A new species of *Paramoera* (Crustacea: Amphipoda: Pontogeneiidae) from an estuary habitat in Hokkaido, Japan

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Disclosure statement

No potential conflict of interest was reported by the authors

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Geolocation information

KUZ Z2041–Z2043 (point): 43.332857°N, 140.410445°E

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ABSTRACT

A new species of the pontogeneiid amphipod, *Paramoera shakotanensis,* from the mouth of Horonaifu River, Hokkaido, Japan, is described. *Paramoera shakotanensis* sp. nov. can clearly be distinguished from its congeners by a combination of the following features: large eyes, deep antennal sinus without sharp incision, epimeral plate 3 with smooth posterior margin, small number of setae on inner plate of the maxilla 1 (up to three) and on inner plate with oblique inner row (up to two), pereopod 7 with coxal gill, and distally tapering telson with almost straight lateral margins bearing submarginal setae.

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KEYWORDS

Gammaridea; Pacific Ocean; estuary; brackish water

Introduction

Paramoera Miers, 1875 is the most species-rich genus within the family Pontogeneiidae and contains more than 50 species, which inhabit mainly cold marine habitats but are occasionally found in brackish or freshwater (Staude 1995; Sidorov 2010; Jung et al. 2016). The type

58 species, *Paramoera australis* Miers, 1875, was described from Kerguelen Island in the
59 southern Indian Ocean and is an epigean amphipod. However, several other species in the
60 genus, described from the northern Pacific Rim region, are hypogean crustaceans (Staude
61 1995; Sidorov 2010; Nakano and Tomikawa 2018).
62 Before this study, none of hypogean *Paramoera* amphipods had been recorded from
63 coastal areas in the northwestern Pacific. Three *Paramoera* species, i.e. *P. erimoensis*
64 Kuribayashi and Kyono, 1995, *P. hanamurai* Hirayama, 1990, and *P. koysama* Kuribayashi
65 and Kyono, 1995, were described from epigean waters of Hokkaido, Japan, and all of them
66 were classified within *Paramoera* sensu stricto (Hirayama 1990; Kuribayashi and Kyono
67 1995). *Paramoera relicta* Uéno, 1971 is a subterranean species inhabiting an underground
68 water habitats of an insular lava tube in Fukuejima island, Goto Islands, Japan (Uéno 1971;
69 Nakano and Tomikawa 2018). In 2012, several specimens of an unidentified *Paramoera*
70 species were collected from a river mouth in Hokkaido, Japan by Masaki Kyono of Sapporo
71 Technical College, and given to the last author. After careful examination, detailed below, we
72 concluded that these specimens belonged to a distinctive species, and thus describe and
73 illustrate them herein as a new species belonging to the genus *Paramoera*.
74
75 **Material and methods**
76 ***Sample collection***

Paramoera amphipods were collected from under stones at a river mouth of Horonaifu River, Shakotan Peninsula, Hokkaido, Japan using a fine-mesh hand-net. Specimens were fixed and preserved in 99% ethanol.

Morphological examination

All appendages of the specimens were dissected in 80% ethanol and mounted in gum-chloral medium on glass slides using a stereomicroscope (Olympus SZX7; Olympus, Tokyo, Japan). The specimens were examined using a light microscope (Nikon Eclipse Ni; Nikon, Tokyo, Japan), and illustrated with the aid of a camera lucida. Body length (BL: to the nearest 0.1 mm) was measured from the rostrum tip to the telson base, along the dorsal curvature. The specimens examined in this study have been deposited in the Zoological Collection of Kyoto University (KUZ).

Taxonomy

Family **Pontogeneiidae** Stebbing, 1906

Genus ***Paramoera*** Miers, 1875

Paramoera shakotanensis sp. nov.

(New Japanese name: *Shakotan-migiwa-yokoebi*)

(Figures 1–5)

Paramoera sp.: Tomikawa et al., 2014: fig 2; Tomikawa et al., 2017: fig. 2.

Paramoera sp. 1: Nakano and Tomikawa, 2018: fig. 4, table 1.

Type material

Holotype. Female (BL 4.6 mm), KUZ Z2041, collected from Horonaifu River (43.332857°N, 140.410445°E), Shakotan, Hokkaido, Japan, by Masaki Kyono, on 13 May 2012.

Paratypes. In total 3 females: female (BL 5.3 mm), KUZ Z1939, female (BL 5.6 mm), KUZ Z2042 (Figure 1), female (BL 5.1 mm), KUZ Z2043, data same as for holotype.

Diagnosis

Head with large eyes; peduncular article 2 gland cone of antenna 2 with 2 apical setae; lacinia mobilis of left mandible 5-dentate; mandibular palp article 3 without B-setae; inner plate of maxilla 1 with 3 plumose setae; gnathopod 2, carpus longer than propodus; coxa of pereopod 4 with shallow posterior concavity; coxal gills on gnathopod 2, and pereopods 3–7; peduncles of pleopods 1–3 with facial setae; uropod 2 inner ramus longer than outer ramus; telson

longer than wide.

Description

Female [holotype, KUZ Z2041]. Body smooth. Rostrum (Figure 2(a)) short, weakly produced; lateral cephalic lobe mammilliform; inferior antennal sinus quadrate, corner of sinus rounded, not incised; eyes sub-oval, large, 0.4 times as high as head. Epimeral plates 1–3 (Figure 2(b–d)): lateral surface with many tiny setae; posterior margins without crenulation, with seta; posterodistal corners slightly pointed, with seta; plate 1 with long seta on ventral submargin; plate 3 with 1 or 2 short setae and short bifid seta on ventral submargin.

Antenna 1 (Figure 2(e), 2(f)): length 0.5 times as long as body length; peduncular articles progressively shorter, length ratio of peduncular articles 1–3 1.0 : 0.7 : 0.5; peduncular article 1 with short setae on anterior margin, 2 single and 1 cluster of setae on posterior margin, posterodistal corner with single seta and pair of setae; peduncular article 2 with short seta on anterior margin, 2 clusters of setae on posterior margin, anterodistal and posterodistal corners with cluster of setae; peduncular article 3 with cluster of setae on posterior margin, anterodistal and posterodistal corners with cluster of setae; flagellum 17-articulate, about 1.9 times as long as peduncles, first article with 2 aesthetascs, articles 2, 4, 6, 8, 10, 12, 14, and 16 each with aesthetasc; accessory flagellum 1-articulate, scale-like, provided with 4 apical setae; calceoli absent. Antenna 2 (Figure 2(g), 2(h)): length ratio of peduncular articles 3–5 1.0 :

1.9 : 1.9; gland cone length 0.8 times that of peduncular article 3, not prolonged, with 2 apical setae; peduncular article 3 with pair of setae on anterior margin, 3 setae on medial face of semi-circular elevation, single seta on lateral face, 3 setae on posterodistal corner; peduncular article 4 with 3 pairs or clusters of setae on anterior margin, 3 pairs of setae on medial surface, and a few short setae on posterior margin; peduncular article 5 with single seta and 2 pairs of setae on anterior margin, short single seta on posterior margin, 2 pairs of setae on medial surface, cluster of setae on anterodistal and posterodistal corners; flagellum with 10+ articles (some distal articles broken); calceoli absent.

Upper lip (Figure 2(i)) ventral margin convex, rounded, with minute setae. Left and right mandibular incisors (Figure 2(j), 2(k)) 6-dentate, with left lacinia mobilis 5-dentate and right tridentate; left and right accessory setal rows with 6 and 5 blade setae, respectively; molar process triturative with plumose seta; palp 3-articulate, length ratio of left and right palp articles 1–3 1.0:2.7:2.4 and 1.0:2.5:2.2, article 1 bare, article 2 with 10 setae, article 3 with pair of A-, 2 C-, 5 D- and 7-E setae, lateral surface with many fine setae. Lower lip (Figure 2(l)) outer lobes broad, setulose, mandibular lobes narrow; inner lobes indistinct. Maxilla 1 (Figure 2(m), 2(n)) inner plate narrow with 3 plumose setae; outer plate rectangular with 10 serrate robust setae; palp 2-articulate; article 1 bare; article 2 with 6 robust and 1 slender setae on apical and subapical margins, respectively, outer margin without setae. Maxilla 2 (Figure 2(o)) inner plate with oblique inner row of 2 plumose setae; outer plate with about 19–20

slender setae on subapically. Maxilliped (Figure 3(a)) inner plate not exceeding palp article 1, with 3 robust setae subapically, medial face with oblique row of plumose setae; outer plate exceeding palp article 1, with 2 thick plumose setae and robust setae apically; palp 4-articulate, article 2 oblong, with a row of setae, article 3 unlobate, article 4 shorter than article 3, nail present and not spinose along the inferior margin but with 3 sub-apical setae.

Gnathopod 1 (Figure 3(d), 3(e)) shorter than gnathopod 2; coxa subrectangular, left and right coxae with 6 and 4 short setae on ventral margins, respectively; basis length about 3 times longer than wide, with long setae on anterior and posterior margins, and inner surface; ischium with setae on posterodistal corner; merus with long ventral setae; carpus 0.8 times as long as propodus, with finely serrate setae on posterodistal corner; propodus subrectangular, length 1.9 times longer than wide; left propodus with single seta, pair and cluster of setae on anterior margin, single seta and 2 clusters of setae on posterior margin, right propodus single seta and pair and cluster of setae on anterior margin, 2 clusters of setae on posterior margin, palm (Figure 3(e)) oblique, about 0.6 times as long as posterior margin, smoothly connected with posterior margin by 2 medial and 2 lateral robust setae; dactylus with seta on anterior margin and 2 short setae subapically, nail indistinct. Gnathopod 2 (Figure 3(f), 3(g)) coxa with 6 setae on ventral margin; basis sub-linear, length about 3 times longer than wide, with anterior and posterior marginal setae; ischium with 3 setae on posterodistal corner; merus with long setae distally; carpus 1.2 times as long as propodus; propodus subrectangular, length 2.3

times longer than wide, with 2 pairs and cluster of setae on posterior margin, palm (Figure 3(g)) oblique, about 0.5 times as long as posterior margin, smoothly connected with posterior margin by 3 medial and 1 lateral robust setae in left gnathopod 2, by 4 medial and 1 lateral robust setae in right one; dactyl similar to that of Gnathopod 1.

Pereopod 3 (Figure 4(a)) coxa ovate, with 6 short setae on ventral margin and robust seta on posterodistal corner; length ratio of from basis to propodus 1.0:0.2:0.6:0.5:0.6; basis sub-liner, with long setae on anterior and posterior margins; ischium with 2 setae on posterodistal corner; merus with 2 setae on anterior margin, single seta and cluster of setae on posterior margin; carpus with seta on anterior and posterior margins; propodus with 2 setae on anterior margin, 2 robust and 1 slender setae on posterior margin; dactyls 0.4 times as long as propodus, bearing seta on anterior margin and 2 minute setae subapically. Pereopod 4 (Figure 4(b)) coxa with shallow posterior concavity, right ventral margins of left and right coxae with 10 and 8 short setae, respectively; length ratio from basis to propodus 1.0:0.3:0.6:0.6:0.6; anterior and posterior margins of basis with long setae; ischium with 1 or 2 setae on posterodistal corner; merus with 1 or 2 setae on anterior margin, 2 setae on posterior margin; anterior and posterior margins of carpus with 1 and 2 setae, respectively; propodus with 2 setae on anterior margin, single and pair robust setae on posterior margin; dactyl 0.3 times as long as propodus, bearing seta on anterior margin and 2 minute setae subapically. Pereopod 5 (Figure 4(c)) coxa bilobed, anterior lobe with small seta, posterior lobe with 2 robust and 1

small setae; length ratio from basis to dactylus 1.0:0.3:0.7:0.7:0.8:0.3; basis ovate, posteroventrally lobate; ischium with pair of setae on anterodistal corner; merus with single and pair of setae on anterior margin, robust seta on posterior margin; carpus with single and pair of robust setae on anterior margin, posterior margin with seta; propodus with 2 pairs of robust setae on anterior margin, single and pair of setae on posterior margin; dactylus with seta on posterior margin and 2 small subapical setae. Pereopod 6 (Figure 4(d)) coxa bilobate, posterior lobe with 1 robust and 1 slender setae; length ratio from basis to dactylus 1.0:0.3:0.8:0.7:0.8:0.3; basis ovate, posteroventrally lobate; ischium with 2 setae on anterodistal corner; merus with single and pair of setae on anterior margin, robust seta on posterior margin; carpus with single and pair of robust setae on anterior margin, posterior margin with 2 robust setae; propodus with 2 single and 1 pair of robust setae on anterior margin, single and pair of robust setae on posterior margin; dactylus with seta on posterior margin and 2 small subapical setae. Pereopod 7 (Figure 4(e)) coxa semicircular with 3 setae on posteroventral margin; length ratio from basis to dactylus 1.0:0.2:0.6:0.6:0.7:0.2; basis ovate, posteroventrally lobate; ischium with 2 setae on anterodistal corner; anterior and posterior margins of merus and carpus with 2 robust setae; propodus with single and 2 pairs of robust setae on anterior margin, 2 robust and 1 small setae on posterior margin; dactylus with seta on posterior margin and small subapical seta.

Coxal gills (Figures 3(f), 4(a–c), 4(e)) ovate, on gnathopod 2 to pereopod 7. Sternal gill

and hump absent. Brood plates (Figure 3(h), 3(i)) on gnathopod 2, pereopods 3 and 4 large, brood plate on pereopod 5 small, narrow, strap-like.

Pleopods 1–3 (Figure 5(a–c)) peduncles with paired retinacula on inner distal margin, and with facial setae; pleopods 1–3 inner ramui 7-, 8- and 7-articulate, respectively, with bifid plumose setae (clothes-pin setae) on inner basal margins, terminal setae on rami length 0.7–0.9 times that of rami; outer rami 10-, 10- and 9-articulate, respectively.

Uropod 1 (Figure 5(d)) not extending beyond peduncle of uropod 3; peduncle with 2 and 4–5 robust setae along medial and lateral ridges, respectively, basofacial seta absent; inner ramus length 0.7 times that of peduncle, with 1–2 robust setae on inner margin; outer ramus length 0.9 times that of inner ramus, with outer marginal robust seta. Uropod 2 (Figure 5(e)) length 0.7 times that of uropod 1; peduncle with 1 medial and 2 lateral robust setae dorsally; inner ramus almost as long as peduncle, with 2 robust setae on inner margin; outer ramus length 0.7 times that of inner ramus, with outer marginal robust seta. Uropod 3 (Figure 5(f)) length 0.6 times that of uropod 1; both rami equal in length, length 1.2 times that of peduncle, uniarticulate, each ramus with 2 subterminal setae; inner ramus with 5 and 2 robust setae on inner and outer margins, respectively; outer ramus with 2 and 3 robust setae on inner and outer margins, respectively. Telson (Figure 5(g)) tapering distally, length 1.3 times longer than wide, cleft for 58%, lateral margin not concave, with several sub-lateral and facial setae, each lobe bearing 1 long and 1 short setae sub-apically, apex rounded.

Variation

Antenna 1 of one paratype (KUZ Z2042) length 0.4 and 1.4 times that of body and antenna 2, respectively.

Distribution

Known only from the type locality.

DNA sequences

In total, 3 sequences of the present paratype (KUZ Z1939) were determined by previous studies (Tomikawa et al. 2014; Tomikawa et al. 2017; Nakano and Tomikawa 2018): nuclear 28S ribosomal RNA (AB778502; 787 bp), histone H3 (LC334142; 328 bp), mitochondrial 16S ribosomal RNA (LC334116; 418 bp), and cytochrome c oxidase subunit I (LC146870; 658 bp).

Etymology

The specific name is an adjective derived from the name of the type locality of this new species.

Remarks

Paramoera shakotanensis sp. nov. is characterized by the antennal sinus without sharp incision and the small number of setae on maxillae 1 and 2 (up to three on the inner plate of the maxilla 1 and up to two on oblique inner row of the inner plate of the maxilla 2). The present species shares these features with *P. austrina* (Bate, 1862), *P.* (*H.*) *crassicauda* Staude, 1995, *P. hermitensis* Barnard, 1932, and *P. tristanensis* Barnard, 1932. *Paramoera shakotanensis* sp. nov. can be distinguished from those five species by the following features (Bate 1862; Barnard 1932; Staude 1995): from *P. austrina* [features of *P. austrina* in parentheses], antennal sinus deep (shallow), epimeral plate 3 moderately (broadly) expanded posteriorly, and ventral margin of coxa of pereopod 4 rounded (almost straight); from *P. crassicauda* [features of *P. crassicauda* in parentheses], eyes large (small, reduced) and pereopod 7 with coxal gill (lacking); from *P. hermitensis* [features of *P. hermitensis* in parentheses], posterior margin of epimeral plate 3 smooth (posterior margin weakly serrate), telson length 1.3 (1.8) times longer than wide with almost straight (concave) lateral margins, and telson with sub-lateral and distal setae (distal setae only); and from *P. tristanensis* [features of *P. tristanensis* in parentheses], posterior margin of epimeral plate 3 smooth (posterior margin slightly crenulate) and lateral margins of telson almost straight (convex) with (without) setae.

The original descriptions of *P. fasciculate* (Thomson, 1880), *P. fissicauda* (Dana, 1852),

and *P. litoralis* (Oldevig, 1959) lack information of antennal sinus and setal numbers of maxillae 1 and 2 (Dana 1852; Thomson 1880; Oldevig 1959). However, *P. shakotanensis* sp. nov. is distinguished from *P. fasciculate* and *P. litoralis* by the following features: palm of propodus of gnathopods 1 and 2 with 4 and 5 robust setae, respectively on posteroproximal corners (2–3 and 3 robust setae, respectively in *P. litoralis*), telson tapering distally (lateral margins parallel in *P. fasciculate*) with sub-lateral setae (lacking lateral setae in *P. litoralis*).

The insufficient description of *P. fissicauda* makes difficult to compare with the present new species. Bellan-Santini and Ledoyer (1974) described *P. fissicauda* based on materials from the Kerguelen and Crozet. *Paramoera fissicauda* described by them has the sharply incised antennal sinus and the maxillae 1 and 2 with many setae, and thus obviously differs from *P. shakotanensis* sp. nov. However, Bellan-Santini and Ledoyer's *P. fissicauda* has been considered to be an undescribed species (De Broyer and Jazdzewski 1993). Accordingly, the taxonomic relationship between *P. shakotanensis* sp. nov. and *P. fissicauda* remains subject to a future study.

Paramoera shakotanensis sp. nov. is also similar to *P. anivae* Labay, 2012 and *P. erimoensis* Kuribayashi and Kyono, 1995 in having an inferior antennal sinus lacking an incision, pereopod 7 with coxal gill, and rami of uropod 3 without plumose setae. However, *P. shakotanensis* can be distinguished from these two species by the following features (Kuribayashi and Kyono 1995; Labay 2012) [features of *P. anivae* and *P. erimoensis* in

parentheses]: from *P. anivae*, peduncular article 2 gland cone of antenna 2 with 2 setae (with 6 setae), inner plate of maxilla 1 with 3 plumose setae (5 plumose setae), outer margin of palp article 2 of maxilla 1 without seta (with seta), inner plate of maxilla 2 with oblique inner row of 2 plumose setae (3 plumose setae); and from *P. erimoensis*, inner plate of maxilla 1 with 3 plumose setae (5 plumose setae), inner plate of maxilla 2 with oblique inner row of 2 plumose setae (3 plumose setae), and carpus of female gnathopod 2 longer than propodus (shorter than propodus).

Paramoera shakotanensis sp. nov. possesses large eyes despite this species inhabits interstitial habitats. Unlike the epigean species, the previously known hypogean *Paramoera* amphipods can be characterised by their eyes, which are vestigial or completely lacking, among other characteristics, and thus, four subgenera have been erected for those species (Staude 1995; Sidorov 2010). Of the four described subgenera, three subgenera, *Moanamoera* Staude, 1995, *Humilomoera* Staude, 1995 and *Rhithromoera* Staude, 1995, were erected by Staude (1995) for the subterranean and/or interstitial species distributed in the North Pacific. The subgenus *Moanamoera* was established for the *Paramoera* amphipod inhabiting brackish lava ponds in the Hawaiian Islands (Barnard 1977; Staude 1995), and the remaining two subgenera, i.e. *Humilomoera* and *Rhithromoera*, were erected from the interstitial subtidal and/or brackish pool species inhabiting the eastern coast of the North Pacific (Staude 1995). Recently, an additional subgenus, *Ganigamoera* Sidorov, 2010, was described for the

stygobitic *Paramoera* species inhabiting inland freshwater habitats in the Russian Far East (Sidorov 2010). The remaining species which were not included in those four subgenera have been assigned to the subgenus *Paramoera* (Staude 1995).

As described above, the new species bears morphological characteristics mostly consistent with the diagnosis of *Humilomoera* as defined by Staude (1995). However, the new species possesses large eyes and a coxal gill on pereopod 7, two characteristics that are at odds with Staude's (1995) definition of this subgenus. Eye reduction is a character that can differ even among two populations of the same species of amphipod if, for example, one population lives underground and the other inhabits surface waters (Culver *et al*. 1995). Therefore, the absence of eyes in the previously known *Humilomoera* species is deemed to be a highly derived character that is related to their interstitial habitats. Moreover, another subgenus, *Rhithromoera*, also contains species with and without a coxal gill on pereopod 7 (Staude 1995).

It was stated that the subgenus-level classification of *Paramoera* remained unresolved, when the two subgenera *Humulomoera* and *Rhithromoera* were erected (Staude 1995). Moreover, it was implied that the other subgenus *Ganigamoera* might not be a monophyletic taxon (Sidorov 2010). The subterranean *P. relicta* was once classified within the genus *Relictomoera* Barnard and Karaman, 1982, of which the type species is *P. relicta*. According to a systematic revision of *P. relicta* (Nakano and Tomikawa 2018), however, *P. relicta* was

genetically close to the epigean *P. koysama* synonymizing *Relictomoera* with *Paramoera*. Since the precise phylogenetic relationships among *P. relicta* and the other hypogean species classified within the three subgenera remained unresolved, *Relictomoera* was not treated as a valid subgenus in Nakano and Tomikawa (2018). Therefore, the new species from Hokkaido is not assigned to the subgenus *Humilomoera* as well as other subgenera, so as to avoid additional taxonomic confusion. To clarify the subgeneric assignment of *P. shakotanensis* sp. nov., as well as to test the validity of subgenus-level classification of *Paramoera*, a molecular phylogenetic study should be necessary along with evaluating morphological characteristics of all *Paramoera* species.

A few *Paramoera* species show sexual dimorphism in their pleopods (Kuribayashi and Kyono 1995; Sidorov 2010). The outer ramus of pleopod 2 in their males is modified as more or less shortened and broadened with thickened short setae distally, whereas that of the females shows usual form common in *Paramoera* (Kuribayashi and Kyono 1995; Sidorov 2010). However, it remains unclear whether *P. shakotanensis* sp. nov. exhibits sexual dimorphism in its pleopods, since any males of the new species have not been collected. The morphological characteristics of the males of *P. shakotanensis* sp. nov. should be documented by a future taxonomic study; the DNA sequences provided from the paratype of the new species will greatly help identify male individuals of the new species.

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Figure captions

Figure 1. *Paramoera shakotanensis* sp. nov., paratype, female, KUZ Z2042, lateral view. Scale bar, 1.0 mm.

Figure 2. *Paramoera shakotanensis* sp. nov., holotype, female, KUZ Z2041. (a) Head, lateral view. (b–d) Epimeral plates 1–3, lateral views. (e) Antenna 1, medial view. (f) Accessory flagellum of antenna 1, medial view. (g) Antenna 2, medial view. (h) Gland cone of peduncular article 2 of antenna 2, medial view. (i) Upper lip, anterior view. (j), (k) Left and right mandible, medial views. (l) Lower lip, ventral view. (m) Right maxilla 1, anterior view. (n) Palp of left maxilla 1, anterior view. (o) Maxilla 2, anterior view. Scale bars, 0.1 mm.

Figure 3. *Paramoera shakotanensis* sp. nov., holotype, female, KUZ Z2041. (a) Maxilliped, anterior view. (b), (c) Inner and outer plates of maxilliped, anterior views. (d) Gnathopod 1, medial view. (e) Palmar margin of propodus and dactylus of gnathopod 1, medial view. (f) Gnathopod 2, medial view. (g) Palmar margin of propodus and dactylus of gnathopod 2, medial view. (h), (i) Brood plates of gnathopod 2 and pereopod 5, medial views. Scale bars, 0.1 mm.

Figure 4. *Paramoera shakotanensis* sp. nov., holotype, female, KUZ Z2041. (a–e) Pereopods 3–7, lateral (a), (c) and medial (b), (d), (e) views. Scale bars, 0.1 mm.

Figure 5. *Paramoera shakotanensis* sp. nov., holotype, female, KUZ Z2041. (a–c) Pleopods 1–3, lateral (a), (c) and medial (b) views. (d–f) Uropods 1–3, ventral views. (g) Telson, ventral view. Scale bars, 0.1 mm.