



A contribution to Project
"Triassic of the Tethys Realm"

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The *sverdrupi* Zone in the Lower Triassic of Svalbard

ABSTRACT: The ammonite *Vavilovites* aff. *sverdrupi* (Tozer), that is close to the index species of the *sverdrupi* Zone of the Upper Dienerian, is reported from the Lower Triassic (Vardebukta Formation) of the Bellsund area, Svalbard. Consequently, the problem of the Dienerian/Smithiań boundary in the area is discussed.

INTRODUCTION

During the IIIrd Polish Paleontological Expedition to Svalbard in 1976, organized by Professor G. Biernat and led by K. Małkowski, M. Sc., of the Institute of Paleobiology of the Polish Academy of Sciences¹, an ammonite *Vavilovites* aff. *sverdrupi* (Tozer) was found at Reinodden Cape in western Spitsbergen (Figs 1—3). This is the first record of the ammonite indicative of the Dienerian stage from the Svalbard archipelago.

GEOLOGICAL SETTING

The investigated specimen (Pls 1—2) was found in Lower Triassic sediments cropping out on eastern shores of Recherchefjorden, about 300 m south of the Reinodden Cape (Figs 1 and 3—4; cf. also Różycki

¹ The program and the first results of the Polish Paleontological Expeditions to Svalbard, organized in the years 1974—1976, are briefly presented by G. Biernat in *Acta Palaeontol. Polon.*, Vol. 23, No. 2, 1978.

1959, Pl. 5; Buchan & *al.* 1965, Fig. 1). The Lower Triassic sediments here comprise two lithostratigraphic formations: the Vardebukta and the Sticky Keep Formation. Within the former, 96 m above the Permian/Triassic boundary there was found an ammonite-bearing horizon (Figs 3—4). In this horizon there sparsely occur large (10—12 cm in size) very poorly preserved, crushed and thus unidentifiable ammonites. The ammonite described here, *V. aff. sverdrupi* (Tozer) was found

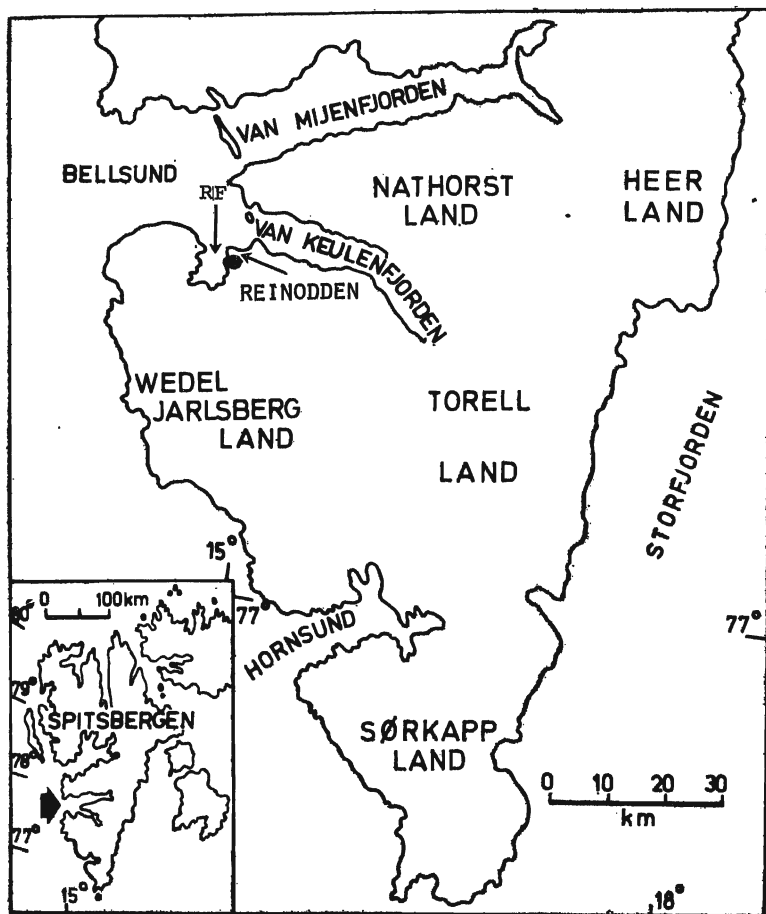


Fig. 1. Location of the Lower Triassic section yielding *Vavilovites aff. sverdrupi* (Tozer) at Reinodden Cape (thick dot) in the Bellsund area (inset shows its position in western Spitsbergen); RF Recherchefjorden. Slightly modified from Birkenmajer & Trammer (1975)

in rock debris at the base of that horizon (Fig. 4). The authors suppose that *V. aff. sverdrupi* (Tozer) is derived from the ammonite-bearing horizon, as:

(1) Up to the present ammonites were not found in any other horizon of the Lower Triassic from the Reinodden Cape;

(2) The mould of *V. aff. sverdrupi* (Tozer) and rocks of the ammonite-bearing horizon are lithologically identical;

(3) The specimen here described as *V. aff. sverdrupi* (Tozer) and unidentifiable ammonites from the ammonite-bearing horizon are characterized by similar proportions (H/D, U/D).

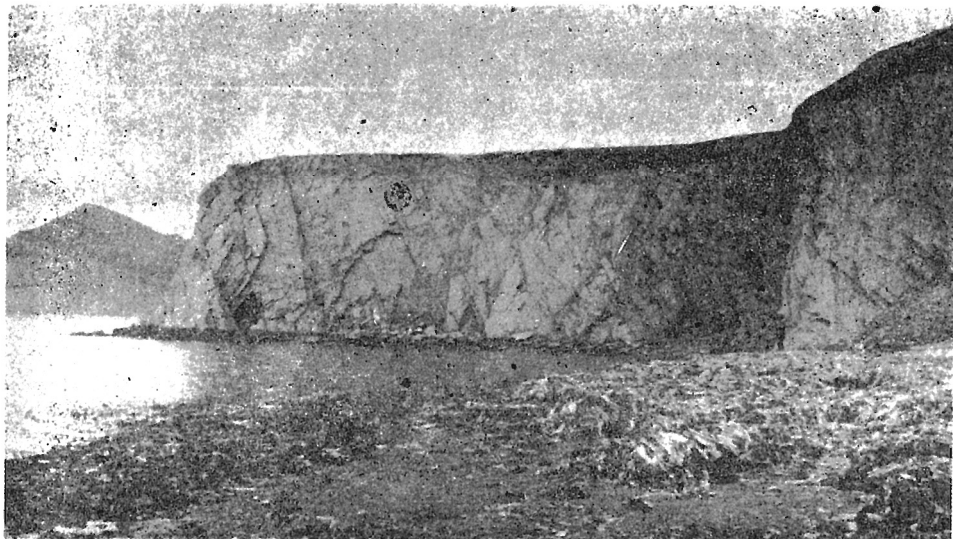


Fig. 2. Landscape of Reinodden Cape in the Bellsund area with exposures of the Triassic deposits (cf. Text-fig. 1)

The fossils are rare in the Vardebukta Formation at the Reinodden Cape, being represented by the ammonites (cf. Fig. 3), pelecypods including *Myalina* sp., *Anodontophora* sp. and other unidentifiable forms, as well as trace fossils *Rhizocorallium* sp. Ammonites are extremely scarce in the Vardebukta Formation. Up to the present only four species were recorded from the lower part of the formation (Tozer & Parker 1968; Korchinskaya 1971, 1972).

STRATIGRAPHICAL REMARKS

The upper part of the Vardebukta Formation was dated at the Dienerian on the basis of indirect evidence (cf. Tozer & Parker 1968; Korchinskaya 1971, 1972). Moreover, a conodont assemblage typical of the Dienerian was described from Hornsund (Birkenmajer & Trammer 1975). Up to the present no ammonites were reported from these strata in Svalbard. The ammonite *Vavilovites aff. sverdrupi* (Tozer) evidences that the rocks yielding it belong to the *sverdrupi* Zone of the Upper Dienerian (cf. Tozer 1967, 1971). This is the second, after the conodonts, direct evidence for the Dienerian stage in Svalbard.

The index species of the *sverdrupi* Zone is not known from the uppermost part of its type section (Tozer 1967). This cannot, however, be used for further precisising the age of the ammonite from Svalbard as the collected specimen is interpreted only as affined to this species.

The position of the specimen in the profile makes it possible to analyse the problem of the Dienerian/Smithian boundary in Svalbard. It was hitherto assumed that the boundary coincides with lithostratigraphic boundary between the Vardebukta and Sticky Keep Formations

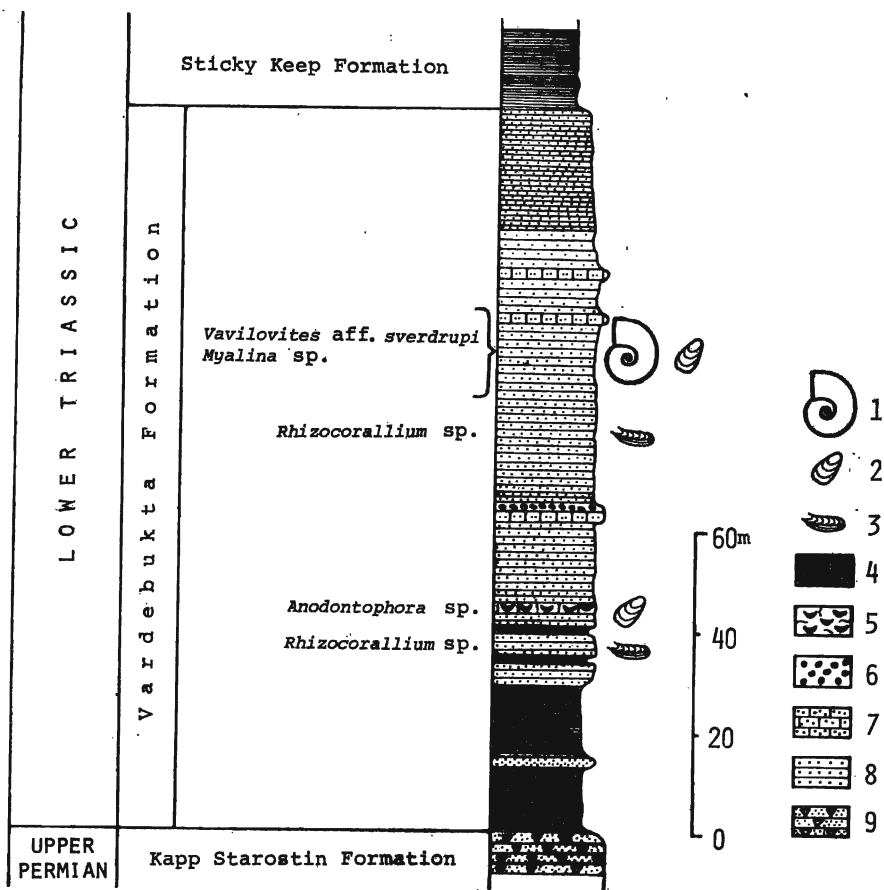


Fig. 3. Lithological column of the Lower Triassic Vardebukta Formation near Reinodden Cape

1 ammonoid *Vavilovites aff. sverdrupi* (Tozer), 2 pelecypods, 3 trace fossils *Rhizocorallium* sp., 4 silty shales, 5 pelecypod lumachelle with *Anodontophora* sp., 6 conglomerate, 7 quartzitic sandstones, 8 siltstones (occasionally slightly calcareous), 9 siliceous siltstones with cherts

(Buchan & al. 1965; Tozer & Parker 1968; Korchinskaya 1971, 1972). The main reason for such an establishment of the boundary was the finding, at the base of the Sticky Keep Formation at Rotundafjellet, of

Euflemingites sp., an index ammonite of the Lower Smithian (Buchan & al. 1965, Tozer & Parker 1968). The data available show that, however, the boundary passes somewhere in the interval between the layer with *V.* aff. *sverdrupi* and that with *Euflemingites* sp. The boundary may therefore pass in the uppermost part of the Vardebukta Formation as well. A sudden appearance of numerous Smithian ammonites at the base of the Sticky Keep Formation in some profiles (e.g., Botneheia, Sticky Keep and Rotundafjellet) is presumably related to favorable facies conditions. The ammonites, so rare in the Vardebukta Formation, are very common in the coeval strata of East Greenland or Ellesmere Island (Spath 1930, 1935; Tozer 1967).

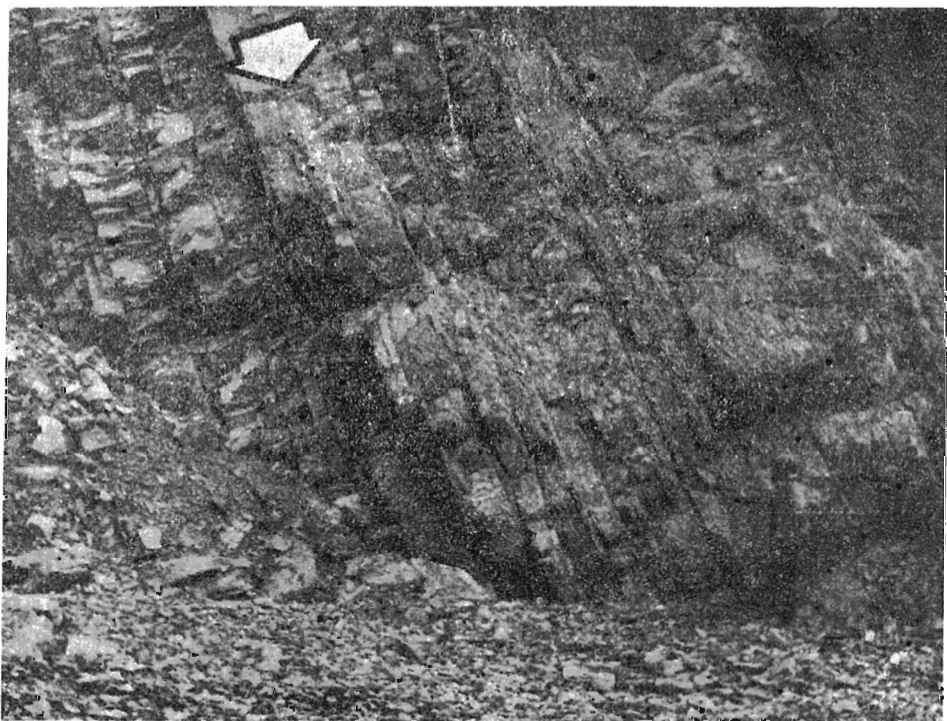


Fig. 4. Exposure of the upper part of the Vardebukta Formation near Reinodden Cape where *Vavilovites* aff. *sverdrupi* (Tozer) was found (arrowed is the ammonoid-bearing horizon; cf. Text-fig. 3)

The occurrence of *V.* aff. *sverdrupi* in the Svalbard archipelago has also some more general implications as *V. sverdrupi* (Tozer), the index species of the *sverdrupi* Zone, was hitherto known from Canada only. At present it appears possible to distinguish this zone also in Svalbard. This confirms a more universal validity of Tozer's (1967) zonal scheme which was questioned by Kummel (1969) as not very useful and of local importance in the case of the Lower Triassic.

The genus *Vavilovites* Tozer, 1971, appears pandemic and indicative of the Dienerian stage. At present its records include (cf. Vavilov 1968, Tozer 1971): *V. sverdrupi* (Tozer) from the North America, *V. turgidus* (Popov), *V. verkhojanicus* (Vavilov) and *V. compressus* (Vavilov) from Siberia, *V. markhami* (Diener) from the Himalaya and, finally, the here reported *V. aff. sverdrupi* (Tozer) from Svalbard.

PALEONTOLOGICAL DESCRIPTION

Family Proptychitidae Waagen, 1895

Genus VAVILOVITES Tozer, 1971

Type species: *Paranorites sverdrupi* Tozer, 1963

Vavilovites aff. *sverdrupi* (Tozer, 1963)

(Pl. 1, Figs 1—2 and Pl. 2, Figs 1—2)

Material: A single mould of phragmocone and a part of body chamber about a quarter of whorl long; original shell represented by small fragments only [Coll. No. ZPAL Am. II/1].

Dimensions (in mm; D diameter, H whorl height, W whorl width and U umbilical width)

D	H	W	U	H/D	W/D	U/D
120	55	29	25	0.46	0.24	0.21
98	46	25	20	0.47	0.26	0.21

Description. — Specimen large, 120 mm in size. Coiling involute; whorl sides weakly convex; whorls thickest in subumbilical area at a quarter of whorl height. Ventral side flattened-convex; separated from whorl sides by fine ventral shoulders with slightly rounded margins and, therefore, subtabulate in character. Umbilical wall high, vertical, with upper margin rounded. Whorl sides smooth except for fine growth lines visible in some places. Suture line (Fig. 5) ceratitic.

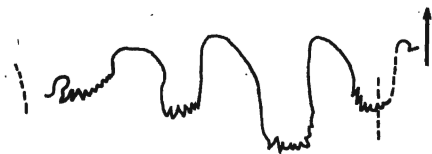
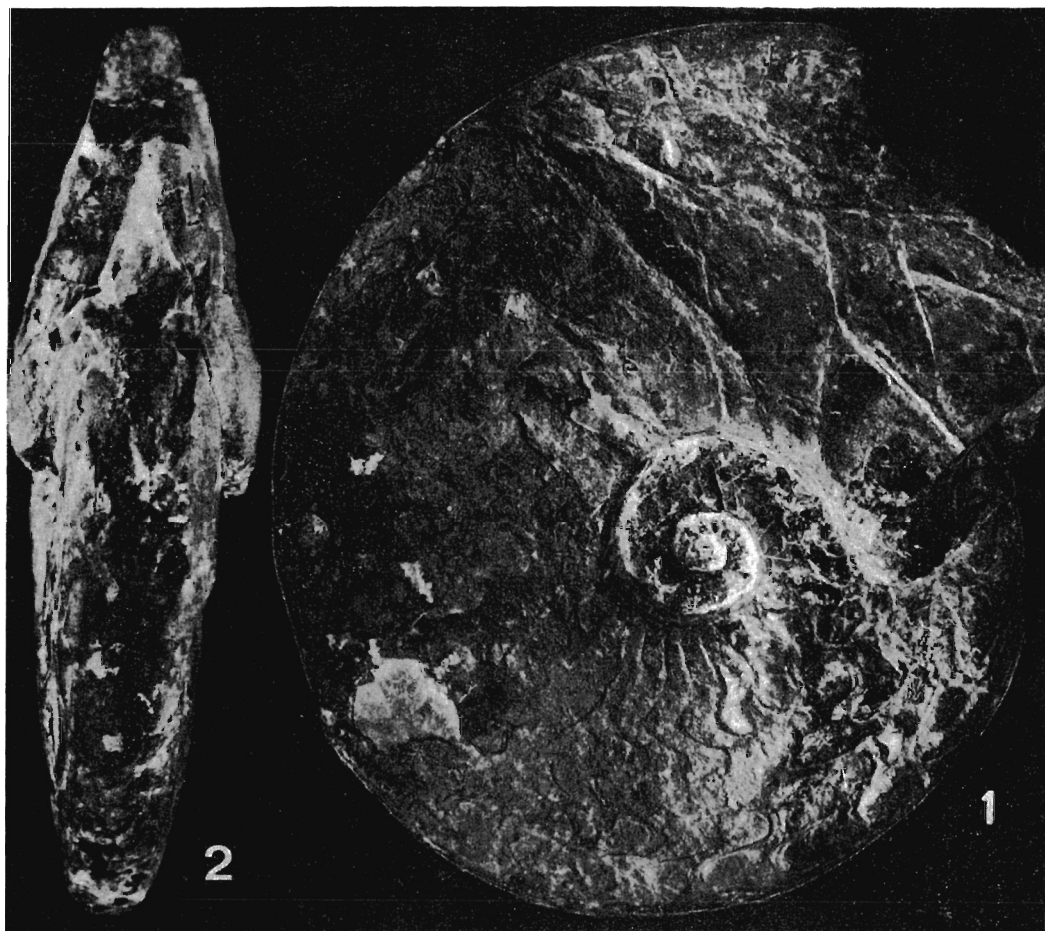


Fig. 5
External suture line of *Vavilovites* aff. *sverdrupi* (Tozer) at H = 52; nat. size

Broad ventral lobe divided by high and wide medial saddle which, in turn, is divided into two small lobes and saddle separating them. Ventral and first lateral saddles are uniform in height and asymmetrical. Second lateral saddle is smaller than the remaining ones. Lobes are clearly denticulate. First lateral lobe is the deepest. The suspensive lobe is partly obscure but one relatively well-developed and heavily denticulate auxiliary lobe is noted.

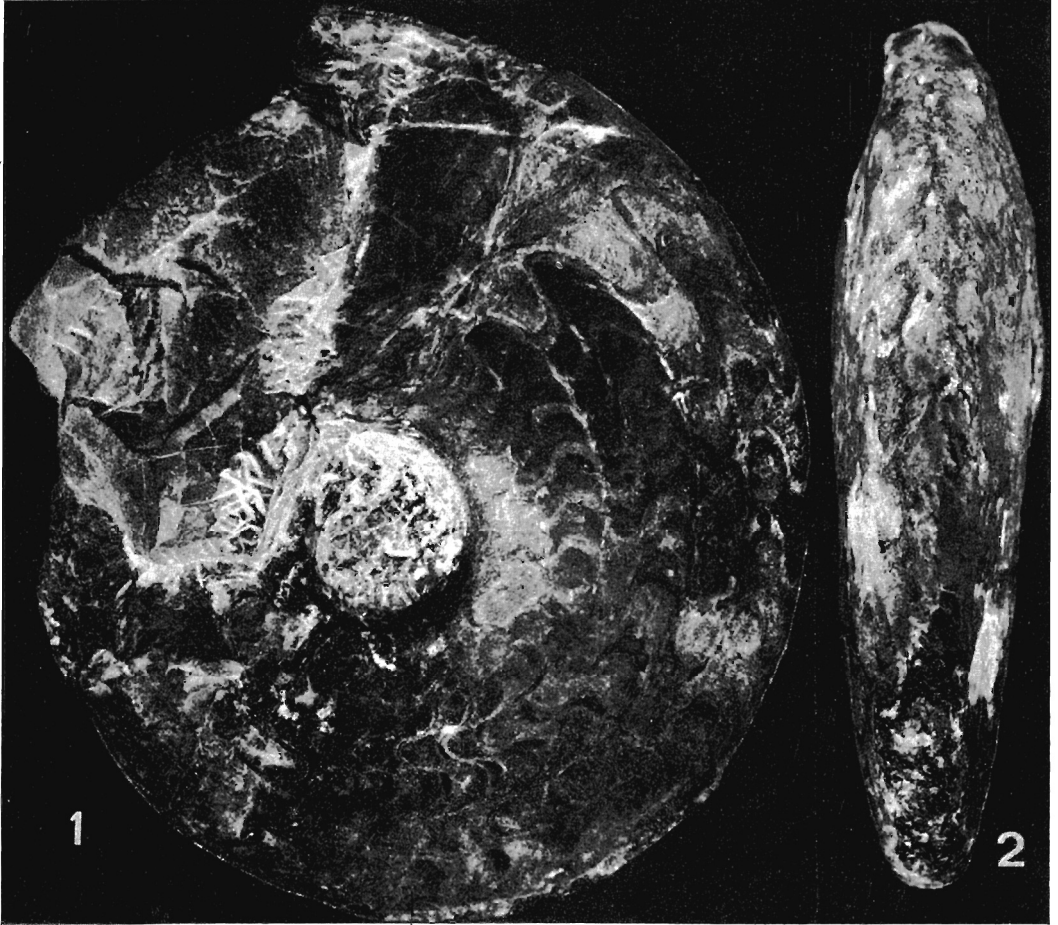
Remarks. — The investigated specimen differs from the representatives of *Vavilovites sverdrupi* (Tozer, 1963) in somewhat narrower whorls and more involute coiling. Tozer (1963) in diagnosis of the species *V. sverdrupi* did not precise the lowermost admissible value of the W/D ratio but it may be stated that the Svalbard specimen is markedly flatter than all the specimens of Tozer. The Svalbard specimen is therefore interpreted as affiliated to *V. sverdrupi* (Tozer).

Vavilovites aff. *sverdrupi* (Tozer); Upper Dienerian, Reinodden
Cape; Bellsund area, western Spitsbergen



1 side view, 2 apertural view; nat. size
Photos taken by S. K. Zielińska

Vavilovites aff. *sverdrupi* (Tozer); Upper Dienerian, Reinodden
Cape; Bellsund area, western Spitsbergen



1 side view, 2 ventral view; nat. size
Photos taken by S. K. Zielińska

The specimens of *V. sverdrupi* (Tozer) with preserved shell (Tozer 1963; Pl. 4, Fig. 6c) display well-defined ventral shoulders whilst those preserved as moulds have ventral shoulders less clearly marked (cf. Tozer 1967, Pl. 4, Fig. 2a) similarly as in the case of the Svalbard specimen.

The Svalbard specimen is somewhat similar to the representatives of the genus *Proptychites* Waagen, 1892, generally differing in subtabulate venter. The species *Proptychites subdiscoides* Spath, 1935, is characterized by similar ratios as the Svalbard form, differing in markedly smaller size (Spath 1935), whilst *P. hemalis* Diener, 1895, is characterized by more evolute coiling and less complex suture line (Diener 1895). Buchan & al. (1965) and Korchinskaya (1971, 1972) reported *P. cf. rosenkrantzi* Spath, 1930, from the Vardebukta Formation in Svalbard. According to Tozer & Parker (1968) this form cannot be positively identified with *P. rosenkrantzi* Spath. The specimen analysed here differs from *P. rosenkrantzi* in strongly rounded venter, much broader whorls and much more involute coiling (cf. also Spath 1930).

The representatives of the genus *Vavilovites* known from the Verkhoyansk region (Vavilov 1968, Tozer 1971) are characterized by much broader whorls than *V. aff. sverdrupi*. The species *V. compressus* (Vavilov, 1968) appears most similar to *V. aff. sverdrupi*, differing in broader and higher whorls at comparable diameters.

Occurrence. — The ammonoid-bearing horizon (Fig. 4), Vardebukta Formation, 96 m above the Permian/Triassic boundary, Reinodden Cape (Bellsund area), western Spitsbergen. Lower Triassic: Upper Dienerian — *sverdrupi* Zone.

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A. GAŹDZICKI i J. TRAMMER

POZIOM SVERDRUPI W DOLNYM TRIASIE SPITSBERGENU

(Streszczenie)

W utworach dolnego triasu (formacja Vardebukta) w rejonie przylądka Reinodden we fiordzie Bellsund na Spitsbergenie (por. fig. 1—4) znaleziono ceratyta (por. pl. 1—2 oraz fig. 5) *Vavilovites* aff. *sverdrupi* (Tozer, 1963). Gatunek *Vavilovites sverdrupi* (Tozer) jest skamieniałością wskaźnikową poziomu *sverdrupi* górnego dinneru. Na podstawie obecności *Vavilovites* aff. *sverdrupi* w obrębie formacji Vardebukta uściślono schemat stratygraficzny dolnego triasu Spitsbergenu, potwierdzając uniwersalność podziału tej epoki, zaproponowanego przez Tozera (1967). W pracy rozważono także problem granicy dwóch środkowych pięter dolnego triasu (diner oraz smit) na obszarze Spitsbergenu.
