



Post-Caledonian sediments in North-East Greenland between 76° and 78° 30'N

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Post-Caledonian sediments in North-East Greenland between 76° and 78° 30'N are, with the exception of an outlier near Kulhøj, restricted to Store Koldewey. The sediments on Store Koldewey, believed to span the Middle Jurassic to Lower Cretaceous (Callovian to Aptian), are dominated by fine-grained sand and silt. They contain a rich macrofauna which, together with material collected for microfloral investigations, will form the basis for a detailed stratigraphy and dating of the sequence.

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The geological map of North-East Greenland compiled by Haller (1983) shows a number of post-Caledonian sedimentary outliers in the region between 76°N and 78° 30'N (fig. 1). During the summer of 1989, these outlier localities were studied to get a better understanding of the post-Caledonian evolution of the region and, if possible, to establish links between the Wandel Sea Basin of eastern North Greenland and the East Greenland sedimentary basin to the south. Previous work in the region is limited to that of H. Jarner (*in* Ravn, 1911), Koch (1929) and E. Nielsen (*in* Frebold, 1935) and concentrated on the Mesozoic sediments of Store Koldewey.

Post-Caledonian sediments outside Store Koldewey

The map of Haller (1983) shows seven localities with post-Caledonian sediments in areas other than Store Koldewey. During the summer we visited the localities west of Sælsøen, at Kulhøj, western Hertugen of Orléans Land, southern side of Orléans Sund, Depotnæsset, Fladebugt and F. Toula Plateau (fig. 1). None of these localities was found to have a post-Caledonian sedimentary cover; they all contained Caledonian or older rocks locally covered with thick moraine. However, the moraines contain various amounts of drifted

Fig. 1. Map showing the locations mentioned in the text. Cross hatched areas are locations where Haller (1983) indicated post-Caledonian strata. Arrow points towards the only location of post-Caledonian sediments found outside Store Koldewey.

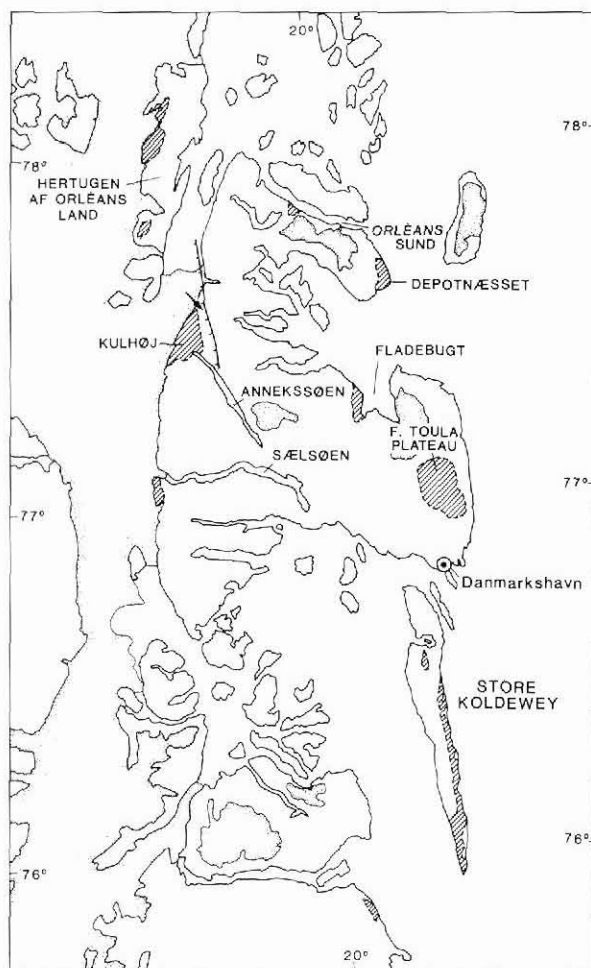




Fig. 2. Post-Caledonian (?) Carboniferous sandstone, north of Kulhøj.

sedimentary rocks, particularly coal, the highest concentrations being found around Kulhøj (fig. 1).

Post-Caledonian sediments were located at only one locality outside Store Koldewey, approximately 15 km north of Kulhøj (fig. 1). Here, a 10 m high and 100 m long exposure of quartzitic sandstone with abundant fragments of chertified wood was found on the down-thrown western side of a NNW–SSE trending fault (fig. 2). No exact age can be given to these sediments on the basis of the collected material, although a post-Devonian age is suggested on account of the size and general character of the wood fragments.

Mesozoic sediments of Store Koldewey

The Mesozoic sequence of Store Koldewey was known to include sediments of Middle Jurassic (Calloviaian), Late Jurassic and Early Cretaceous (Valanginian and Aptian) age from the work of Ravn (1911) and Frebald (1935). The distribution of the exposures of these units on the east coast of the island was somewhat dubious, due to conflicting information given by H. Jarner (*in* Ravn, 1911), Koch (1929) and E. Nielsen (*in* Frebald, 1935).

Field work in 1989 confirmed the presence of four lithologically distinct units which are tentatively dated on the basis of the work by Ravn (1911), Frebald (1935) and Donovan (1957). The distribution of the individual units, their main lithologies and their faunal content will be discussed separately for each unit. It should be stressed that statements by previous workers concerning the general coarse-grained nature of the sediments

could not be substantiated, the main lithology being fine-grained silty sand and, in the Aptian, sandy siltstone. Additional macrofauna, particularly ammonites and bivalves (*Buchia*), were collected from all four units and, together with material collected for microfloral investigations, will form the basis of a detailed stratigraphy and dating.

Middle Jurassic

Sediments of proposed Callovian age, the Trækpas Formation of Koch (1929), are limited to the southernmost part of Store Koldewey. The succession is approximately 60 m thick; to the south it becomes thinner as it overlies a basement high (fig. 3). To the north, the sequence is separated from Lower Cretaceous (Valanginian) sediments by a roughly E–W trending fault (fig. 3).

The sequence is dominated by grey weathering, fine-grained and medium-grained sand. Cemented intervals are few and generally related to bioturbation and more coarse-grained shelly layers. The middle 10–15 m of the sequence consists of laminated siltstone of possible lagoonal origin.

Marine fossils and trace fossils are common throughout. Ammonites and belemnites are common, whilst bivalves occur less frequently. Abundant wood fragments occur at several horizons. Previous dating of this unit is based on three ammonite specimens collected by H. Jarner (*in* Ravn, 1911). The present collection includes more than 60 specimens which will hopefully provide a more precise date for the sequence.

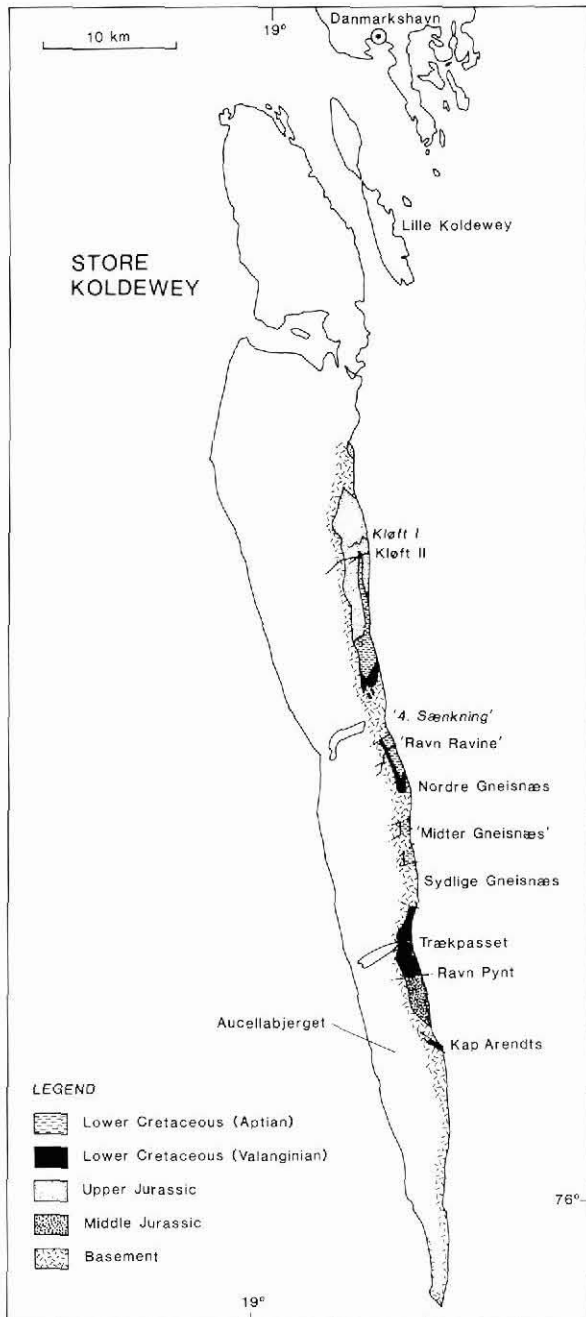


Fig. 3. New geological map of the Mesozoic sediments on Store Koldewey. Ages are provisional, based on previous studies.

Upper Jurassic

The Upper Jurassic sequence is only exposed in the northern part of the region (fig. 3). The sediments were deposited on an irregular to fairly flat basement surface. The lower 4–6 m of strongly bioturbated sandstone is followed by approximately 50 m of loose, fine to me-

dium-grained micaceous sand with fossiliferous beds packed with belemnites, *Dentalium* and oysters. Bivalves are most common in the lower to middle part and occur together with rare ammonites indicating an Oxfordian and earliest Kimmeridgean age (Ravn, 1911, Sykes & Surlyk, 1976). The sand is gradually followed by 15–20 m of black, clay shale without fossils, presumably equivalent to the Bernbjerg Formation further to the south (cf. Surlyk, 1977).

The sequence dips toward the south-east and is followed by Aptian sandy shales and fine-grained sandstones toward the south along the coast (fig. 3). Similar, presumably Jurassic sands are exposed further to the south but are barren of macrofossils. A coast-parallel fault separates these Jurassic sands from Aptian sandy shale in the coastal cliffs.

Lower Cretaceous, Valanginian

Valanginian sediments are exposed in two main areas from Ravn Pynt to Sydlige Gneisnæs, in the south, and from Nordre Gneisnæs to just north of '4. Sænkning' in the north (fig. 3). Isolated, fault-controlled outliers are found at 'Midter Gneisnæs' and just north of Kap Arendts.

The sediments directly overlie Caledonian basement and are unconformably overlain by Aptian sediments in the northern region. The Valanginian sequence is 50–60 m thick and exhibits a highly variable lithology, ranging from conglomerates close to basement highs, through coarse-grained sandstones, to fine-grained sandstones and siltstones in the more distal areas. Macrofossils are mainly bivalves of *Buchia*-type with rare ammonites and belemnites. The fauna is restricted to the areas surrounding the basement highs. The highest concentrations of fossils occur between the basement blocks in the conglomerates where *Buchia* limestones were found (*Aucella* conglomerate of H. Jarner (in Ravn, 1911).

Lower Cretaceous, Aptian

The more than 90 m thick Aptian sequence overlies the Valanginian or Jurassic sediments with a pronounced angular discordance in the northern region. At 'Midter Gneisnæs', the Aptian shales are faulted against the basement (fig. 3).

The Aptian sequence is dominated by black to grey silty shale and fine-grained sand; coarse-grained sand and gravel beds occur as minor elements throughout the sequence. Yellow, very fine-grained, calcareous sandstones are common although rarely found *in situ*. The shales contain characteristic spherical calcareous concretions, 5–10 cm in diameter, with small burrows in

their centre. Belemnites and fossil wood occur frequently throughout the shales whereas ammonites and bivalves, without being common, appear to be confined to sandstones.

The sediments appear to have been deposited in an open marine shelf environment due to their laterally persistent, fine-grained nature and the absence of coarse-grained shallow water sediments even in the vicinity of the topographical basement highs. Similar mid-Cretaceous lithologies have been reported from Traill Ø to Shannon in North-East Greenland.

Frebold (1935) suggested that the macrofossils from the shales indicate a Late Aptian age, although this may be extended following examination of the new faunal and palynological samples.

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