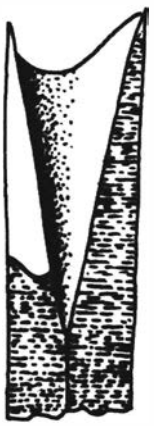

MAASTRICHTIAN BELEMNITES FROM DENMARK

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The Maastrichtian is defined as the chronozone of the ammonite *Scaphites (Hoploscaphites) constrictus* (Sowerby). In practise, however, the base of the Maastrichtian is defined by the first occurrence of the belemnite *Belemnella lanceolata* (Schlotheim), because *S. constrictus* is very rare or virtually absent in the lower part of the Maastrichtian. At one time several workers considered *S. constrictus* to have evolved from *S. tenuistriatus* Kner, which appears in the Upper Lower Maastrichtian. However, Schulz (1978) has shown that *S. constrictus* does indeed occur in the basal Maastrichtian in Kronsmoor Quarry (see Birkelund, this volume).

The Maastrichtian is dubdivided into four zones on the basis of belemnites (Jeletzky, 1951; Birkelund, 1957; Schmid, 1967); the zones are (Fig. 1, bottom to top): *Belemnella lanceolata* and *Belemnella occidentalis* Zones in the Lower Maastrichtian, and *Belemnitella junior* and *Belemnella casimirovensis* Zones in the Upper Maastrichtian. It should be mentioned that Schulz (in press), on the basis of a detailed biometric study of the morphological variation of the genus *Belemnella* in the Lower Maastrichtian, has subdivided the *B. lanceolata* Zone into three zones, viz. (bottom to top): *Belemnella lanceolata*, *Belemnella pseudobtusa*, and *Belemnella obtusa* Zones. He also refers to the *B. occidentalis* Zone as the *B. sumensis* Zone.

The best studied section in northern Europe exposing the Campanian/ Maastrichtian boundary is that of Kronsmoor, NW Germany (Schulz, 1978). There is here a gap of 5 m between the latest Campanian belemnite and the first occurrence of *Belemnella*.

The most detailed studied section in northern Europe exposing the Lower/Upper Maastrichtian boundary is that of Hemmoor, NW Germany (Schmid, 1975). In that chalk pit the boundary between the Lower and Upper Maastrichtian is placed conventionally at the "Tuffit-Schicht" -

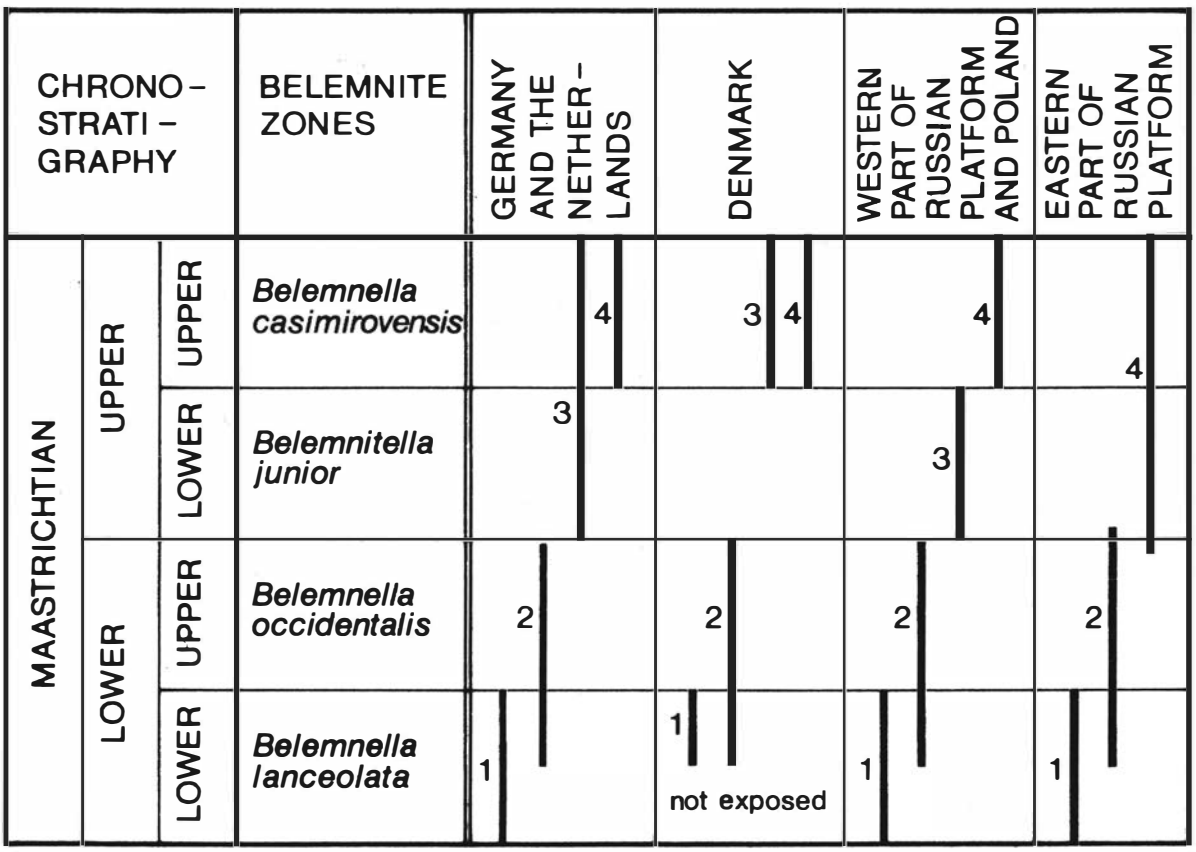

Fig. 1. Stratigraphic range of Maastrichtian zonal belemnites in various areas in northern Europe, based on Birkelund (1957), Christensen (1975, 1976), Jeletzky (1951, 1958), Naidin (1973, 1975), and Schmid (1967, 1975).

a marl layer interpreted by Valeton (1959) as a bentonite. The highest *Belemnella occidentalis cimbrica* Birkelund is found c. 1.5 m below that marl seam, while the lowest *Belemnitella junior* (Nowak) is found c. 5 m above it.

The Danish Maastrichtian belemnites have been studied, notably by Jeletzky (1951) and Birkelund (1957). According to Birkelund (1957) the genus *Belemnitella* is represented by *B. junior junior* and *B. junior nowaki* Jeletzky, and the genus *Belemnella* is represented by the following taxa:*B. lanceolata lanceolata*, *B.* aff. *lanceolata*, *B. occidentalis occidentalis* Birkelund, *B. occidentalis cimbrica* Birkelund, *B.* aff. *occidentalis*, *B. casimirovensis casimirovensis* (Skolozdrowna), *B. casimirovensis archangelskyi* Jeletzky, and *B. casimirovensis* n. subsp.

According to Birkelund (1957) *B. lanceolata* and *B. occidentalis* occur together below a thin hardground in the sequence exposed at Møns Klint. The basal Maastrichtian (the zone containing only *B. lanceolata*) does not outcrop in Denmark. The chalk above the hardground at Møns Klint is referable to the zone of *B. occidentalis* (Upper Lower Maastrichtian) (Birkelund, 1957).

Belemnitella junior and *Belemnella casimirovensis* occur together in the uppermost 25-30 m of the white chalk, and this part of the section is referred to the *B. casimirovensis* Zone (Surlyk, 1970b). The chalk in Denmark that is correlatable with the German *Belemnitella junior* Zone has not yielded any specimens of the index fossil (Surlyk, 1970b). This might be because *B. junior* is very rare in Denmark (Birkelund, 1957).

Belemnites occur rarely in the *B. casimirovensis* Zone in Denmark. The stratigraphically highest specimen was collected at Stevns Klint 30 cm below the Maastrichtian/Danian boundary (Birkelund, 1957). No belemnites have been recorded from the overlying Danian deposits.

The stratigraphic range of the Maastrichtian zonal belemnites in various areas in northern Europe is shown in Fig. 1. *Belemnitella junior* has not been recorded east of the Ukrainian syneclise, and in the eastern part of the Russian Platform transitional forms between *B. occidentalis* and *B. casimirovensis* span the Lower/Upper Maastrichtian boundary and *B. casimirovensis* range throughout the Upper Maastrichtian (Naidin, 1973, 1975).