

The Beach-hopper Genus *Platorchestia* (Crustacea: Amphipoda: Talitridae) on Atlantic Ocean Coasts and on those of Associated Seas

ALAN A. MYERS¹  AND JAMES K. LOWRY^{2†} 

¹ School of Biological, Earth and Environmental Sciences,
University College Cork, Cork Enterprise Centre, Distillery Fields, North Mall, Cork, Ireland

² Australian Museum Research Institute,
1 William Street, Sydney NSW 2010, Australia (deceased 4 November 2021)

ABSTRACT. Five species of *Platorchestia* Bousfield, 1982, are described and figured from Atlantic Ocean shores (including the Caribbean, Baltic, and Mediterranean seas). Four of these are new to science. All five species had previously been illustrated in the literature but four of them had incorrectly been allocated to either *Orchestia platensis* Krøyer, 1945 or *O. monodi* Mateus, Mateus & Afonso, 1986.

Introduction

The genus *Platorchestia* Bousfield, 1982, is widespread on shores of the Atlantic Ocean (including the Caribbean, Baltic, and Mediterranean seas) where it has been reported from South America, Central America, the Caribbean, the Gulf of Mexico, North America, Bermuda, Canada, the United Kingdom, the Baltic, the Mediterranean, Nigeria, and South Africa. All recorded examples attributable to the genus *Platorchestia* in the Atlantic had previously been assigned to either *Orchestia platensis* Krøyer, 1845 (including as *Platorchestia platensis*) or to *Orchestia monodi* Mateus, Mateus & Afonso, 1986. An examination of material from around Atlantic shores has revealed that in the Atlantic Ocean there is a complex of at least five cryptic species in the genus *Platorchestia*. These are *P. platensis*, *P. oliveirae* sp. nov., *P. exter* sp. nov., *P. negevensis* sp. nov. and *P. griffithsi* sp. nov. Males of these species develop an incassate pereopod 7 that only reaches its terminal development in hyperadult males. These are sexually mature males that have continued to develop secondary sexual characters to a complexity that is beyond that of the normal mature male. The terminal

morphology of the carpus of the male pereopod 7 is species specific, but since hyperadult males may be quite rare in a population, further character states need to be examined for the purposes of identification. *Platorchestia* also occurs on the Australian plate (*P. paraplatisensis* Serejo & Lowry, 2008 and *P. smithi* Lowry, 2012) the Pacific plate (*P. ano* Lowry & Bopiah, 2013) and the Asian plate (*P. munmui* Jo, 1988, *P. pachypus* Derzhavin, 1937, *P. pacifica* Miyamoto & Morino, 2004).

Hupalo & Grabowski (2018) present support for close genetic relatedness between populations of putative *P. platensis* on either side of the Atlantic, based on the mitochondrial cytochrome oxidase subunit 1 (CO1) gene. Falk *et al.* (2022) showed that CO1 sequences can be excellent at supporting the hypothesis that two taxa are different species, but can fail to reveal much difference between what are patently different, but closely related species. Falk *et al.* (2022) cite the case of two Nomad bees that are clearly separate species based on good morphological and ecological differences, but which cannot be distinguished by CO1. Henzler & Ingolfsson (2007) considered that there was little genetic distance, based on CO1, between Icelandic

Keywords: Amphipoda, Taxonomy, Talitridae, *Platorchestia*, new species, Atlantic, Baltic, Mediterranean, Caribbean

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ORCID iD: Alan A. Myers <https://orcid.org/0000-0003-3256-2123>, James K. Lowry <https://orcid.org/0000-0003-0437-6753>

Corresponding author: Alan A. Myers bavayia@gmail.com

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and European populations of *Orchestia gammarellus* (Pallas, 1766). Myers & Lowry (2020), however, showed that the species of *Orchestia* Leach, 1814 inhabiting Iceland is not *O. gammarellus*, but a distinct, closely related species, *O. forchuiensis* Myers & Lowry. BOLD is becoming an important “go to” in taxonomic studies, but it is important to understand and work within the limitations of CO1. Where species are separable by morphological techniques but cannot be separated using CO1, it perhaps indicates a relatively recent radiation. Sibling species may require additional mitochondrial and/or nuclear markers or even full genome sequences to be elucidated.

The present study describes morphological differences between European, American, and African *Platorchestia* species and allocates them to several sibling species.

Materials and methods

Material for study was kindly made available to us by Dr Philippe Ste-Marie, Museum of Nature in Ottawa and by Dr Michael Zettler, Rostock, Germany.

Specimens for study were dissected in 70% alcohol and body parts were mounted on glass microscope slides in glycerine. They were examined under a Nikon Optiphot compound microscope with interference contrast attachment and drawn with the use of a drawing tube. Type material is deposited in the National Museum of Canada, Ottawa (CNMC), in the Natural History Museum of Denmark, Copenhagen (NMUC) and in the Hebrew University of Israel.

Abbreviations used in figures: A1, 2 = Antenna 1, 2; Hd = head; G1, 2 = gnathopods 1, 2; P4–7 = pereopods 4–7; Ep 1–3 = epimera 1–3; U1–3 = uropods 1–3; C6 = coxa 6; d = dactylus; M = male; F = female.

Systematic section

Suborder Senticaudata Lowry & Myers, 2013

Infraorder Talitrida Serejo, 2004

Parvorder Talitridira Serjo, 2004

Superfamily Talitroidea Rafinesque, 1815

Family Talitridae Rafinesque, 1815

Subfamily Talitrinae Rafinesque, 1815

Platorchestia Bousfield, 1982

Platorchestia Bousfield, 1982: 26.

Included species. *Platorchestia* includes 11 established species: *P. ano* Lowry & Bopiah, 2013; *P. exter* sp. nov.; *P. griffithsi* sp. nov.; *P. munmui* Jo, 1988; *P. negevensis* sp. nov.; *P. oliveirae* sp. nov.; *P. pachypus* (Derzhavin, 1937); *P. pacifica* Miyamoto & Morino, 2004; *P. paraplatisensis* Serejo & Lowry, 2008; *P. platensis* (Krøyer, 1845)—type species by original designation; *P. smithi* Lowry, 2012 and one putative species, the incompletely described *P. crassicornis* (Costa, 1867).

Diagnosis. *Antenna 1* short, not longer than article 4 of antenna 2. *Antenna 2* peduncle article 3 without ventral plate; articles 4–5 generally incrassate in males. *Maxilliped* palp article 2 with distomedial lobe; article 4 reduced, button-shaped. *Gnathopod 1* sexually dimorphic; subchelate, cuspidactylate. *Gnathopod 2* subchelate in males, mitten-shaped in females. *Pereopods 3–7* cuspidactylate. *Pereopod 7* often incrassate in terminal males. *Uropod 1* endopod without marginal setae. *Telson* with apical and marginal robust setae.

Remarks. Beach hoppers of the genus *Platorchestia* live amongst algal debris, high on marine shores sometimes in estuaries and among mangroves. One Atlantic species has become riparian. In males, pereopod 7 is generally sexually dimorphic, being more robust or incrassate in males—the only exception to this among Atlantic species is *P. negevensis* sp. nov., although it is a frequent state elsewhere. In particularly large males (herein referred to as hyperadults), the carpus of pereopod 7 becomes markedly incrassate, either subrectangular or subovoid and sometimes the anterior margin may be crenulate or notched. Hyperadult males may be quite uncommon in a population, so that large samples of a population may be collected including relatively large males, none of which exhibit full incrassation of pereopod 7. Nevertheless, the type of incrassation found in hyperadult males is of specific importance. When hyperadult males are not represented in a collection, other character states must be observed for correct identification.

Platorchestia platensis (Krøyer, 1845)

Figs 1–4

Orchestia platensis Krøyer, 1845: 304, pl. 2, fig. 2a–i.—Stebbing, 1888: 210.—Spandl, 1924: 462.—Chevreux & Fage, 1925: 276, fig. 287.—Dahl, 1946: 11.—Karlbrink, 1969: 327.—Karaman, 1971, 12, figs 3–4.—Geldiay *et al.*, 1971: 369.—Lincoln, 1979: 220, fig. 101, a–h.—Teigsmark, 1981: 165.—Bellan-Santini, 1993: 749, fig. 514.—Stefanidou & Voultziadou-Koukoura, 1995: 603, tab. 1.—Holmes *et al.*, 1997: 186.—Gönlügür-Demirci, 2006: 1133.

Orchestia incisimana Chevreux, 1888: 347, pl. 6 figs 1, 2. *Orchestia gammarellus*.—Della Valle, 1893: 499 (in part).

Platorchestia platensis.—Jo, 1988: 166, fig. 8.—Köhn & Gosselck, 1989: 61, fig. 19, 3.—Krapp-Schickel & Zavodnik, 1996: 461.—Miyamoto & Morino, 2004: 81, fig. 7.—Serejo, 2004: 19, fig. 10.—Ruffo & Krapp-Schickel, 2005: 36.—Sezgin & Katağan, 2007: 5, tab. 1.—Serejo & Lowry, 2008: 194, figs 25, 26.—Christodoulou *et al.*, 2013: 12, tab. 2.—Zakhama-Sraieb *et al.*, 2017: 498 (checklist).—Zettler & Zettler, 2017: 345, figs 243–244.—Copilaş-Ciocianu *et al.*, 2020: 461, 462, fig. 1, 2.

Not *Orchestia platensis*.—Spence Bate, 1862: 19, pl. 3, fig. 3 [=?*Orchestia*].—Shoemaker, 1921: 101.—Shoemaker, 1933: 17.—Shoemaker, 1935: 241 (= *P. oliveirae* sp. nov.).—Iwasa, 1939: 257, figs 1–3, pl. 9 (= *P. joi* Stock & Biernbaum, 1994).—Stephensen, 1945: 57, figs 15–16 (= *P. joi* Stock & Biernbaum, 1994).—Gurjanova, 1951: 807, fig. 562 (= *P. joi* Stock & Biernbaum, 1994).—Oliveira, 1953: 329, figs. 1012 (= *P. oliveirae* sp. nov.).—Bulycheva, 1957: 159, figs 57a–b (= *P. joi* Stock & Biernbaum, 1994).—Bousfield, 1973, 159, fig. 46.2 (= *P. exter* sp. nov.).—Morino, 1975: 172, figs 1–3 (= *P. joi* Stock & Biernbaum, 1994).—Griffiths, 1975,



Figure 1. *Platorchestia platensis* (Krøyer, 1845), male (14 mm), Bornova, Turkey.

79, fig. 52B (= *P. griffithsi* sp. nov.—Fox & Bynum, 1975: 228 (= *P. oliveirae* sp. nov.). —Soares, 1979: 97 (= *P. oliveirae* sp. nov.).—Ciavatti, 1989: 135, figs. 6–8 (= *P. oliveirae* sp. nov.).—Diemer, 2016, 207, figs. 4, 6 (= *P. griffithsi* sp. nov.).—Herbst & Dimentman, 1983: 20, fig. 3 (= *P. negevensis* sp. nov.).

Not *Platorchestia platensis*. —Myers, 1985: 134, figs 108, 109 (= sp. nov.).—Morino & Ortal, 1995: 829, fig. 4 (not identifiable to any known species).

Lectotype: Male, 12.3 mm, ZMUC CRU 8221 (selected by Serejo, 2004). **Paralectotypes:** 1 male, 6.8 mm; 1 female, 7.6 mm, 7 damaged specimens, Montevideo, 13/12/40, ZMUC 7803.

Other material examined. 4 males and 4 females, Bornova, Izmir, Turkey, Aegean Sea, Ahmet Koçatas, 22.05.1976, CNMC 1982-0358; 4 males 1 female Warnow Estuary, northern Breiting, Rostock/Hohe Dune, Baltic Sea, 07.05.1998, M. L. Zettler; 4 males, 4 females, Gulf of Guinea, Port Harcourt, Creek Market, Nigeria, 23.10.1997, S. Reino Freeman, CMNC 1982-0359; 4 males, 4 females, Ceuta, Morocco, 36°04'N 05°36'W, 03.08.1960, Richard J. Vockeroth, CMNC1982-0357.

Type locality. Rio de la Plata, Montevideo, Uruguay.

Description. Male (based on adult male, 14 mm).

Head. Eyes black, medium size. *Antenna 1* short, not longer than article 4 of antenna 2. *Antenna 2* peduncle incrassate; article 5 longer than 4; peduncular articles with sparse, small robust setae.

Pereon. *Gnathopod 1*; subchelate; posterior margin of carpus and propodus with rugose lobe; carpus of moderate length, about two-and-a-half \times as long as its broadest width and about one and one quarter length of propodus, rugose lobe broad; propodus palm transverse; dactylus weakly overlapping palm, cuspidactylate. *Gnathopod 2* sexually dimorphic; subchelate; basis weakly expanded, subrectangular; merus without medial lobe; carpus reduced, enclosed by merus and propodus; **propodus posterior margin nearly straight**, palm acute, with sinuous margin and subdistal notch, posterodistal corner with protuberance; dactylus scythiform, overlapping posterior margin. *Coxae 2–4* as wide as deep. *Pereopods 3–7* cuspidactylate. *Pereopod 4* significantly shorter than pereopod 3; dactylus thickened different from that of pereopod 3. *Pereopod 5* propodus distinctly longer than carpus. *Pereopod 6* not sexually dimorphic, shorter than pereopod 7; coxa posterior lobe with weak serrations and **posteroproximal corner extended into a distinct lobe**. *Pereopod 7* sexually dimorphic; basis almost as broad as long, posterodistal lobe present; **carpus elongate suboval**, length 1.6 \times breadth, **anterior margin weakly crenulate**; carpus: propodus length ratio = 5:6.

Pleon. *Epimera 1–3* with posterior margin slightly scalloped; posteroventral corner of epimera 2–3 moderately produced, subacute. *Uropod 1* peduncle 1.5 \times length of rami, with robust setae in two rows, distolateral robust seta weak; endopod subequal in length to exopod and with 3 marginal inner robust setae and 4 marginal outer robust setae; endopod without marginal robust setae. *Uropod 2* peduncle inner

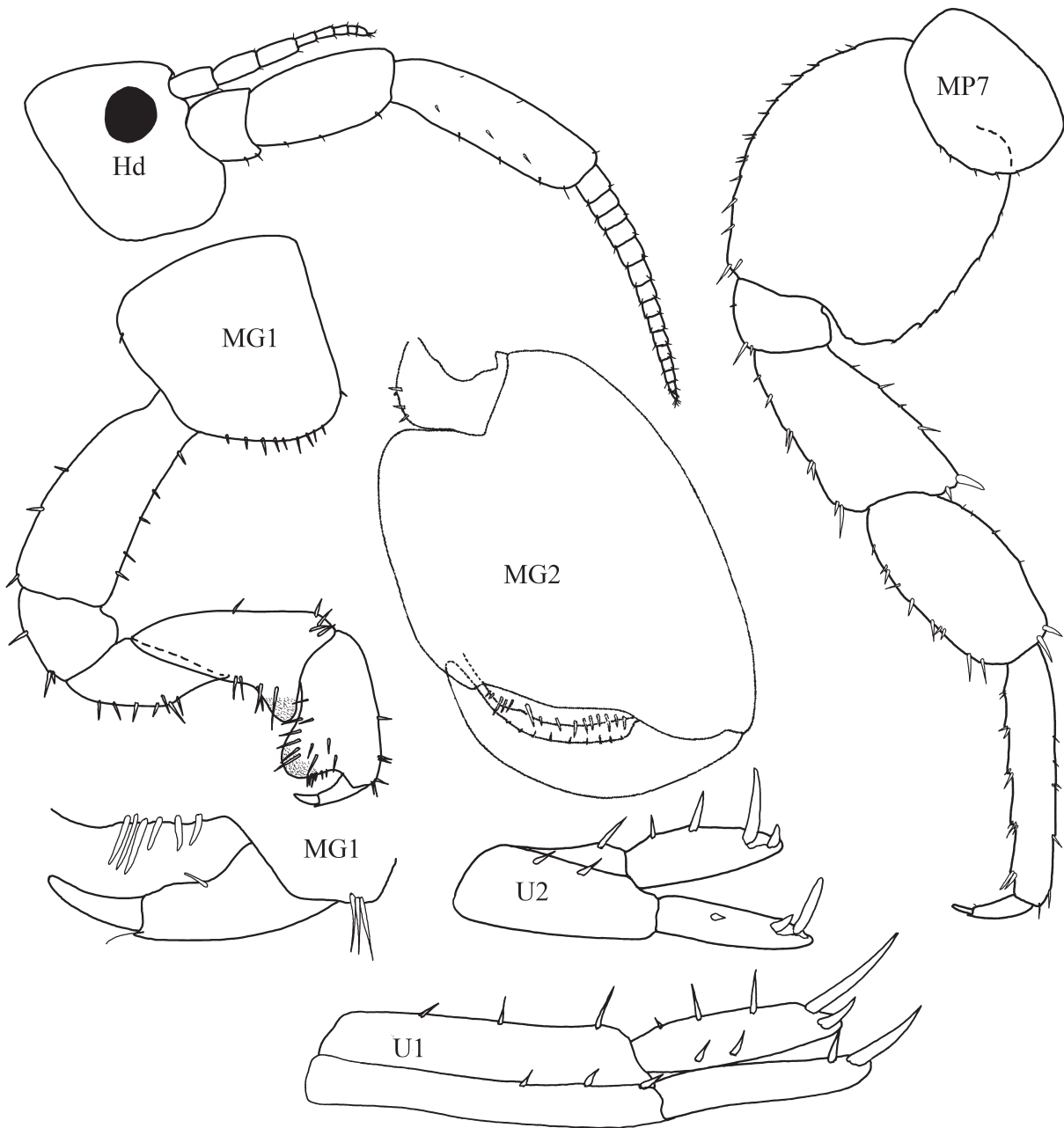


Figure 2. *Platorchestia platensis* (Krøyer, 1845), male paralectotype (12 mm), Montevideo, Uruguay (After Serejo, 2004, except uropods 1–2 from SEM).

margin with about 5 robust setae and outer margin with 3 robust setae; inner ramus subequal in length to exopodite; endopodite with 2 marginal inner robust setae, exopodite with 2 marginal robust setae. *Uropod 3* peduncle 1.5 × length of ramus, with 2 or 3 robust setae; ramus stout, less than 3 × longer than broad, with 0–2 marginal setae, and 3 or 4 apical setae. *Telson* longer than broad, apically incised, with marginal and apical robust setae; each lobe with 3–5 robust setae.

Female (sexually dimorphic characters). *Antennae 2* slender, not incrassate, *Gnathopod 1* without rugose lobes on carpus and propodus. *Gnathopod 2* mitten-shaped; basis anterior margin strongly convex proximally, weakly concave anteriorly. *Pereopod 7* carpus slender.

Remarks. *Platorchestia platensis* shares the presence of a knob-like extension on the posteroproximal margin of coxa 6. with *P. exter* sp. nov. and probably with *P. negevensis* sp. nov., (unconfirmed) among Atlantic species and *P. pacifica* Miyamoto & Morino, 2004 and *P. paraplantensis* Serejo & Lowry, 2008 elsewhere. The knob is absent in the Atlantic species *P. oliveirae* sp. nov. and *P. griffithsi* sp. nov., and is also absent in the non-Atlantic species, *P. ano* Lowry & Bopiah, 2013, *P. smithi* Lowry, 2012, *P. munmui* Jo, 1988 and *P. pachypus* Derzhavin, 1937. *Platorchestia platensis* differs from *P. exter* sp. nov. in the length of the propodus on the male gnathopod 1 that is about two-thirds as long as broad (almost as broad as long in *P. exter* sp. nov.) and in the ramus of uropod 3 being about 2× as long as broad (about 3×

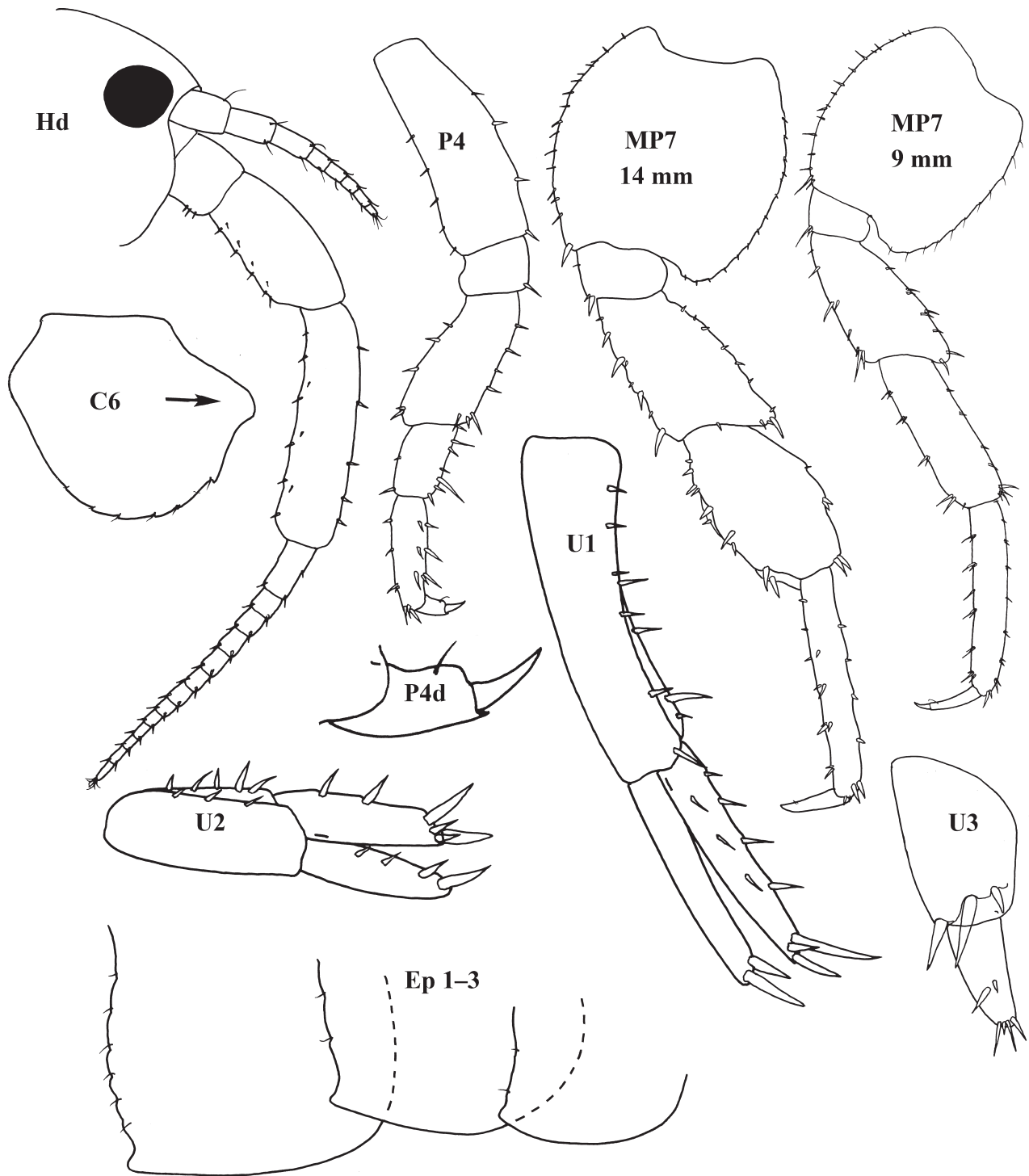


Figure 3. *Platorchestia platensis* (Krøyer, 1845), male (14 mm), Bornova, Turkey.

as long as broad in *P. exter* sp. nov.). It differs from all other Atlantic species by the nearly straight posterior margin of the propodus of the male gnathopod 2 (convex in other species). It differs from *P. negevensis* sp. nov. in the incrassation of the male pereopod 7 (unexpanded in *P. negevensis* sp. nov.) and in the dactylus of gnathopod 1 being almost equal in length to the palm (significantly shorter than the palm in *P. negevensis* sp. nov.). It differs from *P. griffithsi* sp. nov. in the presence of the aforementioned knob-like process on the

posteroproximal margin of coxa 6 (absent in *P. griffithsi* sp. nov.), in the nearly straight posterior margin of the propodus of the male gnathopod 2 (convex in *P. griffithsi* sp. nov.) and in the much shorter propodus of the male pereopod 7. For the several differences between *P. platensis* and *P. oliveirae*, see under the remarks for *P. oliveirae*.

Habitat. In beach algal debris on high shore of protected beaches.

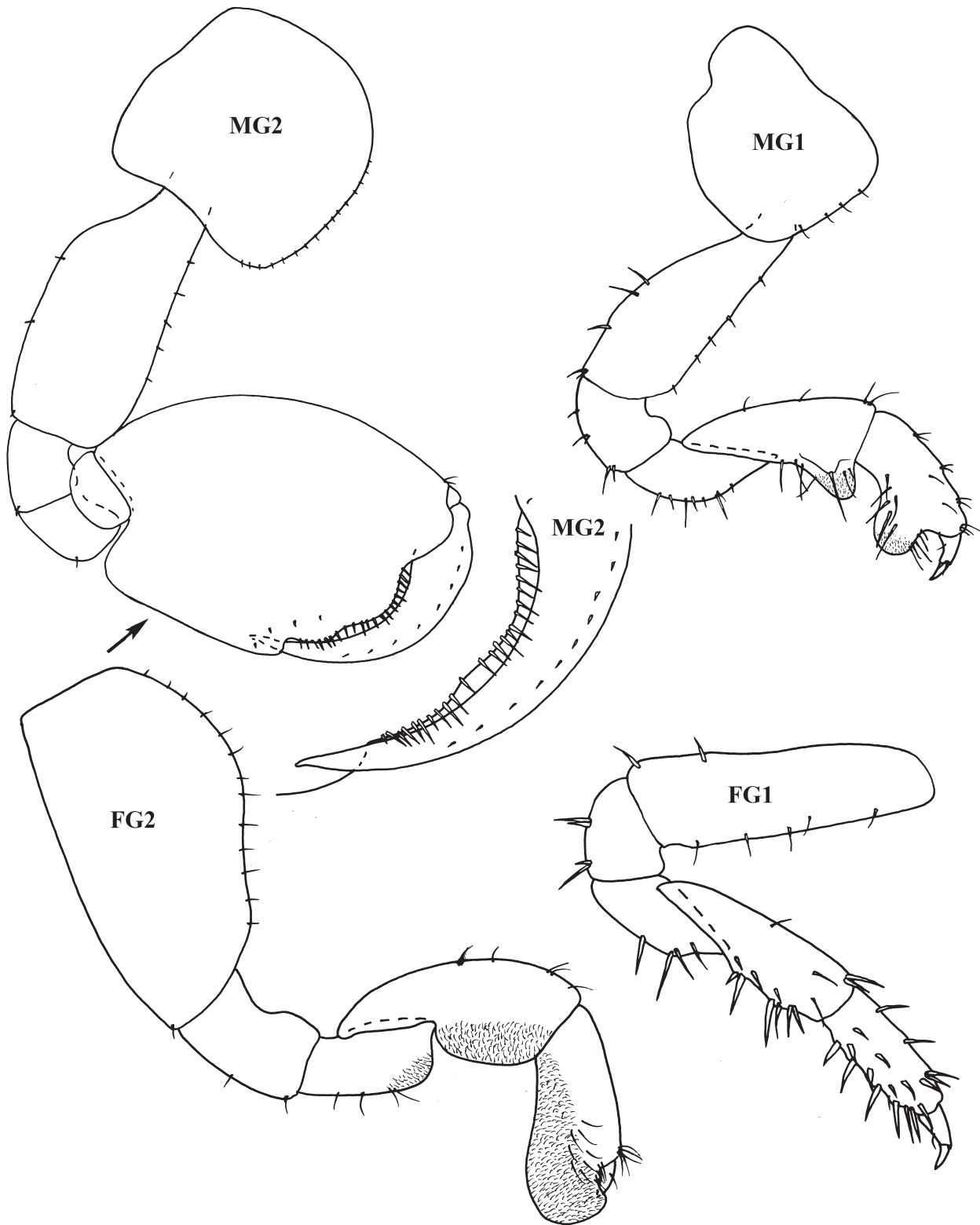


Figure 4. *Platorchestia platensis* (Krøyer, 1845), male (14 mm), female (12 mm), Bornova, Turkey.

Distribution. South America: La Plata, Uruguay (Krøyer, 1845); Mediterranean: Marseille (Bellan-Santini, 1993), Monaco, Minorca, Naples, Algeria, Egypt, Palestine (Chevreux & Fage, 1925); Montenegro, Boka Kotorska (Karaman, 1971); Turkey (Geldiay *et al.*, 1971; present

investigation); Black Sea (Copilaş-Ciocianu *et al.*, 2020); Africa: Morocco (present investigation); Nigeria (present investigation); England (Lincoln, 1979); Baltic: Denmark (Jo, 1988), Germany (Zettler & Zettler, 2017; present investigation).

Platorchestia oliveirae sp. nov.

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Figs 5–7

- Orchestia platensis* Kunkel, 1910: 63, fig. 24.—Shoemaker, 1921: 101.—Shoemaker, 1933: 17.—Shoemaker, 1935: 241.—Oliveira, 1953: 329, figs. 1012.—Soares, 1979: 97.—Fox & Bynum, 1975: 228.—Heard, 1982: 42, fig. 49.—Ciavatti, 1989: 135, figs. 6–8.
- Platorchestia platensis*.—LeCroy *et al.*, 2009: 963.—Gable *et al.*, 2010: 140, appendix 1.
- Orchestia monodi*.—Serejo, 2004: 14, figs 7–9.—Wildish *et al.*, 2016: 1919.
- Not *Orchestia platensis* Krøyer, 1845: 304, pl. 2 figs 2a–i.
- Not *Orchestia monodi* Mateus, Mateus & Afonso, 1986: 100, figs 1–7.

Holotype: Male 9.0 mm, Caioba, Parana State, Brazil, Fritz Plauman, 06.1958, CNMC-1962-0352. **Paratypes:** 65 males and females, same data as holotype, CNMC-1962-0352.1.

Other material examined. 4 males, 4 females, Patos Island, Venezuela, under stones, HW level, Victor C. Quesnel, 1959, CNMC-1962-0421; 4 males, 4 females, Trinidad and Tobago, P. Wagenaar Hummelinck, 11.01.1955, CNMC-1984-0995; 3 males, 3 females, Fort de France, Martinique, Arthur H. Clarke, 27.03.1960, CNMC-1962-0424; 4 males, 4 females, Great Bay, St Maarten, P. Wagenaar Hummelinck, 24.06.1949, CNMC-1984-0977; 4 males, 4 females, Ocean Springs Highway, 90 Bridge, Jackson County, Mississippi, R. Moore, 08.02.1960, CNMC-1963-0076; 4 males, 4 females, Cedar Key, Levy County, Florida, sand beach under debris, Robert A. Menzies, 11.1959, CNMC-1963-0141; 4 males, 4 females Tuckers Town Cove, Bermuda, sand, plant, HW line, Eric L. Mills, 29.05.1962, CNMC-1962-0405.

Type locality. Caioba, Parana State, Brazil.

Etymology. Named after Dr L. P. H. de Oliveira who first described material attributable to this taxon from Rio de Janeiro.

Description. Male (based on adult male holotype, 9 mm).

Head. Eyes black, medium size. *Antenna 1* short, not longer than article 4 of antenna 2. *Antenna 2* peduncle incrassate; article 5 longer than 4; peduncular articles with sparse, small robust setae.

Pereon. *Gnathopod 1* subchelate; posterior margin of carpus and propodus with rugose lobe; **carpus and propodus elongate; carpus 3.5 × longer than its median width, rugose lobe narrow; propodus elongate, parallel sided, not including the palmate lobe; dactylus overlapping palm.** *Gnathopod 2* sexually dimorphic; subchelate; basis weakly expanded, subovate; merus without medial lobe; carpus reduced, enclosed by merus and propodus; propodus subovate, posterior margin evenly convex, palm acute, with strong V-shaped, midpalmar notch, posterodistal corner with protuberance; dactylus scythiform, overlapping posterior margin. *Coxae 2–4* as wide as deep. *Pereopods 3–7* cuspidactylate. *Pereopod 4* shorter than pereopod 3; dactylus thickened but not pinched posteriorly, different from that of pereopod 3. *Pereopod 5* propodus distinctly longer than carpus. *Pereopod 6* shorter than pereopod 7, not sexually dimorphic; **coxa posterior lobe with strong serrations, anteroproximal corner not produced.** *Pereopod 7* weakly incrassate; basis almost as broad as long, posterodistal lobe

present; **carpus broad, rectangular, weakly expanded;** carpus:propodus length ratio = 5:6.

Pleon. *Epimera 1–3* with posterior margin serrated; **posteroventral corner of epimeron 2 produced into strong acute spine. Uropod 1 peduncle elongate, 1.7 × length of rami,** with robust setae in two rows, distolateral robust seta absent; endopodite subequal in length to exopodite with 4 marginal inner robust setae and 3 marginal outer robust setae; endopodite without marginal setae. *Uropod 2* peduncle inner margin with 7–10 robust setae, outer margin with 3 or 4 robust setae; endopodite subequal in length to exopodite; endopodite with two marginal robust setae; exopodite without marginal robust setae. **Uropod 3 peduncle 1.5 × length of ramus,** with 1 robust seta; ramus less than 3 × as long as broad, almost parallel-sided, with 2 or 3 marginal setae, and 3 or 4 apical setae. *Telson* longer than broad, apically incised, with marginal and apical robust setae; each lobe with 5 or 6 robust setae.

Female (sexually dimorphic characters). *Antennae 2* slender, not incrassate. *Gnathopod 1* carpus and propodus without rugose lobes. *Gnathopod 2* mitten-shaped; basis anterior margin weakly concave anteriorly, strongly convex proximally. *Pereopod 7* not incrassate.

Growth stages. The male gnathopod 2 propodus changes both its general shape and in the palm ornamentation with age. The propodus becomes less elongate and the midpalmar notch develops gradually.

Habitat. In beach debris on protected beaches and mangroves.

Remarks. Adult males of *P. oliveirae* sp. nov. have a much more robust pereopod 7 than do females, but only minimal incrassation of the carpus of pereopod 7 has been observed even in the largest males. A number of large males from a wide range of locations have been examined, but the possible existence of hyperadult males with a more incrassate P7 cannot be dismissed. *P. oliveirae* sp. nov. differs from all other Atlantic species in the structure of the male gnathopod 1 in which the carpus length is >3× breadth (length <3× breadth in *P. platensis*, *P. exter* sp. nov. and *P. griffithsi* sp. nov.) and, in addition, the dactylus is long, overlapping the palm whereas it is scarcely equal to or shorter than the palm in all other Atlantic species. The male gnathopod 2 has the basis anterior margin markedly convex, whereas it is nearly straight or at most weakly convex in other Atlantic species and the propodus is very subovoid due to a very convex posterior margin and develops a deep mid-palmar triangular notch in large males. No other Atlantic species has such a notch. Among Asian species. *P. munmui* Jo, 1988 has a small, non-triangular midpalmar notch, but that species has a weak posterodistal spine on epimeron 2, the carpus of the male gnathopod 1 is not strongly elongate, the rugose lobe broad and the posterior lobe of coxa 6 is weakly serrated (strongly serrated in *P. oliveirae* sp. nov.). In *P. oliveirae* sp. nov., coxa 6 does not have a posteroproximal knob (present in *P. platensis* and *P. exter* sp. nov.). In *P. oliveirae* sp. nov. there is a very strong acute spine on the posterodistal corner of epimeron 2 (short and blunt in other species except *P. negevensis* sp. nov., where it is subacute).

Distribution. From Brazil northwards to Bermuda. Brazil (Oliveira, 1953; Soares, 1979; Serejo, 2004;



Figure 5. Above *Platorchestia exter* sp. nov., male holotype (11 mm), Newfoundland; below, *Platorchestia oliveirae* sp. nov., male holotype (9 mm), Parana State, Brazil.

present investigation); Venezuela (present investigation); Barbados (Shoemaker, 1921); Trinidad and Tobago (present investigation); Martinique (present investigation); Guadeloupe (Ciavatti, 1989; present investigation); Saint Maarten (present investigation); Dominican Republic

(Shoemaker, 1933), Puerto Rico (Shoemaker, 1935), North Carolina (Fox & Bynum, 1975); Mississippi (present investigation); Florida (present investigation); northern Gulf of Mexico (Heard, 1982); Bermuda (Gable *et al.*, 2010; Wildish *et al.*, 2016; present investigation).

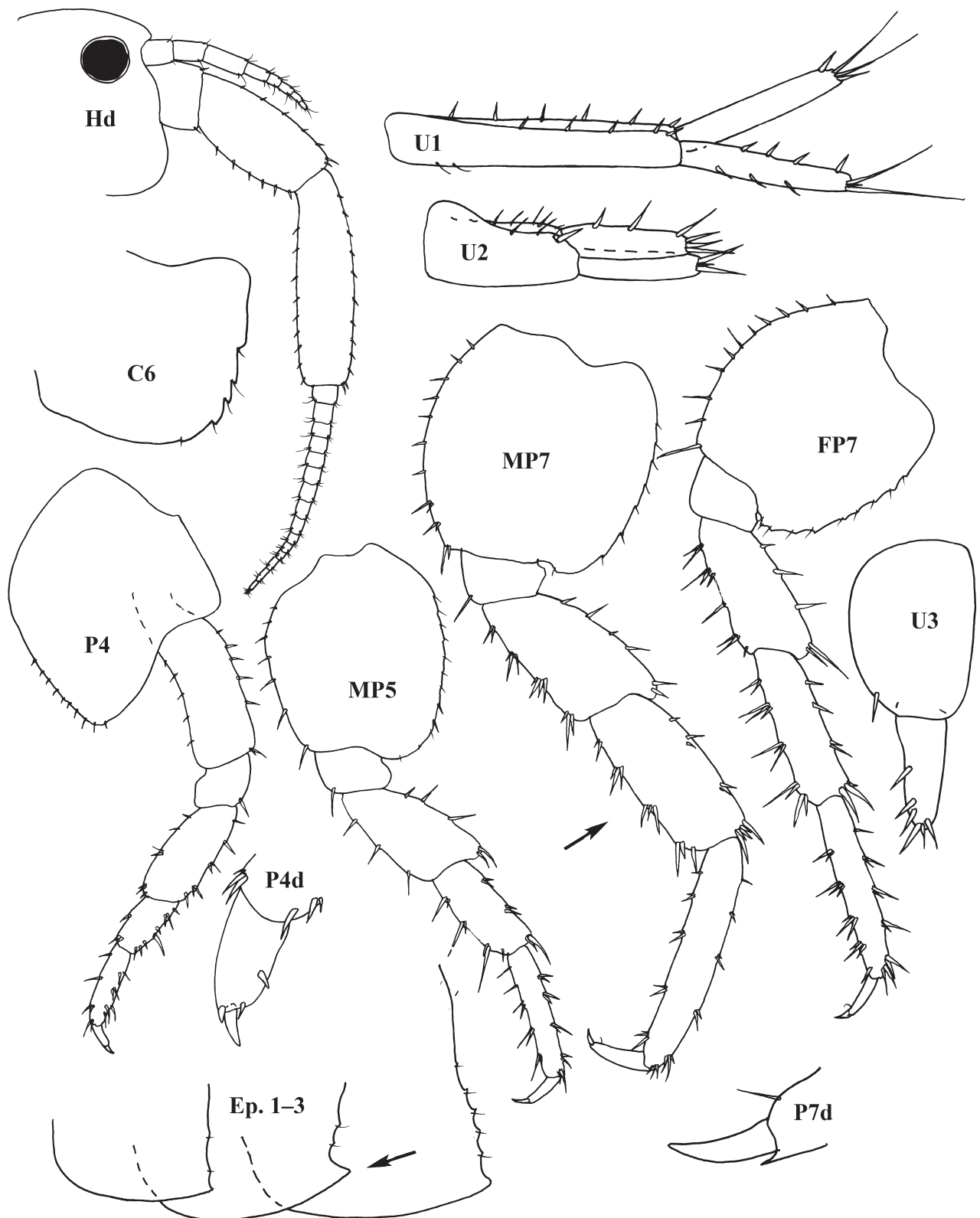


Figure 6. *Platorchestia oliveirae* sp. nov., male holotype (9 mm), Parana State, Brazil.

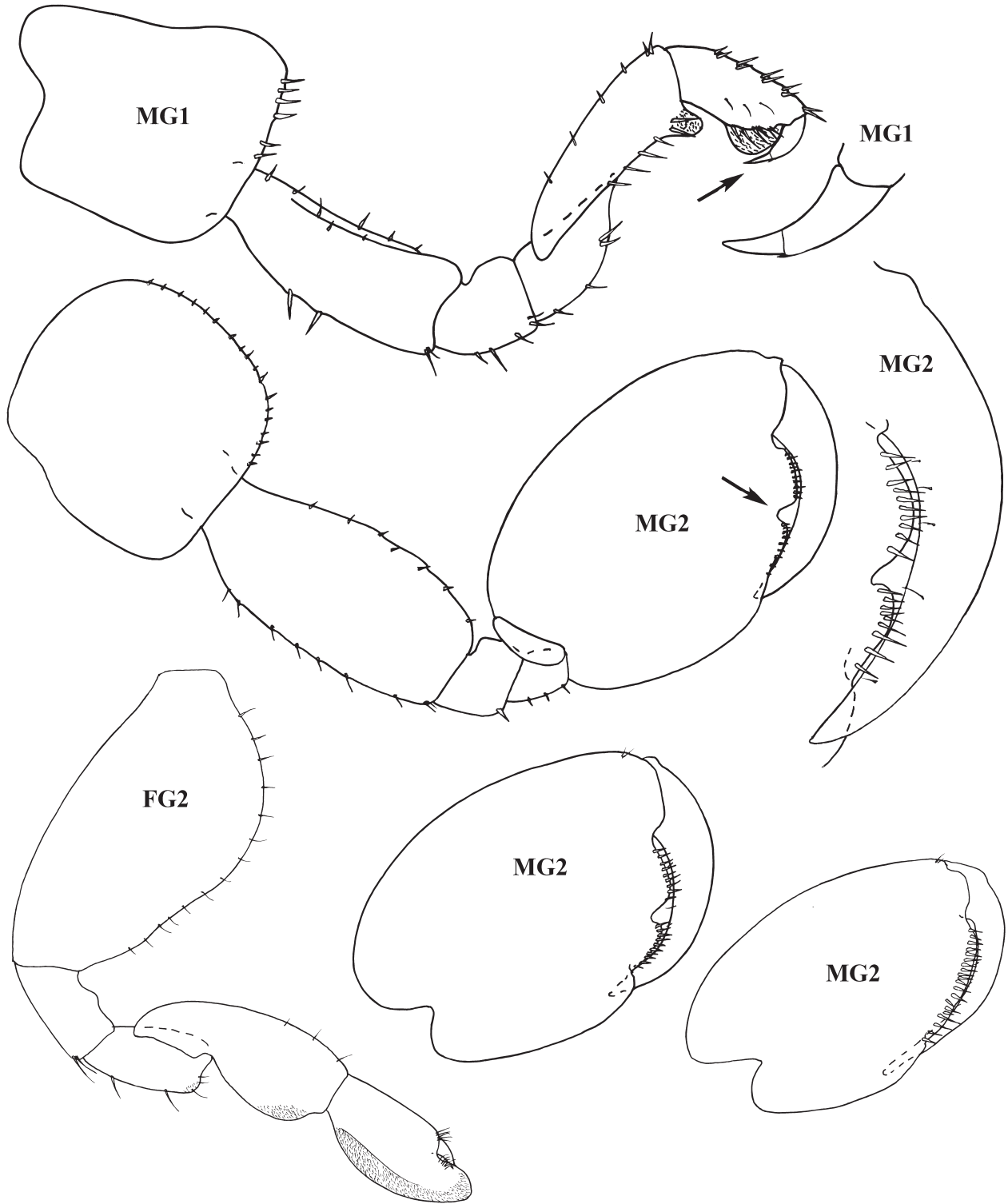


Figure 7. *Platorchestia oliveirae* sp. nov., male holotype (9 mm), female paratype (8 mm), Parana State, Brazil.

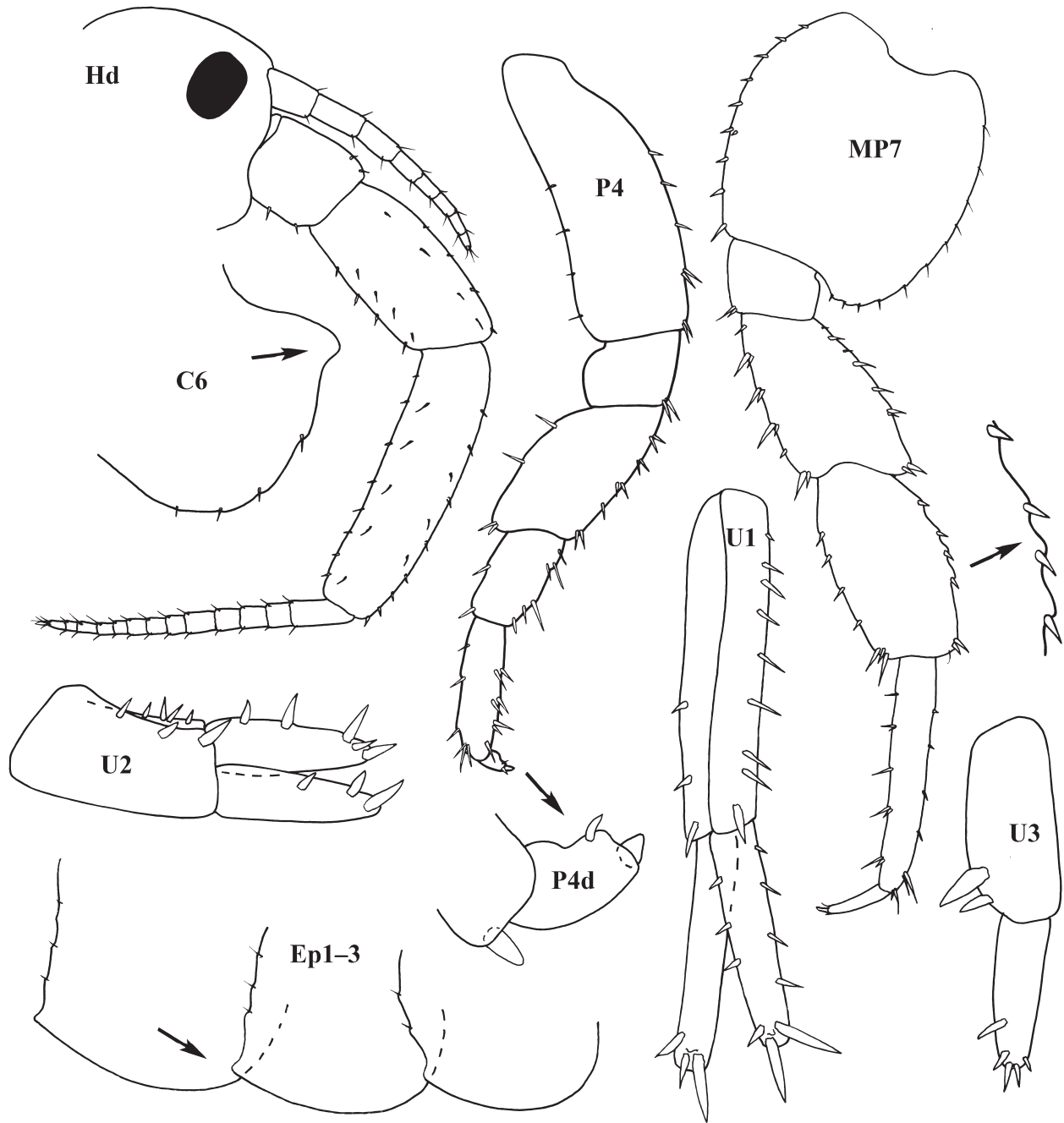


Figure 8. *Platorchestia exter* sp. nov., male holotype (11 mm), Newfoundland.

Platorchestia exter sp. nov.

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Figs 5, 8, 9

Orchestia platensis Bousfield, 1955: 141.—Bousfield, 1956: 32.—Bousfield, 1958: 883, figs 1c, 10b.—Feeley & Wass, 1971: 20.—Bousfield, 1973: 159, fig. 46.2.—Brunel, Bosse & Lamarche, 1998: 200.

Platorchestia platensis.—Bousfield, 1982: 28, fig. 11.—Halcrow & Bousfield, 1987: 277, fig. 16.—?Wildish *et al.*, 2016: 1919.

Not *Orchestia platensis* Krøyer, 1845: 304, pl. 2, figs 2a–i.

Holotype: Male 11.0 mm, Port au Port, Newfoundland, north side of isthmus, 48°33'35"N 58°43'24"W, E. L. Bousfield, 13.07.1954, CNMC-1982.0236. **Paratypes:** 44 males and females, same data as holotype, CNMC-1982.0236.1.

Type locality. Port au Port, Newfoundland.

Etymology. From the Latin *exter* referring to the scalloped anterior margin of the hyperadult male percepod 7 carpus. Used as a noun in apposition.

Ecological type. Beach hopper.

Description. Adult male holotype. 9 mm.

Head. Eyes black, medium size. *Antenna 1* short, not longer than article 4 of antenna 2. *Antenna 2* peduncle incrassate; article 5 longer than 4; peduncular articles with sparse, small robust setae.

Pereon. *Gnathopod 1* subchelate; posterior margin of carpus and propodus with rugose lobe; **carpus less than 3 × as long as its median width, rugose lobe narrow**; propodus short, triangular; dactylus cuspidactylate, shorter than palm. *Gnathopod 2* sexually dimorphic; subchelate; basis weakly

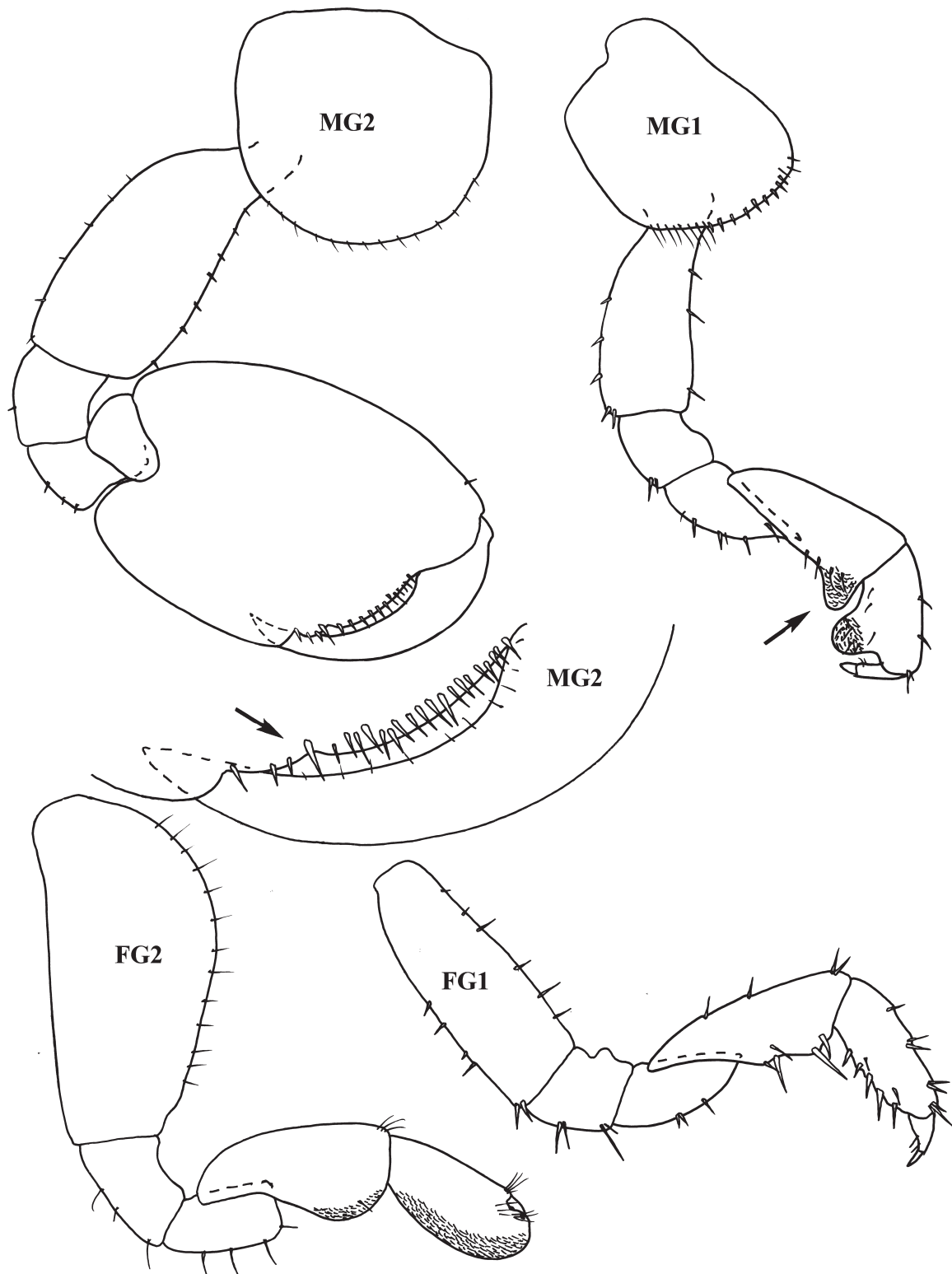


Figure 9. *Platorchestia exter* sp. nov., male holotype (11 mm), female paratype (10 mm), Newfoundland.

expanded, almost parallel-sided; merus without medial lobe; carpus reduced, enclosed by merus and propodus; propodus subovate, posterior margin evenly convex. palm acute, with 2 medio-distal weak indentations, posterodistal corner with rounded protuberance; dactylus scythiform, overlapping posterior margin. *Coxae* 2–4 as wide as deep. *Pereopods* 3–7 cuspidactylate. *Pereopod* 4 significantly shorter than pereopod 3; dactylus thickened pinched posteriorly, different from

that of pereopod 3. *Pereopod* 5 propodus distinctly longer than carpus. *Pereopod* 6 not sexually dimorphic, shorter than pereopod 7; coxa posterior lobe with strong serrations, **posteroproximal corner extended into a distinct lobe.** *Pereopod* 7 sexually dimorphic; basis almost as broad as long, posterodistal lobe present; **carpus very enlarged, weakly subovoid, anterior margin crenulated, each protrusion with a robust seta;** carpus: propodus length ratio = 5:6.

***Platorchestia negevensis* sp. nov.**

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Figs 10–11

Orchestia platensis.—Herbst & Dimentman, 1983: 20, fig. 3 (in part).*Platorchestia monodi*.—Morino & Ortal, 1995: 825, figs 1–3.Not *Orchestia platensis* Krøyer, 1845: 304, pl. 2 figs 2a–i.Not *Orchestia monodi* Mateus, Mateus & Afonso, 1986: 100, figs 1–7.**Syntypes:** 3 males (8.0–9.5 mm), 2 females (7.7–8.5 mm), En Hameara, Negev Desert, Israel, IES 2088 Amp 1246 and IES 5352, Hebrew University of Israel.**Type locality.** En Hameara, Negev Desert, Israel.**Etymology.** Named after the Negev Desert in which the type locality is located.**Ecological type.** Riparian-hopper.**Description.** Based on figures of Morino & Ortal (1995) (male 9.5 mm).**Head.** *Eyes* black, large. *Antenna 1* shorter than article 4 of antenna 2. *Antenna 2* peduncle very weakly incrassate; article 5 longer than 4; peduncular articles with sparse, small robust setae.**Pereon.** *Gnathopod 1* subchelate; posterior margin of carpus and propodus with rugose lobe; carpus 3 × longer than its median width, rugose lobe broad; propodus subtriangular; dactylus cuspidactylate, shorter than palm. *Gnathopod 2* sexually dimorphic; subchelate; basis weakly expanded, parallel-sided; merus without medial lobe; carpus reduced, enclosed by merus and propodus; propodus subovate, posterior margin nearly straight; palm acute, convex, with small notch and protuberance near posterodistal corner; dactylus scyathiform, overlapping posterior margin. *Coxae 2–4* as wide as deep. *Pereopods 3–7* cuspidactylate; *Pereopod 4* significantly shorter than pereopod 3; dactylus short with mini-wavy posterior margin, thickened but not pinched different from that of pereopod 3. *Pereopod 5* propodus longer than carpus. *Pereopod 6* shorter than pereopod 7, not sexually dimorphic, **coxa posterior lobe without process. *Pereopod 7* not incrassate**; basis a little longer than broad, posterodistal lobe present.**Pleon.** *Epimera 1–3* with posterior margin slightly serrated, posteroventral corners produced. *Uropod 1* peduncle with robust setae in two rows, distolateral robust seta absent; rami three quarters length of peduncle; endopodite subequal in length to exopodite with 4 marginal inner setae and 4 marginal outer setae; exopodite without marginal setae. *Uropod 2* peduncle inner margin with 5 setae; outer margin with 3 or 4 strong, robust setae; endopodite subequal in length to exopodite with two rows of 3 marginal robust setae; **exopodite with 2 marginal robust setae. *Uropod 3* peduncle a little longer than ramus, with 3 robust setae; ramus almost parallel-sided**; with 2 marginal setae, and 2 or 3 apical setae. *Telson* longer than broad, apically incised, with marginal and apical robust setae; each lobe with 5–7 robust setae per lobe.**Female** (sexually dimorphic characters). *Gnathopod 1* carpus and propodus without rugose lobes. *Gnathopod 2* mitten-shaped; basis anterior margin irregularly notched, weakly convex proximally, anteriorly nearly straight.**Pleon.** *Epimera 1–3* with posterior margin slightly serrated; posteroventral corner of epimera 1–3 produced into a small spine. *Uropod 1* peduncle 1.4 × length of rami, with robust setae in two rows, distolateral robust seta absent; endopodite subequal in length to exopodite and with 3 marginal inner robust setae and 4 marginal outer robust setae; endopodite without marginal setae. *Uropod 2* peduncle inner margin with 5 or 6 robust setae and outer margin with 2 robust setae; endopodite subequal in length to exopodite; endopodite with 2 marginal inner robust setae; exopodite with 1 marginal robust seta. *Uropod 3* peduncle 1.4 × length of ramus, with 1 robust seta; ramus slender, more than 3 × longer than broad, parallel-sided, with 3 marginal setae, and 3 or 4 apical setae. *Telson* longer than broad, apically incised, with marginal and apical robust setae; each lobe with 3–5 robust setae.**Female** (sexually dimorphic characters). *Antennae 2* slender, not incrassate. *Gnathopod 1* carpus and propodus without rugose lobes. *Gnathopod 2* mitten-shaped; basis anterior margin convex proximally, nearly straight anteriorly. *Pereopod 7* not incrassate.**Habitat.** Amongst debris, high on seashores.**Remarks.** *Platorchestia exter* sp. nov. shares with *P. platensis* the presence of a knob-like extension on the posteroproximal margin of coxa 6 (absent in other species). It differs from *P. platensis*, however, in the narrow-based rugose lobe on the carpus of male gnathopod 1 that is broad based in *P. platensis*, in the short propodus of the male gnathopod 1 that is almost as broad as long (about two-thirds as long as broad in *P. platensis*), in the shape of the gnathopod 2 propodus posterior margin that is evenly convex in *P. exter* sp. nov. (but nearly straight in *P. platensis*) and in having a long slender ramus on uropod 3 about 3 × as long as broad (2 × as long as broad in *P. platensis*). The male antenna 2 is also more strongly incrassate in *P. exter* sp. nov. than it is in *P. platensis*.Bousfield (1973) provides a drawing of an entire male *Orchestia platensis* from New England, but he does not present enlarged drawings of individual male appendages apart from the mouthparts. Appendage metrics derived from the whole animal drawing are unreliable. Non-metric character states based on relative shape, that can be derived from the whole animal drawing include the very stout, incrassate antenna 2 and the narrow-based rugose lobe on the male gnathopod 1 carpus. These character states indicate that the species figured is *P. exter* sp. nov.*Platorchestia exter* sp. nov. differs from *P. oliveirae* sp. nov. in the enlarged, crenulate carpus of pereopod 7 in hyperadult males (broad rectangular weakly expanded in *P. oliveirae* sp. nov.). In *P. exter* sp. nov., the rugose lobe on the carpus of the male gnathopod 1 is narrower than in other species.**Distribution.** The recorded distribution from material examined together with published descriptions, is from Newfoundland (Bousfield, 1958) south through Nova Scotia (Bousfield, 1956, 1982) to New England (Bousfield, 1973). It probably occurs much farther south on the American mainland, but records of the species (as *P. platensis*) from further south have not been substantiated by examination. A record (as *P. platensis*) from Bermuda (Wildish *et al.*, 2016) may be this species, but Wildish *et al.* (2016) provide no description or figures. The incrassate pereopod 7 character state used in the key (p. 1922) for *P. platensis* is compatible with *P. exter* sp. nov.

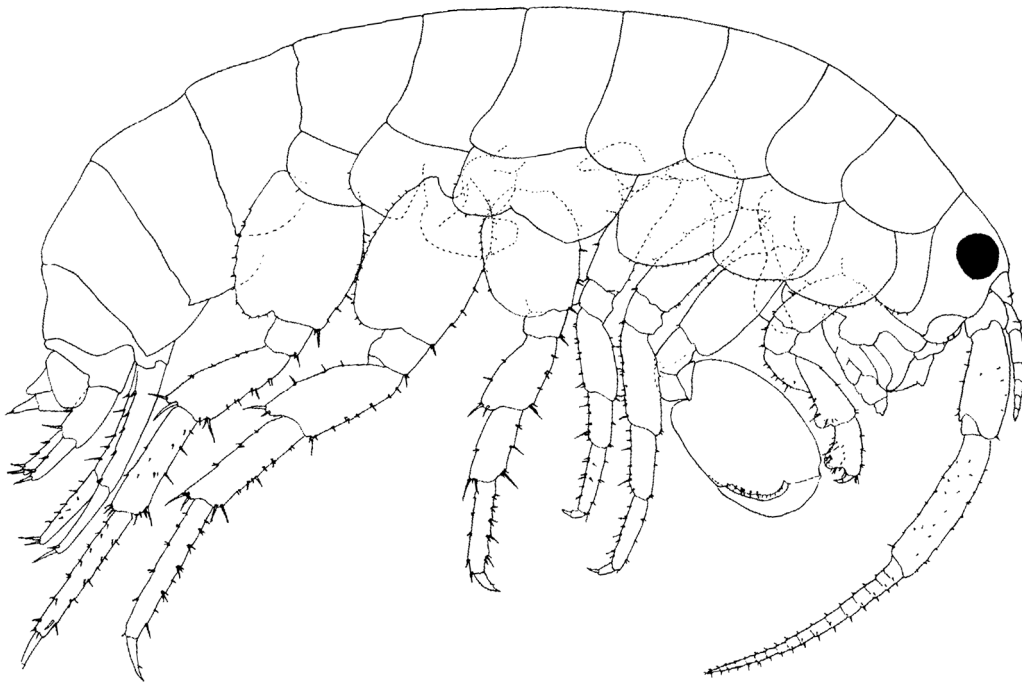


Figure 10. Above *Platorchestia griffithsi* sp. nov., male holotype (9 mm), Knysna lagoon, South Africa; below *P. negevensis* sp. nov., male (9.5 mm), Negev desert (after Morino & Ortal, 1995).

Habitat. Near springs and wells (Morino & Ortal, 1995). Restricted to enclosed perpetually moist habitats such as wells or small springs in caves. It displays an amphibious lifestyle, often being collected in debris and moist sandy soil outside the water (Herbst & Dimentman, 1983).

Remarks. *Platorchestia negevensis* sp. nov. resembles *P. platensis* (Krøyer, 1845) from which it was probably derived during a sea-level regression. It differs in having a neotenous, non-incrassate condition of pereopod 7. It is the only Atlantic species that has this character state neotenous, but the state

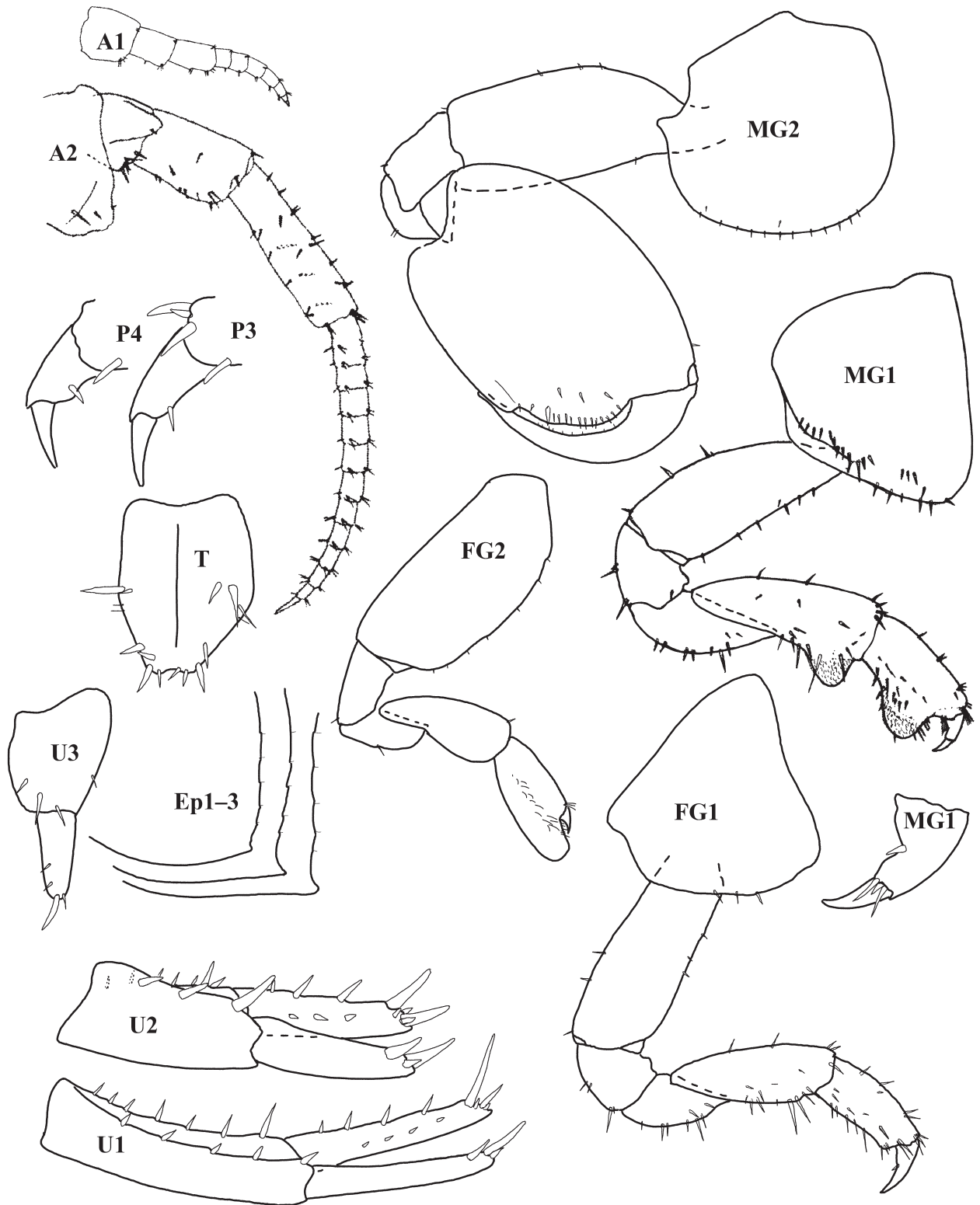


Figure 11. *Platorchestia negevensis* sp. nov., male (9.5 mm), female (8.5 mm), Negev desert (after Morino & Ortal, 1995).

does occur in some non-Atlantic species (*P. ano* Lowry & Bopiah, 2013, *P. pachypus* Derzhavin, 1937 and *P. smithi* Lowry, 2012). It differs from *P. ano* in the relatively short carpus of gnathopod 1 and the poorly incrassate male antenna 2. Both *P. pachypus* and *P. smithi*, unlike *P. negevensis* sp. nov., have a strongly incrassate male antenna 2. The dactylus

of the male gnathopod 1 of *P. negevensis* sp. nov. is distinctly shorter than the palm, whereas in *P. platensis* it is scarcely shorter than the palm.

Distribution. Israel: Sinai and Negev Deserts (Herbst & Dimentman, 1983; Morino & Ortal, 1995).

Platorchestia griffithsi sp. nov.

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Figs 10, 12, 13

Orchestia platensis.—Griffiths, 1975: 79, fig. 52B.? *Orchestia platensis*.—Macnae, 1953: 1027.*Platorchestia platensis*.—Mead *et al.*, 2011: 1998, tab.

1.—Milne & Griffiths, 2013: 77.—Diemer, 2015: 15, 24,

35.—Diemer *et al.*, 2016: 207, figs 4–6.Not *Orchestia platensis* Krøyer, 1845: 304, pl. 2 figs 2a–i.**Holotype:** Male, Knysna lagoon, South Africa, University of Cape Town, 04.15.1949, CMNC-1982-0356. **Paratypes:** 4 males, 4 females, same data as holotype, CMNC-1982-0356.1.**Type locality.** Knysna lagoon, South Africa**Etymology.** Named after Charles Griffiths in recognition of his important work in documenting the amphipod fauna of South Africa.**Description.** Adult male 9 mm.**Head.** *Eyes* black, medium size. *Antenna 1* short, not longer than article 4 of antenna 2. *Antenna 2* peduncle strongly incrassate; article 5 longer than 4; peduncular articles with sparse, small robust setae.**Pereon.** *Gnathopod 1* subchelate; posterior margin of carpus and propodus with rugose lobe; carpus moderately elongate, about 2.5 × as long as its broadest width and over one- and one-half length of propodus; propodus palm transverse; **dactylus much shorter than palm**, cuspidactylate. *Gnathopod 2* sexually dimorphic; subchelate; basis weakly expanded, subrectangular; merus without medial lobe; carpus reduced, enclosed by merus and propodus; propodus subovate, posterior margin evenly convex; palm acute, with subdistal notch, posterodistal corner with protuberance; dactylus scythiform, overlapping posterior margin. *Coxae 2–4* as wide as deep. *Pereopods 3–7* cuspidactylate. *Pereopod 4* significantly shorter than pereopod 3; dactylus thickened weakly pinched posteriorly, different from that of pereopod 3. *Pereopod 5* propodus distinctly longer than carpus. *Pereopod 6* not sexually dimorphic, shorter than pereopod 7; coxa posterior lobe withweak serrations, **posteroproximal corner not extended into a distinct lobe**. *Pereopod 7* sexually dimorphic; basis almost as broad as long, posterodistal lobe present; **carpus subovoid, anterior margin crenulate; carpus: propodus length ratio = 5:7**.**Pleon.** *Epimera 1–3* with posterior margin slightly serrated; **epimeron 3 posteroventral corner with weak spine**. *Uropod 1* peduncle 1.3 × length of rami, with robust setae in two rows, distolateral robust seta absent; endopodite subequal in length to exopodite and with 4 marginal inner setae and 2 marginal outer setae; endopodite without marginal setae. *Uropod 2* peduncle inner margin with 5–7 setae and outer margin with 2 or 3 setae; endopodite subequal in length to exopodite; endopodite with one row of marginal robust setae; exopodite with 1 marginal seta. *Uropod 3* peduncle 1.3 × length of ramus, with 3 robust setae; ramus narrowing distally; with 1 marginal seta, and 3 apical setae. *Telson* longer than broad, apically incised, with marginal and apical robust setae; each lobe with 3–5 robust setae.**Female.** (sexually dimorphic characters). *Antennae 2* slender, not incrassate. *Gnathopod 1* carpus and propodus without rugose lobes. *Gnathopod 2* mitten-shaped; basis anterior margin strongly convex proximally, anteriorly nearly straight; **carpus and propodus very slender, almost 3 × as long as broad**. *Pereopod 7* not incrassate.**Remarks.** *Platorchestia griffithsi* sp. nov. differs from *P. platensis* and *P. exter* sp. nov. in lacking a knob-like projection on coxa 6 and in the shape of the male gnathopod 2 propodus, which has a distinctly convex posterior margin (nearly straight in *P. platensis*). It differs from all other described species in the very long propodus on the male pereopod 7. In the female, *Platorchestia griffithsi* has a very elongate and slender gnathopod 2 carpus and propodus compared with other species. It differs from *P. oliveirae* sp. nov. and *P. negevensis* sp. nov. in the crenulate anterior margin of the carpus in the hyperadult male pereopod 7.**Habitat.** In beach debris on high shore of protected beaches.**Distribution.** South Africa from Langebaan Lagoon in the Western Cape to Swartkops Estuary in the Eastern Cape.

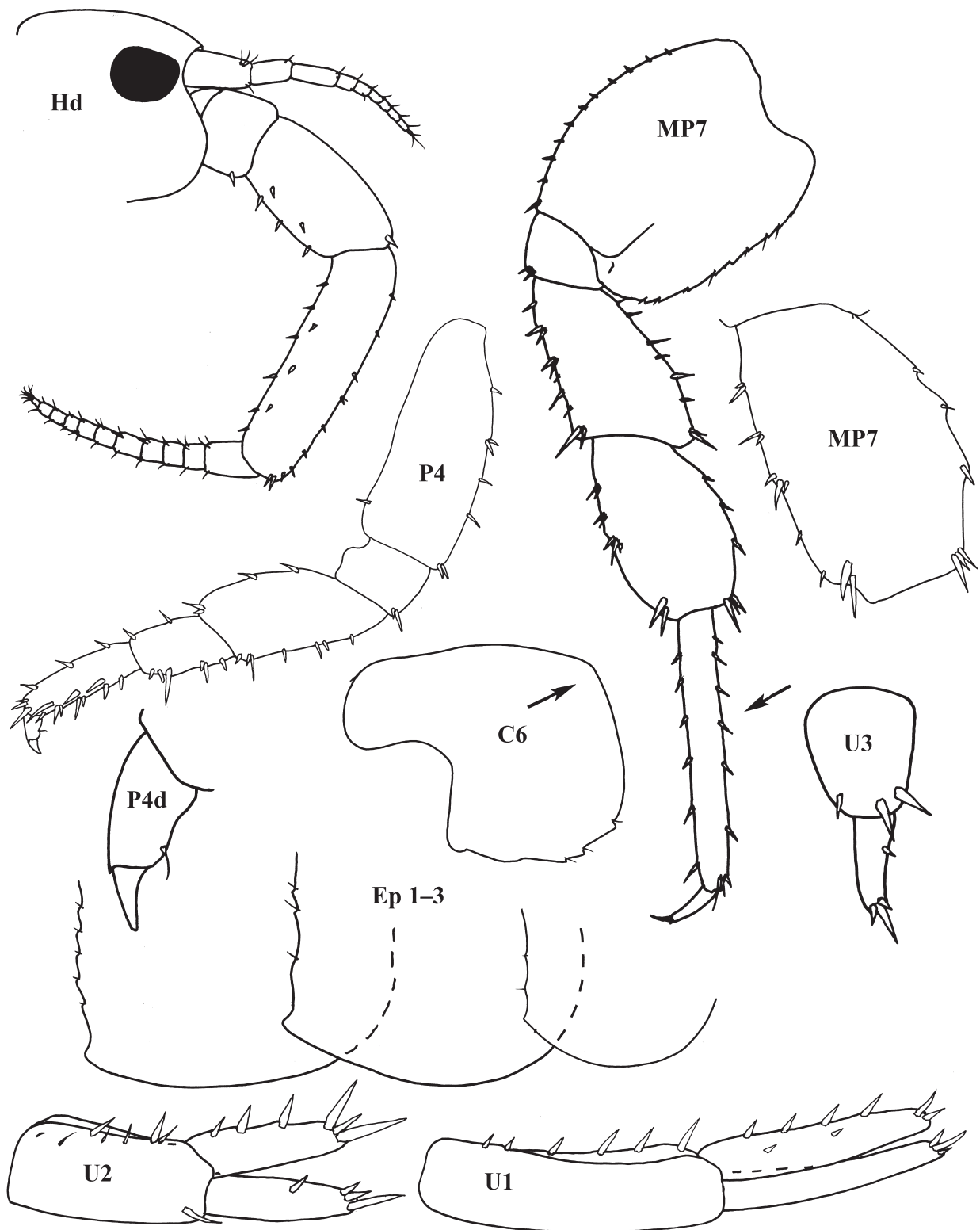


Figure 12. *Platorchestia griffithsi* sp. nov., male holotype (9 mm), Knysna lagoon, South Africa.

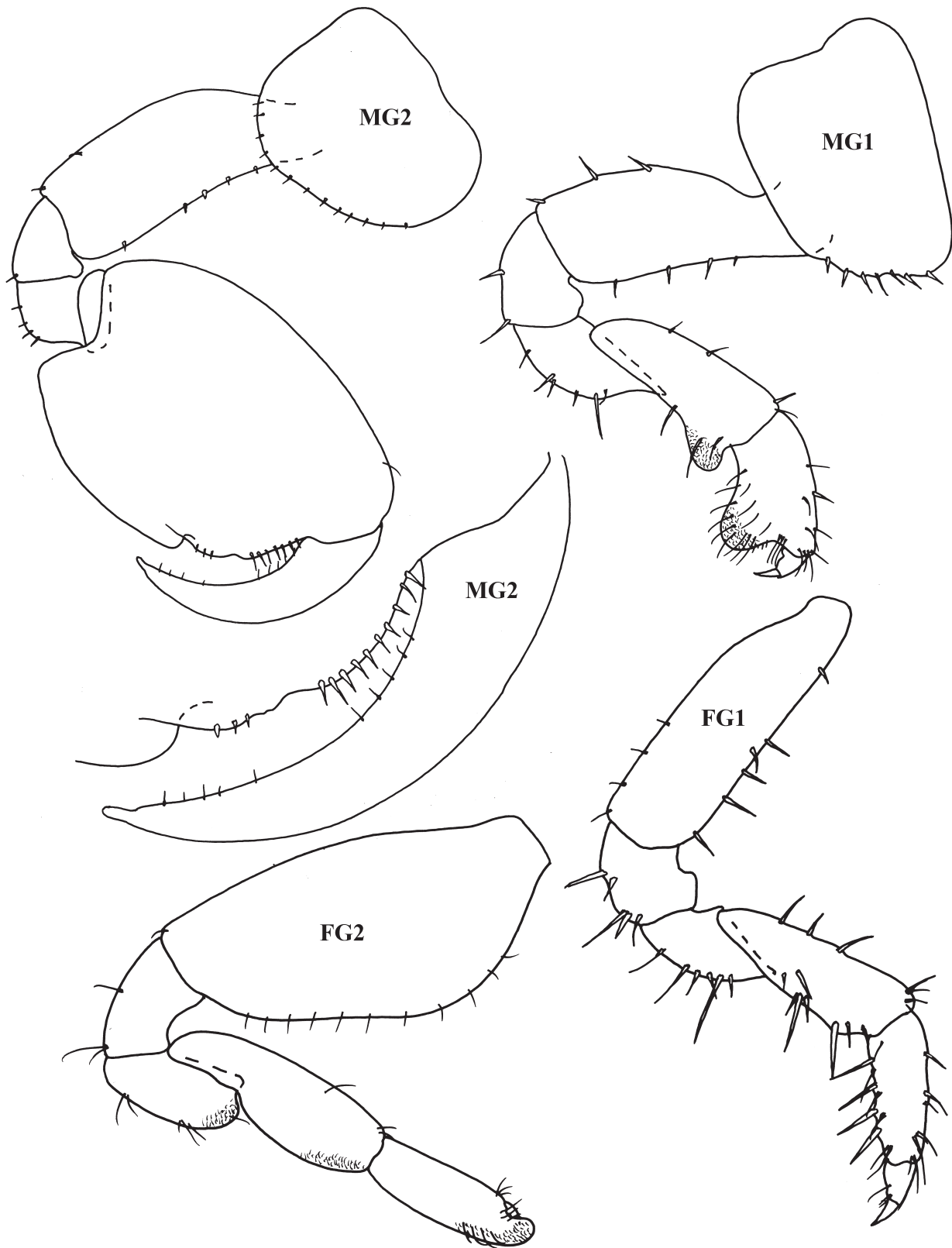


Figure 13. *Platorchestia griffithsi* sp. nov., male holotype (9 mm), female paratype (8 mm), Knysna lagoon, South Africa.

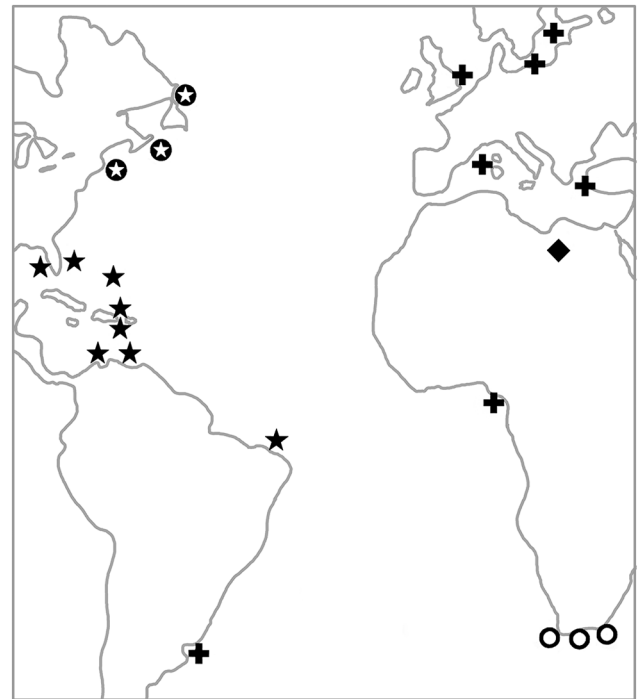
The enigmatic *Platorchestia platensis*

Atlantic species of *Platorchestia*, with one exception, are endemic to clearly defined single continuous regions (Fig. 14). It is remarkable, then, that *P. platensis* (Krøyer, 1845) is now known to occur in two widely separated localities, the northeastern Atlantic on the one hand, where it is widespread, and the southwestern Atlantic on the other, where it is currently known from a single collection only in the La Plata river in Uruguay (the type locality). It is tempting to assume that the Uruguay population has been introduced from Europe, since Montevideo has been an important commercial destination for European ships for centuries. Whether upper shore wrack inhabiting talitrids could be, or have been in the past, transported through ship's ballast as suggested by Mead *et al.* (2011), is difficult to determine. Unfortunately, little collecting of beach amphipods has been reported from Uruguay or Argentina. If *P. platensis* is found to be of wide occurrence along Uruguayan and Argentinian coasts, then introduction may not be the most plausible explanation. If, on the other hand, no other records are forthcoming, then introduction from Europe may be the most parsimonious explanation.

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- ★ *Platorchestia oliveirae* sp. nov.
- ⊛ *Platorchestia exter* sp. nov.
- ⊕ *Platorchestia platensis* (Krøyer, 1845)
- *Platorchestia griffithsi* sp. nov.
- ◆ *Platorchestia negevensis* sp. nov.

Figure 14. Distribution of *Platorchestia* in the Atlantic Ocean and associated seas.

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