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Taxonomic note: *Discoaster stellulus* Gartner, 1967, emended

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1. Introduction

Discoaster stellulus was first described by Gartner (1967) from the Middle Miocene Lengua Formation, Trinidad. The original description, however, was largely based on the distal view of the asterolith, while the proximal view was not depicted in electron micrographs and, therefore, essentially remained undescribed. This may have caused misplacement of specimens in proximal view into a different species, hindering true identification and, consequently, application of this species in biostratigraphy.

A calcareous nannofossil biostratigraphic study on the diatomaceous materials from Hole 1256B, Ocean Drilling Program (ODP) Leg 206 to the eastern equatorial Pacific, yielded abundant, well-preserved specimens of *D. stellulus*. Both sides of this asterolith were extensively examined using light and electron microscopy. A mobile-mount technique was applied to observe multiple views of same specimens. All of these allow a redescription and reillustration of this species, the definition of which is emended herein.

2. Material and methods

The studied materials are dark greenish-gray nannofossil-diatom oozes from a Middle Miocene to Quaternary carbonate-rich section recovered during ODP Leg 206 to the Guatemala Basin. Sixteen zones/combined zones and 28 datums were recognised in the sedimentary sequence in Hole 1256B, according to the biostratigraphic schemes of Martini (1971), Martini & Müller (1986) and Okada & Bukry (1980). The nannofossil assemblages are characteristic of low latitudes, with abundant *Gephyrocapsa*, *Discoaster* and *Sphenolithus*, and are, in general, moderately- to well-preserved, depending on nannofossil abundance and the presence of diatoms. The two consecutive samples containing *Discoaster stellulus* were assigned to Subzone NN11d, based on the co-occurrence of *Discoaster quinqueramus* and *Amaurolithus amplificus* (Jiang & Wise, in press).

Preparation of smear-slides followed the standard technique (Bown, 1998), using Norland 61 optical adhesive as a permanent mounting medium. Selected samples were also prepared and examined in a mobile mount. Unprocessed sediments were smeared on a glass coverslip, dried, and then mixed with Norland 61 optical adhesive as evenly as possible, and the coverslip placed on a glass slide. The slide was not cured under ultraviolet light so that specimens could be rotated by gently moving the coverslip to create flows within the viscous mounting medium. This allowed observation of both sides of a specimen, as well as a side view of the same specimen. Slides were examined using a Zeiss Axioskop II microscope under cross-polarised light (XPL), transmitted light (TL), and phase-contrast light (PC) at 1000x magnification. A JEOL JSM 840 scanning electron microscope (SEM) was employed to observe fine-scale structures.

All materials are deposited in the collections of the Calcareous Nannofossil Laboratory at the Department of Geological Sciences, Florida State University (FSU), Tallahassee, Florida, USA.

3. Systematic palaeontology

Family **DISCOASTERACEAE** Tan, 1927
Genus *Discoaster* Tan, 1927

Discoaster stellulus Gartner, 1967, emend.
Pl.1, figs 1-22

Emended diagnosis: Six-rayed asterolith with elongated, diamond-shaped depressions on the proximal side and prominent parallel-sided ridges along the rays on the distal side.

Original description: Asterolith, usually with six short rays; prominent parallel-sided ridges radiate from center to near tip of each ray.

Emended description: The asterolith consists of six rays, each with a prominent parallel-sided ridge on the distal side, whereas the arms display elongate, diamond-shaped depressions on the proximal side. The arms are stubby, tapering abruptly to a single point or a notched bifurcation. The bifurcations have short, pointed limbs that form an obtuse angle. The central area is very large relative to the entire size of the asterolith, and features a large 6-rayed knob. The knob on the distal side is more robust and larger than on the proximal side. The asterolith appears dim in transmitted light, except that the ridges along the arms are brighter and stand out. In overgrown specimens, all of these features are more distinctive under both transmitted and polarised light.

Differentiation: *D. stellulus* resembles in outline *Discoaster adamanteus* Bramlette & Wilcoxon, 1967, which also has short, stubby, gradually tapering arms. However, in addition to bearing a 6-rayed knob on both sides, *D. stellulus* has diamond-shaped depressions on the proximal side and prominent parallel-sided ridges along the rays on the distal side, which differentiate this species from other Neogene discoasters.

Dimensions: 4-8μm (holotype = 6.4μm).

Occurrence: *D. stellulus* was common to abundant between the last uphole occurrences of *Amaurolithus amplificus* and *Amaurolithus primus* within Subzone NN11d (uppermost Miocene) in our study section from Hole 1256B. Specifically, it was observed in Samples 206-1256B-6H-2, 115-117cm (46.75mbsf) and -6H-2, 40-42cm (46.00mbsf). However, Gartner (1967) originally described the taxon from the *Globorotalia menardii* Planktonic Foraminiferal Zone, of the Lengua Formation of Trinidad (Sample C887M), which corresponds to the lowermost Upper Miocene *Discoaster hamatus* Zone of Bramlette & Wilcoxon (1967), or to Zone NN9 in the Martini (1971) zonation. Therefore, our observations extend the range of the species from Zone NN9 up into Subzone NN11b, although no occurrences of this species were observed in zones/subzones other than NN11d in this present study.

Acknowledgements

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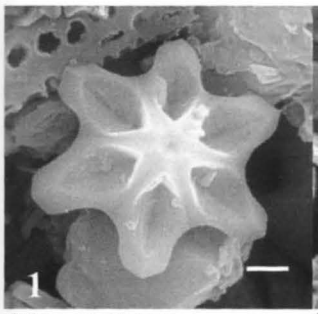
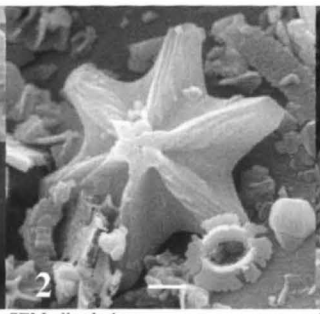
Plate 1

Discoaster stellulus Gartner, 1967, emend.

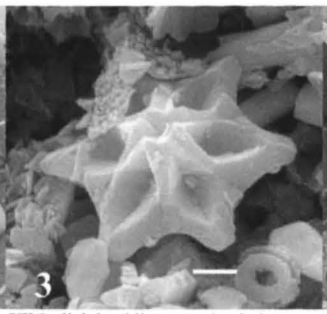
Sample ODP 206-1256B-6H-2, 115-117cm. Scale-bars = 1μm (1-12) or 2μm (13-22)



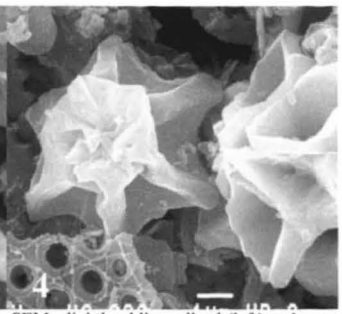
SEM, proximal view



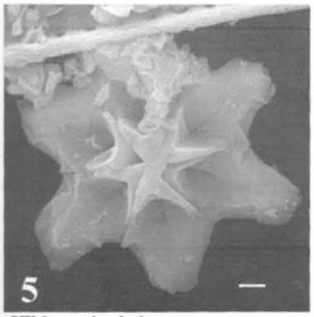
SEM, distal view



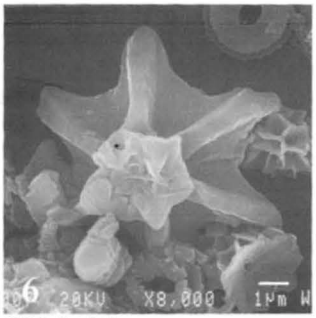
SEM, slightly oblique proximal view



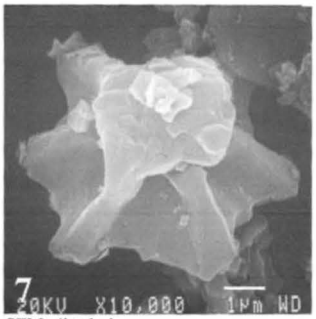
SEM, slightly oblique distal (left) and oblique proximal (right) views



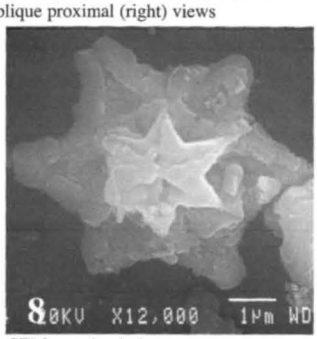
SEM, proximal view



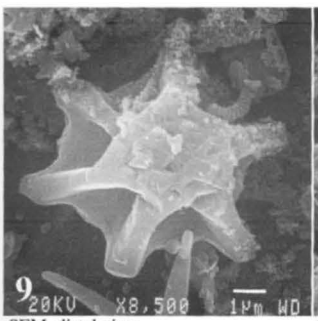
SEM, distal view



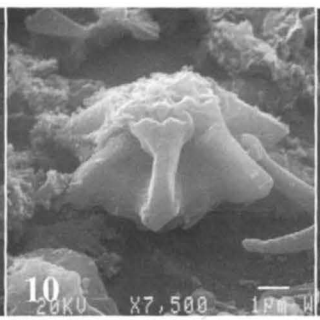
SEM, distal view



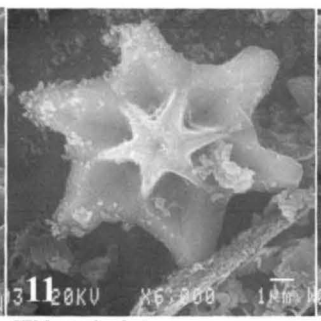
SEM, proximal view



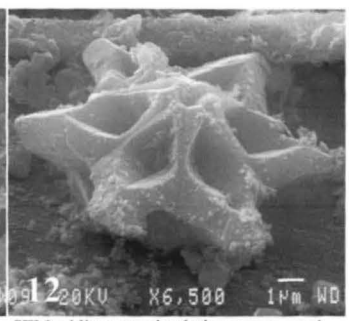
SEM, distal view



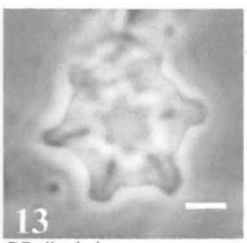
SEM, oblique distal view; same specimen as fig.9



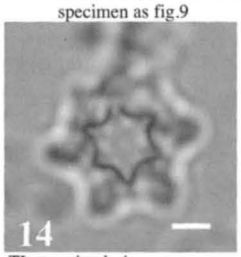
SEM, proximal view



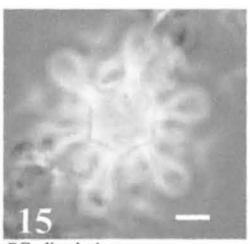
SEM, oblique proximal view; same specimen as fig.11



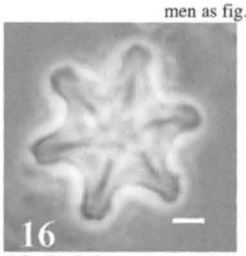
PC, distal view



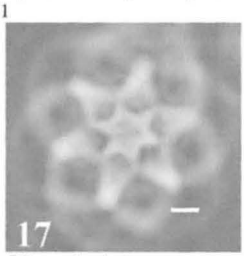
TL, proximal view; same specimen as fig.13



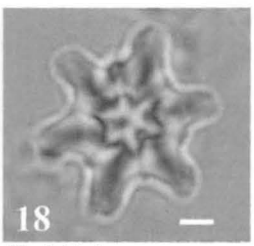
PC, distal view



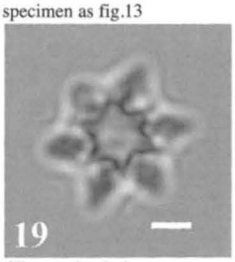
PC, distal view; same specimen as fig.15



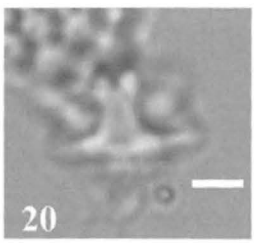
PC, proximal view, same specimen as fig.15



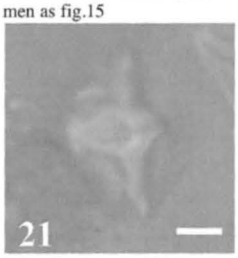
TL, distal view



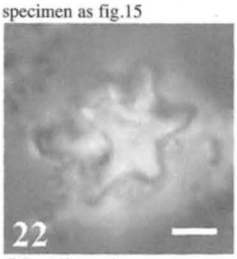
TL, proximal view



TL, side view



TL, side view, mobile mount



PC, oblique view