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Pedunculate Barnacles of the Symbiotic Genus *Octolasmis* (Cirripedia: Thoracica: Poecilasmatidae) from the Northern Gulf of Thailand

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ABSTRACT.–Edible crabs and lobsters (Crustacea), obtained from fishermen and in village markets of a few northern provinces adjoining the Gulf of Thailand, revealed upon examination and dissection the presence of six barnacle species of the genus *Octolalsmis*. Four of these symbiotic barnacle species occupied protective niches, cemented to structures within the gill chambers of the host. Whereas two more exposed species, cemented to the exoskeleton and external mouthparts of the hosts, were protected by robust calcareous plates.

KEY WORDS: *Octolasmis*, Crustacea, Barnacle, Symbiosis, Gulf of Thailand

In the warmer oceans of the world, marine Crustacea of the Order Decapoda are frequently infested with epizoic pedunculate barnacles of the genus *Octolasmis* (Jeffries and Voris, 1996). In the seas adjacent to Singapore, for example, decapods representing 18 families, 38 genera, and 55 species were surveyed as potential hosts of octolasmids. Of these, 27 species representing 9 families were infested with up to 7 *Octolasmis* species each (Jeffries et al., 1982). More recently, decapods from the Gulf of Mexico representing 40 families, 75 genera, and 114 species, were surveyed. Of these, 26 species representing 11 families were infested with up to 4 *Octolasmis* species each (Jeffries and Voris, 2005).

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A number of *Octolasmis* species live in the gill chambers of their hosts cemented to the gill lamellae (Fig. 1) and are often present in large numbers (Voris et al., 2000). Thus they occupy space on the gills normally available for respiration with the result that the host is debilitated and may die (Gannon and Wheatly, 1992). The economic impact of such large infestations on the shellfish industry seems obvious but remains undocumented.

During November and December 2004, some edible species of crabs and lobsters were purchased at village markets along the northern perimeter of the Gulf of Thailand. Upon examination, it was discovered that most species were infested with one or more species of *Octolasmis*.

Body shape and size, the presence or absence of calcareous plates, as well as variations in plate size, shape and disposition, are useful elements in barnacle species

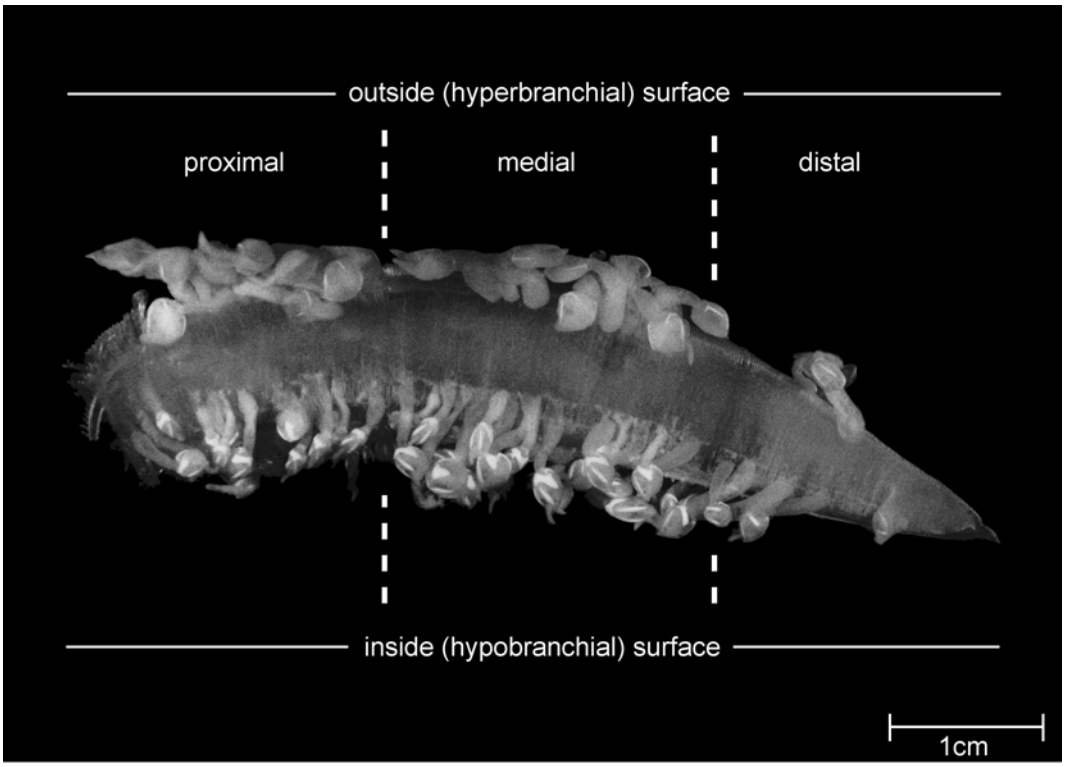

FIGURE 1. Posterior view of gill 5 of the mangrove crab, *Scylla serrata*. *Octolasmis angulata* can be seen to dominate the outside (hyperbranchial) surface whereas *O. cor* dominates the inside (hypobranchial) surface. The proximal, medial, and distal regions of the gill are also shown. (From: Voris, Jeffries and Poovachiranon, 2000)

identification. The most cosmopolitan species of the genus *Octolasmis* is *O. lowei* (Darwin, 1851). It has a muscular peduncle without plates, a fleshy capitulum with 5 calcareous plates embedded in the surface, which support it and protect vital organs such as the feeding apparatus enclosed by it. The calcareous plates include 2 scuta, 2 terga, and 1 carina, which are visible to the unaided eye but are more easily recognized with magnification, using either a hand lens or a dissecting microscope.

In this study the following species of *Octolasmis* were observed on hosts collected from the northern portion of the Gulf of Thailand: *Octolasmis angulata* (Aurivillius, 1894); *Octolasmis cor* (Aurivillius, 1892); *Octolasmis lowei* (Darwin, 1851); *Octolasmis neptuni* (MacDonald, 1869); *Octolasmis tridens* (Aurivillius, 1894); and *Octolasmis warwickii* Gray, 1825 (Fig. 2).

The above mentioned *Octolasmis* species were found on 5 species of crustacean hosts belonging to 3 families. The host families and species were as follows: Menippidae Ortmann, 1893, *Myomenippe granulosa* (A. Milne Edwards, 1867); Portunidae Raffinesque, 1815, *Portunus pelagicus* (Linnaeus, 1758), *Scylla serrata* (Forskål, 1755), and *Thalamita danae* Stimpson, 1858); and Scyllaridae Latreille, 1825, *Thenus orientalis* (Lund, 1793).

Octolasmis angulata, with a mean capitular length of 2.40± 0.34 mm and 3 reduced capitular plates, 2 scuta and a carina, has the second lowest capitular plate coverage (10.5 per cent) among 28 *Octolasmis* species compared

(Voris and Jeffries, 1997). It was described by Aurivillius, 1894 as *Dichelaspis angulata* and observed in the gill chamber of a palinurid from the Java Sea. Daniel (1955) reported *O. angulata* in the gill chambers of species of the families Calappidae, Palinuridae, and Portunidae from the Bay of Bengal, Arabian Sea, Malay Archipelago, and off Madras. In Singapore it was observed in the gill chambers of 15 host species representing 4 families (numbers following family names indicate number of host species infested), Majidae (1), Menippidae (2), Portunidae (8), and Xanthidae (4) (Jeffries et al., 1982). In the current study, *O. angulata* was observed in the gill chambers of 3 host crabs of the families Menippidae (1) and Portunidae (2).

Octolasmis cor, with a mean capitular length of 2.53 ± 0.43 mm and 3 robust capitular

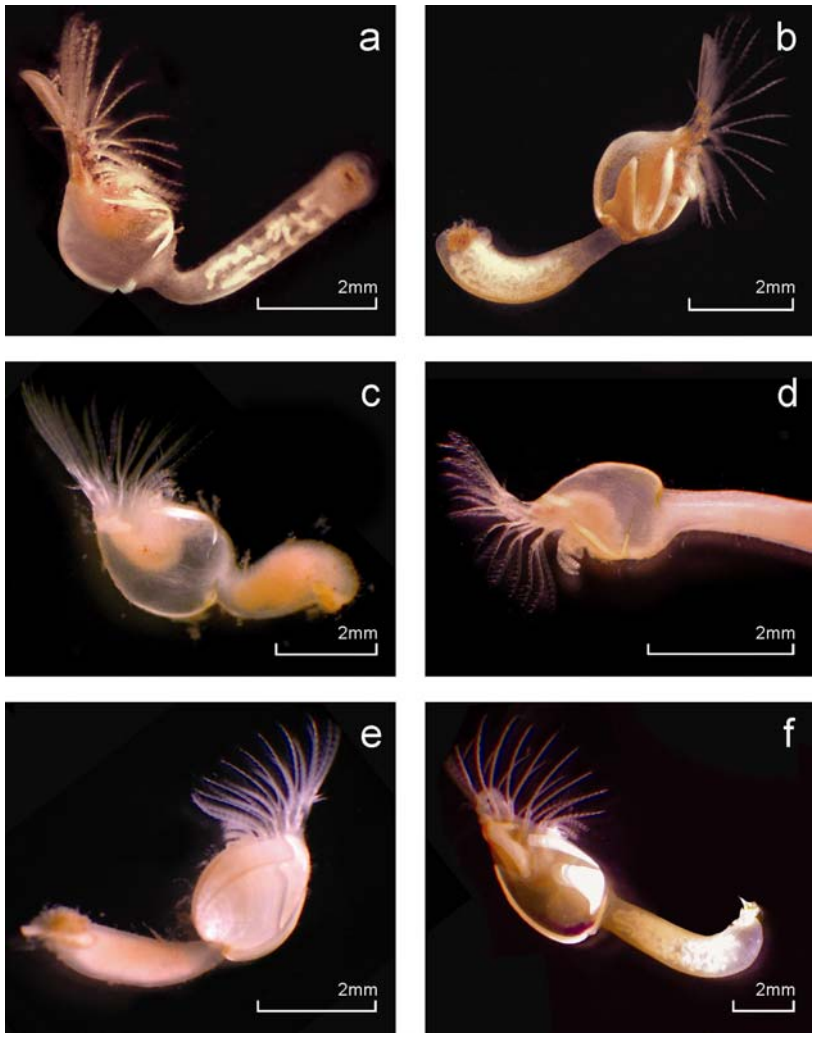

FIGURE 2. A composite of color photographs of 6 live *Octolasmis* species observed on crustacean hosts in the Gulf of Thailand. (a) *Octolasmis angulata*; (b) *O. cor*; (c) *O. lowei*; (d) *O. neptuni*; (e) *O. tridens*; and (f) *O. warwickii*. Photographs (a) and (b) were taken by WBJ, (c)-(f) were taken by HKV. The size bar in each photo represents approximately 2 mm.

plates, 2 scuta, and a carina, has a capitular plate coverage of 27.3 per cent (Voris and Jeffries, 1997). It was described by Aurivillius (1892) as *Dichelaspis cor* on the gills of a decapod from South Africa. Daniel (1955) reported *O. cor* in the gill chambers of a species of Portunidae from the Indian Ocean, the Malay Archipelago and Madras. In Singapore *O. cor* was observed in the gill chambers of 6 crab species, all in the family Portunidae (Jeffries et al., 1982). In the current study it was observed in the gill chambers of 2 crab species of the Portunidae.

***Octolasmis lowei*,** with a mean capitular length of 3.29±0.29mm.and 5 reduced capitular plates, 2 scuta, 2 terga, and a carina, has a capitular plate coverage of 23.6 per cent (Voris and Jeffries, 1997). Darwin (1851) described *Dichelaspis lowei* attached to a brachyourous crab of undisclosed geographic origin. Daniel (1955) reported *O. lowei* from the Indian Ocean, Malay Archipelago, Australia, Japan, Formosa, Atlantic Ocean and off Madras in the gill region of decapod Crustacea of the Palinuridae (1) and Portunidae (1). In Singapore it was observed in the gill chambers of 2 species of the families Portunidae (1) and Scyllaridae (1) (Jeffries et al., 1982). In the Gulf of Mexico *O. lowei* was the most ubiquitous species, being present primarily in the gill chambers of 25 of the 27 host species representing the families: Calappidae (1); Glyphocrangonidae (1); Hepatidae (1); Leucosiidae (1); Menippidae (1); Mithracidae (3); Parthenopidae (1); Pisadae (4); Portunidae (8); Raninidae (1); Scyllaridae (2); and Xanthidae (1) (Jeffries and Voris, 2005). In the current study it was observed in the gill chambers of 2 host species of the Menippidae (1) and the Scyllaridae (1).

Octolasmis neptuni, with a mean capitular length of 1.43±0.25 mm and 5 reduced capitular plates, 2 scuta (whose distal basal arms taper to rod-like chitinous tips), 2 terga, and a carina, has a capitular plate coverage of 16.4 percent (Voris and Jeffries, 1997). It was described as *Dichelaspis neptuni* by MacDonald (1869) from the gills of a portunid from Sydney, Moreton Bay. In Singapore it was observed in the gill chambers of species of the families Menippidae (4) and Scyllaridae (1) (Jeffries et al., 1982). In the current study it was observed in the gill chambers of 2 host species of the Menippidae (1) and the Portunidae (1).

Octolasmis tridens, with a mean capitular length of 2.56±0.25 mm and 5 robust capitular plates, 2 scuta, 2 terga, and a carina, has a capitular plate coverage of 71.0 per cent (Voris and Jeffries, 1997). It was reported from the Gulf of Siam, at Kelantin and Trengannu, and the China Sea by Lanchester (1902) as *Dichelaspis occlusa,* on a species of Scyllaridae. Daniel (1955) observed it in large numbers from the mouth-parts and entrances to gill chambers of cray-fish off the coast of Madras. He listed its distribution as the Pacific Ocean, Philippines, Gulf of Siam, Kelantan and Trengannu, Malay Peninsula, Straits of Malacca, N. Sumatra, and Bay of Bengal. In Singapore it was observed on 10 decapod species of the families Portunidae (8), Scyllaridae (1), and Menippidae (1) (Jeffries et al., 1982). In the current study, it was observed on antennae, external mouthparts, at incurrent openings, and on the base segment of the chelae of 3 decapod species among the Portunidae (2) and Scyllaridae (1).

Octolasmis warwickii, with a mean capitular length of 6.06±0.74 mm and 5 robust capitular plates, 2 scuta, 2 terga, and a carina, has a capitular plate coverage of 43 per cent (Voris and Jeffries, 1997). It was reported from the Gulf of Siam, at Kelantin and Trengannu, and the China Sea by Lanchester (1902) as *Dichelaspis equina* on a species of Portunidae. In Singapore it was observed on the exoskeleton of 17 decapod species in seven families: Dorippidae (1), Leucosiidae (1), Majidae (1), Menippidae (2), Portunidae (10), Scyllaridae (1) and Xanthidae (1) (Jeffries et al., 1982). In the current study it was observed on 2 species

of the families Portunidae (1) and Scyllaridae (1) usually on the dorsal carapace, singly or in small clusters, and sometimes attached to the basal segment of an appendage.

Observations gleaned from examination of potential crustacean hosts of the symbiotic barnacle genus *Octolasmis* obtained from local fishermen in a few northern provinces adjoining the Gulf of Thailand, document that the waters of the Gulf support at least six *Octolasmis* species. This new information, coupled with published reports, suggests that the Gulf of Thailand may be one of the richest habitats on earth in terms of the species diversity within the genus *Octolasmis*.

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