

32. LATE CRETACEOUS DINOFLAGELLATE CYSTS FROM THE SOUTHERN KERGUELEN PLATEAU, SITE 738¹

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ABSTRACT

Forty-one samples from the lower section (between approximately 370 and 495.5 mbsf) drilled at ODP Site 738 (southern Kerguelen Plateau) were analyzed for their palynomorph content. The majority proved to be palynologically barren. Twenty-one species and subspecies of dinoflagellate cysts were recorded, however, from the eight samples that proved productive. The irregular distribution of the cysts makes accurate age determinations difficult, particularly for the lower part of the succession. However, species recovered from Cores 119-738C-21R to 119-738C-23R indicate a latest Maastrichtian age.

INTRODUCTION

The Kerguelen Plateau (Fig. 1) stretches approximately 2500 km between 48°S and 84°S in a northwest-southeast direction on the Antarctic plate. Leg 119 of the Ocean Drilling Program (ODP) drilled four sites (738, 744–748; Fig. 1) on the southern Kerguelen Plateau as part of an investigation into the origin and tectonic history of this region. At one of these sites (Site 738) a 490 m thick sequence of Upper Cretaceous-Quaternary sediments was recovered. This paper examines the distribution of organic-walled microfossils (palynomorphs) recovered from the Upper Cretaceous part of the sequence (i.e., the lower 120 m of Hole 738C; Barron, Larsen, et al., 1989; Site 738).

A total of 44 samples was processed using standard palynological acid digestion techniques (Doher, 1980) (Table 1). The majority of samples were barren of organic material; eight, however, contained moderate to low abundance dinoflagellate cyst assemblages. Twenty-one species and subspecies were recorded (see Appendix); their stratigraphic distribution is plotted on Figure 2. Palynomorph preservation was generally moderate to poor with the majority of forms being fairly thin-walled. No spores, pollen, or other recognizable terrestrial debris were recorded, indicating the absence of any emergent land area near this site during Late Cretaceous times.

BIOSTRATIGRAPHY

Significant intervals of Hole 738C are barren of palynomorphs and, even when present, their distribution is very irregular (Fig. 2).

The oldest productive sample (119-738C-31R-2, 10–12 cm) contains a moderately abundant monospecific assemblage of moderately to poorly preserved specimens of *Isabelidinium glabrum* (Cookson & Eisenack) Lentin & Williams. Using the recently published zonal scheme for the Australian Mesozoic (Helby et al., 1987), *Isabelidinium glabrum* is seen to be typical of the upper part of the *Palaeohystrichophora infusorioides* Zone and the lower part of the *Conosphaeridium striatoconus* Zone, suggesting a Turonian-Coniacian age for this part of the succession. This productive horizon is overlain by a barren interval.

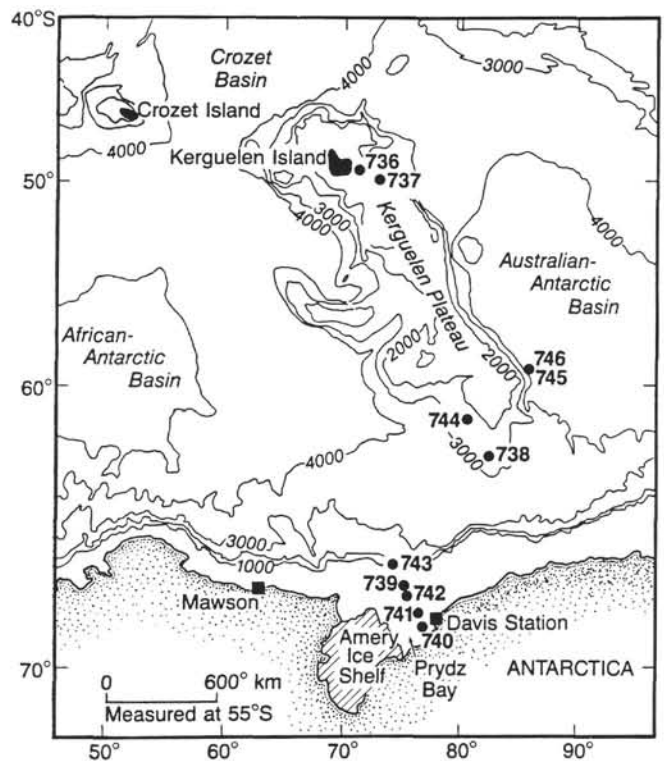


Figure 1. Location of sites drilled during Ocean Drilling Program Leg 119.

The next productive sample (119-738C-26R-2, 125–130 cm) contains a poorly preserved cyst assemblage comprising a few specimens of *Oligosphaeridium complex* (White) Davey & Williams, *Odontochitina costata* Alberti; emend. Clarke & Verdier, and *Cassiculosphaeridia reticulata* Davey. None of these forms is particularly significant biostratigraphically, although the presence of *O. costata* indicates that this sample is no younger than Campanian in age (Tocher, 1987).

A further barren interval extends to Sample 119-738C-23R-1, 54–56 cm, which contains a low-diversity assemblage of moderately preserved cysts. These include stratigraphically significant forms such as *Samlandia carnarvonensis* McMinn, *Manumiella druggii* (Stover) Bujak & Davies, and *Manumiella* sp. 1 (of As-

¹ Barron, J., Larsen, B., et al., 1991. *Proc. ODP, Sci. Results*, 119: College Station, TX (Ocean Drilling Program).

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Table 1. List of samples examined from Hole 738C.

Core, section, interval (cm)	Core, section, interval (cm)
18R-1, 141-146	23R-2, 123-126
18R-2, 141-146	23R-3, 51-53
18R-3, 141-146	24R-1, 5-8
18R-4, 141-146	24R-2, 116-119
18R-5, 141-146	24R-3, 130-133
18R-6, 141-146	25R-1, 100-102
19R-1, 27-30	25R-2, 101-103
19R-2, 27-30	25R-3, 51-53
19R-3, 27-30	25R-4, 60-62
20R-1, 76-79	26R-1, 100-105
20R-2, 125-128	25R-2, 125-130
20R-3, 127-130	26R-3, 80-85
20R-4, 126-129	27R-5, 55-88
20R-5, 37-40	28R-1, 23-28
21R-1, 56-59	28R-2, 71-74
22R-1, 45-48	28R-4, 47-50
22R-2, 45-48	29R-2, 130-134
22R-3, 61-64	29R-3, 61-66
22R-4, 69-72	30R-1, 21-25
22R-5, 38-41	31R-1, 1-4
22R-6, 20-23	31R-2, 10-12
23R-1, 54-56	31R-3, 22-24

kin, 1966). McMinn (1966) suggested that *S. carnarvonensis* was indicative of a late Campanian-early Maastrichtian age. However, the occurrence of *M. druggii* and *Manumiella* sp. 1 (of Askin, 1988) indicate that this sample is at least latest Maastrichtian, suggesting that the range of *S. carnarvonensis* is more extensive than originally thought.

The next sample upsection (119-738C-22R-6, 20-23 cm) contained the most abundant and diverse cyst assemblage found during this study. Stratigraphically significant forms include *M. druggii*, *M. seelandica* (Lange) Bujak & Davies; emend. Firth, *Alisocysta margarita* Harland, *A. circumtabulata* (Drugg) Stover & Evitt, and *S. carnarvonensis*. According to Askin (1988), *M. seelandica* and *A. circumtabulata* first appear in the latest Maastrichtian of Seymour Island (Antarctic Peninsula). This interpretation is in agreement with Helby et al.'s (1987) zonation for the Australian Mesozoic, where both of these forms are characteristic of their (Helby et al., 1987) late Maastrichtian to basal Danian *Manumiella druggii* interval Zone.

Three of the remaining productive samples (119-738C-22R-4, 89-72 cm; 119-738C-22R-2, 45-48 cm; 119-738C-21R-1, 56-59 cm) contain low-abundance and low-diversity cyst assemblages (Fig. 1) whose principal elements are similar to that of the preceding Sample 119-738C-22R-6, 20-23 cm. The presence of *A. margarita*, *A. reticulata*, and *Cladopyxidium foveolatum* McMinn all suggests a latest Maastrichtian-earliest Danian age for this part of the succession.

No taxa referable to Helby et al.'s (1987) *Trithyrodinium evittii* Acme Zone (early Danian) were found. In addition, none of the forms which Askin (1988) and McMinn (1988) recorded as indicating a solely Danian (or younger) age were recorded at Site 736, suggesting that the sediments contained in Cores 119-738C-21R, 119-738C-22R, and 119-738C-23R are, in fact, latest Maastrichtian in age. Unfortunately, samples examined from the overlying cores (119-738C-20R, 119-738C-19R, 119-738C-18R) were barren of palynomorphs thus preventing the precise placement of the Cretaceous/Tertiary boundary position.

CONCLUSIONS

The highly irregular distribution of dinoflagellate cysts in the samples from Site 738 is problematic. Shipboard-based sedimentological and paleontological evidence points to the fact that much of the Cretaceous sequence represents a relatively shallow water, probably shelf, environment (Barron, Larsen, et al., 1989; Site 738).

It is hoped that a comprehensive study (currently underway) of the distribution of palynomorphs from other Cretaceous sequences recovered on the Kerguelen Plateau during ODP Legs 119 and 120 will provide a greater understanding of the oceanographic processes which were operating at that time.

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APPENDIX

List of Taxa

- Achomospaera ramulifera* (Deflandre, 1937) Evitt, 1983
- Alisocysta circumtabulata* (Drugg, 1967) Stover & Evitt, 1978
- Alisocysta margarita* Harland, 1979
- Alisocysta reticulata* Damassa, 1979
- Cassiculosphaeridia reticulata* Davey, 1969
- Cladopyxidium foveolatum* McMinn, 1988
- Elytrocysta* sp. (of Askin, 1988)
- Impagidinium cristatum* (May, 1980) Lentini & Williams, 1981
- Impagidinium* sp. cf. *1. patulum* (of Jan du Chene, 1987)
- Isabelidinium glabrum* (Cookson & Eisenack, 1969) Lentini & Williams, 1977
- Manumiella druggii* (Stover, 1974) Bujak & Davies, 1983
- Manumiella seelandica* (Lange, 1969) Bujak & Davies, 1983; emend. Firth, 1987
- Manumiella* sp. 1 (of Askin, 1988)
- Odontochitina costata* Alberti, 1961; emend. Clarke & Verdier, 1967
- Oligosphaeridium* complex (White, 1942) Davey & Williams, 1988
- Palaeocystodinium* sp. (of Askin, 1988)
- Perodinium cingulatum cingulatum* (O. Wetzel, 1933) Below, 1981
- Perodinium cingulatum ovale* (Cookson & Eisenack, 1974) Lentini & Williams, 1981
- Samlandia carnarvonensis* McMinn, 1988
- Spiniferites ramosus ramosus* (Ehrenberg, 1838) Loeblich & Loeblich, 1988
- Spiniferites ramosus* (Ehrenberg, 1838) reticulatus (Davey & Williams, 1966) Lentini & Williams, 1973

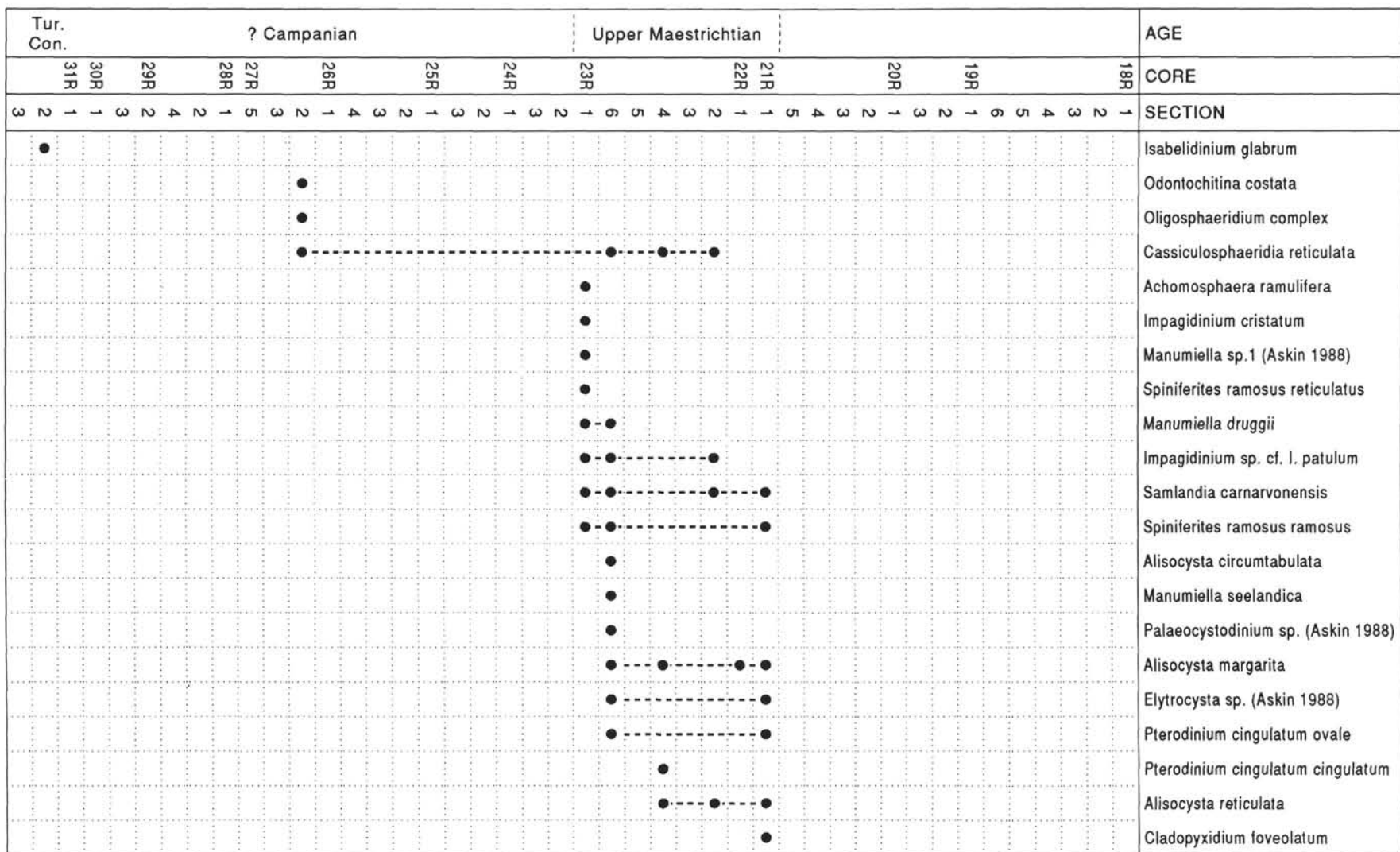


Figure 2. Distribution chart of dinoflagellate cysts recovered from Cretaceous sediments from Hole 738C.