

Illustrated checklist of fishes from the Shubuto River System, southwestern Hokkaido, Japan

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ABSTRACT: A checklist of fish fauna, comprising 40 species representing 15 families and 9 orders, was compiled from field, museum, and literature surveys of the Shubuto River System, southwestern Hokkaido, Japan. This area approximates the boundary of southern/northern affinities of Japanese freshwater fishes. All primary freshwater species, are listed except for *Gymnogobius castaneus* and all anadromous and marine amphidromous species that are scientifically presumed to occur naturally in the area. The list contains two invasive exotic species, *Cyprinus carpio* and *Oncorhynchus mykiss*, and two Siberian primary freshwater species, *Lefua nikkonis* and *Barbatula toni*, which are thought to mark the boundary of southern and northern affinities of Japanese freshwater fishes. *Rhynchocypris perenurus*, another Siberian primary freshwater species with a similar presumed range, was not recorded. The voucher specimen species included *Platycephalus* sp. 2, which is suggested to have the northernmost extended range.

INTRODUCTION

Japanese freshwater fishes primarily originated on the Eurasian Continent (Lindberg 1972; Watanabe 2012). Three Siberian primary freshwater species occur in Hokkaido, the northernmost main island of Japan: *Rhynchocypris perenurus*, *Lefua nikkonis* and *Barbatula toni* (Aoyagi 1957; Goto 1982; Maekawa and Goto 1982; Goto 1994). Accordingly, Aoyagi (1957) characterized the freshwater fish fauna of Hokkaido as belonging to that of the “Siberian area,” based on a zoogeographic margin called the Blakiston Line, which functions as the southern boundary for the range of these species. However, Goto (1982), Maekawa and Goto (1982), and Goto (1994) subdivided the freshwater fish fauna of Hokkaido into two groups, separated by the Kuromatsunai or Ishikari lowland fault zone (Figure 1), because it is likely that these zones more accurately represent the actual southern boundary for the three species. This hypothesis was supported by parsimony analysis of the distribution pattern of Japanese primary freshwater fishes (Watanabe 1998, 2012).

An understanding of the freshwater fish fauna of the Shubuto River System is important for clarifying the biogeography of the Kuromatsunai lowland fault zone, within which the river system is located. The main channel of the river system is ca. 40 km long and of low gradient. Although fed by several headstreams near the Pacific coast (42°35' N, 140°31' E), the Shubuto River discharges into Suttsu Bay, in the Sea of Japan (42°46' N, 140°15' E).

A previous ichthyofaunal survey of the river system in 2005 recorded a total of 17 species belonging to 7 families (Ministry of Land, Infrastructure, Transport and Tourism, Japan 2007), but failed to include registered voucher specimens or even illustrations. In the present study, a more in-depth investigation was undertaken using field, museum, and literature data to establish voucher specimens as much as possible. A checklist of 40 species

with voucher specimens (except for *Hucho perryi*) has been compiled to provide a better understanding of the Shubuto River System ichthyofauna. Some biogeographical problems are discussed, based on the evidence provided by these data.

MATERIALS AND METHODS

Fish collections were obtained through surveys with hand net, cast net, set net, electric shocker and hook & line angling within the Shubuto River System from May to November in 2010 and 2011 (Miyazaki *et al.* 2011). Voucher specimens were deposited in the Biological Laboratory, Imperial Palace, Tokyo, Japan (BLIP), the Kanagawa Prefectural Museum of Natural History, Odawara, Japan (KPM) and the National Museum of Nature and Science, Tsukuba, Japan (NSMT).

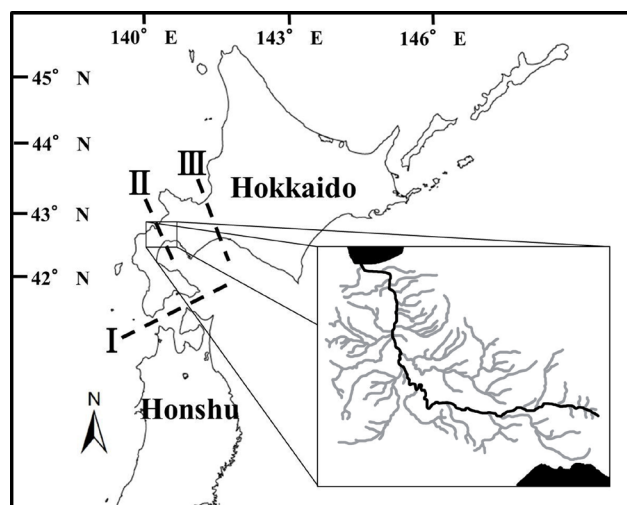


FIGURE 1. Maps of Hokkaido and the Shubuto River System. Black line indicates main channel; gray line indicates tributaries. Dotted lines of “I”, “II” and “III” indicate Blakiston line, Kuromatsunai lowland fault zone and Ishikari lowland fault zone, respectively.

We attempted to ascertain the presence of specimens allegedly registered in the Bihoro Museum, Abashiri, Japan (BIHM), the Hakodate City Museum (HCM), and the Hokkaido University Museum, Hokodate, Japan (HUMZ). The species recorded from the museum surveys were included in the checklist.

The systematic arrangement of families follows that established by Nelson (2006). Scientific names and standard Japanese names generally follow Nakabo (2002) and Eschmeyer and Fricke (2012), with some modifications following recently published taxonomic studies (Goto 2001; Stevenson 2002; Goto and Mori 2003; Sakai et al. 2006; Yamazaki et al. 2006; Suzuki and Chen 2011). The life cycle of diadromous fish follows McDowall (1988). Each voucher specimen, including registration number and collection locality, is listed in Appendix 1.

RESULTS AND DISCUSSION

A total of 40 fish species belonging to 15 families from nine orders were included in the checklist (Figures 2–5; Table 1). In decreasing order of the number of species contained, the fauna included Perciformes (10 species, 25.0% of the total), Cypriniformes (8 species, 20.0%), Salmoniformes (5 species, 12.5%), Scorpaeniformes (5 species, 12.5%), Osmeriformes (3 species), Petromyzontiformes (2 species), Mugiliformes (2 species), Gasterosteiformes (2 species), Pleuronectiformes (2 species), and Clupeiformes (1 species). The order Cypriniformes was represented by three families (20.0% of the total), and Scorpaeniformes, Perciformes, and Pleuronectiformes, each by two families (13.3%). The family Gobiidae had the highest number of represented species (9, 22.5% of the total), followed by Cyprinidae (5 species, 12.5%), Salmonidae (5 species, 12.5%), Cottidae (4 species, 10.0%), and Osmeridae (3 species, 7.5%). Petromyzontidae, Balitoridae, Mugilidae, and Gasterosteidae each had two represented species (5.0%).

Within the life-cycle classification, diadromous fishes were best represented, including 12 anadromous species (30.0% of total) followed by marine (11 species, 27.5%), and freshwater amphidromous species (8, 20.0%). In contrast, primary freshwater fishes were represented by only 9 species (22.5%).

Two invasive exotic species, *Cyprinus carpio* and *Oncorhynchus mykiss* (Lowe et al. 2000), were also recorded.

Additionally, two Siberian primary freshwater species, *Barbatula toni* and *Lefua nikkonis*, were recorded, but the Siberian species *R. perenurus* was not recorded.

Jordan and Snyder (1902) recorded the presence of *Hucho perryi* on the basis of voucher specimens held in the Sapporo Museum and Hakodate Museum (now Hakodate City Museum, HCM), including a specimen collected from the Shubuto River in July 1886. However, we could not find the latter specimen, which has perhaps been lost due to curatorial oversight or specimen deterioration and subsequent disposal, after the year 1922 when old inventory lists were last compiled (Amaoka et al. 1986). According to records, specimens of *Pungitius pungitius*,

Cottus hangiongensis, and *C. sp. ME* or *C. nozawae* were collected from the Shubuto River in July 1886 and registered in the Hakodate Museum. However, these can also not be found, possibly for similar reasons. Although Yamashiro (1990) reported *H. perryi* collected in the Shubuto River in 1988, no photo or voucher specimen exists to confirm this. As there are no formal records from the last half century, Fukushima et al. (2008) and Miyazaki et al. (2011) inferred that the Shubuto River population of *H. perryi* has already become extinct.

The freshwater amphidromous fishes listed in the checklist included one with the northernmost distributional range extension, *Platycephalus* sp. 2 of Nakabo (2002), which was previously recorded from off Usujiri, Hakodate City, southeastern Oshima Peninsula, Hokkaido (Tsuruoka et al. 2009). Freshwater amphidromous species, such as *Hypomesus japonicus*, *Hyporhamphus sajori*, *Ammodytes personatus*, and *Opisthocentrus ocellatus*, which are often reported from rivers in Hokkaido (Goto 1982; Maekawa and Goto 1982; Goto 1994), may also be recorded from the Shubuto River in the future.

The present checklist includes all anadromous and marine amphidromous fish species known to include the Shubuto River system within their natural distribution range (with the exception of *Hucho perryi*, which may be recruited from the neighboring Shiribetsu River via Suttso Bay) (Goto 1994; Nakabo 2002). Moreover, it also includes all possible primary freshwater fish species, except for *G. castaneus*, which is to be expected to be present according to its natural distribution range (Goto 1994; Nakabo 2002).

The rich freshwater fish species pool of the rather compact Shubuto River watershed is worthy of special mention, because the high richness means high γ -diversity. The river system is likely to be considered as a diversity hotspot for freshwater fishes.

Because of the rich fish species pool in the Shubuto River System, close monitoring of the distributions of two invasive alien species, *C. carpio* and particularly *O. mykiss* (Lowe et al. 2000), is necessary. The presence of the latter species in the main stem and tributaries of the Shubuto River is noted in sport fishing guide books (Yamaya 2004; Shiota 2008).

Although *L. nikkonis* and *B. toni* have both been recorded from more southern regions, i.e., the southern Oshima Peninsula (southernmost region of Hokkaido) and Aomori and Iwate Prefectures (northernmost region of Honshu), those populations have been determined to be non-native, based on molecular analyses and information gleaned from a history of fish introductions (Goto 1982; Maekawa and Goto 1982; Matsuzawa and Senou 2008; Goto and Yokoyama pers. comm.). Therefore, the present results indicate that the Kuromatsunai lowland fault zone may function as the southern boundary for both species, but not for another Siberian primary freshwater species, *R. perenurus*. However, it is possible that the actual limits of these three species may differ subtly due to differing dispersal and survival abilities, and more intensive study of the rivers associated with the Kuromatsunai lowland fault zone are needed.

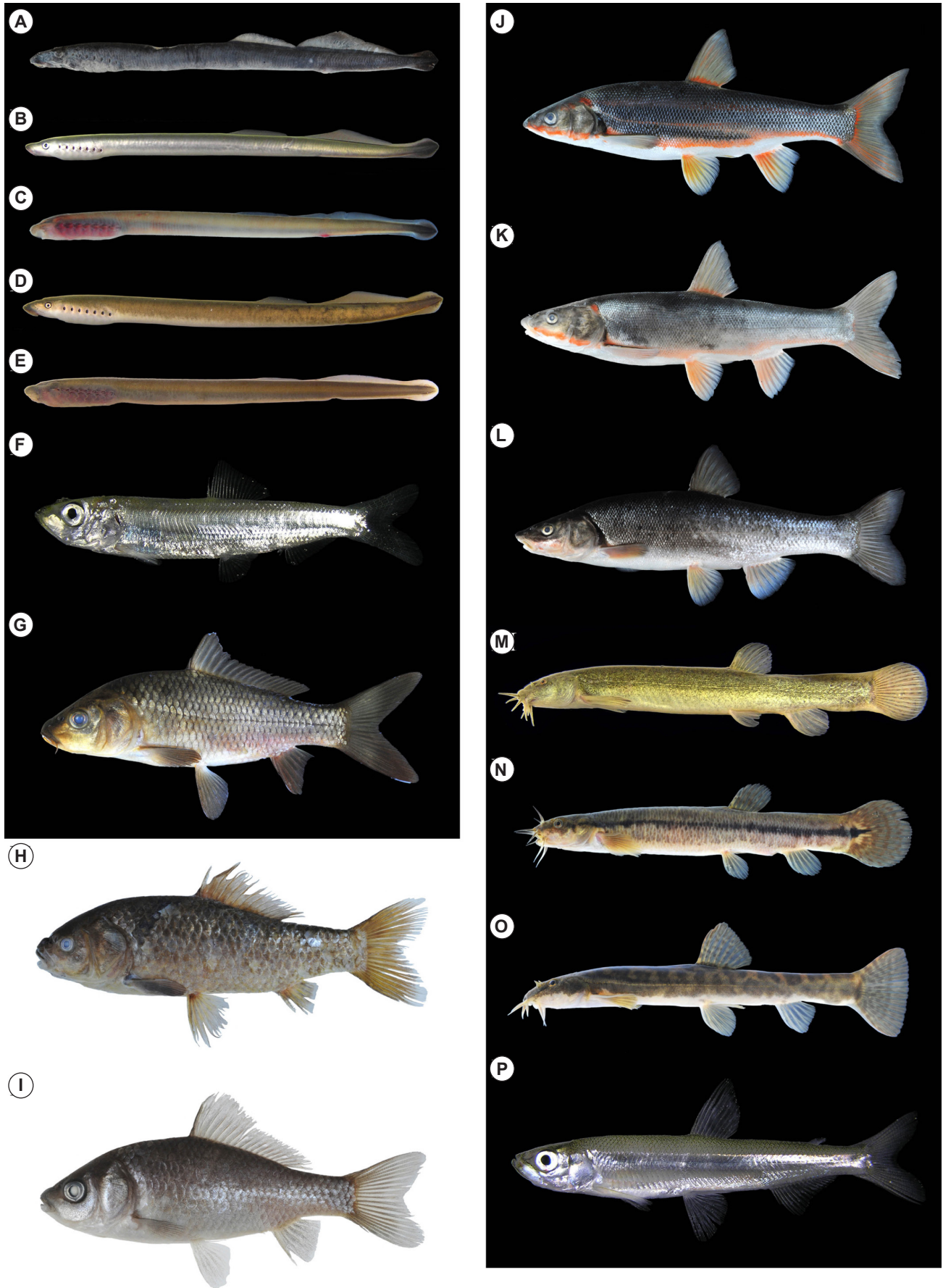


FIGURE 2. A, *Lethenteron camtschaticum*, KPM-NI 29281, 345.8 mm TL (adult); B, *Lethenteron camtschaticum*, KPM-NI 29180, 168.5 mm TL (metamorphosis season); C, *Lethenteron camtschaticum*, KPM-NI 27020, 97.3 mm TL (ammocoetes larvae); D, *Lethenteron* sp. N, KPM-NI 29181, 129.4 mm TL (adult); E, *Lethenteron* sp. N, KPM-NI 29186, 148.6 mm TL (ammocoetes larvae); F, *Clupea pallasii*, KPM-NI 29125, 42.7 mm SL; G, *Cyprinus carpio*, KPM-NI 29441, 137.1 mm SL; H, *Carassius* sp., KPM-NI 29159, 237.5 mm SL (Kin-buna form); I, *Carassius* sp., KPM-NI 29153, 74.5 mm SL (Gin-buna form); J, *Tribolodon hakonensis*, KPM-NI 29283, 268.7 mm SL; K, *Tribolodon brandti*, KPM-NI 29282, 312.9 mm SL; L, *Tribolodon ezoe*, KPM-NI 26812, 245.0 mm SL; M, *Misgurnus anguillicaudatus*, KPM-NI 29170, 90.8 mm SL; N, *Lefua nikkonis*, KPM-NI 26794, 70.7 mm SL; O, *Barbatula toni*, KPM-NI 26798, 93.1 mm SL; P, *Hypomesus nipponensis*, KPM-NI 29111, 58.4 mm SL.

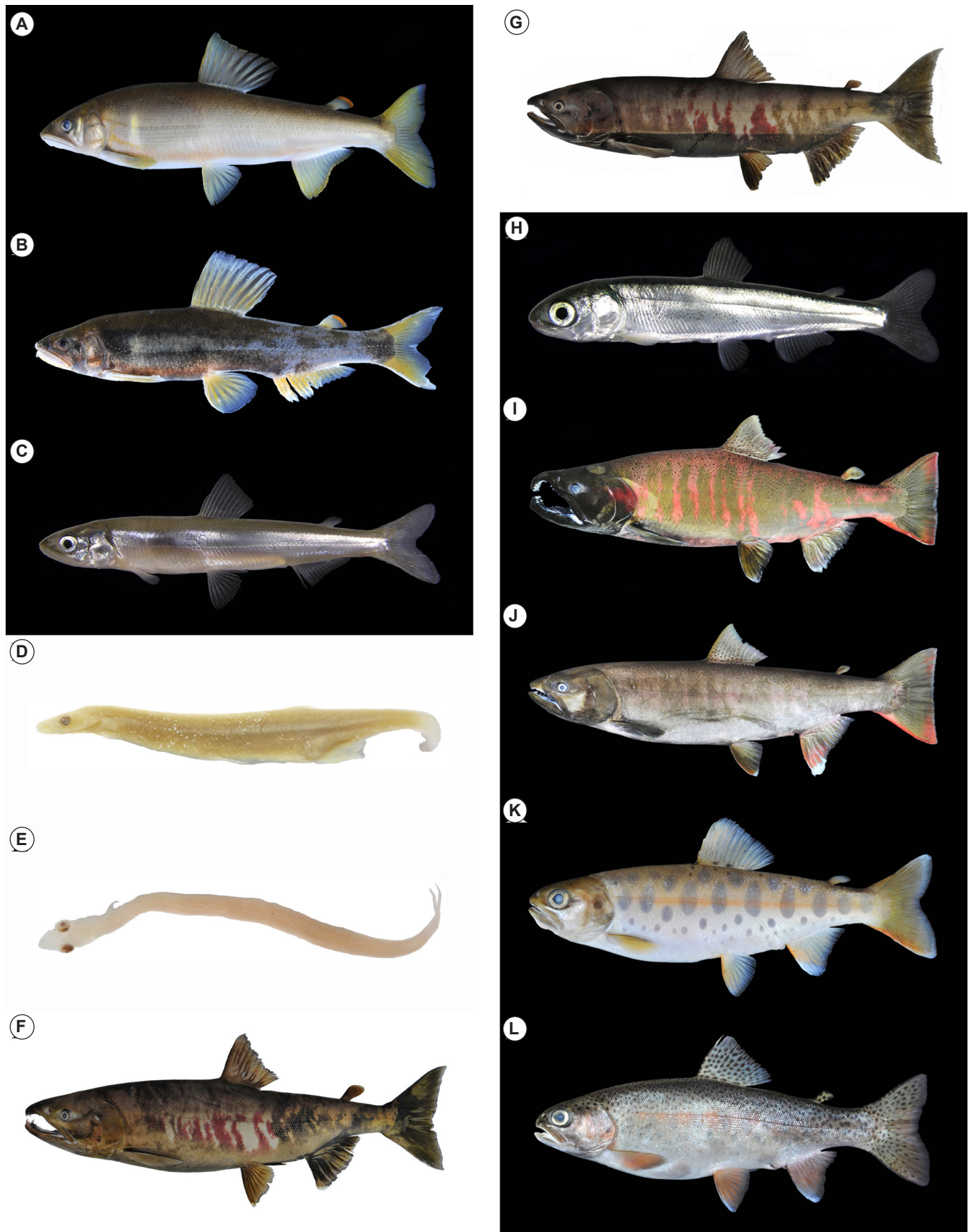


FIGURE 3. A, *Plecoglossus altivelis altivelis*, KPM-NI 29286, 172.3 mm SL (adult); B, *Plecoglossus altivelis altivelis*, KPM-NI 29288, 165.4 mm SL (nuptial coloration); C, *Plecoglossus altivelis altivelis*, KPM-NI 29115, 62.3 mm SL (juvenile); D, *Salangichthys microdon*, HCM 30337, 72.6 mm SL (preserved specimen); E, *Salangichthys microdon*, HCM 30163, 1 of 10, 46.9 mm SL (preserved specimen); F, *Oncorhynchus keta*, KPM-NI 29368, 637.2 mm SL (male); G, *Oncorhynchus keta*, KPM-NI 29369, 587.8 mm SL (female); H, *Oncorhynchus keta*, KPM-NI 29114, 40.1 mm SL (juvenile); I, *Oncorhynchus masou masou*, KPM-NI 27062, 541.2 mm SL (sea-migratory form: male); J, *Oncorhynchus masou masou*, KPM-NI 27060, 479.9 mm SL (sea-migratory form: female); K, *Oncorhynchus masou masou*, KPM-NI 29149, 126.8 mm SL (river-resident form); L, *Oncorhynchus mykiss*, KPM-NI 29442, 193.9 mm SL.

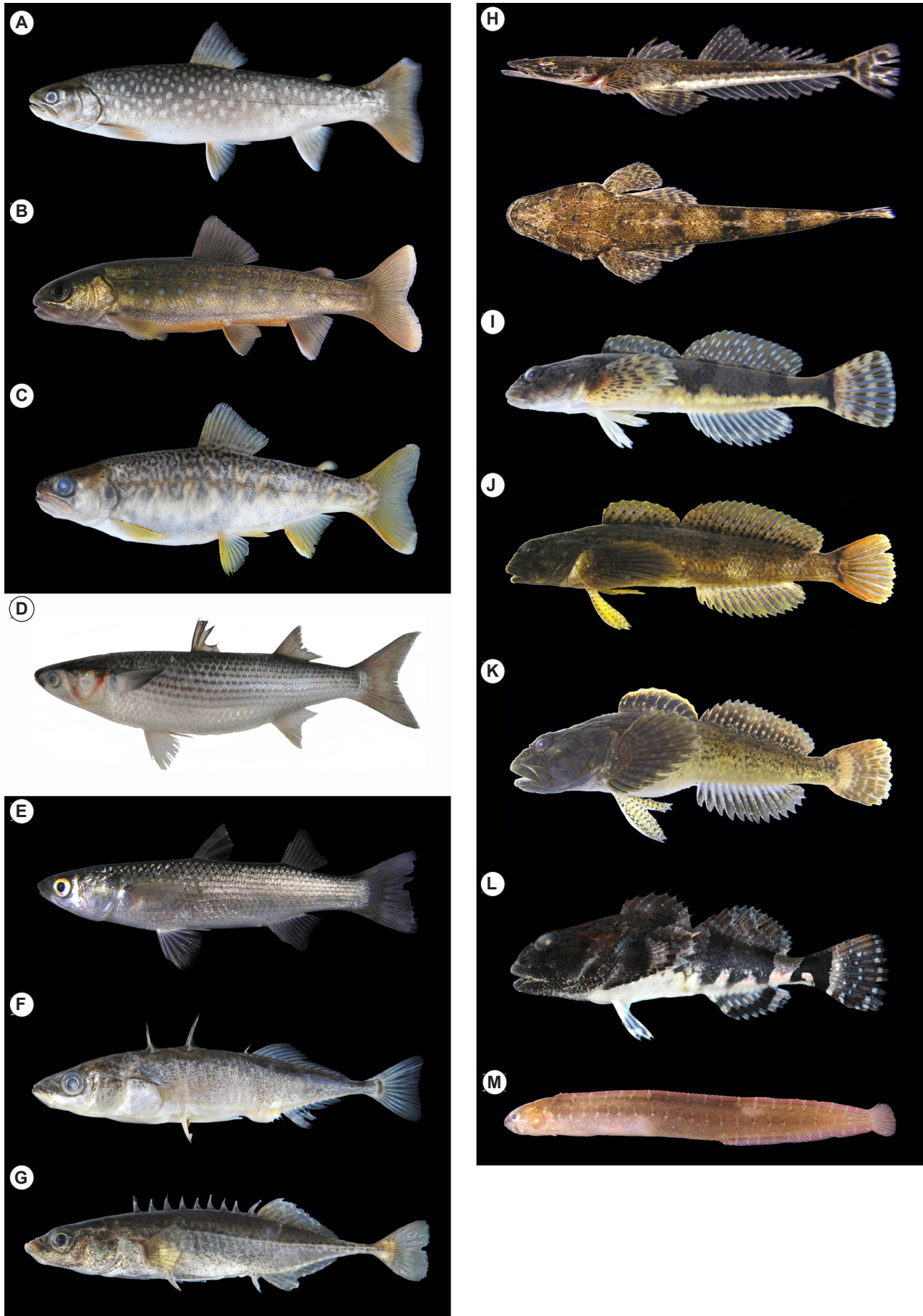


FIGURE 4. A, *Salvelinus leucomaenis leucomaenis*, KPM-NI 26811, 236.6 mm SL (sea-migratory form); B, *Salvelinus leucomaenis leucomaenis*, KPM-NI 29195, 94.8 mm SL (river-resident form); C, *Oncorhynchus masou masou* × *Salvelinus leucomaenis leucomaenis*, KPM-NI 29285, 116.8 mm SL; D, *Mugil cephalus cephalus*, KPM-NI 29367, 421.0 mm SL; E, *Chelon haematocheila*, KPM-NI 29166, 69.6 mm SL; F, *Gasterosteus aculeatus aculeatus*, KPM-NI 26804, 68.7 mm SL; G, *Pungitius pungitius*, KPM-NI 27016, 53.0 mm SL; H, *Platycephalus* sp. 2, KPM-NI 29083, 56.2 mm SL; I, *Cottus* sp. ME, KPM-NI 27017, 58.4 mm SL; J, *Cottus hangiongensis*, KPM-NI 29187, 88.3 mm SL; K, *Cottus nozawae*, KPM-NI 29199, 83.6 mm SL; L, *Myoxocephalus stelleri*, KPM-NI 29806, 57.0 mm SL; M, *Pholis crassispina*, KPM-NI 29477, 55.9 mm SL.

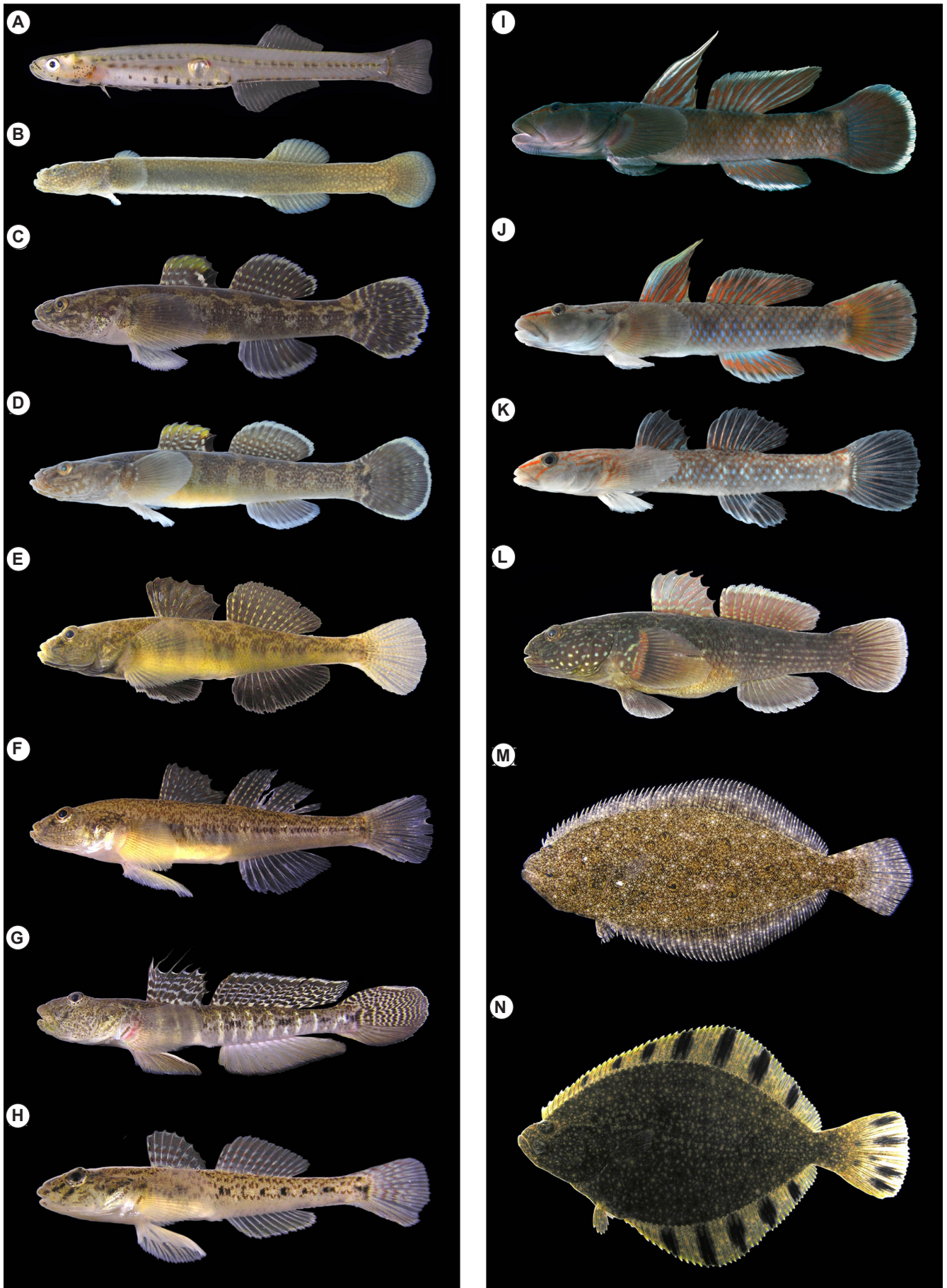


FIGURE 5. A, *Leucopsarion petersii*, KPM-NI 29127, 39.8 mm SL; B, *Luciogobius guttatus*, KPM-NI 29063, 58.2 mm SL; C, *Gymnogobius urotaenia*, KPM-NI 29174, 64.9 mm SL; D, *Gymnogobius operiens*, KPM-NI 27019, 65.9 mm SL; E, *Gymnogobius breunigii*, KPM-NI 29132, 52.4 mm SL (nuptial coloration); F, *Gymnogobius breunigii*, KPM-NI 29092, 53.9 mm SL; G, *Acanthogobius lactipes*, KPM-NI 29085, 54.6 mm SL (nuptial coloration: male); H, *Acanthogobius lactipes*, KPM-NI 29123, 31.4 mm SL; I, *Rhinogobius* sp. CO, BLIP 20101250, 78.4 mm SL (male); J, *Rhinogobius kurodai*, KPM-NI 29001, 62.0 mm SL (male); K, *Rhinogobius kurodai*, KPM-NI 29002, 48.6 mm SL (female); L, *Tridentiger brevispinis*, KPM-NI 29188, 67.0 mm SL; M, *Paralichthys olivaceus*, KPM-NI 29094, 71.8 mm SL; N, *Platichthys stellatus*, KPM-NI 29197, 100.6 mm SL.

TABLE 1. List of fishes in the Shubuto River System, southwestern Hokkaido, Japan. A, anadromous; MA, marine amphidromous; FA, freshwater amphidromous; PF, primary freshwater; life cycle of the species (McDowall 1988). CR, critically endangered; EN, endangered; NT, near threatened; VU, vulnerable; VU, threatened local population; R, rare; LP, threatened local population; R, rare; LP, threatened local population; category of red lists (Natural Environment Division, Hokkaido Government 2001; Ministry of the Environment, Japan 2007). YES, NO; 1Record from the Shubuto River System by the previous survey (Ministry of Land, Infrastructure, Transport and Tourism, Japan 2007); 2Listed in the world's 100 worst invasive species (Lowe et al. 2000).

TAXON	STANDARD JAPANESE NAME	LIFE CYCLE	PREVIOUS SURVEY	INVASIVE ALIEN SPECIES	NATIONAL RED LIST	REGIONAL RED LIST	VOUCHERS OR LITERATURE SOURCE
PETROMYZONTIDAE							
<i>Lethenteron camtschaticum</i> (Tilesius, 1811)	Kawa-yatsume	A	YES	NO	VU	LP	HUMZ, KPM
<i>Lethenteron</i> sp. N	Suna-yatsume-hoppō-shu	PF	NO	NO	VU	LP	KPM
CLUPEIDAE							
<i>Clupea pallasii</i> Valenciennes, 1847	Nishin	FA	NO	NO			KPM
CYPRINIDAE							
<i>Cyprinus carpio</i> Linnaeus, 1758	Koi	PF	NO	YES			KPM
<i>Carrasius</i> spp.	-	PF	NO	NO			KPM
<i>Tribolodon hakonensis</i> (Günther, 1877)	Ugui	A	YES	NO			BIHM, KPM
<i>Tribolodon brandti</i> (Dybowski, 1872)	Maruta	A	YES	NO		N	KPM
<i>Tribolodon ezoe</i> Okada and Ikeda, 1937	Ezo-ugui	PF	YES	NO		N	BIHM, KPM
COBITIDAE							
<i>Misgurnus anguillicaudatus</i> (Cantor, 1842)	Dojō	PF	YES	NO			BIHM, KPM
BALITORIDAE							
<i>Lefua nikkonis</i> (Jordan and Fowler, 1903)	Ezo-hotoke-dojō	PF	NO	NO	EN	EN	KPM
<i>Barbatula toni</i> (Dybowski, 1869)	Fuku-dojō	PF	YES	NO			BIHM, KPM, NSMT
OSMERIDAE							
<i>Hypomesus nipponensis</i> McAllister, 1963	Wakasagi	A	NO	NO			KPM
<i>Plecoglossus altivelis altivelis</i> (Temminck and Schlegel, 1846)	Ayu	MA	YES	NO		R(NT)	HUMZ, KPM
<i>Salangichthys microdon</i> (Bleeker, 1860)	Shirauo	A	NO	NO		R(NT)	HCM
SALMONIDAE							
<i>Hucho perryi</i> (Brevoort, 1856)	Itou	MA	NO	NO	EN	CR	Jordan and Snyder (1902)
<i>Oncorhynchus keta</i> (Walbaum, 1792)	Sake	A	YES	NO			KPM
<i>Oncorhynchus masou masou</i> (Brevoort, 1856)	Sakura-masu, Yamame	A	YES	NO	NT	N	BIHM, KPM
<i>Oncorhynchus mykiss</i> (Walbaum, 1792)	Niji-masu	A	NO	YES			KPM
<i>Salvelinus leucomaenis leucomaenis</i> (Pallas, 1814)	Ame-masu, Ezo-iwana	A	NO	NO			KPM
MUGILIDAE							
<i>Mugil cephalus cephalus</i> Linnaeus, 1758	Bora	FA	NO	NO			KPM
<i>Chelon haematocheila</i> (Temminck and Schlegel, 1845)	Menada	FA	YES	NO			KPM
GASTEROSTEIDAE							
<i>Gasterosteus aculeatus aculeatus</i> Linnaeus, 1758	Itoyo-nihon-kai-gata	A	YES	NO		N	KPM
<i>Pungitius pungitius</i> (Linnaeus, 1758)	Tomiyo-zoku-tansui-gata	PF	NO	NO			KPM
PLATYCEPHALIDAE							
<i>Platycephalus</i> sp. 2	Ma-gochi	FA	NO	NO			KPM
COTTIDAE							
<i>Cottus</i> sp. ME	Kajika-chū-ran-gata	MA	YES	NO	VU	EN	KPM
<i>Cottus hangionensis</i> Mori, 1930	Kankyō-kajika	MA	YES	NO			BIHM, KPM

TABLE 1. CONTINUED.

TAXON	STANDARD JAPANESE NAME	LIFE CYCLE	PREVIOUS SURVEY	INVASIVE ALIEN SPECIES	NATIONAL RED LIST	REGIONAL RED LIST	VOUCHERS OR LITERATURE SOURCE
<i>Cottus nozawae</i> Snyder, 1911	Hana-kajika	PF	NO	NO		N	BIHM, HUMZ, KPM, NSMT
<i>Myoxocephalus stelleri</i> Tilesius, 1811	Gisu-kajika	FA	NO	NO			KPM
PHOLIDAE							
<i>Pholis crassispina</i> (Temminck and Shlegel, 1845)	Take-gimpo	FA	NO	NO			KPM
GOBIIDAE							
<i>Leucopsaron petersii</i> Hilgendorf, 1880	Shiro-uo	A	NO	NO	VU	VU	KPM
<i>Luciogobius guttatus</i> Gill, 1859	Mimizu-haze	A	NO	NO		R(NT)	BLIP, KPM
<i>Gymnogobius urotaenia</i> (Hilgendorf, 1879)	Ukigori	MA	YES	NO			BLIP, KPM
<i>Gymnogobius opperiens</i> Stevenson, 2002	Shima-ukigori	MA	YES	NO			BIHM, BLIP, KPM
<i>Gymnogobius breunigii</i> (Steindachner, 1879)	Biringo	MA	YES	NO			KPM
<i>Acanthogobius lactipes</i> (Hilgendorf, 1879)	Ashishirohaze	MA	YES	NO			KPM
<i>Rhinogobius</i> sp. CO	Ruri-yoshinobori	MA	NO	NO		R(NT)	BLIP
<i>Rhinogobius kurodai</i> (Tanaka, 1908)	Tō-yoshinobori	MA	YES	NO			BLIP, KPM
<i>Tridentiger brevispinis</i> Katsuyama, Arai and Nakamura, 1972	Numa-chichibu	MA	NO	NO			BIHM, KPM
PARALICHTHYIDAE							
<i>Paralichthys olivaceus</i> (Temminck and Schlegel, 1846)	Hirame	FA	NO	NO			KPM
PLEURONECTIDAE							
<i>Platichthys stellatus</i> (Pallas, 1787)	Numa-garei	FA	YES	NO			KPM

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APPENDIX 1. Data for specimens from the Shubuto River System examined in the present study. Specimens collected in Shubuto River unless otherwise stated. NF: not found.

PETROMYZONTIDAE – *Lethenteron camtschaticum*: HCM 4-029; HUMZ 12679 (NF); HUMZ 12680 (NF); HUMZ 12681 (NF); HUMZ 12682 (NF); HUMZ 12683 (NF); HUMZ 12684 (NF); HUMZ 12685 (NF); HUMZ 12686 (NF); HUMZ 12688 (NF); HUMZ 12690 (NF); HUMZ 12691 (NF); HUMZ 12692 (NF); HUMZ 12693 (NF); HUMZ 12694 (NF); HUMZ 12695 (NF); HUMZ 12696 (NF); HUMZ 12697 (NF); HUMZ 12698 (NF); HUMZ 12699 (NF); HUMZ 12701 (NF); HUMZ 12702 (NF); HUMZ 12703 (NF); HUMZ 12704 (NF); HUMZ 12705 (NF); HUMZ 12706 (NF); HUMZ 12707 (NF); HUMZ 12708 (NF); HUMZ 12709 (NF); HUMZ 12710 (NF); HUMZ 12711 (NF); KPM-NI 27020; KPM-NI 27038; KPM-NI 28147; KPM-NI 29062; KPM-NI 29095; KPM-NI 29180; KPM-NI 29281. *Lethenteron* sp. N: KPM-NI 26783, Kuromatsunai River; KPM-NI 26815, Neppu River; KPM-NI 29138, Nakano River; KPM-NI 29181; KPM-NI 29182; KPM-NI 29183, Nakano River; KPM-NI 29184, Nakano River; KPM-NI 29185, Tozawa River; KPM-NI 29186, Isamanai River; KPM-NI 29236. **CLUPEIDAE** – *Clupea pallasii*: KPM-NI 29117; KPM-NI 29125. **CYPRINIDAE** – *Cyprinus carpio*: KPM-NI 29441, Pond of Nishinosawa; KPM-NI 29470, Pond of Nishinosawa. *Carasius* spp.: KPM-NI 27025, Teranosawa River; KPM-NI 27054, Teranosawa River; KPM-NI 27055, Teranosawa River; KPM-NI 27056, Teranosawa River; KPM-NI 27057, Teranosawa River; KPM-NI 27058, Teranosawa River; KPM-NI 27059, Teranosawa River; KPM-NI 29148, Nakano River; KPM-NI 29150, Teranosawa River; KPM-NI 29151, Teranosawa River; KPM-NI 29152, Tozawa River; KPM-NI 29153, Tozawa River; KPM-NI 29154, Tozawa River; KPM-NI 29159, Teranosawa River; KPM-NI 29160, Teranosawa River; KPM-NI 29161, Teranosawa River; KPM-NI 29162, Pond of Nakasato; KPM-NI 29163, Pond of Nakasato; KPM-NI 29164, Pond of Nakasato; KPM-NI 29165, Pond of Nakasato; KPM-NI 29297, Teranosawa River; KPM-NI 29298, Teranosawa River; KPM-NI 29299, Teranosawa River; KPM-NI 29300, Teranosawa River; KPM-NI 29301, Teranosawa River; KPM-NI 29302, Teranosawa River; KPM-NI 29303, Teranosawa River; KPM-NI 29304, Teranosawa River; KPM-NI 29305, Teranosawa River; KPM-NI 29306, Teranosawa River; KPM-NI 29307, Teranosawa River; KPM-NI 29308, Nakano River; NSMT-P 105451, Teranosawa River; NSMT-P 105452, Teranosawa River. *Tribolodon hakonensis*: BIHM 100392; BIHM 100393; BIHM 100394, Kanagasawa River; BIHM 100395, Ichiki River; BIHM 100396, Shirasumi River; BIHM 100398, Choposhinai River; HCM 30104 or 30324; KPM-NI 27026; KPM-NI 29089; KPM-NI 29191; KPM-NI 29228; KPM-NI 29229; KPM-NI 29231; KPM-NI 29283; KPM-NI 29284; KPM-NI 29309, Teranosawa River; NSMT-P 105447, Teranosawa River; NSMT-P 105448, Teranosawa River. *Tribolodon brandtii*: KPM-NI 29282. *Tribolodon ezoe*: BIHM 100399, Neppu River; BIHM 100400, Neppu River; KPM-NI 26812, Utsai River; KPM-NI 27044, Utsai River; KPM-NI 29196, Soibetsu River; NSMT-P 105393, Channel of Utsai Peatland; NSMT-P 105445, Channel of

Utsai Peatland; NSMT-P 105446, Channel of Utsai Peatland. *Tribolodon* sp.: KPM-NI 26779; KPM-NI 26814, Neppu River; KPM-NI 27034; KPM-NI 27037; KPM-NI 27042. **COBITIDAE** – *Misgurnus anguillicaudatus*: BIHM 100397, Choposhinai River; BIHM 100401, Neppu River; HCM 30275; KPM-NI 26773, Kyoshin River; KPM-NI 26813, Neppu River; KPM-NI 27039; KPM-NI 29155, Tozawa River; KPM-NI 29167, Raiba Wetland; KPM-NI 29170, Tozawa River; KPM-NI 29171; KPM-NI 29291, Channel of Utsai Peatland; NSMT-P 52053, Suttu River; NSMT-P 105391, Channel of Utsai Peatland; NSMT-P 105442, Channel of Utsai Peatland. **BALITORIDAE** – *Lefua nikkonis*: KPM-NI 26745, Channel of Utsai Peatland; KPM-NI 26746, Channel of Utsai Peatland; KPM-NI 26747, Channel of Utsai Peatland; KPM-NI 26794; KPM-NI 26795, Channel of Utsai Peatland; KPM-NI 26796, Channel of Utsai Peatland; KPM-NI 29096; NSMT-P 105443, Channel of Utsai Peatland; NSMT-P 105444, Channel of Utsai Peatland. *Barbatula toni*: BIHM 100392, Shirasumi River; BIHM 100394, Kanagasawa River; BIHM 100395, Ichiki River; BIHM 100396, Shirasumi River; BIHM 100397, Choposhinai River; BIHM 100398, Choposhinai River; BIHM 100401, Neppu River; KPM-NI 26770, Kuromatsunai River; KPM-NI 26771, Teranosawa River; KPM-NI 26772, Kitanosawa River; KPM-NI 26790, Wenbetsu River; KPM-NI 26791, Igarashi River; KPM-NI 26797, Teranosawa River; KPM-NI 26798, Teranosawa River; KPM-NI 26799, Kuromatsunai River; KPM-NI 26800; KPM-NI 26810; KPM-NI 27041, Kuromatsunai River; KPM-NI 29156, Tozawa River; KPM-NI 29232, Utsai River; KPM-NI 29233, Utsai River; NSMT-P 52052, Suttu River. **OSMERIDAE** – *Hypomesus nipponensis*: KPM-NI 29082; KPM-NI 29105; KPM-NI 29111. *Plecoglossus altivelis altivelis*: HUMZ 1379; HUMZ 1380; HUMZ 1381; HUMZ 1382; HUMZ 1383; HUMZ 1384; HUMZ 1385; HUMZ 1386; KPM-NI 27022; KPM-NI 27023; KPM-NI 27024; KPM-NI 29115; KPM-NI 29145; KPM-NI 29230; KPM-NI 29286; KPM-NI 29287; KPM-NI 29288; KPM-NI 29289; KPM-NI 29296. *Salangichthys microdon*: HCM 30163 or 30337. **SALMONIDAE** – *Oncorhynchus keta*: KPM-NI 27052, Teranosawa River; KPM-NI 29114, Teranosawa River; KPM-NI 29368, Wenbetsu River; KPM-NI 29369, Wenbetsu River; KPM-NI 29372, Kamiyama River; KPM-NI 29373, Kamiyama River. *Oncorhynchus masou masou*: BIHM 100398, Choposhinai River; BIHM 100399, Neppu River; KPM-NI 26782, Kuromatsunai River; KPM-NI 26784, Kuromatsunai River; KPM-NI 26809; KPM-NI 27053, Teranosawa River; KPM-NI 27060, Kuromatsunai River; KPM-NI 27061, Teranosawa River; KPM-NI 27062, Neppu River; KPM-NI 29134, Soibetsu River; KPM-NI 29137; KPM-NI 29149, Nakano River; KPM-NI 29201; KPM-NI 29234; KPM-NI 29235; KPM-NI 29290, Soibetsu River; KPM-NI 29294, Teranosawa River; KPM-NI 29295, Teranosawa River; NSMT-P 105449, Teranosawa River; NSMT-P 105450, Teranosawa River; NSMT-P 105453. *Oncorhynchus masou masou* × *Salvelinus leucomaenis leucomaenis*: KPM-NI 29285. *Oncorhynchus mykiss*: KPM-NI 29442, Garou River. *Salvelinus leucomaenis leucomaenis*: KPM-NI 26811; KPM-NI 29195, Raiba River; KPM-NI 29293, Raiba River. **MUGILIDAE** – *Mugil cephalus cephalus*: KPM-NI 29367. *Chelon haematocheila*: KPM-NI 28142; KPM-NI 28143; KPM-NI 29086; KPM-NI 29166. **GASTEROSTEIDAE** – *Gasterosteus aculeatus aculeatus*: KPM-NI 26804. *Pungitius pungitius*: KPM-NI 26774, Teranosawa River; KPM-NI 27015, Channel of Utsai Peatland; KPM-NI 27016, Channel of Utsai Peatland; KPM-NI 27043, Utsai River; KPM-NI 29157, Tozawa River; NSMT-P 105454, Channel of Utsai Peatland; NSMT-P 105455, Channel of Utsai Peatland. **PLATYCEPHALIDAE** – *Platycephalus* sp. 2: KPM-NI 29083; KPM-NI 29106. **COTTIDAE** – *Cottus* sp. ME: KPM-NI 26775; KPM-NI 26776; KPM-NI 27017, Soibetsu River; NSMT-P 52055, Suttu River. *Cottus hangiongensis*: BIHM 100392, Shirasumi River; BIHM 100395, Ichiki River; BIHM 100396, Shirasumi River; BIHM 100397, Choposhinai River; BIHM 100398, Choposhinai River; KPM-NI 26777; KPM-NI 26780; KPM-NI 26786; KPM-NI 27021; KPM-NI 27033; KPM-NI 29187; KPM-NI 29198; NSMT-P 52057, Suttu River. *Cottus nozawae*: BIHM 100392, Shirasumi River; BIHM 100397, Choposhinai River; BIHM 100398, Choposhinai River; HUMZ 156706, Shiribeshi-raiba River; KPM-NI 26808; KPM-NI 29118, Horonai River; KPM-NI 29146, Doro River; KPM-NI 29192, Raiba River; KPM-NI 29199, Raiba River; KPM-NI 29210, Raiba River; KPM-NI 29292, Raiba River; NSMT-P 52056, Suttu River. *Myoxocephalus stelleri*: KPM-NI 26805; KPM-NI 29806; KPM-NI 29169; KPM-NI 29177. **PHOLIDAE** – *Pholis crassispina*: KPM-NI 29477. **Gobiidae** – *Leucoparion petersii*: KPM-NI 29127. *Luciogobius guttatus*: BLIP 20110322; KPM-NI 28148; KPM-NI 28149; KPM-NI 29063; KPM-NI 29101; KPM-NI 29103. *Gymnogobius urotaenia*: BLIP 20101070; BLIP 20101071, Teranosawa River; KPM-NI 26787, Kuromatsunai River; KPM-NI 26789, Soibetsu River; KPM-NI 26793, Nakano River; KPM-NI 27032, Soibetsu River; KPM-NI 27035, Shubuto River; KPM-NI 29107; KPM-NI 29158, Tozawa River; KPM-NI 29174. *Gymnogobius operiens*: BIHM 100392, Shirasumi River; BIHM 100394, Kanagasawa River; BIHM 100395, Ichiki River; BIHM 100396, Shirasumi River; BIHM 100397, Choposhinai River; BIHM 100398, Choposhinai River; BLIP 20101068; BLIP 20101069; KPM-NI 26781, Kuromatsunai River; KPM-NI 26785, Kuromatsunai River; KPM-NI 26788, Kuromatsunai River; KPM-NI 27018, Soibetsu River; KPM-NI 27019, Soibetsu River; KPM-NI 27031,

Soibetsu River; KPM-NI 27036; KPM-NI 29088; KPM-NI 29189; KPM-NI 29202; NSMT-P 52054, Suttsu River. *Gymnogobius breunigii*: KPM-NI 28144; KPM-NI 28145; KPM-NI 28146; KPM-NI 29092; KPM-NI 29121; KPM-NI 29122; KPM-NI 29128; KPM-NI 29132; KPM-NI 29142; KPM-NI 29472; KPM-NI 29473; NSMT-P 105433; NSMT-P 105434. *Acanthogobius lactipes*: KPM-NI 26816; KPM-NI 28141; KPM-NI 29085; KPM-NI 29098; KPM-NI 29123; KPM-NI 29136; KPM-NI 29168; KPM-NI 29176; KPM-NI 29205. *Rhinogobius* sp. CO: BLIP 20101250, Soibetsu River. *Rhinogobius kurodai*: BLIP 20101062; BLIP 20101063; BLIP 20101064; BLIP 20101065; BLIP 20101066; BLIP 20101067; BLIP 20101072, Teranosawa River; BLIP 20101074; BLIP 20101075; BLIP 20101247; BLIP 20101248; BLIP 20101249; BLIP 20101251; BLIP 20101252, Soibetsu River; BLIP 20101253, Soibetsu River; BLIP 20101254, Soibetsu

River; BLIP 20110281; BLIP 20110282; BLIP 20110283; BLIP 20110284; BLIP 20110314; BLIP 20110315; BLIP 20110316; BLIP 20110317; KPM-NI 26778; KPM-NI 27040, Kuromatsunai River; KPM-NI 28999; KPM-NI 29000; KPM-NI 29001; KPM-NI 29002; KPM-NI 29129, Soibetsu River; KPM-NI 29141, Soibetsu River; KPM-NI 29147, Soibetsu River. *Tridentiger brevispinis*: BIHM 100393; KPM-NI 26792, Igarashi River; KPM-NI 26807; KPM-NI 29173; KPM-NI 29188; KPM-NI 29193. **PARALICHTHYIDAE** – *Paralichthys olivaceus*: KPM-NI 29094; KPM-NI 29109; KPM-NI 29113; KPM-NI 29172; KPM-NI 29179.

PLEURONECTIDAE – *Platichthys stellatus*: KPM-NI 27027; KPM-NI 27028; KPM-NI 27029; KPM-NI 27030; KPM-NI 29093; KPM-NI 29110; KPM-NI 29130; KPM-NI 29197; KPM-NI 29492; NSMT-P 105438; NSMT-P 105439.