | - | - | 120 | 0.2 | - | - | - | - | - | - |
| Pantopoda            | Pa             | - | - | - | - | - | - | - | - | 20 | 0.2 |
| Gnorimosphaeroma nobelie | Is       | 40 | 0.2 | - | - | - | - | - | - | - | - |
| Ischyrocerus sp.     | Am             | - | - | - | - | - | - | - | - | 20 | 0.1 |
| Metopa sp.           | Am             | 40 | 0.1 | - | - | - | - | - | - | - | - |
| Total biomass of animals |             | 81.1 | 5.5 | 10.8 | 7.7 | 372.2 | 154.2 |
| Total biomass        |                | 3767.1 | 3535.7 | 2930 | 441.9 | 1902.2 | 1628.7 |
Table 7. Density (N, individuals m⁻²) and biomass (B, g wet wt m⁻²) of macrobenthos in the middle intertidal subzone on the blocky-bouldery substratum in the red algae communities. Abbreviations of taxonomic groups as in Table 2.

| Taxa                        | Taxonomic group | Yuzhno-Kurilskaya Bay (location 19) |
|-----------------------------|-----------------|-------------------------------------|
|                             |                 | Corallina pilulifera patches         |
|                             |                 | Tichocarpus crinitus patches         |
|                             |                 | Odonthalia corymbifera patches       |
|                             |                 | Palmaria marginicrassa patches       |
|                             |                 | Mazzaella parksii patches            |
| PLANTS                      |                 | N B N B N B N B N B N B N B N B     |
| Tichocarpus crinitus        | Rh              | – 7444.0 – – –                       |
| Mazzaella parksii           | Rh              | – 182.0 – – 4848.0                  |
| Odonthalia corymbifera      | Rh              | – 3200.0 85.0 – – –                  |
| Corallina pilulifera        | Rh              | 1560.0 – – – – – – – – – – – – –     |
| Palmaria marginicrassa      | Rh              | – – 915.0 – – – – – – – – – – – – – |
| Saccharina sp.              | Och             | – 2840.0 236.0 42.0 – – – – – – –  |
| Chondrus pinnulatus         | Rh              | – – – 47.0 – – – – – – – – – – – – |
| Odonthalia ochotensis       | Rh              | – 18.8 – – – – – – – – – – – – –   |
| Total biomass of plants     |                 | 1560.0 10484.8 3436.0 1090.0 5442.0 |
| ANIMALS                     |                 |                                    |
| Halichondria panicea        | Sp              | – – – – – – – – – – – – – – – – –   |
| Bryozoa                     | Bry             | – – – 752.0 – – – – – – – – – – –  |
| Lottia persona              | Ga              | – – – – – – – – – – – – – – – – –  |
| Obelia longissima           | Hy              | – – – – – – – – – – – – – – – – –  |
| Abietinaria filicina        | Hy              | – – 60.0 – – – – – – – – – – – –  |
| Nacella heysea              | Ga              | 100 12.0 40 57.6 – – – – – – – – – |
| Nereis pelagica             | Po              | 1000 30.0 – – – – – – – – – – – – |
| Eudendrium vaginatum        | Hy              | – – 20.0 1.2 – – – – – – – – – – |
| Falsicingula kurilensis     | Ga              | 3600 11.0 40 0.1 – – – – – – – – – |
| Caprella sp.                | Am              | – – 2280 9.2 80 0.2 – – – – – – – |
| Synidotea lata              | Is              | 100 8.3 – – – – – – – – – – – – – |
| Telmessus cheiragonus       | De              | 300 7.0 40 0.8 240 8.0 – – – – – – |
| Apohyale bassargini         | Am              | – – 40 0.4 + + – – – – – – – – – |
| Turtonia minuta             | Bi              | 100 0.5 – – – – – – – – – – – – – |
| Littorina sitkana           | Ga              | – – – 40 0.8 – – – – – – – – – – |
| Musculus laevigatus         | Bi              | – – – – – – – – – – – – – – – – – |
| Panomya sp.                 | Bi              | – – – – – – – – – – – – – – – – – |

Abbreviations of taxonomic groups as in Table 2.
| Taxa                                      | Taxonomic group | Yuzhno-Kurilskaya Bay (location 19) |
|-------------------------------------------|-----------------|-------------------------------------|
|                                           |                 | Corallina pilulifera patches        |
|                                           |                 | Tichocarpus crinitus patches        |
|                                           |                 | Odonthalia corymbifera patches      |
|                                           |                 | Palmaria marginicrassa patches      |
|                                           |                 | Mazzaella parksi patches            |
|                                           |                 | N                         | B       | N   | B       | N   | B       | N   | B       |
| Idotea ochotensis                         | Is              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Typosyllis adamanteus                     | Po              | 100                      | 2.5     | –   | –       | –   | –       | –   | –       |
| Cliamenella fraudatrix                    | Is              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Modiolus kurilensis                       | Bi              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Lyonsia sp.                               | Bi              | 200                      | 2.1     | –   | –       | –   | –       | –   | –       |
| Sertularia robusta                        | Hy              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Naineris jacutica                         | Po              | –                        | –       | –   | –       | –   | 40      | 2.0 | –       |
| Sabellidae                                 | Po              | 100                      | 1.0     | 40  | 2.0     | –   | –       | –   | –       |
| Allorchestes malleolus                    | Am              | –                        | –       | –   | –       | 40  | 2.0     | –   | –       |
| Pantopoda                                  | Pa              | 200                      | 0.5     | 40  | 0.3     | 280 | 0.8     | 100 | 1.0     |
| Coryphella athadoma                       | Ga              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Orchomenella sp.                          | Am              | 100                      | 0.8     | –   | –       | –   | –       | –   | –       |
| Hiatella arctica                          | Bi              | –                        | –       | –   | –       | –   | –       | –   | 40      | 0.8 |
| Parallorchestes ochotensis                | Am              | –                        | –       | –   | 200     | 0.8 | –       | –   | –       |
| Nereis sp.                                | Po              | 100                      | 0.6     | –   | –       | –   | –       | –   | –       |
| Caprella cristiibrachium                  | Am              | –                        | –       | –   | 520     | 0.2 | 280     | 0.6 | –       |
| Haloconcha minor                          | Ga              | –                        | –       | –   | –       | –   | 100     | 0.5 | –       |
| Ampithee sp.                              | Am              | –                        | –       | 40  | 0.4     | –   | –       | –   | –       |
| Abietinaria thuiarioides                  | Hy              | –                        | –       | –   | –       | –   | –       | –   | –       |
| Jassa marmorata                           | Am              | –                        | –       | 40  | 0.3     | 40  | 0.1     | –   | –       |
| Pontogenia sp.                            | Am              | –                        | –       | 40  | 0.2     | 40  | 0.1     | –   | –       |
| Isopoda                                   | Is              | –                        | –       | –   | 40      | 0.1 | –       | –   | –       |
| Mytilus trossulus kussakini               | Bi              | 100                      | 0.1     | –   | –       | –   | –       | –   | –       |
| Total biomass of animals                   |                 | 76.4                     | 152.4   | 3031.0 | 2.5 | 257.8 |
| Total biomass                             |                 | 1636.4                   | 10637.2 | 6467.0 | 1092.0 | 5699.8 |
Table 8. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos in the middle intertidal subzone on the rocky, rocky-bouldery, and blocky-bouldery substrata in the green algae communities. Abbreviations of taxonomic groups as in Table 2.

| Taxa               | Taxonomic group | Pervukhina Bay (location 1) | Cape Krugly (location 2) | Yuzhno-Kurilskaya Bay (location 19) |
|--------------------|-----------------|-----------------------------|--------------------------|-----------------------------------|
|                    |                 | Ulva lactuca patches        | Cladophora opaca + Chaetomorpha sp. patches | Chaetomorpha moniligera patches | Chaetomorpha melagonium patches | Bidingia minima patches | Ulva lactuca patches |
| PLANTS             |                 | N  | B | N  | B | N  | B | N  | B | N  | B | N  | B | N  | B |
| Chaetomorpha melagonium | Ch   | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ulva lactuca       | Ch             | 632.0 | 190.0 | -- | -- | 1097.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Chaetomorpha moniligera  | Ch  | -- | -- | -- | -- | 465.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Cladophora opaca   | Ch             | -- | -- | 335.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Bidingia minima    | Ch             | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chaetomorpha sp.   | Ch             | -- | -- | 290.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Devaleraea sp.     | Rh             | -- | -- | -- | -- | -- | -- | -- | 250.0 | -- | -- | -- | -- | -- |
| Mazzaella japonica | Rh             | 100.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Analipus japonicus | Och            | -- | -- | -- | -- | 122.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Saccharina sp.     | Och            | 116.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sargassum miyabei  | Och            | 80.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cladophora speciosa| Ch             | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Corallina pilulifera | Rh   | 14.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total biomass of plants |         | 942.4 | 815.0 | 467.0 | 1367.0 | 412.0 | 742.0 | 9100.0 | 100.0 | 300 | 35.0 | -- | -- | -- |
| ANIMALS            |                 | N  | B | N  | B | N  | B | N  | B | N  | B | N  | B | N  | B |
| Chthamalus dalli   | Ci             | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lottia persona    | Ga             | -- | -- | 600 | -- | 32.0 | -- | 1000 | 10.0 | 300 | 35.0 | -- | -- | -- |
| Falsicingula kurilensis | Ga | 520 | 2.8 | 2900 | 5.0 | 6700 | 30.0 | -- | -- | -- | -- | -- | -- | -- |
| Nucella heyeana   | Ga             | -- | -- | 300 | -- | 24.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Telmessus cheiragonus | De  | 40 | 2.0 | -- | -- | 100 | 7.0 | 400 | 20.0 | -- | -- | -- | -- | -- |
| Nassarius fraterculus | Ga | -- | -- | -- | -- | 400 | 18.0 | -- | -- | -- | -- | -- | -- | -- |
| Littorina sikana   | Ga             | -- | -- | 300 | -- | 10.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Amphipoe kussakini | Am             | 80 | 0.4 | 1100 | 6.0 | 200 | 3.0 | -- | -- | -- | -- | -- | -- | -- |
| Amphipoe tarasovi | Am             | 80 | 2.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Corophium sp.     | Am             | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lottia pelta      | Ga             | -- | -- | -- | -- | 100 | 2.0 | -- | -- | -- | -- | -- | -- | -- |
| Spionidae         | Po             | -- | -- | -- | -- | 100 | 1.0 | -- | -- | -- | -- | -- | -- | -- |
| Turtonia minuta   | Bi             | 80 | 0.4 | 300 | 1.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Clamenea fraudatrix | Is  | -- | -- | -- | -- | 200 | 1.0 | -- | -- | -- | -- | -- | -- | -- |
| Amphipoda         | Am             | -- | -- | -- | -- | 400 | 0.6 | -- | -- | -- | -- | -- | -- | -- |
| Pantopoda         | Pa             | -- | -- | -- | -- | 100 | 0.5 | -- | -- | -- | -- | -- | -- | -- |
| Idotea ochotensis | Is             | -- | -- | -- | -- | 100 | 0.5 | -- | -- | -- | -- | -- | -- | -- |
| Amphipoe sp.      | Am             | 80 | 0.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total biomass of animals |         | 8.3 | 44.0 | 92.0 | -- | 22.0 | 13.6 | 37.5 | -- | -- | -- | -- | -- | -- |
| Total biomass     |               | 950.7 | 859.0 | 559.0 | 1389.0 | 425.6 | 779.5 | -- | -- | -- | -- | -- | -- | -- |
Table 9. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos on the boundary between the middle and lower intertidal subzones, on the blocky-bouldery substratum. Abbreviations of taxonomic groups as in Table 2.

| Taxa | Taxonomic group | Yuzhno-Kurilskaya Bay (location 19) | Abietinaria filicula settlings |
|------|----------------|------------------------------------|------------------------------|
|      |                | Sabellidae                         | Abietinaria filicula         |
|      |                | N                                | B                            |
|      |                | N                                | B                            |
| PLANTS |                | Saccharina sp. Och                | 350.0                        |
|       |                | Total biomass of plants           | 350.0                        |
| ANIMALS |                | Sabellidae Po 9350               | 20700.0                      |
|       |                | –                                | –                            |
|       |                | Naineris jacutica Po 8900        | 1395.0                       |
|       |                | –                                | –                            |
|       |                | Abietinaria filicula Hy          | 1169.0                       |
|       |                | –                                | –                            |
|       |                | Lottia pelta Ga –                | 200                          |
|       |                | 363.0                            |
|       |                | Ascidiacea As –                  | 163.0                        |
|       |                | Oulactis orientalis Ac 100       | 153.0                        |
|       |                | –                                | –                            |
|       |                | Celleporella hyalina Bry –       | 149.0                        |
|       |                | Cnidopus japonicus Ac –          | 88.5                         |
|       |                | Syllis hyalina Po 100             | 100                          |
|       |                | 3.2                              |
|       |                | 500                              |
|       |                | 8.8                              |
|       |                | Nereis pelagica Po 200            | 17.8                         |
|       |                | 500                              |
|       |                | 8.8                              |
|       |                | Nereis zonata Po 400              | 16.2                         |
|       |                | 500                              |
|       |                | 8.8                              |
|       |                | Eteone longa Po 100               | 3.2                          |
|       |                | 100                              |
|       |                | 1.0                              |
|       |                | Syllis hyalina Po 100             | 1.4                          |
|       |                | 100                              |
|       |                | 0.4                              |
|       |                | Apohyale bassargini Am –         | 200                          |
|       |                | 1.2                              |
|       |                | Vilasina pillula Bi –            | 100                          |
|       |                | 1.0                              |
|       |                | Abietinaria thuiarioides Hy –    | 0.7                          |
|       |                | 0.6                              |
|       |                | Halecium lucium Hy –             | 0.5                          |
|       |                | 0.2                              |
|       |                | Pantopoda Pa –                   | 300                          |
|       |                | 0.5                              |
|       |                | Eudendrium vaginatum Hy –        | 0.2                          |
|       |                | 0.5                              |
|       |                | Total biomass of animals         | 22286.6                      |
|       |                | 2091.9                           |
|       |                | Total biomass                    | 22286.6                      |
|       |                | 2441.9                           |
Table 10. Density (N, individuals m\(^{-2}\)) and biomass (B, g wet wt m\(^{-2}\)) of macrobenthos on the boundary between the middle and lower intertidal subzones, on the sandy substratum. Abbreviations of taxonomic groups as in Table 2.

| Taxa                        | Taxonomic group | Pervukhina Bay (location 1) | Cape Kruglyy (location 2) | Yuzhno-Kurilskaya Bay (location 19) |
|-----------------------------|-----------------|----------------------------|---------------------------|-------------------------------------|
|                             |                 | N  | B  | N  | B   | N  | B  |
| PLANTS                      |                 |    |    |    |     |    |    |
| *Phyllospadix iwatensis*    | Tra             | 10928.0 | 620.0 | 620.0 | 5528.0 |
| *Corallina pilulifera*      | Rh              |       |     |     |     |     |     |
| Total biomass of plants     |                 | 10928.0 | 626.0 | 5528.0 |        |
| ANIMALS                     |                 |    |    |    |     |    |    |
| *Oulactis orientalis*       | Ac              |   |    |   |     | 80 | 604.0 |
| *Naisneris jacutica*        | Po              | 80 | 24.0 | 480 | 21.4 | 5080 | 404.0 |
| *Chone teres*               | Po              | 11840 | 390.0 | 2560 | 90.0 | 6240 | 364.0 |
| *Nuella heyseana*           | Ga              | 40 | 0.8 | + | + | 80 | 130.0 |
| *Telmessus cheiragonus*     | De              | + | + | - | - | 40 | 80.0 |
| *Eudistyla suavis*          | Po              | - | - | - | - | 40 | 48.0 |
| *Nereis vexillosa*          | Po              | 40 | 31.4 | 80 | 25.5 | 120 | 35.0 |
| *Pseudopotamilla occelata*  | Po              | - | - | - | - | 40 | 34.8 |
| *Littorina sikanak*         | Ga              | - | - | - | - | 120 | 16.0 |
| *Cirratulidae*              | Po              | + | + | 240 | 11.2 | - | - |
| *Idotea ochotensis*         | Is              | 40 | 0.4 | + | + | 80 | 10.0 |
| *Nassarius fraterculus*     | Ga              | - | - | 40 | 8.0 | - | - |
| *Protothaca euglypta*       | Bi              | 40 | 8.0 | - | - | - | - |
| *Glycinde armigera*         | Po              | 40 | 6.4 | 80 | 5.6 | - | - |
| *Nereis zonata*             | Po              | 80 | 5.0 | 80 | 1.4 | - | - |
| *Eudendrium vaginatum*      | Hy              | - | - | - | - | 120 | 4.4 |
| *Eteone longa*              | Po              | - | - | - | - | 40 | 4.0 |
| *Polyxoeidae*               | Po              | + | + | - | - | 40 | 3.6 |
| *Maldanidae*                | Po              | - | - | 200 | 2.4 | - | - |
| *Capitella capitata*        | Po              | 40 | 0.4 | 120 | 2.0 | - | - |
| *Ampithoe kusakini*         | Am              | + | + | + | + | 40 | 2.0 |
| *Typosyllis adamsanteus*    | Po              | - | - | 40 | 1.2 | - | - |
| *Lumbrineris japonica*      | Po              | - | - | 40 | 1.0 | - | - |
| Taxa                                  | Taxonomic group | Pervukhina Bay (location 1) | Cape Krugly (location 2) | Yuzhno-Kurilskaya Bay (location 19) |
|---------------------------------------|-----------------|-----------------------------|--------------------------|-------------------------------------|
|                                       |                 | **Phyllospadix iwatensis**   | **Phyllospadix iwatensis** | **Phyllospadix iwatensis**          |
|                                       |                 | **belt**                    | **patches**              | **belt**                            |
|                                       |                 | N   | B   | N   | B   | N   | B   |
| Typosyllis sp.                        | Po              | –    | –    | –    | –    | 80  | 1.0 |
| Mysella kurilensis litoralis          | Bi              | 120  | 1.0   | –    | –    | –    | –    |
| Epheria turrita                       | Ga              | 40   | 0.8   | –    | –    | –    | –    |
| Pontogeneia sp.                       | Am              | 160  | 0.8   | –    | –    | –    | –    |
| Falsicingula kurilensis              | Ga              | 80   | 0.4   | –    | –    | 40   | 0.4 |
| Haloconcha minor                      | Ga              | 40   | 0.4   | –    | –    | –    | –    |
| Turtonia minuta                       | Bi              | 80   | 0.4   | –    | –    | –    | –    |
| Pontogeneia kondakovi                 | Am              | 80   | 0.3   | –    | –    | –    | –    |
| Anonyx sp.                            | Am              | 40   | 0.3   | –    | –    | –    | –    |
| Gnorimosphaeroma noblei               | Is              | 80   | 0.1   | –    | –    | 40   | 0.3 |
| Parallochrestes ochotensis            | Am              | 40   | 0.2   | +    | +    | –    | –    |
| Holotelson tuberculatus               | Is              | 40   | 0.2   | +    | +    | –    | –    |
| Syllis hyalina                        | Po              | –    | –    | –    | –    | 40   | 0.2 |
| Cleantiella isopus                    | Is              | 40   | 0.0   | –    | –    | –    | –    |
| **Total biomass of animals**          |                 | 471.3 | 169.7 | 1741.7 | 11399.3 | 795.7 | 7269.7 |
| **Total biomass**                     |                 | 11399.3 | 795.7 | 7269.7 |
### Table 11. Density (N, individuals m\(^{-2}\)) and biomass (B, g wet wt m\(^{-2}\)) of macrobenthos in the lower intertidal subzone on the rocky, rocky-bouldery, and blocky-bouldery substrata. Abbreviations of taxonomic groups as in Table 2.

| Taxa | Taxonomic group | Pervukhina Bay (location 1) | Cape Kruglyy (location 2) | Yuzhno-Kurilskaya Bay (location 19) | Cape Rogacheva (location 23) |
|------|----------------|-----------------------------|---------------------------|------------------------------------|-------------------------------|
|      |                | Sargassum miyabei belt       | Scytosiphon lomentaria belt | Saccharina sp. belt                | Sargassum miyabei belt        |
|      |                | N | B | N | B | N | B | N | B | N | B | N | B | N | B | N | B | N | B |
| PLANTS |                | Saccharina sp. | Och | – | – | – | 10280.0 | – | – | – | – | 106880.0 | + | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Alaria ochotensis | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Sargassum thunbergii | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Scytosiphon lomentaria | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | 6008.0 | – | – | – | – | – | – | – | – | – | – |
|        | Sargassum miyabei | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Neorhodomela aculeata | Rh | 200.0 | – | – | – | 644.0 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Pterosiphonia bipinnata | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Mastocarpus pacificus | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Maazzella parkii | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Corallina pilulifera | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Ulva lactuca | Ch | – | – | – | – | 24.8 | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Analipus japonicus | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Costaria costata | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Tichocarpus crinitus | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Chordaria flagelliformis | Och | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Laurencia nipponica | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Porphyra sp. | Rh | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Total biomass of plants | | 4516.0 | 4579.2 | 10280.0 | 2937.2 | 6081.6 | 106880.0 | 9669.0 | 1640.0 | 13.0 |
| ANIMALS |                | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|        | Semibalanus varians | Ci | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Chthamalus dalli | Ci | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Nucella freycinetii | Ga | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Falsicingula kurilensis | Ga | 6760 | 22.0 | 40 | 0.4 | 600 | 3.2 | 22600 | 57.9 | 16200 | 63.2 |
|        | Nassarius fraternus | Ga | 80 | 67.8 | 80 | 40 | 60 | 600 | 49.0 | 22600 | 19.4 |
|        | Eudendrium vaginatum | Hy | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Lottia pelta | Ga | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Mytilus trossulus kussakini | Bi | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Littorina sitkana | Ga | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Homalopoma sangarense | Ga | + + + + | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Parallelochus ochotensis | Am | 140 | 28.0 | 16200 | 63.2 | 22600 | 19.4 | 140 | 1.8 | 560 |
|        | Nucella keyseriana | Ga | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Apohyale bassarcuri | Am | 200 | 50.0 | 200 | 0.6 | 200 | 0.2 | 24160 | 19.4 | 120 | 0.6 |
|        | Nereis pelagica | Po | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
|        | Idotea ochotensis | Is | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – | – |

Abbreviations of taxonomic groups as in Table 2.
| Taxa                          | Taxonomic group | Pervukhina Bay (location 1) | Cape Kruglyy (location 2) | Yuzhno-Kurilskaya Bay (location 19) | Cape Rogacheva (location 23) |
|-------------------------------|-----------------|-----------------------------|---------------------------|-------------------------------------|-------------------------------|
|                               | Sargassum miyabei belt | Scytosiphon lomentaria belt | Saccharina sp. belt       | Sargassum thunbergii belt           | Alaria ochotensis belt       |
|                               | N    | B    | N    | B    | N    | B    | N    | B    | N    | B    | N    | B    | N    | B    |
| Hiatella arctica              | Bi    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Lottia persona                | Ga    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 80   | 9.2  |
| Pusilina plicosa              | Ga    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Ampithoe kussakini            | Am    | 120  | 1.0  | -    | -    | 40   | 0.2  | 440  | 7.4  | 480  | 3.5  | -    | -    | -    | -    |
| Nemertea                      | Ne    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 60   | 4.0  |
| Ampithoe sp.                  | Am    | 120  | 0.8  | -    | -    | 360  | 3.6  | -    | -    | -    | -    | -    | -    | -    | -    |
| Telmessus cheiragonus         | De    | 40   | 3.2  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Polynoidae                    | Po    | 40   | 3.0  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Ischyrocerus sp.              | Am    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 2960 | 2.7  | -    | -    | -    |
| Neris sp.                     | Po    | 40   | 2.0  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Harmothoe imbricata           | Po    | -    | -    | -    | -    | -    | -    | -    | 40   | 2.0  | -    | -    | -    | -    | -    |
| Actinidae juven.              | Ac    | 40   | 2.0  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Ciliamella fraudatrix         | Is    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 120  | 0.2  | -    | -    |
| Caprella bispinosa            | Am    | 520  | 1.3  | -    | -    | 120  | 0.5  | -    | -    | -    | -    | -    | -    | -    | -    |
| Ampithoe lacertosa            | Am    | 40   | 1.2  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Ampithoe volki                | Am    | 360  | 1.0  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Naineris jaucitica            | Po    | -    | -    | -    | -    | -    | -    | -    | -    | 20   | 0.8  | -    | -    | -    | -    |
| Turtonia minuta               | Bi    | 160  | 0.8  | -    | -    | 40   | 0.2  | -    | -    | -    | -    | -    | -    | -    | -    |
| Metopa sp.                    | Am    | -    | -    | -    | -    | -    | -    | -    | 440  | 0.8  | -    | -    | -    | -    | -    |
| Caprella cristibrachium       | Am    | 360  | 1.0  | -    | 840  | 0.7  | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Chone sp.                     | Po    | -    | -    | -    | -    | -    | -    | -    | 80   | 0.7  | -    | -    | -    | -    | -    |
| Holotelson tuberculatus       | Is    | -    | -    | -    | -    | -    | -    | -    | 360  | 0.5  | -    | -    | -    | -    | -    |
| Prothaca euglypta             | Bi    | 40   | 0.5  | -    | -    | 120  | 1.2  | 40   | 0.4  | -    | 80   | 0.1  | -    | -    | -    |
| Typosyllis sp.                | Po    | -    | -    | -    | -    | 120  | 1.2  | 40   | 0.4  | -    | 80   | 0.1  | -    | -    | -    |
| Pagurus sp. juven.            | De    | -    | -    | -    | -    | -    | -    | -    | 100  | 0.4  | -    | -    | -    | -    | -    |
| Jassa marmorata               | Am    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 60   | 0.4  | -    | -    | -    |
| Pontogonia sp.                | Am    | -    | -    | 40   | 0.2  | -    | -    | 120  | 0.3  | -    | -    | -    | -    | -    | -    |
| Caprella sp.                  | Am    | 80   | 0.1  | -    | -    | 80   | 0.2  | -    | -    | -    | -    | -    | -    | -    | -    |
| Musculista senhousia          | Bi    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 620  | 0.2  |
| Campanularia volubilis        | Hy    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 0.2  |
| Capitella capitata            | Po    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 40   | 0.2  | -    | -    | -    |
| Pleusymtes sp.                | Am    | -    | -    | -    | -    | -    | -    | -    | 80   | 0.2  | -    | -    | -    | -    | -    |
| Ischyrocerus cristatus        | Am    | 40   | 0.1  | 40   | 0.2  | -    | -    | 20   | 0.1  | -    | -    | -    | -    | -    | -    |
| Pantopoda                     | Pa    | 40   | 0.0  | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Ischyrocerus anguipes         | Am    | -    | -    | -    | 40   | 0.1  | -    | -    | -    | -    | -    | -    | -    | -    | -    |
| Corophium sp.                 | Am    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 20   | 0.0  | -    | -    | -    |
| Total biomass of animals      | 37.7  | 5.3  | 6.0  | 213.6| 131.2| 67.0  | 11185.0 | 1516.0 | 6.0  | 213.6| 131.2| 67.0  | 11185.0 | 1516.0 |
| Total biomass                 | 4553.7| 4584.5| 10286.0| 3150.8| 6212.8| 106947.0| 11185.0 | 1516.0 | 6.0  | 213.6| 131.2| 67.0  | 11185.0 | 1516.0 |
Table 12. Density (N, individuals m\(^{-2}\)) and biomass (B, g wet wt m\(^{-2}\)) of macrobenthos in the middle and lower intertidal subzones on the sandy-silted-gravelly substratum. Abbreviations of taxonomic groups as in Table 2.

| Taxa                     | Taxonomic group | Izmeny Bay (location 10)                  |
|--------------------------|-----------------|------------------------------------------|
|                          |                 | Batillaria cumingii belt                  | Zostera japonica belt | Zostera marina belt |
|                          |                 | N     | B     | N     | B     | N     | B     |
| PLANTS                   |                 |       |       |       |       |       |       |
| Zostera japonica         | Tra             | –     | –     | 1427.7| –     | 1265.6| –     |
| Zostera marina           | Tra             | –     | –     | –     | –     | 1265.6| –     |
| Chordaria sp.            | Och             | 60.0  | –     | 60.0  | –     | 60.0  | –     |
| Total biomass of plants  |                 | –     | –     | 1487.7| 1265.6| –     | –     |
| ANIMALS                  |                 |       |       |       |       |       |       |
| Batillaria cumingii      | Ga              | 1600  | 445.6 | 140   | 67.6  | 200   | 77.6  |
| Ruditapes philippinarum | Bi              | 80    | 15.6  | 30    | 342.3 | 80    | 1027.6|
| Nassarius fraterculus   | Ga              | 120   | 22.8  | 80    | 11.3  | –     | –     |
| Abarenicola pacifica     | Po              | 80    | 15.6  | 100   | 12.8  | 40    | 0.2   |
| Nereis vexilosa          | Po              | –     | –     | 140   | 14.1  | 120   | 12.8  |
| Nassarius multigranatus  | Ga              | –     | –     | –     | –     | 120   | 9.6   |
| Macoma incongrua         | Bi              | –     | –     | 30    | 2.5   | 40    | 7.6   |
| Alitta brandti           | Po              | –     | –     | –     | –     | 40    | 6.0   |
| Naiheris jacutica        | Po              | –     | –     | –     | –     | 80    | 4.6   |
| Glycinde armigeria       | Po              | –     | –     | –     | –     | 40    | 4.2   |
| Hediste japonica         | Po              | 40    | 4.0   | –     | –     | –     | –     |
| Chone sp.                | Po              | –     | –     | –     | –     | 840   | 3.6   |
| Nereis pelagica          | Po              | –     | –     | –     | –     | 120   | 2.8   |
| Grorimosphaeroma noblei  | Is              | –     | –     | 240   | 1.3   | –     | –     |
| Polychaeta               | Po              | –     | –     | 30    | 0.9   | –     | –     |
| Lepidecrecum sp.         | Am              | –     | –     | 150   | 0.7   | –     | –     |
| Turtonia minuta          | Bi              | –     | –     | 160   | 0.4   | –     | –     |
| Cerithiopsis steinigeri  | Ga              | –     | –     | –     | –     | 80    | 0.4   |
| Pusilina plicosa         | Ga              | –     | –     | –     | –     | 200   | 0.2   |
| Nereis sp.               | Po              | –     | 150   | 0.1   | –     | –     | –     |
| Ampithoe sp.             | Am              | –     | 10    | 0.1   | –     | –     | –     |
| Gastropoda jav.          | Ga              | –     | 30    | 0.1   | –     | –     | –     |
| Dogielinotus moskvitini   | Am              | –     | 10    | 0.1   | –     | –     | –     |
| Falsiscingula kurliensis | Ga              | –     | 30    | 0.1   | –     | –     | –     |
| Linularia iridescent     | Ga              | –     | –     | –     | 840   | 0.0   | –     |
| Allorchestes malleolus   | Am              | –     | –     | 10    | 0.0   | –     | –     |
| Leptostraca              | Le              | –     | 10    | 0.0   | –     | –     | –     |
| Cumacea                  | Cu              | –     | 10    | 0.0   | –     | –     | –     |
| Total biomass of animals |                 | 503.6 | 454.4 | 1157.2| 2422.8|
| Total biomass            |                 | 503.6 | 1942.1| 2422.8|       |
Table 13. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos on the boundary of transition of the walls of the tide pool into the top part of reef. Abbreviations of taxonomic groups as in Table 2.

| Taxa                                | Taxonomic group | Cape Rogacheva (location 23) |
|-------------------------------------|----------------|-------------------------------|
|                                     |                | Littorina sitkana belt        | Chthamalus dalli + Littorina sitkana patches | Gloiopeltis furcata patches |
| PLANTS                              |                | N   | B    | N   | B    | N   | B    |
| Gloiopeltis furcata                 | Rh             | –   | –    | –   | –    | 500.0 | 500.0 |
| Total biomass of plants             |                |     |      |     |      |      | 500.0 |
| ANIMALS                             |                |     |      |     |      |      | 500.0 |
| Littorina sitkana                   | Ga             | 5800 | 290.0 | 6100 | 50.0  | 8200 | 155.0 |
| Chthamalus dalli                    | Ci             | –   | –    | 5000 | 70.0  | 600  | 5.0  |
| Apohyale bassargini                 | Am             | –   | –    | –    | –     | 1600 | 5.0  |
| Cliamenella fraudatrix              | Is             | –   | –    | –    | –     | 600  | 2.0  |
| Total biomass of animals            |                | 290.0 | 120.0 | 120.0 | 167.0 |
| Total biomass                       |                | 290.0 | 120.0 | 167.0 |
Table 14. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos on the walls of the tide pool. Abbreviations of taxonomic groups as in Table 2.

| Taxa                  | Taxonomic group | Cape Rogacheva (location 23) |
|-----------------------|-----------------|------------------------------|
|                       |                 | Silvetia babingtonii belt    | Fucus evanescens patches    | Analipus japonicus patches |
|                       |                 | N     | B     | N     | B     | N     | B     |
| PLANTS                |                 |       |       |       |       |       |       |
| Silvetia babingtonii  | Och             | 18440.0 | –     | –     | +     |       |       |
| Fucus evanescens      | Och             | 10.0   | 8208.0|       | 20.0  |       |       |
| Analipus japonicus    | Och             | –     | –     | 970.0 |       | 970.0 |       |
| Corallina pilulifera  | Rh              | –     | –     | –     | 90.0  |       |       |
| Total biomass of plants|                | 18450.0| 8208.0|       | 1080.0|       |       |
| ANIMALS               |                 |       |       |       |       |       |       |
| Littorina sitkana     | Ga              | 18400  | 360.0 | 4720  | 128.0 | 200   | 5.0   |
| Nacella freycinetti    | Ga              | –     | –     | 80    | 36.0  | –     | –     |
| Lottia persona        | Ga              | 160   | 20.4  | +     | +     | –     | –     |
| Chthamalus dalli      | Ci              | 240   | 13.6  | 160   | 6.0   | –     | –     |
| Apohyale bassargini   | Am              | 920   | 12.0  | 1400  | 6.0   | 100   | 0.1   |
| Ciamaenella fraudatrix| Is              | –     | –     | –     | –     | –     | 700   | 1.2   |
| Nereis sp.            | Po              | –     | –     | –     | –     | –     | –     | 200   | 1.0   |
| Pontogeneia sp.       | Am              | –     | –     | –     | –     | –     | 100   | 0.7   |
| Abietinaria filicula  | Hy              | –     | 0.2   | –     | –     | –     | –     |
| Gnorimosphaeroma noblei| Is               | 40    | 0.0   | +     | +     | –     | –     |
| Total biomass of animals|               | 406.2 | 176.0 |       |       |       | 8.0   |
| Total biomass         |                 | 18856.2| 8384.0|       | 1088.0|       |       |
Table 15. Density (N, individuals m\(^{-2}\)) and biomass (B, g wet wt m\(^{-2}\)) of macrobenthos on the bottom of the tide pool in the plant communities with projective cover up to 90%. Abbreviations of taxonomic groups as in Table 2.

| Taxa                                      | Taxonomic group | Cape Rogacheva (location 23) |                  |                      |                      |
|-------------------------------------------|-----------------|------------------------------|------------------|----------------------|----------------------|
|                                           |                 | Corallina pilulifera         | Phyllospadix iwatensis |
|                                           |                 | N | B |                  |                      |
|                                           |                 | 1293.5 | 8612.0 |                      |                      |

**PLANTS**

- Phyllospadix iwatensis
- Corallina pilulifera
- Cladophora opaca
- Neorhodomela munita
- Chaetomorpha moniligera

**ANIMALS**

- Protothaca euglypta
- Falsicungula kurilensis
- Naineris jacutica
- Littorina sitkana
- Nereis pelagica
- Phascolosoma (Physcosoma) agassizii
- Polychaeta
- Hiatella arctica
- Lumbrineris japonica
- Nucella heyseana
- Clameneda fraudatrix
- Pantopoda
- Bryozoa
- Sertularia similis
- Eudendrium vaginatum
- Mysella kurilensis litoralis
- Abietinaria filicina
- Syllis hyalina

Total biomass of plants 1293.5 8612.0

Total biomass of animals 66.0 147.7

Total biomass 1359.5 8759.7
Table 16. Density (N, individuals m$^{-2}$) and biomass (B, g wet wt m$^{-2}$) of macrobenthos on the bottom of the tide pool in the plant communities with projective cover up to 10%.

Abbreviations of taxonomic groups as in Table 2.

| Taxa                          | Taxonomic group | Cape Rogacheva (location 23) |
|-------------------------------|----------------|-------------------------------|
|                               |                | Neodilsea yendoana patches    | Pterosiphonia bipinnata patches | Neorhodomela aculeata + Neorhodomela oregona patches | Mazzaella parksii patches | Chaetomorpha linum patches | Chaetomorpha melagonium patches |
|                               |                | N  B                          | N  B                          | N  B                          | N  B                          |
| PLANTS                        |                |                               |                               |                               |                               |
| Mazzaella parksii             | Rh             | –                             | –                             | –                             | 7950.0                        | –                             | –                             |
| Pterosiphonia bipinnata       | Rh             | –                             | 6950.0                        | –                             | –                             | –                             | –                             |
| Neodilsea yendoana            | Rh             | 3950.0                        | –                             | –                             | –                             | –                             | –                             |
| Chaetomorpha linum            | Ch             | –                             | –                             | 12.5                          | –                             | –                             | 2620.0                        |
| Neorhodomela aculeata         | Rh             | –                             | 1832.5                        | –                             | –                             | –                             | 177.0                         |
| Neorhodomela oregona          | Rh             | –                             | 975.0                         | –                             | –                             | –                             | –                             |
| Chaetomorpha melagonium       | Ch             | –                             | –                             | –                             | –                             | –                             | 320.0                         |
| Corallina pilulifera          | Rh             | 200.0                         | –                             | 81.3                          | 1110.0                        | 10.0                          | –                             |
| Clathromorphum sp.            | Rh             | –                             | –                             | 17.0                          | –                             | –                             | –                             |
| Phyllospadix iwatusensis      | Tra            | –                             | 6.3                           | –                             | –                             | –                             | –                             |
| **Total biomass of plants**   |                | 4150.0                        | 6950.0                        | 2907.6                        | 9077.0                        | 2630.0                        | 497.0                         |
| ANIMALS                       |                |                               |                               |                               |                               |                               |                               |
| Hiatella arctica              | Bi             | –                             | –                             | 25                            | 0.5                           | 1800                          | 202.0                         | –                              |
| Littorina sikana              | Ga             | 200                           | 2.0                           | 200                           | 5.0                           | 6675                          | 1135                          | 7100                          | 98.0                          | 7300                          | 30.0                          | 1500                          | 4.1                           |
| Chthamalus dalli              | Ci             | –                             | 500                           | 100.0                         | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Nereis pelagica               | Po             | –                             | 1700                          | 50.0                          | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Apolygyle bassargini          | Am             | 100                           | 9.0                           | 4000                          | 16.6                          | 225                           | 0.6                           | 200                           | 29.0                          | 500                           | 2.0                           | 100                           | 17.4                          |
| Idotea ochotensis             | Is             | 80                            | 25.0                          | –                             | 25                            | 0.2                           | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Pontogeneia sp.               | Am             | –                             | –                             | 1400                          | 3.0                           | 6175                          | 20.2                          | –                             | –                             | –                             | –                             | –                             |
| Clameneilla fraudatrix        | Is             | 100                           | 0.5                           | 9400                          | 17.0                          | 650                           | 1.3                           | 900                           | 2.0                           | 100                           | 0.7                           | –                             | –                             |
| Nucella heyseauna             | Ga             | –                             | –                             | 50                            | 15.0                          | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Faliscingula kurilensis       | Ga             | –                             | –                             | 300                           | 0.6                           | 375                           | 1.8                           | 3700                          | 6.5                           | 700                           | 5.0                           | 900                           | 1.0                           |
| Ascidiae                      | As             | –                             | 5.0                           | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Parallorchestes ochotensis    | Am             | –                             | –                             | –                             | –                             | –                             | –                             | 100                           | 4.7                           | –                             | –                             | –                             | –                             |
| Nereis sp.                    | Po             | –                             | –                             | –                             | –                             | –                             | 300                           | 4.0                           | –                             | –                             | –                             | –                             | –                             |
| Nassarius fraterculus        | Ga             | –                             | –                             | –                             | 50                            | 2.5                           | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Panomya sp.                   | Bi             | –                             | –                             | 200                           | 2.0                           | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Lottia persona                | Ga             | –                             | –                             | 50                            | 1.0                           | 100                           | 1.0                           | –                             | –                             | –                             | –                             | –                             | –                             |
| Abietinaria filicula          | Hy             | 1.0                           | –                             | –                             | +                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| Allorchestes malleolus        | Am             | 100                           | 1.0                           | –                             | –                             | –                             | –                             | 100                           | 0.6                           | –                             | –                             | –                             | –                             |
| Gnornimosphaera noblei        | Is             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | 100                           | 0.6                           | –                             |
| Mysella kurilensis litoralis  | Bi             | –                             | –                             | –                             | –                             | –                             | 100                           | 0.5                           | –                             | –                             | –                             | –                             | –                             |
| Pantopoda                     | Pa             | –                             | –                             | –                             | –                             | –                             | 100                           | 0.5                           | –                             | –                             | –                             | –                             | –                             |
| Ischyrocerus sp.              | Am             | 100                           | 0.4                           | –                             | 25                            | 0.0                           | –                             | –                             | –                             | –                             | –                             | 0.2                           | –                             |
| Settularella spinosa          | Hy             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             | –                             |
| **Total biomass of animals**  |                | 43.9                          | 194.2                         | 156.6                         | 348.4                         | 39.3                          | 22.5                          |
| **Total biomass**             |                | 4193.9                        | 7144.2                        | 3064.2                        | 9425.4                        | 2668.3                        | 519.5                         |
Plate 1. The general view of the rocky-bouldery intertidal zone on reef in the Pervukhina Bay.
Plate 2. Communities of the upper intertidal subzone. A – the Littorina sitkana community; B – the Chthamalus dalli community; C – the Gloiopeltis furcata community.
Plate 3. The *Fucus evanescens* community in the middle intertidal subzone. The upper photo – water level is 0.3 m.
Plate 4. The brown algae communities in the middle intertidal subzone. A – the *Fucus evanescens* community and the *Silvetia babingtonii* patches; B – the *Analipus japonicus* community.
Plate 5. The green algae communities in the middle intertidal subzone. A – the *Ulva lactuca* community; B – the *Chaetomorpha moniligera* community.
Plate 6. The red algae communities in the middle intertidal subzone. A – the *Corallina pilulifera* community; B – the *Mazzaella parksii* community.
Plate 7. Communities in the lower part of the middle intertidal subzone and lower intertidal subzone (water level is 0.3–0.4 m). A – the *Phyllospadix iwatensis* community; B – the *Sargassum miyabei* community.
Plate 8. Laminarian communities in the lower intertidal subzone. The upper photo – water level is 0.4 m.
Plate 9.
Vertical distribution of macrobenthos on the boundary between the upper and middle intertidal subzones. A – belt of *Chthamalus dalli* with patches of *Gloiopeltis furcata*, and crustose bases of *Analipus japonicus* are below *Ch. dalli*; B – belts of *Chthamalus dalli* and *Fucus evanescens*.
Plate 10. Vertical distribution of macrobenthos in the middle intertidal subzone. A – patches of the brown alga *Analipus japonicus*, the red alga *Mazzaella parksii*, and barnacle *Chthamalus dalli*; B – belt of *Fucus evanescens*, and over – settlings of *Chthamalus dalli*. 
Plate 11. Intertidal zone in the Izmeny Bay. A – the *Zostera* field (show by arrow); B – the *Zostera marina* belt-forming community (show by arrow); C – the *Batillaria cumingii* community.
Plate 12. The general view of the intertidal zone of the Goryachiy Plyazh (A) and sea anemone Diadumene lineata (B).
Plate 13. The tide pools on the Goryachiy Plyazh. A – the tide pool with “cold” volcanic H$_2$S seeps; B – the tide pool with “hot” volcanic H$_2$S seeps (the algal-bacterial mats is indicated by arrow).
Plate 14. Samplings in the intertidal zone. A – the quantitative samplings in the upper intertidal subzone; B – the quantitative samplings in the middle intertidal subzone; C – the qualitative samplings in the lower intertidal subzone.
Appendix

The list of the macrobenthic plants and animals of the intertidal zone of Kunashir Island

The larvae of Insecta have not been identified. Some groups (Nemertea, Polychaeta, Amphipoda, Isopoda, Cumacea, Pantopoda, LEPTOSTRACA, Bryozoa, ASCIDIACEA, juveniles of gastropods and sea anemones) are partly identified.

The Latin names of species mentioned in previous publications (Kussakin, 1956, 1957, 1975; Zinova and Perestenko, 1974; Kussakin and Tarakanova, 1977; Kostina, 1991) are enclosed in square brackets if these names are true synonyms (=), and it is not determined whether the species of true synonyms or it is incorrectly applied name ("as").

Abbreviations: E – eastern coast, W – western coast, and S – southern coast of Kunashir Island; BG – biogeographical group. In the column “biogeographical group”, the following abbreviations of species are given: ab. – amphi-boreal; ap. – amphi-Pacific; as. – near-Asiatic; at. – anti-tropical; b.-a. – boreal-Arctic; lb. – high-boreal; lb. – low-boreal; n.-tr.-b.(lb. or st.) – notal-tropical-boreal (low-boreal or subtropical); p.-Pacific; p.-o. – panoceanic; st.-b.(lb.) – subtropical-boreal (low-boreal); st.(tr.)-b.-a. – subtropical (tropical)-boreal-Arctic; tr.-st.(lb. or b.) – tropical-subtropical (low-boreal or boreal); wb. – widespread boreal; mz. – multizonal.

| Taxa                                      | E          | W          | S          | BG          |
|-------------------------------------------|------------|------------|------------|-------------|
| **Regnum CHROMISTA**                      |            |            |            |             |
| Phylum Ochrophyta                         |            |            |            |             |
| Classis Phaeophyceae                      |            |            |            |             |
| **Ordo Desmarestiales**                   |            |            |            |             |
| Desmarestia aculeata (Linnaeus) J.V. Lamouroux | +          | b.-a.      |            |             |
| Desmarestia viridis (O.F. Müller) J.V. Lamouroux | +          | ?at.       |            |             |
| **Ordo Ectocarpales**                     |            |            |            |             |
| Pyliella littoralis (Linnaeus) Kjellman, nomen conservandum | +          | mz.        |            |             |
| Chordaria chordaeformis (Kjellman) H. Kawai et S.‘H. Kim [=Chordaria flagelliformis f. chordaeformis] Kjellman | +          | +          | b.-a.      |             |
| Chordaria flagelliformis (O.F. Müller) C. Agardh | +          | +          | +          | at.         |
| Chordaria spp.                            | +          | +          |            |             |
| Colodesme californica (Ruprecht) Kjellman | +          | p. st.-b.  |            |             |
| Colodesme cystoseirae (Ruprecht) Setchell et N.L. Gardner | +          | +          | p. wb.     |             |
| Dictyosiphon chordaria Areschoug           | +          | b.-a.      |            |             |
| Dictyosiphon foeniculaceus (Hudson) Greville | +          | +          | b.-a.      |             |
| Eudesme virescens (Carmichael ex Berkeley) J. Agardh | +          | +          | ?mz.       |             |
| Leathesia marina (Lyngbye) Decaisne [=Leathesia diffornis Areschoug] | +          | +          | +          | mz.         |
| Melanosiphon intestinalis (De A. Saunders) M.J. Wynne | +          | ab., st.-b.|            |             |
| Punctaria chartacea Setchell et N.L. Gardner | +          | p. wb.     |            |             |
| Punctaria flaccida Nagai                  | +          | as. lb.    |            |             |
| Punctaria latifolia Greville              | +          | mz.        |            |             |
| Punctaria occidentalis Setchell et N.L. Gardner | +          | p. wb.     |            |             |
| Punctaria plantaginae (Roth) Greville [=Punctaria rubescens (Lyngbye) J. Agardh] | +          | +          | +          | ?at.        |
| Saundersella simplex (Saunders) Kylin      | +          | b.-a.      |            |             |
| Sphaerotrichia divaricata (C. Agardh) Kylin | +          | +          | at.        |             |

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| Taxa                                                | E  | W  | S  | BG |
|-----------------------------------------------------|----|----|----|----|
| **Streblonema fasciculatum** Thuret                 |    |    |    |    |
| Familia Scytosiphonaceae                            |    |    |    |    |
| **Colpomenia sinuosa** (Mertens ex Roth) Derbes et Solier |  + | +  | +  |    |
| **Petalonia fascia** (O.F. Müller) Kuntze           |    |    |    |    |
| **Scytosiphon lomentaria** (Lyngbye) Link, *nomen conservandum* |  + | +  | +  |    |

**Ordo Fucales**

| Familia Fucales                                    |    |    |    |    |
|-----------------------------------------------------|----|----|----|----|
| **Fucus evanescens** C. Agardh                      |  + | +  | +  |    |
| **Silvetia babingtonii** (Harvey) E.A. Serrão, T.O. Cho, S.M. Boo et Brawley [=Polvetia wrightii Okamura] |  + | +  | +  |    |
| Familia Sargassaceae                                |    |    |    |    |
| **Sargassum miyabei** Yendo [=Sargassum kjellmanianum Yendo] |  + | +  | +  |    |
| **Sargassum pallidum** (Turner) C. Agardh [as Sargassum confusum C. Agardh] |    |    |    |    |
| **Sargassum thunbergii** (Mertens ex Roth) Kuntze   |    |    |    |    |
| **Stephanocystis crassipes** (Mertens ex Turner) Draisma, Ballesteros, F. Rousseau et T. Thibaut [=Cystophyllum crassipes (Mertens ex Turner) J. Agardh: *Cystoseira crassipes* (Mertens ex Turner) C. Agardh] |  + | +  | +  |    |
| **Stephanocystis geminata** (C. Agardh) Draisma, Ballesteros, F. Rousseau et T. Thibaut [=Cystoseira geminata C. Agardh] |    |    |    |    |
| **Stephanocystis hakodatensis** (Yendo) Draisma, Ballesteros, F. Rousseau et T. Thibaut [=Cystoseira hakodatensis (Yendo) Fensholt] |    |    |    |    |

**Ordo Laminariales**

| Familia Agaraceae                                    |    |    |    |    |
|-----------------------------------------------------|----|----|----|----|
| **Costaria costata** (C. Agardh) De A. Saunders     |  + | +  | +  |    |
| Familia Alariaceae                                  |    |    |    |    |
| **Alaria esculenta** (Linnaeus) Greville [=Alaria macroptera (Ruprecht) Yendo] |  + | +  | +  |    |
| **Alaria marginata** Postels et Ruprecht [=Alaria taeniata Kjellman] |    |    |    |    |
| **Alaria ochotensis** Yendo                         |    |    |    |    |
| **Alaria praenlonga** Kjellman                      |    |    |    |    |
| **Alaria spp.**                                     |    |    |    |    |
| Familia Chordaceae                                  |    |    |    |    |
| **Chorda asiatica** Sasaki et Kawai [as Chorda filum (Linnaeus) Stackhouse] |  + | +  | +  |    |
| Familia Laminariace                                 |    |    |    |    |
| **Arthrothamnus bifidus** (S.G. Gmelin) J. Agardh    |  + | +  | +  |    |
| **Arthrothamnus kurilensis** Ruprecht                |  + | +  | +  |    |
| **Laminaria digitata** (Hudson) Lamouroux           |    |    |    |    |
| **Saccharina gyrota** (Kjellman) C.E. Lane, C. Mayes, Drued et G.W. Saunders [=Kjellmaniella gyrota (Kjellman) Miyabe] |  + | +  | +  |    |
| **Saccharina japonica** (Areschoug) C.E. Lane, C. Mayes, Drued et G.W. Saunders [=Laminaria japonica Areschoug] |    |    |    |    |
| **Saccharina spp.**                                  |    |    |    |    |
| Familia Pseudochordaceae                            |    |    |    |    |
| **Pseudochorda nagaii** (Tokida) Inagaki            |  + | +  | +  |    |

**Ordo Ralfsiales**

| Familia Ralfsiae                                    |    |    |    |    |
|-----------------------------------------------------|----|----|----|----|
| **Analipus filiformis** (Ruprecht) Papenfuss [=Analipus fusiformis Kjellman] |  + | +  | +  |    |

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| Taxa                                                                 | E 1951–1964 | W 1987–1991 | S 1991 | BG 1951–1964 |
|---------------------------------------------------------------------|-------------|-------------|--------|--------------|
| Analipus japonicus (Harvey) Wynne [=Heterochordaria abietina (Ruprecht ex Farlow) Setchell et N.L. Gardner] | +           | +           | +      | p. wb.       |
| Rallicia fungiformis (Gunnerus) Setchell et Gardner                | +           | +           |        | tr.:b.:a.    |
| **Ordo Sphacelariales**                                            |             |             |        |              |
| Sphacelaria rigidula Kützing [=Sphacelaria furcigera Kützing]       | +           | +           |        | ?mz.         |
| **Regnum PLANTAE**                                                 |             |             |        |              |
| **Phylum Rhodophyta**                                              |             |             |        |              |
| **Classis Bangiophyceae**                                          |             |             |        |              |
| **Ordo Bangiales**                                                 |             |             |        |              |
| Fuscifolium tasa (Yendo) S.C. Lindstrom [=Porphyra tasa (Yendo) Ueda] | +           |             |        | p. wb.       |
| Porphyra umbilicalis Kützing                                        | +           |             |        | mz.          |
| Porphyra spp.                                                       | +           | +           |        |              |
| Wildemania amplissima Foslie [=Porphyra amplissima (Kjellman) Setchell et Hus] | +           |             |        | b.:a.        |
| Wildemania variegata De Toni [=Porphyra variegata (Kjellman) Kjellman] | +           |             |        | ?tr.:b.      |
| **Classis Compsogonophyceae**                                      |             |             |        |              |
| **Ordo Erythropeltidales**                                         |             |             |        |              |
| Erythrotrichia carnea (Dyllwin) C. Agardh                           |             |             |        | mz.          |
| Erythrotrichia sp.                                                  | +           |             |        |              |
| **Classis Florideophyceae**                                        |             |             |        |              |
| **Ordo Acrochaetiales**                                            |             |             |        |              |
| Acrochaetium kurilense (Nagai) Papenfuss                           |             |             |        | as. wb.      |
| Acrochaetium moniliforme (Rosenvinge) Bergesen [=Kylinia moniliformis (Rosenvinge) Kyli] | +           |             |        | ?n.:tr.:b.   |
| Acrochaetium reductum (Rosenvinge) Hamel                            | +           |             |        | ?n.:tr.:b.   |
| Acrochaetium sp.                                                    | +           |             |        |              |
| **Ordo Ahnfeltiales**                                              |             |             |        |              |
| Ahnfeltia tobuchiensis (Kanno et Matsubara) Makienko [as Ahnfeltia plicata (Hudson) Fries] | +           |             |        | as. lb.      |
| **Ordo Ceramiales**                                                |             |             |        |              |
| Antithamnion sp.                                                    | +           |             |        |              |
| Ceramium japonicum Okamura [as Cerium rubrum C. Agardh]             | +           | +           | +      | as. st.:lb.  |
| Ceramium kondo Yendo                                               | +           | +           |        | p. wb.       |
| **Family Delesseriaceae**                                          |             |             |        |              |
| Heteroglossum carnosum (Mikami) Perestenko [as Okamurina pacifica (Yamada) A.D. Zinova] | +           |             |        | as. wb.      |
| Tokidadendron bullatum (N.L. Gardner) M.J. Wynne                   | +           |             |        | p. wb.       |
| **Family Rhodomelaceae**                                           |             |             |        |              |
| Chondria crassicaulis Harvey                                       | +           | +           |        | tr.:lb.      |
| Laurencia nipponica Yamada                                         | +           | +           |        | ?as. st.:lb. |
| Laurencia okamura Yamada                                           | +           | +           | +      | tr.:st.      |
| Laurencia spp.                                                      | +           |             |        |              |
| Neorhodomela aculeata (Perestenko) Masuda [as Rhodomela larix (Turner) C. Agardh: Neorhodomela larix (Turner) Masuda] | +           | +           | +      | p. wb.       |
| Neorhodomela munita (Perestenko) Masuda                             | +           | +           |        | as. lb.      |
| Neorhodomela oregona (Doty) Masuda                                 | +           | +           |        | p. wb.       |
| Neosiphonia japonica (Harvey) M.-S. Kim et I.K. Lee                 | +           |             |        | ?at.         |
| Taxa | E | W | S | BG |
|------|---|---|---|----|
| (=Polysiphonia japonica Harvey) | + | as. lb. | | |
| Neosiphonia yendoi (Segi) M.S. Kim et I.K. Lee | + | as. wb. | | |
| Odonthalia annae Perestenko | + | ?as. st.‘b. | | |
| Odonthalia corumbifera (S.G. Gmelin) Greville | + | ?as. st.‘b. | | |
| Odonthalia floccosa (Esper) Falkenberg (=Odonthalia aleutica (C. Agardh) J. Agardh) | + | p. wb. | | |
| Odonthalia kantschatica (Ruprecht) J. Agardh | + | p. wb. | | |
| Odonthalia ochotensis (Ruprecht) J. Agardh | + | as. wb. | | |
| Polysiphonia morrowii Harvey | + | at. | | |
| Polysiphonia stricta (Dillwyn) Greville (=Polysiphonia urceolata (Lightfoot ex Dillwyn) Greville) | + | mz. | | |
| Pterosiphonia bipinnata (Postels et Ruprecht) Falkenberg | + | p. wb. | | |
| Rhodomela confervoides (Hudson) P.C. Silva (=Rhodomela subfusca (Woodward) C. Agardh) | + | b.:a. | | |
| Rhodomela sachalinensis Masuda | + | as. lb. | | |
| Familia Wrangeliaceae | | | | |
| Neoptilota asplenioideae (Esper) Kylin ex Scagel, Garbary, Golden et Hawkes (=Ptilota asplenioides (Esper) C. Agardh) | + | + | at. | |
| Ptilota filicina J. Agardh | + | + | p. wb. | |
| Ptilota spp. | + | + | | |
| **Ordo Corallinales** | | | | |
| Familia Corallinaceae | | | | |
| Alatocladia modesta (Yendo) H.W. Johansen | + | as. lb. | | |
| Bossiella compressa N.G. Klozceva (=Amphiroa cretacea (Postels et Ruprecht) Endlicher) | + | as. wb. | | |
| Coralliina officinalis Linnaeus (=Pachyarthron cretaceum (Postels et Ruprecht) Manz): Bossiella cretacea (Postels et Ruprecht) H.W. Johansen | + | + | mz. | |
| Coralliina pilulifera Postels et Ruprecht | + | + | + | n.:tr.’b. | |
| Lithophyllum tumidulum Foslie | + | + | as. st.’lb. | | |
| **Ordo Gigartinales** | | | | |
| Familia Dumontiaceae | | | | |
| Constantinea rosa‘marina (S.G. Gmelin) Postels et Ruprecht | + | p. wb. | | |
| Constantinea subulifera Setchell | + | p. wb. | | |
| Dilsea sp. | + | | | |
| Dumontia contorta (S.G. Gmelin) Ruprecht (=Dumontia incrassata (O.F. Müller) J.V. Lamouroux) | + | ?b.:a. | | |
| Farlowia sp. | + | | | |
| Masudaphycus irregularis (Yamada) S.C. Lindstrom (=Farlowia irregularis Yamada) | + | as. st.’lb. | | |
| Needlessa yendoana Tokida | + | + | as. wb. | | |
| Familia Endocladiaceae | | | | |
| Gloioptis furcata (Postels et Ruprecht) J. Agardh | + | + | + | tr.’b. | |
| Familia Gigartinaceae | | | | |
| Chondrus armatus (Harvey) Okamura | + | ?as. lb. | | |
| Chondrus pinnulatus (Harvey) Okamura | + | + | + | as. lb. | |
| Chondrus yendoi Yamada et Mikami | + | as. lb. | | |
| Chondrus sp. | + | | | |
| Iridaea spp. (=Iridaea subdichotomum) | + | | | |
| Mazzaella japonica (Mikami) Hommersand (=Rhodoglossum japonicum Mikami) | + | as. lb. | | |
| Mazzaella parksii (Setchell et Gardner) Hughey, Silva et Hommersand (=Iridaea cornucopiae Postels et Ruprecht) | + | + | p. wb. | |
| Mazzaella sp. (=Iridophycus sp.) | + | | | |
| Taxa                                      | E       | W       | S       | BG     |
|------------------------------------------|---------|---------|---------|--------|
| Familia Kallymeniaceae                   |         |         |         |        |
| *Callophyllis rynchocarpa* Ruprecht       | +       |         | p. wb.  |        |
| *Callophyllis* sp.                       | +       |         |         |        |
| *Cirrulicarpus gmelinii* (Grunow) Tbkida et Masaki | +       |         | p. wb.  |        |
| Familia Phyllophoraceae                  |         |         |         |        |
| *Mastocarpus pacificus* (Kjellman) Perestenko | + + + + |         | p. wb.  |        |
| [*Gigartina pacifica* Kjellman: *Gigartina ochotensis* (Ruprecht) Yendo] | +       |         | ?n. tr. b. |        |
| Schizymenia dubyi (Chauvin ex Duby) J. Agardh [as Schizymenia dubyi var. palmata Yamada] | +       |         |         |        |
| Familia Tichocarpaceae                   |         |         |         |        |
| *Tichocarpus crinitus* (S.G. Gmelin) Ruprecht | + + + + |         |         | as. wb. |
| Ordo Gracilariales                       |         |         |         |        |
| Familia Gracilariaceae                  |         |         |         |        |
| *Gracilaria vermiculophylla* (Ohmi) Papenfuss [as *Gracilaria verrucosa* (Hudson) Papenfuss: *Gracilaria confervoides* (Linnaeus) Greville] | + + + |         | tr. b.  |        |
| Ordo Hapalidiales                        |         |         |         |        |
| Familia Hapalidiaceae                   |         |         |         |        |
| *Clathromorphum* sp.                     | +       |         |         |        |
| Lithothamnion spp.                       | + + +   |         |         |        |
| Melobesia spp.                           | + +     |         |         |        |
| Ordo Hildenbrandiales                    |         |         |         |        |
| Familia Hildenbrandiaceae               |         |         |         |        |
| *Hildenbrandia rubra* (Sommerfelt) Meneghini [as *Hildenbrandia prototypos* Nardo] | +       |         |         | mz.    |
| Hildenbrandia sp.                        | +       |         |         |        |
| Ordo Palmariales                         |         |         |         |        |
| Familia Palmariae                       |         |         |         |        |
| Devaleraeae sp.                          | +       |         |         |        |
| Halosaccion glandiforme (S.G. Gmelin) Ruprecht | + +     |         |         | p. wb.  |
| Halosaccion hydrophorum (Postels et Ruprecht) Kützing | +       |         |         | p. wb.  |
| Palmaria marginicrassa I.K. Lee          |         | +       |         | as. wb. |
| Palmaria stenogona Perestenko [as *Rhodymenia stenogona* Perestenko] | + +     |         |         | as. wb. |
| Ordo Rhodymeniales                       |         |         |         |        |
| Familia Lomentariaceae                  |         |         |         |        |
| Lomentaria hakodatensis Yendo            | + +     |         |         | ?n. tr. b. |
| Ordo Rhodymeniales                       |         |         |         |        |
| Familia Rhodymeniaceae                  |         |         |         |        |
| Sparlingia pertusa (Postels et Ruprecht) G.W. Saunders, I.M. Strachan et Kraft [=Rhodymenia pertusa (Postels et Ruprecht) J. Agardh] | +       |         |         | b. a.   |
| Classis Stylonematophyceae               |         |         |         |        |
| Ordo Stylonematales                     |         |         |         |        |
| Familia Stylonemataceae                 |         |         |         |        |
| *Stylonema alsidii* (Zanardini) K.M. Drew [=Goniotrichum elegans (Chauvin) Zanardini] | +       |         |         | n. tr. b. |
| Ordo Chlorophyta                         |         |         |         |        |
| Classis Chlorophyceae                   |         |         |         |        |
| Ordo Chlamydomonasales                  |         |         |         |        |
| Familia Chlamydomonaceae                |         |         |         |        |
| Chlorochytrium sp.                      |         |         |         |        |
| Classis Ulvophyceae                     |         |         |         |        |
| Ordo Bryopsidales                       |         |         |         |        |
| Familia Bryopsidae                      |         |         |         |        |
| *Codium ritteri* Setchell et N.L. Gardner [as *Codium dichotomum* S.F. Gray] | +       |         |         | p. hb.  |
| *Codium yezoense* (Tokida) K.L. Vinogradova | + +     |         |         | as. lb. |
MACROBENTHOS IN THE INTERTIDAL ZONE OF KUNASHIR ISLAND

| Taxa                              | E  | W  | S  | BG |
|-----------------------------------|----|----|----|----|
| **Ordo Cladophorales**            |    |    |    |    |
| Familia Cladophoraceae           |    |    |    |    |
| Chaetomorpha aerea (Dyllwin) Kützing | +  | +  | n.: tr.'b. |    |
| Chaetomorpha cannabina (Areschoug) Kjellman | +  | +  | ab., st.'b. |    |
| Chaetomorpha ligustica (Kützing) Kützing | +  |    | '?'mz. |    |
| Chaetomorpha linum (O.F. Müller) Kützing | +  |    | n.: tr.'b. |    |
| Chaetomorpha melagonium (F. Weber et D. Mohr) Kützing | +  |    | ?mz. |    |
| Kützing                           |    | +  |    |    |
| Chaetomorpha moniligeras Kjellman | +  | +  | +  | as. lb. |
| Chaetomorpha spiralis Okamura [=Chaetomorpha torta (Farlow ex F.S. Collins) Yendo] | +  | +  | n.: tr.'st. |    |
| Chaetomorpha sp.                  | +  | +  | +  |    |
| Cladophora opaca Sakai            | +  |    |    |    |
| Cladophora speciosa Sakai         |    |    |    | as. wb. |
| Cladophora stipsonii Harvey       | +  |    |    | tr.'b. |
| Cladophora spp.                   | +  |    |    |    |
| **Ordo Ulotrichales**             |    |    |    |    |
| Familia Monostromataceae          |    |    |    |    |
| Monostroma grevillei (Thuret) Wittrock | +  |    | ?at. |    |
| Familia Ulotrichaceae             |    |    |    |    |
| Acrosiphonia duriuscula (Ruprecht) Yendo | +  | +  | p. wb. |    |
| [=Spongomorpha duriuscula (Ruprecht) Collins: as +  | +  |    |    |    |
| Acrosiphonia sonderi (Kützing) Kornmann |    |    |    |    |
| Pseudothrix groenlandica (J. Agardh) Hanic et S.C. Lindstrom | +  |    | at. |    |
| Ulothrix flacca (Dillwyn) Thuret [=Ulothrix pseudoflacca Wille] | +  |    | mz. |    |
| Urospora penicillusformis (Roth) Areschoug | +  |    | ?mz. |    |
| **Ordo Ulvales**                  |    |    |    |    |
| Familia Kornmanniaceae            |    |    |    |    |
| Blidingia minima (Nägeli ex Kützing) Kylin | +  | +  | mz. |    |
| [=Enteromorpha minima Nägeli ex Kützing] |    |    |    |    |
| Kornmannia leptoderma (Kjellman) Bliding [Monostroma zostericola Tilden] | +  |    | st.'b.'a. |    |
| Familia Ulvaceae                  |    |    |    |    |
| Ulva clathrata (Roth) C. Agardh [=Enteromorpha clathrata (Roth) Greville] | +  |    | mz. |    |
| Ulva compressa Linnaeus [=Enteromorpha compressa (Linnaeus) Nees] | +  |    | mz. |    |
| Ulva intestinalis Linnaeus [=Enteromorpha intestinalis (Linnaeus) Nees] | +  | +  | mz. |    |
| Ulva lactuca Linnaeus [=Ulva fenestrata Postels et Ruprecht] | +  | +  | +  | mz. |
| Ulva linea Linnaeus [=Enteromorpha procera K. Ahlner; Enteromorpha linea (Linnaeus) J. Agardh] | +  | +  | mz. |    |
| Ulva prolifera O.F. Müller [=Enteromorpha prolifera (O.F. Müller) J. Agardh] | +  |    | mz. |    |
| Ulva spp. [=Enteromorpha sp.] | +  |    |    |    |
| Familia Ulvellaceae               |    |    |    |    |
| Ulvella lens P. Crouan et H. Crouan | +  |    | mz. |    |
| **Phylum Tracheophyta**           |    |    |    |    |
| **Classis Monocots**              |    |    |    |    |
| **Ordo Alismatales**              |    |    |    |    |
| Familia Cymodaceae               |    |    |    |    |
| Phyllospadix iwatensis Makino [as Phyllospadix scoleleri W.J. Hooker] | +  | +  | as. st.'lb. |    |
| Familia Zosteraceae               |    |    |    |    |
| Zostera japonica Ascherson et Graeven [as Zostera nana] | +  |    | tr.'b. |    |

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| Taxa | E | W | S | BG |
|------|---|---|---|----|
| Roth |   |   |   |    |
| Zostera marina Linnaeus | + | + | + | ab., st.-b. |
| **ANIMALS** |   |   |   |    |
| Regnum ANIMALIA |   |   |   |    |
| Phylum Porifera |   |   |   |    |
| Classis Calcarea |   |   |   |    |
| Ordo Leucosolenida |   |   |   |    |
| Familia Grantiidae |   |   |   |    |
| Grantia sp. | + |   |   |    |
| **Classis Demospongiae** |   |   |   |    |
| Ordo Halichondrida |   |   |   |    |
| Familia Halichondriidae |   |   |   |    |
| Halichondria panicea (Pallas, 1766) | + | + | + | st.-b.-a. |
| Halichondria sitiens (Schmidt, 1870) | + |   |   | b.-a. |
| **Ordo Poecilosclerida** |   |   |   |    |
| Familia Esperopsidae |   |   |   |    |
| Amphilectus lobata (Bowerbank, 1866) [as Mycale lobata (Bowerbank, 1866)] | + |   |   | b.-a. |
| Familia Microcionidae |   |   |   |    |
| Clathria pennata (Lambe, 1895) [=Biemna pennata Koltun, 1958] | + |   |   | ap. |
| Ophlitaspongia pennata (Lambe, 1894) [=Tyloides pennata Lambe, 1894)] | + |   |   | ap. |
| Familia Tedaniidae |   |   |   |    |
| Tedania fragilis Lambe, 1894 | + |   |   | p. wb. |
| **Phylum Cnidaria** |   |   |   |    |
| Classis Hydrozoa |   |   |   |    |
| Ordo Anthoathecata |   |   |   |    |
| Familia Corynidae |   |   |   |    |
| Coryne pusilla Gaertner, 1774 | + |   |   | ab. |
| Coryne spp. | + |   |   |    |
| Familia Eudendriidae |   |   |   |    |
| Eudendrium vaginatum Allman, 1863 [=Eudendrium annulatum Norman, 1864] | + | + | + | ab. |
| Familia Tubulariidae |   |   |   |    |
| Ectopleura larynx (Ellis et Solander, 1786) [=Tubularia larynxs Ellis et Solander, 1786] | + |   |   | at. |
| Tubularia sp. | + |   |   |    |
| **Ordo Leptothecata** |   |   |   |    |
| Familia Campanulariidae |   |   |   |    |
| Campanularia volubilis (Linnaeus, 1758) | + |   |   | st.-b.-a. |
| Obelia longissima (Pallas, 1766) | + |   |   | at. |
| Orthopyxis integra (McGillivray, 1842) [=Campanularia integra McGillivray, 1842] | + |   |   | b.-a. |
| Orthopyxis platycarpa Bale, 1914 [=Campanularia platycarpa (Bale, 1914)] | + | + |   | p. st.-b. |
| Familia Haleciidae |   |   |   |    |
| Halecium lucium Antsulevich, 1980 | + |   |   | as. lb. |
| Familia Plumulariidae |   |   |   |    |
| Plumularia filicaulis Kirchenpauer, 1876 | + |   |   | n.-tr.-lb. |
| Familia Sertulariidae |   |   |   |    |
| Abietinaria filicula (Ellis et Solander, 1786) | + |   |   | ab. |
| Abietinaria inconstans (Clark, 1876) [=Abietinaria costata (Nutting, 1901)] | + |   |   | p. wb. |
| Abietinaria spiralis Naumov, 1960 | + |   |   | as. lb. |
### MACROBENTHOS IN THE INTERTIDAL ZONE OF KUNASHIR ISLAND

| Taxa                                      | E  | W  | S  | BG           |
|-------------------------------------------|----|----|----|--------------|
| Abietinaria thuiarioides (Clark, 1876)    |    | +  |    | b.–a.        |
| Sertularella mutsuensis Stechow, 1931     | +  | +  |    | as. wb.      |
| Sertularella spinosa Kirchenpauer, 1884   | +  | +  |    | as. wb.      |
| Sertularia robusta (Clark, 1876)          | +  |    |    | ab.          |
| Sertularia similis Clark, 1876            | +  |    |    | ab.          |
| **Classis Staurozoa**                     |    |    |    |              |
| **Ordo Stauromedusae**                    |    |    |    |              |
| Haliclystus borealis Uchida, 1933         | +  |    |    | as. lb.      |
| **Classis Anthozoa**                      |    |    |    |              |
| **Ordo Actiniaria**                       |    |    |    |              |
| Actiniidae gen. sp.                      |    |    |    |              |
| Familia Condylanthidae                   |    |    |    |              |
| Charisea saxicola Torrey, 1902            | +  |    |    | p. wb.       |
| Familia Diadumenidae                     |    |    |    |              |
| Diadumene lineata (Verrill, 1869) [=Haliplanella luciae (Verrill, 1898)] | +  |    |    | p.–o.        |
| Familia Metridiidae                      |    |    |    |              |
| Metridium senile (Linnaeus, 1761)         |    |    |    |              |
| Phylum Nemertea                          |    |    |    |              |
| **Classis Rhynchocoela**                  |    |    |    |              |
| **Ordo Heteronemertea**                   |    |    |    |              |
| Familia Lineidae                         |    |    |    |              |
| Lineus torquatus Coe, 1901                | +  |    |    | p. wb.       |
| **Ordo Tubulaniformes**                   |    |    |    |              |
| Familia Tubulanidae                      |    |    |    |              |
| Tubulanus punctatus (Takakura, 1898)      | +  |    |    | as. st.–lb.  |
| Phylum Annelida                          |    |    |    |              |
| **Classis Polychaeta**                    |    |    |    |              |
| **Ordo Capitellida**                      |    |    |    |              |
| Familia Arenicolidae                     |    |    |    |              |
| Abarenicola claparedi oceania Healy et Wells, 1959 [as Arenicola claparedi Levinsen, 1884] | +  | +  |    | p. wb.       |
| Abarenicola pacifica Healy et Wells, 1959 |    | +  |    | p. wb.       |
| Branchiomalane vincenti Langerhans, 1881  | +  |    |    | ab.          |
| Familia Capitellidae                     |    |    |    |              |
| Capitella capitata (Fabricius, 1780)      | +  | +  | +  | at.          |
| Heteromastus filiformis (Claparède, 1864) |    |    |    | ab.          |
| Heteromastus filiformis luminariae Zachs, 1923 | +  |    |    | as. lb.      |
| Mediomastus californiensis Hartman, 1944  | +  | +  |    | p. wb.       |
| Familia Maldanidae                       |    |    |    |              |
| Nicomache (Nicomache) personata Johnson, 1901 | +  | +  |    | ab.          |
| Maldanidae gen. sp.                      |    |    |    |              |
| **Ordo Cirratulida**                      |    |    |    |              |
| Familia Cirratulidae                     |    |    |    |              |
| Cirratulus branchoiculatus Chlebovitsch, 1959 | +  |    |    | as. lb.      |
| Cirratulus cirratus (O.F. Müller, 1776)   | +  | +  |    | p.–o.        |
| Cirriformia tentaculata (Montagu, 1808) [=Audouinia | +  |    |    | ab., st.–b.  |
tentaculata (Montagu, 1808)

Cirratulidae gen. sp.

Ordo Echiurida
Familia Echiuridae
Echiurus echiurus (Pallas, 1766)

Ordo Eunicida
Familia Dorvilleidae
Schistomeringos japonica (Annenkova, 1937)

Familia Lumbrineridae
Lumbrineris inflata Moore, 1911 [=Lumbrinereis cervicalis Treadwell, 1922] + + p. wb.

Familia Oenonidae
Drilonereis filum (Claparède, 1868) + ab., st.-b.

Familia Onuphidae
Nothria hyperborea (Hansen, 1878) [=Onuphis conchylega (Sars, 1835)] + b.-a.

Ordo Flabelligerida
Familia Flabelligeridae
Pherusa plumosa (O.F. Müller, 1776) [=Stylarioides plumosa (O.F. Müller, 1776)] + + st.-b.-a.

Ordo Opheliida
Familia Opheliidae
Armandia brevis (Moore, 1906) + p. wb.

Familia Scalibregmatidae
Hyboscolex pacificus borealis Imai & Hartman, 1964 [as Oncoscolex pacificus (Moore, 1909)] + + ap.

Ordo Orbiniida
Familia Orbiniidae
Naineris quadricuspidata (Fabricius, 1780) + b.-a.

Familia Nereididae
Alitta brandti Malmgren, 1865 [as Nereis virens M. Sars, 1835] + + ab.

Hediste japonica (Izuka, 1908) [=Neanthes japonica (Izuka, 1908): Nereis japonica Izuka, 1908]

Namaneis littoralis (Müller in Grube, 1871) [as Lycastopsis augeneri Okuda, 1937] + + as. st.:lb.
### MACROBENTHOS IN THE INTERTIDAL ZONE OF KUNASHIR ISLAND

| Taxa                                                                 | E     | W     | S     | BG   |
|----------------------------------------------------------------------|-------|-------|-------|------|
| *Nereis pelagica* Linnaeus, 1758                                      | +     | +     | +     | b.·a.|
| *Nereis vexillosa* Grube, 1851                                       | +     | +     | +     | p. wb.|
| *Nereis zonata* Malmgren, 1867                                       | +     | +     | +     | st.·b.·a.|
| *Nereis zonata* tigrina Zachs, 1933                                  | +     |       |       | as. wb.|
| *Nereis* spp.                                                        | +     | +     |       |      |
| *Platynereis bicanaliculata* (Baird, 1863) [= *Platynereis agassizi* (Ehlers, 1868)] |       |       |       | ap.  |
| **Familia Phyllodocidae**                                             |       |       |       |      |
| *Eteone flavus* (Fabricius, 1780)                                    | +     | +     |       | b.·a.|
| *Eteone longa* (Fabricius, 1780)                                     | +     | +     | +     | b.·a.|
| *Eulalia viridis* (Linnaeus, 1767)                                   | +     | +     | +     | ab., st.·b.|
| *Eumida sanguinea* (Örsted, 1843) [= *Eulalia sanguinea* (Örsted, 1843)] | +     |       |       | ab., st.·b.|
| **Nereiphylla hera** Kato et Mawatari, 1999 [as *Phylloythe castanea* (Marenzeller, 1879)] | +     |       |       | as. lb.|
| *Phylloythe maculata* (Linnaeus, 1767)                               | +     | +     | +     | ab.  |
| **Familia Polynoidae**                                               |       |       |       |      |
| *Halosy rhre brevisetosa* Kinberg, 1855 [as *Halosy rhre nebulous* (Grube, 1866)] | +     |       |       | ap.  |
| *Harmothoe imbricata* (Linnaeus, 1767)                                | +     | +     | +     | st.·b.·a.|
| *Lepidonotus squamatus* (Linnaeus, 1764)                             | +     | +     |       | ab.  |
| *Polyonyx gener. spp.*                                               | +     |       |       |      |
| **Familia Syllidae**                                                 |       |       |       |      |
| *Autolytus beringianus* Annenkova, 1934                              | +     |       |       | as. hb.|
| *Autolytus catheriniae* Uschakov, 1950                                | +     |       |       | as. hb.|
| *Eutychia genninifera* Pagenstecher, 1862                            | +     |       |       | st.·b.·a.|
| *Proclerida prismaticus* (O.F. Müller, 1776) [= *Autolytus prismaticus* (O.F. Müller, 1776)] | +     |       |       | b.·a.|
| *Syllis armillaris* (O.F. Müller, 1776) [= *Typosyllis armillaris* (O.F. Müller, 1776)] | +     | +     | +     | p.·o.|
| *Syllis corina* Rathke, 1843 [as *Langerhansia corina* (Rathke, 1843)] | +     |       |       | p.·o.|
| *Syllis fasciata* Malmgren, 1867 [= *Typosyllis fasciata* (Malmgren, 1867)] | +     |       |       | b.·a.|
| *Syllis hylalina* Grube, 1863                                         | +     |       |       | ab., st.·lb.|
| *Syllis euestila* (Malmgren, 1867) [= *Typosyllis euestila* (Malmgren, 1867)] | +     | +     | +     | b.·a.|
| *Syllis variegra* Grube, 1860 [as *Typosyllis variegra* (Grube, 1860)] | +     | +     | +     | ab., st.·b.|
| *Typosyllis adamanteus* (Treadwell, 1914) [= *Typosyllis decorus* (Annenkova, 1934)] | +     |       |       | as. st.·lb.|
| Typosyllis spp.                                                       | +     | +     | +     |      |

**Ordo Sabellida**

| Taxa                                                                 | E     | W     | S     | BG   |
|----------------------------------------------------------------------|-------|-------|-------|------|
| *Chone teres* Bush, 1905                                             | +     | +     | +     | p. wb.|
| *Chone* spp.                                                         | +     | +     |       |      |
| *Eutistyla suavis* (Grube, 1878) [= *Bispira polymorpha* Johnson, 1901] | +     |       |       | ap.  |
| *Paradialychone cincta* (Zachs, 1933) [= *Chone cincta* Zachs, 1933] | +     |       |       | as. st.·lb.|
| *Paradialychone ecaudata* (Moore, 1923) [= *Chone ecaudata* (Moore, 1923)] | +     |       |       | p. wb.|
| *Potamilla neglecta* (M. Sars, 1851)                                 | +     |       |       | at.  |
| *Pseudopotamilla myriops* (Marenzeller, 1884)                         | +     | +     | +     | p. wb.|
| *Pseudopotamilla occelata* Moore, 1905                               | +     |       |       | p. wb.|
| **Familia Serpulidae**                                               |       |       |       |      |
| Taxa                                                                 | E        | W        | S        | BG |
|----------------------------------------------------------------------|----------|----------|----------|----|
| *Circeis spirillum* (Linnaeus, 1758) [= *Spirorbis spirillum* (Linnaeus, 1758); *Dexiospira spirilla* (Linnaeus, 1758)] | +        | +        | +        | b·a. |
| *Hydrodoides uncinata* (Philippi, 1844)                              | +        |          |          | tr·b. |
| *Laesiospira granulata* (Linnaeus, 1767)                             | +        |          |          | b·a. |
| *Neodexiospira alveolata* (Zachis, 1933) [= *Dexiospira alveolata* (Zachis, 1933)] | +        | +        |          | as. lb. |
| *Paradexiospira vitrea* (Fabricius, 1780)                            | +        |          |          | b·a. |
| Serpulidae gen. spp.                                                  | +        | +        | +        |     |
| **Ordo Spionida**                                                     |          |          |          |     |
| *Boccardia natrix* Söderström, 1920                                  | +        | +        |          | at. |
| *Malacoceros* (Rhyhchospiro) arainculus asiaticus* Chlebovitsch, 1959 [= Rhyhnchospiro arenincola Hartman, 1936] | +        | +        |          | as. wb. |
| *Microspio kussakini* Chlebovitsch, 1959                             |          |          |          | as. lb. |
| *Scolelepis squamata* (O.F. Müller, 1806) [= *Nerine cirratulus* (Delle Chiaie, 1831)] | +        |          |          | ab., st·lb. |
| *Scolelepis spp.* [= *Nerirideae sp.*]                               | +        |          |          |     |
| *Spio filicornis* (O.F. Müller, 1776)                                | +        | +        |          | b·a. |
| Spionidae gen. sp.                                                    |          |          |          |     |
| **Ordo Terebellida**                                                  |          |          |          |     |
| *Schistocomus sovjeticus* Annenkova, 1937                            | +        |          |          | as. lb. |
| *Eupolymnia robusta* (Annenkova, 1925) [as *Eupolymnia trigonostoma* (Schmarda, 1861); *Polymnia trigonostoma* (Schmarda, 1861)] | +        |          |          | as. lb. |
| *Neolepia californica* (Moore, 1904) [= *Terebella californica* (Moore, 1904)] | +        |          |          | ap. |
| *Pista elongata* Moore, 1909                                         |          |          |          | ap. |
| **Phylum Sipuncula**                                                  |          |          |          |     |
| **Classis Phascolosomatidea**                                         |          |          |          |     |
| *Phascolosoma* (Physcosoma) agassizii Keferstein, 1866 [as *Phascolosoma japonicum* Grube, 1877] | +        | +        | +        | tr·b. |
| **Ordo Phascolosomatiformes**                                         |          |          |          |     |
| *Phascolosoma* (Physcosoma) agassizii Keferstein, 1866 [as *Phascolosoma japonicum* Grube, 1877] | +        | +        | +        |     |
| **Phylum Arthropoda**                                                 |          |          |          |     |
| **Classis Pycnogonida**                                               |          |          |          |     |
| **Ordo Pantopoda**                                                    |          |          |          |     |
| *Achelia alaskensis* (Cole, 1904)                                     | +        |          |          | p. wb. |
| *Achelia kurilensis* Losina-Losinsky, 1961                            | +        | +        |          | as. wb. |
| *Nymphon striatum* Losina-Losinsky, 1929                             | +        |          |          | as. lb. |
| **Classis Maxillopoda**                                               |          |          |          |     |
| **Ordo Sessilia**                                                    |          |          |          |     |
| *Semi-balanus cariosus* (Pallas, 1788) [= *Balanus cariosus* (Pallas, 1788)] | +        | +        | +        | p. wb. |
| *Chthamalus dalli* Pilsbry, 1916                                     | +        | +        | +        | p. wb. |
| **Classis Malacostraca**                                             |          |          |          |     |
| **Ordo Amphipoda**                                                   |          |          |          |     |
| *Ampithoe kussakini* Gurjanova, 1955                                  | +        | +        | +        | p. wb. |
| *Ampithoe lacertosus* Bate, 1858 [= *Ampithoe japonica* Stebbing, 1888] | +        |          |          | p. wb. |

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| Taxa                                      | E  | W  | S  | BG |
|-------------------------------------------|----|----|----|----|
| **Ampithoe tarasovi** Bulycheva, 1952     |    |    |    | as. lb. |
| **Ampithoe volki** Gurjanova, 1938        |    |    |    | as wb. |
| **Ampithoe spp.**                         | +  | +  | +  |    |
| **Familia Anisogammaridae**               |    |    |    |    |
| **Anisogammarus pugettensis** (Dana, 1853) | +  | +  | +  | p. wb. |
| **Carineogammarus makarovi** (Bulycheva, 1952) | +  | +  | +  | p. wb. |
| **Eogammarus kygi** (Derzhavin, 1923) [=Anisogammarus kygi (Derzhavin, 1923)] | +  | +  |     | as wb. |
| **Eogammarus possjeticus** Tzetkova, 1967 |     |     | +  | as lb. |
| **Locustogammarus locustoides** (Brandt, 1851) |     |     | +  | +  | p wb. |
| **Spasskogammarus spasskii** (Bulycheva, 1952) | +  | +  | +  | as wb. |
| **Familia Caprellidae**                   |    |    |    |    |
| **Caprella bispinosa** Mayer, 1890        |    |    |    | as. st.-b. |
| **Caprella cristibrachium** Mayer, 1903   | +  | +  | +  | p. wb. |
| **Caprella danilevskii** Czerniavski, 1868 | +  | +  |     | tr.-b. |
| **Caprella irregularis** Mayer, 1890      |    | +  |    | p. wb. |
| **Caprella laeviuscula** Mayer, 1903      |    | +  |    | p. wb. |
| **Caprella mutica** Schurin, 1935         | +  |    |    | as lb. |
| **Caprella spp.**                         | +  | +  | +  |    |
| **Familia Corophiidae**                   |    |    |    |    |
| **Corophium crassicorne** Bruzelius, 1859 |    | +  |    | ab. |
| **Corophium steinegeri** Gurjanova, 1951  | +  |    |    | as wb. |
| **Corophium spp.**                        | +  | +  | +  |    |
| **Familia Dexaminidae**                   |    |    |    |    |
| **Atylus ekmani** (Gurjanova, 1938)       |    |    | +  | as wb. |
| **Guernea (Guernea) coalita** (Norman, 1868) | +  |    |    | as wb. |
| **Familia Dogielinotidae**                |    |    |    |    |
| **Dogielinotus moskvitini** (Derzhavin, 1930) [=Allorchestes moskvitini Derzhavin, 1930] | +  | +  | +  | as wb. |
| **Familia Eusiridae**                     |    |    |    |    |
| **Pontogeneia andrijaschevi** Gurjanova, 1951 | +  |    |    | as wb. |
| **Pontogeneia intermedia** Gurjanova, 1938 | +  |    |    | p. wb. |
| **Pontogeneia kondakovi** Gurjanova, 1951 |    | +  |    | as wb. |
| **Pontogeneia makarovi** Gurjanova, 1951  | +  | +  |    | as wb. |
| **Pontogeneia spp.**                      | +  | +  |    |    |
| **Familia Hyaclidae**                     |    |    |    |    |
| **Allorchestes malleolus** Stebbing, 1899 | +  | +  | +  | as wb. |
| **Apohyale bassargini** (Derzhavin, 1937) [=Hyale novaezealandiae] Bulycheva, 1957, non Thomson, 1879] | +  | +  |     | as wb. |
| **Paralorches ochotensis** (Brandt, 1851) | +  |    |    | p. wb. |
| **Paralorches zibellina** (Derzhavin, 1937) [=Hyale zibellina (Derzhavin, 1937)] |     | +  |    | as wb. |
| **Familia Ischyroceridae**                |    |    |    |    |
| **Ischyrocerus anguipes** Kreyer, 1938    |    | +  |    | h.-a. |
| **Ischyrocerus cristatus** Gurjanova, 1938 |    | +  |    | as wb. |
| Taxa                                               | E   | W   | S   | BG |
|---------------------------------------------------|-----|-----|-----|----|
| Ischyrocerus spp.                                 | +   |     | ab  |    |
| Jassa marmorata Holmes, 1903                      | +   |     | ab  |    |
| Familia Lysianassidae                             |     |     |     |    |
| Anonyx sp.                                        |     |     |     |    |
| Lepidepecreum sp.                                 |     |     |     |    |
| Orchomene sp.                                     |     |     |     |    |
| Orchomenella spp.                                 |     |     |     |    |
| Lysianassidae gen. sp.                            |     |     |     |    |
| Familia Melitidae                                 |     |     |     |    |
| Melita dentata (Krøyer, 1842)                     | +   |     |     |    |
| Melita sp.                                        |     |     |     |    |
| Familia Photidae                                  |     |     |     |    |
| Pareurystheus sexdentatus (Stephensen, 1944)      |     |     |     |    |
| Protomedeia sp.                                   |     |     |     |    |
| Familia Pleustidae                                |     |     |     |    |
| Pleusymtes japonica (Gurjanova, 1938)             |     |     |     |    |
| Pleusymtes sp.                                    |     |     |     |    |
| Familia Stenothoidae                              |     |     |     |    |
| Metopa sp.                                        |     |     |     |    |
| Stenothoidae gen. sp.                             |     |     |     |    |
| Familia Talitridae                                |     |     |     |    |
| Paciforcestia pyatakovi (Derzhavin, 1937) [=Orchestia pyatakovi Derzhavin, 1937] |     |     |     | as. lb.
| Tralorhestia crassicornis (Derzhavin, 1937) [=Orchestia platensis Bulycheva, 1957, non Krøyer, 1845: Talorhestia crassicornis Derzhavin, 1937] |     |     |     | as. lb.
| Platorchestia pachypus (Derzhavin, 1937) [=Talorhestia pachypus Derzhavin, 1937] |     |     |     | as. st:lb.
| Platorchestia Zachsii (Derzhavin, 1937) [=Talorhestia zachsii Derzhavin, 1937] |     |     |     | as. wb.
| Traskorcestia ochotensis (Brandt, 1851) [=Orchestia ochotensis Brandt, 1851] |     |     |     | as. wb.
| Trinorcestia trinitatis (Derzhavin, 1937) [=Orchoestoidea brito Bulycheva, 1957, non Stebbing, 1891: Orchoestoidea trinitatis Derzhavin, 1937] |     |     |     | ab. |
| Talitridae gen. sp.                               |     |     |     |    |
| **Ordo Cumacea**                                  |     |     |     |    |
| Familia Diastylidae                               |     |     |     |    |
| Diastylos lazarevi Lomakina, 1955                  |     |     |     | as. wb.|
| **Ordo Decapoda**                                 |     |     |     |    |
| Familia Cancridae                                 |     |     |     |    |
| Cancer gibbosulus (de Haan, 1835)                 |     |     |     | ap. |
| Familia Cheiragonida                              |     |     |     |    |
| Erimacrus isenbeckii (Brandt, 1848)               |     |     |     | as. wb.|
| Telmessus cheiragonus (Tilesius, 1812)            |     |     |     | p. wb.|
| Familia Crangonida                                |     |     |     |    |
| Crangon propinquus Stimpson, 1860 [=Crangon septemspinosa var. propinquus Stimpson, 1860] |     |     |     | as. wb.|

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| Taxa | E | W | S | BG |
|------|---|---|---|----|
| **Familia Epiaptidae** |   |   |   |    |
| *Pugettia quadridens* (de Haan, 1839) | + | + | + | as. st.'lb. |
| **Familia Hapalogastridae** |   |   |   |    |
| *Dermaturus mandtii* Brandt, 1850 | + | + |   | p. wb. |
| **Familia Hyppolytidae** |   |   |   |    |
| *Eualus leptognathus* (Stimpson, 1860) [*Eualus japonica* (Yokoya, 1930)] | + |   |   | as. st.'lb. |
| *Spirontocaris ochotensis mororani* Rathbun, 1902 | + |   |   | as. st.'lb. |
| **Familia Lithodidae** |   |   |   |    |
| *Paralithodes brevipes* (A. Milne-Edwards et Lucas, 1841) | + |   |   | p. wb. |
| **Familia Paguridae** |   |   |   |    |
| *Pagurus brachiomastus* (Thallwitz, 1891) | + | + | + | as. lb. |
| *Pagurus hirsutiunculus* (Dana, 1851) |   | + |   | p. wb. |
| *Pagurus middendorffii* Brandt, 1851 | + | + | + | p. wb. |
| **Familia Pandalidae** |   |   |   |    |
| *Pandalus latirostris* Rathbun, 1902 | + | + | + | as. st.'b. |
| *Pandalus prorsor* Stimpson, 1860 [*Pandalus meridionalis* (Balss, 1914)] | + |   |   | as. st.'b. |
| **Familia Pinnotheridae** |   |   |   |    |
| *Pinnaxodes mutuensis* Sakai, 1939 [as *Pinnaxodes major* Ortmann, 1894] | + |   |   | as. st.'lb. |
| **Familia Porcellanidae** |   |   |   |    |
| *Pachycheles stevensii* Stimpson, 1858 | + |   |   | as. st.'lb. |
| **Familia Varunidae** |   |   |   |    |
| *Eriocheir japonica* (de Haan, 1835) | + | + | + | as. st.'lb. |
| *Hemigrapsus penicillatus* (de Haan, 1835) [as *Brachynotus penicillatus* (de Haan, 1835)] | + | + |   | as. st.'lb. |
| *Hemigrapsus sanguineus* (de Haan, 1835) [as *Brachynotus sanguineus* (de Haan, 1835)] | + | + |   | as. st.'lb. |
| **Ordo Isopoda** |   |   |   |    |
| **Familia Aegidae** |   |   |   |    |
| *Rocinela maculata* Schioedte et Meinert, 1879 | + |   |   | as. lb. |
| **Familia Cirolanidae** |   |   |   |    |
| *Excirolana japonica* (Thielmann, 1910) | + |   |   | as. st.'lb. |
| **Familia Detonidae** |   |   |   |    |
| *Detonella papillicornis* (Richardson, 1904) [as *Detonella sackchalinus* Verhoeff, 1942] | + | + | + | p. wb. |
| **Familia Idoteidae** |   |   |   |    |
| *Cleantiella isopus* (Miers, 1881) [as *Cleantis isopus* Miers, 1881] | + | + |   | as. st.'lb. |
| *Idotea gurjanovae* Kussakin, 1974 | + |   |   | as. wb. |
| *Idotea ochotensis* Brandt, 1851 | + | + | + | as. wb. |
| *Idotea orientalis* Gurjanova, 1933 | + |   |   | as. wb. |
| *Synidotea lata* Gurjanova, 1933 [as *Synidotea bicuspidata* (Owen, 1839)] | + | + |   | as. wb. |
| **Familia Janiridae** |   |   |   |    |
| *Ianiropsis derjugini* Gurjanova, 1933 | + | + |   | p. wb. |
| *Ianiropsis kincaidi* Richardson, 1904 | + | + |   | p. wb. |
| *Ianiropsis setifera* Gurjanova, 1950 | + |   |   | as. wb. |
| Taxa                                      | E    | W    | S    | BG                  |
|------------------------------------------|------|------|------|---------------------|
| Familia Ligiidae                         |      |      |      |                     |
| Ligia cinerascens Budde-Lund, 1885        | +    | +    | +    | as. st.'lb.         |
| Familia Limnoridiida                     |      |      |      |                     |
| Limnoria lignorum (Rathke, 1799)         | +    | +    |      | ab.                 |
| Familia Paranthuridae                    |      |      |      |                     |
| Paranthura japonica Richardson, 1909     | +    |      |      | as. st.'lb.         |
| Familia Porcellionidae                   |      |      |      |                     |
| Porcellio scaber Latreille, 1804         | +    | +    | +    | p.o.                |
| Familia Sphaeromatidae                   |      |      |      |                     |
| Clamamella fraudatrix (Kussakin, 1962) = Dynamenella glabra (Richardson, 1899) = Dynamenella fraudatrix (Kussakin, 1962) | +    | +    | +    | as. lb.             |
| Cymodoce japonica Richardson, 1907 [as Cymodoce acuta (Richardson, 1904)] | +    |      |      | tr.'lb.             |
| Dynoides dentisimus Shen, 1929           | +    |      |      | as. st.'lb.         |
| Gnorimosphaeroma noblesi (Menzies, 1954) | +    | +    | +    | p. wb.              |
| Gnorimosphaeroma ovatum (Gurjanova, 1933) (as Gnorimosphaeroma oregonense (Dana, 1852))] | +    | +    |      | as. st.'lb.         |
| Holotelson tuberculatus Richardson, 1909 | +    | +    | +    | as. st.'lb.         |
| Familia Tecticipitidae                   |      |      |      |                     |
| Tecticeps glaber Gurjanova, 1933         | +    | +    |      | as. lb.             |
| Familia Tylidae                          |      |      |      |                     |
| Tylos granuliferus Budde-Lund, 1885 = Tylos granulatus (Miers, 1877) | +    |      |      | as. st.'lb.         |
| Ordo Leptostraca                         |      |      |      |                     |
| Familia Nebaliidae                       |      |      |      |                     |
| Nebalia bipes (Fabricius, 1780)          | +    |      |      | ab.                 |
| Nebalia japonensis (Claus, 1888)         | +    |      |      | as. lb.             |
| Ordo Mysida                              |      |      |      |                     |
| Familia Mysida                           |      |      |      |                     |
| Archaeomysis grebnitzkii Czerniavsky, 1882 | +    | +    | +    | p. wb.              |
| Phylum Mollusca                           |      |      |      |                     |
| Ordo Chitonida                           |      |      |      |                     |
| Familia Acanthochitonidae                |      |      |      |                     |
| Cryptochiton stelleri (Middendorff, 1847) | +    |      |      | p. wb.              |
| Familia Ischnochitonidae                 |      |      |      |                     |
| Ischnochiton hakodadensis Pilabry, 1892  | +    | +    |      | as. lb.             |
| Familia Mopaliida                        |      |      |      |                     |
| Mopalia schrencki Thiele, 1909            | +    |      |      | as. lb.             |
| Mopalia seta Jakovleva, 1952              | +    | +    |      | as. lb.             |
| Familia Schizoplacidae                   |      |      |      |                     |
| Schizoplax brandti (Middendorff, 1847)   | +    | +    | +    | p. wb.              |
| Familia Tonicellida                      |      |      |      |                     |
| Boreochiton granulatus (Jakovleva, 1952) = Tonicella granulata (Jakovleva, 1952) | +    | +    |      | as. wb.             |
| Tonicella submarmorea (Middendorff, 1847) | +    |      |      | p. wb.              |
| Taxa | E | W | S | BG |
|------|---|---|---|----|
| Tonicella zotini Jakovleva, 1952 | + |  |  | as. lb. |

**Classis Gastropoda**

**Clade Patellogastropoda**

Familia Lottiidae

*Erginus (Problacmaea) sybariticus* (Dall, 1871) [=Problacmaea sybaritica (Dall, 1871)] + p. wb.

*Lottia ochracea* (Dall, 1871) [=Collisella patina (Eschscholtz, 1833)] + + p. wb.

*Lottia pelta* (Rathke, 1833) [=Collisella cassis (Eschscholtz, 1833)] + + + p. wb.

*Lottia persona* (Rathke, 1833) [=Collisella radiata (Eschscholtz, 1833)] + + + p. wb.

*Nipponacmaea moskalevi* Chernyshev et Chernova, 2002 [=Acmaea granostriata (Schrenck, 1867)] + as. lb.

*Niveotectura pallida* (Gould, 1859) [=Acmaea pallida (Gould, 1859)] + + as. st.

*Neotoacema concinna* (Lischke, 1870) + as. st.

*Neotoacema schrenckii* (Lischke, 1868) + as. st.

*Lottiidae gen. spp.* + + +

**Clade Vetigastropoda**

Familia Trochidae

*Lirularia iridescens* (Schrenck, 1863) [=Minolia iridescens (Schrenck, 1863); Isanda iridescens (Schrenck, 1863)] + + as. lb.

*Margarites helicinus* (Phipps, 1774) + + b.‘a.

*Margarites pilsbryi* Kuroda et Habe, 1952 + + as. lb.

Familia Turbinidae

*Homalopoma sangarense* (Schrenck, 1867) [=Turbo sangarensis Schrenck, 1867; Leptothyra sangarensis Pilsbry, 1888] + + + as. lb.

**Clade Caenogastropoda**

Familia Barleeidae

*Ansola angustata* (Pilsbry, 1901) [=Barleeia angustata (Pilsbry, 1901)] + + as. st.

Familia Batillariidae

*Batillaria cumingii* (Crosse, 1862) [=Potamides aterrima (Dunker, 1882)] + + as. st.

Familia Buccinidae

*Buccinum baeri* (Middendorff, 1848) + p. hb.

*Buccinum middendorffi* Verkrüzen, 1882 + + + as. lb.

*Buccinum mirandum mirandum* E.A. Smith, 1875 + + as. wb.

*Buccinum percrassum* Dall, 1883 + as. wb.

*Buccinum sp. [as Buccinum tricarinatum Dall, 1877] +

*Neptunia arthritica* (Valenciennes, 1858) + + + as. lb.

*Neptunia bulbacea* (Valenciennes, 1858) + as. lb.

*Volutharpa ampullacea* (Middendorff, 1848) + as. wb.

Familia Caecidae

*Caecum dorjugini* Golikov et Kussakin in Golikov et Scarlato, 1967 [=*Brochina dorjugini* Golikov, 1967] + + as. lb.

Familia Calyptraeidae
| Taxa                                                                 | E  | W  | S  | BG   |
|----------------------------------------------------------------------|----|----|----|------|
| **Crepidula derjugini** Golikov et Kussakin, 1962                   |    |    | +  | as. lb. |
| **Crepidula grandis** Middendorff, 1849                              | +  | +  |    | p. wb. |
| **Crepidula spp.**                                                   | +  | +  | +  |      |
| **Familia Cerithiopsidae**                                           |    |    |    |      |
| **Cerithiopsis stejnegeri** Dall, 1884                               | +  | +  |    | p. wb. |
| **Familia Columbellidae**                                            |    |    |    |      |
| **Mitrella burchardi** (Dunker, 1877) [=Columbella dunkeri**        | +  | +  | +  | as. lb. |
| sensu Kussakin, 1956, non Tryon, 1883: Pyrene varians**              |    |    |    |      |
| (Sowerby I, 1832)**                                                 |    |    |    |      |
| **Familia Falsicingulidae**                                          |    |    |    |      |
| **Falsicingula athera** Bartsch in Golikov et Scarlato, 1967         | +  | +  |    | as. lb. |
| **Falsicingula kurilensis** (Pilsbry, 1905) [=Cingula*               | +  | +  |    | as. wb. |
| kurilensis Pilsbry, 1905]                                            |    |    |    |      |
| **Falsicingula mundana** (Yokoyama, 1926) [=Falsicingula*           | +  |    |    | as. lb. |
| elegans Golikov et Kussakin in Golikov et Scarlato, 1967]            |    |    |    |      |
| **Familia Littorinidae**                                             |    |    |    |      |
| **Epheria decorata** (A. Adams, 1861)                                | +  |    |    | as. lb. |
| **Epheria turrita** (A. Adams, 1861)                                 |    | +  | +  | as. lb. |
| **Haloconcha minor** Dall, 1919 [=Lacuna minor** (Dall,            | +  | +  |    | p. wb. |
| 1919)]                                                             |    |    |    |      |
| **Littorina brevicula** (Philippi, 1844)                             | +  |    |    | as. st. lb. |
| **Littorina mandshurica** Schrenk, 1867                             |    | +  |    | as. lb. |
| **Littorina sitkana** Philippi, 1846 [=Littorina kurila**           | +  | +  |    | p. wb. |
| Middendorff, 1848]                                                  |    |    |    |      |
| **Littorina squalida** Broderip et Sowerby I, 1829                   | +  | +  | +  | p. wb. |
| **Stenotis uchidai** Habe, 1953 [=Lacuna uchidai** (Habe,           | +  |    |    | as. lb. |
| 1953)]                                                             |    |    |    |      |
| **Familia Muricidae**                                                |    |    |    |      |
| **Boreotrophon candelabrum** (Reeve, 1848) [=Trophon clathratus**|    | +  | +  | as. lb. |
| (Linnaeus, 1767)]                                                   |    |    |    |      |
| **Nucella elongata** Golikov et Kussakin, 1974 [=Thais*             | +  |    |    | as. lb. |
| lamellosa (Gmelin, 1791)]                                            |    |    |    |      |
| **Nucella freycinetii** (Deshayes, 1839) [=Purpura*                 | +  | +  | +  | p. wb. |
| freycinetii Deshayes, 1839]                                          |    |    |    |      |
| **Nucella hoyseana** (Dunker, 1882)                                  |    | +  | +  | as. lb. |
| **Nucella lima** (Gmelin, 1791) [=Thais lima (Gmelin, 1791)]        |    | +  |    | p. wb. |
| **Ocenebra inornata** (Rècluz, 1851) [=Tritonia japonica**         |    |    | +  | as. st. lb. |
| (Dunker, 1860): Ocenebra japonica Pilsbry, 1895]                    |    |    |    |      |
| **Familia Nassariidae**                                              |    |    |    |      |
| **Nassarius fraterculus** (Dunker, 1860) [=Tritia fratercula**     | +  | +  |    | as. st. lb. |
| (Dunker, 1860)]                                                     |    |    |    |      |
| **Nassarius multigranosus** (Dunker, 1847) [=Tritia*               | +  | +  | +  | as. st. lb. |
| acutidentata (E. A. Smith, 1879): Alectrion festiva (Powis, 1835)] |    |    |    |      |
| **Familia Naticidae**                                               |    |    |    |      |
| **Cryptonatica affinis** (Gmelin, 1791) [=Cryptonatica*            | +  | +  |    | as. lb. |
| clausa (Broderip et Sowerby I, 1829): Natica clausa**               |    |    |    |      |
| Broderip et Sowerby I, 1829]                                        |    |    |    |      |
| **Cryptonatica hirasei** (Pilsbry, 1905) [=Boreonatica*            | +  | +  | +  | as. lb. |
| hirasei (Pilsbry, 1905)]                                            |    |    |    |      |
| **Cryptonatica janthostoma** (Deshayes, 1839)                        | +  |    |    | as. wb. |
| **Lunatia pila** (Pilsbry, 1911) [=Euspira pila** (Pilsbry,        | +  |    |    | as. lb. |
| 1911)]                                                             |    |    |    |      |

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### Taxa

| Family Name | Genus and Species | Reference | E 1951–1964 | W 1987–1991 | S 1991 | BG 1951–1964 |
|-------------|------------------|-----------|--------------|------------|-------|--------------|
| Familia Pomatiopsidae | Cecina manchurica A. Adams, 1861 [=Truncatella tatarica Schrenck, 1867] | + | + | as. wb. |
| Familia Ranellidae | Fusitrion oreganensis (Redfield, 1846) | + | p. wb. |
| Familia Rissoidae | Alvania sp. | + |
| Familia Velutinidae | Pusilina plicosa (Smith, 1875) [=Thapsiella plicosa (Smith, 1875)] | + | + | as. lb. |
| Familia Velutinidae | Velutina coriacea Pallas, 1788 [=Velutina litoralis Golikov et Kussakin, 1967] | + | as. wb. |
| Familia Velutinidae | Velutina tarasovi Derjugin, 1950 [=Velutina fraudatrix Golikov et Kussakin, 1962] | + | as. wb. |
| Clade Heterobranchia | Velutina spp. | + | |
| Familia Cylichnidae | Decorifer matusimanus (Nomura, 1939) [=Acteocina insignis (Pilsbry, 1904)] | + | as. st. lb. |
| Familia Flabellinidae | Coryphella athadona Bergh, 1875 | + | p. wb. |
| Familia Pyramidellidae | Iolaea dubia Golikov et Kussakin, 1967 | + | as. lb. |
| Familia Rissoellidae | Pyrgolampros rufodiscata (E.A. Smith, 1875) | + | as. lb. |
| Familia Siphonariidae | Siphonacmea oblongata (Yokoyama, 1926) | + | as. lb. |
| Classis Bivalvia | Glysmeris yessoensis (Sowerby III, 1889) [as Glycymeris albolineata (Lischke, 1872)] | + | + | + | as. lb. |
| Ordo Arcida | Mya arenaria Linnaeus, 1758 | + | + | b:a. |
| Ordo Myida | Mya japonica Jay, 1857 | + | p. wb. |
| Ordo Mytilida | Penitella penita (Conrad, 1837) | + | p. wb. |
| Ordo Mytilida | Teredo navalis Linnaeus, 1758 | + | ab., st lb. |
| Ordo Mytilida | Adula schmidtii (Schrenck, 1867) | + | as. lb. |
| Ordo Mytilida | Modiolus kurilensis Bernard, 1983 [=Modiolus modiolus (Linnaeus, 1758)] | + | + | + | as. st b. |
| Ordo Mytilida | Musculista senhousia (Benson in Cantor, 1842) [=Brachidontes senhousia (Benson in Cantor, 1842)] | + | + | ?as. st lb. |
| Taxa | E  | W  | S  | BG  |
|------|----|----|----|-----|
|      | 1951–1964 | 1967–1981 | 1981 | 1951–1964 |
| Musculus laevigatus (Gray, 1824) | + | + | b·a. | |
| Mytilus trossulus kussakini Scarlato et Starobogatov, 1979 [as Mytilus edulis Linnaeus, 1758] | + | + | as. wb. | |
| Vlasiina pillula Bartisch in Scarlato, 1960 | + | + | as. lb. | |
| **Ordo Ostreida** | | | | |
| | Familia Ostreidae | | | |
| Crassostrea gigas (Thunberg, 1793) | + | | as. st·lb. | |
| **Ordo Pectinida** | | | | |
| | Familia Pectinidae | | | |
| Mizuhopecten yessoensis (Jay, 1856) | + | + | + | as. lb. |
| **Ordo Pholadomyida** | | | | |
| | Familia Lyonsiidae | | | |
| Entodesma navicula (A. Adams et Reeve, 1850) [=Entodesma naviculoides Yokoyama, 1922] | + | | as. lb. | |
| Entodesma sp. | + | | | |
| Lyonsia sp. | + | | | |
| **Ordo Venerida** | | | | |
| | Familia Cardiidae | | | |
| Clinocardium californiense (Deshayes, 1839) [=Keenocardium californiense (Deshayes, 1839)] | + | | p. wb. | |
| | Familia Lasaeidae | | | |
| Mysella kurilensis litoralis Scarlato et Ivanova, 1974 | + | + | as. wb. | |
| | Familia Mactridae | | | |
| Spisula sachalinensis (Schrenck, 1861) [=Mactra sachalinensis Schrenck, 1861] | + | | as. lb. | |
| | Familia Psammobiidae | | | |
| Nuttallia ezonis Kuroda et Habe in Habe, 1955 | + | | as. lb. | |
| Nuttallia obscurata (Deshayes in Reeve, 1857) [=Nuttallia olivacea (Jay, 1857)] | + | | as. st·lb. | |
| | Familia Tellinidae | | | |
| Cadella lubrica (Gould, 1861) [=Moerella salmonea Carpenter, 1864] | + | | as. st·lb. | |
| Macoma incongrua (Martens, 1865) | + | + | as. st·lb. | |
| Megangulus luteus (Wood, 1828) [=Peronidia lutea (Gray, 1828)] | + | + | p. wb. | |
| Megangulus venulosus (Schrenck, 1861) [=Tellina venulosa Schrenck, 1861; Peronidia venulosa (Schrenck, 1861)] | + | + | as. lb. | |
| | Familia Veneridae | | | |
| Protothaca euglypta (Sowerby III, 1914) [as Protothaca staminea (Conrad, 1837)] | + | + | + | as. st·lb. | |
| Ruditapes philippinarum (A. Adams et Reeve, 1850) [=Venerupis philippinarum (A. Adams et Reeve, 1850); Venerupis japonica (Deshayes, 1853)] | + | + | + | as. st·lb. | |
| Turtonia minuta (Fabricius, 1780) | + | + | + | + | ab. | |
| **Incerti ordinis** | | | | |
| | Familia Hiatellidae | | | |
| Histella arctica (Linnaeus, 1767) [=Saxicava arctica (Linnaeus, 1767)] | + | + | + | b·a. | |
| Panomya sp. | + | | | |
### MACROBENTHOS IN THE INTERTIDAL ZONE OF KUNASHIR ISLAND

| Taxa | E | W | S | BG |
|------|---|---|---|----|
| *Panopea japonica* A. Adams, 1850 | + | + | | as. lb. |
| **Familia Pharidae** | | | | |
| *Siliqua alta* (Broderip et Sowerby I, 1829) [as *Siliqua pulchella* (Dunker, 1852)] | + | + | | p. wb. |
| **Phylum Bryozoa** | | | | |
| **Classis Gymnolaemata** | | | | |
| **Ordo Cheilostomata** | | | | |
| *Bugula pacifica* Robertson, 1905 | + | | | p. wb. |
| **Familia Calloporidae** | | | | |
| *Cauloramphus echinus* (Hincks, 1882) | + | | | p. wb. |
| *Cauloramphus spiniferum* (Johnston, 1832) | + | + | | ab. |
| **Familia Candidae** | | | | |
| *Tricellaria ternata* (Ellis et Solander, 1786) | + | | | b. a. |
| **Familia Celleporidae** | | | | |
| *Celleporina nordenskjoldi* (Kluge, 1929) [= *Cellepora nordenskjoldi* Kluge, 1929] | + | + | | b. a. |
| **Familia Cryptosulidae** | | | | |
| *Cryptosula zavjalovensis* Kubanin, 1976 [= *Lepralia pallasiana* (Moll, 1803)] | + | + | | p. wb. |
| **Familia Hippothoidae** | | | | |
| *Celleporella hyalina* (Linnaeus, 1767) [= *Hippothoa hyalina* (Linnaeus, 1767)] | + | + | + | b. a. |
| **Familia Microporellidae** | | | | |
| *Fenestrulina malusii* (Audouin, 1826) [= *Microporella malusii* (Audouin, 1826)] | + | | | p. o. |
| **Familia Smittinidae** | | | | |
| *Smittina minuscula* (Smitt, 1868) | + | | | b. a. |
| **Ordo Ctenostomata** | | | | |
| **Familia Alcyonidiidae** | | | | |
| *Alcyonidium mamillatum* Alder, 1857 | + | | | b. a. |
| *Alcyonidium mytili* Dalyell, 1847 | + | | | b. a. |
| **Familia Flustrellidididae** | | | | |
| *Flustrellidra cervicornis* (Robertson, 1900) | + | | | p. hb. |
| *Flustrellidra corniculata* (Smitt, 1872) [= *Flustrella corniculata* (Smitt, 1872)] | + | | | b. a. |
| **Familia Vesiculariidae** | | | | |
| *Bowerbankia composita* Kluge, 1955 | + | | | b. a. |
| *Bowerbankia* sp. | + | | | |
| **Classis Stenolaemata** | | | | |
| **Ordo Cyclidostomata** | | | | |
| **Familia Lichenoporididae** | | | | |
| *Lichenopora* sp. | + | | | |
| **Familia Tubuliporididae** | | | | |
| *Tubulipora* sp. | + | | | |
| **Phylum Echinodermata** | | | | |
| **Classis Asteroidea** | | | | |

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| Taxa                                                                                     | E | W | S | BG       |
|----------------------------------------------------------------------------------------|---|---|---|----------|
| **Ordo Forcipulatida**                                                                  |   |   |   |          |
| Familia Asteriidae                                                                      |   |   |   |          |
| *Aphelasterias japonica* (Bell, 1881)                                                   | + | + |  | as. lb.  |
| *Asterias amurensis* Lütken, 1871                                                       | + | + | + | ?at.     |
| *Distolasterias elegans* Djakonov, 1931                                                 | + | + |  | as. lb.  |
| *Èvasterias retífera* Djakonov, 1938                                                    | + | + |  | p. wb.   |
| *Leptasterias (Eoleptasterias) kussakini* Baranova, 1962                               | + |  |   | ?as. lb. |
| *Leptasterias (Eoleptasterias) similispinis* (H.L. Clark, 1908)                        |   | + |   | as. lb.  |
| *Lethasterias fusca* Djakonov, 1931                                                    | + | + |  | as. lb.  |
| *Lethasterias nanimensis chelifera* (Verrill, 1914)                                     | + |  |   | p. wb.   |
| Asteriidae gen. sp.                                                                      | + |   |   |          |
| Familia Pycnopodiidae                                                                   |   |   |   |          |
| *Lysastrosoma anthosticta* Fischer, 1922                                                | + |   |   | as. lb.  |
| **Ordo Spinulosida**                                                                    |   |   |   |          |
| Familia Echinarasteridae                                                                |   |   |   |          |
| *Henricia tumida* Verrill, 1914                                                         | + |   |   | p. wb.   |
| *Henricia* sp.                                                                          | + |   |   |          |
| **Ordo Valvatida**                                                                      |   |   |   |          |
| Familia Asterinidae                                                                     |   |   |   |          |
| *Asterina pectinífera* (Müller et Troschel, 1842) [= *Patiria pectinífera* (Müller et Troschel, 1842)] | + |   |   | as. st. lb. |
| **Classis Ophiuroidea**                                                                 |   |   |   |          |
| **Ordo Ophiurida**                                                                      |   |   |   |          |
| Familia Ophiaciidae                                                                     |   |   |   |          |
| *Ophiopholis aculeata* (Linnaeus, 1767)                                                 | + |   |   | ab.      |
| **Classis Echinoidea**                                                                  |   |   |   |          |
| **Ordo Camarodonta**                                                                    |   |   |   |          |
| Familia Strongylocentrotidae                                                            |   |   |   |          |
| *Strongylocentrotus intermedius* (A. Agassiz, 1863)                                     | + | + | + | as. wb.  |
| **Classis Holothuroidea**                                                                |   |   |   |          |
| **Ordo Aspidochirotiota**                                                                |   |   |   |          |
| Familia Stichopodidae                                                                   |   |   |   |          |
| *Apostichopus japonicus* (Selenka, 1867)                                                | + |   |   | as. st. lb. |
| **Ordo Dendrochirotida**                                                                |   |   |   |          |
| Familia Sclerodactylida                                                                 |   |   |   |          |
| *Èuventacta fraudatrix* (Djakonov et Baranova in Djakonov et al., 1958) [= *Cucumaria fraudatrix* Djakonov et Baranova in Djakonov et al., 1958] | + |   |   | as. wb.  |
| *Èuventacta* sp. [as *Cucumaria chronhjelmi* Théel, 1886]                               | + |   |   |          |
| **Ordo Synaptida**                                                                      |   |   |   |          |
| Familia Synaptida                                                                        |   |   |   |          |
| Synaptidae gen. sp.                                                                     | + |   |   |          |
| **Phylum Chordata**                                                                     |   |   |   |          |
| **Classis Ascidiacea**                                                                  |   |   |   |          |
| **Ordo Aplousobranchia**                                                                |   |   |   |          |
### MACROBENTHOS IN THE INTERTIDAL ZONE OF KUNASHIR ISLAND

| Taxa | 1951–1964 | 1987–1991 | 1991 | 1951–1964 | BG |
|------|-----------|-----------|------|-----------|----|
| Familia Holozoidae | + | + | + | | |
| Distaplia spp. | | | | |
| **Ordo Stolidobranchia** | | | | |
| Familia Styelidae | | | | |
| Botryllus schlosseri (Pallas, 1766) | + | | p.-o. | | |
| **Classis Actinopterygii** | | | | |
| **Ordo Perciformes** | | | | |
| Familia Gobiidae | + | as. lb. | as. wb. | as. lb. | |
| Gobiidae gen. sp. | | | | |
| Familia Pholididae | | | | |
| Pholis nebulosa (Temminck et Schlegel, 1845) | + | | as. lb. | | |
| Pholis picta (Kner, 1868) | + | | as. wb. | | |
| Rhodymenichthys dolichogaster (Pallas, 1814) [=Pholis dolichogaster dolichogaster (Pallas, 1814)] | + | | p. wb. | | |
| Familia Stichaeidae | | | | |
| Alectrias alectrolophus (Pallas, 1814) | + | + | p. wb. | | |
| Opisthocentrus ocellatus (Tilesius, 1811) | + | | as. wb. | | |
| Pholidapus dybowskii (Steindachner, 1880) [=Opisthocentrus dybowskii (Steindachner, 1880)] | + | | as. wb. | | |
| Stichaeopsis nana Kner et Steindachner, 1870 | + | | as. lb. | | |
| Stichaeidae gen. sp. | | | | |
| Familia Zoaridae | | | | |
| Zoarces elongatus Kner, 1868 [=Zoarces viviparus elongatus Schmidt, 1950] | + | | as. wb. | | |
| **Ordo Pleuronectiformes** | | | | |
| Familia Pleuronectidae | + | + | + | | |
| Pleuronectidae gen. spp. | | | | |
| **Ordo Scorpaeniformes** | | | | |
| Familia Cottidae | | | | |
| Myoxocephalus stelleri Tilesius, 1811 | + | + | + | as. wb. | |
| Porocottus allisi (Jordan et Starks, 1904) | + | | as. lb. | | |
| Cottidae gen. spp. | + | + | | | |
| Familia Hemitripteridae | | | | |
| Blepsias cirrhosus (Pallas, 1814) | + | | p. wb. | | |
| Familia Hexagrammidae | | | | |
| Hexagrammos octogrammus (Pallas, 1810) | + | | p. wb. | | |
| Familia Scorpaenidae | | | | |
| Sebastes schlegeli Hilgendorf, 1880 | + | | as. lb. | | |