

Description of a New Talitrid Genus, *Ezotinochestia* with a Redescription of *E. solifuga* (Iwasa, 1939) comb. nov. (Crustacea: Amphipoda: Talitridae)

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Ezotinochestia gen. nov. is established to receive *Orchestia solifuga* Iwasa, 1939. The new genus is defined by an elongate antenna 1 (reaching the mid-point of peduncular article 5 of antenna 2), a 4-dentate lacinia of the left mandible, a mediodistally lobate article 2 and reduced article 4 of the maxillipedal palp, a deeply subchelate male gnathopod 1, the short palm of female gnathopod 1, cuspidactylate pereopods, well-developed pleopods, and the outer ramus of uropod 1 with robust setae. This genus is distinguished from *Kokuborchestia* Morino and Miyamoto, 2015 by the sexually dimorphic gnathopod 1 and the lack of dense, plumose setae on the pleopodal peduncles.

Key Words: Crustacea, Amphipoda, Talitridae, *Ezotinochestia*, new genus, *Ezotinochestia solifuga*, Hokkaido, Japan.

Introduction

Orchestia solifuga Iwasa, 1939 was described from terrestrial coastal habitats (damp places under fallen leaves on a small hill) near the Akkeshi Marine Biological Station in Hokkaido, Japan (Iwasa 1939). Bulycheva (1957) mistakenly synonymized this species with *Orchestia traskiana* Stimpson, 1857. In his revision of the North Pacific talitrids, Bousfield (1982) narrowed the concept of the genus *Orchestia* and restricted the constituent species to the Eastern Atlantic and Mediterranean. At the same time he established *Traskorchestia* Bousfield, 1982 to receive *O. traskiana*, but reserved judgement on the placement of *O. solifuga* due to its incomplete description. Recently, Sidorov and Barabanschikov (2010) redescribed *O. solifuga* based on a female specimen recovered from “subsurface” water in an estuary in northern Primorye, Russia; the Russian specimen, however, shows some morphological differences from Japanese specimens (see the “Remarks” section). Since the type has not been located so far (and is probably lost; H. Morino unpublished data), in this study we examined additional material from the nearest practical place to the type locality in Hokkaido to confirm its generic affiliation, and as a result we allocate *O. solifuga* to a new genus, as *Ezotinochestia solifuga* (Iwasa, 1939) comb. nov.

Materials and Methods

Specimens were collected from terrestrial habitats near seacoasts in On-neto, Rausu, and Utoro, eastern Hokkaido; several specimens secured from the forests of Rishiri and Rebun Islands in northern Hokkaido were forwarded by Dr K. Ishii, which were also examined. The general methodology follows Morino (2014). The specimens were dissected under a stereomicroscope and appendages and bodies were illustrated under a light microscope using a drawing tube. The illustrated appendages were fixed on slide mounts with Hoyer’s medium or kept in tubes with the bodies. The body length was measured from the tip of head to the tip of telson along the straightened dorsal margin. The specimens studied are lodged in the collection of the National Museum of Nature and Science, Tsukuba (NSMT) or in the private collection of H. Miyamoto.

Genus *Ezotinochestia* gen. nov.

[New Japanese name: Kita-okatobimushi zoku]

Type species. *Orchestia solifuga* Iwasa, 1939.

Diagnosis. Body size medium. Eyes medium. Antenna 1 elongate, reaching mid-point of peduncular article 5 of antenna 2, peduncle subequal to flagellum in length, peduncular article 3 longer than either article 1 or 2. Antenna 2 in male not incrassate, flagellum subequal to peduncle in length. Upper lip lacking robust setae. Lacinia of left mandible 4-dentate. In maxilliped, outer margin of precoxa not

stepped, palp articles 2 and 3 broad and mediodistally lobate, article 4 reduced.

Gnathopod 1 sexually dimorphic, male propodus deeply subchelate, carpus and propodus each with broad-based pellucid lobe, merus with small pellucid lobe, lateral surface of propodus with rows of submarginal and facial robust setae; in female, pellucid lobe or scabrous surface both absent, propodus palm vertical, shorter than dactylus. In gnathopod 2 of male, propodus powerfully subchelate, dactylus slightly attenuate; in female, mitten-shaped, basis weakly expanded anteroproximally, propodus with facial and submarginal setae on lateral surface. Pereopods cuspidactylate (bi-cuspidate), locking robust setae of propodi reduced. Coxa of pereopod 4 as deep as wide. Posterior lobe of coxa of pereopod 6 smoothly curved. Pereopod 7 in male not sexually dimorphic. Coxal gills of pereopods 2 and 6 larger than those of pereopods 3–5, gill of pereopod 2 lobed, others convoluted, gill of pereopod 6 distally linguiform.

Pleonite side plates lacking marginal pits; pleopodal peduncles with 2 retinacula, arrays of robust setae both marginally and facially, and well-developed rami. Uropod 1 with distolateral robust seta of peduncle shorter than subdistal one; inner ramus with outer and dorsal marginal robust setae, outer ramus with marginal robust setae. Uropod 2 with rami subequal in length and marginal robust setae in 1 or 2 rows. Uropod 3 with peduncle slightly expanded; ramus stout, shorter than peduncle. Telson wider than long, with dorsolateral, distolateral, and distal robust setae, 6–12 setae

in total per lobe.

Oostegites subovate, with numerous simple or slightly curve-tipped setae.

Etymology. The generic name is a combination of the ancient name for the region of Hokkaido, Ezoti, and part of the generic name *Orchestia*.

Remarks. There are three genera of terrestrial coastal talitrids in the northwest Pacific: *Ezotinorchestia* gen. nov., *Kokuborchestia* Morino and Miyamoto, 2015, and *Ditmorchestia* Morino and Miyamoto, 2015. They show several morphological similarities among themselves. *Ezotinorchestia* is close to *Kokuborchestia* in having 1) an elongate antenna 1, 2) a deeply subchelate and lobed merus-carpus in male gnathopod 1, 3) well-developed pleopods, 4) outer ramus of uropod 1 with robust setae marginally, 5) laterally to distally distributed robust setae on the telson, and 6) simple-tipped setae on the oostegites. However, *Kokuborchestia* displays: 1) a similar gnathopod 1 in both sexes, with a deep palm and lobed merus-carpus (*vs.* sexually dimorphic), 2) the coxal gill of pereopod 6 being broad and distally truncate (*vs.* distally linguiform), 3) densely setose (with plumose setae) peduncles of the pleopods (*vs.* with robust setae), and 4) the telson lobe with 5–6 robust setae (*vs.* 6–12). These are all regarded as generic difference. *Ditmorchestia* displays similarities to *Ezotinorchestia* in having: 1) a sexually dimorphic gnathopod 1, 2) a setose outer ramus of uropod 1 (with robust setae), and 3) a setose telson lobe (also with robust setae). However, the shorter antenna 1, the produced

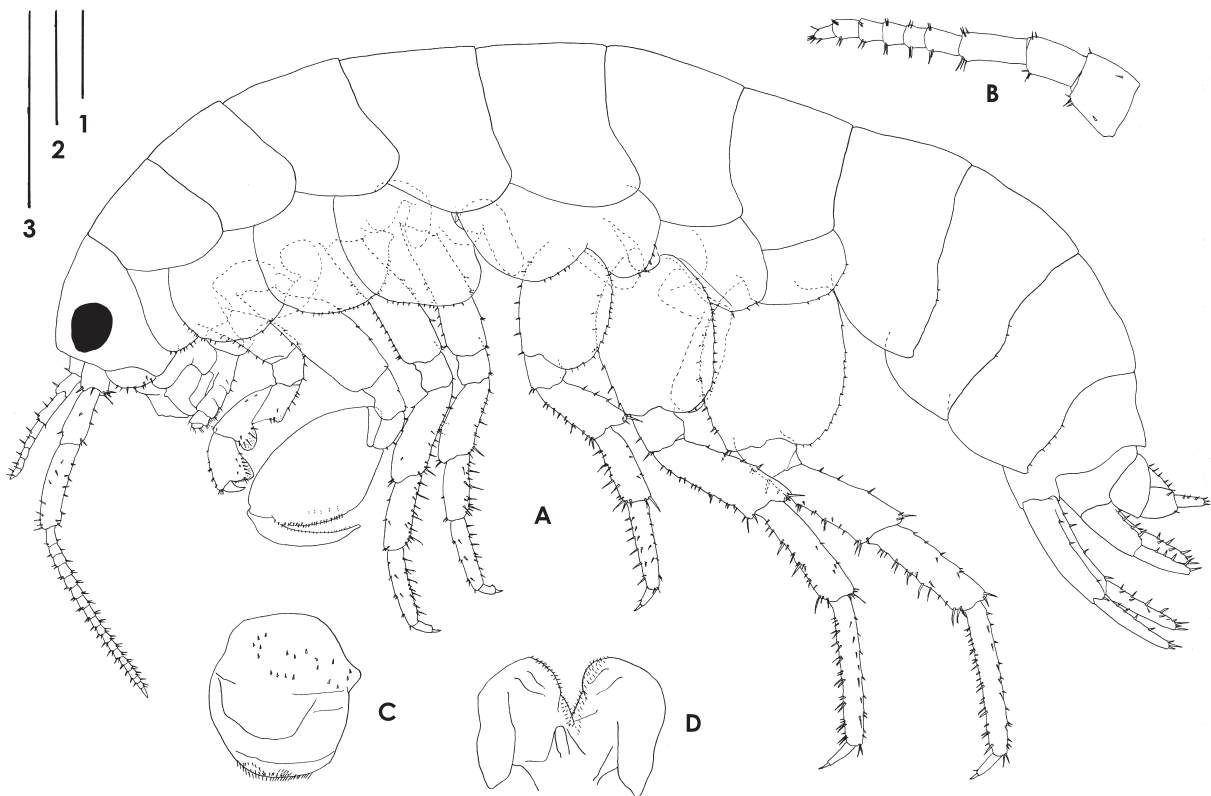


Fig. 1. *Ezotinorchestia solifuga* (Iwasa, 1939). Male, 12.9 mm (NSMT-Cr 24220), Utoro, Abashiri, Hokkaido, Japan. A, habitus, lateral view (after Morino 2015); B, antenna 1; C, upper lip; D, lower lip. Scale 1, 1.0 mm for A; scale 2, 0.2 mm for C and D; scale 3, 1.0 mm for B.

basis of pereopod 7, the moderately reduced pleopods, and the robust ramus of uropod 3 in *Ditmorchestia* separate this genus from *Ezotinorchestia*.

Males of *Orchestia* Leach, 1814, as redefined by Lowry and Fanini (2013), and *Cryptorchestia* Lowry and Fanini, 2013, distributed mostly in the North Atlantic, show similar features to the present new genus in having: 1) a deeply subchelate gnathopod 1, 2) well developed pleopods, and 3) robust setae on the outer ramus of uropod 1. In addition, the lobed merus of gnathopod 1 is shared by *Cryptorchestia* and the present genus, while a high number of robust setae on telson (7+) is common to *Orchestia* and the present genus. However, both *Orchestia* and *Cryptorchestia* are separable from *Ezotinorchestia* by the shorter antenna 1, which does not exceed the end of peduncular article 4 of antenna 2. It should also be noted that recent molecular analyses of *Orchestia* and related species from the Mediterranean and northeast Atlantic suggest polyphyly of the genus *Orchestia* (Pavesi *et al.* 2015). Future molecular studies with extended species sampling could lead to further revision of the diagnosis of *Orchestia*.

***Ezotinorchestia solifuga* (Iwasa, 1939) comb. nov.**
 [Japanese name: Kita-okatobimushi]
 (Figs 1–3)

Orchestia solifuga Iwasa, 1939: 271–273, fig. 12, pl. 14; ?
 Sidorov and Barabanschikov 2010: 71–73, figs 1–5.

Non *Orchesita traskiana* Stimpson, 1857: Bulycheva 1957:
 166, fig. 60.

“*Parorchestia*” *solifuga* (Iwasa, 1939): Bousfield 1984: 207.

Non *Platorchestia solifuga* (Iwasa, 1939): Miyamoto 1984: 3.

“*Orchestia*” *solifuga* Iwasa, 1939: Morino *et al.* 2009: 26;
 Morino 2015: 1076 (fig. 1), 1087.

Material examined. Male 12.9 mm (NSMT-Cr 24220), male 12.4 mm (NSMT-Cr 24219), female 13.3 mm (NSMT-Cr 24221), male, 3 ovig. females, and 2 females (NSMT-Cr 24222), 8 males and 71 females (H. Miyamoto collection); Utoro, Abashiri (base of a cliff, under litter); 1 August 1988; H. Miyamoto coll. Female 12.4 mm (NSMT-Cr 24217), 2 males, 2 ovig. females, and 3 females (NSMT-Cr 24218), 14 males and 9 females (H. Miyamoto collection); On-neto, Nemuro (forest of a shrine, under litter); 2 August 1988; H. Miyamoto coll. 2 females (NSMT-Cr 24223), 5 males and 24 females (H. Miyamoto collection); Rausu (near entrance of the Nature Park, floor of birch forest); 1 August 1988; H. Miyamoto coll. Male 9.2 mm (NSMT-Cr 24224), ovig. fe-

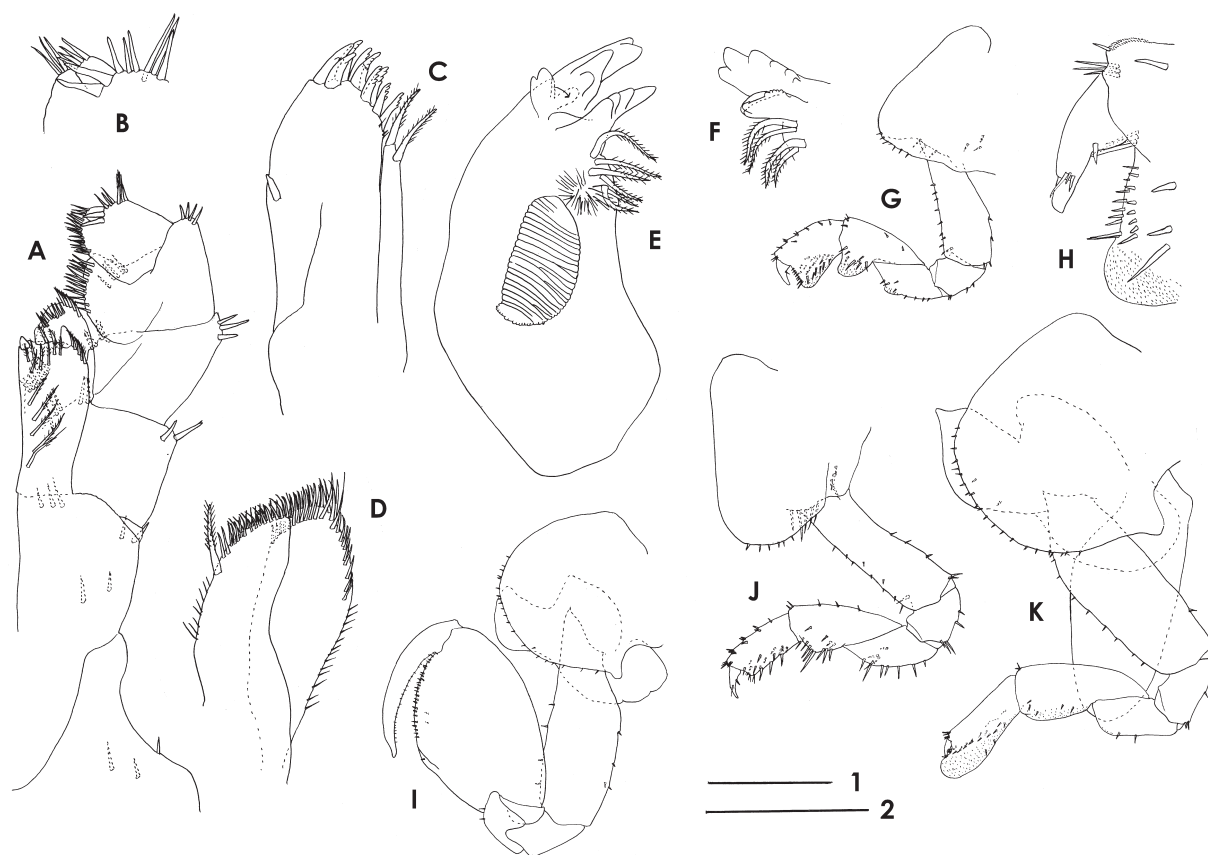


Fig. 2. *Ezotinorchestia solifuga* (Iwasa, 1939). Male, 12.9 mm (NSMT-Cr 24220); female, 13.3 mm (NSMT-Cr 24221). Utoro, Abashiri, Hokkaido, Japan. A, maxilliped; B, palp article 4 of maxilliped; C, maxilla 1; D, maxilla 2; E, left mandible; F, distal part of right mandible; G, J, gnathopod 1; H, palmar margin and dactylus of gnathopod 1; I, K, gnathopod 2. J, K, female; others, male. Scale 1, 0.5 mm for G and I, 0.1 mm for A, C–F and H, 0.05 mm for B; scale 2, 1.0 mm for J and K.

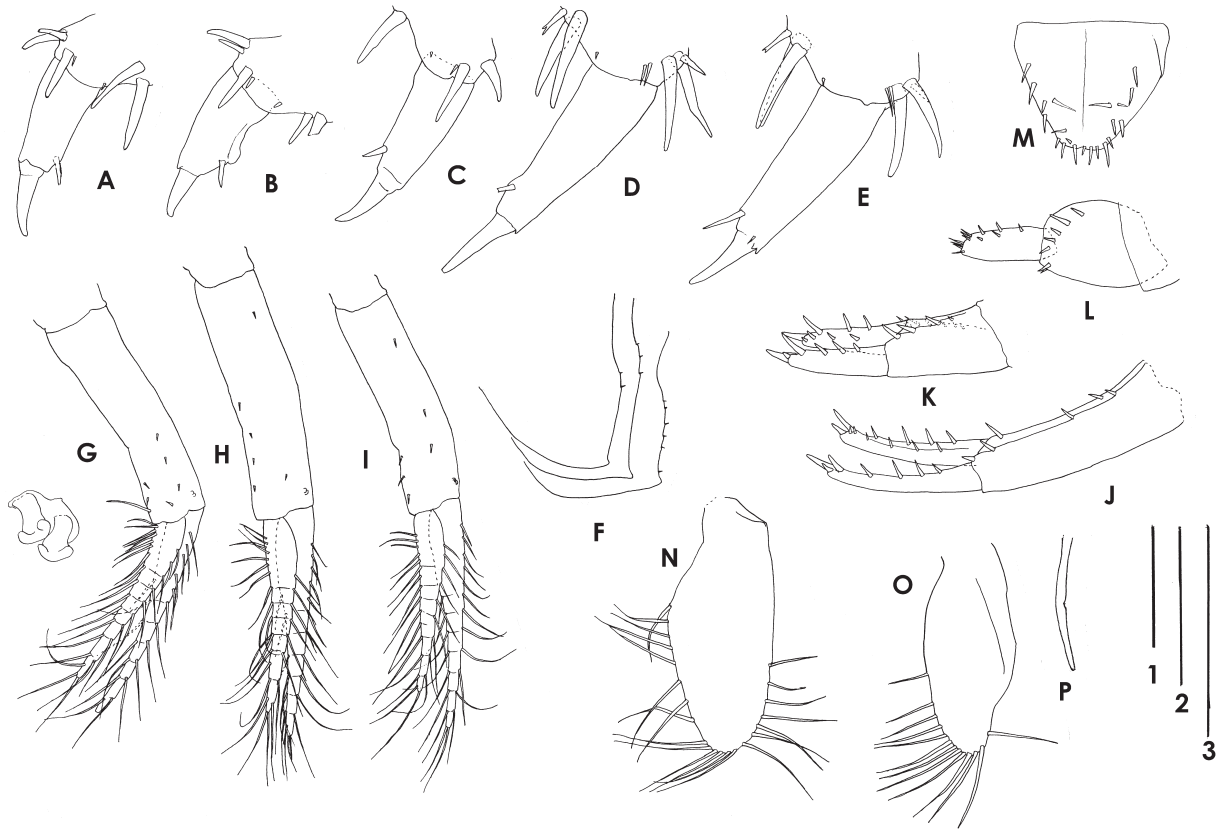


Fig. 3. *Ezotinorchestia solifuga* (Iwasa, 1939). Male, 12.9 mm (NSMT-Cr 24220); female, 13.3 mm (NSMT-Cr 24221). Utoro, Abashiri, Hokkaido, Japan. A-E, distal part of pereopods 3-7; F, pleonite side plates; G-I, pleopods 1-3, with retinacula of pleopod 1; J-L, uropods 1-3; M, telson; N, O, oostegites of pereopods 2, 5; P, tip of seta on oostegite of pereopod 4. N, O, female; others, male. Scale 1, 1.0 mm for F, 0.5 mm for L and M, 0.1 mm for A-E; scale 2, 1.0 mm for N and O; scale 3, 1.0 mm for G-K, 0.1 mm for P.



Fig. 4. Geographical distribution of *Ezotinorchestia solifuga* (Iwasa, 1939). Black circles: sampling sites of *E. solifuga* in this study. Star: type locality in Iwasa (1939).

male 9.2 mm (NSMT-Cr 24225), ovig. female (NSMT-Cr 24226), 2 males and 2 females (NSMT-Cr 24227); Senhoshi, Rishiri Is. (*Picea* and *Abies* forest, 25 m alt.); 31 July 2007; M. Sato and K. Ishii coll. Male and juvenile (NSMT-Cr 24228); Kafukai, Rebun Is. (*Abies* forest, 20 m alt.); 31 May 2007; H. Miyamoto and K. Ishii coll.

Description of male (NSMT-Cr 24220, 12.9 mm). Antenna 1 (Fig. 1A, B) with peduncular article 3 distinctly longer than either article 1 or 2; flagellum with 6 articles. Antenna 2 (Fig. 1A), peduncular article 5 subequal to articles 3 and 4 combined in length, flagellum with 19 articles. Mouthparts (Figs 1C, D, 2A-F) as in generic diagnosis. Gnathopod 1 (Fig. 2G) with merus bearing small pellucid lobe, carpus *ca.* 1.3 times as long as propodus, with prominent pellucid lobe, propodus with submarginal row of 6 robust setae, surface of anterodistal corner scabrous (Fig. 2H). Gnathopod 2 (Fig. 2I) with propodus distally smoothly broadened, palm smooth, as long as posterior margin, dactylus weakly attenuate. Locking robust setae of pereopods 3-7 reduced (Fig. 3A-E). Dactylus of pereopod 4 pinched (Fig. 3B). Bases of pereopods 5-7 (Fig. 1A) shallowly rounded posteriorly. Merus and carpus of pereopod 7 slender, similar to those of pereopod 6.

Pleonite side plates (Fig. 3F) weakly acuminate posteriorly, with several setae on posterior margins. Peduncles of

pleopods 1–3 (Fig. 3G–I) with facial and marginal robust setae, occasionally with plumose setae; rami developed, with *ca.* 8 articles, 0.98, 0.96, and 1.06 times as long as respective peduncles. Uropod 1 (Fig. 3J) with peduncle bearing 5 outer, 3 and 1 tiny inner marginal robust setae; outer ramus with 4 marginal robust setae, inner ramus with 4 outer and 4 dorsomarginal robust setae. Uropod 2 (Fig. 3K) with peduncle bearing 4 outer marginal and 6 inner-medial marginal robust setae, outer ramus with 3 marginal robust setae, inner ramus with 3 outer marginal (distalmost one closely set to apical robust setae) and 2 dorsomarginal robust setae. Uropod 3 (Fig. 3L) with peduncle bearing 7 robust setae from dorsal to ventrodorsal margin, ramus short, 0.71 times as long as peduncle, with 5 marginal and *ca.* 8 distal setae. Telson (Fig. 3M) with 10–11 robust setae per lobe.

Description of female (NSMT-Cr 24221, 13.3 mm).

Gnathopod 1 (Fig. 2J) with carpus *ca.* 1.5 times as long propodus, propodus lacking scabrous surface. Gnathopod 2 (Fig. 2K) with basis almost parallel-sided, merus with small lobe with scabrous surface, propodus with *ca.* 4 submarginal setae. Oostegites of pereopods 2 and 5 respectively with 25 and 13 simple-tipped marginal setae (Fig. 3N, O, P).

Distribution. The present species is terrestrial and was collected from under litter of coastal forests of eastern Hokkaido and islands off northern Hokkaido (Fig. 4). The original description was based on the material from Akkeshi near Kushiro, in Hokkaido (Iwasa 1939).

Remarks. The present material accords well with the original description given by Iwasa (1939), except for the number of robust setae on the telson. Five specimens examined in the present study with body lengths of 9.2–12.9 mm bear 8–12 robust setae per lobe whereas the material from Akkeshi displays 5–6 robust setae (Iwasa 1939: pl. 14, fig. x). Although the body length of the depicted specimen was not specified by Iwasa (1939), the difference in the number of setae is very likely related to body size, since the variation in the number of the setae among the five specimens grossly parallels their body length. The gnathopod 1 of male in this species exhibits a prominent pellucid lobe on the carpus, and the scabrous surface on anterodistal part of the propodus, both of which could be additional generic diagnoses.

Sidorov and Barabanschikov (2010) described a female of *Orchestia solifuga* from “subsurface” water of the Samarga River estuary, northern Primorye, Russia, but the depigmented body, diffuse ocelli, elongate mandible, and peculiar robust setae on the posterior margin of the merus-carpus of pereopod 3 of the Russian material strongly suggest they actually had a different species. Proper generic allocation of this specimen requires further examination of the gnathopods of the males. In terrestrial coastal habitats in Hokkaido, *Kokuborchestia kokuboi* (Uéno, 1929), *Ditmorchestia ditmari* (Derzhavin, 1923), and *Ezotinorchestia solifuga* occur. *Kokuborchestia kokuboi* is found in the southeast (Morino and Miyamoto 2015a) whereas *E. solifuga* inhabits the northern to eastern coast (Fig. 4). *Ditmorchestia ditmari* is confined to a small area in the east (Morino and Miyamoto 2015b), possibly representing the southern-most population of this species, which ranges north to Kamchatka.

The reproductive season of the Rishiri population is estimated to be from July to September, and the egg number per female is around 14 (Morino *et al.* 2009).

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