Comparisons of the late Cenomanian Foraminiferida from Goban Spur, Site 551, DSDP Leg 80 (Western Approaches) and Dover (SE England)

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Introduction

Site 551, Deep Sea Drilling Project (DSDP) Leg 80 is located at lat. 48°54'.64"N long. 13°30'.09"W (Fig. 1), on Goban Spur, and was drilled to a depth of 3,887m. It penetrated a post-Aptian Mesozoic and Tertiary postrift drape over the en echelon listric faulted basement of the eastern Atlantic passive margin (Graciansky et al. 1985). The oldest sediments recovered were 2.3m of late Cenomanian nanofossil chalk which rest unconformably on basaltic basement (Fig. 2). These are overlain by 4.1m of black, organic-rich, finely laminated shale (Graciansky et al. 1985), which are thought to be the local representation of the late Cenomanian Oceanic Anoxic Event (OAE) of Schlanger and Jenkyns (1976) (see Schlanger et al. 1987, for a recent review). The complete section has been used to assess the major microfaunal changes across the OAE (Hart 1985; Hart and Ball 1986; Leary 1987) but this study is only concerned with a comparison of the pre-OAE Foraminiferida. The presence of Rotalipora cushmani (Morrow) and Rotalipora greenhornensis (Morrow) in all samples and T.R.Z. of R. cushmani (Morrow) (Grimsdale and Morkhoven 1955) and to map Cretaceous eustasy to make estimates of depth of deposition of sedimentary rocks (Sliter and Baker 1982; Scheibnerova 1977; Nyong and Olsson 1983; Olsson and Nyong 1984; Koutsoukos 1985) which recognise species specific depth assemblages. In addition, it contains many specimens of the deepest water, low trochospired, well keeled, medium trochospired, partially keeled, intermediate depth praelrobotruncarids and deep water, low trochospired, well keeled rota/oparids (Bailey and Hart 1979; Hart 1980a; Wonders 1980; Caron 1983). The planktonic assemblage from Goban Spur is composed of at least 50% rota/oparids, 40% praelrobotruncarids/dicarinellids and <12% hedbergellids. Thus, the assemblage represents an unrestricted open ocean assemblage. In addition, it contains many specimens of the deepest water, low trochospired rota/oparids (R. greenhornensis and R. deekeni (Franke)).

In contrast, the benthonic assemblage comprises a low diversity assemblage dominated by nodosariids and includes Tritaxia macfadyeni Cushman, Arenobulimina advena Cushman, Eggerellina brevis (d’Orbigny), Marssonella trochus (d’Orbigny), Gavellinella intermedia (Berthelin) and G. reussi (Khan) (Fig. 2). Within each group the gerontic specimens exhibit low size and morphological variability which is indicative of stable environmental conditions at the sediment water interface. The distribution pattern of benthonic foraminifera across Cretaceous shelves and the abyssal plain has been identified (Sliter and Baker 1982; Scheibnerova 1977; Nyong and Olsson 1983; Olsson and Nyong 1984; Koutsoukos 1985) which recognise species specific depth assemblages. The assemblage at Goban Spur, with a high proportion of nodosariids and a small number of agglutinated medium trochospired, partially keeled, intermediate depth praelrobotruncarids and deep water, low trochospired, well keeled rota/oparids (Bailey and Hart 1979; Hart 1980a; Wonders 1980; Caron 1983). The planktonic assemblage from Goban Spur is composed of at least 50% rota/oparids, 40% praelrobotruncarids/dicarinellids and <12% hedbergellids. Thus, the assemblage represents an unrestricted open ocean assemblage. In addition, it contains many specimens of the deepest water, low trochospired rota/oparids (R. greenhornensis and R. deekeni (Franke)).

The late Cenomanian foraminiferal assemblage from Site 551, DSDP Leg 80 (Goban Spur) shows many compositional features different to the coeval assemblage recovered from a typical onshore section in the AngloParis Basin (Dover). These are thought to be the result of deposition of the former in a deeper water facies.
Figure 2. Foraminifera from Site 551, DSDP Leg 80, Goban Spur.
foraminifera, is consistent with the outer slope assemblage of Sliter and Baker (1972).

**Dover, S.E. England**

In contrast, the Foraminiferida from a coeval shallower water sequence from the Anglo-Paris Basin (Dover) exhibits many differences in terms of the relative influence of planktonic and benthonic foraminifera and their respective compositions (Fig. 4). Aspects of the late Cenomanian foraminifera have variously been described (Jeffries 1962; Carter and Hart 1977; Hart 1982; Hart 1985) and synthesised (Leary 1987; Hart and Leary, in press; Jarvis et al. 1988; Leary et al. in press). The abundances of foraminiferal tests is variable (Fig. 4), between around 300 to less than 50 which is a feature of samples from Cenomanian chalk-chalk marl rhythms. This may be a result of orbital forcing on the biota but a greater sample resolution would be required to confirm this supposition. The p:b ratio is much reduced, compared to Goban Spur, which is only represented. In addition, deeper water assemblage than the coeval assemblages from the Anglo-Paris Basin and probably represents a marked deepening of water depth at a feature that may be picked out across the Anglo-Paris Basin. Albian OAE. Placing absolute values on the depth of deposition of these two areas is problematical and it is thought by the writers best to maintain only the relative nature of the two depths.

The benthonic assemblage is compatible with the middle-inner shelf position. The planktonic assemblage has the same species composition as Dover (Fig. 4) except it largely lacks the deepest water Rotaliporid species. R. deecki is absent and R. greenhornensis is only occasionally represented. In addition, R. cushmani forms a far smaller proportion of the total planktonic assemblage (usually under 25-30%) except for a marked increase in bed 1 of the Plenus Marls. This is a feature that may be picked out across the Anglo-Paris Basin and probably represents a marked deepening of water depth at the start of the deposition of this unit (Leary 1987; Jarvis et al. 1988).

The benthonic assemblage is diverse (36 species and varieties) and the assemblage displays much more intra-specific variability, in terms of specimen sizes and morphology, as exemplified by the nodosariids and marssonellids (Fig. 4). Most of the benthonic species found at Goban Spur are present at Dover but, significantly, within the nodosarid population the morphotypes possess a very high degree of ecophenotypic variation. In addition, the Dover assemblage contains species of the genera Ataxophragmium, Pseudopirellula, Gyroidinoides and Plectina (Fig. 4). The assemblage is compatible with a middle-inner shelf positioning according to Sliter and Baker (1972).

**Conclusions**

The late Cenomanian foraminifera of Goban Spur represent a much deeper water assemblage than the coeval assemblages from the on-shore sections of southern England, as exemplified by Dover (Table 1). The deeper water facies not only permitted the fuller representation of the deep water planktonic morphotypes (Rotalipora) but exhibited a lower diversity benthonic assemblage with low ecophenotypic variation. This latter situation is in contrast to the modern benthonic foraminifera where abyssal plain assemblages are the most diverse (Murray, pers. comm.). The reverse situation in the chalk seas may well be a consequence of the higher extinction rates of deep water foraminifera during oceanic anoxic events and their low recolonisation rates. In this case the deeper water assemblage may not have fully recovered from the last Albian OAE. Placing absolute values on the depth of deposition of these two areas is problematical and it is thought by the writers best to maintain only the relative nature of the two depths.

**References**


Caron, M. 1983. La speciation chez les foraminifères planctoniques; une réponse adaptée aux constraintes de l'environnement. Zitteliana, 10, 671-676.


Figure 4. Foraminifera from Dover.


