

A new species of land crab, *Sesarma* Say, 1817 (Decapoda, Brachyura), from the Pleistocene of Jamaica

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Terrestrial arthropods are poorly known from the Cenozoic of Jamaica. A probably Late Pleistocene land crab, *Sesarma primigenium* sp. nov., is described from the Western Cement Company Cave, parish of St. Elizabeth, southwestern Jamaica. The same species is also tentatively recognised from the Late Pleistocene Red Hills Road Cave, parish of St. Andrew, eastern central Jamaica. The propodi of the new species are moderately globose, with an upper margin that is comparatively short and finely granulate ridged; the fingers are obscurely spooned and gaped; and the in-turned fixed finger is in line with, and a little shorter than, the basal margin. Of the nine extant endemic members of this subgenus in Jamaica, *S. jarvisi* Rathbun and *S. verleyi* Rathbun have poorly defined geographic ranges, but *S. bidentatum* Benedict is widely distributed in the southern part of the island as, apparently, was *S. primigenium*.

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Introduction

The Late Pleistocene record of terrestrial biotas on most Antillean islands consists largely or solely of specimens found in cave-fill deposits or fissure fills. Virtually all such faunas include terrestrial gastropods, with or without terrestrial tetrapods. It is only rarely that such deposits preserve members of the terrestrial arthropod biota. One such deposit has already been recorded from Jamaica, namely the Red Hills Road Cave in the parish of St. Andrew, northwest of Kingston, Jamaica (Donovan & Veltkamp, 1994), which preserves millipedes, isopods, ostracods, pupae and a land crab, formerly identified as *Gecarcinus* cf. *ruricola* (Linnaeus, 1758) (J.S.H. Collins in Donovan & Dixon, 1998, p. 825), in addition to land snails (Paul & Donovan, 2006) and terrestrial tetrapods (Savage, 1990; McFarlane & Blake, 2005).

Pleistocene land crabs (decapod crustaceans) from Jamaica occur as disarticulated elements (mainly claws) which are nevertheless identifiable; however, they are much less well known than coeval marine crabs (reviewed by Donovan *et al.*, 2003; Collins *et al.*, 2009). The best known example of a land crab from this interval is *Cardisoma guanahumi* Latreille, 1825, which has been recorded from claws found in both marine (Late Pleistocene Port Morant Formation, parish of St. Thomas; Collins & Donovan, 1998) and terrestrial deposits (a Quaternary fissure fill of uncertain age at Christmas River, parish of Portland; Donovan & Dixon, 1998). We are also aware of large collections of land crab remains in the Florida Museum of Natural History, Gainesville (R.W. Portell pers. comm. to S.K.D., May 2007), that are awaiting description. Herein, we record a new cave locality that has yielded many hundreds of land crab claws all belonging to a new species of the genus *Sesarma*.

Schubart *et al.* (1998a, p. 363) concluded that "land crabs represented a single radiation from a marine ancestor that invaded terrestrial habitats of Jamaica only 4 million years ago," that is, in the early Pliocene. The present material, considered to be of Late Pleistocene age, does not affect this opinion. Schubart *et al.* (1998a) also stated that the rapid radiation of Jamaican land crabs initially resulted in two groups: the one comprising western and central forms; the other, eastern forms. *Sesarma primigenium* as presently known, a southwestern species, would appear to be more closely related to the eastern forms listed by Schubart *et al.*

Specimens discussed herein are deposited in the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (RGM). Further specimens of the same species from the type locality are deposited in the Geology Museum, University of the West Indies, Mona.

Systematic palaeontology

Order Decapoda MacLeay, 1838

Infraorder Brachyura Latreille, 1803

Section Eubrachyura de Saint Laurent, 1980

Superfamily Grapsoidea MacLeay, 1838

Family Grapsidae MacLeay, 1838

Subfamily Sesarminae Say, 1817

Genus *Sesarma* Say, 1817

Type species – *Ocypode reticulatus* Say, 1817, p. 76, by monotypy (Ng *et al.*, 2008). Recent, east coast of U.S.A. (Rathbun, 1918, p. 290).

Remarks – Glaessner (1969, p. R529) considered the oldest members of this genus to be late Oligocene or early Miocene.

Sesarma primigenium sp. nov.

Pls. 1, 2.

1994 claws of nonmarine crustaceans; Donovan & Veltkamp, p. 356.

1998 *Gecarcinus* cf. *ruricola* (Linnaeus); Collins in Donovan & Dixon, p. 825.



Fig. 1. Locality map showing location of Maggotty (west of Balaclava), parish of St. Elizabeth, south-western Jamaica. Dashed lines = main roads in central Jamaica.

2006 claws of nonmarine crabs; Paul & Donovan, p. 110.

2008 *Sesarma* (*Searma*) sp. nov.: Donovan, p. 67, fig. 1.

Etymology – From the Latin *primigenius*, first of its kind.

Type material – Holotype, RGM 211 649 (Pl. 2, figs. 2, 3). Paratypes, RGM 211 643 – 211 648, 211 650, 211 651 (Pl. 1; Pl. 2, figs. 1, 4-8). All from the type locality.

Other material – RGM 211 652 (c. 200 right dactyli), 211 653 (c. 80 right propodi), 211 654 (c. 200 left dactyli), 211 655 (c. 70 left propodi), 211 656 (16 left propodi), 211 657 (hundreds of fragments of chelipeds). All from the type locality.

Locality and horizon – *Sesarma primigenium* was collected from the Western Cement Company Cave, near Maggotty in the parish of St. Elizabeth (Figs. 1, 2). The cave was discovered in 1999 by S.F.M. during the course of the IGCP 393 fieldtrip in Jamaica (Robinson & Mitchell, 1999). The Western Cement Company, which is no longer in operation, at that time worked limestone from four small hills situated in the Ipswich Limestone, which is now placed in the Yellow Limestone Group (Mitchell, 2004). The cave was situated in the middle hill (Figs. 2) and consisted of a narrow fissure that was open at the top and filled with red clay. Abundant fossils were present in the clay, including, in decreasing abundance, land snails, crab propodi and rare lizard bones. The cave was subsequently quarried away.

Diagnosis – Typical propodi of *Sesarma*, moderately globose, upper margin comparatively short and granulate ridged; fingers obscurely spooned and gaping; in-turned fixed finger in line with and a little shorter than basal margin.

Description – The general outline and length/width proportions would seem to agree in both left and right propodi. The length of the manus more or less equals the distal

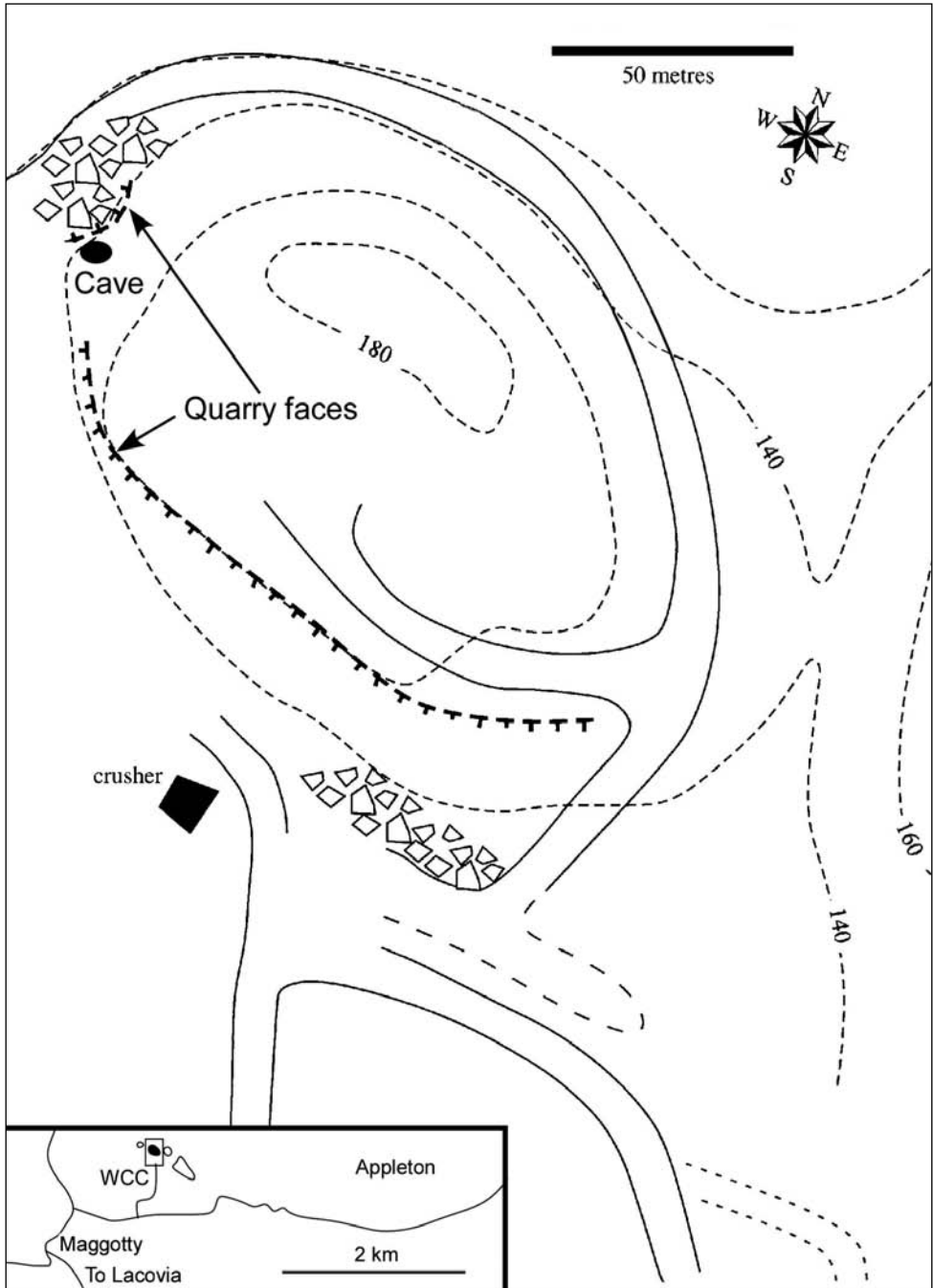


Fig. 2. Detailed map showing the location of the cave (in black) in the middle hill at the Western Cement Company. Inset location of middle hill (in black) at the Western Cement Company.

height. The weakly convex upper margin is about six-tenths of the lower, more strongly convex lower margin which leads into a shallow depression before the fixed finger. Outer surface is tumid with a shallow depression before the straight interdigital margin. Inner surface a little less tumid and deeply excavated at the lower carpal facet. A prominent granulated ridge extends along the upper margin. Granules crowding the upper part of the outer surface uncommonly extend more loosely round the carpal margin. Tubercles on the inner surface may be concentrated towards the upper margin, more widely scattered or virtually absent. The fixed finger, moderately curved inwards, is in line with and a little shorter than the basal margin. The occludent margin is granulated with a larger proximal 'cusp' followed by a median one and another immediately before a small terminal 'cusp.' Spooning may be absent or reduced to a slit containing three or four setae pores.

Left and right dactyli, about one and a half times the length of the manus upper margin, are strongly curved and in-turned. The occludent margin is irregularly granulated, but generally includes the arrangement of cusps as seen in a right articulated juvenile fixed finger and dactylus (Pl. 1, figs. 2, 5); there is a small proximal 'cusp,' one about mid-length and a row of granules before a larger 'cusp,' inclined forwards, on the outer edge near the tip. Spooning, a little more obvious on the right side, is commonly reduced to little more than a slit. Tubercles lining the upper margin vary from virtually obsolete to seven or eight reaching mid-length or 12-16 extending to, or beyond, three-quarters of the length. An approximate juxtaposition of the dactylus to the fixed finger produces a noticeable gape (Pl. 1, figs. 2, 5).

Discussion

Descriptions of claws of three Recent species of *Sesarma* endemic to Jamaica were given by Rathbun (1918) and augmented by Chace & Hobbs (1969). From a palaeontological point of view, these descriptions are barely adequate. However, between them they afford characters sufficient to determine the generic position of the specimens described herein with some confidence.

By and large, the general outline and length/width proportions of propodi belonging to the three species concerned, *Sesarma bidentatum* Benedict, 1892, *Sesarma jarvisi* Rathbun, 1914, and *Sesarma verleyi* Rathbun, 1914, would seem to agree, as does the relative length of the fixed finger to manus in both left and right propodi. However, "a sharp crenulated ridge" along the upper margin of the hand, as in *S. jarvisi* (Rathbun, 1918, p. 296; see also Chace & Hobbs, 1969, p. 191), is represented in *S. primigenium* by a sharp, granulated ridge.

The outer surface of *Sesarma verleyi* (Rathbun, 1918, p. 289), is "... sparingly covered with depressed granules more numerous above and towards the carpus where they are arranged in rows." Chace & Hobbs (1969, p. 191) described the same feature in which "... scattered tubercles are arranged dorsally in oblique rows." In *S. primigenium*, granules are considerably more dense and, in this respect, approach the much more tuberculate *S. bidentatum*, on which the granules extend onto the fixed finger. There is no evidence of horny edges as noticed by Rathbun (1918, p. 296).

Rathbun (1918, p. 296) described the manus of *S. jarvisi* as "... rough with a few scabrous granules inside;" the fixed finger agreed in having an "... irregularly toothed

opposing surface." Similarly, Chace & Hobbs (1969, p. 191) noted that the presence of a distinct crenulated dorsal ridge, "extending over entire length", and also, "... fingers pointed, very obscurely spooned tipped." Furthermore, while Chace & Hobbs noted the presence of eight or nine small tubercles on the upper margin of the dactylus, they may extend almost to the tip, as observed by Rathbun, thereby agreeing with *S. primigenium*.

In one instance of associated, juvenile (closed) fingers, there remains only a slight gape between the fingers which could be alluded to Rathbun's "opposing surface nearly meeting" in *S. jarvisi*, but the juxtaposition of larger claws indicates a much larger gape in keeping with the irregular gape of *S. bidentatum* as observed by Rathbun (1918, p. 295) and exemplified in plate 80 therein.

Since the two definitive works by Rathbun (1918) and Chase & Hobbs (1962), six other species of *Sesarma*, all endemic to Jamaica, have been described. The eastern Jamaican *Sesarma cookei* Hartnoll, 1971, was described as "an apparent ecological counterpart to the western *Sesarma jarvisi*" (Schubart et al., 1997, p. 403). Characters peculiar to these two species, together with the dentition of the dactylus and fixed finger of *S. cookei*, readily distinguished that species from *S. primigenium*.

The central-western Jamaican species *Sesarma windsor* Türkay & Diesal, and *Sesarma fossarum* Schubart et al., living in the upper reaches of streams and rivers, were considered by Schubart et al. (1997, p. 413) to be closely related to *S. bidentatum*, known only from eastern Jamaica. The chelae of both *S. windsor* and *S. fossarum* differ from those of *S. primigenium* in that the upper edge of the manus is granulated rather than ridged; the upper surface of *S. windsor* has lines of larger granules on an overall coarsely granulated surface. Additionally, the latter species has an oval gape, whereas *S. fossarum* has a moderate one. A fairly recent caverniculous habitat for *S. windsor* was suggested by Schubart et al. (1997, p. 403).

Closely related to *S. fossarum* is *Sesarma dolphinum* Reimer et al., 1998 (p. 186), restricted to the Mount Dolphin Head, parish of Hanover, western Jamaica. It has the upper margin of the manus deeply indented to accommodate the carpus, an inclined interdigital margin and a more strongly convex dactylus than *S. primigenium*.

Sesarma meridies Schubart & Koller, 2005, from the southeastern Cockpit Country, differs primarily from *S. primigenium* in that the regularly concave basal margin is in line with the fixed finger, although the upper margin of the palm is similarly indented. Moreover, the morphology of the occludent margin of *S. meridies* differs from that of *S. primigenium*.

In common with *S. primigenium*, *Sesarma ayatum* Schubart et al., 1998b, from eastern Jamaica, has a gape between the fingers. Otherwise, it differs in having a broken row of tubercles along the upper margin of the manus and the inner surface has larger tubercles than those on the outer surface.

Also present in Jamaica, but not endemic (Warner, 1969), are *Sesarma curacaoense* de Mann, 1892, and *Sesarma ricordi* H. Milne Edwards, 1853. The introduction of DNA sampling to separate Recent species (Schubart et al., 2005) further complicates comparison with apparently similar fossil forms. However, there is considerable difference in the specific variation of the occludent margins, which, together with other characters peculiar to *Sesarma primigenium*, justifies its position as a new species.

Other fossil claws, attributable to *S. cf. primigenium* are known from the Red Hills Road Cave (see above), where they are neither so abundant nor so well preserved (RGM

211 658; 24 miscellaneous specimens). These were formerly identified as *Gecarcinus* cf. *ruricola* (Linnaeus).

Based on the evidence of claws, it is apparent that *S. primigenium* could be considered the ancestral form of at least three species of *Sesarma* presently endemic to Jamaica whose territories would extend, according to Rathbun (1918), as follows.

- *Sesarma bidentatum* extends to an altitude of 4500 feet, and lives in freshwater rivers and mountain streams near Troy, Acconpong (parish of St. Elizabeth); Mandeville, parish of Manchester; near Kingston Harbour, Mountain Spring, parish of St. Andrew; Yallahs River and Clyde Spring, Blue Mountain, parish of St. Thomas.
- Apart from "in the interior," Rathbun (1918, p. 101) recognised *Sesarma jarvisi* from Mount Diablo, parish of St. Ann. No locality is mentioned by Chace & Hobbs (1969, p. 191); concerning habitat, they merely commented "Unknown, probably at least partially terrestrial at higher elevations."
- *Sesarma verleyi*, an inhabitant of limestone caves, was only recorded by Rathbun from Mulgrave, Cockpit Country, near Ipswich, parish of St. Elizabeth (Fig. 1). Chace & Hobbs (1969, p. 191) noted the habitat as subterranean freshwater.

Therefore, it is evident that the present range of at least *S. bidentatum* overlaps with *S. primigenium* in both St. Elizabeth and St. Andrew, and *S. verleyi* also occurs in St. Elizabeth. *Sesarma bidentatum* has the broadest known range of the extant species in Jamaica and it is perhaps significant that *S. primigenium* has almost as extensive a range, although it is not as yet known to extend east of Kingston and the parish of St. Andrew into the Blue Mountain region.

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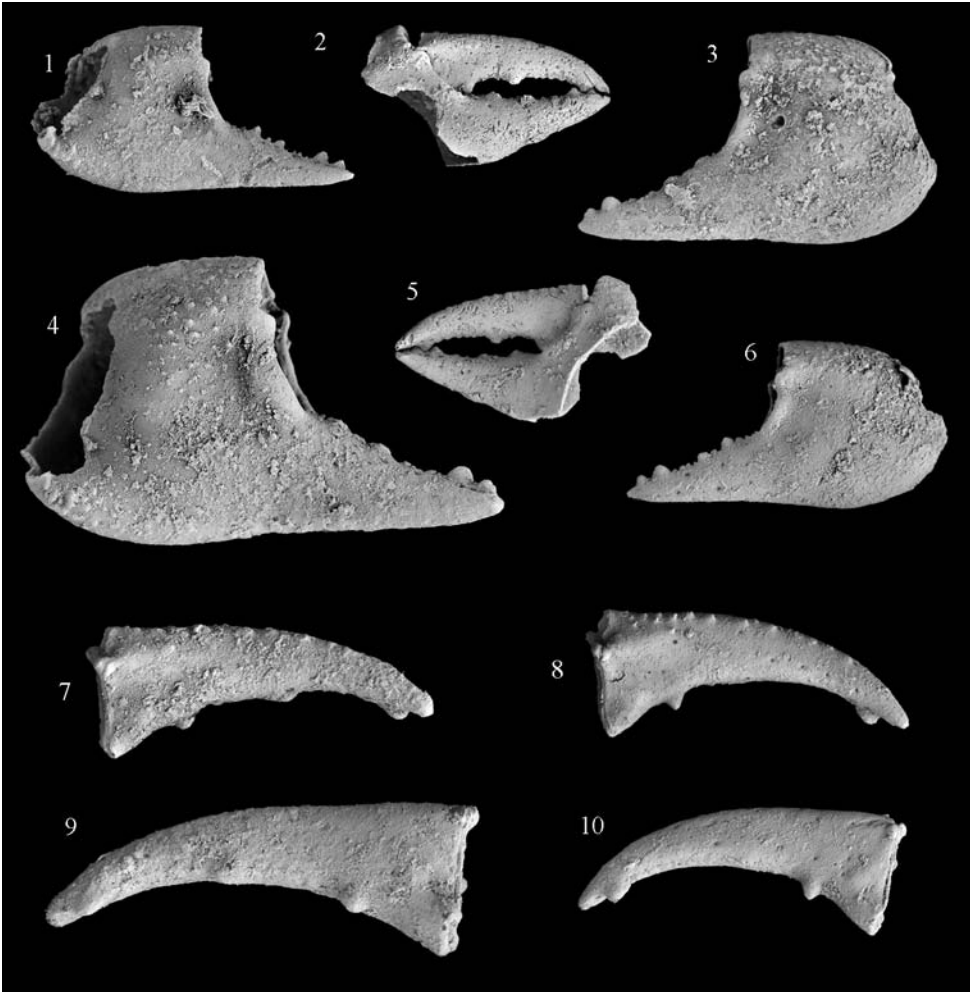


Plate 1

Sesarma primagenium sp. nov., left chelipeds (except Figs. 2, 5). All paratypes.

Figs. 1, 6. RGM 211 643, propodus. (1) Inner surface. (6) Outer surface.

Figs. 2, 5. RGM 211 644, articulated right free and fixed fingers. Of the many hundreds of specimens available, this is the only RGM specimen in which two elements remain articulated. (2) Outer surface. (5) inner surface.

Figs. 3, 4. RGM 211 645, propodus. (3) Outer surface, $\times 2.8$. (4) Inner surface.

Figs. 7, 9. RGM 211 646, dactylus. (7) Inner surface. (9) Outer surface, $\times 4.7$.

Figs. 8, 10. RGM 211 647, dactylus. (8) Inner surface. (10) Outer surface.

All images $\times 3.7$ unless stated otherwise. Specimens whitened with ammonium chloride.



Plate 2

Sesarma primagenium sp. nov., right chelipeds. Paratypes (except Figs. 2, 3).

Figs. 1, 7. RGM 211 648, dactylus. (1) Outer surface. (7) Inner surface.

Figs. 2, 3. RGM 211 649, holotype, propodus. (2) Inner surface. (3) Outer surface.

Figs. 4, 5. RGM 211 650, propodus. (4) Inner surface. (5) Outer surface.

Figs. 6, 8. RGM 211 651, dactylus. (6) Inner surface. (8) Outer surface.

All images $\times 4.5$. Specimens whitened with ammonium chloride.

