

Short communication

First zoea of commensal crab *Porcellanella triloba* White, 1851 (Crustacea, Decapoda, Porcellanidae) reared under laboratory conditions

V S Kakati^{a,*}, K Vinod^b & P D Bandekar^c

^aBangalore, Karnataka – 560 067, India

^bMandapam Research Centre of CMFRI, Mandapam Camp,
Tamil Nadu – 623 520, India

^cDepartment of Studies in Marine Biology, KUPG Centre,
Karwar, Uttara Kannada, Karnataka – 581 303, India

*[E-mail: vskakati@gmail.com]

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First zoea of the porcelain crab *Porcellanella triloba* White, 1851, which is commensal with the sea pen *Pteroeides* sp., was hatched from a berried crab, collected from Mandapam in the Gulf of Mannar waters. The ambient temperature maintained was 30°C and salinity was 34 ppt. The zoea is compared with the other known zoeae of the genera *Polonyx* and *Porcellana* species.

[Keywords: Commensal crab, First zoea, Gulf of Mannar, *Porcellana* group, *Porcellanella triloba*]

Introduction

The genus *Porcellanella* White, 1851 (family Porcellanidae) includes only two species, namely *P. haigae* Sankarankutty, 1963 and *P. triloba* White, 1851 (= *P. picta* Stimpson, 1858)^{1,2}. In Indian waters, Sankarankutty^{3,4} originally described *P. haigae* from Mandapam. Further, Jones⁵ recorded *P. triloba* on the sea pen *Pteroeides esperi* Herklots, from the Gulf of Mannar, and Ramanandan⁶ subsequently reported *P. picta* (= *P. triloba*) from the Gujarat coast. Later, Kanagasabapathy *et al.*⁷ also recorded this species from the southeast coast of India.

The zoeas of porcelain crabs are morphologically unique among the decapod crustacean larvae, in having an extremely elongated rostral spine and a closely appressed pair of long posterior spines. Although the family Porcellanidae now comprises about 283 species worldwide, the full larval development has been described only for 52 species, while part of the larval cycle has been described for 45 species⁸. Since no descriptions of larvae in the genus *Porcellanella* are available, the current study describes here the first stage zoea of *P. triloba* that

hatched in the laboratory the very next day of the collection of the berried female crab.

Materials and Methods

In March 2010, a sea pen *Pteroeides* sp., with porcellanid crabs was found rolling along with the waves in the low tide zone during receding tide at Mandapam coast (Fig. 1) (9°16'36.9" N; 79°09'16.2" E) in the Gulf of Mannar waters. A close examination of the sea pen yielded male and berried female specimens of *P. triloba* (Fig. 2).

The female crab hatched nearly 150 larvae (first-stage zoeae) on the very night of the day of collection. The larval development could not be achieved further as the larvae with their long rostral spines (Fig. 3) got entangled overnight among themselves in the hatching container, leading to their mortality. The ambient rearing temperature was maintained at 30°C, and the salinity of the seawater in the holding container was kept at 34 ppt. The carapace spines and Rostral Spine Length (RSL) (its base to the tip) were measured with the help of a stage micrometer. The posterior carapace spines length (PSL) is measured from their basal fork angle to their tip. The carapace length of the larvae is measured from the base of the rostral spine to the base of the posterior opressed spines. The larvae were dissected using entomological needles on a stereo binocular dissecting microscope and the appendages were examined and sketched using a Celestron digital microscope. The resultant photographs were transferred to a computer for line drawings.

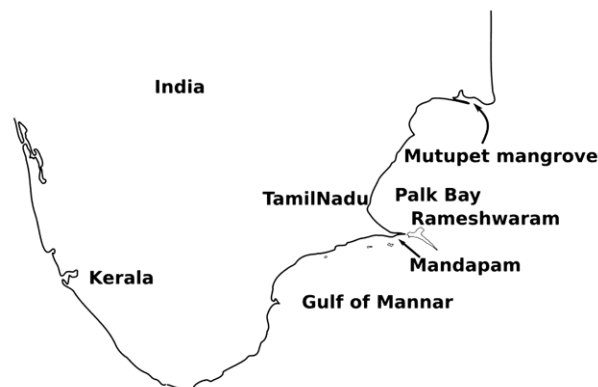


Fig. 1 — Collection site map of *Pteroeides* sp. and *Porcellanella triloba* White, 1852 at Mandapam (9°16'36.9" N; 79°09'16.2" E)

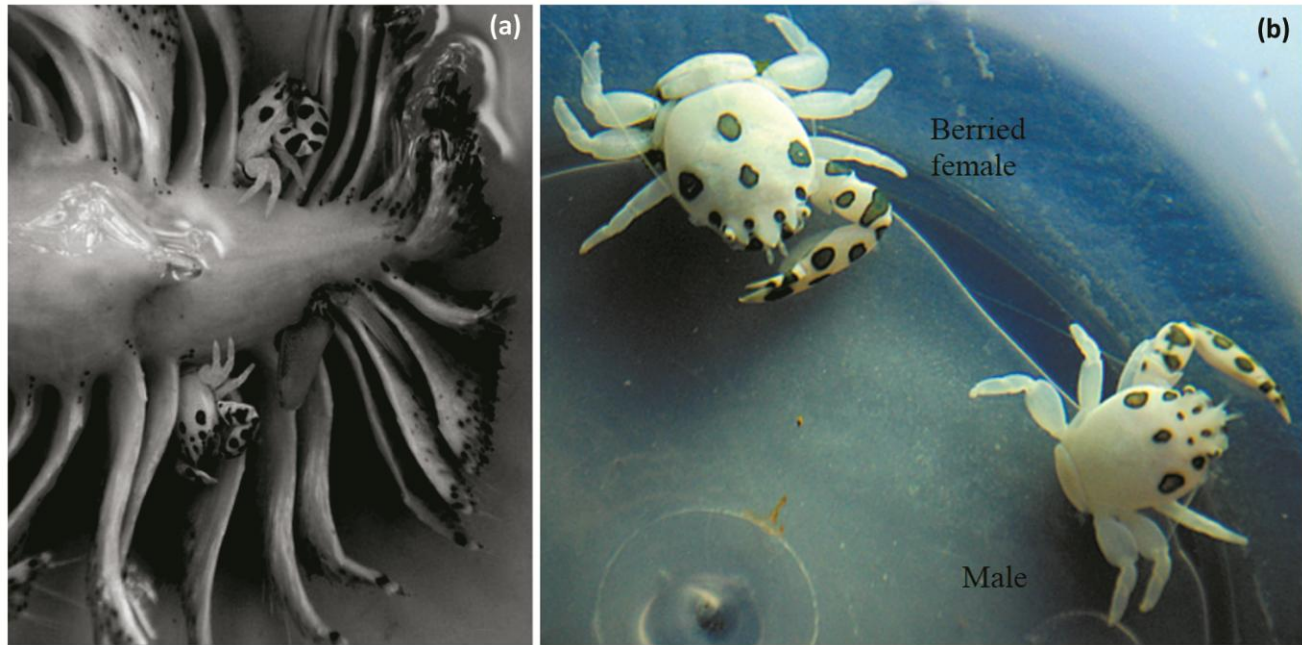


Fig. 2 — a) Sea pen *Pteroeides* sp. with *Porcellanella triloba* White, 1852, and b) Ovigerous female of *P. triloba*

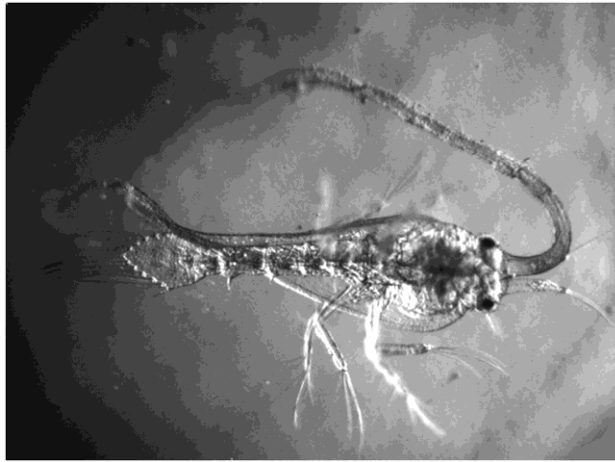


Fig 3 — First stage zoea of *Porcellanella triloba* White, 1852, hatched in the laboratory of Mandapam Regional Centre of CMFRI during March 2010

Results

First zoea

Carapace: Typically porcellanid form, its length 0.82 mm. Rostral spine long, about 3.52 times carapace length, dorsally curved as illustrated (Fig. 4), armed with hair-like minute spinules entirely. Posterior carapace spines about 1.06 times carapace length. Eyes sessile (Fig. 4a, b). Antennule (Fig. 4c): Simple rod, tapering distally, with three aesthetascs, and one large and two small setae terminally. Antenna (Fig. 5b): Exopodite slender rod, longer than endopodite, with a single seta on the distal 1/4 tip.

Endopodite thicker than exopodite, with one or two minute setae terminally. Mandibles (Fig. 4d): Asymmetrical dentate processes; right with large tooth and left with molar process; no palp. Maxillule (Fig. 4e): Coxal and basial endites, each with 8 plumocuspidae setae, respectively; endopodite two-segmented, with three terminal plumose setae. Maxilla (Fig. 4f): Coxal and basial endites with five (or 6) and six plumocuspidae setae, respectively; endopodite unsegmented, with four terminal setae and four (2+2) subterminal setae; scaphognathite with two terminal and one apical long plumose seta. Maxilliped 1 (Fig. 5c): Coxopodite with one seta on ventral margin; basipodite with 2, 1, 2, 2 (total 7) ventral setae; endopodite four-segmented, with 1, 1, 2 and 6 terminal setae from proximal to distal end, exopodite two-segmented, with 4 terminal natatory setae. Maxilliped 2 (Fig. 5d): Coxopodite naked; basipodite with one median and 2 terminal setae on ventral margin; endopodite four-segmented, with 2, 2, 2 setae on proximal three segments and 2 setae proximally and 2 setae terminally on 4th segment; exopodite two-segmented, with four terminal natatory setae on distal segment. Maxilliped 3 (Fig. 4e): Small naked bud. Pereopods are simple buds. Abdomen (Fig. 5a): Five somites; 4th and 5th somites, each with a pair of postero-lateral spines. Pleopods: Not yet developed. Telson (Fig. 4g): Posterior margin with five pairs of long plumose setae as illustrated (only outer and inner ones are shown with secondary setae on them), central

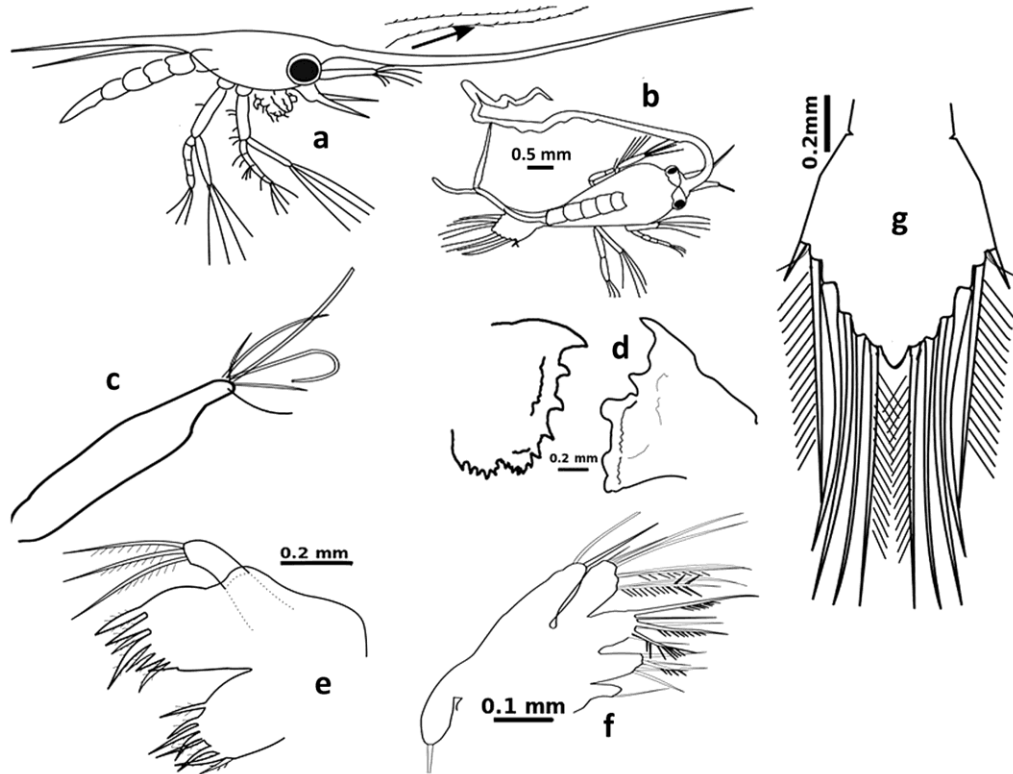


Fig. 4 — *Porcellanella triloba* White, 1852, first stage zoea: a) Lateral view of entire specimen (not to scale, diagrammatic), b) Dorsal view of entire specimen (normal first stage zoea with coiled rostral spine, zoea separated from the entangled bundle of larval group), c) Antennule, d) Mandibles, e) Maxillule, f) Maxilla, and g) Telson

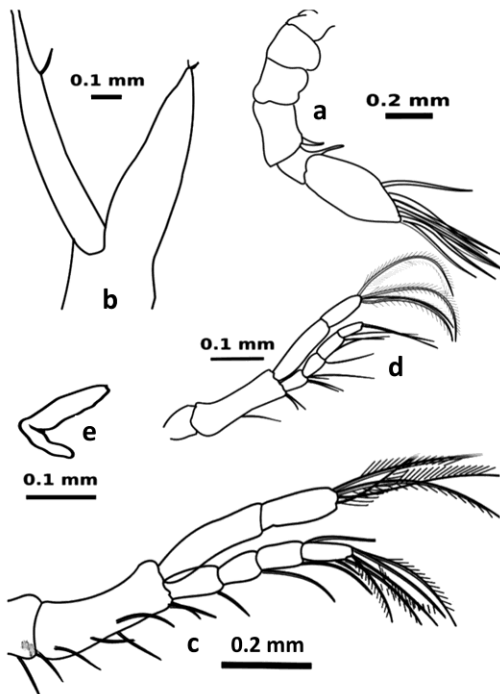


Fig. 5 — *Porcellanella triloba* White, 1852, first stage zoea: a) Abdomen lateral view, b) Antenna, c) First maxilliped, d) Second maxilliped, and e) Third maxilliped (Bud)

prominence rounded, without seta; a small seta located next to each distinct lateral telson spine (in its angle).

Discussion

Lebour⁹ suggested two groups of porcellanid larvae, mainly based on the characteristics of the telson of zoeas, the *Porcellana* group and the *Petrolisthes* group. In the *Porcellana* group, the fifth long plumose seta is situated away from the central prominence on the posterior margin of the telson, whereas in the *Petrolisthes* group, it is on the central prominence. The zoeae of both genera (*Porcellana* and *Petrolisthes*) share common characteristics such as the antennal exopod is usually only with a single seta, the endopod of the maxillule with three setae, the endopod of the maxilla usually with nine setae, the basis of the first maxilliped, usually with 1+2+2+3 ventral setae from the proximal to distal end, the basis of the second maxilliped, usually with 1+2 ventral setae, but the central prominence on the posterior margin of the telson bearing setae in *Petrolisthes* only and not in *Porcellana*. Among the larvae of decapod crustaceans, the zoeae of porcelain crabs are physically distinct due to their highly elongated

rostral spine and strongly apressed pair of long posterior spines. Despite the fact that there are currently 283 species in the family Porcellanidae worldwide, only 52 of those species have had their entire larval lifecycle fully published, and 45 species have only had portions of their larval cycle recorded⁸.

Lee *et al.*¹⁰ separated the first zoeae of nine Korean porcellanid species into three groups: two *Pachycheles* species, which lack setae, are in the first group; three *Petrolisthes* species, which have two or three setae, are in the second group; and the remaining *Enosteoides*, *Pisidia*, *Polyonyx* and *Porcellana* species, which have only one seta, are in the third group. Because *P. triloba* has only one short seta on its antennal exopod, it now falls into the third group.

P. triloba's first zoea is morphologically distinctive in having eight setae on the maxilla's endopod, seven setae based on the first maxilliped, just one seta on the antenna's exopod, and delicately plumose posterior processes on the telson. Future research on the larvae of *P. haigae* Sankarankutty, 1963, may corroborate these features, even though they may be of generic interest. Maxillary endopodite of *Porcellana triloba* has eight plumose setae, which is also present in the zoea of *P. hendersoni* as reported by Shanoy & Sankolli¹¹. Presence of seven setae on the basis of the first maxilliped in *P. triloba* is also observed in the zoea of *Polyonyx loimicola* as described by Shenoy & Sankolli¹¹. The basis of the second maxilliped in the known zoeae of *Polyonyx*, *Porcellana* and *Porcellanella* has 1+2 ventral setae, except for *P. loimicola* (2+2) and *P. gibbesi* (1 or 2 + 3). All the described zoeae of *Polyonyx*, *Porcellana* and *Porcellanella* has a central prominence on the posterior margin of the telson and thus belong to the *Porcellana* group, as suggested by Lebour⁹.

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Conflict of Interest

None of the writers have any competing interests.

Ethical Statement

The rights, welfare, and dignity of the participants were respected during the course of this study. The responsibility for this study rests with the primary author.

Author Contributions

The first author (VSK) dissected the zoea and raised the larvae. The second (KV) and third (PDB) authors contributed to the production of the drawings and photographs and wrote the first and later revisions of the text. All of the authors reviewed and modified the manuscript via email because they are spread across three distinct places.

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