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BRYOZOA FROM THE ORDOVICIAN ERRATIC BOULDERS OF POLAND

Abstract. — Ordovician bryozoans from erratic boulders of Poland are described. They represent three orders: Cyclostomata, Trepostomata and Cryptostomata. 10 families, 22 genera and 34 species have been identified. Out of these, 1 genus, 1 subgenus and 10 species are new to science. The age and the stratigraphic and geographical distribution of the forms under consideration are discussed.

INTRODUCTION

The bryozoans here described have been etched out from Ordovician erratic boulders, collected at various localities in Poland. The boulders are part of a rich collection of Ordovician erratics in the possession of Professor Roman Kozłowski. Some of them, besides bryozoans, also contain many other groups of animals.

Work on the present paper was started by the writer in 1957 at the Palaeozoological Laboratory of the Polish Academy of Sciences, under the guidance of Professor Kozłowski, to whom she conveys her warmest thanks for the kind loan of the material, the numerous valuable suggestions and help furnished in the course of frequent talks and discussions.

The writer also feels indebted to the following persons: Dr. G. G. Astrova, Dr. I. P. Morozova and Dr. N. A. Shishova of the Palaeontological Institute of the USSR. Academy of Sciences in Moscow, offered a generous hospitality in December 1961, examined the writer's collection of Ordovician bryozoans and made many helpful suggestions. Prof. V. P. Nekhoroshev and Dr. E. A. Modzalevskaya of the VSEGEI Institute at Leningrad have shown a great interest in the writer's material and made valuable suggestions. Dr. R. Männil of the Geological Institute of the Estonian Academy of Sciences at Tallinn, facilitated the examination of the rich collections of Estonian bryozoans, studied by him, and made valuable criticism of the writer's description of the Polish forms. Dr. I. R. P. Phillips-Ross of the State Geological Survey

Division of Urbana, Ill., and Dr. N. Spjeldnaes of the Geological Institute of the Oslo University, made most helpful suggestions on taxonomic assignments and kindly loaned some reference books.

All the drawings were made by Mrs. K. Budzyńska from the writer's pencil sketches; the photographs were taken by Miss L. Łuszczewska. Mrs. J. Humnicka kindly translated the paper into English.

The here described collection of bryozoans from the Ordovician erratic boulders of Poland is housed at the Palaeozoological Laboratory of the Polish Academy of Sciences in Warsaw, registered under the number Br. O. I.

MATERIAL

All the bryozoans prepared from the Ordovician erratics of Poland are silicified, but the silicification process has not caused any important structural deformations. Nevertheless the specimens are extremely fragile and cannot be used for the preparation of thin slides.

The assemblage of Ordovician bryozoans displays rather strong taxonomic differentiation. It contains representatives of three orders, i.e. Cryptostomata (18 species), Cyclostomata (12 species), and Trepostomata (only 4 species). A total of 34 species has been identified belonging to 22 genera. The number of specimens from each particular species is on the whole rather limited. *Rhinidictya exserta* (Eichwald), *Pachydictya bifurcata* (Hall), *Glauconomella plumula* (Wiman) are numerically the most abundant, as well as the genus *Corynotrypa* which is represented by the greatest number of species. Some species are represented by single fragments of zoaria, e.g. *Stellipora vesiculosa* Modzalevskaya, *Arthrostyloecia nitida* Bassler, *Sceptropora spinosa* n.sp., *Ptilodictya gladiola* Billings.

Most of these specimens are fragments varying in size. The zoaria can be incrusting (*Ceramoporella, Crepipora*), reticulated (*Phylloporina, Fenestella, Semicoscinium*), thin-branched (*Arthrostyloecia, Heminematopora, Nematopora*) and thick-branched (*Bythopora, Enallopora, Glauconomella*), also bifoliate (*Ptilodictya, Rhinidictya, Pachydictya*). Some forms occur as single, mostly detached zooecia (*Corynotrypa*) or as loose segments of colonies (*Arthrostyloecia, Sceptropora*).

The bryozoans here described have been etched from seven erratic boulders (numbered: 0.12, 0.17, 0.124, 0.204, 0.233, 0.268, 0.298), collected from the following five localities in Poland: Zbójno, Wielki Kack, Wyszogród, Mochty and Ustka. All the specimens were etched by treatment in HCl, with the exception of those from boulder 0.17, which was completely silicified and therefore treated in hydrofluoric acid; this acid, however, had not attacked the siliciferous specimens of Bryozoa.

The following are brief lithological and faunal characteristics of the

particular boulders under consideration, kindly supplied by Professor Kozłowski.

Boulder 0.12, Zbójno (prov. of Olsztyn). Baltic light-cream coloured limestone, with limonitized radiolarians and few bryozoans, the latter containing one identified representative of Cyclostomata and one of Cryptostomata.

Boulder 0.17, Wielki Kack (prov. of Gdańsk). Extremely compact limestone of the Baltic type (Ostseekalk), nearly completely silicified, consisting mainly of silicified fragments of various organisms such as bryozoans, ostracods, brachiopods, sponges (Astraeospongidae), yielding also scolecodonts and Graptolithina (*Acanthograptus* sp.). The bryozoans are represented by 14 species; 7 belong to Cyclostomata, and 7 to Cryptostomata. They are characterized by satisfactory preservation and fairly large number.

Boulder 0.124, Wyszogród (prov. of Warsaw). Light-grey, fine-grained limestone, containing silicified remains of bryozoans and Graptolithina (Dendroidea, ?*Didymograptus* sp.). Within the poorly preserved bryozoans, only one species of Cyclostomata has been identified.

Boulder 0.204, Mochty (prov. of Warsaw). Cream-coloured, extremely fine-grained limestone with numerous organic fragments of bryozoans, brachiopods, tetracorals, tabulates, but without graptolites. The bryozoans with 21 species come first as regards number of species; of these 4 belong to Cyclostomata, 4 to Trepostomata and 13 to Cryptostomata. The specimens are rather numerous, but in a somewhat worse state of preservation than those from boulder 0.17 (Wielki Kack).

Boulder 0.233, Mochty (prov. of Warsaw). Baltic limestone with scarce bryozoans, conodonts, Graptolithina (*Orthograptus gracilis* (Roemer)) and *Cornulites* sp. Four bryozoan species have been identified all belonging to Cyclostomata.

Boulder 0.268, Mochty (prov. of Warsaw). Grey, medium-grained organogenic limestone containing silicified bryozoans, brachiopods, ostracods, trilobites, but without graptolites. Two bryozoan species have been determined: 1 belonging to Cyclostomata, 1 to Cryptostomata.

Boulder 0.298, Ustka (prov. of Koszalin). Extremely fine-grained limestone, resembling the Baltic type, containing silicified bryozoans and indeterminate fragments of Graptolithina (Dendroidea). The bryozoan remains are scarce and poorly preserved. One species only has been identified and assigned to the Cryptostomata.

In table 1 are listed the bryozoan species yielded by the seven boulders here considered. The bryozoan fauna in each of these boulders contained quite different assemblages. E.g. of 14 species furnished by boulder 0.17, and of 21 species furnished by boulder 0.204, only 4 species are common to both (*Ceramoporella distincta* Ulrich, *Enallopora exigua* Ulrich, *Nematopora sublineata* Männil, *Sceptropora facula* Ulrich). The presence of representatives of other animal groups to a certain extent confirms that each of these boulders contains a distinctly differentiated faunal assemblage. Boulder 0.17 from Wielki Kack is the most fossiliferous one and differs in that respect from the remaining boulders.

With regard to the age of the boulders, it should be stressed that boulder 0.233 with *Orthograptus gracilis* (Roemer) is, most probably, from the middle part of the Upper Ordovician. Boulders 0.12, 0.17 and

Table 1

Bryozoan species from Ordovician erratic boulders of Poland

Species \ Locality, No. of boulder	Zbójno 0.12	Wielki Kack 0.17	Wyszogród 0.124	Mochty 0.204	Mochty 0.233	Mochty 0.268	Ustka 0.298
Cyclostomata							
Corynotrypa (Corynotrypa) canadensis (Whiteaves)	–	+	–	–	–	–	–
C. (Corynotrypa) dissimilis (Vine)	–	+	–	–	–	–	–
C. (Corynotrypa) inflata (Hall)	–	+	–	–	+	–	–
C. (Corynotrypa) bassleri n. sp.	–	+	–	–	+	–	–
C. (Corynotrypa) gibbosa n.sp.	–	–	–	–	+	–	–
C. (Dentalitrypa) bidens n.sp.	–	+	–	–	+	–	–
Flabellotrypa rugulosa Bassler	–	+	–	–	–	–	–
Ceramoporella distincta Ulrich	+	+	–	+	–	+	–
C. interporosa Ulrich	–	–	+	–	–	–	–
Crepipora simulans Ulrich	–	–	–	+	–	–	–
C. schmidti Bassler	–	–	–	+	–	–	–
C. cf. *solida* Ulrich	–	–	–	+	–	–	–
Trepostomata							
Bythopora cf. *subgracilis* (Ulrich)	–	–	–	+	–	–	–
Orbipora minima n.sp.	–	–	–	+	–	–	–
Stellipora vesiculosa Modzalevskaya	–	–	–	+	–	–	–
Hallopora dumalis (Ulrich)	–	–	–	+	–	–	–
Cryptostomata							
Phylloporina sublaxa Ulrich	–	–	–	+	–	–	–
Chasmatopora sp.	–	–	–	+	–	–	–
Conphylloporina mochtyensis n.sp.	–	–	–	+	–	–	–
Fenestella vistulensis n.sp.	–	–	–	+	–	–	–
Enallopora exigua (Ulrich)	+	+	–	+	–	–	–
Semicoscinium ordovicium n.sp.	–	–	–	–	–	+	–
Arthrostyloecia nitida Bassler	–	+	–	–	–	–	–
Glauconomella plumula (Wiman)	–	–	–	+	–	–	+
Heminematopora? virginiana Bassler	–	–	–	+	–	–	–
H. rossi n.sp.	–	–	–	+	–	–	–
Nematopora sublineata Männil	–	+	–	+	–	–	–
Sceptropora facula Ulrich	–	+	–	+	–	–	–
S. florida n.sp.	–	–	–	+	–	–	–
S. spinosa n.sp.	–	+	–	–	–	–	–
Ptilodictya gladiola Billings	–	+	–	–	–	–	–
Rhinidictya exserta (Eichwald)	–	–	–	+	–	–	–
Pachydictya bifurcata (Hall)	–	–	–	+	–	–	–
P. elegans Ulrich	–	+	–	–	–	–	–

\+ present, – absent

lithological characters and are probably of the same age. The age of 0.298 did not yield this index graptolite form, but display analogous boulders 0.124, 0.204 and 0.268 has not yet been accurately determined, since they lack index graptolites. Neither can their age be closely determined on the bryozoan fauna they yielded, since the species that have been identified are not good index fossils, and may be referred both to the Middle and the Upper Ordovician. For example, in boulder 0.204, which supplied the greatest number of bryozoan species, there are 27 per cent of Upper Ordovician forms (*Crepipora* cf. *solida* Ulrich, *Stellipora vesiculosa* Modzalevskaya, *Glauconomella plumula* (Wiman), *Nematopora sublineata* Männil, *Sceptropora facula* Ulrich, *Pachydictya bifurcata* (Hall)), and approx. 18 per cent of Middle Ordovician forms (*Crepipora schmidti* Bassler, *Bythopora* cf. *subgracilis* Ulrich, *Hallopora dumalis* (Ulrich), *Heminematopora? virginiana* Bassler). Another 18 per cent are species recorded both from the Middle and the Upper Ordovician (*Ceramoporella distincta* Ulrich, *Crepipora simulans* Ulrich, *Enallopora exigua* (Ulrich), *Rhinidictya exserta* (Eichwald)), and 4 per cent are Lower and Middle Ordovician species (*Phylloporina sublaxa* Ulrich). The remaining approx. 32 per cent are species described as new or specifically indeterminate (*Orbipora minima* n. sp., *Chasmatopora* sp., *Conphylloporina mochtyensis* n. sp., *Fenestella vistulensis* n. sp., *Hemimematopora rossi* n. sp., *Sceptropora florida* n. sp.).

Boulder 0.17 from Wielki Kack is somewhat different in this respect. Its predominant species are known both from the Middle and Upper Ordovician (*Corynotrypa* (*Corynotrypa*) *inflata* (Hall), *Ceramoporella distincta* Ulrich, *Enallopora exigua* (Ulrich), *Pachydictya elegans* Ulrich), and they constitute 30 per cent of the bryozoans obtained from this boulder. Middle Ordovician species represent 15 per cent of all bryozoans (*C.* (*Corynotrypa*) *canadensis* (Whiteaves), *Arthrostyloecia nitida* Bassler and the Upper Ordovician ones (*C.* (*Corynotrypa*) *dissimilis* (Vine), *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings) — represent each slightly over 23 per cent of the bryozoans from this boulder, while the remaining 32 per cent belong to new species (*C.* (*Corynotrypa*) *bassleri* n. sp., *C.* (*Dentalitrypa*) *bidens* n. sp., *Flabellotrypa rugulosa* Bassler, *Sceptropora spinosa* n. sp.) or could not be identified with any certainty.

The other boulders under consideration contain very few bryozoan species which cannot be regarded as reliable age markers.

ON THE AGE OF STUDIED BRYOZOANS

Age determination of faunal assemblages yielded by erratic boulders always presents considerable obstacles. The Polish Ordovician erratic reliable evidence for an accurate stratigraphic assignment of the fossils boulders from the Baltic-Scandinavian province do not furnish perfectly

they contain. On the basis, in the first place, of bryozoan material, and of stratigraphic anologies, we can only refer the boulders here considered to the Middle and Upper Ordovician.

The stratigraphic distribution of the bryozoans here discussed has been based on information available on the Ordovician bryozoans from the U. S. S. R. (chiefly Estonia), Sweden, United States of America, and Canada, regions that had furnished many bryozoan species now obtained from the erratic boulders of Poland.

As has already been mentioned above, the bryozoan species identified in the erratic boulders of Poland, are reasonably referable to the Middle and Upper Ordovician (table 2). An exception here is the species *Phylloporina sublaxa* Ulrich, which was described by Ulrich (1890a) from the Lower Ordovician of the U. S. A.

Some species identified by the present writer are known from the Middle and Upper Ordovician beds of the U. S. S. R. (chiefly Estonia), U.S.A., Canada (Ottawa, Quebec, Anticosti), and from the Upper Ordovician of Sweden (erratic bryozoans from Öjle Myr). Many species here described occur in the Middle and Upper Ordovician beds of Estonia. The abundant and strongly differentiated bryozoan fauna of that country was first described by Eichwald (1825, 1860) and Dybowski (1877). In more recent times, it has been worked out by Bassler (1911*b*), Toots (1952), Modzalevskaya (1953, 1955), and Männil (1958, 1959, 1960). Among the Middle Ordovician species that are recorded both from Estonia and from the Polish boulders, are: *Crepipora schmidti* Bassler, *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich) and *Rhinidictya exserta* (Eichwald). Upper Ordovician species in common are: *Corynotrypa* (*Corynotrypa*) *dissimilis* (Vine), *C.* (*Corynotrypa*) *inflata* (Hall), *Stellipora vesiculosa* Modzalevskaya, *Glauconomella plumula* (Wiman), *Nematopora sublineata* Männil, *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings, *Rhinidictya exserta* (Eichwald), *Pachydictya bifurcata* (Hall) and *Pachydictya elegans* Ulrich. Out of the 14 species in common with Estonia, 4 belong to the Middle Ordovician, 8 to the Upper Ordovician, 2 species occur both in the Middle and the Upper Ordovician.

The bryozoans of Sweden, described by Wiman (1902) from Öjle Myr (Island of Gotland), have been yielded, similarly as the Polish material, by erratic boulders. In addition to bryozoans, the boulders examined by Wiman contained an assemblage of other organisms, similar to that found in our boulders. Moreover, it seems that Wiman's boulders displayed a certain lithological resemblance with some of the boulders here considered, e. g. with 0.17 from Wielki Kack. It might be mentioned that the Swedish boulders have been correlated by Wiman with the Upper Ordovician Borkholm limestones of Estonia. Hence,

It may aso be mentioned that the fauna of the Borkholm limestone only to the boulders from Öjle Myr, but also to the Borkholm limestones. *Enallopora exigua* (Ulrich), *Glauconomella plumula* (Wiman), and *Pachydictya bifurcata* (Hall) are the bryozoan species in common to the erratic boulders from Sweden, examined by Wiman, and to boulders from Poland; they are Upper Ordovician forms. The resemblance is stressed by the presence of a similar assemblage of other animal remains (ostracods, brachiopods, Anthozoa, Annelida, Graptolithina).

It may also be mentioned that the fauna of the Borkholm limestone is, to a certain extent, connected with that of our boulders. Of the 15 bryozoan species reported from that formation by Bassler (1911*b*), 6 are in common: *Corynotrypa* (*Corynotrypa*) *dissimilis* (Vine), *Ptilodictya gladiola* Billings, *Pachydictya bifurcata* (Hall), *Sceptropora facula* Ulrich, *Glauconomella plumula* (Wiman), *Enallopora exigua* (Ulrich). Of 13 genera identified in our boulders, there are 10 in common with Borkholm limestone: *Corynotrypa, Ptilodictya, Pachydictya, Sceptropora, Nematopora, Glauconomella, Hallopora, Chasmatopora, Fenestella* and *Enallopora.*

The above faunal and lithological affinities of the Polish boulders with the Swedish boulders from Öjle Myr and the Borkholm limestones of Estonia suggest that our boulders are Upper Ordovician in age. Nevertheless, the stratigraphic distribution of the full assemblage of the Polish species indicates the side by side existence of Middle Ordovician and Upper Ordovician forms (table 2), and the occurrence of the former, as well as the latter from the Middle and the Upper Ordovician strata of other countries, as specified in our table 2.

In the Ordovician deposits of the U. S. A., which carry a rich bryozoan fauna, there are as many as 14 species, i. e. more than anywhere else, in common with the bryozoan assemblage from the erratic boulders of Poland. Of these species, 6 are recorded from the Middle Ordovician (*Ceramoporella interporosa* Ulrich, *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler, *Pachydictya elegans* Ulrich), 3 species from the Upper Ordovician, (*Crepipora* cf. *solida* Ulrich, *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich), 4 species from both the Middle and the Upper Ordovician (*Corynotrypa* (*Corynotrypa*) *inflata* (Hall), *Ceramoporella distincta* Ulrich, *Crepipora simulans* Ulrich, *Enallopora exigua* (Ulrich)), and one — *Phylloporina sublaxa* Ulrich — both from the Lower and Middle Ordovician.

The strong resemblance between the bryozoan fauna of the U. S. A. and that of Poland is probably due to the communication route that linked the Middle and Upper Ordovician marine basins of North Ame-

Table 2

Stratigraphic distribution of bryozoan species from Ordovician erratic boulders of Poland

Species	U.S.S.R.			Sweden			U.S.A.			Canada		
	L	M	U	L	M	U	L	M	U	L	M	U
Corynotrypa (Corynotrypa) canadensis (Whiteaves)	—	—	—	—	—	—	—	—	—	—	+	—
C. (Corynotrypa) dissimilis (Vine)	—	—	+	—	—	—	—	—	—	—	—	+
C. (Corynotrypa) inflata (Hall)	—	—	+	—	—	—	—	+	+	—	—	—
C. (Corynotrypa) bassleri n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
C. (Corynotrypa) gibbosa n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
C. (Dentalitrypa) bidens n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Flabellotrypa rugulosa Bassler	—	—	—	—	—	—	—	—	—	—	—	—
Ceramoporella distincta Ulrich	—	—	—	—	—	—	—	+	+	—	—	—
C. interporosa Ulrich	—	—	—	—	—	—	—	+	—	—	—	—
Crepipora simulans Ulrich	—	—	—	—	—	—	—	+	+	—	—	—
C. schmidti Bassler	—	+	—	—	—	—	—	—	—	—	—	—
C. cf. *solida* Ulrich	—	—	—	—	—	—	—	—	+	—	—	—
Bythopora cf. *subgracilis* (Ulrich)	—	+	—	—	—	—	—	+	—	—	—	—
Orbipora minima n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Stellipora vesiculosa Modzalevskaya	—	—	+	—	—	—	—	—	—	—	—	—
Hallopora dumalis (Ulrich)	—	+	—	—	—	—	—	+	—	—	—	—
Phylloporina sublaxa Ulrich	—	—	—	—	—	—	+	+	—	—	—	—
Chasmatopora sp.	—	—	—	—	—	—	—	—	—	—	—	—
Conphylloporina mochtyensis n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Fenestella vistulensis n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Enallopora exigua (Ulrich)	—	+	—	—	—	+	—	+	+	—	+	+
Semicoscinium ordovicium n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Arthrostyloecia nitida Bassler	—	—	—	—	—	—	—	+	—	—	—	—
Glauconomella plumula (Wiman)	—	—	+	—	—	+	—	—	+	—	—	—
Heminematopora? virginiana Bassler	—	—	—	—	—	—	—	+	—	—	—	—
H. rossi n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Nematopora sublineata Männil	—	—	+	—	—	—	—	—	—	—	—	—
Sceptropora facula Ulrich	—	—	+	—	—	—	—	—	+	—	—	+
S. florida n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
S. spinosa n. sp.	—	—	—	—	—	—	—	—	—	—	—	—
Ptilodictya gladiola Billings	—	—	+	—	—	—	—	—	—	—	—	+
Rhinidictya exserta (Eichwald)	—	+	+	—	—	—	—	—	—	—	—	—
Pachydictya bifurcata (Hall)	—	—	+	—	—	+	—	—	—	—	—	—
P. elegans Ulrich	—	+	+	—	—	—	—	+	—	—	—	—

L Lower Ordovician, *M* Middle Ordovician, *U* Upper Ordovician,
+ present, — absent

rica and Europe, and indicates similar environmental conditions. The distinct relationship of North American bryozoans with those from the Baltic province has been stressed by Bassler (1911*b*), Astrova (1960), Nekhoroshev (1960) and others. The Ordovician bryozoans from the

U. S. A. have been discussed in many papers. The most outstanding ones among them are the publications of Ulrich (1882-84, 1886, 1890*a*,*b*, 1893) and Bassler (1906, 1911*a*).

Among the Ordovician bryzoans from Canada, described by Bassler (1928), Fritz (1957) and recently by Phillips-Ross (1960), there are 5 species in common with our species. Three: *Corynotrypa* (*Corynotrypa) dissimilis* (Vine), *Sceptropora facula* Ulrich and *Ptilodictya gladiola* Billings — are recorded from Upper Ordovician, *C.* (*Corynotrypa*) *canadensis* (Whiteaves) occurs in Middle Ordovician, while *Enallopora exigua* (Ulrich) is known from both the Middle and the Upper Ordovician of Canada. When correlating the Ordovician formations of Estonia, Canada and the U. S. A. Twenhofel (1928) ascertained that the Borkholm and Lyckholm limestones of Estonia correspond to the Richmondian, and are equivalents of the Vauréal and Ellis Bay formations of Anticosti. In that author's list of species in common, there are four reported from Polish erratic boulders, too, namely: *Corynotrypa (Corynotrypa) dissimilis* (Vine), *Enallopora exigua* (Ulrich), *Sceptropora facula* Ulrich, and *Ptilodictya gladiola* Billings. The description of the Anticosti bryozoans by Phillips-Ross (1960) likewise confirms that the Vauréal and Ellis Bay formations are contemporaneous with the Richmondian deposits of the U. S. A., i. e. Upper Ordovician.

With respect to the geographical distribution of the bryozoans here studied, it should be stressed that they are known in the Ordovician of the U. S. S. R. (chiefly in Estonia), Sweden, the U. S. A., and Canada. The greatest number of species in common (15) occur in the Lower, Middle and Upper Ordovician of the United States. The Polish bryozoan assemblage contains 14 species in common with the Middle and Upper Ordovician beds of U. S. S. R., 3 species in common with the Upper Ordovician bryozoans of Sweden, and 5 in common with the Middle and Upper Ordovician bryozoans of Canada.

The stratigraphic range of species identified in the bryozoan material, obtained from Ordovician erratic boulders of Poland, is shown in table 3, and the stratigraphic range of genera — in table 4.

GEOGRAPHICAL DISTRIBUTION

Enallopora exigua (Ulrich) has the widest geographical distribution, being known from the Middle Ordovician of the U. S. S. R., from the Upper Ordovician of Sweden, and both the Middle and the Upper Ordovician of U. S. A., and Canada. Similarly wide distribution characterizes *Sceptropora facula* Ulrich which is known in Upper Ordovician of the U. S. S. R., U. S. A., and Canada. *Glauconomella plumula* (Wiman) occurs in the Upper Ordovician of the U. S. S. R. and Sweden,

Table 3

Stratigraphic range of bryozoan species from Ordovician erratic boulders of Poland

Species	Ordovician	Silurian	Devonian
Corynotrypa (Corynotrypa) canadensis (Whiteaves).	+	—	—
C. (Corynotrypa) dissimilis (Vine)	+	+	—
C. (Corynotrypa) inflata (Hall)	+	—	—
C. (Corynotrypa) bassleri n. sp..	*	—	—
C. (Corynotrypa) gibbosa n.sp.	*	—	—
C. (Dentalitrypa) bidens n. sp.	*	—	—
Flabellotrypa rugulosa Bassler	*	—	+
Ceramoporella distincta Ulrich	+	—	—
C. interporosa Ulrich	+	—	—
Crepipora simulans Ulrich	+	—	—
C. schmidti Bassler	+	—	—
C. cf. *solida* Ulrich	+	—	—
Bythopora cf. *subgracilis* (Ulrich)	+	—	—
Orbipora minima n. sp.	*	—	—
Stellipora vesiculosa Modzalevskaya	+	—	—
Hallopora dumalis (Ulrich)	+	—	—
Phylloporina sublaxa Ulrich	+	—	—
Chasmatopora sp.	—	—	—
Conphylloporina mochtyensis n. sp	*	—	—
Fenestella vistulensis n. sp.	*	—	—
Enallopora exigua (Ulrich)	+	—	—
Semicoscinium ordovicium n. sp.	*	—	—
Arthrostyloecia nitida Bassler	+	—	—
Glauconomella plumula (Wiman)	+	—	—
Heminematopora? virginiana Bassler	+	—	—
H. rossi n. sp.	*	—	—
Nematopora sublineata Männil	+	—	—
Sceptropora facula Ulrich	+	—	—
S. florida n. sp.	*	—	—
S. spinosa n. sp.	*	—	—
Ptilodictya gladiola Billings	+	+	—
Rhinidictya exserta (Eichwald)	+	—	—
Pachydictya bifurcata (Hall)	+	+	—
P. elegans Ulrich	+	—	—

+ present, * genera new for the Ordovician, — absent.

and in the Middle Ordovician of the U. S. A. Some of the remaining Polish bryozoans are species thus far reported only from European areas. They are: *Crepipora schmidti* Bassler, *Nematopora sublineata* Männil, *Rhinidictya exserta* (Eichwald), *Pachydictya bifurcata* (Hall). On the other hand, *Corynotrypa (Corynotrypa) canadensis* (Whiteaves), *Ceramoporella distincta* Ulrich, *C. interporosa* Ulrich, *Crepipora simu-*

Table 4

Stratigraphic range of bryozoan genera from Ordovician erratic boulders of Poland

Genera	Ordovician	Silurian	Devonian	Carboniferous	Permian	Triassic	Jurassic	Cretaceous
Corynotrypa Bassler	+	+	+	+	+	+	+	+
Flabellotrypa Bassler	*	+	+	—	—	—	—	—
Ceramoporella Ulrich	+	+	—	—	—	—	—	—
Crepipora Ulrich	+	+	—	—	—	—	—	—
Bythopora Miller & Dyer	+	+	+	—	—	—	—	—
Orbipora Eichwald	+	—	—	—	—	—	—	—
Stellipora Hall	+	—	—	—	—	—	—	—
Hallopora Bassler	+	+	+	+	—	—	—	—
Phylloporina Ulrich	+	+	—	—	—	—	—	—
Chasmatopora Eichwald	+	+	—	—	—	—	—	—
Conphylloporina n. gen.	*	—	—	—	—	—	—	—
Fenestella Lonsdale	+	+	+	+	+	—	—	—
Enallopora d'Orbigny	+	+	—	—	—	—	—	—
Semicoscinium Prout	*	+	+	+	—	—	—	—
Arthrostyloecia Bassler	+	—	—	—	—	—	—	—
Glauconomella Bassler	+	+	+	—	—	—	—	—
Heminematopora Bassler	+	—	—	—	—	—	—	—
Nematopora Ulrich	+	+	+	+	+	—	—	—
Sceptropora Ulrich	+	+	—	—	—	—	—	—
Ptilodictya Lonsdale	+	+	+	—	—	—	—	—
Rhinidictya Ulrich	+	+	—	—	—	—	—	—
Pachydictya Ulrich	+	+	—	—	—	—	—	—

+ present, * genera new for the Ordovician, — absent

lans Ulrich, *C.* cf. *solida* Ulrich, *Phylloporina sublaxa* Ulrich, *Arthrostyloecia nitida* Bassler and *Heminematopora? virginiana* Bassler — have been hitherto described only from North America. Several of our species have up to now been found both in Europe and North America; they are: *C. (Corynotrypa) dissimilis* (Vine), *C. (Corynotrypa) inflata* (Hall), *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Ptilodictya gladiola* Billings and *Pachydictya elegans* Ulrich. The 10 other species here described must be regarded as new to science.

Three groups of forms may be distinguished on the base of geographical distribution of the bryozoans from the erratic boulders of Poland, namely:

1° Most numerous, contains the North American Ordovician species: *Corynotrypa (Corynotrypa) canadensis* (Whiteaves), *Ceramoporella distincta* Ulrich, *C. interporosa* Ulrich, *Crepipora simulans* Ulrich, *C.* cf.

solida Ulrich, *Phylloporina sublaxa* Ulrich, *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler, and one Silurian species: *Pachydictya bifurcata* (Hall).

2° Less numerous, contains few species, until now reported only from the Ordovician of Europe (*Crepipora schmidti* Bassler, *Nematopora sublineata* Männil, *Rhinidictya exserta* (Eichwald)).

3° Nearly as numerous as group 1, contains species in common with the Ordovician of Europe and North America (*C. (Corynotrypa) inflata* (Hall), *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich), *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich, *Pachydictya elegans* Ulrich), and from the Silurian (*C. (Corynotrypa) dissimilis* (Vine), *Ptilodictya gladiola* Billings).

The assemblage of bryozoans from the erratic boulders of Poland probably comes from the marine basin of the Baltic region. This is distinctly suggested by the relatively strong predominance of the Baltic forms (14 species and 17 genera). The presence of numerous North American species (17) and genera (19) decidedly confirms the close connection of the Baltic and American bryozoan faunas during the Middle and the Upper Ordovician.

DESCRIPTIONS

The latest papers on the bryozoans (Astrova & Morozova, 1956; Männil, 1958; Boardman, 1960; Nekhoroshev, 1961, and others) based on microscopic structure and on the morphological study of the zoarium, supplement and emend the present taxonomy of that group. All these papers, however, are concerned only with certain taxonomic units, such as suborders, families, genera etc. One of the most recent classifications which covers the taxonomy of the whole group of Bryozoa is that by Bassler (1953). The present writer uses it here, although recognizing the new systematic position of the Phylloporinidae that has been suggested by Astrova and Morozova (1956). These authors have revised the taxonomy of bryozoans from the order of Cryptostomata, to which they refer the Phylloporinidae. Their studies, based on microstructure, seem reliably to determine the systematic position of that family. However, on the lack of adequate evidence of cryptostomatic features, Bassler (1953) placed the Phylloporinidae among the Trepostomata, even though previously (1911*b*) in his well known paper on the Baltic bryozoans, he referred them to the Cryptostomata.

The poor preservation of the Polish material handicapped the study of microstructure and hence some taxonomic problems could not be cleared up.

34 species belonging to 22 genera, 10 families and 3 orders, have been identified within the bryozoan assemblage, obtained from the Ordovician erratic boulders of Poland.

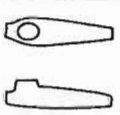
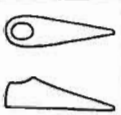
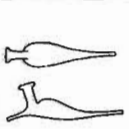
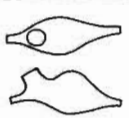
Order **Cyclostomata** Busk, 1852
Suborder **Tubuliporina** Milne-Edwards, 1838
Family **Diastoporidae** Gregory, 1899
Genus *Corynotrypa* Bassler, 1911

The genus *Corynotrypa* has been erected by Bassler (1911*a*) to include some species previously referred to the genus *Stomatopora* Bronn, 1825. In the bryozoan assemblage here considered, *Corynotrypa* is a genus of widest stratigraphic distribution, occurring from the Ordovician to the Cretaceous of Europe and North America.

One new subgenus *Corynotrypa (Dentalitrypa)* and five species of *Corynotrypa* s. str. have been identified in our material: *C. (Corynotrypa) canadensis* (Whiteaves), *C. (Corynotrypa) dissimilis* (Vine), *C. (Corynotrypa) inflata* (Hall), *C. (Corynotrypa) bassleri* n.sp., *C. (Corynotrypa) gibbosa* n.sp. The diagnostic features, tabulated in table 5,

Table 5

Diagnostic features of 5 species of the genus *Corynotrypa (Corynotrypa)* from the Ordovician erratic boulders

Species / Features of zooecia	*C.(C.) canadensis* (Whiteaves)	*C.(C.) dissimilis* (Vine)	*C.(C.) inflata* (Hall)	*C.(C.) bassleri* n. sp.	*C.(C.) gibbosa* n. sp.
Shape					
Maximum length	1.30 mm	1.50 mm	0.90 mm	2.00 mm	0.64 mm
Stolon	short	long	very short	long	long
Peristomal neck	high	low	very low	high	high
Aperture	circular or ovate	circular or ovate	ovate	circular or ovate	circular
Basal surface of zooecium	flat, with edge	convex	flat, with edge	convex	convex
Outer ornamentation	fibrous	fibrous	fibrous	fibrous	fibrous

illustrate the differences between the particular species. The most important differences are:

1) general outline, which is either pyriform or club-shaped;

2) size, expressed mainly in length and height dimensions;

3) the stolon, which is either long or short, distinctly or indistinctly delimited from the zooecial tube;

4) peristomal neck, varying in length, width and shape, with peristomal rim or without it[1];

5) shape of aperture, either ovate or circular;

6) basal surface of zooecia, either flat with distinct peripheral edges, or convex at the frontal surface;

7) more or less distinct outer ornamentation consisting of longitudinal fibres arranged in transverse bands.

Corynotrypa (Corynotrypa) canadensis (Whiteaves, 1897)

(text-fig. 1,2; pl. I, fig. 6-7)

1911*a*. *Corynotrypa canadensis* (Whiteaves); R. S. Bassler, Corynotrypa, a new genus..., p. 526, fig. 27 a, b.

Material. — About 200 single zooecia, probably broken off at the juncture of two adjacent individuals. State of preservation rather good; the terminal part of the peristomal neck, including the peristomal rim, mostly damaged.

Description. — Zooecia rather club-shaped, subtubular, with distinctly flattened basal surface by which they were attached. The proximal end of the zooecial tube considerably narrower, as compared with the distal end. Stolon, relatively short, passes into the gradually dilating zooecium. Peristomal neck rather high, with an aperture that is either circular or ovate. The peristomal neck oriented at different angles with regard to the remaining part of the zooecial tube. Walls of zooecium thin, lacking the characteristic porosity, that has probably been obliterated by silicification. Frontal surface of zooecium ornamented, with transverse bands of longitudinal fibres. These bands are nearly uniform in length, more distinct in the proximal end of the zooecium. They may, perhaps, represent zones of gradual growth. The flattened basal surface bears no such ornamentation.

Dimensions of zooecia (in mm):

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[1] When describing the zooecia of *Corynotrypa (Corynotrypa)* and *C. (Dentalitrypa)* n. subgen. the present writer uses the therms „pristomal neck" and „peristomal rim" which define the structural elements of the peristome.

Br.O.I No.	Length	Proximal width	Distal width	Diameter of peristomal neck *
11	0.60	0.06	0.18	0.12
12	0.66	0.08	0.22	0.16
13	0.76	0.10	0.28	0.18
14	0.82	0.12	0.30	0.22
15	0.90	0.16	0.36	0.24
16	0.96	0.18	0.42	0.28
17	1.02	0.22	0.46	0.30
18	1.12	0.24	0.48	0.34
19	1.20	0.28	0.52	0.36
20	1.30	0.30	0.60	0.40

* The diameters of peristomal necks were measured at the base since their upper parts are generally damaged.

The length of zooecia ranges from 0.60 to 1.3 mm, the most frequent being 0.9 mm. The distal width is from 0.18 to 0.6 mm, most frequently approx. 0.35 mm. Proximal width: 0.06 to 0.3 mm, the most common one: 0.10 mm. The peristomal necks, measured at the base, are 0.12 to 0.4 mm in diameter, most frequently 0.25 mm. The distal/proximal width ratio determines the shape of zooecium. Three groups of zooecia may thus be distinguished:

1) rather few zooecia, with lowest ratio indices, i.e. insignificant differences between the distal and proximal width dimensions;

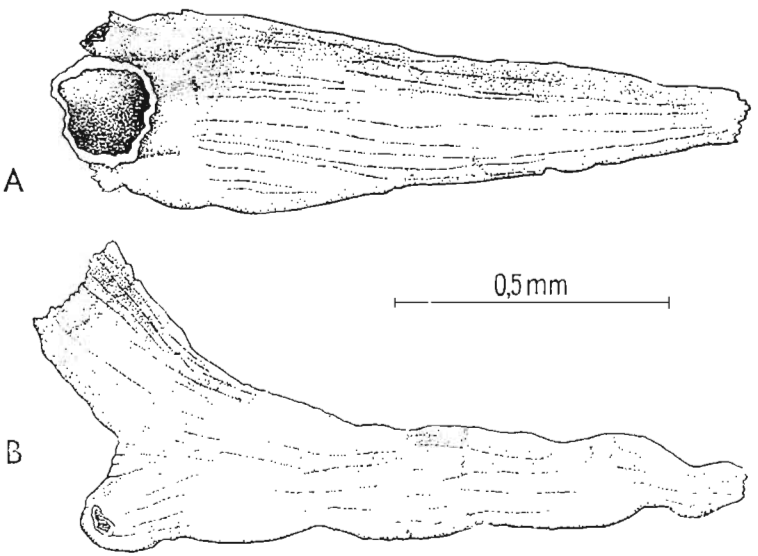

Fig. 1. — *Corynotrypa (Corynotrypa) canadensis* (Whiteaves). Single zooecium with preserved bases of dichotomous branching: *A* top view, *B* side view showing growth zones. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/8.

2) the most numerous group of zooecia, with moderately high ratio indices, i.e. the distal width 2.5 — 4 times the size of the proximal width;

3) very rare zooecia, with highest ratio indices, i.e. the distal width up to 6 times the proximal width.

Variation. — In addition to the differences mentioned above, variations in this species concern the shape of zooecia, since long and narrow forms occur side by side with short and wide ones; the peristomal neck is either very high — nearly one half the length of zooecium, or quite short and oriented at varying angle; the most common shape of the aperture is circular, but it may be ovate, too. The variation range of 6 species is shown on fig. 2. Their comparison leads to the differentiation of three morphological types which are determined by the orientation of the peristomal neck, which may be: a) vertical, at a nearly right angle, b) at an obtuse angle, inclined towards the distal part of zooecium, and c) at an acute angle, inclined towards the proximal part of zooecium.

Most of the zooecia (up to 70 per cent) have the peristomal neck oriented vertically. 22 per cent have the peristomal neck oriented at an obtuse angle, while only 8 per cent are with the peristomal neck at an acute angle.

Discussion. — As compared with the zooecia of *Corynotrypa (Corynotrypa) canadensis* (Whiteaves), described by Bassler (1911*a*) from the Middle Ordovician of Canada, our specimens differ primarily in having a higher peristomal neck. The material here considered, which consists of a great number of zooecia, displays great variations. Some of our zooecia are comparable in dimensions with the Canadian specimens. A part of our smaller zooecia in size resembles *C. (Corynotrypa) tho-*

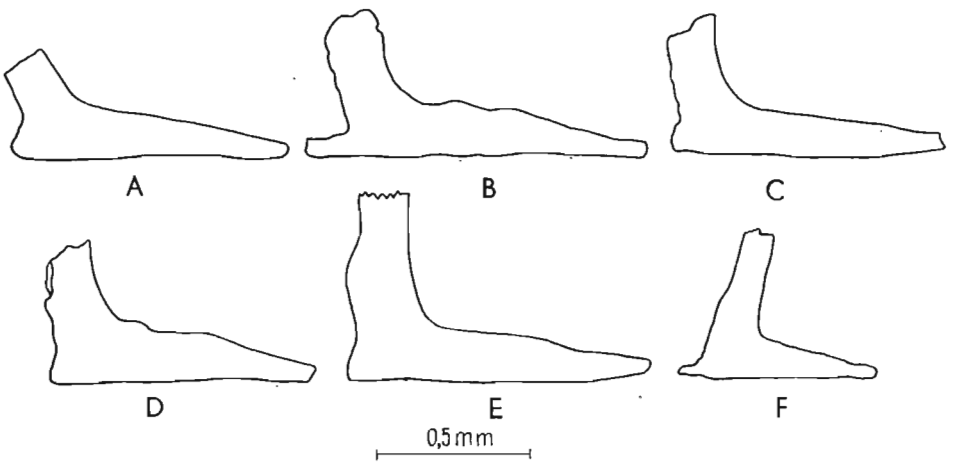

Fig. 2. — *Corynotrypa (Corynotrypa) canadensis* (Whiteaves). Profiles of single zooecia, showing varying inclination angle of peristomal neck.

masi Condra & Elias, 1944, from the Carboniferous beds of Nebraska, U. S. A. The majority of our specimens are slender forms, with longer distal and proximal diameters and greater height of the peristomal neck. They have certain characters in common with the zooecia of *Corynotrypa* sp. from the Silurian of Estonia, which the writer was able to examine in the collection of the Geological Institute of the Estonian Academy of Sciences in Tallinn. The Polish and Estonian zooecia that were compared have the same dimensions, and similar shape and height of peristomal neck.

Occurrence. — Boulder 0.17, Wielki Kack (prov. of Gdańsk). Canada: Middle Ordovician, at Swampy, Winnipeg.

Corynotrypa (Corynotrypa) dissimilis (Vine, 1881)
(text-fig. 3,4; pl. I, fig. 3)

1906. *Stomatopora dissimilis* Vine; R. S. Bassler, The Bryozoan Fauna..., p. 15, pl. 4, fig. 15-19.
1906. *Stomatopora minor* Hennig; A. Hennig, Gotlands Sylur-Bryozoer, 2, p. 24, pl. 3, fig. 6.
1911a. *Corynotrypa dissimilis* (Vine); R. S. Bassler, Corynotrypa, a new genus..., p. 523, fig. 23.
1911b. *Corynotrypa dissimilis* (Vine); R. S. Bassler, The early Paleozoic Bryozoa..., p. 68, fig. 14.
1959. Corynotrypa dissimilis (Vine); R. M. Männil, Voprosy stratigrafii i msanki..., p. 32.

Material. — 20 detached zooecia, some slightly damaged.

Description. — The zooecia are characterized by small differences between the distal and the proximal width. This greatly hinders the de-

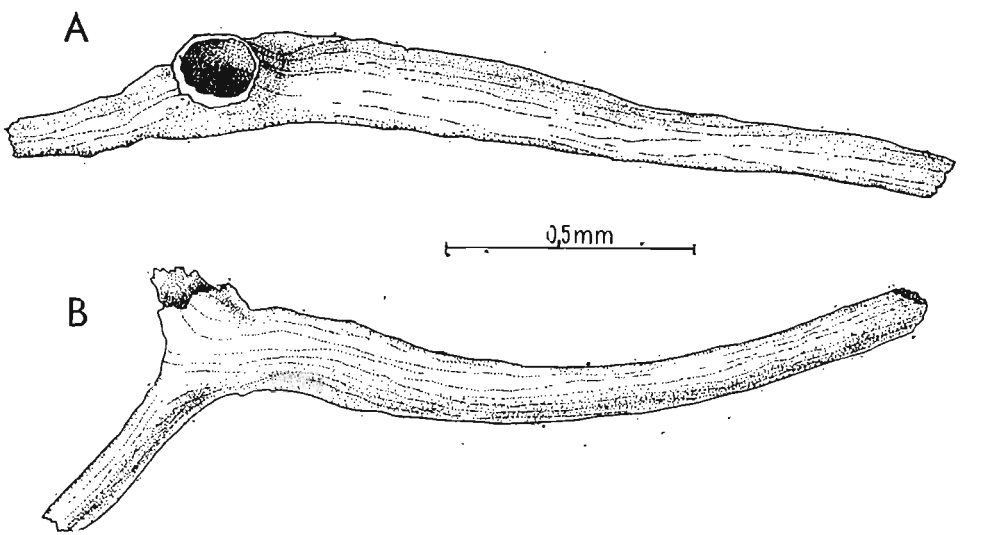

Fig. 3. — *Corynotrypa (Corynotrypa) dissimilis* (Vine). Single zooecium: *A* top view, *B* side view. Boulder 0,17, Wielki Kack (prov. of. Gdańsk); No. Br. 0.I/201.

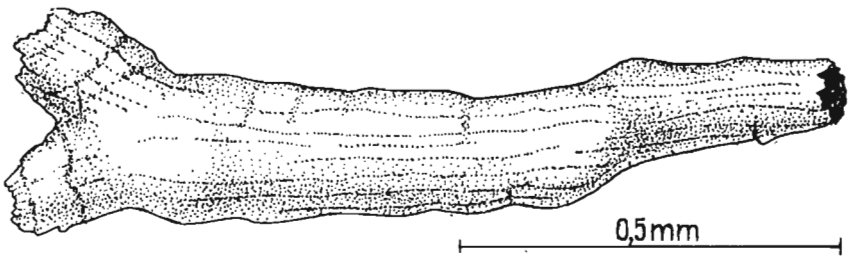

Fig. 4. — *Corynotrypa (Corynotrypa) dissimilis* (Vine). Single zooecium, side view. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/202.

limitation of the true zooecium from the stolon. The frontal and basal surfaces are convex. The aperture circular, sometimes ovate. The peristomal neck moderately high — from 0.03 to 0.09 mm. The zooecial walls are thin, with more or less distinctly banded outer structure.

Dimensions of zooecia (in mm):

Br.O.I. No.	Length	Height	Proximal width	Distal width	Apertural diameter	Height of peristomal neck
207	0.90	0.30	0.12	0.24	0.21	0.06
208	0.90	0.33	0.12	0.24	0.15	0.09
209	0.99	0.30	0.12	0.24	0.15	0.06
210	1.05	0.33	0.09	0.27	0.21	0.06
211	1.29	0.30	0.15	0.24	0.15	0.06
212	1.32	0.30	0.15	0.24	0.18	0.06
213	0.90	0.27	0.12	0.24	0.15	0.03
214	1.50	0.36	0.15	0.27	0.24	0.09
215	0.96	0.30	0.12	0.21	0.15	0.06
216	1.14	0.30	0.12	0.24	0.15	0.06
217	1.17	0.39	0.15	0.30	0.18	0.09
218	1.62	0.24	0.06	0.18	0.15	0.06
219	0.75	0.30	0.12	0.21	0.15	0.09
220	0.90	0.30	0.12	0.24	0.15	0.06

Variation. — Zooecia show strong variation in size and in shape. They may be either rod-like, moderately long, with but slight differences between the proximal and distal width, or very elongated, with sensible difference in width of the two ends.

Discussion. — Zooecia of this species display some similarities, concerning the length and general outline, with zooecia of *Corynotrypa* (*Corynotrypa*) *canadensis*. They differ, however, in a longer stolon, low peristomal neck and convex basal surface. A comparison of the dimensions of our specimens with those of *C.* (*Corynotrypa*) *dissimilis*, as given by Bassler (1911*a*, *b*), will reveal some similarities of these two forms. The zooecia of our specimens, in length approaching Bassler's specimens, display somewhat smaller differences between the distal and proximal diameters, and they are more slender.

The dimensions of Bassler's specimens are: length 1.15 mm, distal diameter 0.35 mm, proximal diameter 0.10 mm.

Specimens of here described species, similarly to those of *C. (Corynotrypa) bassleri* n. sp., have the zooecia longer than those of all the other representatives of *Corynotrypa* s. str. in the studied material.

Occurrence. — Boulder 0.17, Wielki Kack (prov. of Gdańsk). Estonia: Lyckholm limestone (F_1) at Kertel, Dago Island; Borkholm limestone (F_2) at Borkholm. England: Buildwas beds in the Wenlockian shales of Shropshire. Sweden: the Silurian in the Gotland Island. U. S. A.: Silurian shales at Rochester, Lockport, and other localities in the west of the state of New York; Osgood beds, near Osgood, Indiana. Canada: Grimsby, Ontario.

Corynotrypa (Corynotrypa) inflata (Hall, 1847)

(text-fig. 5; pl. I, fig. 1-2)

1911*a*. *Corynotrypa inflata* (Hall); R. S. Bassler, Corynotrypa, a new genus..., p. 513-517, fig. 12-15.

1911*b*. *Corynotrypa inflata* (Hall); R. S. Bassler, The early Paleozoic Bryozoa..., p. 64, fig. 10 a-g.

1959. *Corynotrypa inflata* (Hall); R. M. Männil, Voprosy stratigrafii i mšanki..., p. 32.

Material. — About 100 detached zooecia in various state of preservation.

Description. — Zooecia are pyriform, with convex frontal wall and flattened basal surface, with a distinct peripheral edge. They are characterized by an extremely low peristome and ovate terminal apertures. The stolon is very short and cannot be readily distinguished from the remaining part of the zooecium. Zooecium walls generally thin, distally fairly dilated. Fibrous ornamentation well indicated on the frontal surface.

Dimensions of zooecia (in mm):

Br.O.I No.	Length	Height	Proximal width	Distal width	Apertural diameter
301	0.90	0.21	0.03	0.21	0.12
302	0.84	0.18	0.03	0.15	0.12
303	0.75	0.21	0.06	0.15	0.15
304	0.69	0.18	0.06	0.18	0.12
305	0.66	0.24	0.06	0.21	0.21
306	0.60	0.24	0.06	0.21	0.18
307	0.60	0.21	0.06	0.18	0.18
308	0.60	0.18	0.06	0.18	0.15
309	0.42	0.12	0.03	0.15	0.12
310	0.38	0.12	0.03	0.15	0.12

Variation. — The variation concerns mainly the length of stolons, most of which are short, but longer ones occur, too. The shape of the zoecium is connected with the length of the stolon. If the stolon is short, the zooecium is pyriform, but rather club-shaped when the stolon is longer. Some variations are also observable concerning the size of the aperture which ranges from 0.12 to 0.21 mm, as well as its shape which may be ovate or circular.

Discussion. — As compared with specimens of *Corynotrypa (Corynotrypa) inflata,* described by Bassler from North America, most of our zooecia are longer and narrower, with slightly greater apertural diameters. A comparison of the zooecia from Poland with those of

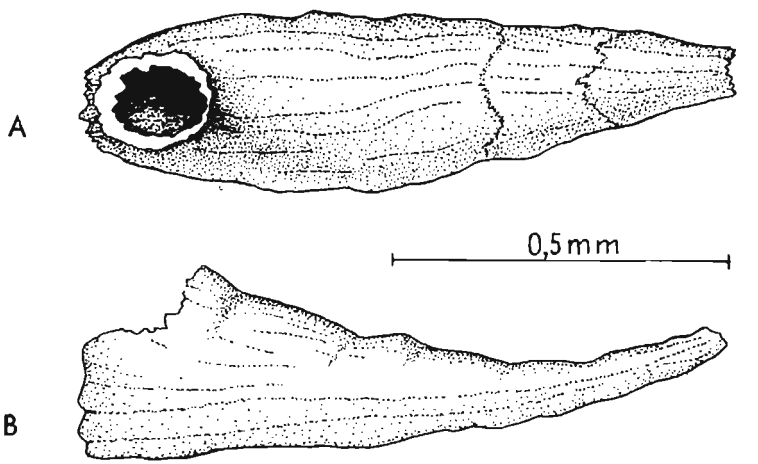

Fig. 5. — *Corynotrypa (Corynotrypa) inflata* (Hall). Single zooecium: *A* top view, *B* side view. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/300.

C. (Corynotrypa) curta Bassler, 1911, shows marked differences in the shape and size of zooecia, also in size and arrangement of the aperture and of the peristome. Zooecia of *C. (Corynotrypa) inflata* (Hall, 1847), similarly to those of *C. (Corynotrypa) gibbosa* n. sp. are smaller than those of all the other species of *Corynotrypa* s. str. in the studied material.

Occurrence. — Boulders: 0.17, Wielki Kack (prov. of Gdańsk), and 0.233, Mochty (prov. of Warsaw). Estonia: the Upper Ordovician at Wesenberg. U. S. A.: the Middle Ordovician (Trentonian) and the Upper Ordovician (Richmondian) in the state of New York.

Corynotrypa (Corynotrypa) bassleri n. sp.

(text-fig. 6-8; pl. I, fig. 4-5)

Holotypus: Specimen No. Br. O. I/321; text-fig. 6 a, pl. I, fig. 5.
Stratum typicum: Baltic limestone with *Orthograptus gracilis* (Roemer).
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: bassleri — in honour of the eminent American palaeontologist Prof. Dr. R. S. Bassler.

Diagnosis. — Zooecia with high peristomal neck (up to 0.5 mm), provided with peristomal rim; long, conspicuous stolon; convex basal surface of zooecium.

Material. — 30 detached, fairly well preserved zooecia.

Description. — Zooecia characterized by a conspicuous, long and narrow stolon. The distal width of zooecia ranges from 2 to 3½ times

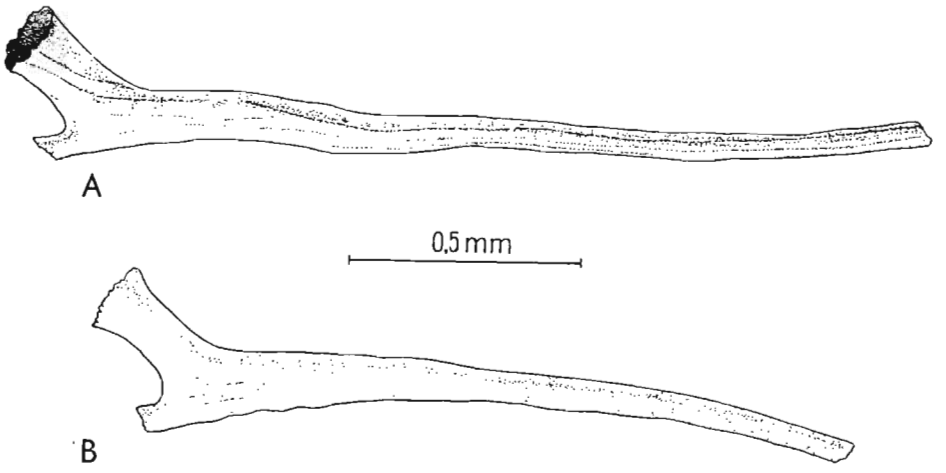

Fig. 6. — *Corynotrypa (Corynotrypa) bassleri* n. sp. *A, B* Two single zooecia, side view: *A* holotype, *B* paratype. Boulder 0.233, Mochty (prov. of Warsaw); *A* No. Br. 0.I/321, *B* No. Br. 0.I/325.

the proximal width. The tall, slender peristomal neck occasionally attains one half or even more of the total zooecial length; it dilates upwards and terminates in a fringed rim. This rim is damaged in most cases. The aperture is circular, occasionally slightly ovate. The basal wall of the zooecium, similarly as the frontal, is convex. The ornamentation consists of longitudinal fibres. Nearly every zooecium has preserved a fragment of the stolon of the next individual.

Dimensions of zooecia (in mm) — see p. 368.

Variation. — Maximum zooecial length is 2.00 mm, against the minimum length of 0.66 mm. Maximum height 0.54 mm, against the minimum height of 0.15 mm. Moreover, the other dimensions of zooecium are not always in proportion with the length of zooecium. For example, a zooecium of moderate length (0.75 mm) is 0.54 mm high and has a peristomal neck that is 0.36 mm long, while a much longer zooecium (2.00 mm) is only 0.45 mm high, and has a much lower peristomal neck of scarcely 0.24 mm. Hence, most probably, the zooecial structure does not follow any fixed proportions, and there is no direct correlation between the numerical values of the particular morphological elements.

Dimensions of zooecia (in mm):

Br.O.I No.	Length	Height	Proximal width	Distal width	Basal diameter of peristomal neck	Top diameter of peristomal neck	Height of peristomal neck
327	2.00	0.51	0.06	0.18	0.12	0.18	0.33
328	1.20	0.45	0.06	0.21	0.18	0.24	0.30
329	1.11	0.48	0.06	0.18	0.15	0.21	0.30
330	1.08	0.51	0.06	0.18	0.12	0.18	0.33
331	1.05	0.44	0.06	0.18	0.15	0.18	0.26
332	0.96	0.39	0.06	0.21	0.18	0.24	0.18
333	0.96	0.36	0.03	0.18	0.15	0.24	0.18
334	0.90	0.33	0.03	0.18	0.12	0.15	0.15
335	0.78	0.36	0.06	0.21	0.12	0.18	0.15
336	0.75	0.54	0.06	0.15	0.12	0.18	0.39
337	0.75	0.45	0.06	0.21	0.18	0.21	0.24
338	0.66	0.42	0.06	0.21	0.15	0.21	0.21

Variation concerns also the orientation of the stolonal region with regard to the remaining part of zooecium, height and shape of peristomal neck, and its aperture which terminates in a peristomal rim of varying width. A range of variation of this species is shown in fig. 8.

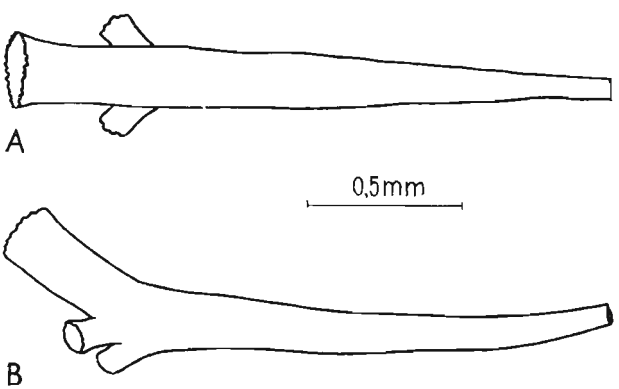

Fig. 7. — *Corynotrypa (Corynotrypa) bassleri* n. sp. Single zoeecium with preserved bases of dichotomous branching: *A* top view, *B* side view. Boulder 0,233, Mochty (prov. of Warsaw); No. Br. 0.I/340.

Discussion. — Our new species differs from the other representatives of *Corynotrypa* s. str. in that it has a very high peristomal neck. It comes closest to *Corynotrypa (Corynotrypa) abrupta* Bassler, 1911, described from Lyckholm limestone (F_1), at Kertel, island of Dago (Estonia), from which it differs, however, in much greater height of the peristomal neck.

Occurrence. — Boulders: 0. 17, Wielki Kack (prov. of Gdańsk), and 0.233, Mochty (prov. of Warsaw).

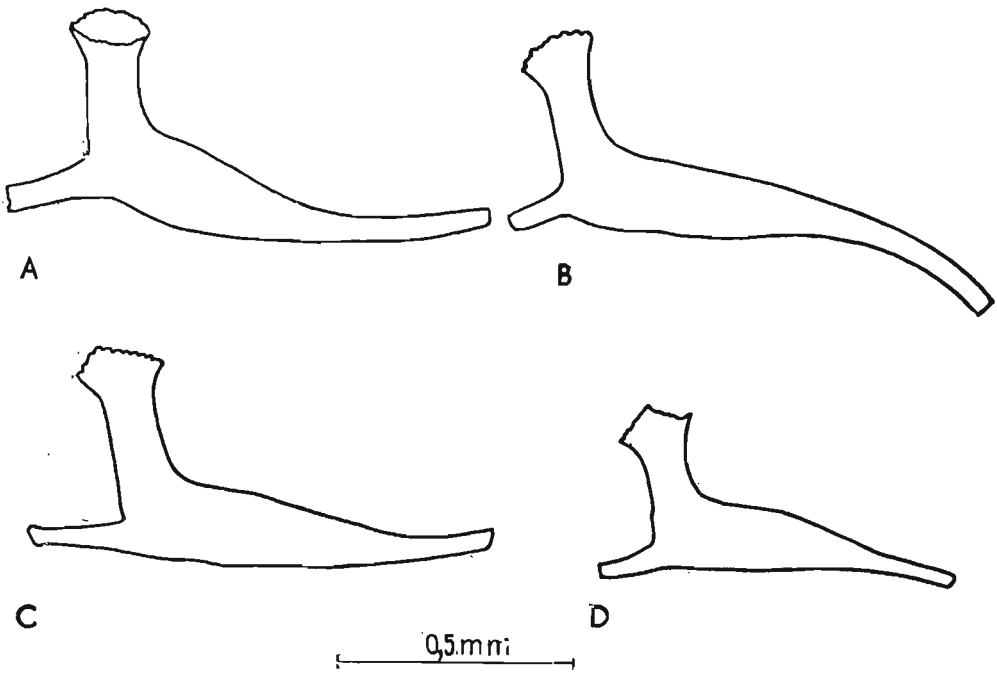

Fig. 8. — *Corynotrypa (Corynotrypa) bassleri* n. sp. *A-D* Profiles of single zooecia.

Corynotrypa (Corynotrypa) gibbosa n. sp.

(text-fig. 9, 10; pl. II, fig. 1)

Holotypus: Specimen No. Br. 0.I/352; text-fig. 9.
Stratum typicum: Baltic limestone with *Orthograptus gracilis* (Roemer).
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: gibbosa — Lat. *gibbus* = hunch; with characteristically gibbous zooecia.

Diagnosis. — Short, hummocky zooecia; distinct stolon, short peristomal neck; convex basal wall.

Material. — About 40 detached, occasionally connected zooecia, in satisfactory state of preservation.

Description. — Zooecia of this species, similarly as those belonging to *C. (Corynotrypa) inflata* (Hall, 1847), are smaller than any other of our representatives of *Corynotrypa* s. str. The zooecial length ranges from 0.52 to 0.64 mm. The most characteristic feature is the peculiar shape of zooecia which display a distinctly central dilation. The proximal end of zooecium is relatively thin, and its width may be from 3 to 6 times smaller than the widest part of zooecium.

Dimensions of zooecia (in mm) — see p. 370.

Owing to the conspicuous hummocky dilation of zooecium the stolon is distinctly delimited from the remaining part of the zooecium,

Dimensions of zooecia (in mm):

Br. O.I No.	Length	Proximal width	Distal width *	Diameter of peristomal neck	Height of peristomal neck
365	0.64	0.05	0.21	0.11	0.04
366	0.60	0.04	0.13	0.08	0.05
367	0.58	0.04	0.18	0.09	0.09
368	0.57	0.03	0.18	0.10	0.04
369	0.52	0.04	0.19	0.09	0.06
370	0.52	0.03	0.10	0.08	0.06

* Measured at maximum convexity of zooecium.

and usually attains half the total length of the zooecia. Most of the apertures are circular. The moderately high peristomal neck only very seldom retains a finely denticulate rim, probably due to fibrous structure of the neck. The basal wall of the zooecium is convex. A fibrous ornamentation is occasionally discernible on the surface of zooecium. Some zoarial fragments, e. g. those consisting of two zooecia, display distinct differences in their shape. In the ancestral individual the zooecium

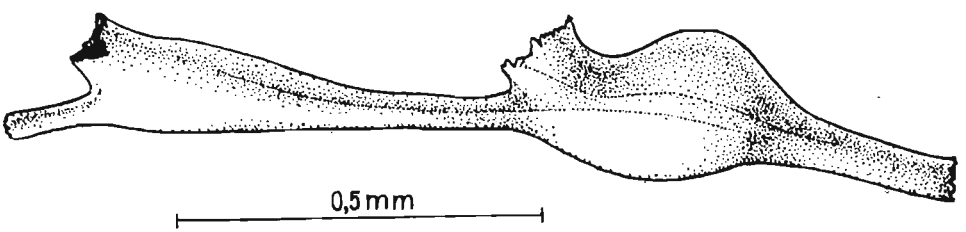

Fig. 9. — *Corynotrypa (Corynotrypa) gibbosa* n.sp. Two joint zooecia of different shape, showing ornamentation, in side view; holotype. Boulder 0.233, Mochty (prov. of Warsaw); No. Br. O.I/352.

is characteristically dilated, contrary to the descendant zooecium which is club-shaped. The features in common for both are the nearly identical length, similar values of proximal width and occasionally the width of the peristomal neck. The descendant individual usually retains a part of the stolon of the next zooecium and this is probably an evidence of its maturity. Hence, it may reasonably be supposed that maturity is not correlated with the degree of dilation, since the club-shaped, ontogenetically younger individuals may also give offshoots.

Variation. — The comparatively strong variation of this species is expressed in the dimensions of zooecia and their variable shape. Some differences are also observable in the variable length of the stolon and of the peristomal neck, also of the peristomal neck diameters.

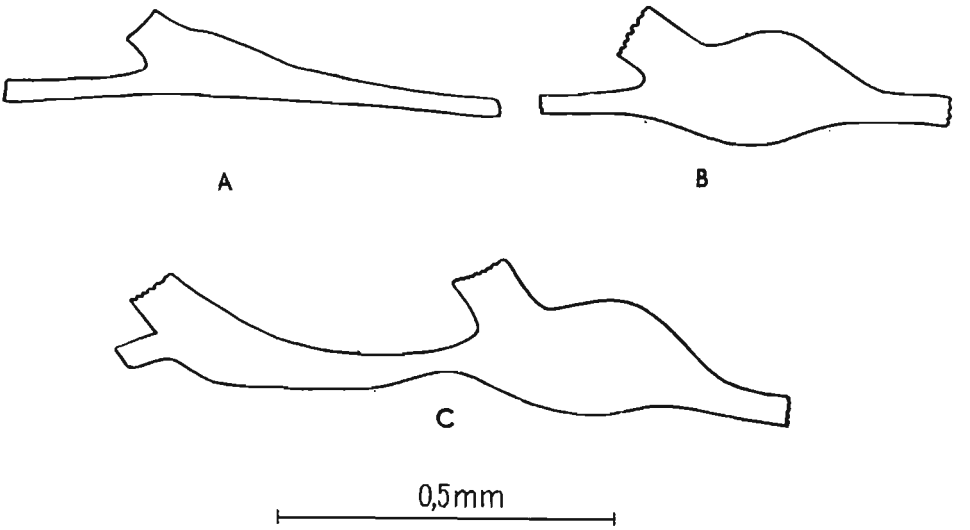

Fig. 10. *Corynotrypa (Corynotrypa) gibbosa* n. sp. *A-C* Profiles of differently shaped zooecia.

Discussion. — The new species exhibits certain similarities with the smaller specimens of *C. (Corynotrypa) inflata* (Hall). However, they concern the zooecial length only, while in all other characters these two species differ noticeably.

Occurrence. — Boulder 0.233, Mochty (prov. of Warsaw).

Subgenus *Corynotrypa (Dentalitrypa)* n. subgen.
Type species: *Corynotrypa (Dentalitrypa) bidens* n. sp.

Derivatio nominis: Dentalitrypa, Lat. *dentalis* = tooth-like, Gr. *trypa* = aperture with two denticulate processes.

Diagnosis. — Zooecia club-shaped, with convex basal wall; stolon moderately long; apertures generally ovate; peristomal neck low, with two internal denticles at the base of the peristomal neck.

Remarks. — The new subgenus is monotypical, erected to include *C. (Dentalitrypa) bidens* n. sp., which differs from all known representatives of genus *Corynotrypa* s. str. by the presence of two internal denticles.

Corynotrypa (Dentalitrypa) bidens n. sp.
(text-fig. 11-13; pl. II, fig. 2-3)

Holotypus: Specimen No. Br. 0. I/410; text-fig. 11.
Stratum typicum: Baltic limestone with *Orthograptus gracilis* (Roemer).
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: bidens — Lat. *bis* = twice, *dens* = tooth; having two teeth.

Diagnosis. — As for the subgenus.

Material. — About 30 zooecia in various state of preservation, either single or double.

Description. — Zooecium club-shaped, with the proximal part gradualy dilating towards the distal end. Zooecial length: 0.60 to 1.20 mm, distal width: 0.18 to 0.24 mm, proximal width: 0.09 to 0.15 mm.

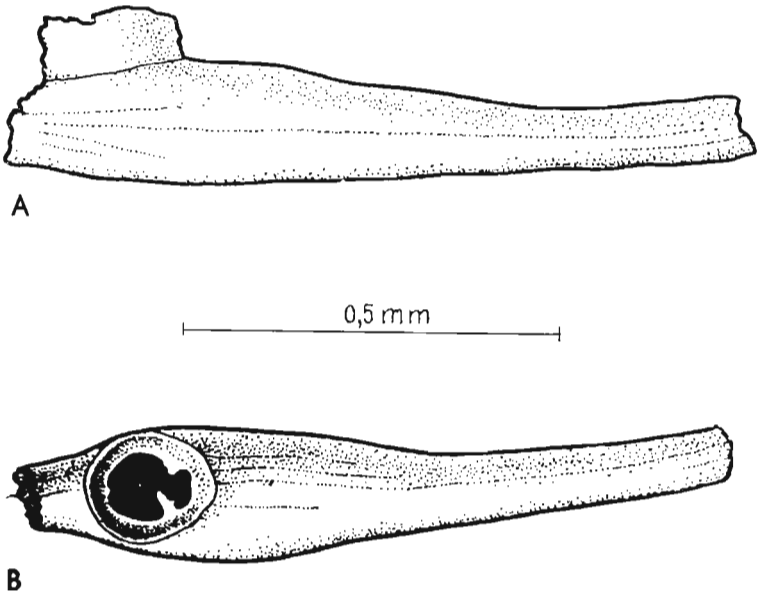

Fig. 11. — *Corynotrypa (Dentalitrypa) bidens* n. sp. Single zooecium: *A* top view, *B* side view; holotype. Boulder 0.233, Mochty (prov. of Warsaw); No. Br. 0.I/410.

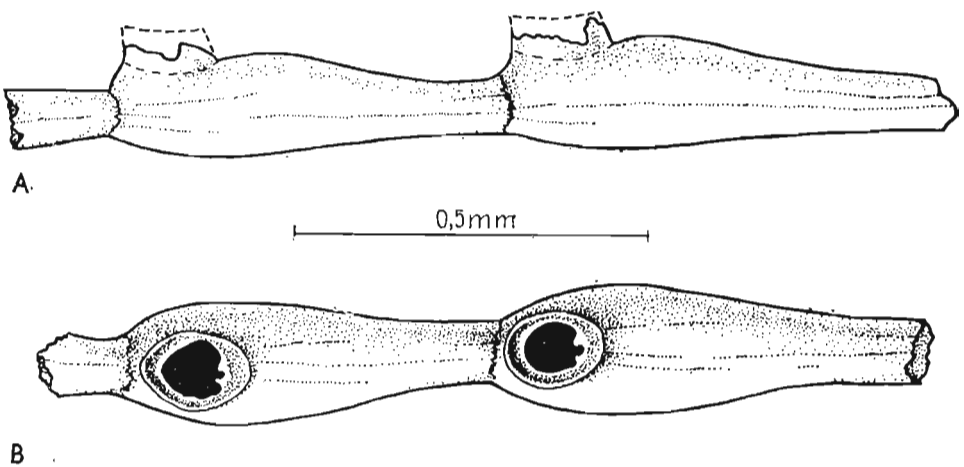

Fig. 12. — *Corynotrypa (Dentalitrypa) bidens* n. sp. Two joint zooecia, paratype: *A* top view, *B* side view. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/418.

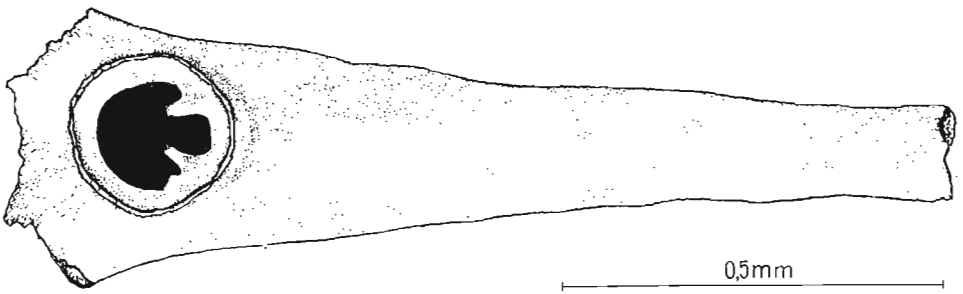

Fig. 13. — *Corynotrypa (Dentalitrypa) bidens* n. sp. Single zooecium with preserved bases of dichotomous branching, showing (in top view) well preserved dentiform processes; paratype. Boulder 0.233, Mochty (prov. of Warsaw); No. Br. 0.I/413

Basal and frontal walls of zooecium convex. Stolon of moderate length, not very distinctly delimited from the proper zooecium. Peristomal neck low, always vertically oriented. Two conspicuous dentiform processes occur in the interior of the peristomal neck, at its base. These denticles form a part of a sort of collar, developed at the limit of the neck and the zooecium. Apertures generally ovate. Fibrous ornamentation is visible on the frontal and basal surfaces of zooecium. Among zooecia of this species, some give two stolons to produce two descendant zooecia, introducing two uniserial lines.

Dimensions of zooecia (in mm):

Br. O. I No.	Length	Proximal width	Distal width	Diameter of peristomal neck
393	1.20	0.12	0.24	0.18
394	1.20	0.09	0.18	0.15
395	1.08	0.12	0.24	0.12
396	0.96	0.09	0.21	0.18
397	0.92	0.12	0.20	0.18
398	0.84	0.15	0.21	0.15
399	0.60	0.12	0.18	0.12

Variation. — The shape of zooecia does not vary to a very great extent. More important changes affect the zooecial length only; its numerical value is not closely correlated with the other zooecial dimensions. Some variations concern the size and shape of internal denticulate appendages, also the outline of aperture and the mutual relation of apertural diameters.

Discussion. — The zooecia of *C.* (*Dentalitrypa*) *bidens* n. sp. differ from the representatives of *Corynotrypa* s. str. chiefly in the presence of denticulate processes, but by its club-like shape, ovate aperture,

height of the peristomal neck, convex basal wall and fibrous ornamentation, this form resembles the typical representatives of genus *Corynotrypa*.

Occurrence. — Boulders: 0.17, Wielki Kack (prov. of Gdańsk), and 0.233, Mochty (prov. of Warsaw).

Genus *Flabellotrypa* Bassler, 1952

The generic name *Flabellotrypa* was introduced by Bassler in 1952, for zoaria from the Devonian (Helderbergian) in the state of Tennessee, USA, whose zooecia display a characteristically flabelliform arrangement. According to Bassler (1953), this genus occurs from the Silurian to the Devonian, but the species described below has been obtained from an erratic boulder of the Ordovician age.

Flabellotrypa rugulosa Bassler, 1952

(text-fig. 14, 15; pl. II, fig. 5)

1952. *Flabellotrypa rugulosa* Bassler; R. S. Bassler, Taxonomic notes..., p. 381, fig. 1.

1953. *Flabellotrypa rugulosa* Bassler; R. S. Bassler, *in:* R. C. Moore, Treatise on invertebrate..., p. G. 43. fig. 13, 11.

Material. — 10 zoaria of various size and in different state of preservation.

Description. — The flabelliform zoaria have extremely thin and translucent walls, and zooecia closely fitting one to another. The largest and best preserved zoarium is 1 mm in diameter. It contains about 20, generally clearly delimited, zooecia. The terminal apertures open up along the outer edges of zoarium The apertures are more or less circular, only occasionally slightly contracted. Transverse, rather close wrinkles, are more or less distincly indicated on the external surface of the zoarium. The length of zooecia varies within the same zoarium. Zooecia that are near the ancestroecium are the shortest ones (0.1 mm), while those more distant are up to 0.2 — 0.3 mm in length. The longest zooecium (0.6 mm) of the zoarium occurs in the centre of the colony. The initial part of the zoarium, i. e. the protoecium, has been preserved in one specimen.

Ontogeny. — Specimens of zoaria in different stages of development permitted to make the following observations:

1) The rounded protoecium gives rise to the ancestroecium. Two zooecia bud from the ancestroecium and from these, in turn, bud the next zooecia. Through the gradual and repeated budding the zoarium attains its maturity on becoming flabelliform.

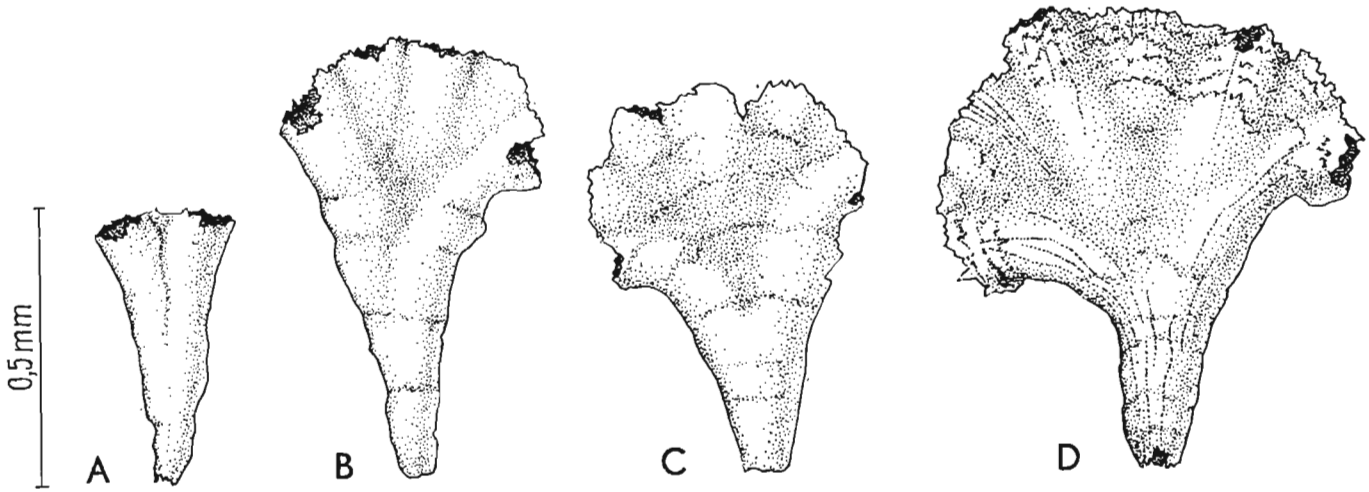

Fig. 14. — *Flabellotrypa rugulosa* Bassler. Various growth stages of the zoarium: *A* with 2 zooecia, *B* with 5 zooecia, *C* with 7 zooecia, *D* with 16 zooecia. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/421-I/424.

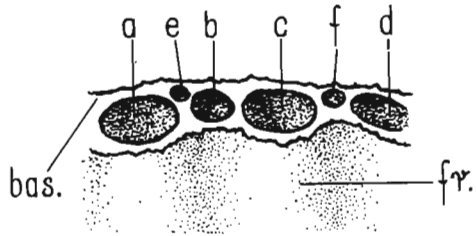

Fig. 15. — *Flabellotrypa rugulosa* Bassler. Fragment of the margin of zoarium showing zooecial apertures (scheme): *a-d* apertures of older zooecia, *e, f* apertures of young zooecia, at the proximity of the basal surface of zoarium; *fr.* frontal surface of zoarium, *bas.* basal surface of zoarium.

2) When the zoarium contains only two zooecia, the banded ornamentation is not indicated on their frontal surface. In this stage both zooecial tubes are elongated and of similar dimensions.

3) During the later stages of ontogeny, when the zoarium consists of several zooecia, there is a tendency to realize the flabelliform shape.

4) In the mature stage, the zoarium contains more than ten zooecia and it is typically flabelliform. Within such a zoarium, the zooecia — to the right and left of the longest central zooecium of the colony — are similarly arranged.

During the development of the zoarium, new zooecia appear, arranged near the dorsal surface of the zoarium.

Variation. — Variation concerns the size of apertures, the width and length of the individual tubes and thickness of zooecial walls. Moreover, some readily discernible variations occur in the shape of zoarium, which is more or less flabelliform.

Discussion. — The Polish specimens strongly resemble the American zoaria, first described by Bassler in 1952. The only difference is the smaller size of our specimens.

Occurrence. — Boulder 0.17, Wielki Kack (prov. of Gdańsk). Lower Devonian (Helderbergian) at Linden, western Tennessee, USA.

Suborder **Ceramoporoidea** Bassler, 1913
Family **Ceramoporidae** Ulrich, 1882
Genus *Ceramoporella* Ulrich, 1882

The genus *Ceramoporella* Ulrich, recorded from the Ordovician and Silurian beds, has thus far been known from Europe and North America. The Polish Ordovician material has yielded the two species described below: *Ceramoporella distincta* Ulrich and *C. interporosa* Ulrich.

Ceramoporella distincta Ulrich, 1890
(pl. VII, fig. 1)

1890. *Ceramoporella distincta* Ulrich; E. O. Ulrich, Palaeozoic Bryozoa, p. 464, pl. 39, fig. 6, 6a.

1893. *Ceramoporella distincta* Ulrich; E. O. Ulrich, On Lower Silurian Bryozoa..., p. 328, pl. 28, fig. 13.

1900. *Ceramoporella distincta* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 200.

1911. *Ceramoporella distincta* Ulrich; R. S. Bassler, The early Paleozoic Bryozoa..., p. 81.

1934. *Ceramoporella distincta* Ulrich; R. S. Bassler, *in* Fossilium Catalogus, p. 69.

1953. *Ceramoporella distincta* Ulrich; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G81, fig. 44, 2 a-c.
1960. *Ceramoporella distincta* Ulrich; T. G. Saryčeva, in: J. A. Orlov, Osnovy Paleontologii..., p. 52, fig. 49.

Material. — 57 fragmentary zoaria of different size, mostly well preserved, with the predominance of young stages.

Description. — Incrusting zoaria, the majority one-layered, mainly circular in outline, and with a diameter of approx. 5 mm. The first formed zooecium of a colony, the ancestroecium, has generally a central position in the zoarium. The succesive younger zooecia devolop around the ancestroecium, in more or less distinct, concentric verticils. Hence, the peripheral verticils of a zoarium contain the greatest number of zooecia. The zooecia are conical, up to 0.5 mm in length, proximally contracted, distally dilated. The apertures are round or ovate, up to 0.1 mm in diameter, with prominent, hood-like lunaria. The zooecia recline obliquely, at a very small angle, against the basal surface of zoarium. The zoecial walls are thin. Spaces between zooecia occupied by numerous mesopores, characterized by strong shape variations. Some are polygonal, others circular or ovate, etc. The mesopores are arranged in ladder-like, uni- or biserial rows, which sometimes completely isolate the particular zooecia. This arrangement of mesopores gives a perforate appearance to the zoarium.

Ontogeny. — On some zoaria of this species the ancestroecium is very distinct. In most cases it occurs in the centre of the transparent zoarium. A minute discoid thickening, probably representing the protoecium, occasionally occurs at the base of the ancestroecium. The ancestroecium is surrounded by 6 mesopores which may be called the first mesopore verticil. Zooecia do not develop in it. The next verticil contains 9 mesopores and 3 zooecia. During further development of zoarium, no regular pattern seems to be followed in the realization of its structure.

Variation. — Zoaria of this species may be one - or many-layered, mainly circular in shape. The zooecia of the same zoarium display fairly strong variations of length, which ranges from 0.2 to 0.5 mm. The apertures may also be either circular or ovate in shape. The strongest variation in this respect is observable in mesopores. Their shape may be quadrate, rectangular, triangular, ovate, etc. The number of mesopores separating the zooecia varies, too. They may be arranged in series of one, two or more rows that separate the zooecia.

Discussion. — Our specimens show some resemblance with the zoarium from the Edenian in Ohio, USA, figured by Bassler (1953). The similarities concern here the dimensions of zooecia, apertural diameters

and the presence of numerous mesopores. The chief difference lies in that most of our zoaria are one-layered specimens.

Occurrence. — Boulders: 0.12, Zbójno (prov. of Olsztyn); 0.17, Wielki Kack (prov. of Gdańsk), and 0.204 & 0.268, Mochty (prov. of Warsaw). USA: in the Cincinnati group, at Cincinnati in Ohio, Wilmington in Illinois; Eden and Maysville in Ohio Valley; the Trenton shales at Minneapolis and St. Paul.

Ceramoporella interporosa Ulrich, 1895

(pl. II, fig. 4)

1893. *Ceramoporella interporosa* Ulrich; E. O. Ulrich, On Lower Silurian Bryozoa..., p. 330, pl. 28, fig. 12.

1900. *Ceramoporella interporosa* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 200.

1953. *Ceramoporella interporosa* Ulrich; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 81, fig. 44,3.

Material. — 10 more or less fragmentary specimens.

Description. — Incrusting, lamellar zoarium, the largest specimen 0.3 mm in thickness and 3 × 5 mm in size. The zooecia obliquely arranged in more or less regular rows. They are tubular, longer on the frontal surface, shorter on the basal side. A delicate, longitudinal edge is occasionally preserved on the frontal surface of zooecium. The apertures are generally ovate, but circular ones occur, too. Often they are covered by the projecting hoodlike anterior border of the distal part of zooecium. Mesopores vary in size, they have ovate or circular outlines; 5, 6 or even more surround the zooecia. The arrangement of mesopores is irregular. The size of the mesopores, as compared with the apertures of the zooecia, is small, their diameters ranging from 0.05 to 0.08 mm, as against 0.3 to 0.5 mm of the zooecial apertures.

Variation. — The strongest variations in this species concern dimension of mesopores which, occasionally, may be only one tenth the size of zooecial apertures. The shape of the mesopores may be ovate, circular or irregular. The zooecial apertures vary also in size of diameter and in shape.

Discussion. — On comparing the zoaria of Polish specimens with the American ones, described by Ulrich in 1893, strong resemblance will be readily seen in outline of the incrusting zoarium, in shape and number of zooecial apertures and of mesopores. They differ, however, in that the Polish specimens exhibit an oblique arrangement of zooecia and a more conspicuous edge on the frontal surface of zooecium. Some dimensions are given below to illustrate the similarities and differences between the Polish and American representatives of this species (in mm):

Diameters	Zoaria from Poland	Zoaria from U. S. A.
In zooecia	0.30 — 0.50	0.15 — 0.30
In mesopores	0.05 — 0.08	0.05 — 0.15

Occurrence. — Boulder 0.124, Wyszogród (prov. of Warsav). U. S. A.: Galena shales of the Trenton formation, at Cannon Falls, Minnesota.

Genus *Crepipora* Ulrich, 1882

This genus has been recorded from the Ordovician of E Europe (Baltic Region), and from the Ordovician and Silurian of W Europe and North America.

Three species: *Crepipora simulans* Ulrich, 1890, *C. schmidti* Bassler, 1911, and *C.* cf. *solida* Ulrich, 1890, have been identified.

Crepipora simulans Ulrich, 1890

(pl. II, fig. 6)

1890b. *Crepipora simulans* Ulrich; E. O. Ulrich, Palaeozoic Bryozoa, p. 470, pl. 39, fig. 4, 4a; pl. 40, fig. 3, 3a.

1900. *Crepipora simulans* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 217.

1934. *Crepipora simulans* Ulrich; R. S. Bassler, *in* Fossilium Catalogus, p. 82.

1953. *Crepipora simulans* Ulrich; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G 82, fig. 45, 1 a-d.

Material. — Two fragmentary incrusting zoaria.

Description. — Lamellate, incrusting zoarium, with surface 5 × 5 mm. Zooecia tubular, not very long, with moderately thick walls. Apertures subrhomboidal, or polygonal and rounded, with diameter from 0.3 to 0.5 mm; 6 to 8 apertures occur in 2 mm, arranged in more or less regular oblique rows. In the proximal part of the zooecium, on its longer wall, there is a characteristically incised lunarium. The mesopores are few, depressed or elevated and surrounded by zooecia that are slightly larger in diameter and different in shape. The diameter of mesopores ranges from 0.1 to 0.2 mm. Most of them are ovate, with thick walls, and they occur as few clusters. According to Ulrich (1890b), scarcity of mesopores is a characteristic feature of young zoaria, hence our specimens would belong to the early stages of astogeny.

Variation. — The strongest variations concern the shape and size of zooecial apertures. Some differences also occur with respect to dimensions of mesopores, their number and arrangement. The zooecia are generally obliquely placed at a varying inclination angle, occasionally they are subvertical in relation to the base of zoarium.

Discussion. — The zoarium of the Polish specimens differs from that of *Crepipora simulans* described from U. S. A. (Ulrich, 1890*b*) mainly in that it has larger apertural diameters, namely from 0.3 to 0.5 mm, while in the American specimens they are from 0.22 to 0.4 mm. Moreover, our specimens in comparison with the American bear very few mesopores. Certain characters in common, e.g. similar dimensions of apertural diameters (0.4 — 0.6 mm), bring the Polish zoarium near to the *Crepipora epidermata* Ulrich, 1890. The differences here concern chiefly dimensions of zoarium. In *C. epidermata* the diameter is up to 8 cm, and even more, while in the Polish incomplete zoarium it is 0.5 cm.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). In the U.S.A. at Richmond, Cincinnati, Ohio; Madison, Indiana; Wilmington, Illinois; Maysville, Ohio; Trenton, Kentucky and Tennessee.

Crepipora schmidti Bassler, 1911

(text-fig. 16; pl. II, fig. 7)

1911*b*. *Crepipora schmidti* Bassler; R. S. Bassler, The early Paleozoic Bryozoa..., p. 87, fig. 26.

1959. *Crepipora schmidti* Bassler; R. M. Männil, Voprosy stratigrafii i mšanki..., p. 32.

Material. — 8 fragments of zoaria, most of them rather small, in various state of preservation.

Description. — The surface of fragmentary zoaria is up to 2 × 3 mm in size and 1 mm in thickness. The zooecia are somewhat obliquely oriented. They consist of moderately long tubes which dilate distally and produce very characteristic lunaria. The apertures are large, from 0.3 × 0.5 mm to 0.4 × 0.6 mm in diameter, rhomboidal, ovate or irregular. The apertures that occur close to the mesopores are characterized by somewhat different shape and slightly larger dimensions. There are, on the average, 3 or 4 apertures in 2 mm. A sharp edge, in varying state of preservation, is observable on the frontal surface of the zooecium. The maculae are weakly developed and slightly raised. The mesopores have relatively wide orifices, 0.1 to 0.3 mm in diameter. Their shape is variable: ovate, triangular, rounded, and so on.

Variation. — Apertures of zooecia are variably shaped. The zooecial apertures may be rhomboidal, ovate, or of another shape, and their diameters vary in dimensions. The mesopores are rounded, triangular or differently shaped, with diameters of varying dimensions. The maculae may be either slightly raised or depressed, their size, shape and position are not constant characters.

Discussion. — A comparison of the Polish specimens with those described by Bassler (1911*b*) from Estonia show that they have thicker zooecial walls and greater apertural diameters. The longest apertural diameter in a Polish specimen is 0.6 mm, while the corresponding maximum in an Estonian specimen is 0.4 mm. A more or less distinct edge is preserved on the frontal side of the Polish zooecia, a feature

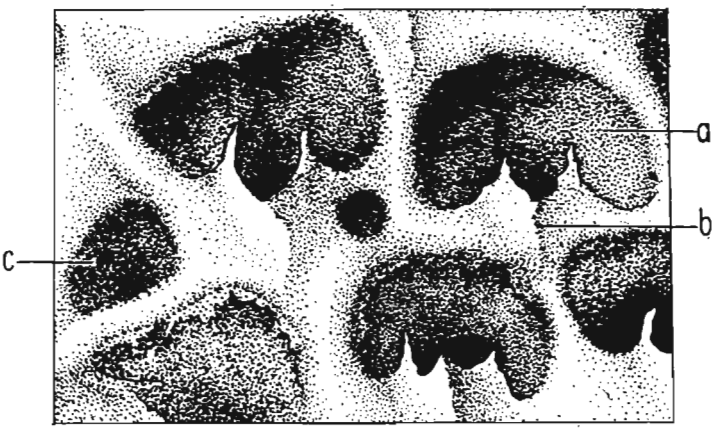

Fig. 16. — *Crepipora schmidti* Bassler. Fragment of zoarium (scheme): *a* zooecial aperture with elevated lunarium, *b* frontal wall of zooecium with longitudinal edge, *c* mesopore.

not mentioned by Bassler. In the zoarium here described there occur 3 or 4 apertures in 2 mm, while in the Estonian zoarium there are 4 or 5 apertures. *Crepirora schmidti* differs from *C. simulans* and *C.* cf. *solida* — the other two species identified in the Polish erratics — chiefly in larger apertures and different shape of lunaria.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsav). In Estonia: Jewe limestone (D_1).

Crepipora cf. *solida* Ulrich, 1890

(pl. III, fig. 3)

Material. — 5 fragmentary zoaria of different size and state of preservation.

Description. — Lamellate, incrusting zoaria, the largest up to 3 × 7 mm, and approx. 0.7 mm in thickness. Tubular, moderately long zooecia, somewhat obliquely oriented to the base of zoarium. Zooecial walls thin. Apertures ovate, occasionally pyriform, or irregular in contour, with diameters from 0.15 × 0.25 mm to 0.2 × 0.3 mm. As many as 6 apertures may occur in 2 mm. The projecting frontal wall of the

zooecium forms a characteristically shaped lunarium. The interzooecial mesopores, well preserved, occur between the zooecial apertures which are triangular, ovate or rounded, commonly three in number. The mesopore diameters are from 0.05 × 0.08 to 0.1 × 0.2 mm. In relation to the zooecial apertures, the mesopores are slightly depressed. The maculae are few, slightly raised.

Variation. — The strongest shape and size variations concern the zooecial apertures and the interzooecial mesopores. The distances separating the mesopores range from 0.2 to 0.5 mm.

Discussion. — The Polish zoaria show some differences in comparison with the American ones, described by Ulrich (1890*b*).

Dimensions	Specimen from Poland No. Br. O. I	Specimen from U. S. A.*
Diameters of apertures	0.15 × 0.25 0.20 × 0.30	0.17 × 0.22 0.22 × 0.30
Diameters of mesopores	0.10 × 0.20	0.05 × 0.17
Distance between the mesopores	0.20 — 0.50	0.10 — 0.30

* Owing to lack of numerical data in the description of the American species, the dimensions were made by the writer from Ulrich's figures.

The above data indicate considerable differences in the zooecial apertures and mesopores in the two zoaria here considered. In addition the spacing of interzooecial mesopores is slightly greater in the Polish specimens. In view of these differences, the assignment of our specimens to the American species is not quite certain.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). U.S.A.: Cincinnatian, from a creek south of Covington, Kentucky.

Order **Trepostomata** Ulrich, 1882
Suborder **Amalgamata** Ulrich & Bassler, 1904
Family **Batostomellidae** Miller, 1889
Genus *Bythopora* Miller & Dyer, 1878

The genus *Bythopora* has so far been recorded only from the Ordovician of Europe, and from the Ordovician to the Devonian of North America. The Polish specimens on the whole correspond with Ulrich's diagnosis, but they differ in having more conspicuous acanthopores.

Bythopora cf. *subgracilis* (Ulrich, 1893)

(pl. IV, fig. 2-3)

Material. — 13 fragmentary zoaria of different size.

Description. — The ramose zoaria are dichotomous. The branches are about 1 mm in thickness, but nearly 2 mm at points of branching. The oblique zooecial apertures, mostly ovate, do not exhibit a constant pattern as regards their arrangement and dimensions. They are dispersed at random and somewhat obliquely oriented. Four to five spiniform acanthopores surround the apertures. There are from 5 to 7 apertures in 2 mm. The zooecial interspaces are fairly thick, chanelled. The mesopores closely resemble the zooecia, hence they are not readily distinguishable. The zooecia and mesopores lack diaphragms.

Variation. — Variation concerns the shape of zooecia and their number on a given segment of a branch. Quite distinct differences may be noted concerning the number, size and shape of acanthopores. They may be small or fairly large and projecting above the surface.

Discussion. — The Polish zoaria differ in certain respects from the Estonian specimens, described by Bassler (1911*b*) from the Wassalem beds. In our zoaria the branches are narrower, the apertures more irregular in contour, the acanthopores more conspicuous. Similar differences distinguish our zoaria from the American ones described by Ulrich (1893). Hence, their assignment to Ulrich's species is not quite certain.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). Estonia: Wassalem beds (D_3), Uxnorm. U.S.A.: Black River (Decorah), the Minnesota shales.

Genus *Orbipora* Eichwald, 1856

Until recently the genus *Orbipora* has been recorded from Europe only, namely from Estonia and Sweden, where it has been described by Eichwald (1856, 1860), Dybowski (1877), and Bassler (1911*b*). More recently, Fritz (1957) reported it from the Middle Ordovician beds in Ottawa, Canada.

Orbipora minima n. sp.

(pl. III, fig. 1)

Holotypus: Specimen No. Br. O.I/526; pl. III, fig. 1.

Stratum typicum: indeterminate.

Locus typicus: Mochty, prov. of Warsaw, Poland.

Derivatio nominis: Lat. *minimus* — the smallest, with reference to the dimension of the zoarium, smaller than any so far described.

Diagnosis. — Zoarium hemispherical, with slightly concave circular base, approx. 3 mm in diameter; zooecia tubular; apertures hexagonal; conspicuous, spiniform acanthopores.

Material. — 3 zoaria of different size and state of preservation.

Description. — Zoaria hemispherical, with maximum height up to 1 mm. They were attached to the substratum by a flat or slightly concave base, more or less circular in contour. The basal diameters are from 2.5 to 3 mm. The zooecial tubes of uniform width throughout their length; only occasionally contracted in the proximal end at the zoarial base. The length of zooecia is affected by the hemispherical shape of the zoarium; these occurring in the peripheral part are shorter than those in the central part. The zooecial apertures are mostly hexagonal, sometimes irregularly polygonal or ovate. The larger apertures are 0.33 × 0.33 mm, and 0.33 × 0.30 mm in diameter; the smaller ones 0.26 × 0.20 mm, and 0.20 × 0.20 mm. Acanthopores occur around the zooecial apertures, where the zooecial walls are amalgamated. They are developed as spiniform projections, over 0.1 mm long, conspicuously dilated at the base, distinctly protruding above the zoarial surface. One acanthopore intervenes between three adjacent zooecia. The zooecia coalesce very closely and are thin-walled. The walls of the adjacent zooecia are amalgamated by means of their common acanthopore projections. Our specimens lack diaphragms and mesopores.

Variation. — Strongest variations occur concerning the length and width of zooecia. This is closely correlated with their position in the zoarium, since the peripheral zooecia are shorter and narrower than those in the central, most elevated part of the zoarium. Slight variations may also be observed as regards the size and number of acanthopores (4-6).

Discussion. — In the general appearance of the zoarium and the hexagonal shape of apertures, *Orbipora minima* n.sp. comes nearest to *O. distincta* (Eichwald, 1856). It differs from it chiefly in considerably smaller dimensions of the zoarium and the zooecia, and less abundant acanthopores. From *Orbipora acanthopora* Bassler, described from Estonia (1911b), our new species differs by its irregularly polygonal shape of apertures, and the shape and mode of distribution of acanthopores. The points in common are dimensions of zoaria and zooecial apertures, also the number of acanthopores.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw).

Family **Constellariidae** Ulrich, 1890

Genus *Stellipora* Hall, 1847

The genus *Stellipora* has, thus far, been known from the Ordovician strata of Europe (the Baltic Region), Asia (the Siberian Platform) and North America (Trentonian limestones).

Stellipora vesiculosa Modzalevskaya, 1955

(pl. III, fig. 2)

1955. *Stellipora vesiculosa* Modzalevskaya; E. A. Modzalevskaya, Polevoj Atlas..., p. 53, pl. 37, fig. 1.

Material. — One zoarium of about 1 sq. cm.

Description. — Zoarium incrusting, lamellate, 0.5 to 1 mm thick, subcircular, 10 mm in diameter. Three stellate maculae are indicated on the frontal side of zoarium, of which the largest is approx. 4 mm in diameter. The stellate shape of maculae is stressed by the radial arrangement of zooecial apertures which occur as 10—12 radial stellate clusters, directed to the middle of maculae. Within the stellate cluster the apertures are arranged in two, occasionally in three rows. As compared with the mesopores, they are rather small, approx. 0.25 mm in diameter, round, ovate or polygonal, and considerably thicker-walled than the mesopores. From 6 to 8 zooecial apertures occur in 2 mm. The interspaces of the stellate clusters of apertures are filled by mesopores which also occupy the middle of the maculae. Mesopores are from 0.08 to 0.1 mm in diameter. The naturally exposed longitudinal sections show diaphragms, few in zooecia and crowded in mesopores.

Variation. — Certain variations affect the number of apertures in the stellate clusters which may occur there either in 2 or 3 rows; also the apertural shape may vary, being round, ovate or polygonal, and finally the dimensions of apertures. Mesopores are subject to distinct variations, their number in the interspaces of the clusters of zooecial apertures, and in the middle maculae, is not at all constant. The dimensions of mesopores vary, too.

Discussion. — The zoarium here considered greatly resembles specimens described by Modzalevskaya (1955) from the Ordovician of the Siberian Platform.

Below are given some dimensions of these forms (in mm):

Dimensions	Zoarium from Poland No. Br. O. I	Zoarium from Siberia
Thickness of zoarium	0.50 — 1.00	2.00
Diameters of apertures	0.20 — 0.25	0.15 — 0.24
Diameters of mesopores	0.08 — 0.10	0.15
Number of apertures in radial clusters	10 — 12	9 — 10

In summing up the above data it should be noted that our zoarium is characterized by more numerous clusters of zooecial apertures, ranging from 10 to 12, and by slightly shorter diameters of mesopores. In the Siberian specimens the zoarium is thicker and the dimensions of the apertural diameters more strongly differentiated. In all probability, however, these differences fit into the range of individual variations.

Occurrence. — Boulder No. 0.204 from Mochty (prov. of Warsaw). U.S.S.R.: the basin of the Podkamennaya Tunguska river, the Chunke river and the Rybokupcha river, Upper Ordovician beds, Dolborsk horizon.

Suborder **Integrata** Ulrich & Bassler, 1904
Family **Halloporidae** Bassler, 1911
Genus *Hallopora* Bassler, 1911

Hallopora is a long-lived genus since it is recorded from the Ordovician to the Carboniferous. Moreover, it has a very wide geographical distribution, being known from Europe, North America, Africa and Australia.

Hallopora dumalis (Ulrich, 1893)
(pl. IV, fig. 1)

1893. *Callopora dumalis* Ulrich; E. O. Ulrich, On Lower Silurian..., part 1., p. 282, pl. 23, fig. 1-8.
1900. *Callopora dumalis* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 188.
1911b. *Hallopora dumalis* (Ulrich); R. S. Bassler, The early Paleozoic Bryozoa..., p. 331, fig. 207.
1921. *Hallopora dumalis* (Ulrich); H. Bekker, The Kuckers stage..., p. 42-43, pl. 6, fig. 9-13.
1959. *Hallopora dumalis* (Ulrich); R. M. Männil, Voprosy stratigrafii i mšanki..., p. 32.

Material. — 10 fragments of zoarial branches, of different size, some with exposed longitudinal sections.

Description. — Fragments of branches, 4 mm in width, do not exceed a length of 5 mm. The surface of branches is smooth. The zooecia are somewhat obliquely oriented, at a certain angle to the axis of the branch. The zooecial apertures mostly ovate, with diameters e.g. 0.2 × 0.3 mm, and 0.25 × 0.4 mm; 5 or 6 occur in 2 mm. The mesopores around the apertures vary in number and in shape. Most of them are polygonal, commonly rectangular or triangular. The diameters of mesopores are many times smaller than those of zooecial apertures. The longitudinal sections are characterized by the presence of diaphragms, both in zooecia and in mesopores. The zooecial diaphragms

are very far spaced, the distance between them may be up to 0.2 mm. In the mesopores the diaphragms are closely and evenly spaced.

Variation. — The variations noted in specimens of this species concern the shape and size of zoaria, zooecia and mesopores. The zoarial branches vary in width and degree of convexity. The apertures occasionally deviate from the most common ovate shape and may be circular. The contour of mesopores varies rather strongly, too, but polygonal mesopores predominate.

Discussion. — Some differences are observable in the Polish zoaria of *Hallopora dumalis* (Ulrich) as compared with specimens described by Bassler (1911*b*) from Estonia. They may namely be distinguished by broader branches and greater apertural diameters of zooecia and mesopores. Five to six apertures occur in 2 mm on our specimen, while seven to eight apertures are found in the same length of the Estonian zoarium.

Our zoaria also display some resemblance with *Hallopora subnodosa* (Ulrich), figured by Ulrich (1890*b*), from Cincinnati, U.S.A. The apertural dimensions, also the number, size and arrangement of mesopores are similar in these two forms. The chief difference is the presence on American zoaria of tubercled monticules. As compared with the genotype of *H. elegantula* (Hall, 1852), the Polish zoaria do not differ much in dimensions, but in smaller apertures, in their different shape and in smaller number and smaller dimensions of mesopores.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). Estonia: Kuckers shales (C_2), the Jarve Quarry (C_2). U.S.A.:*Phylloporina* bed, (Decorah) Black River shales and the *Clitambonites* horizon, the lowermost Trentonian near St. Paul and Cannon Falls, Minnesota.

Order **Cryptostomata** Vine, 1883
Family **Phylloporinidae** Ulrich, 1890

The systematic position of the family Phylloporinidae has often been a subject of discussion. Commonly it is referred to the order Cryptostomata (Ulrich, 1890*a*, 1890*b*; Bassler, 1911*b*, 1935; Toots, 1952; Männil, 1958). Bassler (1953) places the Phylloporinidae in the Trepostomata, though in his earlier papers (1911*b*, 1935) he referred it to the Cryptostomata. Astrova and Morozova (1956) include the Phylloporinidae into the Cryptostomata; together with the Fenestellidae and Acanthocladiidae, the Phylloporinidae are assigned by these authors to a new suborder — the Fenestelloidae Astrova & Morozova, 1956. No definite views regarding this matter can be advanced by the present writer on account of the lack of material suitable for microscopic studies. In accordance, however, with a revision of this order, made by

Astrova and Morozova on the basis of a keen-sighted microscopic analysis of its anatomy, the present writer assigns the Phylloporinidae to the Cryptostomata.

Genus *Phylloporina* Ulrich, 1887

The stratigraphic range of this genus comprehends the Ordovician and Silurian of Europe (Baltic Region and Italy), Asia (Siberian Platform) and North America (Tennessee and Minnesota).

Phylloporina sublaxa Ulrich, 1890

(pl. V, fig. 1)

1890*a*. *Phylloporina sublaxa* Ulrich; E. O. Ulrich, New Lower Silurian Bryozoa, p. 179, fig. 6 a-f.

1893. *Phylloporina sublaxa* Ulrich; E. O. Ulrich, On Lower Silurian Bryozoa..., p. 209, pl. 4, fig. 1-7.

1900. *Phylloporina sublaxa* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 353.

1953. *Phylloporina sublaxa* Ulrich; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 116, fig. 79, 5 a-b.

Material. — Two larger and a score or so of smaller fragments of zoaria in various state of preservation.

Description. — Zoarium composed of reticulating, slender, convex branches, from 0.24 to 0.6 mm in width. On the front side occur 3 rows of apertures. The apertures are mostly rounded, from 0.05 to 0.1 mm in diameter. Fenestrules large, ovate or slightly irregular in outline. Their length is two and a half times their width. Poorly preserved, not readily discernible acanthopores and mesopores occur in the apertural interspaces. The noncelluliferous side, similarly as the celluliferous, is rounded in section and marked by delicate longitudinal striae. The zoaria were attached to the substratum by a disc-shaped base which is preserved on some of our specimens.

Variation. — *Phylloporina sublaxa* displays rather strong variations which have been noted already by Ulrich (1890*a*) since he stated that zoaria of this species collected in Tennessee and Minnesota differ in dimensions. In our material, variability is expressed foremost in the length and width of branches, in size and outline of fenestrules, and in the shape of apertures.

Discussion. — The following measurements are given to stress the affinities and differences that exist between the Polish specimens and the American ones investigated by Ulrich (1890*a*).

Comparison of dimensions:

Dimensions	Specimen from U.S.A.	Specimen from Poland Br. O. I
Width of branches	0.3 — 0.6 mm	0.24 — 0.35 mm *
Number of fenestrules:		
in 1 cm — longitudinally . .	5 — 7	4 — 5
in 1 cm — transversely . . .	9 — 10	8 — 9
Number of apertural rows . .	3	3
Diameters of apertures	0.09 mm	0.05 — 0.1 mm
Number of apertures in 5 mm	23 — 25	22 — 24
Length of fenestrules	2.3 times long as broad	2—2.5 times long as broad

* At ramifications the width of branches is 0.6 mm.

Our zoaria, as is shown by the data given above, are distinguished by more slender branches, and larger, more elongated fenestrules which give the whole zoarium a delicately reticulated appearance. The other morphological features are very much alike in the two specimens compared. *Phylloporina sublaxa* Ulrich approaches *Ph. granistriata* Ulrich in the width of branches, the number of zooecial rows, and dimensions of apertural diameters. In other features, however, these species differ very essentially, since the zoaria in *Ph. granistriata* Ulrich have more elongated fenestrules, apertures separated by fine carinae and longitudinal granulated striae on the noncelluliferous side. When compared with *Ph. tricellata* Nekhoroshev (1955), described from the Lower Silurian beds in the U.S.S.R., the Polish specimens differ chiefly in smaller width of branches and greater number of apertures as measured in 5 mm.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). U.S.A.: Lower Trentonian (Glade limestone), Lebanon and La Vergne; Murfreesboro, Tennessee; limestone and sandstone from St. Peter, Minneapolis, Minnesota; upper part of Trentonian shales, St. Paul, Minnesota.

Genus *Chasmatopora* Eichwald, 1860

This genus is known from the Ordovician and Silurian of Europe, Asia and North America.

Chasmatopora sp.

(pl. III, fig. 4)

Material. — 1 fragmentary zoarium in a poor state of preservation.

Description. — Zoarium reticulate, with closely spaced branches. Width of branches up to 0.4 mm. Apertures arranged in two rows. In the attachment of the anastomosing branches there are more than two rows of apertures. Their shape and size are rather varied, since they

may be elliptic, ovate or subcircular in outline. From 5 to 6 apertures occur in 2 mm longitudinally measured. The apertures may be rimmed by delicate low peristomes which are not always preserved. The elongated fenestrules are mostly ovate or more or less irregular in outline. The largest one is 0.5 × 1.5 mm in size. About 3 fenestrules occur in 3 mm of the zoarial width. The noncelluliferous side is longitudinally striated. The striae run parallel to the edges of the slightly flattened branches. The frontal side of branches is somewhat convex, the opposite one flat.

Variation. — The width of branches, the shape and size of apertures, the outline and size of fenestrules are all more or less subject to variations. Moreover fairly strong differences occur in the length of anastomosing branches which ranges from 0.3 to 1.15 mm. The number of apertures in the anastomosing branches varies, too, and it is not directly correlated with the length of branches, since short anastomosing branches are often characterized by more numerous apertures than the long branches.

Discussion. — The Polish zoaria somewhat resemble *Chasmatopora reticulata* (Hall, 1847). In addition to a similarly reticulated structure, they are alike in width of branches and the presence of delicate peristomes. The most important difference lies in that the Polish specimens lack acanthopores and have a smaller number of apertures.

Comparison of dimensions:

Dimensions	Zoaria from Poland No. Br. O. I	Zoaria from U.S.A
Width of branches	0.4 mm	0.3 mm
Diameters of fenestrules . . .	0.5 × 1.5 mm	0.3 × 1.1 mm
Number of apertural rows . .	2	2
Number of apertures in 2 mm .	5 — 6	8 — 9
Acanthopores	lacking	numerous

Occurrence. — Boulder No. 0.204 from Mochty (prov. of Warsaw).

Genus *Conphylloporina* n.gen.

Type species: *Conphylloporina mochtyensis* n. sp.

Derivatio nominis: Lat. *con* — with, to stress the structural resemblance with the *Phylloporina*.

Diagnosis. — Zoarium reticulate; branches wide, with two rows of large tetragonal apertures; roughly alternating arrangement of apertures; the noncelluliferous side granulated and striated with fine pores; mesopores small.

Remarks. — The new genus *Conphylloporina* comes nearest to the genus *Phylloporina*. The features in common are: reticulated structure

of zoaria and the presence of mesopores. They differ, however, in the number of apertural rows, the size of apertures and their arrangement. In number of apertural rows the new genus approaches some species of *Chasmatopora* Eichwald, 1860, and *Moorephylloporina* Bassler, 1952.

Conphylloporina mochtyensis n.sp.

(pl. VIII, fig. 3)

Holotypus: Specimen No. Br. O. I/551; pl. VIII, fig. 3.
Stratum typicum: indeterminate.
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: mochtyensis — after the name of the locality Mochty on the Vistula, where the boulder which yielded this species, was found.

Diagnosis. — As for the genus.

Material. — 5 fragments of zoaria of different size, fairly well preserved.

Description. — Zoarium reticulate, consisting of branches from 0.4 to 0.6 mm in width, at points of ramification reaching up to 1 mm. The alternating arrangement of apertures is the most characteristic feature of our zoaria which distinguishes them from other Phylloporinidae. The apertures are somewhat obliquely arranged in two alternating rows. They are very large, tetragonal or ovate in shape, with the longer diameters from 0.25 to 0.30 mm and the shorter from 0.15 to 0.23 mm. Each aperture occupies one half or even more of the branchial width. They are rimmed by low peristomes. There are 7 apertures or so in 2 mm. Mesopores are present in the peripheral parts of branches between the apertures. The mesopores are rather small, circular or irregular in shape. They occur mostly twos by twos, only occasionally in greater numbers and are always placed in distinct depressions. The noncelluliferous side of branches is granulated and striated, with pores irregularly dispersed on its surface. The granular ornamentation does not exhibit any constant plan in the arrangement of grains. The fenestrules are elongated; proximally subcircular, distally sharply terminated.

Variation. — It concerns mainly the width of branches and size and shape of apertures which are mostly tetragonal, very rarely ovate. The dimensions, outline and number of mesopores vary, too.

Discussion. — When comparing the zooecia here described with some representatives of the Phylloporinidae, it will be noted that e.g. in the number of apertural rows our specimens resemble the American genus *Moorephylloporina* Bassler, 1952. They differ from it in size, shape and arrangement of apertures, width of branches and outline of fenestrules. In width of branches and the similarly granulated ornamentation of the noncelluliferous side of branches our species also

approaches the American genus *Oeciophylloporina* Bassler, 1952. In other characters our species differs so much from both here discussed genera that the present author decided to consider it as belonging to a separate genus — *Conphylloporina* n.gen. The development of mesopores is a feature shared by the newly erected genus and the genus *Phylloporina* Ulrich, 1887.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw).

Family **Fenestellidae** King, 1850
Genus *Fenestella* Lonsdale, 1839

Fenestella is a cosmopolitan, well differentiated genus. It ranges from the Ordovician to the Permian. In the Polish material it is represented by one species, described here as *Fenestella vistulensis* n.sp.

Fenestella vistulensis n.sp.
(text-fig. 17; pl. V, fig. 2)

Holotypus: Specimen No. Br. O. I/556; pl. V, fig. 2.
Stratum typicum: indeterminate.
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: vistulensis — from Vistula, Latin name of the river Wisła.

Diagnosis. — Zoarium delicate, flabellate, branches narrow, flexuous, with two rows of apertures; a low sharp keel with spiny acanthopores; dissepiments short.

Material. — 5 fragmentary zoaria.

Description. — Zoarium flabellate, forming delicate slender branches up to 0.15 mm in width. On the noncelluliferous side the branches are convex and finely longitudinally striated, while on the celluliferous side the surface of branches is varyingly depressed. The keel is low, but fairly sharp, with acanthopores represented by regularly spaced and sharply pointed spines, slightly expanded at the base. Their height equals or even exceeds the apertural diameter. The apertures, arranged in two rows, are circular or ovate, occasionally with extremely low peristomes. The apertural diameters are up to 0.05 mm. In 2 mm there occur about 12 apertures which are spaced from 0.05 to 0.13 mm. The branches are joined by thin, short dissepiments whose width equals that of branches or is slightly smaller. The fenestrules are more or less elongated, rectangular, ovate or irregular in outline. Three fenestrules occur longitudinally in 2 mm, and six fenestrules transversely. There are 6 to 8 apertures adjoining one fenestrule. The distance between the nodes varies from 0.3 to 1.2 mm.

Variation. — It affects mainly the shape of apertures which are ovate or circular, also the shape and size of fenestrules which pass from

rectangular to irregular. The distance between the nodes varies, too. The height of acanthopores on the keel is also subject to variations, most commonly they are about 0.05 mm, but may be higher.

Discussion. — Our species comes nearest to *Fenestella modesta*, described by Ulrich (1890*b*) from the Coal Measures of Knox County and

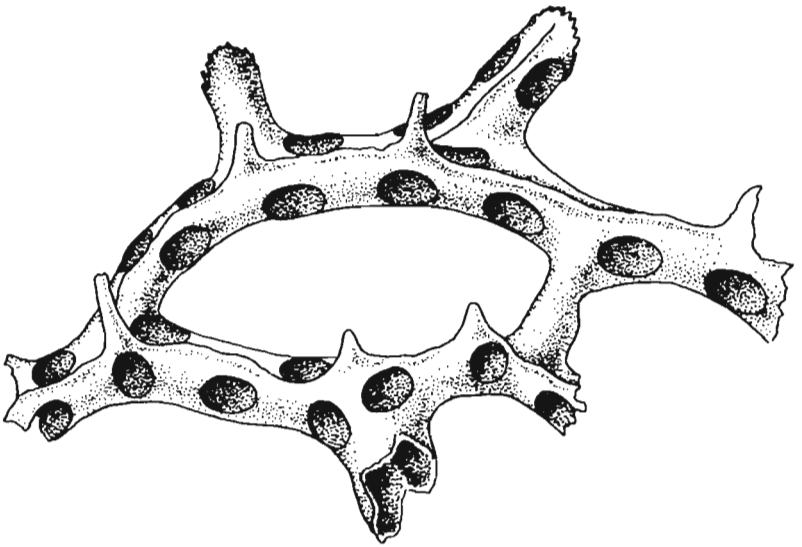

Fig. 17. — *Fenestella vistulensis* n. sp. Fragment of zoarium (scheme) in slightly oblique view, showing high acanthopore processes.

Seville, Illinois. These two species resemble each other in flabellate zoaria, in outline and number of apertures, while they differ slightly in the shape of fenestrules. It is not possible, however, to assign the Polish form to *F. modesta*, as it differs from it in smaller size, thinner branches, different spacing of nodes, sharp keel and high, spiny acanthopores.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw).

Genus *Enallopora* d'Orbigny, 1849

In older palaeontological papers this genus, described under the name of *Protocrisina* Ulrich, 1890, used to be referred to the Cyclostomata family Tubuliporidae Johnston, 1838 (Idmoneidae Busk, 1859). It was not until 1911 that Bassler expressed some hesitation as to the taxonomic position of this genus, though he continued to refer *Enallopora* to the Cyclostomata. This problem has lately been discussed by Toots (1952) and Männil (1958). In Toots' opinion, *Enallopora* must be assigned to Cryptostomata and reasonably be placed among the Arthrostylidae. Soviet palaeontologists (Osnovy Paleontologii, 1960) have lately ascribed *Enallopora* to the Cyclostomata. However, since the correct syste-

its knots are more or less sharp and the edge of the keel may be more or less distinct.

Discussion. — As compared with *Semicoscinium planodorsatum*, described by Ulrich (1890b) from the upper Helderberg in the Ohio river, the zoaria of *S. ordovicium* n.sp. differ in the greater dimensions of branches, wider dissepiments, smaller fenestrules and simpler keel construction. A certain resemblance exists between our species and *S. lineatum*, in 1936 described by Nekhoroshev from the Upper Silurian beds U.S.S.R., which also has thin dissepiments.

Occurrence. — Boulder O.268 from Mochty (prov. of Warsaw).

Family **Arthrostylidae** Ulrich, 1888
Genus *Arthrostyloecia* Bassler, 1952

The genus *Arthrostyloecia*, erected by Bassler in 1952, has thus far been recorded only from the Middle Ordovician of North America (Virginia).

Arthrostyloecia nitida Bassler, 1952
(pl. VIII, fig. 1)

1952. *Arthrostyloecia nitida* Bassler; R. S. Bassler, Taxonomic notes..., p. 384, fig. 19-21.

1953. *Arthrostyloecia nitida* Bassler; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 128, fig. 89, 7 a-c.

Material. — 1 segment of zoarium, satisfactorily preserved.

Description. — Extremely slender, elongated segment with vestigial articulated proximal surface, 0.2 — 0.24 mm in diameter, about 2.5 mm in length. The zooecia are arranged in 3 rows, on the three sides of the branch segment. The remaining surface of the segment is noncelluliferous and shows longitudinal striation. On the celluliferous side of the segment, the arrangement of striae more or less distinctly indicates the boundaries of the zooecial tubes. The apertures are ovate, relatively large, with distinct, granularly ornamented peristomes. About 5 apertures occur longitudinally in 2 mm. The apertural diameters are 0.08 × 0.16 mm and 0.1 × 0.22 mm. The longitudinal interspaces between the apertures vary considerably, they may be 0.06, 0.2, 0.24 and 0.4 mm. The celluliferous side of the segment is marked by extremely delicate, slightly sinuous, longitudinal carinae ornamented by tiny, wide spaced grains.

Variation. — The strongest variations affect the longitudinal distance between the apertures which ranges from 0.06 to 0.4 mm. The apertural dimensions do not vary to any notable extent.

Discussion. — The Polish specimen exhibits considerable resemblance with the American zoaria as regards width of segment, size of apertures and carinate ornamentation. Minute, widely spaced grains occur on the carinae in our specimen.

Occurrence. — Boulder 0.17 from Wielki Kack (prov. of Gdańsk). U. S. A.: Blackriverian at Edinburgh, Virginia.

Genus *Glauconomella* Bassler, 1952

The genus *Glauconomella* is known from the Ordovician to the Devonian of Europe, Asia and North America.

Glauconomella plumula (Wiman, 1902)

(pl. VIII, fig. 2)

1902. *Glauconome plumula* Wiman; C. Wiman, Über die Borkholmer Schicht..., p. 181, pl. 6, fig. 17-24.
1911b. *Glauconome plumula* Wiman; R. S. Bassler, The early Paleozoic Bryozoa..., p. 160, fig. 80.
1953. *Glauconomella plumula* (Wiman); R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 128, fig. 89, 4.
1959. *Glauconomella plumula* (Wiman); R. M. Männil, Voprosy stratigrafii i mšanki..., p. 39.

Material. — 25 fragmentary zoaria of different size and in various state of preservation; 1 larger fragment with preserved base, attached to another indeterminate bryozoan.

Description. — Zoarium continuous, consisting of dichotomously dividing branches, ramose in appearance. The lateral branches are obliquely oriented, more or less equidistant, their common arrangement is an alternating one, only occasionally opposite, narrower than, but sometimes as wide as the stem. Most of the fragmentary zoaria are about 5 mm in length, while one specimen with preserved circular, expanded base, is 10 mm long. The diameter of the stem does not exceed 1 mm, it is ovate or subcircular in outline. The apertures occur only on one side of the branches. The noncelluliferous surface is marked by fine longitudinal striae and one more distinct carina which runs centrally along the middle of the branch. The apertures occur in 2-4 rows delimited by longitudinal striae. They form somewhat oblique transversal rows, containing 2, 3 or 4 apertures, which are ovate in shape and with the longer diameter in most cases double the length of the shorter one e.g. 0.12 × 0.25 mm, 0.15 × 0.30 mm. A peristome is developed around the aperture. About 5 apertures occur in a length of 2 mm. The distance between the apertures nearly equals the smaller diameter of the aperture.

Variation. — Arrangement of lateral branches is one of the characters subject to variations. In relation to the main stem it may be either alternating or opposite. The width of the lateral branches varies, too. Most commonly, their diameter is narrower than that of the stem, but sometimes very much the same. Some slight differences also exist in dimensions of apertural diameters and the interspaces between them.

Discussion. — *Glauconomella plumula* (Wiman), when compared with *Gl. strigosa* (Billings), differs from it in the following characters, already observed by Bassler (1911*b*): closer and more regular ramification of zoaria, somewhat different arrangement of apertures and smaller apertural diameters. The Polish specimens do not essentially differ from those described by Wiman (1902) and Bassler (1911*b*).

Occurrence. — Boulders: 0.204 from Mochty (prov. of Warsaw) and 0.298 from Ustka (prov. of Koszalin). Estonia: Harjuan series F_{1b}, F_2. Sweden: Öjle Myr in the Gotland island. U.S.A.: Richmond group Fernvale shales from Illinois and other states.

Genus *Heminematopora* Bassler, 1952

The genus *Heminematopora,* erected by Bassler in 1952, has thus far been known only from the Middle Ordovician of the U.S.A. (Virginia).

The zoaria of *Heminematopora,* which are fairly abundant in our material, represent two species: *H. ? virginiana* Bassler, 1952, with 3 longitudinal rows of zooecia, and one noncelluliferous longitudinally striated surface, and *H. rossi* n.sp. with 4 longitudinal rows of zooecia and one noncelluliferous, longitudinally striated surface. On account of the lack of distinct basal articulation, the assignment of our zoaria to *Heminematopora* is only tentative. But, according to Bassler (1911*b*, p. 155), articulation is sometimes lacking in the allied genus *Nematopora* Ulrich, 1888; hence this may reasonably be supposed to be the case also in the genus *Heminematopora* Bassler, 1952. Therefore, as has been suggested by Dr. Männil (*in litt.*), a new genus ought perhaps to be erected for the specimens here considered.

Heminematopora ? virginiana Bassler, 1952

(pl. IX, fig. 4-5)

1952. *Heminematopora virginiana* Bassler; R. S. Bassler, Taxonomic notes..., p. 384, fig. 16-18.

1953. *Heminematopora virginiana* Bassler; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 129, fig. 89, 8 a-c.

Material. — 5 incomplete branching zoaria.

Description. — Zoaria consist of thin branches, about 0.4 mm in width nearly along the complete length of zoarium. Branches mostly

straight, dividing alternately at an interval of about 1 mm. The fragmentary branches about 5 mm in length. Zoaria attached to the substratum by an expanded base (of polygonal shape), 1 mm in diameter. In transverse section the branch is more or less quadrate, sometimes subovate. The apertures are arranged in 3 longitudinal rows, separated by delicate longitudinal ridges. One side of the branched zoarium is noncelluliferous, with fairly well marked longitudinal striae. About 3 apertures occur longitudinally in 2 mm. They are ovate in outline and rimmed by a rather low, but distinct peristome. The apertures have a slightly oblique orientation. The interzooecial surfaces have longitudinally striated ornamentation.

Variation. — It concerns the length of interzooecial surfaces and outline of branches in transverse section, commonly quadrate but sometimes ovate.

Discussion. — The following table gives some measurements of the Polish and American specimens of *H. virginiana.*

Comparison of dimensions:

Dimensions	Zoarium from Poland No. Br. O. I	Zoarium from U.S.A.*
Length of fragmentary branches .	5.00 mm	1.75 mm
Width of fragmentary branches .	0.40 mm	0.35 mm
Number of apertural rows	3	3
Number of apertures in 1 mm . .	1.5	3
Transverse section of branch . .	quadrate or ovate	quadrate

* The above data have been obtained by measuring the figures in Bassler's paper (1953).

Our specimens differ from the American ones in smaller number of apertures in 1 mm and in their slightly smaller width.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). U.S.A.: Blackriverian (Edinburg), Strasburg Junction, Virginia.

Heminematopora rossi n.sp.

(pl. XI, fig. 1)

Holotypus: Specimen No. Br. O. I/632; pl. XI, fig. 1.
Stratum typicum: indeterminate.
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: rossi — after the American palaeontologist Dr. June R. P. Phillips-Ross.

Diagnosis. — Zoarium thin branched, in section pentagonal, with 4 rows of apertures and one noncelluliferous side.

Material. — More than 50 branches of different length, mostly well preserved.

Description. — Zoaria consisting of thin, dichotomously dividing branches. Lateral branches few, meeting the main branch mostly at an angle of about 80°. Length of greatest zoarium 8 mm. Thickness of branches 0.3 mm. Apertures arranged in 4 longitudinal rows separated by delicate, granulose ridges. Apertures oval-shaped, rimmed by a low peristome. 6 apertures occur longitudinally in 2 mm. The noncelluliferous side is longitudinally striated.

Variation. — It is expressed in shape of apertures, commonly ovate, but occasionally sharp pointed, particularly so in the distal end. Some differences also occur in the arrangement of apertures.

Discussion. — From the American *H. virginiana* Bassler, our species differs in having a pentagonal — not quadrangular — section of branches, and in forming 4 — not 3 — apertural rows.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw).

Genus *Nematopora* Ulrich, 1888

The long-lived genus *Nematopora* Ulrich is recorded from the Ordovician to the Permian of Europe, Asia and North America.

Nematopora sublineata Männil, 1959

(pl. IX, fig. 6)

1959. *Nematopora sublineata* Männil; R. M. Männil, Voprosy stratigrafii i mšanki..., p. 39.

Material. — 12 fragmentary branches, in various state of preservation.

Description. — Zoarium consists of thin, dichotomously dividing branches, about 0.3 mm in width, at points of ramification exceeding 0.5 mm. Transverse section of branches polygonal. Apertures form 6 longitudinal rows, divided by delicate ridges. Surface of ridges ornamented by small but distinct, uniformly dispersed granules. Apertures rimmed by delicate peristome, similarly granulated as the ridges. The peristome embraces the aperture only proximally and laterally, where it is gradually and gently fused with the longitudinal ridges. The apertures somewhat obliquely oriented, there occur from 3 to 4 apertures longitudinally in 2 mm.

Variation. — The width of branches, the length of apertural diameters and the interzooecial surfaces vary in the same zoarium.

Discussion. — When compared with Estonian specimens of this species, our zoaria display strong similarities. They differ only in that some

of the Estonian zoaria have more closely spaced apertures, since from 3 to 6 occur in 2 mm, while there are only 3 to 4 apertures in 2 mm in our zoaria. Moreover, the granular ornamentation is less developed on the Estonian specimens. From the other representatives of *Nematopora*, *N. sublineata* Männil differs in the first place by a characteristic development of the apertures, which are slightly obliquely oriented and have no peristome in the distal part.

Occurrence. — Boulders: 0.17 from Wielki Kack (prov. of Gdańsk) and 0.204 from Mochty (prov. of Warsaw). Estonia: Tapa-Tyrma, Saksbi, Moe (F_1); Porkuni (F_2).

Genus *Sceptropora* Ulrich, 1888

The genus *Sceptropora* has a wide geographical distribution. Thus far it has been recorded from the Ordovician and Silurian of Europe, Asia and North America.

In our material consisting of erratic boulders from the Ordovician of Poland this genus is represented by 3 species: *Sceptropora facula* Ulrich, *S. florida* n.sp. and *S. spinosa* n.sp.

Sceptropora facula Ulrich, 1888

(pl. X, fig. 1-3)

1890b. *Sceptropora facula* Ulrich; E. O. Ulrich, Palaeozoic Bryozoa, p. 400—401, fig. 15.
1900. *Sceptropora facula* Ulrich; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 399.
1911b. *Sceptropora facula* Ulrich; R. S. Bassler, The early Paleozoic Bryozoa..., p. 153, fig. 74 a-d.
1928. *Sceptropora facula* Ulrich; R. S. Bassler, *in* W. H. Twenhofel, Geology of Anticosti Island, p. 160.
1935. *Sceptropora facula* Ulrich; R. S. Bassler, Fossilium Catalogus, p. 193.
1953. *Sceptropora facula* Ulrich; R. S. Bassler, *in* R. C. Moore, Treatise on invertebrate..., p. G. 130, fig. 90, 3 a-b.
1959. *Sceptropora facula* Ulrich; R. M. Männil, Voprosy stratigrafii i mšanki..., p. 39.

Material. — 20 zoarial segments in various state of preservation, one of the segments is with two top sockets, indicating dichotomous branching of zoarium.

Description. — Zoarium consists of club-shaped segments, which are preserved as detached elements. The presence at the top of one segment of 2 sockets indicates dichotomous branching of the zoarium. The segments attain a length of 1.3 to 2 mm, distally they expand and are up to 0.6—1.2 mm in width. The proximal end is distinctly

narrower, 0.2 — 0.8 mm, and bulbous. In shape and size the bulbous base corresponds to the socket at the top of the preceding segment. The diameters of the top sockets for the articulation range from 0.5 to 0.9 mm. Minute but distinct, finely serrate or crenulate ridges occur along the segment, separating the longitudinal rows of apertures. The surface of the bulbous proximal end of the segment is smooth, delicately striated. The apertures are circular or ovate and occur only on the upper part of the segment.

Variation. — The segments of *Sceptropora facula* vary in size and shape. Long and slender segments occur with short and broad ones. The apertures also show some deviations in size and shape, their diameter varies, their outline may be circular or ovate. Another variation is expressed in the ornamentation of ridges which may be serrate or crenulate.

Discussion. — The table of dimensions given below stresses the similarities and differences between specimens of *S. facula* from Poland and those described by Ulrich (1890*b*) from North America.

Comparison of dimensions:

Dimensions	Specimen from Poland No. Br. O. I	Specimen from North America
Shape	club-shaped	club-shaped
Length	1.3—2.0 mm	1.0—2.0 mm
Maximum width	0.6—1.2 „	0.7—2.0 „
Minimum width	0.2—0.8 „	0.23 „
Diameter of socket	0.5—0.9 „	—
Ridges	serrate or crenulate	delicately granulated
Proximal end	bulbous, smooth, finely striated	bulbous, smooth

The main difference consists in the variation of shape of the compared zoarial segments. The Polish specimens are more slender, since distally they do not expand so abruptly as in the proximal part. From the Estonian specimens our zoaria differ in having slightly larger segments.

Occurrence. — Boulders: 0.17 from Wielki Kack (prov. of Gdańsk) and 0.204 from Mochty (prov. of Warsaw). Estonia: Borkholm limestone (F_2) near Borkholm. U.S.A.: Cincinnati group from Manitoba and Wilmington, Illinois. Canada: English Head (1-4), Vauréal (1), the Anticosti Island.

Sceptropora florida n. sp.

(pl. X, fig. 4-5)

Holotypus: Specimen No. Br. O. I/705; pl. X, fig. 4.
Stratum typicum: indeterminate.
Locus typicus: Mochty, prov. of Warsaw, Poland.
Derivatio nominis: florida — Lat. *floridus* = flowery, with reference to the flower-like habitus of the segments.

Diagnosis. — Segments with slender, globular proximal end; ridges well developed, apertures concealed between the ridges in the distal part of segment.

Material. — 10 detached segments, in various state of preservation.

Description. — The zoarium consists of segments that are flower-like in appearance and attain a length of over 1 mm. Distally they are conspicuously expanded, with diameter up to 0.7 mm, proximally narrow, with diameter about 0.2 mm. The proximal end is small, globular, with diameter about 0.1 mm. The socket at top may be slightly concave or nearly flat, occasionally with a central slit. The strongly developed ridges, characteristic of this species, have discontinuous or constricted surfaces of edges, delicately serrate. The ridges of the expanded, distal portion of the segment are particularly well developed. They are elevated, broad, flattened, with convex outer edges that are delicately serrate. The apertures occur in the upper parts of the segment between the well developed ridges.

Variation. — It concerns the varying size of segments. The edges of the strongly developed ridges may be more or less serrate.

Discussion. — When comparing the segments of *Sceptropora florida* n.sp. with those of *S. facula* Ulrich, the most important differences will be noted in the development of ridges that run along the segments. In *S. florida* the ridges are broad, serrate, with edge line distally strongly developed, while in *S. facula* the ridges are narrow, with minutely sharply crenulate edges.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw).

Sceptropora spinosa n.sp.

(pl. X, fig. 6)

Holotypus: Specimen No. Br. 0. I/714; pl. X, fig. 6.
Stratum typicum: Baltic limestone (?)
Locus typicus: Wielki Kack, prov. of Gdańsk, Poland.
Derivatio nominis: spinosa — Lat. *spinosa* = spiny, with reference to the conspicuous spiniform processes on the surface of segments.

Diagnosis. — Zoarium consists of large segments; the top socket is broad and deep; the proximal end convex; the ridges slender, crenulate; there are 6 longitudinal rows of conspicuous spiniform processes.

Material. — One segment of zoarium, satisfactorily preserved.

Description. — Segment 2.25 mm in length, with distal part expanded to 1.35 mm in diameter. The proximal part of the segment is 0.60 mm broad, terminated by domed base, about 0.25 mm high. The top socket is broad and deep. Strong processes, arranged in 6 longitudinal rows, are the characteristic feature of this species. Narrow longitudinal ridges, with crenulate edges, occur between the rows of strong processes. Apertures are present between the ridges on the distal, expanded end of segment. They are numerous, subcircular, small, arranged in single rows.

Discussion. — Table 6 gives a comparison of three *Sceptropora* species here considered: *S. facula* Ulrich, *S. florida* n.sp. and *S. spinosa*

Table 6

Diagnostic features and measurement data of 3 species of *Sceptropora* Ulrich, 1888

Species	*Sceptropora facula* Ulrich	*Sceptropora florida* n.sp.	*Sceptropora spinosa* n.sp.
Shape of segment			
Length of segment (in mm)	1.3	1.4	2.25
Distal width of segment (in mm)	0.6	0.7	1.33
Proximal width of segment (in mm)	0.3	0.2	0.6
Height of the base of segment (in mm)	0.2	0.1	0.3
Depth of top socket (in mm)	0.2	—	0.4
Shape of socket	concave, wide	flat, with central slit	deep, wide
Number of ridges	12	20	30
Shape of ridges	narrow, with sharply serrate surface	flat, with semicircularly crenulate surface	narrow, with sharply serrate surface
Number of apertures in 1 mm	5	8	10
Shape of apertures	circular, ovate	circular	circular

n.sp. It clearly shows that the studied segments of the three zoaria are referable to three separate species of the same genus.

Occurrence. — Boulder 0.17 from Wielki Kack (prov. of Gdańsk).

Family **Ptilodictyidae** Zittel, 1880
Genus *Ptilodictya* Lonsdale, 1839

The genus *Ptilodictya* is known from the Ordovician to the Devonian of Europe, Asia and North America.

Ptilodictya gladiola Billings, 1866
(pl. IX, fig. 1)

1900. *Ptilodictya gladiola* Billings; J. M. Nickles & R. S. Bassler, A synopsis of American fossil Bryozoa..., p. 379.

1911b. *Ptilodictya gladiola* Billings; R. S. Bassler, The early Paleozoic Bryozoa..., p. 114—115, fig. 43.

1928. *Ptilodictya gladiola* Billings; R. S. Bassler, *in* W. H. Twenhofel, Geology of Anticosti Island, p. 162, pl. 10, fig. 12-13.

Material. — Two well preserved zoaria.

Description. — Zoarium consists of a lanceolate, gently flexuous frond, 0.8 mm in width. It is slightly convex, with flattened and sharp-edged margins. Two layers of tubular zooecia grow out from the median lamina or mesotheca. The apertures are of subrectangular outline, arranged in 10 or more very regular longitudinal rows. There are about 6 apertures longitudinally in 2 mm.

Variation. — It concerns mainly the size of apertures, whose length is 2 or 3, or even more times their width.

Discussion. — Our specimen is similar to a zoarium of this species, described and figured by Bassler (1911b) from the Borkholm limestone (F_2) of Estonia. The apertures of the two zoaria are of similar dimensions and both have 6 apertures longitudinally in 2 mm. The same resemblance is to be noted between the Polish specimens and the Canadian zoaria of *Ptilodictya gladiola*, described by Bassler (*in* Twenhofel, 1928) from the Ordovician of the Anticosti Island. From *Ptilodictya sulcata* Billings, 1866, from the Silurian of the Anticosti Island, *P. gladiola* differs in larger size and rectangular apertures, while those of *P. sulcata* are subquadrate and provided with single spiniform processes.

Occurrence. — Boulder 0.17 from Wielki Kack (prov. of Gdańsk). Estonia: in the Borkholm limestone of Borkholm and Lyckholm. Canada: from Ellis Bay, Becscie, Gun River, Jupiter in the Anticosti Island.

Family **Rhinidictyidae** Ulrich, 1895
Genus *Rhinidictya* Ulrich, 1882

The occurrence of genus *Rhinidictya*, which has by many authors been described under the name of *Stictopora* Ulrich, 1882, is confined

to the Ordovician and Silurian strata of Europe, Asia and North America. In our material it is represented by only one species — *Rhinidictya exserta* (Eichwald, 1847).

Rhinidictya exserta (Eichwald, 1847)

(pl. XI, fig. 2-3)

1860. *Stictopora exserta* Eichwald; E. Eichwald, Lethaea Rossica, p. 392, pl. 26, fig. 11 a-b.

1911b. *Rhinidictya exserta* (Eichwald); R. S. Bassler, The early Paleozoic Bryozoa..., p. 133-134, fig. 57-58.

1921. *Rhinidictya exserta* (Eichwald); H. Bekker, The Kuckers stage..., p. 34.

1952. *Rhinidictya* cf. *exserta* (Eichwald); H. Toots, Bryozoen des estnischen Kuckersits, p. 129, pl. pl. 10, fig. 2.

1959. *Rhinidictya exserta* (Eichwald); R. M. Männil, Voprosy stratigrafii i mšanki..., p. 38.

Material. — More than 100 fragmentary zoaria of different size; some with the base preserved.

Description. — Zoaria branching dichotomously at a rather variable angle, from 75 to 110°, at 7 mm intervals. The branches are up to 4 mm in width, up to 1 mm in thickness, compressed, with thin and sharp margins. In natural transverse section the branch has the shape of a strongly compressed disc and displays a thin, straight laminar mesotheca. The zooecial tubes, obliquely oriented, grow out of the mesotheca in two opposite directions. Apertures mostly elliptical, with granulose separating ridges, are longitudinally arranged in regular rows, from 4 to 12 in number. The lateral margins narrow, rather indistinctly granulated. The arrangement, size and shape of apertures on the same branch do not substantially differ. Only the most external apertural rows are distinguished by an oblique arrangement and somewhat larger dimensions. The production of new zooecia takes place by interpolation and causes a widening of the branch. The zoarium was attached to the substratum by a strong, well developed base. Near the base, the zoarial branch is subcircular, but grows more compressed upwards. From 4 to 5 apertures occur longitudinally in 2 mm, from 6 to 7 transversely in 2 mm.

Variation. — Our zoaria vary strongly in width and thickness of branches, also in number of zooecia, which are arranged in a varying number of rows. Moreover, the dimensions and, to a very slight extent, the shape of apertures are also subject to variation.

Discussion. — Close similarities may be observed when comparing our zoaria with conspecific specimens, described from Estonia by Bassler (1911b) and Toots (1952). Some forms among the copious Polish material are nearly identical with Estonian specimens. A number of common features have been noted with zoaria of *Rhinidictya exserta*

(Eichwald, 1847) and *R. nitidula* (Billings, 1866), described by Bassler (in Twenhofel, 1928), from the Ordovician of the Anticosti Island, Canada. The Canadian specimens differ, however, in considerably smaller width and smaller apertures arranged in the same number of rows.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). Estonia: Wesenberg (E) and Kegel (D_2) limestones, also Kuckers shales (C_2).

Genus *Pachydictya* Ulrich, 1882

The genus *Pachydictya* Ulrich has thus far been recorded from the Ordovician and Silurian strata of Europe, Asia and North America.

In the Polish material it is represented by two species: *Pachydictya bifurcata* (Hall, 1883) and *P. elegans* Ulrich, 1893.

Pachydictya bifurcata (Hall, 1883)

(pl. IX, fig 2,3)

1860. *Stictopora scalpellum* Eichwald; E. Eichwald, Lethaea Rossica, p. 390, pl. 24, fig. 15 a-c.

1902. *Rhinidictya? Borkholmiensis* Wiman; C. Wiman, Über die Borkholmer Schicht..., p. 180, pl. 6, fig. 1-7.

1911b. *Pachydictya bifurcata* (Hall); R. S. Bassler, The early Paleozoic Bryozoa..., p. 143-145, fig. 67-68.

Material. — 30 zoarial branches of different size and in various state of preservation.

Description. — Zoaria consist of narrow (1.5 mm), but rather thick (0.8 mm), dichotomously dividing branches. The margins of branches are narrower and less sharp than in other representatives of this genus. On the whole, the width of the noncelluliferous margins is equal to the average interzooecial interval and only sometimes exceeds it. The apertures are arranged in more or less regular rows, most commonly 4 or 5. The apertures are elliptical, rarely ovate, and display some size variations. Those in the most peripheral rows may be obliquely oriented and may be larger and somewhat different in outline. From 4 to 4.5 apertures occur longitudinally in 2 mm, while about 3 are present transversely in 1 mm. Surface ornamentation is missing.

Variation. — The following morphological features are more or less subject to variations: width of branches, width of noncelluliferous margins, varying number of longitudinal apertural rows, size and shape of apertures.

Discussion. — From the specimens described by Bassler (1911b) the Polish zoaria differ in thinner branches and thinner-walled zooecia, but resemble them to a varying extent in the other characters. Close similarities are also observable with zoaria from Öjle Myr, figured by

Wiman (1902), though these forms develop more longitudinal rows of apertures. From other species of *Pachydictya* our specimens differ usually in lack of ornamentation on the interzooecial spaces and the noncelluliferous margins.

Occurrence. — Boulder 0.204 from Mochty (prov. of Warsaw). Estonia: Lyckholm limestone (F_2) near Kertel and Lyckholm; Borkholm limestone (F_2) near Borkholm. Sweden: Öjle Myr in the island of Gotland. U. S. A.: Silurian limestone from Clinton, Dayton and other localities of Ohio and Indiana.

Pachydictya elegans Ulrich, 1893

(pl. VII, fig. 3)

1893. *Pachydictya elegans* Ulrich; E. O. Ulrich, On Lower Silurian Bryozoa..., p. 154, pl. 8, fig. 18—19; pl. 9, fig. 8—9.

1911b. *Pachydictya elegans* Ulrich; R. S. Bassler, The early Paleozoic Bryozoa..., p. 138—139, fig. 62 a-c.

1952. *Pachydictya elegans* Ulrich; H. Toots, Bryozoen des estnischen Kuckersits, p. 130, pl. 8, fig. 4.

1959. *Pachydictya elegans* Ulrich; R. M. Männil, Voprosy stratigrafii i mšanki..., p. 38.

Material. — 10 rather small fragments of zoaria, in various state of preservation.

Description. — The branches are narrow (up to 2 mm), about 0.5 mm thick, with compressed, broad, noncelluliferous margins. The marginal line is more or less regularly crenulated. The apertures form 3 — 5 longitudinal rows; they are elliptical-shaped, large and rimmed by elevated peristomes. From 3 to 3.5 apertures occur longitudinally in 2 mm, while 5 apertures are counted transversely in the same length. The apertures are superimposed one above the other and form longitudinal rows, separated by prominent ridges. These are gently flexuous and bear rather crowded or more widely spaced granules. The apertures of the most peripheral rows are larger and generally obliquely oriented. The granular ornamentation is extremely scarce, only a few detached minute granules are dispersed on the interzooecial spaces. A scarce number of the granules also occur in rows on the marginal edges of branches.

Variation. — The most characteristic variations which affect the zoarial branches here described concern width of branches, number of apertural rows, deviations in the shape and size of apertures.

Discussion. — The Polish specimens display rather strong similarities with *Pachydictya occidentalis* Ulrich, 1886, described by Ulrich from Trentonian shales near St. Paul in Minnesota. These two species resemble each other most particularly in a very poor granular ornamentation.

Occurrence. — Boulder 0.17 from Wielki Kack (prov. of Gdańsk). Estonia: Kuckers shales (C_2), Wesenberg limestone (E) found in C_{1b} and E horizons. U. S. A.: Galena shales at St. Paul, Minnesota; Clitambonites beds, Lower Trentonian group, Minnesota and Iowa.

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of the Polish Academy of Sciences
Warszawa, March 1962

REFERENCES

ASTROVA, G. G. 1960. Stratigrafičeskoe rasprostranenie mšanok v ordovike i silure SSSR i Severnoj Ameriki. — *Mežd. Geol. Kongr., 21 ses., Dokl. Sov. Geol.* 136-153, Leningrad.

ASTROVA, G. G. & MOROZOVA, I. P. 1956. K sistematike mšanok otrjada Cryptostomata. — *Dokl. Akad. Nauk SSSR,* **110**, 4, 661-664, Leningrad—Moskva.

BASSLER, R. S. 1906. The Bryozoan fauna of the Rochester shale (Silurian). — *U. S. Geol. Surv.,* **292**, 1-137, Washington.

— 1911*a*. Corynotrypa, a new genus of tubuliporoid Bryozoa. — *Proc. U. S. Nat. Mus.,* **39**, 497-527, Washington.

— 1911*b*. The early Paleozoic Bryozoa of the Baltic Provinces. — *Smith. Inst. U. S. Nat. Mus.,* **77**, 1-382, Washington.

— 1928. Bryozoa. *In:* Twenhofel, W. H. Geology of Anticosti Island. — *Canada Geol. Surv.,* **154**, 135, 143-168, Ottawa.

— 1934. Fossilium Catalogus, I; Animalia, Bryozoa (Generum et Genotyporum Index et Bibliographia). — 1-229, Gravenhage.

— 1952. Taxonomic notes on genera of fossil and recent Bryozoa. — *J. Wash. Acad. Sci.,* **42**, 12, 381-385, Washington.

— 1953. Bryozoa. *In:* Moore, R. C. Treatise on invertebrate paleontology. Part G. — *Geol. Soc. Amer. Univ. Kansas Press,* 1-13, G1-G253, Lawrence.

BEKKER, H. 1921. The Kuckers Stage of the Ordovician rocks of NE Estonia. — *Acta Comment. Univ. Dorpat.* AII_1, 1-92, Tartu.

BOARDMAN, R. S. 1960. Trepostomatous Bryozoa of the Hamilton Group of New York State. — *Geol. Surv. Prof. Paper,* **340**, 1-87, Washington.

CONDRA, G. E. & ELIAS, M. K. 1944. Hederella and Corynotrypa from the Pennsylvanian. — *J. Paleont.* **18**, 6, 535-539, Menasha.

DYBOWSKI, W. 1877. Die Chaetetiden der Ostbaltischen Silur-Formation. — *Rus.-K. Miner. Ges. St. Petersburg,* **2**, 14, 1-134, Dorpat.

EICHWALD, E. 1856. Beitrag zur geographischen Verbreitung der fossilen Thiere Russlands. — *Bull. Soc. Imp. Nat. Moscou,* **29**, 91-96, 448-466, Moscou.

— 1860. Lethaea Rossica ou Paléontologie de la Russie. I. Ancienne Période. Bryozoa, 355-419, 434-435, 450-452, 475-494, Stuttgart.

FRITZ, M. A. 1957. Bryozoa (mainly Trepostomata) from the Ottawa Formation (Middle Ordovician) of the Ottawa-St. Lawrence Lowland. — *Geol. Surv. Canada,* **42**, 1-41, Ottawa.

HENNIG, A. 1906. Gotlands Silur-Bryozoer, 2. — *Ark. Zool.,* **3**, 2, 10, 1-62, Uppsala & Stockholm.

JAANUSSON, V. 1956. Untersuchungen über den Oberordovizischen Lyckholm-

Stufenkomplex in Estland. — *Publ. Palaeont. Inst. Univ. Uppsala*, **36**, 12 369-398, Uppsala.

— 1960*a*. The Viruan (Middle Ordovician) of Öland. — *Ibidem*, **37**, 28, 207-288.

— 1960*b*. Graptoloids from the Ontikan and Viruan (Ordov.) Limestones of Estonia and Sweden. — *Ibidem*, **38**, 29, 289-366.

JAANUSSON, V. & STRACHAN, I. 1954. Correlation of the Scandinavian Middle Ordovician with the graptolite succession. — *Geol. Fören, Förhandl.*, **76**, 4, 684-696, Stockholm.

KALJO, D., RÕÕMUSOKS, A. & MÄNNIL, R. 1958. O serjach pribaltijskogo ordovika i ich značenii. — *Eesti NSV Tead. Akad. Toim.*, **7**, 1, 71-74, Tallin.

MÄNNIL, R. 1958. Novye mšanki otrjada Cryptostomata iz ordovika Estonii. — *Izv. Akad. Nauk. Eston. SSR*, **7**, 4, 330-347, Tallin.

— 1959. Voprosy stratigrafii i mšanki ordovika Estonii. (Avtoreferat dissertacii...). — *Akad. Nauk. Eston.* SSR, 1-40, Tallin.

— 1960. Stratigrafičeskoe značenie mšanok ordovika Pribaltiki. — *Mežd. Geol. Kongr.*, **21** *ses., Dokl. Sov. Geol.* 154-167, Leningrad.

MODZALEVSKAYA, E. A. 1953. Trepostomaty ordovika Pribaltiki i ich stratigrafičeskoe značenie. — *Tr. VNIGRI, n. ser.*, **78**, 91-167, Moskva-Leningrad.

— 1955. Kolonii mšanok ordovika i zavisimost ich ot uslovij suščestvovanija. — *Vopr. Paleont.*, **2**, 125-135, Leningrad.

— 1955. Polevoj Atlas ordovikskoj i sylurijskoj fauny Sibirskoj Platformy. — *Vses. Naucno-Issled. Geol. Inst. (VSEGEI)*. 3-140, Moskva.

NECHOROŠEV (NEKHOROSHEV), V. P. 1936. Nachodka verchnesilurijskich mšanok v Tannu-Tuve. — *Tr. CNIGRI*, **61**, 37-40.

— 1948. Devonskie mšanki Altaja. — *Paleontologia SSSR*, **3**, 2, 1, 1-172, Moskva, Leningrad.

— 1960. Značenie mšanok dla stratigrafii i paleogeografii ordovika SSSR. — *Mežd. Geol. Kongr.*, **21** *ses., Dokl. Sov. Geol.*, 129-135, Leningrad.

— 1961. Ordovikskie i silurijskie mšanki Sibirskoj Platformy. — *Tr. VSEGEI*, n. ser., **41**, 2, 1-168, Moskva.

NICKLES, J. M. & BASSLER, R. S. 1900. A synopsis of American fossil Bryozoa including bibliography and synonymy. — *Bull. U. S. Geol. Surv.*, **173**, 1-663, Washington.

PHILLIPS-ROSS, J. R. P. 1960. Larger Cryptostome Bryozoa of the Ordovician and Silurian, Anticosti Island, Canada. Part 1. — *J. Paleont.*, **34**, 6, 1057-1076, Menasha.

RÕÕMUSOKS, A. 1960. Stratigraphy and paleogeography of the Ordovician in Estonia. — *Int. Geol. Congr., Rep.* **21** *Sess., Norden.* Pt. VII, Ordovician and Silurian stratigraphy and correlations. 58-69, Copenhagen.

SARYČEVA (SARYCHEVA), T. G. 1960. *In:* J. A. Orlov, Osnovy Paleontologii. Spravočnik dlja paleontologov i geologov SSSR. — *Izdat. Akad. Nauk. SSSR*, 5-112, Moskva.

SOKOLOV, B. S., ALICHOVA, T. N., KELLER, B. M., NIKIFOROVA, O. I. & OBUT, A. M. 1960. Stratigrafija, korrelacija i paleogeografija ordovika SSSR. — *Mežd. Geol. Kongr.*, **21** *sess., Dokl. Sov. Geol.*, 7-21, Leningrad.

TOOTS, H. 1952. Bryozoen des estnischen Kukersits. — *Mitt. Geol. Staatsinst.*, **21**, 113-137, Hamburg.

TWENHOFEL, W. H. 1928. Geology of Anticosti Island. — *Canada Geol. Surv.*, **154**, 135, 1-481, Ottawa.

TWENHOFEL, W. H., DUNBAR, C. O., WHITTINGTON, H. B. et alii. 1954. Correlation of the Ordovician formations North America. — *Bull. Geol. Soc. Amer.*, **65**, 247-298. New York.

ULRICH, E. O. 1882—1884. American Palaeozoic Bryozoa. — *J. Cincinnati Soc. Nat. Hist.*, 1882, **5**, 121-175, 232-257; 1883, **6**, 82-92, 148-168, 245-279; 1884, **7**, 24-51.
— 1886. Report of the Lower Silurian Bryozoa of Minnesota. — *Geol. Nat. Hist. Surv. Minnesota*, 57-113, St. Paul.
— 1890*a*. New Lower Silurian Bryozoa. — *J. Cincinnati Soc. Nat. Hist.*, 173-198.
— 1890b. Palaeozoic Bryozoa. — *Illinois Geol. Surv.*, **8**, 283-688, Springfield.
— 1893. On Lower Silurian Bryozoa of Minnesota. — *Geology Minnesota*, **3**, 1, 96-332, Minneapolis.
WIMAN, C. 1902. Über die Borkholmer Schicht im Mittelbaltischen Silurgebiet. — *Bull. Geol. Inst. Univ. Uppsala*, **5**, 2, 149-222, Uppsala.

MARIA KIEPURA

BRYOZOA Z ORDOWICKICH GŁAZÓW NARZUTOWYCH POLSKI

Streszczenie

WSTĘP

Mszywioły, opisane w niniejszej pracy, zostały wypreparowane z siedmiu ordowickich głazów narzutowych, zebranych w następujących miejscowościach: Zbójno, Wielki Kack, Wyszogród, Mochty i Ustka. Reprezentują one 3 rzędy: Cyclostomata, Trepostomata i Cryptostomata. Ogółem zidentyfikowano 34 gatunki, należące do 22 rodzajów i 10 rodzin, w tym jako nowe dla nauki wyróżniono: 1 rodzaj, 1 podrodzaj i 10 gatunków.

Niektóre z omawianych narzutniaków zawierają, oprócz Bryozoa, szczątki wielu innych grup zwierząt (Ostracoda, Brachiopoda, Anthozoa, Annelida, Graptolithina). Stanowią one część pokaźnej kolekcji narzutniaków ordowickich, należącej do Profesora Romana Kozłowskiego, pod którego kierunkiem wykonałam niniejszą pracę.

CHARAKTERYSTYKA MATERIAŁU

Okazy opisanych w niniejszej pracy mszywiołów są skrzemionkowane. Proces sylifikacji nie spowodował jednak poważniejszych zniekształceń strukturalnych, chociaż okazy są bardzo kruche i do przygotowania szlifów cienkich na ogół się nie nadają.

Zespół wypreparowanych mszywiołów ordowickich jest dość bogato zróżnicowany pod względem taksonomicznym. Najliczniej reprezentowane są Cryptostomata (18 gatunków) i Cyclostomata (12 gatunków), a najbardziej ubogo Trepostomata (4 gatunki). Ilość okazów w obrębie poszczególnych gatunków jest przeważnie niewielka. Najobficiej występują *Rhinidictya exserta* (Eichwald), *Pachy-*

dictya bifurcata (Hall), *Glauconomella plumula* (Wiman) i najbardziej gatunkowo zróżnicowany rodzaj *Corynotrypa*.

Opisane Bryozoa zostały wypreparowane przy pomocy kwasu solnego z głazów narzutowych Nr 0.12, 0.17, 0.124, 0.204, 0.233, 0.268 i 0. 298. Jedynie głaz 0.17, prawie kompletnie skrzemionkowany, był trawiony kwasem fluorowodorowym, który jednak skrzemionkowanych okazów Bryozoa nie atakował.

Tabela 1 (str. 350) przedstawia wykaz gatunków Bryozoa w omawianych siedmiu głazach. Każdy z narzutniaków odznacza się niemal odrębnym gatunkowo zespołem Bryozoa.

Odnośnie wieku opisywanych narzutniaków należy podkreślić, że głaz 0,233 z *Orthograptus gracilis* (Roemer) należy, według wszelkiego prawdopodobieństwa, do części środkowej ordowiku górnego. Głazy 0.12, 0.17 i 0.298, aczkolwiek nie dostarczyły tego przewodniego graptolita, mają ten sam charakter litologiczny i zapewne ten sam wiek. Wiek głazów 0.124, 0.204 i 0.268, ze względu na brak w nich przewodnich graptolitów, nie może być na razie ściśle ustalony. Również i Bryozoa wydobyte z omawianych głazów nie określają w dostatecznej mierze ich wieku, gdyż zidentyfikowane tutaj gatunki bywają związane zarówno ze środkowym, jak i górnym ordowikiem.

ZAGADNIENIE WIEKU ZBADANYCH MSZYWIOŁÓW

Ordowickie głazy narzutowe Polski, pochodzące z obszaru bałtycko-skandynawskiego, nie pozwalają rozstrzygnąć bez zastrzeżeń, do jakich poziomów stratygraficznych mogą być zaliczane występujące w nich skamieniałości. Opierając się przede wszystkim na materiale mszywiołowym oraz na analogiach faunistyczno-stratygraficznych, wiek badanych narzutniaków można określić jedynie jako środkowy i górny ordowik. Bryozoa z głazów typu wapienia bałtyckiego (Ostseekalk) reprezentują najprawdopodobniej środkową część ordowiku górnego. Wiek mszywiołów z pozostałych głazów nie może być ściślej ustalony, gdyż inne skamieniałości, występujące w nich obok Bryozoa, na ogół nie zostały jeszcze opracowane.

W celu ustalenia wieku badanych mszywiołów uwzględniono rozprzestrzenienie stratygraficzne Bryozoa ordowickich Związku Radzieckiego (głównie Estonii), Szwecji, Stanów Zjednoczonych A. P. oraz Kanady, tj. regionów, z których opisano gatunki mszywiołów, stwierdzone obecnie w polskich głazach narzutowych (tabela 2, str. 354). Wszystkie te gatunki są środkowo- lub górno-ordowickie, z wyjątkiem jednego — *Phylloporina sublaxa* Ulrich, występującego w ordowiku dolnym Stanów Zjednoczonych A. P. Niektóre z oznaczonych gatunków są znane ze środkowego i górnego ordowiku Związku Radzieckiego (głównie Estonii), Stanów Zjednoczonych A. P. oraz Kanady (Ottawa, Quebec, Anticosti) oraz z górnego ordowiku Szwecji (Öjle Myr, mszywioły wypreparowane z narzutniaków).

14 z opisanych w niniejszej pracy gatunków występuje w środkowym i gór-

nym ordowiku Estonii, przy czym 4 są gatunkami środkowo-ordowickimi (*Crepipora schmidti* Bassler, *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich)), 8 z nich — to gatunki górno-ordowickie (*Corynotrypa (Corynotrypa) dissimilis* (Vine), *C. (Corynotrypa) inflata* (Hall), *Stellipora vesiculosa* Modzalevskaya, *Glauconomella plumula* (Wiman), *Nematopora sublineata* Männil, *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings *Pachydictya bifurcata* (Hall), zaś 2 gatunki występują zarówno w środkowym, jak i górnym ordowiku (*Rhinidictya exserta* (Eichwald), *Pachydictya elegans* Ulrich)).

Mszywioły Szwecji, opisane przez Wimana (1902) z Öjle Myr (Gotland), pochodziły — podobnie jak materiał polski — z głazów narzutowych. Narzutniaki zbadane przez Wimana zawierały, oprócz podobnych Bryozoa, także zbliżony do naszego zespół innych organizmów. Ponadto, sądząc z opisów Wimana, wykazywały one pewne podobieństwo litologiczne do niektórych polskich głazów narzutowych, np. do głazu 0.17 z Wielkiego Kacka, oraz do górno-ordowickich wapieni borkholmskich Estonii. W głazach szwedzkich i polskich występują następujące wspólne gatunki Bryozoa: *Enallopora exigua* (Ulrich), *Glauconomella plumula* (Wiman), *Pachydictya bifurcata* (Hall). Są to formy górno-ordowickie.

Bardzo bogate w Bryozoa utwory ordowickie Stanów Zjednoczonych A. P. wykazują 14 gatunków, wspólnych z zespołem mszywiołowym z głazów narzutowych Polski. 6 z tych gatunków znanych jest ze środkowego ordowiku (*Ceramoporella interporosa* Ulrich, *Bythopora* cf. *subgracilis* (Ulrich) *Hallopora dumalis* (Ulrich), *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler, *Pachydictya elegans* Ulrich), 3 gatunki — to formy górno-ordowickie (*Crepipora* cf. *solida* Ulrich, *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich), 4 gatunki występują w środkowym i górnym ordowiku (*Corynotrypa (Corynotrypa) inflata* (Hall), *Ceramoporella distincta* Ulrich, *Crepipora simulans* Ulrich, *Enallopora exigua* (Ulrich)), zaś 1 gatunek (*Phylloporina sublaxa* Ulrich) znany jest zarówno z dolnego, jak i ze środkowego ordowiku.

Wśród ordowickich mszywiołów Kanady występuje 5 gatunków wspólnych z naszymi, przy czym 3 znane są z utworów górno-ordowickich (*Corynotrypa (Corynotrypa) dissimilis* (Vine), *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings), 1 gatunek (*C. (Corynotrypa) canadensis* (Whiteaves)) występuje w środkowym ordowiku, zaś gatunek *Enallopora exigua* (Ulrich) znany jest ze środkowego i górnego ordowiku Kanady.

Zasięg stratygraficzny gatunków, zidentyfikowanych w materiale mszywiołowym z ordowickich głazów narzutowych Polski, przedstawiony został na tabeli 3, a zasięg stratygraficzny rodzajów — na tabeli 4 (str. 356-357).

ROZPRZESTRZENIENIE GEOGRAFICZNE

W zespole mszywiołów polskich, gatunkiem o największym zasięgu geograficznym jest *Enallopora exigua* (Ulrich), znany ze Związku Radzieckiego (środkowy ordowik), Szwecji (górny ordowik) oraz ze Stanów Zjednoczonych A. P.

i z Kanady (środkowy i górny ordowik). Podobnie dużym rozprzestrzenieniem geograficznym odznacza się *Sceptropora facula* Ulrich, który jako gatunek górno-ordowicki znany jest ze Związku Radzieckiego, Stanów Zjednoczonych A. P. i z Kanady. Gatunkiem o dużym zasięgu geograficznym jest również *Glauconomella plumula* (Wiman), występujący w górnym ordowiku Związku Radzieckiego, Szwecji i Stanów Zjednoczonych A. P.

Badając rozprzestrzenienie geograficzne przeważającej części mszywiołów z polskich głazów narzutowych, można wyróżnić trzy grupy geograficzne:

1) najliczniejsza — obejmuje gatunki znane dotychczas z Ameryki Północnej, z utworów ordowickich (*Corynotrypa (Corynotrypa) canadensis* (Whiteaves), *Ceramoporella distincta* Ulrich, *C. interporosa* Ulrich, *Crepipora simulans* Ulrich, *C.* cf. *solida* Ulrich, *Phylloporina sublaxa* Ulrich, *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler), bądź sylurskich (*Pachydictya bifurcata* (Hall));

2) nieliczna — obejmuje gatunki stwierdzone dotychczas wyłącznie w ordowiku Europy (*Crepipora schmidti* Bassler, *Nematopora sublineata* Männil, *Rhinidictya exserta* (Eichwald));

3) podobnie liczna jak grupa pierwsza — obejmuje gatunki występujące zarówno w Europie, jak i w Ameryce Północnej, w ordowiku (*Corynotrypa (Corynotrypa) inflata* (Hall), *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich), *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich, *Pachydictya elegans* Ulrich) oraz w sylurze (*Corynotrypa (Corynotrypa) dissimilis* (Vine), *Ptilodictya gladiola* Billings).

Zespół mszywiołów narzutniakowych Polski pochodzi prawdopodobnie z basenu Prowincji Bałtyckiej, za czym przemawia stosunkowo duży udział form bałtyckich (14 gatunków, 17 rodzajów). Obecność dużej liczby gatunków i rodzajów północno-amerykańskich (17 gatunków, 19 rodzajów) zdecydowanie potwierdza ścisłe powiązanie faun mszywiołów bałtyckich z amerykańskimi w czasie środkowego i górnego ordoviku.

OPISY NOWYCH FORM

Rząd **Cyclostomata** Busk, 1852
Podrząd **Tubuliporina** Milne-Edwards, 1839
Rodzina **Diastoporidae** Gregory, 1899
Rodzaj *Corynotrypa* Bassler, 1911
Corynotrypa (Corynotrypa) bassleri n. sp.
(tekst-fig. 6-8; pl. I, fig. 4-5)

Zoecja o kształtnym pokroju, z wyraźnym, długim i wąskim stolonem, od 2 do 3,5 razy szersze w części dystalnej, niż w proksymalnej. Wysoka, wysmukła szyjka osiąga niekiedy połowę lub nieco więcej długości całego zoecjum.

Jest ona nieco poszerzona ku górze i kończy się obwódką o postrzępionych brzegach. Apertury przeważnie okrągłe. Powierzchnia bazalna, podobnie jak frontalna strona zoecjum, wypukła.

Głaz 0.17, Wielki Kack (woj. gdańskie) i 0.233, Mochty (woj. warszawskie).

Corynotrypa (Corynotrypa) gibbosa n. sp.
(tekst-fig. 9, 10; pl. II, fig. 1)

Zoecja bardzo krótkie, długości do 0,64 mm. Oryginalny kształt zoecjów przejawia się w wydatnym, kopulastym poszerzeniu ich części środkowej. Stolon osiąga przeważnie połowę długości całego okazu; jest on cienki i odgraniczony wyraźnie od pozostałej części garbowato poszerzonej rurki zoecjalnej. Szyjka perystomalna niezbyt wysoka, przeważnie uszkodzona. Apertury najczęściej okrągłe. Powierzchnia bazalna zoecjum jest wypukła. Kształt zoecjów bardzo zmienny.

Głaz 0.233, Mochty (woj. warszawskie).

Podrodzaj *Corynotrypa (Dentalitrypa)* n. subgen.

Zoecja maczugowate, z wypukłą stroną bazalną; stolon długości umiarkowanej; apertury przeważnie owalne; szyjka perystomalna niska, wewnątrz przy podstawie opatrzona dwoma zębowatymi wyrostkami.

Gatunek typowy niżej opisany.

Corynotrypa (Dentalitrypa) bidens n. sp.
(tekst-fig. 11-13; pl. II, fig. 2-3)

Zoecjum kształtu maczugowatego. Strona bazalna i frontalna wypukłe. Stolon krótki. Wewnątrz niskiej szyjki perystomalnej, u jej nasady, wykształcone 2 wydatne wyrostki zębowate. Apertury najczęściej owalne.

Głaz 0.17, Wielki Kack (woj. gdańskie) i 0.233, Mochty (woj. warszawskie).

Rząd **Trepostomata** Ulrich, 1882
Podrząd **Amalgamata** Ulrich & Bassler, 1904
Rodzina **Batostomellidae** Miller, 1889
Rodzaj *Orbipora* Eichwald, 1856
Orbipora minima n. sp.
(pl. III, fig. 1)

Zoarium hemisferyczne, z podstawą spłaszczoną lub nieco wklęsłą, mniej lub bardziej kolistą w zarysie. Rurki zoecjalne prawie jednakowej szerokości na całej długości. Apertury przeważnie sześcioboczne, rzadziej wieloboczne lub owalne. Dookoła apertur, w miejscach połączeń ścian zoecjalnych, wykształcone są akantopory w postaci kolczastych wyrostków.

Głaz 0.204, Mochty (woj. warszawskie).

Rząd **Cryptostomata** Vine, 1883
Rodzina **Phylloporinidae** Ulrich, 1890
Rodzaj *Conphylloporina* n. gen.

Zoarium siateczkowate; szerokie gałązki, z dwoma rzędami dużych, tetragonalnych apertur; układ apertur naprzemianległy; strona bezzoecjalna granulowana, z drobnymi porami; mezopory niewielkie.

Gatunek typowy niżej opisany.

Conphylloporina mochtyensis n. sp.
(pl. VIII, fig. 3)

Szeroko gałązkowe, siateczkowate zoarium, z naprzemianległym układem apertur. Apertury, otoczone bardzo niskimi perystomami, mają zarys tetragonalny; ustawione są nieco skośnie, w dwóch rzędach. Są one tak duże, że każda z nich zajmuje połowę lub więcej szerokości gałązki. Pomiędzy aperturami, w peryferycznych częściach gałązek, występują mezopory, umieszczone przeważnie parami, w wyraźnych zagłębieniach. Fenestrule wydłużone, w części proksymalnej zaokrąglone, a w dystalnej ostro zakończone. Strona bezzoecjalna gałązek jest granulowana, a na jej powierzchni występują bezładnie rozrzucone pory.

Głaz 0.204, Mochty (woj. warszawskie).

Rodzina **Fenestellidae** King, 1850
Rodzaj *Fenestella* Lonsdale, 1839
Fenestella vistulensis n. sp.
(tekst-fig. 17; pl. V, fig. 2)

Zoarium wachlarzowate, o delikatnych gałązkach. Apertury ustawione w dwóch rzędach, okrągłe lub owalne, z bardzo niskimi perystomami. Kil niski, lecz dość ostry, z rzadkimi i wysokimi kolczastymi wyrostkami. Dissepimenta cienkie i krótkie. Fenestrule mniej lub więcej wydłużone, prostokątne, owalne, lub o zarysie nieregularnym. Dookoła jednej fenestruli występuje 6-8 apertur.

Głaz 0.204, Mochty (woj. warszawskie).

Rodzaj *Semicoscinium* Prout, 1859
Semicoscinium ordovicium n. sp.
(pl. VII, fig. 2)

Zoarium o wysmukłych, nieznacznie falisto wygiętych, anastomozujących gałązkach. Gałązki w przekroju wypukłe, lub niekiedy na stronie bezzoecjalnej prawie płaskie. Zoecja ustawione w dwa rzędy, oddzielone bardzo wysokim, dobrze rozwiniętym kilem. Kil w pobliżu powierzchni gałązki bardzo cienki, w partiach szczytowych poszerza się i wytwarza kolcowate guzki oraz podłużną, ostrą krawędź. Fenestrule przeważnie owalne.

Głaz 0.268, Mochty (woj. warszawskie).

Rodzina **Arthrostylidae** Ulrich, 1888
Rodzaj *Heminematopora* Bassler, 1952
Heminematopora rossi n. sp.
(pl. XI, fig. 1)

Zoaria cienkogałązkowe, rozgałęziające się dychotomicznie. Apertury owalne otoczone niskim perystomem, ustawione w 4 podłużne rzędy, oddzielone cienkimi listewkami. Bezzoecjalna powierzchnia gałązki wykazuje podłużne prążkowanie.

Głaz 0.204, Mochty (woj. warszawskie).

Rodzaj *Sceptropora* Ulrich, 1888
Sceptropora florida n. sp.
(pl. X, fig. 4-5)

Segmenty, z których składa się zoarium, przypominają wyglądem kielichy kwiatów. Są one wydatnie poszerzone w części dystalnej i wąskie w części proksymalnej. Nasada segmentu mała, kuleczkowata, a zagłębienie szczytowe lekko wklęsłe lub prawie płaskie. Silnie rozwinięte listewki podłużne mają płaszczyzny krawędziowe przerywane, o drobno ząbkowanych brzegach. Szczególnie silnie wykształcone są listewki w dystalnej, poszerzonej części segmentu. Apertury występują w górnych częściach segmentu, pomiędzy silnie rozwiniętymi listewkami.

Głaz 0.204, Mochty (woj. warszawskie).

Sceptropora spinosa n. sp.
(pl. X, fig. 6)

Zoarium złożone z dużych segmentów, zakończonych kopulasto w części proksymalnej. Zagłębienie szczytowe szerokie i głębokie. Znamienną cechą tego gatunku są bardzo silne wyrostki, ustawione jeden nad drugim, w 6 podłużnych rzędów. Pomiędzy dwoma rzędami wyrostków wykształcone są wąskie, podłużne listewki, o piłkowanych krawędziach. W dystalnej części segmentu, pomiędzy listewkami, występują apertury. Zarys apertur, ułożonych w pojedyncze szeregi, jest okrągły.

Głaz 0.17, Wielki Kack (woj. Gdańskie).

OBJAŚNIENIA DO ILUSTRACJI

Fig. 1 (p. 361)

Corynotrypa (Corynotrypa) canadensis (Whiteaves). Pojedyncze zoecjum z zachowanymi podstawami dychotomicznego rozwidlenia gałązki: *A* z góry, *B* z boku, z widocznymi strefami wzrostu. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/8.

Fig. 2 (p. 362)

C. (Corynotrypa) canadensis (Whiteaves). Profile szeregu oddzielnych zoecjów o zmiennym nachyleniu szyjki perystomalnej.

Fig. 3 (p. 363)

C. (Corynotrypa) dissimilis (Vine). Pojedyncze zoecjum: *A* z góry, *B* z boku. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/201.

Fig. 4 (p. 364)

C. (Corynotrypa) dissimilis (Vine). Pojedyncze zoecjum widziane z boku. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/202.

Fig. 5 (p. 366)

C. (Corynotrypa) inflata (Hall). Pojedyncze zoecjum: *A* z góry, *B* z boku. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/300.

Fig. 6 (p. 367)

C. (Corynotrypa) bassleri n. sp. *A* i *B*. Dwa pojedyncze zoecja, widziane z boku: *A* holotyp, No. Br. 0.I/321; *B* paratyp, No. Br. 0.I/325. Głaz 0.233, Mochty (woj. warsz.).

Fig. 7 (p. 368)

C. (Corynotrypa) bassleri n. sp. Pojedyncze zoecjum z zachowanymi podstawami dychotomicznego rozwidlenia gałązki: *A* z góry, *B* z boku. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/340.

Fig. 8 (p. 369)

C. (Corynotrypa) bassleri n. sp. *A-D* Szereg oddzielnych zoecjów, widzianych z profilu.

Fig. 9 (p. 370)

C. (Corynotrypa) gibbosa n. sp. Dwa połączone zoecja różnego kształtu, z zaznaczoną ornamentacją, widziane z boku, holotyp. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/325.

Fig. 10 (p. 371)

C. (Corynotrypa) gibbosa n. sp. *A-C*. Szereg zoecjów różnego kształtu, widzianych z profilu.

Fig. 11 (p. 372)

Corynotrypa (Dentalitrypa) bidens n. sp. Pojedyncze zoecjum: *A* z góry, *B* z boku, holotyp. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/410.

Fig. 12 (p. 372)

C. (Dentalitrypa) bidens n. sp. Dwa połączone zoecja; paratyp: *A* z góry, *B* z boku. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/418.

Fig. 13 (p. 373)

C. (Dentalitrypa) bidens n. sp. Pojedyncze zoecjum z zachowanymi podstawami dychotomicznego rozwidlenia gałązki, widziane z góry, z dobrze zachowanymi wyrostkami zębowatymi; paratyp. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/413.

Fig. 14 (p. 375)

Flabellotrypa rugulosa Bassler. Różne stadia rozwojowe zoarium: *A* o 2 zoecjach, *B* o 5 zoecjach, *C* o 7 zoecjach, *D* o 16 zoecjach. Głaz 0.17. Wielki Kack (woj. gdańskie); No. Br. 0.I/421, 422, 423, 424.

Fig. 15 (p. 375)

Flabellotrypa rugulosa Bassler. Fragment brzegu zoarium z widocznymi aperturami (schemat): *a-d* apertury starszych zoecjów, *e*, *f* apertury młodych zoecjów, występujące w pobliżu powierzchni bazalnej zoarium; *fr.* powierzchnia frontalna zoarium, *bas.* powierzchnia bazalna zoarium.

Fig. 16 (p. 381)

Crepipora schmidti Bassler. Fragment zoarium (schemat): *a* apertura zoecjum ze wzniesionym lunarium, *b* ściana frontalna zoecjum z podłużną krawędzią, *c* mezopora.

Fig. 17 (p. 393)

Fenestella vistulensis n. sp. Fragment zoarium (schemat), widziany lekko skośnie, z zaznaczonymi wysokimi wyrostkami akantoporowymi.

PL. I

Corynotrypa (Corynotrypa) inflata (Hall)

Fig. 1 Pojedyncze zoecjum: *a* z góry, *b* z boku; × 45. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/310.

Fig. 2. Pojedyncze zoecjum: *a* z góry, *b* z boku; × 45. Głaz — jak fig. 1; No. Br. 0.I/311.

Corynotrypa (Corynotrypa) dissimilis (Vine)

Fig. 3. Pojedyncze zoecjum, widziane z boku; × 43. Głaz — jak fig. 1; No. Br. 0.I/203.

Corynotrypa (Corynotrypa) bassleri n. sp.

Fig. 4. Pojedyncze zoecjum, widziane z boku; × 32. Głaz — jak fig. 1; No. Br. 0.I/340.

Fig. 5. Pojedyncze zoecjum, widziane z boku, holotyp; × 32. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/321.

Corynotrypa (Corynotrypa) canadensis (Whiteaves)

Fig. 6. Pojedyncze zoecjum, widziane z boku; × 60. Głaz — jak fig. 1; No. Br. 0.I/10.

Fig. 7. Pojedyncze zoecjum z zachowanymi podstawami dychotomicznego rozwidlenia gałązki, widziane z boku; × 43. Głaz — jak fig. 1; No. Br. 0.I/8.

PL. II

Corynotrypa (Corynotrypa) gibbosa n. sp.

Fig. 1. Dwa połączone zoecja różnego kształtu widziane z boku; × 50. Głaz 0.233, Mochty (woj. warsz.); No. Br. 0.I/355.

Corynotrypa (Dentalitrypa) bidens n. sp.

Fig. 2. Pojedyncze zoecjum, widziane z boku; × 30. Głaz — jak fig. 1; No. Br. 0.I/411.

Fig. 3. Pojedyncze zoecjum z zachowanymi podstawami dychotomicznego rozwidlenia gałązki, widziane z góry; × 30. Głaz — jak fig. 1; No. Br. 0.I/412.

Ceramoporella interporosa Ulrich

Fig. 4. Zewnętrzny wygląd zoarium; × 9. Głaz 0.124, Wyszogród (woj. warszawskie); No. Br. 0.I/490.

Flabellotrypa rugulosa Bassler

Fig. 5. Zewnętrzny wygląd zoarium; × 25. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/428.

Crepipora simulans Ulrich

Fig. 6 Zewnętrzny wygląd zoarium; × 8. Głaz 0.204, Mochty (woj. warsz.); No. Br. I/498.

Crepipora schmidti Bassler

Fig. 7. Zewnętrzny wygląd zoarium; × 18. Głaz — jak fig. 6; No. Br. 0.I/502.

PL. III

Orbipora minima n. sp.

Fig. 1. Zewnętrzny wygląd zoarium; holotyp. × 15. Głaz 0. 204, Mochty (woj. warsz.); No. Br. 0.I/526.

Stellipora vesiculosa Modzalevskaya

Fig. 2. Zewnętrzny wygląd zoarium; × 5. Głaz — jak fig. 1; No. Br. 0.I/529.

Crepipora cf. *solida* Ulrich

Fig. 3. Zewnętrzny wygląd zoarium; × 10. Głaz — jak fig. 1; No. Br. 0.I/508.

Chasmatopora sp.

Fig. 4. Zewnętrzny wygląd zoarium: *a* strona zoecjalna, *b* strona bezzoecjalna; × 15. Głaz — jak fig. 1; No. Br. 0.I/550.

PL. IV

Hallopora dumalis Ulrich

Fig. 1. *a* Zewnętrzny wygląd zoarium, *b* naturalnie odsłonięty przekrój podłużny; × 12. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0. I/530.

Bythopora cf. *subgracilis* (Ulrich)

Fig. 2. Zewnętrzny wygląd zoarium dychotomicznie rozgałęziającego się; × 16. Głaz — jak fig. 1; No. Br. 0.I/513.

Fig. 3. Zewnętrzny wygląd zoarium; × 40. Głaz — jak fig. 1; No. Br. 0.I/518.

PL. V

Phylloporina sublaxa Ulrich

Fig. 1. Zewnętrzny wygląd zoarium: *a* strona zoecjalna, *b* strona bezzoecjalna; × 17. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/540.

Fenestella vistulensis n. sp.

Fig. 2. Zewnętrzny wygląd zoarium: *a* strona zoecjalna, *b* strona bezzoecjalna; holotyp. × 23. Głaz — jak fig. 1; No. Br. 0.I/556.

PL. VI

Enallopora exigua (Ulrich)

Fig. 1. Zewnętrzny wygląd zoarium: *a* strona zoecjalna, *b* strona bezzoecjalna; × 25. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/562.

Fig. 2. Zoarium dychotomicznie rozgałęziające się, z zachowaną podstawą: *a* widoczne apertury zoecjalne i liczne pory, *b* widoczne apertury i nieliczne pory; × 25. Głaz — jak fig. 1; No. Br. 0.I/574.

PL. VII

Ceramoporella distincta Ulrich

Fig. 1. Zewnętrzny wygląd zoarium; × 20. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/441.

Semicoscinium ordovicium n. sp.

Fig. 2. Zewnętrzny wygląd zoarium, z widocznym kilem; holotyp. × 20. Głaz 0.268, Mochty (woj. warsz.); No. Br. 0.I/581.

Pachydictya elegans Ulrich

Fig. 3. Fragment gałązki zoarium z dobrze zachowaną strukturą zewnętrzną; × 20. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/847.

PL. VIII

Arthrostyloecia nitida Bassler

Fig. 1. Zewnętrzny wygląd segmentu zoarium; × 20. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/591.

Glauconomella plumula (Wiman)

Fig. 2. Fragment gałązki zoarium: *a* strona zoecjalna, *b* strona bezzoecjalna; × 14. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/605.

Conphylloporina mochtyensis n. sp.

Fig. 3. Fragment siateczkowatego zoarium: *a* strona zoecjalna z tetragonalnymi, naprzemianległymi aperturami i mezoporami, *b* strona bezzoecjalna granulowana i prążkowana podłużnie z porami; holotyp. × 12. Głaz — jak fig. 2; No. Br. 0.I/551.

PL. IX

Ptilodictya gladiola Billings

Fig. 1. Fragment gałązki zoarium; × 13. Głaz 0.17, Wielki Kack (woj. gdańskie); No. Br. 0.I/715.

Pachydictya bifurcata (Hall)

Fig. 2. Fragment dychotomicznie rozwidlonej gałązki zoarium; × 8,5. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/817.

Fig. 3. Fragment gałązki zoarium, część terminalna; × 8,5. Głaz — jak fig. 2; No. Br. 0.I/829.

Heminematopora? virginiana Bassler

Fig. 4. Fragment zoarium z zachowaną podstawą; × 28. Głaz — jak fig. 2; No. Br. 0.I/617.

Fig. 5. Fragment zoarium ontogenetycznie starszego, niż zoarium zamieszczone na fig. 4; × 28. Głaz — jak fig. 2; No. Br. 0.I/620.

Nematopora sublineata Männil

Fig. 6. Fragment gałązki zoarium; × 25. Głaz — jak fig. 1; No. Br. 0.I/678.

PL. X

Sceptropora facula Ulrich

Fig. 1. Pojedynczy segment zoarium; × 50. Głaz 0.17, Wielki Kack (woj. warsz.); No. Br. 0.I/684.

Fig. 2. Pojedynczy segment zoarium; × 40. Głaz — jak fig. 1; No. Br. 0.I/687.

Fig. 3. Pojedynczy segment zoarium z dwoma zagłębieniami szczytowymi, wskazującymi na dychotomiczne rozwidlanie się kolonii; × 25. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/703.

Sceptropora florida n. sp.

Fig. 4. Pojedynczy segment zoarium, holotyp; × 50. Głaz — jak fig. 3; No. Br. 0.I/705.

Fig. 5. Pojedynczy segment zoarium; × 50. Głaz — jak fig. 3; No. Br. 0.I/708.

Sceptropora spinosa n. sp.

Fig. 6. Pojedynczy segment zoarium; holotyp. × 27. Głaz — jak fig. 1; No. Br. 0.I/714.

PL. XI

Heminematopora rossi n. sp.

Fig. 1. Fragment zoarium z odgałęzieniem bocznym: *a* strona zoecjalna, *b* strona bezzoecjalna; holotyp. × 24. Głaz 0.204, Mochty (woj. warsz.); No. Br. 0.I/632.

Rhinidictya exserta (Eichwald)

Fig. 2. Fragment zoarium dychotomicznie rozgałęziającego się; × 7,5. Głaz — jak fig. 1; No. Br. 0.I/720.

Fig. 3. Fragment zoarium; × 10. Głaz — jak fig. 1; No. Br. 0.I/802.

МАРИЯ КЕПУРА

МШАНКИ ИЗ ОРДОВИКСКИХ ВАЛУНОВ ПОЛЬШИ

Резюме

ВСТУПЛЕНИЕ

Описанные в настоящей работе мшанки отпрепарированы из семи ордовикских валунов, собранных в следующих местностях: Збуйно, Вельки Кацк, Вышогруд, Мохты и Устка. В материале имеются представители трех отрядов: Cyclostomata, Trepostomata и Cryptostomata. В общем идентифицировано 34 видов принадлежащих 22 родам и 10 семействам. В том числе новыми для науки являются: 1 род, 1 подрод и 10 видов.

Некоторые из упомянутых валунов кроме мшанок содержат остатки многих других животных (Ostracoda, Brachiopoda, Anthozoa, Annelida, Graptolithina). Составляют они часть большой коллекции ордовикских валунов, принадлежащей проф. Р. Козловскому, под которого руководством исполнена настоящая работа.

ХАРАКТЕРИСТИКА МАТЕРИАЛА

Описанные образцы мшанок силифицированы. Хотя вследствие процесса силификации не произошли более серьёзные искажения структуры, однако образцы очень хрупкие и по большей части непригодны для изготовления тонких шлифов.

Комплекс отпрепарированных ордовикских мшанок, с таксономической точки зрения, довольно разнообразный. Наиболее многочисленные Cryptostomata (18 видов) и Cyclostomata (12 видов), а наиболее скудны остатки Trepostomata (4 вида). Количество образцов отдельных видов по большей части небольшое. В наибольшем изобилии встречаются *Rhinidictya exserta* (Eichwald), *Pachydictya bifurcata* (Hall), *Glauconomella plumula* (Wiman) и отличающийся наибольшим количеством видов род *Corynotrypa*.

Описанные мшанки отпрепарированы соляной кислотой из валунов отмеченных номерами 0.12, 0.17, 0.124, 0.204, 0.233, 0. 268, 0.298. Только валун 0.17, почти целиком силифицированный, отпрепарирован плавиковой кислотой, которая однако не действовала на силифицированные образцы мшанок. На таблице 1 дана перечень видов мшанок из рассматриваемых семи валунов. Каждый отличается почти совсем иным сочетанием видов (стр. 350).

Относительно возраста валунов следует подчеркнуть, что валун 0.233 с *Orthograptus gracilis* (Roemer) принадлежит, по всей вероятности, средней части верхнего ордовика. Валуны 0.12, 0.17 и 0.298, хотя не доставили остатков этого руководящего граптолита, обнаруживают тот же литологический характер и повидимому являются того же возраста. Ввиду отсутствия руководящих граптo-

литов, возраст валунов 0.124, 0.204 и 0.268 не может быть пока точно определен. Также и мшанки добыты из упоминаемых валунов не дают достаточных указаний относительно возраста, так как обнаруженные тут виды известны равным образом из среднего, как и из верхнего ордовика.

ВОПРОС ВОЗРАСТА ИЗУЧЕННЫХ МШАНОК

Ордовикские валуны Польши балтийско-скандинавского происхождения не дают возможности связать заключенные в них окаменелости с определенными стратиграфическими горизонтами. На основании материала мшанок и фаунистическо-стратиграфических аналогий изучаемые мшанки можно отнести к среднему и верхнему ордовику. Мшанки из валунов типа балтийского известняка (Ostseekalk) соответствуют, по всей вероятности, средней части верхнего ордовика. Ввиду того, что окаменелости сопровождающие мшанки еще не обработаны, точное определение возраста мшанок из остальных валунов невозможно.

Для определения возраста изучаемых мшанок учтено стратиграфическое распространение ордовикских мшанок СССР (главным образом Эстонии), Швеции, Соединенных Штатов и Канады, т.е. районов, из которых описаны виды мшанок, обнаруженные в настоящее время в польских валунах (табл. 2, стр. 354). Все эти виды средне- или верхнеордовикского возраста, за исключением одного — *Phylloporina sublaxa* Ulrich, известного из нижнего ордовика Соединенных Штатов Северной Америки. Некоторые из определенных видов известны из среднего и верхнего ордовика СССР (главным образом Эстонии), Соединенных Штатов Северной Америки и Канады (Оттава, Квибек, Антикости) и из верхнего ордовика Швеции (Öjle Myr). 14 из описанных в настоящей работе видов выступает в среднем и верхнем ордовике Эстонии, причем 4 (*Crepipora schmidti* Bassler, *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich)) являются средне-ордовикскими видами, 8 (*Corynotrypa* (*Corynotrypa*) *dissimilis* (Vine), *C.* (*C.*) *inflata* (Hall), *Stellipora vesiculosa* Modzalevskaya, *Glauconomella plumula* (Wiman), *Nematopora sublineata* Männil, *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings, *Pachydictya bifurcata* (Hall)) — верхне-ордовикскими, а 2 (*Rhinidictya exserta* (Eichwald) и *Pachydictya elegans* Ulrich) выступают так в среднем, как и в верхнем ордовике.

Мшанки Швеции, описанные Виманом (1902) из Öjle Myr (остров Готланд), происходят, также как и польский материал, из ледниковых валунов. Валуны изученные Виманом содержали, кроме сходных мшанок, комплекс других организмов близкий нашему. Кроме того, судя по описаниям Вимана, обнаруживали они иногда литологическое сходство с некоторыми польскими валунами, например с валуном 0.17 из местности Вельки Кацк и с верхне-ордовикскими борк-гольмскими известняками Эстонии. В шведских и польских валунах находятся три общие виды мшанок: *Enallopora exigua* (Ulrich), *Glauconomelia plumula* (Wiman) и *Pachydictya bifurcata* (Hall). Это верхне-ордовикские формы.

Очень богаты мшанками верхне-ордовикские отложения в Соединенных Штатах Северной Америки обнаруживают самое большое число (14) общих

с комплексом мшанок из валунов Польши. Среди них 6 (*Ceramoporella interporosa* Ulrich, *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler, *Pachydictya elegans* Ulrich) известны из среднего ордовика, 3 (*Crepipora* cf. *solida* Ulrich, *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich) являются верхне-ордовикскими, а 4 (*Corynotrypa (Corynotrypa) inflata* (Hall), *Ceramoporella distincta* Ulrich, *Crepipora simulans* Ulrich, *Enallopora exigua* (Ulrich)) выступают в среднем и верхнем ордовике. Один вид (*Phylloporina sublaxa* Ulrich) известный так из нижнего, как и из среднего ордовика.

Среди ордовикских мшанок Канады 5 видов тождественные с нашими. В том числе 3 (*Corynotrypa (Corynotrypa) dissimilis* (Vine), *Sceptropora facula* Ulrich, *Ptilodictya gladiola* Billings) известны из верхнего ордовика, а 1 (*Corynotrypa (Corynotrypa) canadensis* (Whiteaves)) выступает в среднем ордовике. Вид *Enallopora exigua* (Ulrich) встречается в среднем и верхнем ордовике Канады.

Стратиграфическое распространение описанных видов дано на таблице 3, а родов на таблице 4 (стр. 356—357).

ГЕОГРАФИЧЕСКОЕ РАСПРОСТРАНЕНИЕ

В комплексе польских мшанок самое большое географическое распространение обнаруживает *Enallopora exigua* (Ulrich), известная из СССР (средний ордовик), Швеции (верхний ордовик), Соединенных Штатов Северной Америки и Канады (средний и верхний ордовик). Не менее большим распространением пользуется *Sceptropora facula* Ulrich, которая известна из верхнего ордовика СССР, Соединенных Штатов и Канады. Большое географическое распространение имеет тоже *Glauconomella plumula* (Wiman), встречающаяся в верхнем ордовике СССР, Швеции и Соединенных Штатов Северной Америки.

Рассматривая географическое распространение подавляющей части мшанок из польских валунов, можно выделить три географические группы.

1) самая многочисленная, содержит виды известные до сих пор из Северной Америки и являющиеся ордовикского (*Corynotrypa (Corynotrypa) canadensis* (Whiteaves), *Ceramoporella distincta* Ulrich, *Ceramoporella interporosa* Ulrich, *Crepipora simulans Ulrich*, *C.* cf. *solida* Ulrich, *Phylloporina sublaxa* Ulrich, *Arthrostyloecia nitida* Bassler, *Heminematopora? virginiana* Bassler), или силурийского возраста (*Pachydictya bifurcata* (Hall));

2) немногочисленная, вмещающая виды известные до сих пор исключительно из ордовика Европы (*Crepipora schmidti* Bassler, *Nematopora sublineata* Männil, *Rhinidictya exserta* (Eichwald));

3) также многочисленная как первая группа, обнимает виды встречаемые так в Европе, как и в Северной Америке в ордовике (*Corynotrypa (Corynotrypa) inflata* (Hall), *Bythopora* cf. *subgracilis* (Ulrich), *Hallopora dumalis* (Ulrich), *Enallopora exigua* (Ulrich), *Glauconomella plumula* (Wiman), *Sceptropora facula* Ulrich, *Pachydictya elegans* Ulrich) и силуре (*Corynotrypa (Corynotrypa) dissimilis* (Vine), *Ptilodictya gladiola* Billings).

Комплекс мшанок из валунов Польши, происхождением связанный по всей вероятности с бассейном балтийской провинции, в пользу чего говорит относительно большое участие балтийских форм (14 видов, 17 родов). Присутствие большого количества северо-американских видов и родов (17 видов, 19 родов) решительным способом подтверждает теснейшую связь между балтийской и американской фаунами мшанок во времена среднего и верхнего ордовика.

ОПИСАНИЕ НОВЫХ ФОРМ

Отряд **Cyclostomata** Busk, 1852
Подотряд **Tubuliporina** Milne-Edwards, 1839
Семейство **Diastoporidae** Gregory, 1899
Род *Corynotrypa* Bassler, 1911
Corynotrypa (Corynotrypa) bassleri n. sp.
(фиг 6-8; пл. I, фиг. 4-5)

Ячейки стройной формы с отчетливым, длинным и узким столоном, в дистальной части в 2 — 3,5 раза шире, чем в проксимальной. Высокая, тонкая перистомальная шейка достигает длины, равной половине целой ячейки или немного больше. Она расширяется несколько в верхней части и окончена отчетливой каймой с неровным краем. Устья ячеек по большей части круглого сечения. Базальная поверхность, также как и фронтальная сторона ячейки, выпуклая.

Валун № 0.17, Вельки Кацк (Гданское воеводство); № 0.233 Мохты (Варшавское воеводство).

Corynotrypa (Corynotrypa) gibbosa n. sp.
(фиг. 9-10; пл. II, фиг. 1)

Ячейки очень короткие, длины до 0,64 мм. Особенностью формы ячеек является заметное куполеобразное расширение их средней части. Столон составляющий по большей части половину длины всего образца, тонкий и отделен отчетливой границей от остальной части зоэциальной трубки, расширенной в виде горба. Перистомальная шейка не очень высокая, с зубчатой каймой не всегда сохраняющейся. Устья по большей части круглые. Базальная поверхность ячейки выпуклая, форма ячеек очень изменчива.

Валун № 0.233, Мохты (Варшавское воеводство).

Подрод *Corynotrypa (Dentalitrypa)* n. subgen.

Ячейки булавообразные, с выпуклой базальной стороной; столон умеренной длины; устья по большей части овальные; перистомальная шейка низкая, внутри возле основания снабжена двумя зубными отростками. Типичный вид описан ниже.

Corynotrypa (Dentalitrypa) bidens n. sp.
(фиг. 11-13; пл. II, фиг. 2-3)

Ячейка булавообразной формы. Базальная сторона и фронтальная выпуклы. Столон короткий. Внутри низкой перистомальной шейки, возле ее основания находятся 2 заметные зубные отростки. Устья по большей части овального сечения.

Валун № 0.17, Вельки Кацк (Гданское воеводство) и № 0.233, Мохты (Варшавское воеводство).

Отряд **Trepostomata** Ulrich, 1882
Подотряд **Amalgamata** Ulrich & Bassler, 1904
Семейство **Batostomellidae** Miller, 1889
Род *Orbipora* Eichwald, 1856
Orbipora minima n. sp
(пл III. фиг. 1)

Зоария полусферическая со сплющенным или вогнутым основанием и более или менее круглым контуром. Трубки ячеек почти одинаковой ширины на протяжении всей длины. Устья по большей части шестиугольные, в более редких случаях многоугольные или овальной формы. Вокруг устьев, в местах соединения стенок ячеек имеются акропоры в виде колючих отростков.

Валун № 0.204, Мохты (Варшавское воеводство).

Отряд **Cryptostomata** Vine, 1883
Семейство **Phylloporinidae** Ulrich, 1890
Род *Conphylloporina* n. gen.

Зоария сетчатая; широкие веточки с двумя рядами больших четыреугольных устьев; устья ячеек расположены вперемежку; неячеистая поверхность снабжена мелкими порами и покрыта грануляцией; мезопоры небольшие. Описание типичного вида дано ниже.

Conphylloporina mochtyensis n. sp.
(пл. VIII, фиг. 3)

Зоария сетчатая образует широкие прутья с расположенными вперемежку устьями. Устья окружены очень низким перистомом, четырехугольной формы, косо расположенные в двух рядах. Благодаря их большей величине, каждое из них занимает половину и больше ширины прути. Между устьями в периферических частях прутьев находятся мезопоры распределенные преимущественно попарно в отчетливых углублениях. Фенеструлы удлиненные, в проксимальной части округлены, а в дистальной остро окончены. Неячеистая поверхность гранулирована, с беспорядочно расположенными порами.

Валун № 0.204, Мохты (Варшавское воеводство).

Семейство **Fenestellidae** King, 1850

Род *Fenestella* Lonsdale, 1839

Fenestella vistulensis n. sp.

(фиг. 17; пл. V, фиг. 2)

Зоария веерообразная с нежными прутьями. Устья распределены в двух рядах, круглые или овальной формы, с очень низкими перистомами. Киль низок, но довольно острый, с редкими и высокими колючими отростками. Диссепименты тонкие и короткие. Фенеструлы более или менее удлиненные, прямоугольные, овальные или неправильного очертания. Вокруг одной фенеструлы находится 6 до 8 устьев.

Валун № 0.204, Мохты (Варшавское воеводство).

Род *Semicoscinium* Prout, 1859

Semicoscinium ordovicium n. sp.

(пл. VII, фиг. 2)

Зоария с тонкими, несколько волнообразно изогнутыми, анастомозирующими прутьями. Прутья с выпуклым сечением, или иногда почти плоские, по лишенной ячеек стороне. Ячейки расположены двумя рядами, отделенные очень высоким, хорошо развитым килем. В поблизости поверхности прути киль очень тонкий, в вершинной части расширяется, образуя одновременно шипообразные бугорки и острую продольную грань. Фенеструлы преимущественно овальной формы.

Валун № 0.268, Мохты (Варшавское воеводство).

Семейство **Arthrostylidae** Ulrich, 1888

Род *Heminematopora* Bassler, 1952

Heminematopora rossi n. sp.

(пл. XI, фиг. 1)

Зоария тонковетвистая, разветвленная дихотомически. Устья овальные, окружены низкими перистомами, расположенные в 4 продольных рядах, отделенные тонкими ребрами. Лишенная ячеек поверхность ветки обнаруживает продольную полосатость.

Валун № 0.204, Мохты (Варшавское воеводство).

Род *Sceptropora* Ulrich, 1888

Sceptropora florida n. sp.

(пл. X, фиг. 4-5)

Сегменты составляющие зоарию по форме напоминают бокалы цветов. Они сильно расширяются в дистальной части, а узкие в проксимальной. Основание сегмента маленькое, шаровидное, а вершинное углубление несколько вогнуто или плоское. Сильно развитые продольные ребра снабжены прерывистыми, граньевыми поверхностями, с мелко зазубренными краями. Особенно сильно развиты

ребра дистальной, расширенной части сегмента. Устья помещаются в верхних частях сегментов, между сильно развитыми ребрами.

Валун № 0.204, Мохты (Варшавское воеводство).

Sceptropora spinosa n. sp.
(пл. X, фиг. 6)

Зоария сложенная большими сегментами, оконченными куполеобразным основанием. Вершинные углубления широкие и глубокие. Характерной особенностью этого вида являются очень сильные отростки, расположенные друг над другом в 6 продольных рядах. Между двумя рядами отростков развиты узкие, продольные ребра с зубчатыми гранями. В дистальной части сегмента, между ребрами, находятся устья, расположенные в простые ряды. Очертание устьев круглое.

Валун № 0.17, Вельки Кацк (Гданское воеводство).

PLATES

(All photographs retouched)

Pl. I

Corynotrypa (Corynotrypa) inflata (Hall)

Fig. 1. Single zooecium: *a* top view, *b* side view; × 45. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/310.

Fig. 2. Single zooecium: *a* top view, *b* side view; × 45. Boulder — as fig. 1; No. Br. 0.I/311.

Corynotrypa (Corynotrypa) dissimilis (Vine)

Fig. 3. Single zooecium, side view; × 43. Boulder — as fig. 1; No. Br. 0.I/203.

Corynotrypa (Corynotrypa) bassleri n. sp.

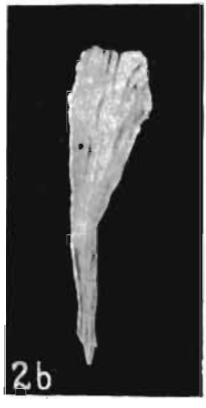
Fig. 4. Single zooecium, side view; × 32. Boulder — as fig. 1; No. Br. 0.I/340.

Fig. 5. Single zoecium, side view; × 32. Boulder 0.233. Mochty (prov. of Warsaw); No. Br. 0.I/321, holotype.

Corynotrypa (Corynotrypa) canadensis (Whiteaves)

Fig. 6. Single zooecium, side view; × 60. Boulder — as fig. 1; No. Br. 0.I/10.

Fig. 7. Single zooecium with preserved bases of dichotomous branching, side view; × 43. Boulder — as fig. 1; No. Br. 0.I/8.



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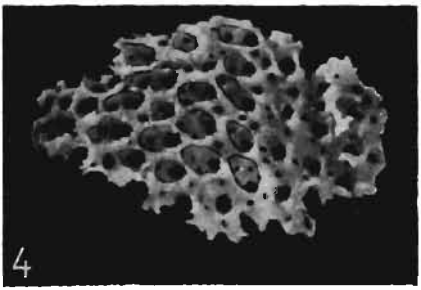
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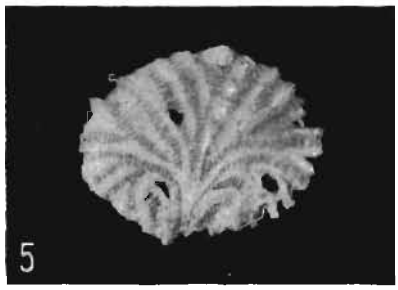
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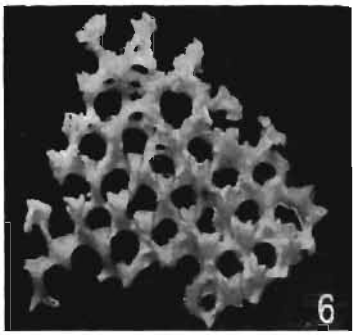
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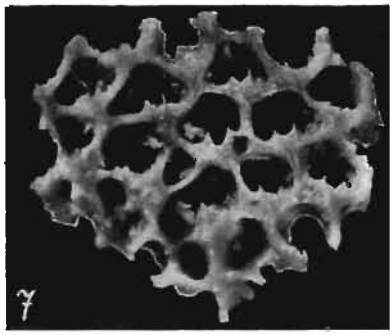
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Pl. II

Corynotrypa (Corynotrypa) gibbosa n.sp.

Fig. 1. Two joint zooecia of different shape, side view; × 50. Boulder 0.233, Mochty (prov. of Warsaw); No. Br. 0.I/355.

Corynotrypa (Dentalitrypa) bidens n. sp.

Fig. 2. Single zooecium, side view; × 30. Boulder — as fig. 1; No. Br. 0.I/411.

Fig. 3. Single zooecium with preserved bases of dichotomous branching, top view; × 30. Boulder — as fig. 1; No. Br. 0.I/412.

Ceramoporella interporosa Ulrich

Fig. 4. Zoarium, external aspect; × 9. Boulder 0.124, Wyszogród (prov. of Warsaw); No. Br. 0.I/490.

Flabellotrypa rugulosa Bassler

Fig. 5. Zoarium, external aspect; × 25. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/428.

Crepipora simulans Ulrich

Fig. 6. Zoarium, external aspect; × 8. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/498.

Crepipora schmidti Bassler

Fig. 7. Zoarium, external aspect; × 18. Boulder — as fig. 6; No. Br. 0.I/502.

Pl. III

Orbipora minima n. sp.

Fig. 1. Zoarium, external aspect; holotype. × 15. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/526.

Stellipora vesiculosa Modzalevskaya

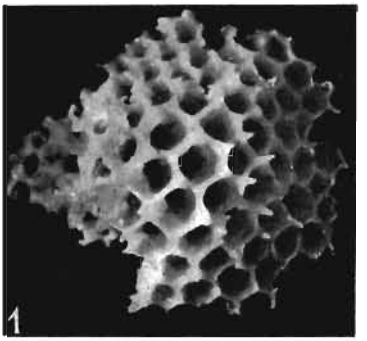
Fig. 2. Zoarium, external aspect; × 5. Boulder — as fig. 1; No. Br. 0.I/529.

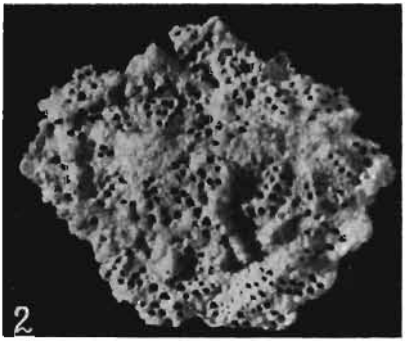
Crepipora cf. *solida* Ulrich

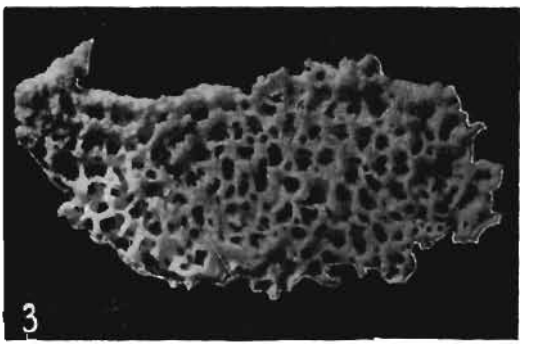
Fig. 3. Zoarium, external aspect; × 10. Boulder — as fig. 1; No. Br. 0.I/508.

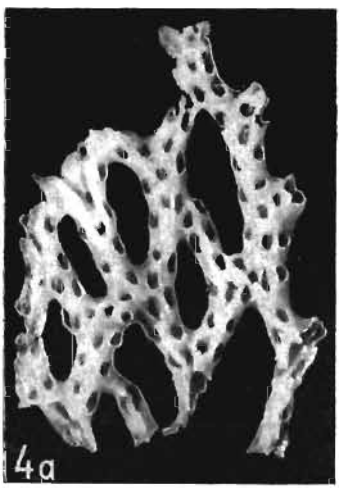
Chasmatopora sp.

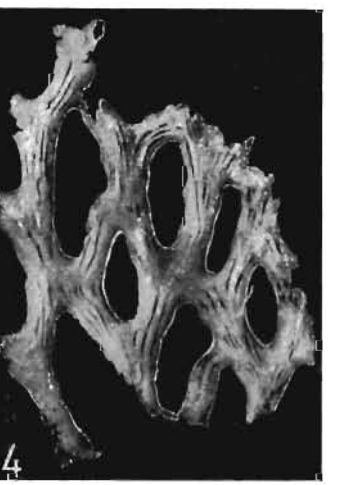
Fig. 4. Zoarium, external aspect: *a* celluliferous side, *b* noncelluliferous side; × 15. Boulder — as fig. 1; No. Br. 0.I/550.











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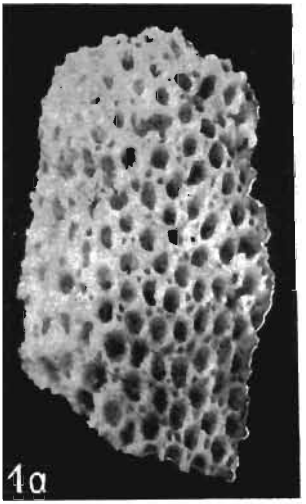

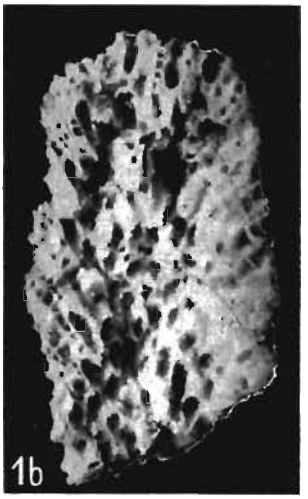

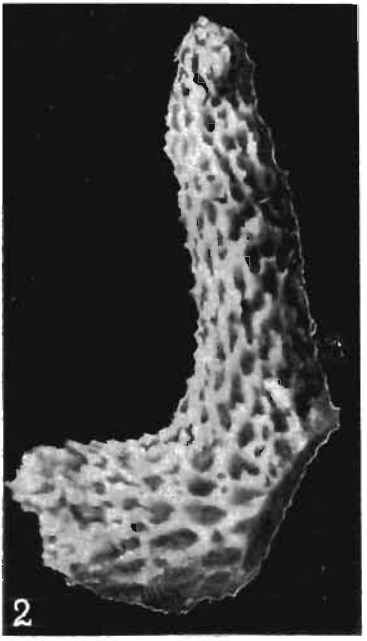

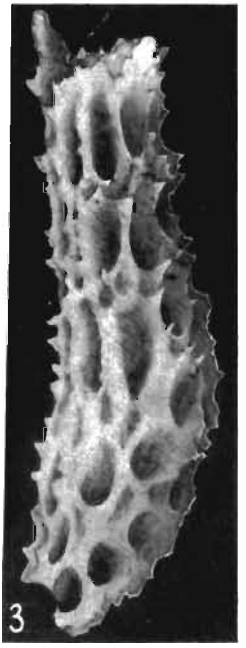

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Pl. IV

Hallopora dumalis Ulrich

Fig. 1. Zoarium: *a* external aspect, *b* longitudinal natural section; × 12. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/530.

Bythopora cf. *subgracilis* (Ulrich)

Fig. 2. Zoarium branching dichotomously, external aspect; × 16. Boulder — as fig. 1; No. Br. 0.I/513.

Fig. 3. Zoarium, external aspect; × 40. Boulder — as fig. 1; No. Br. 0.I/518.

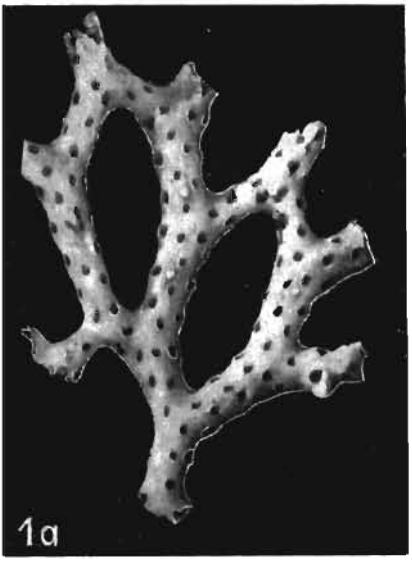
Pl. V

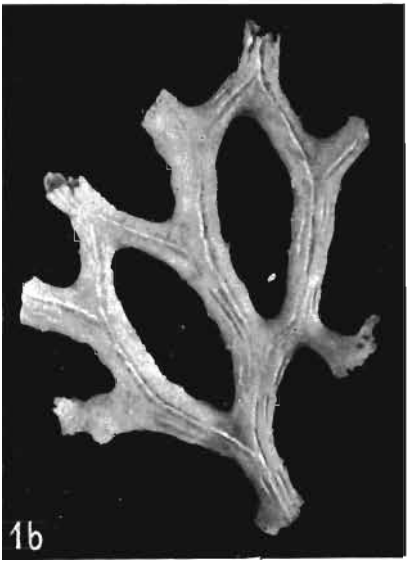
Phylloporina sublaxa Ulrich

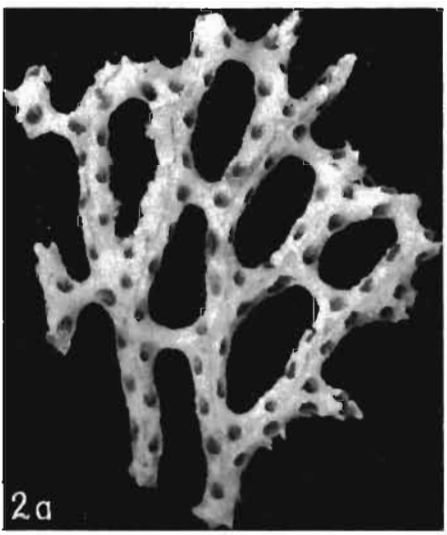
Fig. 1. Zoarium, external aspect: *a* celluliferous side, *b* noncelluliferous side; × 17. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/540.

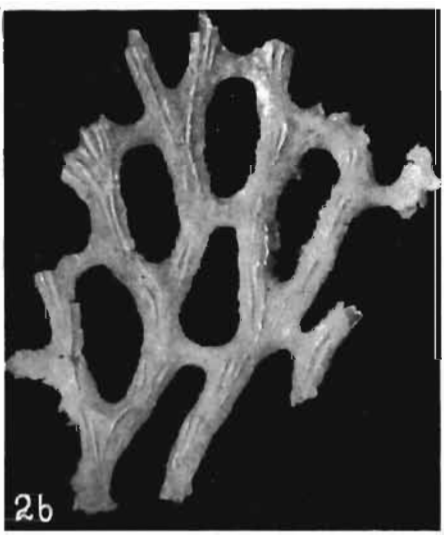
Fenestella vistulensis n. sp.

Fig. 2. Zoarium, external aspect: *a* celluliferous side, *b* noncelluliferous side; holotype. × 23. Boulder — as fig. 1; No. Br. 0.I/556.









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Pl. VI

Enallopora exigua (Ulrich)

Fig. 1. Zoarium, external aspect: *a* celluliferous side, *b* noncelluliferous side; × 25. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/562.

Fig. 2. Zoarium branching dichotomously, with preserved base showing: *a* zooecial apertures and numerous pores, *b* zooecial apertures and scarce pores; × 25. Boulder — as fig. 1; No. Br. 0.I/574.

Pl. VII

Ceramoporella distincta Ulrich

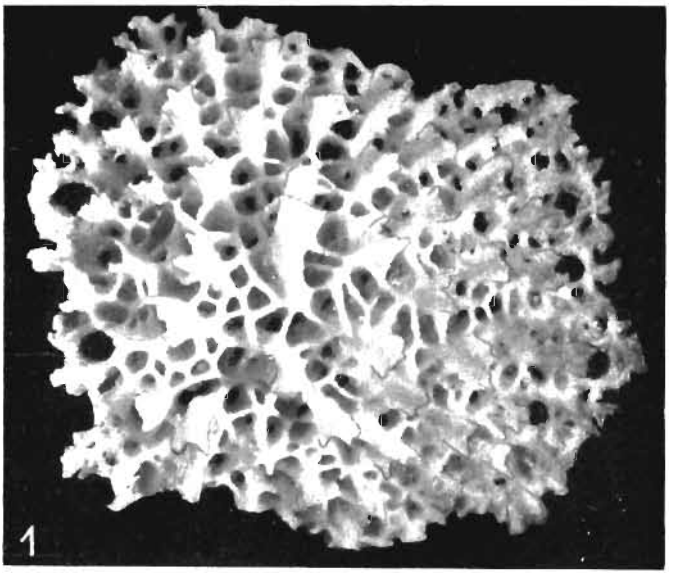
Fig. 1. Zoarium, external aspect; × 20. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/441.

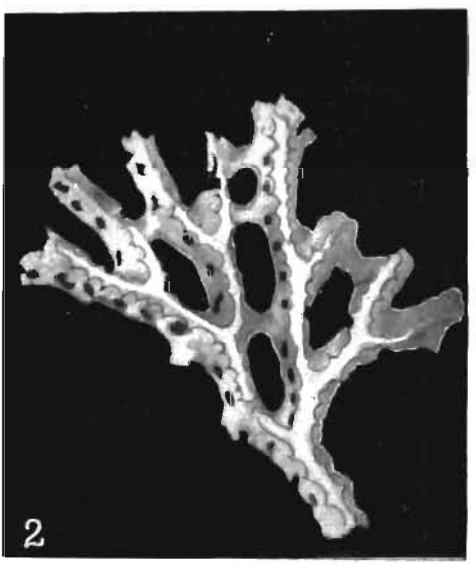
Semicoscinium ordovicium n. sp.

Fig. 2. Zoarium with keel, external aspect; holotype. × 20. Boulder 0.268, Mochty (prov. of Warsaw); No. Br. 0.I/581.

Pachydictya elegans Ulrich

Fig. 3. Fragment of a branch of zoarium, with well preserved external structure; × 20. Boulder 0.17, Wielki Kack (prov. of Gdańsk): No. Br. 0.I/847.





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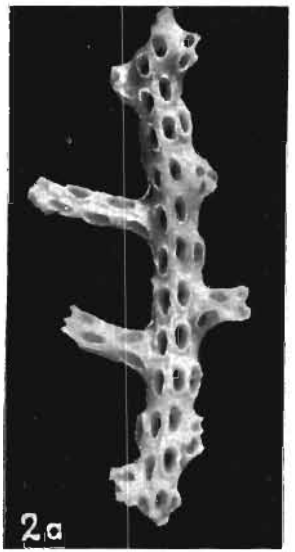
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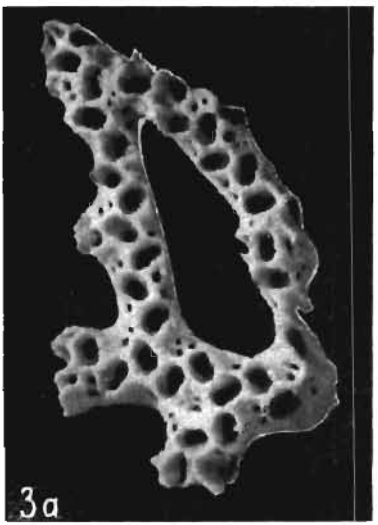
2b


3a


3b

Pl. VIII

Arthrostyloecia nitida Bassler

Fig. 1. Segment of zoarium, external aspect; × 20. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/591.

Glauconomella plumula (Wiman)

Fig. 2. Fragment of a branch of zoarium: *a* celluliferous side, *b* noncelluliferous side; × 14. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/605.

Conphylloporina mochtyensis n. sp.

Fig. 3. Fragment of reticulate zoarium: *a* celluliferous side, with tetragonal, alternating apertures and mesopores, *b* noncelluliferous side, granulated and striated longitudinally, with pores; holotype. × 12. Boulder — as fig. 2; No. Br. 0.I/551.

Pl. IX

Ptilodictya gladiola Billings

Fig. 1. Fragment of a branch of zoarium; × 13. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/715.

Pachydictya bifurcata (Hall)

Fig. 2. Fragment of zoarium branching dichotomously; × 8.5. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/817.

Fig. 3. Fragment of a branch of zoarium, terminal part; × 8.5. Boulder — as fig. 2; No. Br. 0.I/829.

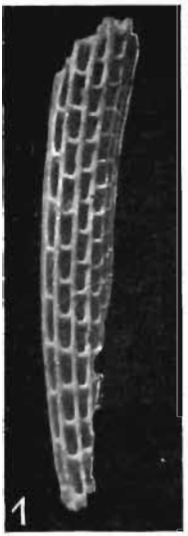
Heminematopora? virginiana Bassler

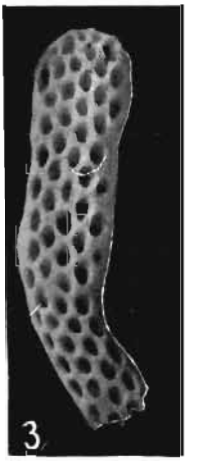
Fig. 4. Fragment of zoarium with preserved base; × 28. Boulder — as fig. 2; No. Br. 0.I/617.

Fig. 5. Fragment of a zoarium ontogenetically older than that represented on fig. 4; × 28. Boulder — as fig. 2; No. Br. 0.I/620.

Nematopora sublineata Männil

Fig. 6. Fragment of a branch of zoarium; × 25. Boulder — as fig. 1; No. 0.I/678.





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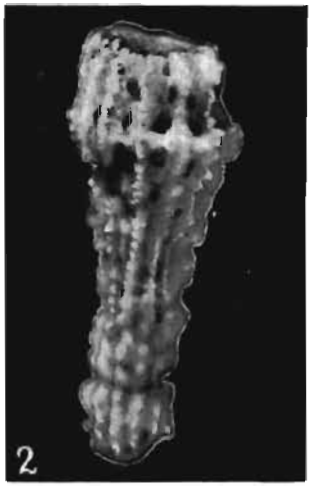

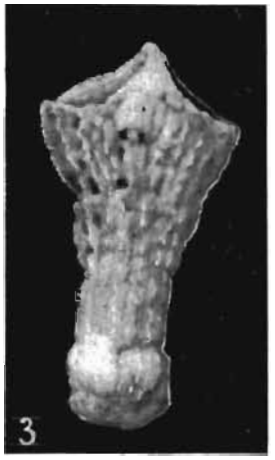

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Pl. X

Sceptropora facula Ulrich

Fig. 1. Single segment of zoarium; × 50. Boulder 0.17, Wielki Kack (prov. of Gdańsk); No. Br. 0.I/684.

Fig. 2. Single segment of zoarium; × 40. Boulder — as fig. 1; No. Br. 0.I/687.

Fig. 3. Single segment of zoarium with two top sockets, indicating dichotomous branching; × 25. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/703.

Sceptropora florida n. sp.

Fig. 4. Single segment of zoarium; holotype. × 50. Boulder — as fig. 3; No. Br. 0.I/705.

Fig. 5. Single segment of zoarium; × 50. Boulder — as fig. 3; No. Br. 0.I/708.

Sceptropora spinosa n. sp.

Fig. 6. Single segment of zoarium; holotype. × 27. Boulder — as fig. 1; No. Br. 0.I/714.

Pl. XI

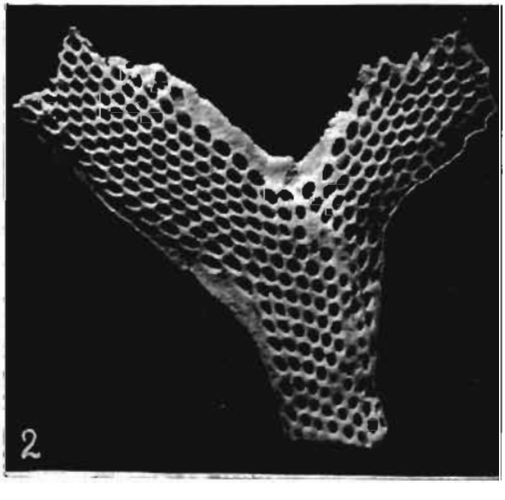
Heminematopora rossi n. sp.

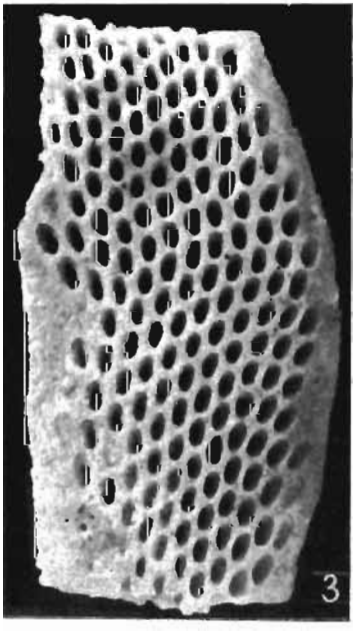
Fig. 1. Fragment of zoarium with lateral branching: *a* celluliferous side, *b* non-celluliferous side; holotype. × 24. Boulder 0.204, Mochty (prov. of Warsaw); No. Br. 0.I/632.

Rhinidictya exserta (Eichwald)

Fig. 2. Fragment of zoarium branching dichotomously; × 7.5. Boulder — as fig. 1; No. Br. 0.I/720.

Fig. 3. Fragment of zoarium; × 10. Boulder — as fig. 1; No. Br. 0.I/802.





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