The Early Devonian (Emsian) acrotretid microbrachiopod *Opsiconidion minor* Popov, 1981, from the Alaska/Yukon Territory border and Novaya Zemlya

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Abstract. New records of the poorly known acrotretid (Biernatidae) microbrachiopod *Opsiconidion minor* Popov are described from middle Emsian strata of the Ogilvie Formation in east-central Alaska and the adjacent Yukon Territory, Canada, and compared with new better-preserved topotypes from the late Early Devonian (Emsian) of Novaya Zemlya, Russia. In Alaska *O. minor* occurs together with fragmentary material of *Lingulipora* sp. and an indeterminate discinid. The only other previous record of *O. minor*, outside the type area, comes from the Early to ?Middle Devonian (Pragian to ?Givetian) of Australia (Victoria and NSW). *Opsiconidion* Ludvigsen is a stratigraphically extremely long-ranging and cosmopolitan acrotretid, which exhibits a remarkable conservatism; the morphology of the ventral valve remains essentially unchanged from the earliest Ordovician (Darriwilian) records to the Devonian.

Key words: Brachiopoda, Lingulata, Acrotretida, Biernatidae, Devonian, Emsian, Novaya Zemlya, Russia, Alaska, Yukon Territory.

INTRODUCTION

Devonian records of acrotretid lingulate brachiopods were for a long time comparatively uncommon, but recently our knowledge has increased significantly. Since the first possible reports by Rowell (1965, p. H276) and Langer (1971), numerous records of Devonian acrotretids have been described from many parts of the world (e.g. Ludvigsen 1974; Cocks 1979; von Bitter & Ludvigsen 1979; Popov 1981a; Brock et al. 1995; Huson & Over 2000; Mergl 2001, 2009, 2019; Mergl & Ferrova 2009; Mergl & Vodrážková 2012; Mergl & Jimenez-Sanchez 2015).

The only surviving acrotretid genera in the Devonian seem to be *Opsiconidion* Ludvigsen, 1974, *Concaviseptum* Brock et al., 1995, and *Havlicekion* Mergl, 2001, belonging within the Family Biernatidae Holmer, 1989. Although *Opsiconidion* has its main range in the Silurian and Devonian, it extends down also into the Ordovician (e.g. Popov et al. 1994; Holmer 2000; Sutton et al. 2000). Most previous important Devonian records of *Opsiconidion* have been reviewed and discussed by Mergl (2001, 2019), in connection with comparative descriptions of faunas from Bohemia, which are presently the best-known occurrences of the genus and of other Devonian lingulates (see also Mergl 2009; Mergl & Ferrova 2009; Mergl & Jimenez-Sanchez 2015). The youngest possible report to date remains Langer (1971), who recorded some problematic and poorly known highly conical forms that possibly represent *Opsiconidion* from the early Late Devonian (Frasnian) of Germany; however, the youngest well-established occurrence is from the Givetian of Australia (Brock et al. 1995) and Southern Mongolia (Arno 2010).

The object of this study is to describe new material of the poorly known *Opsiconidion minor* Popov, 1981a, from middle Emsian strata of the Ogilvie Formation in east-central Alaska and the adjacent Yukon Territory, Canada. The original publication of Popov (1981a) is unfortunately poorly available and consequently new, well-preserved topotypes from the late Early Devonian (Emsian) of Novaya Zemlya, Russia, are illustrated for comparison with the new North American material.

GEOGRAPHICAL AND GEOLOGICAL SETTING

Novaya Zemlya

The illustrated topotypes of *O. minor* come from Valnev Island, Novaya Zemlya Archipelago (VSEGEI, St Petersburg, locality No. 39). They were etched from sample No. 39-31 (see Sobolev 1984, fig. 1), from the Lower Devonian (Emsian) *Polygnathus perbonus* Biozone (see Sobolev 1984, for further details).

Alaska and the Yukon Territory

Two middle Emsian (late Early Devonian) occurrences of *Opsiconidion minor* are known from two localities of the uppermost strata of the Ogilvie Formation exposed in the Jones Ridge–Squaw Mountain area along the Alaska–Yukon border, one on either side of the boundary. Both are in equivalent beds representing the uppermost Ogilvie Formation, and the associated fauna represents the deepest-water faunal association found in the Ogilvie Formation locally (Fig. 1). This association was termed the *Elythyna* cf. *E. kingi* palaeocommunity in Blodgett (1978) and characterized by an extreme abundance of the reticularid brachiopod *Elythyna* cf. *E. kingi*. Other associated brachiopods include *Athyrhynchus susanae*, *Phagmostrophia* cf. *P. merriami*, *Bifida* sp., *Linguopugnoides glabberhynchus*, '*Chonetes*' spp., *Leptathyris* sp., *Orbiculoidea* sp. and *Opsiconidion minor*. The dacryoconarid *Nowakia* is also seen in abundance here.

The University of Alaska (UA) Museum locality A-941 (Fig. 1) is from the base of Section D of Blodgett (1978). The section is situated in the Yukon Territory (latitude 65º05.2´N, longitude 140º59.56´W) and was measured in a small cliff composed of thinly bedded dark grey, petroliferous, micritic limestone. The cliff is located on the south side of Hard Luck Creek (also known as Harrington Creek), in its upper reaches approximately 0.805 km (0.5 mile) east of the Alaska–Yukon boundary, at the point where the creek makes a sharp bend to the north upstream. The total height of the section is 4.3 m (14 feet). The UA Museum locality A-941 represents the basal 1.22 m (4 feet) of section D. Conodonts from this locality include the age-diagnostic *Polygnathus inversus* Klapper & Johnson of middle Emsian age (Blodgett 1978).

A second nearby locality in the Ogilvie Formation is situated in the Charley River A-1 1:63 360 scale quadrangle (latitude 65º06.2´N, longitude 141º01.1´W) in east-central Alaska (Fig. 1). This locality 83RB48 (USGS locality 11920-SD) consists of micritic to encrinoidal limestone from talus rubble slides on the south flank of Jones Ridge, elevation about 3000 feet (914.4 m), NW1/4, SW1/4 section 10, T. 3 N., R. 33 E. This locality is located approximately 1.29 km (0.8 mile) N10ºW of the first locality. Conodonts from this locality, identified by Audrey L. Orndorff and Anita G. Harris (written commun., 7 October 1988), contain two identifiable polygnathid species, *Polygnathus inversus* Klapper & Johnson and *Polygnathus laticostatus* Klapper & Johnson, indicating an Inversus/Laticostatus Zone (middle Emsian) age.

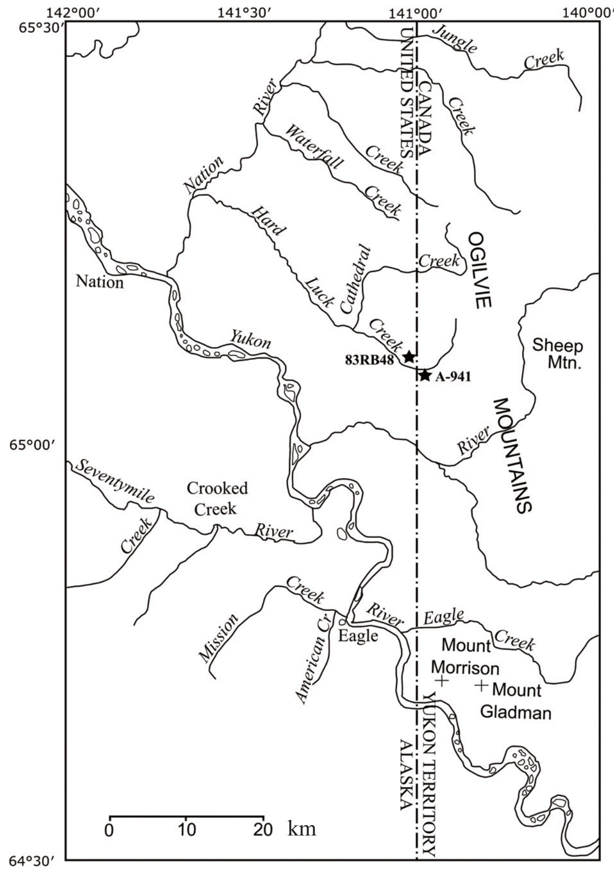

Fig. 1. Map showing localities 83RB48 (Alaska) and University of Alaska Museum locality A-941 (Yukon Territory) in the uppermost strata of the Ogilvie Formation exposed in the Jones Ridge–Squaw Mountain area along the Alaska–Yukon border. Locality 83RB48 is located approximately 0.8 mile (1.29 km) N10ºW of the University of Alaska Museum locality A-941.

Brabb & Churkin (1969) and Churkin & Brabb (1968) included the above localities within the basal limestone and shale member (Emsian age) of the McCann Hill Chert established by Churkin & Brabb (1965). Blodgett (1978) recognized that these platformal carbonates exposed in the vicinity of Jones Ridge and Squaw Mountain are lithologically distinct from the deeper-water type basal limestone and shale member exposed to the south in Eagle D-1 1:63 360 scale quadrangle, and he assigned them rather to the Ogilvie Formation. The Ogilvie Formation is exposed widely to the east and north in the Yukon Territory and ranges from late Early to Middle Devonian (Emsian to Givetian) in age (Perry et al. 1974). The outcrops discussed here represent the southwesternmost exposures of the Yukon Stable Block of Lenz (1972). Both to the south and west coeval Emsian strata grade from platformal carbonate facies of the Ogilvie Formation into basinal slope facies of the limestone and shale member of the McCann Hill Chert (Blodgett 1978; Blodgett et al. 1984; Clough & Blodgett 1984, 1987, 1988; Dover & Miyaoka 1988; Dover 1992).

SYSTEMATIC PALAEONTOLOGY

Measurements and repository. Measurements (in millimetres) were made with a binocular microscope on specimens oriented in the conventional manner: W = maximum width; L = maximum sagittal length; WI = maximum width of dorsal pseudointerarea; LI = maximum length of dorsal pseudointerarea; WM = maximum combined width of dorsal cardinal muscle scars; LM = maximum length of dorsal cardinal muscle scars; LS = maximum length of dorsal median septum, measured from the posterior sagittal margin. The mean values (X), standard deviation (S) and number (N) of measured specimens are given.

The specimens discussed and described here are deposited in the Swedish Museum of Natural History, Stockholm (NRM-PZ Br), the CNIGR (Central Scientific Geological Exploration) Museum, St Petersburg, and the University of Alaska Museum, Earth Sciences Collection, Fairbanks, Alaska (UAMES).

Class LINGULATA Gorjansky & Popov, 1985
Order ACROTRETIDA Kuhn, 1949
Family BIERNATIDAE Holmer, 1989

Diagnosis. See Holmer & Popov (2000, p. 130) and Sutton et al. (2000, p. 100).

Genera included. *Biernatia* Holmer, 1989; *Opsiconidion* Ludvigsen, 1974 [= *Caenotreta* Cocks, 1979]; ?*Eschatelasma* Popov, 1981b; *Concaviseptum* Brock et al., 1995; *Bathmoleca* Sutton (in Sutton et al.), 2000; *Havlicekion* Mergl, 2001.

Occurrence. Ordovician (upper Tremadoc)–Middle Devonian (Givetian), ?Upper Devonian.

Remarks. The problematic Silurian genus *Eschatelasma* from Estonia was originally referred to the Subfamily Acrotretinae (Popov 1981b; Holmer & Popov 2000) but restudy of the type material (Holmer & Popov, unpublished information) indicates that it might be an aberrant biernatide. The morphology and pitting of the metamorphic shell (see, e.g., Zhang et al. 2018) are identical to those of *Opsiconidion*, whilst the median septum lacks the upper septal rod and is quite unlike that of any biernatide.

Genus *Opsiconidion* Ludvigsen, 1974

Type species. *Opsiconidion arcticon* Ludvigsen, 1974, by original designation, from the Early Devonian (early Emsian) Michelle Formation, Yukon Territory.

Diagnosis. See Holmer & Popov (2000, p. 131) and Sutton et al. (2000, p. 100).

Species included. See Mergl (2001, 2009, 2018, 2019), Mergl et al. (2018), Sutton et al. (2000), Valentine et al. (2003).

Stratigraphic distribution. Ordovician (Darriwilian) to Middle Devonian (Givetian), ?Upper Devonian.

Remarks. *Opsiconidion* is a morphologically very conservative genus; the morphology of the ventral valve remains essentially unchanged from the earliest Ordovician records (Popov & Holmer in Popov et al. 1994; Holmer 2000; Sutton et al. 2000) to the Devonian. The genus probably originated directly from within *Biernatia* Holmer, 1989, and it is difficult to distinguish *Opsiconidion* from this genus on the basis of the ventral valve alone, because it has very few internal and external characters, and all forms seem to be strongly apsacline. The dorsal valve of *Opsiconidion* is usually more distinctive, and especially the median septum and pseudointerarea provide a possible means of taxonomic discrimination. As compared with species of *Biernatia*, it seems that the dorsal median septum and pseudointerarea of *Opsiconidion* are reduced; the complex, wide and convex surmounting plates of the former genus are never developed and instead simple septal rods or very narrow, flattened surmounting plates are present.

The pitting and general shape of the metamorphic shell of *Opsiconidion* are also rather distinctive; the dorsal metamorphic shell usually has a very distinct sulcus, and the large pits of both valves are usually distinctly cross-cutting. The interpretation of the cross-cutting pits in *Opsiconidion* has been discussed repeatedly. According to Ludvigsen (1974) and von Bitter & Ludvigsen (1979), they were formed through a complex process involving resorption of shell material. However, Williams & Curry (1991, fig. 1) proposed a more likely model in which the cross-cutting relationships of the large circular pits are formed through overlapping vesicles or mineralized minute plates in the periostracum. The discovery of such mineralized siliceous plates in living and fossil discinoids (Holmer 1989, fig. 41; Williams et al. 1998; Baliński & Holmer 1999) further supports this interpretation, and protection from solar radiation has been suggested as a possible function (Williams 2003; Lüter 2004).

The possible life habits of *Opsiconidion* have also been the subject for various interpretations (see also Mergl & Vodrážková 2012; Mergl et al. 2018). Bassett (1984, p. 244) provided a review of the proposed lifestyles and suggested that minute, elongated microbrachiopods like *Opsiconidion* might have been interstitial. In contrast, Popov et al. (1994; see also Mergl 2002, p. 16 for discussion) noted that many assemblages dominated by microbrachiopods are associated with numerous sponge spicules. It is clear from the recently described (Lenz 1993) Canadian Silurian occurrence of the lingulid *Paterula* sp. (referred to as '*Craniops* sp.') attached around the oscular margin of sponges that a sponge–lingulate association is a plausible possibility. This type of the secondary tiering mode of life on sponges and other epibionts is also clearly present in many other micromorphic Palaeozoic linguliform brachiopods (e.g. Wang et al. 2012; Topper et al. 2015a, 2015b).

Opsiconidion minor Popov, 1981a
Figures 2, 3A–D, 4, 5A

1981a *Opsiconidion minor* Popov, p. 62, pl. 1, figs 1–7.
1995 *Opsiconidion minor* Popov; Brock et al., p. 111, fig. 4G–L.

Holotype. Dorsal valve (L = 1.37, W = 1.51), CNIGR No. 1/11829 (Fig. 5A), from the upper Lower Devonian (Emsian) of Valnev Island, Novaya Zemlya (Popov 1981a, pl. 1, fig. 7).

Figured material. From Novaya Zemlya: RM Br 136300–136304. From east-central Alaska and closely nearby Yukon Territory: UAMES 5509, 5511, 5514, 5516 and 5520 (Yukon Territory), NRM-PZ Br 136305–136307 from 83RB48 (east-central Alaska).

Diagnosis. Dorsal valve gently convex to flattened; dorsal pseudointerarea with well-defined median groove and narrow propareas; surmounting plate well-developed, narrow, with fine median furrow; lower septal rod usually present; posterior platform well-developed; *vascula media* and *vascula lateralia* well-developed, closely spaced.

Description of the North American material. Shell transversely oval with maximum width placed somewhat anterior to mid-length.

Ventral valve strongly apsacline and acutely conical, on average about 1.5 times as high as wide in adult specimens. Ventral pseudointerarea undivided and poorly defined laterally. Ventral interior mainly lacking distinctive characters, but with some poorly developed traces of mantle canals.

Dorsal valve gently convex to flattened subcircular in outline, on average 87% (Table 1) as long as wide with poorly defined, shallow median sulcus. Dorsal pseudointerarea, broadly triangular in outline, anacline, occupying on average 39% (Table 1) of the maximum valve width; median groove well-defined in adults; propareas narrow. Dorsal median septum starting at a short distance from the pseudointerarea and extending on average 85% (Table 1) of the maximum valve length; maximum height placed at about 2/3 of the valve length from the posterior margin; surmounting plate, well-developed, narrowly triangular, up to 0.12 mm wide, extending and widening along posteroventral slope of septum to place of maximum height; with weakly defined median furrow ending in two node-like swellings at anterior end; anterior slope of surmounting plate slightly undercut near top, usually bounded by a single lower septal rod (which is lacking in some specimens); anterior apex of septal rod variably developed, projecting outwards as short node, or ending at sharp angulation from median septum, then declining to dorsal valve floor. Dorsal cardinal muscle scars well-defined in adults, occupying about 40–50% of the maximum shell valve width and length; scars diverging anteriorly, slightly raised and bounded laterally by ridges; dorsal anterior muscle scars apparently entirely lacking; dorsal *vascula media* and *vascula lateralia* well-developed and strongly impressed, very closely spaced and originating at a point about 1/5 of the total valve length from the posterior margin.

Metamorphic shell around 0.12–0.17 mm in diameter; well-developed median sulcus on dorsal metamorphic shell; metamorphic ornamentation with large circular, shallow flat-bottomed pits of somewhat varying size (up to about 5 µm across) showing cross-cutting relationships; clusters of extremely minute pits (less than 500 nm across) are sometimes developed between the flat-bottomed pits. Post-metamorphic shell ornamented by fine, closely spaced growth lines.

Discussion. The North American material is indistinguishable from the Russian type material; the only difference is that the recorded maximum width is slightly larger in the Russian material. The morphological details and relative size of the dorsal pseudointerarea, median septum, cardinal scars and mantle canals recorded by Popov (1981a) are all completely identical to the material described here. For ease of comparison, some topotypes from Novaya Zemlya are figured here (Fig. 4) along with a *camera lucida* drawing of the holotype (Fig. 5A).

The morphology of *O. minor* is closely similar to the Ludlowian *Opsiconidion ephemerus* (Mergl, 1982) in all important aspects; however, the maximum size of the Bohemian species is much smaller and the largest ventral valve is only 0.8 mm in width. The musculature and mantle canal system of *O. ephemerus* are unfortunately not known in detail.

Opsiconidion minor is also similar to Silurian *O. celloni* (Cocks, 1979), which also has a narrow, triangular surmounting plate with a median furrow. According to Cocks (1979), the surmounting plate actually consists of

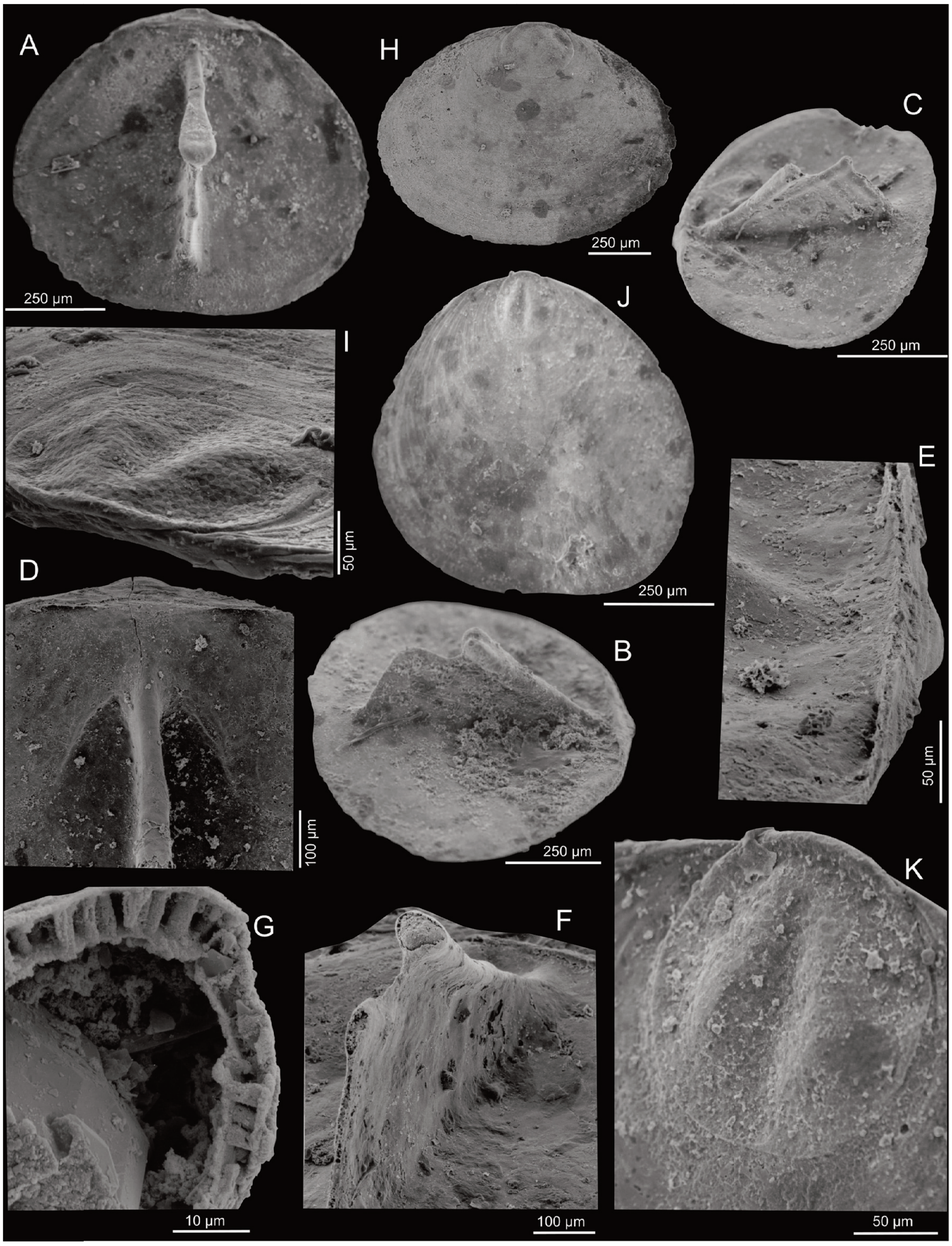

Fig. 2. *Opsiconidion minor* Popov, middle Emsian, all specimens from the Ogilvie Formation, east-central Alaska and the adjacent Yukon Territory. **A**, UAMES 5516, dorsal interior, from UA Museum locality A-941, Yukon Territory; **B**, UAMES 5511, lateral view of dorsal interior, from UA Museum locality A-941, Yukon Territory; **C**, UAMES 5514, lateral view of dorsal interior, from UA Museum locality A-941, Yukon Territory; **D**, NRM-PZ Br 136305, detail of dorsal pseudointerarea, from locality 83RB48, east-central Alaska; **E**, lateral view of D; **F**, oblique anterior view of dorsal median septum of D; **G**, detail of columnar shell structure in dorsal median septum of D; **H**, NRM-PZ Br 136306, dorsal exterior, from locality 83RB48, east-central Alaska; **I**, oblique anterior view of metamorphic shell of H; **J**, UAMES 5520, oblique anterior view of dorsal median septum, from UA Museum locality A-941, Yukon Territory; **K**, detail of metamorphic shell of J.

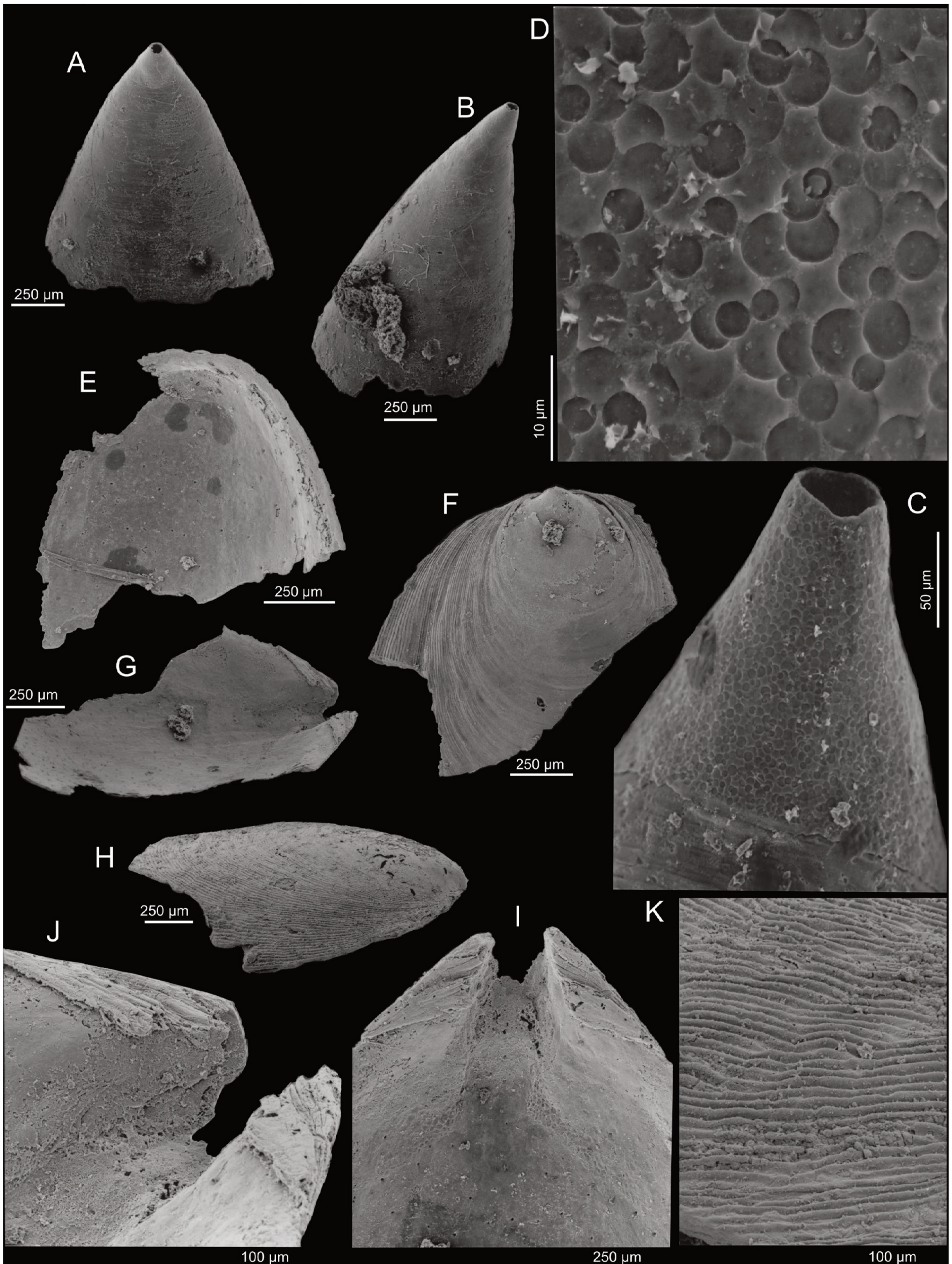

Fig. 3. A–**D**, *Opsiconidion minor* Popov, middle Emsian, both specimens from the Ogilvie Formation, east-central Alaska and the adjacent Yukon Territory: A, NRM-PZ Br 136307, posterior view of ventral exterior, from locality 83RB48, east-central Alaska; B, lateral view of A; C, UAMES 5509, detail of ventral metamorphic shell, from UA Museum locality A-941, Yukon Territory; D, detail of metamorphic pitting of C. **E–K**, *Lingulipora*? sp., all specimens from the Ogilvie Formation, locality 83RB48, east-central Alaska: E, NRM-PZ Br 136308, dorsal interior; F, NRM-PZ Br 136309, dorsal exterior; G, NRM-PZ Br 136310, lateral view of dorsal exterior; H, NRM-PZ Br 136311, lateral view of ventral interior; I, detail of pseudointerarea of H; J, oblique lateral view of pedicle groove of H; K, NRM-PZ Br 136312, detail of ornamentation of shell fragment.

two coalescing rods and the furrow is the junction between these, but this cannot be confirmed by the present study. *Opsiconidion minor* appears to differ from the Silurian species in having a relatively higher ventral valve, narrower propareas and a well-developed posterior platform (Fig. 5A). The mantle canals and musculature of *O. celloni* are not known.

The type species, *O. arcticon* Ludvigsen, 1974, is only slightly older than *O. minor* and comes from the early Emsian of the Yukon Territory, but it has also been recorded from the Middle Devonian of Ontario (von Bitter & Ludvigsen 1979). The dorsal valve of the type species differs strongly from that of *O. minor* in lacking a surmounting plate and the pseudointerarea is completely undivided and forms a narrow rim along the posterior margin; the shape and relative size of the dorsal cardinal muscle scars appear to differ from *O. minor* (Fig. 5B). The maximum recorded size of *O. arcticon* from the Yukon Territory is only slightly less than that of *O. minor*, whilst the material from Ontario is considerably smaller (von Bitter & Ludvigsen 1979, text-fig. 2).

Opsiconidion aldridgei (Cocks, 1979) from the Llandovery of the Welsh Borderland and Estonia

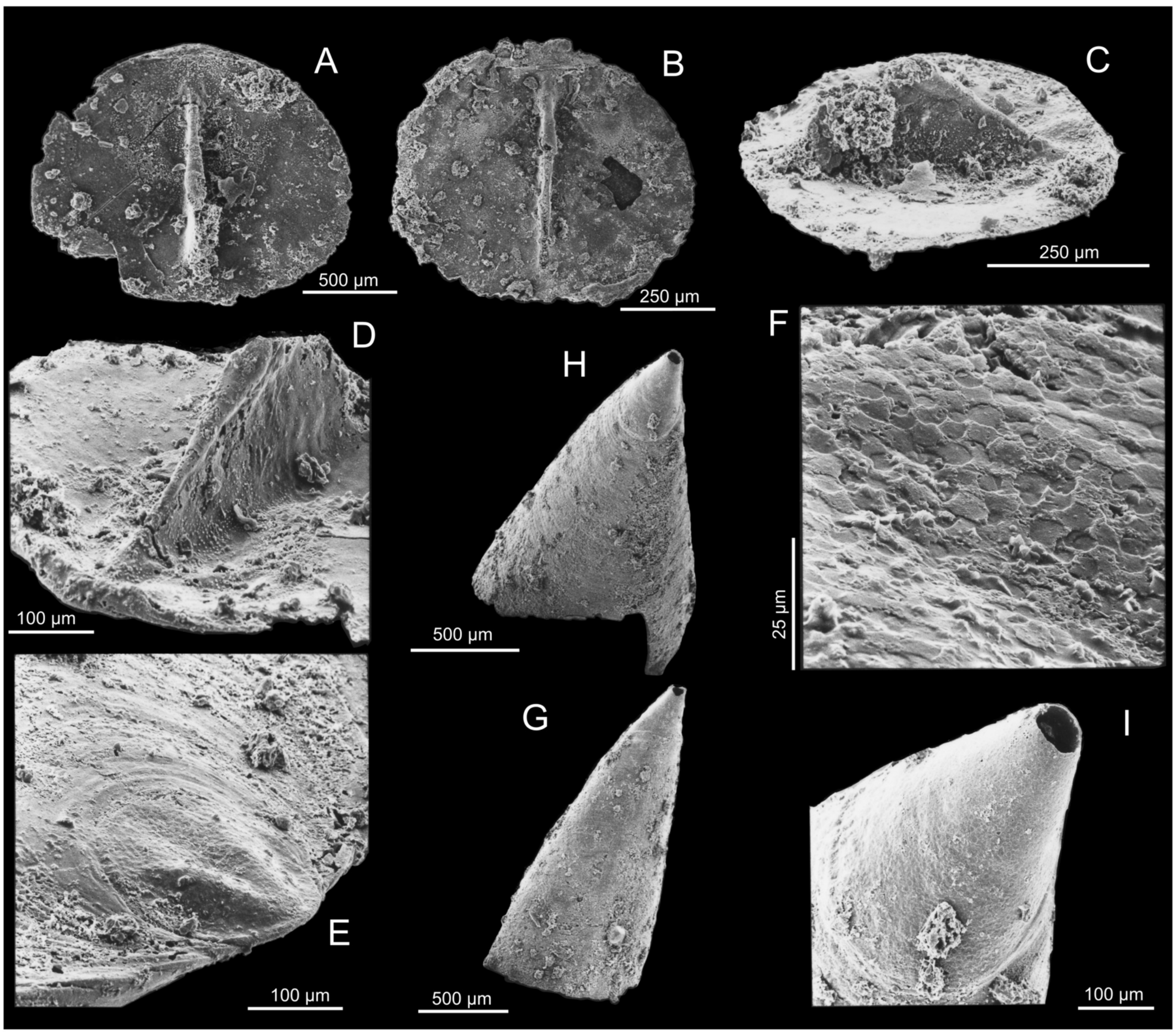

Fig. 4. *Opsiconidion minor* Popov, all specimens are topotypes from the Lower Devonian (Emsian) of Valnev Island, Novaya Zemlya, sample No. 39-31 (see Sobolev 1984, fig. 1). **A**, RM Br 136300, dorsal interior; **B**, RM Br 136301, dorsal interior; **C**, lateral view of B; **D**, oblique posterior view of B; **E**, RM Br 136302, oblique posterior view of dorsal metamorphic shell; **F**, detail of metamorphic pitting of E; **G**, RM Br 136303, lateral view of ventral exterior; **H**, RM Br 136304, lateral view of ventral exterior; **I**, detail of metamorphic shell of H.

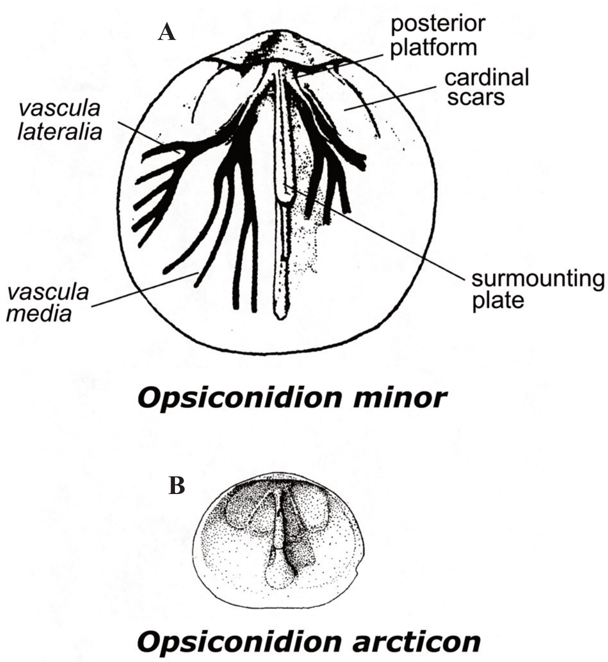

Fig. 5. A, *Opsiconidion minor* Popov, CNIGR No. 1/11829, *camera lucida* drawing of the holotype; **B**, *Opsiconidion arcticon* Ludvigsen, drawing based on the dorsal interior figured by von Bitter & Ludvigsen (1979, pl. 90, fig. 7).

(Popov 1981b), *O. podlasiensis* Biernat, 1984, from the Wenlock of Poland and *O. praecursor* Popov & Holmer (in Popov et al. 1994) from the Late Ordovician of Estonia all differ from *O. minor* mainly in the lack of a surmounting plate.

Order LINGULIDA Waagen, 1885
Family UNCERTAIN

Genus *Lingulipora* Girty, 1898

Type species. *Lingula* (*Lingulipora*) *williamsana* Girty, 1898, p. 387, by original designation.

Diagnosis. See Holmer & Popov (2000, p. 78).

Occurrence. Devonian–Upper Carboniferous. North America; Europe.

Lingulipora? sp.
Figure 3E–K

Figured material. From east-central Alaska: NRM-PZ Br 136308–136312, from 83RB48 (east-central Alaska).

Remarks. The species is only represented by strongly fragmented material. The ventral valve has a very deep triangular pedicle groove and elevated propareas that lack flexure lines. The dorsal valve completely lacks a pseudointerarea. The interior of neither valve preserves any muscle scars or mantle canals. The micro-ornamentation consists of high, closely spaced and irregular, concentric wrinkles; the valve interior carries numerous perforations (up to about 10 μm across) that apparently continue through the shell and are visible as minute holes (some 1–3 μm across) also on the valve surface.

Lingulipora is a poorly known genus, and its systematic position is presently uncertain, in view of the lack of detailed information on the musculature, mantle canals, etc., from the type species. The specimens described here are somewhat similar to Devonian–Carboniferous forms that are usually assigned to the genus. It is possible that the deeply cut pedicle groove results from the fragmentation of the umbonal region and pedicle groove. Similar types of damages to the umbonal region were also noted by Baliński (1988), who studied the shell structure and ornamentation of Polish material from the Upper Devonian that he assigned to *Lingulipora*. However, it is to be noted that lingulids of the Family Lingulellotretidae Koneva & Popov, 1983, form an enclosed pedicle foramen which is somewhat similar to that of *Lingulipora* described by Baliński (1988), and it is not entirely impossible that the deeply cut and sometimes enclosed pedicle groove could be a feature of this genus.

The micro-ornamentation described by Baliński (1988, pp. 11–12) is similar to that illustrated here, but the perforations in the Polish species appear to be considerably wider. It is unclear if the perforations in *Lingulipora* represent true ‘articulate-like’ endopuncta as proposed by Baliński. Although considerably thicker, they are more likely comparable in structure and function with canals filled with extensions of the outer epithelium as present in Recent lingulates (see Williams et al. 1992).

Table 1. Dimensions (in millimetres) and ratios of dorsal valves of *Opsiconidion minor* (see p. 145 for abbreviations)

	L	W	LI	WI	LM	WM	LS	L/W	LI/L	LI/WI	WI/W	LM/L	WM/W	LS/L
N	6	6	6	6	1	1	6	6	6	6	6	1	1	6
X	0.93	1.07	0.06	0.42	0.40	0.52	0.79	87%	7%	15%	39%	42%	48%	85%
S	0.23	0.26	0.03	0.13			0.22	0.03	0.03	0.06	0.05			0.04
MIN	0.52	0.60	0.02	0.20	0.40	0.52	0.40	84%	3%	7%	33%	42%	48%	77%
MAX	1.20	1.32	0.08	0.60	0.40	0.52	1.04	91%	10%	17%	45%	42%	48%	89%

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Vara-Devoni (Emsi) akrotretiidne mikrobrahhiopood *Opsiconidion minor* Popov, 1981 Alaskal ja Yukoni territooriumil ning Novaja Zemljal

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On kirjeldatud Vara-Devoni senini vähetuntud väikesemõõdulisi brahhiopoode seltsist Acrotretida (klass Lingulata). Uuritud materjal kuulub liiki *Opsiconidion minor* Popov, mille topotüübiline materjal on kirjeldatud Novaja Zemlja arhipelaagist. Kirjeldatud materjal pärineb Põhja-Ameerika kahest leiukohast, mis asuvad Alaska (USA) ja Kanada Yukoni territooriumi piirialal, kus on esindatud Alam-Devoni (Emsi) Ogilvie kihistu. Kirjeldatud brahhiopoodid esinevad kihtides, mis kuuluvad konodondi *Polygnathus inversus* Klapper & Johnson biotsooni. Akrotretiidi *Opsiconidion minor* koonilise kujuga ventraalsel (selgmisel) poolmikul pole liigispetsiifilisi tunnuseid. Välisskulptuuris eristub selgelt algse arengustaadiumi (diameetriga kuni 0,17 mm) "võrkjas" skulptuur poolme tipus (*metamorphic shell*) ja hilisema arengu jooksul kujunenud peen kasvujoontest moodustunud muster. Nõrgalt kumer või lame subtsirkulaarne dorsaalne poolmik laiusega kuni 6 mm on aga iseloomustatud rea spetsiifiliste kesksepti ja musklite kinnitusaluseid iseloomustavate tunnustega. Liigi Ameerika esindajad on praktiliselt identsed topotüüpiliste eksemplaridega Novaja Zemljalt, olles neist ainult veidi väiksemad. Kaasneva Alam-Devoni liigina on artiklis lühidalt kirjeldatud veel linguliid *Lingulipora*? sp., mille täpne taksonoomiline kuuluvus on ebaselge eksemplaride halva säilimise tõttu.