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Microplankton and sedimentological studies in the Nûgssuaq and Disko region, central West Greenland

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In 1975 the Danish Natural Science Foundation (SNF) and the Geological Survey of Greenland (GGU) initiated an investigation of the microplankton (dinoflagellate cyst) of the Cretaceous and Tertiary sediments in central West Greenland. The purpose of this invest-

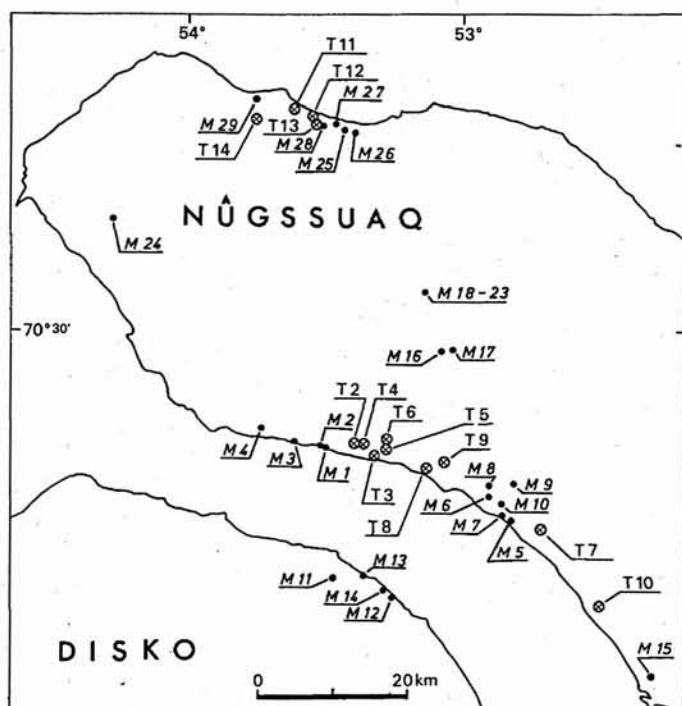


Fig. 11. Map showing the location of measured sections on Nûgssuaq and the adjacent coast of Disko, central West Greenland.

ation is the establishment of a dinoflagellate stratigraphy based on samples from measured sections to assist in a basin analysis.

SNF provided the funds for the establishment of a laboratory for palynological preparation and investigation. They also funded a Leitz Orthoplan microscope with a Leica camera for the study of the microplankton, and two of the six Honda ATC 90 motor tricycles that facilitated the field work.

The main field activity in 1975 has been outlined by Croxton (this report). As mentioned by Schiener & Henderson (1975), seven weeks field work were carried out in 1974 by the writer and T. Jürgensen.

In 1974 ten sections (M 1 – M 10) totalling 2670 m of sediment were measured and 201 samples were collected. T. Jürgensen also measured a series of sections (T 2 – T 14). In 1975 nineteen sections (M11 – M 29) were measured and 837 samples were collected (see fig. 11 for localities).

Marine sections

A sedimentary model differing from that of Schiener (1975) by the presence of turbidites is presented in fig. 12. Turbidites have not previously been recorded from the

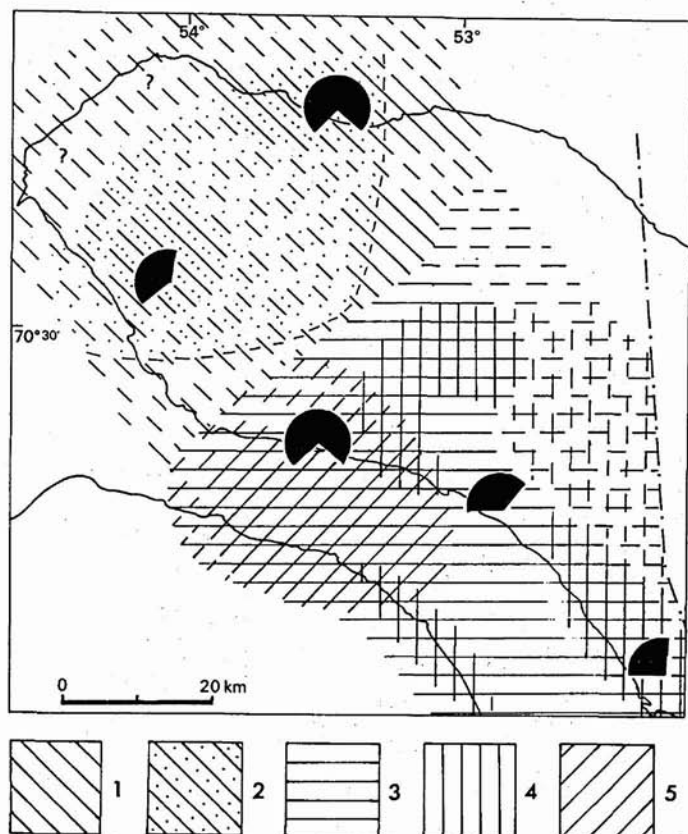


Fig. 12. A sedimentary model for the Cretaceous-Tertiary deposits of Nûgssuaq and the adjacent coast of Disko, central West Greenland. 1 - Dark marine shales; 2 - Dark marine shales with turbidites; 3 - Sedimentary sequence type 1, i.e. coarsening upwards sequences; 4 - Sedimentary sequence type 2, i.e. fining upwards sequences; 5 - Sedimentary sequence type 3, i.e. giant rippled beds. Black circles indicate palaeodirections, i.e. stream directions, palaeoslope directions and directions of turbidity currents.

Cretaceous–Tertiary sediments of West Greenland. In 1975 a 1100 m sedimentary section was measured in the Itivdle valley and along the river Anariartorfik (M 24). This section is mainly composed of black marine shales (c. 800 m) and sandstones with turbidite characteristics (c. 300 m). In the lower part of the section the turbidites are composed of fine- to coarse-grained sandstones often including boulders and large lumps of shale. The sandstones frequently form units between 10–50 m thick, comprising both small and large channels, the bases of which truncate underlying sand-filled channels or marine shales. In the upper part of the section the sandstones occur as single 0.1–1.0 m thick, fine- to medium-grained, massive and lenticular bodies. The lateral extension of these varies from 20–30 m (probably in transverse sections) to some hundred metres.

In the turbidites trace fossils such as *Ophiomorpha* and *Thalassinoides* are very common, whereas other types of trace fossils have not been seen. Sedimentary structures such as flute casts and parting lineations indicate current directions towards the north-west. In general, the sandstones could be interpreted to represent the ta and tb units of Bourma (1962), whereas the units may be represented by the black marine shales between the sandstones. The lithology as well as the trace fossil assemblage seem to indicate a proximal nature for the turbidites.

Furnished with the impressions of the Itivdle section some sections on the north coast of Nûgssuaq were measured and some re-examined. Thin graded sandstones were also found here, particularly in the sections at Pujortoq (M 29) and Niaqorssuaq (M 28). The graded sandstones on the north coast resemble the turbidites in the upper part of the Itivdle section (M 24) but are somewhat darker in colour and apparently more argillaceous.

Non-marine sections

Seventeen sections in the Atane Formation (Koch, 1964) were measured in 1974 and 1975 on the south coast and the central part of Nûgssuaq. Three main types of sedimentary sequences can generally be recognised in these sections.

Type 1: Coarsening upwards sequences. Lower parts of these sequences are composed of black, often coaly shale, containing one or more coal seams. The shale coarsens upwards into a flaser-bedded sequence of siltstone and fine-grained sandstone. The upwards coarsening continues in a large-scale, ripple-bedded sandstone, which is often incised by coarse-grained, festoon-bedded channel sandstones. These channel sandstones occasionally display a fining upwards trend leading over to a thin, large-scale ripple-bedded sandstone sequence.

This type of sedimentary sequence is the most common in the Atane Formation, and in the area around Atâ (e.g. M 9) almost all the Cretaceous sediments are of this type. In the section M 9, 38 sequences of this type were found within 330 m of sediment. Almost all the sequences contained one or more coal seams, the four thickest measuring 155 cm (alt. 490 m), 95 cm (alt. 560 m), 80 cm (alt. 410 m) and 80 cm (alt. 540 m). Similar sediment types have been interpreted by Elliot (1974) as having accumulated in interdistributary bays of a delta complex.

Type 2: Fining upwards sequences. In lower parts these sequences are composed of sandstones showing cut-and-fill trough cross-bedding, in places with conglomeratic horizons. They are overlain by only slightly downcutting or non-erosional units with festoon or tabular

cross-bedding. This lower sandy part of a sequence passes upwards into a more argillaceous lithology. In the lower parts it is dominated by small-scale ripple-bedded, fine-grained sandstone or siltstone with upwards increasing amounts of clay laminae. The sequences usually terminate with structureless mudstones.

This type of sedimentary sequence is most common in the eastern developments of the Atane Formation, especially in the Atanikerdluk area (M 15), where it comprises approximately 30–40 per cent of the section. Elliot (1974) interpreted these fining upwards sequences as deposited by distributary channels of a delta complex.

Type 3: Giant ripple-bedded sandstones. In the area around Asuk (northern Disko, M 11–12) and Alianaitsunguaq (south-western Nûgssuaq, M 1–3) a characteristic development of sandstones is found. The sandstone units are medium- to coarse-grained, composed of 10–30 m high foreset beds. Usually they comprise only one generation of foreset beds, but two or more sets may be found within the same unit. The foreset laminae are rather thick, 1–5 cm, coarsening upwards and very homogeneously developed over long distances. The top of the foresets has in most cases been intensively bioturbated, yielding well-preserved trace fossils such as *Ophiomorpha* and *Muensteria*. Due to the rapid sediment accumulation penecontemporaneous structures such as minor faults, slump folds and sandstone dykes are often found. These sandstone bodies can be traced laterally over several kilometres.

This type of development might be interpreted as having formed in a delta front where distributary channels meet a delta slope.

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