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ACANTHANAS PUSILLUS, NEW GENUS, NEW SPECEIS, A MINIATURE ALPHEID SHRIMP WITH SPINY EYES FROM THE PHILIPPINES (CRUSTACEA: DECAPODA)

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ABSTRACT. **–** *Acanthanas pusillus*, new genus, new species, is described on the basis of three specimens collected from coral and coral rubble in Panglao, Philippines. The new genus appears to be most closely related to *Athanas* Leach, 1814, from which it may be separated by the stouter, bulky body; the more concealed eyes with two peculiar acute projections; the presence of a subacute projection on the merus of the chelipeds; non-enlarged chelipeds; and the presence of strap-like epipods on the third maxilliped and first and second pereiopods. With a total length of about 6-7 mm, *Acanthanas pusillus* is one of the smallest known caridean shrimps.

KEY WORDS. **–** Alpheidae, new genus, *Athanas*, Indo-West Pacific, coral reefs, micro-shrimp.

INTRODUCTION

The shrimp family Alpheidae consists of relatively small to medium-sized shrimps, with an average total length (TL) of 20-30 mm, but also containing much smaller species (around 10 mm TL), and fairly large species, particularly in the genus *Alpheus* Fabricius, 1798 (up to 80 mm TL) (A. Anker, pers. obs.). Some members of the alpheid genera *Athanas* Leach, 1814, *Alpheopsis* Coutière, 1896, *Leptalpheus* Williams, 1965, *Salmoneus* Holthuis, 1955, *Synalpheus* Bate, 1888 and *Potamalpheops* Powell, 1979 are among the smallest known caridean shrimps, with maximum TL of adults around 10 mm or even less. For instance, the maximum carapace length (CL) of *Leptalpheus mexicanus* Ríos & Carvacho, 1983, and *Potamalpheops palawanensis* Cai & Anker, 2004, was 3.54 mm and 3.70 mm, respectively (Ríos & Carvacho, 1983; Cai & Anker, 2004), corresponding to a TL of less than 10 mm. Therefore, these alpheids may be easily overlooked or mistaken for juveniles or other small-sized caridean shrimps.

The international Panglao Marine Biodiversity Project in May-July 2004 enabled an extensive collection of caridean shrimps to be made around the island of Panglao, situated southwest off Bohol, Philippines. Among them were three specimens of a minute alpheid shrimp that was initially identified as an undescribed, dwarf-sized, unusually bulky species of *Athanas*. However, the presence of two spiny projections on the eyestalks and several other features suggest that this interesting new species should be assigned to a distinct genus, which is established herein.

MATERIAL AND METHODS

All specimens were collected during brushing of dead and living corals and coral rubble, and preserved in 70% ethanol. Two specimens were digitally photographed to document the colour pattern. All drawings were made under the dissection microscope with the aid of a camera lucida. The carapace length (CL) and the total length (TL) were measured with a micrometer along the mid-dorsal line, from the tip of the rostrum to the posterior margin of the carapace (CL) and the telson (TL), respectively. The holotype is deposited in the National Museum of the Philippines, Manila, Philippines

(NMCR). The paratypes are deposited in the Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore, Singapore (ZRC), and the Muséum national d'Histoire naturelle, Paris, France (MNHN). Abbreviations used in the text: P – pereiopod; Mxp – maxilliped.

TAXONOMY

FAMILY ALPHEIDAE RAFINESQUE, 1815

Acanthanas, new genus

Diagnosis. – Body bulky, stout. Frontal margin with long distally acute rostrum and acute orbital teeth. Pterygostomial angle bluntly angular to rounded, protruding. Eyes mostly concealed in dorsal and lateral view, visible in frontal view; anteromesial margin of cornea and base of eyestalk with spiny projections. Antennular peduncle stout, first segment with large ventromesial tooth; lateral antennular flagellum feebly biramous. Antenna with moderately robust basicerite; carpocerite short, not overreaching scaphocerite. Mouthparts typical for family; mandible with two-segmented palp and expanded incisor process. Third maxilliped pediform, lateral plate ear-shaped, acute; tip of ultimate segment armed with strong spines. First pereiopods (= chelipeds) feebly enlarged, equal, symmetrical, carried extended; ischium unarmed; merus with subacute distal projection on dorsal margin; carpus subcylindrical, mesial face without rows of setae; chela simple; palm smooth, linea impressa and adhesive discs absent; fingers unarmed, without snapping mechanism. Second pereiopod with five-segmented carpus. Third pereiopod with ischium bearing spine on ventral margin, merus and carpus unarmed; propodus with small spines on ventral margin, dactylus biunguiculate. Fifth pereiopod with propodus bearing several rows of setae. Sixth abdominal somite with articulated plate at posteroventral angle. Second pleopod with appendix interna and appendix masculina (including some ovigerous specimens). Uropod with sympodite bearing slightly bifid tooth; diaeresis sinuous. Telson with two pairs of dorsal spines and two pairs of posterolateral spines; posterior margin feebly rounded; anal tubercles absent. Gill formula as following: 5 pleurobranchs (P1-5); 0 arthrobranch; 0 podobranch; 2 lobe-like epipods (Mxp1-2); 3 strap-like epipods (= mastigobranchs) (Mxp3, P1-2); 3 setobranchs (P1-3); 3 normally developed exopods (Mxp1-3), 1 rudimentary exopod (P1).

Type species. – *Acanthanas pusillus*, new species, by monotypy and present designation.

Etymology. – The generic name is a combination of two Greek words, *acantha* (spike, spine, prickle etc., referring to the two acute projections on the eyes), and *Athanas* (a Greek king and the most similar alpheid genus). Gender masculine.

Remarks. – See below.

Acanthanas pusillus, new species

Type material. – Holotype: 1 post-ovigerous female, CL 2.30, TL 6.80 (NMCR-27001), north of Doljo, Panglao I., Philippines, Panglao 2004 Marine Biodiversity Project Sta. B36, 9°35.9'N 123°44.5'E, 24 m, reef wall, from corals, 1 Jul.2004 [specimen parasitized by bopyrid isopod, Hemiarthrinae; bopyrid detached and deposited under NMCR-27002]. Paratypes: 1 ovigerous female, CL 2.10, TL 5.90 (ZRC 2005.0089), type locality and data; 1 ovigerous specimen with appendix masculina, CL 2.45, TL 6.95 (MNHN-Na 15777), Bingag, Panglao I., Philippines, Panglao Marine Biodiversity Project Sta. B16, 9°37.6'N 123°47.3'E, 20 m, from coral rubble on sand and gravel, 17 Jun.2004.

Description. – Body bulky, stout (Fig. 1a, b), not compressed laterally, glabrous, not setose. Rostrum triangular, elongated, about twice as long as broad at base (Fig. 2a), slightly ascendant in lateral view (Fig. 2b, c), tip acute, reaching from middle of second segment to end of third segment of antennular peduncle (Fig. 2a-c), rostral carina slight, disappearing posteriorly to rostrum. Orbital teeth acute, shorter than rostrum, directed slightly mesially (Fig. 2a). Pterygostomial margin protruding, bluntly angular or rounded (Fig. 2b, c). Branchiostegial margin without marked emargination and devoid of setae. Cardiac notch well developed (Fig. 1b). Eyes concealed in dorsal and lateral view, except for most anterior portion (Fig. 2a), exposed in frontal view (Fig. 2e); cornea well-developed, anteromesial margin with relatively slender subacute tooth; base of eyestalk with stout acute projection (Fig. 2d, e); both corneal tooth and basal projection conspicuous in lateral view (Fig. 2b, c). Ocellar beak not conspicuous. Epistomial sclerite without marked acute tooth.

Antennular peduncle moderately stout (Fig. 2a-c, f), second segment slightly broader than long, much shorter than first segment, subequal to third segment (Fig. 2a, f); stylocerite falling short of distal margin of second segment, distally acute (Fig. 2a-c); ventromesial carina with large acute tooth as illustrated (Fig. 2f); lateral flagellum biramous, with secondary ramus short and partly fused to main ramus, bearing a few aesthetascs (Fig. 2f); proximal portion basal to bifurcation composed of three or four segments (Fig. 2f). Antenna with basicerite moderately stout, ventrolateral margin with strong acute tooth (Fig. 2b); dorsomesial margin with subacute tooth and blunt projection (Fig. 2b, h); scaphocerite broad, short, ovate (Fig. 2a, h), anterior margin of blade convex, reaching or extending slightly beyond strong distolateral tooth (Fig. 2h); carpocerite small, reaching to distal 3/4 of scaphocerite (Fig. 2b, g).

Mouthparts typical for family. Mandible (Fig. 3a) with two-segmented palp; molar process stout; incisor process expanded, distolateral margin with at least 12 minute teeth, distal margin with 10 larger, subtriangular, acute teeth, middle teeth largest (Fig. 3a). Maxillule (Fig. 3b) with bilobed palp, dorsal and ventral lobe each with one stiff seta; ventral endite with strong elongated spine-like setae. Maxilla (Fig. 3c) with narrow scaphognathite; endopod small, unsegmented; dorsal endite not distinctly subdivided into two halves. First maxilliped (Fig. 3d) feebly developed caridean lobe on exopod; endopod apparently without segmentation; epipod narrow, ear-shaped. Second maxilliped (Fig. 3e) with relatively small oval-rounded epipod; endopod and exopod typical for family, without specific features. Third maxilliped (Fig 3g, h) pediform, relatively stout; lateral plate ear-shaped, distally acute (Fig. 3f); antepenultimate segment flattened, with inconspicuous suture proximal to exopod; penultimate segment about twice as long as wide at base; ultimate segment

slightly tapering distally, armed with three strong apical spines (Fig. 3f); exopod reaching distal margin of antepenultimate segment, with at least one flexible seta; arthrobranch absent.

First pereiopods (chelipeds) (Fig. 4a-d) equal in size, symmetrical in shape, carried extended or simply flexed, not particularly modified or enlarged; coxa mesially with broad, rounded, weakly protruding lobe furnished with setae; basis with small exopod; ischium unarmed; merus not particularly swollen, distally widening, about four times as long as wide at base, dorsal margin ending in subacute distal tooth; carpus subcylindrical, distally widening, about three times as long as wide at base (Fig. 4c); chela simple, moderately slender, not enlarged, with fingers slightly shorter than palm (Fig. 4a, d); palm smooth, linea impressa and adhesive discs absent; fingers slightly gaping when closed (Fig. 4d), cutting edges unarmed, without snapping mechanism, finger tips acute.

Second pereiopod slender (Fig. 4e); ischium subequal to merus; carpus five-segmented, segment length ratio approximately equal to 4 : 1 : 1.2 : 1.2 : 1.5; chela simple, fingers longer than palm, tips acute (Fig. 4e). Third pereiopod moderately slender (Fig. 4f); ischium with one spine on ventrolateral margin; merus about 1.2 times longer than ischium, unarmed; carpus slightly more than half length of merus, unarmed; propodus more slender and longer than merus, with five spinules on ventral margin and two slender distoventral spinules proximal to dactylus (Fig. 4f); dactylus slender, slightly curved, about 0.3 length of propodus, biunguiculate, secondary unguis subterminal. Fifth pereiopod (Fig. 4g) generally slightly similar to third pereiopod; ischium with one spine on ventral margin; merus and carpus unarmed;

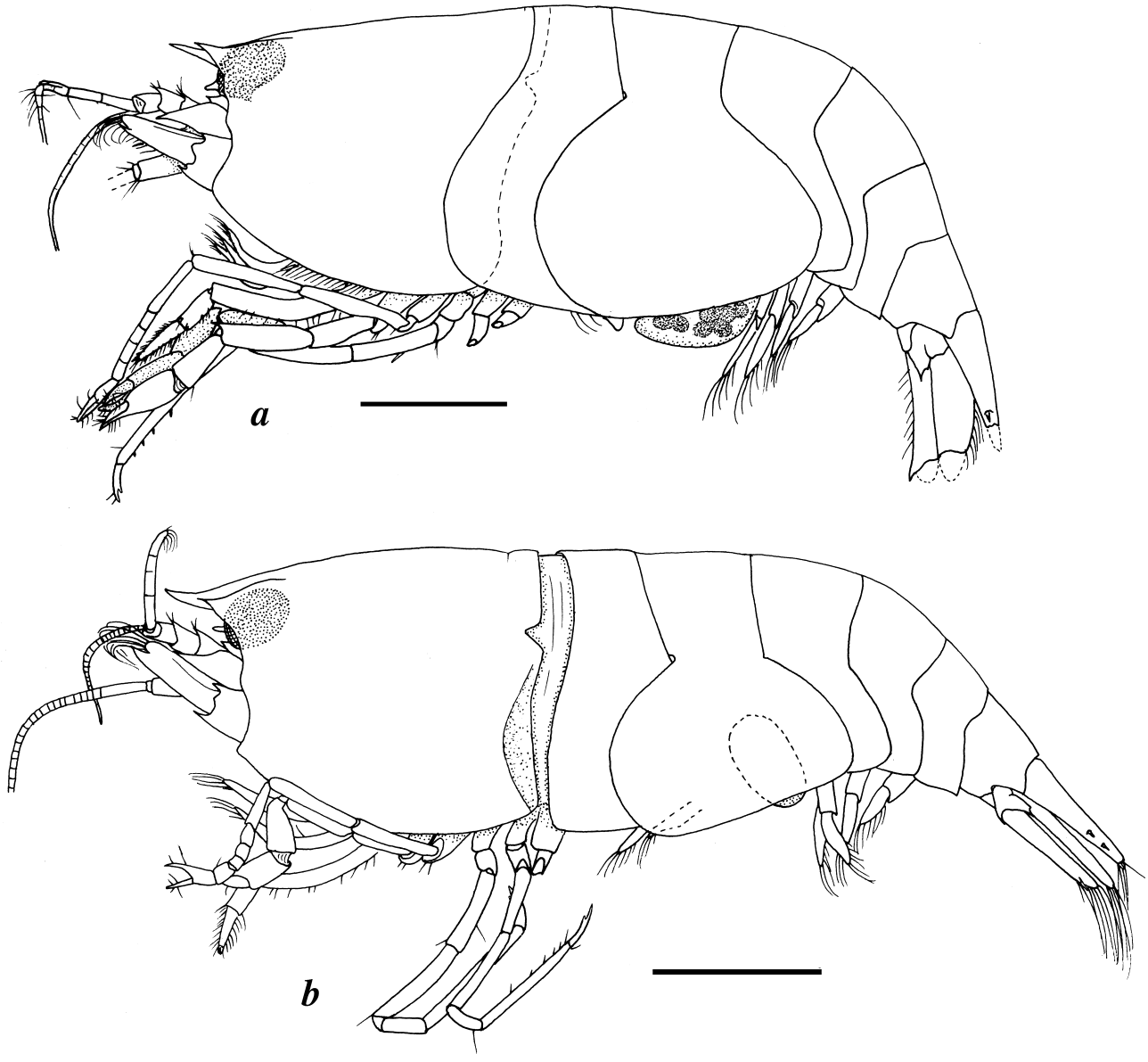

Fig. 1. *Acanthanas pusillus*, new genus, new species, habitus: a, holotype, NMCR-27001 (note parasitic hemiarthrine bopyrid under second abdominal somite); b, paratype, ZRC 2005.0089. Scale bars = 1 mm.

propodus with two or three slender spinules on ventromesial margin, slender spine proximal to dactylus, and several rows of setae along distal ventrolateral margin (Fig. 4g); dactylus biunguiculate, similar to that of third pereiopod.

Abdominal pleuron II greatly expanded (Fig. 1); posterolateral angles of pleura rounded (somites I-II), rounded-angular (somites III-IV) or acute (somite V) (Figs. 1, 4k); somite VI with subtriangular articulated plate at posteroventral angle (Figs. 1, 4k), posterior projection subacute (Fig. 4k); preanal plate posteriorly rounded. First pleopod with endopod small, shorter than half-length of exopod. Second pleopod of one ovigerous specimen (MNHN-Na 15777) with appendix masculina inserted slightly above appendix interna, tip of appendix masculina reaching tip of endopod, furnished with at least four slender spines (Fig. 4h, i); second pleopod of another ovigerous specimen (ZRC 2005.0089) and post-ovigerous specimen (NMCR) with appendix interna only (Fig. 4j); protopod with subacute projection distally (Fig. 4h). Uropods sligthly exceeding telson (Fig. 4l); lateral lobe of sympodite distally with two acute teeth, mesial tooth much smaller than lateral tooth (Fig. 4l); exopod with diaeresis bearing blunt tooth near lateral margin, almost straight from

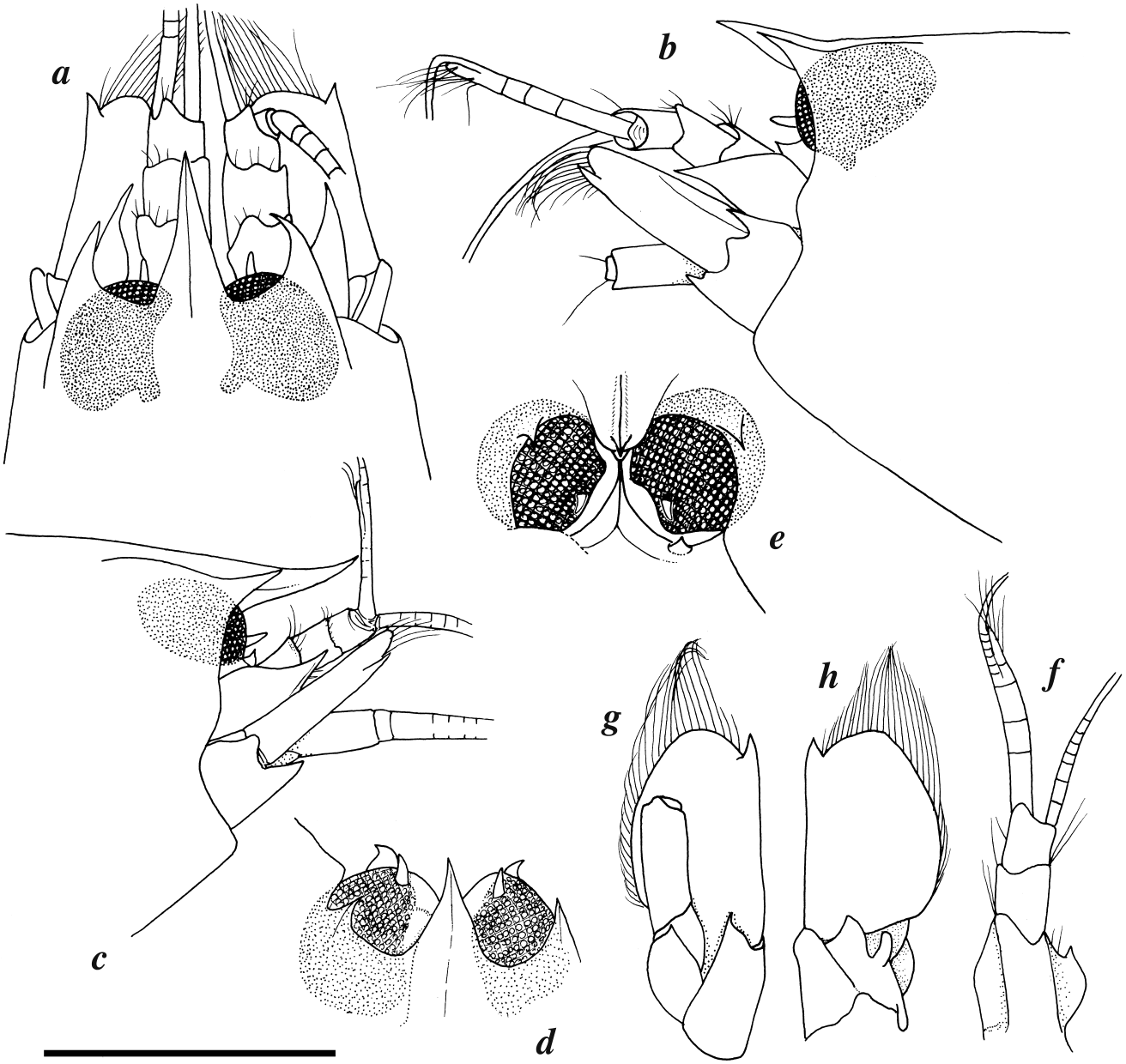

Fig. 2. *Acanthanas pusillus*, new genus, new species: a, frontal region, dorsal view; b, c, same, lateral view; d, frontal margin and eyes, anterodorsal view; e, same, frontal view (left antennule and antenna detached); f, antennule, mesial view; g, antenna, ventral view; h, same, dorsal view. Holotype, NMCR-27001: a-b, d-h; paratype, ZRC 2005.0089: c. Scale bar = 1 mm.

this tooth to mesial margin (Fig. 4l); lateral spine slender, reaching posterior margin of exopod (Fig. 4l).

Telson (Fig. 4l) moderately slender, tapering distally; about twice as long as broad at base; proximal margin about twice as long as posterior margin; dorsal surface with two pairs of spines both situated in posterior half, at some distance from lateral margin; posterior margin slightly rounded with two pairs of slender posterolateral spines, mesial more than twice length of lateral (Fig. 4l); median portion between spines with about six elongated plumose setae; anal tubercles absent.

Gill formula as given for genus. Number of eggs relatively low (8 in smaller ovigerous female, 15 in larger ovigerous male); eggs relatively large (diameter 0.58 x 0.45 mm to 0.88 x 0.50 mm).

Coloration. **–** Ground colour beige-ochre, mottled with more or less intense red and pink, especially on the abdomen, where red chromatophores may form diffuse transverse bands; some carapace areas appearing golden; appendages and tail fan mostly colourless (description based on two freshly dead specimens) (Fig. 5).

Size. **–** This species is one of the smallest alpheid and caridean shrimps: the smallest and the largest ovigerous specimens measure only 2.10 mm CL (5.90 mm TL) and 2.45 mm CL (6.95 mm TL), respectively.

Etymology. **–** The Latin adjective *pusillus* (tiny, dwarf) obviously refers to the very small size of this shrimp.

Habitat. **–** Coral reef wall, in crevices of dead corals, and in coral rubble on sand and gravel, at depths of 20-24 m.

Parasite. **–** The holotype was parasitized by a hemiarthrine bopyrid isopod (female), attached under the abdomen (Fig. 1a).

Distribution. **–** Presently known only from the type locality, Panglao, off southwestern Bohol, Philippines.

Remarks. **–** *Acanthanas* belongs to a group of genera characterized by the absence of arthrobranch on the third maxilliped and the presence of an articulated triangular plate on the sixth abdominal somite. These include *Athanas* Leach, 1814; *Arete* Stimpson, 1860; *Aretopsis* De Man, 1910; *Athanopsis* Coutière, 1896; *Pseudathanas* Bruce, 1983; and

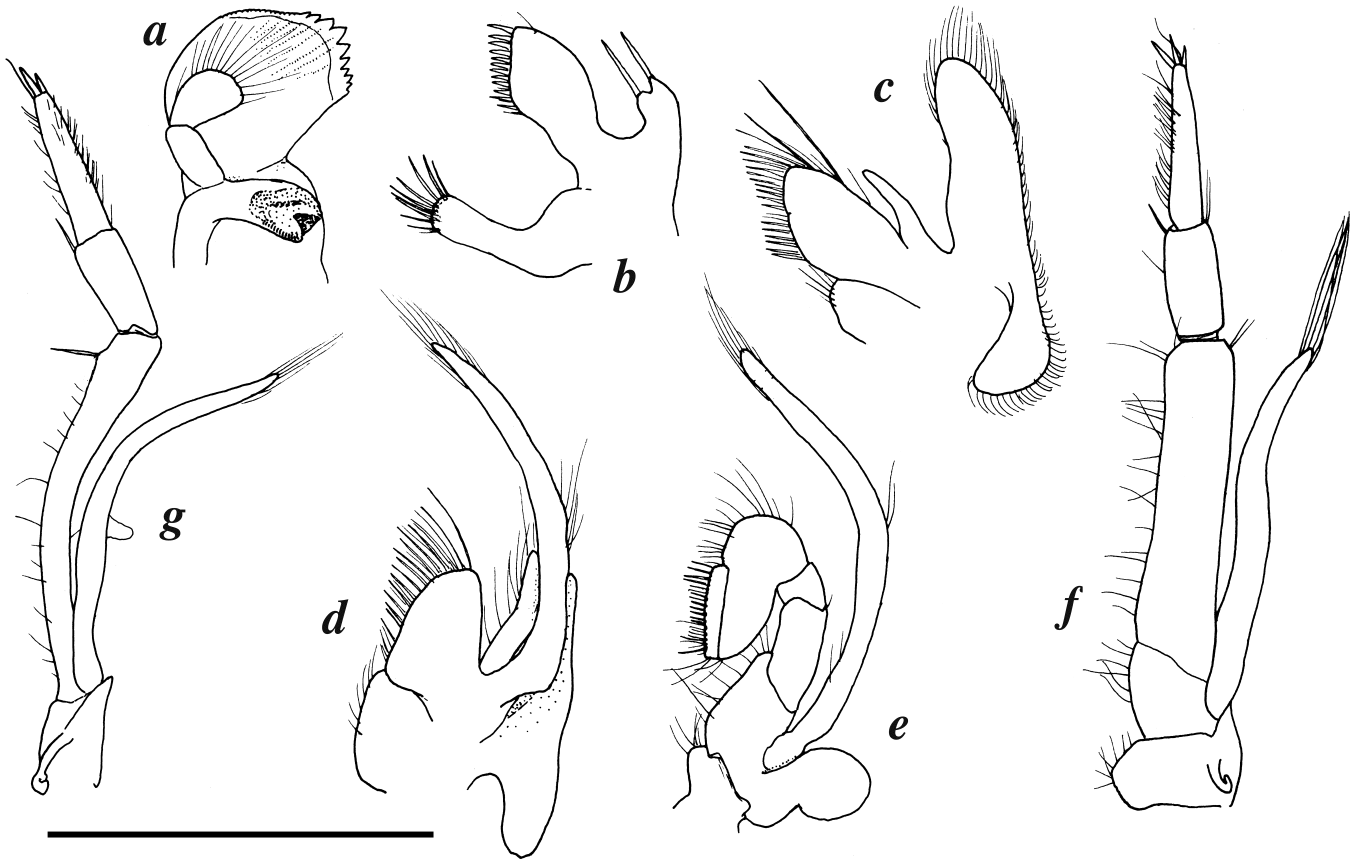

Fig. 3. *Acanthanas pusillus*, new genus, new species, holotype, NMCR-27001: a, mandible, ventromesial view; b, maxillule, lateral view; c, maxilla, lateral view; d, first maxilliped, lateral view; e, second maxilliped, lateral view; f, third maxilliped, ventrolateral view; g, third maxilliped, lateral view. Scale bar = 1 mm.

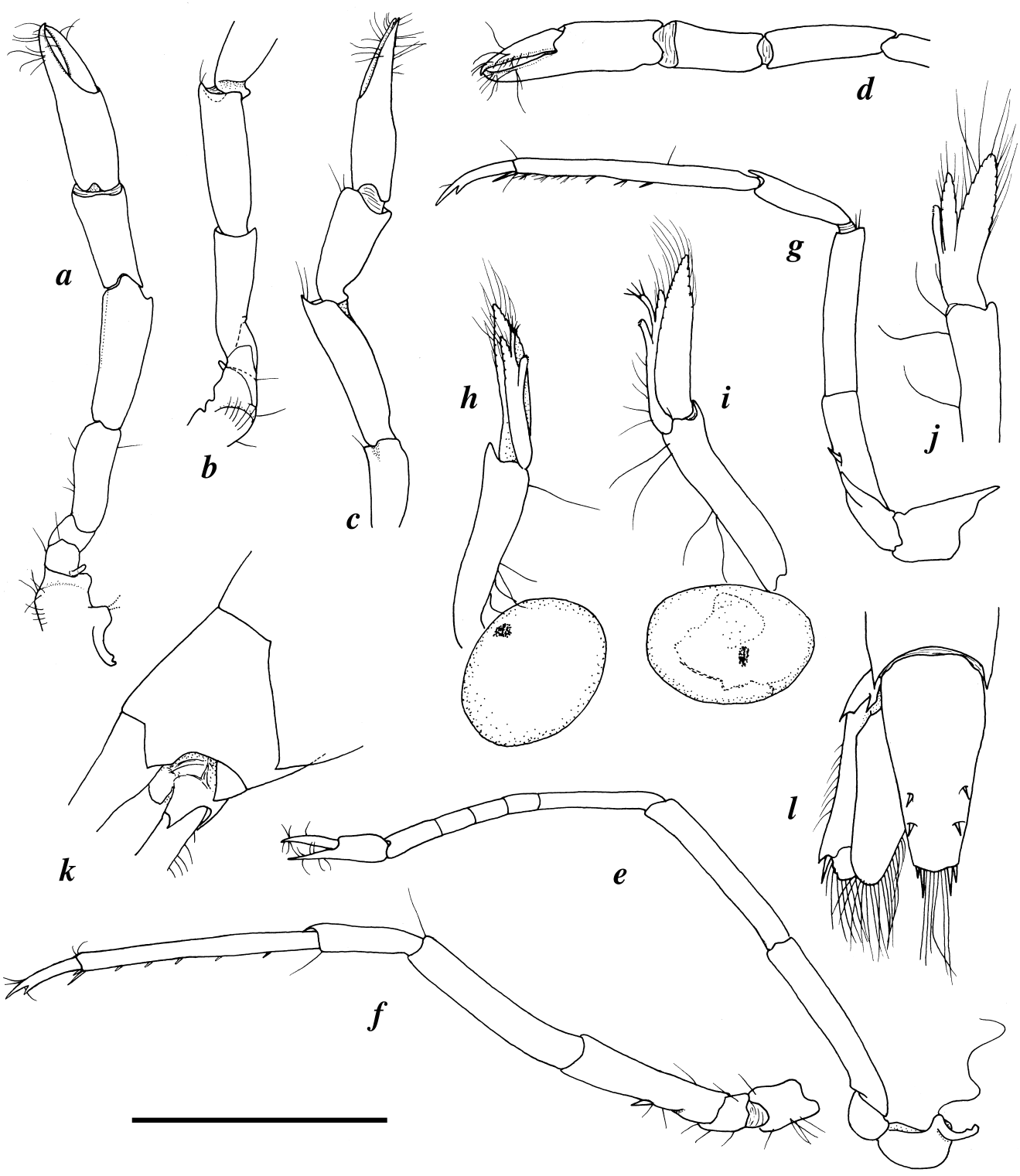

Fig. 4. *Acanthanas pusillus*, new genus, new species: a, left cheliped, lateral view; b, same, coxa to carpus, mesial view; c, same, ischium to chela, ventral view; d, merus, carpus and chela, lateral view; e, second pereiopod; f, third pereiopod; g, fifth pereiopod (e-g lateral view); h, second pleopod of one ovigerous specimen, mesial view (note presence of appendix masculina); i, same, lateral view; j, second pleopod of post-ovigerous specimen; k – abdominal somites V and VI, lateral view; l – tail fan, dorsal view. Holotype, NMCR-27001: a-f, j; Paratype, MNHN-Na 15777: g-i; Paratype, ZRC 2005.0089: k, l. Scale bar = 1 mm.

two undescribed genera (A. Anker, pers. obs.). Other features shared by these genera are the presence of small exopods on the first and sometimes the second pereiopods (except in *Pseudathanas*), and the presence of a rostrum and orbital teeth (except in one of the two undescribed genera, A. Anker, pers. obs.).

Acanthanas appears to be most closely related to *Athanas*. However, the presence of two spine-like projections on the eyestalks and two pereiopodal epipods (instead of three in *Athanas*) immediately separates *Acanthanas* from *Athanas*. Further distinguishing features of *Acanthanas* are the more concealed eyes; the presence of a subtriangular projection on the distodorsal margin of the cheliped merus and on the distal margin of the protopod of the second pleopod; the presence of a peculiar blunt tooth on the dorsomesial region of the antennal basicerite; and the absence of spines on the ischium of the chelipeds (usually present in *Athanas*).

Acanthanas may be separated from *Arete* by the development and shape of the chelipeds; the presence of two acute projections on the eyes; and the carpus of the second pereiopod bearing five segments (vs. four in *Arete*). The remaining "athanoid" genera, namely *Aretopsis*, *Athanopsis* and *Pseudathanas*, are more distantly related to *Acanthanas*, new genus, and may be easily separated from it by numerous features on the chelipeds, frontal margin, uropods etc. (Bruce, 1969, 1983; Miya, 1980; Berggren, 1991).

The incisor process of the mandible of *Acanthanas pusillus* is conspicuously expanded and distally furnished with minute to small-sized teeth. This feature, however, may not be of generic importance since a similar condition is also found in *Athanas areteformis* Coutière, 1903, *A. verrucosus* Banner & Banner, 1960 and *A. borradailei* (Coutière, 1903) (A. Anker, pers. obs.). Another interesting and yet to be explained feature of *Acanthanas* is the presence of an appendix masculina in one of the two ovigerous specimens. Similar observations were made in *Athanas ornithorhynchus* Banner and Banner, 1973 (Marin et al. 2005.) and *Aretopsis amabilis* De Man, 1910 (Nomura, 1986). In *Arete* spp., the presence of an appendix masculina in egg-bearing individuals is related to protandric hermaphroditism (Suzuki, 1970; Gherardi & Calloni, 1993). However, the small sample size of *Acanthanas* – three specimens – does not allow further assumptions. The relative small number of large (compared to the body) eggs may indicate an abbreviated larval development.

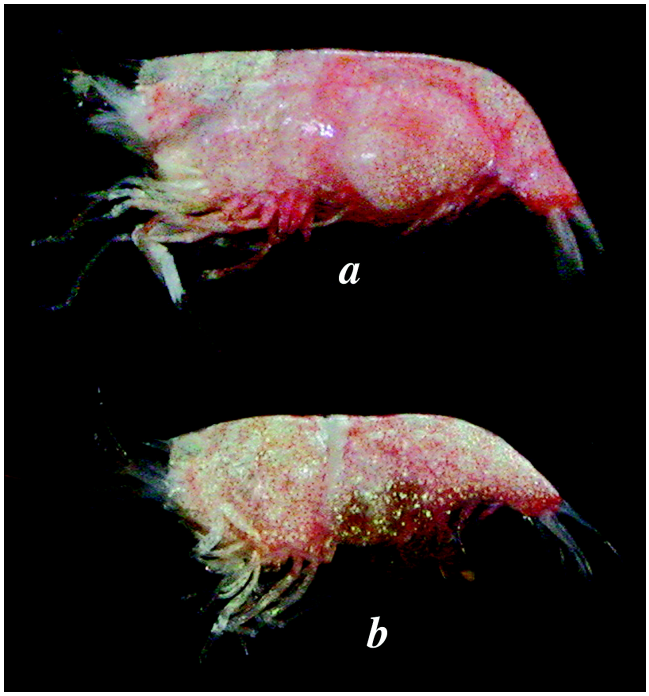

Fig. 5. *Acanthanas pusillus*, new genus, new species, colour pattern: a, holotype, NMCR-27001; b, paratype, ZRC 2005.0089.

The chelipeds of *Acanthanas* appear to be among the least specialized within the family Alpheidae. They are barely enlarged and end in a very simple claw with unarmed fingers. Similar chelipeds occur in females of some *Athanas* species (e.g., *A. marshallensis* Chace, 1955).

The finding of *Acanthanas pusillus* may have been possible because of the very intensive sampling over a relatively extended period (five weeks). Even so, only three specimens of this interesting "micro-shrimp" were collected, showing that very small-sized (nearly amphipod-sized) shrimps may be easily overlooked, escape or avoid being found by dwelling inside the smallest coral crevices.

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