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A new Jurassic discinid brachiopod from Spitsbergen

ABSTRACT: A small collection of discinids from Spitsbergen includes two poorly preserved fragments of ventral valves with an incomplete pedicle disc bearing a narrowly trigonal pedicle tract. This element is similar to the type known in Recent discinids. Its general size, comparatively large, is suggestive of a wide embayment of the larval ventral valve. A new species *Discinisca spitsbergensis* sp. n. is proposed.

Key words: Arctic, Spitsbergen, Jurassic, Brachiopoda (discinids), taxonomy.

Introduction

During 1979, the summer palaeontological investigations of the Sassenfjorden area in central Spitsbergen yielded a collection of phosphatic brachiopods, representatives of the lingulids and discinids, preserved in phosphate nodules.

This fossil material is from the condensed Brentskardhaugen Conglomerate Bed (Unit G of Wierzbowski *et al.* 1981) exposed between Janussfjellet and Botneheia, in the inner part of Isfjord (Fig. 1). The nodules, highly fossiliferous, in addition to the brachiopods, have provided many other groups, often in abundance. The majority of them, par example, ammonites, bivalves, gastropods and serpulids have been described in a few papers, *e. g.* Wierzbowski *et al.* (1981) and the lingulids have been revised by Biernat and Emig (1993). The discinids are presented here.

The Brentskardhaugen collection of discinids is housed at the Institute of Paleobiology, Polish Academy of Sciences (Warszawa), abbreviation ZPAL.

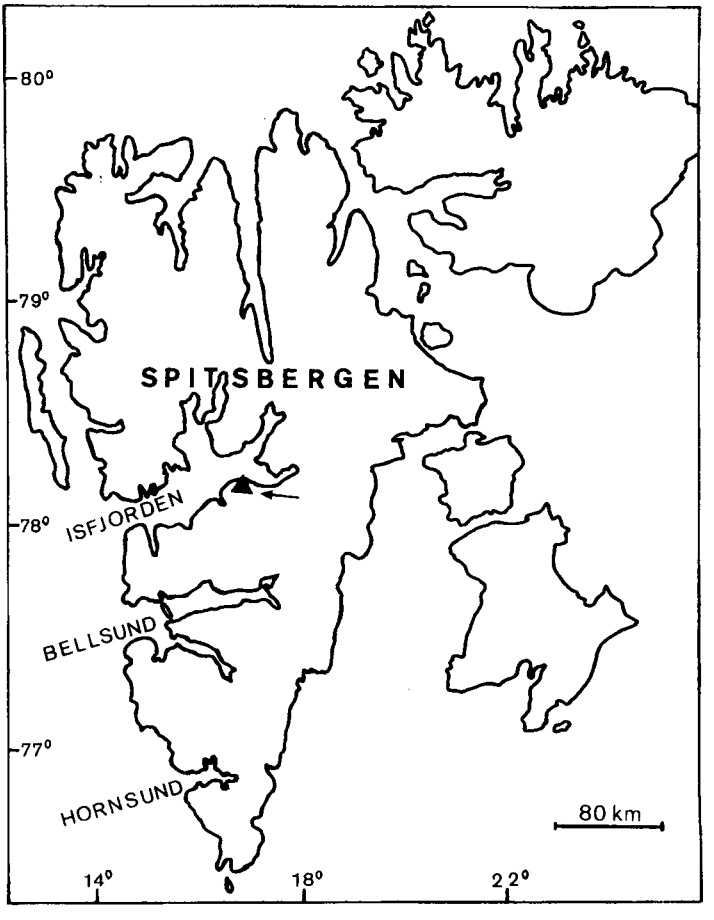

Fig. 1. Sketch-map showing location of Sassenfjorden area, central Spitsbergen investigated during the Fourth Polish Palaeontological Expedition to Spitsbergen in 1979; Sassenfjorden area arrowed.

Previous records

The typical Brentskardhaugen Bed (a regional marker horizon) has been reported from many regions of Spitsbergen (Birkenmajer 1972, Birkenmajer and Pugaczewska 1975, Parker 1967; Pčelina 1965, 1967; Wierzbowski *et al.* 1981, Bäckström and Nagy 1985). Reports on the fossil content (the phosphate brachiopods included) and stratigraphic range of the phosphorite conglomerates are scattered in publications dealing with the Jurassic strata of the Island. With regard to the phosphate brachiopods, these are briefly described and illustrated, among others, in a paper of Birkenmajer and Pugaczewska (1975) on southern Spitsbergen, SW Torell Land and were considered to be of

Toarcian/Bajocian age. In turn, the fauna is mentioned by Wierzbowski *et al.* (1980) and, partly described (lingulids) by Biernat and Emig (1993) from Sassenfjorden area, along its southern coast; it is considered to be Toarcian/Aalenian in age. Bäckström and Nagy (1984) briefly described and figured their record of brachiopods from the phosphorite pebbles, Central Spitsbergen, localities 5, 7, 8, 17 (*op. cit.* 1985, p.31) referring them to the Bajocian, after Pompeckij (1900).

Material

The fossiliferous phosphorite nodules vary in size depending on the nature of the enclosed fossils (*see* Bäckström *et al.*, 1985). Those preserving discinids (usually two or more specimens) are, generally, small (to about 20 mm long) and more round in outline in comparison with nodules containing lingulids. All the brachiopods are preserved as internal or external moulds, in different degrees of completeness, with attached (rarely in discinids) fragments of shell (Pl. 1, Figs 1–5).

The collection of discinids, in contrast to that of the lingulids (*compare* Biernat and Emig 1993), is much less abundant. It comprises thirty separate dorsal valves nearly of uniform size and often bilaterally compressed, their length rarely exceeding 12 mm. Present are also three discinid specimens, "seemingly complete — that is to say ?articulated", narrowly elongate with surfaces distinctly polished and shining. These discinid "shells" are composed, incidentally, of two dorsal valves (their apices lying oppositely) almost perfectly fitted together along all their margins (Pl. 1, Fig. 2) and having some parts of each valve correspondingly truncated. This preservation is a result of, among others, a highly turbulent environment favouring the segregation of the fossils, their conversion to moulds and their breakage.

Included are, also, small fragmentary moulds of the ventral valve delicately impressed on the dorsal valve exterior. One preserves an incomplete pedicle disc (available for study) superimposed on the apical area of the dorsal valve (Pl. 1, Fig. 1; Pl. 2, Figs 1–2).

Systematic description

Family **Discinidae** Gray, 1840
Subfamily **Disciniscinae** Schuchert *et* LeVene, 1929
Genus *Discinisca* Dall, 1971

Remarks. — Fossil discinids remain imperfectly known, particularly their internal structure: as a rule, it is rarely preserved in available records. A lack of

discriminating, taxonomically valuable, characters makes generic and specific assignments difficult. Hitherto identifications were based, by necessity, mostly on the dorsal valve exteriors, usually the only valves preserved.

Most species referred to the genus *Discinisca* Dall have dorsal valves, to a varying degree of rounded outline, lowly conical with subcentral apexes, and a surface concentric sculpture with or without radial costellae (Dall 1920, Thomson 1927).

Regarding the radial ornament it was recognized as a character readilly distinguishing the radiate discinids from the nonradiate forms (Dall 1920, p. 275; Muir–Wood 1929 p. 468; 1939, p. 156; Hertlein and Grant 1944, p. 26; Cooper 1977, p. 51). Accordingly, the radially ornamented *Discradisca* was recognized (Stenzel 1964) as a subgenus of *Discinisca* Dall and, in turn, elevated to generic rank by Cooper (1977). However, Hammond (1980) considered that genus to be unjustified being based, solely, on the surface ornamentation and proposed to retain *Discradisca,* temporarily, at the subgenus level. Indeed, radial ornamentation although sufficiently well distinguishing *Discradisca* from *Discinisca,* may appear to be inadequate as the only criterion diagnostic at the genus level. To mention, appearance of the radiating sculpture (*i. e.* thickness, frequency of bifurcation) may vary within one species, often considerably: from thick ribs to very fine ones with a tendency to dissapearance (Dall 1920, p. 277; Radwańska and Radwański 1989, p. 75).

According to suggestions of Hammond (1980) additional criteria based on the ventral valve morphology (including the larval characters) should be regarded as valuable in defining the three discinid genera: *Palagodiscus* Dall, *Discinisca* (*Discinisca*) Dall and *Discinisca* (*Discradisca*) Stenzel. His proposed taxonomic review of Discinidae (based on these criteria) is not published yet.

In addition, the newly described (Radwańska and Radwański 1994) subgenus *Discinisca* (*Arquinisca*) with *D.* (*A*) *vistulae* sp. n. from the Cretaceous strata (topmost Maastrichtian) of Poland is based on the dorsal valve morphology only (ventral valve unknown). Its main characterics comprise: the elongated, to a varying degree, postlarval (adult) valve of dome–like profile with eccentral apex and well developed surface concentric lines. The authors define their new taxon as well distinguishing among the Jurassic and Tertiary counterparts.

Generally speaking, the taxonomic procedure within family is still vague and the generic status of the disciniscid taxa remains unclear.

The Spitsbergen discinids were assigned by Bäckström and Nagy (1985, p. 31) to the genus *Discinisca* Dall. Their generic status is, here, pending the availability of more and better material, taxonomically decessive, particularly of the ventral valves.

Note on the pedicle disc area. — External mould of the pedicle tract with adherent areas, is the main morphological element preserved, although poorly (Pl. 1, Fig. 1). It is rather widely trigonal than oval, comparatively large and

occupies about one-fifth or more of the area of the available valve (Pl. 1, Fig. 1). The pedicle disc resembles a similar structure in the Recent *Discinisca lamellosa* Broderip 1833 (*i. e.* Rowell in Moore 1965 H286, Fig. 178 – 3a) as well as in the Recent (Chile) *Discinisca sowerbyi* Muir-Wood 1936, (*op. cit.* 1936, p.473, Fig. 3) with the difference, that in the latter forms it is more disctinctly oval. It may correspond also to the pedicle disc in the adult forms of *Discinisca* (*Discradisca*) and *Pelagodiscus atlanticus* King discussed by Hammond (1980). That author considered the larger size and shape of the pedicle disc in the above forms as "reminiscence of the development of a wide embayment the ventral larval valve", like in the other, studied by him, specimens of discinid larvae (*op. cit.* 1980, p. 659).

The median element of the pedicle disc, corresponding to the pedicle fissure, appears to be "originally" narrowly trigonal (Pl. 2) very much like that of the Triassic (Anisian, Carnian) *Orbiculoidea sibirica* Moisseiev, 1947 figured and briefly described by Dagys (1965, p. 18; P. 1, Fig. 17a, 19a). It extends posteriorly, and presumably, as a continuation of the internal ?apical septal ridge, fairly marked (Pl. 1, Fig. 1; Pl. 2).

More detailed morphology of both the fissure and the pedicle foramen remains indefinable since both are obliterated by the rock matrix. One can suggest that the appearance of the above, particularly of the second one, does not differ greatly from those in the living discinids and the pedicle foramen may look like a slit.

Surface ornamentation of the preserved parts of the valve and of the pedicle disc consists of rugae, differentiated in breadth, interrupted by a pedicle fissure. Rugae at the apex are thinner and of more uniform appearance, with growth, their pattern becomes more step-like (Pl. 1, Fig. 1; Pl. 2, Figs 1 – 2).

Additionally, some parts of valve bear fine and widely spaced lines, two-three per 1 mm, crossing (somewhat angularly) concentric rugae in a way similar to those observed in a specimen of the Recent *Pelagodiscus* sp. from the collection of Dr. Chr. Emig (Marine Station, Marseille). These lines may be connected with the location of setae along the mantle margins and concentric lines? described on a number of lingulacean genera (*compare* Savazzi, 1986, p. 59).

It is worth to mention that, on the dorsal apical area, anteriorly to the pedicle disc, two rounded scars lying very close one to another are preserved. They are deformed (one more enlarged) and, somewhat displaced (Pl. 2, Fig. 1). Each of them is surrounded by a darker rim supposedly connected with the decay of organic matter. Their general appearance and location may be suggestive of the dorsal adductor muscle scars. These look very much like the dorsal "retractors" *sensu* Davidson (1888, Pl. 26, Figs 23 – 25) and, the anterior adductors (Thomson 1927, Fig. 38b) in *Discinisca lamellosa* Broderip, or in *D. variabilis* (Thomson 1971, Figs 4b, 6) and *Pelagodisus atlanticus* figured by Lee (1987, Fig. B: f). The above interpretation seems probable.

Discinisca spitsbergensis sp. n.
Pl. 1. Figs 1–7; Pl. 2. Figs 1–2)

1829. cf. *Orbicula reflexa* Sowerby; p. 4, Pl. 506, Fig. 1.
1900. cf. *Discina reflexa* (Sowerby); Pompeckij, p. 58, Pl. 1, Figs 6–9.
1985. *Discinisca* cf. *reflexa* (Sowerby 1829); Bäckström and Nagy, p. 31, Pl. 1, Figs 3–5.

Holotype: ZPAL Bp. XXIVa/1, Pl. 1, Fig. 4; Paratype: ZPAL Bp. XXIVa/2, Pl. 1, Fig. 1.

Type locality: Wimanfjellet (between Janussfjellet and Botneheia), Sassenfjorden area, central Spitsbergen.

Type horizon: Brentskardhaugen Bed (phosphorite nodules), Jurassic Toarcian/Aalenian (Wierzbowski *et al.* 1981).

Etymology: *spitsbergensis* – relates to the type locality – Spitsbergen.

Material and occurrence. — Thirty disarticulated external and internal moulds of dorsal valves, partly exfoliated, two fragmentary ventral valves. All material comes from the Brentskardhaugen Conglomerate Bed (phosphorate nodules) of Wimanfjellet (between Jaanussfjellet and Botneheia), Sassenfjorden, central Spitsbergen.

Diagnosis. — Small, rounded to oval, lowly conical species, apex subcentral and pointed, posterior margin evenly cutted, pedicle tract narrowly trigonal with

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PLATE 1

Discinisca spitsbergensis sp. n. 1. Fragmentary mould of a ventral valve, paratype (ZPAL Bp. XXIVa/2, apical view, pedicle disk partly preserved; 2–7. Dorsal valves in different state of preservation: 2. paratype (ZPAL Bp. XXIVa/453) with two dorsal valves tightly conjoint; 3. incomplete paratype (ZPAL Bp. XXIVa/495; 4. holotype ZPAL Bp. XXIVa/1) seriously decorticated with subcentral apex and very weak traces of muscle scars; 5–7. paratypes (ZPAL Bp. XXIVa/487, ZPAL Bp. XXIVa/489, ZPAL Bp. XXIVa/490), all with subcentral and marked apex. All × 7

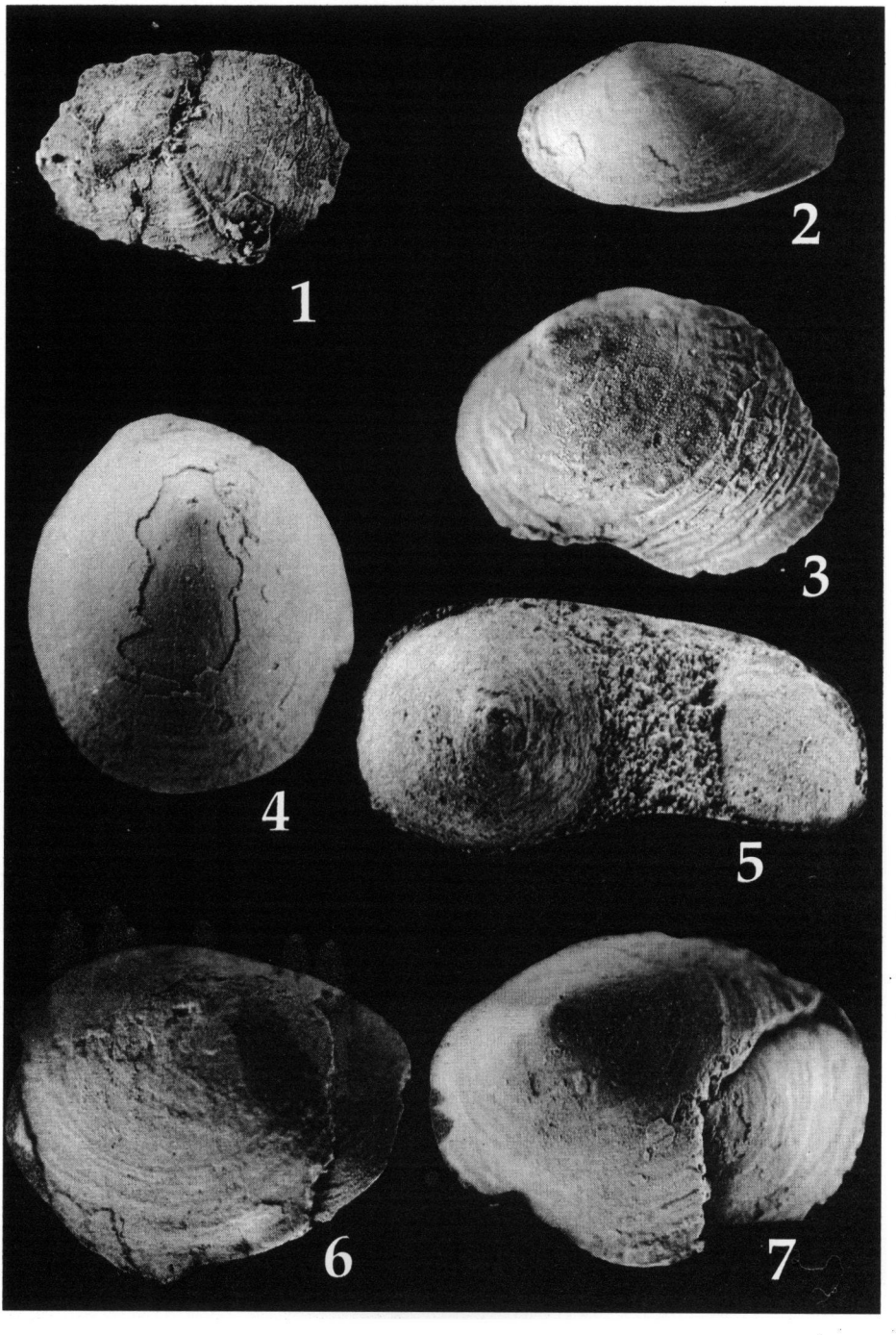
Phosphorite nodules of the Brentskardhaugen Bed Toarcian/Aalenian, Wimanfjellet, Sassenfjorden.

PLATE 2

Discinisca spitsbergensis sp. n. Fragmentary mould of a ventral valve, paratype (ZPAL Bp. XXIVa/2).

Fig. 1 — incomplete pedicle disk (pd) with a median pedicle fissure (pf) bordered by two, poor, adherent areas (aa) and bearing traces of concentric rugae (cr) of varying breadth; at the apex traces of ?dorsal adductor scars (d a a) being marked. Fig. 2 — focussed on a median pedicle fissure (pf) and on adherent area (aa).

Phosphorite nodules of the Brentskardhaugen Bed Toarcian/Aalenian, Wimanfjellet, Sassenfjorden.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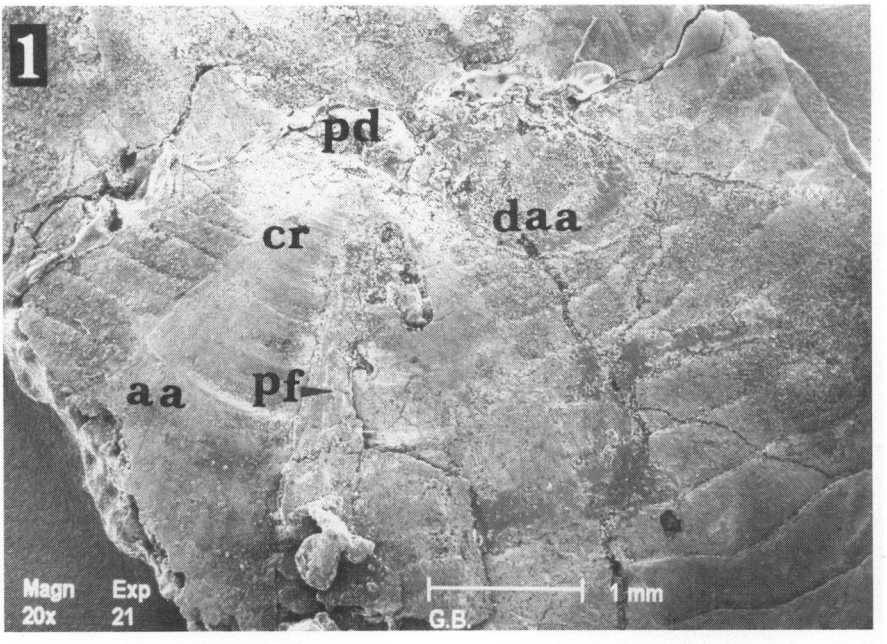
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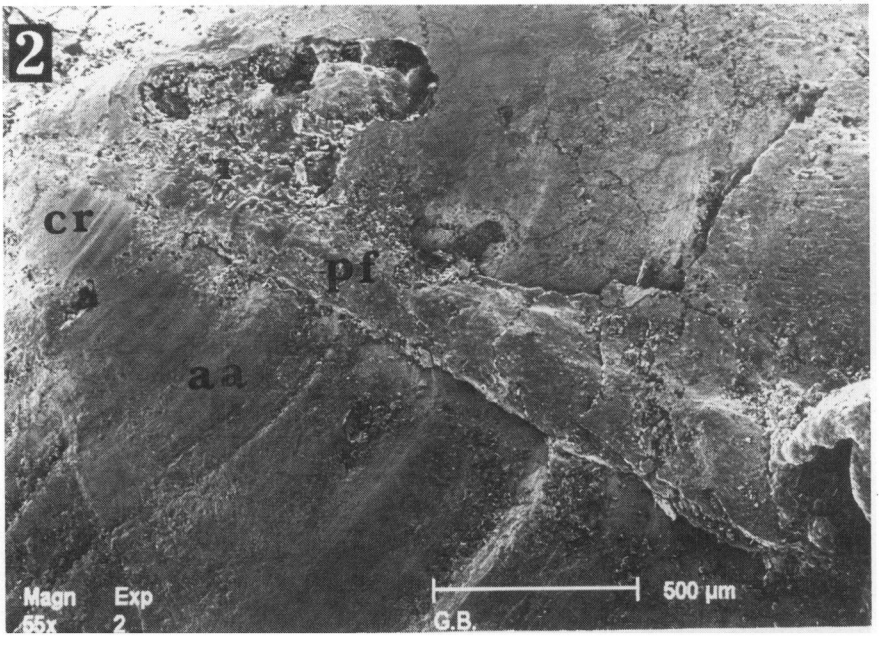
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quite large adherent areas; width and arrangement of the surface concentric lines varying, particularly on the adult shell.

Description — Dorsal valve small, rarely exceeding 12 mm in length, lowly conical in profile, somewhat oval or almost circular in outline; apex subcentral, moderately pointed; posterior slope somewhat flattish and its margin insignificantly truncated or slightly rounded; anterior slope lightly elongated with rounded margins.

Surface concentric lines of varying width and arrangement, usually with three to five thinner lines in between the two thicker ones, the latter, often look like discontinuous corrugations particularly at the marginal areas (Pl. 1, Fig. 3); very faint and discontinuous traces of radial "capillae" are seen on small shell patches. One decorticated valve shows very poor and fragmentary traces of ? mantle canals (vascula media) and, probably of anterior adductors (Pl. 1, Fig. 4), the latter may correspond to those of the living *Discinisca* figured by Rudwick (1970, Fig. 10c).

Ventral valve. Small, flattened with somewhat convex peduncular area; pedicle fissure of narrowly trigonal outline: pedicle foramen probably slit like (Pl. 1, Fig. 1; Pl. 2, Figs 1–2), a short apical ?septal ridge traceable.

Surface concentric lines, somewhat irreglarly arranged, of varying width, and deflected on the pedicle area: discontinuous when at both borders of the pedicle fissure. They are, additionally, crossed by very fine radial thread - like lines, two per 1 mm.

Remarks. — Bäckström and Nagy (1985) regarded the discinids from Spitsbergen, as being almost identical with *Discinisca reflexa* (Sowerby) poorly illustrated and described by Pompeckij (1900; p. 58, Pl. 1, Figs 6–9), who identified them as *Discinisca cf. reflexa* (Sowerby). As a matter of fact, that species, independently of the records usually inadequate for identification, has been often cited from Jurassic (mainly Lias) localities (*i.e.* Davidson 1851, 1876; Rollier 1915). This is, however, a controversial species. Above all, its appropriate interpretation is hindered by the fact that the formation and locality of the type of the species is still unclear. That problem has been briefly discussed by Muir–Wood (1936) who provided some data on the species in question, including nomenclatural corrections (*op. cit.* 1936, pp. 476–477); in addition, Whitby (England) was suggested as a supposed locality of the two syntypes of *D. reflexa* originally described and figured by G.B. Sowerby in 1825, p. 321, Pl. 11, Fig. 7).

D. spitsbergensis sp. nov., in size and general outline, resembles the specimens mentioned and figured by the above authors as *D. reflexa*. It differs in having lower dorsal valve, a more subcentral (posterior) apex cutted posterior margin and, unknown till now, widely trigonal pedicle disc.

D. holdeni (Tate), briefly described from the Lias (Dorset) by Muir–Wood (1936; p. 473, Figs 1a–1b), is smaller, its dorsal valve, being higher and apex

lying more centrally. The ventral valve of *D. langi* Muir–Wood (the only preserved) from the Lower Lias of Dorset is of much larger size with broader concentric rugae; the pedicle disc, unfortunately, is not preserved (Muir–Wood 1936; p. 474, Text — fig. 2). The Triassic *Orbiculoidea sibirica* Moisseiev from Siberia is more elongate with higher dorsal valve and has a more central apex (Dagys 1965, p. 6, Pl. 1, Figs 17–20). The Carnian *Orbiculoidea* sp., (basin of the Kolyma River) is much larger in size, the dorsal apex more central and concentric lines are thinner (*op. cit.* 1965; Pl. 2, Fig. 1).

Conclusions

1. The shell morphology, particularly of the ventral valve, justify erection of a new species.

2. The widely trigonal pedicle disc, recognized up to now, in only the Triassic and Jurassic discinisid brachiopods may proved characteristic of the Mesozoic forms.

3. The comparatively large size of the pedicle disc in *Discinisca spitsbergensis* sp. n. may be indicative of a wide embayement in the larval ventral valve.

4. The few traces of the ventral valve moulded on the dorsal one may suggest that the latter could serve as a substrate for attachement of juvenile discinids in like manner as the Recent discinids (Rowell 1965, Taylor 1971, Ricards 1973, Watson 1982).

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Streszczenie

Badania ramienionogów (discinidów) z fosforytów warstwy Brentskardhaugen (jednostka G: Wierzbowski *et al.*, 1981) rejonu Sassenfjorden w centralnej części Spitsbergenu (fig. 1) wykazały, że stanowią one nowy gatunek *Discinisca spitsbergensis* sp. n. (pl. 1–2). Zachowany fragmentarycznie dysk nóżkowy (pl. 1, fig. 1; pl. 2, fig. 1–2) stosunkowo duży, w porównaniu z niewielkimi rozmiarami skorupki wykazuje znaczne podobieństwo do dysku u współcześnie żyjących discinidów. Niewielka różnica dotyczy głównie zarysu tego elementu — trójkątny u gatunku spitsbergeńskiego i owalny u form współczesnych. Podobny (trójkątny) dysk zaobserwowano również u triasowego gatunku *Orbiculoidea sibirica* Moisseiev (Dagys 1965; pl. 1, fig. 19a) z Syberii. Wydaje się, że kształt dysku nóżkowego może być istotną diagnostycznie (dla rodzaju) cechą. Niewątpliwie, zarysowuje się tutaj pewna tendencja w kierunku zmiany w zarysie dysku nóżkowego. Na wykazanie tego potrzebna jest kompletniejsza dokumentacja kopalna.