MICROPALAEONTOLOGY NOTEBOOK

The First Appearance Datum (FAD) of Hetero sphera ridium difficile (Manum & Cookson), dinoflagellata, in clastic deposits offshore Norway

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INTRODUCTION

Thick sequences of clastic deposits of Late Cretaceous age (1000–1500 m) are present offshore mid and north Norway. Dinoflagellate assemblages from these deposits have Arctic affinities and are dominated by species of Chatangiella, Trithyriondium and Isabelidinium. The First Appearance Datum (FAD) of Heterosphaeridium difficile is an important correlation point within this sequence and is equated with a Turonian age in most current zonal schemes. Our observations on the relative ranges of H. difficile, members of the Endoceratium dettmanniae—E. ladbrookiæ plexus and other key index species in well materials offshore mid and north Norway are not consistent with ranges documented from European stratotypes and suggest a Cenomanian age for the correlation point. This note is intended as a basis for discussion pending a more detailed account of these deposits.

OBSERVATIONS

Three released offshore wells with good control from sidewall and core samples were selected for study. All of the well sections produced rich typical middle Cretaceous dinocyst assemblages with common H. difficile. At some level, typical forms of H. difficile with discrete processes intergrade with morphotypes having shorter, wider, coalescing processes, probably related to species in the Cyclonephelium membrandiphorum complex. As recognized here, H. difficile is restricted to forms similar to the holotype, with discrete processes. Species of Endoceratium are present consistently in the lower part of the H. difficile range zone. There is gradation between forms close to E. dettmanniae and E. ladbrookiæ to reticulate forms similar to E. turneri. Well 35/3-5 is located about 190 km NNW of Bergen in the North Sea. H. difficile occurs in sidewall cores down to 2896 m and is associated with E. dettmanniae and E. detturneri in sidewall cores between 2733 and 2896 m. Well 7119/7-1 is located 200 km N of Tromsøa in the Barents Sea. E. dettmanniae occurs from 2529.5 m and co-occurs with H. difficile in sidewalls between 2529.5 m and 2654.0 m. The lower part of the H. difficile range zone in this well is also associated with Bastoiladinium jaegeri. Cauca parva occurs at 2654 m. Well 6507/7-1 is in the mid-Norway exploration area about 275 km NW of Trondheim. A thick Cenomanian–Turonian sequence is present. H. difficile occurs in sidewall and core samples down to 3506 m; E. dettmanniae and B. jaegeri occur in samples downhole from 3131 m and 3239 m, respectively. The planktonic foraminifera Hedbergella deivriinae is present from 3419 m and is common at 3464 m. Hedbergella planispira is present at 3470 m. These foraminifera are typically, but not exclusively associated with Cenomanian deposits.

DISCUSSION

Costa & Davey (1992) in a critical review of (mainly British) Cretaceous dinoflagellate data indicate mutually exclusive ranges for H. difficile and E. dettmanniae. The FAD of H. difficile is given as Early Turonian and the Last Occurrence Datum (LOD) of E. dettmanniae within the Late Cenomanian. The widespread occurrence of the H. difficile–E. dettmanniae assemblage in these and other wells on the Norwegian shelf is taken to imply that the assemblage is in situ and the records documented above are therefore consistent with the accepted ranges of these species. A consideration of the actual data on the occurrence of H. difficile in English and French Turonian deposits, as documented by Tocher & Jarvis (1987), (1995), Jarvis et al. (1988), Foucher (1981) and others shows the distribution to be erratic and it is not a consistent marker for the Turonian of these areas. In Norwegian Arctic deposits H. difficile is common and regular throughout its range. These differences are thought to be due, at least in part, to dinoflagellate provincialism though other factors may also be involved.

Outside of Western Europe, Chlonova (1996), commenting on provincialism in Late Cretaceous assemblages from Western Siberia, notes that they differ markedly from Western Europe and that there are variations in species abundance and apparent range from area to area, though no details are given. In Western Greenland (Nehr-Hansen, 1996, & pers. comm., 1996) the oldest relevant deposits investigated are of Coniacian or possibly Late Turonian age and the FAD of H. difficile has not been located. Norvick & Burger (1976) documented assemblages from two Cenomanian sections from Bathurst Island, Northern Territory, Australia. These sections include H. difficile, Endoceratium spp., B. jaegeri and Liposphaeridium siphoniphorum. The chronostratigraphy is well documented. Kennedy (1970) indicated a mid-Cenomanian age for ammonites from an adjacent cliff section and Burger (pers. comm. 1996) notes that an ammonite from the same fauna was recovered from the sample containing the lowermost record of H. difficile. Planktonic foraminifera indicate an Early to mid-Cenomanian age for the lower part of the cored sections (Norvick & Burger, 1976, p.5).

CONCLUSIONS

A concurrent range zone defined by the FAD of H. difficile and the LOD of E. dettmanniae is widely recognizable in wells from the Norwegian shelf. Evidence from the Australian stratotype suggests that this zone is of Early to mid-Cenomanian age and that the FAD of H. difficile in a continuous section should probably be considered as close to the Early to mid-Cenomanian boundary. This may be of some significance to the regional model as potential hydrocarbon reservoir horizons are present around the H. difficile FAD level.

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