acta
geologica
polonica

Vol. 28, No. 2 Warszawa 1978

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Middle Triassic (Ladinian) conodonts and cephalopod arm hooks from Hornsund, Spitsbergen

ABSTRACT: The conodonts *Gondolella mombergensis mombergensis* Tatge, *G. mombergensis media* Kozur, and *G. haslachensis trammeri* Kozur, and cephalopod arm hooks have been found in the Middle Triassic (Somovbreen Member, Drevbreen Formation) of Hornsund area, Spitsbergen. The Somovbreen Mb. has been attributed to the Lower Ladinian (Fassanian) on the basis of the recognized conodonts. The Ladinian conodont fauna of Spitsbergen resembles its time equivalents from the German and North American bioprovinces.

INTRODUCTION

A hundred samples derived from complete Triassic sections exposed in the areas of Isfjorden, Bellsund, and Hornsund, were studied for conodonts. The Hornsund area was sampled by K. Małkowski, M. Sc., in 1975; the other regions were sampled by the author along with Dr. A. Gaździcki in 1976. The field investigations made part of the research program of the paleontological expeditions to Spitsbergen organized by the Institute of Paleobiology of the Polish Academy of Sciences.

Both conodonts and cephalopod arm hooks have been found but in two samples from the Hornsund area. Thus, conodonts appear to be uncommon in the Triassic of Spitsbergen. In part, this may also be due to a considerable silicification of the Triassic rocks which makes their maceration difficult. Only 4 Lower Triassic (Dienerian) conodont species have been reported from Spitsbergen, namely from Hornsund area (Birkenmajer & Trammer 1975, Birkenmajer 1977). In addition, Dr. G. Hamar, Oslo, has also got a collection of Lower Triassic conodonts from Spitsbergen (*see* Sweet 1970, p. 216), which has however not been insofar described.

CONODONTS

All the investigated conodonts come from Treskelen section, Creek *IV*, from Somovbreen Member of Drevbreen Formation (Figs 1—2; for complete geological description *see* Birkenmajer 1977). Both the conodont-bearing samples were derived from siltstones with phosphatic nodules, 5 m above the boundary between Pashatten and Somovbreen Members (*cf.* Birkenmajer 1977, Fig. 6).

According to Birkenmajer (1977), the Somovbreen Member of Hornsund area is to be attributed to the Lower Ladinian and it is a facies equivalent to the upper part of the Botneheia Formation of Isfjorden and Bellsund areas (*cf.* Buchan & *al.* 1965, Flood & *al.* 1971).

The following conodonts have been determined:
Gondolella mombergensis mombergensis Tatge, 1956; 17 specimens (Pl. 1, Figs 3—4 and Pl. 2, Figs 6—8),
Gondolella mombergensis media Kozur, 1968; 3 specimens (Pl. 1, Fig. 1),
Gondolella haslachensis trammeri Kozur *in* Kozur & Mock, 1972; 1 specimen (Pl. 1, Fig. 2).

All the specimens are adult. There are no ramiform conodonts, even in fragments.

The recorded conodont assemblage is indicative of the Lower Ladinian, that is Fassanian (*cf.* Kozur 1968; Sweet & *al.* 1971; Kozur & Mostler 1972; Trammer 1972, 1975; Budurov 1976). Thus, the conodont fauna

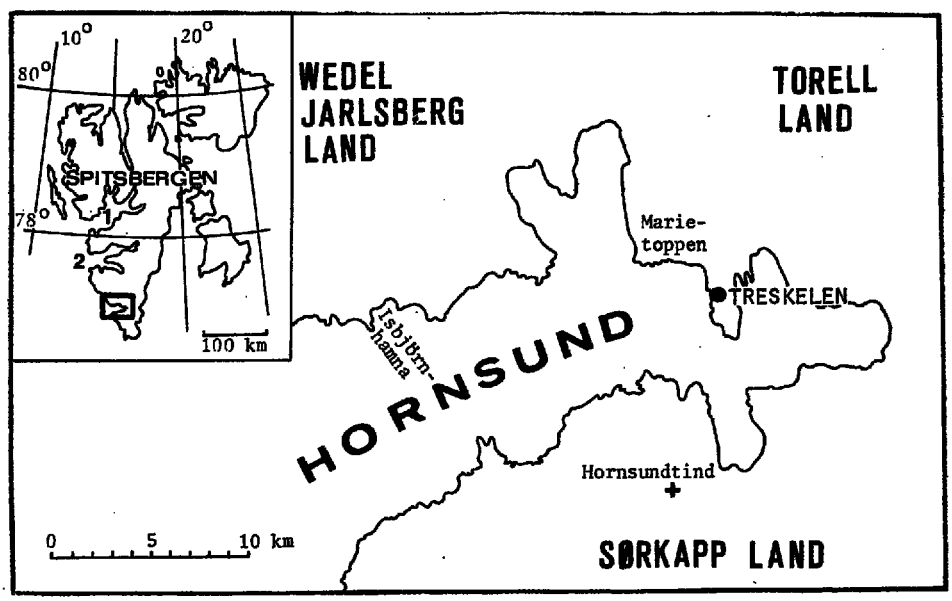
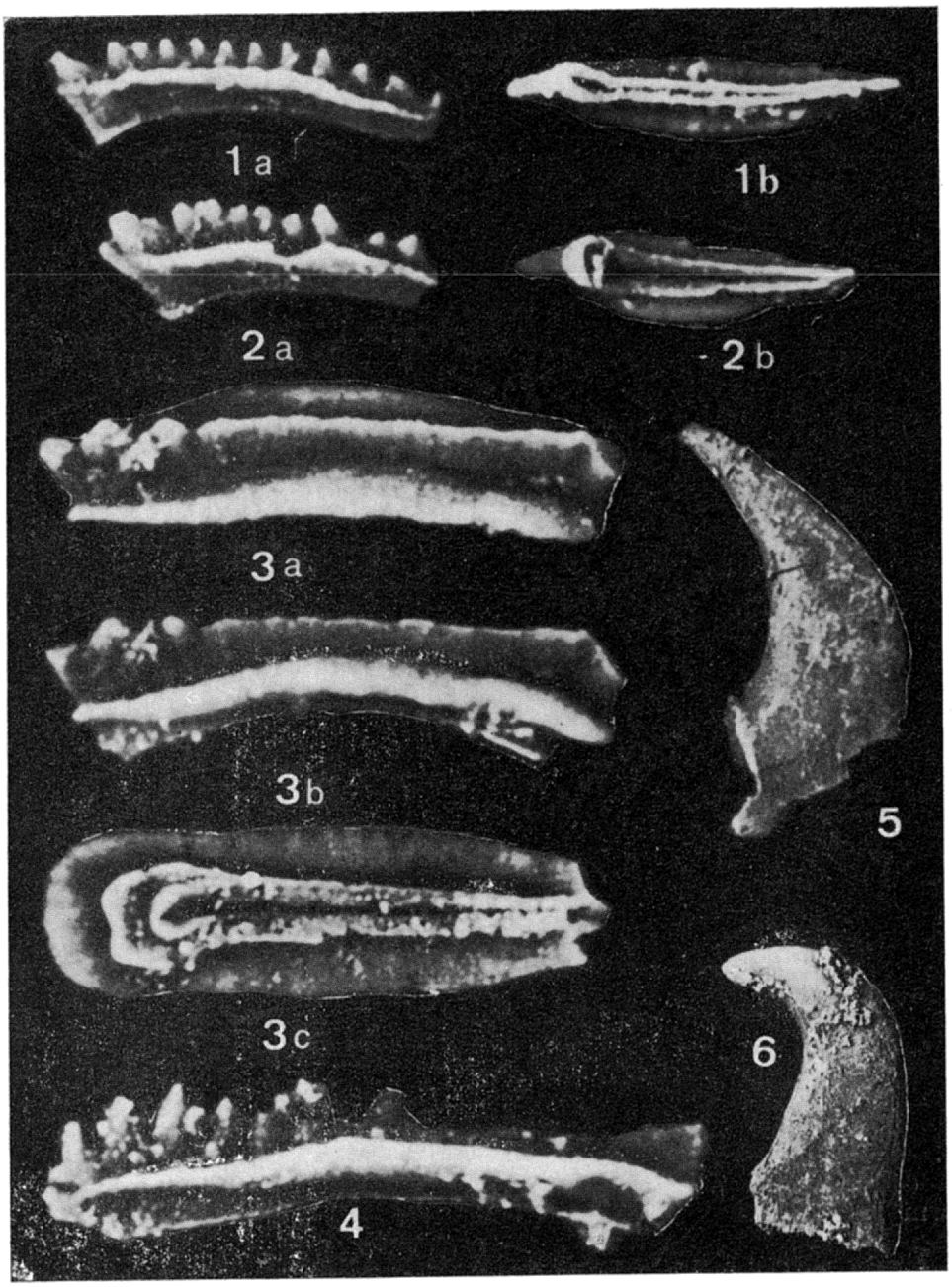
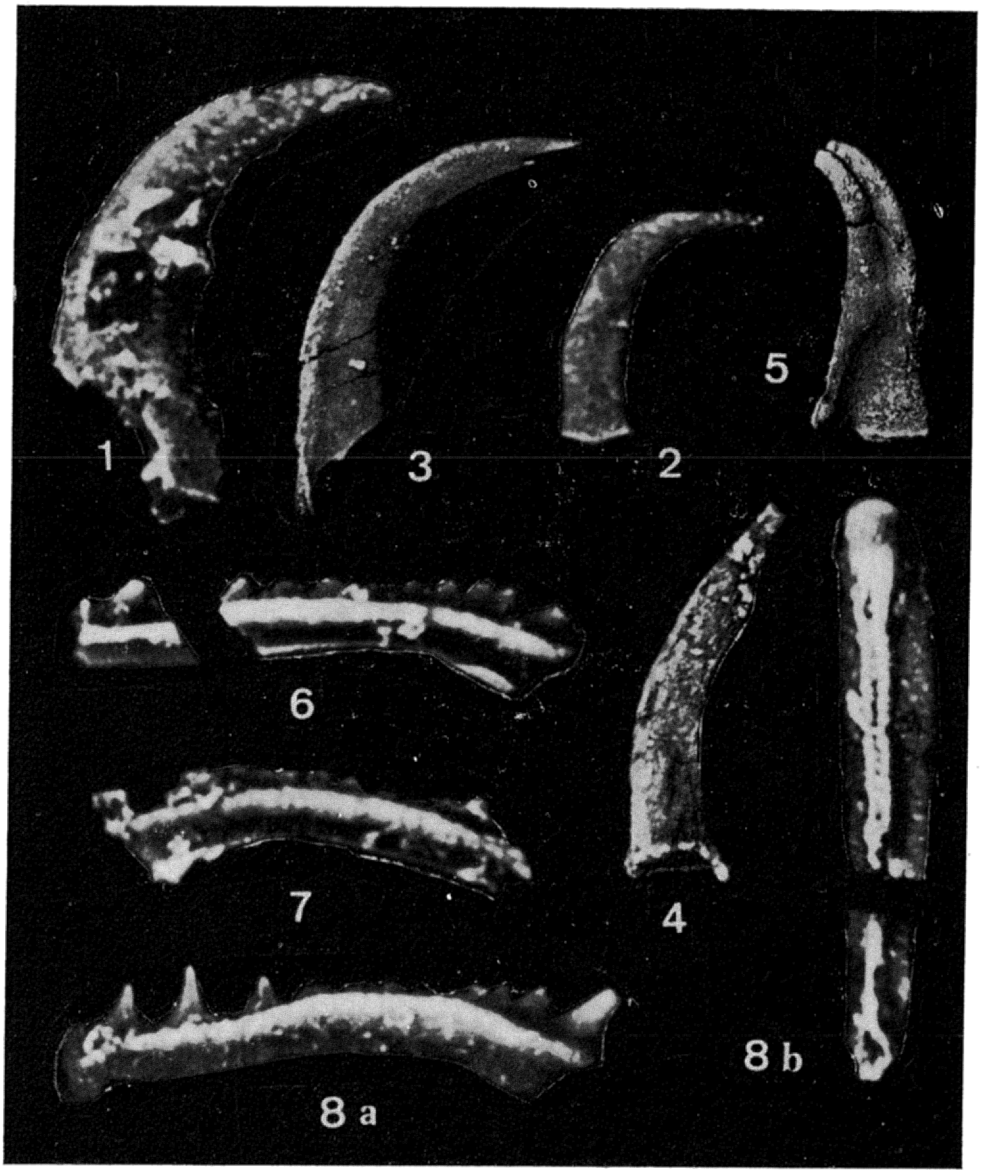


Fig. 1. Location of the Middle Triassic section yielding conodonts and cephalopod arm hooks at Treskelen in the Hornsund area (inset shows its position in Spitsbergen); *1* Isfjorden, *2* Bellsund (*after* Wrona, 1977; slightly modified)



Middle Triassic (Ladinian) conodonts (magn. × 100) and cephalopod arm hooks from the Drevbreen Formation at Hornsund, Spitsbergen; photos taken by L. Łuszczewska, M. Sc.

1 *Gondolella mombergensis media* Kozur; *a* side view, *b* bottom view
2 *Gondolella haslachensis trammeri* Kozur; *a* side view, *b* bottom view
3 *Gondolella mombergensis mombergensis* Tatge; *a* top view, *b* side view, *c* bottom view
4 *Gondolella mombergensis mombergensis* Tatge; side view
5—6 Cephalopod arm hooks (Fig. 5 magn. × 40; Fig. 6 × 25)



Middle Triassic (Ladinian) conodonts (magn. × 100) and cephalopod arm hooks from the Drevbreen Formation at Hornsund, Spitsbergen; photos taken by L. Łuszczewska, M. Sc.

1—5 Cephalopod arm hooks (Figs 1—2 × 100; Figs 3—4 × 40; Fig. 5 × 25)

6—7 *Gondolella mombergensis mombergensis* Tatge; side view

8 *Gondolella mombergensis mombergensis* Tatge; *a* side view, *b* bottom view

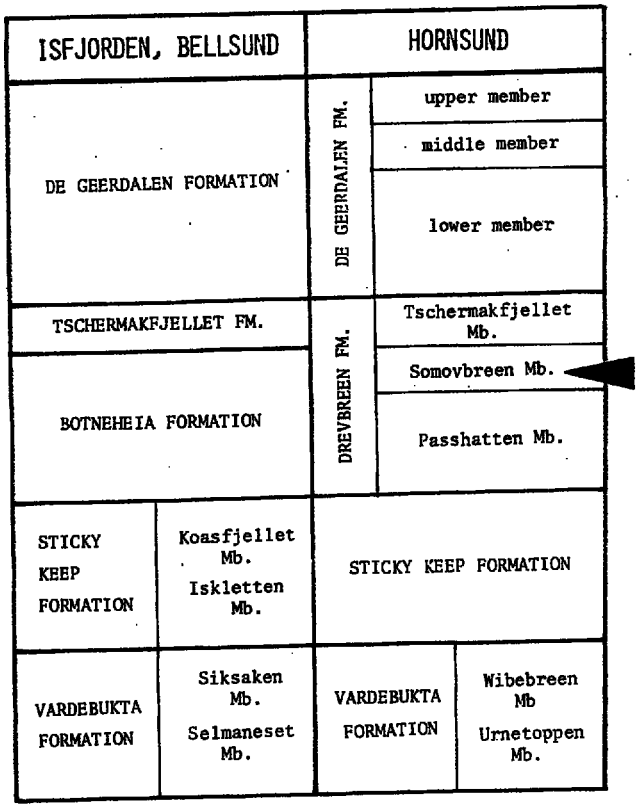


Fig. 2. Lithostratigraphical subdivision of the Triassic successions in the Isfjorden-Bellsund and Hornsund areas (*cf.* Text-fig. 1) in Spitsbergen (modified from Birkenmajer, 1977, Table 4); arrowed is position of the samples yielding conodonts and cephalopod arm hooks

confirms Birkenmajer's (1977) age attribution of the Somevbreen Member based on a scarce macrofauna.

It appears noteworthy that apart from a cosmopolitic subspecies *G. mombergensis mombergensis*, there occurs also in Spitsbergen *G. mombergensis media* reported insofar exclusively from the German basin and some separate horizons from Sardinia, Westmediterranean province (*cf.* Kozur & Mostler 1972). Furthermore, the subspecies *G. haslachensis trammeri* has been insofar reported only from the German basin and Hungary (*cf.* Kozur & Mock 1972, Trammer 1975).

The Triassic of Spitsbergen represents the northern boreal bioprovince. Nevertheless, the Lower Ladinian conodont fauna appears identical to that of the German bioprovince and close to that of Nevada, North American bioprovince (*cf.* Mosher 1973; Kozur 1973, 1976). At the same time, it is quite distinct from the conodont faunas of the Asiatic, Austroalpine, Westmediterranean (= Sephardic), and other provinces (*cf.* Hirsch 1972; Kozur 1973, 1976).

CEPHALOPOD ARM HOOKS

In Treskelen section, 9 specimens of cephalopod arm hooks (Pl. 1, Figs 5—6 and Pl. 2, Figs. 1—5) have been found along with the conodonts. As judged from the discussion by Jeletzky (1966) and Zawidzka (1974), these hooks are to be assigned to some representatives of the coleoid order Phragmoteuthida Jeletzky *in* Sweet, 1964. Recently, Kulicki & Szaniawski (1972) introduced parataxonomy of cephalopod arm hooks. Nevertheless, the investigated hooks are not assigned to any parataxa since they are very few and poorly preserved while cephalopod arm hooks are usually highly variable even within the range of a single hook row (*cf.* Zawidzka 1974).

It is, however, noteworthy that cephalopod arm hooks may attain their maximum frequency in the Upper Anisian and Lower Ladinian of several regions, *viz.* Poland, Germany, Switzerland, and Spitsbergen (*cf.* Wilczewski 1967; Kozur 1967, 1970, 1971; Rieber 1970; Zawidzka 1974).

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ŚRODKOWOTRIASOWE KONODONTY I HACZYKI GŁOWONOGÓW Z FIORDU HORNSUND NA SPITSBERGENIE

(Streszczenie)

W utworach środkowego triasu (formacja Drevbreen, ogniwo Somovbreen) w profilu Treskelen we fiordzie Hornsund na Spitsbergenie (*por.* fig. 1—2) stwierdzono występowanie konodontów (*patrz* pl. 1, fig. 1—4; pl. 2, fig. 6—8) oraz haczyków głowonogów (pl. 1, fig. 5—6; pl. 2, fig. 1—5). Obecność takich gatunków konodontów, jak *Gondolella mombergensis mombergensis* Tatge, *G. mombergensis media* Kozur oraz *G. haslachensis trammeri* Kozur, wskazuje, iż ogniwo Somovbreen reprezentuje dolny ladyn (fassan). Rozważając zagadnienia dotyczące paleogeografii wskazano na podobieństwo ladyńskiego zespołu konodontów ze Spitsbergenu z równowiekowymi zespołami bioprowincji germańskiej i północno-amerykańskiej. Zwrócono również uwagę, że na przełomie anizyku i ladynu zaznacza się w wielu rejonach świata maksimum występowania haczyków głowonogów, które wiązane są powszechnie z przedstawicielami dziesięciornic rzędu Phragmoteuthida Jeletzky.