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Unrecorded species of Korean invertebrates discovered through the project of 'Discovery of Korean Indigenous Species' III

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This is the third series of catalogs reporting on Korean species discovered through the 'Discovery of Korean Indigenous Species'. This catalog includes 22 species of invertebrates, excluding insects. The catalog includes the scientific name, an abridged list of synonyms, collection sites, distribution, diagnosis, and figures for each species. Additionally, we provide the newly assigned Korean name, specimen voucher, and, if available, mitochondrial CO1 or 16S gene sequences of the species listed. All species identified and documented here will be officially listed on the 'National Species List of Korea', a database maintained by the National Institute of Biological Resources (NIBR).

Keywords: DNA barcode, Korean new records, morphology, National Institute of Biological Resources (NIBR), species diversity

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Introduction

In 1994, the Republic of Korea ratified the 'Convention on Biological Diversity', an international convention on the conservation and sustainable use of biodiversity and fair sharing of benefits arising from its use (Cho, 2017). Accordingly, the discovery and cataloging of species inhabiting Korea was recognized as a very important issue in terms of securing the sovereignty of biological resources (Hur *et al*., 2016). In line with this, the National Institute of Biological Resources (NIBR) of the Ministry of Environment of the Republic of Korea has been ordering and implementing research projects for the investigation, excavation, and documentation of native organisms every year

since 2006. To date, 58,050 species have been officially registered on the 'National Species List of Korea' (National List of Species of Korea, 2022).

The present publication, prepared under the project 'Discovery of Korean Indigenous Species' for surveying and documenting Korean species diversity, is the third catalog following 'Unrecorded species of Korean invertebrates discovered through the project of 'Discovery of Korean Indigenous Species' II' (Ji *et al*., 2023). The original plan of publishing a mere list of previously undocumented Korean species has transformed into a catalog that provides extensive taxonomic information for each species (Song *et al*., 2017; Ji *et al*., 2023). This comprehensive catalog now includes vital details, such as the collection locations (GPS coordinates), specimen vouchers, worldwide distribution, diagnostic features or remarks, figures, and if possible, molecular barcodes. These additional details provide a more thorough understanding of each species and facilitate further research and identification. Originally, the catalogs of this project were published every few years, with a goal of publishing unpublished species and officially registering these species in the 'National Species List of Korea'. However, as part of the effort to reach 60,000 species on the 'National Species List of Korea' this year, a paper in catalog format has been prepared following that in 2022 (Ji *et al*., 2023). Here, we describe 22 invertebrate species from five phyla: Platyhelminthes, Rotifera, Mollusca, Annelida, and Arthropoda; a list of protozoa was prepared separately.

Materials and Methods

Data for this catalog were primarily obtained from reports of the project from 2013 to 2023 and were carefully reviewed by each author. Materials for the listed species were collected from 22 sites in intertidal coastal waters, subtidal zones, soil, freshwater ponds, and reservoirs in South Korea. Amplification by polymerase chain reaction was performed as described by Soors *et al*. (2019) for *Girardia tigrina*, Zhang *et al*. (2021) for *Cyrtonia tuba*, Williams *et al*. (2017) for *Pseudopolydora gigeriosa*, Dabert *et al*. (2015) for *Tyrophagus fanetzhangorum*, Dabert *et al*. (2008) for *Macrocheles scutatiformis* and *Parasitus wangdunqingi*, and Pham *et al*. (2021) for *Vargula ascensus*. The examined specimens were deposited at the National Institute of Biological Resources, Korea.

Results

A total of 22 species belonging to five phyla (Platyhelminthes, Rotifera, Mollusca, Annelida, and Arthropoda) were presented. Among them, two families (Stenostomidae Vejdovsky, 1880; Dugesiidae Ball, 1974) and seven genera (*Stenostomum* Schmidt, 1848; *Girardia* Ball, 1974; *Cyrtonia* Rousselet, 1894; *Robertgurneyella* Gómez, 2020; *Nihonotrypaea* Manning and Tamaki, 1998; *Vargula* Skogsberg, 1920; *Spinileberis* Hanai, 1961) have not been previously reported in Korea. We provide CO1 or 16S sequences for seven species (CO1 for *Girardia tigrina* (Girard, 1850); *Cyrtonia tuba* (Ehrenberg, 1834); *Pseudopolydora gigeriosa* Radashevsky and Hsieh, 2000; *Tyrophagus fanetzhangorum* Klimov and OConnor, 2009; *Macrocheles scutatiformis* Petrova, 1967; *Parasitus wangdunqingi* Ma, 1995; and 16S for *Vargula ascensus* Kornicker, 1979), along with taxonomic information of all species listed.

List of Species

Phylum Platyhelminthes Minot, 1876 편형동물문
Class Catenulida 사슬납작벌레강
Order Catenulida Meixner, 1924 사슬납작벌레목
Family Stenostomidae Vejdovsky, 1880
좁은입납작벌레과
Genus *Stenostomum* Schmidt, 1848
좁은입납작벌레속 (신칭)

1. *Stenostomum leucops* (Dugès, 1828) (Fig. 1)
좁은입납작벌레 (신칭)
Derostoma leucops Dugès, 1828 Ehrenberg

Material examined. Pocheon-si (37°47′13.50″N, 127°13′34.75″E), Korea; collected by JW Jung on 11 October 2016.
Deposition. NIBRIV0000753823.
World distribution. Cosmopolitan.

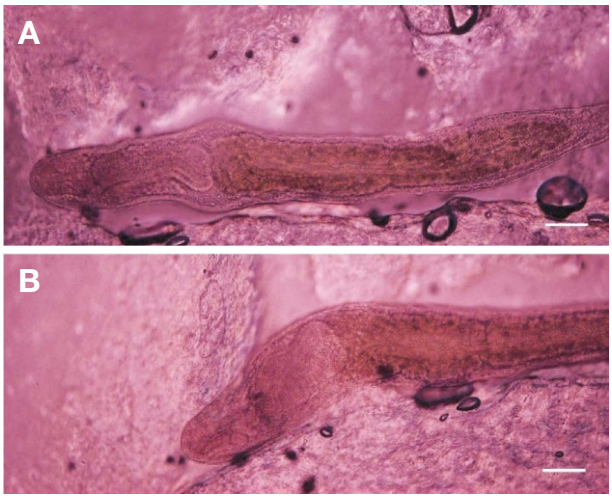

Fig. 1. *Stenostomum leucops* (Dugès, 1828). A. Dorsal view; B. Lateral view. Scale bars = 100 μm.

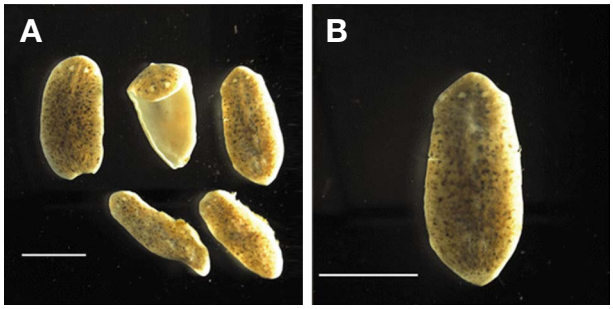

Fig. 2. *Girardia tigrina* (Girard, 1850). A. Some individuals of *G. tigrina* (preserved); B. dorsal view (preserved). Scale bars = 5 mm.

Diagnosis. Body fusiform and very elongated, obtuse in front, pointed behind; mouth at a distance from the anterior end, equal to the greatest width of the body; on either side of the head, an oblong, pellucid dimple; excretophores present; nephridiopre subterminal.

Order Tricladida Lang, 1884 삼기장목
Family Dugesiidae Ball, 1974
삼각머리플라나리아과 (신칭)
Genus *Girardia* Ball, 1974 흑점플라나리아속 (신칭)

2. *Girardia tigrina* (Girard, 1850) (Fig. 2)
흑점플라나리아 (신칭)

Material examined. Suncheon-si (34°56′37.52″N, 127°29′54.36″E), Korea; collected by DH Ahn on 15 August 2021; freshwater.
Deposition. NIBRIV0000901588.
GenBank accession No. OR178933 for CO1.
World distribution. Endemic to the Americas (from Argentina to Canada), having been introduced in other continents (Europe, Australia, and Asia) and islands. Korea (this study).
Diagnosis. Size about 4–6 mm (length) × 2 mm (width); Head triangular, with bluntly pointed anterior tip. Two eyes present at the middle of the head at the level of auricles, positioned close together and located in broad pigment-free patches. Unpigmented auricular grooves marginally placed just posteriorly to the eyes. The dorsal surface with black-spotted pigmentation pattern.
Remarks. *Girardia tigrina* is anatomically very similar to *G. dorotocephala*. In both species, the shape of the penis papilla is rather variable and the same holds true for the course and the shape of the intrapenial sections of the sperm ducts. Usually, specimens of *G. tigrina* have a distinctly angled bursal canal, whereas in *G. dorotocephala* the canal generally curves smoothly anteriad.

Phylum Rotifera Cuvier, 1817 윤형동물문
Class Eurotatoria De Ridder, 1957 진윤충강

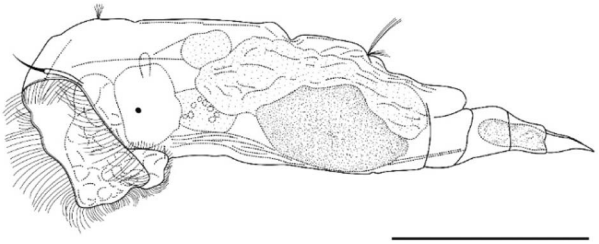

Fig. 3. *Cyrtonia tuba* (Ehrenberg, 1834). Scale bar = 100 μm.

Order Ploima Hudson and Gosse, 1886 유영목
Family Epiphanidae Harring, 1913 물윤충과
Genus *Cyrtonia* Rousselet, 1894 혹등윤충속 (신칭)

3. *Cyrtonia tuba* (Ehrenberg, 1834) (Fig. 3)
나팔혹등윤충 (신칭)
Notommata tuba Ehrenberg, 1834
Proales hyalina Stokes, 1897

Material examined. Chungju-si (36°57′36.5″N, 127°55′22.1″E), Korea; from reservoir; collected by GS Min on 7 October 2022.
Deposition. NIBRIV0000900973.
GenBank accession no. OQ940324–6 for CO1.
World distribution. Cosmopolitan.
Diagnosis. Body transparent and conical shape, 280–310 μm in length. Back arched in latera view. Corona with long cilia and located on the anterior margin of head. Dorsal antenna on neck region. Lateral antennae located posterior third of trunk. Foot short, with two toes. Two toes symmetrical and slightly curved ventrally. Trophi malleate. Fulcrum short and stubby. Rami rhomboid with several teeth on the inner margin. Each uncus with 10–11 distinct teeth.
Remarks. The morphological characteristics of the Korean specimens generally correspond to those described in previous studies, but there are differences in the direction of the toe tips and the number of unci teeth when compared to those studies (Koste, 1978; Jersabek and Leitner, 2013).

Phylum Mollusca Linnaeus, 1758 연체동물문
Class Gastropoda Cuvier, 1795 복족강
Order Neogastropoda Wenz, 1938 신복족목
Family Cystiscidae Stimpson, 1865 싸라기고둥과
Genus *Crithe* Gould, 1860 꼬마싸라기고둥속

4. *Crithe huna* (Kay, 1979) (Fig. 4)
넓은어깨싸라기고둥 (신칭)
Cystiscus huna Kay, 1979

Material examined. Jejudo (33°59′9.58″N, 126°14′53.82″E), Korea; by SCUBA diving; collected by JK Park,

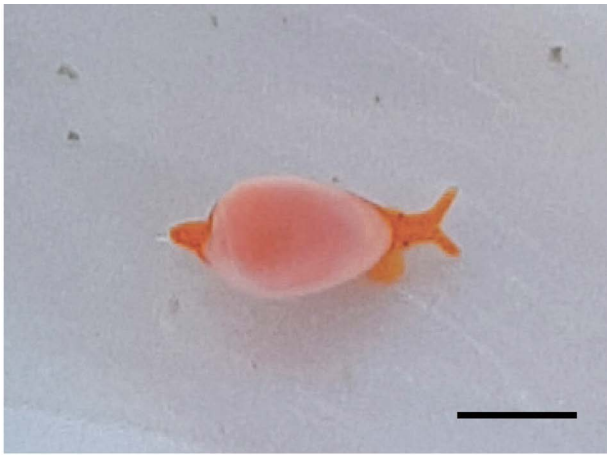

Fig. 4. *Crithe huna* (Kay, 1979). Scale bar = 2 mm.

YH Shin, and JA Park on 12 September 2017.
Deposition. NIBRIV0000834773.
World distribution. Japan, Philippines, Hawaii, Pitcairn Islands, and Korea.
Diagnosis. Shell small, glossy, translucent white and rounded-pyriform in shape. Spire low very short, almost immersed. Body whole most of the shell length, shoulder very broad with round edge. Aperture long and narrow, somewhat wider anteriorly. Outer lip thick, especially near shoulder. Apex slightly higher than the posterior end of lip. Siphonal notch and posterior notch absent. Columella with three distinct plaits. Animal body vivid orange. Bifurcated head with elongated frontal lobes, red eyes at side of head. Foot triangular and relatively narrower than shell width.
Remarks. In shell morphology, *C. huna* is similar to other species belonging to the same family. When alive, some internal organs such as mantle and visceral mass can be visible to vivid orange through translucent shell.

Family Granulinidae G. A. Coovert and H. K. Coovert, 1995 입술싸라기고둥과
Genus *Granulina* Jousseaume, 1888 입술싸라기고둥속

5. *Granulina cotamago* (Yokoyama, 1922) (Fig. 5)
보석싸라기고둥 (신칭)
Marginella cotamago Yokoyama, 1922

Material examined. Incheon-si (37°59′01.65″N, 124° 40′29.71″E), Korea; by SCUBA diving; collected by JK Park and YC Lee on 12 August 2020.
Deposition. NIBRIV0000879438–40.
World distribution. Japan and Korea.
Diagnosis. Shell small, glossy, translucent white and rounded-pyriform in shape. Spire immersed. Body whole occupies most of the shell length, shoulder very broad



Fig. 5. *Granulina cotamago* (Yokoyama, 1922). Left. Ventral view; Right. Dorsal view. Scale bar = 1 mm.

with round edge. Outer lip thick, especially near shoulder, inner margin finely denticulated, receding both above and below. Apex rounded, lower than the posterior end of lip. Columella with four distinct plaits near the anterior end. Animal body blackish brown in color.
Remarks. In shell morphology, *G. cotamago* is similar to other species belonging to the same family. This species is distinguished by the posterior end of lip elevated than apex and mantle edge of the animal body colored with blackish brown.

Class Polyplacophora Gray, 1821 다판강
Order Chitonida Thiele, 1909 군부목
Family Tonicellidae Simroth, 1894 북방군부과
Genus *Tonicella* P. P. Carpenter, 1873 북방군부속

6. *Tonicella undocaerulea* Sirenko, 1973 (Fig. 6)
파란물결무늬군부 (신칭)

Material examined. Goseong-gun (38°16′13.35″N, 128° 33′28.75″E), Korea; from rocky seashore; collected by JK Park and YH Shin on 14 May 2018.
Deposition. NIBRIV0000831178.
World distribution. Japan, Russia and Northeastern Pacific, and Korea.
Diagnosis. Body oval shaped. Valves color mixed brown and yellowish white with blue stripes. Head valve semicircle shape, smooth surface with zigzag stripes forms concentric. Intermediate valves wide rectangular, posterior center beaked, jugal area wedge shaped, smooth and patternless, pleurolateral area with longitudinally zigzag stripes, and dark brown color of beside on the top, lateral area slightly raised. Tail valve oval, mucro anterior of the center. Girdle narrow, densely covered with short and blunt point spicules. Gills arrangement merobranchial and abanal.
Remarks. Living *Tonicella undocaerulea* has blue stripes on its valves, which turn into white when preserved in alcohol. This species is morphologically similar to *T. lin-*

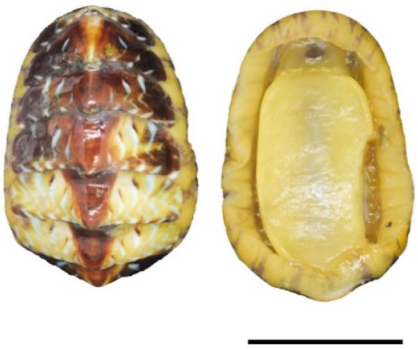

Fig. 6. *Tonicella undocaerulea* Sirenko, 1973. Left, Dorsal view; Right, Ventral view. Scale bar = 5 mm.



Fig. 7. Photomicrograph of *Aeolosoma headleyi* Beddard, 1888. Scale bar = 500 μm.

eata (W. Wood, 1815). *Tonicella lineata* has a white stripe with brown lines at the border, while *T. undocaerulea* has a blue stripe with brown lines at the end.

Phylum Annelida Lamarck, 1802 환형동물문
Family Aeolosomatidae Beddard, 1895
Genus *Aeolosoma* Ehrenberg, 1828 넓적코물지렁이속

7. *Aeolosoma headleyi* Beddard, 1888 (Fig. 7)
큰넙적코물지렁이 (신칭)

Material examined. Jejudo (33°28′29″N, 126°35′50″E), Korea; collected by JW Jung on 25 June 2021.
Deposition. NIBRIV0000895447.
World distribution. Northern Hemisphere.
Diagnosis. Large, zooid up to 2 mm length with 150–200 μm width. Fission-zone after IX to XI. Prostomium somewhat triangular, slightly wider than following segments; tactile hairs up to about 12 μm. Epidermal glands mostly of irregular form, green, yellow. Indistinct intersegmental furrow present. Hair setae unequal, up to six per bundle; short setae 75–200 μm shorter than dorsal setae.

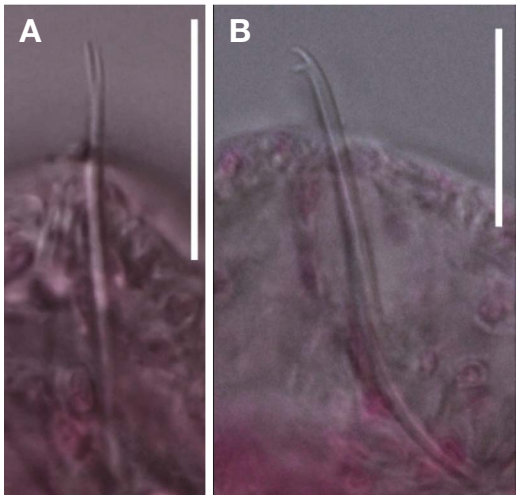

Fig. 8. *Pristina* (*Pristinella*) *jenkinae* (Stephenson, 1931). A. dorsal needle chaeta; B. ventral chaeta of VI. Scale bars = 40 μm

Class Clitellata Linnaeus, 1740 환대강
Order Haplotaxida Grube, 1850 지렁이목
Family Naididae Ehrenberg, 1828 물지렁이과
Family Naididae Ehrenberg, 1828 물지렁이과
Genus *Pristina* (*Pristinella*) Brinkhurst, 1985

8. *Pristina* (*Pristinella*) *jenkinae* (Stephenson, 1931) (Fig. 8) 납작민주둥이물지렁이 (신칭)
Naidium jenkinae Stephenson, 1931
Pristina jenkinae Sperber, 1948
Pristinella jenkinae Brinkhurst, 1985

Material examined. Jejudo (33°29′43.64″N, 126°30′44.00″E), Korea; collected by JH Lee on 20 June 2019.
Deposition. NIBRIV0000901662.
World distribution. Cosmopolitan.
Diagnosis. Prostomium simple, without proboscis. Dorsal and ventral chaetae from segment II. Hair chaetae smooth, both hair and needle chaetae 1–2 per bundle, with parallel teeth, lower tooth thicker and longer than upper tooth. Ventral chaetae 3–7 in anterior bundles, with upper tooth a bit longer or equal to lower, and 2–3 and with equal teeth posteriorly.
Remarks. Our specimens were found in streams. Its habitat is brooks with very little water and dominating stony-gravel substrates.

Class Polychaeta Grube, 1850 다모강
Order Spionida sensu Rouse and Fauchald, 1997
얼굴갯지렁이목

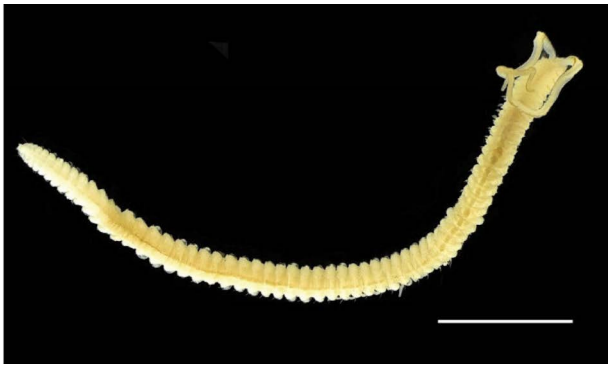

Fig. 9. *Pseudopolydora gigeriosa* Radashevsky and Hsieh, 2000. Scale bar = 2 mm.

Family Spionidae Grube, 1850 얼굴갯지렁이과
Genus *Pseudopolydora* Czerniavsky, 1881
선녀얼굴갯지렁이속

9. *Pseudopolydora gigeriosa* Radashevsky and Hsieh, 2000 (Fig. 9) 주머니선녀얼굴갯지렁이 (신칭)
Pseudopolydora gigeriosa Radashevsky and Hsieh, 2000

Material examined. Seocheon-gun (36°09′41.2″N, 126° 31′11.1″E), Korea; collected by GH Lee on 19 October 2020.
Deposition. NIBRIV0000904516.
GenBank accession No. OQ996870 for CO1.
World distribution. Taiwan and Korea.
Diagnosis. Prostomium anteriorly rounded, extending to posterior end of chaetiger 2 as caruncle; occipital antenna present. Chaetiger 1 weakly separated from peristomium; notochaetae absent. Chaetiger 5 with outer winged capillaries pennoned with curved pointed tip 8–9 in series, posterior-row spines falcate with fine bristles on curved subdistal inner part, 4–5 in series. Gizzard-like structure present in chaetiger 10.

Phylum Arthropoda 절지동물문
Class Arachnida Cuvier, 1812 거미강
Order Sarcoptiformes Reuter, 1909
Family Acaridae Ewing and Nesbitt, 1942 가루진드기과
Genus *Tyrophagus* Oudemans, 1924 긴털가루진드기속

10. *Tyrophagus fanetzhangorum* Klimov and OConnor, 2009 (Fig. 10)
작은긴털가루응애 (신칭)

Material examined. Jejudo (33°39′59″N, 126°38′21″E), Korea; from rice and grain cupboard; collected by C. Jung on 4 August 2021.
Deposition. NIBRIV0000901670.
GenBank accession No. MT226405 for CO1.

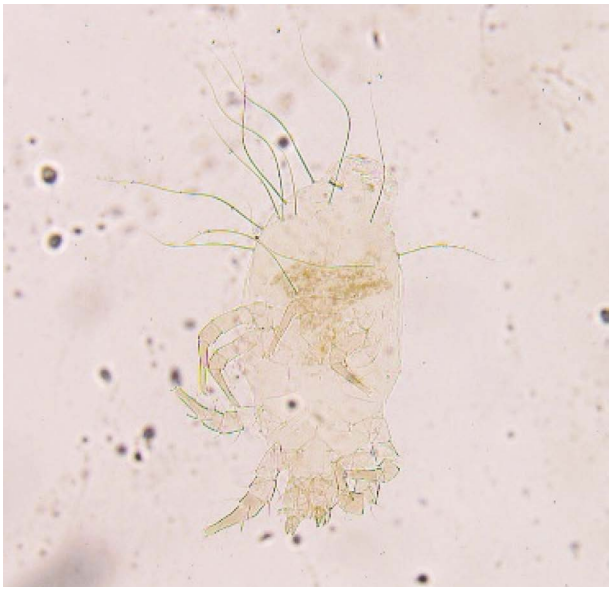

Fig. 10. Sexual organism and habitus of *Tyrophagus fanetzhangorum* Klimov and OConnor, 2009.

World distribution. Cosmopolitan.
Diagnosis. White and hairy long body shape of coxal sclerotization II narrowing sharply solenidion w1 on tarsus I obviously widened in distal 2/3. Distal one-third of aedeagus bent at an angle degree 80–100 not more than 110. This is smaller than *Tyrophagus putrescentiae*, but similar in morphological characters.

Order Mesostigmata Canestrini, 1891 중기문목
Family Macrochelidae Vitzthum, 1930 파리응애과
Genus *Macrocheles* Agamaliev and Alekperov, 1976
파리응애속

11. *Macrocheles scutatiformis* Petrova, 1967 (Fig. 11)
별박이파리응애 (신칭)
Macrocheles scutatiformis Petrova, 1967

Material examined. Andong-si (36°53′69″N, 128°80′ 69″E), Korea; collected by CE Jung on 1 August 2020.
Deposition. NIBRIV0000901668.
GenBank accession No. MH983584 for CO1.
World distribution. Spain, Central and Southern Croatia, Dalmatia and Southern Turkmeni, Malaysia, and Korea.
Diagnosis. Size about 90–125 × 30–40 μm. The genital shield is flat with rounded front edge. In male, the genital shield is fused with the sternal shield. Ventrianal shield of female mite is with rounded sides, transverse lines (Fig. 11). Unlike the female, surface of the male's anal shield has a reticulate pattern instead of a distinct one. Legs II of a female is with thick bristles at the distal but with a large spine on the lower legs of the males. Similar to legs IV.



Fig. 11. *Macrocheles scutatiformis* Petrova, 1967.



Fig. 12. photo-microscopic presentation of deutonymph stage of *Parasitus wangdungqingi* Ma, 1995.

Remarks. Differentiation with congeners: The female has a slightly longer dorsal shield than that of the male. Sternal shield of female is sculptured with lines and punctuations and the ornamentation of the species is more developed than that of *M. scutatus*.

Family Parasitidae 기생응애과
Genus *Parasitus* Latreille, 1795 기생응애속

12. *Parasitus wangdunqingi* Ma, 1995 (Fig. 12)
삼각왕기생응애 (신칭)

Material examined. Andong-si (36°53′69″N, 128°80′69″E), Korea; from coleoptera sawdust; collected by KJ Cheon 2 August 2020.
Deposition. NIBRIV0000901669.
GenBank accession No. MK270528 for CO1.
World distribution. China and Korea.
Diagnosis. Size about 804–919 × 448–597 μm. Epigynial shield triangular and flanked by large discrete metasternal shields. Dorsum divided into two shields, the two shields are not overlapping. Smooth podonotal shield with 22 pairs of simple setae, but some with long blunt, brush like. 24 pairs of setae of some with blunt toothbrush-like. Tectum (=epistome) trispinate with median prolong and longer than lateral ones. Hypostome and palpcoxal seta present.
Remarks. Differentiation with congeners: similar to *Parasitus consanguineus* Oudemans et Voigts, 1903, but distinct with epigynial shield. Females deutonymphs, setae z5 of dorsal hexagon markedly different in shape and length from setae j5, j6. Males, tritosternum absent, reduced or greatly modified.

Class Copepoda Milne Edwards, 1840
Order Harpacticoida Sars, 1903 갈고리노벌레목
Family Parastenheliidae Lang, 1936 부요정노벌레과
Genus *Parastenhelia* Thompson and Scott, 1903
부요정노벌레속

13. *Parastenhelia similis* Thompson and Scott, 1903 (Fig. 13) 닮은꼴부요정노벌레 (신칭)
Parastenhelia hornelli Wells and Rao, 1987

Material examined. Korea, Pohang-si, Gupyeong-ri (35°57.351′N, 129°32.799′E); collected from shallow littoral by T Karanovic on 30 March 2013.
Deposition. NIBRIV0000904517.
World distribution. Sri Lanka, Andaman Islands, Mozambique, New Zealand, and Korea.
Diagnosis. Female 0.72 mm long. Genital double somite (Fig. 13A) with small epicopulatory bulb. Principal caudal setae (Fig. 13B) slightly swollen. Antennule (Fig. 13C) short. First endopodal segment of first leg (Fig. 13D) 1.5 times as long as exopod. Third exopodal segment of fourth leg (Fig. 13E) with three inner setae. Exopod of fifth leg (Fig. 13F) ovoid, 1.6 times as long as wide, with strong spinules on both sides.
Remarks. Huys and Mu (2021) revised the family Parastenheliidae globally and reinstated as valid *P. similis*, which was considered for a long time as a junior subjective synonym of *P. hornelli* (see Lang, 1948).

Family Porcellidiidae Boeck, 1865 딱정노벌레과
Genus *Porcellidium* Claus, 1860 딱정노벌레속

14. *Porcellidium zosteraphila* (Harris and Iwasaki, 1996) (Fig. 14) 거머리말딱정노벌레 (신칭)
Kushia zosteraphila Harris and Iwasaki, 1996

Material examined. Pohang-si (35°57.351′N, 129°

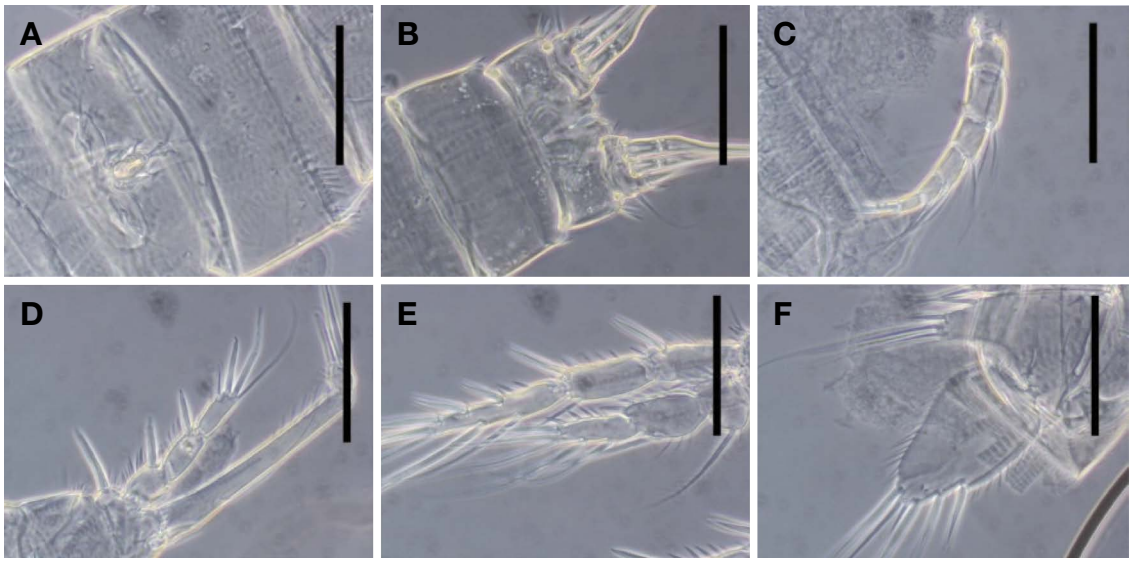

Fig. 13. *Parastenhelia similis* Thompson and Scott, 1903, adult female: A. genital double somite; B. anal somite and caudal rami; C. antennule; D. first swimming leg; E. fourth swimming leg; E. fifth leg. Scales bars = 100 μm.

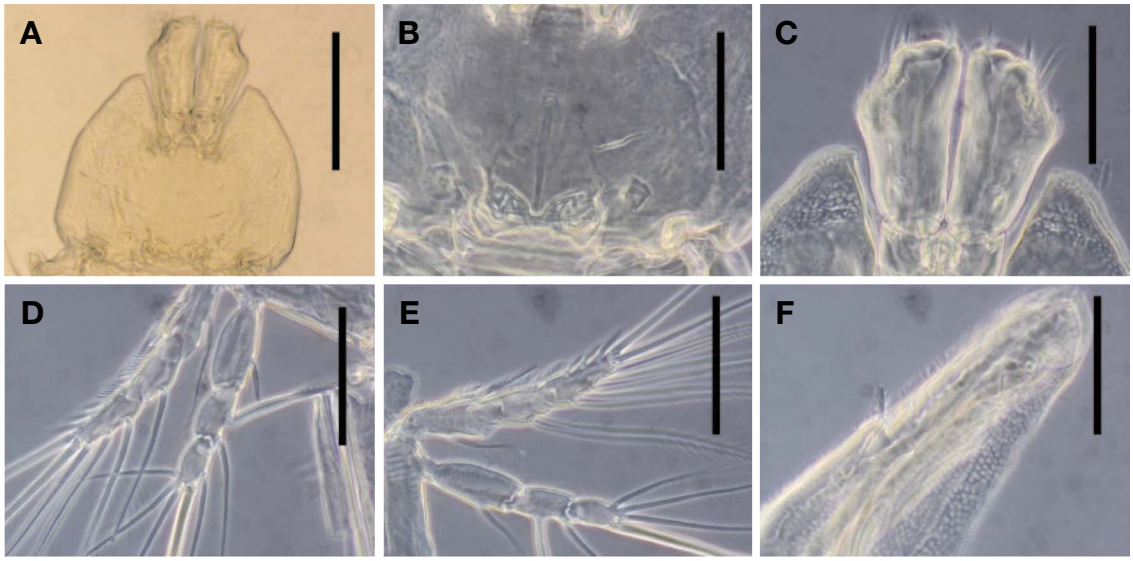

Fig. 14. *Porcellidium zosteraphila* (Harris and Iwasaki, 1996), adult female: A. urosome; B. genital area; C. anal somite and caudal rami; D. third swimming leg; E. fourth swimming leg; F. distal half of fifth leg. Scale bars: A = 200 μm; B–F = 100 μm.

32.799′E), Korea; collected from shallow littoral by T Karanovic on 30 March 2013.

Deposition. NIBRIV0000904518.

World distribution. Japan and Korea.

Diagnosis. Female 0.94 mm long. Posterior apex of urosome (Fig. 14A) not pointed, reaching middle of caudal rami. Copulatory duct (Fig. 14B) narrow. Caudal rami (Fig. 14C) with narrow base and large outer protrusion in distal third. Third endopodal segment of third leg (Fig. 14D) with two inner setae. Third endopodal segment of fourth leg (Fig. 14E) with single inner seta. Fifth leg (Fig. 14F) with strong first dorsal seta.

Remarks. Walker-Smith synonymized the genus *Kushia* with *Porcellidium* (2001). *Porcellidium zosteraphila* is very similar to *P. gamoi* (Harris and Iwasaki, 1996), which was reported from Korea by Kim and Kim (1997) and Lee *et al.* (2012), but the latter is a much larger species and has wider caudal rami, with a prominent lateral bump.

Family Miraciidae Dana, 1846 놀람장수노벌레과

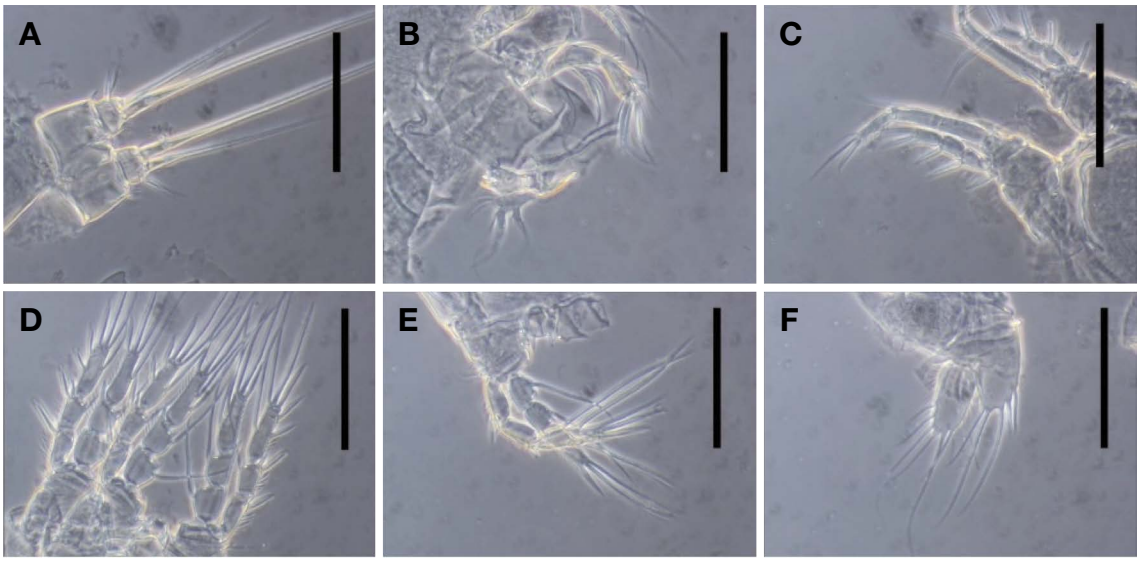

Fig. 15. *Robertgurneyella spinulosa* (Sars, 1911), adult female: A. anal somite and caudal rami; B. antenna (top) and mandible (bottom); C. first swimming legs; D. second and third swimming legs; E. fourth swimming leg; F. fifth leg. Scales bars = 100 μm.

Genus *Robertgurneyella* Gómez, 2020

15. *Robertgurneyella spinulosa* (Sars, 1911) (Fig. 15)
가시로버트장수노벌레 (신칭)
Amphiascus spinulosus Sars, 1911
Robertgurneya spinulosa Lang, 1948

Material examined. Pohang-si (36°2′51″N, 129°45′19.01″E), Korea; collected from shallow littoral by T Karanovic on 30 March 2013.
Deposition. NIBRIV0000904519.
World distribution. Scandinavia, Micronesia, and Korea.
Diagnosis. Female 0.56 mm long. Caudal rami (Fig. 15A) half as long as wide. Second exopodal segment of antenna (Fig. 15B) with one seta. First endopodal segment of first leg (Fig. 15C) 1.2 times as long as exopod. Second to fourth legs (Fig. 15D, E) armature formula (exopod/endopod): 0.1.123/1.1.121; 0.1.123/1.1.221; 0.1.223/1.1.121. Fifth leg (Fig. 15F) with prominent space between two longest setae on baseoendopod; exopod twice as long as wide, with two apical setae on prominent setophores.
Remarks. Described from Norway by Sars (1911), found in Sweden by Lang (1948), and finally in Ifalik Atoll, Micronesia by Vervoort (1964). This is the first record in the Northern Pacific. Gómez (2020) transferred it into a newly established and monotypic genus *Robertgurneyella*.

Class Malacostraca Latreille, 1802 연갑강
Order Amphipoda Latreille, 1816 단각목
Family Talitridae Rafinesque, 1815 도약옆새우과
Genus *Platorchestia* Bousfield, 1982 도약옆새우속



Fig. 16. *Platorchestia platensis* (Krøyer, 1845), male (lateral view). Scale bar = 2 mm.

16. *Platorchestia platensis* (Krøyer, 1845) (Fig. 16)
참도약옆새우
Orchestia platenis Krøyer, 1845
Platorchestia platensi Bousfield, 1982

Material examined. Seosan-si (36°49′N, 126°19′E), 14 May 2009; Incheon-si (37°27′N, 126°21′E), 8 May 2009; Mokpo-si (34°47′N, 126°25′E), 18 March 2010; Sinan-gun (34°04′N, 125°05′E), 4 December 2010; Yeong-gwang-gun (35°21′N, 126°26′E), 17 March 2010; collected by MS Kim.
Deposition. N. A.
World distribution. Atlantic coast and Korea.
Diagnosis. Antenna 1 not reaching end of peduncular



Fig. 17. Photomicrograph of *Nihonotrypaea petalura* (Stimpson, 1860).

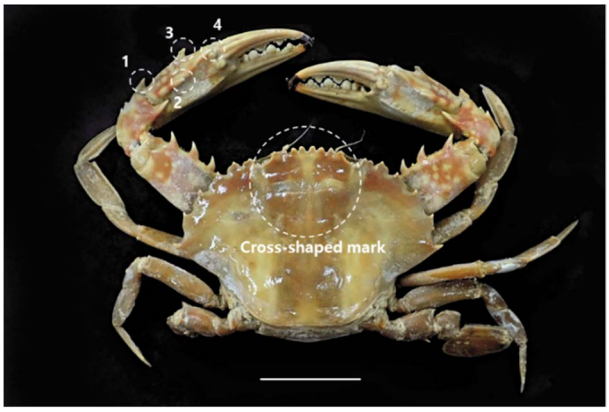

Fig. 18. *Charybdis feriata* (Linnaeus, 1758). Scale bar = 50 mm.

article 4 of antenna 2. Antenna 2 (♂), peduncular articles 4–5 strongly incrassate, with many minute spines. Gnathopod 1 (♂) cuspidactylate and subchelate. Gnathopod 2 (♂), powerfully subchelate; propodus oval in shape, posterior margin marginally bare and palmar margin with two protrusions, these protrusions wide and shallow. Coxal plate 6, anterodistal corner of posterior lobe with process. Pereopod 7 (♂), carpus strongly incrassate.

Order Decapoda 십각목
Family Callianassidae Dana, 1852 쏙붙이과
Genus *Nihonotrypaea* Manning and Tamaki, 1998

17. *Nihonotrypaea petalura* (Stimpson, 1860) (Fig. 17)
가는팔쏙붙이 (신칭)
Callianassa petalura Stimpson, 1860

Material examined. Jejudo (33°20′37.32″N, 126°10′11.69″E), Korea; collected by SH Kim on 12 July 2015.
Deposition. NIBRIV0000905115.
World distribution. China, Japan, North Pacific Ocean (Russia), and Korea.
Diagnosis. Total length of adult female about 42 mm. Rostrum very inconspicuous, overreaches full length of eyes. Cervical groove situated at about posterior one fourth of carapace. Ischium of third maxilliped with a vertical row of spinules and distinct operculum. Carpus of female major cheliped about 2 times as long as high, longer than merus. Palm distinctly longer than high.

Family Portunidae Rafinesque, 1815 꽃게과
Genus *Charybdis* De Haan, 1833 민꽃게속

18. *Charybdis feriata* (Linnaeus, 1758) (Fig. 18)
십자무늬민꽃게 (신칭)
Cancer feriata Linnaeus, 1758

Material examined. Samchunpo-si (34°55′34.78″N, 128°04′22.04″E), Korea: from a fish market; collected by SH Kim on 18 September 2014.
Deposition. NIBRIV0000905116.
World distribution. China, Taiwan, Japan, Australia, India, East Africa, Madagascar, Mediterranean Sea, and Korea.
Diagnosis. Carapace smooth, with cross-shaped light mark. Front with 6 triangular teeth and anterolateral margin with 6 teeth. Chelipeds stout, asymmetrical. Merus armed with 3 strong teeth on anterior margin. Palm with 4 stout spines on outer dorsal margin. Carapace length of the male 95 mm, breadth 125 mm.
Remarks. This specimen found from the fish market in Samchunpo-si. However, it is not clear whether this specimen was directly collected from the South Sea of Korea.

Class Ostracoda Latreille, 1802 패충강
Order Myodocopida Sars, 1866 근병목
Family Cypridinidae Baird, 1850 씨벌레과
Genus *Vargula* Skogsberg, 1920

19. *Vargula ascensus* Kornicker, 1979 (Fig. 19)
고랑볼록부리씨벌레 (신칭)
Vargula ascensus Kornicker, 1979

Material examined. Maemul Island (34°32.007′N, 128°43′54.43″E), Korea; collected by Ho Young Soh on 25 July 2011.
Deposition. NIBRIV0000890421.
GenBank accession No. ORO21935 for 16S rDNA.
World distribution. Australia, New Zealand, and Korea
Diagnosis. Carapace oval in lateral view with well-defined incisur and narrow-to-elongate caudal process; caudal process low (below incisur), and shaped as triangular curved point, present of infold teeth. Surface smooth and without ornamentation. Lateral eye well-developed with ommatidia.

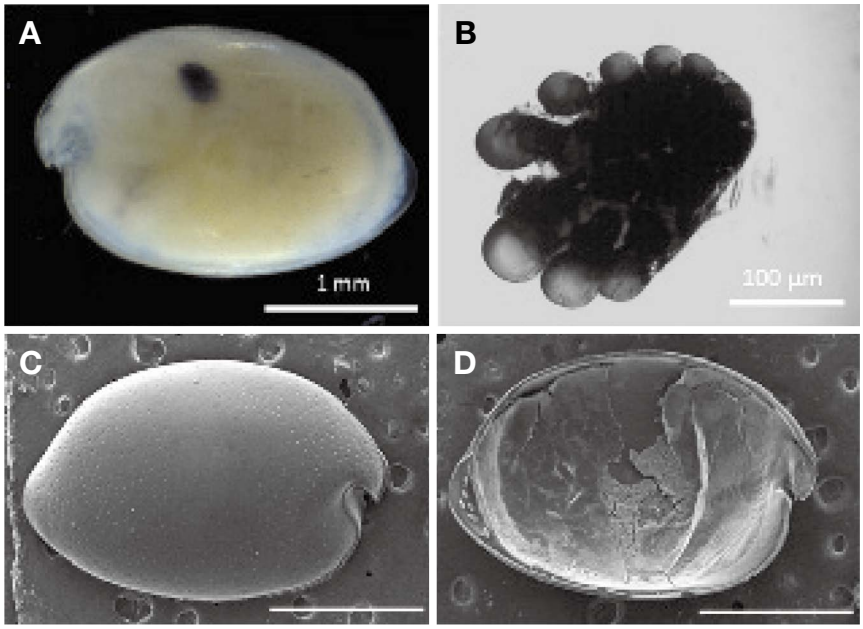

Fig. 19. Microscopic and SEM photos of *Vargula ascensus* Kornicker, 1979, adult female. A. lateral view from right view; B. lateral eye; C. external view from left view; D. Internal view. Scale bars: A, C, D = 1 mm, B = 100 μm.

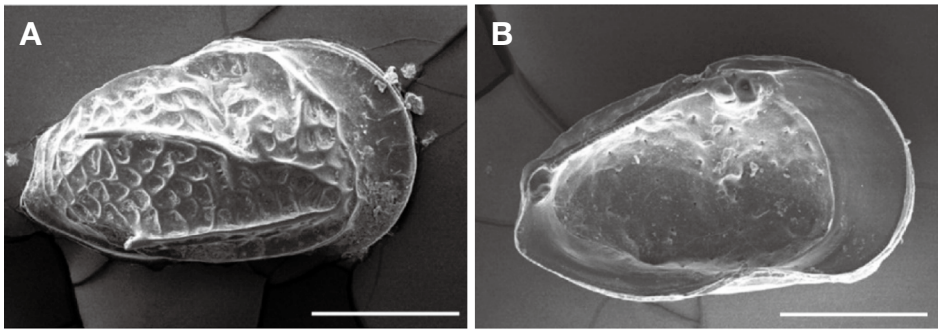

Fig. 20. SEM images of *Spinileberis quadriaculeata*. A. right valve, outside view; B. Left valve, inside view. Scale bars = 200 μm.

Remarks. The specimen is smaller (2.1–2.3 mm) than *V. ascensus* Kornicker 1979 (2.64 mm), with a notable difference being the number of ommatidia in their lateral eyes: *V. ascensus* has four (two larger ventral ommatidia), while *V. ascensus* cf. in Korea has at least nine.

Order Podocopida Sars, 1866 절병목
Family Cytheridae Baird, 1850 얇은씨벌레과
Genus *Spinileberis* Hanai, 1961

20. *Spinileberis quadriaculeata* (Brady, 1880) (Fig. 20)
새로운사각점박이스피니레베리스씨벌레 (신칭)
Cythere quadriaculeata Brady, 1880

Material examined. Wando-gun (34°11′N, 126°33′E), Korea; collected by HS Yoo on 24 September 2011.

Deposition. NIBRIV0000901009.
World distribution. China, Japan, USA, and Korea.
Diagnosis. Carapace covered with coarse reticulation, except on the anterior and posterior marginal zones. Four strong ridges present. Central ridge and ventral ridge have a spine at posterior end. Calcified inner lamella relatively broad.

Family Loxoconchidae Sars, 1925 경사씨벌레과
Genus *Loxoconcha* Sars, 1866

21. *Loxoconcha taiwanensis* Zhao, 1988 (Fig. 21)
타이완경사씨벌레

Material examined. Seongsan, Jejudo (33°27′N, 126°56′E), Korea; by washing seaweeds; collected by Anna

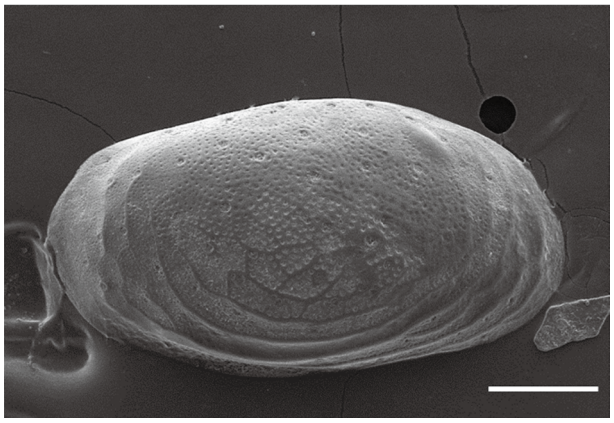

Fig. 21. SEM image of *Loxoconcha taiwanensis* Zhao, 1988. Scale bar = 150 μm.

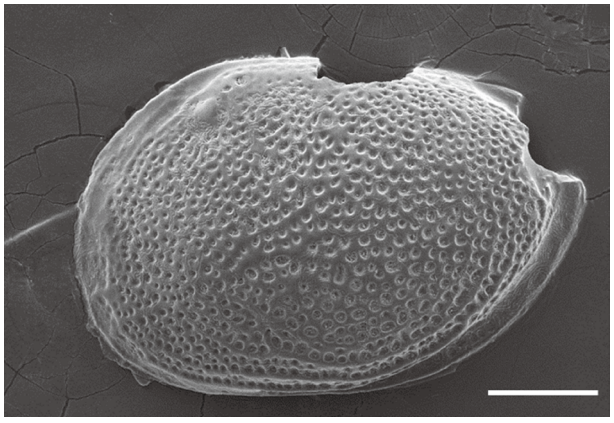

Fig. 22. SEM image of *Loxoconcha viva* Ishizaki, 1968. Scale bar = 150 μm.

Beata Jöst on 20 August 2018.
Deposition. NIBRIV0000901019.
World distribution. Taiwan and Korea.
Diagnosis. Carapace outline elliptical compressed in lateral outline; lateral surface punctate with wide-spread pits around mid-dorsal area and ventral ridges merging into a median reticulation pattern; broad posterior flange; anterior flange narrower.
Remarks. *Loxoconcha taiwanensis* differs from *L. puchra* by elliptical, elongated valves with very fine pits.

22. *Loxoconcha viva* Ishizaki, 1968 (Fig. 22)
비바경사씨벌레 (신칭)
Loxoconcha viva Ishizaki, 1968

Material examined. Seongsan, Jejudo (33°27′13″N, 126°56′45″E), Korea; collected by Anna Beata Jöst on 20 August 2018.
Deposition. NIBRIV0000901020.
World distribution. Japan and Korea.
Diagnosis. Carapace outline subovoid in lateral view; lateral surface finely pitted; posterior and anterior flanges smooth; prominent eye spot.
Remarks. *Loxoconcha viva* differs from *L. puchra* by having a strongly developed fringe on the postero-ventral margin and lacks a few ridges on the anterior part of the carapace.

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