

MAASTRICHTIAN BRACHIOPODS FROM DENMARK

Finn Surlyk

Geological Museum
Øster Voldgade 5-6, DK-1350 Copenhagen K

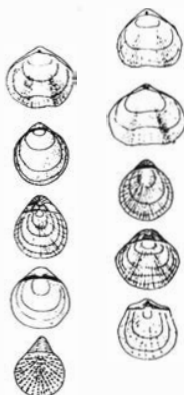
The brachiopods of the Maastrichtian white chalk of Denmark have been studied in detail from taxonomic, stratigraphic and palaeoecologic points of view (Surlyk, 1969, 1970a, b, 1972, 1973, 1974).

The material numbers about 100.000 specimens obtained mainly from bulk samples (5 or 10 kg). The total fauna numbers about 45 species, 8 of which are inarticulate (Fig. 1). The majority of the species - and by far the most abundantly occurring - are minute articulate forms which rarely exceed an adult length of 2 - 4 mm. Those species may occur in hundreds or even thousands in each sample (Fig. 2). The larger articulate species are generally rare and were either loose lying on the sea floor or attached with a pedicle to large suitable substrates such as echinoid tests. The inarticulate species mainly belong to the Craniacea which had a cementing or eventually freely recumbent mode of life (Surlyk, 1973). The species *Lingula cretacea* is notable in that it represents a mainly infaunal, burrowing group of brachiopods which is normally claimed to live in very shallow marine waters. Here it occurs in a pelagic chalk deposited well below the photic zone in the deeper part of the shelf. *Lingula cretacea* belonged to the normal benthic fauna and quantitative data from the chalk of Rügen, East Germany (Steinich, 1972) shows that it varies in abundance in the same way as the main part of the other benthic species. An epiplanktic mode of life can thus be excluded.

The more precise substrate preference of some of the pedunculate minute brachiopod species (Fig. 1) can be ascertained by rare finds of specimens preserved *in situ*, still adjacent to the substrate to which they were attached (Surlyk, 1974) and by the discovery of minute borings of different types produced by the strands of brachiopod pedicles (Fig. 3) (Bromley & Surlyk, 1973).

II) SECONDARILY FREE-LIVING FORMS, MEDIUM TO LARGE SIZED: 10 species.

Cretirhynchio limbata (Schlottheim) - 12 mm
Cretirhynchio retracta (Roemer) - 25 mm
Cretirhynchia sp. - approx. 30 mm
Corneithyrus subcardinalis (Sohni) - 45 mm
Terebratulina gracilis (Schlottheim) - 13 mm
Trigonosemus pulchellus (Nilsson) - 20 mm
Gemmarcula humboldtii (Hagenow) - 20 mm
Magas chitoniformis (Schlottheim) - 11 mm
Meonia semiglobularis (Posselt) - 4 mm
Thecidea poppillata (Schlottheim) - 10 mm



III) BURROWING FORMS: 1 species.

Lingula cretacea Nilsson - 8 mm



IV) ATTACHED TO THE SUBSTRATE BY CEMENTATION: 8 species.

a) Attached to the very small substrates: 2 species.

Isocrania costata (Sowerby) - approx. 7 mm
Isocrania barbata (Hagenow) - approx. 7 mm



b) Confined to large, hard substrates: 6 species.

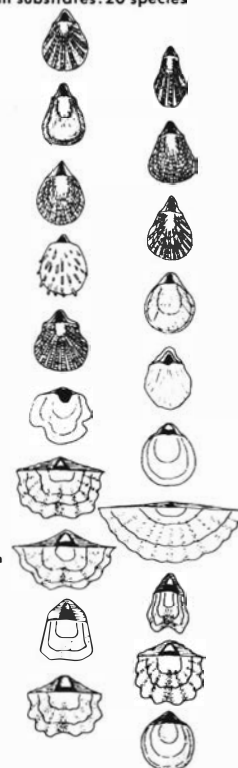
Ancistrocrania tubulosa (Nielsen) - 8 mm
Crania antiqua Defrance - 14 mm
Crania off. *cranialaris* (Linnaeus) - 7 mm
Vermiculothecidea vermicularis (Schlottheim) - 12 mm
Thecidea recurvirostra Defrance - 7 mm
Bifolium wetherelli (Morris) - 4 mm



I) ATTACHED TO THE SUBSTRATE BY MEANS OF A PEDICLE: 24 species.

a) Minute forms able to use very small substrates: 20 species

Terebratulina faujasii (Roemer) - 4.6 mm
Terebratulina longicollis Steinich - 5.2 mm
Terebratulina subtilis Steinich - 2.5 mm
Rugia tenuicostata Steinich - approx. 3 mm
Rugia acutirostris Steinich - 2.5 mm
Rugia tegulata Surlyk - 2.5 mm
Rugia spinosa Surlyk - 1.3 mm
Gisilina gisii (Roemer) - 5.5 mm
Gisilina jasmundi Steinich - 4.5 mm
Dracius carnifex Steinich - approx. 4 mm
Aemula inusitata Steinich - 3.6 mm
Scumulus inapinatus Steinich - 2.5 mm
Argyrotheca bronnii (Roemer) - 5 mm
Argyrotheca coniuncta Steinich - 3.7 mm
Argyrotheca n. sp. off. *coniuncta* - approx. 4 mm
Argyrotheca hirunda (Hagenow) - 4 mm
Argyrotheca obstinata Steinich - 4 mm
Argyrotheca stevensii (Nielsen) - 2.5 mm
Argyrotheca bronnii s.l. (late form) - 5 mm
Dalligobis nobilis Steinich - approx. 5 mm



b) Medium to very large sized forms confined to large, hard substrates: 3 species.

Neoliathyra obesa Sahni - 70 mm
Neoliathyra fittani (Hagenow) - 15 mm
Kingena pentangulata (Woodward) - 17 mm



c) Attached directly to the sediment: 1 species.

Terebratulina chrysalis (Schlottheim) - 22 mm



Fig. 1. The brachiopod species found in the Maastrichtian chalk of Denmark distributed on ecological groups (from Surlyk, 1972). A few additional rare species have been found later.

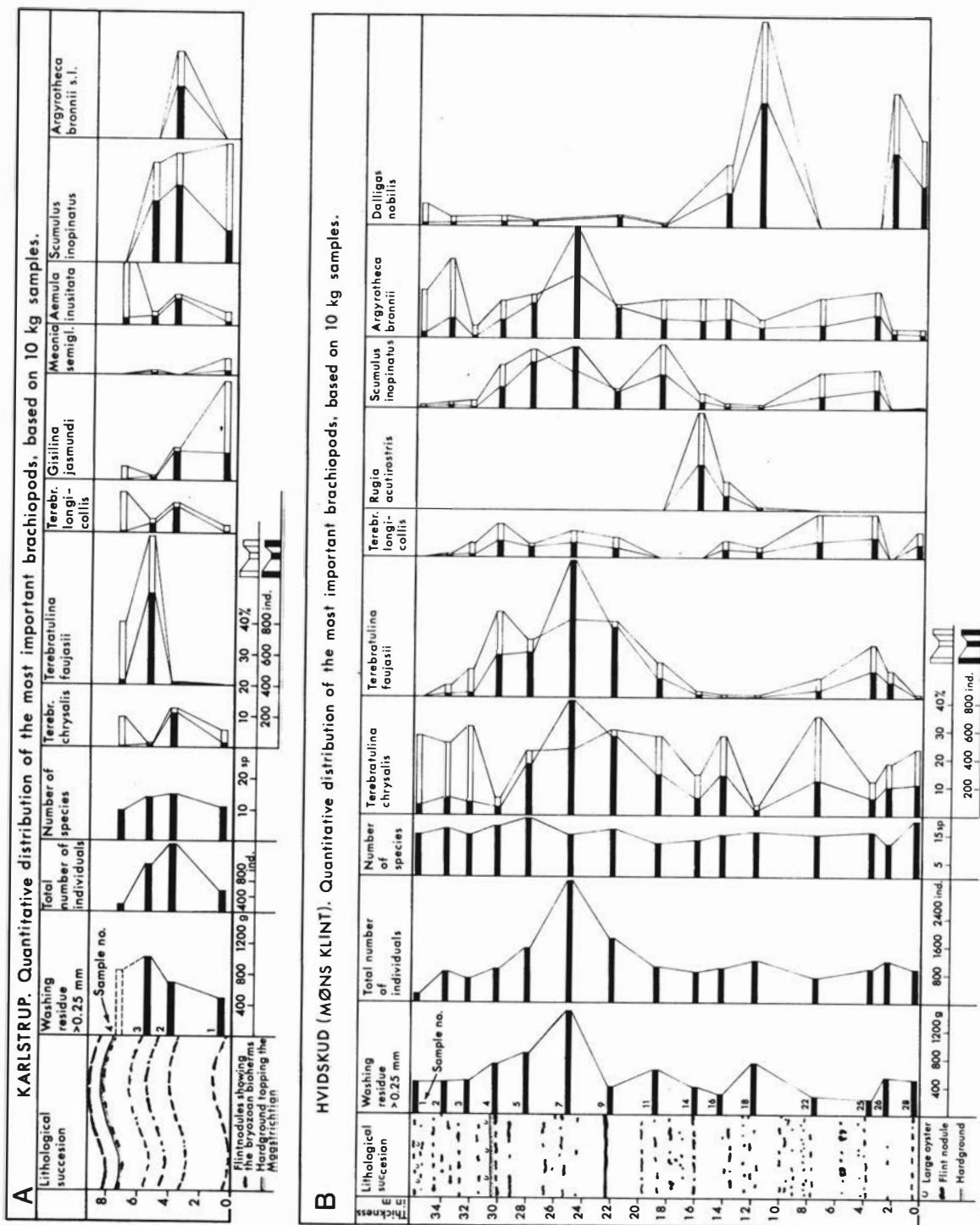


Fig. 2. A: The quantitative distribution of the most important brachiopod species in the Maastrichtian/Danian boundary section at Karlstrup, Sjælland, Denmark. B: The quantitative distribution of the most important brachiopod species in the Lower Maastrichtian section at Hvidskud, Møns Klint, Denmark (from Surlyk, 1972).

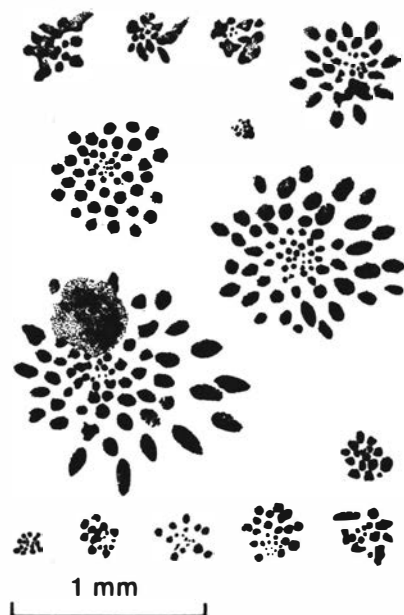


Fig. 3. Examples of borings (*Podichnus*) produced by brachiopod pedicles in a single Lower Campanian belemnite from Eastern England (from Bromley & Surlyk, 1973).

The brachiopods have proved to be of great biostratigraphical value in the chalk of NW Europe because many of the species have a limited vertical distribution, occur in great numbers, and are easy to determine (Steinich, 1965; Surlyk, 1970b; Surlyk & Birkelund, 1977). The Lower-Upper Maastrichtian boundary strata of Rügen were divided into five zones by Steinich (1965). Three of these zones could be recognized also in Denmark, and the whole of the Danish Maastrichtian was divided into 10 zones (Surlyk, 1970b). The boundaries of all the zones are defined by the first or last occurrence of a species whilst the zone itself is characterized by the presence of one or more species. Later, partly unpublished work has shown that the main zonation is also valid for the Maastrichtian of NW Germany (Surlyk, 1975), Eastern England and SW Sweden. A slightly modified version of this zonation is shown on Fig. 4. Apart from the zonation itself several important results emerged from the work on the stratigraphy of the brachiopod fauna. Firstly, a great number of localities were precisely dated for the first time (Surlyk, 1969) and, secondly, a thick chalk sequence above the last occurrence of *Belemmella occidentalis* and the first occurrence of *Belemnitella junior* and *Belemmella casimirovensis* (see Christensen, this volume) which earlier has been placed in the Lower Maastrichtian, was removed to the Upper Maastrichtian (Fig. 4) (Surlyk, 1970b). The key species in the zonation are the minute forms *Rugia spinosa*, *R.*

The highest Maastrichtian chalk at all localities is characterized by the fauna of zone 10, which continues to the basal Danian bed. This fauna often shows extremely high densities and relatively high diversity.

The taxonomy and stratigraphy of the brachiopods of the Danian of Denmark are only known in broad outline, whereas the palaeoecology of the brachiopods from Fakse, type locality of the Danian, has been treated by Asgaard (1968). Consequently nothing detailed is known about extinctions and faunal turnover across the Maastrichtian/Danian boundary. The Maastrichtian and Danian stages have practically no brachiopod species in common. Preliminary data seem to suggest, however, that several of the latest Maastrichtian species pass into the lowest few metres of the Danian. Morphologically and palaeoecologically the Danian brachiopod fauna as a whole shows great resemblances with the Maastrichtian fauna. This is to be expected because the main facies of the two stages are quite similar.