

***Hadromastax dinamoraze* sp. nov., the first occurrence of the family Hadromastacidae Bruce and Müller, 1991 (Isopoda, Crustacea, Limnoriidea) in the Indian Ocean**

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The isopod family Hadromastacidae Bruce and Müller, 1991 is recorded from the Indian Ocean for the first time. *Hadromastax dinamoraze* sp. nov., the third species in the genus, is described from the Mascarene Island of Rodrigues, Republic of Mauritius, in the western Indian Ocean, where it has been found to occur widely on coral-reef habitats from the intertidal reef flat to the reef slope to depths of about 18 m.

KEYWORDS: Hadromastacidae, *Hadromastax*, Indian Ocean, Mascarene Islands, Rodrigues.

Introduction

The family Hadromastacidae Bruce and Müller, 1991 contains a single genus, *Hadromastax* Bruce, 1998, and was previously known from two southern Pacific locations. The type species, *Hadromastax merga* Bruce, 1988, is known from a single specimen taken at a depth of about 150 m off the central New South Wales coast, south-eastern Australia. The second species to be described, *Hadromastax polynesica* Bruce and Müller, 1991, was found at several shallow-water sites on the coral reefs around Tahiti.

The occurrence of a third species on the reefs around the Mascarene island of Rodrigues, Mauritius, represents a vast range extension, and is intriguing given that the genus is apparently absent from similar habitats in north-eastern Australia, Papua New Guinea and East Africa, regions that have been reasonably well collected by myself and others. The family was not reported at Aldabra (southern Seychelles) by Kensley (1988), a similarly isolated and oceanic coral-reef habitat.

Rodrigues is an isolated volcanic island, approximately 595 km east of Mauritius, and 2200 km from the African coast (and more than 5000 km from Western Australia). Surface ocean currents flow primarily from east to west,

originating from the north-eastern Indian Ocean, an area where, as far as is known, the family does not occur. One can only speculate that the distribution of this distinctive taxon may represent a relict Indo-Pacific distribution and that there have been historical extinctions in continental coral-reef habitats. It would indeed be informative to discover if the family is present on other oceanic Indo-Pacific reefs.

Material and methods

Describing these small animals presented several difficulties. The specimens were fixed for 24–36 h in 5% formaldehyde, then transferred to ethanol. Despite the fixation they remain brittle, and therefore extremely difficult to dissect. It proved nearly impossible to remove pleopods without multiple fragmentation and consequent confusion as to which rami were which (pleopods 3–5 are effectively identical); mouthpart dissection was similarly difficult (the male mandible was not successfully dissected). Furthermore, there was only one apparently adult male and one ovigerous female with embryos in the marsupium. Dissection resulted in the specimen being largely destroyed, so rather than carry on destroying specimens the description is based on the female holotype and dissected paratype and a fully dissected male.

Classification follows Poore (2002).

The following abbreviations are used: BMNH, The Natural History Museum, London, UK; NLB, N. L. Bruce; NMNZ, National Museum of New Zealand Te Papa Tongarewa, Wellington; QM, Queensland Museum, Brisbane, Australia; PMS, plumose marginal setae; CP, circumplumose; RS, robust seta/setae.

Systematic account

Family **HADROMASTACIDAE** Bruce and Müller, 1991

Genus *Hadromastax* Bruce, 1988

Type species: *Hadromastax merga* Bruce, 1988, by monotypy and original designation.

Remarks

The family Hadromastacidae and the sole genus *Hadromastax* were diagnosed by Bruce and Müller (1991; see also Poore, 2002); the diagnostic characters are the separate articulation of the uropodal rami and the unique pleon structure with only two visible segments, both of which have posteriorly directed processes, and the massive mandible which lacks a lacinia mobilis, spine row and molar process. The three species of *Hadromastax* are remarkably similar, differing mainly in fine details of coxal and uropodal morphology. The present illustrations show more detail than earlier descriptions due to the use of Nomarskii interference microscopy but do not reveal any new information relevant to generic or family characters. The genus is unusual in that the mature males appear to undergo a mouthpart metamorphosis similar to that shown by female Sphaeromatidae, a morphological transformation not known to occur in any other family of Sphaeromatidea or Limnoriidea.

The family is now known to have a Southern Hemisphere distribution in the Pacific and Indian Oceans.

Hadromastax dinamoraze sp. nov.
(figures 1–5)

Material examined

All material from Rodrigues, Mauritius, collected during the Shoals of Capricorn Programme Workshop held at Port Mathurin, September to October 2001.

HOLOTYPE: female (non-ovig. 2.1 mm), Gravier, 19°43.878'S, 63°29.610'E, 19 September 2001, outer margin of reef crest, *Porolithion* clumps, NLB Stn 15, coll. N. L. Bruce (BMNH 2004.203).

PARATYPES: two males (immature 1.9, manca 1.4 mm), five females [ovig. 1.9, 1.8; non-ovig. 2.0 (dissected), 1.5, 1.1 (manca)], same data as holotype (BMNH 2004.224–230). Five females (ovig. 2.2; non-ovig. 1.9, 2.3, 2.4; manca 1.3 mm), Pointe Coton, 19°40.974'S, 63°29.892'E, 17 September 2001, inter-tidal, outer edge of reef crest, compacted coral rock, NLB Stn 3, coll. N. L. Bruce (BMNH 2004.206–210). Female (ovig. 2.0 mm), Gravier, 19°43.878'S, 63°29.610'E, 19 September 2001, inner margin of reef crest, dead coral, NLB Stn 14, coll. N. L. Bruce (BMNH 2004.211). Female (ovig. 2.0 mm), Passe Coco, reef off Port Mathurin, 19°40.282'S, 63°25.378'E, 22 September 2001, dead coral on reef slope, 9–6 m, scuba, NLB Stn 24, coll. N. L. Bruce and Leonie Salmon (NIWA P1392). Male (1.5 mm), western Rodrigues reef, Passe Demi, 19°42.104'S, 63°17.570'E, 25 September 2001, dead coral heads, 17–18 m, scuba, NLB Stn 39, coll. N. L. Bruce and Leonie Salmon (BMNH 2004.212). Manca (0.8 mm), Rivière Banane, 19°40.261'S, 63°28.582'E, 20 September 2001, outer reef crest, '*Porolithion*' clumps and encrustations, NLB Stn 19, coll. N. L. Bruce (NIWA P1393).

Also examined. Paratypes of *Hadromastax polynesica* Bruce and Müller, 1991, six specimens, males and ovigerous females, Mooréa (QM W15949).

Description

Female. Body 2.3 times as long as greatest width; maximum width at pereonite 4; dorsal surfaces granular, with prominent CP setae; coxae prominent in dorsal view. Cephalon loosely articulated with pereonite 1, 1.8 times as wide as long. Eyes minute, six small ocelli set in a tight circle. Pereonite 1 half as long as pereonite 2, pereonites 2 and 3 subequal in length, pereonites 4–7 becoming progressively shorter; pereonite 7 shortest, about half as long as pereonite 1. Coxae without acute marginal denticles; coxa 3 overlapping coxae 2 anteriorly and coxa 4 posteriorly; coxa 5 extending to mid-point of pereonite 6; coxae 6 extending to posterior of pleon; posteroventral angles of coxae 5 and 6 bluntly rounded; coxae 7 largely overlapped and concealed by coxae 6. Pleon with only two visible segments in dorsal and lateral view, each segment with two prominent, posteriorly directed and terminally acute processes; processes not making contact with each other. Pleotelson about 0.9 as long as greatest width, posterior margin subtruncate, provided with approximately 12–14 long plumose marginal setae.

Antennule peduncle article 1 longest, 1.2 times as long as article 2, 1.5 times as long as wide, distolateral angles each with single palmate seta; article 2 shortest, 0.9 times as long as article 3, 1.5 times as long as wide, superior distal angle with two

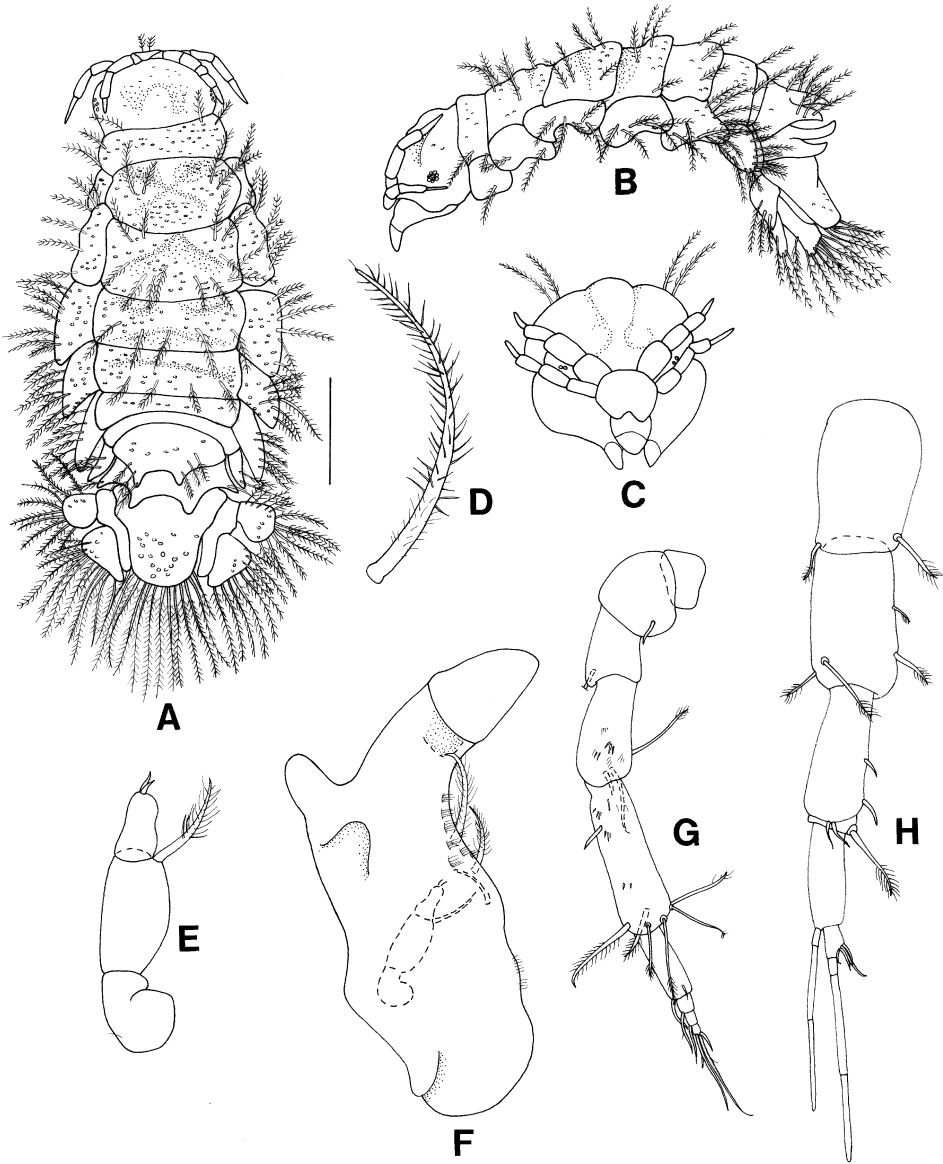


FIG. 1. *Hadromastax dinamoraze* sp. nov. (A–C) Holotype; (D–H) female paratype (BMNH 2004.224–230). (A) Dorsal view; (B) lateral view; (C) frons, anterior view; (D) seta from pereonite 1; (E) mandibular palp; (F) mandible; (G) antenna; (H) antennule. Scale bar: 0.5 mm.

palmate setae, inferior margin with two plumose setae; article 3 subequal in length to article 1, about 2.4 times as long as wide, with short fourth peduncle article with two simple and one palmate setae, inferior margin with two stout simple setae; flagellum short, 0.9 times as long as peduncle article 3, with two articles, article 2 being 0.3 times as long as article 1. Antenna peduncle article 1 very short and narrow, articles 2–5 becoming progressively longer, articles 3–5 of similar width;

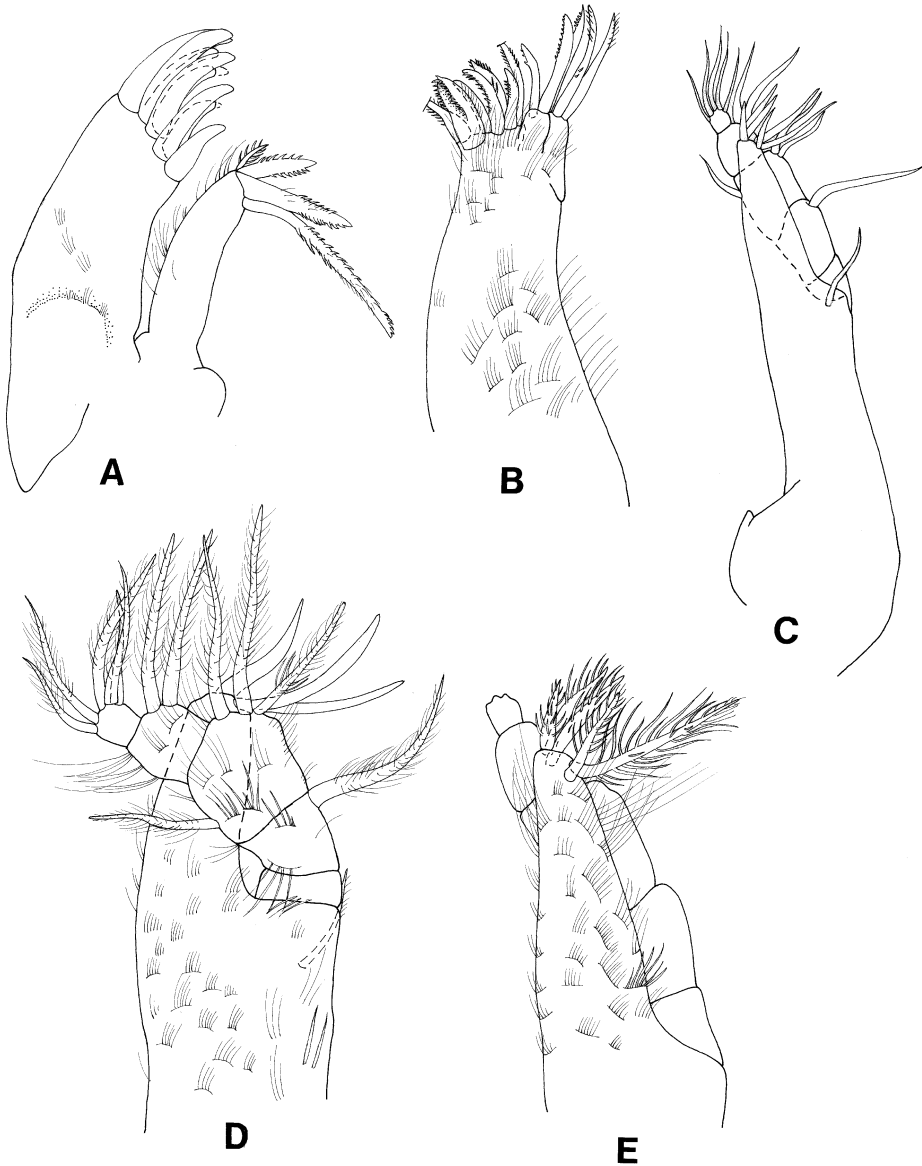


FIG. 2. *Hadromastax dinamoraze* sp. nov., female paratype (BMNH 2004.224–230). (A) Maxillule; (B) maxilla; (C) maxilliped, setules not shown; (D) maxilliped palp; (E) maxilliped endite.

article 3 1.3 times as long as article 2, with one marginal seta; article 4 1.6 times as long as 3, with one marginal and two distal plumose setae; article 5 longest, 1.3 times as long as 4, superior margin with single proximal simple seta, distal with six plumose and palmate setae; flagellum of four articles, 0.7 times as long as peduncle article 1, flagellum article 1 0.6 length of flagellum.

Epistome anterior margin smoothly rounded, posterior margin with median indentation.

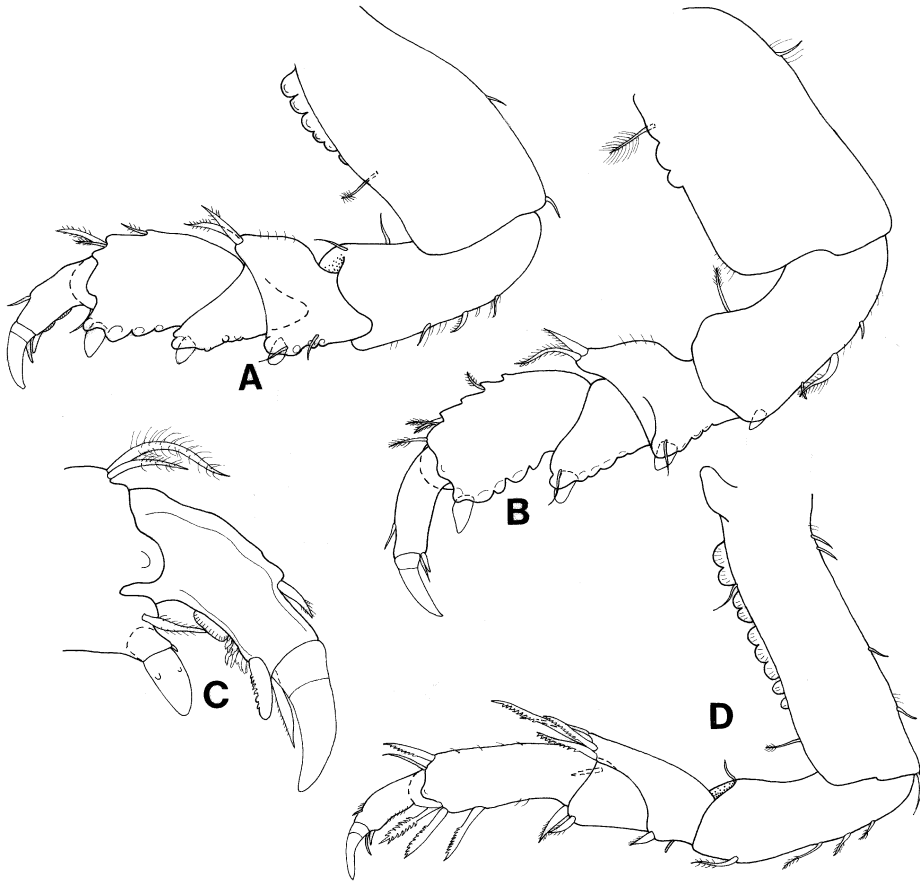


FIG. 3. *Hadromastax dinamoraze* sp. nov., female paratype (BMNH 2004.224–230). (A) Pereopod 1; (B) pereopod 2; (C) pereopod 1, dactylus; (D) pereopod 7.

Mandible mesial margin with two prominent CP setae; palp article 2 distal angle with one large CP seta, palp article 1 with one short plumose seta and 3 with two short simple setae. Maxillule lateral lobe with eight RS on gnathal surface, mesial lobe with one short plumose seta and three long biserrate RS, mesial-most seta being longest. Maxilla lateral lobe with three serrate setae, middle lobe small, stub-like, with one serrate and one biserrate RS, mesial lobe with seven stout serrate and biserrate RS, of which the mesial-most two have broad spoon-like hollow face. Maxilliped palp articles 1 and 2 appearing fused; lateral margin of article 3 with single large CP seta; mesial margins of articles 3 and 4 with three and two large CP setae, respectively; article 4 small 0.5 as wide as 4, distal margin with five long CP setae; endite long, extending beyond distal margin of palp article 4, distally with five large CP setae, without coupling hooks.

Pereopod 1 basis 2.0 times as long as wide, inferior margin with proximal cuticular tubercles, superior distal angle with single, simple seta; ischium 0.6 times as long as basis, 1.6 times as long as wide, inferior margin with three weakly plumose setae, superior margin with single simple seta, superior distal angle with single simple seta; merus 0.6 times as long as ischium, inferior margin with four low

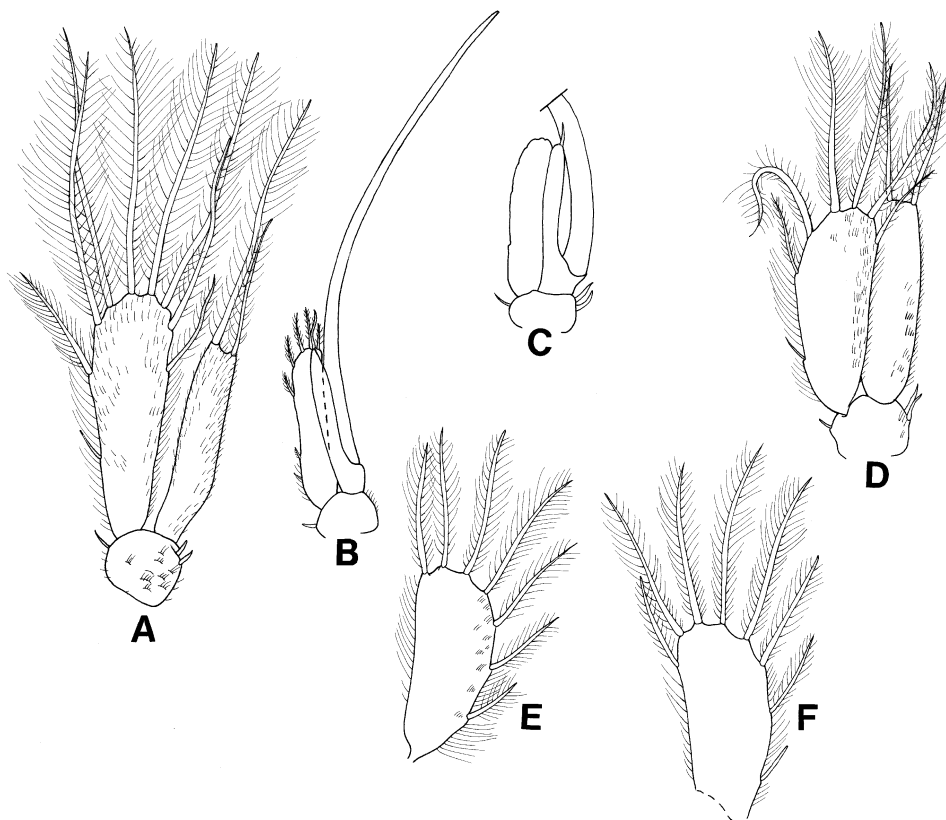


FIG. 4. *Hadromastax dinamoraze* sp. nov., male paratype (BMNH 2004.212). (A) Pleopod 1; (B) right pleopod 2; (C) left pleopod 2 showing articulation of appendix masculina; (D) pleopod 3; (E) pleopod 4 endopod; (F) pleopod 5 endopod.

rounded nodules, single large blunt RS at distal angle and small submarginal simple setae, superior distal angle with two acute plumose RS; carpus 0.8 times as long as merus, inferior margin with five low rounded nodules and single large blunt RS; propodus about as long as ischium, 1.7 times as long as wide, inferior margin with four large rounded nodules, single large blunt RS at distal angle and one small submarginal simple seta, superior margin with one short plumose seta and two plumose setae at distal angle; dactylus 0.7 times as long as propodus, unguis 57% of total length, superior margin with single simple seta, inferior margin with complex cuticular scales, secondary unguis serrate with prominent flat seta arising between bases of primary and secondary ungui. Pereopod 2 similar to pereopod 1, propodus superior margin with four serrations, with two short plumose setae, distal angle with one plumose seta. Pereopod 6 similar to pereopod 7 but longer. Pereopod 7 basis 3.1 times as long as wide, inferior margin with flat cuticular tubercles or scales, superior distal angle with single simple seta; ischium 0.6 times as long as basis, 2.1 times as long as wide, inferior margin with four weakly plumose setae, superior distal angle with single simple seta; merus inferior margin 0.37 times as long as ischium, inferodistal angle with one serrate RS, superior margin overriding carpus, with four serrate and one simple RS; carpus 1.48 times as long as merus

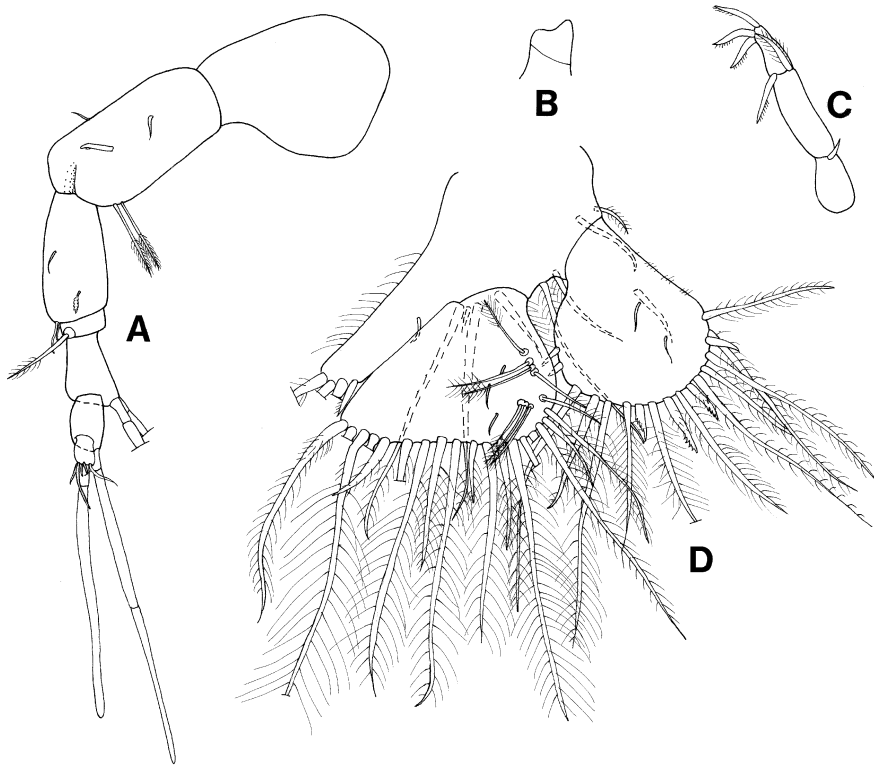


FIG. 5. *Hadromastax dinamoraze* sp. nov. (A–C) Male paratype (BMNH 2004.212); (D) female paratype (BMNH 2004.224–230). (A) Antennule; (B) mandible incisor; (C) mandible palp; (D) uropod.

inferior margin, inferodistal angle with one serrate and one biserrate RS, superior distal angle unarmed; propodus about as long as ischium, 2.9 times as long as wide, inferior margin with one large serrate RS, inferodistal angle with one large serrate and one large biserrate RS, superior distal angle with one simple seta and one serrate RS; dactylus similar to that of pereopod 1 but lacking cuticular scales.

Oostegites arising from sternites 2, 3 and 4, overlapping mesially and forming the marsupium; without anterior or posterior pockets.

Pleopods similar to those of male; pleopod 2 similar to pleopod 3.

Uropod peduncle mesial lobe strongly produced, distally subtruncate, with four long CP setae, inferior margin with three long PM setae beneath endopod, further two long CP setae between exopod and endopod; exopod 1.6 times as long as wide, lateral margin straight, distal and mesial margin forming one smoothly rounded margin provided with 11 long CP setae and four short biserrate and plumose RS; endopod 1.5 times as wide as long, distal margin straight, with 16 long CP setae and two short plumose RS.

Male. Antennule slightly more robust than that of female, with fewer setae on peduncle, article 3 0.8 times as long as article 2; flagellum of three articles, with two aesthetascs on article 1, one each on articles 2 and 3.

Mandible incisor smaller than that of female, distal margin subtruncate, with

mesial cusp; palp article 1 with single distal simple seta, article 2 with one serrate and one CP setae, article 3 with three stout serrate setae.

Penes paired, not fused, apparently opening flush with sternite 7; relative position of openings not discernible.

Pleopod 1 exopod 3.7 times as long as wide, mesial and lateral margins weakly divergent, distal margin rounded, with eight PMS; endopod slender, 5.2 times as long as wide, distal margin truncate with two PMS; inferior margins of both rami with abundant microtrichs. Pleopod 2 rami and peduncle small, about 0.6 times as long as pleopod 1, exopod 5.5 times as long as wide, with five short PMS, endopod six times as long as wide with one short simple distal seta, appendix masculina elongate, 3.3 times as long as endopod, 41 times as long as basal width, curving mesially, apex acute. Pleopod 3 endopod 2.8 times as long as wide, with straight mesial margin, lateral margin convex, with six PMS, endopod 3.4 times as long as wide, distally truncate with two PMS. Pleopods 4 and 5 similar to pleopod 3, exopods with seven and eight setae, respectively; endopods (*in situ*) elongate and subtruncate.

Sexual dimorphism

Males and females can be differentiated on the basis of the more elongate body of the male and in sexually mature males by the mandible incisor being far smaller and less conical than that of the female. The dissected male, with a well-developed appendix masculina, does not have the 'metamorphosed' mouthparts of the Polynesian species but is similar to the female with the exception that the mandible is less robust and the mandible palp has more setae. The rami of pleopod 2, while small in comparison to the others, are not as small as those of *H. polynesica*. With only one male available it is not possible to say if this difference is maturity related or a species difference.

Remarks

The three *Hadromastax* species are extremely similar in general appearance: small, with granular dorsal surfaces that have prominent, long, plumose setae on the body segments. The general shape of the head, coxae and uropods and pleotelson are all similar. The type species is distinguished by having the two pleonal processes closely pressed together.

Hadromastax dinamoraze sp. nov. is most similar to *H. polynesica* and can be distinguished from that species by the following: body slightly more elongate in *H. dinamoraze*; pereopod 1 ischium without blunt ventrodiscal RS (with such in *H. polynesica*); male pleopod 2 endopod about five times as long as wide (about twice as long as wide); pleotelson in males without longitudinal median ridge (with such in *H. polynesica*); dorsal surfaces strongly setose (weakly setose in *H. polynesica*); coxae of pereonite 5 not extending to pleon (large, extending to posterior of pleon in *H. polynesica*); and the pleonal process dorsal set apart (close-set and also more acute in *H. polynesica*). The differences between *H. dinamoraze* and *H. merga* are: coxae and pereonite margins not serrate, without acute denticles (with such in *H. merga*); pereopod 1 ischium without blunt ventrodiscal RS (with such in *H. merga*); uropod endopod poster margin even (indented in *H. merga*); coxae of pereonite 5 not extending to pleon (large, extending to anterior of pleon in *H. merga*); pleonal processes separate (pressed together in *H. merga*).

One female had embryos (with their mandible incisors visible) and appears to have three pairs of oostegites arising on segments 2, 3 and 4. These oostegites are highly transparent and fragile, and the articulation with the coxa and the oostegite margins could not be clearly seen. This is the best interpretation that could be achieved with a single ovigerous female.

Habitat

Hadromastax dinamoraze is found around the island of Rodrigues; it occurs on the outer reef flat in conditions of high exposure and oceanic water (at Gravier and Passe Demi) to moderate exposure (at Pointe Coton) and in moderately silty conditions (at Passe Coco); at depths from the intertidal to at least 18 m.

Etymology

From Dina Moraze, the first recorded name for the island of Rodrigues (on a 10th-century map by the Arab geographer Al Sharif el-Edrissi; Anon., 2002); noun in apposition.

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