



## Short Communication

### Report on commensal shrimp *Ensiger custos* (Forskål, 1775) (Caridea: Palaemonidae) associated with bivalve *Pinna bicolor* Gmelin, 1791 in Palk Bay, India

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For the first time, a *Pinna* shell associated shrimp *Ensiger custos* was documented from the shallow seagrass beds of Palk Bay, India. The shrimp specimen was identified based on the morphological characteristics such as chela of the first pereiopod cannulate, absence of distal teeth on the rostrum, antennal spine minute and dactylus of the second pereiopod with single large triangular tooth in the proximal half. The *E. custos* was found to be closely related to *E. custoides*. In the present study, *E. custos* shrimp was found associated with *Pinna bicolor* Gmelin 1971.

**[Keywords:** Biogeography, Bivalve, Caridean shrimp, India, Symbiotic]

#### Introduction

In a coral reef ecosystem, commensal palaemonid shrimps have been known to possess remarkable adaptations in terms of morphology, host diversity, and sexual biology<sup>1,2</sup>. Palaemonids commonly associate with various marine organisms such as sponges, sea anemones, corals, bivalves, and echinoderms, representing over 70 % of commensal decapod crustacean diversity in coral reef ecosystems, including associations with both vertebrates and invertebrates<sup>3-9</sup>. In India, commensal shrimp diversity has gained attention in recent years<sup>5-8</sup>. So far, more than 215 species of caridean shrimps have been hitherto recorded from Indian waters<sup>6,7</sup>.

The genus *Ensiger* Borradaile, 1915, is mainly associated with bivalves, including giant clams<sup>10</sup>. To date, only two species have been described under the genus *Ensiger*. Both have been documented in India, especially from the Andaman and Nicobar Islands and the Gulf of Mannar. *Ensiger custos* (Forskål, 1775) was from the Andaman and Nicobar Islands<sup>11-13</sup>. Previously,

*Ensiger custoides* (Bruce, 1977) and *E. custos* were under the genus *Anchistus* Borradaile, 1898. However, a recent study by De Gier & Franssen<sup>14</sup> has resurrected both the species under the genus *Ensiger* based on extensive morphological and molecular phylogeny studies.

#### Materials and Methods

In this study, bivalve-associated shrimps were collected during routine biodiversity survey in the Olaikuda region, Palk Bay. Olaikuda village in Palk Bay, Rameswaram, is renowned for its vibrant fishing culture and diverse marine ecosystems, attracting tourists for snorkeling, SCUBA diving, and adventure sports in its shallow waters, rich with coral reefs and marine life. Altogether, seven individuals of bivalve *Pinna bicolor* Gmelin, 1791<sup>(ref. 15)</sup> were collected by hand picking from the seagrass beds. With the help of forceps, the valves were slightly opened without causing any damage to the shell and examined for the presence of commensal shrimps. Out of seven individuals of *P. bicolor*, only one held a pair of symbiotic shrimps. Upon collection, the shell was transported to the laboratory at Sathyabama Marine Research Station, Rameswaram. The shrimps were subsequently identified as *Ensiger custos* (Forskål, 1775) based on the morphological characters. Photographs of the bivalve shell and the pair of shrimps were taken using a Canon G16 Digital camera (Fig. 1a-d). The shrimps were transported to the Centre for Climate Change Studies, Sathyabama Institute of Science and Technology, Chennai, for microscopic examination. The female shrimp were dissected under an SMZ25 microscope fitted with a DSFi3 camera (Nikon, Japan), and the images were processed using NIS Elements software. The size measurements were made in mm with an accuracy of 0.01 mm. The Carapace Length (CL in mm) was measured from the post-orbital angle to the posterior end of the carapace. The collected specimens were deposited in the Zoological Collections of the Marine Biological Research Centre, Chennai, as voucher material.

#### Results

##### Systematics

Order: Decapoda Latreille, 1802

Infraorder: Caridea Dana, 1852

Family: Palaemonidae Rafinesque, 1815

Genus: *Ensiger* Borradaile, 1915

*Ensiger custos* (Forskål, 1775)<sup>16</sup> (Fig. 1c, d; Fig. 2; and Fig. 3)

#### Material examined

Two individuals (one male – CL 6.71 mm, and one ovigerous female – CL 8.9 mm) Olaikuda, Rameswaram, 9°17'44" N; 79°19'42" E, depth 1–2 m on bivalve *Pinna bicolor*, 15 September 2021, ZSI/MBRC/D1-693.

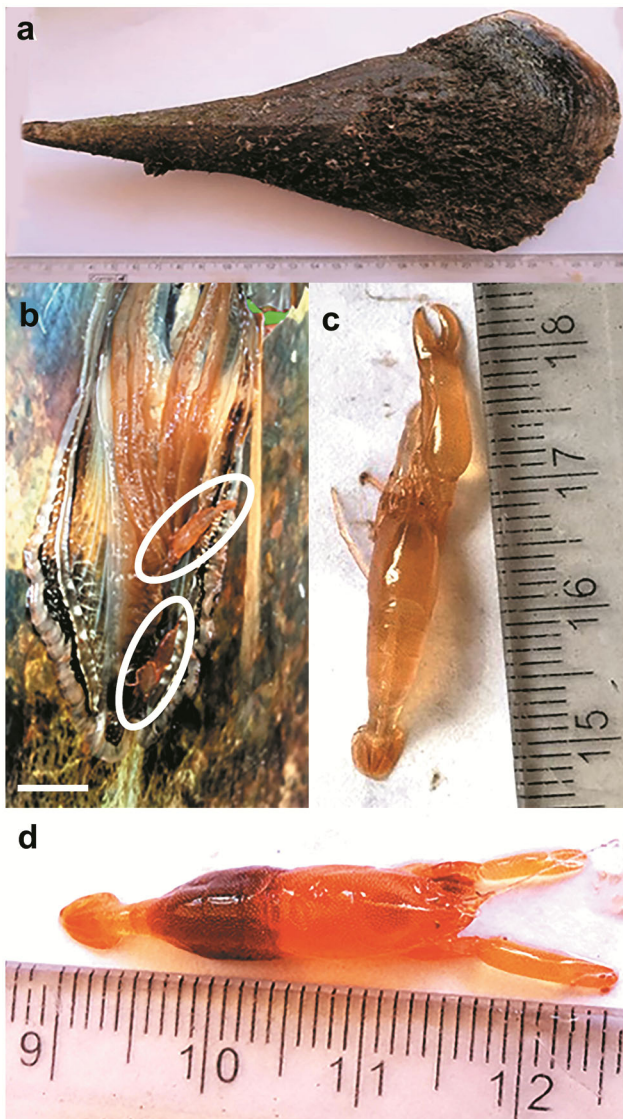


Fig. 1 — a) Bivalve mollusk *Pinna bicolor* Gmelin, 1791 collected from the Olaikuda region, Rameswaram; b) Inner view of shell showing the presence of shrimps (white circles); c) *Ensiger custos* (Forskål) male (dorsal view); and d) *E. custos*, female (dorsal view). Scale bar: b–10 mm

#### Species description

Rostrum broad proximally and rounded; compressed distally without denticles; 2.46 mm in length, not reaching distal margin of second antennular segment (Fig. 2a–c); ventral margin generally convex, midrib on the rostrum feebly developed and continuous posteriorly up to orbital margin. Carapace smooth, markedly swollen, 3.6 times more than rostral length. Antero-lateral angle rounded. The presence of small antennal spine on anterior margin. Scaphocerite overreaching third segment of antennular peduncle, lateral borders convex bearing a disto-lateral tooth (Fig. 2d). Antennular peduncle first segment broad with acute stylocerite, exceeding the distal region of third segment; lateral border convex with one small slender acute tooth laterally (Fig. 2e). Second, third segments subequal; upper part of flagellum with two rami fused

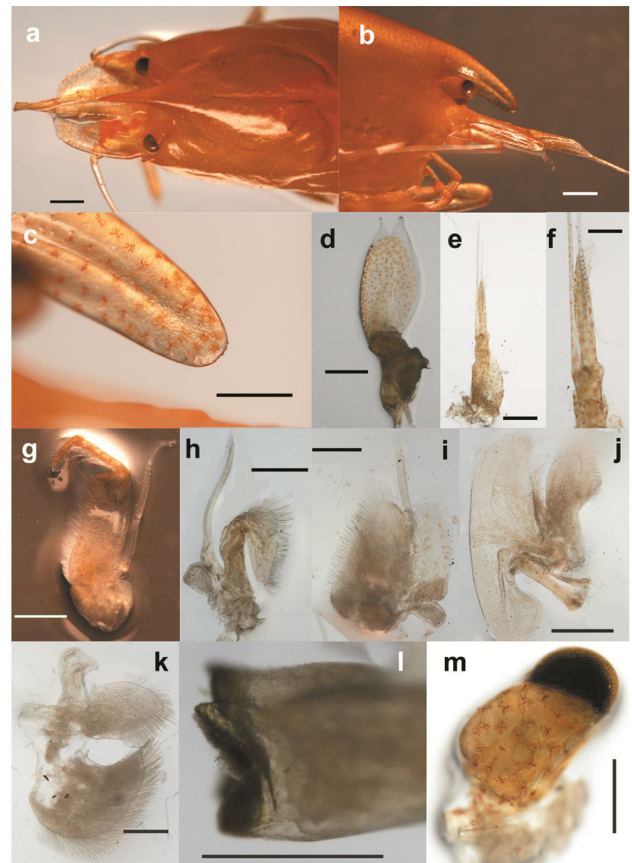


Fig 2 — *Ensiger custos* (Forskål, 1775) – Female: a) Dorsal view of rostrum; b) Lateral view of carapace and rostrum; c) Magnified view of rostrum; d) Scaphocerite; e) Antennular peduncle; f) Closer view of rami; g) Third maxilliped; h) Second maxilliped; i) First maxilliped; j) Maxilla; k) Maxillula; l) Molar process of mandible; and m) Eye. Scale bars: a, b, d, e, g-i, k-l mm; c, f, j, l, m – 0.5 mm



proximally to form six segments; short ramus has eight segments (Fig. 2f).

Antepenultimate segment of third maxilliped about 2.5 times the length of penultimate segment and 3 times to length of terminal segment; lateral borders densely setose; exopod well-developed, exceeds antepenultimate segment (Fig. 2g). Second maxilliped with well-developed endopod, sub-rectangular epipod (Fig. 2h). First maxilliped median palp subcylindrical, bears setae in terminal region; exopod well developed, epipod bilobed (Fig. 2i). Maxillula broadened on lower region than upper, bordered with dense setae (Fig. 2j). Maxilla bears a single broad endite, bordered with setae; palp well developed, subcylindrical, bear setae on lateral borders (Fig. 2k). Mandible without palp; incisor process with small teeth; molar process robust bearing several short setae (Fig. 2l).

Eyes well-developed, cornea hemispherical; small accessory pigment spot present on cornea eyestalk sub-cylindrical (Fig. 2m).

Abdominal segments 1.5 times longer than carapace; pleura of first five segments rounded ventrally; sixth segment slightly pointed postero-ventrally (Fig. 3a). Telson 1.3 times longer than rostrum, presence of two pairs of acute teeth dorsally; posterior region of telson with 3 pairs of robust terminal spines (Fig. 3b, c).

First pereiopod slender and exceeds length of scaphocerite; fingers short and stout, sub-spatulate; nearly half the length of carpus region, possess dense row of long plumose setae along dactylus border, tufts of setae on anterior end of fingers (Fig. 3d, e). Second pereiopod major robust and subequal; propodus more than 4 times length of carpus; dactylus contains single acute tooth, fixed finger bears five small teeth proximally; fingers distinctly hooked with tuft of setae behind terminal end (Fig. 3f, g). Ambulatory pereiopods three to five similar; dactylus slender, compressed, hooked with distinct unguis; third pereiopod propodus 6 times than length of dactyl; carpus 0.6 times the length of propodus; merus 1.09 times of propodus (Fig. 3h, i). Fourth pereiopod propodus 1.4 times the length of dactyl, 2.7 times the length of carpus, 1.2 times the length of merus. Fifth pereiopod propodus 6.4 times the length of dactyl, 2.1 times the length of carpus, 1.09 times the length of merus.

Color pattern of female pale orange to yellow with white spots spread throughout the body (Fig. 1d). Male pale orange to yellow with reddish or brown spots spread throughout the body (Fig. 1c). In formalin-preserved female specimens, the spots were turned

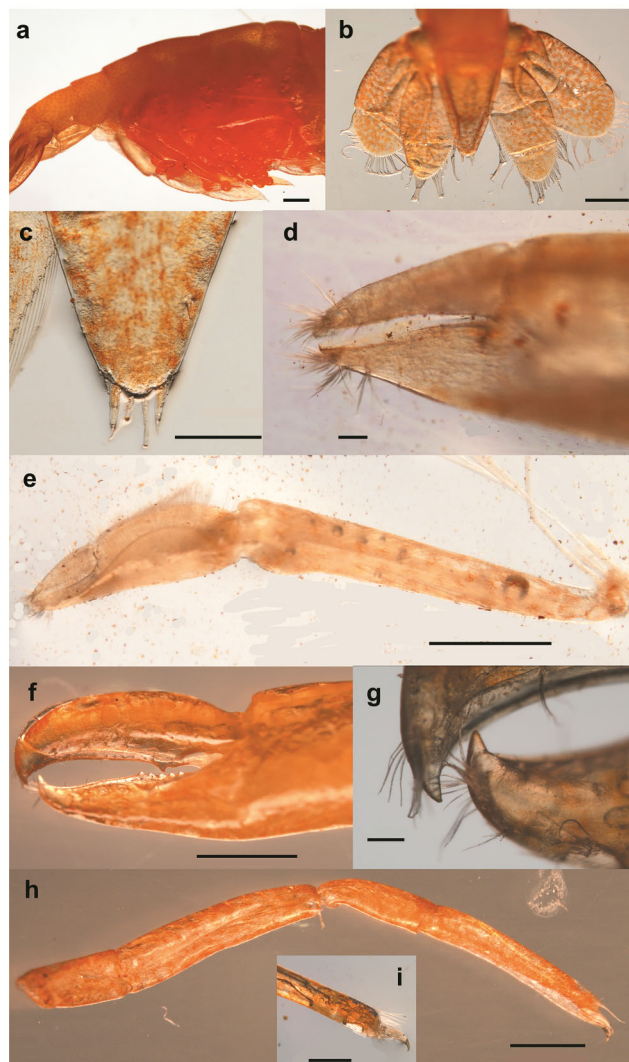


Fig 3 — *Ensiger custos* (Forskål, 1775) – Female: a) Abdominal somites I-VI (lateral view); b) Telson and uropods (dorsal view); c) Telson – terminal spines (dorsal view, magnified); d) Fixed finger and dactyl of first major chela; e) First major chela (right); f) Fixed finger and dactyl of second major chela; g) Pointed tips of second major chela; h) Third pereiopod (lateral view); and i) Dactyl of third pereiopod (lateral view, magnified). Scale bars: a-b, e-f, h-l – 1 mm; c, i – 0.5 mm; d, g – 0.1 mm

orange-red spread throughout the body including scaphocerite, antennular peduncle, some regions of maxillipeds, mouthparts, and eyestalk. Telson and the uropods also bear orange spots throughout.

## Discussion

The present specimen *Ensiger custos* can be easily distinguished with its closest congener, *E. custoides*, with key morphological characters. For instance, the chela of the first pereiopod in *E. custos* is cannulate compared to chela sub-cannulate in *E. custoides*. Rostrum without teeth in *E. custos* compared to rostrum

with minute dorsal and distal spines in *E. custoides*. Likewise, antennal spine minute in *E. custos* compared to well-developed antennal spine in *E. custoides*. Second pair of the pereopods are sub-equal and dactylus with large triangular tooth in proximal half in *E. custos* compared to one to two small teeth on the dactylus proximal half of *E. custoides*<sup>14</sup>.

The present specimen was found associated with the bivalve mollusc *Pinna bicolor* from the shallow seagrass beds of the Olaikuda region, Rameswaram, Palk Bay. The type specimen of *E. custos* from Arabia was found associated with *Atrina vexillum*<sup>17</sup>. The Singapore material was found associated with *Pinna atropurpurea*<sup>17</sup>. Further, *E. custos* is an obligatory associate of large bivalves of genera *Atrina*, *Pinna* and *Pteria*<sup>13,17-18</sup>.

The distribution range of *E. custos* is found throughout the Arabian Gulf and Indo-Pacific: Singapore, Indonesia, Vietnam, Palau, Australia<sup>17</sup>, Japan<sup>2</sup>, China<sup>18</sup> and in India.

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### Conflict of Interest

The authors declare no conflict of interest.

### Ethical Statement

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

### Author Contributions

Both authors (SP & AM) have contributed equally.

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