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Bryozoans of the Genus *Diplotrypa* Nicholson, 1879 from the Middle Ordovician of the Leningrad Region

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Abstract—The two earliest members of the genus *Diplotrypa* (*D. olgae* sp. nov. and *D. catenulata* Coryell, 1921) are described from the Middle Ordovician of the Leningrad Region. The diagnosis, composition, and occurrence of this genus are provided.

INTRODUCTION

Bryozoans of the order Trepotomida are very diverse in the Arenigian of the East European Platform. They are represented by 35 species, 13 genera, and 7 families (Bassler, 1911; Modzalevskaya, 1953; Pushkin, 1973, 2001; Astrova, 1978; Ropot and Pushkin, 1987). The greatest taxonomic diversity is shown by the Arenigian bryozoans of the Leningrad Region, in which representatives of 7 families, 12 genera, and 28 species have been found. However, additional collections from this region make it possible to extend the taxonomic composition of this bryozoan assemblage and to emend the species composition and occurrence of the genus *Diplotrypa* Nicholson, 1879. No representatives of this genus have been known from the Arenigian. Two species of this genus, i.e., *D. catenulata* Coryell, 1921 and *D. olgae* sp. nov., are described from the Arenigian of the East European Platform for the first time.

MATERIAL AND METHODS

The material studied was collected by the author from a section on the left bank of the Lynna River near the village of Khamontovo in the Leningrad Region in 2002 (for a description of the section see Dronov, 1998). Of 63 bryozoan colonies, 4 belong to the order Cystoporida, and 59 to the order Trepotomida.

The collections contain two species of the genus *Diplotrypa*: *D. olgae* sp. nov. and *D. catenulata* Coryell, 1921. The former is confined to the upper Volkhov Horizon (Subhorizon B₂γ); the latter, to the Kunda Horizon (Subhorizons B₃α and B₃β).

The bryozoans were studied using the conventional method of examination in thin precision sections. Both longitudinal and transverse thin sections have been made from the only colony of *D. olgae* sp. nov. Longitudinal,

transverse, and tangential thin sections have been made from two colonies of *D. catenulata* Coryell, 1921.

The originals are housed in the Paleontological Institute of the Russian Academy of Sciences, coll. no. 3535.

SYSTEMATIC PALEONTOLOGY

Order Trepotomida

Suborder Halloporina

Family Halloporidae Bassler, 1911

Genus *Diplotrypa* Nicholson, 1879

Diplotrypa: Nicholson, 1879, p. 312; Bassler, 1911, p. 312; 1953, p. G114; Astrova, 1948, p. 15; 1960, p. 60; 1965, p. 182; 1978, p. 67; Modzalevskaya, 1953, p. 155.

Dianulites (pars): Astrova, 1945, p. 88.

Type species. *Monticulipora* (*Diplotrypa*) *petropolitana* Nicholson, 1879 (non *Favosites petropolitana* Pander, 1830); Middle Ordovician, Sweden.

Diagnosis. Colonies of massive type, hemispherical, discoid, nodulelike, trimorphic, with wrinkled base. Autozoecia tubular-prismatic, slightly tapering proximally. Diaphragms straight, oblique, convex, or concave, varying in number. Walls slender, with longitudinal fibrous microstructure. Apertures polygonal or rounded polygonal. Mesozoecia shaped like irregular triangles or quadrangles in cross section.

Species composition. About 38 species of worldwide distribution in the Ordovician and Silurian. In addition to the species described in this paper, four more species are known from the Llanvirnian–Caradocian of the Middle Ordovician of the East European Platform: *D. bicornis* (Eichwald, 1829) from the Aseri and Keila horizons of the Baltic region, northern Urals, and United States; *D. hennigi* Bassler, 1911 from the Lasnamägi and Oandu horizons of the Baltic region, Belarus, Pay-Khoy Range, and Vaygach Island; *D. petropolitana* Nicholson, 1879 from the Uhaku and Rak-

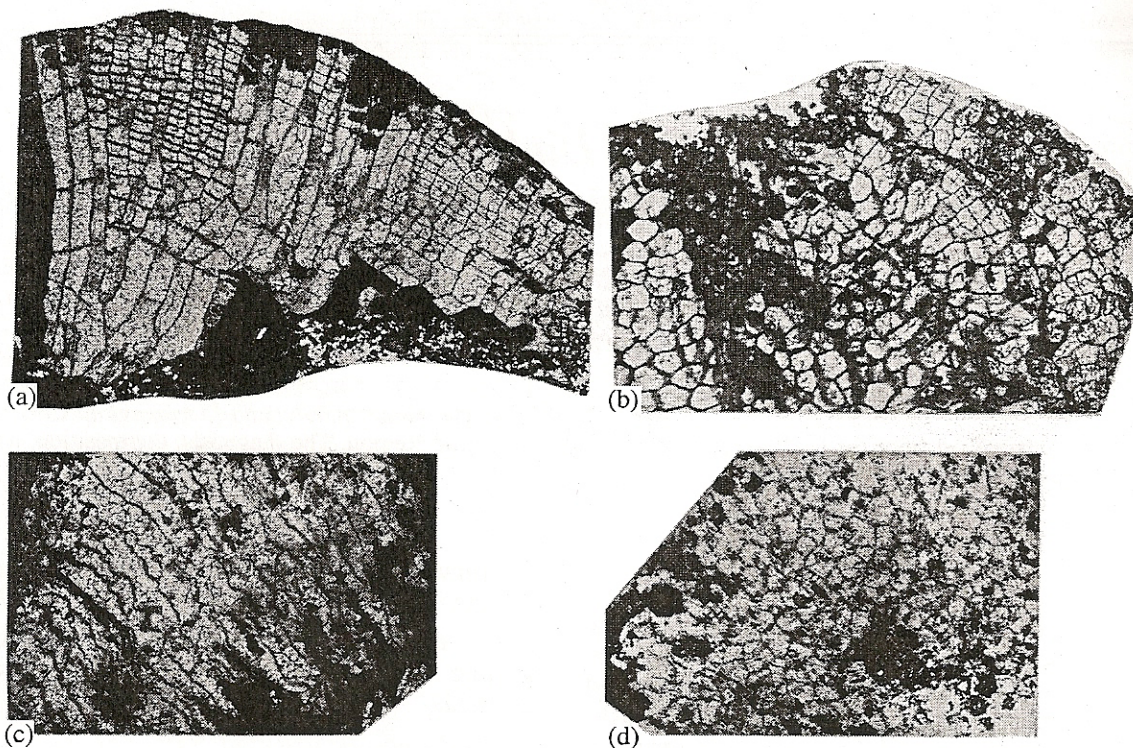


Fig. 1. Bryozoans from the Middle Ordovician of the Leningrad Region; (a, b) *Diplotrypa olgae* sp. nov.; holotype PIN, no. 3535/2090; (a) longitudinal section of the colony showing autozoecia and mesozoecia with diaphragms, $\times 10$; (b) cross section of the colony showing polygonal sections of autozoecia, $\times 10$; village of Khamontovo, left bank of the Lynna River; Arenigian, Volkhov Horizon, Subhorizon B₂ γ ; (c, d) *Diplotrypa catenulata* Coryell, 1921; specimen PIN, no. 3535/2084; (c) longitudinal section of the colony showing autozoecia and mesozoecia with diaphragms, $\times 10$; (d) tangential section of the colony showing apertures of autozoecia, $\times 10$; village of Khamontovo; Llanvirnian, Kunda Horizon, Subhorizon B₃ β .

vere horizons of the Baltic region, Belarus, Pay-Khoy Range, Vaygach Island, Podolia, and Sweden; and *D. moniliformis* Bassler, 1911 from the Uhaku and Keila horizons of the Baltic region and Belarus.

Comparison. This genus differs from the genera *Hallopora* Bassler, 1911 and *Calloporella* Ulrich, 1882 in the hemispherical shape of the colony and longitudinal fibrous microstructures of walls and, in addition, differs from the latter genus in the polygonal apertures.

Diplotrypa olgae Koromyslova, sp. nov.

Etymology. In honor of paleontologist Olga Borisovna Bondarenko.

Holotype. PIN, no. 3535/2090; Leningrad Region, village of Khamontovo, left bank of the Lynna River; Middle Ordovician, Arenigian, Volkhov Horizon, Subhorizon B₂ γ .

Description (Figs. 1a, 1b). The colonies are discoid, with a knobby irregular frontal surface and a wrinkled base. The colony is 6.5 mm high at the center and 23 mm wide at the base. The autozoecia are hexagonal or irregular pentagonal in cross section and of irregular outline in longitudinal section (being alternately wider and thinner). The apertures are polygonal

in outline and 0.25–0.55 mm in diameter. The walls of the autozoecia are undulating to varying degrees, their bends are confined to diaphragms. The walls are 0.05–0.1 mm thick. The diaphragms are of four types, i.e., oblique, straight, and (more rarely) concave and convex, with varying thickness (0.05–0.125 mm) and uneven distribution in the colony (in places the distribution is nearly uniform; however, the number of diaphragms increases near the frontal surface of the colony). The distance between diaphragms is 0.95–1.85 or, more rarely, 0.15–0.9 mm, five or six diaphragms occur within a 5-mm length of an autozoecium. The mesozoecia are closely spaced, form maculae at a distance of 3 mm from the base of the colony, and are uniformly distributed (one macula after three to five autozoecia). The number of mesozoecia per macula varies. The edges of the colony consist entirely of mesozoecia. The mesozoecia are 0.1–0.4 mm in diameter. The walls of the mesozoecia are 0.025–0.075 mm thick. The diaphragms of the mesozoecia are closely spaced, 0.025–0.05 mm thick, and uniformly distributed; the distance between diaphragms is 0.075–0.2 mm in the central part of the colony and 0.05–0.55 mm at the edges. A 3-mm length of a mesozoecium contains 16

to 18 diaphragms in the central part and 10 to 12 in the peripheral regions.

Variability. Intracolony variability is seen in the irregular variations in the width of autozooezia, in the different numbers of mesozooezia in different maculae and in the peripheral areas, and in the different number of diaphragms per mesozooezium in different regions of the colony.

Comparison. This species most closely resembles *D. microcellata* (Astrova, 1945) in the shape of the zooecia but differs from it in having maculae, larger apertures (0.25–0.55 instead of 0.19–0.33 mm), wider range of distances between diaphragms (0.15–1.85 instead of 0.51–0.73 mm), larger diameter of mesozooezia (0.1–0.4 instead of 0.07–0.1 mm), and a larger range of distances between diaphragms in mesozooezia (0.05–0.55 instead of 0.10–0.13 mm).

Material. Holotype.

Diplotrypa catenulata Coryell, 1921

Diplotrypa catenulata: Coryell, 1921, p. 296; Astrova, 1965, p. 185, pl. 29, fig. 1; Nekhorosheva, 1970, p. 75, pl. II, figs. 4 and 5.

Diplotrypa moniliformis Bassler var. *argutus*: Astrova, 1948, p. 21, pl. III, fig. 4; pl. IV, figs. 1 and 2, text-fig. 9, 10a–10f.

Holotype. United States National Museum USNM, no. 44658; United States, Tennessee; Middle Ordovician.

Description (Figs. 1c, 1d). The colonies are roughly hemispherical or cone-shaped with an even or knobby surface. The base is wrinkled and flat or concave. The colony is 8.0–30.0 mm high at the center of the colony and 28.0–75.0 mm wide. The autozooezia are hexagonal or, in places, irregularly pentagonal in cross section. The apertures are polygonal in outline and 0.2–0.75 mm in diameter. The walls of autozooezia are slender, strongly undulating, in places serrate. Both the walls of the autozooezia and the autozooezia themselves are curved. In most cases, their bends are confined to the attachment sites of the diaphragms. The walls are 0.035–0.075 mm thick. The diaphragms are of three types: straight, oblique, and concave with varying thickness (0.05–0.075 mm). Some concave diaphragms are related to the sharp bends of the walls of the autozooezia. Two to four diaphragms occur within a 5-mm length of an autozooezium. The distribution of diaphragms is uneven: they are closely spaced within some regions of the colony (0.08–0.2 mm apart) and widely spaced in other regions (0.53–2.43 mm apart). Some autozooezia lack diaphragms. The mesozooezia are widely spaced, showing only their separate regions, and shaped like triangles or quadrangles in cross section. The size of the sections of mesozooezia is 0.15–0.2 or, in places, up to 0.35 mm. The diaphragms of mesozooezia are closely spaced. The walls of the mesozooezia are constricted in the places where the diaphragms develop; hence, the moniliform pattern of the mesozooezia.

Variability. The intracolony and intercolony variabilities are seen in the uneven distribution of diaphragms and in the variations in their shape.

Comparison. This species differs from *D. olgae* sp. nov. in having autozooezia with walls more markedly undulating, or even serrated, and showing a different range of thickness (0.035–0.075 mm instead of 0.05–0.1 mm), in the uneven distribution of diaphragms, and in the absence of maculae.

Occurrence. Middle Ordovician, Arenigian–Llanvirnian, Kunda Horizon; Leningrad Region, Lynna River; Upper Ordovician, Yugor Horizon; Pay-Khoy Range; Upper Ordovician; Vaygach Island, Nether-Polar Urals, United States.

Material. Two specimens in good condition; PIN, nos. 3535/2092 and 3535/2084; left bank of the Lynna River, village of Khamontovo, Leningrad Region; Middle Ordovician, Arenigian–Llanvirnian, Kunda Horizon, Subhorizons B₃α and B₃β.

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