

Acanthodian scales and worm tubes from the Kapp Kjeldsen Division of the Lower Devonian Wood Bay Formation, Spitsbergen

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Results of a thin section study of bonebeds from the Kapp Kjeldsen Division are presented and discussed. The material for this study was collected in the talus on the south-eastern side of Bockfjorden, northern Spitsbergen. The stratigraphical position of the Kapp Kjeldsen Division within the Devonian strata of Spitsbergen is shown in Table 1.

The thin sections for this study were not made to standard thickness, but are slightly thicker for better resolution of the vertebrate material. Each thin section was individually polished. The photos are made with crossed nichols.

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Acanthodian scales

Fossils of acanthodians are quite common in the Devonian strata of Spitsbergen, and occur from the Red Bay Group to the Mimerdalen Formation (Blieck et al. 1987). Ørvig (1967) described the first acanthodians from the Kapp Kjeldsen Division, *Xylacanthus grandis* and “*Onchus*” *overathensis* based on macrofossils of jaw-elements and fin spines. Scales from this unit were first reported by Ilyes (1990).

The scales are all of the “*Acanthodes*” histologic-type of Moy-Thomas & Miles (1971). Such scales have a thick base of acellular bone with non-vascular canals, and a crown of true dentine.

The scale shown in Fig. 1A is assigned to the genus *Cheiracanthus* Agassiz, 1835, on the basis of external morphology and internal structure of the crown. The scale in Fig. 1B has a morphology suggesting that it is a scale from the genus *Ptychodichtyon* Gross, 1973. The overall morphology of the scale in Fig. 2C suggests that it can be assigned either to the genus *Cheiracanthus* or *Ptychodichtyon*. The scale in Fig. 1D has a general morphology indicating that it belongs to the genus *Acanthodes* Agassiz, 1833. Scales from the younger Grey Hoek Formation with a morphology very similar to this form have previously been described as *Acanthodes?* sp. (Valiukevicius 1979, 1985).

The presence of at least three new genera indicate that the acanthodian fauna of the Kapp Kjeldsen Division is more diverse than previously considered.

Invertebrates and plants

Worm tubes of the genus *Spirorbis* Daudin, 1800, have been found in thin sections together with the acanthodian scales (Fig. 2A and B). Fossil worm tubes are very rare in the Devonian strata of Spitsbergen, and have previously only been described from the Red Bay Group (Friend 1961). As they are useful in discussions regarding paleo-environment, their presence in the Kapp Kjeldsen Division is significant.

None of the three specimens of *Spirorbis* found were attached to substratum; this indicates that they have been transported *post mortem*. The specimens appear, however, not to be damaged, suggesting that they must have lived near the area of deposition (Ilyes 1990).

Ostracods and charophytes are well represented in the bonebeds (Fig. 2C-I). Valves from both large leperditiid and small, smooth non-leperditiid ostracods are present. However, the large and thick valves of the leperditiid ostracods dominate totally in a number of individuals. The leperditiid ostracods are represented only by dis-

articulated valves, while some of the valves of the non-leperditiid ostracods are articulated. Articulated valves indicate short or no *post mortem* transport.

In the thin sections the charophytes are only

represented by female reproductive organs, the oogonia. Their overall morphology suggests that they belong to the genus *Trochiliscus*, and some of the plant macrofossils found in the studied material from the Kapp Kjeldsen Division

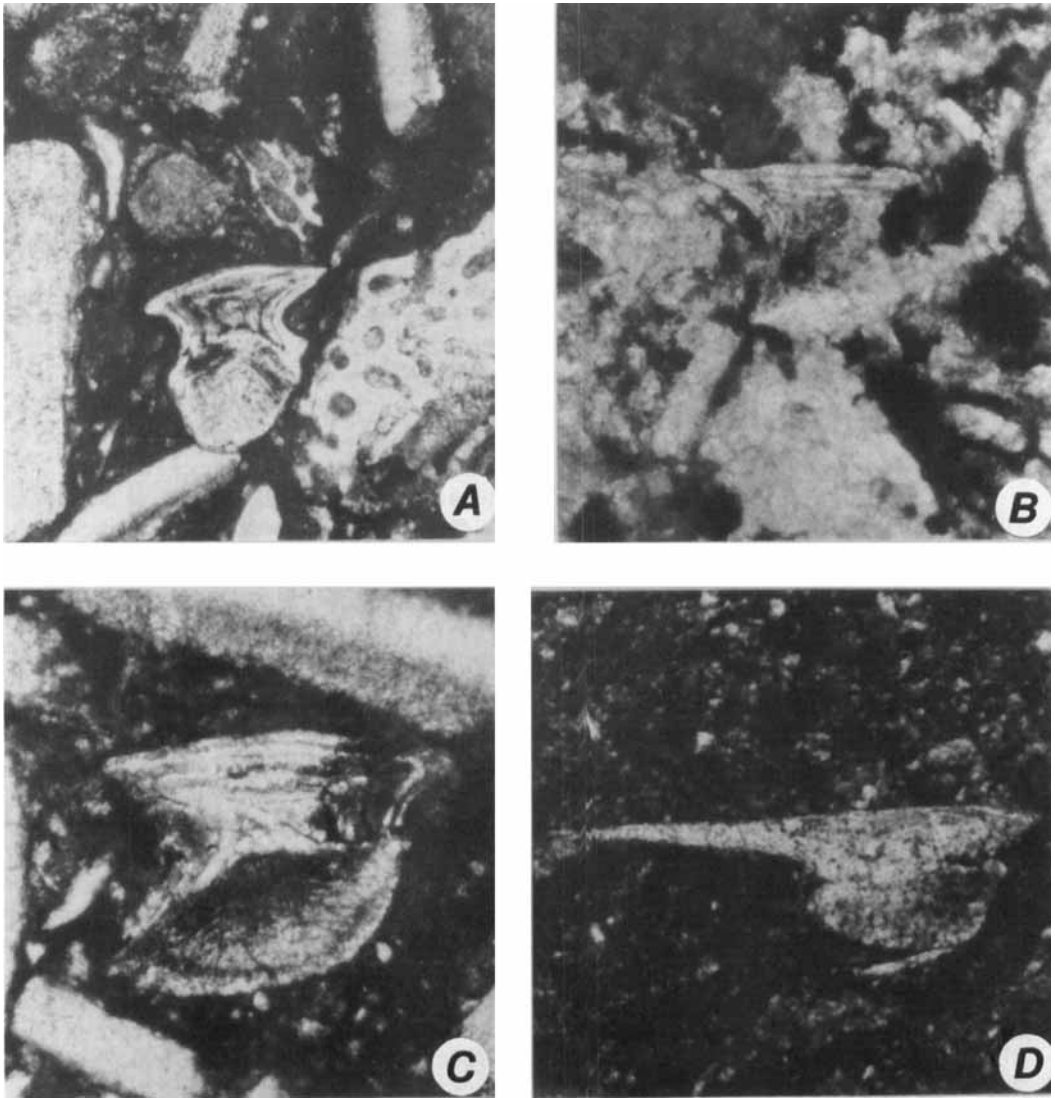


Fig. 1. Vertical thin sections through acanthodian scales. (A) Genus *Cheiracanthus*, 83 \times . (B) Genus *Ptychodichtyon*, 85 \times . (C) Genus *Ptychodichtyon* or *Cheiracanthus*, 85 \times . (D) Genus *Acanthodes*?, 83 \times .

Fig. 2. Thin sections of invertebrates and plants. (A) *Spirorbis*, 40 \times . (B) *Spirorbis*, 45 \times . (C) "Bonebed", 25 \times . (D) Valve of a leperditiid ostracod, 40 \times . (E) Unidentified smooth, small ostracod with both valves in situ, 63 \times . (F) Charophyte oogonia (*Trochiliscus* sp.), 100 \times . (G) Charophyte oogonia (*Trochiliscus* sp.), 63 \times . (H) Unidentified fossil (invertebrate?), 63 \times . (I) Charophyte oogonia (*Trochiliscus* sp.), 63 \times . (J) Plant macrofossils, "*Hostimella*".

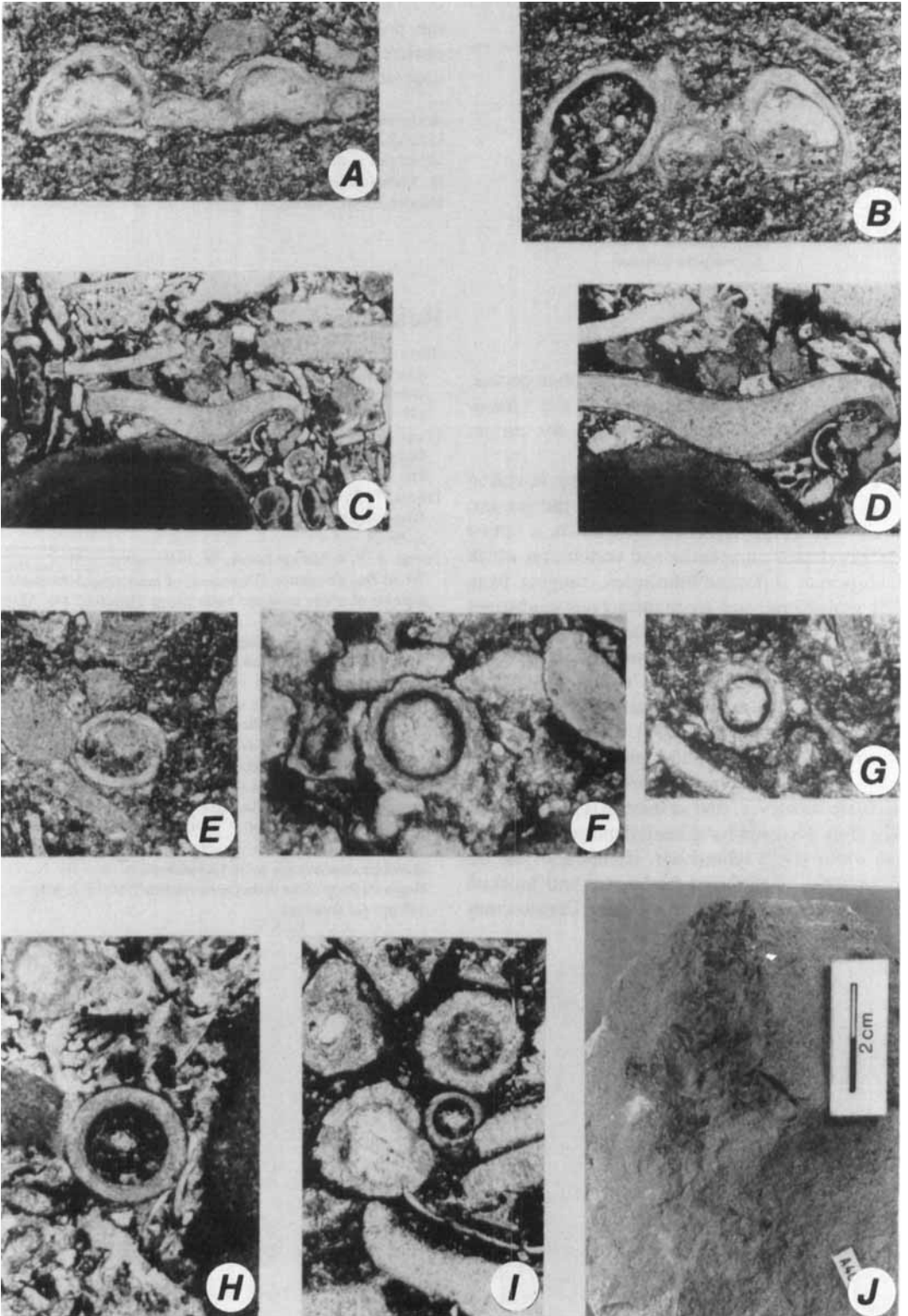


Table 1. Stratigraphy of the Devonian strata of Spitsbergen (after Blicek et al. 1987).

Mimerdal Formation
Wijde Bay Formation
Grey Hoek Formation (Eifelian)
Wood Bay Formation (Pragian-Emsian)
Stjørdalen Division
Keltjefjellet Division
Kapp Kjeldsen Division
Sigurdjfellet Division
Red Bay Group

(Fig. 2J) might consist of charophyte plant bodies. The plant material is, however, of the "*Hostimella*"-type which lacks characters for proper identification.

The paleoenvironment of the Kapp Kjeldsen Division is not well understood at the present time. The Kapp Kjeldsen Division is a faunal division based on agnathes and vertebrates which incorporate different lithologies, ranging from fine-grained red and green micaceous sandstones to coarser pebble conglomerates. This indicates different depositional environments. It has previously been interpreted as a pure freshwater deposit with no marine influence (Friend 1965; Friend & Moody-Stuart 1972). The association of leperditiid ostracods, charophyte oogonia, and worm tubes of the genus *Spirorbis* in the bonebeds indicate, however, that at least parts of the Kapp Kjeldsen Division have been deposited in brackish water (D. Vachard per. commun.). The co-occurrence of different freshwater and brackish environments in the Kapp Kjeldsen Division may

be an indication of deposition in the lowland near the paleocoast where freshwater and brackish environments intertwined in at least parts of the depositional area (Ilyes 1990).

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