

Fig. 7. *Rhabdonotus xyxon* new species, holotype female, cl 8.4 mm, cb 7.7 mm (MNHN): A, dorsal view; B, ventral view.

Table 1. Differences between *Rhabdonotus pictus* A. Milne Edwards, 1879, *R. pilipes* new species and *R. xynon* new species.

	<i>Rhabdonotus pictus</i>	<i>R. pilipes</i>	<i>R. xynon</i>
Frontal margin	Mildly tuberculated; bilobed, lobes rounded; cleft between lobes shallow (Fig. 2A, 4A, 4G)	Heavily tuberculated, margin appears serrated; bilobed, lobes rounded; cleft between lobes shallow (Fig. 6A)	Heavily tuberculated, margin appears serrated; bilobed, lobes more triangular; cleft between lobes deeper (Figs. 8A, 8G)
Supraorbital teeth	Distinct (Figs. 2A, 4A, 4G)	Distinct (Fig. 6A)	Less distinct (Fig. 8A)
Infraorbital teeth	Rounded	Rounded	Triangular
Anterolateral margin	Lined with flat and small granules (Figs. 2A, 4A, 4G)	Heavily tuberculated with tall granules, margin appearing serrated (fig. 6A)	Heavily tuberculated with tall granules (Fig. 8A)
Epibranchial cleft	More often present in adult males than in females; in adult specimens than juveniles (Figs. 2A, 4A, 4G)	Very often present in females (Fig. 6A)	May be present in small females (Fig. 8G)
Epibranchial tooth	Very small and weak tooth (Fig. 2A)	Stronger (Fig. 6A)	May be present in small females (Fig. 8G)
Posterolateral margin	Converging (Figs. 2A, 4A, 4G)	Slightly straighter (Fig. 6A)	Straight (Fig. 8A)
Third maxilliped:			
1. Anterior and inner margins of merus	Usually tuberculated	Usually heavily tuberculated	Not tuberculated (mildly tuberculated in young)
2. External angle of merus	Quadrangle	Quadrangle	Rounded
3. Inner margin of ischium	Tuberculated (Figs. 2E, 4E)	Heavily tuberculated (Fig. 6E)	Not tuberculated (mildly tuberculated in young) (Fig. 8E)
Cheliped	Mildly tuberculated with flat granules (Figs. 2K, 4F)	Heavily tuberculated with tall granules (Fig. 6F)	Heavily tuberculated with tall granules (Fig. 8F)
Dorsal margins of all ambulatory legs end in a triangular lobe	Absent	Absent	Present
Hairiness of ambulatory legs	Slightly hairy	Very hairy	Not hairy
Outer margins of ambulatory carpus and propodus	Mildly granulated (more granulated in juveniles) (Figs. 2C, 4C, 4H)	Lined with strong tubercles (Fig. 6C)	Carpus mildly granulated; propodus appears smooth (Fig. 8C)
Colour pattern	Outer and inner margins of chelipeds bear two parallel stripes; all stripes are red or dark brown in color; in transverse stripes 2-4 and concentric ring, centre of stripes appearing pale yellow (Fig. 10A, B)	Chelipeds bear no markings; all stripes are brown in colour, centre of stripes do not appear as pale (Fig. 10C)	Overall colour appearing purplish-brown. Possible pale reddish-orange markings along the frontal and anterolateral margins, cardiac region and chelipeds (Fig. 10D)

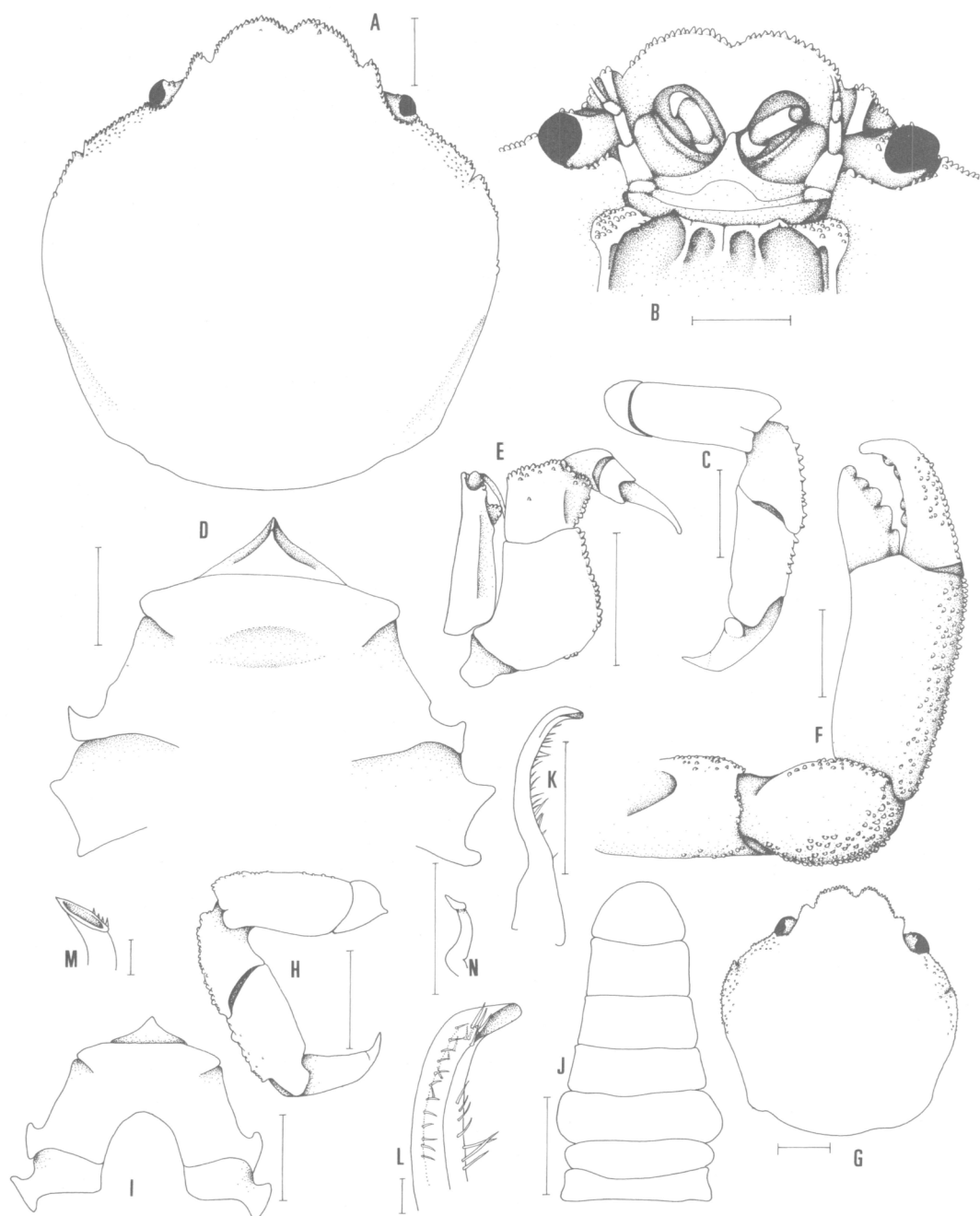


Fig. 6. *Rhabdonotus pilipes* new species. A–F, holotype female, cl 7.2 mm, cb 6.8 mm, (NTM Cr008806): A, carapace; B, face of carapace; C, right fourth ambulatory leg; D, anterior sternites; E, right third maxilliped; F, right cheliped. G–N, male, cl 5.2 mm, cb 4.9 mm, (NTM Cr007875): G, carapace; H, left fourth ambulatory leg; I, anterior sternites; J, abdomen; K, ventral view of tip of left G1; L, ventral view of tip of left G2; M, ventral view of tip of left G1; N, ventral view of left G2. Scales for A–K, N = 1.0 mm; for L–M = 0.1 mm.

more tuberculated, the supra-orbital teeth more pronounced, with the distinct epibranchial cleft and tooth, narrower sternum and more distinctive colour pattern. As seen in *R. pictus* and *R. pilipes* new species, smaller specimens are usually more tuberculated than the larger ones. The narrower sternum of the Vanuatu specimen could be size related — the sterna of females generally become broader as they increase in size. The Vanuatu specimen still has its colour markings on the carapace as opposed to the holotype. Most of the markings have already faded in the holotype. Thus, we cannot ascertain if the difference (see later in descriptions of colour) observed here is due to preservation or merely variation within the species. As for the other differences, with only two specimens on hand, we prefer to regard them as infra-specific variation for the moment. It is interesting to note that both the specimens were collected from very different depths (holotype from 73-84m; Vanuatu specimen from 550-571m). Whether the depth reading for either specimen is erroneous cannot be determined. Externally, the differences observed at present on the basis of only two female specimens do not warrant their recognition as a separate species.

Host records. — Although an arm of a crinoid was collected together with the holotype, identification was not possible. It at least confirms that *R. xynon* new species, is also a crinoid symbiont.

Distribution. — At the present moment, this species is only known from the Philippines and Vanuatu.

Colour. — Holotype: overall colour appearing purplish-brown including legs and chelipeds; a faint reddish-orange transverse stripe runs between the orbits reaching the anterolateral margins. Vanuatu specimen: overall appearing purplish-brown as well with additional reddish-orange markings; a transverse marking runs along the frontal and

anterolateral margins; a concentric ring and a crescent shape marking present on the cardiac region; a whitish stripe runs longitudinally along the chelipeds; between the supra-orbital teeth there is a dark transverse stripe (see Fig. 10D).

Morphology of the first zoea of
Rhabdonotus pictus

Fig. 9A-I

Description (Fig. 9). — Length of carapace (Fig. 9A) is ca. 0.7mm. Carapace with slightly hooked dorsal, short lateral and short rostral spine straight. Regions adjacent to lateral and dorsal spines heavily tuberculated, with scattered short setae, anterolateral margin lined with numerous sharp denticles. Eyes sessile. Abdomen (Fig. 9B) with five somites, six fused to telson. Dorsal surfaces of somite 2 with a pair of robust, lateral knobs, somites 3 to 5 each with a pair of distinct upward and backwardly directed spines. Somites 2-5 with a pair of posterolateral processes each, blunt on somite 2, sharp on somites 3-5. Dorsal surfaces of somites 2-5 with varying number of short setae: 4-6, 4-6, 4-5, 4-6 respectively; somites 2-5 with two additional long hairs. Postero-dorsal margins of somites 2-5 with 8, 10, 10, 8 minute denticles respectively. Pleopods absent on all somites. Telson (Fig. 9B) bifurcate, margins of furcae spinulose, each with 1 large lateral spine and 1 small dorsal spine. Inner margin of telson fork with 3 pairs of large setose spines.

Antennule (Fig. 9C) uniramous, unsegmented, cone-shaped, with 2 stout and long, 2 thin and short aesthetascs, 2 simple terminal setae.

Antennal exopod (Fig. 9D) approximately equal in length to spinous process, both sharply tapering. Spinous process with 2 rows of spinules on distal margin. Outer margin of exopod with 2 thick median spine; distal part with 2 rows of spinules.

Mandible (Fig. 9E) heavily chitinised,



Fig. 9. *Rhadonotus pictus* A Milne Edwards, 1879, first zoea: A, lateral view; B, Abdomen (dorsal view); C, Antennule; D, Antenna; E, mandibles; F, Maxillule; G, Maxilla; H, First maxilliped; I, Second maxilliped. Scale bar = 0.1 mm.



Fig. 10A–B. *Rhabdonotus pictus* A Milne Edwards, 1879: A, female, cl. 5.3mm, cb 4.8mm, (ZRC 1995.224); B, female, cl 7.5mm, cb 7.2mm (ZRC 1989.2046) (Photo courtesy of K. Sagathevan); C, *Rhabdonotus pilipes* new species, one of the ovigerous paratypes, size not recorded (Photo courtesy of A. J. Bruce); D, *Rhabdonotus xynon* new species, female, cl 5.2mm, cb 4.9mm (MNHN) (Photo courtesy of A. Crosnier).

both with inter-digitating incisor and molar processes, palp absent.

Coxal endite of maxillule (Fig. 9F) with 7 stout setae (4 terminal, 3 subterminal, stepped), basal endite with 2 serrated spines, 3 setae and 1 tubercle. Endopod 2-

segmented, proximal segment with 1 long seta, distal segment with 2 subterminal and 4 terminal setae, stepped.

Coxal and basal endites of maxilla (Fig. 9G) bilobed, with 6, 5 setae on proximal lobes and 4, 4 setae on distal lobes re-

Table 2. Differences between the first zoeal stages of *Rhabdonotus pictus* A. Milne Edwards, 1879, *Harrovia longipes* Lanchester, 1900 (fide Lim & Ng, 1988) *H. albolineata* Adams & White, 1849 (fide Chia *et al.*, 1993), *Echinoecus pentagonus* Rathbun, 1894 (fide Van Dover *et al.*, 1986) and *Zebrida adamsi* White, 1847 (fide Mori *et al.*, 1991).

	<i>Rhabdonotus pictus</i>	<i>Harrovia longipes</i>	<i>Harrovia albolineata</i>	<i>Echinoecus pentagonus</i>	<i>Zebrida adamsi</i>
Carapace	Regions around lateral and dorsal spines heavily tuberculated, with scattered short setae, anterolateral margin lined with numerous sharp denticles	Regions around lateral and dorsal spines finely tuberculated, with scattered setae	Regions around lateral and dorsal spines finely tuberculated, with scattered setae	All regions smooth	All regions smooth
Antennule	4 aesthetascs, 2 long, 2 short with 2 terminal setae	4 aesthetascs, 2 long, 2 short	4 aesthetascs, 2 long, 2 short	3 aesthetascs, with 2 terminal setae	3 aesthetascs, with 1-3 terminal setae
Maxillule:	7 setae	7 setae	8 setae	7 setae	7 setae
Coxa					
Maxilla:					
Setal formula (distal-proximal) of					
Basial	4, 5	4, 4	4, 5	4, 5	4, 5
Coxa	4, 6	4, 5	6, 2	4, 5	4, 6
Second maxilliped:					
Setal formula (proximal-distal) of					
endopod	1, 1, 6	1, 1, 6	1, 1, 5	1, 1, 6	1, 1, 6
Abdomen:					
Posterolateral process	Somites 3-5 sharp	Somites 3, 4 sharp	Somites 3-5 sharp	Somites 3-5 sharp	Somites 3-5 sharp

spectively. Endopod bilobed, with 3 setae on proximal lobe, setae on distal lobe stepped, in the arrangement of: 3, 2; outer margin with fringe of fine hairs. Scaphognathite with 4 stout, plumose marginal setae; tip strongly tapered, plumose.

Coxa of first maxilliped (Fig. 9H) bare, basis with 10 setae (2, 2, 3, 3, proximal to distal). Endopod five-segmented, setation from proximal to distal segment 3, 2, 1, 2, 5. Exopod constricted medially, appearing 2-segmented, with 4 stout, setose terminal natatory setae.

Coxa of second maxilliped (Fig. 9I) bare, basis with 4 setae (1, 1, 1, 1).

Endopod 3-segmented, setation from proximal to distal segment 1, 1, 6. Exopod constricted medially, with 4 stout, setose terminal setae. Third maxilliped absent.

Remarks. — The first zoeal stage of *Rhabdonotus pictus* is compared to those described for *Harrovia longipes* Lanchester, 1900 (fide Lim & Ng, 1988), *H. albolineata* Adams & White, 1849 (fide Chia *et al.*, 1993), *Echinoecus pentagonus* (A. Milne Edwards, 1879) (fide Van Dover *et al.*, 1986) and *Zebrida adamsi* White, 1847 (fide Mori *et al.*, 1991). The differences (Table 1) observed are not significant at the species or genus level. The similarities observed are: 1) in the gen-

eral shape of carapace, abdomen and antennule; 2) antenna's subequal spinous protopodal process and exopod; 3) setae arrangement on the endopod segment of maxillule in the groups of 4, 2, 1 and on basal segment 5; 4) setae arrangement on the endopod of maxilla in the groups of 5, 3, and the scaphognathite bearing 4 plumose setae; 5) first maxilliped (see description above) is entirely the same for all species; and 6) setae arrangement on the basis of second maxilliped being 1, 1, 1, 1. The many similarities support the current contention that these genera belong to one monophyletic taxon (i.e. Eumedonidae).

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