

Kellia porculus Pilsbry, 1904 (Bivalvia: Lasaeidae), a new record in the Russian molluscan fauna, with taxonomic notes on allied species

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ABSTRACT. *Kellia porculus* Pilsbry, 1904, is recorded for the first time in the Russian waters of the Sea of Japan along the coast of Primorye (Valentin, Olga, Rynda bays and Tatarsky Strait). An updated description, photographs, synonymy, data on biology and distribution are provided. Taxonomic comments on seven other north-western Pacific species of *Kellia* Turton, 1822 are given, along with illustrations of type material, for *K. japonica* Pilsbry, 1895, *K. laperosii* (Deshayes, 1839), *K. subrotunda* (Dunker, 1882), *K. comandorica* Scarlato, 1981, and *K. grebnitzskii* (Dall, 1916). *K. subrotunda* is confirmed as a distinct species and it is recorded in China (Yellow Sea) for the first time previously being known only from Japan. *K. grebnitzskii* is regarded as a valid species and reinstated as such for Russian waters.

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Kellia porculus Pilsbry, 1904 (Bivalvia: Lasaeidae), новый вид для фауны моллюсков России, с таксономическими замечаниями о близких видах

рассматривается как валидный вид, впервые приводимый в этом статусе для российских вод.

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РЕЗЮМЕ. *Kellia porculus* Pilsbry, 1904 впервые обнаружен в российских водах Японского моря у побережья среднего и северного Приморья (бухта Валентина, заливы Ольги и Рында и в пределах Татарского пролива). Составлено дополненное описание вида; приведены фотографии, синонимия, данные по экологии и распространению. Даны таксономические комментарии по семи другим северо-западно-тихоокеанским видам *Kellia* Turton, 1822, а для *K. japonica* Pilsbry, 1895, *K. laperosii* (Deshayes, 1839), *K. subrotunda* (Dunker, 1882), *K. comandorica* Scarlato, 1981 и *K. grebnitzskii* (Dall, 1916) воспроизведены иллюстрации типового материала. *K. subrotunda* подтвержден в качестве самостоятельного вида и также впервые отмечен в Желтом море (у берегов Китая), будучи до этого известным только у Японских островов. *K. grebnitzskii*

Introduction

The genus *Kellia* Turton, 1822 belongs to a taxonomically complicated group of bivalve mollusks now assigned to the family Lasaeidae Gray, 1842, within the superfamily Galeommatoidea Gray, 1840 (with another family, Galeommataceae J. Gray, 1840) [Carter *et al.*, 2011]. Kelliidae Forbes et Hanley, 1849 and Montacutidae W. Clark, 1855, often used in regional literature, are both synonyms of Lasaeidae. Although it was believed that no sufficient data to divide this family into supported clades were available in a recent classification of bivalves [Bieler *et al.*, 2010], later Goto *et al.* [2012] showed that molecular phylogeny recovered six well-supported major clades within Galeommatoidea; however, current “families/subfamilies” are almost all polyphyletic.

In Japanese waters, former “Kelliidae” contains 21 species, and among them – six species of *Kellia*: *K. japonica* Pilsbry, 1895; *K. subrotunda* (Dunker, 1882); *K. porculus* Pilsbry, 1904; *K. laperosii* (Deshayes, 1839); *K. tsujitai* Habe, 1959; and *K. subelliptica* Yokoyama, 1927 [Higo *et al.*, 1999]; the latter species belongs to *Montacutona* Yamamoto et Habe, 1959 [Oyama, 1973; Kawase *et al.*, 2015] or *Nipponomysella* Yamamoto et Habe, 1959 [Fukuda, 2020], both in Lasaeidae.

Scarlato [1981] recognized four species of *Kellia* in the Russian waters of the north-western Pacific: *K. comandorica* Scarlato, 1981, *K. japonica*, *K. laperousii*, and *K. suborbicularis* (Montagu, 1803), although he didn't personally examine the two latter species and they were characterized and illustrated by drawings based on literature data. Scarlato [l.c.] did not mention three Japanese species enumerated above in comparisons or in synonymies while he stated that wide distributional range of *K. suborbicularis* may be indicative of mixture of several close species [l.c., p. 322].

Coan *et al.* [2000] went further and synonymized north-western Pacific *K. japonica*, *K. comandorica*, *K. laperousii* with *K. suborbicularis* which is regarded as a wide circumboreal species ranging from Prince William Sound, Alaska to Peru, and from Iceland to the Mediterranean, from Greenland to New York, and from Kurile Islands to Honshu, Japan. Additionally, Coan *et al.* [2000] listed 11 synonyms (two being *nom. nud.*) of *K. suborbicularis*.

This was not followed by Okutani [2000] who enumerated *K. japonica*, *K. porculus* and *K. subrotunda* for Japan, and by Lutaenko and Noseworthy [2012] listed *K. japonica* for the Russian and Korean coasts of the Sea of Japan. Kamenev [2004] described a new species in this difficult complex (*Kellia kussakini* Kamenev, 2004 from Commander Islands) and discussed relationships with some other species but he made no clear statements on status of Japanese species as well as he did not examine their types.

Later, Coan and Valentich-Scott [2012] believed that *K. suborbicularis* has 15 synonyms (species and subspecies, among them two – *nom. nud.*) in the Atlantic and Pacific oceans, and among north-western Pacific synonymous species, they mentioned *Chironia laperousii* Deshayes, 1839 and *K. japonica* but not *K. porculus*, *K. subrotunda*, *K. tsujitai*, *K. comandorica*. Thus, there is still no consensus in the understanding of taxonomy of this genus in the northern Pacific.

In most recent treatment of *Kellia*, Huber [2015] recognized 28 extant species worldwide including three undescribed whereas only seven species are known from the north-western Pacific: *K. japonica*, *K. porculus*, *K. comandorica*, *K. laperousii*, *K. subrotunda*, *K. kussakini* and *K. tsujitai*, and only four of them are known from Russia. They mostly have subtle morphological differences, and little molecular evidence is known to separate the species (e.g., there are molecular data for *K. porculus* and *K. japonica* [Valentich-Scott *et al.*, 2024]), but many species are quite rare, and it is not easy to collect live specimens of all North Pacific species for a genetic study. However, we have been able to identify an additional species for the Russian Far Eastern waters, *K. porculus*, recorded for the first time in the north-western Sea of Japan, Primorye coast. Herefore we provide a de-

scription, synonymy, taxonomic and biogeographic comments on *K. porculus* and related species.

Materials and methods

We examined collections of *Kellia* of the ZIN (St. Petersburg), ZMFU (Vladivostok), and the MIMB (Vladivostok). Additional material was received from the NMNS (Tsukuba/Tokyo) and IOCAS (Qingdao) for comparison; photographs of type material were provided by the ZMB (Berlin) and the USNM (Washington, D.C.). Other images of types are available from websites of relevant museums cited in the text. When studied shells and shells with dried soft parts available in above collections, morphological descriptions were made and photographs were prepared with cameras Canon EOS 80D (W), Olympus EZ-1745 (E), and also using a binocular (stereo microscope) Stemi 508 with an Axiocam 105 camera (Zeiss). Measurements include shell length (L), shell height (H) and shell width (W). In total, morphology of seven species of *Kellia* from the north-western Pacific was examined and 38 lots (112 specimens) were studied.

Abbreviations of scientific organizations: **ANSP** – Academy of Natural Sciences of Drexel University, Philadelphia, USA; **IOCAS** – Marine Biological Museum, Institute of Oceanology of the Chinese Academy of Sciences, Qingdao, China; **MFEH** – V.K. Arseniev Museum of Far East History, Vladivostok, Russia; **MIMB** – Museum of the A.V. Zhirmunsky National Scientific Center of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia; **MNHN** – Muséum national d'Histoire naturelle, Paris, France; **NHMUK** – Natural History Museum, London, United Kingdom; **NMNH** – National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; **NMNS** – National Museum of Nature and Science, Tsukuba/Tokyo, Japan; **SBMNH** – Santa Barbara Museum of Natural History, Santa Barbara, USA; **SMBL** – Seto Marine Biological Laboratory, Kyoto University, Japan; **TINRO** – Pacific Branch of Russian Federal Research Institute of Fisheries and Oceanography, Vladivostok, Russia; **ZIN** – Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; **ZMB** – Museum für Naturkunde Berlin, Leibniz-Institut für Evolutions- und Biodiversitätsforschung an der Humboldt-Universität zu Berlin, Germany; **ZMFU** – Zoological Museum, Educational and Science Museum, Far Eastern Federal University, Vladivostok, Russia.

Taxonomy

Supefamily Galeommatoidea Gray, 1840

Family Lasaeidae Gray, 1842

Genus *Kellia* Turton, 1822

Type species. *Mya suborbicularis* Montagu, 1803 (SD), Recent, North Atlantic.

Synonyms. *Chironia* Deshayes, 1839; *Oronthea* Leach in Gray, 1852; *Diplodontina* Stempell, 1899.

Diagnosis. “Shell subovate, inflated, subequi-

lateral, equivale; sculpture of commarginal striae and growth checks; periostracum thin, translucent, green to yellow, dehiscent to adherent; umbones prosogyrate, incurved; hinge plate narrow; two small cardinal teeth in left valve, one in right valve; one elongate, posterior lateral tooth in both valves; ligament internal, robust, in elongate resilifer; byssate" [Coan, Valentich-Scott, 2012, p. 509].

Kellia porculus Pilsbry, 1904
(Figs. 1A–D; 2A–H; 3A–F; 4A–D)

Kellia porculus Pilsbry, 1904: 558, pl. 41, figs 18–20; Habe, 1951: 136, text-figs. 299–301 (on p. 135); Kuroda, Habe, 1952: 22; Kuroda, 1957: 29; Ito, 1967: 68; Kuroda *et al.*, 1971: 623 (Japanese), pl. 119, figs 3, 4; Habe, 1973: 17; Habe, 1977: 139, pl. 26, figs 10–12; Honma, Kitami, 1978: 31; Ito, 1978: 211; Habe, 1981: 97; Ishiyama, Kosuge, 1982: 406; Inaba, 1983: 46; Habe *et al.*, 1986: 31; Ogasawara *et al.*, 1986: pl. 66, fig. 1; Qi *et al.*, 1989: 184, fig. 134; Ito, 1990: 120, pl. 29, fig. 6; Morton, Scott, 1989: 133 (part.); Kafanov, 1991: 86; Bernard *et al.*, 1993: 61; Tsuchida, Hayashi, 1994: 94; Sasaki, 1996: 51; Xu, 1997: 112; Rho *et al.*, 1998: 273; Higo *et al.*, 1999: 462; Higo *et al.*, 2001: 163, fig. B689; Kitamura *et al.*, 2002: 550, 552, 554, 556, 558; Lee, Min, 2002: 160; Qi, 2004: 260, pl. 143, fig. J (as "*proculus*"); Seo *et al.*, 2005: 369; Xu, Zhang, 2008: 129, fig. 380; Onda *et al.*, 2008: 42; Toba, 2009, p. 81, fig. 16 (p. 82); Jiang, Huang, 2012: 51, unnumbered photo; Peng *et al.*, 2013: 2473; Seo, Tananongan, 2014: 113; Baba, 2014: 208; Hwang *et al.*, 2014: e209; Huber, 2015: 136 (photos), 496 (text); Lee, 2016: 196; Lee *et al.*, 2016: 35; Zhang *et al.*, 2016: 285, fig. 352; Choi *et al.*, 2017: 223; Li *et al.*, 2019: 161, text-fig.; NIBR, 2019: 277; Wu, He, 2019: 9; Hayase, Kimura, 2020: pl. 12, fig. 6; Lutaenko *et al.*, 2021: 212, pl. 6, fig. G; Kawase *et al.*, 2024: 88, pl. 4, fig. 18; ?Nakamura *et al.*, 2024: 17, pl. 9, fig. 8.

Kellia japonica Pilsbry, 1895: ?Scarlato, 1981, photo 290 (part.); Lutaenko, 1999: 266 (part.).

Kellia porcula Pilsbry, 1904: Kishi *et al.*, 2017: 44; Enya, Suzuki, 2020: 23.

Type locality. "Hirado, Hizen" [Pilsbry, 1904, p. 558]; Hirado is a region in Kyushu, Japan; Hizen Province (肥前国) was an old province of Japan in the area of the present-day Saga and Nagasaki prefectures.

Type material. 2 valves (shell), holotype, collected by Y. Hirase, ANSP 86266, figured by Higo *et al.* [2001, p. 163, fig. B689; as holotype] and herein (Fig. 4), shell length 8.5 mm. Pilsbry [1904, p. 558] stated as "Type No. 86,266, A. N. S. P." and it is designated at the website of the ANSP as "syntypes" but it should be the holotype (two paired valves).

Material studied. ZIN (without no.), 13 specimens, Sea of Japan, Tatarsky Strait, July 5, 1933, R/V *Blukher*, sta. 17, depth 34 m; ZIN (without no.), 5 specimens, Sea of Japan, Primorye, entrance to Olga Bay, depth 28 m, August 9, 1932; MIMB, 1 specimen, Sea of Japan, Primorye, Valentin Bay, Cape Titova, depth 15 m, rocky bottom, 18th cruise

of the R/V *Akademik Oparin*, sta. B-41, September 30, 1995; MIMB 2985, 2 specimens, Sea of Japan, Primorye, Rynda Bay, Dzhigit Bay, Cape Egorova, depth 8 m, rocky bottom, expedition of the Inst. Mar. Biol., sta. 136, August 10, 1980; ZMFU no. 54852/Bv-9116, 3 specimens, Sea of Japan, Olga Bay, entrance to Tikhaya Pristan Harbour, pier, depth 4–6 m, August 7, 2013. In total, 24 specimens, 5 lots.

Description (updated from Pilsbry [1904]). The shell is small (up to 9–10 mm in length), generally cream-white, color of the shell surface may vary from dirty white, yellowish-white to light brown. The shell is stout as compared to other species. The shell shape is rounded to round-subquadrate, but never elongated, with ventral margin slightly straightened. Surface is shiny, with glossy periostracum, the commarginal growth lines can be quite rough and well defined, in some individuals the shell is smoother. The right valve has a single rather broad, oblique cardinal tooth, and a small triangular lateral tooth, the left valve has two erect, subequal cardinals and a strong, triangular lateral tooth. Beaks are prosogyrate, placed in the midline or slightly anteriorly. Ligament is internal and robust, dark brown, in elongated resilifer.

Dimensions. Shell length up to 9.4 mm [Kuroda *et al.*, 1971]; in our collection, dimensions of the largest specimen (complete shell) are as follows: length 10.7 mm, height 9.6 mm, width 6.6 mm (Tatarsky Strait).

Comparison. The shell of *K. porculus* is thicker than in *K. japonica* and *K. laperousii*, generally more rounded, with much stronger teeth. *K. porculus* differs from *K. subrotunda* by coloration (generally white in the latter species), more subquadrate shell and stronger teeth. See additionally comments in the next chapter.

Taxonomic comments. Scarlato [1981] and subsequent Russian workers [e.g., Lutaenko, 1999; Kamenev, 2004] did not recognize this species in the Sea of Japan fauna although they had it in their possession. This species is rather distinct and we have not found cases when it is synonymized with other *Kellia* although *K. porculus* is close to *K. japonica* which was regarded previously by American workers as a synonym of *K. laperousii* (see above) but later recognized as distinct [Valentich-Scott *et al.* [2024].

An illustration of *K. porculus* from Niigata [Nakamura *et al.*, 2024, pl. 9, fig. 8] is similar to both *K. japonica* and *K. subrotunda*. Shell of "*K. porculus*" from Korea [Min *et al.*, 2004, p. 422, fig. 1380] has a circular shape with a perfectly rounded ventral margin and may belong to a young specimen of *K. japonica* or to an unknown species similar to our round specimens from Primorye (Figs. 5E–H; 6A–D); both species are listed for Korea [Lee, 2016]. A similar circular specimen from Korea [Kwon *et*

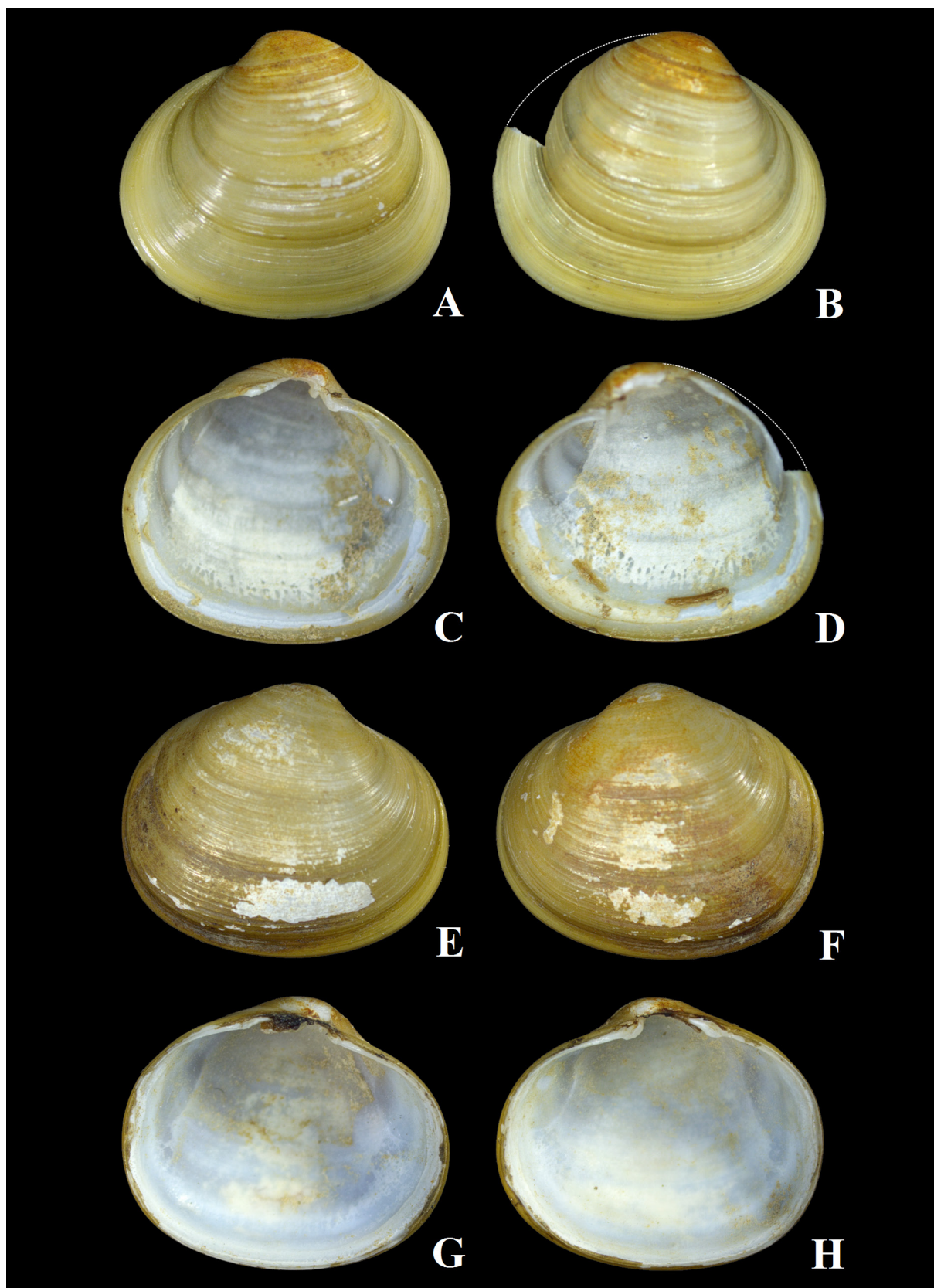


FIG. 1. *Kellia* spp. A–D, *K. porculus* Pilsbry, 1904, Sea of Japan, Primorye, Olga Bay, shell length 7.3 mm, ZMFU 54852/Bv-9116; E–H, *K. japonica* Pilsbry, 1895, Sea of Japan, Primorye, Olga Bay, shell length 11.1 mm, ZMFU 54851/Bv-9115. Outer and inner views of the left (A, C, F, H) and right (B, D, E, G) valves.

РИС. 1. *Kellia* spp. A–D, *K. porculus* Pilsbry, 1904, Японское море, Приморье, залив Ольги, длина раковины 7.3 мм, ZMFU 54852/Bv-9116; E–H, *K. japonica* Pilsbry, 1895, Японское море, Приморье, залив Ольги, длина раковины 11.1 мм, ZMFU 54851/Bv-9115. Снаружи и изнутри левая (A, C, F, H) и правая (B, D, E, G) створки.

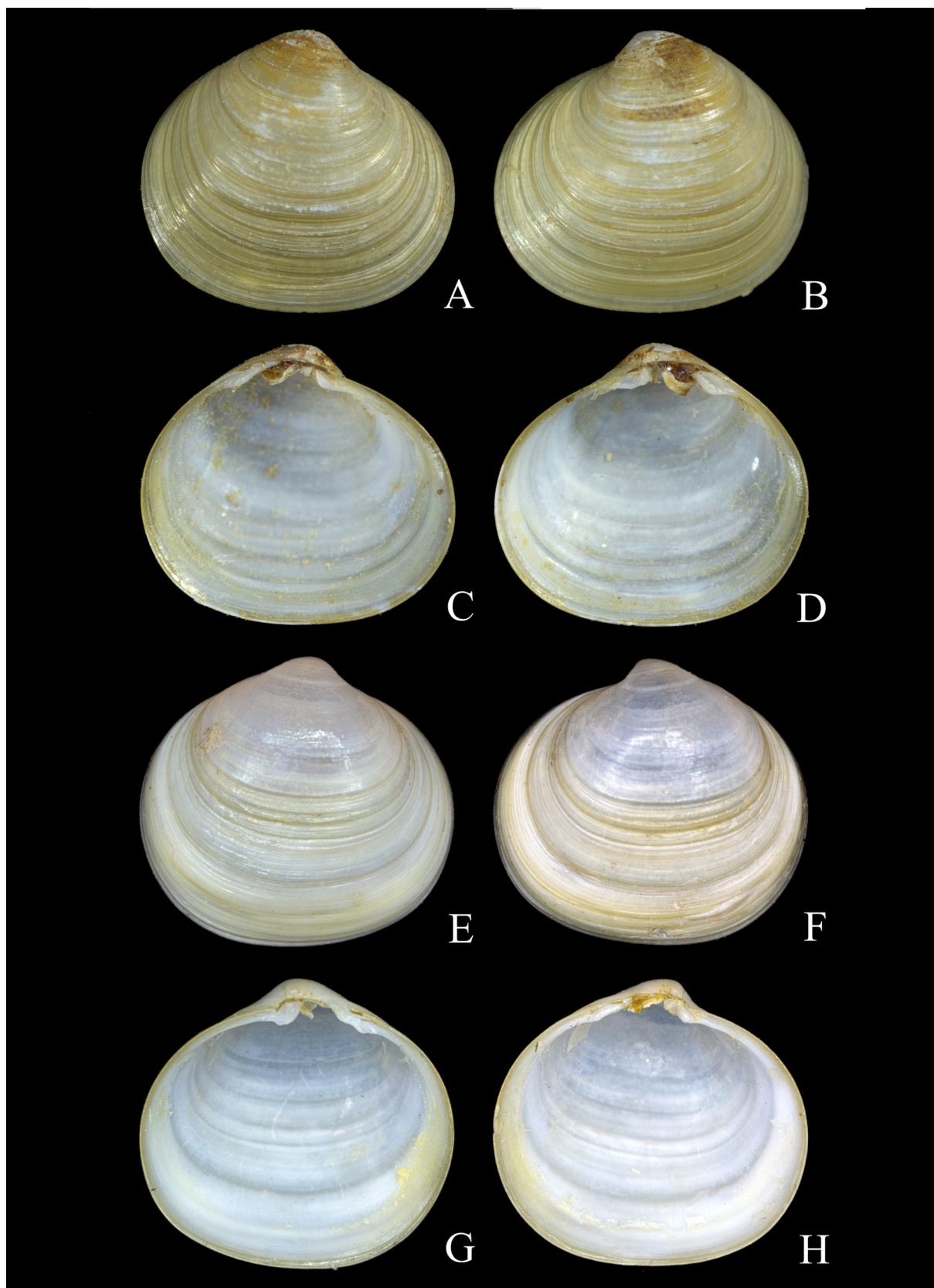


FIG. 2. *Kellia porculus* Pilsbry, 1904. A–D, Sea of Japan, Primorye, Olga Bay, shell length 6.3 mm, ZMFU 54852/Bv-9116; E–H, Sea of Japan, Primorye, Valentin Bay, Cape Titova, shell length 7.0 mm, MIMB 52132. Outer and inner views of the left (B, C, F, H) and right (A, D, E, G) valves.

РИС. 2. *Kellia porculus* Pilsbry, 1904. А–Д, Японское море, Приморье, залив Ольги, длина раковины 6.3 мм, ZMFU 54852/Bv-9116; Е–Н, Японское море, Приморье, бухта Валентина, мыс Титова, длина раковины 7.0 мм, MIMB 52132. Снаружи и изнутри левая (В, С, F, H) и правая (А, D, E, G) створки.

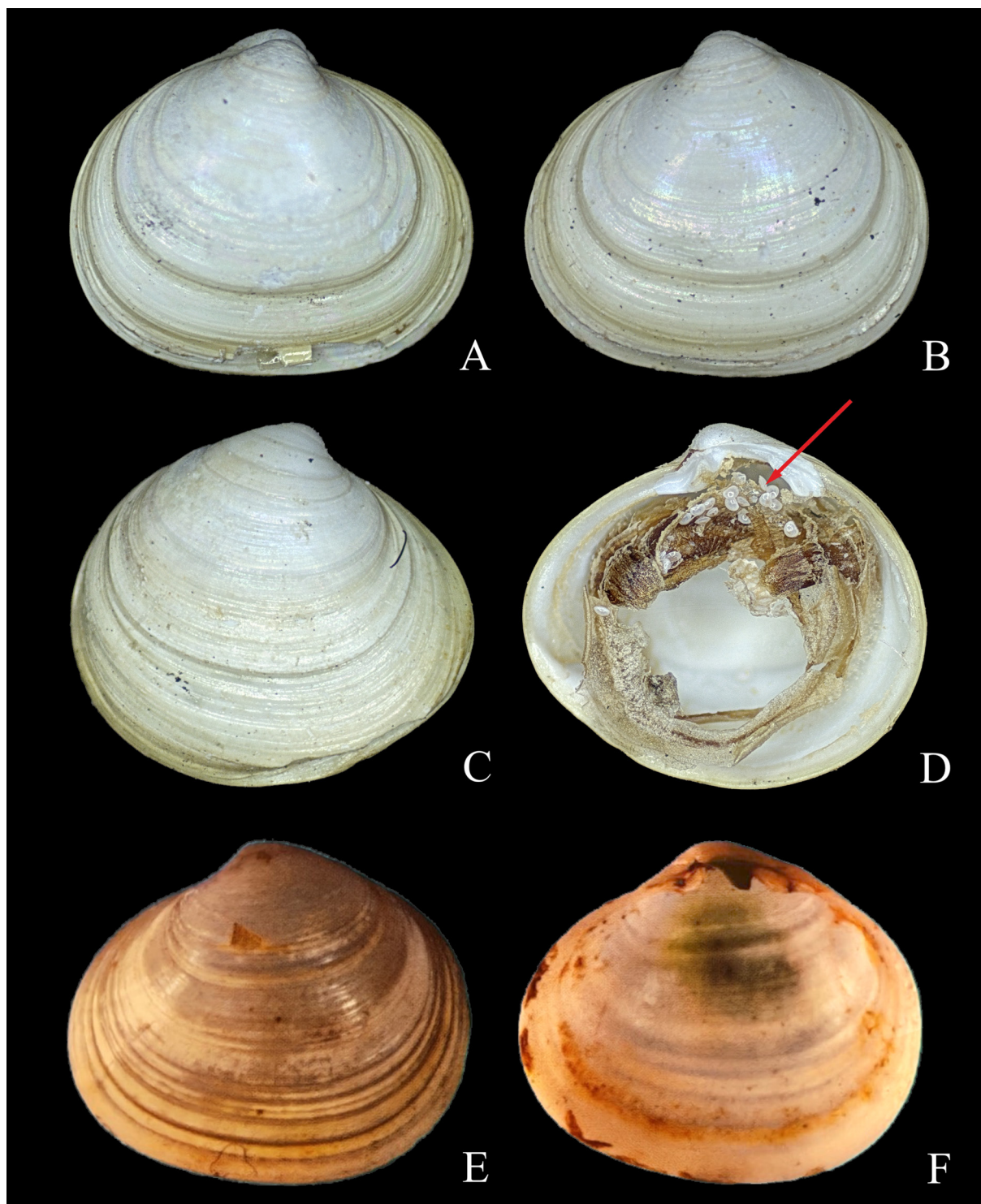


FIG. 3. *Kellia porculus* Pilsbry, 1904. **A, B**, Sea of Japan, Primorye, Rynda Bay, Dzhigit Inlet, Cape Egorova, shell length 4.0 mm, MIMB 2985; **C, D**, Sea of Japan, Primorye, Rynda Bay, Dzhigit Inlet, Cape Egorova, shell length 2.9 mm, MIMB 2985; **E, F**, China (after Xu, Zhang, 2008, p. 129, fig. 380). Outer and inner views of the left (**B, E**) and right (**A, C, D, F**) valves; in **D**, numerous larvae are seen as indicated by an arrow (brooding).

РИС. 3. *Kellia porculus* Pilsbry, 1904. **A, B**, Японское море, Приморье, залив Рында, бухта Джигит, мыс Егорова, длина раковины 4.0 мм, МИМВ 2985; **C, D**, Японское море, Приморье, залив Рында, бухта Джигит, мыс Егорова, длина раковины 2.9 мм, МИМВ 2985; **E, F**, Китай (по Xu, Zhang, 2008, p. 129, fig. 380). Снаружи и изнутри левая (**B, E**) и правая (**A, C, D, F**) створки; на изображении **D** стрелкой обозначены многочисленные личинки (стадия вынашивания потомства).

al., 2001, p. 242, fig. 976] has strong dentition, a trait of *K. porculus*.

Perfectly circular specimen of “*K. porculus*”

from Dalian (Yellow Sea, China) [Jiang, 2019, p. 217, text-fig.] has a weak dentition and it bears some resemblance to *K. subrotunda*. However, *K. porculus*

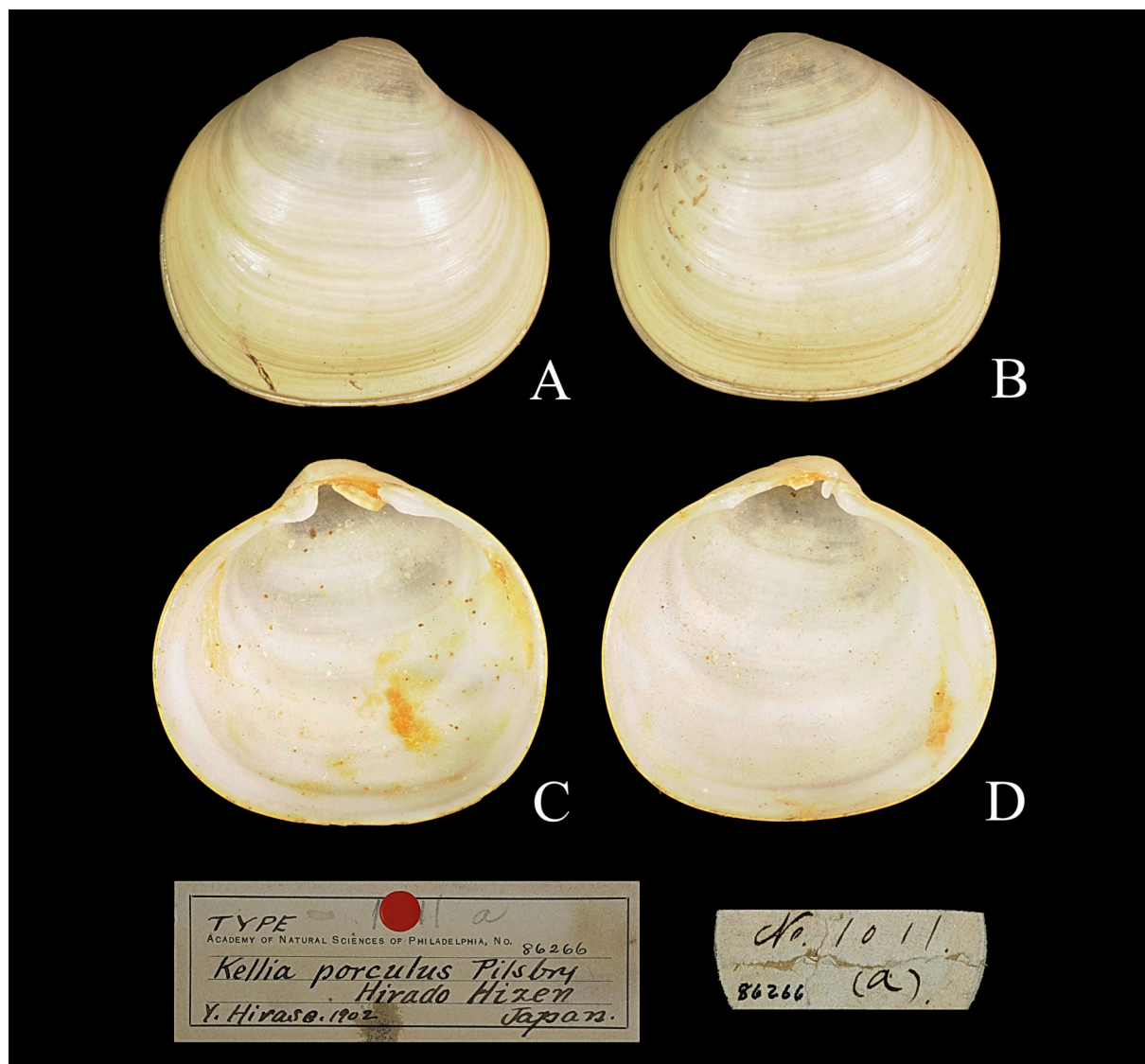


FIG. 4. *Kellia porculus* Pilsbry, 1904, Japan, Kyushu Island, Hirado, Hizen, ANSP 86266, shell length 8.5 mm (<https://clade.anasp.org/>). Outer and inner views of the right (A, C) and left (B, D) valves.

РИС. 4. *Kellia porculus* Pilsbry, 1904, Япония, остров Кюсю, Хирадо, Хизен, ANSP 86266, длина раковины 8.5 мм (<https://clade.anasp.org/>). Снаружи и изнутри левая (A, C) и правая (B, D) створки.

is undoubtedly present in the northern Chinese waters as exemplified by illustrations in Chinese works (Fig. 3E, F). “*K. porculus*” was listed and illustrated for Thailand [Robba *et al.*, 2002, pl. 8, fig. 3], Hong Kong [Morton, Scott, 1989, fig. 3; Scott, 1994, pl. 7, fig. D; Valentich-Scott, 2003, pl. 8, fig. D; Lutaenko, Volvenko, 2013, pl. 7, figs O, P] and Dongtou (Zhejiang Province of China) [Zhang *et al.*, 2012, p. 176, text-fig.], however, these specimens represent a distinct, undescribed species: subquadrate, more solid, with relatively thick hinge line, and a coral habitat [Huber, 2015]. The Dongtou specimens has some similarity to *K. subrotunda* as well.

K. porculus shows superficial resemblance to the endemic South African *Kellia becki* (Turton, 1932) (illustration in: Valentich-Scott *et al.* [2024, fig. 4]) and the Atlantic *K. suborbicularis* (syntypes

are figured by Oliver *et al.* [2017, fig. 78]; see good images for comparison: Hoffman, Zettler [2024, fig. 3]). Interestingly, a phylogenetic analysis shows that *K. porculus* and *K. suborbicularis* form same clade whereas *K. japonica* is placed separately [Valentich-Scott *et al.*, 2024].

Distribution. In zonal-geographical terminology, this species is subtropical-low-boreal extending its range from northern China and Yellow Sea to northern Sea of Japan, Japan (both sides), Korea, southern Sea of Okhotsk [Higo *et al.*, 1999; Min *et al.*, 2004; Xu, Zhang, 2008; Huber, 2015; Lee, 2016; our data]. In China, it is known from Jiaozhou Bay (Shandong Peninsula, Yellow Sea) [Qi, 2004]; Laizhou Bay (Bohai Sea) [Ren *et al.*, 2015]; Dongtou County (Zhejiang Province, East China Sea) [Peng *et al.*, 2013]; in Korea – Jindo Island [Lee, 2016]; Jeju

Island [Lutaenko *et al.*, 2021]; Uido Island (south-western Korea, Yellow Sea) [Seo *et al.*, 2005]; off Busan [Hwang H. *et al.*, 2014]; Geojedo Island [Rho *et al.*, 1998]; in Japan – Honshu, Shikoku, Kyushu and Hokkaido; Wakayama Prefecture [Habe, 1981]; Tajima, Hyogo Prefecture [Ito, 1967]; Sado Island and Mano Bay (Sea of Japan) [Kuroda, 1957; Honma, Kitami, 1978; Ito, 1978]; Tsukumo Bay, Noto Peninsula (Sea of Japan) [Habe, 1973]; Wakasa Bay (Sea of Japan) [Ito, 1990]; Genkai-nada (southern Sea of Japan) [Ishiyama, Kosuge, 1982]; Suruga Bay [Habe *et al.*, 1986]; Seto Inland Sea [Inaba, 1983]; Boso Peninsula [Baba, 2014]; Onagawa Bay (north-eastern Japan) [Sasaki, 1996]; Oki-Kaikyo Strait (eastern Sea of Japan/East Sea, Honshu, depth 71 m) [Tsuchida, Hayashi, 1994]; China Prefecture [Huber, 2015]; Sagami Bay [Kuroda *et al.*, 1971]; Kagawa Prefecture [Seo, Tananongan, 2014]; Kojima Bay [Kishi *et al.*, 2017]; Nagoya Port [Kawase *et al.*, 2024]; Iwate Prefecture [Toba, 2009]; northern Hokkaido (Sea of Okhotsk) [Kitamura *et al.*, 2002]; Okushiri Island (southern Hokkaido, Sea of Japan) [Enya, Suzuki, 2020]. In Russian waters, this species was found along the middle to northern Primorye: Tikhaya Pristan Harbour (Olga Bay), Cape Egorova (Rynda Bay), Cape Titova (Valentin Bay) and Tatarsky Strait. Finding in Hawaii [Bernard *et al.*, 1991] is needed in verification.

Paleontology. Fossil records of *K. porculus* are known from the Akita oil-field (Plio-Pleistocene) [Ogasawara *et al.*, 1986], the Pleistocene Furuya Formation in Shizuoka Prefecture [Onda *et al.*, 2008] and the Holocene deposits in Boso Peninsula [Kayanne, 1991].

Ecology/habitat. *K. porculus* is an intertidal to subtidal species, byssally attached to shells and stones, in crevices [Huber, 2015]. In Sagami Bay, it is collected at a depth of 55 m, however, it commonly lives in Japan intertidally down to 20 m deep, attaching by byssus to shells and gravels [Kuroda *et al.*, 1971]. Empty shells were collected in Wakasa Bay at a depth of 59–125 m [Ito, 1990], in Sado Island, at 5–52 m [Ito, 1978] and northern Hokkaido (Sea of Okhotsk), at 78–130 m [Kitamura *et al.*, 2002]. In Russia, in Olga Bay (Tikhaya Pristan Harbor), this species was found as a member of epifauna on shells of the bivalve *Pododesmus macroschisma* (Deshayes, 1839) (Anomiidae), along with *K. japonica* and *Hiattella arctica* (L., 1767) s.l. (Hiattellidae), at a depth of 4–6 m, and in another sample, at 28 m; in Rynda Bay, at 8 m, in Valentin Bay, at 15 m, and in Tatarsky Strait, at 34 m; in total, in Russian waters, at a depth of 4–34 m. *K. porculus*, among other small bivalves, serves as food for the flounder *Glyptocephalus stelleri* (Schmidt, 1904) in coastal waters of Korea (Sea of Japan) [Seong *et al.*, 2019]. We have found a brooding adult specimen of *K. porculus* with larvae inside (perhaps, prodissoconch

I), among dried soft tissues (Fig. 3D), similarly to *K. suborbicularis* [Schiaparelli *et al.*, 2001] and *K. japonica* and *K. comandorica* [Scarlato, 1981].

Taxonomic notes on some *Kellia* species in the north-western Pacific

Taxonomic treatments and identifications in faunal/ecological studies of the Northern Pacific *Kellia* are confusing, type material for some species were not examined by many workers, even when they were describing new and closely related species, and hereafter we provide some comments on taxonomy useful for further studies.

Kellia japonica Pilsbry, 1895 (Figs. 5E–H; 6E, F; 7; 8A–H; 9A–H)

Pilsbry [1895, p. 132] mentioned that *K. japonica* is less elongated (“quadrate-rounded”) than *K. laperousii*, the teeth are rather stronger, and the cardinals are squarer. However, some specimens of *K. japonica* are approaching in shape to *K. laperousii*. Huber [2015] stated that *K. japonica* is an unambiguous species with an elongate shape and illustrated growth series from Yellow Sea (l.c., p. 135) showing both young circular and larger subovate, even with nearly straight ventral margin, forms. The syntypes figured by Higo *et al.* [2001, p. 163, fig. B687] and herein (Fig. 7) are rather round or subquadrate-round, perhaps, representing young mollusks. We generally follow this concept of individual/age variability of shell shape in *K. japonica* based on specimens studied by us. However, some large elongated shells of *K. japonica* (for example, Figs. 8E–H; 9A–H) can be found nearly inseparable from *K. laperousii*. Such elongated-ovate specimens are known from the Japanese Plio-Pleistocene (Akita oil-field) [Yokoyama, 1926, pl. 44, fig. 8; as *Kellia laperousii*]. Illustrations of *K. porculus* from Japan by Okutani [2000, pl. 467, fig. 4], Kamenev [2004, figs 38, 39] and Okutani [2017, pl. 523, fig. 3; as “*K. porcula*”] are erroneous and do not match the original description neither type material, as noted previously by Huber [2015]: the illustrated shells seem to represent “*subrotunda-japonica*” complex. Differentiating characters for these three species provided by Kamenev [2004, table 2] are confusing, especially for shell shape, convexity and position of beaks.

Kellia laperousii (Deshayes, 1839) (Fig. 10)

This is very variable species with many synonyms: *Bornia luticola* Valenciennes, 1846, *Kellia laperousii chironii* Carpenter, 1864, *Kellia rotundata* Carpenter, 1864, *Lepton meroeum* Carpenter, 1864 (good illustrations are in Huber [2015, p. 136]). Whereas some American malacologists found it unseparable from the Atlantic *K. suborbicularis* [Coan *et al.*, 2000; Coan, Valentich-Scott, 2012], Dall

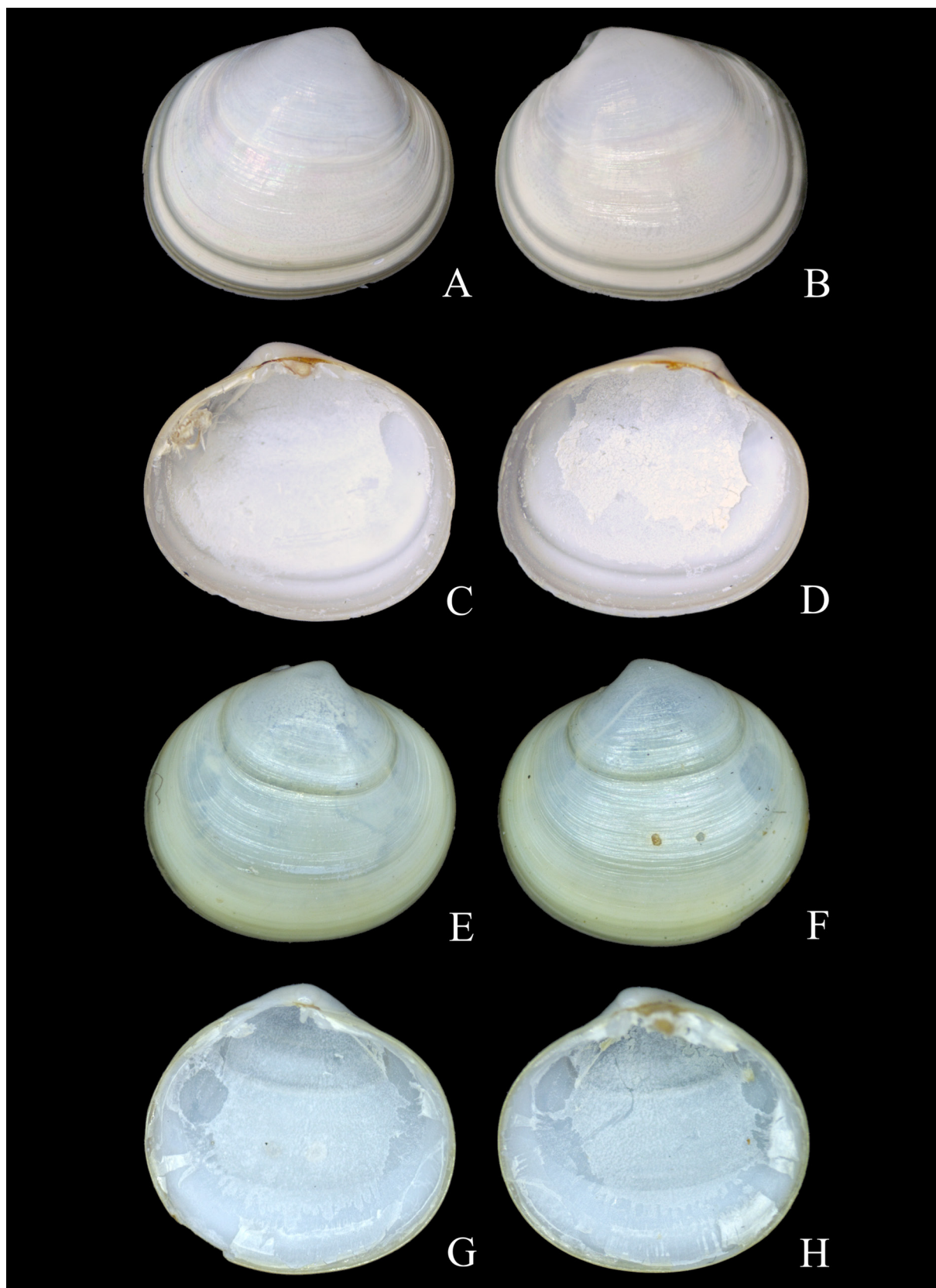


FIG. 5. *Kellia* spp. A–D, *K. subrotunda* (Dunker, 1882), Yellow Sea, Liaoning Province, Dalian, shell length 7.4 mm, ZMFU 54855/Bv-9119; E–F, *K. cf. japonica* Pilsbry, 1895, Sea of Japan, Primorye, Rynda Bay, Plastun Inlet, shell length 4.5 mm, MIMB 2979. Outer and inner views of the left (B, D, F, H) and right (A, C, E, G) valves.

РИС. 5. *Kellia* spp. A–D, *K. subrotunda* (Dunker, 1882), Желтое море, провинция Ляонин, Далянь, длина раковины 7.4 мм, ZMFU 54855/Bv-9119; E–F, *K. cf. japonica* Pilsbry, 1895, Японское море, Приморье, залив Рында, бухта Пластун, длина раковины 4.5 мм, MIMB 2979. Снаружи и изнутри левая (B, D, F, H) и правая (A, C, E, G) створки.

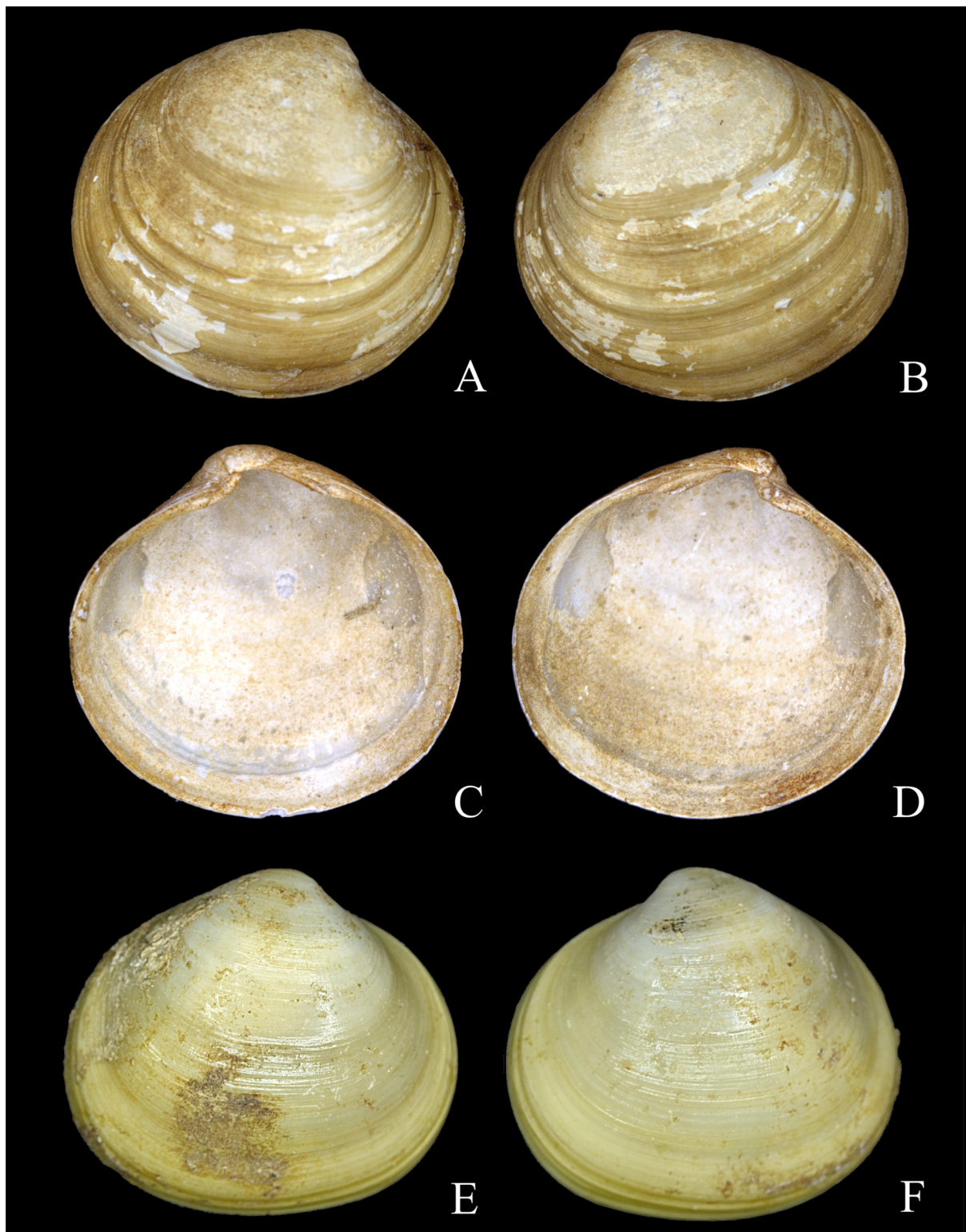


FIG. 6. *Kellia* spp. A–D, *K. sp.*, Sea of Japan, Primorye, Rynda Bay, Dzhigit Inlet, shell length 8.2 mm, MIMB 2978; E, F, *K. japonica* Pilsbry, 1895, Sea of Japan, Primorye, Peter the Great Bay, Askold Island, shell length 15.1 mm, ZIN (unnumbered). Outer and inner views of the left (B, D, F) and right (A, C, E) valves.

РИС. 6. *Kellia* spp. A–D, *K. sp.*, Японское море, Приморье, залив Рында, бухта Джигит, длина раковины 8.2 мм, МИМВ 2978; E, F, *K. japonica* Pilsbry, 1895, Японское море, Приморье, залив Петра Великого, остров Аскольд, длина раковины 15.1 мм, ZIN (без номера). Снаружи и изнутри левая (B, D, F) и правая (A, C, E) створки.

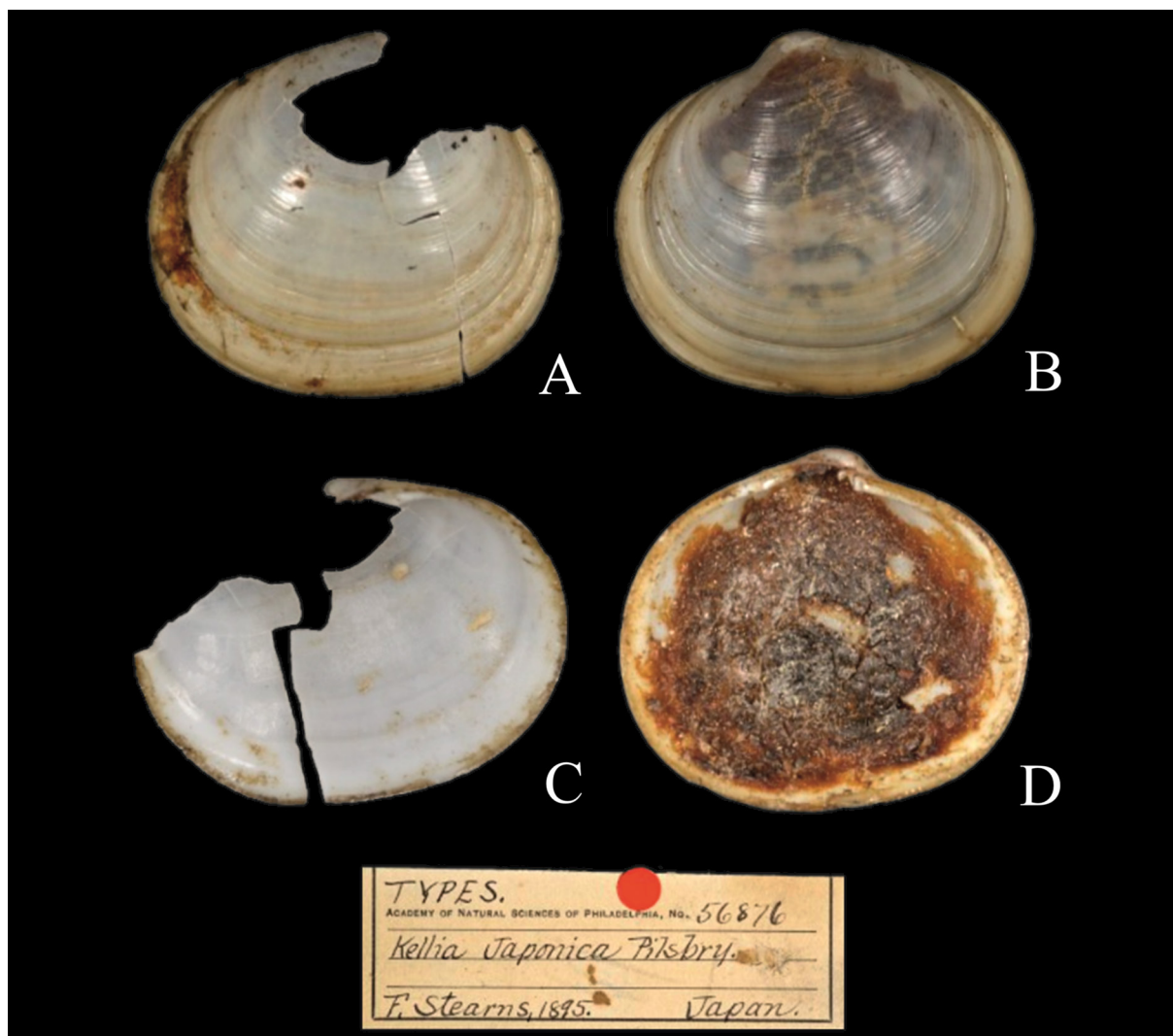


FIG. 7. *Kellia japonica* Pilsbry, 1895, a **syntype**, Japan, ANSP 56876 (<https://clade.ansp.org/>). Outer and inner views of the right (A, C) and left (B, D) valves.

РИС. 7. *Kellia japonica* Pilsbry, 1895, **синтип**, Япония, ANSP 56876 (<https://clade.ansp.org/>). Снаружи и изнутри левая (A, C) и правая (B, D) створки.

[1899] and Huber [2015] believed that this species is distinct. Kamenev [2004], although followed the synonymy of the former authors, found clear differences between the Atlantic *K. suborbicularis* (syntypes are figured at: <https://rammcollections.org.uk/object/moll3908/>) and its possible Pacific specimens: the north-eastern specimens had ovate-elongated, less inflated shell (more than 26 mm, up to 34 mm [Coan, Valentich-Scott, 2012] – largest lasaeid in the world), with more anteriorly placed beaks and yellow, polished periostracum whereas specimens from the North Atlantic were markedly more rounded, higher, more inflated with less anteriorly placed beaks, and with a slightly polished yellowish-gray periostracum. Kamenev (op. cit.) suggested that most likely the Pacific specimens refer to *K. laperousii* and this species was recorded also from Russian waters (Kurile Islands). However, no further records from Russian waters were published; Scarlato [1981] did not have

this species in his collection (ZIN) although he indicated its presence in Russian waters in Commander Islands based on Dall [1921]. Deshayes [1839] did not provide data on type locality and it is understood as California [Coan *et al.*, 2024]. According to Coan *et al.* [2024], syntype in the NHMUK 20150581 is missing, however, Huber [2015] mentioned it is in the museum collection and its length is 21.7 mm; another syntype not enumerated by Coan *et al.* (op. cit.) is in the MNHN and is figured herein (Fig. 10). Comparison of type material of both *K. japonica* and *K. laperousii* proves their distinctness.

Kellia kussakini Kamenev, 2004

This species is rather distinct with its small (to about 5 mm in length), nearly globular and high shell. However, some specimens [Kamenev, 2004, figs 40–48] approach to *K. porculus*. Identity of the round *Kellia* sp. from the Sea of Japan (Figs. 6A–D)

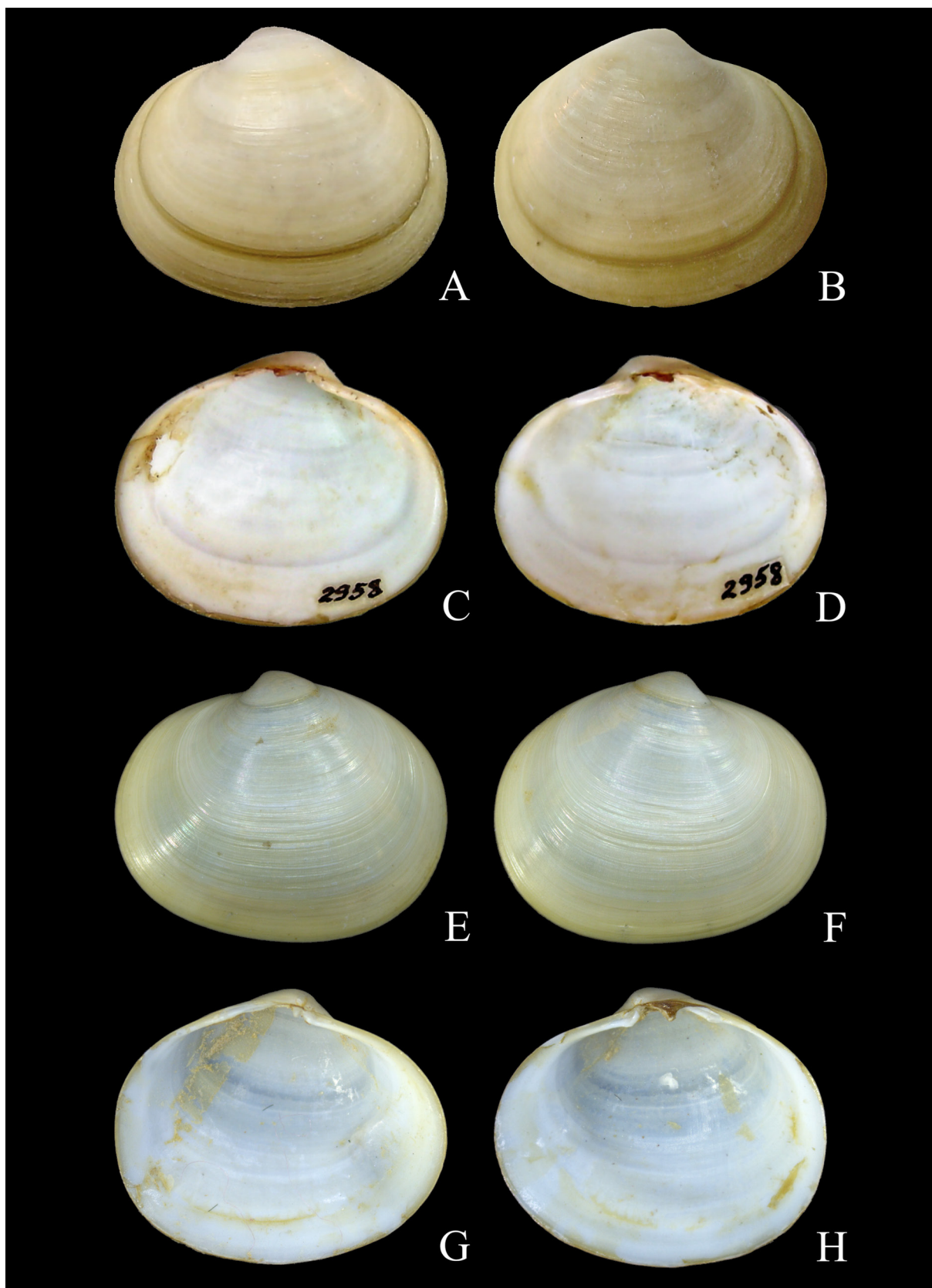


FIG. 8. *Kellia japonica* Pilsbry, 1895. A–D, Sea of Japan, Primorye, Udobnaya Bay, shell length 13.1 mm, ZMFU 19665/Bv-2958; E–H, Sea of Japan, Primorye, Olga Bay, shell length 11.6 mm, ZMFU 54854 Bv- 9118. Outer and inner views of the left (A, C, E, G) and right (B, D, F, H) valves.

РИС. 8. *Kellia japonica* Pilsbry, 1895. A–D, Японское море, Приморье, бухта Удобная, длина раковины 13.1 мм, ZMFU 19665/Bv-2958; E–H, Японское море, Приморье, залив Ольги, длина раковины 11.6 мм, ZMFU 54854 Bv- 9118. Снаружи и изнутри левая (A, C, E, G) и правая (B, D, F, H) створки.

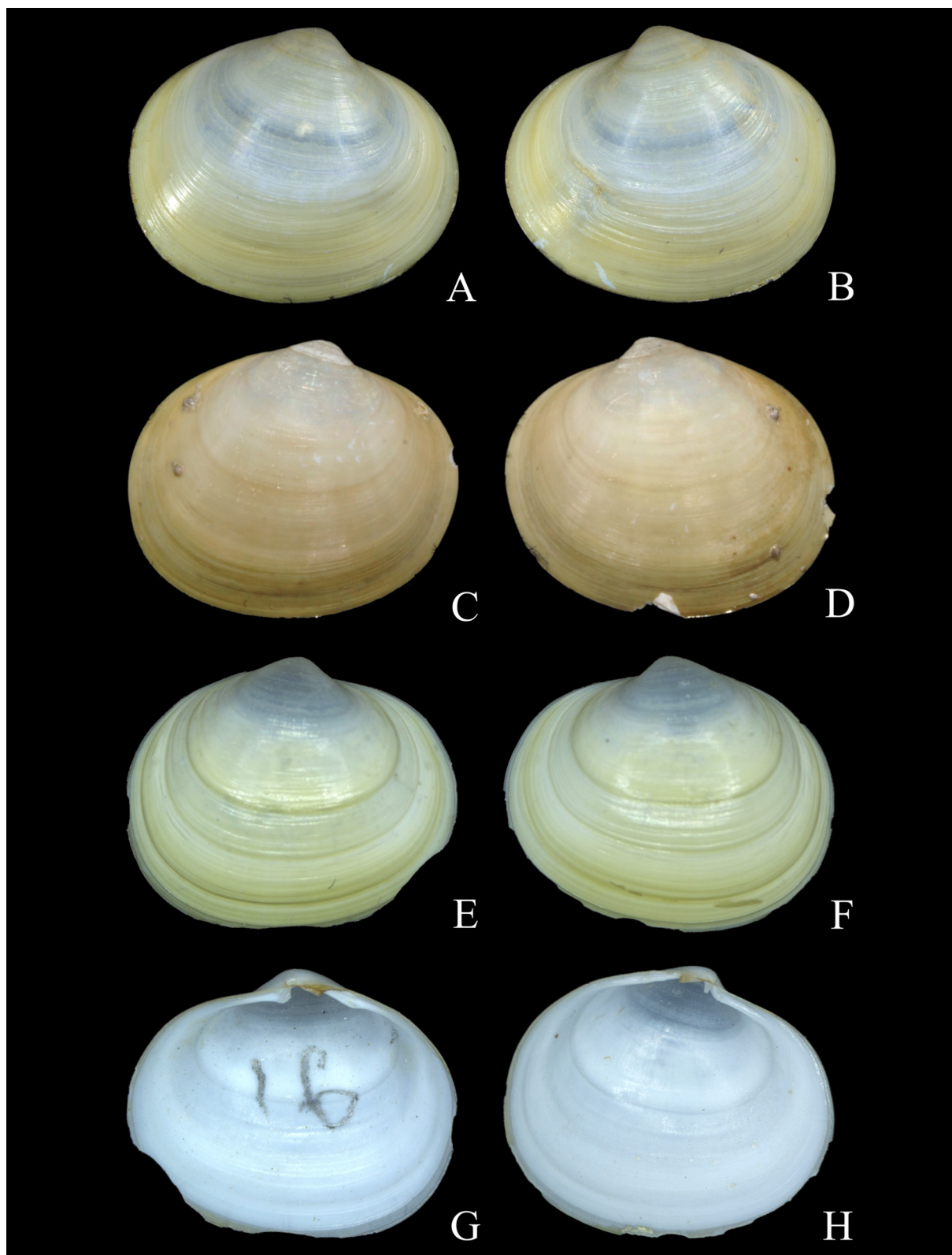


FIG. 9. *Kellia japonica* Pilsbry, 1895. **A, B**, Sea of Japan, Primorye, Olga Bay, shell length 6.3 mm, ZMFU 54854/Bv-9118; **C, D**, Sea of Japan, South Korea, Gangwon Province, Geumjin-ri, shell length 10.7 mm, ZMFU 46589/Bv-7576; **E–H**, Sea of Japan, Primorye, Peter the Great Bay, Vostok Bay, shell length 8.8 mm, ZMFU 18314/Bv-2536. Outer and inner views of the left (**B, D, F, H**) and right (**A, C, E, G**) valves.

РИС. 9. *Kellia japonica* Pilsbry, 1895. **A, B**, Японское море, Приморье, залив Ольги, длина раковины 6.3 мм, ZMFU 54854/Bv-9118; **C, D**, Японское море, Южная Корея, провинция Канвондо, Кьумджин-Ри, длина раковины 10.7 мм, ZMFU 46589/Bv-7576; **E–H**, Японское море, Приморье, залив Петра Великого, залив Восток, длина раковины 8.8 мм, ZMFU 18314/Bv-2536. Снаружи и изнутри левая (**B, D, F, H**) и правая (**A, C, E, G**) створки.

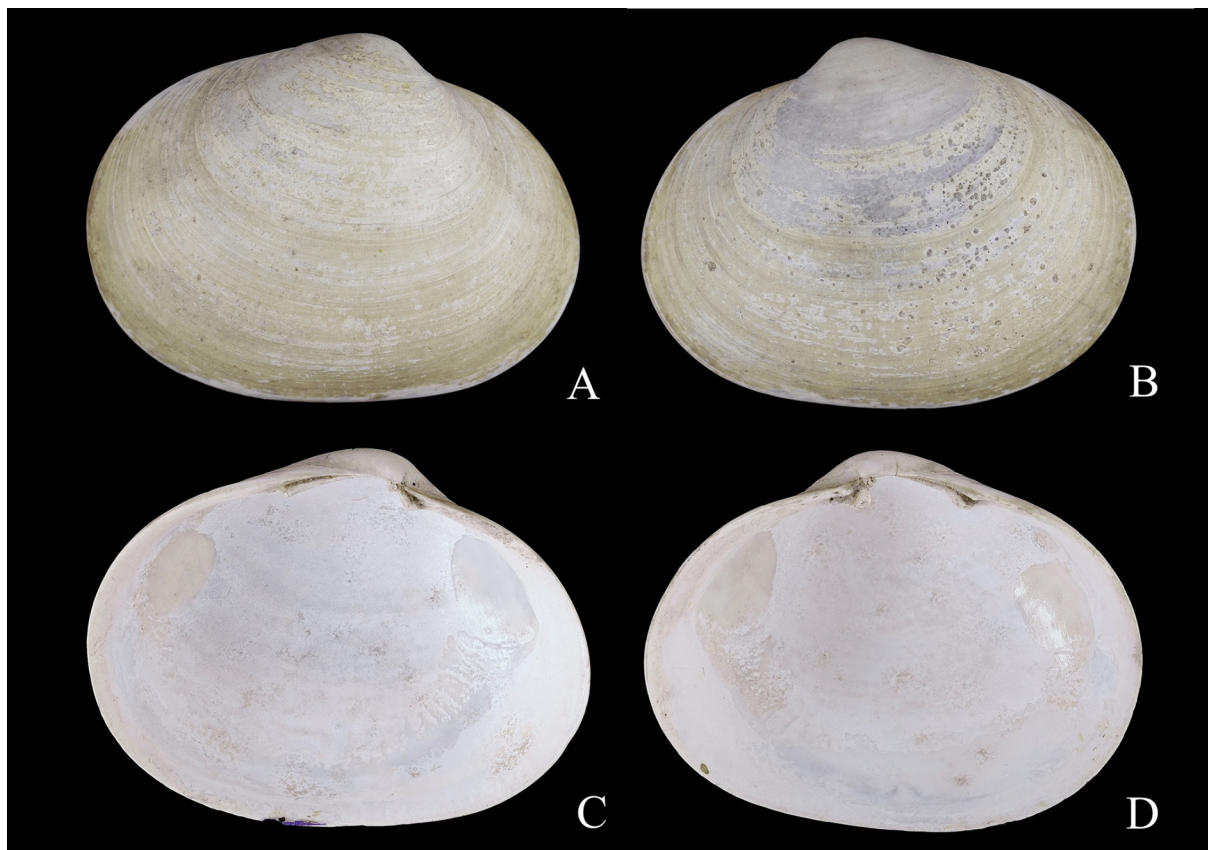


FIG. 10. *Kellia laperousii* (Deshayes, 1839), a **syntype** of *Chironia laperousii* Deshayes, 1839, probably, California, MNHN 2000-37998 (<http://colhelper.mnhn.fr/>). Outer and inner views of the right (A, D) and left (B, C) valves.

РИС. 10. *Kellia laperousii* (Deshayes, 1839), **синтип** *Chironia laperousii* Deshayes, 1839, вероятно, Калифорния, MNHN 2000-37998 (<http://colhelper.mnhn.fr/>). Снаружи и изнутри левая (A, D) и правая (B, C) створки.

remains unresolved. Distribution of *K. kussakini* was recently extended south to Urup Island, Kurile Islands [Lisitsyna, Kamenev, 2024].

Kellia subrotunda (Dunker, 1882)
(Figs. 5A–D; 11)

This enigmatic species was described from Japan, type locality – near Tokyo [Dunker, 1882, p. 219, pl. 14, figs. 12, 13; as *Lepton subrotundum*], not often illustrated in Japanese literature and unknown in Korea. We illustrate its type material herein for the first time (Fig. 11). This species was frequently misspelled as “*subrotundata*” (e.g., Kuroda *et al.* [1971]; Habe [1977]; Higo *et al.* [1999]; Kamenev [2004]). Beaks are placed more anteriorly than in other species, surface is white rather than yellowish or brown as in *K. japonica* and *K. porculus*; additionally, shell is ovate-subquadrate, with comparatively weak dentition and huge ligament portion [Huber, 2015]. Perhaps, a rather typical specimen is figured by Kuroda *et al.* [1971, pl. 119, fig. 1]. *Kellia* sp. from Mikawa Bay (Aichi Prefecture) [Hayase, Kimura, 2020, pl. 12, fig. 7] is similar to *K. subrotunda*. A specimen from Dalian (Yellow Sea, China) (Fig. 5A–D) seems to belong to *K. subrotunda* and is the first record for China. Yamamoto, Habe [1959]

mentioned that *K. porculus* is the nearest species to *K. subrotunda* with more inflated shell. Huber’s [2015, p. 137–138] specimens of *K. subrotunda* are nearly identical with *K. porculus*.

Kellia comandorica Scarlato, 1981
(Fig. 12)

According to Kamenev [2004], this distinct species has a less inflated shell with a non-polished gray periostracum, conspicuous growth lines, and less anteriorly placed beaks as compared to other *Kellia* species. Most important trait of this species is presence of conspicuous radial rows of fossae extending to pallial line on inner surface of shell [Scarlato, 1981; Kamenev, 2004]. Although this species was previously known only from type locality (Commander Islands), it was later found at Urup and Paramushir Islands (Kurile Islands) [Kamenev, 2004; Ivanova, Tsurpalo, 2019].

Kellia grebnitzskii (Dall, 1916)
(Fig. 13)

Status of *Rochefortia grebnitzskii* Dall, 1916 (length is 3.25 mm in original description) [Dall, 1916] was unclear: it was treated as a synonym of *K. suborbicularis* [Coan, Valentich-Scott, 2012]

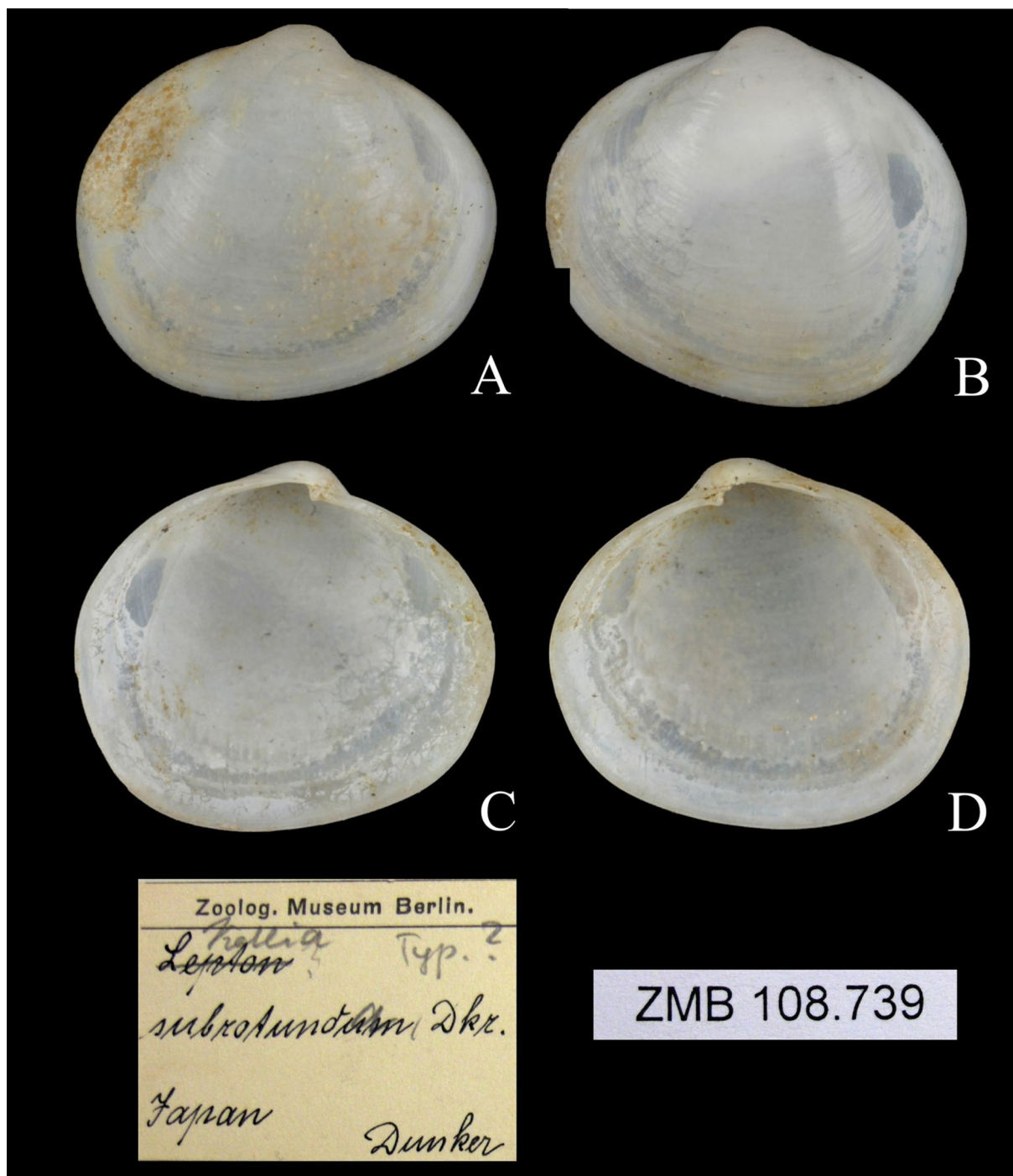


FIG. 11. *Kellia subrotunda* (Dunker, 1882), probable **syntype** of *Lepton subrotundum* Dunker, 1882, Japan, near Tokyo, ZMB 108.739, shell length 10 mm. Outer and inner views of the right (A, D) and left (B, C) valves.

РИС. 11. *Kellia subrotunda* (Dunker, 1882), возможный **синтип** *Lepton subrotundum* Dunker, 1882, Япония, около Токио, ZMB 108.739, длина раковины 10 мм. Снаружи и изнутри левая (A, D) и правая (B, C) створки.

or as *Mysella grebnitzskii* (Dall, 1916) [Bernard, 1983; Kamenev, 1995] or as *Mysella (Rochefortia) grebnitzskii* (Dall, 1916) [Kafanov, 1991]. Kamenev [2004] did not consider this species at all in his *Kellia* review. Upon examination of type material (Fig. 13), we regard this species as distinct and close to *K. comandorica*: it differs from the latter by absence of fossae in the inner shell surface.

Kellia tsujitai Habe, 1959

According to Habe [1959], this species very closely relates to *K. japonica*, but is smaller and thicker even in the adult stage, with the roughened dull surface. It is distributed in Hakata Bay (Fukuoka Prefecture) and Amakusa (Kumamoto Prefecture), Kyushu, and in Tanabe Bay, Wakayama Prefecture,



FIG. 12. *Kellia comandorica* Scarlato, 1981, the **holotype**, Commander Islands, Bering Island, ZIN 9372, shell length 8.7 mm. Outer and inner views of the right (A, C) and left (B, D) valves.

РИС. 12. *Kellia comandorica* Scarlato, 1981, **голотип**, Командорские острова, остров Беринга, ZIN 9372, длина раковины 8.7 мм. Снаружи и изнутри левая (A, C) и правая (B, D) створки.

Honshu and it was collected at a depth of 10–30 m, in sandy mud [Habe, 1959; Higo *et al.*, 1999] being a subtropical species not recorded in the Sea of Japan. Based on the photograph of the probable holotype [Higo *et al.*, 1999, p. 163, fig. B691], shell of this species is covered with rough growth lines, slightly elongated, teeth are more delicate than in *K. porculus*. Huber's [2015, p. 138] specimens of *K. tsujitai* do not match the original description and the type material: they have rather shiny and smooth surface.

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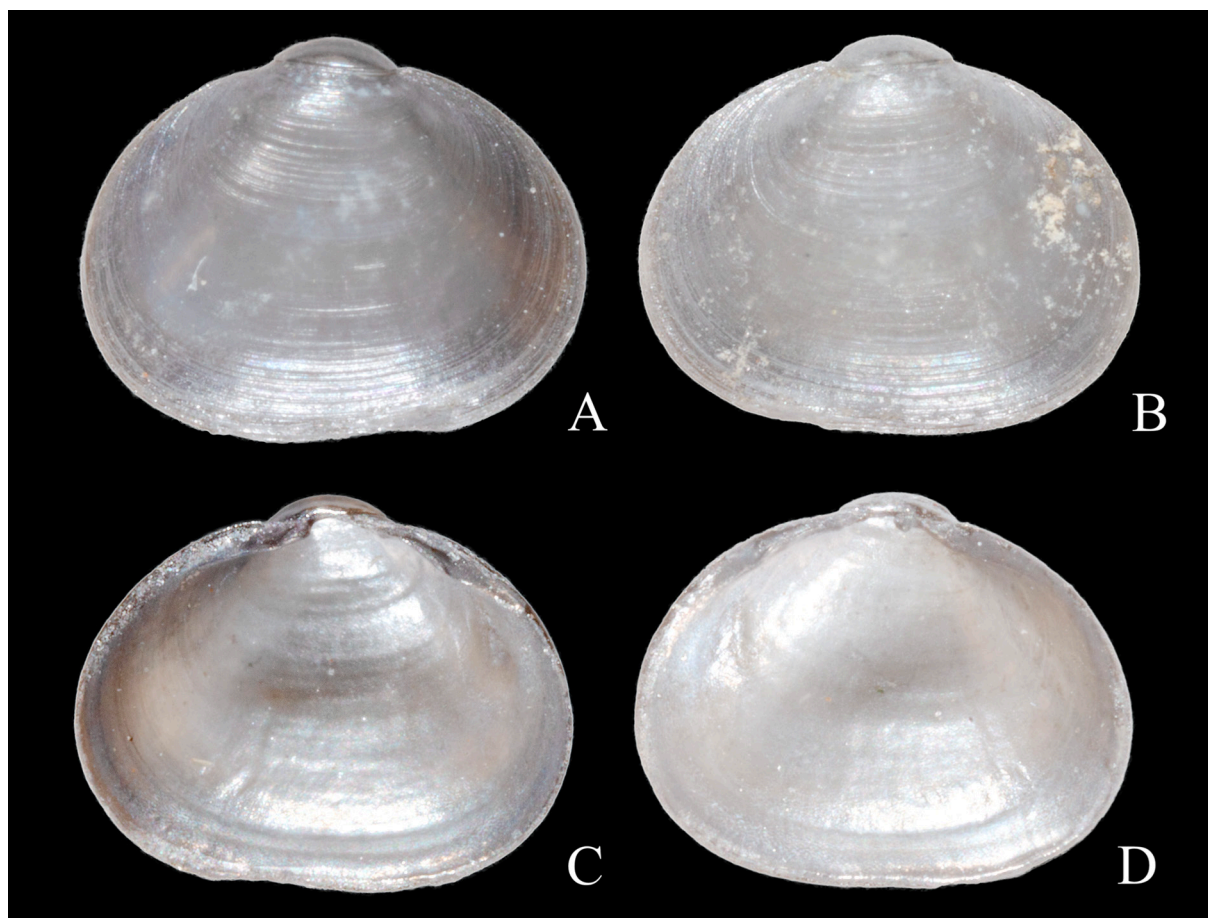


FIG. 13. *Kellia grebnitzskii* (Dall, 1916), the **holotype** of *Rocheportia grebnitzskii* Dall, 1916, Commander Islands, Bering Island, USNM 207258, shell length about 3 mm. Outer and inner views of the right (A, C) and left (B, D) valves.

РИС. 13. *Kellia grebnitzskii* (Dall, 1916), **голотип** *Rocheportia grebnitzskii* Dall, 1916, Командорские острова, остров Беринга, USNM 207258, длина раковины около 3 мм. Снаружи и изнутри левая (A, C) и правая (B, D) створки.

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