SESARMA JARVISI AND *SESARMA COOKEI*: MONTANE, TERRESTRIAL GRAPSID CRABS IN JAMAICA (DECAPODA)

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There are a number of terrestrial and semi-terrestrial species among the decapod crustaceans (Bliss, 1968; Abele, 1970). Most of these, except for the freshwater Astacidea and Potamidea, are supratidal and return to seawater to reproduce. Grapsid crabs, which are typically supratidal with marine planktonic larvae, have, however, undergone an extensive radiation on the West Indian island of Jamaica (Hartnoll, 1964, 1965, 1971). In addition to typical supratidal species there are six endemic species reported from Jamaica: *Sesarma bidentatum* Benedict, 1892, occurs in freshwater streams and rivers from 130 to 1500 m elevation; *S. verleyi* Rathbun, 1914, occurs in caves; *Metopaulias depressus* Rathbun, 1896, completes its life cycle in bromeliads; *Glyptograpsus jamaicensis* (Benedict, 1892) occurs in coastal streams; the habits of the two remaining species *S. jarvisi* Rathbun, 1914, and *S. cookei* Hartnoll, 1971, were previously unknown although the limited data available suggested that they are terrestrial (Hartnoll, 1971). We visited Jamaica during May 1976, and collected both *S. jarvisi* and *S. cookei*. Both species are terrestrial and occur on Jamaican mountain slopes between 300 and 900 m in elevation in completely dry rock rubble habitats which they share with such groups as onychophorans and amblypygid arachnids. We prefer at present to maintain these species in the genus *Sesarma* (sensu lat.) rather than consider them in the genus *Sesarmoides* Serene & Soh, 1970. Both species will be fully described in a review of the American species of *Sesarma* now in preparation (by L.G.A.).

Sesarma jarvisi is apparently restricted to limestone talus and rock rubble substrates on Jamaica west of the Blue Mountains between 300 and 900 m elevation. We collected specimens near Hollymount in the Mount Diablo Forest on the border between the parishes of St. Ann and St. Catherine and from a site near Mile Gully, Manchester Parish. The crabs were common in both areas under limestone rocks in second growth forest. Two sites were talus slopes (one man-made along a road shoulder), three were old rock cairns piled up during coffee agriculture and one was loose limestone rubble lying in the bed of a surface runoff gully. Leaf litter overlying the rocks was damp but the underlying reddish clay substrate and the limestone rubble were dry. Juveniles, males, females and ovigerous females were represented. The only permanent water was in tanks (the central water-filled portion) of large bromeliads. Examination of more than 100 bromeliads failed to

yield a single specimen although another grapsid crab *Metopaulias depressus* Rathbun, which is known to complete its life cycle in the tanks, was collected. Ovigerous females of *S. jarvisi* (carapace breadth 10-12 mm) with eggs apparently a few days from hatching were collected from the rubble. The time to hatching may be underestimated since the berried females were transported to and maintained at lower altitudes and higher temperatures. Eggs early in development measured about 1 mm in diameter, reaching 1.32 mm immediately prior to hatching. Females carried 7-18 eggs although some may have been lost during handling. From each of seven eggs a large zoea emerged (measuring 3 mm total length and 1.36 mm across the yolk-filled carapace). The mouthparts are poorly developed, consisting of small lobes suggesting that the zoea does not feed; all pereiopods are present and larger than in the related *M. depressus*, a species with modified larval development (Hartnoll, 1964). A search of the area failed to reveal any water, other than that in bromeliads, which could serve as a site for larval development. We could have overlooked zoeae in bromeliads but probably not females. Berried females from which zoeae hatched were maintained in plastic bags with damp leaf litter and 5-10 ml water in the bottom. Unfortunately both females and larvae died within a few hours of hatching before observations on development were possible.

The igneous Blue Mountains bisect Jamaica north to south apparently forming a zoogeographic barrier between *S. jarvisi* and *S. cookei* and preclude the occurrence of bromeliad crabs on the eastern end of Jamaica. No terrestrial *Sesarma* were found in talus or other rock rubble at any altitude in the Blue Mountains. *Sesarma cookei* occurs in the John Crow mountains on the eastern side of Jamaica among limestone rock rubble. Juveniles, males and females were collected among limestone rock rubble above the town of Ecclesdown (Portland Parish) from about 400 to 650 m elevation. No ovigerous females were collected but the ovaries of a mature female (carapace breadth 19 mm) contained about 21 eggs, each with a diameter of approximately 1.25 mm. Collecting sites were shaded and leaf litter was damp but the rock rubble was comparatively dry. One habitat was rocky rubble in and along a surface runoff gully and another was a talus pile at the base of a steep rock wall about 25 m from a dry stream bed. Two specimens in the Science Museum of the Institute of Jamaica were said to have come from leaf litter and a third from a bromeliad (C. B. Lewis, in Hartnoll, 1971). But examination of approximately 80 bromeliads and about 10 hours of vigorously raking leaf litter failed to reveal any crabs at all. *Sesarma cookei* was more difficult to find in seemingly suitable habitats than *S. jarvisi*; in twice the field time we collected many fewer specimens (13 vs ca. 100) of the former. This seems to be due to a wider tolerance for habitat types in *S. jarvisi* which occurred often in edificarion sites (man-made rock talus and cairns in tropical successional forest). In contrast *S. cookei* was collected by us only from natural rock talus in secondary tropical forest that had been selectively logged.

Both *S. jarvisi* and *S. cookei* have well developed pericardial sacs and the following gill formulae: mxp 2 with a reduced podobranch; mxp 3 with a reduced

podobranch and two arthrobranchs; pereiopod 1 with two arthrobranchs; pereiopods 2 and 3 each with a single pleurobranch. The pericardial sacs appear relatively larger and the gill volume relatively smaller than related aquatic species such as *S. reticulatum* Say, an observation consistent with terrestrial adaptations. The female abdomen of both species is not as wide as in species which carry many eggs; ovigerous females carry the abdomen pressed tightly against the sternum, possibly as an adaptation against desiccation of the eggs.

The larvae are large and may have a larval development time at least as fast as *M. depressus* which passes through two zoeal stages in 72 hours and then develops from a megalopa to the first crab stage in six or seven days (Hartnoll, 1964). Thus there are several possible microhabitats in which larval development can occur: (1) larvae hatch and rapidly develop while held by the female; (2) larvae hatch and are deposited in rock rubble where rapid development takes place during periods of extensive rainfall when the rubble is continuously wet; (3) larvae hatch and are deposited in ephemeral streams and are washed downstream in the torrential current; juveniles migrate later up stream; (4) larvae are released and develop in bromeliads; and (5) larvae are deposited in areas where they percolate into the ground water and develop in the extensive limestone karst on Jamaica. We favor the second possibility for the following reason. Females which had apparently just released larvae (pieces of the egg membrane still attached to the pleopods) were collected from the rock rubble and talus sites along with juveniles and females that carried eggs a few days away from hatching. It seems probable that spawning takes place in the immediate area and since we found no females or juveniles in bromeliads the only other water would be that formed following heavy rains.

We thank M. and M. Henzell of Hollymount for their hospitality, the Institute of Jamaica for assistance and E. Connor, R. Gore, K. Heck, and A. J. Provenzano, Jr. for comments. N.S.F. grant DEB 75-22583 provided support.

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Received of publication 22 July 1976.