

Two new species of branchial fish parasitic isopod of the genus *Mothocya* Costa, in Hope, 1851 (Isopoda, Cymothoidae) from Nigeria

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ABSTRACT

The branchial attaching, fish parasitic genus *Mothocya* Costa, in Hope, 1851 is recorded for the first time from Nigerian brackish waters on *Monodactylus sebae* (Perciformes: Monodactylidae). *Mothocya andoni* n. sp. is characterised by a trapezoid-shaped cephalon with a subtruncate rostrum; pereonite 1 anterolateral angles only reaching to the posterior margin of the eyes; particularly large and wide coxa 7 extending to pleonite 4; pereopod 7 with a narrow basis; broadly rounded pleotelson; and uropods extending to the pleotelson posterior margin, with subequal rami. *Mothocya powelli* n. sp. is characterised by its small size (7 mm); a posteriorly ovoid body shape; cephalon anterior margin truncate; a short pleon with pleotelson lateral margins converging to a narrowly rounded apex; pleonite lateral margins overlapped by pereonite 7; slender uropods that extend to the posterior margin of the pleotelson with the uropodal exopod almost double the length of the endopod.

1. Introduction

The isopod fauna of tropical and subtropical West Africa remains one of the least documented regions of the world and the family Cymothoidae Leach, 1818 is no exception. A fraction of the potential cymothoid diversity has to date been recorded with a mere ten publications on the family in this region since Van Name's (1920) contribution on riverine isopods from the Congo (see Monod, 1931; Brian and Darteville, 1949; Trilles, 1986; Ugombah and Nwosu, 2016; Welicky and Smit, 2019), including the contributions of the Polish taxonomist Jerzy Rokicki (1977, 1981, 1984, 1985, 1986). The most recent contribution from the region was the description of *Anilocra hadfieldae* Welicky and Smit, 2019 from Cape Blanco, The Gambia (Welicky and Smit, 2019).

Unsurprisingly therefore, the predominately branchial attaching genus *Mothocya* Costa, in Hope, 1851, one of the better-known genera of the family (Bruce, 1986; Hadfield et al., 2014, 2015) remains very poorly known from this region. Only a single species, *Mothocya longicopa* Bruce, 1986, has been recorded from West Africa, with a distribution from Senegal to Equatorial Guinea (Bruce, 1986). This species was obtained from the flat needlefish, *Ablennes hians* (Belonidae), the hound

needlefish, *Tylosurus crocodilus crocodilus* (Belonidae), and the garfish *Belone belone* (Belonidae) (see Bruce, 1986; Rokicki, 1986; Hadfield et al., 2015). The descriptions presented here of two undescribed species of *Mothocya* from Nigeria is an anticipated addition to the fauna of the eastern South Atlantic.

2. Materials and methods

Mothocya specimens were collected from Birakiri (4°34'10"N, 7°08'E) in December 1985, from the seaward end of Hughes Channel, Bonny River, ca 15 km upstream of Bonny Town, Nigeria. More recently, specimens of *Mothocya* were collected from the Andoni Creek (4°29'35.2"N 7°20'09.0"E) in the Niger Delta, in August 2015.

Specimens were identified by illustrating all body parts and appendages using a Nikon SMZ1500 Stereo Microscope, as well as a Nikon Eclipse80i Compound Microscope, both equipped with drawing tubes. Species descriptions were made using DELTA (Descriptive Language for Taxonomy) (see Coleman et al., 2010), modifying a general Cymothoidae character data set developed by Hadfield et al. (2016). Ratios and measurements for the descriptions were made using the maximum

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values at the middle of the specific measured article, and all proportional measurements were rounded to one decimal place. Host authorities are not included in the text or references; host nomenclature and distribution being sourced from Catalog of Fishes (Fricke et al., 2021) and FishBase (Froese and Pauly, 2021). Specimens are deposited at the Iziko South African Museum (SAM).

3. Taxonomy

Suborder Cymothoida Wägele, 1989.
Superfamily Cymothooidea Leach, 1814
Family Cymothoidae Leach, 1814
Genus *Mothocya* Costa, in Hope, 1851

Mothocya Costa, in Hope, 1851: 48.—Monod, 1971: 174.—Bruce, 1986: 1092–1095.—Trilles, 1994: 197.—Hadfield et al. (2014): 111.—Hadfield et al. (2015): 148.

Irona Schioedte and Meinert, 1884: 381.—Stebbing, 1905: 27.—Richardson, 1905: 265.—Hale, 1926: 218.—Monod, 1971: 174.—Kussakin, 1979: 307.—Trilles, 1994: 166.

Type species. *Mothocya epimerica* Costa, in Hope, 1851; by subsequent designation (see Bruce, 1986).

Remarks. Diagnostic characters for *Mothocya* include an asymmetrical (twisted) body, antennae bases widely separated, antennula stout and longer than antenna, maxilliped lacking oostegital lobe, with 3–5 robust setae on article 3, pereopods without carina and protrusions and simple pleopods without setae. A full diagnosis of the genus was provided by Bruce (1986) and later updated by Hadfield et al. (2014).

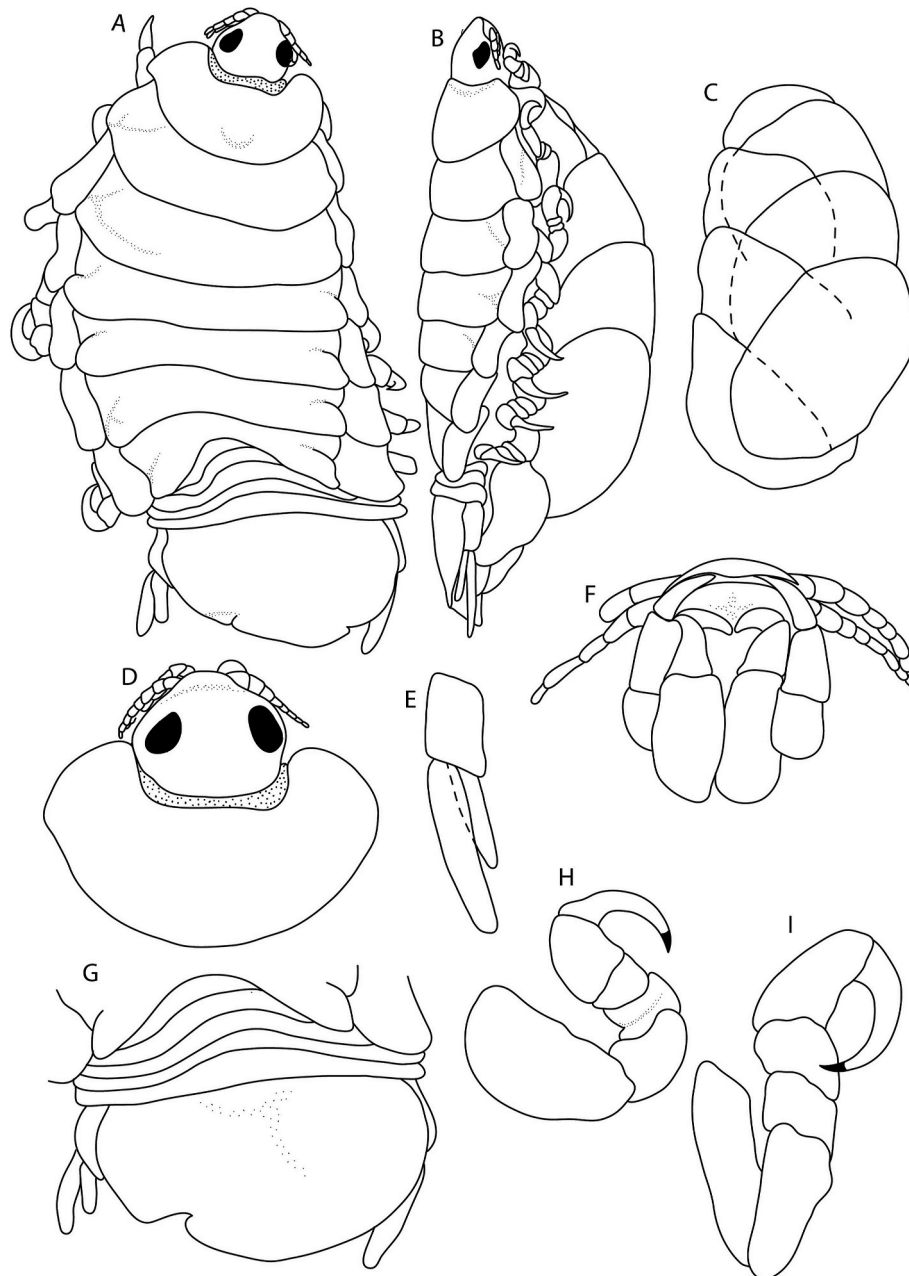


Fig. 1. *Mothocya andoni* n. sp. holotype ♀ (ovigerous, 15.0 mm total length, 8.0 mm width) (SAMC-AA092737). A, Dorsal body; B, Lateral body; C, Oostegites; D, Dorsal view of cephalon and pereonite 1; E, Uropod; F, Ventral cephalon; G, Dorsal view of pleon; H, Pereopod 1; I, Pereopod 7.

3.1. *Mothocya andoni* n. sp

Figs. 1–6.

3.1.1. Material examined

Holotype. Female (ovigerous, 15.0 mm total length, 8.0 mm width), from Andoni Creek, Niger Delta (4° 29' 35.2" N 7° 20' 09.0" E), Nigeria, August 2015, from the African moony, *Monodactylus sebae* (Cuvier, 1829), coll: B Olaosebikan (SAMC-A092737).

Paratypes. Female (non-ovigerous, dissected, 18.0 mm total length, 9.0 mm width), same data as holotype. Three males (12.0 mm total length, 5.0 mm width, dissected; 7.0 mm total length, 4.0 mm width;

12.0 mm total length, 5.0 mm width), same data as holotype (SAMC-A092738).

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3.1.2. Description ovigerous ♀ (holotype)

Fig. 1

Body ovoid, slightly twisted to the right, 1.9 times as long as greatest width; dorsal surfaces smooth, polished in appearance, widest at pereonite 4, most narrow at pereonite 1. **Cephalon** trapezoid shaped, 0.8 times longer than wide, visible in dorsal view, with subtruncate rostrum;

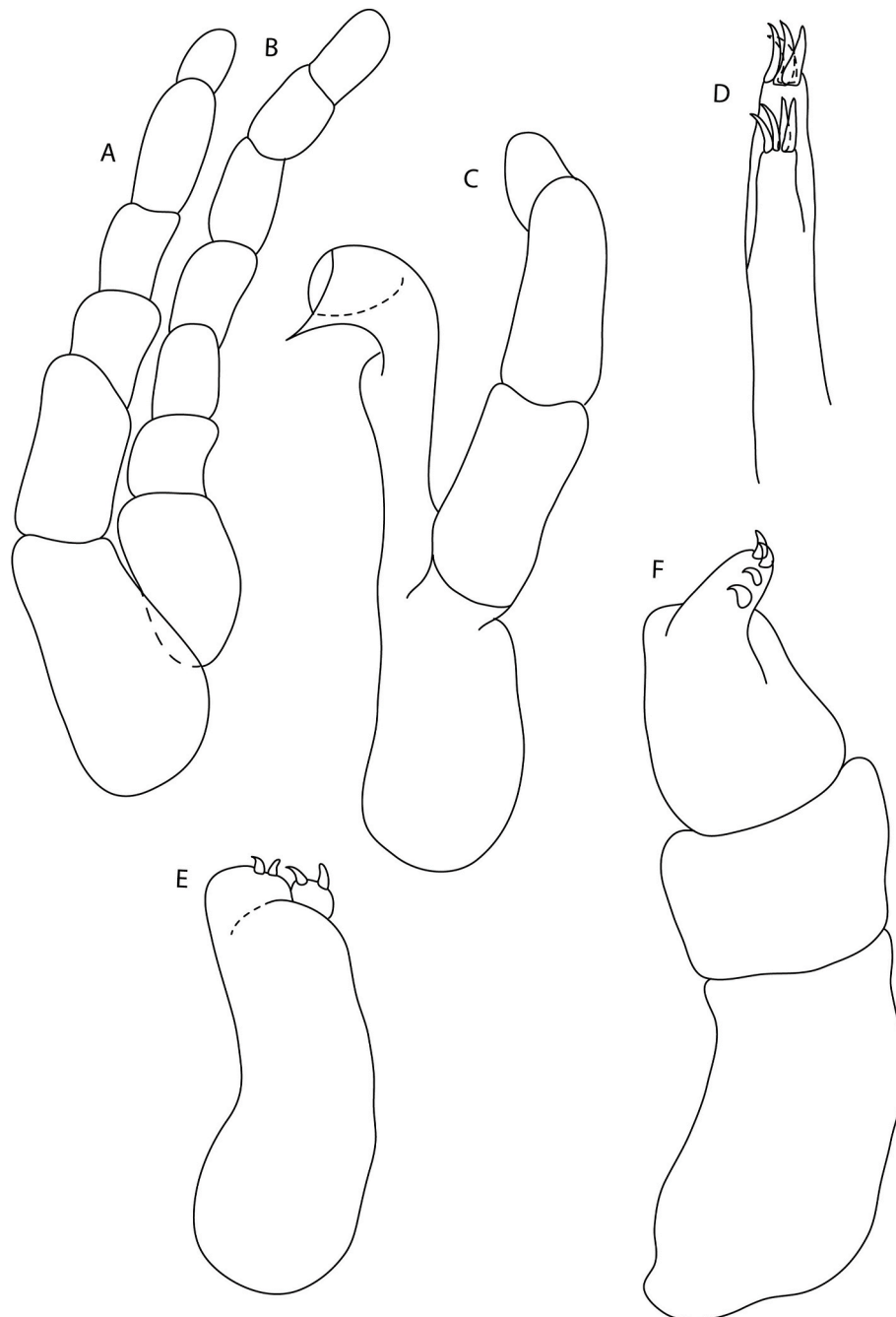


Fig. 2. *Mothocya andoni* n. sp. paratype ♀ (non-ovigerous, 18.0 mm total length, 9.0 mm width) (SAMC-A092738). A, Antennula; B, Antenna; C, Mandible; D, Maxillula; E, Maxilla; F, Maxilliped.

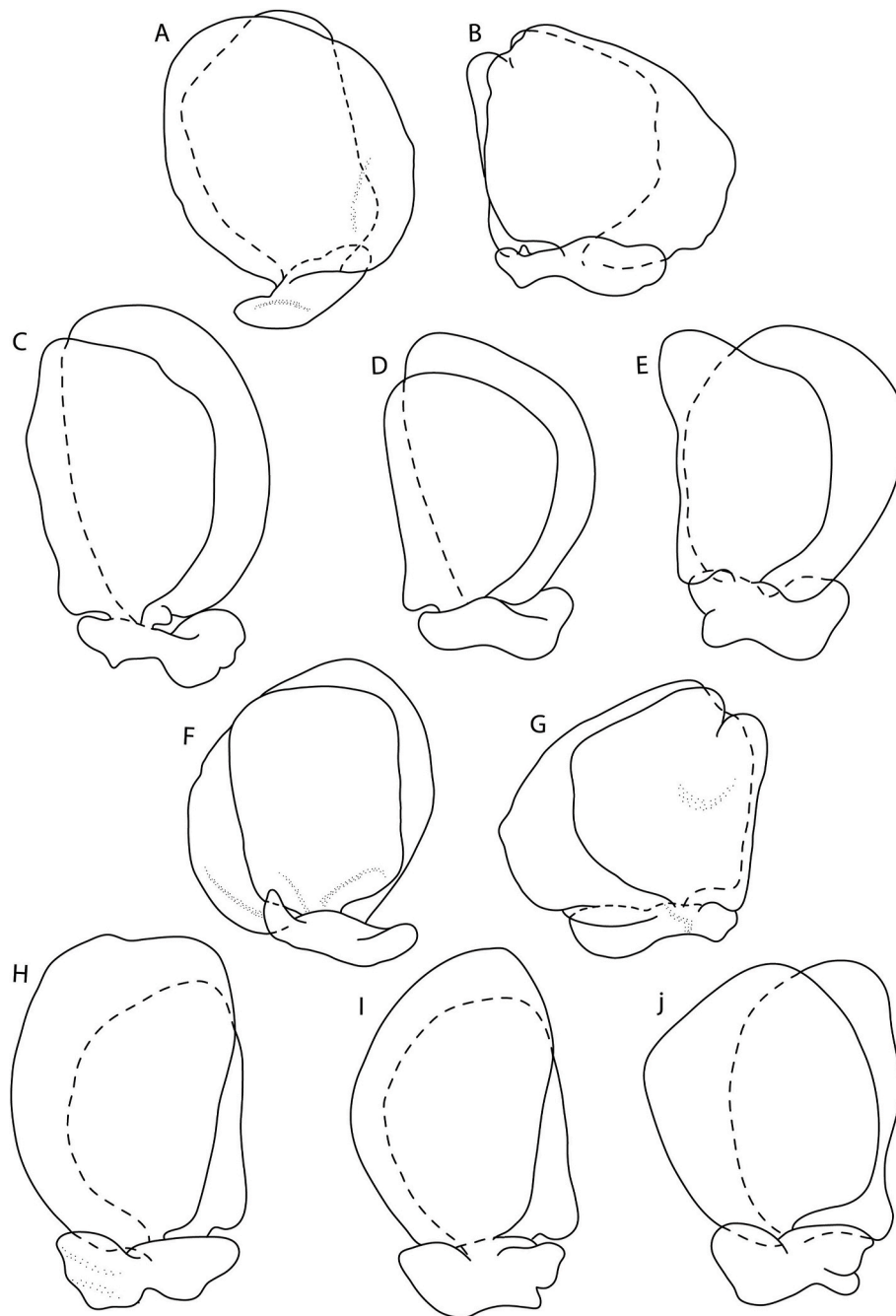


Fig. 3. *Mothocya andoni* n. sp. paratype ♀ (non-ovigerous, 18.0 mm total length, 9.0 mm width) (SAMC-A092738). **A**, Pleopod 1 ventral view; **B**, Pleopod 2 ventral view; **C**, Pleopod 3 ventral view; **D**, Pleopod 4 ventral view; **E**, Pleopod 5 ventral view; **F**, Pleopod 1 dorsal view; **G**, Pleopod 2 dorsal view; **H**, Pleopod 3 dorsal view; **I**, Pleopod 4 dorsal view; **J**, Pleopod 5 dorsal view.

frontal margin slightly ventrally folded. *Eyes* irregular in outline; one eye 0.2 times width of cephalon, 0.4 times length of cephalon. *Pereonite 1* smooth, anterior border anteriorly expanded with connective tissue, anterolateral angles broadly rounded, extending to posterior margin of eyes. *Pereon* lateral margins mostly ovate posteriorly; posterior margins smooth and straight, pereonite 7 deeply recessed medially. *Pereonites 1–4* increasing in length and width; 5–7 decreasing in length and width; 4–7 becoming progressively narrower, 2–3 subequal. *Coxae 1–5* not extending past pereonite posterior margin; 6–7 extending slightly past pereonite posterior margin.

Pleon 0.2 times as long as total body length, pleonite 1 slightly visible in dorsal view; pleonites posterior margin smooth and curved, mostly concave. *Pleonite 2* laterally entirely overlapped by pereonite 7. *Pleonites*

3–5 (most convex side) and 4–5 (less convex side) with free lateral margins. *Pleonite 5* widest, posterior margin straight. *Pleotelson* broadly rounded, 0.6 times as long as anterior width, lateral margins convex.

Antennula consists of 6 articles; peduncle articles 1 and 2 distinct and articulated; article 2 0.6 times as long as article 1; article 3 1.4 times as long as wide, 0.2 times as long as combined lengths of articles 1 and 2; flagellum with 4 articles, extending to posterior margin of eye, without setae. *Antenna* consists of seven articles; peduncle article 3 1.1 times as long as article 2; article 4 1.6 times as long as wide, 1.1 times as long as article 3; article 5 1.6 times as long as wide, 1.1 times as long as article 4; flagellum with 5 articles, terminating without setae. *Mandible* present, ending in an acute incisor; mandible palp article 2–3 without setae. *Maxillula lateral lobe* with 4 terminal robust setae, mesial lobe with 4

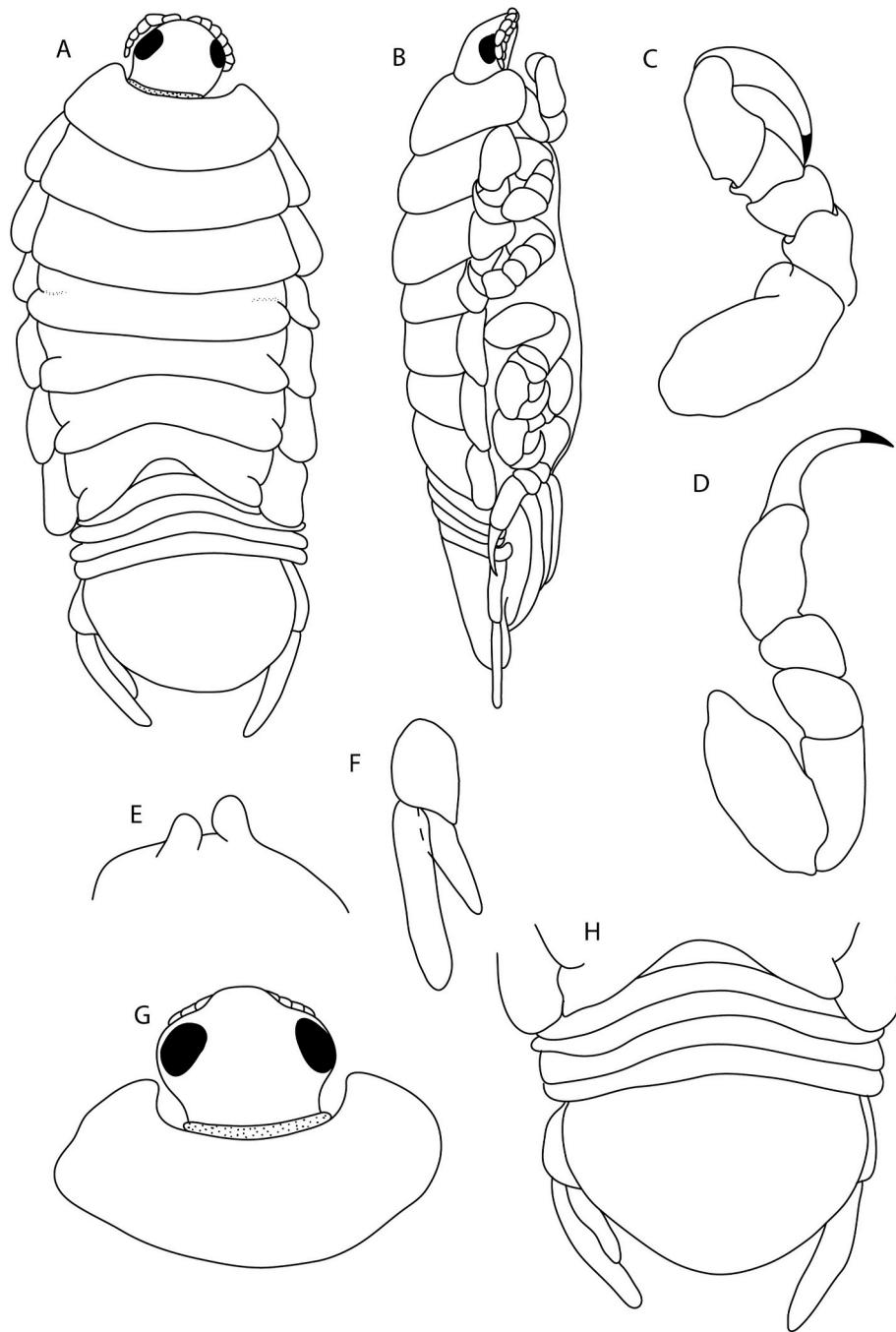


Fig. 4. *Mothocya andoni* n. sp. ♂ (12.0 mm total length, 5.0 mm width) (SAMC-A092738) **A**, Dorsal body; **B**, Lateral body; **C**, Pereopod 1; **D**, Pereopod 7; **E**, Penes; **F**, Uropod; **G**, Dorsal view of cephalon with pereonite 1; **H**, Dorsal view of pleon.

large recurved robust setae. *Maxilla* with 2 distinct lobes, 2.7 times longer than wide; medial lobe with 2 robust setae; lateral lobe with 2 robust setae. *Maxilliped* consists of 3 articles, article 3 with 4 recurved robust setae.

Pereopod 1 basis 1.9 times as long as greatest width; ischium 0.6 times as long as basis; carpus with rounded proximal margin; propodus 1.4 times as long as wide; dactylus slender, 1.8 times as long as propodus, 3.9 times as long as basal width. *Pereopod 7* basis 3.8 times as long as greatest width; ischium 0.7 times as long as basis, with slight bulbous protrusion; merus 0.7 times as long as wide, 0.3 times as long as ischium; carpus 0.9 times as long as wide, 0.5 times as long as ischium; propodus twice as long as wide, as long as ischium; dactylus slender, as long as propodus, 3.3 times as long as basal width.

Uropod peduncle 0.5 times longer than rami, lateral margin without setae; rami extending to the posterior end, or slightly beyond pleotelson posterior margin (shorter on the left side due to twisting), marginal setae absent. *Uropod endopod* narrowly rounded, 4 times as long as greatest width, lateral margin straight, mesial margin weakly convex, without setae. *Uropod exopod* extending beyond end of endopod, 4.8 times as long as greatest width, 1.6 times as long as endopod; lateral margin weakly convex, mesial margin straight, without setae.

3.1.3. Description non-ovigerous ♀ (paratype)

Figs. 2–3.

Non-described structures, same as ovigerous female.

Body ovoid, slightly twisted to the left, twice as long as greatest

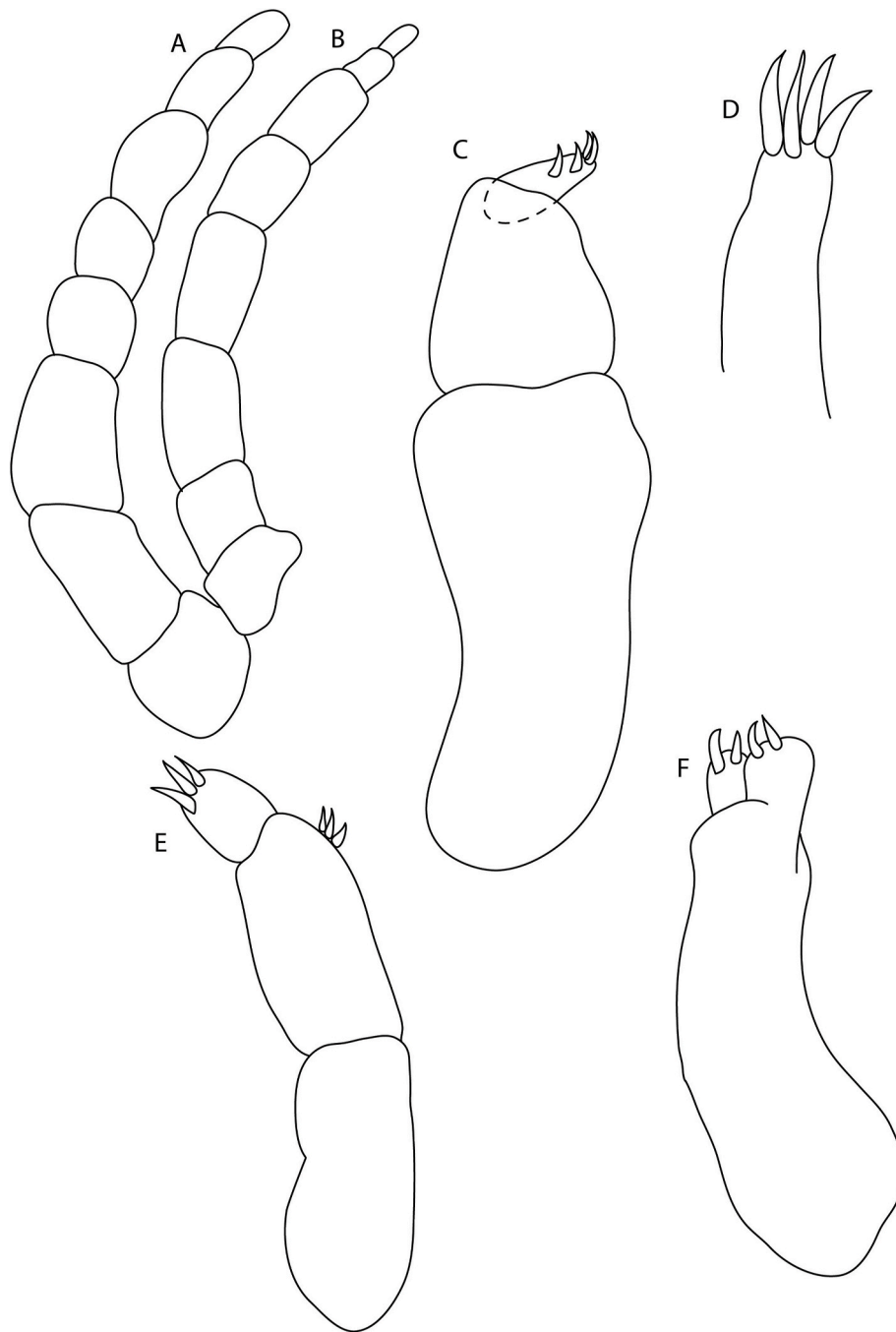


Fig. 5. *Mothocya andoni* n. sp. ♂ (12.0 mm total length, 5.0 mm width) (SAMC-A092738). A, Antennula; B, Antenna; C, Maxilliped; D, Tip of maxillula; E, Mandible palp; F, Maxilla.

width, widest at pereonite 3. *Cephalon* 0.5 times longer than wide. *Frontal margin* thickened, ventrally folded.

Pereonite 1 extend to anterior margin of eyes. Pereonites 1–3 increasing in length and width; 4–7 decreasing in length and width. *Pleopod 1 exopod* 1.1 times as long as wide, lateral margin strongly convex, distally broadly rounded, mesial margin strongly convex. *Pleopod 1 endopod* 1.6 times as long as wide, lateral margin straight, distally broadly rounded, mesial margin slightly convex, peduncle 2.7 times as wide as long. *Pleopods 1–5* proximomedial lobes increasing in size, with proximomedial lobes. *Pleopods 2–5* similar to pleopod 1. Pleopod peduncle lobes increasing in size from pleopod 2–5. *Uropod peduncle* as long as rami. *Right uropod rami* extending to pleotelson posterior margin, left uropod rami extending to half the length of the

pleotelson (due to twisting). *Uropod exopod* extending to end of endopod, 3.3 times as long as greatest width.

3.1.4. Description paratype ♂ (paratype)

Figs. 4–6.

Body ovoid, 2.4 times as long as greatest width, dorsal surfaces smooth and polished in appearance, widest at pereonite 3, most narrow at pereonite 7, lateral margins mostly posteriorly ovate. *Cephalon* subtriangular, 0.3 times longer than wide; visible in dorsal view, with blunt point. *Eyes* oval with distinct margins, one eye 0.2 times width of cephalon, 0.3 times length of cephalon. *Pereonite 1* smooth, anterior border medially straight, curved laterally, anteriorly expanded, anterolateral angle wide, with inwardly produced point, extending to

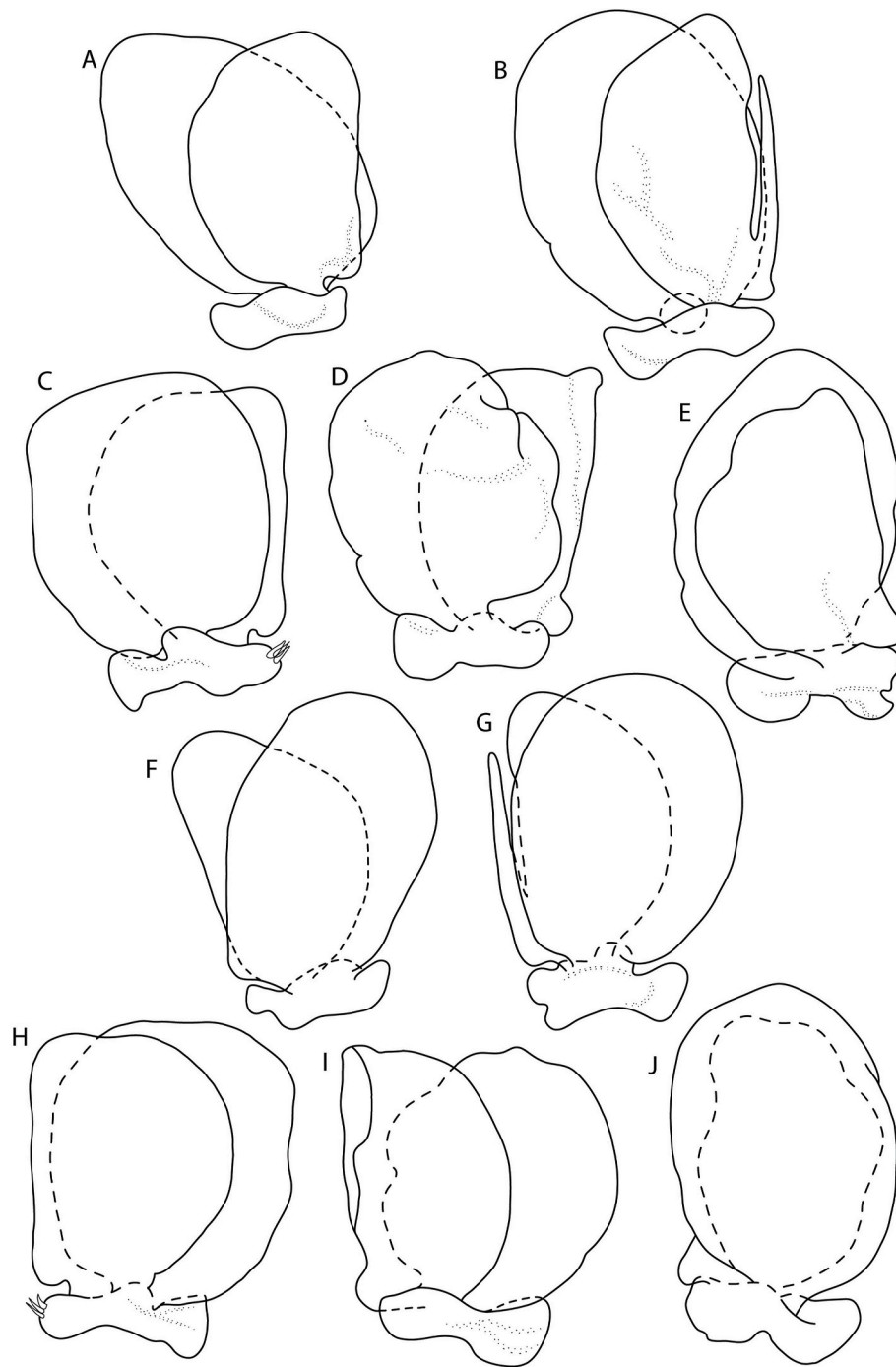


Fig. 6. *Mothocya andoni* n. sp. ♂ (12.0 mm total length, 5.0 mm width) (SAMC-A092738). A, Pleopod 1 ventral view; B, Pleopod 2 ventral view; C, Pleopod 3 ventral view; D, Pleopod 4 ventral view; E, Pleopod 5 ventral view; F, Pleopod 1 dorsal view; G, Pleopod 2 dorsal view; H, Pleopod 3 dorsal view; I, Pleopod 4 dorsal view; J, Pleopod 5 dorsal view.

posterior margin of eyes. Posterior margins of pereonites smooth and slightly curved laterally, pereonite 7 medially recessed. Pereonites 1–3 increasing in length and width; 4–7 decreasing in length and width; 4–7 becoming progressively narrower, 2–3 subequal. Coxae 2–3 with posteroventral angles rounded; coxae 4–7 rounded; coxae 6–7 extending slightly past pereonite posterior margin. *Pleon* with pleonite 1 largely concealed by pereonite 7, slightly visible in dorsal view; pleonites posterior margin smooth, straight. *Pleonite* 2 partially overlapped by pereonite 7, posterior margin straight. *Pleotelson* 0.7 times as long as anterior width, dorsal surface smooth; lateral margins weakly convex; posterior margin converging to slight caudomedial point, evenly

rounded.

Antennula consists of 8 articles; peduncle articles 1 and 2 distinct and articulated; article 2 1.6 times as long as article 1; article 3 1.6 times as long as wide, 0.6 times as long as combined lengths of articles 1 and 2; flagellum with 4 articles, without setae. *Antenna* consists of 8 articles; peduncle article 3 1.9 times as long as article 2; article 4 1.8 times as long as wide, 0.9 times as long as article 3; article 5 1.2 times as long as wide, 0.7 times as long as article 4; terminal article without setae. *Mandible* palp article 2 with 3 distolateral setae. *Maxillula* simple with 4 terminal robust setae; lateral lobe with 2 recurved robust setae; mesial lobe with 2 large recurved robust setae. *Maxilliped* consists of 3 articles,

article 3 with 4 recurved robust setae.

Pereopod 1 basis 2.1 times as long as greatest width; ischium 0.5 times as long as basis; propodus 1.9 times as long as wide; dactylus slender, 1.2 times as long as propodus, 3.8 times as long as basal width. *Pereopod 7* basis without carina, 2.4 times as long as greatest width; ischium 0.6 times as long as basis; merus 0.9 times as long as wide, 0.6 times as long as ischium; carpus 0.9 times as long as wide, 0.6 times as long as ischium; dactylus slender, 1.3 times as long as propodus, 3.4 times as long as basal width.

Pleopods simple, with setae on peduncle of pleopod 3; exopod larger than endopod. *Pleopod 1* exopod 1.4 times as long as wide, lateral margin weakly convex, distally broadly rounded, mesial margin weakly convex; endopod 1.6 times as long as wide, lateral margin weakly convex, distally broadly rounded, mesial margin straight, peduncle 2.8 times as wide as long. *Pleopod 2* appendix masculina with parallel margins, 0.8 times as long as endopod, distally narrowly rounded. *Pleopods 1–5* proximomedial lobes increasing in size, with proximomedial lobes. *Pleopod* peduncle lobes increasing in size from pleopod 2 to 5.

Uropod peduncle 0.6 times longer than rami, peduncle lateral margin without setae; rami extending beyond pleotelson posterior margin. *Uropod endopod* 3.3 times as long as greatest width, lateral margin straight, mesial margin weakly convex, terminating without setae. *Uropod exopod* extending beyond end of endopod, 5.4 times as long as greatest width, lateral margin straight, mesial margin straight, terminating without setae.

Penes distinct, distally rounded, 1.2 times as long as basal width.

Etymology. Named after the Andoni state and the Andoni Creek, from where the species was collected Noun in apposition.

Size. Ovigerous female 15.0 mm total length, 8.0 mm width. Non-ovigerous female 18.0 mm total length, 9.0 mm width. Males 7.0–12.0 mm total length, 4.0–5.0 mm width.

Remarks. *Mothocya andoni* n. sp. adult female specimens are characterised by the particularly large and wide coxa 7 extending posteriorly to pleonite 4; trapezoid shaped cephalon with subtruncate rostrum; pereonite 1 anterolateral angles only reaching to the posterior margin of eyes; pereopod 7 has a narrow basis; broadly rounded pleotelson; and uropods extending to the pleotelson posterior margin.

The only other known *Mothocya* from this region, *Mothocya longicopa*, has been recorded from western Africa, from Conakry, Liberia in the West to Fernando Po, Equatorial Guinea in the East, and is specific to Belonidae hosts: *Ablennes hians*, *Belone belone* and *Tylosurus crocodilus crocodilus*. *Mothocya andoni* n. sp. can be distinguished from *Mothocya longicopa* by: posterior coxae short and rounded (*Mothocya andoni* n. sp.) vs elongate and posteriorly rounded (*M. longicopa*); uropodal rami both apically rounded, exopod 1.6 as long as endopod vs endopod apically acute, exopod 2.0 as long as endopod (*M. longicopa*); and the male is without the characteristically large proxomedial lobe on the pleopod 5 peduncle.

Mothocya andoni can also be compared to *Mothocya omidaptia* Bruce, 1986; *Mothocya sajori* Bruce, 1986 and *Mothocya girellae* Bruce, 1986, all of which are somewhat similar in appearance. *Mothocya omidaptia* has been reported only from marine habitats in Rio de Janeiro, Brazil and Curaçao, West Indies (Bruce, 1986) from the common halfbeak, *Hyporhamphus unifasciatus* (Hemiramphidae). This species can be distinguished from *M. andoni* by the following characters: a narrowly produced rostrum, compared to the blunt rostrum of *M. andoni*; acute coxae of pereonite 7, versus the wider, broadly rounded coxae of *M. andoni*; uropodal rami that extend well beyond the pleotelson posterior margin, compared to those of *M. andoni* that only reaching, or slightly exceed the pleotelson posterior margin; and the number of terminating robust setae on the maxillae and maxillipeds.

Mothocya sajori is only known from Japan, from the Japanese halfbeak *Hyporhamphus sajori* (Hemiramphidae). It can be distinguished from *M. andoni* by the following characters: ovoid shape of the cephalon with weakly produced rostrum, versus the trapezoid shaped cephalon of *M. andoni*, with subtruncate rostrum; narrower coxae with pointed

posterior margins, compared to the wide, broadly rounded coxae of *M. andoni*.

Mothocya girellae has only been recorded from Lake Illawarra, southeastern Australia, from luderick, *Girella tricuspidata* (Girellidae). It can be distinguished from *M. andoni* by the following characters: coxae with narrowly rounded posterior margins, compared to the wide, broadly rounded coxae posterior margins of *M. andoni* (especially noticeable from male individuals); wider uropod exopod, with narrowly rounded apices, versus the narrower uropod exopod of *M. andoni*, with broadly rounded apices; maxilliped article 3 with four recurved setae (*M. andoni* with five setae).

Mothocya andoni n. sp. was obtained from the branchial chambers of the pelagic–neritic African moony, *Monodactylus sebae* (Monodactylidae). This shoaling fish occurs in fresh, brackish and marine waters of the eastern Atlantic, from Cape Verde (West Africa) south to Angola, in shallow bays and lower courses of rivers, sometimes ascending over long distances upstream (Vreven, 2008), and grows to a maximum standard length of 20 cm.

No substantial variation was noted between the examined ovigerous female holotype and non-ovigerous female paratype other than the development of a large brood pouch in the ovigerous specimen.

3.2. *Mothocya powelli* n. sp.

Fig. 7

3.2.1. Material examined

Holotype. Female (ovigerous, 7.0 mm total length, 5.0 mm width; dry) from Birakiki (4°34'10"N, 7°08'E), host unknown, seaward end of Hughes Channel, Bonny River (ca 15 km NNW of Bonny Town), Nigeria, December 1985, coll. CB Powell and B Olaosebikan (SAMC-A092739).

ZooBank registration: The Life Science Identifier (LSID) of the article is urn:lsid:zoobank.org:pub:38FB6597-830B-45AA-A8BF-A692B39F765C. The LSID for the new name *Mothocya powelli* n. sp. is urn:lsid:zoobank.org:act:D31760A8-8AFC-44E1-8D98-94A28BAD740D.

3.2.2. Description ovigerous ♀ (holotype)

Body ovoid, slightly twisted to the right, 1.4 times as long as greatest width; dorsum weakly convex; widest at pereonite 5, most narrow at pereonite 1. **Cephalon** anteriorly sub-truncate, 0.7 times longer than wide, visible in dorsal view, immersed in pereonite 1, medially concave; frontal margin thickened, ventrally folded. **Eyes** oval with distinct margins; one eye 0.3 times width of cephalon, 0.4 times length of cephalon. **Pereonite 1** with slight indentations, anterior border straight, anterolateral angles broadly rounded, extending past the medial region of eyes. **Pereon** lateral margins mostly ovate posteriorly, medially indented; posterior margins mostly straight, smooth, pereonite 7 medially recessed. **Pereonites 1–4** increasing in length and width; 5–7 decreasing in length and width; 3–5 subequal. **Coxae 2–3** with posterior-ventral angles right-angled; 4–7 rounded, large and produced. Coxae not extending past pereonite posterior margins. **Pleon** 0.4 times as long as total body length, with pleonite 1 largely concealed by pereonite 7; pleonites posterior margin smooth, mostly concave. **Pleonite 2** partially overlapped by pereonite 7. **Pleonites 3–5** similar in form to pleonite 2; pleonite 5 widest, lateral margins overlapped by pereonite 7, posterior margin straight. **Pleotelson** triangular, 0.7 times as long as anterior width, with anteromedial furrow, lateral margins straight, posterior margin converging to blunt caudomedial point.

Antennula consists of 5 articles; peduncle articles 1 and 2 distinct and articulated; extending to middle of eye. **Antenna** consisting of 5 articles, extending to middle of the eye.

Pereopod 1 basis 1.8 times as long as greatest width; ischium 0.6 times as long as basis; carpus with rounded proximal margin; propodus 1.4 times as long as wide; dactylus slender, 1.7 times as long as propodus, 3.5 times as long as basal width. *Pereopod 7* basis 2.2 times as long as greatest width; ischium 0.7 times as long as basis; merus 0.9 times as

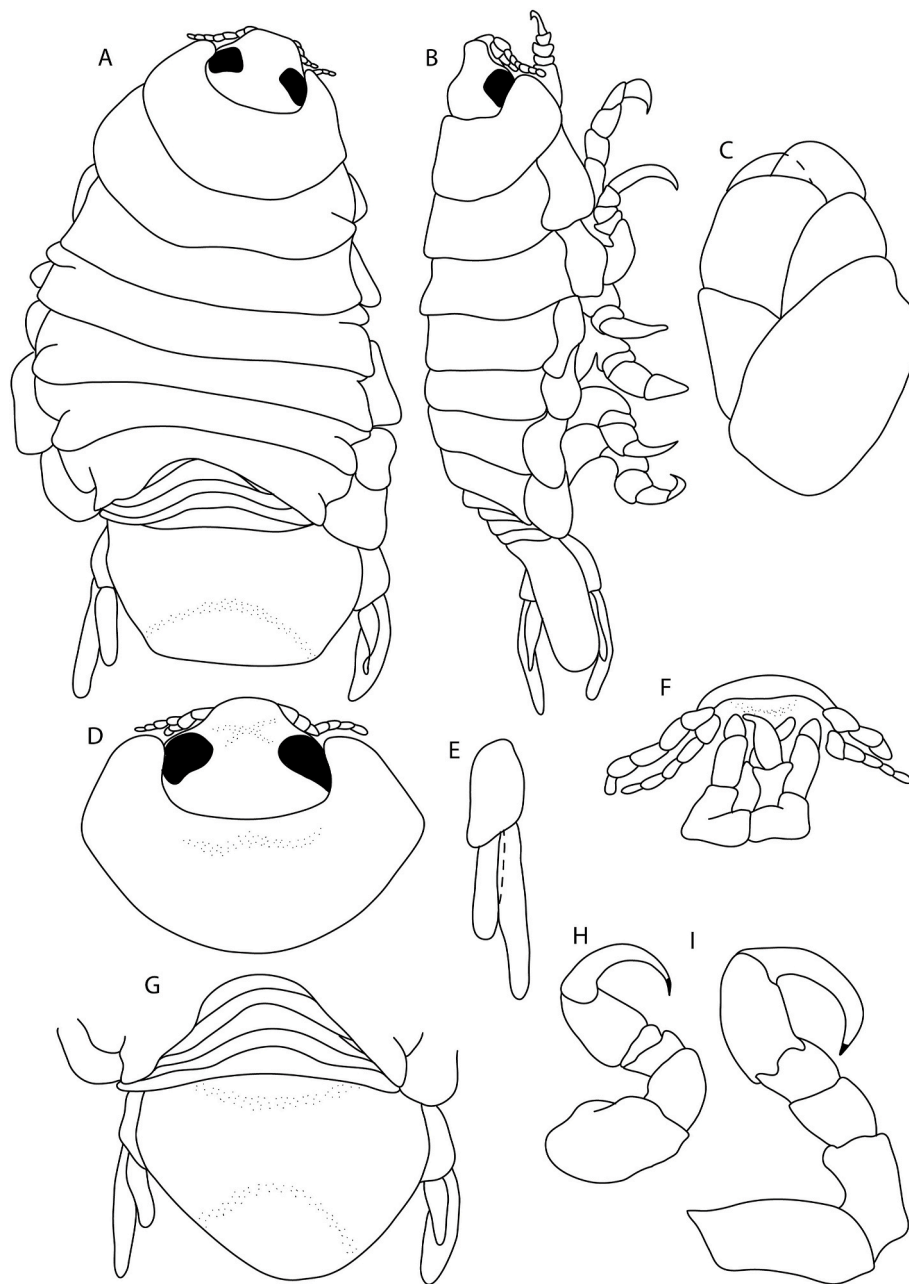


Fig. 7. *Mothocya powelli* n. sp. holotype ♀ (ovigerous, 7.0 mm total length, 5.0 mm width) (SAMC-A092739). **A**, Dorsal body; **B**, Lateral body; **C**, Oostegites; **D**, Dorsal view of cephalon with pereonite 1; **E**, Uropod; **F**, Ventral cephalon; **G**, Dorsal view of pleon; **H**, Pereopod 1; **I**, Pereopod 7.

long as wide, 0.5 times as long as ischium; carpus 0.9 times as long as wide, 0.4 as long as ischium; propodus 2.1 times as long as wide, as long as ischium; dactylus slender, 1.2 times as long as propodus, 3 times as long as basal width.

Uropod same length as pleotelson, peduncle 0.6 times longer than rami, peduncle lateral margin without setae; rami extending to pleotelson apex, apices broadly rounded. **Uropod endopod** 3.5 times as long as greatest width, lateral margin straight, mesial margin straight, without setae. **Uropod exopod** extending beyond end of endopod, 6.2 times as long as greatest width, 1.9 times as long as endopod; lateral margin straight, mesial margin straight, without setae.

Etymology. Named in honour of the late Prof C. B. Powell who was a foremost ecological expert on the fauna of Niger Delta, Nigeria.

Remarks. *Mothocya powelli* n. sp. can be recognised by its small size (7 mm); posteriorly ovoid body shape; blunt anterior margin of the cephalon; large eyes; antennulae and antennae with five articles;

triangular pleotelson; short pleon with all pleonite lateral margins overlapped by pereonite 7; and slender uropods reaching the posterior margin of pleotelson.

This species can be distinguished from *Mothocya andoni* n. sp. by the notable difference in size (*M. andoni* n. sp. is 15–18 mm; *M. powelli* n. sp. is 7 mm, based on the single specimen available; see Fig. 8); body posteriorly ovoid (in contrast to the medially ovoid *M. andoni* n. sp.); pereonite 7 overlapping the lateral margins of all pleonites (only overlaps the lateral margins of pleonites 3–4 in *M. andoni* n. sp.); triangular pleotelson (broadly rounded pleotelson in *M. andoni* n. sp.); and the uropod exopod is almost twice as long as the endopod (1.6 times as long as endopod in *M. andoni* n. sp.).

4. Discussion

To date, records of Cymothoidae from Nigeria include species of

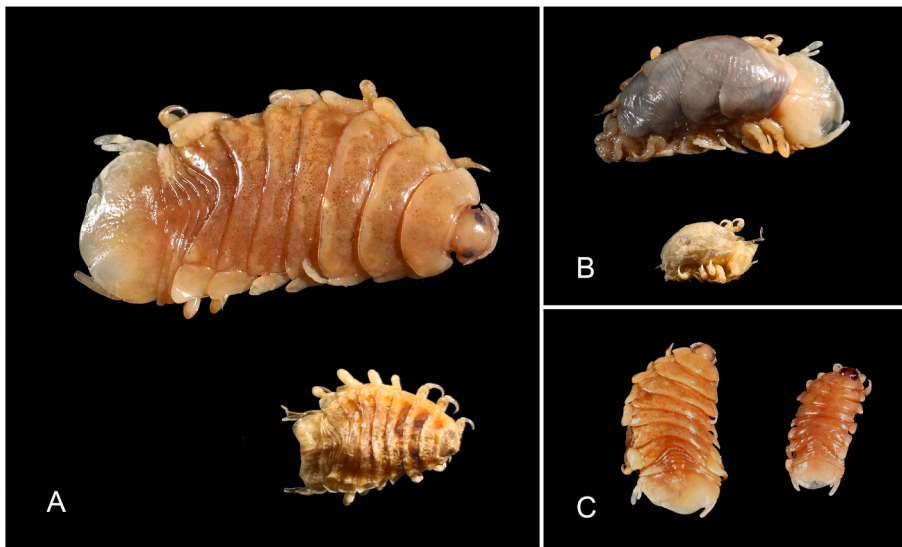


Fig. 8. A, Dorsal view of *Mothocya andononi* n. sp. holotype ♀ (ovigerous, 15.0 mm total length, 8.0 mm width) (SAMC-A092737) (top) and *Mothocya powelli* n. sp. holotype ♀ (ovigerous, 7.0 mm total length, 5.0 mm width) (SAMC-A092739) (bottom); B, Ventral view of *Mothocya andononi* n. sp. holotype ♀ (top) and *Mothocya powelli* n. sp. holotype ♀ (bottom); C, Dorsal view of *Mothocya andononi* n. sp. holotype ♀ (left) and *Mothocya andononi* n. sp. ♂ (12.0 mm total length, 5.0 mm width) (SAMC-A092738) (right).

Cymothoa Fabricius, 1793, *Elthusa* Schioedte and Meinert, 1884, and *Nerocila* Leach, 1818 from fish hosts from the families Cichlidae, Elopidae Gerreidae, Haemulidae, Pomadacyidae and Scianidae (Ugbombeh and Nwosu, 2016; Wonodi et al., 2019). These species were collected from the upper regions of the Bonny and Iwofe rivers. Thus far, there hasn't been a record of *Mothocya* from Nigerian waters. The nearest record of *Mothocya* to this location is that of *M. longicopa* from Western Africa and the Gulf of Guinea (Bruce, 1986; Rokicki, 1986). The two new *Mothocya* reported here thus increase our knowledge of these isopods from the understudied eastern South Atlantic.

The majority of Cymothoidae are distributed in marine environments, but several species have also been recorded from brackish and freshwater environments (Smit et al., 2014, 2019; Tavares-Dias et al., 2014; Hata et al., 2017). Four species of Cymothoidae have been recorded from African freshwater habitats. Fryer (1965) described *Ichthyoxenos tanganyikae* (Fryer, 1965) and *Livoneca enigmatica* (Fryer, 1968) from Lake Tanganyika [the latter based on immature, juvenile specimens, which led to the species' validity being questioned]. *Ichthyoxenos tanganyikae* was described from an endemic fish species *Simochromis diagramma* (Cichlidae), and *L. enigmatica* from a widely distributed pelagic species *Limnothrissa miodon* (Clupeidae). Lincoln (1971) later described the third species, *Ichthyoxenos africana* (Lincoln, 1972) from the same lake, from the cichlid species *Lepidiolamprologus elongatus* (Cichlidae) and *L. pleurostigma* (Cichlidae). Fryer (1968) mentions that these species are possible invasions that were transferred to the lake with their fish hosts, but there is no verification to support the origin. Lastly, *Ichthyoxenos expansus* Van Name (1920) was described from the distichodontid fish species *Eugnathichthys eetveldii* (Distichodontidae), from the Congo River basin, a freshwater habitat that is the second largest river basin in the world, after the Amazon River basin, in terms of size and freshwater species diversity. Thus, with the exception of the unconfirmed identity of *L. enigmatica*, all records of freshwater Cymothoidae in African freshwater, are *Ichthyoxenos* representatives.

The biodiverse Niger Delta is a low-lying region in southern Nigeria, where the waters of the Niger River drain into the Gulf of Guinea in the Atlantic Ocean. The Andoni River system falls into the lower tidal floodplain (including estuaries, mangroves, and creeks) and is a brackish water habitat. Fluctuation in the salinity of the water of the Andoni River system, based on seasonality and rainfall, has been noted (Komi and Sikoki, 2013). Ansa et al. (2007) noted salinity variations between 8 ppt in the wet season and 21 ppt during the dry season. Ezekwe and Edoghotu (2015) recorded the salinity (measuring total dissolved solids) of the Andoni River estuary at various locations, ranging between 14,

900 and 27,840 (mg/L). These fluctuating environmental variables indicate that this region is a sensitive ecological zone in the Niger Delta region and these *Mothocya* species recorded here could be considered hardy and stress tolerant organisms.

The Andoni River system was also found to be severely affected by the oil pollution occurring upstream, waste discharge, and urban run-off that is causing a decline in the capacity to support aquatic life in this area (Ezekwe and Edoghotu, 2015). This pollution will negatively affect the fish and aquaculture practices within the system, which are of major economic importance. Recent studies in the Bonny River have investigated the use of cymothoid isopods as indicators of metal pollution (Ugbombeh and Nwosu, 2016). Although the mouth-attaching parasites utilised in the study were not found to be useful bioindicators, it was recommended that more studies be done using branchial cymothoids (such as *Mothocya* species).

In conclusion, two new *Mothocya* species were collected from Nigeria. These discoveries have increased our knowledge on the biodiversity of cymothoids from the understudied West Africa region. *Mothocya andononi* n. sp from the Andoni River is tolerant of marine and brackish water (similar to its host) and *M. powelli* n. sp. is from the Bonny River; both of which could potentially be useful in investigating the polluted waters in the Andoni and Bonny river systems.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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