

# Crustaceans of the upper Miocene August Town Formation of southeastern Jamaica

J.S.H. Collins, S.K. Donovan, T.A. Stemann & D.J. Blissett

J.S.H. Collins, S.K. Donovan, T.A. Stemann & D.J. Blissett. Crustaceans of the upper Miocene August Town Formation of southeastern Jamaica. *Scripta Geologica Special Issue*, 7: 177-183, 2 figs., Leiden, December 2010.

Joe S.H. Collins, 8, Shaw's Cottages, Perry Rise, Forest Hill, London, SE23 2QN, and Department of Palaeontology, The Natural History Museum, Cromwell Road, London, SW7 5BD, England; Stephen K. Donovan, Department of Geology, NCB Naturalis, Postbus 9517, NL-2300 RA Leiden, The Netherlands (Steve.Donovan@ncbnaturalis.nl); Thomas A. Stemann, Department of Geography & Geology, University of the West Indies, Mona, Kingston 7, Jamaica (thomas.stemann@uwimona.edu.jm); Donovan J. Blissett, 24 Denver Crescent, Kingston 20, Jamaica (donovan.blissett@gmail.com).

Key words – Jamaica, Miocene, barnacles, Cirripedia, crabs, Decapoda.

Crustaceans remain poorly known from the Miocene of Jamaica. Herein, we report three species from the upper Miocene August Town Formation of Fowl House Spring, parish of St. Thomas, southeast Jamaica; poorly preserved propodi of a mud shrimp, "*Callianassa*" sp.; the anterior part of the carapace of *Mithraculus* sp. aff. *Mithraculus coryphe* (Herbst); and the cirripede *Tetraclita* sp. cf. *T. stalactifera* (Lamarck). *Mithraculus* sp. aff. *M. coryphe* at Fowl House Spring considerably extends the stratigraphic occurrence of the genus in the Antillean region down into the Miocene. Hitherto, fossil *T. stalactifera* in the Caribbean was known from the Plio-Pleistocene of Curaçao and the Pleistocene of Venezuela.

## Contents

Introduction .....	177
Locality and horizon .....	178
Systematic palaeontology .....	179
Acknowledgements .....	181
References .....	182

## Introduction

The only nominal Miocene crustaceans from Jamaica are restricted to decapods (crabs) found at one site in the Montpelier Formation, White Limestone Group, from the coral rock assemblage exposed at Duncans quarry, parish of Trelawny (Portell & Collins, 2004). This occurrence is peculiar, decapods originating from allochthonous slide blocks of reefal limestone that are preserved in deeper water chalk deposits. Until now, reports of at least parautochthonous Miocene crustaceans have been limited to balanid barnacles and fragments of mud shrimps. Therefore, the discovery of tetraclitid cirripede remains, together with a portion of a majid carapace, both representing the earliest known members of their respective genera, is a significant contribution to the fossil record of the island.

Specimens discussed herein are deposited in the NCB Naturalis, Leiden, The Netherlands (NNM RGM). Our philosophy of open nomenclature follows Bengtson (1988). The terminology of the decapod exoskeleton is explained in Glaessner (1969).

### Locality and horizon

The sedimentary succession of the Neogene August Town Formation, Lower Coastal Group, in southern central and southeastern Jamaica, rests unconformably on the White Limestone Group (Matley, 1951, pp. 40, 61). This represents a notable change of depositional environment. White Limestone deposition had occurred over much of what is today the Jamaican land area for over 40 million years (Robinson, 1994, fig. 6.6). In contrast to the pure white limestones that typify this mid-Cenozoic succession, the August Town Formation is characterised by impure yellow limestones, with conglomerates and other siliciclastic rocks, and a macrofauna dominated by scleractinian corals and benthic molluscs (Robinson, 1963, p. 46).

The study of the palaeontology of the August Town Formation has lagged behind that of many other fossiliferous units of the Jamaican Neogene. In part this is because the type area, in the Hope River gorge, has a bad reputation for criminal activity. Therefore, those studies of the fossils of the August Town Formation that have appeared during the past 25 years have concentrated on sections exposed on the south coast such as Round Hill, parish of Clarendon (for example, Littlewood & Donovan, 1988; Pickerill *et al.*, 1993). The present contribution follows this pattern.

The studied locality (Fig. 1) is found on the coast east of Morant Bay, St. Thomas in the Lyssons District (GPS N17° 52.541' W76° 22.932') (about NGR 535 358, 1:50,000 topographic sheet 19, 'Morant Bay'). It lies at the mouth of a small stream labeled Fowl House Spring on the 1:12,500 topographic map of the area, though local inhabitants do not commonly use this name.

The exposure consists of bedded limestone and sandstone dipping to the south at roughly 8-10°. A yellow impure, pebbly, bioclastic limestone makes up the basal unit here with approximately 2 m of thickness exposed above tide level. It contains abundant casts of large molluscs, and branched and free living corals, as well as the large benthic foraminiferan *Sphaerogypsina*, a common taxon in the August Town Formation. This lower limestone is capped by an irregular erosive boundary with associated overturned, large (~0.5 m diameter) coral heads and is overlain by brown, pebbly, coarse- to medium-grained, lithic-rich sandstone. The sandstone is irregularly bedded with scattered molluscs, corals, crustaceans and echinoids, and generally less pebbly and coarse grained upward. At the coast, the sandstone unit is 1.8-2.0 m thick and grades into a weathered soil cover.

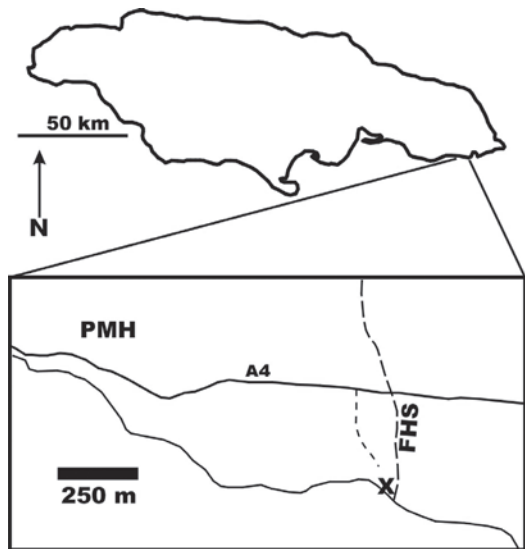


Fig. 1. Map showing studied fossil locality (X) at the mouth of Fowl House Spring (FHS). The approximate coastline, the main coastal road (A4) and the location of the Princess Margaret Hospital (PMH) are also shown.

**Systematic palaeontology****Order Decapoda Latreille, 1802**  
**Infraorder Thalassinidea Latreille, 1831**  
**Family Callianassidae Dana, 1852**  
**Genus *Callianassa* Leach, 1814**

*Type species.*—*Cancer (Astacus) subterraneus* Montagu, 1808, by monotypy.

*Remarks.*—We follow the suggestion of Collins *et al.* (1997, p. 52) to include indeterminate fossil callianassids in "*Callianassa*" sp. within the Callianassidae *sensu lato*.

**"*Callianassa*" sp.**

*Material.*—Two imperfectly preserved propodi, NNM RGM 544 494 and 544 495.

*Locality and horizon.*—Neogene (upper Miocene) August Town Formation, Lower Coastal Group, Lyssons area, parish of St. Thomas, southeast Jamaica.

*Remarks.*—Although adequate to confirm the presence of callianassids at Fowl House Spring, these specimens are not worthy of description or illustration. The only previous record of decapods from the August Town Formation was a report of "rare crab chelae" from Alligator Pond, parish of Manchester, southern central Jamaica (Donovan *et al.*, 1994, p. 173). These are similarly based on indeterminate callianassids.

**Infraorder Brachyura Linnaeus, 1758**  
**Superfamily Majoidea Samouelle, 1819**  
**Family Majidae Samouelle, 1819**  
**Subfamily Mithracinae MacLeay, 1838**  
**Genus *Mithraculus* White, 1847**

*Type species.*—*Mithraculus coronatus* White, 1847, p. 7 (= *Maia sculpta* Lamarck, 1818, non *Cancer coronatus* Herbst, 1785), by monotypy (Ng *et al.*, 2008, p. 120).

***Mithraculus* sp. aff. *Mithraculus coryphe* (Herbst, 1785)**

Fig. 2A.

*Material.*—Anterior part of a dorsal carapace, NNM RGM 544 496 (Fig. 2A).

*Locality and horizon.*—Neogene (upper Miocene) August Town Formation, Lower Coastal Group, Lyssons area, parish of St. Thomas, southeast Jamaica.

*Description.*—Carapace nodose. The anterolateral margins are lined with two smooth, round, widely spaced and even-sized lobes; an apparent third lobe is the distal part of the epibranchial lobe.

The orbitofrontal margin occupies 73.0 % of the carapace width, measured behind the second lobe. The very small rostrum has two truncated nodes separated by a U-shaped sinus; the thickened sides leave a space before thickened upper orbital margins, each with a single fissure, the larger inner angle being in advance of the outer. Rounded median parts of the lower orbital margin extend slightly beyond the rostrum. Fused epigastric lobes form an ovate post-rostral lobe. A deep furrow separates this lobe from the rounded tip of a broad antero-mesogastric process. The protogastric lobes are formed by three nodes set in a triangle within a crescentric lobe. Sharp, tapering anterior extensions of the mesogastric lobe project almost to the outer edge of the protogastric lobes and are bounded by a large, medially directed, mesobranchial lobe.

*Remarks.* – There appears to be a close correspondence of the lobes to those of *Mithraculus coryphe* (Rathbun, 1925, pl. 153, fig. 1). The Jamaican upper Miocene carapace has more even-sized anterolateral lobes and a complete union of the epigastric lobes rather than the, apparent, median sinus of Rathbun's figured specimen.

Hitherto, the fossil record of *Mithraculus* from Jamaica has been limited to the Plio-Pleistocene, most notably the recording of an exceptionally well-preserved carapace of *Mithraculus* sp. aff. *M. forceps* A. Milne-Edwards, 1875, from the upper Pleistocene Falmouth Formation (Morris, 1993, fig. 2.11). A right chela-carpus from the upper Pleistocene Port Morant Formation was identified as *M. forceps* (Collins et al., 2009a, pl. 4, fig. 1). Elsewhere, *Mithraculus ruber* (Stimpson, 1871), as *Mithrax (Mithraculus) ruber*, was recorded from the Pleistocene Coral

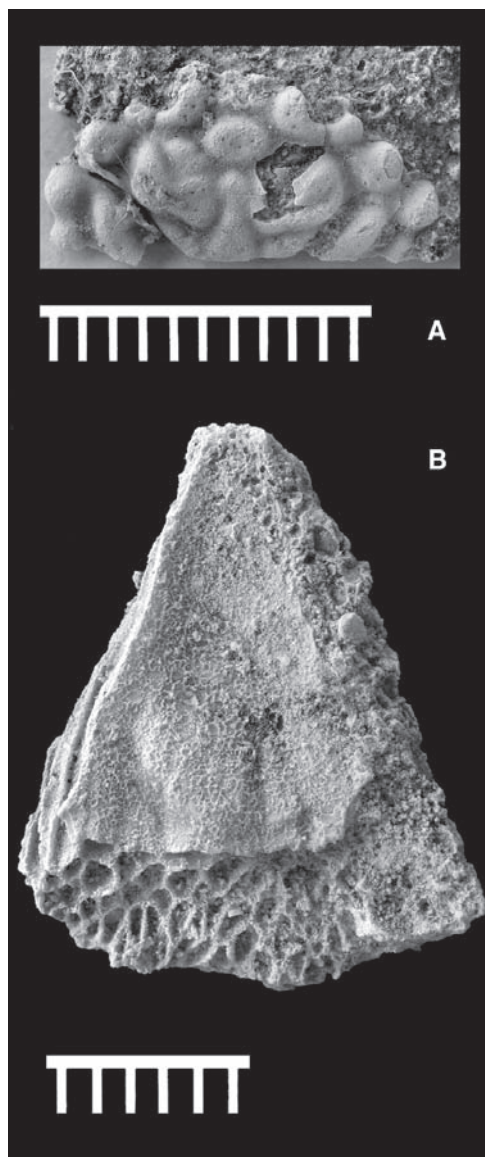


Fig. 2. Crustaceans from the upper Miocene August Town Formation from just west of Fowl House Spring, near Lyssons, parish of St. Thomas, south-east Jamaica. (A) *Mithraculus* sp. aff. *Mithraculus coryphe* (Herbst, 1785), NNM RGM 544 496, anterior part of a carapace. (B) *Tetracrita* sp. cf. *T. stalactifera* (Lamarck, 1818), NNM RGM 544 497, inner surface of a fragmentary compartment showing characteristic pores. Specimens whitened with ammonium chloride. Scale bars in mm.

Rock of Barbados (Collins & Morris, 1976, pl. 17, fig. 8). Thus, the discovery of a carapace from the Miocene considerably extends the stratigraphic occurrence of the genus in the Antillean region (Collins *et al.*, 2009b, tables 2-4).

**Class Cirripedia Burmeister, 1834**  
**Order Balanomorpha Pilsbry, 1916**  
**Family Tetraclitidae Gruvel, 1903**  
**Subfamily Tetraclitinae Gruvel, 1903**  
**Genus *Tetraclita* Schumacher, 1817**

*Type species.* – *Tetraclita squamulosa* Schumacher, 1817, p. 91, by original designation (= *Balanus squamosus* Bruguière, 1789, p. 170) (Newman *et al.*, 1969, p. R287).

***Tetraclita* sp. cf. *Tetraclita stalactifera* (Lamarck, 1818)**

Fig. 2B.

*Material.* – Fragments of two compartments, NNM RGM 544 497 (Fig. 2B) and 544 498.

*Locality and horizon.* – Neogene (upper Miocene) August Town Formation, Lower Coastal Group, Lyssons area, parish of St. Thomas, southeast Jamaica.

*Remarks.* – A Recent taxon that was formerly regarded as a subspecies of *Tetraclita squamosa* Bruguière, 1789, *Tetraclita stalactifera* was first listed as a distinct species by Newman & Ross (1976, p. 48), and therein recorded from the Plio-Pleistocene of Curaçao and the Pleistocene of Venezuela. The stratigraphic and geographic range is now extended down to the upper Miocene of Jamaica.

Fragmented as they are, the two compartmental pieces provide clear indication of the arrangement of the pores. The larger fragment has pores, averaging three in a row (Fig. 2B); the smaller, possibly growth-crowded compressed piece, has two distinctly separated rows. Both arrangements compare favourably with those of specimens illustrated by Pilsbry (1916, pl. 59, figs. 1-5). Traces of fine, evenly ribbed surface sculpture are preserved on both pieces. The Recent distribution of *T. stalactifera* includes the Caribbean, Cape Peninsular, South Africa and the Arabian Sea (Newman & Ross, 1976, p. 48).

Other barnacles reported from the August Town Formation include *Balanus improvisus* Darwin, 1854, and *Balanus eburneus* Gould, 1841 (Littlewood & Donovan, 1988, pp. 1019-1020) from the Round Hill beds at Round Hill, parish of Clarendon, on the central south coast. Both species are also known from the upper Pleistocene Port Morant Formation in the parish of St. Thomas, southeast Jamaica (Collins *et al.*, 1997, p. 58).

### Acknowledgements

S.K.D. thanks the Percy Sladen Memorial Fund of the Linnean Society of London and the Nationaal Natuurhistorisch Museum - Naturalis, Leiden, for supporting his fieldwork in Jamaica. We thank Phil Crabb (Photographic Unit, The Natural History

Museum, London) for taking the images and Niko Korenhof (NCB Naturalis, Leiden) for arranging them in Figure 2. Our reviewers, Gérard Breton (Le Havre) and Dr. John W.M. Jagt (Natuurhistorisch Museum Maastricht), are thanked for their supportive comments.

## References

- Bengtson, P. 1988. Open nomenclature. *Palaeontology*, **31**: 223-227.
- Bruguière, J.G. 1789. *Encyclopédie méthodique. B. Suite à l'introduction de l'histoire naturelle des vers, I*. Paris: 158-173. [Not seen.]
- Burmeister, H. 1834. *Beiträge zur Naturgeschichte der Rankenfüßser (Cirripedia)*. G. Reimer, Berlin: 60 pp.
- Collins, J.S.H., Donovan, S.K. & Dixon, H.L. 1997. Crabs and barnacles (Crustacea: Decapoda & Cirripedia) from the late Pleistocene Port Morant Formation of southeast Jamaica. *Bulletin of the Mizunami Fossil Museum*, **23** (for 1996): 5163.
- Collins, J.S.H., Donovan, S.K. & Stemann, T.A. 2009a. Fossil Crustacea of the Late Pleistocene Port Morant Formation, west Port Morant Harbour, southeastern Jamaica. *Scripta Geologica*, **138**: 23-53.
- Collins, J.S.H. & Morris, S.F. 1976. Tertiary and Pleistocene crabs from Barbados and Trinidad. *Palaeontology*, **19**: 107-131.
- Collins, J.S.H., Portell, R.W. & Donovan, S.K. 2009b. Decapod crustaceans from the Neogene of the Caribbean: diversity, distribution and prospectus. *Scripta Geologica*, **138**: 55-111.
- Dana, J.D. 1852-1855. *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U.S.N. Crustacea (in 2 volumes)*. C. Sherman, Philadelphia. [Not seen.]
- Darwin, C. 1854. A monograph on the fossil Balanidae and Verrucidae of Great Britain. *Monograph of the Palaeontographical Society*, **8** (30): 44 pp.
- Donovan, S.K., Dixon, H.L., Littlewood, D.T.J., Milsom, C.V. & Norman, Y.J.C. 1994. The clypeasteroid echinoid *Encope homala* Arnold and Clark, 1934, in the Cenozoic of Jamaica. *Caribbean Journal of Science*, **30**: 171-180.
- Glaessner, M.F. 1969. Decapoda. In: Moore, R.C. (ed.), *Treatise on Invertebrate Paleontology, Part R, Arthropoda 4* (2), R399-R533, R626-R628. Geological Society of America and University of Kansas Press, Boulder and Lawrence.
- Gould, A.A. 1841. *Report on the Invertebrata of Massachusetts, comprising the Mollusca, Crustacea, Annelida, and Radiata*. Cambridge, Massachusetts: xiii+373 pp.
- Gruvel, A. 1903. Révision des Cirrhipèdes appartenant à la collection du Muséum (Pédonculés). *Nouvelles Archives du Muséum d'Histoire Naturelle, Paris*, **4**: 95-170. [Not seen.]
- Herbst, J.F.W. 1782-1804. *Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten*. Volumes 1-3. Gottlieb August Lange, Berlin and Stralsund: 515 pp.
- Lamarck, J.B.P.A. de Monet de. 1818. *Histoire naturelle des animaux sans vertèbres*. **5**. Verdière, Paris: 612 pp.
- Latreille, P.A. 1802-1803. *Histoire naturelle générale et particulière des crustacés et des insectes*. F. Dufart, Paris: 468 + 391 pp.
- Latreille, P.A. 1831. *Cours d'Entomologie, ou de l'Histoire Naturelle des Crustacés, des Arachnides, des Myriapodes et des Insectes; à l'usage des élèves de l'École du Muséum d'Histoire naturelle*. Roret, Paris: xiii + 562 pp. [Not seen.]
- Leach, W.E. 1813-1814. Crustaceology. In: Brewster, Sir D. (ed.), *The Edinburgh Encyclopaedia; conducted by D. Brewster*. **7** (1), 383-384 [1813]; **7** (2), 385-437 [1814].
- Linnaeus, C. 1758. *Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, Cum characteribus, Differentiis, Synonymis, Locis. Edition 10, 1*. Holmiae: iii+824 pp. [Not seen.]
- Littlewood, D.T.J. & Donovan, S.K. 1988. Variation of Recent and fossil *Crassostrea* in Jamaica. *Palaeontology*, **31**: 1013-1028.
- MacLeay, W.B. 1838. On the brachyurous Crustacea brought from the Cape by Dr Smith. In: *Illustrations of the Zoology of South Africa, 5, Invertebratae*. Smith Elder & Co., London: 53-71.



- Matley, C.A. (ed. Raw, F.). 1951. *Geology and Physiography of the Kingston District, Jamaica*. Institute of Jamaica, Kingston, published by the Crown Agents of the Colonies, London: 139 pp.
- Milne-Edwards, A. 1873-1881. Études sur les Xiphosures et les Crustacés de la région Méxicque. In *Mission scientifique au Mexique et dans l'Amérique centrale, Recherches Zoologiques pour servir à l'Histoire de la Faune de l'Amérique centrale et du Mexique 5*. Imprimerie Nationale, Paris: 368 pp.
- Montagu, G. 1808. Description of several marine animals found on the south coast of Devonshire. *Transactions of the Linnean Society of London*, **9**: 18-114.
- Morris, S.F. 1993. The fossil arthropods of Jamaica. In: Wright, R.M. & Robinson, E. (eds.), *Biostratigraphy of Jamaica*. Geological Society of America Memoir, **182**: 115-124.
- Newman, W.A. & Ross, A. 1976. Revision of the balanomorph barnacles; including a catalog of the species. *Memoirs of the San Diego Society of Natural History*, **9**: 1-108.
- Newman, W.A., Zullo, V.A. & Withers, T.H. 1969. Cirripedia. In: Moore, R.C. (ed.), *Treatise on Invertebrate Paleontology, Part R, Arthropoda 4 (1)*, R206-R295. Geological Society of America and University of Kansas Press, Boulder and Lawrence.
- Ng, P.K.L., Guinot, D. & Davie, P.J.F. 2008. Systema Brachyurorum: part I. An annotated checklist of extant brachyuran crabs of the world. *The Raffles Bulletin of Zoology, Supplement 17*: 1-286.
- Pickerrill, R.K., Donovan, S.K. & Dixon, H.L. 1993. The trace fossil *Dactyloidites ottoi* (Geinitz, 1849) from the Neogene August Town Formation of southcentral Jamaica. *Journal of Paleontology*, **67**: 1070-1074.
- Pilsbry, H.A. 1916. The sessile barnacles (Cirripedia) contained in the collections of the U.S. National Museum; including a monograph of the American species. *U.S. National Museum Bulletin*, **60**: xi+366 pp.
- Portell, R.W. & Collins, J.S.H. 2004. Decapod crustaceans of the Lower Miocene Montpelier Formation, White Limestone Groups of Jamaica. *Cainozoic Research*, **3** (for 2003): 109-126.
- Rathbun, M.J. 1925. The spider crabs of America. *Bulletin of the U.S. National Museum*, **129**: xx+613 pp.
- Robinson, E. 1963. Later Tertiary formations. In: Zans, V.A., Chubb, L.J., Versey, H.R., Williams, J.B., Robinson, E. & Cooke, D.L., 1963, *Synopsis of the Geology of Jamaica*. Geological Survey of Jamaica Bulletin, **4** (for 1962): 44-49.
- Robinson, E. 1994. Jamaica. In: Donovan, S.K. & Jackson, T.A. (eds.), *Caribbean Geology: An Introduction*: 111-127. Mona, University of the West Indies Publishers' Association.
- Samouelle, G. 1819. *The Entomologist's useful Compendium; or an introduction to the knowledge of British Insects, comprising the best means of obtaining and preserving them, and a description of the apparatus generally used; together with the genera of Linné, and the modern method of arranging the classes Crustacea, Myriapoda, Spiders, Mites and Insects, from their affinities and structure, according to the views of Dr. Leach. Also an explanation of the terms used in entomology; a calendar of the times of appearance and usual situations of near 3,000 species of British insects; with instructions for collecting and fitting objects for the microscope*. Thomas Boys, London: 496 pp.
- Schumacher, C.F. 1817. *Essai d'un nouveau système des habitations des vers testacés*. Copenhagen: 287 pp.
- Stimpson, W. 1871. Notes on North American Crustacea in the Museum of the Smithsonian Institution. No.3. *Annals of the Lyceum of Natural History, New York*, **10**: 92-136.
- White, A. 1847. *List of the specimens of Crustacea in the collection of the British Museum*. British Museum, London: viii+143 p.

