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Species Composition and Distribution of Butterfishes (Stromateidae) in Waters of Russia

V. N. Dolganov, V. E. Kharin, and V. V. Zemnukhov

Institute of Sea Biology, Far Eastern Department, Russian Academy of Sciences—IBM, ul. Palchevskogo 17, Vladivostok, 690041 Russia

e-mail: vndolganov@mail.ru

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Abstract—Descriptions and distribution of two species of butterfishes (genus *Pampus*) in the waters of Russia are given. All known findings in the national waters are documented. The generic and specific characteristics are defined more exactly. The validity of *P. echinogaster* is confirmed.

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The family Stromateidae is represented in the waters of Russia by two rare, subtropical, epipelagic, and neritic species belonging to the genus *Pampus* (Soldatov and Lindberg, 1930; Taranets, 1937; Lindberg, 1947; Lindberg and Krasyukova, 1975; Haedrich, 1967; Sokolovskaya et al., 1998; Borets, 2000; Novikov et al. 2002; Parin, 2003).

In spite of rather numerous publications, the taxonomy of this genus is elaborated very poorly up to now. Till recently, for the waters of Russia, Japan, Korea, and China (including Taiwan), *P. argenteus* was indicated in addition to *P. chinensis* and *P. echinogaster* (Lindberg and Krasyukova, 1975; Chyung Moon-ki, 1977; Masuda et al., 1984; Kim and Han, 1989; Sokolovskaya et al., 1998; Borets, 2000; Choi Youn and Kim Ji-Hyun et al., 2002; Novikov et al., 2002; Parin, 2003). At the same time, the Japanese and Chinese ichthyologists (Yamada et al., 1995a, 1995b; Liu and Liu, 1998a, 1998b, 2002; Nakabo, 2002), to our mind, indicated rather persuasively that the latter taxon (sensu lato) is represented in the northwestern Pacific at the minimum by two morphologically rather closely related species, i.e., *P. punctatissimus* and *P. cinereus*, which earlier were considered the junior subjective synonyms of *P. argenteus*.

Up to this day, all material from the Russian waters comprised individual findings from the south of the Maritime Territory and the northwestern coast of Sakhalin, mainly belonging to *P. echinogaster*. The collection obtained in August–September 2006 made it possible to significantly specify the distribution and certain traits of morphology of these rather rare species periodically calling on the waters of Russia during the period of rise of temperature, as a rule, in early August and the first half of September (18–24°C). This collection and preparation of a planned 4-volume monograph by IBM DVO RAN "Fishlike vertebrates and Fishes" in the series of keys "Biota of the Russian waters of the Sea of Japan" prompted the authors of the present work to prepare a number of summaries on the rare and little known species of the water area in question, one of which we offer below.

MATERIAL AND METHODS

The collections of the Zoological Institute of the Russian Academy of Sciences (ZIN), Zoological Museum of the Far Eastern State University (ZMUFE), Pacific Fisheries Research Center (TINRO), Zhirmunskii Institute of Sea Biology of DVO RAN (MIMB), and the Department of Marine Biology of the Far Eastern State University (MBUFE) served as material for this article.

The following abbreviations are established in the work: SL, standard length of the body; H, maximum depth of the body (without the lengths of D and A); c, length of the head; hc, depth of the head; ao, length of the snout; po, length of the postorbital space; io, interorbital distance; lmx, length of the upper jaw; lmd, length of the lower jaw; o, horizontal diameter of the eye; hcd, depth of the caudal peduncle; lcd, length of the caudal peduncle; lD, length of the insertion of D; lA, length of the insertion of A; lP, length of the insertion of P; lC', length of the greatest ray of the upper lobe of C; lC", length of the greatest ray of the lower lobe of C; hD, length of the greatest ray of D; hA, length of the greatest ray of A; hP, length of the greatest ray of P; aD, antedorsal distance; aA, anteanal distance; and aP, antepectoral distance.

Pampus Bonaparte, 1834

Diagnosis. Body diamond-shaped, deep (the greatest depth is greater than 60% of SL), highly squeezed from the sides, covered by small scales, of silvery blue color. Mouth small, terminal. Mouth slit does not

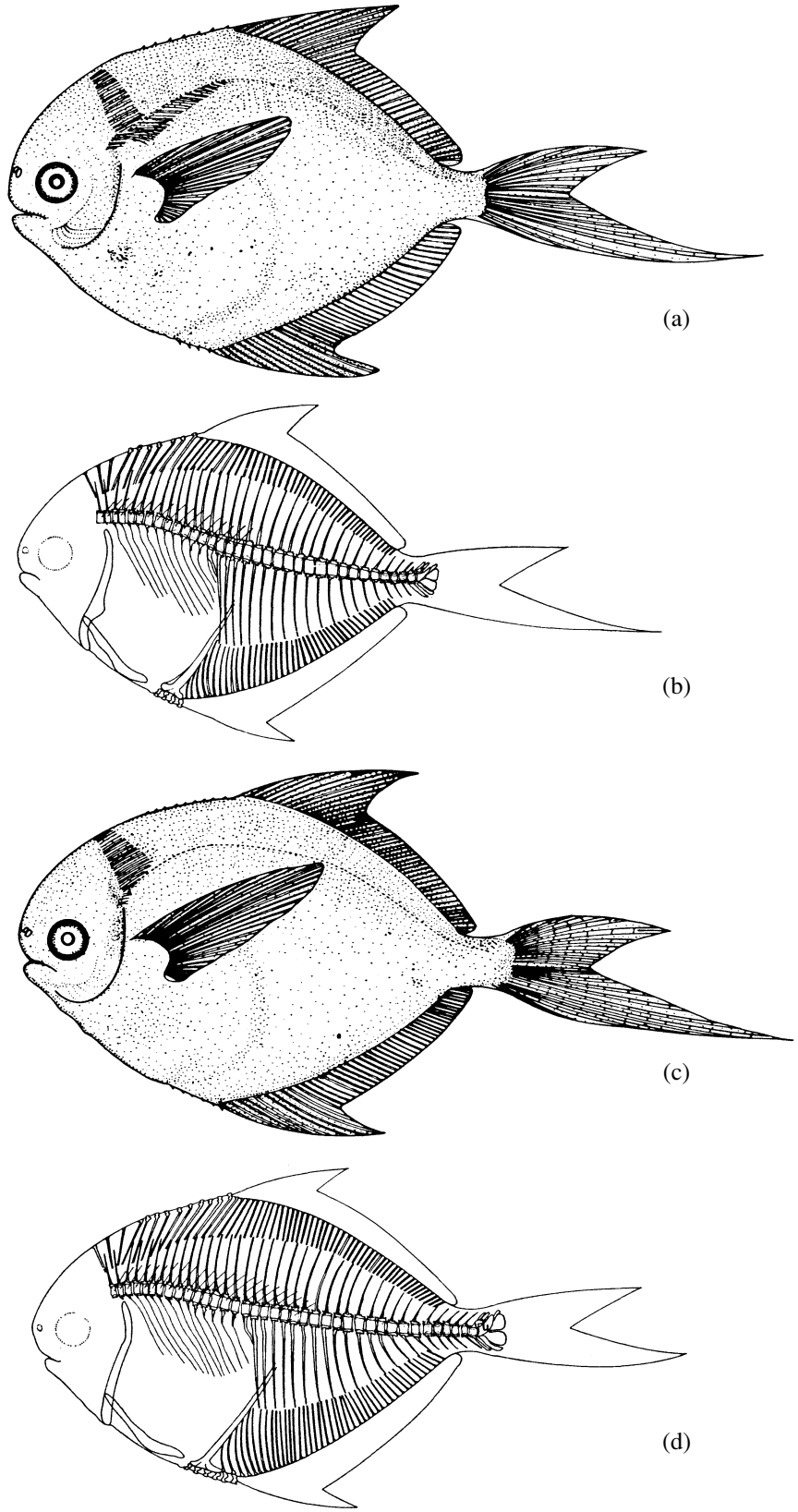

Fig. 1. *Pampus punctatissimus* (a, b) and *Pampus echinogaster* (c, d): a, c—form of wavy crests zone; b, d—skeleton.

Fig. 2. *Pampus punctatissimus*, SL 234 mm.

stretch over the vertical of the anterior edge of the eye. Praemaxillare is nonprotractile, maxillare immovable, covered by scales, and connected with cheek. Nostrils large, the anterior one is round, the posterior one in form of long slit. Both nostrils are located on the top of the snout at the level of upper edge of the eye. Operculum and praeoperculum smooth at the edge. Operculum with two short flat spines. In the anterior part of the body, just after operculum top there is the zone of wavy crests whose form has a diagnostic significance (Figs. 1a, 1b). Teeth on the jaws in one row, small; squeezed from the sides; absent on the vomer and platinum. There are no teeth on entopterygoideum and metapterygoideum. In the pharyngeal sacs, there are papillae in both halves; the teeth sit along the central column. Branchiostegal membranes fused with isthmus. Rays of branchiostegal membrane five–six. No false gills. One dorsal fin, equal to the anal fin in size. Both fins crescent shaped (in the Russian species). If in front of D and A (in the individuals with SL less than 150 mm) there are five–ten flat two-topped spines (free tips of interneural processes slightly projecting outside), the beginning of the insertion of D is located slightly behind the vertical through the posterior end of the insertion of P. If the spines are absent, D begins above the insertion of P. The ends of D and A at the same vertical. No ventral fins. Caudal fin with deep excision; its lower lobe in the adult individuals longer as compared with the upper lobe. Pectoral fins long and pointed. Lateral line in the form of tubular scales is situated high repeating the profile of the back and goes onto the caudal peduncle. Caudal peduncle very short, compressed from the sides. Anal papilla in front of the middle of the body, slitlike. Vert. 33–41 (with urostyle).

In the northwestern Pacific, the genus is represented by five species (*P. echinogaster*, *P. punctatissimus*, *P. cinereus*, *P. chinensis*, and *P. minor*); two first species of them occur in our waters.

Pampus punctatissimus (Temminck et Schlegel, 1884)

(Figs. 1a, 1b, 2)

Materials. 3 specimens. ZIN 39676 (earlier TINRO 1383)—1 specimen 303 mm SL, Sea of Japan, Tavaiza Bight,[1] 45°10′ N, 136°50′ E, August 03, 1925, collector

[1] On the label found under the operculum, it is written by Lindberg's hand as follows: "*Stromateus punctatissimus*;" on the other, later label it is written (not by Lindberg's hand) as follows: "*Pampus argenteus* Euphrasen, Tavaiza Island" (Sheiko, personal communication).

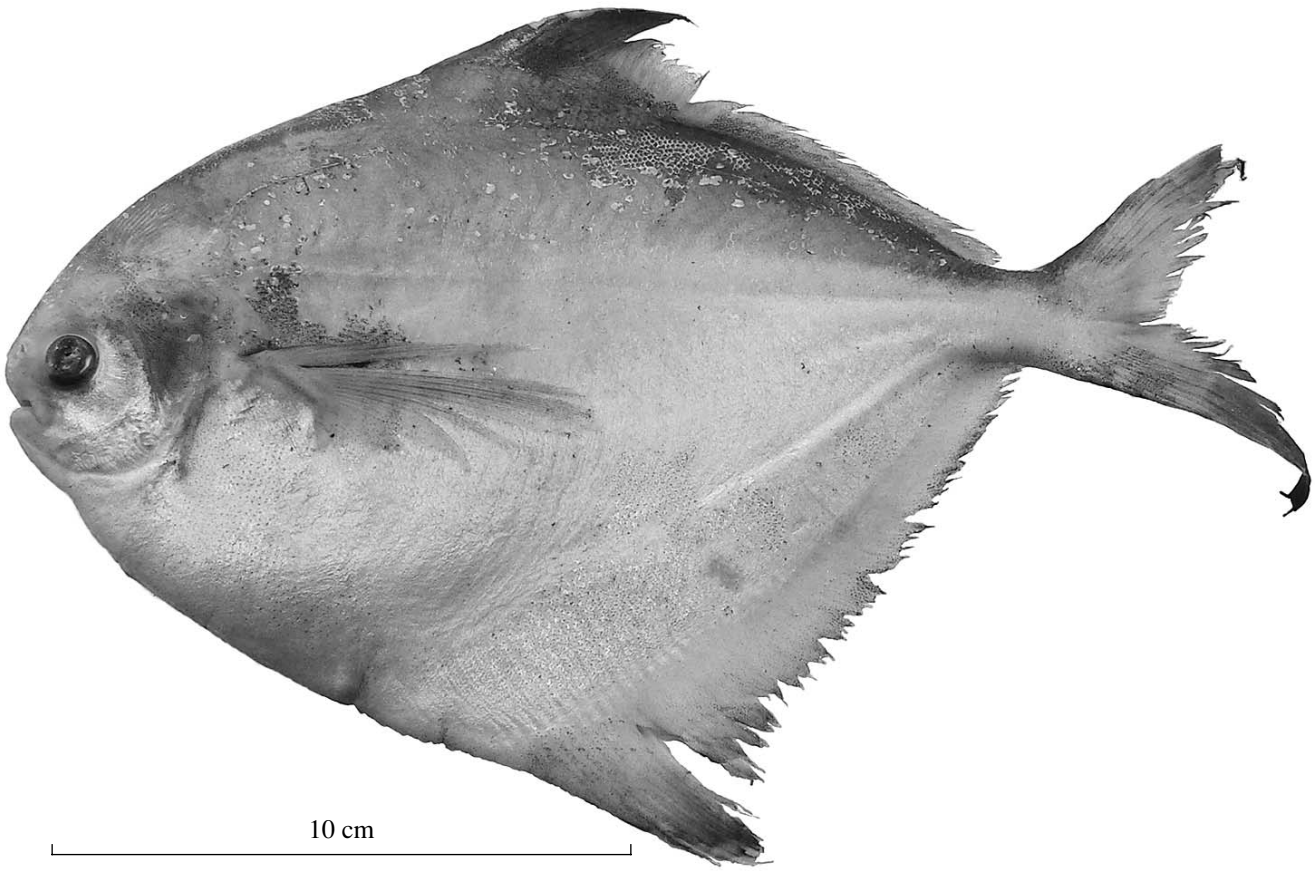

Fig. 3. *Pampus echinogaster*, SL 200 mm.

Dobrzhanskii. ZIN 54084—1 specimen 215 mm SL, Sea of Japan, Nel'ma Bight, trap seine, July 17, 1930, collector Kamernitskaya. MIMB 16571—1 specimen 234 mm SL, Sea of Japan, Peter the Great Bay, Reid Pallada Bight, bottom net, July 25, 2006, depth 4 m, collector D.V. Panfilov.

Diagnosis. D VII–VIII 40–46, A V–VII 38–44, P 24–27, vert. 34–37 (with urostyle, Fig. 1b). On the 1st branchial arch, the gill rakers 2–3 + 8–10 = 10–13. Wavy crests zone advanced to the right, along the lobe of pectoral fin (Figure 1a).

Measurements. As % of SL: H 54.3–62.3, c 20.7–23.5, hc 37.2–41.4, ao 5.3–6.5, po 11.4–12.9, io 8.0–9.5, o 3.6–4.7, lmx 8.2–6.5, lmd 6.0–6.9, lcd 7.6–9.5, hcd 8.4–9.9, lD 50.2–54.7, lA 42.2–54.7, lP 9.7–9.9, hD 24.6–38.0. hA 28.4–35.0, hP 32.0–34.6, aD 48.5–54.2, aA 43.2–43.7, aP 21.8–23.9, lC' 29.9, and lC" 37.2. As % of c: hc 126.3–158.2, ao 30.1–34.5, po 54.5–60.4, io 39.3–45.0, o 18.1–21.8, lmx 31.8–39, and lmd 29.5–33.4.

Distribution. Sea of Japan—Peter the Great Bay, coast of the Hokkaido Island to the south up to Sado Island (Soldatov and Lindberg, 1930; Taranets, 1937; Lindberg, 1947; Rumyantsev, 1947; Lindberg and Krasyukova, 1975; Sokolovskaya et al., 1998; Borets, 2000; Markevich, 2001; Novikov et al., 2002; Parin, 2003); Pacific coast of Japan (the Hokkaido and Honsu islands), the Yellow and East China seas.

Pampus echinogaster (Basilewsky, 1855)

Materials. 10 specimens. ZIN 39679—2 specimens 264 and 222 mm SL: Sea of Japan, Nel'ma Bight, trap seine, July 17, 1930, collector Kamernitskaya. MIMB 16572—1 specimen, 200 mm SL; ZIN 54081—1 specimen 207 mm SL; TINRO P-107—1 specimen 207 mm; SL—Sea of Japan, Peter the Great Bay, Reid Pallada Bight, bottom net, July 25, 2006, depth 4 m, collector V.N. Panfilov. MIMD 16573—1 specimen 233 mm SL, Sea of Japan, Peter the Great Bay, Novgorodskaya Bight, bottom net, September 16, 2006, depth 3 m, collector D.V. Panfilov. ZMUFE IV 7507-E/924—1 specimen 204 mm SL, Sea of Japan, Peter the Great Bay, Kievka Bight, bottom net, August 19, 1997, collector A.E. Samuilov. MIMB 16574—1 specimen 254 mm SL, Sea of Japan, Vostok Bay, estuary of Volchanka River, bottom net, September 07, 2006, depth 1.5–4.0 m, collector V.A. Kuchumov. MBUFE (not catalogued)—2 specimens. 171 and 202 mm SL, Sea of Japan, Peter the Great Bay, Kievka Bight, bottom net, collector V.N. Ivankov.

Diagnosis. D IX–XI 45–50, A VI–VII 42–48, vert. 38–41 (with urostyle, Fig. 1d). On the 1st branchial arch the gill rakers 3–5 + 12–15 = 15–20. Wavy crests zone is not advanced to the right along the lobe of the pectoral fin (Fig. 1c).

Measurements. As % of SL: H 62.3–66.6, c 20.2–21.7, hc 31.0–34.7, ao 5.7–6.5, o 4.5–5.0, po 11.0–12.5, io 7.8–8.5, lmx 7.7–8.6, lmd 4.8–5.5, lcd 6.5–7.5, hcd 9.1–9.6, lD 50.7–60.0, lA 55.0–57.0, lP 10.1–12.5, hD 22.5–24.1, hA 22.5–27.0, hP 28.0–30.0, aD 48.3–51.6, aA 50.7–53.0, aP 21.5–24.6, aC' 21.0–24.1, and aC" 27.0–28.5. As % of c: hc 142.8–160.0, ao 42.2–43.3, po 55.5–57.1, io 55.5–57.1, o 21.4–22.2, lmx 38.0–46.6, and lmd 22.2–36.6.

Distribution. Sea of Japan—the Peter the Great Bay to the north up to the Nel'ma Bight and northwestern coast of Sakhalin (Rybnovodsk settl.), to the south up to Busan; the Yellow, East China, and South China seas. Pacific coast of Japan (Soldatov and Lindberg, 1930; Taranets, 1937; Lindberg, 1947; Rumyantsev, 1947; Lindberg and Krasyukova, 1975; Ivankov and Samuilov, 1979, 1987; Roslyi, 1984; Ivankov, 1995; Ivankov et al., 1996, 2001). The Chinese ichthyologists (Liu and Liu, 1998a, 1998b, 2002) brought *P. echinogaster* into synonymy of *P. argenteus*. However, from our point of view, it is hardly possible to agree with this. The greater number of vertebrae (38–41 vs. 34–37 in the group of the species *P. argenteus* sensu lato: *P. argenteus* sensu stricto, *P. punctatissimus* and *P. cinereus*), greater number of gill rakers on the first branchial arch (15–20 vs. 10–13), and different form of the wavy crests zone speak in favor of the specific self-dependence of *P. echinogaster*. Some Russian and foreign ichthyologists adhere to the same opinion (Lindberg and Krasyukova, 1975; Randall and Lim, 2000; Nakabo, 2002; Parin, 2003).

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