

# A Pliocene asteroid from the Netherlands Antilles

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## Abstract

The Seroe Domi Formation of Curaçao has yielded the first fossil asteroid from the Netherlands Antilles, based on a disarticulated superomarginal(?) ossicle. This is only the second occurrence of Pliocene asteroids in the Antillean region. The ossicle is about as long as broad, but low, and may represent a pycinasterid sp. indet. The Seroe Domi Formation has hitherto yielded a moderate diversity of robust echinoids.

*Key words:* Curaçao, Seroe Domi Formation, echinoderms

## Introduction

Fossil asteroids remain poorly known and imperfectly understood from the Antillean region (Table 1). They are largely unknown because complete specimens are particularly rare (but see Donovan *et al.*, 2008; Table 1 herein); almost all occurrences are based on disarticulated marginal ossicles. They are poorly understood because of the limited information such ossicles provide regarding systematics and morphology. Further, most records are from Jamaica, giving the published fossil record of these fossils a strong geographical bias.

Herein, we publish the first record of a fossil asteroid from the Netherlands Antilles. This is only the second site to yield Pliocene asteroid ossicles from the Antilles (Table 1).

## Material and methods

The specimen described herein is deposited in the Nederlands Centrum voor Biodiversiteit - Naturalis, Leiden, registration number RGM 617 971. It was collected by S. K. D. in June 2003 from exposures on the northwest coast of the Saliña Sint Michiel, north of the settlement of Dorp Sint Michiel, southwest coast of central Curaçao (GPS 12° 9.081' N 68° 59.719' W). The Seroe Domi Formation on Curaçao ranges from Late Miocene to Pliocene in age, but the older part is only exposed in the southeastern part of the island (Jackson and Robinson, 1994, p. 255); the outcrop at Saliña Sint Michiel is considered to be Pliocene. The low exposure extends into the lake and is capped unconformably by coralliferous limestones. It consists of brown weathering, calcareous,

medium- to coarse-grained sandstones, rich in pectinids and *Spondylus*, with rarer decapods, balanid barnacles, the micromorphic brachiopod *Thecidellina*, echinoids and the present asteroid ossicle (see below) (Harper *et al.*, 2003).

Examination of the asteroid ossicle was by hand lens and binocular microscope. Photography was with a Canon PowerShot G11 digital camera; the specimen was not coated for photography (Fig. 1). Descriptive terminology of asteroids mainly follows Gale (1987, pp. 4–6, text-fig. 1). Our philosophy of open nomenclature follows Bengtson (1988). Measurements were taken using a set of digital calipers.

## Description

A single, robust, superomarginal(?) ossicle, about as long as broad, but low (Fig. 1). Most faces more or less peppered with pits, presumably due to corrasion (*sensu* Brett and Baird, 1986, pp. 213–214). Sculpture not preserved on lateral surface. Lateral surface overhanging distal more than the proximal articular facet, which is also larger; both facets rounded triangular in outline. Inferomarginal facet planar, tetragonal, but convex internally, and convex and flared externally.

Measurements (orientations *sensu* Gale, 1987, text-fig. 1d): height (h) = 5.3 mm; breadth (b) = 8.0 mm; length (l) = 8.1 mm.

## Discussion

The obvious comparison for this specimen is with the marginal ossicles from the Late Pliocene Bowden shell beds of southeast Jamaica.

Table 1. Known geographic and stratigraphic distribution of Cenozoic fossil asteroids, based mainly on marginal ossicles, within the fossil record of the Antillean region, revised and corrected after Donovan (2001, table 5). Key: \* = articulated specimens.

Location	Unit	Age	Reference
Jamaica	Port Morant Formation	Late Pleistocene	research in progress, S. F. Mitchell*
Barbados	Middle Coral Rock	Pleistocene	Donovan (2000)
Jamaica	Bowden shell bed	Late Pliocene	Donovan and Paul (1996, 1998)
Curaçao	Seroe Domi Formation	Mio - Pliocene	herein
Carriacou	Grand Bay Formation	Middle Miocene	research in progress, J. W. M. Jagt <i>et al.</i> *
Jamaica	Montpelier Formation	Early Miocene	Donovan <i>et al.</i> (2005)
Antigua	Antigua Formation	Late Oligocene	research in progress, C. Mah
Jamaica	'Browns Town' Formation	Late Oligocene	research in progress, C. Mah
Jamaica	Swanswick Formation	Middle Eocene	Donovan <i>et al.</i> (1993)
Jamaica	Chapelton Formation	Middle Eocene	Donovan <i>et al.</i> (1993)
Cuba	?	Early Eocene or Early Miocene	Valette (1926), Sánchez Roig (1949)
Jamaica	Richmond Formation	Early Paleocene	----
Jamaica	<i>Titanosarcolithes</i> limestones	Late Cretaceous	Donovan <i>et al.</i> (1993)

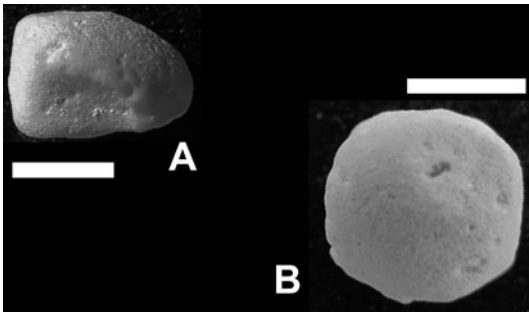


Fig. 1. Asteroid superomarginal(?) ossicle, pycinasterid sp. indet., RGM 617 971, from the Pliocene Seroe Domi Formation of Curaçao. A, distal articular facet, note overhanging lateral surface; B, lateral surface, distal articular facet to left (note surface corrosion). Specimen not coated for photography.

These were referred to astropectinid or goniasterid sp. indet.; in contrast, J.W.H. Jagt (written communication) has suggested that RGM 617 971 may represent a pycinasterid. Donovan and Paul (1998, p. 130) had 13 marginal ossicles from the Bowden shell beds, plus a fourteenth from a slightly higher horizon. Two of these specimens have been illustrated, both in facet view (Donovan and Paul, 1996, fig. 1G; 1998, pl. 1, fig. 2) - the former is referred to as an astropectinid superomarginal - but neither is close to RGM 617 971 (compare with Fig. 1). However, as there was doubt as to how many species were represented by the Bowden shell beds collection and their precise classification, any comparison with the specimen from Curaçao must be regarded as preliminary.

As is true for many sedimentary units in the Cenozoic of the Antilles, the only echinoderms that have been documented hitherto from the Seroe Domi Formation of the Netherlands Antilles (mainly Curaçao) have been echinoids (de Buissonjé, 1974; Table 2 herein). These are principally large and robust *Echinometra*, clypeasteroids and

spatangoids, which similarly dominate so many other Antillean 'faunas' in the literature of fossil echinoderms. These are the echinoderms that have the highest preservation potential, and include the largest and most obvious genera. Many Antillean formations have only yielded their echinoderms to those with little expertise in the group (see, for example, Arnold and Clark, 1927, pp. 5–6), so only the most distinctive members have been found, leaving behind an unsuspected diversity of taxa that will only reveal themselves to the specialist collector. This has certainly been the case with the Seroe Domi Formation. Although Fouke (1994, p. 35) suggested that "... echinoderms have been extensively leached," they have not been systematically collected either until now. The number of echinoid species that have been recorded from this formation hitherto have now been almost doubled (R. S., research in progress), to which is added the asteroid documented herein. We suggest that disaggregation of the sedimentary rock at this locality might yield microscopic ossicles of diverse echinoderms such as have been recorded from elsewhere (for example, Dixon *et al.*, 1994; Donovan and Paul, 1998). Already, it is the most important echinoderm-bearing deposit in the Pliocene of the region.

#### Acknowledgements

S. K. D. thanks the Nationaal Natuurhistorisch Museum - Naturalis (now part of Nederlands Centrum voor Biodiversiteit) for financial support for his fieldwork in 2003. As always, collecting with Roger Portell (Florida Museum of Natural History, Gainesville) and David Harper (Geological Museum, University of Copenhagen) was productive and illuminating. We thank Wouter Wildenberg of NCB - Naturalis for registering this specimen. A particularly illuminating review by Dr. John Jagt (Natuurhistorisch Museum Maastricht) is gratefully acknowledged.

Table 2. Fossil echinoids of the Seroe Domi Formation of Aruba, Bonaire and Curaçao (after de Buissonjé, 1974; Donovan & Paul, 1996, table 2).

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Order PHYMOSOMATOIDA
<i>Arbacia waccamaw</i> Cooke
Order ECHINOIDA
<i>Echinometra lucunter</i> (Linnaeus)
Order CLYPEASTEROIDA
<i>Clypeaster rosaceus</i> (Linnaeus)
<i>Clypeaster carrizoensis</i> Kew
<i>Clypeaster</i> sp. cf. <i>C. subdepressus</i> (Gray)
<i>Encope michelini</i> L. Agassiz
Order SPATANGOIDA
<i>Brissus glenni</i> Cooke
<i>Meoma ventricosa</i> (Lamarck)

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Manuscript accepted on May 19, 2011