

Chirostylidae from north-western Australia (Crustacea: Decapoda: Anomura)

SHANE T. AHYONG¹ AND KEIJI BABA²

¹Department of Marine Invertebrates, Australian Museum, 6 College St, Sydney, NSW 2010, Australia
(shanea@austmus.gov.au)

²Faculty of Education, Kumamoto University, 2-40-1 Kurokami, Kumamoto 860-8555, Japan
(keiji@gpo.kumamotu-u.ac.jp)

Abstract

Ahyong, S.T., and Baba, K. 2004. Chirostylidae from north-western Australia (Crustacea: Decapoda: Anomura). *Memoirs of Museum Victoria* 61(1): 57–64.

New records and a new species of Chirostylidae from north-western Australia are reported. Prior to the present study, two chirostylids were known from north-western Australia. The present collection comprises seven species arrayed in three genera: *Chirostylus*, *Eumunida* and *Uroptychus*. Five species are newly recorded from Australian waters: *Eumunida ampliata*, *E. funambulus*, *E. pacifica*, *Uroptychus joloensis* and *U. nigricapillis*. *Chirostylus dolichopus* is newly reported from the Northern Territory. One species from the North West Shelf, *U. oxymerus* is new to science. A total of 40 species of Chirostylidae are now known from Australian waters.

Keywords

Crustacea, Decapoda, Anomura, Chirostylidae, Uroptychus, new species

Introduction

The Australian deep-water squat lobsters of the family Chirostylidae are known from relatively few studies (Henderson, 1885, 1888; Haig, 1974; Baba, 1986, 2000; de Saint Laurent and Macpherson, 1990; de Saint Laurent and Poupin, 1996; Ahyong and Poore, 2004). Of the 34 chirostylids recorded from Australia (Ahyong and Poore, 2004), only two are known from north-western Australia: *Chirostylus dolichopus* Ortmann, 1892 and *Uroptychus brucei* Baba, 1986. The present study is based on miscellaneous chirostylid collections from north-western Australia in the collections of the Australian Museum, Museum Victoria, and the South Australian Museum. Of the seven species reported below, five represent range extensions into Australian waters, and one is new to science. A total of 40 species of Chirostylidae is now known from Australian waters.

Measurements of specimens, given in millimetres (mm), indicate the carapace length including the rostrum unless indicated otherwise. Specimens are deposited in the Australian Museum, Sydney (AM), Natural History Museum, London (BMNH), Museum Victoria, Melbourne (NMV), and the South Australian Museum, Sydney (SAM).

Chirostylidae Ortmann, 1892

Chirostylus Ortmann, 1892

Chirostylus dolichopus Ortmann, 1892

Chirostylus dolichopus Ortmann, 1892: 246, pl. 11, figs 2, 2b, 2c,

2e, 2i, 2z [type locality: Kadsiyama (= Katsuyama), Sagami Bay, Japan].—Haig, 1974: 447.—Davie, 2002: 30.

Material examined. AM P25058, 1 male (4.4 mm), Timor Sea, Northern Territory, 9°30'S, 132°34'E, 124 m, MV *San Pedro Sound*, P. Colman, 9 Nov 1969.

Remarks. *Chirostylus dolichopus* was reported from tropical Western Australia by Haig (1974) without mention of a specific locality. The present specimen represents a new record for the Northern Territory.

Distribution. Western Indian Ocean, Sulu Archipelago, Japan, Western Australia and now the Northern Territory; 35–140 m (Baba, 1988).

Eumunida Smith, 1883

Eumunida (Eumunida) funambulus Gordon, 1930

Eumunida funambulus Gordon, 1930: 744, figs 1c, 2a, b, 3b, 4b, 5 [type locality: Gulf of Aden].

Eumunida (Eumunida) funambulus.—de Saint Laurent and Poupin, 1996: 350–352.

Material examined. SAM C725, 1 female (38.8 mm), Timor Sea, off Palmerston [now Darwin], Northern Territory, P. Foelske, Nov 1890.

Remarks. The single specimen agrees well with published accounts. Unfortunately, the depth of capture was not recorded for this and other specimens of *Eumunida* reported herein.

Distribution. Gulf of Aden to Indonesia, the Philippines, Japan (de Saint Laurent and Poupin, 1996) and now from Timor Sea, Northern Territory; 130–732 m.

***Eumunida (Eumunida) pacifica* Gordon, 1930**

Eumunida pacifica Gordon, 1930: 746, figs 6–7 [type locality: Timor Sea, Indonesia].

Eumunida (Eumunida) pacifica.— de Saint Laurent and Poupin, 1996: 359–362, figs 4a, b, 12a.

Material examined. SAM C724, 1 female (43.0 mm), Timor Sea, off Palmerston [now Darwin], Northern Territory, P. Foelske, Nov 1890; SAM C725, 4 males (16.9–32.1 mm), 1 female (20.0 mm), Timor Sea, off Palmerston [now Darwin], Northern Territory, P. Foelske, Nov 1890.

Remarks. The present specimens of *E. pacifica* are all in dry condition. One lot (SAM C725) forms part of a larger series of *Eumunida* that includes *E. funambulus* and *E. ampliata* (see below) registered as a single lot.

Distribution. Indonesia (Timor Sea, Moluccas, Kai Islands) and now from northern Australia; 204–304 m (de Saint Laurent and Poupin, 1996); 293–605 m (de Saint Laurent and Poupin, 1996).

***Eumunida (Eumunidopsis) ampliata* de Saint Laurent and Poupin, 1996**

Eumunida (Eumunidopsis) ampliata de Saint Laurent and Poupin, 1996: 368–371, figs 7a–e, 8a–e, 12c [type locality: Timor Sea].

Material examined. SAM C725, 2 males (21.8–25.9 mm), 2 females (23.1–28.1 mm), Timor Sea, off Palmerston [now Darwin], Northern Territory, P. Foelske, Nov 1890.

Remarks. The specimens are fragmented but nevertheless identifiable as *E. ampliata*.

Distribution. Indonesia (Kai Islands, Sahul Bank) and now from northern Australia; 204–304 m (de Saint Laurent and Poupin, 1996).

Uroptychus* Henderson, 1888**Uroptychus joloensis* Van Dam, 1939**

Figure 1

Uroptychus joloensis Van Dam, 1939: 395–398, figs 2, 2a, 2b, 2c [type locality: Jolo, Indonesia].

Material examined. NMV J21046, 2 males (5.6–7.3 mm), ovigerous female (7.8 mm), North West Shelf between Port Hedland and Dampier, 18°45'S, 118°24'E, 142 m, trawl, G. Poore and H. Lew Ton, 5 Jun 1983 (stn NWA-23).

Diagnosis. Carapace lateral margins convex; dorsum unarmed; with anteriorly directed anterolateral spine and 2 lateral spines in advance of midlength; with low, narrow, marginal ridge extending from orbital to posterior margin. Sternal plastron with faintly concave anterior margin, and median notch. Cornea not dilated, about one-third length of remaining stalk. Antennal basal segment with small lateral spine; ultimate and penultimate segments of peduncle each with long distal spine. Antennal scale not exceeding apex of ultimate peduncle segment. Chelipeds smooth but sparsely setose; ischium with 2 dorsal and 1 ventral spine. Walking legs similar, slightly decreasing in length posteriorly, sparsely setose, segments

smooth; propodus with paired movable spines on distal flexor margin; dactylus with 6 or 7 strong, widely spaced, perpendicularly (or near perpendicularly) directed corneous teeth on flexor margin.

Description. *Carapace*: Length excluding rostrum slightly less than breadth. Lateral margins convex; with anteriorly directed anterolateral spine and 2 lateral spines in advance of midlength; with low, narrow, marginal ridge extending from orbital to posterior margin. Rostrum narrow, triangular, dorsally excavate. Outer orbital angle produced to small acute spine. Dorsum smooth, with scattered setae. Pterygostomial flap visible in dorsal view; with strong anterior spine, otherwise unarmed.

Sternum: Plastron about as long as wide, subquadrate. Sternite 3 (at base of maxilliped 3) with faintly concave or irregular anterior margin; with narrow, U-shaped median notch; anterolateral angle with blunt tubercle; anterior margin level with or very slightly exceeding sternite 4. Sternite 4 (at base of pereopod 1) with anterolateral margins angular.

Abdomen: Segments smooth, sparsely setose. Telson about one-third as long as broad; distal portion broadly convex anteriorly, shorter than proximal portion.

Eye: Cornea not dilated, about one-third length of remaining stalk; reaching approximately to midlength of rostrum.

Antenna: Basal segment with distolateral spine. Peduncle extending almost to apex of rostrum. Ultimate segment longer than penultimate segment, both with long distomesial spine. Antennal scale slightly wider than opposite peduncular segments, extending almost to apex of ultimate segment (excluding distal spine).

Maxilliped 3: Dactylus and propodus unarmed. Carpus with proximal spine on extensor margin. Merus with distolateral spine and 2 small flexor spines. Ischium with small distal spine lateral to rounded flexor distal margin. Crista dentata denticulate for length of ischium.

Pereopod 1 (cheliped): About 4 times carapace length; smooth but sparsely setose. Palm 5 times as long as high. Fingers crossing, opposable margins dentate and each with low process proximally; slightly longer than one-third palm-length. Carpus about as long as palm. Merus with 2 or 3 small spines on lower proximal margin. Ischium with 2 dorsal spines; ventrally with short subterminal spine on mesial margin.

Pereopods 2–4 (walking legs): Similar, slightly decreasing in length posteriorly, sparsely setose; segments smooth. Merus shorter than carapace. Propodus more than twice as long as carpus, not broadened distally, with paired movable spines on distal flexor margin. Dactylus with 6 or 7 strong, widely spaced, perpendicularly (or near perpendicularly) directed corneous teeth on flexor margin.

Remarks. The present specimens generally agree with the type account of *U. joloensis* Van Dam, 1939, based on a specimen from Jolo, Indonesia, in carapace shape and lateral spination, the armature of the dactyli of the walking legs, and small eyes. The present specimens differ from the type account of *U. joloensis* chiefly in the following features: the rostrum lacks distolateral spines, the fingers of the cheliped are longer than one-third instead of about one-quarter the length of the propodal palm, the anterior margin of the sternal plastron (sternite

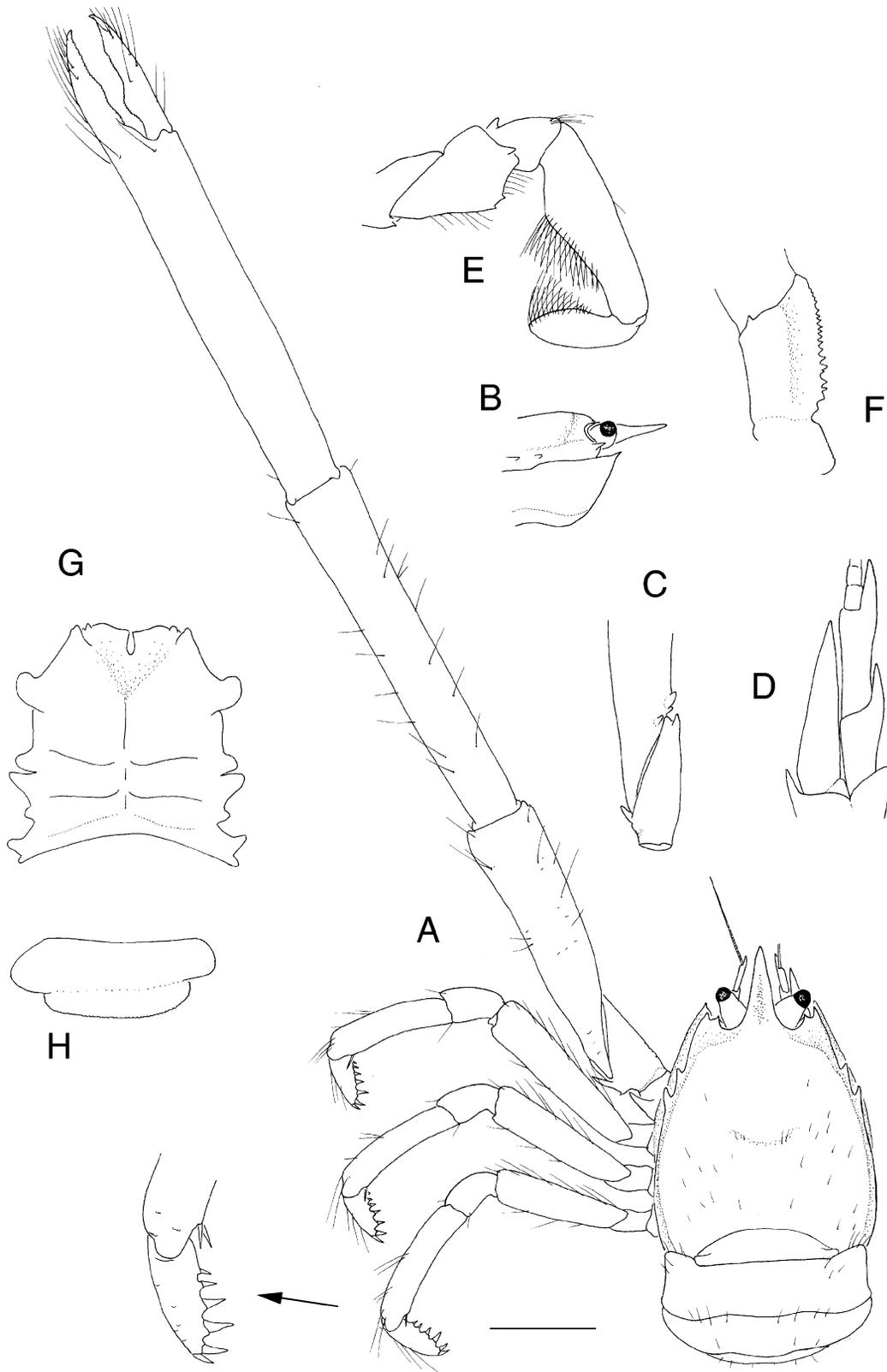


Figure 1. *Uroptychus joloensis* Van Dam, 1939, ovigerous female (7.8 mm), NMV J21046. A, dorsum. B, anterior carapace, right lateral view. C, right cheliped, proximal mesial view. D, right antenna, ventral view. E, right maxilliped 3, lateral view. F, crista dentata, right. G, sternal plastron. H, telson. Scale A–C, G = 3.0 mm, D–F = 0.7 mm, H = 1.5 mm.

3) does not distinctly exceed that of sternite 4, and the median notch of the sternal plastron is distinctly narrowed rather than a broad U-shape. The difference in rostral spination, whether apically trifid (as in the type) or singular (as in present material) is variable in this species as also in *U. tridentatus* (Henderson, 1885) and *U. zezuensis* Kim, 1972 (Baba, unpublished). The last mentioned differences appear to be within the range of expected morphological variation. As only the second record of the species, a description and figures of Australian material are provided.

Distribution. Jolo, Indonesia, and now from north-western Australia at depths between 37.8–56.7 m and 142 m.

Uroptychus nigricapillis Alcock, 1901

Figures 2A–I

Uroptychus nigricapillis Alcock, 1901: 282–284, pl. 3 fig. 3, 3a [type locality: Andaman Islands].—Alcock and McArdle, 1902, pl. 56 fig. 3.

Material examined. AM P67832, 1 ovigerous female (11.0 mm), North West Shelf, 240 km NW of Port Hedland, Western Australia, 500 m, J. Paxton, 7 Apr 1982 (stn S02/82/31).

Diagnosis. Carapace excluding rostrum distinctly longer than broad; lateral margins slightly divergent; with 3 or 4 small spines behind base of cervical groove; with anteriorly directed anterolateral spine; posterior quarter with low ridge. Rostrum sharply triangular, exceeding one-third length of remaining carapace. Outer orbital angle produced to small spine extending to level of anterolateral spines. Dorsum with pair of distinct epigastric spines. Sternite 3 anterior margin deeply emarginate, with pair of median spines separated by narrow notch. Antennal basal segment with small outer spine; ultimate and penultimate segments unarmed. Antennal scale extending slightly beyond midlength of ultimate peduncular segment. Chelipeds smooth, fingers setose. Pereopod 4 slightly shorter than pereopods 2 and 3; sparsely setose; propodi with 6–9 movable spines on distal flexor margin, none paired; distalmost flexor spine remote from distal margin; dactyli with 8–10 small spines on flexor margin, oriented oblique to dactylar margin, distal 2 appressed.

Description. *Carapace:* Length excluding rostrum distinctly greater than breadth. Lateral margins slightly divergent; with 3 or 4 small spines behind base of cervical groove, anterior-most spine with small additional dorsal spine; with anteriorly directed anterolateral spine; posterior quarter with low carina. Rostrum sharply triangular, exceeding one-third length of remaining carapace; margins unarmed. Outer orbital angle produced to small spine extending to level of anterolateral spines. Dorsum smooth, with pair of distinct epigastric spines; cervical groove distinct medially. Pterygostomian flap with small anterior spine.

Sternum: Plastron broader than long, widening posteriorly. Sternite 3 (at base of maxilliped 3) depressed, anterior margin narrow, deeply emarginate, with pair of median spines separated by narrow notch; with distinct anterolateral tooth. Sternite 4 (at base of pereopod 1) with distinct anterolateral tooth extending anteriorly to level of base of emargination of sternite

3; margins dentate, irregular; demarcation between sternites 4 and 5 dentate.

Abdomen: Abdominal segments glabrous. Telson length about half breadth; distal portion posteriorly emarginate, about twice length of proximal portion.

Eye: Cornea moderately dilated, subequal to length of peduncle; reaching to distal quarter of rostrum;

Antenna: Basal segment with small outer spine. Peduncle extending to distal third of rostrum. Flagellum about 3 times as long as peduncle. Ultimate and penultimate segments unarmed; ultimate segment about 2.5 times length of penultimate segment. Antennal scale slightly wider than opposite peduncular segments, extending slightly beyond midlength of ultimate peduncular segment.

Maxilliped 3: Dactylus, propodus, carpus and merus unarmed. Crista dentata distinctly serrate on proximal two-thirds of ischium, extending onto basis.

Pereopod 1 (cheliped): Slender, cylindrical, about 3.5 times carapace length; glabrous dorsally; fingers setose. Palm about 4 times as long as high, about 1.5 times as long as fixed finger; lower margin with row of low granules. Fingers crossing, opposable margins dentate; occlusal margin of movable finger with obtuse process proximally; occlusal margin of fixed finger without distinct prominence. Carpus longer than merus and propodal palm; glabrous. Merus usually with several low granules on inner proximal margin. Ischium with short, slender spine on dorsolateral margin.

Pereopods 2–4 (walking legs): Similar; sparsely setose; decreasing in length posteriorly. Pereopod 1 merus longer than carapace. Merus extensor margin smooth. Carpus about 0.5 merus length, about two-thirds propodus length. Propodi not broadened distally, with 6–9 movable spines on distal flexor margin; distalmost flexor spine remote from distal margin. Dactyli setose marginally, with 8–10 small spines on flexor margin, oriented oblique to dactylar margin, distal 2 appressed. Pereopod 4 slightly shorter than pereopods 2 and 3.

Ova: Diameter 0.8 mm.

Remarks. The single Australian specimen agrees well with the original account and figures of *U. nigricapillis* in most respects (Alcock, 1901; Alcock and McArdle, 1902) and represents the first record from Australian waters. It differs from figures of the holotype in having relatively longer legs, such that the merus of the first walking leg in the Australian specimen is longer than, instead of shorter than, the carapace length (excluding rostrum). In a series of Indian Ocean specimens (from several localities) attributed to *U. nigricapillis*, Tirmizi (1964) noted considerable variation in the ornamentation of the sternites, the distinctness of the epigastric and lateral spines on the carapace, and length of the antennal scale – features normally considered diagnostic in many species. Unfortunately, the sternum of the holotype of *U. nigricapillis* was neither figured nor described by Alcock (1901). A Java Sea specimen figured by Van Dam (1940: fig. 2), however, bears a transverse row of tubercles behind the dentate anterior margin of sternite 4 in contrast to the Australian specimen which lacks tubercles. Tirmizi (1964) also noted variation in the sternal armature, in which the sternum of only one specimen resembled Van Dam's (1940) figure.

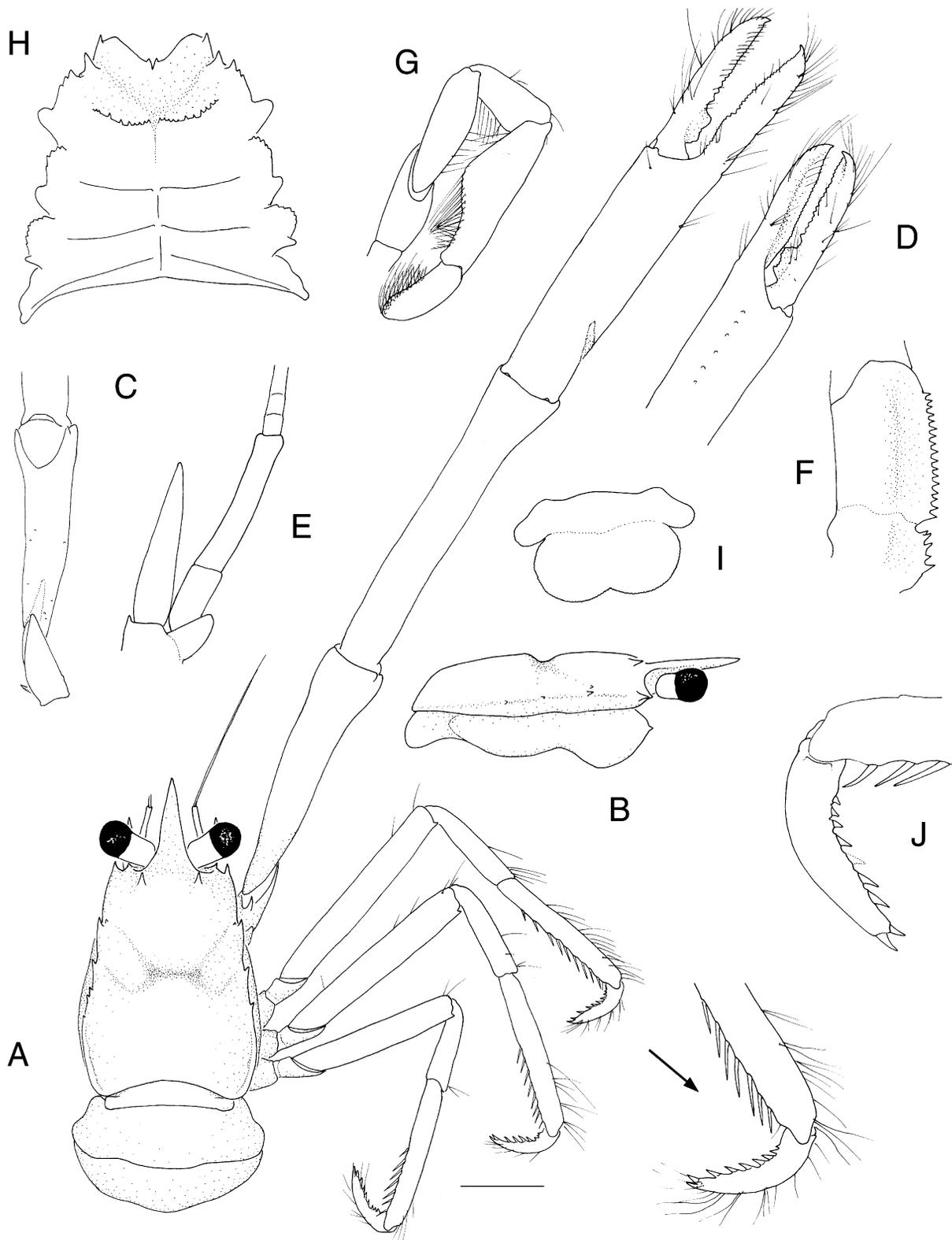


Figure 2. A–I, *Urotychus nigricapillis* Alcock, 1901, ovigerous female (11.0 mm), AM P67832. J, *Urotychus gracilimanus* (Henderson, 1885), female (9.4 mm), AM P65825. A, dorsum. B, carapace, right lateral view. C, cheliped, proximal ventral view. D, cheliped, distal ventral view. E, right antenna, ventral view. F, right maxilliped 3, lateral view. G, crista dentata, right. H, sternal plastron. I, telson. J, left pereopod 2, dactylus and distal propodus. Scale A–D = 3.0 mm, E–F = 0.7 mm, G–J = 1.5 mm.

The Australian specimen bears well-developed epigastric spines, and small but distinct lateral carapace spines as in Alcock's (1901) account. Variation in the presence and degree of epigastric ornamentation is also known in other congeners (e.g. *U. australis* (Henderson, 1885), *U. gracilimanus* (Henderson, 1885), *U. vandamae* Baba, 1990). However, variation in other characters mentioned by Tirmizi (1964) and other studies (e.g. Baba, 1981, 1988), namely, the lateral carapace spination and ornamentation and morphology of the sternal plastron, suggests that more than one species could be confused under *U. nigricapillis*. In view of morphological variation in *U. nigricapillis* reported in previous studies, the Australian specimen is described and illustrated.

Uroptychus nigricapillis closely resembles *U. gracilimanus*, described from off Port Jackson, in general habitus, armature of the dactyli of the walking legs, and in variation in the presence and size of the epigastric spines. *Uroptychus nigricapillis* differs, however, in the presence of lateral spines on the carapace margins, in bearing a short slender spine instead of a low tooth on the cheliped ischium, and in the spination of the propodi of the walking legs. Thus, in *U. nigricapillis* the distal flexor spine on the propodi of the walking legs is positioned more remotely from the distal margin than in *U. gracilimanus* (Fig. 2A). The distal-most of the flexor spines is located close to the articulation with the dactylus, a fact confirmed by examination of the holotype of *U. gracilimanus* (BMNH 1888: 33, off Port Jackson). In the specimen of *U. gracilimanus* figured by Ah Yong and Poore (2004: fig. 10, AM P65825, off Port Jackson), some of the movable propodal spines on the walking legs are damaged or lost. The dactylus and distal portion of the propodus of the left first walking leg of the same specimen of *U. gracilimanus* is shown (Fig. 2J) for comparison with the condition in *U. nigricapillis*.

Distribution. Western Indian Ocean, Andaman Sea, Indonesia, the Philippines and now from north-western Australia at 66–1930 m depth.

Uroptychus oxymerus sp. nov.

Figure 3

Material examined. Holotype: NMV J21040, male (>6.5 mm), North West Shelf, between Port Hedland and Dampier, 184 m, G. Poore and H. Lew Ton, 6 Jun 1983 (stn NWA-24).

Diagnosis. Carapace lateral margins convex; dorsum unarmed; with strong, anteriorly directed anterolateral spine and 5 or 6 stout lateral spines. Rostrum apically trifid; dorsally excavate. Sternal plastron with faintly concave anterior margin, and median notch. Cornea not dilated, about one-third length of remaining stalk. Antennal basal segment with outer spine; ultimate and penultimate segments of peduncle each with long distal spine. Antennal scale exceeding apex of ultimate peduncle segment. Chelipeds rugose, setose; merus with row of strong, stout spines on mesial ventral margin. Walking legs similar, slightly decreasing in length posteriorly, setose, segments rugose; propodus distal flexor margin with 2 or 3 movable spines, distal most paired; dactylus with 6 or 7 strong, widely

spaced, perpendicularly (or near perpendicularly) directed corneous teeth on flexor margin.

Description. *Carapace:* Length excluding rostrum subequal to breadth. Lateral margins convex; with anterolateral spine and 5 lateral spines and spinule above third lateral spine; anterolateral spine, strong, directed anteriorly; first and second lateral spine slender; third and fourth lateral spines stout, larger than others; fifth lateral spine low, blunt. Rostrum apically trifid; dorsally excavate. Outer orbital angle produced to small acute spine. Dorsum smooth, with scattered setae. Pterygostomial flap with strong anterior spine and field of spines and tubercles on anterior half.

Sternum: Plastron about as long as wide, subquadrate. Sternite 3 (at base of maxilliped 3) anterior margin shallowly concave, with narrow U-shaped median notch, anterolateral angle blunt. Sternite 4 (at base of pereopod 1) with anterolateral margins pointed, not produced beyond anterior concavity of sternite 3.

Abdomen: Segments glabrous. Telson about half as long as broad; distal portion posteriorly emarginate, longer than proximal portion.

Eye: Cornea not dilated, about half as long remaining stalk; not reaching beyond midlength of rostrum;

Antenna: Basal segment with distolateral spine. Peduncle extending beyond distal half of rostrum. Ultimate segment about twice as long as penultimate segment, both with long distomesial spine; ultimate also with 2 small marginal spines. Antennal scale slightly wider than opposite peduncular segments, extending slightly beyond apex of ultimate segment.

Maxilliped 3: Dactylus and propodus unarmed. Carpus with distal and 2 proximal spines on extensor margin. Merus with distal extensor spine and 2 distal flexor spines. Ischium with small spine lateral to distal end of flexor margin. Crista dentata denticulate for length of ischium.

Pereopod 1 (cheliped): About 4 times carapace length; all segments rugose and setose. Palm 3 times as long as high, about 2.5 times as long as fixed finger; surface with short, transverse, depressions. Fingers crossing, opposable margins dentate and each with low process proximally. Carpus with small lower distal spine adjacent to each articular condyle of propodus. Merus with row of 5 stout spines on mesial ventral margin and group of 3 spines proximally. Ischium with 2 dorsal spines and 1 ventral spine; distal dorsal spine slender, depressed.

Pereopods 2–4: Similar, slightly decreasing in length posteriorly, strongly setose; segments rugose, setose. Merus shorter than carapace. Propodus more than twice length of carpus, not broadened distally, with 2 or 3 movable spines on distal flexor margin, distalmost paired. Dactylus with 6 or 7 strong, widely spaced, perpendicularly (or near perpendicularly) directed corneous teeth on flexor margin.

Etymology. From *oxy*, sharp, and *merus*, the fourth limb segment, in reference to the sharp, stout spines on the merus of the cheliped that distinguish the new species from *U. tridentatus* and *U. zezuensis*.

Remarks. *Uroptychus oxymerus* sp. nov. closely resembles *U. tridentatus* (Henderson, 1885), described from Indonesia,

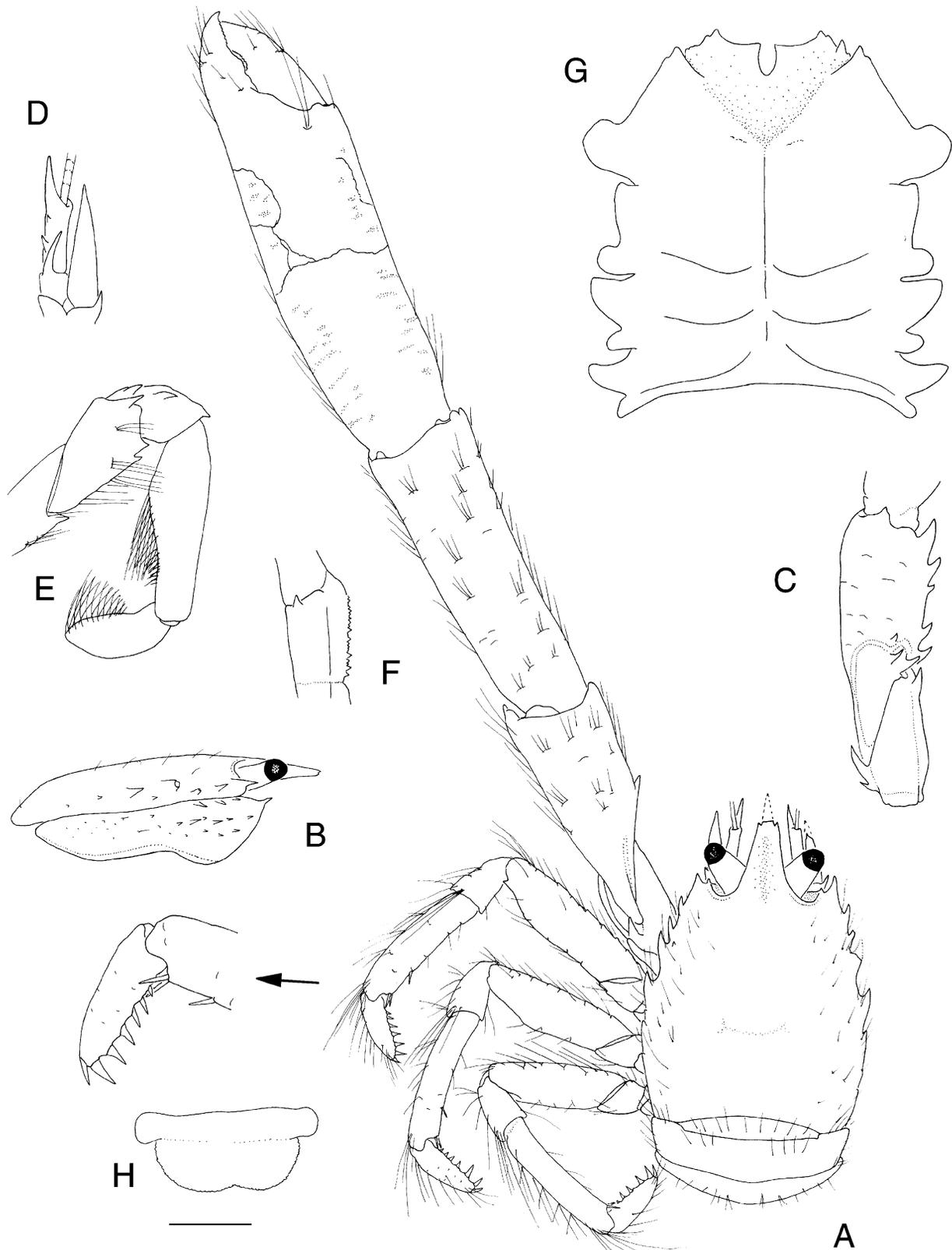


Figure 3. *Uroptychus oxymerus* sp. nov., holotype male (+6.5 mm), NMV J21046. A, dorsum. B, carapace, right lateral view. C, right cheliped, proximal mesial view. D, left antenna, ventral view. E, right maxilliped 3, lateral view. F, crista dentata, right. G, sternal plastron. H, telson. Scale A–C = 2.0 mm, D–H = 1.0 mm.

and *U. zezuensis* Kim, 1972 from Korea, in almost all respects including the spinose carapace margins, distally spinose segments of the antennal peduncle, armature of pereopods 2–4, and shape of the sternal plastron. The new species is readily distinguished from both *U. tridentatus* and *U. zezuensis* by having a row of large, stout spines instead of a cluster of spines on the mesial ventral margin of the merus of the cheliped, in having three instead of two spines on the extensor margin of the carpus of the third maxilliped, and in having spines along the lower margin of the ultimate segment of the antennal peduncle in addition to the distal spine.

Four species of *Uroptychus* are now known from the North West Shelf. *Uroptychus oxymerus* is readily distinguished from *U. joloensis* by having distinctly more spinose lateral carapace margins (5 or 6 instead of 2); from *U. nigricapillis* by lacking a pair of epigastric spines on the carapace and in having a distal spine on the ultimate and penultimate segments of the antennal peduncle; and from *U. brucei* by having lateral carapace spines.

Distribution. Known only from the type locality at 184 m depth.

Acknowledgments

We are grateful to Jo Taylor (Museum Victoria) and Thierry Laperousaz (South Australian Museum) for the loan of specimens.

References

- Ahyong, S.T. and Poore, G.C.B. 2004. The Chirostylidae of southern Australia (Crustacea: Decapoda: Anomura). *Zootaxa* 436: 1–88.
- Alcock, A. 1901. *Descriptive catalogue of the Indian Deep Sea Crustacea Decapoda Macrura and Anomura in the Indian Museum. Being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship Investigator*. Trustees of the Indian Museum: Calcutta. 286 pp.
- Alcock, A., and McArdle, A.F. 1902. *Illustrations of the Zoology of the Royal Indian Marine Survey Steamer "Investigator", Crustacea*. Part 10, pls 56–67. Trustees of the Indian Museum: Calcutta.
- Baba, K. 1981. Deep-sea galatheidean Crustacea (Decapoda, Anomura) taken by the R/V Soyo-Maru in Japanese waters. I. Family Chirostylidae. *Bulletin of the National Science Museum, Tokyo, series A* 7: 111–134.
- Baba, K. 1986. Two new anomuran Crustacea (Decapoda: Anomura) from North-West Australia. *The Beagle, Occasional Papers of the Northern Territory Museum of Arts and Sciences* 3: 1–5.
- Baba, K. 1988. Chirostylid and galatheid Crustaceans (Decapoda, Anomura) of the "Albatross" Philippine expedition, 1907–1910. *Researches on Crustacea, Special Number* 2: 1–203.
- Baba, K. 1990. Chirostylid and galatheid crustaceans of Madagascar (Decapoda, Anomura). *Bulletin du Muséum national d'Histoire naturelle Paris, series 4, section A* 11: 921–975. [Dated 1989].
- Baba, K. 2000. Two new species of chirostylids (Decapoda: Anomura: Chirostylidae) from Tasmania. *Journal of Crustacean Biology, Special Number* 2: 246–252.
- Davie, P.J.F. 2002. Crustacea: Malacostraca: Eucarida (Part 2). In: Wells, A. and Houston, W.W.K. (eds) *Zoological Catalogue of Australia*. Vol. 19.3B. CSIRO Publishing: Melbourne. xii + 551 pp.
- Gordon, I. 1930. On the species of the galatheid genus *Eumunida* (Crustacea, Decapoda). *Proceedings of the General Meetings for Scientific Business of the Zoological Society of London* 1929: 741–753.
- Haig, J. 1974. The anomuran crabs of Western Australia: their distribution in the Indian Ocean and adjacent seas. *Journal of the Marine Biological Association of India* 14(2): 443–451.
- Henderson, J.R. 1885. Diagnoses of the new species of Galatheidea collected during the "Challenger" Expedition. *Annals and Magazine of Natural History* (ser. 5) 16: 407–421.
- Henderson, J.R. 1888. Report on the Anomura collected by H.M.S. Challenger during the years 1873–76. *Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873–76, Zoology*, 27, i–vi+1–221, pls 1–21.
- Kim, H. S. 1972. A new species of the family Chirostylidae (Crustacea: Anomura) from Jeju Island, Korea. *Korean Journal of Zoology* 15: 53–56.
- Ortmann, A. 1892. Die Decapoden-Krebse des Strassburger Museums IV. *Die Abtheilungen Galatheidea und Paguridea. Zoologischen Jahrbuchern, Abtheilung für Systematik, Geographie und Biologie der Tiere* 6: 241–326, pls 11, 12.
- Saint Laurent, M. de, and Macpherson, E. 1990. Crustacea Decapoda: le genre *Eumunida* Smith, 1883 (Chirostylidae) dans le eaux néo-calédoniennes. In: A. Crosnier (ed.), *Résultats des Campagnes MUSORSTOM, Vol. 6. Mémoires du Muséum national d'Histoire naturelle, Paris A* 145: 227–288, figs 1–17.
- Saint Laurent, M. de, and Poupin, J. 1996. Crustacea Anomura: Les espèces indo-ouest pacifiques du genre *Eumunida* Smith, 1880 (Chirostylidae). Description de six espèces nouvelles. In: A. Crosnier (ed.), *Résultats des Campagnes MUSORSTOM, Vol. 15. Mémoires du Muséum national d'Histoire naturelle, Paris A* 168: 337–385, figs 1–13.
- Smith, S.I. 1883. Preliminary report on the Brachyura and Anomura dredged in deep water off the south coast of New England by the United States Fish Commission in 1880, 1881, and 1882. *Proceedings of the United States National Museum* 6: 1–57.
- Tirmizi, N.M. 1964. Crustacea: Chirostylidae (Galatheidea). *The John Murray Expedition 1933–34, Scientific Reports* 11: 167–234.
- Van Dam, A.J. 1939. Über einige *Uroptychus*-arten des museums zu Kopenhagen. *Bidrajen tot de Dierkunde Uitgegeven door het koninklijk zoologisch genootschap "Natur Artis Magistra" de Amsterdam* 27: 392–407.
- Van Dam, A.J. 1940. Anomura, gesammelt vom Dampfer "Gier" in der Java-See. *Zoologischer Anzeiger, Leipzig* 129: 95–104.