
Patricia Cabezas* & Tin-Yam Chan

**Abstract.** The genus *Paramunida* belongs to the family Munididae, one of the most speciose families among anomuran decapod crustaceans. During the PANGLAO 2004, PANGLAO 2005, and AURORA 2007 expeditions in the Philippines, eight species of the genus were collected, including a new record and three new species, namely *Paramunida akaina*, *P. aspera*, and *P. aurora*. These new lineages are distinguished by subtle and constant morphological differences, which are in agreement with molecular evidence from the mitochondrial markers ND1 and 16S. Here, we describe these new species, provide new distribution records, and present phylogenetic relationships within the genus.

**Key words.** Munididae, *Paramunida*, new species, Philippines, mitochondrial genes

INTRODUCTION

The deep-sea squat lobsters of the genus *Paramunida* Baba, 1988 are distributed across the Indian and Pacific oceans, and are commonly found living on the continental shelf and slope between 200–700 m (Baba et al., 2008). This genus has received considerable attention during recent years (Macpherson & Baba, 2009; Cabezas et al., 2009) and the discovery of several new species indicates the existence of an extraordinary hidden diversity (Cabezas et al., 2010). During the PANGLAO and AURORA marine biodiversity expeditions carried out in the Philippines between 2004 and 2007 (Bouchet et al., 2009; Richer de Forges et al., 2009), numerous specimens of the genus *Paramunida* were collected. Eight species of *Paramunida* have been reported in the Philippines to date: *Paramunida crinita* Cabezas, Macpherson & Machordom, 2010; *P. granulata* (Henderson, 1885); *P. polita* Macpherson, 1993; *P. proxima* (Henderson, 1885); *P. scabra* (Henderson, 1885); *P. setigera* Baba, 1988; *P. stchas* Macpherson, 1993; and *P. tricarinata* (Alcock, 1894). Detailed study on the collected material revealed the presence of four more *Paramunida* species in the Philippines; a new record for *P. salai* Cabezas, Macpherson & Machordom, 2009, and three undescribed species. The present study describes these new taxa, together with molecular evidence from two mitochondrial markers (16S and ND1) to support their new taxonomic status.

**MATERIAL AND METHODS**

The material examined in the present study is deposited in the National Taiwan Ocean University, Keelung (NTOU) and the National Museum of the Philippines, Manila (NMCR). The terminology used mainly follows Baba et al. (2011). The size of the carapace is indicated as the postorbital carapace length measured along the dorsal midline from the posterior margin of the orbital to the posterior margin of the carapace. The length of the antennular and antennal article is always measured excluding distal spines, and along their lateral margins; the width is measured at mid-length of each article. The abbreviations used in the text are as follows: CL, carapace length; P1, pereopod 1, cheliped; P2–P4, pereopods 2–4, first to third walking legs.

Molecular data collection was performed under the same conditions showed in Cabezas et al. (2010). New isolated sequences were analysed together with those from previous works (Machordom & Macpherson, 2004; Cabezas et al., 2009; Cabezas et al., 2010; Cabezas et al., 2012) and are available in GenBank under accession numbers KJ021630–KJ021687 (Table 1). The 16S and ND1 sequences were checked using the program Sequencher (Gene Codes Corporation, Ann Harbour, MI). Alignment of the 16S gene dataset under Bayesian inference (BI) using MrBayes 3.1.2 (Ronquist & Huelsenbeck, 2003), implementing the partitioned scheme suggested by PartitionFinder (Lanfear et al., 2012). Four chains were run for 5,000,000 generations,
Table 1. Species and genes sequenced de novo for this study, including GenBank accession numbers.

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sampling one tree every 100 generations. Trees prior to the log likelihood stabilisation were discarded as burn-in after assessing run convergence in Tracer v1.4 (Rambaut & Drummond, 2003). Once all the parameters reached their stationary distributions, a 50% majority rule consensus tree was obtained. Robustness of the inferred trees was evaluated through Bayesian posterior probabilities (Pp). *Onconida alaini* Baba & de Saint Laurent, 1996 and *Plesionida concava* Cabezas, Macpherson & Machordom, 2009, were selected as outgroup taxa, because previous work has shown that these two genera are part of the sister clade of *Paramunida* (Machordom & Macpherson, 2004).

**TAXONOMY**

**Family Munididae Ahyong, Baba, Macpherson & Poore, 2010**

**Genus Paramunida Baba, 1988**

*Paramunida akaina*, new species

(Fig. 1)

**Material examined.** Holotype: AURORA 2007, Philippines, ovigerous female (CL 5.7 mm) (NMCR), station CP2667, 15°56′N, 121°47′E, 292–307 m, 21 May 2007. — Paratypes: PANGLAO 2004, Philippines, 1 male (CL 6.0 mm), 1 female (CL 5.4 mm), 1 ovigerous female (CL 6.7 mm) (NTOU A01411), station L42, 9°31.2′N, 123°50.7′E, 134–190 m, 04 July 2004. — AURORA 2007, Philippines, 4 males (CL 5.2–6.4 mm), 1 female (CL 6.5 mm), 10 ovigerous females (CL 5.6–6.8 mm) (NTOU A01413), station CP2667, 15°56′N, 121°47′E, 292–307 m, 21 May 2007.

**Description.** Carapace: As long as broad. Dorsal surface covered with numerous spinules; with few short simple setae. Epigastric region with two spines, each behind supraocular spine; without median row of spinules behind rostral spine. Mesogastric region with one well-developed spine usually merged with a smaller spine. Anterior branch of cervical groove with short setae. Cervical groove distinct. Cardiac and anterior branchial regions slightly circumscribed. Cardiac region with a median row of three well-developed spines, first thicker than others. Each branchial region with row of spines near cardiac region. Frontal margin slightly concave. Lateral margins convex, with some spines and iridescent setae on anterior half. Anterolateral spine well developed, exceeding sinus between rostral and supraocular spines. Rostral spine spinoform, with thin dorsal longitudinal carina; supraocular spines well developed, shorter and slightly slender than rostral spine; margin between rostral and supraocular spines slightly concave (Fig. 1A, B).

Sternum: Thoracic sternite 4 with few arcuate striae; sternites 5–7 smooth (Fig. 1C).

Abdomen: Abdominal somites 2–3 each with four well-developed spines on anterior ridge, posterior ridge with two median spines. Abdominal somite 4 with four spines on anterior ridge; posterior ridge without distinct single median spine. Ridges with numerous spinules and a few small spines (Fig. 1A).

Eyes: Maximum corneal diameter about one-third distance between bases of anterolateral spines.

Antennule: Article 1 exceeding cornea, with distomesial spine small and slightly shorter than distolateral; about twice longer than wide and with fringe of long setae along lateral margin; lateral margin with straight (distal) portion clearly shorter than convex (proximal) portion (Fig. 1D).

Antenna: Anterior prolongation of article 1 clearly overreaching antennular peduncle by about one-sixth of its length. Article 2 about 2.5 times length of article 3 and 2.5 times longer than wide, ventral surface with scales; distomesial spine slightly mucronated, exceeding antennal peduncle and without tuff of setae, overreaching mid-length of anterior prolongation of article 1, and far from distal end of antennular article 1, distolateral spine not reaching end of article 3; article 3 about 1.5 times longer than wide and unarmed (Fig. 1D).

Maxilliped 3: Ischium about 1.6 times length of merus measured along extensor margin, flexor margin bearing long distal spine; merus with well-developed median spine on flexor margin; extensor margin unarmed (Fig. 1E).

Pereopod 1: Long and slender, squamate, between 3.1–3.2 times carapace length; carpus about as long as palm, and 1.1–1.3 times longer than height; palm 1.4–1.5 times fingers length. Base of carpus without bundle of setae (Fig. 1F).

Pereopods 2–4: Long and slender, with scales on lateral sides of meri, carpi and propodi; scales with short setae. P2 2.5–2.9 times carapace length, merus 1.1–1.2 times longer than carapace, about 14–15 times as long as height, 4.3–4.4 times as long as carpus and 1.6–1.7 times as long as propodus; propodus about 14–15 times as long as height, and 1.1 times dactylus length. Merus with well-developed spines on extensor border, increasing in size distally, flexor margin with few spines and one well-developed distal spine; bearing row of small spines along flexolateral margin. Carpus with few small extensor spines, bearing small distal spine on extensor and distal margins. Propodus with small movable flexor spines. Dactylus compressed, slightly curved, with longitudinal carinae along mesial and lateral sides, flexor border unarmed. End of P2 carpus not reaching end of P1 merus. P3 with similar spination and article proportions as P2; merus slightly longer than P2 merus; propodus and dactylus longer than those of P2. P4 about as long as P2; merus as long as carapace length; propodus and dactylus as long as those of P3; merocarpal articulation clearly exceeding end of anterior prolongation of article 1 of antennal peduncle (Fig. 1G–I).

Remarks. *Paramunida akaina*, new species, belongs to the group of species with the rostral spine larger than supraocular spines, distomesial spine of antennal article 2 mucronated.
Fig. 1. *Paramunida akaina*, new species, ovigerous female holotype, 5.7 mm (NMCR), Philippines. A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, thoracic sternum; D, left antennule and antenna, ventral view; E, right maxilliped 3, lateral view; F, right P1, dorsal view; G, left P2, lateral view; H, left P3, lateral view; I, left P4, lateral view. Scale bars = 2 mm.
and mesogastric region with one or two spines. The new species is morphologically closely related to *P. belone* Macpherson, 1993, but they can be easily distinguished by the following characters:

- The distomesial spine of the antennal article 2 overreaches the antennular peduncle in *P. belone*, but is far from distal the end of antennular peduncle in *P. akaina*, new species.
- The distolateral spine of the antennal article 2 not reaching end of article 3 in the new species, instead of overreaching article 3 as in *P. belone*.

The genetic divergence between *P. akaina*, new species, and *P. belone* are in the range of 9.6–10.4% for the ND1 and between 4.6–5.5% % for the 16S.

The new species is also very similar to *P. spica* Cabezas, Macpherson & Machordom, 2010; however, both species chiefly differs in the number of mesogastric spines (three in *P. spica* versus one in *P. akaina*, new species). The article 3 of the antenna is nearly twice longer than wide in *P. spica*, but only 1.5 times longer than wide in the new species. The genetic divergence between *P. akaina*, new species, and *P. spica* are in the range of 9.6–10.1% for the ND1 and between 5.5–5.9% for the 16S.

*Paramunida akaina*, new species, can be also allied with *P. antipodes* Ahyong & Poore, 2004, but the distomesial spine of the antennal article 2 clearly overreaches antennal peduncle in the new species, but never reaches it in *P. antipodes*. No molecular data are available for *P. antipodes*.

**Colour.** Not known.

**Etymology.** From the Greek “akaina”, which means thorn or spine, in reference to the spine merged to the well-developed mesogastric spine. The name is considered as a noun in apposition.

**Distribution.** Philippines, between 80–307 m depth.

*Paramunida aspera*, new species  
(Figs. 2, 4A)


**Description.** Carapace: As long as broad. Dorsal surface covered with numerous granules and spinules; with few short simple setae. Epigastric region with two spines, each behind supraoculuar spine; without median row of spinules behind rostral spine. Mesogastric region with median row of three spines, first thicker than others. Anterior branch of cervical groove with short setae. Cervical groove distinct. Cardiac and anterior branchial regions slightly circumscribed. Cardiac region with a median row of three well-developed spines, first thicker than others. Each branchial region with row of spines near cardiac region. Frontal margin slightly concave. Lateral margins convex, with some spines and iridescent setae on anterior half. Anterolateral spine well developed, exceeding sinus between rostral and supraocular spines. Rostral spine spiniform, with thin dorsal longitudinal carina; supraocular spines well developed, shorter and slender than rostral spine; margin between rostral and supraocular spines slightly concave (Fig. 2A, B).

Sternum: Thoracic sternite 4 with numerous arcuate striae; sternites 5–7 with only few striae on each lateral side (Fig. 2C).

Abdomen: Abdominal somites 2–3 each with four well-developed spines on anterior ridge, posterior ridge with two median spines. Abdominal somite 4 with four spines on anterior ridge; posterior ridge with distinct single median spine. Ridges with numerous spinules and a few small spines (Fig. 2A).

Eyes: Maximum corneal diameter more than one-third distance between bases of anterolateral spines.

Antennule: Article 1 exceeding corneae, with distomesial spine small and slightly shorter than distolateral; about twice longer than wide and with fringe of long setae along lateral margin; lateral margin with straight (distal) portion clearly shorter than convex (proximal) portion (Fig. 2D).

Antenna: Anterior prolongation of article 1 clearly overreaching antennular peduncle by about one-third of its length. Article 2 about 2.5 times length of article 3 and twice longer than wide, ventral surface with scales; distomesial spine spiniform, slightly exceeding antennal peduncle and without tuff of setae, reaching mid-length of anterior prolongation of article 1, and far from distal end of anterolateral article 1, distolateral spine nearly reaching end of article 3; article 3 as long as wide and unarmed (Fig. 2D).

Maxilliped 3: Ischium about 1.7 times length of merus measured along extensor margin, flexor margin bearing long distal spine; merus with well-developed median spine on flexor margin; extensor margin unarmed (Fig. 2E).

Pereopod 1: Long and slender, squamate, between 3.8–4.0 times carapace length; carpus about 1.1–1.2 palm length, and 5.3–5.5 times longer than height; palm about as long as fingers length. Base of carpus without bundle of setae (Fig. 2F).

Pereopods 2–4: Long and slender, with numerous scales on lateral sides of meri, carpi and propodi; scales with short setae. P2 2.6–2.9 times carapace length, merus 1.1–1.2 times longer than carapace, about 14 times as long as height, 4.1 times as long as carpus and 1.6–1.7 times as long as propodus; propodus about 11–13 times as long as height, and 1.2 times dactylus length. Merus with well-developed
Fig. 2. Paramunida aspera, new species, ovigerous female holotype, 7.9 mm (NMCR). Philippines. A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, thoracic sternum; D, left antennule and antenna, ventral view; E, right maxilliped 3, lateral view; F, right P1, dorsal view; G, right P2, lateral view; H, right P3, lateral view; I, right P4, lateral view. Scale bars = 2 mm.
spines on extensor border, increasing in size distally, flexor margin with few spines and one well-developed distal spine; bearing row of small spines along flexolateral margin. Carpus with some small extensor spines, small distal spine on extensor and flexor margins. Propodus with small movable flexor spines. Dactylus compressed, slightly curved, with longitudinal carinae along mesial and lateral sides, flexor border unarmed. End of P2 carpus reaching end of P1 merus. P3 with similar spination and article proportions as P2; merus slightly shorter than P2 merus; propodus and dactylus about 1.2 times longer than those of P2. P4 as long as P2; merus about 1.1 times carapace length; propodus and dactylus as long as those of P3; merocarpal articulation slightly exceeding end of anterior prolongation of article 1 of antennal peduncle (Fig. 2G–I).

Remarks. Paramunida aspera, new species, belongs to the group of species with the rostral spine larger than supraocular spines, distomesial spine of antennal article 2 spiniform and mesogastric region with three spines. The new species is morphologically related to P. marionis Cabezas, Macpherson & Machordom, 2010, but the following characters can distinguish them:

- The number of striae on the thoracic sternite 4 is clearly higher in P. aspera, new species, than in P. marionis. Furthermore, the thoracic sternite 7 is smooth in P. marionis, but with few striae on each lateral side in P. aspera, new species.
- The antennal article 3 is as long as wide in the new species and about 1.5 times longer than wide in P. marionis.

No molecular comparison was performed with P. marionis. The new species is also morphologically allied with P. stichas Macpherson, 1993, but the distomesial spine of the antennal article 2 is spiniform in P. aspera, new species, and mucronated in P. stichas. Furthermore, the antennal segment 3 is as long as wide in the new species, but 1.5 times longer than broad in P. stichas. The genetic divergence between P. aspera, new species, and P. stichas are in the range of 3.9–5.5% for the ND1 and between 1.5–2.4% for the 16S.

Furthermore, the new species also resembles to P. proxima, but both species can be easily distinguished by the number of mesogastric spines (one in P. proxima versus three in P. aspera, new species) and striae on sternum (numerous striae in P. proxima versus few striae on each side of sternites 5–7 in P. aspera, new species). The genetic divergence between P. aspera, new species, and P. proxima are between 6.6–7.3% for the ND1 and between 1.5–2.4% for the 16S.

Finally, the new species is close related to P. leptotes Macpherson & Baba, 2009, but they clearly differ in the number of mesogastric spines (three in P. aspera, new species, but one or rarely two in P. leptotes). Furthermore, the distomesial spine of the antennal article 2 clearly overreaches antennal peduncle in P. leptotes, whereas this spine only slightly exceeds the antennal peduncle in the new species. The genetic divergence between P. aspera, new species, and P. leptotes are in the range of 10.3–10.6% for the ND1 and between 4.3–4.6% for the 16S.


Etymology. From the Latin “asper”, which means rough, in reference to the numerous granules and spines covering the carapace.

Distribution. Philippines, between 357–380 m depth.

Paramunida aurora, new species

(Fig. 3)

Material examined. Holotype: AURORA 2007, Philippines, 1 ovigerous female (CL 6.2 mm) (NMCR), station CP2748, 15°56’N, 121°45’E, 247–249 m, 2 June 2007. — Paratypes: AURORA 2007, Philippines, 10 males (CL 4.2–6.2 mm), 8 females (CL 5.5–7.1 mm), 6 ovigerous females (CL 5.6–6.6 mm) (NTOU-A01416), station CP2655, 16°03’N, 121°54’E, 189 m, 20 May 2007. — 3 males (CL 6.0–6.4 mm), 6 females (4.8–7.2 mm), 2 ovigerous females (5.9–7.6 mm) (NTOU-A01417), station CP2748, 15°56’N, 121°45’E, 247–249 m, 2 June 2007.

Description. Carapace: As long as broad. Dorsal surface covered with numerous spines; with few short simple setae. Epigastric region with two spines, each behind supraocular spine; without median row of spines behind rostral spine. Gastric region indistinctly separated from hepatic area, metagastric region well defined and mesogastric region without well-developed spines. Anterior branch of cervical groove with short setae. Cervical groove deeply excavated. Cardiac and anterior branchial regions well defined, slightly convex, round scale-like ridge at anterior end of branchiocardiac boundary distinctly elevated and provided with few spines. Cardiac region with one well-developed spine. Each branchial region with one spine near cardiac region. Frontal margin slightly concave. Lateral margins convex, with iridescent setae on anterior half. Anterolateral spine well-developed, slightly exceeding sinus between rostral and supraocular spines. Rostral spine spiniform, without thin dorsal longitudinal carina; supraocular spines as long as and slightly slender than rostral spine; margin between rostral and supraocular spines slightly concave (Fig. 3A, B).

Sternum: Thoracic sternite 4–6 with numerous striae (Fig. 3C), sternite 7 with fewer striae.

Abdomen: Abdominal somites 2–3 each with four spines on anterior ridge, posterior ridge with two median spines. Abdominal somite 4 with four spines on anterior ridge; posterior ridge with distinct single median spine. Ridges with numerous spines and a few small spines (Fig. 3A).

Eyes: Maximum corneal diameter more than one-third distance between bases of anterolateral spines.
Fig. 3. *Paramunida aurora*, new species, ovigerous female holotype, 6.2 mm (NMCR). Philippines. A, carapace and abdomen, dorsal view; B, carapace, lateral view; C, thoracic sternum; D, right antennule and antenna, ventral view; E, right maxilliped 3, lateral view; F, right P1, dorsal view; G, left P2, lateral view; H, left P3, lateral view; I, left P4, lateral view. Scale bars = 2 mm.
Antennule: Article 1 exceeding corneae, with distomesial spine shorter than distolateral; about twice longer than wide and with fringe of long setae along lateral margin; lateral margin with straight (distal) portion clearly shorter than convex (proximal) portion (Fig. 3D).

Antenna: Anterior prolongation of article 1 overreaching antennular peduncle by about one-fifth of its length. Article 2 about 1.5 times length of article 3 and 2.5 times longer than wide, ventral surface with scales; distomesial spine slightly mucronated, extending antennal peduncle and without tuff of setae, overreaching mid-length of anterior prolongation of article 1, and far from distal end of antennular article 1, distolateral spine not reaching end of article 3; article 3 about 1.5 times longer than wide and unarmed (Fig. 3D).

Maxilliped 3: Ischium about twice length of merus measured along extensor margin, flexor border bearing long distal spine; merus with well-developed median spine on flexor margin; extensor margin unarmed (Fig. 3E).

Pereopod 1 (broken): Long and slender. Merus distinctly longer than carapace, dorsally armed with row of spines, and about 19 times longer than height (Fig. 3F).

Pereopods 2–4: Long and slender, with scales on lateral sides of meri, carpi and propodi; scales with short setae. P2 4.1–4.2 times carapace length, merus 1.8–1.9 times longer than carapace, about 23–24 times as long as height, 4.1–4.7 times as long as carpus and 1.6–1.7 times as long as propodus; propodus about 16–19 times as long as height, and 1.3–1.4 times dactylus length. Merus with well-developed spines on extensor border, increasing in size distally, flexor margin with few spines and one well-developed distal spine. Carpus with few small extensor spines, bearing small distal spine on extensor and flexor margins. Propodus with small movable flexor spines. Dactylus compressed, slightly curved, with longitudinal carinae along mesial and lateral sides, flexor border unarmed. End of P2 carpus not reaching end of P1 merus. P3 with similar spination and article proportions as P2; merus as long as P2 merus; propodus and dactylus longer than those of P2. P4 about as long as P2; merus 1.8–1.9 times carapace length; propodus and dactylus as long as those of P3; merocarpal articulation clearly exceeding anterior prolongation of article 1 of antennal peduncle (Fig. 3G–I).

Remarks. Paramunida aurora, new species, belongs to the group of species with the rostral spine as long as supraocular spines, distomesial spine of antennal article 2 slightly mucronated and mesogastric region without well developed spines. The new species is closely related to P. tenera Cabezas, Macpherson & Machordom, 2010, but they can be distinguished by the following morphological characters:

- The rostral spine is short and triangular, with thin dorsal carina in P. tenera, but longer, spiniform and without dorsal carina in the new species.
- The cardiac region has one well-developed spine in P. aurora, new species, whereas there is a row of 3 well-developed spines in P. tenera.
- The number of striae at the thoracic sternites 4–7 is distinctly higher in P. aurora, new species, than in P. tenera.

The genetic divergence between P. aurora, new species, and P. tenera are in the range of 11.3–12.6% for the ND1 and between 4.6–4.8% for the 16S.

The new species is also morphologically very close to P. setigera Baba, 1988, but they clearly differ in the shape of the rostrum (spiniform in P. aurora, new species, but triangular in P. setigera). The genetic divergence between P. aurora, new species, and P. setigera are in the range of 10.8–11.7% for the ND1 and between 5.5–6.0% for the 16S.

Colour. Not known.

Etymology. The name refers to the deep-sea expedition “AURORA”.

Distribution. Philippines, between 189–249 m depth.

Paramunida aurora Cabezas, Macpherson & Machordom, 2010 (Fig. 4B)

Paramunida scabra. — Macpherson, 1993: 462 (in part, only specimens from the Philippines, MUSORSTOM 1, 2 and 3) (not Henderson, 1885).


Material examined. PANGLAO 2004, Philippines, 3 males (CL 4.1–5.9 mm), 1 female (CL 6.4 mm) (NTOU A01351), station T34, 9°31.3’N, 123°51.4’E, 145–163 m, 3 July 2004. — 1 male (CL 8.1 mm), 1 ovigerous female (CL 9.1 mm) (NTOU A01352), station T37, 9°28.2’N, 123°50.7’E, 134–190 m, 4 July 2004. — PANGLAO 2005, Philippines, 6 males (CL 6.7–11.0 mm), 3 females (7.0–11.5 mm), 1 ovigerous female (CL 10.0 mm) (NTOU A01353), station CP2344, 9°28.4’N, 123°50.1’E, 128–155 m, 23 May 2005. — 2 males (CL 10.2-12.1mm) (NTOU A01354), station CA2345, 9°28.3’N, 123°54.1’E, 276m, 23 May 2005. — 1 male (CL 11.7 mm), 1 female (CL 5.0 mm) (NTOU A01355), station DW2346, 9°28.4’N, 123°54.5’E, 261–280 m, 24 May 2005. — 1 male (CL 12.2 mm) (NTOU A01356), station CP2348, 9°29.6’N, 123°52.5’E, 164–196 m, 24 May 2005. — 1 female (CL 8.8mm) (NTOU A01357), station CP2349, 9°31.6’N, 123°55.5’E, 229–240 m, 24 May 2005. — 1 female (CL 11.0 mm) (NTOU A01358), station CP2350, 9°31.4’N, 124°0.6’E, 738–798 m, 24 May 2005. — 2 males (CL 8.8–11.8 mm), 3 females (6.9–10.8 mm) (NTOU A01359), station CP2409, 9°44.8’N, 123°44.8’E, 257–269 m, 1 June 2005.


Distribution. Philippines, between 128–798 m.
**Paramunida proxima** (Henderson, 1885) 
(4C: 311)


Material examined. PANGLAO 2004, Philippines, 1 male (CL 12.0 mm) (NTOU A01369), station PN, 9°31.2’N, 123°41.3’E, 50–500 m, no specific day. — 1 male (CL 10.2 mm), 1 ovigerous female (CL 7.2 mm) (NTOU A01370), station P2, 9°39.0’N, 123°43.8’E, 400 m, 30 May 2004. — 1 female (CL 8.9 mm), 5 ovigerous female (CL 9.8–12.6 mm) (NTOU A01371), station P3, 9°31.1’N, 123°41.5’E, 100 m, 31 May 2004. — 1 male (CL 12.0 mm), 1 female (CL 13.1 mm) (NTOU A01372), Balicasag, no specific locality and depth, March 2004. — 1 ovigerous female (CL 11.0 mm) (NTOU A01374), Balicasag, no specific locality and depth, November 2003. — PANGLAO 2005, Philippines, 1 male (CL 10.0 mm) (NTOU A01375), station CP2343, 9°27.4’N, 123°49.4’E, 273–302 m, 23 May 2005. — 2 males (CL 6.6–11.3 mm) (NTOU A01376), station CA2345, 9°28.3’N, 123°54.1’E, 276m, 23 May 2005.

Colour. Not known.

Distribution. Solomon Islands, Indonesia, and Philippines, between 50 and 500 m.

**Paramunida stichas** Macpherson, 1993: 465 (in part, only specimens from Indonesia) (not Macpherson, 1993).

Material examined. PANGLAO 2004, Philippines, 1 male (CL 12.0 mm) (NTOU A01369), station PN, 9°31.2’N, 123°41.3’E, 50–500 m, no specific day. — 1 male (CL 10.2 mm), 1 ovigerous female (CL 7.2 mm) (NTOU A01370), station P2, 9°39.0’N, 123°43.8’E, 400 m, 30 May 2004. — 1 female (CL 8.9 mm), 5 ovigerous female (CL 9.8–12.6 mm) (NTOU A01371), station P3, 9°31.1’N, 123°41.5’E, 100 m, 31 May 2004. — 1 male (CL 12.0 mm), 1 female (CL 13.1 mm) (NTOU A01372), Balicasag, no specific locality and depth, March 2004. — 1 ovigerous female (CL 11.0 mm) (NTOU A01374), Balicasag, no specific locality and depth, November 2003. — PANGLAO 2005, Philippines, 1 male (CL 10.0 mm) (NTOU A01375), station CP2343, 9°27.4’N, 123°49.4’E, 273–302 m, 23 May 2005. — 2 males (CL 6.6–11.3 mm) (NTOU A01376), station CA2345, 9°28.3’N, 123°54.1’E, 276m, 23 May 2005.

Colour. Not known.

Distribution. Solomon Islands, Indonesia, and Philippines, between 50 and 500 m.

**Paramunida scabra** (Henderson, 1885)


Not *Paramunida scabra*. — Wu et al., 1998: 145, figs 41, 42G (Taiwan) — Macpherson, 1993: 462 (in part) (*P. tricarinata* (Alcock, 1894)).


**Paramunida stichas** Tirmizi & Javed, 1993: 131, figs 58, 59 (off Tanzania and off Mozambique, 100–347 m).
Material examined. PANGLAO 2005, Philippines, 17 males (CL 5.5–11.3 mm), 7 females (CL 6.4–8.3 mm), 1 ovigerous female (CL 11.3 mm) (NTOU A01377), station CP2343, 9°27.4’N, 123°48.4’E, 273–302 m, 23 May 2005. — 1 male (CL 6.3 mm), 1 female (CL 11.2 mm) (NTOU A01378), station CA2345, 9°28.3’N, 123°54.1’E, 276 m, 23 May 2005. — 4 males (CL 6.4–12.2 mm), 1 female (CL 10.3 mm) (NTOU A01379), station DW2346, 9°28.4’N, 123°54.5’E, 261–280 m, 24 May 2005. — 1 ovigerous female (CL 10.0 mm) (NTOU A01380), station CP2348, 9°29.6’N, 123°52.5’E, 24 May 2005. — 1 male (CL 6.7 mm) (NTOU A01382), station CP2381, 8°43.3’N, 123°19.0’E, 275–280 m, 28 May 2005. — 19 males (CL 4.8–14.0 mm), 19 females (CL 4.8–11.2 mm) (NTOU A01380), station CP2348, 9°29.6’N, 123°52.5’E, 24 May 2005. — 1 ovigerous female (CL 10.0 mm) (NTOU A01381), station CP2380, 8°41.3’N, 123°17.8’E, 163–271 m, 28 May 2005. — 1 male (CL 6.7 mm) (NTOU A01382), station CP2381, 8°43.3’N, 123°19.0’E, 275–280 m, 28 May 2005. — 1 female (CL 6.5 mm) (NTOU A01383), station CP2406, 9°40.6’N, 123°46.8’E, 379–389 m, 1 June 2005.

Colour. Ground colour of carapace and abdomen pale pink. Epigastric and cardiac regions reddish. Ground colour of P1–4 whitish, with red bands and some small red spots; P1 fingers white, distal portion reddish (from Baba et al., 2009).

Distribution. Hong Kong, East and South China Sea (Dongsha), Indonesia (Kei Islands), Philippines, Taiwan, Japan, and Australia (off Central Queensland), between 70 and 1630 m. The records along the Eastern Africa (off Tanzania and off Mozambique) should be revised in order to determine its taxonomic status.

*Paramunida setigera* Baba, 1988 (Fig. 4D)


Material examined. PANGLAO 2004, Philippines, 2 males (CL 13.2–13.4 mm), 5 ovigerous female (CL 8.8–12.2 mm) (NTOU A01384), station P1, 9°36.1’N, 123°45.0’E, 90–200 m, 30 May 2004. — 2 males (CL 8.9–13.9 mm), 3 ovigerous females (CL 9.8–12.10 mm) (NTOU A01385), station T25, 9°41.1’N, 123°49.3’E, 262–278 m, 20 May 2007. — 3 males (CL 5.9–7.2 mm), 1 female (CL 7.1 mm), 2 ovigerous female (CL 6.9–7.6 mm) (NTOU A01399), station CP2662, 15°47’N, 121°44’E, 253 m, 21 May 2007. — 1 male (CL 6.1 mm), 1 female (CL 5.8 mm), 1 ovigerous female (CL 5.2 mm) (NTOU A01400), station CP2666, 15°57’N, 121°44’E, 198–199 m, 21 May 2007. — 1 female (CL 6.3 mm) (NTOU A01401), station CP2667, 15°56’N, 121°47’E, 292–307 m, 21 May 2007. — 1 female (CL 7.6 mm) (NTOU A01402), station CP2710, 15°15’N, 121°33’E, 207–216 m, 28 May 2007. — 1 male (CL 6.0 mm) (NTOU A01403), station CP2711, 15°19’N, 121°32’E, 184–200 m, 28 May 2007. — 2 males (CL 9.3–9.7 mm) (NTOU A01418), station CP2711, 14°37’N, 121°47’E, 216–220 m, 29 May 2007. — 2 males (CL 9.5 mm), 1 ovigerous female (CL 8.7 mm) (NTOU A01404), station CP2720, 14°26’N, 121°47’E, 300–301 m, 29 May 2007. — 1 ovigerous female (CL 8.9 mm) (NTOU A01405), station CP2737, 16°02’N, 121°33’E, 269–272 m, 01 June 2007. — 1 male (CL 5.9 mm), 1 female (CL 5.8 mm) (NTOU A01406), station CP2741, 16°03’N, 121°55’E, 194–203 m, 1 June 2007. — 1 female (CL 6.6 mm) (NTOU A01407), station CP2746, 15°59’N, 121°46’E, 182–220 m, 2 June 2007. — 1 female (CL 9.9 mm) (NTOU A01408), station CP2749, 15°56’N, 121°49’E, 473 m, 2 June 2007.


Distribution. Philippines and Indonesia, between 90 and 532 m.

MOLECULAR ANALYSIS

Phylogenetic analysis of the combined dataset unequivocally supports the taxonomic position of the three new species, confirming them as distinct species of *Paramunida* (Fig. 5). After the alignment of the 16S sequences, the final dataset contained 942 characters (482 16S and 460 ND1). Divergences among the new species and their congeners are similar to values reported by Cabezas et al. (2010). The analysis recovered *Paramunida* as monophyletic with *P. granulata* (Henderson, 1885) representing the earliest offshoot within the genus (Fig. 5). This species is unique in having a granulated carapace and the distomesial spine
Fig. 5. Majority-rule-consensus from Bayesian analysis of the combined dataset (16S + ND1). One asterisk represents Pp=0.9–1 and two asterisks Pp=0.70–0.85.
of the antennal article 2 almost reaching the end of the anterior prolongation of article 1 (Baba, 1988), which in combination with high genetic divergence suggest that it might be the single representative of a different lineage (Cabezas et al., 2012). In summary, both morphological and molecular placement confirms the status of the newly described species in Paramunida, bringing current diversity in the genus up to 40 species.

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LITERATURE CITED


