Facies variation and trace fossil assemblages of the Vardekløft and Olympen Formations of Jameson Land and Scoresby Land, central East Greenland

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In connection with the systematic mapping programme carried out by the Geological Survey of Greenland in the Scoresby Sund region of central East Greenland during 1968–1972, the Jurassic sediments of Scoresby Land and Jameson Land were mapped and a lithostratigraphical scheme established (Bromley *et al.*, 1970; Surlyk & Birkelund, 1972; Surlyk *et al.*, 1973). Among the established formations, the Vardekløft Formation and the Olympen Formation of the Middle and Upper Jurassic showed remarkable variation in thickness and facies within the area studied. In order to get a more detailed picture of this pattern a closer study of a number of selected sections has been carried out (fig. 24).

Pelion Member

The Pelion Member of the Vardekløft Formation has been studied in detail in 9 sections (fig. 24, locs 1, 4, 6–12). Data on grain size, sorting, primary sedimentary structures, concretions, trace fossils and body fossils have been recorded. Detailed sampling has especially been carried out in the type section (Pelion, loc. 8).

The Pelion Member shows a trend from fine to medium-grained well sorted sandstones, in the southern part of the area, to medium to coarse and very coarse-grained sandstones, often poorly sorted, in the northern part. The lower part of the sequence, especially to the south, is more fine-grained than the upper part.

To the south the lower part of the sequence is predominantly small-scale cross-bedded. Higher parts of the member, and to the north the greater part of the sandstone body, are mainly composed of bed sets built up of 20–50 cm thick planar or trough cross-bedded units. In certain cases it can be shown that these bed sets, up to 25 m thick, belong to a single giant cross-bedded unit. They are wedge-shaped and can be followed over distances up to 6×6 km. Uneroded surfaces of the large-scale cross-bedded units show large undulatory current ripples or large linguoid ripples. Between these units finer grained horizons of horizontally bedded sandstones or lenticular and flaser-bedded silt and fine-grained sand may be seen. Thin local conglomerates, containing scattered, well rounded quartzite pebbles, are common to the north. Planar cross-bedded units, more than 30 cm thick, show a rather uniform direction of transport to the south, in good agreement with the main variation in grain size.

On the basis of fossil evidence and sedimentary structures the sandstones are believed to have been deposited in a shallow marine environment. In order to get a better understanding of the regime a close study of the trace fossils and their spatial distribution has been carried out in the field. These data are now being compared to the biostratigraphical zonal scheme based on ammonites (the zonal scheme was published in Surlyk *et al.*, 1973, and a more detailed description is under preparation by J. H. Callomon and T. Birkelund).

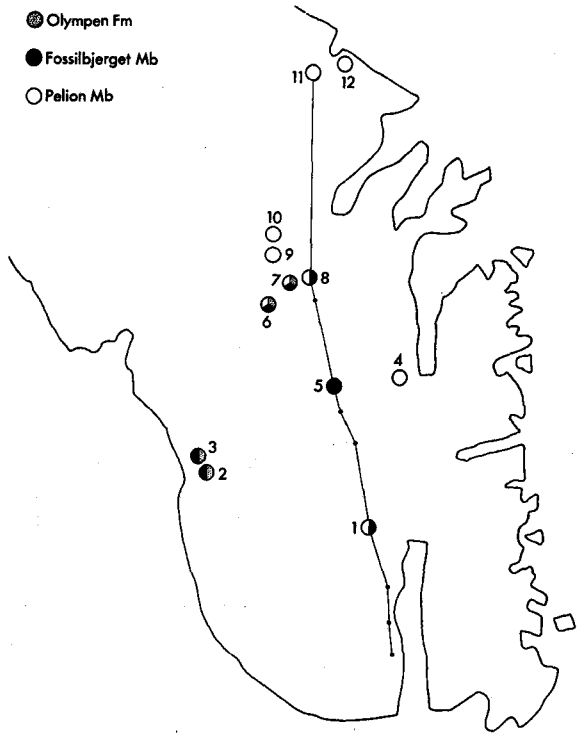

Fig. 24. Map of Jameson Land and Scoresby Land with the position of localities, and section shown in fig. 25. 1: Ugleelv; 2: Draba Sibirica Elv; 3: Depotelv; 4: Trefjord Bjerg; 5: Fossilbjerget; 6: Olympen S; 7: Olympen N; 8: Pelion; 9–10: Pothorst Bjerge; 11: Kolledalen; 12: Antarctics Havn. Only specially investigated members and formations are indicated.

The following characteristic trace fossil assemblages are represented:

(1) Deep hair-pin *Diplocraterion* (comparable to *D. habichi* (Lisson), but much deeper). This occurs in medium to coarse-grained, often large-scale through cross-bedded units and is usually connected with the upper eroded surface of thick sandstone units. The assemblage only occasionally occurs together with other trace fossils, for example *Gyrochorte.*

(2) *Ophiomorpha.* This assemblage occurs in fine to coarse-grained sandstones, often in large-scale trough cross-bedded units, occasionally together with *Gyrochorte.*

(3) *Curvolithos–Gyrochorte–Planolites.* This assemblage can be further subdivided. The three different burrows may occur separately, or two or three of them together. The density is also highly variable; the most dense occurrences are seen in fine-grained sandstones. The burrows occur in fine to coarse-grained sandstones and in small and large-scale cross-bedded units, as well as in horizontally bedded sandstones.

(4) *Arenicolites.* In fine-grained sandstones.

(5) *Rhizocorallium.* In fine-grained sandstones, alone or together with *Thalassinoides.*

(6) *Muensteria–Gyrochorte*-small Endichnia. In fine-grained sandstones which often display small-scale cross-bedding.

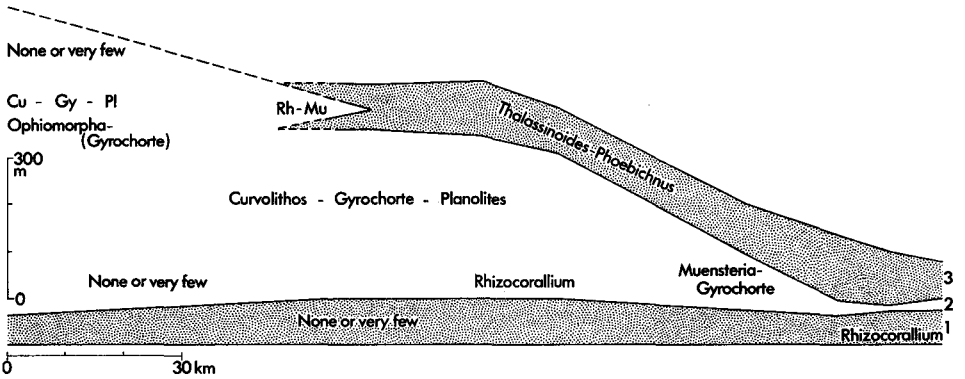

Fig. 25. N–S section through Jameson Land and Scoresby Land showing the main distribution of trace fossil assemblages in the Vardekløft Formation. The lower boundary of the Vardekløft Formation is used as a base line. The position of the section is shown in fig. 24. Cu: *Curvolithos;* Gy: *Gyrochorte;* Pl: *Planolites;* Rh: *Rhizocorallium;* Mu: *Muensteria.* 1: Sortehat Member; 2: Pelion Member; 3: Fossilbjerget Member.

Scattered occurrences of *Siphonites, Anchorichnus* and *Phoebichnus* are further recorded.

Most of the trace fossils here mentioned are described in Heinberg (1970, 1973, 1974) and Bromley & Asgaard (1972).

The main distribution of the most important trace fossil assemblages is shown in fig. 25. Most characteristic is the occurrence of the *Muensteria–Gyrochorte*–small Endichnia assemblage in the distal lower part of the lower wedge, and the restricted occurrence of *Ophiomorpha* in the proximal upper part of the lower wedge. The pattern of distribution of trace fossils in the small upper wedge of the Pelion Member seems to be very much like that of the lower wedge.

Fossilbjerget Member

New information on the Fossilbjerget Member has especially been gained from localities 1, 5–7 (fig. 24), where detailed collecting of shale samples recorded in relation to the established ammonite succession has been carried out. A detailed study was also made of the interfingering of the Fossilbjerget Member with the Pelion Member in locality 7 at Olympen (fig. 24).

The most characteristic trace fossils of the Fossilbjerget Member are *Phoebichnus* and *Thalassinoides,* both represented in fine-grained sandstones and siltstones. These are replaced by *Rhizocorallium* and *Muensteria* in interfingering Pelion Member facies north of Olympen.

Olympen Formation

This formation was studied in the area around Olympen (locs 6, 7), Draba Sibirica Elv (loc. 2) and Depotelv (loc. 3).

In the Olympen area the tripartition of the formation so characteristically developed south of Olympen (loc. 6) (described in Surlyk *et al.*, 1973), was found also north of Olympen (loc. 7). At Draba Sibirica Elv (loc. 2) and Depotelv (loc. 3) the occurrence of the lower and middle units was established. The middle unit contains ammonites of Lower Oxfordian age in concretionary limestone layers. A tendency to a higher content of body fossils as well as of trace fossils to the west and south-west of Olympen in the lower unit, together with occurrences of *Chondrites* in the middle unit at Depotelv and Draba Sibirica Elv, seems to indicate more offshore conditions in that direction.

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The Kap Parry complex, central East Greenland

John Engell

The Kap Parry complex belongs to the NE–SW trending zone of subvolcanic centres extending from the Werner Bjerge massif (72°N) to Kap Broer Ruys (73°31'N) in East Greenland. The existence of the Kap Parry complex (fig. 26) has been known since the beginning of the last century. A map and a short description is given by Schaub (1942). It is a semicircular subvolcanic complex about 11 km in diameter, partly covered by the sea to the east and south. The rock types involved are, listed in the order of formation, acid volcanic breccias, alkaline quartz-syenite and at least two generations of alkali granite. The whole complex is cut by a suite of alkaline acid dykes and dolerites. The