

An Annotated List of Cartilaginous Fishes (Chondrichthyes: Elasmobranchii, Holocephali) of the Coastal Waters of Sakhalin Island and the Adjacent Southern Part of the Sea of Okhotsk

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Abstract—An annotated list of cartilaginous fish (Chondrichthyes: Elasmobranchii, Holocephali) is given for the first time in the 200-year history of studying the ichthyofauna of Sakhalin Island and adjacent waters of the southern parts of the Sea of Okhotsk (including the coast of Hokkaido Island) and the northern Sea of Japan. The list includes 43 species in two classes, eight orders, 16 families, and 25 genera. Information on nature conservation status, English and Latin names, depths of habitat, and distribution within the coastal waters of Sakhalin are presented. For a number of species caught off the coast of Sakhalin and in the adjacent waters, information is provided on collection specimens confirming their presence in the region under study. For a number of species of the Rajiformes order (*Arctoraja parmifera*, *A. smirnovi*, *A. simoterus*), the modern ranges and taxonomic status are being refined in the light of new data. The taxonomic status of the so-called “disputed” taxa is discussed as well as the validity of the species considered in the *Bathyraja matsubarai* complex. Based on the study of the collections, *Arctoraja simoterus*, previously unknown in the waters of Russia, as well as *Myliobatis tobijei*, caught in the Bering Sea, has been discovered, which significantly expands the range of this species to the north.

Keywords: cartilaginous fishes, Chondrichthyes, Elasmobranchii, Holocephali, annotated list, Sakhalin Island, Northwestern Pacific, Sea of Okhotsk

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INTRODUCTION

Cartilaginous fish (Chondrichthyes) in marine sediments are known from the upper Devonian and existed more than 350 million years ago (Gubanov et al., 1986). In a number of countries, sharks and skates serve as the most valuable object of fishing. Meat and fins are widely used for food purposes. The skin goes to the manufacture of footwear and haberdashery, and the fat obtained from the liver is a most valuable raw material for perfumery and the pharmaceutical industry (Maksimov, 1970; Gubanov et al., 1986). These fish are characterized by slow rates of growth and maturation and low fecundity (Maksimov, 1970; Gubanov et al., 1986), which should be taken into account when organizing the exploitation of their stocks in order to prevent overfishing. Specific species (*Carcharodon carcharias*, *Isurus oxyrinchus*), which occur near the coast of Sakhalin, are extremely dangerous for humans.

Modern knowledge of cartilaginous fishes has not yet fully formed and is now cumulative and descriptive. Nevertheless, in recent years, the interest in this group noticeably increased, which, in particular, was reflected in the description of new species. Thus, from 2008 to early 2017, 196 new species of cartilaginous fishes were described, with the largest number in the Carcharhiniformes, Rajiformes, and Myliobatiformes orders (Eschmeyer and Fong, 2017). Another example of interest in cartilaginous fishes are various specialized databases, among which the largest and most authoritative is “Shark-References: Bibliography Database” (Pollerspöck and Straube, 2017). Cartilaginous fish are attracting increased interest from international conservation organizations and fishery management organizations (CITES, CMS, FAO, IUCN, etc.), which is partly due to a sharp decrease in the number of some commercial species because of overfishing due to high demand for products from sharks and skates in Asian markets.

To date, approximately 40 species of sharks, 59 species of skates, and seven species of chimaeras (the total number of cartilaginous fishes is 106 species) are known in the waters of Russia and the surrounding waters, with the maximum species diversity in the Far Eastern waters of Russia (Borets, 2000; Grigorov and Orlov, 2013; Parin et al., 2014; Dyldin, 2015). Nevertheless, the degree of study of the cartilaginous fishes of the waters of Sakhalin and the adjacent waters remains extremely low, and the published information is fragmentary and largely erroneous. Until now, there is no general list of cartilaginous fishes registered in the waters of Sakhalin, as, indeed, for all the marine fish of this region. The difficulty in drawing up such a list is partly due to the fact that a number of reports for representatives of this group indicate information on the geographic distribution of only a general nature, for example, the Sea of Japan or the Sea of Okhotsk (Borets, 2000; Parin, 2001; Grigorov and Orlov, 2013; Parin et al., 2014; Tuponogov and Kodolov, 2014), and there is information on the occurrence in the waters of Sakhalin only in rare cases (Ueno, 1971; Sokolovsky et al., 2007; Parin et al., 2014; Dyldin, 2015). In a recent report on the cartilaginous fishes of Russia and adjacent waters (Dyldin, 2015), 22 species of cartilaginous fishes are indicated directly for the waters of Sakhalin, but the information is very general without reporting data on distribution limits, habitats, occurrence, commercial significance, collection specimens, recent rare records, etc.

The purpose of this work is to continue the revision of the whole ichthyofauna of the waters of Sakhalin, which began with a series of four publications on freshwater and coastal brackish-water fish species without taking into account marine species (Dyldin and Orlov, 2016a, 2016b, 2017a, 2017b).

MATERIALS AND METHODS

The views on the macrosystematic of cartilaginous fishes in modern ichthyology vary considerably. According to some authors (Rass and Lindberg, 1971; Nelson, 2006), Elasmobranchii and Holocephali are considered in the rank of subclasses in the Chondrichthyes class. In a later work by Nelson et al. (2016), one Chondrichthyes class is also accepted, but Elasmobranchii is already indicated in the rank of the infra-class within the Euselachii subclass (sharks, rays, and related fossils), and the Holocephali subclass is left in the same rank. According to another opinion (van der Laan et al., 2014; Eschmeyer and Fong, 2017), which the authors adhere to, Elasmobranchii and Holocephali are two separate classes. In this paper, the basic classification of higher taxa from class to family is adopted in accordance with the latest developments of Eschmeyer and Fong (2017) and van der Laan et al. (2014). Type locality and synonymy are given in accordance with a number of recent publications (Dyldin,

2015; Last et al., 2016a; Weigmann, 2016; Eschmeyer et al., 2017).

Critically analyzed literature sources (books, publications, dissertations), electronic catalogs and databases, such as Catalog of Fishes (Eschmeyer et al., 2017), Global Biodiversity Information Facility (GBIF, 2017), and FishBase (Froese and Pauly, 2017), personal reports of colleagues, and materials of our own multiyear research in the Northwestern Pacific were the basis of this work. The work also provides the data on the samples (the place of capture and specific name) of cartilaginous fishes from the studied region and adjacent waters, kept in the collections of scientific institutes in Russia, Japan and the United States: Kholmsk Museum of Sea Fauna, Kholmsk, Sakhalin Island, Russia (KhMSF); Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZIN RAN); the Fish Collection of Kyoto University, Kyoto, Japan (FAKU); Museum of Tokyo University of Fisheries, Tokyo, Japan (MTUF); Fish Collection of Hokkaido University, Hokkaido, Japan (HUMZ); Fish Collection of the National Museum of Nature and Science, Tokyo, Japan (NSMT); the National Museum of Natural History, Smithsonian Institution, Washington, D.C., United States (USNM).

Data on each species is presented according to the following scheme. Each species is assigned its own serial number and the name is given in Latin (scientific name) and English. The Latin name is accompanied by the author(s) and the year of the original description. The English name is given in accordance with the published work (Dyldin, 2015) or the Internet resource FishBase (Froese and Pauly, 2017). The scientific name is followed by the date of the original description with a type locality, and, only if necessary, synonymy, since earlier the synonymy of the cartilaginous fish of Russia and adjacent waters is detailed in the work of the first author (Dyldin, 2015).

The zoogeographical characteristics are mainly given in accordance with the latest developments of FAO (2017) and Eschmeyer et al. (2017), which adopted the following zoogeographical categories: Arctic, North Pacific, Northwestern Pacific etc., including such general categories as cosmopolitan and circumglobal.

To describe the local distribution of cartilaginous fish within the waters of Sakhalin on the basis of hydrological and climatic conditions, its coastal water area is conditionally divided into the following regions: northern, southern, northeast, southeast, northwest and southeast (Dyldin and Orlov, 2016a). In addition, in order to exclude erroneous information on the distribution of a species within the waters of Sakhalin Island, we give the range mainly based on the data specified for specimens kept in various museums around the world (indicating the numbers and locations of storage under the heading "Samples"), as well

as in accordance with the original descriptions and other authoritative sources that are trustworthy.

Depending on the ecological features, the species were referred to exclusively marine (M.) or to marine but also marked in brackish waters—marine, brackish-water (M., Br.). Information on the depths of habitat is presented according to the latest data (Weigmann, 2016) with some additions indicated in the text. By the degree of abundance, there were numerous, common, rare, or very rare species.

For most species, taxonomic and other information is additionally listed under the heading “Note.”

For each valid species, information on the conservation status (if any) is provided in accordance with criteria of the Red List of the International Union for Conservation of Nature (IUCN). To characterize the conservation status of species, the following categories are adopted: Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern, Data Deficient, Not Evaluated (IUCN, 2012, 2015, 2017).

The following designations are accepted in the work: * according to our and literary data for the Sakhalin waters, the species is not noted but is known from the adjacent water areas of the southern part of the Sea of Okhotsk; ** was indicated in the past for the studied region but, in the light of new data, it is not observed at present off the coast of Sakhalin and adjacent waters, where it is replaced by other species or, possibly, it was incorrectly identified in the past; ? the taxonomic status or identification is doubtful or the area is not clear, and also in cases where the information on distribution, abundance, etc. needs clarification.

RESULTS

History of the Study of Cartilaginous Fishes in the Waters of Sakhalin Island and Adjacent Waters

The first scientific information relating to the cartilaginous fishes of the coastal waters of Sakhalin belongs to Schmidt (1904) who first indicated the only species of *Raja binoculata* for Aniva Bay (the southern part of Sakhalin Island) and preserved a specimen in the collection of the Zoological Institute of the Russian Academy of Sciences. The famous “Albatross” North Pacific Expedition visited the southwestern part of Sakhalin in 1906, where a collection of fish was collected in the Tatar Strait, including several specimens of skates that were subsequently identified as *Arctoraja smirnovi* and *Bathyraja isotrachys* and are still kept in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., United States. Somewhat later, Tanaka (1908) indicated *Squalus mitsukurii* for Aniva Bay. Berg (1911), on the basis of the collection built by Schmidt in 1901 kept in the Zoological Institute of the Russian Academy of Sciences, indicated *Bathyraja interrupta* as a possible

species for the southwestern part of the island and *Squalus acanthias*, for Aniva Bay. Jordan et al. (1913) indicated *R. binoculata* for the southern part of Sakhalin Island. Soldatov and Pavlenko (1915) described a new *Raja smirnovi* species from the waters of Peter the Great Bay (Sea of Japan), which later appeared to be widespread near the shores of Sakhalin. Soldatov and Lindberg (1930) summed up the first results of Soviet studies on the ichthyofauna of the far eastern seas (Sea of Japan, Sea of Okhotsk, and Bering Sea): they reported on 22 species of cartilaginous fishes, including those from adjacent waters (mainly Japan) but not yet observed in our seas. However, in this monograph no new information on the capture of cartilaginous fish off the coast of Sakhalin has been given. Liu (1932) described a new *Raja pulchra* species from the waters of the Yellow Sea, which later, like *R. smirnovi*, appeared to be widespread off the shores of Sakhalin. Schmidt and Taranetz (1934) indicated the presence of a hammerhead shark *Sphyrna zygaena* in the waters of the mainland coast of the northern part of Tatar Strait, adjacent to western Sakhalin. Suvorov (1935) described a new *Raja violacea* species from the waters of the Okhotsk coast of Kamchatka, which was later discovered in the waters of Sakhalin. Taranetz (1937) summarized the accumulated materials of previous studies together with possible findings from the adjacent waters of Japan and expanded the list of Far Eastern cartilaginous fishes almost two times compared with the data of Soldatov and Lindbergh (1930) (35 species of cartilaginous fishes for the waters of the Soviet Far East). At the same time, he indicated two species directly for the waters of Sakhalin: *Raja kenojei* for the western part and *R. binoculata* for Aniva Bay with the “?” sign.

Isii (1940) presented some information, including biology and fishing, about several cartilaginous fishes of the waters of southern Sakhalin, such as *Lamna ditropis*, *Prionace glauca*, *Squalus suckleyi*, *Okamejei kenojei* (and its current junior synonym *Raja katsukii*), and *Bathyraja isotrachys*¹. In Schmidt’s fundamental monograph (1950) on the fish of the Sea of Okhotsk, there is some information about cartilaginous fishes of Sakhalin and adjacent waters, such as *Squalus acanthias suckleyi* (western Sakhalin), *Raja smirnovi* (Tatar Strait), *R. violacea* (western Kamchatka), and *R. binoculata* (Aniva Bay). In relation to the latter, the author suggested that this specimen possibly belongs to another species. Probatov (1951, 1952) indicated two species of sharks—*Carcharias japonicus* and *Isurus glauca*—for the first time for the waters of southwestern Sakhalin. In the same period, publications by Ishiyama (Ishiyama, 1950, 1951, 1952, 1955, 1958, 1967; Hubbs and Ishiyama, 1968), specializing in the systematics of skates, began to be issued. The result of his research was the description of 12 new species, the

¹ Scientific names are given in accordance with modern views on the taxonomy of cartilaginous fishes.

identification of a number of new subgenera (*Okamejei*, *Notoraja*, etc.) and the *Rhinoraja* genus. In addition, he applied a new approach to the study of this group, which consists of studying both external and internal characters (the morphology of claspers, egg capsule, neurocranium, shoulder, and pelvic girdles), which is still widely used in studies of the taxonomy of skates. A number of skate species described by Ishiyama (1952, 1958) were subsequently found off the coast of Sakhalin and in the southern part of the Sea of Okhotsk (for example, *Bathyrāja diplotaenia*, *B. matsubarai*, *B. trachouros*, *Rhinoraja longicauda*).

In 1947–1949, ZIN AS USSR and TINRO organized a joint expedition under the leadership of G.U. Lindberg under the general name “Kurilo-Sakhalin Sea Complex Expedition ZIN–TINRO,” which existed for 3 years. On the basis of collected materials (including a collection of cartilaginous fishes) and literature data, Lindberg (1959) published a list of fish in the southern part of Sakhalin and the South Kurils, where he indicated six species of cartilaginous fishes for the waters of Sakhalin and the adjacent southern part of the Sea of Okhotsk: *Lamna ditropis*, *Isurus glaucus* (with the “?” sign), *Squalus acanthias acanthias*, *Raja kenojei*, *R. interrupta*, and *R. smirnovi*. In the same year, the first part of the multivolume capital work of Lindberg and Legeza (1959) was published, in which eight species of cartilaginous species are listed for southern Sakhalin and the southern part of the Sea of Okhotsk: *Sphyrna zygaena* (northern part of the Tatar Strait), *Carcharhinus gangeticus* (southwestern Sakhalin), *Squalus acanthias acanthias* (southern Sakhalin), *Raja kenojei* (southeastern Sakhalin), *R. pulchra* (western Sakhalin and the La Perouse Strait), *Breviraja interrupta* (southwestern Sakhalin), *B. isotrachys* (possibly the Sea of Okhotsk), *B. smirnovi* (southern Sakhalin).

Ueno (1971) published a list of marine fishes of Hokkaido Island (Japan) and adjacent waters, in which 13 species of cartilaginous fishes are indicated for the waters of the southern part of the Sea of Okhotsk and southern Sakhalin: *Sphyrna zygaena*, *Lamna ditropis*, *Scoliodon walbeehmi*, *Clyphis glaucus*, *Squalus acanthias*, *Raja pulchra*, *R. tengu*, *Breviraja kenojei*, *B. smirnovi*, *B. violacea*, *B. aleutica*, *Dasyatis akajei*, *Holorhinus tobijei*. In the work on the skates of the Northwestern Pacific and the Bering Sea (Ishiyama and Ishihara, 1977), five new species are described: *Bathyrāja caeluronigricans*, *B. notoroensis*, *B. lindbergi*, *B. maculata*, and *B. minispinosa*. Subsequently, it was found that all of the listed species occur either off the coast of Sakhalin or in the adjacent waters of the southern part of the Sea of Okhotsk (Dyldin, 2015). The publication by Ishihara and Ishiyama (1985) describes two new species of *Bathyrāja pseudoisotrachys* and *B. hubbsi*, the first of which (*Bathyrāja bergi* [= *Bathyrāja pseudoisotrachys*]) was subsequently found off the coast of Sakhalin.

Dolganov (1983a) provided descriptions of several new species (*Bathyrāja bergi*, *B. fedorovi*, *B. tzinovskii*) for the first time. In this case, the description of the first species is based on a specimen obtained off the coast of southwestern Sakhalin. In his next publication, Dolganov (1985) partially duplicated the information presented earlier (Dolganov, 1983a) and redescribed the previously described species. Later Dolganov and Tuponogov (1999) published a survey of the skates of the Far Eastern seas, in which 12 species were indicated for the Sea of Okhotsk. Nevertheless, none of Dolganov’s works (1983a, 1983b, 1985, 1987, 2003) presented any information about the skates that live off the shores of Sakhalin (with the exception of Berg’s type specimen of skate). Based on the results of the expedition of the RV “*Darvin*” in 1989, Dudnik and Dolganov (1992) presented some new data on the cartilaginous fishes of the Sea of Okhotsk: in particular, *Bathyrāja andriashevi*, *B. tzinovskii*, and *B. spinosissima* were first mentioned for this water area. Blagoderov (1993) summarized long-term data on the distribution and biology of *Lamna ditropis* in the Northwestern Pacific, including the waters of Sakhalin Island. Two years later, an illustrated review of the ichthyofauna of the waters of northern Japan (Amaoka et al., 1995) was issued, which also presented data on the cartilaginous fishes of the Okhotsk coast of Hokkaido Island. In 2011 year, the same authors publish work, but already on the fishes of the Hokkaido Islands (Amaoka et al., 2011), where also present information about cartilaginous fishes of the Okhotsk coast.

At the turn of the century, the “Annotated List of Fish in the Far Eastern Seas” was published (Borets, 2000), which also contains fragmentary information on the cartilaginous fishes of the southern part of the Sea of Okhotsk, but some of the presented data are not devoid of taxonomic and other errors. Since the 2000s and up to the present, a number of works have been published that contain scattered information about cartilaginous fishes, including new findings from Sakhalin Island and the adjacent southern part of the Sea of Okhotsk (Balanov, 2000, 2003; Parin, 2001; Fedorov et al., 2003; Tokranov et al., 2005; Fadeev, 2005; Gritsenko et al., 2006; Kim, 2007, 2010; Sokolovsky et al., 2007, 2009, 2011; Velikanov, 2010; Antonenko et al., 2011; Tuponogov and Kodolov, 2014; Tuponogov and Snytko, 2014; Romanov, 2015). Of recent publications, mention should be made of the work of Grigorov and Orlov (2013), in which the authors summarized the data on cartilaginous fishes of Russia, including the Sea of Okhotsk, and the monograph of Parin et al. (2014), which includes information on some species of Sakhalin Island and adjacent waters. Noteworthy is also the publication of the first author (Dyldin, 2015), where information on 22 two species of cartilaginous fishes for the waters of Sakhalin Island and adjacent waters is given and, besides, a number of the species, which have not been noted in

waters of Russia, but findings of which are quite probable, are indicated. We should also separately mention the list of fish of the Okhotsk Sea waters of the Siretoko Peninsula, Hokkaido, Japan (Uchida, 2017), which is constantly updated and today contains information on 19 species of cartilaginous fishes living in the adjacent waters of the southern part of the Sea of Okhotsk. In conclusion, paleontological studies on the cartilaginous fishes of Sakhalin by Nazarkin and his colleagues (Nazarkin and Malyshkina, 2012; Nazarkin, 2013, 2014) should also be noted. However, in this paper, we confine ourselves to the living species, and, therefore, we do not quote these works in the text.

Thus, it is long overdue to systematize and summarize the incomplete and fragmentary data on cartilaginous fishes of Sakhalin in a separate report in accordance with modern nomenclature (International Code of Zoological Nomenclature (ICZN, 2017)) and the notions of the taxonomy of this understudied group.

ANNOTATED LIST OF CARTILAGINOUS FISHES OF SAKHALIN AND THE SOUTHERN PART OF THE SEA OF OKHOTSK

I. CLASS ELASMOBRANCHII

– Sharks and batoids

The Elasmobranchii class includes sharks and batoids (rays and skates). According to the latest taxonomic developments (Eschmeyer and Fong, 2017) in the Elasmobranchii class, there are eight shark orders (Hexanchiformes, Heterodontiformes, Orectolobiformes, Lamniformes, Carcharhiniformes, Squaliformes, Pristiophoriformes, Squatiniformes) and four skate orders (Torpediniformes, Rhinopristiformes, Rajiformes, Myliobatiformes), which include 61 families with a total number of valid species of 1167. At the same time, approximately 2200 taxa have been described for all the time, including synonyms and invalid species.

1. ORDER HEXANCHIFORMES, 1913 – Cow sharks

1. Family HEXANCHIDAE Gray, 1851 – Cow sharks

1. Genus *NOTORYNCHUS* Ayres, 1855

1. * (M.) *Notorynchus cepedianus* (Péron, 1807) – Broadnose sevengill shark

Squalus cepedianus Péron, 1807. P. 337 (Adventure Bay, Tasmania, Australia).

Almost circumglobally, with the exception of the North Atlantic. Sakhalin: it can probably be observed along the southeastern and southwestern coasts, including Aniva Bay. It is known most closely to the island for the southern part of the Sea of Okhotsk, near the northern and eastern part of Hokkaido

Island, Japan (Nagasawa and Torisawa, 1991; Imai et al., 2005; Grigorov and Orlov, 2013).

Marine. Lives at depths of 0–570 m. There is no reliable information about captures in the waters of Russia.

Notation. Dangerous for humans, there are several cases of attack, including by those kept in aquariums. When being captured, it behaves extremely aggressively (Compagno, 1984; Gubanov, 1993). It was documentarily recorded (two specimens in the HUMZ collection) near the northern and eastern part of Hokkaido Island, Japan (Imai et al., 2005). Earlier (Dyldin, 2015) there was a typo: with reference to Imai et al. (2005), it was stated that the capture of this species has no confirmation for Hokkaido Island.

Samples: HUMZ no. 95297—off eastern Hokkaido, Japan; HUMZ no. 98336—off Yukuru, Wakkanai, Hokkaido, Japan.

Conservation status: IUCN (Data Deficient).

2. ORDER ORECTOLOBIFORMES Compagno, 1973 – Carpet sharks

2. Family RHINCODONTIDAE Muller et Henle, 1841 – Whale sharks

2. Genus *RHINCODON* Smith, 1829

2. * (M.) *Rhincodon typus* Smith, 1828 – Whale shark

Rhincodon typus Smith, 1828. P. 2 (Table Bay, South Africa, southeastern Atlantic).

In temperate, mainly warm waters of all oceans. It was observed most closely to the island in 2012 in early October in the southern part of the Okhotsk Sea near Monbetsu, Hokkaido Island, Japan (Tomita et al., 2014).

Marine. Lives at depths of 0–1928 m. It is not observed in the waters of Russia.

Notation. Safe for humans (Gubanov, 1993).

Samples: HUMZ no. 215293 (preserved pectoral, pelvic and caudal fins)—44°22'50" N 143°21'44" E, southern Sea of Okhotsk, off Monbetsu, Hokkaido, Japan.

Conservation status: IUCN (Vulnerable). In order to protect this species, a special international conference was convened in 2005. In 1999, it was listed in Appendix II of CMS (Convention on Migratory Species), and in Appendix II of CITES in 2002 (Camhi et al., 2009).

3. ORDER **LAMNIFORMES** Garman,
1885 – Mackerel sharks

3. Family **LAMNIDAE** Bonaparte,
1835 – Mackerel sharks

3. Genus **CARCHARODON** Smith, 1838

3. (M., Br.) *Carcharodon carcharias* (Linnaeus,
1758) – Great white shark

Squalus carcharias Linnaeus, 1758. P. 235 (“in
Europa”).

In all oceans, with the exception of the Arctic. It
occurs mainly in temperate waters. Sakhalin: the
southwestern part and Aniva Bay (Velikanov, 2010;
Dyldin and Orlov, 2016a).

Marine, brackish-water. Lives at depths of 0–1200 m.
Rare.

Notation. Of all the species of sharks, it is consid-
ered to be the most dangerous; often attacks on
humans are not provoked, and attacks on small boats
with fatal consequences are known (Compagno, 1984;
Gubanov et al., 1986; Gubanov, 1993; Ebert and Steh-
mann, 2013).

Conservation status: IUCN (Vulnerable). Cur-
rently, it is protected in some regions (for example,
Australia, South Africa, Namibia, Malta, United
States); it was included in Appendix I of CITES in
2012 (Fergusson et al., 2009; Ebert and Stehmann,
2013). In the Mediterranean Sea, it is Endangered
(Cavanagh and Gibson, 2007).

4. Genus **ISURUS** Rafinesque, 1810

4. ? (M.) *Isurus oxyrinchus* Rafinesque,
1810 – Shortfin mako

Isurus oxyrinchus Rafinesque, 1810. P. 12, pl. 13,
Fig. 1 (Sicily, Italy, Mediterranean Sea).

Oxyrhina glauca Müller et Henle, 1839. P. 69 (Java,
Indonesia).

Everywhere in tropical and temperate waters.
Sakhalin: the southern part (Probatov, 1952, Lind-
berg, 1959, with the “?” sign, as *Isurus glauca*).

Marine. Lives at depths of 0–750 m. Rare.

Notation. Along with *C. carcharias*, it is a danger-
ous for humans, and there are cases of attacks on boats
(Gubanov et al., 1986; Gubanov, 1993). Type speci-
mens are unknown. Writing the species name as “*oxy-
rhinchus*” or “*oxyrhynchus*” is mistaken (Eschmeyer
et al., 2017). According to Dolganov (2009), the indi-
cation of Probatov (1952) about the finding of this
species (by several specimens) off southwestern
Sakhalin near Antonovo village is based on incorrect
identification, since the indicated sizes (>4 m) are not
characteristic of it and, most likely, the findings refer
to the white shark *C. carcharias*. However, at the pres-
ent time, it is impossible to confirm or disprove this
assumption, and Dolganov’s statement (2009) con-
cerning the maximum length of the shortfin mako is

controversial, since there are reports in the literature
that it can reach a length of 7 m (Lindberg and Legeza,
1959, as *Isurus glauca*) or nearly 6 m (Weigmann,
2016). To confirm the occurrence of this species in the
waters of Sakhalin, documentary evidence is required.

Conservation status: IUCN (Vulnerable).

5. Genus **LAMNA** Cuvier, 1816

5. (M., Br.) *Lamna ditropis* Hubbs et Follett,
1947 – Salmon shark

Lamna ditropis Hubbs et Follett, 1947. P. 194 (at La
Jolla, California, United States).

Northern Pacific and, possibly, the adjacent Arc-
tic. Sakhalin: probably along all the coasts, including
Aniva Bay (Blagoderov, 1993; Mel’nikov, 1997; Rad-
chenko et al., 2002; Velikanov, 2006; Velikanov and
Mukhametov, 2011; Dyldin, 2015; Dyldin and Orlov,
2016a).

Marine, brackish-water, including estuaries and
lower reaches of large rivers. Lives at depths of 0–375
m. Common. It is often caught as by-catch, but is not
used for commercial purposes.

Notation. Potentially dangerous for humans, there
is a registered case of a nonfatal attack on a human
(Wright, 2011).

Conservation status: IUCN (Least Concern).

4. Family **CETORHINIDAE** Gill,
1861 – Basking sharks

6. Genus **CETORHINUS** Blainville, 1816

6. (M.) *Cetorhinus maximus* (Gunnerus, 1765) –
Basking shark

Squalus maximus Gunnerus, 1765. P. 33, pl. 2
(northern Norway).

Occurs in all oceans, but mainly in temperate and
Arctic waters. Sakhalin: the southern part (Fadeev,
2005). It is also observed in the southern part of the
Sea of Okhotsk off Hokkaido, where the recent cap-
ture dates from 2010 (Murakami et al., 2011).

Marine. Lives at depths of 0–1264 m. Rare.

Notation. Safe for humans, but the impressive size
of this species (up to 12 m) is likely to pose a danger to
small boats. Type specimens are unknown (Eschmeyer
et al., 2017).

Conservation status: IUCN (Vulnerable). In some
territorial waters, it is protected by law and is listed in
CITES Appendix II. For the Northern Pacific and
Northeast Atlantic regions, where abundance has been
significantly eroded by targeted fishing, the conserva-
tion status is currently estimated to be under threat of
extinction. If up to 6000 specimen were fished
throughout the 1920s–1970s within the Pacific waters
of Canada and the United States, then only 13 obser-
vations have been confirmed off the coast of Canada
since 1996, and the entire population in this region is

estimated to be approximately 321–535 specimens (Compagno, 2002; Fowler, 2005; Camhi et al., 2009; *Fisheries...*, 2011; Kyne et al., 2012; Ebert and Stehmann, 2013).

5. Family **ALOPIIDAE** Bonaparte, 1838 – Thresher sharks

7. Genus **ALOPIAS** Rafinesque, 1810

7. * (M., Br.) *Alopias vulpinus* (Bonnaterre, 1788) – Thintail thresher

Squalus vulpinus Bonnaterre, 1788. P. 9 (Mediterranean Sea).

Circumglobal up to temperate and cold waters. Sakhalin: perhaps the southeastern part and Aniva Bay, where it can penetrate both from the Sea of Japan and from the Pacific waters of Hokkaido Island. In the waters of Russia, it is unknown. It was recorded most closely to the waters of Sakhalin in 2004 in the southern part of the Sea of Okhotsk off Hokkaido Island, Japan (Uchida, 2017). It is also known in the Sea of Japan (Shinohara et al., 2014).

Marine, brackish-waters. Lives at depths of 0–650 m.

Notation. Safe for humans (Gubanov, 1972, 1993).

Samples: HUMZ no. 179891 – off Usujiri, south-eastern coast of Oshima Peninsula, Hokkaido, Japan.

Conservation status: IUCN (Vulnerable).

4. ORDER **CARCHARHINIFORMES** Garman, 1913 – Ground sharks

6. Family **TRIAKIDAE** Gray, 1851 – Hound sharks

8. Genus **TRIAKIS** Müller et Henle, 1838

8. * (M.) *Triakis scyllium* Müller et Henle, 1839 – Banded hound shark

Triakis scyllium Müller et Henle, 1839. P. 63, pl. 26 (Japan).

Northwestern Pacific. Sakhalin: specified for the island in the Gubanov's guide (1993). In addition, it is known in Japan (from Hokkaido), and in the waters of Russia by two specimens from the Peter the Great Bay, the Sea of Japan (Ebert et al., 2009a; Dyldin, 2015), but it occurs mainly in more southerly waters.

Marine but can also withstand slightly brackish water. The depths of habitation are 30–150 m. It is an extremely rare species for the waters of Russia.

Notation. Findings from Sakhalin require documentary evidence, since we did not find any other information about its capture in the vicinity of Sakhalin Island apart from the mention in Gubanov's (1993) guide. It is safe for humans (Gubanov, 1993).

Conservation status: IUCN (Least Concern).

7. Family **CARCHARHINIDAE** Jordan et Evermann, 1896 – Requiem sharks

9. Genus **CARCHARHINUS** Blainville, 1816

9. ? (M., Br.) *Carcharhinus plumbeus* (Nardo, 1827) – Sandbar shark

Squalus plumbeus Nardo, 1827. P. 26, 35 (Adriatic Sea).

? *Carcharias (Prionodon) japonicus* Temminck et Schlegel, 1850. P. 302, pl. 133 (Japan).

Circumglobally in tropical and temperate seas. Sakhalin: the southwestern part (Probatov, 1951, as *Carcharias japonicus*; Lindberg and Legeza, 1959).

Marine, brackish-water. Lives at depths of 0–280 m. Rare.

Notation. The presence of this species off the coast of Sakhalin requires documentary evidence, as there is no reliable information about the capture of this species since the 1950s (Dyldin and Orlov, 2016a). There are no reliable cases of attacks on people (Ebert and Stehmann 2013), while it is dangerous for humans according to other sources (Gubanov, 1993). The taxonomy of this species is not completely clear. According to recent molecular studies, Western Atlantic populations are distinct from the Indo-Pacific ones, and the name *Carcharhinus japonicus* (Temminck et Schlegel, 1850) should be restored for the latter (Ebert et al., 2013).

Conservation status: IUCN (Vulnerable).

10. Genus **PRIONACE** Cantor, 1849

10. (M.) *Prionace glauca* (Linnaeus, 1758) – Blue shark

Squalus glaucus Linnaeus, 1758. P. 235 (“in Oceano Europeo”).

In tropical and temperate waters. Sakhalin: the southern part (Isii, 1940). It is also observed in the adjacent waters of the Sea of Okhotsk, including its southern part off the coast of Hokkaido, Japan (Nagasawa and Torisawa, 1991; Ivanov and Sukhanov, 2010; Uchida, 2017).

Marine. Rare. Lives at depths of 0–1000 m. In more southerly regions, for example, in Japan, it is an object of fishing.

Notation. There are known cases of attacks on people (Gubanov, 1993). Type specimens are unknown (Eschmeyer et al., 2017). In the summer time, it was noted by Isii (1940) for the southern part of Sakhalin Island, where individuals of this species, when approaching the shore, follow the shoals of salmon and mix with *L. ditropis*. To date, the presence of this species in the waters of southern Sakhalin requires documentary evidence. However, its occurrence here is quite probable, since it was observed in the adjacent waters of the Pacific coast of the South Kurils and the Okhotsk coast of Hokkaido Island as well as in Peter

the Great Bay, the Sea of Japan, and Russia (Nagasawa and Torisawa, 1991; Savinykh, 1998; Sokolovsky et al., 2007, 2011; Shinohara et al., 2012; Uchida, 2017).

Conservation status: IUCN (Near Threatened).

11. Genus *RHIZOPRIONODON* Whitley, 1929

11. * (M., Br.) *Rhizoprionodon acutus* (Rüppell, 1837) – Milk shark

Carcharias acutus Rüppell, 1837. P. 65, pl. 18, Fig. 4 (Jeddah, Saudi Arabia, Red Sea).

Carcharias (Scoliodon) walbeehmi Bleeker, 1856. P. 353 (Bintan Island, Riau Islands, Indonesia).

Circumglobally in the tropical zone up to moderate waters. Sakhalin: perhaps the southeastern part. It was observed most closely to the island in the southern part of the Sea of Okhotsk (Ueno, 1971, as *Scoliodon walbeehmi*; Nagasawa and Torisawa, 1991); also occurs in the Sea of Japan (Shinohara et al., 2014). In the waters of Russia, it is not reported.

Marine, brackish-water. Lives at depths of 0–200 m.

Notation. A lectotype is designated for this species (Klausewitz, 1960). It is safe for humans.

Conservation status: IUCN (Least Concern).

8. Family *SPHYRNIDAE* Bonaparte 1840 – Hammerhead sharks

12. Genus *SPHYRNA* Rafinesque, 1810

12. * (M., Br.) *Sphyrna zygaena* (Linnaeus, 1758) – Smooth hammerhead

Squalus zygaena Linnaeus, 1758. P. 234 (Mediterranean Sea and Atlantic).

Circumglobally, mainly in temperate and tropical waters. Sakhalin: it may easily be noted near the southwestern and southeastern coasts. It was observed most closely to the waters of Sakhalin in the southern part of the Sea of Okhotsk, including the coast of Hokkaido, and in the Sea of Japan off the mainland coast up to the northern part of the Tatar Strait (49°17' N) (Schmidt and Taranetz, 1934; Lindberg and Legeza, 1959; Ueno, 1971; Nagasawa and Torisawa, 1991; Borets, 2000; Novikov et al., 2002; Fadeev, 2005; Grigorov and Orlov, 2013; Dylidin, 2015).

Marine, brackish-water. Lives at depths of 0–200 m. It is rare in the waters of Russia.

Notation. Potentially dangerous, several cases of attacks on humans with fatal outcomes were recorded, but other allied species of sharkshammers (Compagno, 1984; Ebert, Stehmann, 2013) may be involved in the attacks since attacks are usually recorded in warm waters.

Conservation status: IUCN (Vulnerable).

5. ORDER *SQUALIFORMES* Goodrich, 1909 – Dogfish sharks

9. Family *SOMNIOSIDAE* Jordan, 1888 – Sleeper sharks

13. Genus *SOMNIOSUS* Lesueur, 1818

13. (M.) *Somniosus pacificus* Bigelow et Schroeder, 1944 – Pacific sleeper shark

Somniosus pacificus Bigelow et Schroeder, 1944. P. 35 (Sagami Sea, Japan).

North Pacific and the adjacent Arctic. Sakhalin: the eastern part and Aniva Bay, the Sea of Okhotsk (Balanov, 2000; Ebert et al., 2009b; Velikanov, 2010; Kim, 2010; Orlov and Baitalyuk, 2014; Tuponogov and Kodolov, 2014; Dylidin, 2015), the Tatar Strait (Fedorov et al., 2003).

Marine. Lives at depths of 0–2008 m. Common in the southeastern part of the island. It is usually noted in by-catch; however, only the liver is of commercial interest, and meat is not used because of certain toxicity (Orlov, 2017).

Notation. Safe, no data on attacks on humans.

Conservation status: IUCN (Data Deficient).

10. Family *SQUALIDAE* de Blainville, 1816 – Dogfish sharks

14. Genus *SQUALUS* Linnaeus, 1758

14. (M., Br.) *Squalus suckleyi* (Girard, 1855) – North Pacific spiny dogfish

Spinax (Acanthias) suckleyi Girard, 1855. P. 196 (Hood Channel, Puget Sound, Washington, United States).

North Pacific and the adjacent Arctic. Sakhalin: along all the coasts, including Aniva and Terpeniya bays (Isii, 1940; Schmidt, 1950; Lindberg, 1959; Lindberg and Legeza, 1959; Fadeev, 1960, 2005; Ueno, 1971; Velikanov, 2010; Tuponogov and Kodolov, 2014; Orlov, 2012; Orlov et al., 2012; Dylidin, 2015).

Marine, brackish-water, observed in the brackish lagoons of the island, is also known in the brackish lakes of Hokkaido Island and the estuary zone of the rivers of Primorsky Krai (Ueno, 1971; Barabanshchikov and Magomedov, 2002). Lives at depths of 0–1236 m. Common, numerous. Promising commercial target; the fishery is not developed. In the past, in the southern part, including Aniva and Terpeniya bays, there was specialized Japanese fishery (Isii, 1940).

Notation. A type location according to an established neotype (Ebert et al., 2010). Safe for humans (Gubanov, 1993). In the past, for the waters of Sakhalin and the entire North Pacific region, it was indicated as *Squalus acanthias* Linnaeus, 1758, or as a subspecies of the latter *S. a. suckleyi* (Schmidt, 1950; Lindberg and Legeza, 1959; Sokolovsky et al., 2007, 2011). Based on the revision (Ebert et al., 2010), the validity of *S. suckleyi* has recently been restored.

Tanaka (1908), on the basis of two captures, gives another species for the coast of Korsakov (Aniva Bay, southern part of Sakhalin)—*Squalus mitsukurii* Jordan et Snyder, 1903—which is quite probable, since the latter was observed in the Pacific waters of Hokkaido and near the Korean Peninsula (Dyldin, 2015). However, more recent information on the occurrence of this species in Sakhalin is absent (apparently, it was simply ignored), and, therefore, it is not included in our list. Berg (1911) suggested that *Squalus mitsukurii*, indicated for Aniva Bay (Tanaka, 1908), should be referred to *Squalus acanthias* Linnaeus, 1758, as the geographical variation of the latter. Probably, therefore, later Russian researchers did not take it into account, following the authoritative opinion of Berg. However, it should be noted that Berg (1911) did not perform a comparative analysis between these two species but was guided by a brief description of Tanaka (1908).

Samples: KhMSF no. KP-225. P-152—Tatar Strait; ZIN RAN no. 14999—La Perouse Strait, Cape Soya, Hokkaido Island, Japan; HUMZ nos. 131195, 131288, 133559 (all as *Squalus acanthias*)—off Shari, Okhotsk Sea, Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

6. ORDER RAJIFORMES Muller et Henle, 1841 – Skates

According to a recent revision, based on the results of genetic and morphological analysis (Last et al., 2016a), this group includes 291 species in four families. Representatives of two families are found off the coast of Sakhalin. In our work, we are guided by the results of this revision. However, since we followed Eschmeyer and Fong (2017) in constructing our system, we do not include tribes within the families indicated by Last et al. (2016a). In addition, we preliminary leave *Arctoraja* in the rank of a separate genus, which was previously considered as a subgenus (Orr et al., 2011; Spies et al., 2011). Comments on this subject are available in recent articles (Dyldin, 2015; Weigmann, 2016).

11. Family RAJIDAE de Blainville, 1816 – Skates

15. Genus *AMBLYRAJA* Malm, 1877

15. ** (M.) *Amblyraja hyperborea* (Collett, 1879) – Arctic skate

Raja hyperborea Collett, 1879. P. 7 (155 km west of Spitzbergen).

Occurs mainly in Arctic waters as well as near-border cold waters of the Pacific and Atlantic oceans. Sakhalin: the southeastern part (Balanov, 2003). It is also indicated for the northern part of the Sea of Okhotsk (Fedorov et al., 2003).

Marine. Lives at depths of 167–3167 m. Rare.

Notation. The presence of this species in the Sea of Okhotsk (Fedorov et al., 2003) and, in particular, off the coast of Sakhalin (Balanov, 2003) raises some doubt and requires documentary confirmation. Most likely, this species is absent in the Far Eastern seas of Russia (Grigorov and Orlov, 2013), since it is widespread only in the Arctic seas (Mecklenburg et al., 2016).

Conservation status: IUCN (Least Concern).

16. Genus *BERINGRAJA* Ishihara, Treloar, Bor, Senou et Jeong, 2012

16. (M., Br.) *Beringraja pulchra* (Liu, 1932) – Mottled skate

Raja pulchra Liu, 1932. P. 162, Figs. 10, 10a (Tsingtao, China).

Northwestern Pacific. Sakhalin: eastern and southwestern parts, including the waters of Moneron Island and Terpeniya and Aniva bays (Lindberg and Legeza 1959; Jeong, 1999; Kim, 2007; Antonenko et al., 2011), La Perouse Strait (Lindberg and Legeza, 1959).

Marine, brackish-water, brackish lakes of the Okhotsk Sea side of Hokkaido Island (Ueno, 1971). Lives at depths of 5–700 m. Common. Fished as by-catch; may have some commercial interest, since its stocks off the coast of western Sakhalin are estimated to exceed 500 t (Antonenko et al., 2011).

Notation. A number of authors (Lindberg and Legeza, 1959; Sokolovsky et al., 2007; Antonenko et al., 2011; Grigorov and Orlov, 2013; Panchenko et al., 2016) consider mottled skate in the *Dipturus* or *Raja* genus; however, according to a recent revision (Ishihara et al., 2012), it should be considered in the *Beringraja* genus based on the results of morphological and genetic analyzes (Last et al., 2016a).

Samples: ZIN RAN no. 35390, 35391—southern Sakhalin, ZIN RAN no. 35395—La Perouse Strait; HUMZ no. 99210—Horonai, Okhotsk coast of Hokkaido, Japan; HUMZ nos. 131142, 131193, 132502—off Shari, Okhotsk Sea, Hokkaido, Japan; FAKU nos. 201459–201461, 201465, 201466–201471, 201472, 201473, 201474, 201475, 201476—Kitami-Yamato bank, southern Sea of Okhotsk off northeastern Hokkaido, Japan.

Conservation status: IUCN (Vulnerable).

17. Genus *DIPTURUS* Rafinesque, 1810

17. * (M.) *Dipturus tenu* (Jordan et Fowler, 1903) – Acutenose skate

Raja tenu Jordan et Fowler, 1903. P. 654, Fig. 8 (Matsushima Bay, Sendai, Japan).

Northwestern Pacific. Sakhalin: probably in the continental slope in the southeastern part. In addition, it is also observed in the Pacific waters of northern Japan near Hokkaido Island (Amaoka et al., 1989;

Jeong and Ishihara, 2009; Shinohara et al., 2009). It is noted in the southern part of the Sea of Okhotsk off the coast of Hokkaido (Ueno, 1971).

Marine. Lives at depths of 45–400 m (Weigmann, 2016) or at 300–400 m according to other data (Jeong and Ishihara, 2009). Throughout the whole range, it is a very rare species (Jeong and Ishihara, 2009).

Conservation status: IUCN (Data Deficient).

18. Genus *OKAMEJEI* Ishiyama, 1958

18. (M.) *Okamejei kenojei* (Müller et Henle, 1841) – Ocellate spot skate

Raja kenojei Müller et Henle, 1841. P. 149 (Nagasaki market, Japan)

Raja katsukii Tanaka, 1927. P. 662, pl. 154, Figs. 426–428 (off Province Echizen, western coast of Aomori Prefecture, Japan).

Northwestern Pacific. Sakhalin: southeast and southwest, including Aniva Bay (Issii, 1940; Lindberg, 1959; Lindberg and Legeza, 1959; Ueno, 1971; Sokolovsky et al., 2007), the northwestern part (Tarantetz, 1937).

Marine. Lives at a depth of 20–230 m. Common.

Notation. For this species, Boeseman (1947) selected a lectotype. In the past, some authors (Berg, 1911; Lindberg, 1959; Lindberg and Legeza, 1959) mentioned the ocellate spot skate as *Raja kenojei* or *R. (Okamejei) kenojei*. Antonenko et al. (2011) believe that the indication of this species by Tarantetz (1937) for the northern part of the Tatar Strait near Aleksandrovsk-Sakhalinsky should be attributed to *Beringraja pulchra*.

Conservation status: IUCN (Data Deficient).

12. Family *ARHYNCHOBATIDAE* Fowler, 1934 – Softnose skates

19. Genus *ARCTORAJA* Ishiyama, 1958

19. ** (M.) *Arctoraja parmifera* (Bean, 1881) – Alaska skate or armored skate

Raja parmifera Bean, 1881. P. 157 (Iliuliuk, Unalaska Island, Aleutian Islands, Alaska, United States).

North Pacific and the adjacent Arctic. Sakhalin: eastern and western parts, including Aniva Bay (Balanov, 2000; Velikanov and Stominok, 2004; Kim, 2004, 2007, 2010; Antonenko et al., 2007; Davis et al., 2007; Grigorov et al., 2015).

Marine. Lives at depths of 17–1840 m. Common, locally numerous.

Notation. Distribution, including in the waters of Sakhalin, requires further study, since the range of this species is limited to the Northeastern Pacific, the Bering Sea, and the adjacent Arctic according to a number of authors (Tarantetz, 1937; Stevenson et al., 2007,

2008; Orr et al., 2011; Dyldin, 2015; Mecklenburg et al., 2016). In addition, other researchers also did not include this species in the ichthyofauna of the waters of Sakhalin and adjacent areas in the past (Tarantetz, 1937; Schmidt, 1950; Lindberg, 1959; Lindberg and Legeza, 1959; Orr et al., 2011), and indicated *A. smirnovi* (Soldatov et Pavlenko, 1915) instead of it. Probably, the inclusion of the waters of Sakhalin Island and adjacent areas in the range of *A. parmifera* is due to the fact that *A. smirnovi* and some other allied species (for example, *A. simoterus* (Ishiyama, 1967)) have been wrongly synonymized with *A. parmifera* without the comparative analysis of the type material (Dolganov, 1983, 2001; Dolganov and Korolev, 2006). Nevertheless, before conducting a detailed revision of the Far Eastern skates using the data of morphological and genetic analyses, we attribute all the above-mentioned findings of *A. parmifera* in the waters of Sakhalin to *Arctoraja smirnovi*.

Based on the results of molecular genetic studies, Orr et al. (2011) attributed the armored skate to the *Arctoraja* subgenus, Dyldin (2015) considers it in the *Arctoraja* genus, and Last et al. (2016a) adhere to the generally accepted opinion and give this species in the *Bathyraja* genus.

Conservation status: IUCN (Least Concern).

20. (M.) *Arctoraja smirnovi* (Soldatov et Pavlenko, 1915) – Smirnov's skate

Raja smirnovi Soldatov et Pavlenko, 1915. P. 162, pl. 5 (Peter the Great Bay, Sea of Japan, Russia).

Northwestern Pacific. Sakhalin: southwestern and southeastern part, including Terpeniya Bay, Tatar Strait, Aniva Bay near Korsakov (Schmidt, 1904, 1950; Gratsianov, 1907; Berg, 1911, Soldatov and Lindberg, 1930; Lindberg, 1959; Lindberg and Legeza, 1959; Brinkman, 1971; Ueno, 1971; Ishihara and Orlov, 2009; Orr et al., 2011; our data).

Marine. Lives at depths of 100–1125 m. Common.

Notation. In the past, a number of authors (Dolganov, 1983b; Dolganov and Tuponogov, 1999; Mecklenburg et al., 2002; Dolganov and Korolev, 2006), without studying the type material and anatomical features, in the absence of molecular data, and only on the basis of visual external morphological similarity considered the Smirnov's skate as a synonym of *Arctoraja parmifera*. As a result, the range of the latter was artificially expanded to the southern part of the Sea of Okhotsk and the Sea of Japan and the Pacific waters of northern Japan. At present, the majority of specialists (Novikov et al., 2002; Orr et al., 2011; Dyldin, 2015; Tohkairin et al., 2015; Last et al., 2016a; Mecklenburg et al., 2016; Uchida, 2017) rightly recognize the considered species as valid. Some authors (Orr et al., 2011) attribute it to the *Arctoraja* subgenus, others (Dyldin, 2015) attribute it to the *Arctoraja* genus. Formerly, they were usually included in the

Breviraja or *Raja* genus (Schmidt, 1904; Lindberg and Legeza, 1959; Nakabo, 2002), while they are now mostly included in the *Bathyrāja* genus (Last et al., 2016a). In the past, a number of authors (Gratsianov, 1907; Berg, 1911; Soldatov and Lindberg, 1930), based on the erroneous initial identification of the specimen ZIN RAN no. 12603 by Schmidt (1904), indicated the big skate *Raja binocularata* Girard, 1855, for the southern part of the island (Aniva Bay off Korsakov), which, according to modern data (Dyldin, 2015), is common in the Bering Sea and the Northeastern Pacific. Subsequently, this specimen was reidentified as *Raja smirnovi* (Lindberg, 1959; Lindberg and Legeza, 1959). Schmidt (1950) believed that the skate he found in Aniva Bay belongs, most likely, to one of the species previously described by Japanese researchers, and not to *R. binocularata*. It should also be noted that, according to Kim (2007), almost all Rajiformes in the waters of Sakhalin before 1997 were identified as one *A. parmifera* species. Later on, with a more detailed study, it turned out that there are at least five species of skates just off eastern Sakhalin.

Samples: ZIN RAN no. 12603—Korsakov, Aniva Bay, southern Sakhalin, 1901. Originally, Schmidt (1904) identified this specimen as *Raja binocularata*, while Lindberg and Legeza (1959) later reidentified it as *Breviraja smirnovi*. However, this specimen probably still belongs to another species and requires further study, since the minimum depth where the Smirnov's skate lives is 100 m, which does not correspond to the conditions off the waters off Korsakov in Aniva Bay with a maximum depth of 20–40 m. ZIN RAN no. 35385—southern Sakhalin, 48.8° N 143.6° E; no. 35386—25 miles southeast off Cape Svobodnyy, Sea of Okhotsk, off southeastern Sakhalin Island; USNM no. 170485—Tatar Strait, off southwestern coast of Sakhalin Island; HUMZ no. 103372—off Terpeniya Bay, Sakhalin; HUMZ no. 58997—East of Sakhalin, 47.7167° N 144.1667° E; HUMZ nos. 152269, 152271, 152273, 152284, 152305, 152311, 152312, etc.—off Utoro, Hokkaido, Okhotsk Sea; HUMZ nos. 120238, 120325, 126278, etc.—Sea of Okhotsk; HUMZ no. 124022—Kitami-Yamato bank, Sea of Okhotsk, Hokkaido; FAKU nos. 200793, 201462, 201464—Kitami-Yamato bank, southern Sea of Okhotsk off northeastern Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

21. * (M.) *Arctoraja simoterus* (Ishiyama, 1967) — Hokkaido skate

Breviraja (*Arctoraja*) *simoterus* Ishiyama, 1967. P. 62, Figure (Muroran, Hokkaido, Japan).

Northwestern Pacific. Previously *A. simoterus* was unknown for the waters of Russia and was indicated only for the adjacent waters (Dyldin, 2015). Nevertheless, specimens of this species from the waters of the Northern Kurils are found in the HUMZ collection

(see below), which makes it possible for the first time to add it to the list of ichthyofauna of Russia. Sakhalin: perhaps the southeastern part. It was found most closely to the waters of the island in the southern part of the Sea of Okhotsk near Hokkaido (Orr et al., 2011).

Marine. Lives at depths of 96–540 m.

Notation. In the past, some authors (Mecklenburg et al., 2002; Dolganov and Korolev, 2006), on the basis of the analysis of external morphology without studying the type material considered it as a junior synonym of *Bathyrāja parmifera* (Bean, 1881). The results of detailed morphological studies (Orr et al., 2011) have proven the validity of this species, on the basis of which it is now recognized as a valid species (Orr et al., 2011; Spies et al., 2011; Dyldin, 2015; Last et al., 2016a) in the *Arctoraja* subgenus (Orr et al., 2011) or the *Arctoraja* genus (Dyldin, 2015).

Samples: HUMZ nos. 126747, 126791—Northern Kuril Islands.

Conservation status: IUCN (Not Evaluated).

20. Genus *BATHYRAJA* Ishiyama, 1958

22. (M.) *Bathyrāja abyssicola* (Gilbert, 1896) — Deepsea skate

Raja abyssicola Gilbert, 1896. P. 396, pl. 20 (off Queen Charlotte Island, British Columbia, Canada, 52°39'30" N 132°38'00" W).

North Pacific. Sakhalin: near the southeastern part on the continental slope (Balanov, 2003). Known in the adjacent waters of the Sea of Okhotsk (Dudnik and Dolganov, 1992; Cook and Zorzi, 2015).

Marine. Lives at depths of 362–2906 m.? Rare.

Samples: HUMZ nos. 120001, 120222, 126420—Sea of Okhotsk; HUMZ nos. 124192, 124193, 124204—Kitami-Yamato bank, Sea of Okhotsk, Japan.

Conservation status: IUCN (Data Deficient).

23. (M.) *Bathyrāja aleutica* (Gilbert, 1896) — Aleutian skate

Raja aleutica Gilbert, 1896. P. 397, pl. 21 (north of Sannak Pass, Aleutian Islands, Alaska, United States).

North Pacific. Sakhalin: the eastern part (Balanov, 2000; Tokranov et al., 2005; Davis et al., 2007; Kim, 2007; Tuonogov and Kodolov, 2014). It is also observed in the adjacent waters of the Sea of Okhotsk and its southern part (Ueno, 1971; Davis et al., 2007; Ivanov and Sukhanov, 2010; Uchida, 2017). Based on the wide bathymetric range, it also may be found in Aniva Bay and off the southwest coast of the island.

Marine. Lives at depths of 15–1602 m. Common. Represents potential commercial interest as by-catch.

Notation. This species was included in the *Breviraja*, *Raja*, or *Rhinoraja* genus (Dyldin, 2015).

Samples: HUMZ no. 152417—off Utoro, Shari, Okhotsk Sea, Hokkaido, Japan; HUMZ nos. 120261, 120311, 126279—Sea of Okhotsk; HUMZ nos. 124097, 124126, 124251, 124133, 124312—Kitami-Yamato bank, Sea of Okhotsk, off Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

24. (M.) *Bathyrāja bergi* Dolganov, 1983 — Berg's skate, bottom skate

Bathyrāja bergi Dolganov, 1983a. P. 70 (in key), Fig. 95 (off Kholmsk, southwestern coast of Sakhalin Island, Russia).

Northwestern Pacific. Sakhalin: the southeastern and western parts, probably, Aniva Bay as well (Berg, 1911 as *Raja interrupta*; Lindberg, 1959 as *R. interrupta*; Lindberg and Legeza, 1959 as *Bathyrāja interrupta*; Ueno, 1971 as *B. interrupta*; Tuponogov and Kodolov, 2014). According to some data, it occurs at depths of 70 m (Tuponogov and Kodolov, 2014; Weigmann, 2016) or from 38 m according to other sources (Panchenko et al., 2016); so there is a distinct possibility of findings in Aniva Bay, where the maximum depth is 110 m.

Marine. Lives at depths of 70–900 m (Weigmann, 2016) and 38–538 m in the Sea of Japan (Panchenko et al., 2016). Not numerous.

Notation. In the past, it was indicated for the southern part of Sakhalin under the name *Raja interrupta* or *Bathyrāja interrupta* (Berg, 1911; Lindberg, 1959; Lindberg and Legeza, 1959). This species was first described by Berg (1911) by a specimen obtained by Schmidt in 1901 off the coast of southwestern Sakhalin, which he subsequently transferred to ZIN RAS. Berg (1911) at that time only suggested that this species can be identified as *B. interrupta* and gave a complete description of this specimen (ZIN RAN no. 12602). Subsequently, the description of Berg (1911) and this specimen itself served Dolganov (1983a) to description a new species. He repeatedly described this species as a new one in a later publication (Dolganov, 1985), but the date of the original description is considered to be in accordance with the previous publication (Dolganov, 1983a).

Samples: ZIN RAN no. 12602 (*Bathyrāja bergi* holotype)—west coast of Sakhalin, Kholmsk (Mauka); ZIN RAN no. 35382—southern Sakhalin (in the work of Lindberg and Legeza (1959), along with a specimen of ZIN RAN no. 12602, it is defined as *B. interrupta*); it is also known from the adjacent waters of Hokkaido (Japan) and the Pacific side of Iturup; HUMZ no. 103614—off Muroan, Pacific coast of Hokkaido, Japan; HUMZ no. 161900—off Iturup Island; HUMZ no. 105320—Kushiro, Pacific coast of Hokkaido, Japan; HUMZ nos. 152418, 154845, 154846, 154847—off Utoro, Shari, Hokkaido, Okhotsk Sea; HUMZ nos. 109515, 109516, 109751—Usujiri, Minamikayabe, Hokkaido, Japan; HUMZ

no. 107849—off Sekinai, Kumaishi, Hokkaido; MTUF no. 26071—off Monbetsu, Sea of Okhotsk, Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

25. * (M.) *Bathyrāja diplotaenia* (Ishiyama, 1952) — Dusky-pink skate

Brevirāja diplotaenia Ishiyama, 1952. P. 15, pl. 2, Fig. 5 (Hokkaido, Japan).

Northwestern Pacific. Sakhalin: probably on the continental slope off the southeast coast. It was observed most closely to the island in the Sea of Okhotsk and in the Okhotsk Sea waters of Hokkaido (Shinohara et al., 2012; Grigorov and Orlov, 2013; Uchida, 2017).

Marine. Lives at depths of 100–1000 m. In the waters of Russia, it is a rare species.

Samples: it is known from the adjacent waters of the southern part of the Okhotsk Sea and the Pacific coast of Hokkaido: NSMT no. 59390—off Ohmu, Sea of Okhotsk, Hokkaido, Japan; HUMZ nos. 154837, 154838, etc.—off Kushiro, Pacific coast of Hokkaido, Japan; HUMZ no. 110309—off Erimo, Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

26. (M.) *Bathyrāja fedorovi* Dolganov, 1983 — Fedorov's skate

Bathyrāja fedorovi Dolganov, 1983a. P. 74, Fig. 101 (southern Sea of Okhotsk, 44°41' N 146°12' E, Russia).

Northwestern Pacific. Sakhalin: the eastern part (Orlov and Ishihara, 2009a). The wide distribution of this species throughout the Sea of Okhotsk, including the southern part, is also mentioned in other works (Dolganov, 1985; Fedorov et al., 2003). Described from the southern part of the Sea of Okhotsk near the southern Kurils (Dolganov, 1983a, 1985).

Marine. Lives at depths of 447–2025 m. Rare.

Notation: redescribed as a new species by Dolganov (1985), but the date of the original description is considered to be in accordance with an earlier publication (Dolganov, 1983a).

Conservation status: IUCN (Least Concern).

27. (M.) *Bathyrāja isotrachys* (Günther, 1877) — Raspback skate, Challenger's skate

Raja isotrachys Günther, 1877. P. 434 (Shizuoka, 34°07' N 138°00' E, Japan).

Northwestern Pacific. Sakhalin: southwestern and eastern part (Issii, 1940; Brinkman, 1971; Jeong, 1999; Orlov and Tokranov, 2005; Orlov and Ishihara, 2009b; Tuponogov and Kodolov, 2014).

Marine. Lives at depths of 100–2000 m. Common.

Notation. In the past, it was included in the *Breviraja* or *Rhinoraja* genus. A type locality is represented according to the work of Ishihara and Ishiyama (1985).

Samples: USNM no. 170478—Tatar Strait, off the southwestern coast of Sakhalin Island; it is also known in the adjacent waters of the Sea of Okhotsk and its southern part; HUMZ nos. 120342, 126233, 126291—Sea of Okhotsk; HUMZ no. 124001—Kitami-Yamato bank, Sea of Okhotsk, off Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

28. * ? (M.) *Bathyraja lindbergi* Ishiyama et Ishihara, 1977 – Commander skate or Lindberg's skate

Bathyraja lindbergi Ishiyama et Ishihara, 1977. P. 82, Figs. 14A, 14B (Bering Sea, 57°47' N 173°47' W).

North Pacific. Sakhalin: probably on the continental slope off the southeastern part. It was observed most closely to the island in the southern part of the Sea of Okhotsk off Hokkaido Island, Japan (Uchida, 2017).

Notation. A number of authors recognize it as a valid species (Compagno, 1999, 2005; Ormseth et al., 2015, Last et al., 2016a; Weigmann, 2016), but some (Dolganov and Tuponogov, 1999; Sheiko and Fedorov, 2000) consider it as a junior synonym of *B. matsubarai*. The results of genetic analysis with the use of the *COI* gene as a marker indicate a very low level of genetic differences between *B. maculata*, *B. lindbergi*, and *B. matsubarai* (Coulson et al., 2011; Spies et al., 2011; Lago et al., 2012), which was shown earlier by American specialists (Spies et al., 2006), who recommended the search for other genetic markers to identify interspecific differences. Before conducting a detailed revision with the use of new genetic markers, we consider Lindberg's skate as a valid species.

Conservation status: IUCN (Least Concern).

29. ? (M.) *Bathyraja maculata* Ishiyama et Ishihara, 1977 – White-blotched skate

Bathyraja maculata Ishiyama et Ishihara, 1977. P. 80, Figs. 13A, 13B (off northeastern Kamchatka, Bering Sea, 59°10' N 166°19' E, Russia).

North Pacific. Sakhalin: eastern part (Tokranov et al., 2005; Tuponogov and Kodolov, 2014) and western (Sokolovsky et al., 2007). Based on the depths of the habitat, can probably also be observed in Aniva Bay.

Marine. Lives at depths of 73–1193 m. It is also necessary to specify the abundance and population size of this species off the coast of Sakhalin.

Notation. Morphological features of the white-blotched skate do not cause doubts about the validity of this species. However, the results of genetic analysis with the use of the *COI* gene as a marker indicate a very low level of genetic differences between *B. maculata*, *B. lindbergi*, and *B. matsubarai* (Coulson et al.,

2011; Spies et al., 2011; Lago et al., 2012), which was previously identified by American specialists (Spies et al., 2006), who recommended the search for other genetic markers to identify interspecific differences.

Conservation status: IUCN (Least Concern).

30. (M.) *Bathyraja matsubarai* (Ishiyama, 1952) – Dusky-purple skate or Matsubara's skate

Breviraja matsubarai Ishiyama, 1952. P. 10, pl. 1, Fig. 3 (off Erimo Peninsula, 41°30' N 143°15' E, Hokkaido, Japan).

? *Bathyraja caeluronigricans* Ishiyama et Ishihara, 1977. P. 74, Figs. 9a, 9b (Off Hachinohe, Japan, 41°00' N 142°00' E).

Northwestern Pacific. Sakhalin: the eastern part, including Terpeniya Bay (Balanov, 2000; Tokranov et al., 2005; Kim, 2007, 2010; Tuponogov and Kodolov, 2014).

Marine. Lives at depths of 120–2000 m. Common. May be fished as by-catch.

Notation. Synonymy of *B. matsubarai* includes close taxa: Purple-black skate *B. caeluronigricans* Ishiyama et Ishihara, 1977, and Notoro skate *B. notoroensis* Ishiyama et Ishihara, 1977, (Ishihara, 1990; Sheiko and Fedorov, 2000; Parin, 2001; Orlov et al., 2009b; Weigmann, 2016). Other authors (Dyldin, 2015; Froese and Pauly, 2017) consider *B. caeluronigricans* and *B. notoroensis* as valid species. In a recent revision (Last et al., 2016a), *B. notoroensis* is indicated as a valid species, with the remark that its taxonomic status requires additional research with the inclusion of molecular data, and only *B. caeluronigricans* was left in synonymy with *B. matsubarai*, which was supported by Eschmeyer et al. (2017). It is probably necessary to agree with this opinion before carrying out additional studies. For this reason, *B. notoroensis* is further indicated as an independent species with a question mark, and *B. caeluronigricans* is given as a junior synonym of *B. matsubarai*. It should be noted that, in the work of the first author (Dyldin, 2015), the *B. caeluronigricans* and *B. notoroensis* taxa are considered as valid species with remarks that a comparative morphological analysis of the type material and molecular-genetic studies are required to clarify their taxonomic status. However, at the time of preparation of this publication, unfortunately, the author was not able to get acquainted with the thesis of Ishihara (1990), in which *B. caeluronigricans* and *B. notoroensis* were synonymized with *B. matsubarai*. The results of genetic analysis with the use of the *COI* gene as a marker indicate a very low level of genetic differences between *B. maculata*, *B. lindbergi*, and *B. matsubarai* (Coulson et al., 2011; Spies et al., 2011; Lago et al., 2012), which was shown earlier by American specialists (Spies et al., 2006), who recommended the search for other genetic markers to identify interspecific differences.

Samples: are known from the adjacent waters of the Sea of Okhotsk and its southern part: FAKU no. 201463—Kitami-Yamato bank, southern Sea of

Okhotsk off northeastern Hokkaido, Japan; HUMZ nos. 152170, 152164—off Utoro, Shari, Hokkaido, Okhotsk Sea; HUMZ no. 120269—Sea of Okhotsk; HUMZ nos. 143351, 143353, 143355, 143358, 143364, 143365 (all as *B. caeluronigricans*, caught at a depth of 500–700 m)—north to Shiretoko Peninsula, off Shari-cho, Sea of Okhotsk, Hokkaido, Japan; no. 124134, 124152 (caught at a depth of 985–1040 m)—Kitami-Yamato bank, Sea of Okhotsk, Hokkaido, Japan.

Conservation status: IUCN (Data Deficient).

31. (M.) *Bathyraja minispinosa* Ishiyama et Ishihara, 1977 – Whitebrow skate

Bathyraja minispinosa Ishiyama et Ishihara, 1977. P. 83, Figs. 15A, 15B (Bering Sea, 59°10' N 166°19' E).

North Pacific. Sakhalin: in the continental slope off the east coast (Tuponogov and Kodolov, 2014). It was observed in the northern part of the Sea of Okhotsk (Fedorov et al., 2003) and its southern part off Hokkaido Island (Uchida, 2017).

Marine. Lives at depths of 150–1420 m (Pien et al., 2015).

Samples: known from the adjacent waters of the Sea of Okhotsk: HUMZ nos. 120042–120044, 126307—Sea of Okhotsk; HUMZ nos. 124111, 124305—Kitami-Yamato bank, Sea of Okhotsk, off Hokkaido, Japan; HUMZ nos. 134982, 134982—off Shikotan Island, Kuril Islands.

Conservation status: IUCN (Least Concern).

32. * ? (M.) *Bathyraja notoroensis* Ishiyama et Ishihara, 1977 – Notooro skate

Bathyraja notoroensis Ishiyama et Ishihara, 1977. P. 78, Figs. 12A, 12B (off Notooro Peninsula, 44°00' N 144°30' E, Japan).

Northwestern Pacific. Sakhalin: probably in the continental slope off the southeastern part. It was observed most closely to the island along the Okhotsk Sea coast of Hokkaido (Ishiyama and Ishihara, 1977; Nakaya and Shirai, 1992; Shinohara et al., 2012). So far, it has not been observed in the waters of Russia, and it is absent in all known reports, including recent ones (Grigorov and Orlov, 2013; Parin et al., 2014; Dyldin, 2015), because it was previously considered as a synonym of *B. matsubarai*; however, collection specimens of HUMZ from the waters near Iturup Island make it possible to introduce this species reliably into the list of ichthyofauna of Russia.

Marine. Lives at depths of up to 600 m (Froese and Pauly, 2017) or from 505 to 1335 m according to the specimens of the HUMZ collection. Rare.

Notation. see above for views on the taxonomic status of this species.

Samples: are known from adjacent waters: HUMZ nos. 161816–161820—off Iturup, Kuril Islands; HUMZ nos. 120141, 120235, 120245, 120247, 120248, 120251, 120252, 120354, etc.—Sea of Okhotsk; HUMZ no. 124316—Kitami-Yamato bank, Sea of Okhotsk, off Hokkaido, Japan; HUMZ no. 143359—north to Shiretoko Peninsula, off Shari-cho, Sea of Okhotsk, Hokkaido.

Conservation status: IUCN (Not Evaluated).

33. * (M.) *Bathyraja trachouros* (Ishiyama, 1958) – Erimo skate

Breviraja (Bathyraja) trachouros Ishiyama, 1958. P. 329, Fig. 62 (off Erimo Peninsula, Hokkaido, Japan).

Northwestern Pacific. It was noted most closely to Sakhalin Island in the southern part of the Sea of Okhotsk off Hokkaido Island (Tohkairin et al., 2015). It was not previously noted in the waters of Russia (Grigorov and Orlov, 2013, Parin et al., 2014, Dyldin, 2015); however, collection specimens of HUMZ (see below) from the waters near Iturup Island and Kunashir Island (Southern Kurils) allow the supplementation of the list of ichthyofauna of Russia with this species for the first time.

Marine. Lives at depths of 100–800 m.

Notation. In the past, some authors (Dolganov and Tuponogov, 1999) believed that *B. trachouros* is a junior synonym of *Bathyraja violacea* (Suvorov, 1935). However, these species differ from each other in the morphology of claspers (Ishihara et al., 2009). Currently, *B. trachouros* is recognized as a valid species by other authors as well (Nakabo, 2002; Shinohara et al., 2009; Dyldin, 2015; Tohkairin et al., 2015; Last et al., 2016a; Weigmann, 2016).

Samples: known from the waters adjacent to Sakhalin: HUMZ no. 161924—off Iturup Island, Kuril Islands; HUMZ no. 154848—off Shikotan Island; HUMZ no. 126746—North Kurils; FAKU no. 200676—Kitami-Yamato Bank, southern Sea of Okhotsk, off northeastern Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

34. ** (M.) *Bathyraja trachura* (Gilbert, 1892) – Roughtail skate

Raja trachura Gilbert, 1892. P. 539 (32°40'30" N 117°31'30" W, Santa Barbara Channel, California, United States).

North Pacific. Sakhalin: east coast (Fedorov, 2000; Tuponogov and Kodolov, 2014).

Marine. Lives at depths of 91–2900 m (Weigmann, 2016) or 213–2550 m (Froese and Pauly, 2017).

Notation. The presence of this species in the southern part of the Sea of Okhotsk and near the eastern part of Sakhalin Island requires documentary evidence. In particular, it has never been observed on the

Okhotsk Sea side of Hokkaido Island or in the waters of Japan as a whole (H. Ishihara, pers. comm), which makes one doubt the data on its occurrence in the adjacent part of Sakhalin Island as well, since the main part of the range lies in the East Pacific, and this species is already quite rare in the waters of the northern Kuril Islands (Orlov and Tokranov, 2005). The minimum depth of this species, by various data, is 91 or 213 m (Weigmann, 2016, Froese and Pauly, 2017), nevertheless, there is a sample, no. 103404, fished in 1984 in the Gulf of Alaska from a depth of 63 m in the HUMZ collection. However, it is possible that the indicated depth is erroneous.

Conservation status: IUCN (Least Concern).

35. (M.) *Bathyrāja tzinovskii* Dolganov, 1983 – Creamback skate or Tzinovsky's skate

Bathyrāja tzinovskii Dolganov, 1983a. P. 76 (in key), Fig. 105 (Pacific coast off Honshu, Japan, 40°12' N 143°35' E).

Northwestern Pacific. Sakhalin: eastern part (Orlov et al., 2009a). It is also observed in the adjacent waters of the Sea of Okhotsk (Ivanov and Sukhanov, 2010).

Marine. Lives at depths of 1776–2500 m. Rare.

Notation: is described in the work of Dolganov (1985) repeatedly as a new species; the date of the original description is considered to be in accordance with the previous publication (Dolganov, 1983a).

Conservation status: IUCN (Least Concern).

36. (M.) *Bathyrāja violacea* (Suvorov, 1935) – Okhotsk skate

Raja violacea Suvorov, 1935. P. 433, Fig. 1 (western coast of Kamchatka, Okhotsk Sea, Russia).

Brevirāja abasiriensis Ishiyama, 1952. P. 19, pl. 3, Fig. 6 (off Abasiri, Okhotsk Sea, Japan).

North Pacific from the northern part of Honshu Island, Japan, to Vancouver, Canada (Grigorov et al., 2017). Sakhalin: east coast (Balanov, 2000; Kim, 2010; Tuponogov and Kodolov, 2014; Grigorov et al., 2017). Based on the depths of the habitat, it can penetrate through the La Perouse Strait to the Sea of Japan, including the southwestern part of the island.

Marine. Lives at depths of 23–1110 m. ? Common.

Notation. In the past, some authors (Dolganov and Tuponogov, 1999) considered *Bathyrāja trachouros* (Ishiyama, 1958) as a junior synonym of this species. Later it was found that the former is a valid species (see above).

Samples: known from the waters of the Sea of Okhotsk and its southern part adjacent to the island: HUMZ no. 120259—Sea of Okhotsk; no. 152421—off Utoro, Shari, Okhotsk Sea, Hokkaido, Japan; NSMT no. 68832—Sea of Okhotsk, off eastern Hokkaido,

Japan; MTUF no. 26170—off Abashiri, Hokkaido, Japan.

Conservation status: IUCN (Data Deficient).

21. Genus *RHINORAJA* Ishiyama, 1952

37. * (M.) *Rhinoraja kujiensis* (Tanaka, 1916) – Dapple-bellied softnose skate

Raja kujiensis Tanaka, 1916. P. 173 (off Kuji, Ibarabi Prefecture, Japan).

Northwestern Pacific. Sakhalin: probably off the southeast coast. It is known most closely to the waters of the island near the Okhotsk Sea and Pacific coasts of Hokkaido, in the waters of Paramushir Island, and the Southern Kurils (Shinohara et al., 2009; Wang et al., 2009; Ishihara et al., 2012; Uchida, 2017).

Marine. Lives at depths of 450–1000 m. Rare species, it is known in the waters of Russia from the waters of the Kuril Islands (Wang et al., 2009).

Samples: known from the adjacent waters of the southern part of the Sea of Okhotsk – HUMZ no. 143346 - Siretoko Peninsula, along coast of Shari-cho, Shari-gun, Hokkaido, Japan.

Conservation status: IUCN (Least Concern).

38. * (M.) *Rhinoraja longicauda* Ishiyama, 1952 – White-bellied softnose skate

Rhinoraja longicauda Ishiyama, 1952. P. 25, pl. 4, Fig. 7 (off Hachinohe to Erimo Peninsula, Japan).

Northwestern Pacific. Sakhalin: probably on the continental slope in the southeastern part. It was observed most closely to the waters of Sakhalin in the southern part of the Sea of Okhotsk, including the Pacific waters of the Southern Kurils (Parin, 2001; Orlov and Ishihara, 2009c; Grigorov and Orlov, 2013; Parin et al., 2014; Dyldin, 2015).

Marine. Lives at depths of 300–1165 m. Rare species in the waters of Russia.

Samples: HUMZ no. 120086—Sea of Okhotsk.

Conservation status: IUCN (Least Concern).

7. ORDER MYLIOBATIFORMES Compagno, 1973 – Stingrays

13. Family *DASYATIDAE* Jordan, 1888 – Whiptail stingrays

22. Genus *BATHYTOSHIA* Whitley, 1933

39. * (M., Br.) *Bathytoshia brevicaudata* (Hutton, 1875) – Short-tail stingray

Trygon brevicaudata Hutton, 1875. P. 317 (Dunedin Harbor, New Zealand).

Trygon schreineri Gilchrist, 1913. P. 33, figure (off the rocks at St. James in False Bay, South Africa).

Dasyatis matsubarai Miyosi, 1939. P. 96, Fig. 3 (off Hyuga Nada, east coast of Miyazaki Prefecture, Japan).

Urolophoides multispinosus Tokarev in Lindberg et Legeza, 1959. P. 142, Figs. 89, 90 (Sea of Japan, 140 miles south of Cape Gamov, Russia).

? Circumglobally. Sakhalin: perhaps off the south-east coast and in Aniva Bay. A shallow-water way of life allows it, as the water gets warm, to penetrate the southern part of the Sea of Okhotsk from the Sea of Japan (where it is not rare) through the La Perouse Strait as well as from the Pacific waters of Hokkaido. It was observed most closely to the waters of Sakhalin in the southern part of the Sea of Okhotsk off Abashiri (Hokkaido) in October 2007 as evidenced by the voucher specimen (Nagao et al., 2011, as *Dasyatis matsubarai*). According to the same authors, the previous finding of the species (without preservation of the specimen) in the specified area was registered in 2003.

Marine. Lives at depths of 0–480; 0–60 m (for *Dasyatis matsubarai*).

Notation. According to the latest data, *Dasyatis matsubarai* is synonymized with *Bathytoshia brevicaudata* (Last et al., 2016b; Eschmeyer et al., 2017).

Samples: HUMZ no. 209188 (as *Dasyatis matsubarai*)—Sea of Okhotsk, Abashiri, Hokkaido Island.

Conservation status: IUCN (Least Concern).

14. Family **MYLIOBATIDAE** Bonaparte, 1835 – Eagle rays

23. Genus **MYLIOBATIS** Cuvier, 1817

40. * (M.) *Myliobatis tobijei* Bleeker, 1854 – Japanese eagle ray

Myliobatis tobijei Bleeker, 1854. P. 425 (Nagasaki, Japan).

Northwestern Pacific. Sakhalin: perhaps the southeastern part. A shallow-water way of life of this species (0–220 m), also allows us to suggest findings in Aniva Bay. It was observed most closely to the waters of Sakhalin along the Pacific and Okhotsk Sea coasts of Hokkaido (Ueno and Abe, 1966; Ueno, 1971).

Marine. Lives at depths of 0–60 m. Not observed in waters of Russia.

Notation. Of interest is a specimens of HUMZ no. 144552 caught in July 1986 in the Bering Sea (the coordinates of the catch are not indicated). In case of the absence of a mistake in species identification or labeling, the range of this species can be significantly expanded in the northern direction with the inclusion of the waters of Russia in it. To date, the northernmost known occurrence of this species is the southern part of the Okhotsk Sea off Hokkaido (Jeong et al., 2009).

Conservation status: IUCN (Data Deficient).

15. Family **MOBULIDAE** Gill, 1893 – Mobulid rays

24. Genus **MOBULA** Rafinesque, 1810

41. * (M.) *Mobula tarapacana* (Philippi, 1892) – Chilean devil ray

Cephaloptera tarapacana Philippi, 1892. P. 8, pl. 3, Fig. 2 (12 miles west of Iquique, Tarapacá Province, Chile).

? Circumglobal in warm waters. Sakhalin: perhaps the southeastern part and Aniva Bay. It was observed most closely to the waters of the island in 2011 in the southern part of the Sea of Okhotsk near Hokkaido (Tomita et al., 2013). Not registered in the waters of Russia.

Marine. Lives at depths of 0–1896 m.

Samples: HUMZ no. 215294—southwestern Sea of Okhotsk, off Mombetsu, northeastern Hokkaido, Japan, 45° N 145° E.

Conservation status: IUCN (Data Deficient).

II. CLASS HOLOCEPHALI – Chimaeras

One order Chimaeriformes with three families (Callorhynchidae, Chimaeridae and Rhinochimaeridae) and 52 valid species belong to the Holocephali class (Eschmeyer and Fong, 2017). In Sakhalin waters, two species of the family Chimaeridae were observed.

8. ORDER **CHIMAERIFORMES** Patterson, 1965 – Chimaeras

16. Family **CHIMAERIDAE** Rafinesque, 1815 – Shortnose chimaeras, ratfishes

25. Genus **HYDROLAGUS** Gill, 1862

42. (M.) *Hydrolagus barbouri* (Garman, 1908) – Nine-spot chimaera or Barbour's chimaera

Chimaera barbouri Garman, 1908. P. 255 (Aomori, near Tsugaru Strait, Japan).

Northwestern Pacific. Sakhalin: on the continental slope off the southeastern part (Kim, 2000; Balanov, 2003).

Marine. Lives at depths of 250–1100 m. Rare.

Conservation status: IUCN (Data Deficient).

43. ? (M.) *Hydrolagus purpurescens* (Gilbert, 1905) – Purple chimaera

Chimaera purpurescens Gilbert, 1905. P. 582, Fig. 231 (Vicinity of Kauai Island, Hawaiian Islands).

West Pacific, including the waters of the Hawaiian Islands. Sakhalin: on the continental slope off the southeastern part (Poltev and Sheiko, 2007, as *Hydrolagus* cf. *purpurescens*).

Marine. Lives at depths of 920–1951 m. Very rare.

Conservation status: IUCN (Data Deficient).

CONCLUSION

According to the data of Borets (2000), 83 species of cartilaginous fish are found in the Far Eastern waters of Russia (the Bering Sea, the Sea of Okhotsk and the Sea of Japan and the Pacific waters of Kamchatka and the Kuril Islands) and the adjacent waters of Japan and Alaska (United States). Sheiko and Fedorov (2000) indicate up to 27 species in the waters of Kamchatka and adjacent waters, including disputed ones and those observed in the near-border waters. In the northern part of the Sea of Okhotsk, there are 17 species (Fedorov et al., 2003), 23 species in the waters of Primorye (Sokolovsky et al., 2011), and 25 species in the Russian part of the Sea of Japan (Sokolovsky et al., 2007). In the waters of Sakhalin, the largest number of cartilaginous fishes was observed not only in comparison with other regions of the Far East of Russia (Kamchatka, Primorye, Northern Kurils) but also in comparison with the entire Arctic (five species) and the European part of Russia (for example, the Barents Sea with 22 species and the Black Sea with nine species) (Vasil'eva, 2007; Dolgov, 2011; Mecklenburg et al., 2016). The highest occurrence of cartilaginous fishes in the waters of Sakhalin in comparison with the adjacent water areas is partly due to the fact that Sakhalin is washed by two seas: the Sea of Okhotsk and the Sea of Japan. Along the east coast of the island, there is a continental slope, within which there are a number of deep-sea species that do not occur in the Sea of Japan. At the same time, a number of pelagic species can approach the shores of Sakhalin both from the Sea of Japan and from the Pacific Ocean as the water gets warm.

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