

Six species of the ostracod families Loxoconchidae and Cushmanideidae from South Korea

Hyunsu Yoo and Ivana Karanovic*

Department of Life Science, College of Natural Sciences, Hanyang University, Seoul 04763, Republic of Korea

*Correspondent: ivana@hanyang.ac.kr

Three *Loxoconcha* Sars, 1866 (*L. bizenensis* Okubo, 1980, *L. japonica* Ishizaki, 1968, and *L. tosaensis* Ishizaki, 1968), one *Loxocorniculum* Benson and Coleman, 1963 (*Lc. mutsuense* Ishizaki, 1971), and two *Pontocythere* Dubowsky, 1939 (*P. miurensis* (Hanai, 1959), and *P. xiphoidea* Nakao and Tsukagoshi, 2002) species are briefly redescribed and illustrated. Soft part morphology of *L. tosaensis* are described and illustrated here for the first time, since this species was known only by the shell morphology. A key to all living *Loxoconcha* and *Loxocorniculum* species from East Asia is suggested to facilitate subsequent identification, along with the lists to all East Asian species of the three genera.

Keywords: East Asia, *Loxoconcha*, *Loxocorniculum*, *Pontocythere*, species list, taxonomic key

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INTRODUCTION

Loxoconchidae is a diverse family with 36 described genera (see Brandão *et al.*, 2018). Most of its numerous representatives belong to the genus *Loxoconcha* Sars, 1866, which, according to Le *et al.* (2016), accounts for over 200 living and over 300 fossil species. The genus has a worldwide distribution, and 85 species have been recorded in East Asia (Tanaka and Ikeya, 2002). Of these East Asian species, a majority were described from Japan and China and, with the exception of a few representatives, most species are known only from their shell morphology. *Loxoconcha* was not only studied from the taxonomic and diversity points of view, but also looking at its ontogenetic development (Smith and Akira, 2005) and, more specifically, ontogenetic development of its maxillula (Le *et al.*, 2016). There were several attempts to revise the genus, the most notable one done by Tanaka and Ikeya (2002) who divided *Loxoconcha* into five species groups based on carapace morphology. Tohru *et al.* (2005) divided the genus into two species groups based on the distribution of the shell surface pores, while Le and Tsukagoshi (2014) added one more species group. However, all these divisions encompassed only Japanese and/or East Asian *Loxoconcha*. A numerous *Loxoconcha* species have been reported from Korea. Lee *et al.* (2000) provided a list of more than 500 ostracods collected during an environmental survey from around Korea, but no taxo-

nomic description or illustrations accompanied these records. A total of 23 species were attributed to *Loxoconcha*, but only 10 were named: *L. chinzeii* Ikeya and Zhou, 1992; *L. harimensis* Okubo, 1980; *L. hattori* Ishizaki, 1977; *L. japonica* Ishizaki, 1968; *L. laeta* Ishizaki, 1968; *L. cf. ozawai* Tabuki, 1986; *L. tosaensis* Ishizaki, 1968; *L. cf. tosaensis* Ishizaki, 1968; *L. uranouchiensis* Ishizaki, 1968; *L. cf. uranoushiensis* Ishizaki, 1968. Recently, Karanovic *et al.* (2017) reported *L. pulchra* Ishizaki, 1969 from Korea and provided a brief redescription along with detailed SEM photographs and drawings of the soft parts.

Loxocorniculum Benson and Coleman, 1963 is very closely related to *Loxoconcha*, and the only difference between the two genera is the presence of hornlike protuberances postero-dorsally *Loxoconcha*. The validity of *Loxocorniculum* has been questioned (Tohru *et al.*, 2005) based on the shell characteristics. Currently there are 30 species in the genus around the world (Brandão *et al.*, 2018), but soft parts were described for only four species, including *L. mutsuense* Ishizaki, 1971, a species described and redescribed from Japan (Okubo, 1980) and only reported from Korea (see the list in Lee *et al.*, 2000). Soft part morphology of *Loxocorniculum* species further supports validity of the genus.

In comparison to Loxoconchidae, the family Cushmanideidae is not so diverse, including only three genera (*Cushmanidea* Blake, 1933; *Hulingsina* Puri, 1958; *Pontocythere* Dubowsky, 1939) and about 100 species (Bran-

ção *et al.*, 2018). Similarly, to Loxoconchidae, Cushmaniidae is mostly known based on shell morphology of species. *Pontocythere* is the most specious genus within the family with about 20 species reported from East Asia. Kim and Park (1980) reported three species (*P. miurensis* (Hanai, 1959); *P. japonica* (Hanai, 1959); and *P. subjaponica* Hanai, 1959) but without any taxonomic descriptions or illustrations. Lee *et al.* (2000) listed nine *Pontocythere* species from Korea, six of which were named (*P. japonica*; *P. kashiwarensis* (Hanai, 1959); *P. minuta* Ikeya and Hanai, 1982; *P. cf. sekiguchii* Ikeya and Hanai, 1982; *P. spatiosa* Hou, 1982; *P. subjaponica*).

In this paper we provide brief redescrptions and illustrations of the following Loxoconchidae and Cushmaniidae species: *Loxoconcha bizenensis* Okubo, 1980, *L. japonica*, *L. tosaensis*, *Loxocorniculum mutsuense*, *Pontocythere miurensis*, and *P. xiphoidea* Nakao and Tsuka-

goshi, 2002. *Loxoconcha tosaensis* was so far known only from its shell morphology and this is the first time its soft parts have been described. In order to facilitate further identification of the growing number of *Loxoconcha* and *Loxocorniculum* species from East Asia which are known from both soft parts and the shell, we provide a taxonomic key. In addition, lists of 61 species of *Loxoconcha*, one species of *Loxocorniculum*, and 19 species of *Pontocythere* from East Asia are included.

MATERIALS AND METHODS

Samples were collected either from shallow, littoral regions reaching from the shore, or from the beach interstitial following Karaman and Chappuis method (Karaman, 1935; Chappuis, 1942). In both cases water was fil-

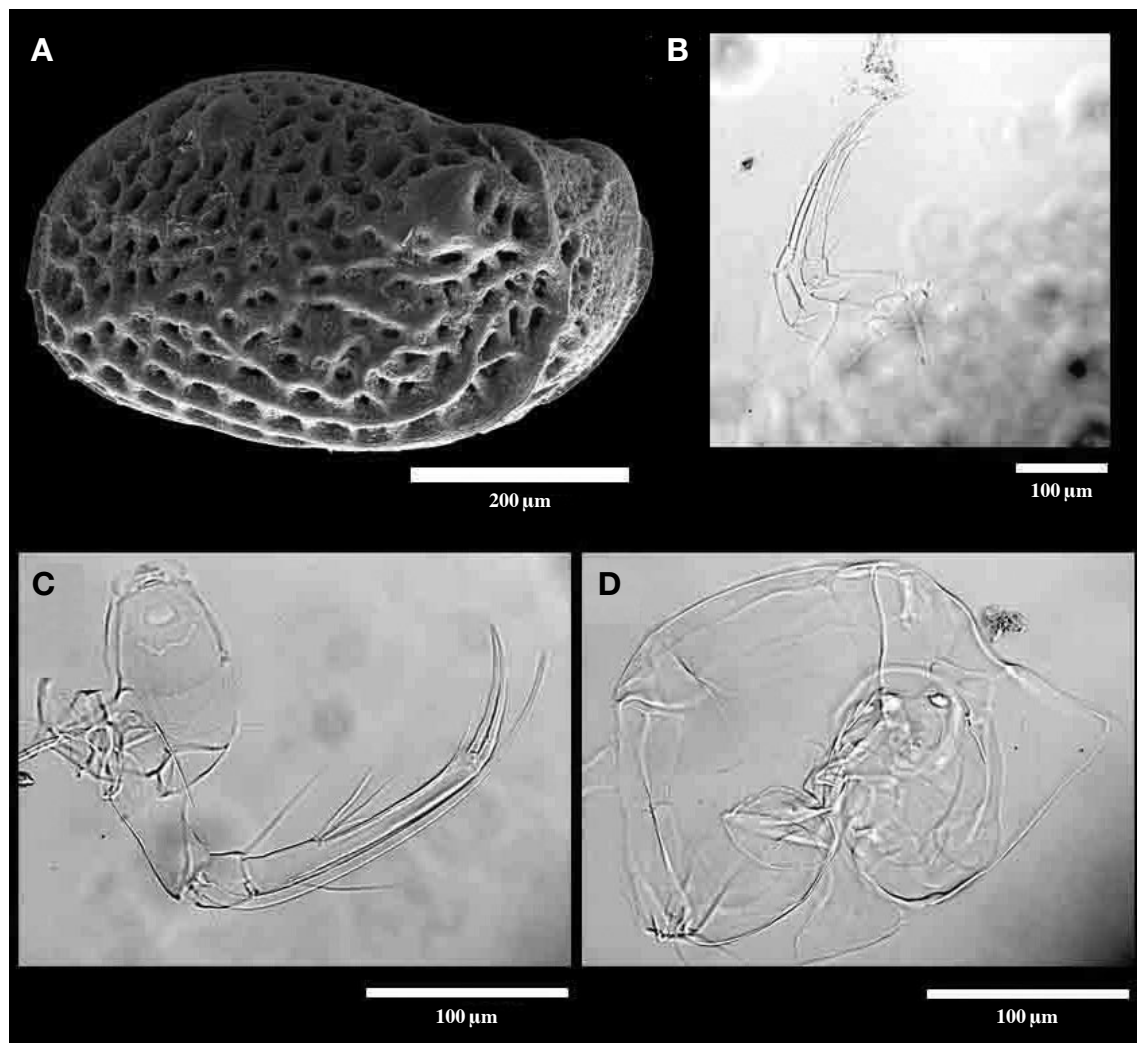


Fig. 1. *Loxoconcha bizenensis* Okubo, 1980. Male. A, Left valve; B, Antennule and Antenna; C, Antenna (High magnification); D, Male copulatory organ.

tered through a plankton hand net (mesh size 100 μm). Samples were fixed in 99% Et-OH. Sorting was done under a stereomicroscope (Olympus SZX12) in the Biodiversity Laboratory at Hanyang University. Specimens were dissected and soft parts mounted on slides in CMC-10 Mounting Media (Masters Company, Inc.), while carapaces were kept on the micropaleontology slides or mounted on SEM stubs. All drawings were prepared using a drawing tube attached onto a Olympus BX51. For SEM, carapaces were coated with Platinum. SEM photographs were taken at Eulji University with a Hitachi S-4700 scanning electron microscope. Photographs of soft parts were taken using a stereomicroscope (Leica DM2500) connected camera (LMF275). Materials were deposited in the invertebrate collection of the National Institute of Biological Resources (Korea).

SYSTEMATICS

Class Ostracoda Latreille, 1802
 Subclass Podocopa Sars, 1866
 Order Podocopida Sars, 1866
 Superfamily Cytheroidea Baird, 1850
 Family Loxoconchidae Sars, 1925
 Genus *Loxoconcha* Sars, 1866

1. *Loxoconcha bizenensis* Okubo, 1980 (Fig. 1)

Synonymy

Loxoconcha bizenensis sp. nov. - Okubo (1980): p. 418, Figs. 14, 18e-j.

Material examined. One male dissected on slide (NIBR IV0000813442), shell of on micropalaeontology slide (NIBRIV0000813442).

Locality in Korea. Jeollanam-do, Jindo-gun, littoral, 34° 24.678'N 126° 19.415'E, 04/04/2012, coll. I. Karanovic.

Identifier. Ivana Karanovic.

Diagnosis. Small ostracod, less than 1 mm long (Fig. 1A). Dorsal margin sinusoid, with greatest height in front of middle. One small hump present anteriorly to caudal process. Posterior margin rounded but with one caudal process terminated at 2/3 of height. Anterior margin rounded. Ventral margin convex and steeply passing into posterior margin. Valves slightly asymmetrical. Surface irregularly reticulated with two ventral ridges. Except for clearly present bulge in eye region, one more smooth bulge posteriorly. Marginal zone with long, straight canals. Hinge of *Loxoconcha* type (gongylodont). Antennula slender 6-segmented all setae thin (Fig. 1B). Antenna 4-segmented with two distal claws (Fig. 1C). Hemipenis robust (Fig. 1D) with broad triangular distal lobe and proximally with additional triangular process tucked closely to distal pro-

cess.

Distribution. According to Okubo (1980), the species is common in the intertidal zones of rocky shores in the Inland Sea in Japan. This is the first report for Korea.

Remarks. There are a few differences between the original description and our record: the posterior smooth bulge on the shell seems not to be present in the Japanese populations. Contrary to the original description we only detected two (instead of three) ventral ridges on the shell. However, Okubo (1980) did not provide any SEM photographs, therefore the posterior bulge might have been overlooked. Our identification was primarily based on the similarity in hemipenis between Japanese and Korean populations. According to Tanaka and Ikeya (2002) *L. bizenensis* belongs to the *ozawai* species group.

2. *Loxoconcha japonica* Ishizaki, 1968 (Fig. 2)

Synonymy

Loxoconcha japonica sp. nov. - Ishizaki (1968): p. 28, Pl. 2, Fig. 1; Pl. 6, Figs. 10-12.

Loxoconcha japonica Ishizaki - Ishizaki (1971): p. 86, Pl. 3, Fig. 21; Okubo (1980): p. 416, Figs. 12, 13, 18a-d; Paik and Lee (1988): Pl. 3, Fig. 17; Tohru *et al.* (2005): Fig. 1A.

Material examined. One female dissected on slide (NIBR IV0000813441), shell of on micropalaeontology slide (NIBRIV0000813441).

Locality in Korea. Gyeongsangnam-do, Goseong-gun, littoral, 34° 59.629'N 128° 26.201'E, 04/04/2012, coll. I. Karanovic.

Identifier. Ivana Karanovic.

Diagnosis (female only). Small ostracod, less than 1 mm long (Fig. 2A, B). Dorsal margin broadly rounded. Posterior margin rounded but with one clear caudal process terminated at 2/3 of height. Anterior margin rounded, and narrower than posterior one. Ventral margin straight to slightly concave. Valves not asymmetrical. Surface regularly reticulated. Marginal zone with long, straight canals. Hinge of *Loxoconcha* type (gongylodont). Antennula slender 6-segmented (Fig. 2C); all setae thin. Antenna 4-segmented with two distal claws (Fig. 2B).

Distribution. Species has been recorded throughout Japan. Paik and Lee (1988) also reported this species from Plio-Pleistocene deposits from Korea. Beside Okubo (1980) this is the second report of the species soft parts.

Remarks. The identification was based only on female specimens, because males have not been collected. Nevertheless, there are no significant differences between the original description and illustrations and our current record. This species belongs to the *japonica* species group (Tanaka and Ikeya, 2002).

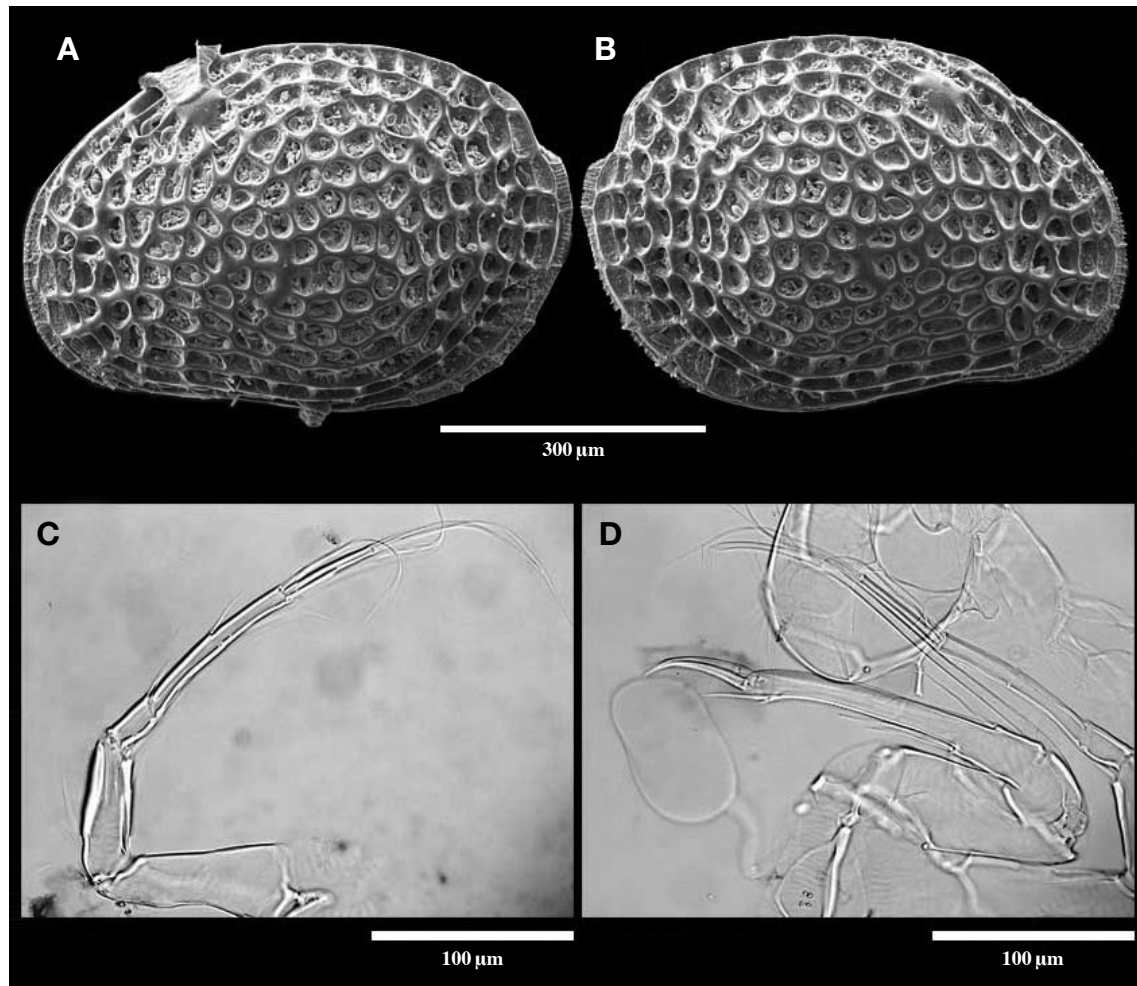


Fig. 2. *Loxoconcha japonica* Ishizaki, 1968. Female. A, Left valve; B, Right valve; C, Antennule; D, Antenna.

3. *Loxoconcha tosaensis* Ishizaki, 1968 (Figs. 3-5)

Synonymy

Loxoconcha tosaensis sp. nov. - Ishizaki (1968): p. 31, Pl. 2, Fig. 3; Pl. 7, Figs. 6-9.

Loxoconcha tosaensis Ishizaki - Ishizaki (1971): p. 87, Pl. 3, Fig. 18; Tohru *et al.* (2005): Fig. 1G; Yasuhara and Seto (2006): Fig. 4m.

Material examined. One male dissected on slide (NIBR IV0000813449), shell of on micropalaeontology slide (NIBRIV0000813449).

Locality in Korea. Jeollanam-do, Goheung-gun, littoral close to Naro Space Center, 34°27.348'N 127°31.216'E, 18/08/2013, coll. I. Karanovic.

Identifier. Ivana Karanovic.

Diagnosis (male only). Small ostracod, less than 1 mm long (Fig. 3A, B). In lateral view, carapace oblong, slightly depressed antero-dorsally. Dorsal margin straight. Ventral margin straight to slightly convex around mouth region. Anterior margin broadly rounded. Posterior margin

closes down on dorsal margin with angle; but no prominent caudal process. Surface ornamented with relatively regular coarse reticulation throughout. Eye tubercle distinct. Hinge of *Loxoconcha* type (gongyodont). Antennula 5-segmented with slender segments. Antenna 4-segmented: first segment carrying only spinneret seta (exopod), second segment with one postero-distally reaching middle of the following segment. Penultimate segment with two setae situated anteriorly on one third of segment's length, and three setae postero-medially, slightly below external setae, penultimate segment also carrying two short setae postero-distally; terminal segment with two claws (Fig. 5B). Mandibula (Fig. 4A) with two claws and two setae on terminal segment. Mandibular exopod with three setae. Vibratory plate of maxillula with 15 rays; maxillular palp 2-segmented, first segment carrying three setae; terminal segment elongated and with four setae. All maxillular endites with four setae, and third one in addition with one very thick seta situated proximally. Hemipenis (Fig. 5A) with triangular distal part and one

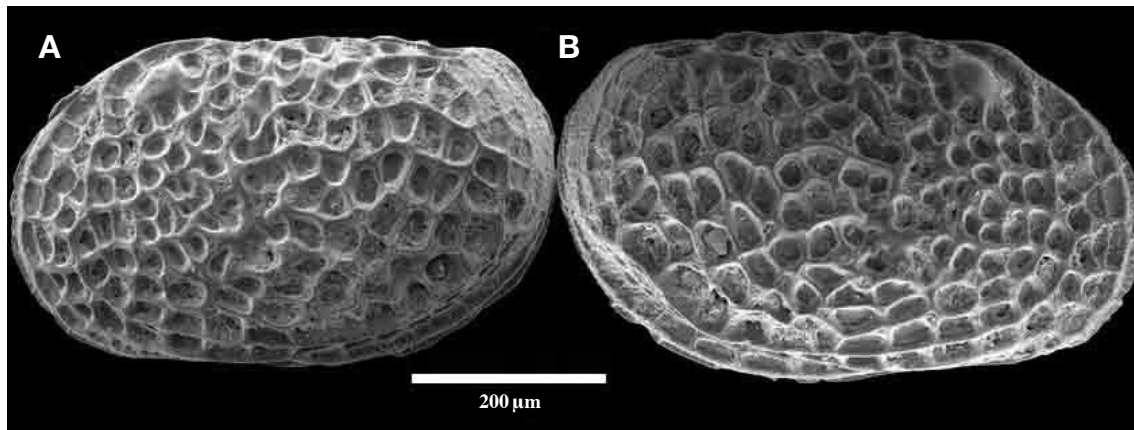


Fig. 3. *Loxoconcha tosaensis* Ishizaki, 1968. A, SEM photograph of Male left carapace; B, Right carapace.

additional lateral projection being very similar in shape like distal part; clasping organ withheld internally and in rod-like shape.

Distribution. Species has been reported from Japan, and it was known only from its shell. This is the first report of soft parts.

Remarks. This is the first description of the soft parts of *L. tosaensis*. It belongs to the *uranouchiensis*-species group (Tanaka and Ikeya, 2002).

Genus *Loxocorniculum* Benson and Coleman, 1963

4. *Loxocorniculum mutsuense* Ishizaki, 1971 (Fig. 6)

Synonymy

Loxocorniculum mutsuensis sp. nov. - Ishizaki (1971): p. 89, Pl. 5, Fig. 11, Pl. 6, Figs. 3, 6, 7, Pl. 7, Fig. 5.

Loxocorniculum mutsuense Ishizaki - Hanai *et al.* (1977): p. 65; Okubo (1980): p. 424, Figs. 17, 20; Tohru *et al.* (2005): Fig. 1Q.

Material examined. One male dissected on slide (NIBR IV0000831180), shell of on micropalaeontology slide (NIBRIV0000831180).

Locality in Korea. Jeollanam-do, Boseong-gun, interstitial, 34°40.172'N 127°05.424'E, 17/08/2013, coll. I. Karanovic.

Identifier. Ivana Karanovic.

Diagnosis. Small ostracod, less than 1 mm long (Fig. 6A, B). Carapace sexually dimorphic, males more elongated. Left and right valve similar. Trapezoidal in lateral views, greatest height situated anteriorly. Dorsal margin straight. Anterior margin broadly and obliquely rounded, forming cardinal angle with dorsal margin. Posterior margin narrowly rounded, slightly projecting toward postero-dorsal area. Ventral margin slightly sinuated. Surface pitted. Five ridges on surface: two anterior and three posterior; postero-dorsal one terminating in horn-like protuberance.

Eye tubercle prominent. Hinge of *Loxoconcha* type (gonygodont). Antennula 5-segmented with ancestral segments four and five fused (Fig. 6C). Antenna 4-segmented with two distal claws (Fig. 6D). Hemipenis subtriangular, anterior process narrowly triangular and with one clearly visible strongly sclerified copulatory process, in shape of upward turned hook (Fig. 6D).

Distribution. Species has been reported from Japan (Okubo, 1980), Russia (Schornikov, 2006). This is the first record for Korea.

List of East Asian *Loxoconcha* and *Loxocorniculum* species (*-species with described soft parts; K-species reported from South Korea)

1. *Loxoconcha alata* Brady, 1868
2. *Loxoconcha binhaiensis* Hou, 1982
3. *Loxoconcha bispinosa* Hu, 1981
4. *Loxoconcha bizenensis**^K Okubo, 1980
5. *Loxoconcha brevia* Hu, 1984
6. *Loxoconcha chinzeii* Ikeya and Zhou, 1992
7. *Loxoconcha crassella* Hu, 1984
8. *Loxoconcha crispatum* (Hu, 1978)
9. *Loxoconcha ellipitica* Brady, 1868
10. *Loxoconcha epeterseni* Ishizaki, 1981
11. *Loxoconcha fujianensis* Zheng, 1987
12. *Loxoconcha gigantea* Gou, 1981
13. *Loxoconcha hanachirusato* Yajima, 1982
14. *Loxoconcha harimensis**^K Okubo, 1980
15. *Loxoconcha hataii* Ishizaki, 1963
16. *Loxoconcha hattorii* Ishizaki, 1971
17. *Loxoconcha hemicrenulata* Ho, 1982
18. *Loxoconcha ikeyai* Zhou, 1995
19. *Loxoconcha japonica**^K Ishizaki, 1968
20. *Loxoconcha kamiyai* Ozawa and Ishii, 2008
21. *Loxoconcha kattoi**^K Ishizaki, 1969
22. *Loxoconcha kitanipponica* Ishizaki, 1971
23. *Loxoconcha kosugii** Nakao and Tsukagoshi, 2002

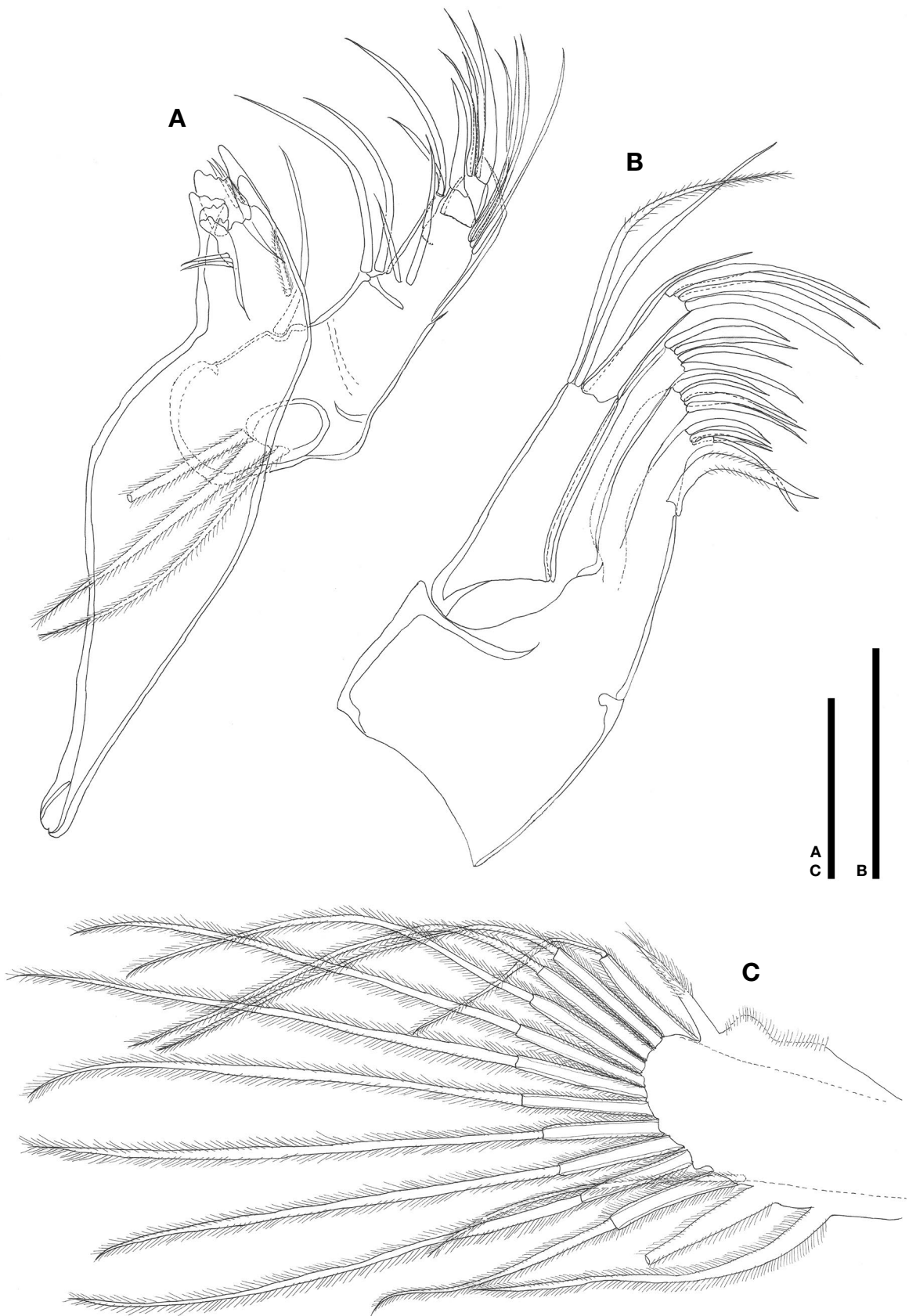


Fig. 4. *L. tosaensis* Ishizaki, 1968. A, Mandibula; B, Maxillua; C, Vibratory organ; All scale bars are 50 μ m.

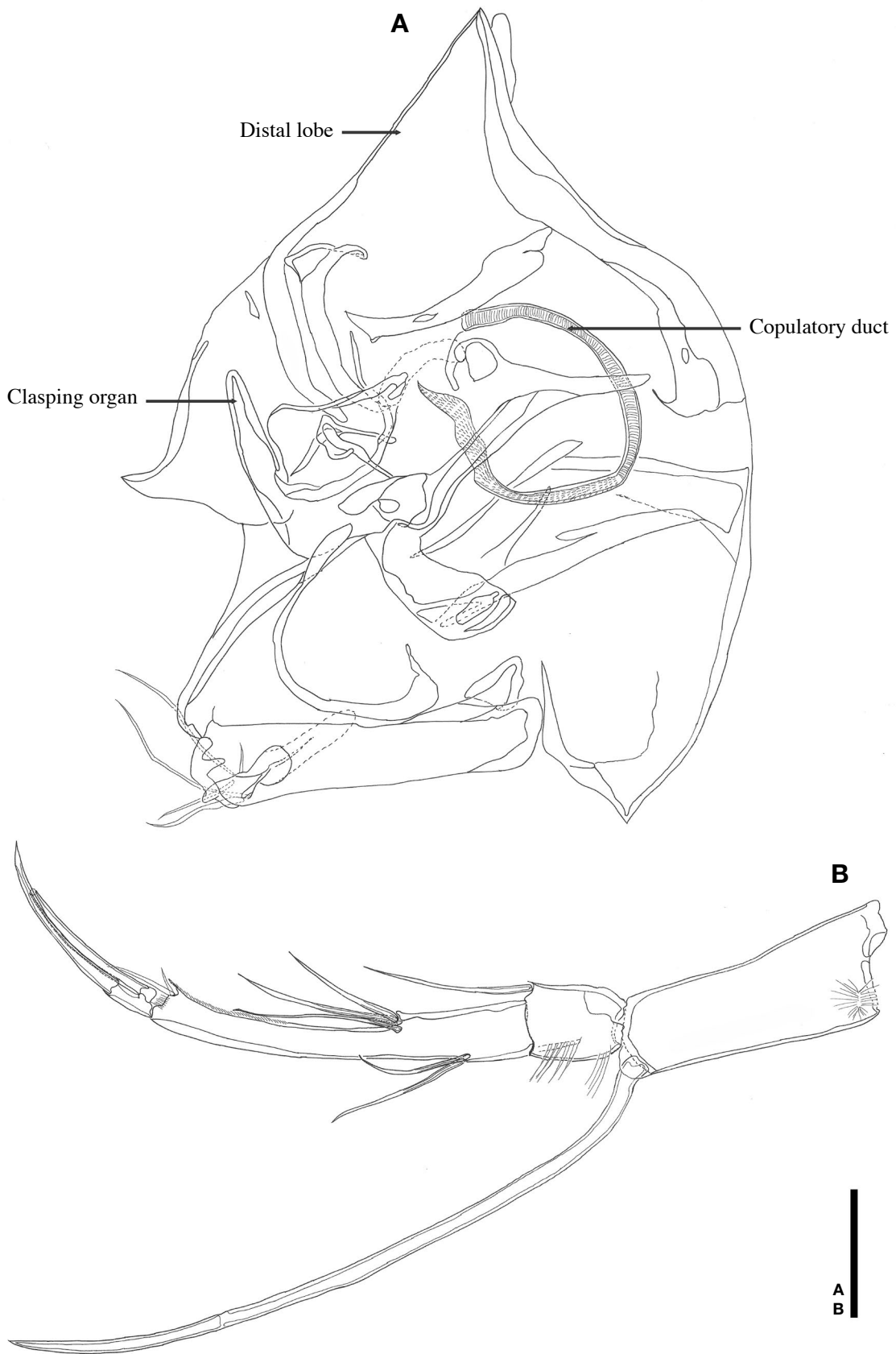


Fig. 5. *L. tosaensis* Ishizaki, 1968. A, Male copulatory organ; B, Antenna; Scale bar is 50 μ m.

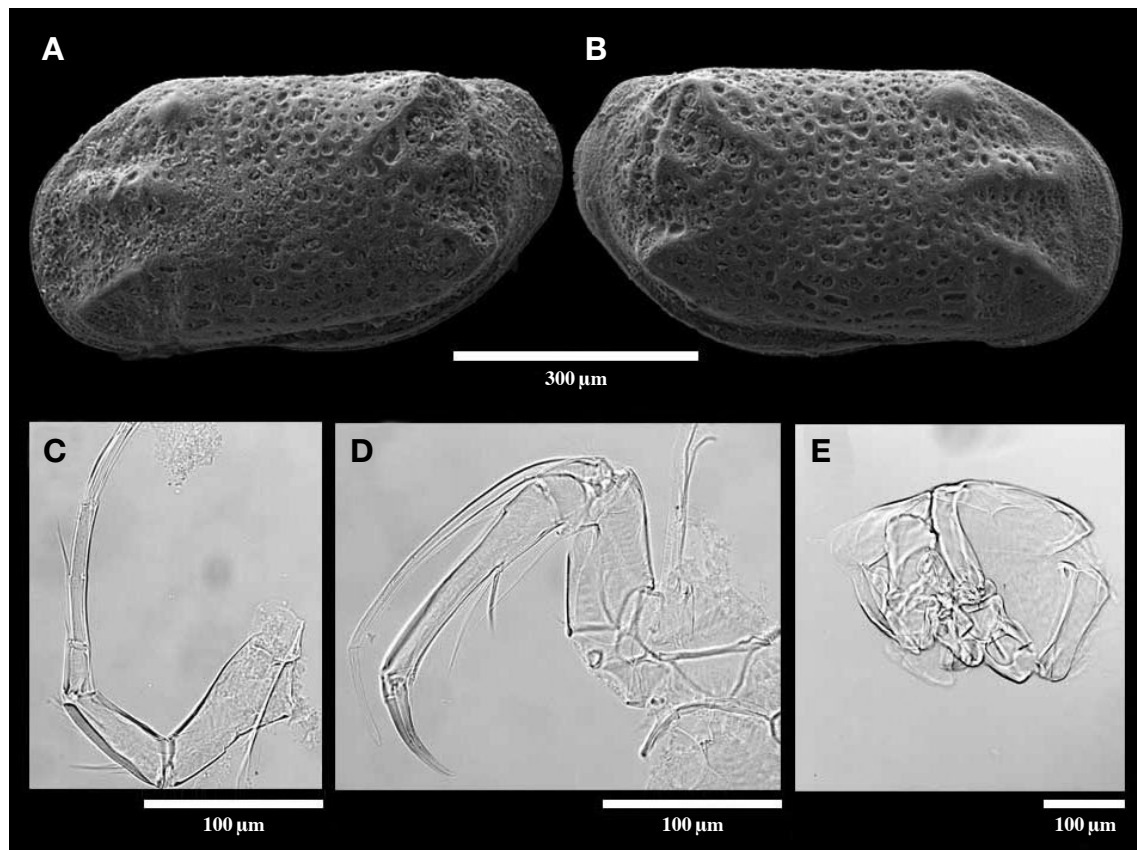


Fig. 6. *Loxocorniculum mutsuense* Ishizaki, 1971. Male. A, Left valve; B, Right valve; C, Antennule; D, Antenna; E, Copulatory organ.

24. *Loxoconcha laeta*^K Ishizaki, 1968
 25. *Loxoconcha lilljeborgii** (Brady, 1868)
 26. *Loxoconcha malayensis* Zhao, 1989
 27. *Loxoconcha modesta* Ishizaki, 1968
 28. *Loxoconcha noharai** Dung and Tsukagoshi, 2014
 29. *Loxoconcha nozokiensis* Ishizaki, 1963
 30. *Loxoconcha ocellata* Bold, 1973
 31. *Loxoconcha optima*^K Ishizaki, 1968
 32. *Loxoconcha orientalis* Hu, 1978
 33. *Loxoconcha ozawai* Tabuki, 1986
 34. *Loxoconcha paiki* Whatley and Zhao, 1988
 35. *Loxoconcha pashihaiensis* Hu, 1979
 36. *Loxoconcha pleistocenica* Hu, 1978
 37. *Loxoconcha prolaeta* Zhou, 1995
 38. *Loxoconcha pulchra**^K Ishizaki, 1968
 39. *Loxoconcha santosi** Dung and Tsukagoshi, 2014
 40. *Loxoconcha sesokoensis** Dung and Tsukagoshi, 2014
 41. *Loxoconcha shanhaiensis** Hu, 1981
 42. *Loxoconcha sinensis* Brady, 1869
 43. *Loxoconcha subcirculata* Gou, 1981
 44. *Loxoconcha subkotoriforma* Ishizaki, 1966
 45. *Loxoconcha subpulchra* Ho, 1982
 46. *Loxoconcha taiwanensis* Zhao and Whatley, 1981
 47. *Loxoconcha tamakazura* Yajima, 1982
 48. *Loxoconcha tarda* Guan, 1978
 49. *Loxoconcha tarta* Hu, 1978
 50. *Loxoconcha tata* Hu, 1978
 51. *Loxoconcha tosaensis**^K Ishizaki, 1968
 52. *Loxoconcha tosamodesta* Ishizaki, 1981
 53. *Loxoconcha triconicula* Zhao and Whatley, 1989
 54. *Loxoconcha tumulosa* (Hu, 1979)
 55. *Loxoconcha uranouchiensis** Ishizaki, 1968
 56. *Loxoconcha ventospina* Zheng, 1987
 57. *Loxoconcha viva* Ishizaki, 1968
 58. *Loxoconcha xuwenensis* Zheng, 1983
 59. *Loxoconcha yinggehaiensis* (Tanaka and Ikeya, 2002)
 60. *Loxoconcha zamia* (Ishizaki, 1968)
 61. *Loxoconcha zhejiangensis* Zhao, 1984
 62. *Loxocorniculum mutsuense**^K Ishizaki, 1971

Key to East Asian *Loxoconcha* and *Loxocorniculum* species with described soft parts
 (Modified after Okubo, 1980)

1. Valves reticulated 2
 – Valves pitted 12
 2. Greatest height situated behind the middle 3

- Greatest height situated medially or in front of the middle 5
- 3. Distal lobe of the hemipenis in the shape of an equilateral triangle *L. lilljeborgii*
- Distal lobe of the hemipenis not in the shape of equilateral triangle, but with elongated ventral margin 4
- 4. Tip of the distal lobe filamentous *L. shanghaiensis*
- Tip of the distal lobe pointed *L. japonica*
- 5. Valve with ventral wing-like ridge ventrally *L. harimensis*
- Valve without ventral wing-like ridge ventrally 6
- 6. Dorsal margin of the valves almost straight in lateral view, especially in males 7
- Dorsal margin rather sinusoid *L. bizenensis*
- 7. In males height to length ration of the shell does not exceed 50% 8
- In males height to length ratio of the shell over 60% *L. tosaensis*
- 8. Terminal segment of mandibular palp with four setae/claws 9
- Terminal segment of mandibular palp with 5 setae (one small and plumose, 4 longer and simple) *L. kosugii*

- 9. Terminal segment of mandibular palp with four simple setae 10
- Terminal segment of mandibular palp with two claws and 2 setae *L. uranouchiensis*
- 10. Tip of the distal lobe of hemipenis rounded 11
- Tip of the distal lobe ending with thin, elongated, finger-like projection *L. sesokoensis*
- 11. Third thoracopod much larger and longer than first and second thoracopod *L. santosi*
- Third thoracopod not much larger and longer than first and second thoracopod *L. noharai*
- 12. Valve without lateral ridges *L. pulchra*
- Valves with three posterior and two anterior ridges *Loxocorniculum mutsuense*

Family Cushmanideidae Puri, 1974
 Genus *Pontocythere* Dubovsky, 1939

5. *Pontocythere miurensis* (Hanai, 1959) (Fig. 7)

Synonymy

Cushmanidea miurensis sp. nov. - Hanai (1959): p. 299, Pl. 16, Figs. 7-10.
Cushmanidea miurensis Hanai - Hanai (1961): Fig. 4A.
Cushmanidea subjaponica Hanai - Okubo (1977): p. 135,

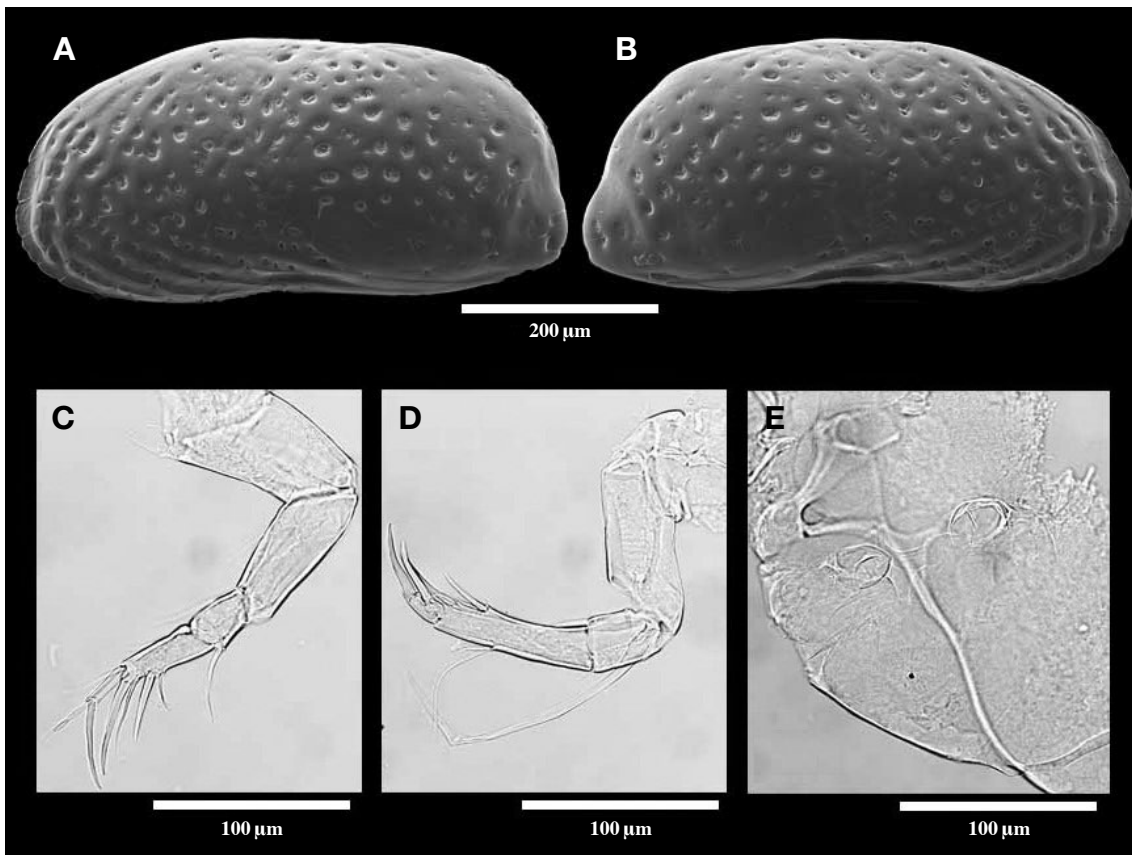


Fig. 7. *Pontocythere miurensis* (Hanai, 1959). Female. A, Left valve; B, Right valve; C, Antennule; D, Antenna; E, Copulatory organ.

Figs. 2, 3.

Pontocythere subjaponica Hanai - Kamiya and Nakagawa (1993): Pl. 1 Figs. 7, 8.

Pontocythere miurensis (Hanai) comb. nov. - Hanai *et al.* (1977): p. 25.

Pontocythere miurensis (Hanai) - Nakao and Tsukagoshi (2002): p. 76, Fig. 5A-D.

Material examined. One female dissected on slide (NIBR IV0000831179), shell of on micropalaeontology slide (NIBRIV0000831179).

Locality in Korea. Gyeongsangnam-do, Goseong-gun, littoral, 34°59.629'N 128°26.198'E, 31/03/2013, coll. I. Karanovic.

Identifier. Ivana Karanovic.

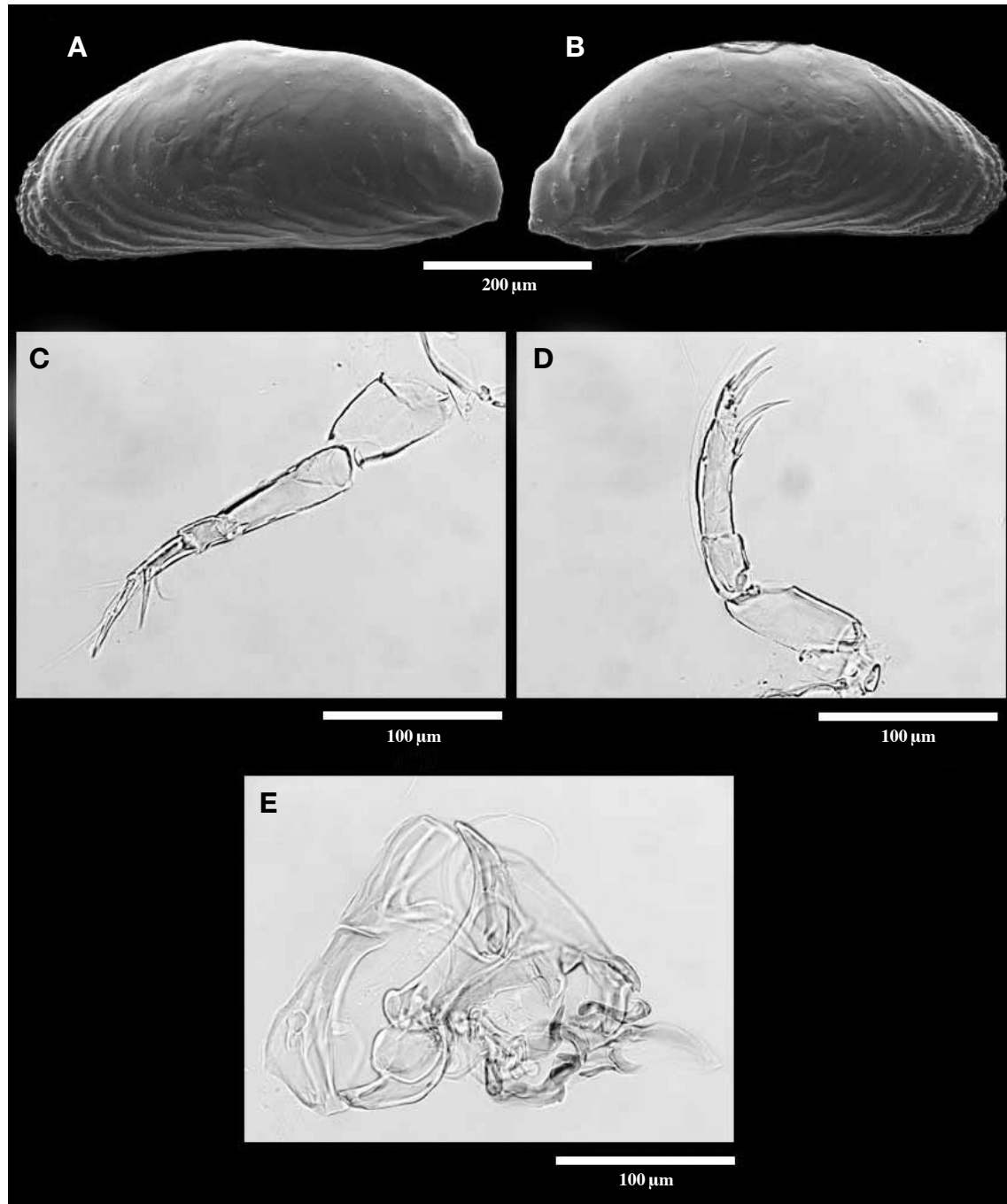


Fig. 8. *Pontocythere xiphoidea* Nakao and Tsukagoshi, 2002. Male. A, Left valve; B, Right valve; C, Antennule; D, Antenna; E, Copulatory organ.

Diagnosis. Small ostracod, less than 1 mm long (Fig. 7A, B). Size about 1 mm. Carapace sub-quadrate in lateral view. Dorsal margin almost straight with one slight groove around middle length. Dorsal margin forming one angle with posterior margin and gently sloping towards anterior margin. Posterior margin almost straight with one caudal process at postero-ventral margin. Caudal process relatively small. Anterior margin more broadly rounded anteriorly than posteriorly. Ventral margin concave in middle. Greatest height situated behind middle. Surface ornamented with few irregular pits and weak ridges, especially in anterior part of shell. Hinge desmodont. Antennula 5-segmented, with relatively robust segments and short, stiff setae (Fig. 7A). Second antenna 4-segmented with two strong claws and one seta (Fig. 7D).

Distribution. Species has been reported from Japan (Hanai *et al.*, 1977), Russia (Schornikov, 2006). This is the first record for Korea.

Remarks. There is confusion in the literature regarding the names *L. miurensis* and *L. subjaponica* (Hanai, 1959). Namely, Okubo (1977) reported *P. subjaponica* (in the paper referred to as *Cushmanidea subjaponica*) and described the soft parts for the first time. However, Nakao and Tsukagoshi (2002) attributed Okubo's (1977) finding to *P. miurensis*. The difference between the two species is a less developed caudal process in *P. miurensis* than in *P. subjaponica*, but this is very subtle. It is possible that *P. miurensis* and *P. subjaponica* are synonyms, but since the soft parts are known only for one of them, here we follow Nakao and Tsukagoshi (2002)'s opinion and identified the Korean population as *P. miurensis* due to a slightly less developed caudal process than in *P. subjaponica*.

6. *Pontocythere xiphoidea* Nakao and Tsukagoshi, 2002 (Fig. 8)

Synonymy

Pontocythere xiphoidea sp. nov. - Nakao and Tsukagoshi (2002): p. 78, figs. 5E-Q, 6.

Material examined. One male dissected on slide (NIBR IV0000813452), shell of on micropalaeontology slide (NIBRIV0000813452).

Locality in Korea. Muui-do, Hanagae Beach, littoral, 37°23.126'N 126°24.526'E, 26/05/2012, coll. Ivana Karanovic.

Identifier. Ivana Karanovic.

Diagnosis. Small ostracod (less than 1 mm). Carapace elongated in lateral view (Fig. 8A, B), with greatest height situated slightly in front of middle. Dorsal margin rounded, with small groove on left valve behind middle. Posterior margin narrow and with prominent caudal process. Anterior margin also narrow. Ventral margin straight. Surface not pitted, and with several ridges being strong in

the anterior part, fading away towards posterior end, and absent in the middle. Antennula 5-segmented (Fig. 8C), antenna 4-segmented (Fig. 8D). Hemipenis with triangular distal process (Fig. 8E).

Distribution. The species has been reported only once from Japan (Nakao and Tsukagoshi, 2002). This is the first record for Korea.

List of East Asian *Pontocythere* species

(*-species with described soft parts; K-species reported from South Korea)

1. *Pontocythere brevicula* Ruan, 1988
2. *Pontocythere carpeta* (Hu, 1977)
3. *Pontocythere formosana* (Hu, 1976)
4. *Pontocythere granulata* (Guan, 1981)
5. *Pontocythere huihoi* Hu & Tao, 2008
6. *Pontocythere japonica*^K (Hanai, 1959)
7. *Pontocythere kashiwarensis*^K (Hanai, 1959)
8. *Pontocythere littoralis* Zhao, 1984
9. *Pontocythere mera* (Guan, 1981)
10. *Pontocythere minuta*^K Ikeya & Hanai, 1982
11. *Pontocythere miurensis*^{*K} (Hanai, 1959)
12. *Pontocythere sekiguchii*^K Ikeya & Hanai, 1982
13. *Pontocythere spatiosa*^K Hou, 1982
14. *Pontocythere subjaponica*^K (Hanai, 1959)
15. *Pontocythere subtriangularis* Hou, 1982
16. *Pontocythere suprema* Hao, 1988
17. *Pontocythere triangulata* Hou, 1982
18. *Pontocythere versicoloria* Hu & Tao, 2008
19. *Pontocythere xiphoidea*^{*K} Nakao and Tsukagoshi, 2002

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