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Nematosphaeropsis downii sp. nov.: a new dinoflagellate cyst from Miocene sediments in the Bay of Biscay

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ABSTRACT—A new fossil dinoflagellate cyst *Nematosphaeropsis downii* sp. nov. is described from Miocene sediments encountered in Leg 80 of the Deep Sea Drilling Project. The age range of this species is restricted to the Early Miocene on available evidence.

INTRODUCTION

Until recently, detailed biostratigraphy of the Neogene in N.W. Europe has relied heavily on calcareous micro- and nannofossils; little use being made of dinoflagellate cysts. Relatively few studies have been made of cysts of this age, and recent papers dealing specifically with the Miocene and Pliocene are scarce. The papers of Jan du Chene (1977), Harland (1979) and Piasecki (1980) are the most significant relating to dinocysts of this age in western Europe. Their studies of the biostratigraphic distribution of dinocysts in the Neogene of Andalusia, Spain, the Bay of Biscay and Denmark respectively have laid the groundwork for further study.

At present, no refined dinocyst zonation scheme has been published for the Neogene, however Costa & Müller (1978) published a correlation of the informal dinocyst zones of Costa & Downie (1979) with the standard nannoplankton zones of Martini (1971), based on the study of material from the Rockall Plateau (Leg 48 of the Deep Sea Drilling Project). The relative paucity of information on the distribution of dinoflagellate cysts in the Neogene has seriously hindered progress towards a widely applicable zonation scheme. It is hoped that studies such as this, with good age control from nannofossils will further enhance the resolution of Neogene dinocyst biostratigraphy.

SYSTEMATIC DESCRIPTION

Division Pyrrophyta Pascher, 1914
Class Dinophyceae Fritsch, 1929
Order Peridinales Häckel, 1894
Family* Spiniferitaceae. Sarjeant & Downie, emend. Norris, 1978

*cyst family, since this cyst is not known to have been produced by an extant dinoflagellate.

Genus *Nematosphaeropsis* Deflandre & Cookson emend. Williams & Downie, 1966
Nematosphaeropsis downii sp. nov.
(Pl. 1, figs. 1-6)

Derivation of name. Named after Professor Charles Downie in honour of his work in the field of microplankton biostratigraphy.

Diagnosis. A species of *Nematosphaeropsis* with a faintly granular, ovoidal to subspherical central body. The gonal and sutural processes are linked distally by thin-walled, broad, membranous trabeculae. Parasutural features are evident in places on the central body.

Holotype. D.S.D.P. Leg 80, Hole 548A, core 14-1, 52-54 cm. Slide 2, England Finder reference U32/1.

Description. Chorate cysts with ovoidal to subspherical central bodies. Sutural and gonal processes linked together by distal trabeculae to form an outer sphere. A single wall layer is visible in transmitted light, the surface is regularly granular. No internal structure is visible in the wall. Gonal and sutural processes are present, occasionally linked by parasutural features on the surface of the inner body. The processes may be hollow, but due to compression and folding of the specimens this is not certain. All processes expand distally into two trabeculae linked by a thin membrane which join adjacent processes. The overall length of the processes is usually between 20 μm and 30 μm, and consistently the same on each specimen, to such an extent that the outer ovoid formed by the trabeculae is a constant distance from the central body.

The archaeopyle (Type P) is interpreted as being formed by the loss of one precingular paraplate (3″) and the operculum is usually free. The paratabulation formula cannot be accurately determined, however indications from the course of the trabeculae between processes, where visible, would suggest a typical Gonyaulacacean formula of:

3-4′, 5-6″, 6c, 5-6″, 1p, 1‴″

This paratabulation is not clearly visible in the specimens obtained for this study since all had undergone some degree of compression. The paracingulum appears to be slightly helicoidal.

Dimensions. Holotype (Pl. 1, figs. 1 and 2). Overall length: 95 μm; overall breadth: 88 μm. Central body length: 65 μm; Central body width: 60 μm; Process length: 28-30 μm. Variation (mean in brackets): Overall length – 95 μm (82.2 μm) 59 μm; Overall breadth – 88 μm (71.1 μm) 45.5 μm; Central body length – 65 μm

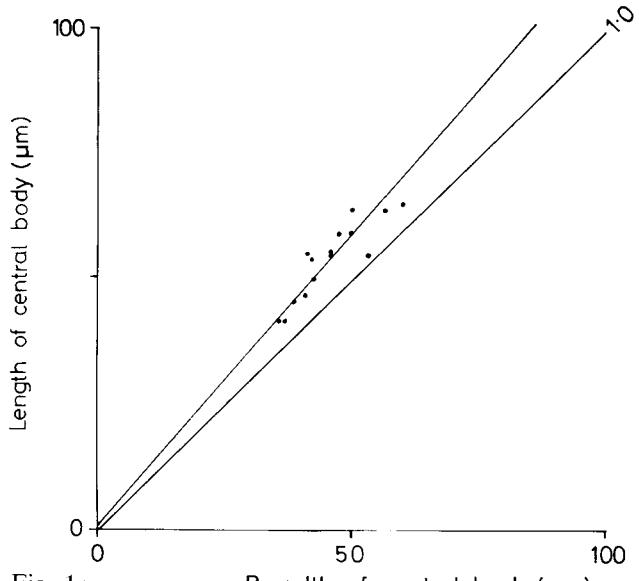


Fig. 1a.

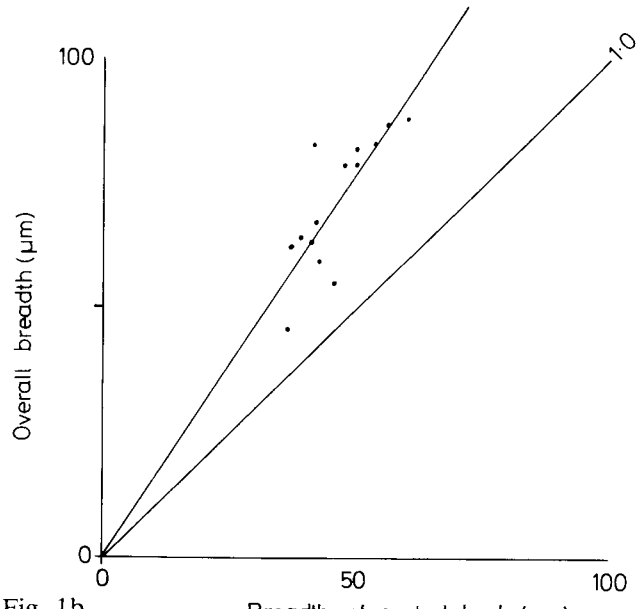


Fig. 1b.

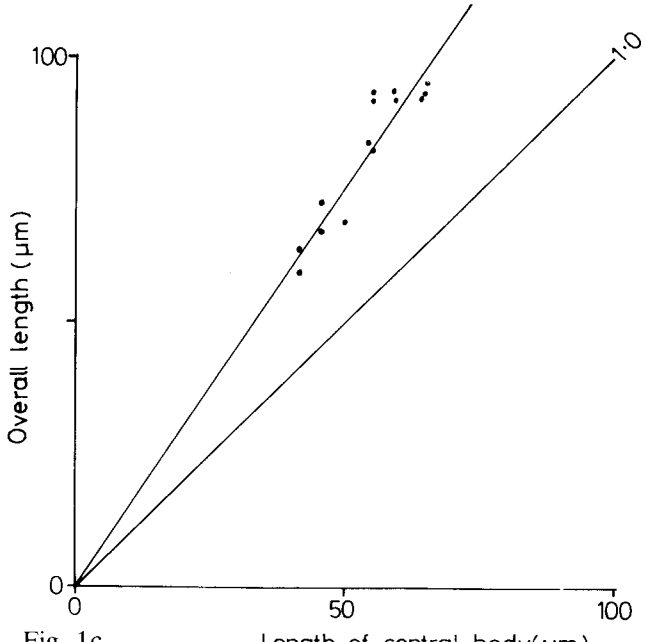


Fig. 1c.

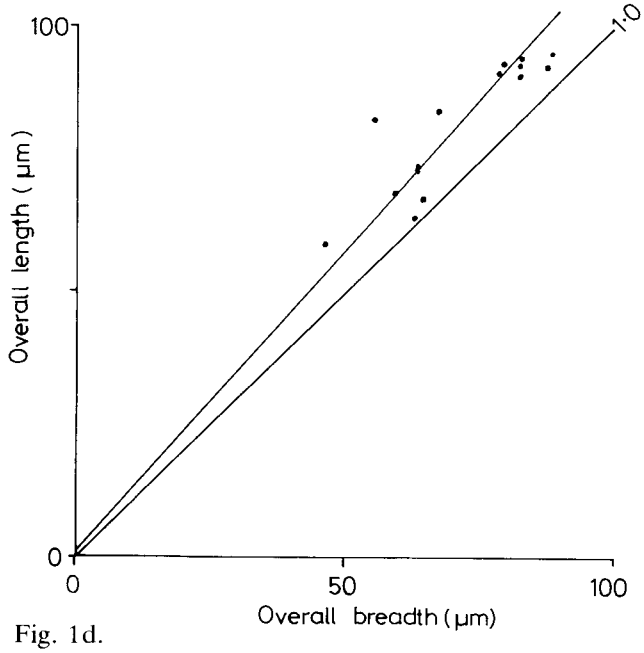


Fig. 1d.

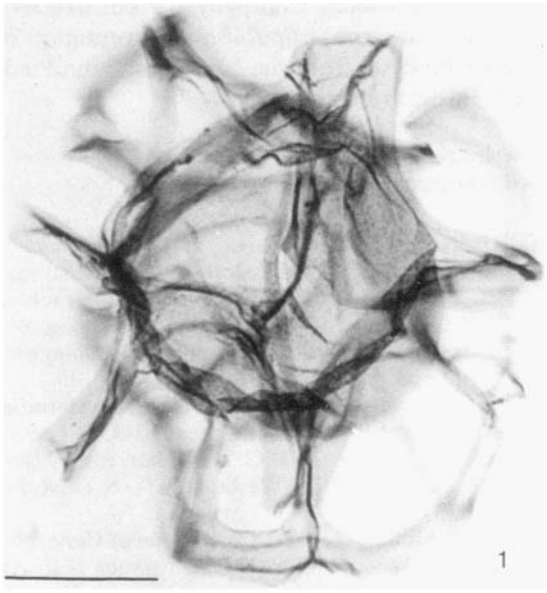
Explanation of Plate 1
Scale Bars 25 microns (approx.)

Figs. 1, 2. *Nematosphaeropsis downii* sp. nov. Holotype, D.S.D.P. Hole 548A, Core 14-Section 1, 52-54cm. Slide 2, England Finder reference U32/1.

Figs. 3, 5. *N. downii* sp. nov. D.S.D.P. Hole 548A, Core 14-Section 1, 52-54cm. Slide 1, G35/1. Specimen showing precingular archaeopyle.

Fig. 4. *N. downii* sp. nov. D.S.D.P. Hole 548A, Core 14-Section 1, 52-54cm. Slide 3, R46/0. Ventral view showing helicoid nature of the paracingulum.

Fig. 6. *N. downii* sp. nov. 548A-14-1, 52-54cm. Slide 2, Q39/0. (×1000 approx.). Detail showing regular granulate ornament on the central body.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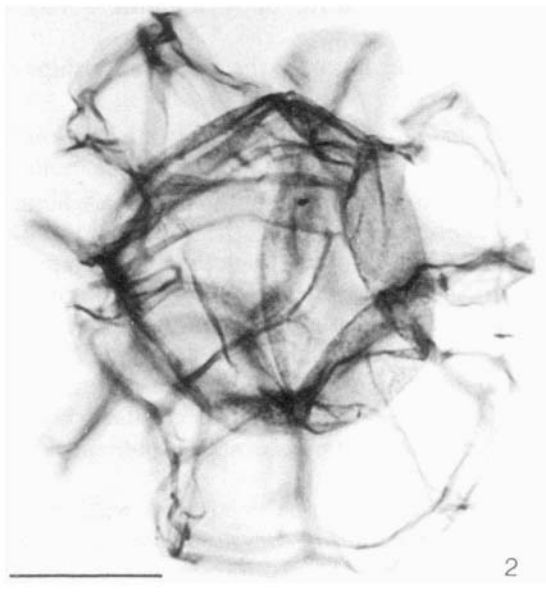
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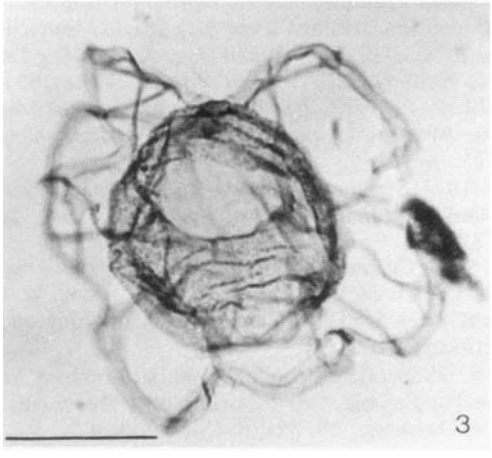
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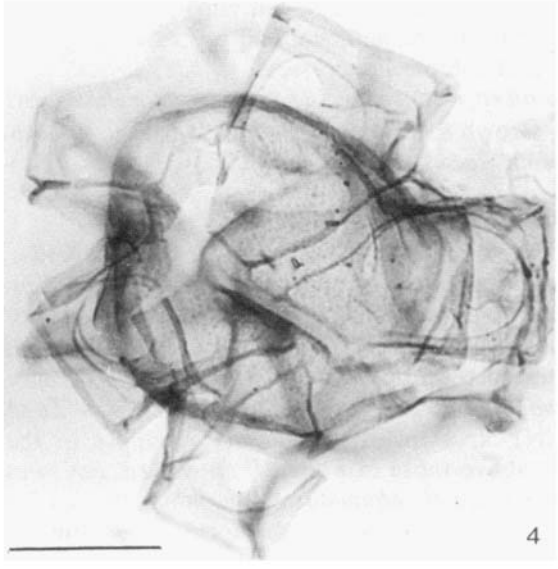
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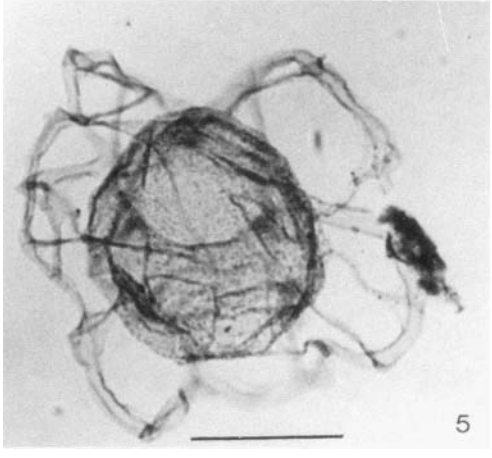
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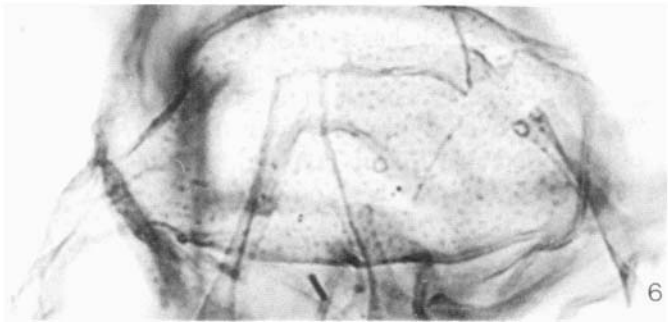
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(53.8μm) 41.5μm; Central body breadth – 60μm (45.8μm) 36.5μm.

Figs. 1a-d show the nature of the size relationships of *N. downii* sp. nov.

Remarks. *N. downii* sp. nov. differs from previously described species of the genus in its greater size, both of the central body and the length of the processes. Similar forms have been recorded from the Early Miocene of Italy (Powell, 1983, thesis) although these lack granulate ornament on the central body. *N. downii* sp. nov. has certain structural similarities to *N. aquaeducta* Piasecki, although the latter is much smaller and has processes which are shorter in proportion to the central body diameter. The concave nature of the trabeculae occurring in *N. aquaeducta* can also be discerned in some specimens of *N. downii* sp. nov.

Similarities exist on a superficial level with several species of other genera. *Balteocysta perforare* (Davey, 1978) Wilson & Clowes, 1980 differs in that it possesses only intratabular paracingular processes. *Arachnodinium antarcticum* Wilson & Clowes, 1982 superficially resembles *N. downii* sp. nov. but has an apical rather than precingular archaeopyle, and possesses only precingular and antapical processes.

N. downii sp. nov. was recorded as *Nematosphaeropsis* sp. A by Brown & Downie (1984), however no description was included.

CONCLUSIONS

The limited stratigraphic range of *N. downii* sp. nov. should in future allow greater precision in the zonation of the Early Miocene since it is restricted to the nannoplankton zones NN3 and NN4 (Müller, 1984) its age is equivalent to the upper half of the *Tuberculodinium vancampoae* Zone of Costa & Downie (1979) – Zone VIIb, NN1-NN4 inclusive. The next sample in the sequence above those in which *N. downii* sp. nov. was found contained *N. aquaeducta*, the zonal species for Costa & Downie's Zone VIII; this species was formerly known as *Leptodinium* sp. V (Manum, 1976) and has been shown to occur widely for the first time in NN5 (Middle Miocene). It can therefore be clearly demonstrated that *N. downii* sp. nov. has a range restricted to the upper part of the Early Miocene, and may in future be useful in a formal zonation scheme of the Neogene as a whole. The closely related forms found in the Early Miocene of the Piedmont Basin in Northern Italy (Powell, 1983, thesis) indicate that closer examination of this time interval in other areas may produce further records of *N. downii* sp. nov.

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