Note on the first phyllosoma stages of *Palinurellus wieneckii* (de Man, 1881) and *Puerulus aff. angulatus* (Bate, 1888) (Crustacea, Decapoda, Synaxidae and Palinuridae) from New Caledonia

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We describe the first stage phyllosoma (‘phyllamphion’) larvae of two species taken from the plankton off New Caledonia and which we refer to as *Palinurellus wieneckii* (de Man, 1881) and *Puerulus aff. angulatus* (Bate, 1888).

**INTRODUCTION**

Among the phyllosomata, the larvae of decapods of the superfamily Palinuroidea, those of the genera *Palinurellus* (Synaxidae) and *Puerulus* (Palinuridae) are peculiar and have been referred to as ‘phyllamphion larvae’ (Sims, 1966; Johnson, 1968, 1971; Sekiguchi and Saisho, 1994). As they develop, their cephalic shield covers first the thorax and then the abdomen (Santucci, 1927; Belloc, 1959).

According to Holthuis, there are four species of *Puerulus*, all living in the Indo-West Pacific region, whereas *Palinurellus* is represented by one species in the Indo-West Pacific and another in the Atlantic Ocean (Holthuis, 1991). Adult and larval *Palinurellus wieneckii* (de Man, 1881) and *Puerulus angulatus* (Bate, 1888) have been recorded around and near New Caledonia (Michel, 1970, 1971; Richer de Forges and Laboute, 1995), but *P. angulatus* may in fact be a complex formed by three species. Adults of *Puerulus* trawled around New Caledonia are currently being studied by Professor Chan at the Museum of Taiwan and it appears that what has been known as *P. angulatus* can be divided into three species separated by ‘the number of gastric teeth on the median keel behind the cervical groove of the carapace, and the color of antennal flagella and lateral carapace’ (Chan, personal communication).

Between 1999 and 2000, plankton sampling was carried out in the south-west of New Caledonia to enhance the laboratory’s phyllosomata collection. The plankton net (mouth area 2 m²; mesh size 500 μm) was hauled at night obliquely from 60 m to the surface near the barrier reef. In this note we describe two first stage larvae obtained during this sampling, the first being attributed to *Palinurellus wieneckii* and the second, because the characters separating the adults are not visible on the larvae, to *Puerulus aff. angulatus*.

**RESULTS**

The specimens have been deposited at the Museum of New Zealand Te Papa Tongarewa.

**Description of first stage larva of *Palinurellus wieneckii* (de Man, 1881) (Figure 1)**

This phyllosoma was collected above the outer slope of the Great Aboré reef (22°23’S; 175°14’W) at 20:30 LMT on 5 April 2000.

Total length (TL), from the anterior margin of the cephalic shield between the eyes to the posterior tip of the abdomen: 2.25 mm; antennule length (A1L): 0.75 mm; antennal length (A2L): 0.75 mm; eye length (EL): 0.46 mm; cephalic shield length (CL): 1.20 mm; cephalic shield width (CW): 1.21 mm; thorax length (ThL): 0.13 mm; thorax width (TW): 0.60 mm.
Rostrum not present. Eyestalk unsegmented. Cephalic shield is pear shaped. Antennule (A1) unsegmented, terminating in three long terminal setae and a short spine at outer distal angle; a centripetal strong seta at submedian position where the future inner ramus will appear. Antenna (A2) unsegmented and biramous, inner ramus terminating in a long, strong spine surrounded by three shorter ones, and two spines in submedian position (one centrifugal and one centripetal); outer ramus (=2/3 length of inner ramus) terminating in two spines forming a fork; basal antennal gland protruding beyond the antennal margins. Anterior endite of first maxilla (Mx1) bearing a palp with two terminal setae. Second maxilla (Mx2) consisting of an elongated basal segment with three anterior spines, and a smaller apical article terminating in five plumose setae. The first maxilliped (Mxp1) is bud-like, terminating in two fine setae. The second maxilliped (Mxp2) bearing on the first article a centripetal spine in sub-proximal position and a centrifugal spine on the second article. The third maxilliped (Mxp3) with exopod terminating in seven pairs of plumose setae. First pereiopod (P1) and second pereiopod (P2) biramous, with setose (eight pairs) exopod. Third pereiopod (P3) with only a small exopod bud. Fourth pereiopod (P4) bud visible. Mxp3 and P1–3 with ventral coxal spine (with an accessory seta) but without

Fig. 1. Palinurellus wienekii (de Man, 1881), stage I phyllosoma. (a) Ventral surface; (b) antennule and antenna; (c) mouthparts; (d) abdomen. Vertical scale = 1 mm; horizontal scales = 0.2 mm.
subexopodal spine. Dactyls of Mxp3 and P1–3 are short. Abdomen parallel-sided, terminating on each side in a posterolateral spine with three basal setae. Telson not differentiated in this stage.

Description of first stage larva of *Puerulus aff. angulatus* (Bate, 1888) (Figure 2)

This phyllosoma was collected in the Dumbea Passage in the barrier reef (22°21.3'S; 175°14.7'W) at 19:30 LMT on 29 November 2000.

TL: 2.87 mm; A1L: 0.68; A2L: 0.89 mm; EL: 0.88 mm; CL: 1.80 mm; CW: 1.92 mm; TW: 0.014 mm; ThL: 0.46 mm.

Rostrum not present. Eyestalk unsegmented. Cephalic shield rounded. A1 unsegmented, terminating in three fine terminal setae with a short spine at outer distal angle; a centripetal fine seta at sub-median position where the future inner ramus will appear. A2 unsegmented but biramous with a small, pointed, outer process; inner ramus with two spines in sub-distal position, two spines and one seta in outer distal angle, and a long, strong spine in inner distal angle. Basal antennal gland protruding beyond the antennal margins. Anterior endite of Mx1 bearing a well-developed palp with two terminal setae. Mx2 consisting of an elongated basal segment with two anterior spines, and a smaller apical article terminating by five plumose setae.
Mxp₃ bud-like, terminating in two fine setae; Mxp₄ bears on first article a centripetal spine in sub-proximal position and a centrifugal spine on the second article. Mxp₃ with exopod bearing six pairs of plumose setae. P₁₋₂ biramous, with setose (seven pairs) exopod. P₃ with a non-setose exopod. P₄ bud visible. Mxp₃ and P₁₋₃ with ventral coxal spine (with an accessory seta) but without subexopodal spine. Dactyls of Mxp₃ and P₁₋₃ are short. Abdomen parallel-sided, terminating on each side in a posterolateral spine with three basal setae. Telson not differentiated in this stage.

**DISCUSSION**

The first stage phyllosoma of *Palinurellus wieneckii* was described by Michel (Michel, 1971) from plankton collections near New Caledonia, but some anatomical details were insufficiently illustrated, something we have attempted to rectify here. Moreover, the first stage phyllosomata caught in the Laccadive Seas by Prasad and Tampi (Prasad and Tampi, 1959), initially described as *Panulirus* sp. VI but in a following article (Prasad and Tampi, 1966) referred to as *Puerulus sewelli* Ramadan, 1938 because of morphological similarities with embryos obtained from a berried female of this species, seem in fact to belong to *P. wieneckii*. Mohamed et al. described the first stage of *Puerulus sewelli* hatched in aquaria from berried females and confirmed that the larvae of Prasad and Tampi were definitely not this species (Mohamed et al., 1971). The long exopod of the antennae and the cephalic shield being pear shaped, and *P. wieneckii* being the only species of this genus hitherto recorded in the Indian Ocean, strongly suggest that the larvae of Prasad and Tampi are those of *P. wieneckii*.

Whereas the adult of *P. wieneckii* has been recorded in New Caledonian waters by only one mouch (Richer de Forges and Laboute, 1995), adults are known from adjoining areas (Holthuis, 1991) and its larvae have been caught during two of the three zooplankton sampling campaigns around New Caledonia (Michel, 1971; Coutures, 2000; present study). This implies that adults could be more frequent around New Caledonia, but records are limited by their cryptic habitat. We are convinced that *P. wieneckii* is more frequent around New Caledonia, but some anatomical results from New Caledonia, despite significant sampling effort during numerous MUSORSTOM campaigns (Richer de Forges, 1990; Richer de Forges et al., 2000).

Based on the literature (Santucci, 1927; Bellocc, 1959; Johnson, 1968, 1971; Mohamed et al., 1971; Sekiguchi and Saisho, 1994; Sekiguchi et al., 1996), our second larva seems to belong to *Puerulus* on account of (i) a cephalic shield beginning to cover the thorax, and relatively rounded; (ii) a process at the outer border of the antenna; and (iii) a well-developed anterior palp on Mxp₁. We attribute this larva to *P. angulatus* because although Holthuis (Holthuis, 1991) lists two species in the western Pacific, *P. angulatus* and *P. velutinus*, only referred to as *P. angulatus* has been recorded from New Caledonian and nearby waters.

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**REFERENCES**


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