Zootaxa 5213 (1): 049–063
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5213.1.3
http://zoobank.org/urn:lsid:zoobank.org:pub:57908CCC-E7FD-4AAB-8B1D-7EA0B85BC508

A new amphipod species of the bathyal genus *Dautzenbergia* Chevreux, 1900 (Amphipoda, Calliopioidea, Pontogeneiidae) associated with cold-water corals off Angola

MICHAEL L. ZETTLER[1*], ED A. HENDRYCKS[2] & ANDRÉ FREIWALD[3]
[1]*Leibniz Institute for Baltic Sea Research Warnemünde, Seestr. 15, D-18119 Rostock, Germany*
[2]*Canadian Museum of Nature, Research and Collections, P.O. Box 3443, Station D, Ottawa, K1P 6P4, Canada*
EHENDRYCKS@nature.ca; https://orcid.org/0000-0001-6199-7121
[3]*Senckenberg am Meer, Südstrand 40, D-26382 Wilhelmshaven, Germany*
Andre.Freiwald@senckenberg.de; https://orcid.org/0000-0002-2335-4042
[*]*Corresponding author. michael.zettler@io-warnemuende.de; https://orcid.org/0000-0002-5437-5495*

Abstract

A new species of pontogeneiid amphipod, *Dautzenbergia concavipalma* **sp. nov.**, is described from cold-water corals off Angola. This is only the second observation of this genus in the South Atlantic. Important morphological characters in combination, which define the new species from its congeners, occur especially in the shape and size of gnathopod 1–2 propodus, the smooth pereopod dactyls, the shape of the basis of pereopod 7 and the telson shape with narrow cleft. The taxon is fully described and figured and is compared with known species of the genus. A key to *Dautzenbergia* species is also given.

Key words: Amphipoda, Pontogeneiidae, new species, *Dautzenbergia*, Angola, cold-water corals

Introduction

Recently discovered cold-water reefs off Angola constructed by the scleractinian corals *Desmophyllum pertusum* (Linnaeus, 1758) (formerly *Lophelia pertusa*), *Madrepora oculata* Linnaeus, 1758 and supplemented by hexactinellid sponges, *Aphrocallistes* sp. and *Sympagella* sp., thrive in hypoxic waters at 330 to 500 m water depth (Hanz *et al.* 2019; Hebbeln *et al.* 2020; Orejas *et al.* 2021). Targeted sampling with ROV manipulators and grabs in the deep coral habitat yielded further insights into the associated amphipod community (see Zettler *et al.* 2018). This study describes a new *Dautzenbergia* species from the recently discovered Angolan cold-water coral province (Hanz *et al.* 2019; Hebbeln *et al.* 2020; Orejas *et al.* 2021). We also transfer *Pleusymtes comitari* Myers & Hall-Spencer, 2004 to *Dautzenbergia* based on several morphological characters consistent with the genus, as it does not belong to the family Pleustidae.

The family Pontogeneiidae is presently assigned to the suborder Senticaudata proposed by Lowry & Myers (2013) within the order Amphipoda. Worldwide, this family comprises about 168 species within 29 genera (Horton *et al.* 2022).

The genus *Dautzenbergia* Chevreux, 1900 currently contains three species: *Dautzenbergia dentata* (Chevreux, 1919), which occurs around the Canary Islands in water depths down to 1000 m (Chevreux 1920), *Dautzenbergia grandimana* (Chevreux, 1887) and *Dautzenbergia megacheir* (Walker, 1897) which occur in the Mediterranean Sea, eastern north Atlantic (Greenland to Canary Islands), Indian Ocean (Northern Arabian Sea, 952 m) (K.H. Barnard 1937) and South-East Africa, 800–1200 m (Griffiths 1977) in bathyal water depths (Chevreux 1887; Bellan-Santini *et al*. 1998). The Indian Ocean and South-East Africa records for *D. grandimana* should be carefully checked, as these may not belong to this species. These records are very distant from the Atlantic and Mediterranean ones and as *Dautzenbergia* species are associated with corals, the possibility exists that they are not congeneric.

Accepted by K. Tomikawa: 26 Oct. 2022; published: 23 Nov. 2022

Material and methods

The material was sampled during the R/V Meteor M122 cruise ANNA (Cold-Water Coral Ecosystems off Angola and Namibia) in January 2016 (Hebbeln *et al*. 2016). About 50 km offshore of Caboledo, northern Angola, several seabed mounds were inspected with the Squid remotely operated vehicle (ROV) of the MARUM deep-sea group at Bremen University. Despite the oxygen deficient environmental condition, the mounds turned out to be covered by a flourishing cold-water coral habitat, dominated by *Desmophyllum pertusum* and *Madrepora oculata* as major framework builders. The dead coral portions were colonized by octocorals, hydroids, bryozoans and predominantly by hexactinellid sponges. The *Dautzenbergia* specimens came from three of these mounds, which we informally named as the Anna Ridge, Buffalo Mound and Scary Mound.

The *locus typicus* is the Buffalo Mound complex at 9.7003°S and 12.7303°E at about 349 m water depth. Ambient seawater temperature and oxygen concentration was 11.3°C and 0.76 ml/l, respectively. The sampling site near the summit of Buffalo Mound was characterised by a gallery of *D. pertusum* colonies forming an outer "hedge"-like wall. The dead parts of the coral skeleton were colonized by plexaurid and clavulariid octocorals and antipatharians (Fig. 1).

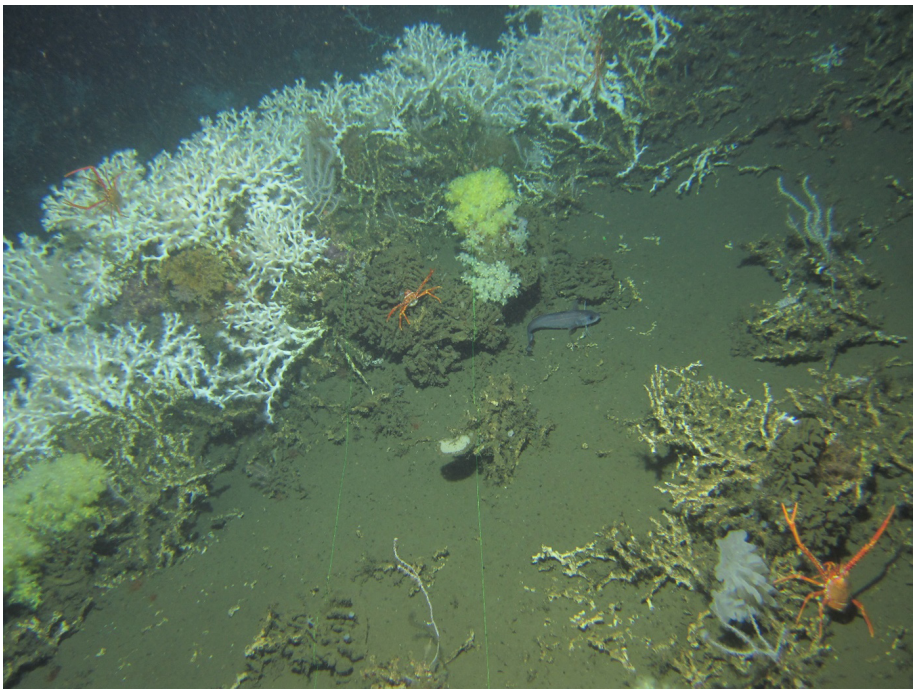

FIGURE 1. Overview of the type location on Buffalo Mound near the summit at 349 m water depth (Stn. 20927, 9.7003°S and 12.7303°E, 21st January 2016). The holotype was collected from the yellow zoanthid-infested *Aphrocallistes* sp. specimen that was rooted on the dead parts of a *Desmophyllum pertusum* colony. Distance between green laser beams = 30 cm (ROV image © MARUM).

The second sampling site was near the summit of Scary Mound at 374 m water depth at 9.82287°S and 12.77393°E. Ambient seawater temperature and oxygen concentration was 9°C and 0.65 ml/l, respectively. This site was characterized by a plexaurid octocoral garden surrounded by galleries of live *Madrepora oculata* and *Desmophyllum pertusum* colonies. The sessile associated fauna was comprised of *Aphrocallistes* sp., *Sympagella* sp., several plexaurid gorgonians, the stoloniferid *Clavularia* sp. and hydroids. The third sampling site was at the base of Anna Ridge at 307 m water depth at 9.78827°S and 12.77335°E. Ambient seawater temperature and oxygen concentration was 7.3°C and 0.98 ml/l, respectively. The sampled target was a 40 cm large colony of the oculinid scleractinian *Madrepora oculata* with live and dead branches. The colony, as many others in the area, came from higher upslope but was able to survive at the foot of the mound. The entire colony attracted halosaurid and morid teleost fishes. The dead coral branches provide hard substrate for some antipatharian colonies (probably *Parantipathes*), many hydroids, some plexaurid gorgonians, bryozoans and encrusting sponges. All live *Dautzenbergia* (holotype and paratypes) were imaged with a Keyence VHX 1000 prior to fixation with 98% ethanol (see Fig. 2).

A total of 13 specimens were examined. Selected specimens were dissected under a Zeiss stereomicroscope (Discovery V8) and dissected appendages were preserved in non-permanent slides mounted in glycerine. The figures were drawn using a Zeiss compound microscope (Axio Lab.A1). Body length was measured from the anterior end of the head to the posterior end of urosomite 3. After preparation, single digital microphotographs of the amphipod parts were made using an AxioCam ICC3 and ERc5s (Carl Zeiss MicroImaging GmbH, Jena) and AxioVision software (Carl Zeiss Imaging Solutions GmbH, Jena). The resulting files were imported into Adobe© Illustrator CS5 and digital line drawings were made using a WACOM Intuos® Digitizer Board, with the corresponding specimens always focused and magnified in parallel in the microscope, according to the methods of Coleman (2003). On figures, straight arrows point to a detail enlargement of a drawing.

In the descriptions, the term "tooth" is used for non-articulated, pointed ectodermal structures, "spine" for stout, inflexible articulated structures (synonymous of "robust setae" of Watling 1989) and "seta" for slender, flexible articulated structures (d'Udekem d'Acoz & Hendrycks 2011). Classification of the mandibular palp setae follows Lowry & Stoddart (1993).

Type specimens are deposited in the collections of the following natural history institutions: Canadian Museum of Nature (CMN), Ottawa (Canada) and the Museum für Naturkunde (ZMB), Berlin (Germany).

The following abbreviations are used in the figures: a = antenna (1–2); cp = coxal plate (1–7); ep = epimeron plate (1–3); gn = gnathopod (1–2); lbr = labrum (upper lip); lm = labium (lower lip); md = mandible; mp = mandible palp; mx = maxilla (1–2); mxpd = maxilliped; p = pereopod (3–7); pl = pleopod (1–3); t = telson; u = uropod (1–3) and ur = urosome (1–3).

Systematics

Order Amphipoda Latreille, 1816

Suborder Senticaudata Lowry & Myers, 2013

Superfamily Calliopioidea G.O. Sars, 1895

Family Pontogeneiidae Stebbing, 1906

Genus *Dautzenbergia* Chevreux, 1900

Dautzenbergia Chevreux, 1900: 73; J.L. Barnard 1961: 106; Barnard & Karaman 1991: 316

The generic status of the type species of *Dautzenbergia* has changed frequently. The species was originally placed in *Amphithopsis*, then to *Sympleustes* to *Dautzenbergia* (by Chevreux 1900). Sexton (1909) moved the species back to *Sympleustes* with the synonymy of *Dautzenbergia* to *Sympleustes*. J.L. Barnard (1961) recognized the non-pleustid form of the lower lip and cleft telson and consequently revived and transferred it back to *Dautzenbergia*.

Amended diagnosis. (see Barnard & Karaman 1991 and Bellan-Santini *et al.* 1998). Antenna 1 longer than antenna 2. Accessory flagellum absent or with a minute article. Head with short rostrum. Body dorsally smooth, urosome 2 not shortened. Coxa 1 strongly directed anteriorly, apically pointed. Gnathopods subchelate, grossly unequal (gnathopod 1 much smaller than gnathopod 2), inner margin of dactylus of gnathopod 1 toothed; carpus of gnathopod 1 subequal to propodus, carpus of gnathopod 2 very short, with small short ventral lobe. Pereopods 3–7 dactyls smooth or toothed, pereopods 5–7 homopodous, basis expanded. Labrum bilobed, slightly incised. Labium with inner lobes small or obsolescent. Maxilla 1 inner plate with few terminal setae (2). Maxilla 2 with inner and outer plates subequal. Mandible with strong columnar, triturative molar, palp article 3 long. Maxilliped, palp 4-articulate, powerful with long dactyl. Uropods long, lanceolate, serially spinose, uropods 1–2 rami apices lacking spines, outer rami not strongly shortened. Telson slightly cleft, not ventrally keeled.

Type species. *Amphithopsis grandimana* Chevreux, 1887: 570–571

Included species. *Dautzenbergia* includes 5 species: *Dautzenbergia grandimana* (Chevreux, 1887); *Dautzenbergia megacheir* (Walker, 1897); *Dautzenbergia dentata* (Chevreux, 1919); *Dautzenbergia comitari* (Myers & Hall-Spencer, 2004) **new comb.**; *Dautzenbergia concavipalma* **sp. nov.**

Dautzenbergia grandimana (Chevreux, 1887)

Amphithopsis grandimana Chevreux, 1887: 570–571
Sympleustes grandimanus: Stebbing, 1906: 318; Sexton 1909: 857–864, pl. 80, figs. 8–32; Chevreux 1927: 86–88, pl. 7, figs. 1–5; ?K.H. Barnard 1937: 158
Dautzenbergia grandimana: Chevreux, 1900: 73–75, pl. 10, fig. 1
Dautzenbergia grandimanus: J.L. Barnard, 1961: 106; ?Griffiths 1977: 109–112, fig. 3; Barnard & Karaman 1991: 316

Locus typicus: Cape Finisterre, 363–510 m.

Distribution: North Atlantic: Cape Finisterre, 510 m (Chevreux 1887), Bay of Biscay (Sexton 1909), Mauretania, 655 m (Chevreux 1927); Indian Ocean: Northern Arabian Sea, 952 m (K.H. Barnard 1937), South-East Africa, 800–1200 m (Griffiths 1977).

Remarks. The records of K.H. Barnard (1937) from the southern Arabian coast and Griffiths (1977) off South-East Africa are geographically distant from other observations reported in the literature and may belong to a different species. We have not examined this material and until these specimens are studied in detail, the species attribution remains uncertain.

Dautzenbergia megacheir (Walker, 1897)

Parapleustes megacheir Walker, 1897: 230–232, pl. 18, fig. 4
Sympleustes megacheir: Stebbing 1906: 317; Chevreux 1927: 88–89, pl. 7, figs. 6–12; Stephensen 1944: 5, fig. 1
Dautzenbergia megacheir: Barnard 1961: 106; Diviacco 1982: 632–637, figs. 1–4; Barnard & Karaman 1991: 316; Bellan-Santini *et al.* 1998: 822–823, fig. 557; Cartes *et al.* 2022: 5, figs. 2 & 4

Locus typicus: SW of Ireland, 1372 m water depth.

Distribution: North Atlantic: Ireland, 1372 m (Walker 1897), Canary Islands, 1200 m (Chevreux 1927), Greenland, 2448 m (Stephensen 1944); Mediterranean Sea: 650 m (Diviacco 1982), >1000 m (Cartes *et al.* 2022). Found on a finely ramose gorgonid (see Stephensen 1944, p. 5) and the bamboo coral, *Isidella elongata* (see Cartes *et al*. 2022).

Dautzenbergia dentata (Chevreux, 1919)

Sympleustes dentatus Chevreux, 1919: 574; Chevreux 1920: 8; Chevreux 1927: 90–92, pl. 7, figs. 13–26; Stephensen 1944: 4–5
Dautzenbergia dentatus: J.L. Barnard 1961: 106
Dautzenbergia dentata: Barnard & Karaman 1991: 316

Locus typicus: Canary Islands, 946 m.

Distribution: North Atlantic: Canary Islands, 946 m (Chevreux 1919, 1920, 1927), Greenland, 740 m (Stephensen 1944).

Dautzenbergia comitari (Myers & Hall-Spencer, 2004) comb. nov.

Pleusymtes comitari Myers & Hall-Spencer, 2004: 1029–1032, figs. 1–3

Locus typicus: North Atlantic, off south-west Ireland, Porcupine Bank, 730 m.

Distribution: Only known from the type locality, "Twin Mounds" sea mound in water depths between 725–900 m (Myers & Hall-Spencer 2004). Associated with the gorgonian *Acanthogorgia* sp.

Remarks. Myers & Hall-Spencer (2004) placed this species into the genus *Pleusymtes* (family Pleustidae). However, our study has shown that it cannot be retained in the Pleustidae based on the following atypical and non-pleustid characters: mandibular left lacinia with 5 teeth, mandibular palp article 3 with facial A3 setae not basally clustered; urosome 2 dorsally not shortened; uropods 1–2 rami apices lacking spines and telson incised, lacking a ventral keel.

The ventral keel of the telson in pleustids is an important, diagnostic character and the lack of the keel clearly excludes all *Dautzenbergia* species from that family. We here transfer it to *Dautzenbergia*, based on the following characters: strongly anteriorly directed, pointed coxa 1; the strongly dissimilar, raptorial gnathopods with gnathopod 2 massive; the toothed dactyls of the pereopods; the long, lanceolate, subequal rami of the uropods lacking apical spines and the incised telson lacking a ventral keel. In combination, these are all characteristic of the genus *Dautzenbergia* and the five species now included in the genus are very distinctive and form a recognizable, morphological group.

***Dautzenbergia concavipalma* sp. nov.**
Figs. 2–8

Diagnosis. Gnathopod 1 propodus subchelate, broadly triangular, length 1.7 x width, palm relatively straight, clearly distinct from posterior margin, dactylus exceeding palm, with inner margin serrated. Gnathopod 2, propodus massive, dorsal margin strongly convex, length 3.36 x width, palm strongly concave, densely setose, occupying nearly the complete length of the propodus, delimited by a strong tooth of the ventrally directed posterior margin and distal margin with a flanged, bidentate cusp near insertion of dactylus, dactylus very powerful, strongly curved, elongate, fitting palm. Pereopods 3–7, dactyls short and strongly curved, inner margins smooth. Pereopod 7 basis short, length 1.4 x width. Epimeron 3 lacking a strong posteroventral tooth. Telson subovate, broad, length 1.4 x width, incised one-sixth of length, lobes not separated.

Type material. Holotype: male, 11.0 mm, photographed and figured, (CMNC 2022-4376), South Atlantic, off Angola, Stn 20927, Buffalo Mound, 9.7003°S, 12.7303°E; water depth 349 m; associated with hexactinellid sponges (*Sympagella* sp. and *Aphrocallistes* sp.) within a *Desmophyllum pertusum* gallery, leg. 21st January 2016.

Allotype: female, 10.8 mm, photographed and figured, (CMNC 2022-4377), data same as holotype.

Paratypes: male, 9.2 mm, (CMNC 2022-4378), data same as holotype. 7 specimens, (ZMB 32994), data same as holotype; 2 specimens, (CMNC 2022-4379), South Atlantic, off Angola, Stn. 20913, Anna Ridge, 9.78827°S, 12.77335°E; water depth 307 m, leg. 18th January 2016; 1 specimen, (ZMB 32995), South Atlantic, off Angola, Stn. 20930, Scary Mound, 9.82287°S, 12.77393°E; water depth 374 m, leg. 22nd January 2016.

Locus typicus. South Atlantic, off Angola, 110 km south-southwest of Luanda, Buffalo Mound, 9.7003°S, 12.7303°E; water depth 349 m. Ambient seawater temperature and oxygen concentration was 11.3°C and 0.76 ml/l.

Etymology. The species is named in reference to the strongly concave shape of the palm of the gnathopod 2 (especially in males), which is highly distinctive.

Description.

Holotype. Male, 11.0 mm, CMNC 2022-4376.

Colour (Figs. 2–3). Mostly white, with some light brown highlights in the head, mouthparts and gnathopods.

Head (Figs. 2–4). With rostrum weakly developed, eyes prominent, luminescent in the living state; lateral cephalic lobe slightly angular, broad, not projecting strongly.

Body (Figs. 2–4). Smooth, lacking dorsal teeth, humps or carinae, urosome 2 not dorsally occluded, subequal in length to urosome 3 (Figs. 4, 8).

Antenna 1 (Figs. 2–4, 6). Long, about three-quarters of the body length; peduncular articles short, article 1 sparsely setose dorsally, article 2 three-quarters length of article 1, article 3 short, about two-fifths length of article 2, accessory flagellum absent; flagellum broken but with over 30 remaining articles, normally 40–50 articulate (see Figs. 2–3).

Antenna 2 (Figs. 2–4, 6). About two-thirds length of antenna 1, with weak setation, gland cone prominent and acute, extending past peduncular article 3, peduncular articles 4–5 subequal; flagellum ~ 30-articulate.

Labrum (Fig. 5). Unevenly bilobed, with a shallow, oblique incision, inner margin of the right lobe finely serrate.

Mandible (Fig. 5). Incisor toothed, 6–7 dentate, left lacinia mobilis 5-dentate, right lacinia present and toothed; accessory spine row with 8 (right mandible) and 12 pectinate spines (left mandible); molar subovate, projecting, large and triturative; palp 3-articulate, elongated, article 1 0.44 x length of article 2, article 2 with 8 B2-setae, article 3 long, 1.6 x length of article 2, with 8 A3-setae, the distal third with about 19 fine, comb-like teeth posteroventrally, covered with a row of ~ 18 D3-pectinate setae of equal length and 4 long E3-pectinate setae.

Labium (Fig. 5). Outer plates densely setose, distal inner margins slightly excavated.

FIGURE 2. *Dautzenbergia concavipalma* **sp. nov.**, Habitus, photo of freshly collected specimens. Holotype, male, 11 mm (CMNC 2022-4376); allotype, female, 10.8 mm (CMNC 2022-4377).

Maxilla 1 (Fig. 5). Inner plate narrowly subovate, finely setose, with two strong and 2 tiny pinnate setae; outer plate with 7 toothed and forked spine-teeth, plate sparsely covered with setae; palp narrow, two segmented with 5–6 stout spines and 5 setae distally.

Maxilla 2 (Fig. 5). Inner and outer plates subequal, inner slightly shorter, distally rounded, covered in fine setae, some strong, pinnate setae distally on both plates, inner plate distomedially with 1 strong, pectinate seta.

Maxilliped (Fig. 5). Inner and outer plates short, outer plate broader than inner, reaching about 0.3 x length of article 2 of palp, with setae distally and medially; inner plate reaching distal end of article 1 of palp, with 2 stout spines distomedially; palp raptorial, very prominent, 4-articulate, article 2 very long and densely setose medially, article 3 narrow and setose, dactylus falcate, well developed, longer than article 3 and with a distal seta.

Gnathopod 1 (Fig. 6). Coxa strongly produced anteriorly in a subacute lobe, basis with long posterior marginal setae; ischium-merus subequal with strong distoventral clusters of setae; carpus length 0.86 x length of propodus, ventral margin densely setose; propodus subchelate, broadly triangular, length 1.7 x width, with several groups of dorsal and ventral marginal clusters of setae, palm relatively straight, distinct from posterior margin, with spines and setae, dactylus slightly exceeding palm, with inner margin serrated.

FIGURE 3. *Dautzenbergia concavipalma* **sp. nov.**, Habitus, photo. Holotype, male, 11 mm (CMNC 2022-4376).

Gnathopod 2 (Fig. 6). Coxa subrectangular, broader than long; basis widening distally, posterior margin with long setae proximally, with a rounded flange/lobe anterodistally; ischium with a rounded flange/lobe on anterior margin; merus twice as long as ischium, with a strong cusp distoventrally; carpus very short, length 0.1 x propodus, cup-shaped, with a very weak distal lobe; propodus powerful, massive, subchelate, subovoid, dorsal margin strongly convex, length 3.36 x width, palm strongly concave, nearly the complete length of the propodus, delimited by a strong tooth of the ventrally directed posterior margin carrying a spine and distal margin with a strong, flanged cusp near insertion of dactylus, palm entirely lined with a dense covering of setae; dactylus very powerful, strongly curved, proximally widened, inner margin smooth, elongate, fitting palm.

Pereopod 3 (Fig. 7). Slender; coxa rectangular, length 1.35 x width, ventral margin straight; basis slender, length 5.9 x width, margins with very small spines and long setae anterodistally and posteroproximally; merus slightly longer than carpus, margins weakly spinose; propodus posterior margin with 5 pairs of spines; dactyl short, strongly curved, smooth.

Pereopod 4 (Fig. 7). Coxa narrowing ventrally, anterior margin straight, posterior margin excavated, posteroventral lobe small; rest of pereopod as in pereopod 3 except basis with a strong cluster of long setae anteroproximally.

Pereopod 5 (Fig. 7). Shorter, 0.89 x length of pereopods 6–7, coxa larger than coxa 6, strongly posterolobate, with anterodistal lobe shallow and broadly rounded, posterodistal lobe slightly narrowed; basis expanded, length 1.46 x width, ovate, anterior margin slightly concave, with small spines and proximally with long setae, posterior margin convex, smooth with minute setules, posterodistal lobe narrowly rounded and not reaching distal margin of ischium; merus about subequal in length to carpus, produced posteriorly into a long pointed lobe, margins spinose; carpus expanded distally, anterior margin with 5 clusters of strong spines; propodus curved, anterior margin with 5 pairs of spines; dactylus short and strongly curved, smooth.

Pereopod 6 (Fig. 7). Subequal in length to pereopod 7; coxa with anterodistal lobe narrow, posterodistal lobe broad; basis expanded, length 1.32 x width, ovate, with 5 surface setae, anterior margin with small spines and

proximally with long setae, posterior margin convex, smooth with minute setules, posterodistal lobe narrowly rounded and not reaching distal margin of ischium; merus about subequal in length to carpus, produced posteriorly into a long pointed lobe, margins spinose; carpus expanded distally, anterior margin with 5 clusters of strong spines; propodus curved, anterior margin with 5 pairs of spines; dactylus short and strongly curved, smooth.

Pereopod 7 (Fig. 7). Subequal in length to pereopod 6; coxa small, subovate; basis expanded, length 1.4 x width, ovate, anterior margin with small spines and proximally with long setae, posterior margin nearly straight, smooth with minute setules, posterodistal lobe broadly rounded and reaching distal margin of ischium; rest of pereopod as in pereopod 6.

Gills (Fig. 7). Present on gnathopod 2 to pereopod 6. Subovate, largest on pereopod 4.

Epimeron 1 (Fig. 7). Subovate, slightly subacute ventrally, posterior margin convex.

Epimeron 2 (Fig. 7). Narrowly subquadrate, ventral margin convex, posterodistal angle very weakly pointed, posterior margin nearly straight.

Epimeron 3 (Fig. 7). Subquadrate, ventral margin evenly convex, posterodistal angle very weakly pointed, posterior margin slightly convex.

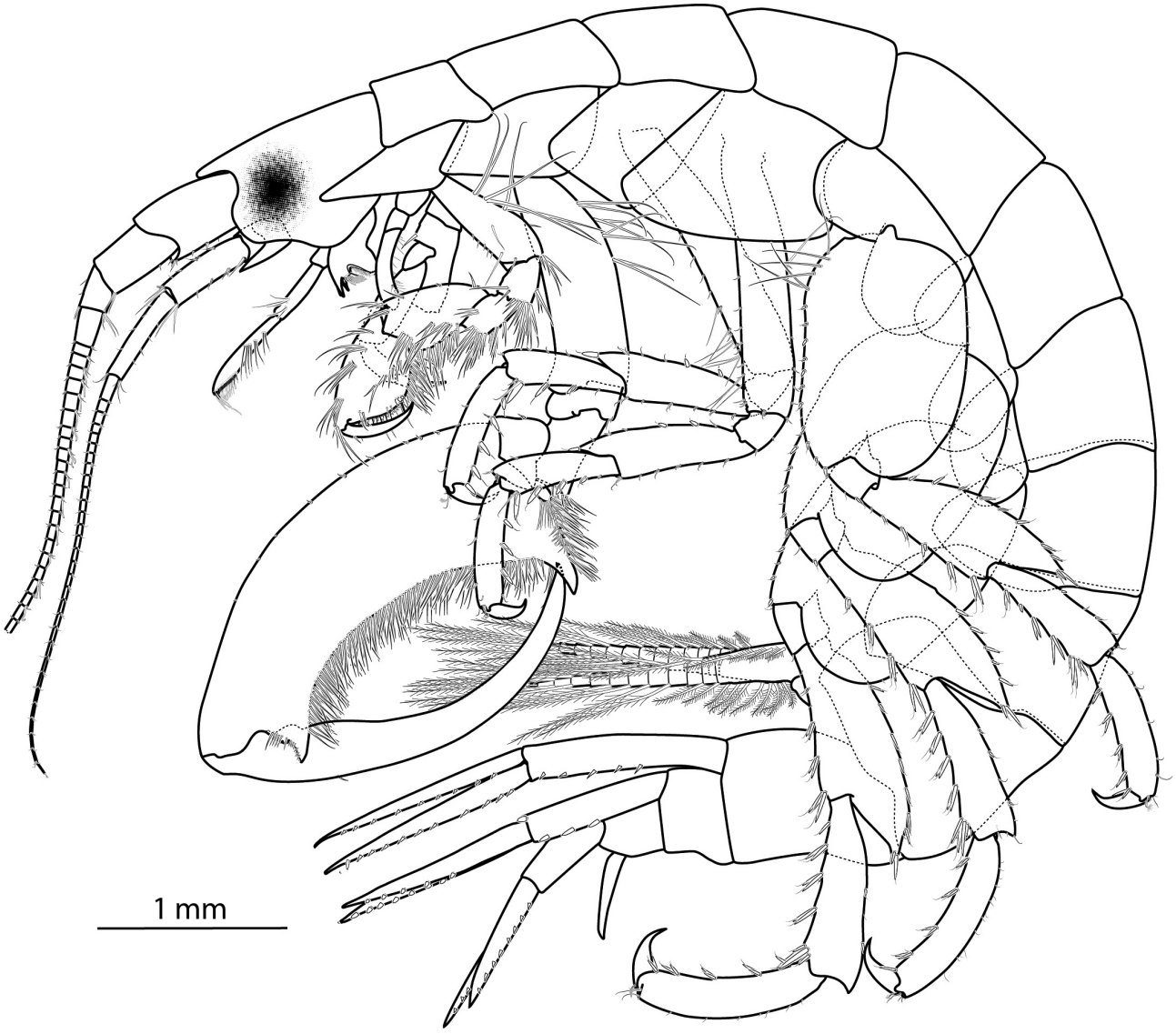

FIGURE 4. *Dautzenbergia concavipalma* **sp. nov.**, Habitus. Holotype, male, 11 mm (CMNC 2022-4376). Antenna 1 flagellum broken. Only one pleopod shown.

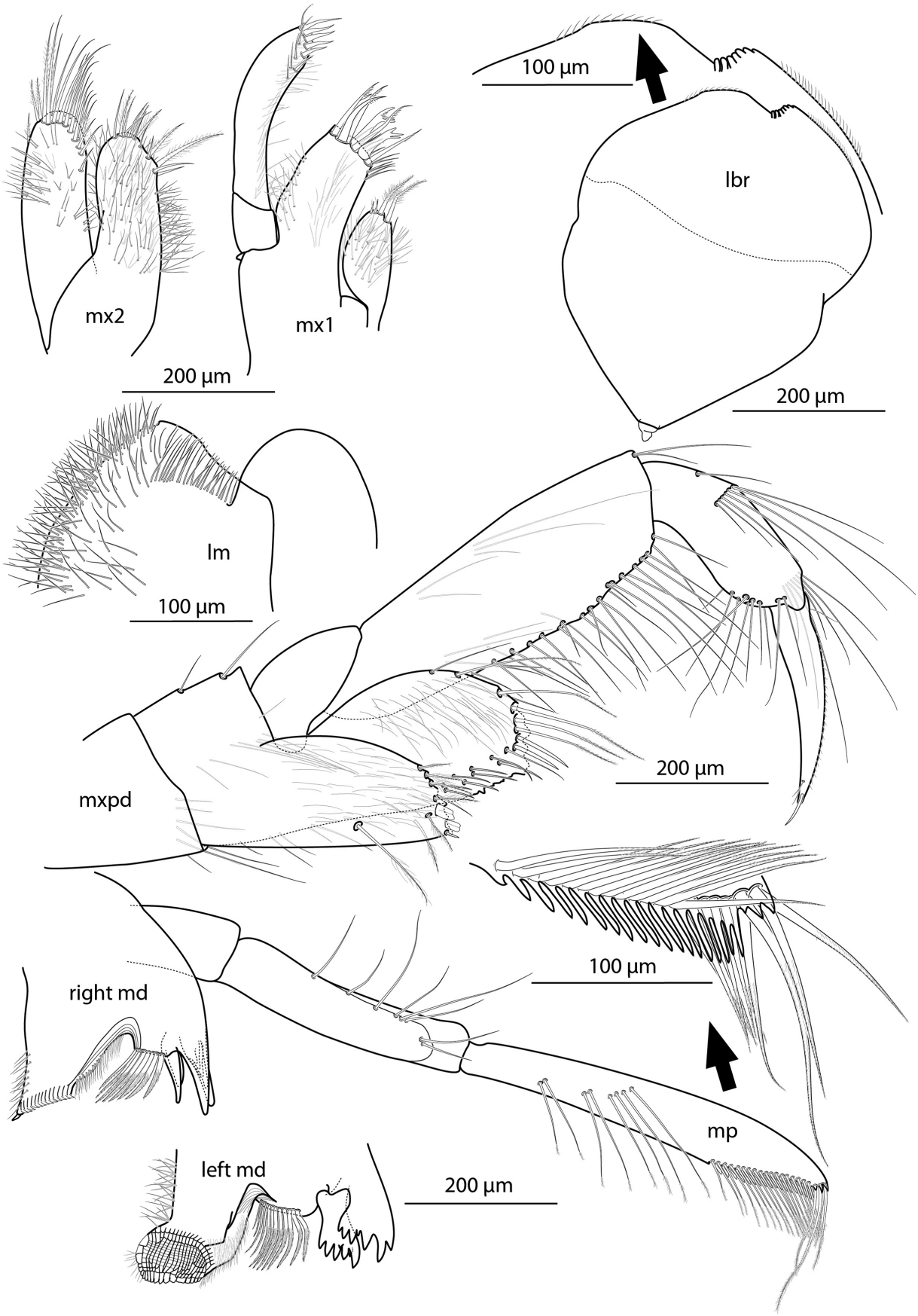

FIGURE 5. *Dautzenbergia concavipalma* **sp. nov.**, Holotype, male, 11 mm (CMNC 2022-4376). Outer lobe of labium shown. Mandibular palp setae folded back to show comb-like structure on inner margin.

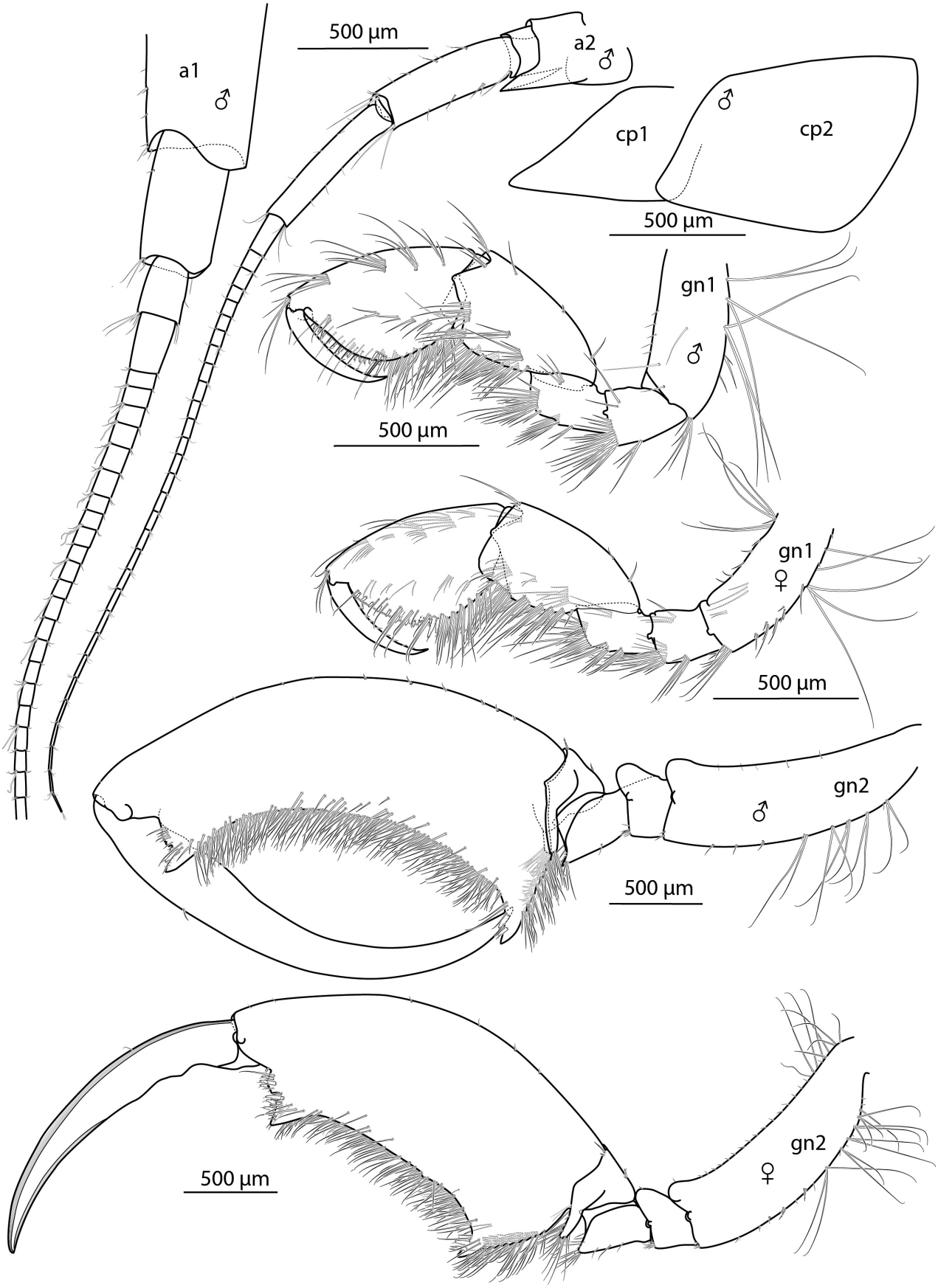

FIGURE 6. *Dautzenbergia concavipalma* **sp. nov.**, Holotype, male, 11 mm (CMNC 2022-4376); Allotype, female, 10.8 mm (CMNC 2022-4377). Antenna 1 flagellum broken.

Pleopods 1–3 (Fig. 7). Long, peduncle with ~ 5 proximal clothespin spines; rami lined with marginal plumose setae.

Uropod 1 (Fig. 8). Peduncle long, subequal to rami, with marginal spines; rami slender, lanceolate, subequal, with marginal spines, apices lacking spines.

Uropod 2 (Fig. 8). Peduncle length 0.74 x outer ramus, both margins spinose; rami slender, lanceolate, outer ramus length 0.95 x inner ramus, both rami margins spinose, apices lacking spines.

Uropod 3 (Fig. 8). Peduncle length 0.71 x outer ramus, with 3 marginal spines; rami slender, lanceolate, outer ramus length 0.85 x inner ramus, both rami strongly spinose.

Urosome 1–3 (Fig. 8). Urosome 1 length about 2 x length of urosome 2–3 combined, urosome 2 not dorsally occluded.

Telson (Fig. 8). Subovate, broad, length 1.4 x width, incised one-sixth (17 %) of length, lobes appressed not open, with hint of small distal notches (appear worn down), likely missing the fine, inset spine.

Female. Allotype, 10.8 mm, CMNC 2022-4377

Similar to male, but differing as follows:

Gnathopod 1 (Fig. 6). Dactylus inner margin, serrations are more pronounced.

Gnathopod 2 (Fig. 6). Basis widening distally, anterior and posterior margins with long setae; propodus powerful, but smaller than male and less curved, subovoid, length 2.6 x width, palm less concave, posterior marginal tooth delimiting palm smaller than male; dactylus less robust and straighter.

Brood plates. Present on gnathopod 2 and pereopods 3–5, largest on pereopod 3, subrectangular, length 3.2 x width, distal end truncated, slightly convex posteriorly, lined with ~ 47 curved brood setae.

Telson (Fig. 8). Apices with small distal notches stronger than in male.

Ecology. As reported for other species of this genus, *Dautzenbergia concavipalma* **sp. nov.** is associated with deep-water corals and their sponge assemblages. Species-coral relationships between *Dautzenbergia* and azooxanthellate scleractinian corals (Caryophylliidae, Isididae, and Oculinidae) and plexaurid gorgonians have been observed and reported previously (Stephensen 1944, Myers & Hall-Spencer 2004, Cartes *et al.* 2022 and this study). In contrast to other species of the genus, *D. concavipalma* **sp. nov.** occurred in water depths between 300–400 m, i.e. much shallower than previously known.

Remarks. *Dautzenbergia concavipalma* **sp. nov.** is easily differentiated from all known species by the very distinctive shape and massive size of the propodus of gnathopod 2 (especially in male), with its very strongly concave, setose palm occupying nearly the full length of the propodus and the powerful, strongly curved dactylus. The ventrally directed, strong tooth of the posteroproximal margin of the palm is also very characteristic and does not occur in any of the other congeners. Further, from *D. comitari* (Myers & Hall-Spencer, 2004), it differs in the much broader propodus of gnathopod 1, length 1.7 x width (vs narrow, length 2.6 x width), the very differently shaped gnathopod 2 and the short, strongly curved, smooth pereopod dactyls (vs toothed dactyls). *Dautzenbergia concavipalma* **sp. nov.** is differentiated from *D. dentata* (Chevreux, 1919) in the broader propodus of gnathopod 1, length 1.7 x width (vs 2.1 x width), the broader basis of pereopods 5–7, basis of pereopod 7 length 1.4 x width, posteroventral lobe broadly rounded (vs 1.8 x width, posteroventral lobe narrowly rounded), and the much shorter and broader telson, length 1.4 x width, incised one-sixth (vs 2.1 x width and widely cleft, greater than one-quarter). From *D. grandimana* (Chevreux, 1887), our species differs in the smooth pereopod dactyls (vs toothed), the very differently shaped gnathopod 2 and the much shorter and broader telson, length 1.4 x width (vs 2.1 x width). Lastly, *D. concavipalma* **sp. nov.** differs from *D. megacheir* (Walker, 1897) in the broader, subacute distal end of coxa 1 (vs very acutely pointed coxa 1), the different shape of gnathopod 2, the epimeral plate 3 with the posterodistal angle very weakly pointed (vs with a strong tooth at posterodistal corner) and the much shorter and broad telson, length 1.4 x width, incised one-sixth (vs 2.1 x width and cleft, widely, about one-quarter).

The peculiar, comb-like structure that we discovered on the inner margin of the distal third of the mandibular palp, article 3 (see Fig. 5) appears to be also shown by Griffiths (1977) for *Dautzenbergia grandimana* (see Fig. 3, p. 111). Unfortunately, he did not mention this structure and as far as we know, it has never been reported on. It is a difficult structure to observe due to its small size and the palp D3 setae of the inner margin cover it, so may be easily overlooked. The function of this serrated section of the palp is not known, but perhaps it is related to feeding/grooming or possibly the structure plays a role in the coral relationship. It is unlikely to be related to mating, as the form is present in both males and females. Whether this morphological character is present in all *Dautzenbergia* species is unknown and until all the mandibles are examined carefully in these species, this question remains unresolved.

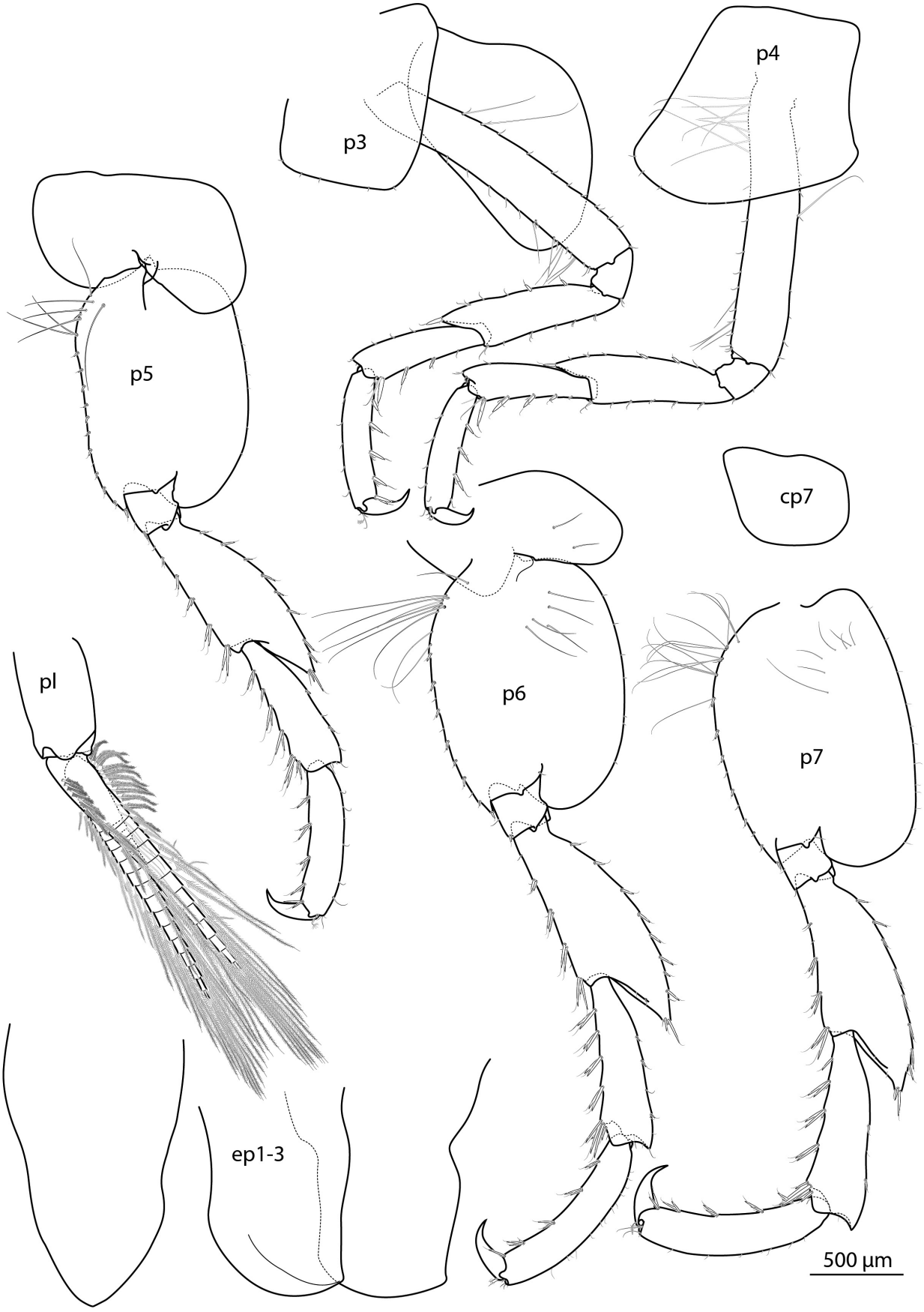

FIGURE 7. *Dautzenbergia concavipalma* **sp. nov.**, Holotype, male, 11 mm (CMNC 2022-4376).

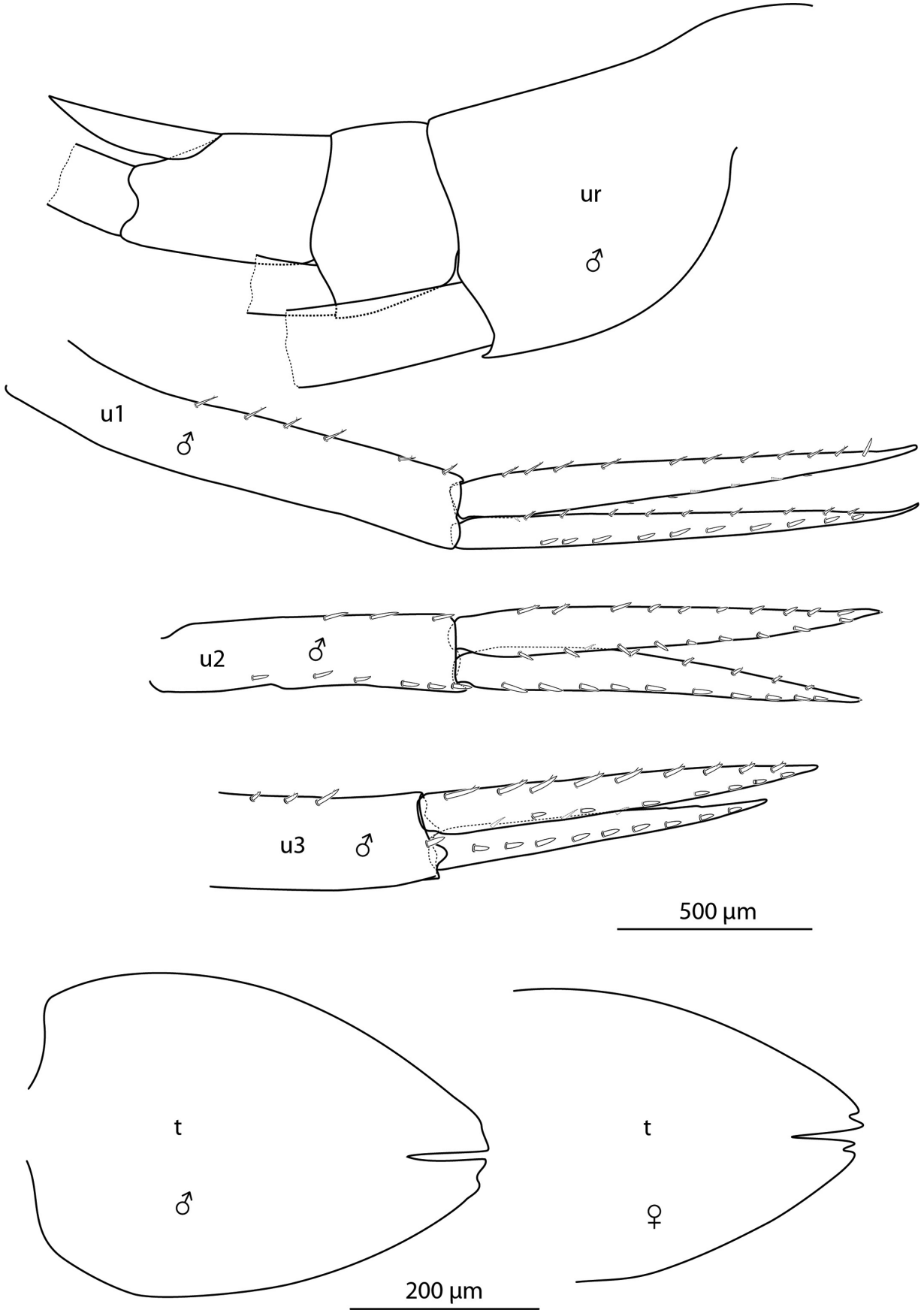

FIGURE 8. *Dautzenbergia concavipalma* **sp. nov.**, Holotype, male, 11 mm (CMNC 2022-4376); Allotype, female, 10.8 mm (CMNC 2022-4377). Uropods not shown in lateral view of urosome.

Key to *Dautzenbergia* species

1. Pereopods 3–7, dactyls toothed 2
- Pereopods 3–7, dactyls smooth 3
2. Gnathopod 1, propodus narrow, length 2.6 x width; gnathopod 2, propodus posterior margin shorter than palm, palm straight, strongly setose; epimeron plate 3, weakly subquadrate, without posteroventral cusp; telson, oval, length 1.4 x width, split 15 % of length, lobes rounded, without distal inset spine . . . . . *D. comitari* (Myers & Hall-Spencer, 2004)
- Gnathopod 1, propodus broad, length 1.6 x width; gnathopod 2, propodus posterior margin subequal to palm, palm evenly convex, lined with small spines; epimeron plate 3, posteroventral corner with a small cusp; telson, subtriangular, length ~ 2 x width, split 9 % of length, lobes slightly angular, with small distal inset spine. . . . . *D. grandimana* (Chevreux, 1887)
3. Gnathopod 2, propodus dorsal margin strongly convex, length 3.36 x width (female 2.6 x), palm strongly concave and setose, occupying nearly the complete length of the propodus, with a strong tooth at the posteroproximal corner and posterodistal margin with a strong, flanged cusp near insertion of dactylus; pereopod 7, basis broad, length 1.4 x width; telson, length 1.4 x width, split 17 % of length . . . . . .*D. concavipalma* **sp. nov.**
- Gnathopod 2, propodus dorsal margin slightly convex, length 1.8–2.6 x width, palm not occupying the complete length of the propodus, palm not strongly setose, lacking a tooth at posteroproximal corner; pereopod 7, basis narrower, length > 1.5 x width; telson, length > 1.7 x width, split > 20 % of length 4
4. Gnathopod 2, propodus palm concave proximally, slightly setose, distal half of palm with 3 tubercles, the first rounded and followed by a deep sinus; pereopod 7, basis length 1.8 x width; telson, length 2.1 x width, split 25 % of length, lobes rounded, lacking distal inset spine. . . . . *D. dentata* (Chevreux, 1919)
- Gnathopod 2, propodus palm nearly straight proximally, spinose, distal half of palm with 2 tubercles, the first broadly rectangular and preceded by a deep sinus; pereopod 7, basis length 1.5 x width; telson, length 1.8 x width, split 20–25 % of length, lobes pointed, with fine distal inset spine . . . . . .*D. megacheir* (Walker, 1897)

Acknowledgements

We take this opportunity to thank the officers, crew and the scientific personnel of the R/V Meteor M122 cruise ANNA (MARUM, Bremen University) for a successful collecting expedition, of which (AF) was taking part. This research received support from the Deutsche Forschungsgemeinschaft (DFG) through providing ship time and access to the ROV and through the DFG Research Center/Cluster of Excellence ‘‘MARUM—The Ocean in the Earth System.’’ Catalogue numbers for type material were provided by Philippe Ste-Marie (CMN) and Dr. Kristina von Rintelen from (ZMB). Photographs of live *Dautzenbergia* on the vessel were taken by Leon Hoffman and is gratefully acknowledged.

Suggestions and comments given by the reviewers on earlier versions of the manuscript are greatly appreciated and improved the manuscript.

References

Barnard, J.L. (1961) Gammaridean Amphipoda from depths of 400–6000 meters. *Galathea Report*, 5, 23–128.

Barnard, J.L. & Karaman, G.S. (1991) The families and genera of marine gammaridean Amphipoda (except marine gammaroids). Part 1. *Records of the Australian Museum*, Supplement, 13 (1), 1–417. https://doi.org/10.3853/j.0812-7387.13.1991.91

Barnard, K.H. (1937) Amphipoda. The John Murray Expedition 1933–1934. *Scientific Reports. British Museum (Natural History)*, 4 (6), 131–201.

Bellan-Santini, D., Karaman, G.S., Ledoyer, M., Myers, A.A. & Ruffo, S. (1998) The Amphipoda of the Mediterranean. Part 4. Addenda to Parts 1–3. *Memoires de l'Institut Oceanographique, Monaco*, 13, 815–844.

Cartes, J.E., Díaz-Viñolas, D., González-Irusta, J.M., Serrano, A., Mohamed, S. & Lombarte, A. (2022) The macrofauna associated to the bamboo coral *Isidella elongata*: to what extent the impact on isideidae affects diversification of deep-sea fauna. *Coral Reefs*, 41, 1273–1284. https://doi.org/10.1007/s00338-022-02243-w

Chevreux, E. (1887) Crustaces amphipodes nouveaux dragues par “l’Hirondelle” pendant sa campagne de 1886. *Bulletin de la Société Zoologique de France*, 12, 566–580. https://doi.org/10.5962/bhl.part.7932

Chevreux, E. (1900) Amphipodes provenant des campagnes de “l’Hirondelle” 1885–1888. *Resultats des campagnes scientifiques du Prince Albert I de Monaco*, 16, i–iv + 1–195.

Chevreux, E. (1919) Note preliminaire sur les amphipodes recueillis par les expeditions du “Travailleur” et du “Talisman” (1880–1883). *Bulletin du Museum national d’Histoire naturelle*, 25, 574–580. https://doi.org/10.5962/bhl.part.7932

Chevreux, E. (1920) Note preliminaire sur les amphipodes recueillis par les expeditions du “Travailleur” et du “Talisman” (1880–1883) (Fin). *Bulletin du Museum national d’Histoire naturelle*, 26, 7–13.
Chevreux, E. (1927) Malacostracés (suite). III. Amphipode. *Expéditions scientifiques du “Travailleur” et du “Talisman” pendant les années 1880, 1881, 1882, 1883*, 9, 41–152.
Coleman, C.O. (2003) “Digital inking”: how to make perfect line drawings on computers. *Organisms Diversity and Evolution*, 3 (Electronic Supplement), 14, 1–14. [http://www.senckenberg.uni-frankfurt.de/odes/03-14.pdf] https://doi.org/10.1078/1439-6092-00081
Diviacco, G. (1982) Primo ritrovamento di *Dautzenbergia megacheir* (Walker) in Mediterraneo e considerazioni sul genere *Dautzenbergia* Chevreux (Crustacea Amphipoda). *Bollettino del Museo Civico die Storia Naturale die Verona*, 9, 631–640.
d’Udekem d’Acoz C. & Hendrycks E.A. (2011) A new deep-sea *Liljeborgia* (Crustacea: Amphipoda: Liljeborgiidae) from the DIVA II cruise in the equatorial eastern Atlantic. *Proceedings of the Biological Society of Washington*, 124 (3), 198–211. https://doi.org/10.2988/0006-324X-124.3.198
Griffiths, C.L. (1977) The South African Museum’s Meiring Naude Cruises. Part 6. Amphipoda. *Annals of the South African Museum*, 74 (4), 105–123.
Hanz, U., Wienberg, C., Hebbeln, D., Duineveld, G., Lavaleye, M., Juva, K., Dullo, W.C., Freiwald, A., Tamborrino, L., Reichart, G.J., Flögel, S. & Mienis, F. (2019) Environmental factors influencing cold-water coral ecosystems in the oxygen minimum zones on the Angolan and Namibian margins. *Biogeosciences*, 16, 4337–4356. https://doi.org/10.5194/bg-16-4337-2019
Hebbeln, D., Wienberg, C., Bender, M., Bergmann, F., Dehning, K., Dullo, W.C., Eichstädter, R., Flöter, S., Freiwald, A., Gori, A., Haberkern, J., Hoffman, L., Mendes João, F., Lavaleye, M., Leymann, T., Matsuyama, K., Meyer-Schack, B., Mienis, F., Moçambique, B.I., Nowald, N., Orejas Saco del Valle, C., Cordova, C.R., Saturov, D., Seiter, C., Titschack, J., Vittori, V., Wefing, A.M., Wilsenack, M. & Wintersteller, P. (2016) s.n. *In*: *ANNA—Cold-water coral ecosystems off Angola and Namibia*, Cruise No. M122, Meteor Berichte, pp. 1–74.
Hebbeln, D., Wienberg, C., Dullo, W.C., Freiwald, A., Mienis, F., Orejas, C. & Titschack J. (2020) Cold-water coral reefs thriving under hypoxia. *Coral Reefs*, 39, 853–859. https://doi.org/10.1007/s00338-020-01934-6
Horton, T., Lowry, J., De Broyer, C., Bellan-Santini, D., Coleman, C.O., Corbari, L., Costello, M.J., Daneliya, M., Dauvin, J.-C., Fišer, C., Gasca, R., Grabowski, M., Guerra-García, J.M., Hendrycks, E., Hughes, L., Jaume, D., Jazdzewski, K., Kim, Y.-H., King, R., Krapp-Schickel, T., LeCroy, S., Lörz, A.-N., Mamos, T., Senna, A.R., Serejo, C., Sket, B., Souza-Filho, J.F., Tandberg, A.H., Thomas, J.D., Thurston, M., Vader, W., Väinölä, R., Vonk, R., White, K. & Zeidler, W. (2022) World Amphipoda Database. Pontogeneiidae Stebbing, 1906. Accessed through: World Register of Marine Species at: https://www.marinespecies.org/aphia.php?p=taxdetails&id=176946 (accessed 29 June 2022)
Lowry, J.K. & Myers, A.A. (2013) A Phylogeny and Classification of the Senticaudata subord. nov. (Crustacea: Amphipoda). *Zootaxa*, 3610 (1), 1–80. https://doi.org/10.11646/zootaxa.3610.1.1
Lowry J.K. & Stoddart H.E. (1993) Crustacea Amphipoda: Lysianassoids from Philippine and Indonesian waters. *In*: Crosnier, A. (Ed.), Résultats des Campagnes MUSORSTOM. Volume 10. *Mémoires du Muséum national d’Histoire naturelle*, 156, pp. 55–109.
Myers, A.A. & Hall-Spencer, J.M. (2004) A new species of amphipod crustacean, *Pleusymtes comitari* sp. nov., associated with gorgonians on deep-water coral reefs off Ireland. *Journal of the Marine Biological Association of the United Kingdom*, 84 (5), 1029–1032. https://doi.org/10.1017/S0025315404010367h
Orejas, C., Wienberg, C., Titschack, J., Tamborrino, L., Freiwald, A. & Hebbeln, D. (2021) *Madrepora oculata* forms large frameworks in hypoxic waters off Angola (SE Atlantic). *Scientific Reports*, 11, 15170. https://doi.org/10.1038/s41598-021-94579-6
Sexton, E.W. (1909) Notes on some Amphipoda from the north side of the Bay of Biscay. Families Pleustidae and Eusiridae. *Proceedings of the Zoological Society of London*, 1909, 848–879.
Stebbing, T.R.R. (1906) Amphipoda. I. Gammaridea. *Das Tierreich,* 21, 1–806.
Stephensen, K. (1944) Crustacea Malacostraca. VIII. (Amphipoda IV). *Danish Ingolf Expedition*, 3 (13), 1–51.
Walker, A.O. (1897) On some new species of *Edriophthalma* from the Irish Seas. *The Journal of the Linnean Society, Zoology*, 26 (167), 226–232. https://doi.org/10.1111/j.1096-3642.1897.tb00404.x
Watling L. (1989) A classification system for crustacean setae based on the homology concept. *In*: Felgenhauer, B.E., Watling, L. & Thistle, A.B. (Eds.), Functional Morphology of Feeding and Grooming in Crustacea. *Crustacean Issues*. *Vol. 6*. Balkema, Rotterdam, pp. 15–27. https://doi.org/10.1201/9781003079354-2
Zettler, M.L., Freiwald, A. & Guerra-García, J.M. (2018) Cold-water corals off Angola as refuge for a new *Aeginella* species (Crustacea, Amphipoda, Caprellidae). *Zootaxa*, 4462 (4), 535–546. https://doi.org/10.11646/zootaxa.4462.4.6