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Lower Devonian Fenestrata (Bryozoa) of the Prague Basin, Barrandian Area, Bohemia, Czechoslovakia

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Lower Devonian Fenestrata (Bryozoa) of the Prague Basin, Barrandian Area, Bohemia, Czechoslovakia

Abstract

Diverse and abundant fenestrate bryozoans occur in two Lower Devonian levels of reefal and perireefal limestones of Central Bohemia, within the type area for the Lower Devonian stages. The reefal deposits of the Koněprusy Limestone (Pragian) are characterized by greater abundance and diversity, with 29 species. A less abundant and, in large part, different fauna of 17 species is found in perireefal and basinal deposits of the younger Zlíchov Limestone (Zlíchovian). The two faunas have high biostratigraphic, paleogeographic, and evolutionary importance.

Five species from the Koněprusy Limestone are newly described: **Fenestella conopeum** McKinney & Kříž, **Flexifenestella bellaforma** McKinney & Kříž, **Alternifenestella strigilla** McKinney & Kříž, **Cyclopelta victrola** McKinney & Kříž, and **Hemitrypa linotheras** McKinney & Kříž. **Alternifenestella estrellita** McKinney & Kříž is newly described from the Zlíchov Limestone; and three new species, **Hemitrypa mimicra** McKinney & Kříž, **Fabifenestella joachimi** McKinney & Kříž, and **Polypora inusitata** McKinney & Kříž, occur in both strata. Twenty-six species originally described by Barrande, Počta, and Prantl are redescribed on the basis of original and recently collected abundant material. Descriptions of new and revised species are based predominantly on thin sections and acetate peels, with emphasis on zooecial chamber geometry and linear measurements of both zooidal and zoarial features.

Introduction

The Devonian was a time of transition in bryozoan faunas, from the dominance of trepostomes, cystoporates, and bifoliate cryptostomes among Ordovician and Silurian erect bryozoans to dominance by fenestrates by the Devonian's end. Very few Silurian representatives of the order Fenestrata had any skeletal elaborations, such as high, expanded keels or other superstructures projecting from the branches, and such elaborations were essentially nonexistent during the Ordovician. A great diversity of high, expanded keels and secondary networks became well established, however, by the beginning of Middle Devonian time (Cuffey & McKinney, 1979, text fig. 1).

Fenestrate bryozoans are locally abundant and diverse in Lower Devonian reefal bioclastic limestones in Central Bohemia. In the quarries of Zlatý Kůň Hill, south of the village of Koněprusy (fig. 1, locality 1), their diversity and abundance are so great that this is one of the most important known sites for Devonian fenestrates and is among the oldest of the fenestrate-dominated bryozoan faunas.

The pioneering geologist and paleontologist Joachim Barrande (1799–1883) collected fenestrates along with other fossils from Zlatý Kůň Hill and prepared plates illustrating them for an almost completed monograph on Silurian (and Devonian) bryozoans and coelenterates. After his death, his student Philippe Počta completed the monograph, which was published in 1894. Počta added new portions to the manuscript but apparently did not rework the plates. Počta's and Barrande's parts were published together in a volume of Barrande's *Systême Silurien du Centre de la Bohême.* In that monograph, Barrande's and Počta's taxa are clearly attributed to the correct author of each.

Ferdinand Prantl published a revision of the Lower Devonian fenestrates of Central Bohemia in 1932, adding specimens from other localities, including one noted in this monograph (fig. 1, locality 3). Prantl's contribution presents problems, however; although some specimens originally illustrated as line drawings by Barrande in Počta (1894) are reillustrated by photographs in Prantl (1932), magnifications indicated in plate descriptions are often incorrect, and an already moderately scrambled assignment of specimens to species and genera became even more thoroughly mixed-up. In both publications, very few specimens were examined or illustrated in polished or thin section; virtually all studies were made on zooid-barren, reverse exterior surfaces.

Few other papers are devoted to the Lower Devonian bryozoans of Central Bohemia. Prantl described a new species of *Ptylopora* in 1928, and in 1929 published a preliminary summary of his revision of the fenestrates. McKinney (1980) recently redescribed the Bohemian fenestrate *Utropora nobilis* and revised the concept of the genus. Cryptostome and cystoporate bryozoans from the Lower Devonian of Bohemia were described by Prantl (1935), and trepostomes were briefly treated by Prantl (1933) and by Astrova (1970). These nonfenestrate bryozoans are in need of more attention.

The purpose of the present study is to redescribe the Lower Devonian fenestrate bryozoans of Central Bohemia, including qualitative and quantitative description of external and internal features. Such restudy is desirable because of the quality, uniqueness, and critical stratigraphic level of the fauna in the rise to dominance of fenestrates among erect bryozoans, and especially because four fenestrate genera—*Utropora, Seriopora, Filites,* and *Pseudoisotrypa*—are based on type species from these beds. Most important, however, is the biostratigraphic value of knowing the fenestrates of the Koněprusy Limestone from this type region for the Pragian Stage, and of the Zlíchov Limestone, which immediately overlies the Pragian Stage and constitutes the basis for the Zlíchovian Stage.

This monograph is based on the original collections of fenestrates made by Barrande, Počta, and Prantl, which are deposited in the National Museum (Natural History), Prague; and on large collections totaling several hundred specimens made by one of us (JK) during the period 1956–1972 and by both of us in 1981 and 1983. In addition, a few specimens from the collection of the Geological Survey, Prague, were studied.

Acknowledgments

Ivo Chlupáč provided field discussions of the localities, guidance through the Devonian of Central Bohemia, and comments about the sedimentary environment of the Koněprusy and Zlíchov Limestones; V. Turek helped with preparation of samples in the National Museum, Prague; R. Prokop and A. Skalický provided access to and assistance with collections in the National Museum (Natural History), Prague; M. J. McKinney assisted with preparation of peels and measurements of specimens; D. Bowman helped set up statistical procedures; and V. Havlíček, R. S. Boardman, R. J. Cuffey and A. S. Horowitz read the manuscript. The Geological Survey, Prague, and Appalachian State University gave support, and acknowledgment is made to the Donors of the Petroleum Research Foundation for partial support of this research (to FKM).

The major support for this research was the opportunity for us to work together at the National Museum in Prague for a total of two months in 1981 and 1983. This was made possible by grants for travel and subsistence to FKM through the joint exchange program of the U. S. National Academy of Sciences and the Czechoslovak Academy of Sciences.

To all, we are grateful.

Geological Setting

In Central Bohemia the fenestrate-bearing, Lower Devonian reefal fossil grainstones represent a part of the Ordovician to Devonian sequence developed in the linear sedimentary depression known as the Prague Basin (Havlíček, 1981). The Paleozoic sediments form a portion of the Upper Proterozoic to Middle Paleozoic sedimentary complex of the Barrandian Area, which was first investigated by Joachim Barrande in the period 1831–1883. The sedimentary complex of this region is studied extensively still as a classic sequence for the Silurian and Devonian Periods.

Chronostratigraphy of the Lower Devonian rocks of the Prague Basin is based on Bohemian stages as defined by Chlupáč (1976, 1982) and accepted as the standard Lower Devonian stages (Lochkovian and Pragian) by the Subcommission on Devonian Stratigraphy in 1983. The lithostratigraphy and facies development of the Czech Devonian

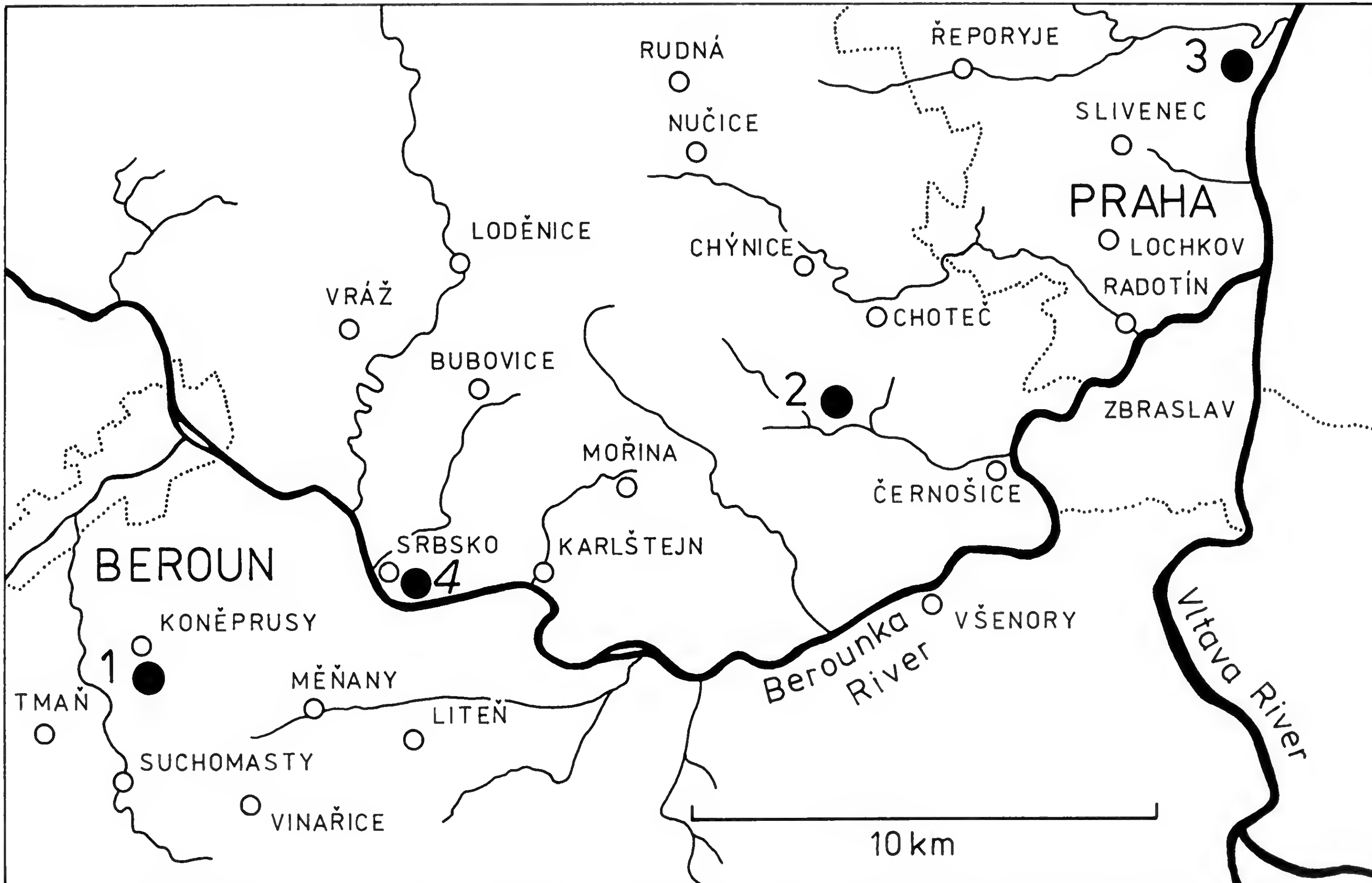

FIG. 1. Collecting localities in Central Bohemia, Czechoslovakia. **1,** Koněprusy, Zlatý Kůň Hill (Koněprusy Limestone, Pragian Stage); **2,** Solopysky (Zlíchov Limestone, Chapel Coral Horizon, Zlíchovian Stage); **3,** Praha-Hlubočepy, Kaplička quarry locality (Zlíchov Limestone, Chapel Coral Horizon, Zlíchovian Stage; **4,** Srbsko (Zlíchov Limestone, Chapel Coral Horizon, Zlíchovian Stage).

were studied by Chlupáč (1955, 1957, 1968, 1976) (fig. 2). In general, Lower Devonian sedimentary rocks in the Prague Basin vary from white, well-washed, whole-fossil boundstones and grainstones to black micritic limestones and calcareous shales. The majority are medium- to dark-colored, have appreciable quantities of lime mud and clay, and are interpreted as ramp and basinal deposits. The smaller volume of light-colored rocks that essentially lack fine-grained constituents are interpreted as reef core and flank deposits that locally formed on topographically high spots around the margin of the basin. The reef centers migrated or died off and reformed in new spots, for the reefal deposits indicate different centers of growth in different Lower Devonian stages. More detailed lithostratigraphic settings and paleoenvironmental interpretations for each collecting site are given in the following section.

Collecting Localities

All the material investigated herein was collected from only four localities and two stratigraphic levels. These represent the only known, presently available sources of fenestrates in the Lower Devonian of the Prague Basin.

1. Koněprusy. The locality name Koněprusy represents the quarries on the slopes of Zlatý Kůň Hill, south of the village of Koněprusy, near Beroun (fig. 1, locality 1). Fenestrates deposited in older collections were mostly collected in the Císařský lom quarry and in the Houbův lom quarry. (For detailed geological and topographical maps, see Svoboda & Prantl, 1949.) New collections were made by the authors from the crinoidal grainstones exposed in the rock face and from derived rubble opposite the Houbův lom quarry face in which the entrances to the Koněprusy Caverns are located. According to Chlupáč (1955, 1957), the transition between reef-core and reef-flank deposits that are part of the Koněprusy Limestone reef complex of the Pragian Stage is exposed in this region of Zlatý Kůň Hill. These limestones contain a rich fauna dominated by brachiopods, crinoids, bryozoans, algae, and corals, and have been widely studied since Barrande's time. Disarticulated crinoid plates that are difficult or impossible to identify as to species or genus are the most abundant constituent of the rock; fenestrate bryozoans constitute the most abundant identifiable element.

2. Solopysky. Rare fragmentary but important specimens of fenestrates were collected from the lower part of the Zlíchov Limestone at a locality near the village of Solopysky (fig. 1, locality 2). This locality was described in detail by Chlupáč (1957, pp. 376–378). New collections were made by the authors in the coarse-grained, broken-fossil packstone marked by Chlupáč (1957, p. 377, fig. 1) as the level rich in fragmentary trilobite, brachiopod, and bryozoan remains. This layer represents sedimentation influenced by the early Zlíchovian Age reef complex in the Prague region, but was at a greater distance from the reef than the Kaplička quarry locality, as indicated by the thinner broken-fossil packstones and the smaller fragmentary remains of the fauna.

3. Kaplička. Initial sedimentation of the Zlíchov Limestone (Zlíchovian Stage) in the vicinity of Prague was influenced by the existence of another reef complex that was eroded during post-Variscan time. At the base of the Zlíchov Limestone is a facies consisting of whole- to broken-fossil packstones and wackestones and limestone breccias, called the Chapel Coral Horizon. This horizon represents perireefal sediments derived from a reef that was situated southeast of the Kaplička quarry locality, which is in Praha-Hlubočepy (fig. 1, locality 3). Several beds (levels 2, 3, and 6 in fig. 3) are rich in fenestrates as well as in brachiopods, crinoids, and corals. The geology, stratigraphy, and paleontology of this locality were studied by Chlupáč (1957, 1982) and by Havlíček (1956, 1967). New collections were made by the authors in level 6 (fig. 3).

4. Srbsko. A small collection of fragmentary fenestrate specimens was made from the lower part of the Zlíchov Limestone where laid open in near-vertical beds, in a roadside exposure on the left bank of the Berounka River south of the village of Srbsko (fig. 1, locality 4). The Srbsko section displays upper Lochkovian through Zlíchovian strata and has been described in detail by Chlupáč (1957, 1968). The lower part of the Zlíchov Limestone consists of cherty, graded, broken-fossil packstones to mudstones with some dark shales intercalated between the limestone beds. Bryozoans were collected from Schönlaub's conodont sample beds 37 and 49 (Chlupáč et al., 1980), both of which are graded crinoidal packstones. The Zlíchov Limestone here represents basinal sedimentation, as indicated by the black shales and graded bedding, and was influenced by one or more early Zlíchovian Age reefs.

Methods of Study

All specimens available, including those in the National Museum (Natural History) and the Geo-

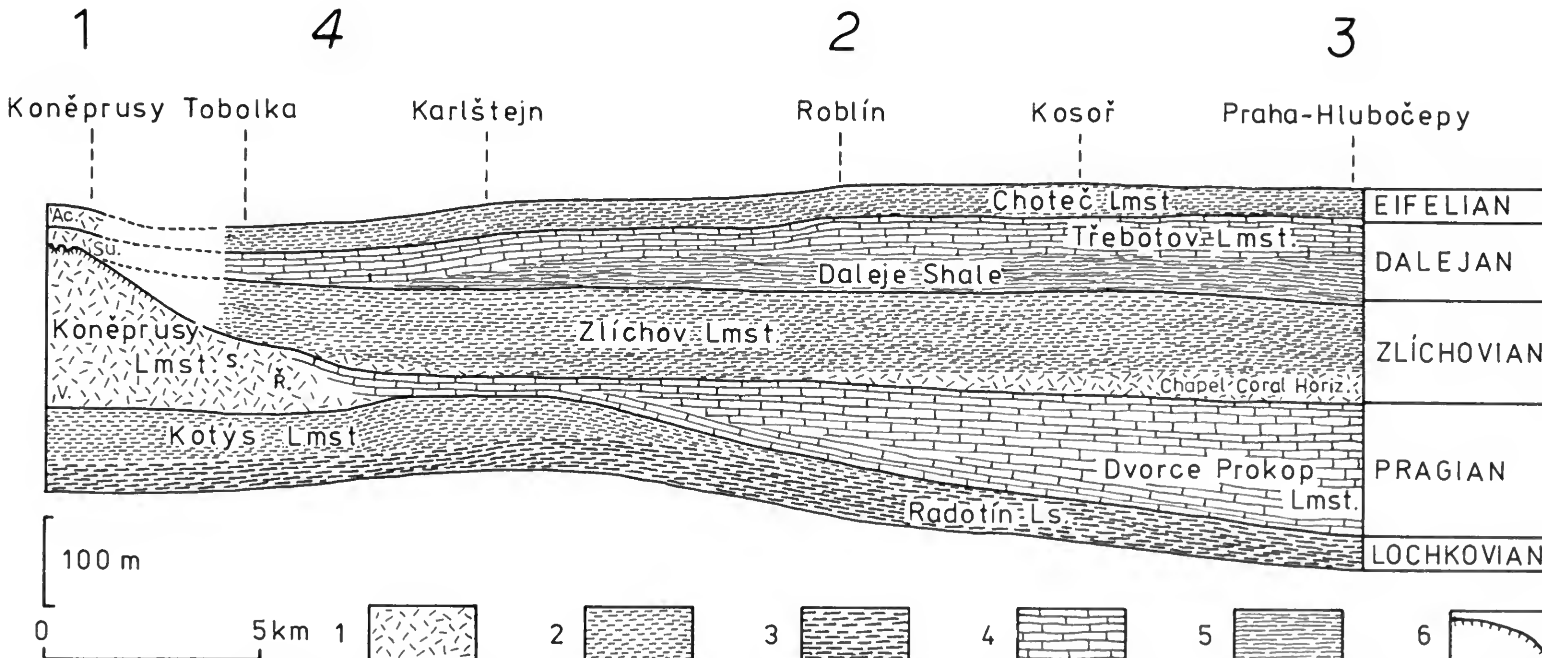

FIG. 2. Facies relationships and chronostratigraphy of Lower and early Middle Devonian in the southeast flank of the Prague Syncline, Prague Basin, Barrandian Area, Bohemia. **1**, reefal boundstones and whole- to broken-fossil lime grainstones; **2**, well-bedded, fine-grained broken-fossil lime packstones and wackestones and lime mudstones, commonly with cherts; **3**, dark platy lime mudstones with shale intercalations; **4**, nodular lime mudstones; **5**, calcareous shales; **6**, disconformity. **V**, vinařiče Limestone; **S**, Slivenec Limestone; **R**, Řeporyje Limestone; **Su**, Suchomasty Limestone; **Ac**, *Acanthopyge* Limestone. (After Chlupáč, 1976.)

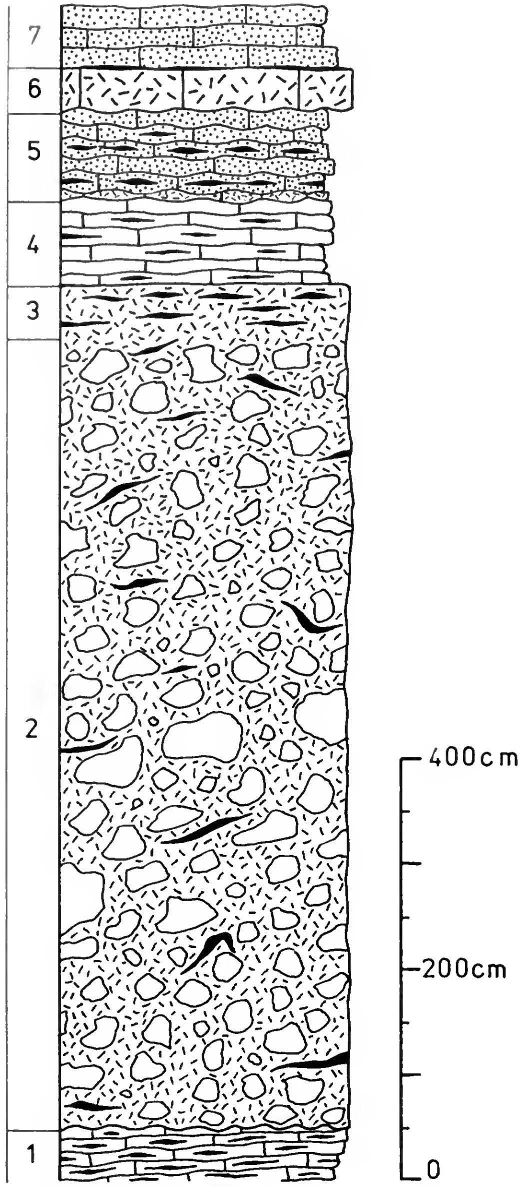

FIG. 3. Columnar section through the lower part of the Zlíchov Limestone (Zlíchovian Stage) at the Kaplička quarry locality in Praha-Hlubočepy. **1,** irregularly bedded lime mudstones with chert; **2,** massive whole- to broken-fossil lime packstone and wackestone with boulders of fossil lime packstones and diagenetic chert; **3,** coarse fossil lime packstones with chert; **4,** irregularly bedded lime mudstones with chert; **5,** fine-grained broken-fossil lime packstones and wackestones with chert; **6,** fine- and coarse-grained broken-fossil lime packstone with nodular lower bedding plane, containing fragmentary bryozoans, brachiopods, crinoids, rostroconchs, trilobites, and corals; **7,** fine-grained broken-fossil lime packstones and wackestones. Measured in 1981.

logical Survey in Prague and those collected by us, were grouped according to external similarities. These include growth form; spacing of branches and dissepiments; width of branches; and presence and type of superstructure, where visible.

Where such qualitatively determined groups contained 10 or fewer specimens, small fragments of a few to about 100 mm^2 were broken or cut from each of them for preparation of acetate peels or thin sections. Where groups contained more than 10 specimens, acetate peels or thin sections were initially made from 10 specimens. If more than one set of internally distinguishable character states were included within the 10 cut specimens, they were regrouped by using both external and internal characters such as chamber shape and skeletal microstructure. Peels or thin sections were prepared from additional specimens in an attempt to get 10 specimens for each of the new groupings.

Acetate peels were prepared for specimens from Koněprusy, Solopysky, and Srbsko, following procedures of Boardman and Utgaard (1964). Thin sections were prepared for most specimens from Kaplička because leaching and partial silicification have rendered most of the rock too friable and unsuitable for preparation of peels. With few exceptions, fragments from which peels or thin sections were made were imbedded in small epoxy blocks for better cohesion and for ease of handling, following procedures given by Nye et al. (1972). In several cases serial peels were made, cutting through progressively deeper levels within the colony fragment.

Cut surfaces, i.e., thin sections and peels of fenestrates viewed by transmitted light, are necessary for determination of zooecial chamber shape and other internal character states, such as skeletal microstructure. In addition, unless weathered free from the matrix, most fenestrates have the frontal surface adhering to the rock, both in outcrop and in hand specimen, and consequently obscured; the relatively featureless reverse surface is much more typically exposed. Aperture size, spacing, and distribution cannot, therefore, be determined for most specimens prior to production of cut surfaces. The tendency of frontal surfaces of fenestrates to be obscured by embedment in the rock matrix was noted soon after work began on them in the late 19th century (Young, 1877).

The standard cut surface is the tangential section, which is parallel with the surface of the fenestrate frond and ideally cuts the branches at different levels in different parts of the section. A few

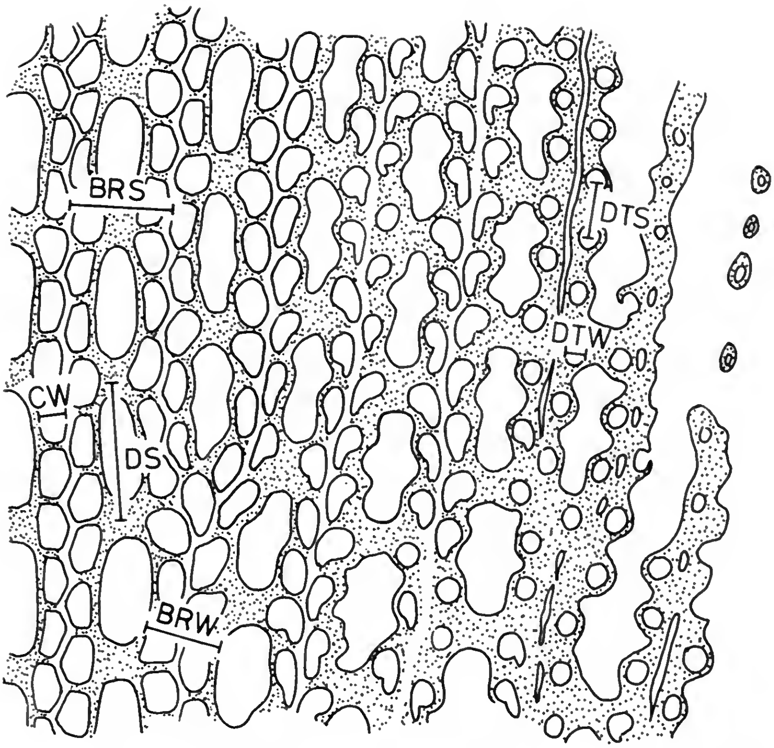

FIG. 4. Linear measures as used in this study. Definitions of abbreviations are given below.

transverse sections, which are perpendicular to branch axes, were cut for most species; they are especially useful for determining the cross-sectional shapes of basal plates and the height of superstructure, where present. In addition, a few longitudinal sections, which are cut along branch length perpendicular to the frontal surface, were prepared for species whenever possible; these sections are most useful for determination of angles between basal plates and transverse zooecial walls.

Images of the thin sections and peels were projected at about 50× magnification for measurement of characters. About one-third of the total measurements were made by using a scale and manually recording the values. The remainder were made by projecting the magnified images onto a Hi-Pad digitizing board and touching a cursor to the two end points that define the distance being measured; distances were automatically scaled according to magnification of the image and stored in an Apple II microcomputer. Ten measurements of each character were made on each specimen where possible, and as many measurements as possible were made where 10 were not available.

Six types of measurements were regularly made (fig. 4): spacing between branch centers (BRS); branch width (BRW); spacing from midline to midline of adjacent dissepiments (DS); spacing between centers of adjacent apertures or distal tubes within a longitudinal row (DTS); endozonal zooecial chamber width (CW); and aperture or distal tube diameter (DTW). In addition to these types of measures, the angle between the basal plate and transverse zooecial walls (BA) was determined where possible; distance from the basal plate to upper surface of superstructure was measured where a superstructure was present; maximum spacing was measured between midlines of adjacent, strongly sinuous branches (BRSM) in *Flexifenestella* and *Reteporina*; width of pinnae (LBRW) was measured in *Penniretepora* and *Ptylopora*; endozonal width of zooecial chambers in main branches (CWM) and in lateral branches (CWL) were distinguished in *Filites*; and, in *Polypora*, spacing between centers of nearest-neighbor (NN) apertures or distal tubes diagonally between rows was measured.

The measured characters include both zooecial and extrazooecial features. Size, shape, and spacing of zooecial chambers are closely related to polypide size, shape, and number of tentacles in living stenolaemates (McKinney & Boardman, in press). Zooecial features in the Bohemian fenestrates that were measured are similar to those with relatively low variability within species of living stenolaemates that have high correlation with polypide sizes and structures. Aperture diameters correlate with lophophore diameters at 0.783 ($P < 0.01$) for cheilostomes and at 0.826 ($P < 0.001$) in living stenolaemates (McKinney & Jackson, in press). Inasmuch as apertures in fenestrates are the outer ends of distal tubes and have the same diameter, diameters of distal tubes were measured because apertures typically are embedded in sediment.

Spacing between zooidal apertures has very low variability and correlates at 0.84 ($P < 0.001$) with tentacle number and also at 0.84 ($P < 0.001$) with lophophore diameter in cheilostomes (McKinney & Jackson, in press). Correlation of spacing between zooidal apertures with lophophore diameter is not known for living stenolaemates, but nearest-neighbor spacing correlates at 0.76 ($P < 0.01$) with number of tentacles in free-walled stenolaemates, which is slightly higher than correlation of maximum or minimum chamber diameter with number of tentacles (McKinney & Boardman, in press). Therefore, we measured spacing between zooecial apertures or distal tubes as well as endozonal zooecial chamber width.

Endozonal zooecial chamber length as seen in tangential section was not measured for all specimens because it is only a portion of the total length of the strongly curved or bent zooecia. It was, however, measured and compared with spacing between distal tubes for several specimens in several species (fig. 5). Correlation between the two is very high ($r = 0.95$, $P < 0.0001$, $N = 49$) if *Spinofenestella inclara* (Počta) is removed from the sample, and the intercept of 0.019 mm is equal to the thickness of the transverse zooecial wall, which has low variability throughout the fenestrates. In *S. inclara* the two rows of zooecia in each branch are completely overlapped, so that successive zooecia in a row are separated from one another by two skeletal walls and by a zooecial chamber that belongs to the companion zooecial row. Therefore, endozonal chamber length as seen in tangential sections is much less than the spacing between distal tubes and apertures in this species, making it anomalous within the fauna for this feature.

Extrazooecial features measured include the spacings and widths of branches and dissepiments. Branch spacing is highly characteristic for species and has fairly low variability. Wherever distance between branches becomes greater than about 20%–25% of the norm, bifurcation occurs; it is by this means that the uniformly spaced branches constitute coherent filtration sheets that are apparently necessary for fenestrates and similar post-Paleozoic arborescent unilaminate bryozoans (McKinney, 1981).

Branch width is a compound feature dependent upon width of axial wall, width of zooecial chambers, amount of zooecial overlap along the branch axial plane, and thickness of extrazooecial skeleton along the branch sides. Total branch width, however, has a moderately low coefficient of variability (CV ~ 15) within species, but differs substantially between species and apparently is an important determinant in resistance to flow of filtered water passing through the colony. We therefore include branch width as a useful taxonomic character, even though it is in part redundant with chamber width.

Dissepiment spacing has low variability in some specimens and species and quite high variability in others; its CV ranges from 3.4 to 41.8 in the species studied herein. Inasmuch as dissepiments connect adjacent branches, they provide greater structural integrity to the colony by decreasing the distance over which stress is translated along single branches (McKinney, 1982). Their presence, however, interferes with flow of filtered water between branches, and so their spacing seems to be critical to the colony and is considered an important taxonomic character. Their width as measured parallel with branch axes is, on the other hand, difficult to determine in thin sections and peels; it also increases proximally at a greater rate than does branch thickness. Therefore, we consider dissepiment width to be at present of limited taxonomic usefulness and only describe it in general terms relative to branch width.

We have not measured length and width of fenestrule openings because those measures are dependent on spacing and width of dissepiments and on spacing and width of branches. Fenestrules, although of apparent functional importance in allowing filtered water to pass from frontal to reverse sides of colonies (Cowen & Rider, 1972; McKinney, 1977; Cook, 1977; Winston, 1978, 1979, 1981; Taylor, 1979; McKinney et al., 1986), are the residue—albeit apparently necessary—of other attributes of the colony. In addition, there is some disagreement in the literature as to what constitutes fenestrule measurements. Some investigators

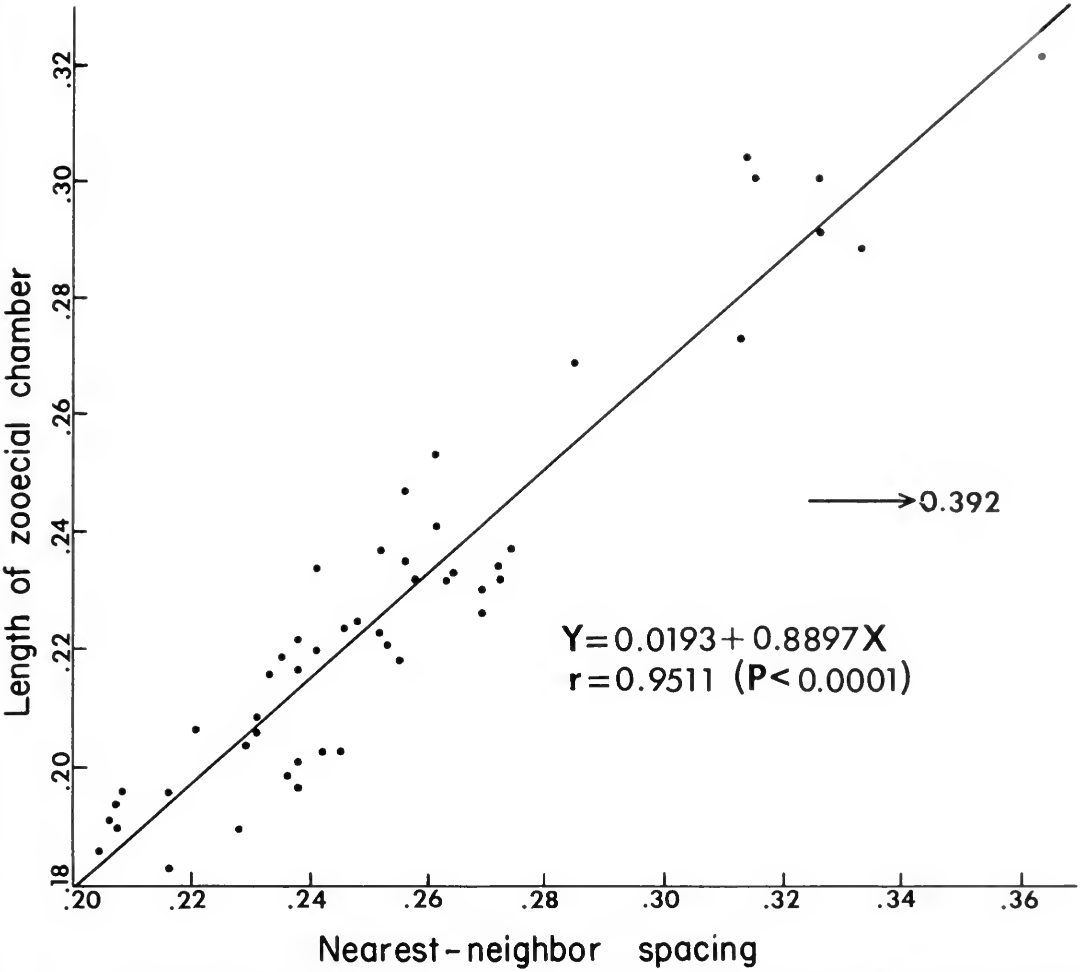

FIG. 5. Plot and regression of endozonal length of zooecial chambers in tangential section against nearest-neighbor spacing of apertures in 49 specimens of *Fenestella gracilis*; *F. conopeum*; *Laxifenestella capillosa*; *L. digittata*; *Rectifenestella exilis*; *Fabifenestella joachimi*; *Flexifenestella bellaforma*; *Utropora nobilis*; *U. parallela*; *Cyclopelta sacculus*; *Isotrypa cancellata*; *I. bifrons*; *I. sportula*; *Hemitrypa tenella*; and *H. mimicra*. Arrow indicates point for *Spinofenestella inclara*, which falls off the graph and is not included in the regression. Each point is based on 20 measurements.

have measured openings (e.g., Astrova & Shishova, 1963; Kodsi, 1967), while others have measured branch and dissepiment spacing (e.g., Elias, 1964; Tavener-Smith, 1973).

This study does not make use of the micrometric formula, which is a method of recording the number of branches, dissepiments, zooecial apertures, and carinal nodes per unit of distance across the frond surface. Elements on which the micrometric formula is based were introduced by F. M'Coy (1844). It was formalized by V. P. Nekhoroshev (1926a) and has been used with various modifications in most studies of fenestrates ever since. Nevertheless, we agree with Tavener-Smith (1966) that the micrometric formula should be abandoned in favor of measurements of single structures. Such combinative measurements as are used in the formula are not as precise as measurements on single items, which are as easily made, and may be influenced by more than one variable. In order to compare the Bohemian Lower Devonian fenestrates with known Devonian species from other areas, published micrometric formulas were converted into estimates of spacing. The resulting estimates were checked by directly measuring the spacings from illustrations within the publications.

Data matrices were generated for each genus, using the mean of the measures for each character (columns) of each specimen (rows). The data matrices were analysed by cluster analysis for cases without weighting the characters, using the single linkage method provided in the *Biomedical Data Package* (Dixon et al., 1981). The resulting clusters were compared with the qualitatively grouped specimens and found to agree consistently, with few exceptions. Where the qualitative and quantitative clustering did not correspond, the specimen in question was again examined in detail and compared with its two possible groups. If there were similarities in chamber shape or skeletal microstructure with the original group but not with the quantitatively-determined group, the specimen was retained with its original group. Where no such unmeasured features differed between the two possible groups, the specimen was transferred to its quantitatively-determined group.

Descriptive statistics recorded in Tables 1–3, 5, and 7 were computed by the "Condescriptive" package, available in *Statistical Package for the Social Sciences* (Nie et al., 1970). Additional statistics provided by the package are on file at the National Museum (Natural History), Prague.

Definitions of Terms

APERTURE—Skeletal opening at distal end of zooecium; the outer end of a distal tube, generally situated on or elevated slightly above frontal surface.

AUTOZOOECIUM—The most common type of zooecium, presumed to be the skeleton of an autozooid and to have contained feeding polypide.

AXIAL WALL—Straight to zigzag wall of granular skeleton between basal plate and frontal surface, perpendicular to but continuous with basal plate, extending along length of branch and dividing the two rows of zooecia in biserial fenestrates.

BASAL PLATE—Thin, generally continuous sheet of granular skeleton, part of which constitutes the reverse wall of autozooecia; generally transversely curved but planar in some; crenellated into one to several rounded, longitudinal ridges on reverse side.

DISSEPIMENT—Skeletal bar between adjacent branches; with a core of granular skeleton but consisting predominantly of lamellar skeleton.

DISTAL TUBE—Cylindrical, exozonal, distal portion of zooecium, generally oriented sharply away from basal plate by abrupt bend at endozone-exozone boundary and of reduced diameter compared with remainder of zooecium.

EXTRAZOOECIAL—Skeleton deposited and remaining outside zooecial boundaries.

FRONTAL (SURFACE)—Surface of branch of zoarium that bears autozooecial apertures or toward which apertures are directed if they are situated laterally on branches; as used here, the term is not related to frontal walls of fixed-wall stenolaemates or cheilostomes (Boardman & Cheetham, 1983).

GONOZOOECIUM—Inflated polymorphic zooecium presumed to have functioned as brood chamber in which eggs developed into larvae.

GRANULAR SKELETON—Skeleton consisting of coarsely granular calcite and appearing clear in peels and thin sections; constitutes basal plates, axial and transverse walls, and cores of styles.

HEMISEPTUM—Skeletal plate projecting partially across zooecial chamber, most commonly from inside of bend at boundary between endozone and exozone, less commonly projecting from basal plate or distal transverse wall.

KEEL—Ridge along midline of frontal surface of branch, formed by outer edge of axial wall, either low or high.

LAMELLAR SKELETON—Skeleton that appears to be composed of thin lamellae deposited in most places parallel with branch surface; composed of platy calcite crystals.

PERISTOME—Sleeve elevated above the adjacent skeletal surface, surrounding the aperture.

REVERSE (SURFACE)—Surface of branch or zoarium that bears no autozooecial apertures and away from which apertures are directed; on opposite side of basal plate from autozooecia.

STYLE—Skeletal rod, generally less than 10 μm in diameter and located in extrazooidal skeleton in the Fenestrata, around which laminae are deflected toward the zoarial surface.

SUPERSTRUCTURE—Skeletal structure borne on high keels or spines above frontal surface; consisting of expanded flanges along outer edge of keels or of laterally fused spines extending from keels or spine tips; except in *Semicoscinium* and *Cyclopelta,* forming meshwork with openings scaled from zooecial to fenestrular sizes.

TRANSVERSE (ZOOECIAL) WALL—Endozonal wall generally continuous with basal plate and axial and lateral walls, joining them at high angles and separating zooecia within linear series.

ZOARIUM—Mineralized skeleton of a colony, including zooecia and extrazooidal skeleton.

ZOOECIUM—Skeleton of a zooid.

Repositories

All specimens illustrated in this paper are deposited in the National Museum (Natural History), Prague, abbreviated as NM, or in the Geological Survey, Prague, abbreviated as UUG. Some paratypes of some new species and a reference set of specimens are deposited in Field Museum of Natural History, abbreviated as FMNH.

Stratigraphic Considerations

The importance of all fossils from Lochkovian and Pragian strata of the Prague Basin has been enhanced since the establishment in 1983 of this as the type area for the two stages by the Subcommission on Devonian Stratigraphy. The Koněprusy Limestone constitutes part of the Pragian sequence, and the Zlíchov Limestone, which immediately overlies the Pragian sequence, constitutes the uppermost of the three subdivisions of the Lower Devonian strata in the Prague Basin. Therefore, the fenestrates from these two formations hold an important position as reference faunas for Lower Devonian fenestrate faunas from around the world.

Distribution of Species

There is a rather substantial difference in species compositions of the fenestrate bryozoan faunas from the Koněprusy and Zlíchov Limestones, probably the result of the vertical stratigraphic difference between the two formations. Although the collecting sites in the two limestones were in rocks deposited in different environments (reefal in the Koněprusy, perireefal and basinal in the Zlíchov), they should contain remains that grew in similar environments. The relatively whole, excellently preserved zoaria of the Koněprusy locality were preserved essentially in place; however, the fragmentary remains in the Zlíchov indicate transport downslope of a majority of specimens into the perireefal and basinal deposits of the collecting localities. The apparently deepest basinal portion of the Zlíchov Limestone contains a few fragments of *Fenestella, Alternifenestella,* and *Polyporella* that were insufficient for description but distinctly differ from the species described here. It is possible that they were indigenous to the basinal environment, but they probably lived in shallower water, as suggested by their small, fragmentary remains.

Six species were found to occur in both the Koněprusy Limestone and in the Zlíchov Limestone at Kaplička: *Utropora parallela* (abundant in the Koněprusy and rare in the Zlíchov); *Isotrypa bifrons*; *I. cancellata*; *Hemitrypa mimicra*; *H. bohemica*; and *Reteporina transiens*. Each of the latter five species is roughly of equal relative abundance in the Koněprusy and in the Zlíchov at Kaplička.

Eighteen species were identified only from the Koněprusy Limestone: *Fenestella gracilis*; *F. conopeum*; *Rectifenestella exilis*; *Spinofenestella inclara*; *Flexifenestella bellaforma*; *Alternifenestella strigilla*; *Semicoscinium subacta*; *Cyclopelta sacculus*; *C. victrola*; *Isotrypa pannosa*; *I. lineolata*; *I. sportula*; *Hemitrypa tenella*; *H. linotheras*; *Reteporina petala*; *Polyporella incerta*; *Penniretepora spinosa*; and *Ptylopora bohemica*.

The Zlíchov Limestone is characterized by the presence of six species of fenestrates that were not found in the Koněprusy Limestone, namely: *Laxifenestella digittata*; *Alternifenestella estrellita*; *Semicoscinium discreta*; *Cyclopelta bohemica*; *Polypora hanusi*; and *Penniretepora bohemica*.

The affinities of the fenestrate bryozoan fauna at the base of the Zlíchov Limestone at Srbsko are enigmatic. It consists of 15 species: *Fenestella* sp.; *Fabifenestella joachimi*; *Laxifenestella capillosa*; *Alternifenestella estrellita*; *Alternifenestella* sp.; *Utropora nobilis*; *Semicoscinium discreta*; *Cyclopelta bohemica*; *Isotrypa bifrons*; *I. cancellata*; *Hemitrypa mimicra*; *Polyporella* sp.; *Polypora inusitata*; *Penniretepora bohemica*; and *Filites bohemicus*. Eight species co-occur at Srbsko and Koněprusy, and seven occur at both Srbsko and Kaplička. The Simpson index of similarity [(number of species in common/number of species in the smaller fauna) (100)] results in values of 53 for the Srbsko : Koněprusy comparison and 58 for the Srbsko : Kaplička comparison. These two values are only slightly higher than the value (50) for Koněprusy : Kaplička. This may mean that the Bryozoa in the Zlíchov Limestone at Srbsko were derived from an environment more similar to that represented by the Koněprusy Limestone than that of the Zlíchov Limestone at Kaplička. The Simpson indices above are difficult to interpret, however, given their similarities and the small numbers of taxa involved. They could as well be due to environmental variations or faunal patchiness as to stratigraphic position.

Comparison with Other Faunas

Lower Devonian fenestrate bryozoans are poorly known around the world. They have been studied from New York State and other areas of eastern

North America by Hall (1874, 1879, 1883, 1886, 1888), Hall and Simpson (1887), and Ulrich and Bassler (1913). Many of the species, however, are unrecognizable from the descriptions and illustrations. Much stratigraphic revision has been done since the 19th century, so that some strata then considered to be "Helderbergian" have been reassigned to the Middle Devonian. Among scattered descriptions and compilations of Lower Devonian fenestrates from other localities are Nekhoroshev's (1977) final monograph on Devonian bryozoans of Kazakhstan; Yaroshinskaya's (1968) preliminary listing of Lower Devonian Bryozoa from the Altai; and Kopaevich's (1984) study of Devonian fenestrates from Mongolia. None of these resembles the Bohemian Lower Devonian fenestrates in species, and they contain only cosmopolitan, long-lived genera. The fenestrates of the upper Lower Devonian (Emsian) Erbray Limestone of the Armorican Massif in France are apparently similar to those of the Lower Devonian of Bohemia, possibly having *Utropora nobilis, Ptylopora bohemica, Hemitrypa bohemica,* and *Rectifenestella exilis* in common with the Koněprusy (Bigey, 1970, 1972a,b).

Among the cosmopolitan fenestrate genera, the Bohemian Lower Devonian species may be compared most closely with Middle Devonian species from several areas, including the Altai (Nekhoroshev, 1948; Morozova, 1960; Krasnopeeva, 1962; Volkova, 1974); the Kuznets Basin (Morozova, 1960; Nekhorosheva, 1960); Kazakhstan (Nekhoroshev, 1977); northwest Mongolia (Nekhoroshev, 1926b); Kirin (Yang, 1956); Kwangsi (Yang & Hu, 1965); and Michigan (Deiss, 1932). Such ease of comparison with Middle Devonian species is likely a reflection of the numerous descriptions of Middle Devonian fenestrates and the dearth of such for the Lower Devonian. At present, close faunal similarity for the Bohemian Lower Devonian fenestrates can only be demonstrated for Emsian deposits of the Armorican Massif.

Systematic Treatment

Phylum BRYOZOA Ehrenbert, 1831
Class STENOLAEMATA Borg, 1926
Order FENESTRATA Elias and Condra, 1957

Fenestella Lonsdale, 1839

TYPE SPECIES—*Fenestella subantiqua* d'Orbigny, 1852.

DIAGNOSIS—Zoaria conical or fan-shaped; straight branches connected by regularly spaced dissepiments equal to or less than branches in width; axial wall planar, forming low keel with or without small- or moderate-sized carinal nodes, separating two rows of zooecia; zooecia side-by-side or alternating along branches; zooecial chambers short, rectangular to rhomboidal in section parallel to base, with short distal tube somewhat inclined laterally away from axial wall; single hemiseptum on proximal wall at base of distal tube, diaphragms absent; no superstructure present; granular wall present in basal plate and axial wall but absent in transverse walls; moderate-size styles abundant in extrazooidal lamellar skeleton.

DISCUSSION—Morozova (1974) revised the genus *Fenestella,* naming several new genera and recognizing as separate genera some that were previously erected from species originally placed in *Fenestella,* even though it is probable that some of the *Fenestella*-derived genera recognized by her are form taxa. *Fenestella s.l.* obviously contains many distinct morphological groups, based on living chamber shape, polymorphism, and skeletal microstructure. Some of the morphological groups probably represent evolutionary grades or result from constructional constraints, while others are probably single clades. At this point in our understanding of the genus, it is impossible to recognize which morphological groups are clades and which are polyphyletic. Therefore, Morozova's revision is accepted here in large part, despite the probability that some of the *Fenestella*-derived genera which she recognized are form genera.

Fenestella gracilis (Barrande). Figure 6.

Reteporina gracilis (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pp. 63, 64, pl. 14, figs. 1–6 (not fig. 7).
Fenestella gracilis (Barrande). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 10, 11, pl. 1, figs. 7–9, pl. 2, fig. 13.

DIAGNOSIS—Branches about 0.38 mm wide, spaced about 0.65 mm center to center, connected by dissepiments averaging 1.64 mm center to center; zooecial chambers box-shaped, narrowest at bottom, with laterally inclined distal tubes about 0.10 mm in diameter and spaced about 0.23 mm center to center.

DESCRIPTION—Zoarial fragments are large, delicate, undulating sheets up to 63 mm high and 58 mm wide. Branches are typically straight, rarely

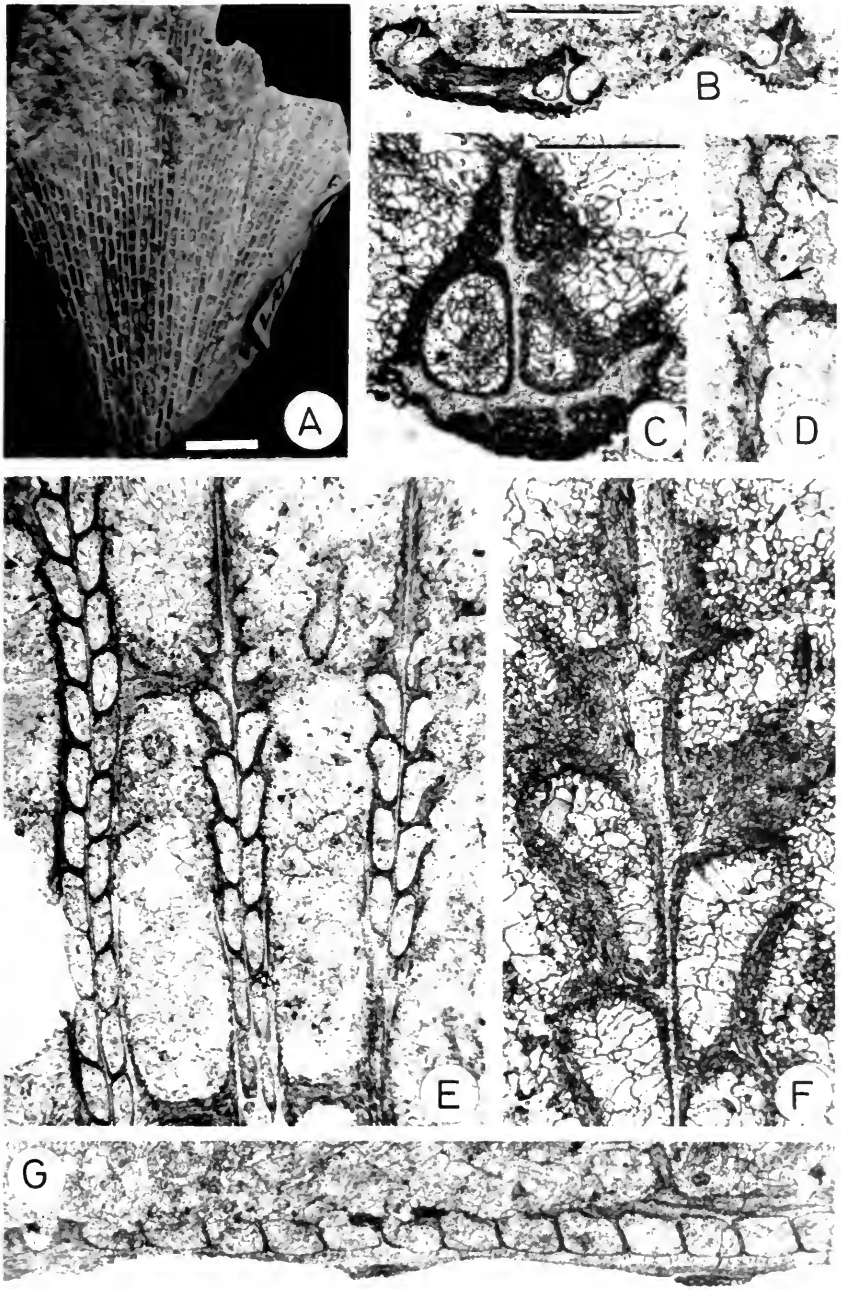

FIG. 6. *Fenestella gracilis* (Barrande). **A**, exterior of funnel-shaped colony; lectotype, NM L18498, Koněprusy. **B**, transverse section through three adjacent branches, two of which are connected by a dissepiment; lectotype, NM L18498. **C**, transverse section through single branch, showing thin development of lamellar skeleton on reverse side and prominent high keel with thick granular axial wall in keel; lectotype, NM L18498. **D**, tangential section with apparent ovicell (arrow), on specimen with lectotype of *Utropora nobilis* (Barrande). NM L15507, Koněprusy. **E**, tangential section, shallowest at top right and deepest at bottom right; lectotype, NM L18498. **F**, shallow tangential section showing thickened axial wall in keel (top) and minimal presence of granular skeleton in transverse walls between zooecia; lectotype, NM L18498. **G**, longitudinal section cutting near axial plane on right, gradually diverging to lateral margin of branch on left; NM L24641, Koněprusy. Scale bar in A = 5 mm; in B = 0.5 mm; and in C = 0.1 mm. D–G are at same scale as B.

slightly sinuous; they are connected by fairly regularly spaced dissepiments whose spacing averages about two and one-half times that of branches.

Autozooecia usually alternate in position along the branches. They are box-shaped, with the base slightly narrower than more frontal portions. The distal-frontal portion of the zooecium is tube-shaped, angled away from the branch axial plane at about 45° toward the adjacent fenestrule. The end turns up as a distal tube. The axial wall is almost straight, but curves slightly due to the overlap of alternating zooecia along the branch midplane. In deep tangential sections, zooecial chambers are elongate parallelograms to weakly developed pentagons near the basal wall; length is about three times width. In shallower tangential sections, chamber sections are crescent-shaped, progressively more constricted at the proximal end until the shallowest sections cut only the short distal tube. There is a slight hemiseptum at the base of the distal tube in some zooecia within colonies. The distal tube terminates as a low peristome around the aperture.

The basal plate is about 0.02–0.03 mm thick and flat to gently curved transversely, with a few large longitudinal ridges on the reverse surface. Lamellar skeleton is less than 0.03 mm thick on the reverse side of the basal plate and on frontal sides of zooecia, and is even thinner on lateral zooecial surfaces.

Apparent gonozooecia are about twice autozooecial length and width and are higher than autozooecia, but they have the same distal tube and aperture diameter as autozooecia. They are located at branch bifurcations and adjacent to dissepiments.

Discussion—Barrande (in Počta, 1894) erected two species with the trivial name *gracilis*, *Reteporina gracilis* (pp. 81, 82, pl. 14, figs. 1–7), and *Fenestella gracilis* (pp. 63, 64, pl. 14, figs. 8–11). The latter belongs to *Isotrypa*, in that it carries a well-developed superstructure supported by a high keel above branches and dissepiments.

Originally figured specimens of *Reteporina gracilis* Barrande include two fenestellid species (see Appendix I). The three specimens illustrated by Barrande as figures 1–6 of plate 14 apparently are closest to the concept that he had for the species and are here designated lectotype (NM L18498, Barrande's figs. 5 and 6) and paralectotypes (NM L21338, Barrande's figs. 1 and 2; NM L21333, Barrande's figs. 3 and 4) for his species.

Most characteristics of the species would place it in *Fenestella*. It differs from the diagnosis of *Fenestella* given above by having somewhat irregularly spaced dissepiments and from Morozova's (1974) diagnosis by not having wide branches. Nevertheless, we consider the differences to be slight and have included it in *Fenestella*, as did Prantl (1932).

Measurements—See Table 1.

Type Material—Lectotype, NM L18498; paralectotypes, NM L21333; NM L21338; additional registered material, NM L15507; NM L24641.

Locality—Koněprusy.

Fenestella conopeum McKinney & Kříž, sp. nov. Figure 7A–E.

Diagnosis—Branches about 0.27 mm wide, spaced about 0.63 mm apart, connected by irregularly spaced dissepiments 2.41 mm apart on the average; zooecial chambers a flat-sided, proximally truncated cornucopia shape, narrowest at bottom, with distal tubes about 0.10 mm in diameter and spaced 0.23 mm center to center.

Description—Zoarial fragments are very delicate, broad, undulating sheets up to 43 mm high and 22 mm wide. Branches are straight, connected by straight dissepiments that vary in relation to branches from about a 70° angle to perpendicular. Dissepiments have smaller widths compared to branches and rather variable spacing, averaging three and one-half to four times that of branches.

Autozooecia are arranged in alternating positions along the branches. The axial wall is straight to zigzag. Zooecial chambers have a flat-sided, proximally truncated cornucopia shape that is narrowest at the bottom. In deep tangential sections that cut near the basal plate, zooecia are elongate, narrow parallelograms; transverse walls that divide zooecia along a row are at about a 60° angle to the axial wall. Chambers are over five times as long as they are wide just above the basal plate, but their width increases toward the frontal surface so that maximum width is equal to 40% of the length. In shallow tangential sections, chambers are raindrop-shaped, then almost circular where only the distal tube is cut. Distal tubes are short, and apertures are essentially flush with the frontal surface of the branch.

The basal plate is about 0.02–0.03 mm thick and strongly curved transversely, with a few large longitudinal ridges on the reverse. Lamellar skeleton is less than 0.03 mm thick on reverse and

TABLE 1. Measurements of species of *Fenestella* and related genera (see page 7 for definitions of abbreviations).

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
Fenestella gracilis **(Barrande)**					
BRS	14	110	0.380–0.987	0.648	0.085
BRW	14	110	0.212–0.438	0.276	0.028
CW	5	50	0.067–0.115	0.092	0.012
DS	13	94	0.743–3.815	1.645	0.191
DTS	14	140	0.153–0.272	0.231	0.021
DTW	14	140	0.072–0.120	0.095	0.008
Fenestella conopeum **McKinney & Kříž**					
BRS	2	13	0.485–0.784	0.632	0.090
BRW	2	13	0.213–0.376	0.271	0.045
CW	2	20	0.077–0.113	0.098	0.010
DS	1	6	1.703–4.444	2.411	1.007
DTS	2	18	0.266–0.353	0.300	0.025
DTW	2	20	0.088–0.138	0.114	0.012
Fenestella **sp.**					
BRS	1	4	0.555–0.664	0.614	0.043
BRW	1	4	0.305–0.354	0.331	0.021
CW	1	10	0.129–0.193	0.159	0.018
DS	1	6	1.036–1.248	1.160	0.064
DTS	1	10	0.260–0.319	0.286	0.021
DTW	1	10	0.114–0.145	0.129	0.010
Fabifenestella joachimi **McKinney & Kříž**					
BRS	6	53	0.296–0.716	0.499	0.062
BRW	6	53	0.189–0.405	0.275	0.040
CW	5	50	0.092–0.139	0.114	0.010
DS	6	56	0.601–1.337	0.877	0.050
DTS	6	57	0.192–0.305	0.245	0.012
DTW	6	53	0.074–0.118	0.096	0.006
Laxifenestella capillosa **(Počta)**					
BRS	26	216	0.379–0.977	0.648	0.067
BRW	26	210	0.221–0.483	0.342	0.035
CW	5	50	0.089–0.131	0.111	0.010
DS	26	243	0.469–2.253	1.022	0.161
DTS	26	248	0.189–0.340	0.248	0.015
DTW	26	253	0.078–0.139	0.106	0.007
Laxifenestella digittata **(Prantl)**					
BRS	7	56	0.302–0.868	0.615	0.070
BRW	7	47	0.235–0.554	0.342	0.071
CW	5	50	0.080–0.156	0.119	0.017
DS	7	66	0.647–1.269	0.972	0.148
DTS	7	67	0.192–0.298	0.248	0.013
DTW	7	65	0.075–0.129	0.096	0.007
Rectifenestella exilis **(Počta)**					
BRS	4	36	0.274–0.653	0.474	0.055
BRW	3	22	0.169–0.265	0.212	0.019
CW	5	50	0.072–0.138	0.100	0.013
DS	3	23	0.431–0.979	0.648	0.186
DTS	4	40	0.156–0.319	0.234	0.027
DTW	4	39	0.055–0.103	0.078	0.009
Spinofenestella inclara **(Počta)**					
BRS	1	5	0.681–0.742	0.710	0.020

TABLE 1. *Continued.*

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
BRW	1	6	0.220–0.257	0.238	0.022
CW	1	10	0.114–0.135	0.126	0.007
DS	1	3	1.082–1.373	1.232	0.119
DTS	1	10	0.295–0.463	0.392	0.044
DTW	1	10	0.089–0.105	0.096	0.005
Flexifenestella bellaforma **McKinney & Kříž**					
BRSM	1	6	0.989–1.452	1.125	0.153
BRW	2	11	0.289–0.534	0.423	0.070
CW	2	20	0.129–0.173	0.150	0.011
DS	1	6	2.114–2.860	2.430	0.303
DTS	2	20	0.236–0.467	0.298	0.053
DTW	2	20	0.107–0.143	0.129	0.010
Alternifenestella strigilla **McKinney & Kříž**					
BRS	4	35	0.357–1.204	0.744	0.157
BRW	4	37	0.245–0.406	0.328	0.035
CW	4	40	0.111–0.166	0.139	0.014
DS	4	34	0.972–2.010	1.437	0.203
DTS	4	40	0.238–0.364	0.296	0.019
DTW	4	39	0.076–0.140	0.112	0.015
Alternifenestella estrellita **McKinney & Kříž**					
BRS	4	26	0.361–0.839	0.574	0.022
BRW	4	24	0.247–0.343	0.282	0.026
CW	5	50	0.100–0.165	0.131	0.013
DS	4	27	0.632–1.115	0.888	0.133
DTS	4	37	0.189–0.405	0.276	0.044
DTW	4	40	0.069–0.116	0.093	0.008

frontal surfaces and is even thinner on lateral surfaces. A low keel with a single row of low spines, whose spacing is unknown, extends down the frontal surface of each branch.

DISTINGUISHING FEATURES—This relatively uncommon species seems closely related to *Fenestella gracilis,* especially in the widely spaced, narrow branches, the greatly spaced dissepiments, and the relatively sparsely developed lamellar skeleton. The most conspicuous differences from *F. gracilis* are the greater spacing of dissepiments, the narrower basal shape of zooecia, and the larger size of zooecia.

Fenestella conopeum differs from *F. sardjalensis* Nekhoroshev, 1977, in having more widely spaced branches, much more widely spaced dissepiments, and more closely spaced zooecia. *Fenestella fragila* Krasnopeeva, 1962, from the Givetian of the Altai has more widely spaced branches, more closely spaced dissepiments, and more widely spaced zooecia. *Fenestella conopeum* most closely resembles *F. buratinensis* Krasnopeeva, 1935, as characterized by Morozova (1960), but its branches

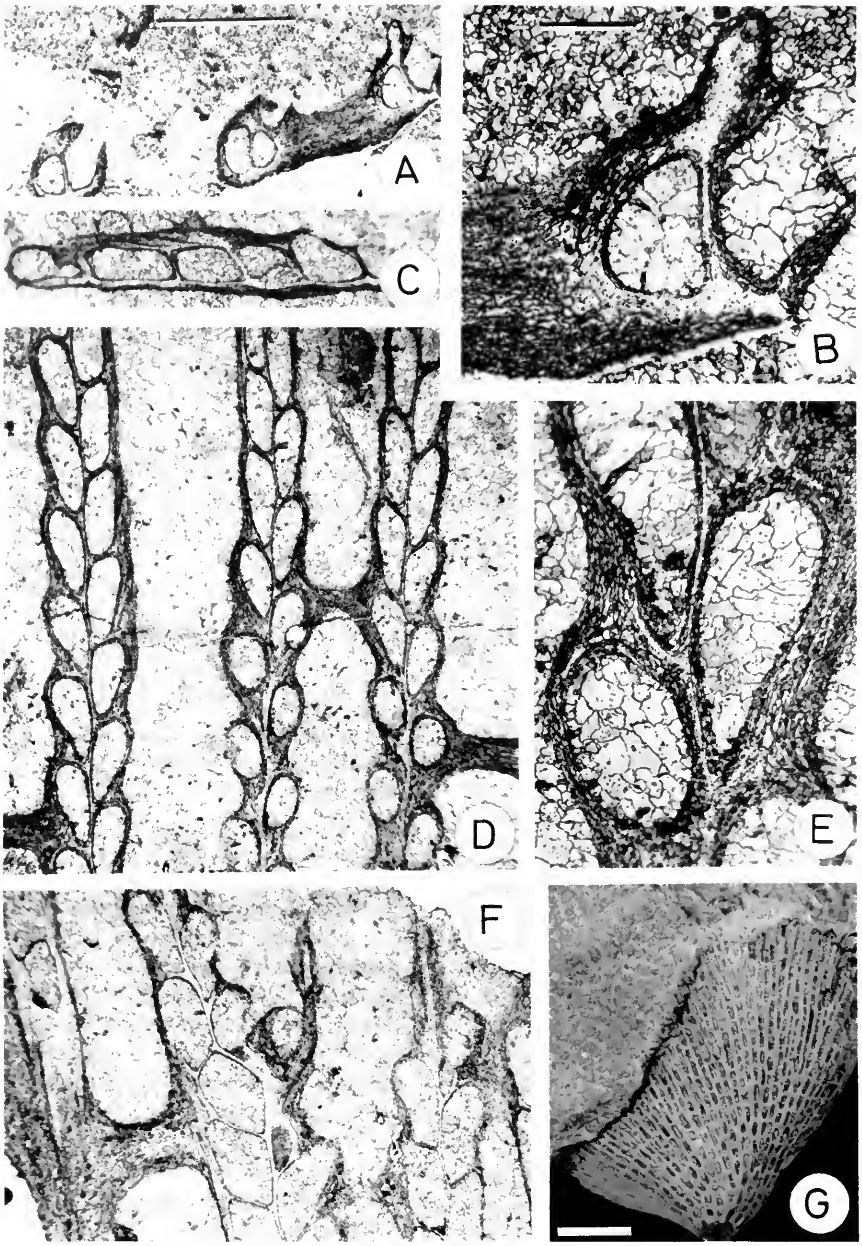

FIG. 7. *Fenestella conopeum* McKinney & Kříž. **A,** transverse section through three branches, two of which are connected by a dissepiment; holotype, NM L18537, Koněprusy. **B,** transverse section through a branch and adjacent part of dissepiment; note thickening of axial wall in frontal keel; holotype, NM L18537. **C,** slightly oblique longitudinal section; paratype, NM L24642, Koněprusy. **D,** tangential section, shallowest at bottom and cutting near basal plate at top; holotype, NM L18537. **E,** shallow tangential section through distal tube (bottom of figure) and tops of two chambers (top of figure); note thickening of granular axial wall toward bottom of figure, which approaches the frontal surface; holotype, NM L18537. **F-G.** *Fenestella* sp. NM L18515, Koněprusy. **F,** tangential section. **G,** exterior of funnel-shaped colony. Scale bar in A = 0.5 mm; in B = 0.1mm; and in G = 5 mm. C–D and F are at same scale as A; E is at same scale as B.

are slightly more closely spaced and its dissepiments more widely spaced.

ETYMOLOGY—From Latin *conopeum,* a delicate net to keep off gnats or mosquitoes.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype, NM L18537; paratype, NM L24642.

LOCALITY—Koněprusy.

Fenestella sp. Figure 7F–G.

Fenestella capillosa (pars) Počta, 1894, Syst. Sil. VIII, pl. 12, fig. 3, 3a.

DESCRIPTION—The zoarium is conical, widening at an angle of 60° along the short diameter and 90° along the long diameter; it is 17 mm high and 24 mm wide. The frontal side is on the inner surface. Branches are straight and connected by dissepiments with a slightly smaller diameter and spacing, on the average, twice that of branches.

Autozooecia alternate in position along the branches, but the axial wall is straight. Zooecial chambers are box-shaped, with length about one and two-thirds width and a slightly convex frontal wall. A large, short distal tube arises from the distal part of the frontal wall and inclines very slightly toward the adjacent fenestrule. Transverse walls are at about a 70° angle with the axial wall.

The basal plate is gently to moderately convex transversely, and has a few large ridges on the reverse. Lamellar skeleton on the reverse and frontal sides is up to 0.05 mm thick in the section, but calcification on the reverse side is thicker near the base of attachment. A low keel with a core of granular skeleton bears robust styles at unknown spacing.

DISCUSSION—Zooecial characteristics resemble no other specimens studied in the collections but are like typical *Fenestella s.s.,* rather than the species herein referred to *Laxifenestella.*

MEASUREMENTS—See Table 1.

TYPE MATERIAL—NM L18515.

LOCALITY—Koněprusy.

Fabifenestella Morozova, 1974

TYPE SPECIES—*Fenestella praevirgosa* Schulga-Nesterenko, 1951.

DIAGNOSIS—Zoaria generally fan-shaped, frequently undulating; linear to slightly sinuous branches connected by regularly spaced dissepiments; dissepiment width equal to or less than branch width; keel low, bearing nodes in zigzag pattern; two rows of zooecia per branch; zooecial chambers flat-sided near base but somewhat inflated laterally above, with side toward branch axial plane strongly curved; zooecial length less than twice their width; distal tubes short; single hemisepta may be present in the chambers.

Fabifenestella joachimi McKinney & Kříž, sp. nov. Figures 8, 12A.

Fenestella exilis (pars) Počta, 1894, Syst. Sil. VIII, pl. 13, fig. 3 (not figs. 1, 2, 6, 7).

Utropora nobilis (Barrande) (pars). Prantl, 1932, Paleontogr. Bohemiae XV, pl. 3, fig. 5.

DIAGNOSIS—Branches about 0.28 mm wide, spaced about 0.50 mm apart, connected by very regularly spaced dissepiments averaging 0.88 mm apart; zooecial chambers inflated, sack-shaped, concave sides against next-proximal and diagonally proximal zooecia, with distal tubes about 0.10 mm in diameter and spaced about 0.24 mm center to center.

DESCRIPTION—Zoaria are gently pleated, fan-shaped, radiating up to 360° from the base of attachment. The largest fragment is 22 mm high and 29 mm wide. Branches are straight, connected by perpendicular dissepiments with slightly smaller diameter. Dissepiments have spacing about one and three-quarters times that of branches.

Autozooecia are in alternating positions along the branches. The axial wall is typically zigzag with crescentic segments. Zooecia are inflated and sack-shaped, with concave sides where formed against the next-proximal and diagonally proximal zooecia. In deep tangential sections zooecial chambers are nearly pentagonal, except for the convex distal edge. Slightly higher, they are bean-shaped, and in shallower sections are even more distinctly indented on the lateral sides. Distal tubes are located disto-laterally, have well-developed hemisepta at their bases, and are tilted both proximally and toward the adjacent fenestrule. The end of the distal tube is a low peristome that surrounds the aperture, which is inclined proximally and laterally with respect to the frontal plane.

The basal plate is 0.01–0.03 mm thick and has several longitudinal ridges on the reverse. Lamellar skeleton is up to 0.04 mm thick on reverse surfaces and constitutes a prominent low keel on

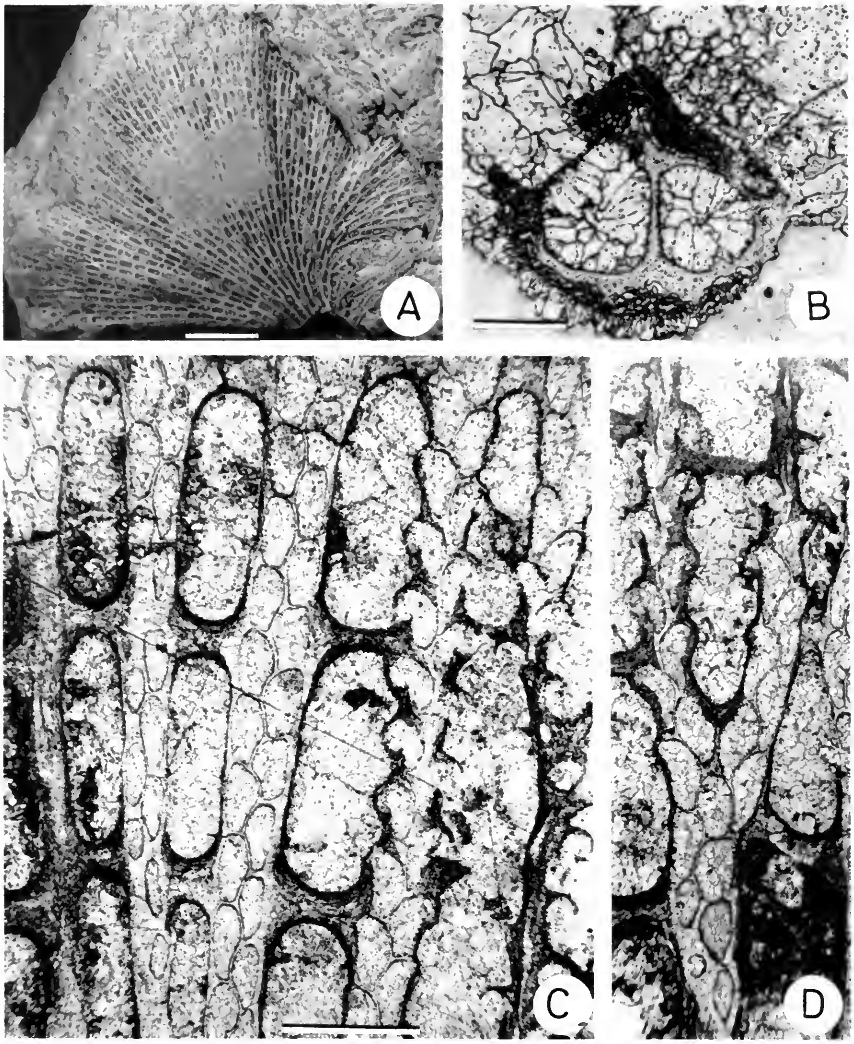

FIG. 8. *Fabifenestella joachimi* McKinney & Kříž. **A,** exterior of fan-shaped colony; holotype, NM L18539, Koněprusy. **B,** transverse section of single branch; paratype, NM L18534, Koněprusy. **C,** tangential section cutting below basal plate at far left and grazing frontal surface at far right; holotype, NM L18539. **D,** tangential section cutting branch bifurcation; paratype, NM L18534. Scale bar in A = 5 mm; in B = 0.1 mm; and in C = 0.5 mm. D is at same scale as C.

the frontal side, supporting nodes or low spines with granular cores up to about 0.05 mm in diameter and spaced about 0.30 mm apart in a slightly zigzag row.

DISTINGUISHING FEATURES—Among Lower and Middle Devonian species of *Fabifenestella, F. joachimi* is most similar to *F. mirifica* (Morozova, 1960), of Givetian deposits in the Kuznets Basin, from which it differs in having more widely spaced dissepiments and larger, more widely spaced keel nodes. *Fabifenestella joachimi* differs from other Lower and Middle Devonian species of *Fabifenestella* in having more closely spaced branches; moreover, it has more closely spaced dissepiments and zooecia than *F. vaigatschensis* (Nekhorosheva, 1960), more closely spaced dissepiments than *F. altshedatensis* (Morozova, 1960), and more distantly spaced dissepiments than *F. subpioneri* (Morozova, 1960).

ETYMOLOGY—Named after Joachim Barrande.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype NM L18539; paratypes, NM L18497; NM L18533; NM L18534; NM L18572; NM L21332.

LOCALITIES—Koněprusy; Srbsko.

Laxifenestella Morozova, 1974

TYPE SPECIES—*Fenestella sarytshevae* Schulga-Nesterenko, 1951.

DIAGNOSIS—Zoaria conical or fan-shaped, with straight to slightly sinuous branches connected by regularly spaced dissepiments equal to or slightly smaller than branches in diameter; low keel with small nodes aligned in single row; branches with two rows of zooecia that are not inflated laterally but are rectangular to pentagonal in deep tangential section, depending on whether axial wall is straight or zigzag near base; single hemiseptum on proximal wall; low peristome typically present around apertures.

Laxifenestella capillosa (Počta). Figures 9, 10.

Fenestella capillosa (pars) Počta, 1894, Syst. Sil. VIII, p. 61, pl. 12, figs. 1, 2, 2a (not fig. 3).
Fenestella subacta Počta, 1894, Syst. Sil. VIII, pl. 12, fig. 6 (not figs. 4, 5, 7–11); Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 8 (right) (not pl. 1, fig. 10, pl. 2, figs. 6, 7).
Fenestella exilis Počta, 1894, Syst. Sil. VIII, pl. 13, fig. 1 (not figs. 2, 3, 6, 7).
Isotrypa acris (Počta). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 4, fig. 13 (not fig. 12).

DIAGNOSIS—Branches about 0.34 mm wide, spaced about 0.65 mm center to center, connected by fairly regularly spaced dissepiments averaging 1.02 mm center to center; zooecial chambers weakly five-sided to box-shaped near base to kidney-shaped near frontal, with distally tilted distal tubes about 0.11 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are fan-shaped with longitudinal pleats. Commonly specimens show local growth centers along which many asymmetrical bifurcations are clustered, so that branches diverge radially in those areas. There are two such centers in the largest zoarial fragment, which is 52 mm high and 45 mm wide. Branches are straight to slightly sinuous, connected by dissepiments with slightly smaller diameter and spacing which averages one and three-fourths times that of branches.

Autozooecia alternate in position along the branches. The axial wall is zigzag, locally almost straight. Zooecial chambers are five-sided to box-shaped, with a short cylinder of lesser diameter extending distally at about 45° to the frontal surface. In deep tangential sections, zooecia appear pentagonal, with length almost twice the width, near the basal plate. Some basal sections are barely bent on the axial side and are therefore almost quadrangular. In tangential sections that cut near the frontal side, zooecia become kidney-shaped, especially where the hemiphragm at the base of the distal tube causes a sharp indentation in the lateral margin. Distal tubes are short, inclined only slightly toward the adjacent fenestrule and inclined about 45° distally toward the frontal surface.

The basal plate is about 0.02 mm thick, with a strong transverse curve up to about a 180° arc and several longitudinal ridges on the reverse. Lamellar skeleton may be up to at least 0.10 mm thick on reverse and frontal surfaces, but it is thinner on lateral surfaces. A median keel of lamellar skeleton extends down the frontal side of the branches and is penetrated at about 0.30 mm intervals by high spines with granular cores 0.02 mm in diameter.

DISCUSSION—The specimen originally illustrated as plate 12, figure 3, in Počta (1894) belongs to an undetermined species of *Fenestella*; the specimen originally illustrated there as plate 12, figure 2 (NM L18516) is here designated as lectotype. *Laxifenestella capillosa* is the most abundant species in the *Fenestella*-group complex at Koněprusy.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Lectotype, NM L18516; paralectotype, NM L21377; additional registered material, NM L21334; NM L21339; NM L21447; NM L24643–L24646.

LOCALITIES—Koněprusy; Srbsko.

Laxifenestella digittata (Prantl). Figure 11.

Fenestella digittata Prantl, 1932, Palaeontogr. Bohemiae XV, p. 11, pl. 2, fig. 12, ?11.
Fenestella spinulosa (pars) Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 9, 10, pl. 1, figs. 1–3, pl. 2, fig. 10 (not pl. 3, fig. 17) (not Condra, 1902).
Fenestella exilis Počta. Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 3 (not fig. 4).

DIAGNOSIS—Branches about 0.34 mm wide, spaced about 0.62 mm center to center, connected

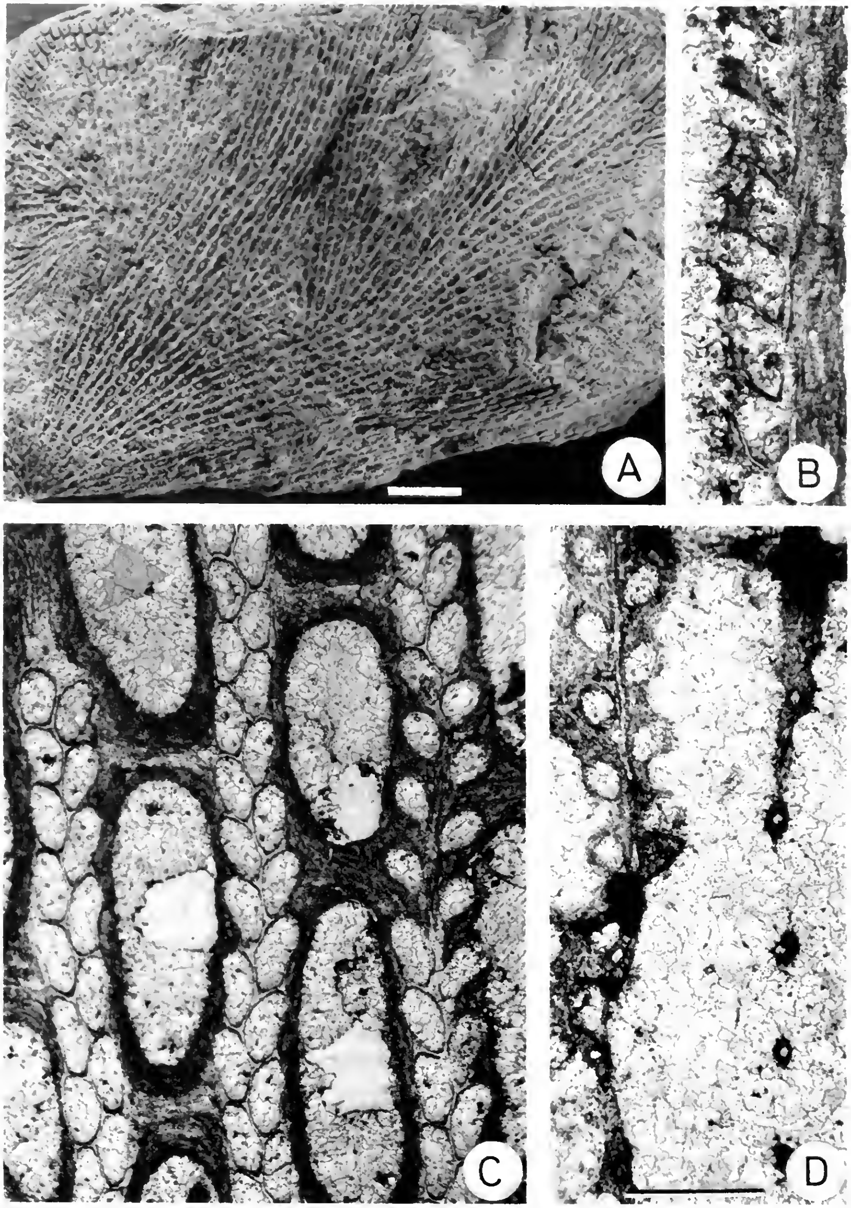

FIG. 9. *Laxifenestella capillosa* (Počta). **A,** exterior of colony, with several centers of abundant branch bifurcation; lectotype, NM L18516, Koněprusy. **B,** longitudinal section along a row of zooecia with weakly developed hemiseptum at bottom of distal tube; NM L24643, Koněprusy. **C,** tangential section cutting below basal plate at top left and at level of distal tubes at right center; lectotype, NM L18516. **D,** shallow tangential section cutting distal tubes at top left and through carinal nodes at bottom right; NM L24644, Koněprusy. Scale bar in A = 5 mm and in D = 0.5 mm. B–C are at same scale as D.

by variably spaced dissepiments averaging 0.97 mm center to center; zooecial chambers strongly pentagonal at base to kidney-shaped frontally, with only slightly inclined distal tubes about 0.10 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are simple to complexly folded, fan-shaped, up to at least 75 mm wide, 50

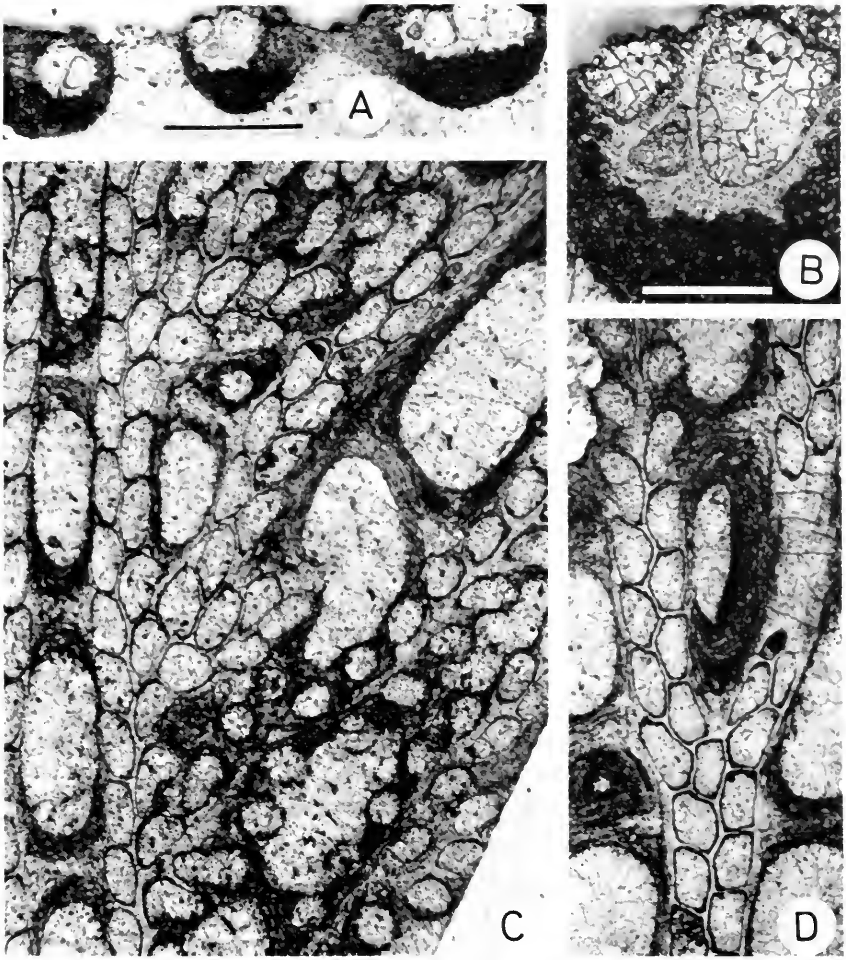

FIG. 10. *Laxifenestella capillosa* (Počta). **A,** transverse section through three branches, the one on the right at a bifurcation; lectotype, NM L18516, Koněprusy. **B,** transverse section of single branch; lectotype, NM L18516. **C,** tangential section through series of asymmetrical bifurcations where colony rapidly spread laterally; NM L24645, Koněprusy. **D,** tangential section through typical branch bifurcation; NM L24646, Koněprusy. Scale bar in A = 0.5 mm and in B = 0.1 mm. C–D are at same scale as A.

mm high, and about 30 mm deep. Branches are straight to slightly sinuous, connected by dissepiments of about the same diameter, with spacing that averages about one and one-half times that of branches.

Autozooecia alternate in position along the branches. The axial wall is strongly zigzag near zooecial bases, less so near the frontal surface. Zooecial chambers are five-sided to box-shaped, with a short cylinder of lesser diameter extending distally toward the frontal surface or inclining slightly toward the adjacent fenestrule. In deep tangential sections, zooecia appear pentagonal, with length about one and one-half times width near the budding plate. In tangential sections that cut near the frontal side, zooecia are kidney-shaped, with a small hemiseptum at the base of the distal tube; in some cases the kidney shape is modified by a flat proximal side. Zooecial axis in shallow tangential sections is oblique with respect to branch axis. Distal tubes are short and incline slightly toward the adjacent fenestrule, somewhat distally.

The basal plate is about 0.03 mm thick and strongly curved transversely, with several longitudinal ridges on the reverse. Lamellar skeleton may be over 0.10 mm thick on reverse and frontal surfaces but is thinner on lateral surfaces. A straight median keel with a granular skeletal core extends

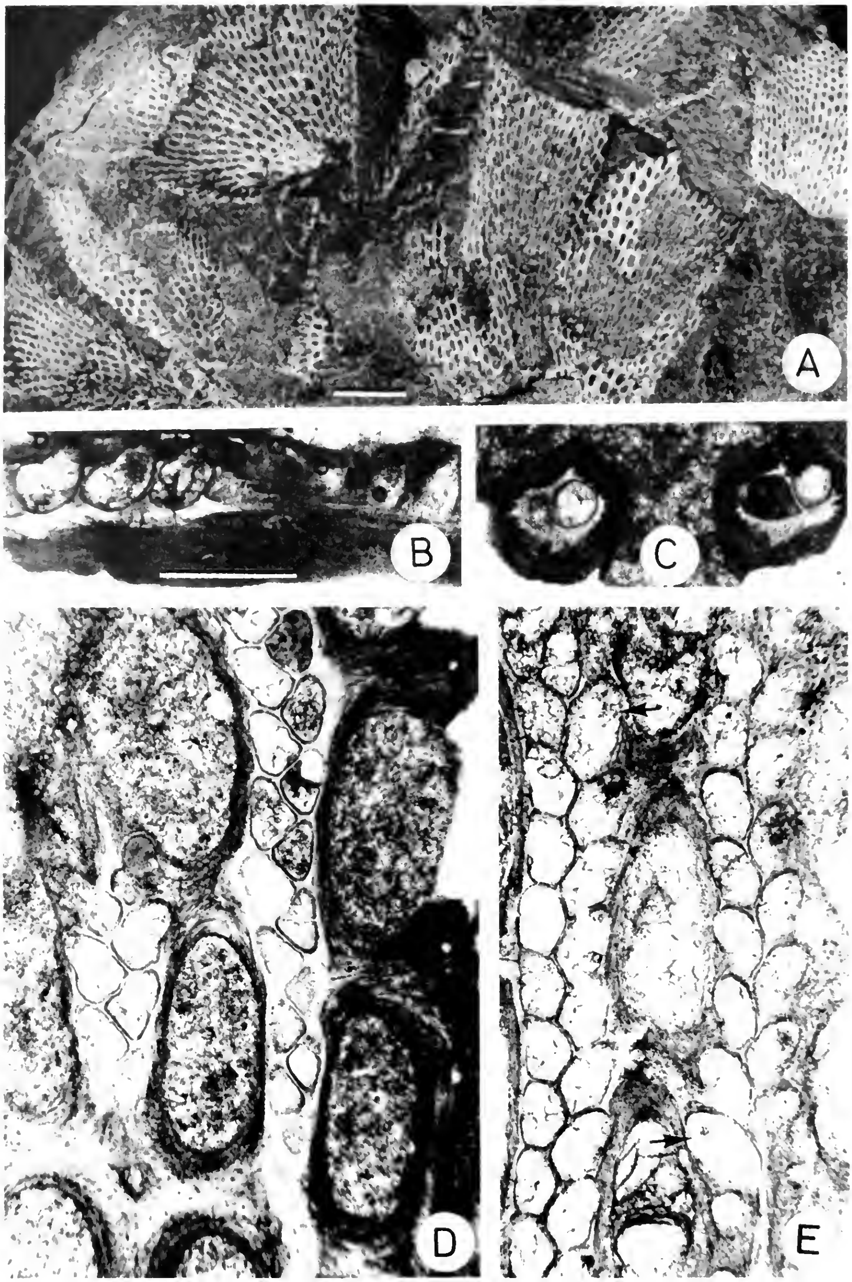

FIG. 11. *Laxifenestella digittata* (Prantl). **A**, exterior of complexly grown colony; NM L18562, Kaplička. **B**, longitudinal section; NM L18562. **C**, transverse section of two branches; NM L18562. **D**, tangential section that cuts below basal plate on right and bottom and through keel at top left, where one spine is cut in cross section; NM L18562. **E**, tangential section that cuts two possible ovicells (arrows); NM L18512, Kaplička. Bar scale in A = 5 mm and in B = 0.5 mm. C–E are at same scale as B.

down the frontal side of the branches and gives rise at variable spacing to high spines with 0.01–0.04 mm diameter granular cores that appear stellate in cross section; spines similar in spacing and appearance also extend from the reverse side of the basal plate.

Apparent ovicells are present in one specimen. They are about 50% longer and slightly broader

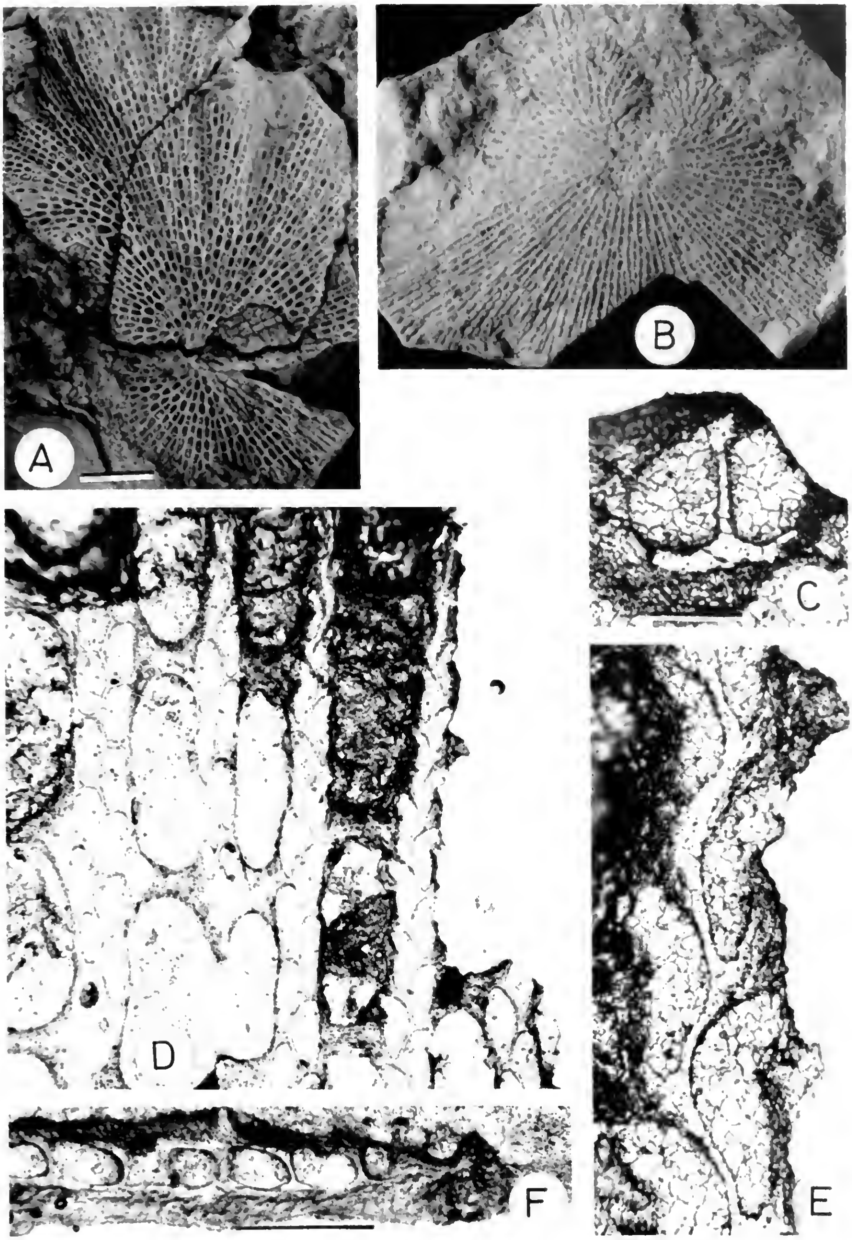

FIG. 12. *Fabifenestella joachimi* McKinney & Kříž. **A**, exterior view of broad, pleated, conical zoarium; NM L21332, Koněprusy. *Rectifenestella exilis* (Počta). **B**, exterior view of broad, nonpleated, conical colony; lectotype, NM L18525, Koněprusy. **C**, transverse section of single branch; lectotype, NM L18525. **D**, tangential section, cutting below basal plate at lower left and at keel level at top right; lectotype, NM L18525. **E**, tangential section, cutting narrow frontal portions of branches and apertures of zooecia; lectotype, NM L18525.**F**, longitudinal section, cutting near branch axial plane at left and along branch margin at right; NM L24647, Koněprusy. Bar scale in A = 5 mm; in C = 0.1 mm; and in F = 0.5 mm. B is at same scale as A; D is at same scale as F; E is at same scale as C.

than normal autozooecia and are near dissepiments.

DISCUSSION—Prantl's (1932) *Fenestella spinulosa* is a junior synonym of *Fenestella spinulosa* Condra, 1902 (pp. 343, 344, pl. 21, figs. 4, 5) and is therefore an invalid name. Inasmuch as at least one of the originally figured specimens of *F. digittata* Prantl, 1932, belongs to the same species as

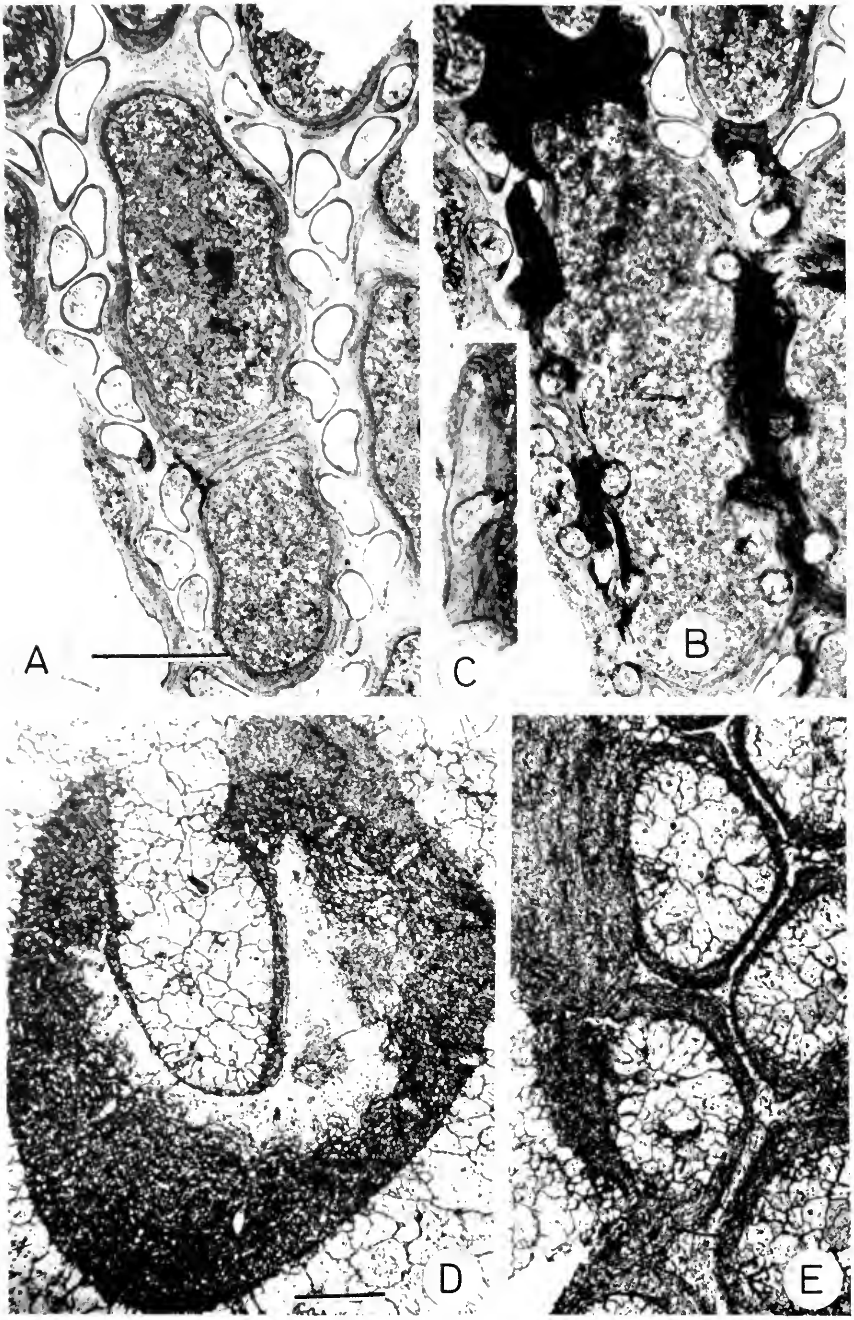

FIG. 13. *Spinofenestella inclara* (Počta). Holotype, NM L21452, Koněprusy. **A,** deep tangential section. **B,** shallow tangential section, covering same area as in A. **C,** longitudinal section along margin of branch. **D-E.** *Flexifenestella bellaforma* McKinney & Kříž. Holotype, NM L24648, Koněprusy. **D,** transverse section across single branch. **E,** shallow tangential section, through two zooecia and part of a third left of zigzag axial wall. Scale bar in A = 0.5 mm and in D = 0.1 mm. B–C are at same scale as A; E is at same scale as D.

the majority of the original specimens of Prantl's *F. spinulosa,* the trivial name *digittata* is retained for the species and the specimen figured by Prantl (1932) as plate 2, figure 12 (NM L21440), is chosen as lectotype.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Lectotype, NM L21440; NM L18512; NM L18562.

LOCALITY—Kaplička.

Rectifenestella Morozova, 1974

TYPE SPECIES—*Fenestella medvedkensis* Schulga-Nesterenko, 1951.

DIAGNOSIS—Zoaria conical or perhaps fan-shaped, composed of straight branches connected by regularly spaced dissepiments; dissepiment diameters less than branch diameters; branches bearing two rows of alternating zooecia divided by zigzag to sinuous axial wall; zooecia angular to rounded, pentagonal in tangential sections, some slightly inflated laterally; weakly developed hemisepta may be present.

Rectifenestella exilis (Počta). Figure 12.

Fenestella exilis (pars) Počta, 1894, Syst. Sil. VIII, pp. 62, 63, pl. 13, figs. 2, 3 (not fig. 1).
Reteporina gracilis (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pl. 14, fig. 7 (not figs. 1–6, 8–11).

DIAGNOSIS—Branches about 0.21 mm wide, spaced about 0.47 mm center to center, connected by variably spaced dissepiments averaging 0.65 mm center to center; zooecial chambers pentagonal basally and narrowing to elongate slit frontally, with laterally directed distal tubes about 0.08 mm in diameter and spaced about 0.23 mm center to center.

DESCRIPTION—Zoaria are slightly undulating and fan-shaped, radiating up to 360° from the base of attachment. The largest specimen is nearly complete and has a diameter of about 35 mm. Branches are straight and are connected by slightly thinner dissepiments with spacing about one and one-half times that of branches. Dissepiments are perpendicular to branches or are nearly so.

Autozooecia alternate in position along branches. The axial wall is zigzag or sinuous. Zooecial chambers are elongate, about twice as long as maximum width and height. They are complexly shaped—pentagonal near the base, bean-shaped in shallower sections, and slitlike in shallowest sections. The short distal tubes are steeply inclined toward the adjacent fenestrules and are located below the narrow crests of the chambers. Distal tubes extend from disto-lateral regions of the chambers.

The basal plate is about 0.02 mm thick, moderately curved laterally, with a few longitudinal ridges on the reverse. Lamellar skeleton on the reverse and frontal surfaces is about 0.05 mm thick and not appreciably thickened near the base of the zoaria studied. The narrow frontal keel is composed of lamellar skeleton penetrated by a single row of small styles spaced about 0.23 mm apart.

DISCUSSION—The specimen originally illustrated as plate 13, figure 1, in Počta (1894) belongs to *Laxifenestella capillosa,* and the one as plate 13, figure 3, belongs to *Fabifenestella joachimi.* The specimen originally illustrated as plate 13, figure 2 (NM L18525), in Počta (1894) is here designated as lectotype.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Lectotype, NM L18525; additional registered material, NM L21331; NM L24647.

LOCALITY—Koněprusy.

Spinofenestella Termier & Termier, 1971

TYPE SPECIES—*Fenestella spinulosa* Condra, 1902.

DIAGNOSIS—Zoaria conical or fan-shaped; straight narrow branches bearing two rows of zooecia strongly overlapped basally; branches connected by regularly spaced, very thin dissepiments; zooecia not strongly inflated laterally, in single row along basal plate, triangular to crescentic in deep tangential section, extending to alternate sides along frontal surface, obliquely oval in shallow tangential sections below the level of the short distal tubes, and often circular in cross sections; single hemisepta absent or weakly developed on proximal wall; aperture surrounded by peristome; axial wall strongly zigzag to sinuous, extending from side to side of branch near zooecial bases; single linear row of nodes along frontal surface of branch, but axial wall not projecting as a keel.

Spinofenestella inclara (Počta). Figure 13A–C.

Fenestella inclara Počta, 1894, Syst. Sil. VIII, p. 65, pl. 7, figs. 15, 16.

DIAGNOSIS—Branches about 0.24 mm wide, spaced about 0.71 mm center to center, connected by fairly regularly spaced dissepiments averaging 1.23 mm center to center; zooecial chambers crescentic to triangular at base, oval near frontal, with short frontally-directed distal tubes about 0.10 mm in diameter and spaced about 0.39 mm center to center.

DESCRIPTION—Zoarial fragments are small, delicate sheets up to 7 mm high and 8 mm wide. Branches are typically straight to slightly sinuous and are connected by dissepiments whose spacing averages between one and one-half to two times that of branches.

Autozooecia alternate in position along the branches. They are steeply and obliquely oriented toward the frontal surface, semicylindrical below and changing to cylindrical above. A very weakly developed hemiseptum is present on the proximal wall. The axial wall is highly sinuous, curving or sharply bending from one side of the budding plate to the other. Deep tangential sections of zooecial chambers are crescentic to triangular, with length about twice width. In shallower sections, chambers are oval to raindrop-shaped, with main axis oblique to branch axis. Shallowest sections cut only the short distal tubes that alternate along branch sides, extend straight toward the frontal side, and terminate as a peristomial rim around the apertures.

The nature of the basal plate was not determined. Lamellar skeleton is thin on all surfaces. The axial wall does not project as a frontal keel, but gives rise to large, granular-cored nodes spaced about one per pair of zooecia.

DISCUSSION—*Spinofenestella inclara* is rare, only one specimen being recognized in all the collections available to us. It is at the base of the range of the genus as given by Morozova (1974).

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype, NM L21452.

LOCALITY—Koněprusy.

Flexifenestella Morozova, 1974

TYPE SPECIES—*Fenestella eichwaldi* Stuckenberg, 1885.

DIAGNOSIS—Zoaria conical or fan-shaped; sinuous robust branches bearing two rows of zooecia, connected by very short dissepiments or touching of adjacent branches; zooecia alternating or paired along branches, not strongly inflated laterally, rectangular to pentagonal in deep tangential section; axial wall planar, in zigzag or crescentic zigzag segments; distal tube typically short; single hemiseptum absent or present on proximal wall; zooecia may be capped by centrally perforate, planar terminal diaphragm; frontal keel low and broad, typically bearing single row of nodes.

Flexifenestella bellaforma McKinney & Kříž, sp. nov. Figures 13D–E, 14.

DIAGNOSIS—Strongly sinuous branches about 0.42 mm wide, joined at about 2.43-mm intervals by anastomosis or short dissepiments; maximum distance between adjacent branches about 1.10 mm; zooecia compressed, tubular, widest at mid-level, pentagonal in deep sections with distal tubes about 0.13 mm wide and spaced about 0.30 mm center to center.

DESCRIPTION—The larger zoarial fragment is a curved sheet about 12 mm high and 13 mm wide. Highly sinuous branches are touching at points of juncture or are connected by short, broad dissepiments. Adjacent branches join at about twice the maximum spacing that develops between them.

Autozooecia alternate in position along the branches; they are compressed, tubular-shaped, and narrowest at the basal plate and at the distal tube. Zooecia in deep tangential sections are pentagonal near the basal plate; closer to the frontal surface they are oval, with the long axis oblique to the branch axis; their length in tangential section is one and one-half to two times their width. The axial wall is strongly zigzag due to overlap of alternating zooecia along the branch midplane. Hemisepta are absent. Distal tubes are short; apertures are not elevated above the frontal surface.

The basal plate has a few large longitudinal ridges on the reverse side. Lamellar skeleton may be relatively thick on all surfaces, most particularly on frontal and reverse surfaces. The granular axial wall does not project frontally as an axial keel. The frontal surface is rounded in transverse view and lacks nodes or spines.

DISCUSSION—This Lower Devonian occurrence represents a substantial extension of the range of the genus downward from the Lower Carboniferous (Morozova, 1974).

DISTINGUISHING FEATURES—*Flexifenestella bellaforma* differs from the type species, *Fenestella eichwaldi* Stuckenberg, from the Lower Permian of the central Urals, in having more closely spaced branches and smaller, more closely spaced distal tubes.

ETYMOLOGY—From Latin *bella,* elegant, and *forma,* figure, for its sinuously anastomosed branches.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype, NM L24648; paratype, NM L24649.

LOCALITY—Koněprusy.

Alternifenestella Termier & Termier, 1971

TYPE SPECIES—*Fenestella minor* Nikiforova, 1933.

DIAGNOSIS—Zoaria fan-shaped or perhaps conical; linear to moderately sinuous branches bearing two alternating rows of zooecia, connected by narrow, regularly spaced dissepiments; zooecia not strongly inflated laterally, trapezoidal to triangular in deep sections parallel to chamber base; distal tube short; hemisepta absent or weakly developed; zooecial bases in single row along budding plate; axial wall highly zigzag, crossing from side to side of budding plate.

Alternifenestella strigilla McKinney & Kříž, sp. nov. Figure 15.

DIAGNOSIS—Gently sinuous branches about 0.33 mm wide, spaced about 0.74 mm apart, connected by regularly spaced dissepiments about 1.44 mm apart; zooecia erect, sack-shaped, expanded upward from narrow trapezoidal or triangular base to inflated, partially rounded portion; distal tubes about 0.11 mm in diameter, continuing linear zooecial axis, and spaced about 0.30 mm center to center.

DESCRIPTION—Zoaria are fan-shaped, the largest fragment being 9 mm high and 13 mm wide. Branches are sinuous, connected by dissepiments at about twice the branch spacing. Dissepiments have about the same diameter as that of branches.

Autozooecia alternate in position along branches. The axial wall is highly zigzag along its base, crossing from side to side of the basal plate, but the amplitude of folds becomes less toward frontal side, merging into the linear keel. Zooecia are erect and sack-shaped, with height greater than length or width and major axis inclined distally with respect to the frontal surface of the branch. The distal tube is a narrowed continuation of the axis of the inflated chamber. Zooecia are trapezoidal or triangular in deep tangential sections. Tangential sections that pass through the mid-level of zooecia cut them as flat-based ovals or boot shapes whose major axis is oblique to the branch axis; shallowest sections cut the distal tubes as nearly circular ovals.

The basal plate is strongly curved transversely and is about 0.03–0.05 mm thick, with a few very low ridges on the reverse side. Lamellar skeleton may form sheaths up to 0.05 mm thick on reverse, lateral, and frontal sides, but a large part of the skeleton is thick granular wall in the budding plate, axial wall, and portions of transverse walls.

The frontal surface has a low keel with a thick core of granular wall. Large, widely spaced nodes with granular cores are developed from it, apparently only at branch-dissepiment junctions.

DISTINGUISHING FEATURES—*Alternifenestella strigilla* differs from *A. rigida* (Yang & Hu, 1965), from Middle Devonian deposits of Kwangsi, in the much greater branch spacing, branch width, dissepiment spacing, distal tube spacing, and greater width of distal tubes. It differs from *A. afonitschevi* (Nekhoroshev, 1977), from the Givetian of Kazakhstan, in greater branch and dissepiment spacing and more closely spaced distal tubes.

ETYMOLOGY—From the Latin *strigilis,* a scraper.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype, NM L24651; paratypes, NM L24650; NM L24678.

LOCALITY—Koněprusy.

Alternifenestella estrellita McKinney & Kříž, sp. nov. Figure 16.

Fenestella spinulosa (pars) Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 3, fig. 17 (not pl. 1, figs. 1–3, pl. 2, fig. 10).

DIAGNOSIS—Straight to slightly sinuous branches about 0.28 mm wide, spaced about 0.57 mm apart, connected by regularly spaced dissepiments about 0.90 mm apart; zooecia sack-shaped, with maximum length lateral and distal with respect to branch axis; distal tubes about 0.09 mm in diameter, spaced about 0.28 mm center to center.

DESCRIPTION—Zoaria are fan-shaped, the largest fragment being 6 mm wide and 13 mm high. Straight to slightly sinuous branches are connected by dissepiments at less than one and one-half times the spacing of branches. Dissepiments have about the same diameter as that of branches.

Autozooecia alternate in position along branches. The axial wall is highly zigzag along its base,

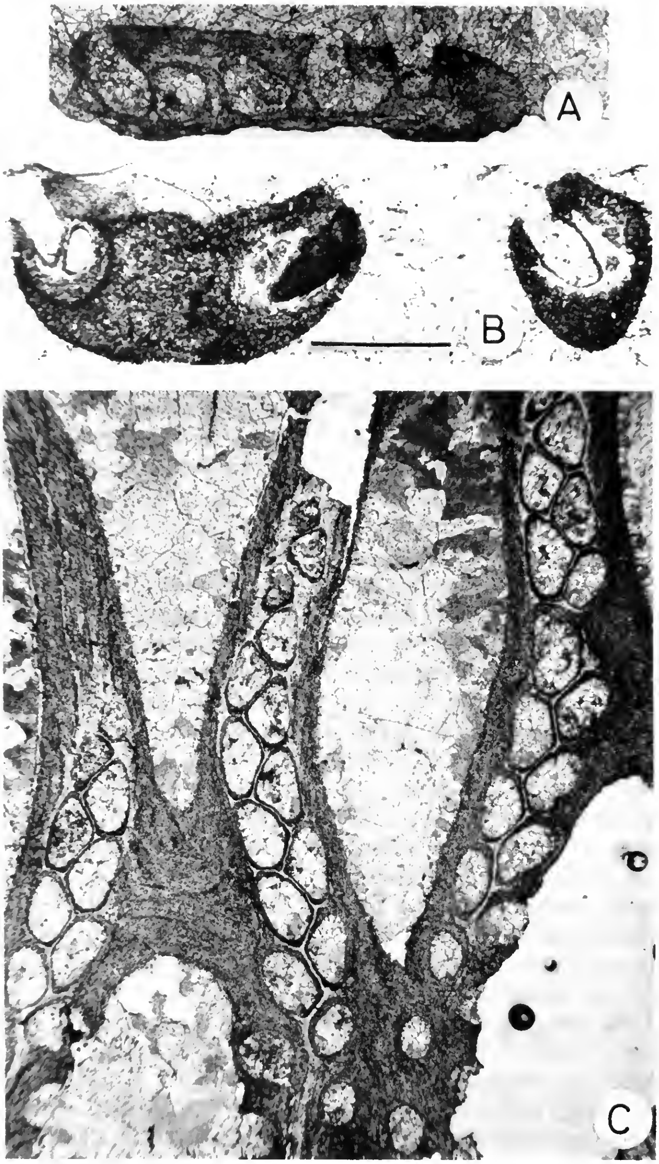

FIG. 14. *Flexifenestella bellaforma* McKinney & Kříž. **A,** longitudinal section; paratype, NM L24649, Koněprusy. **B,** transverse section through three branches, the middle and left branches being linked by a dissepiment; holotype, NM L24648, Koněprusy. **C,** tangential section below level of basal plate at top left and cutting near frontal at bottom right; holotype, NM L24648. Bar scale in B = 0.5 mm. All figures to same scale.

crossing from side to side of the basal plate, but the amplitude of folds becomes less toward the frontal side, merging into the linear keel. Zooecia are sack-shaped, with diagonal length greater than height or width; the major axis is inclined distally with respect to the frontal surface of the branch. The distal tube is a narrowed, frontally deflected continuation of the axis of the inflated chamber. Zooecia are triangular or trapezoidal in deep tangential sections. Tangential sections that pass through the mid-level of zooecia cut them as flat-based, distally tapering ovals whose major axis is oblique to the branch axis; shallowest sections cut the distal tubes as nearly circular ovals.

The basal plate is strongly curved transversely and is about 0.02–0.05 mm thick. It has several

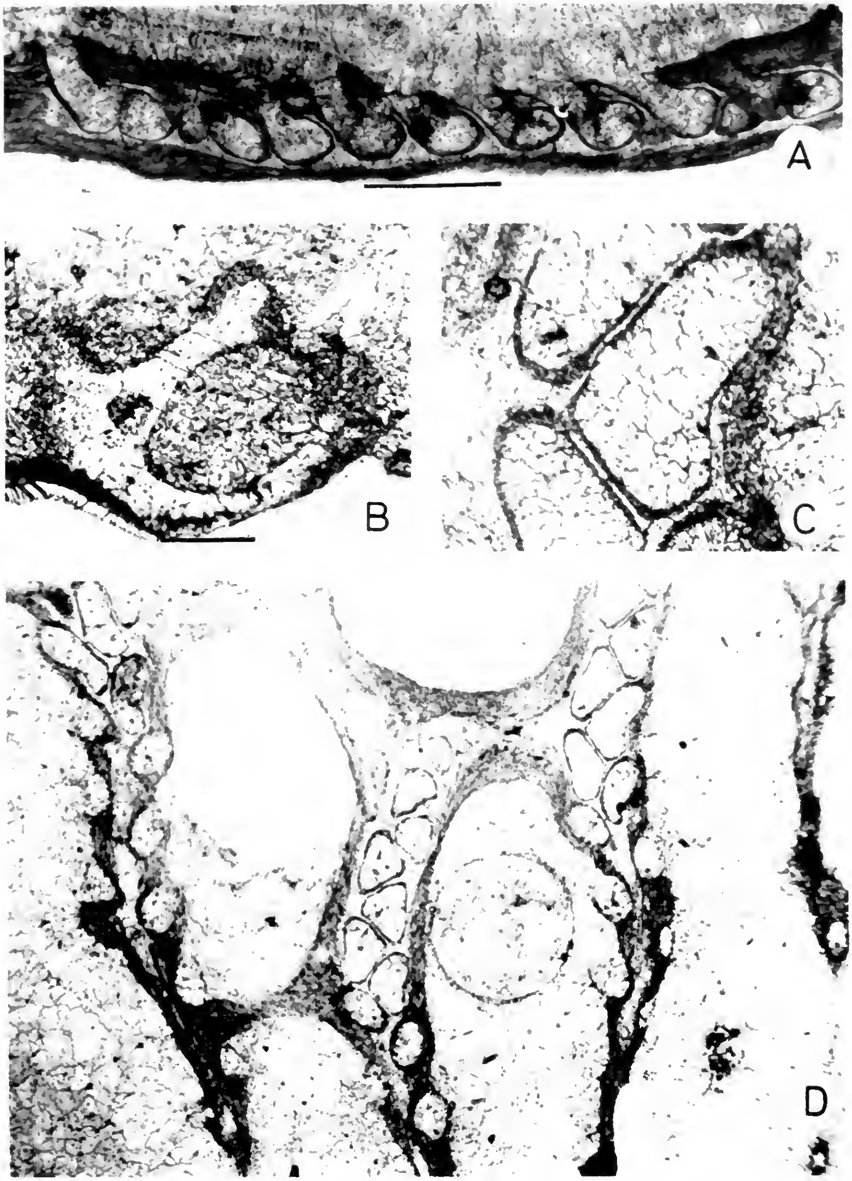

FIG. 15. *Alternifenestella strigilla* McKinney & Kříž. **A,** longitudinal section; paratype, NM L24650, Koněprusy. **B,** transverse section of single branch; holotype, NM L24651, Koněprusy. **C,** tangential section, cutting boot-shaped section through zooecium at intermediate depth; holotype, NM L24651. **D,** tangential section, cutting below basal plate at top center and through frontal keel at bottom and right; holotype, NM L24651. Scale bar in A = 0.5 mm and in B = 0.1 mm. D is at same scale as A; C is at same scale as B.

pronounced ridges on the reverse side. Lamellar skeleton may form sheaths up to 0.05 mm thick on reverse sides but is thinner on lateral and frontal sides. A large part of the skeleton is thick granular wall in the basal plate, frontal portions of the axial wall, and portions of transverse walls.

The frontal surface has a low keel with a thick core of granular wall. Moderate-sized nodes with granular cores project from the keel with approximately the same spacing as zooecia along one side of the branch.

DISTINGUISHING FEATURES—*Alternifenestella estrellita* differs from *A. strigilla* in being smaller in all measurements recorded herein. *A. rigida*

(Yang & Hu, 1965) has narrower, more closely spaced branches, greater space between dissepiments, and more closely spaced zooecia. *A. afonitschevi* (Nekhoroshev, 1977) has more widely spaced branches, dissepiments, and zooecia.

ETYMOLOGY—From *estrellita,* Spanish diminutive for star.

MEASUREMENTS—See Table 1.

TYPE MATERIAL—Holotype, NM L18513; paratypes, NM L21443; NM L24679; NM L24680; FMNH PE 39307.

LOCALITIES—Kaplička; Srbsko.

Utropora Počta, 1894

TYPE SPECIES—*Fenestella* (*Utropora*) *nobilis* Barrande, in Počta, 1894.

DIAGNOSIS—Zoaria fan-shaped or possibly conical; linear to slightly sinuous branches connected by regularly or irregularly spaced dissepiments; two rows of autozooecia alternating along each branch; major portion of zooecial chamber flask-shaped, with long distal tube extending lower portion of outer distal region in plane of branches and along side of next-distal zooid before turning sharply toward frontal surface; hemisepta absent; axial wall extends as pronounced keel on frontal side of branch.

Utropora nobilis (Barrande). Figures 17, 18.

Fenestella nobilis Barrande. Bigsby, 1868, Thesaurus Siluricus, p. 200 (*nomen nudum*).
Fenestella (*Utropora*) *nobilis* Barrande in Počta, 1894, Syst. Sil. VIII, pp. 76–77, pl. 17, figs. 4–15.
Utropora nobilis (Barrande) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 15–16, pl. 3, figs. 1–3, 5 (not fig. 4).
Utropora aff. *U. nobilis* (Barrande). Bigey, 1972a, Bull. Soc. Géol. Fr., ser. 7, 14, pp. 316–318, figs. 1–6.
Utropora nobilis (Počta). McKinney, 1980, Jour. Paleontol. 54, pp. 250–252, pls. 1–3, text fig. 3.

DIAGNOSIS—Branches about 0.46 mm wide, spaced about 1.10 mm center to center, connected by irregularly spaced dissepiments averaging about 2.79 mm center to center; zooecial chambers highly elongate, recumbent, flask-shaped, with long distal tube along base of lateral side of next-distal zooecium and short, upturned distalmost portion, about 0.11 mm in diameter and spaced about 0.33 mm center to center.

DESCRIPTION—Zoaria are fan-shaped; larger fragments commonly are pleated by folds parallelling growth direction. The largest fragments are up to 80 mm high and 85 mm wide. Widely spaced branches are straight to slightly sinuous, connected by dissepiments at variable but generally widely spaced intervals. Dissepiments have smaller diameters than do branches.

Autozooecia alternate in position along branches and across fenestrules so that apertures are distributed in a rhombic pattern. The axial wall is straight. Zooecial chambers are very long, recumbent along the basal plate, and flask-shaped, with the neck (distal tube) bent at a 90° angle toward the frontal surface beside the next-distal zooecium. The portion of the distal tube beyond the pronounced bend is short, situated laterally at about the mid-level of the branch. Zooecia are elongate and pyriform in deep tangential sections, with the narrower end distal, and are oriented obliquely with respect to the branch axis. Tangential sections that pass through the mid-level of zooecia cut them in two isolated parts: a large, rhomboidal proximal portion against the axial wall, and a small circular section through the distal tube laterally adjacent to the proximal portion of the next-distal zooecium. In shallowest tangential sections, only the proximal inflated portions of zooecia are cut, appearing as oval spaces surrounded by lamellar wall.

The basal plate is planar to slightly curved transversely and about 0.02–0.03 mm thick. It has a few longitudinal ridges on the reverse side. Lamellar skeleton may build sheaths, up to at least 0.10 mm thick, all the way around branches.

DISCUSSION—For discussion, see McKinney, 1980. The specimen illustrated in Počta (1894) as plate 17, figure 15 (NM L15507), is here designated lectotype.

MEASUREMENTS—See Table 2.

TYPE MATERIAL—Lectotype, NM L15507; paralectotypes, NM L15497–L15506; NM L15508; NM L17872; NM L21347.

LOCALITIES—Koněprusy; Srbsko.

Utropora parallela (Barrande). Figure 19.

Fenestella parallela Barrande in Počta, 1894, Syst. Sil. VIII, pp. 69, 70, pl. 16, figs. 13, 14.
Fenestella pannosa (pars) Počta, 1894, Syst. Sil. VIII, pl. 14, fig. 13 (not figs. 12, 14, 15).
Fenestella exilis (pars) Počta, 1894, Syst. Sil. VIII, pl. 13, figs. 6, 7 (not figs. 1–3).
Fenestella pannosa Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 1, fig. 4 (not pl. 2, figs. 8, 9).

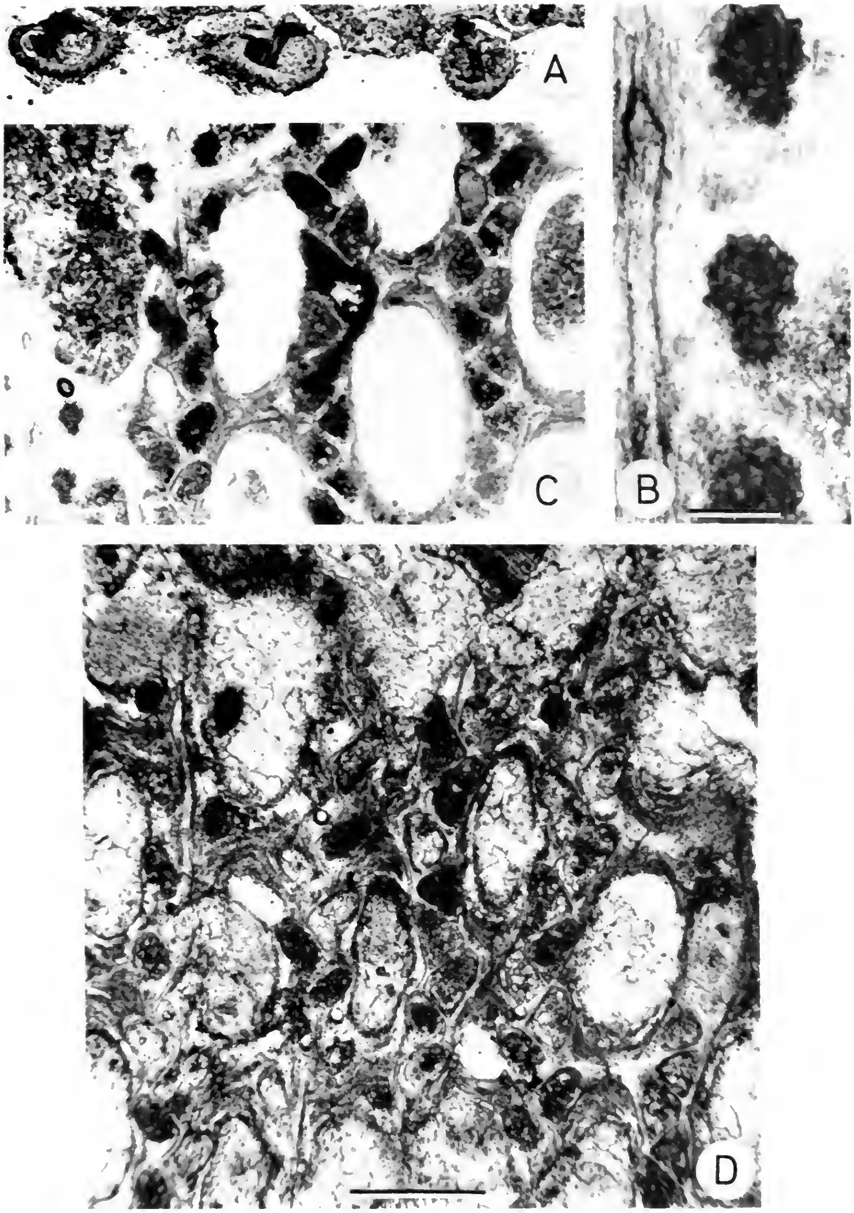

FIG. 16. *Alternifenestella estrellita* McKinney & Kříž. **A,** transverse section through three branches; holotype, NM L18513, Kaplička. **B,** tangential section through three keyhole-shaped distal tubes with stellate cross sections; paratype, NM L21443, Kaplička. **C,** tangential section through specimen with relatively narrow branches; paratype, NM L21443. **D,** tangential section through specimen with relatively wide branches; holotype, NM L18513. Scale bar in B = 0.1 mm and in D = 0.5 mm. A and C are at same scale as D.

DIAGNOSIS—Branches about 0.28 mm wide, spaced about 0.58 mm center to center, connected by regularly spaced dissepiments averaging 0.89 mm center to center; zooecial chambers recumbent, flask-shaped, with somewhat elongated distal tube extended short distance along proximal end of next-distal zooecium and short, upturned distalmost portion, about 0.10 mm in diameter and spaced about 0.32 mm center to center.

DESCRIPTION—Zoaria are probably conical;

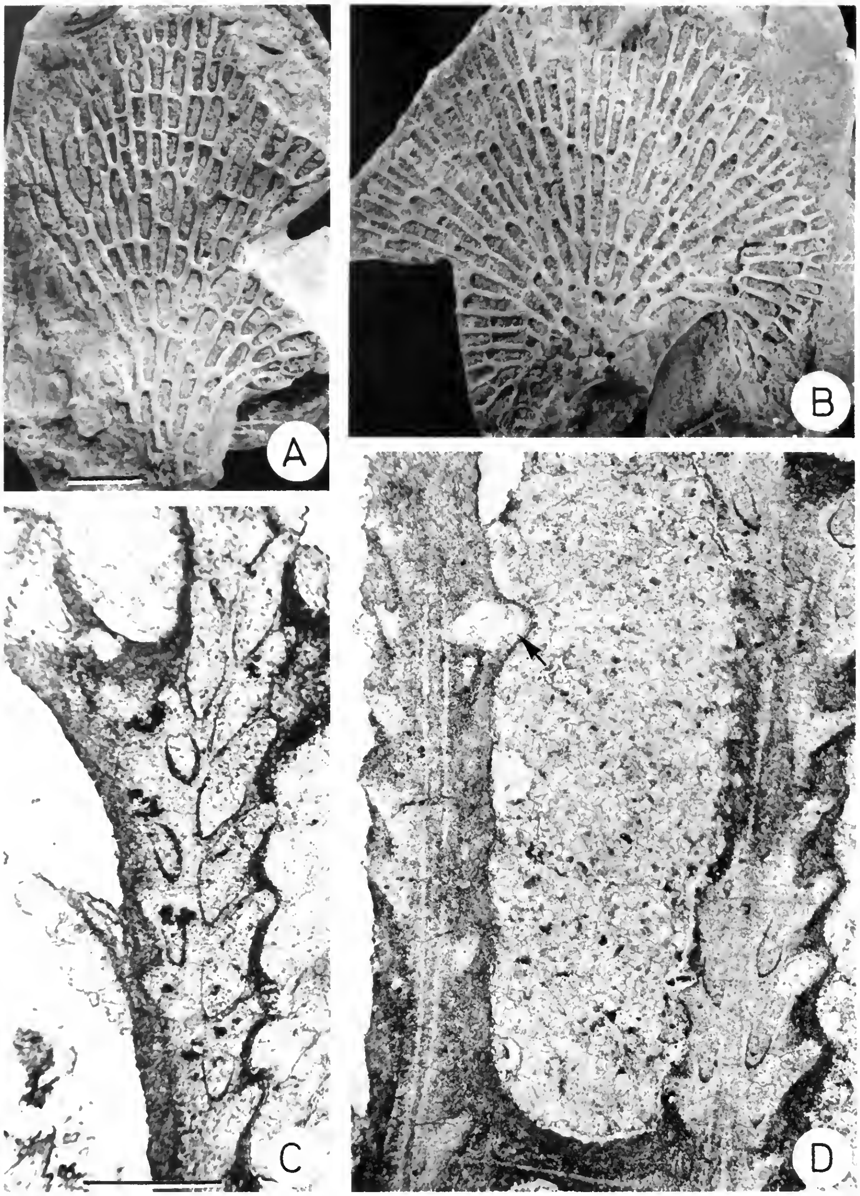

FIG. 17. *Utropora nobilis* (Barrande). **A,** exterior of fan-shaped zoarium; lectotype, NM L15507, Koněprusy. **B,** exterior of nearly complete fan-shaped zoarium, radiating at an angle of more than 180° from point of colony origin; paralectotype, NM L15500, Koněprusy. **C,** slightly oblique tangential section with zooecial bases on left and more complete zooecial chambers on right; lectotype, NM L15507. **D,** deep tangential section at and below level of basal plate, cutting possible ovicell (arrow); paralectotype, NM L15500. Scale bar in A = 5 mm and in C = 0.5 mm. B is at same scale as A; D is at same scale as C.

available fragments are transversely curved, pleated sheets that curl around in an arc up to 120°, the largest being 41 mm high and 49 mm wide. Branches are straight to slightly sinuous, connected by dissepiments having about one and one-half times their average spacing. Lateral placement of apertures gives branches a serrated profile where seen at their mid-level. Dissepiments have about the same diameter as do branches.

Autozooecia alternate in position along branches and across fenestrules so that apertures are distributed in a rhombic pattern. The axial wall varies

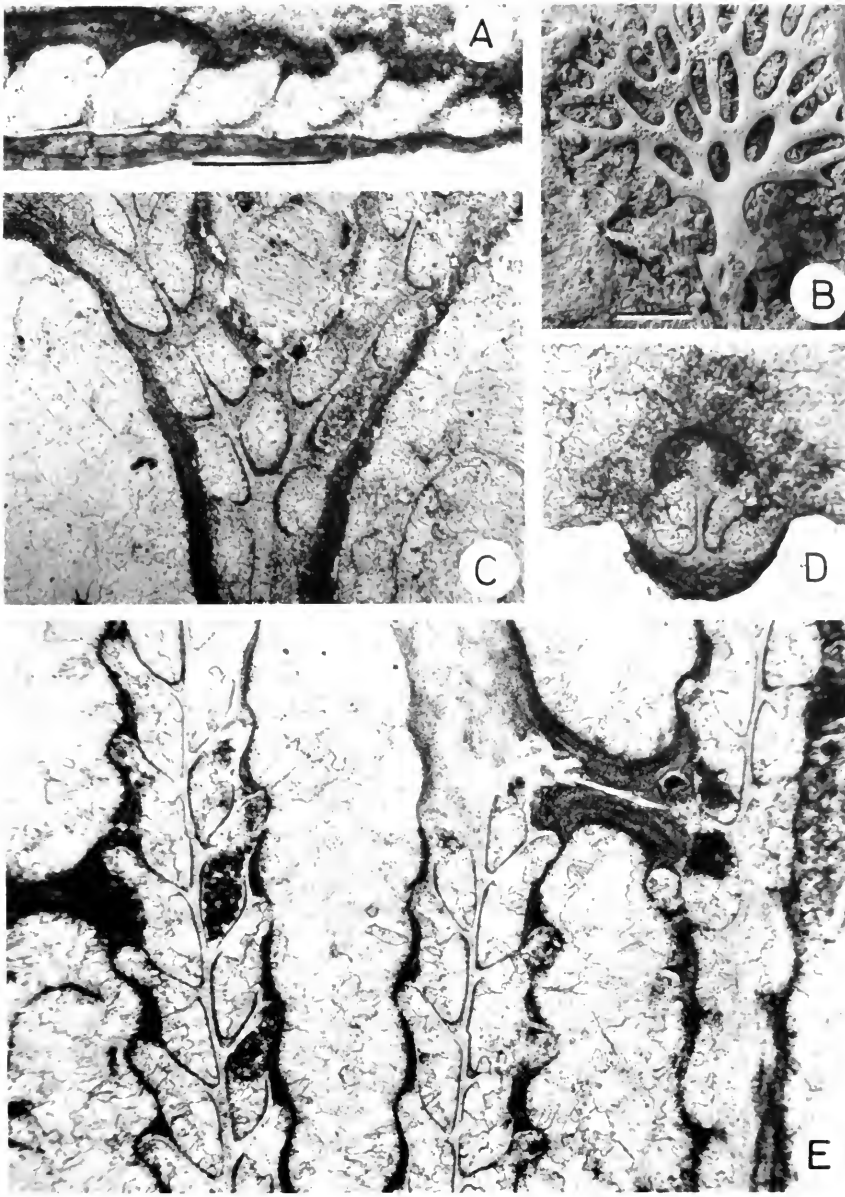

FIG. 18. *Utropora nobilis* (Barrande). **A,** longitudinal section, cutting close to branch axial plane at left and near branch margin at right; NM L17872, Koněprusy. **B,** exterior of small fan-shaped zoarium, including base of attachment; paralectotype, NM L15504, Koněprusy. **C,** tangential section through branch bifurcation; lectotype, NM L15507, Koněprusy. **D,** transverse section through single branch; lectotype, NM L15507. **E,** tangential section, shallowest at bottom right and deepest at top center, cutting many zooecia in two separate places (inflated chamber and distal tube); NM L17872, Koněprusy. Scale bar in A = 0.5 and in B = 5 mm. C–E are at same scale as A.

from almost straight to zigzag or scalloped. Zooecial chambers are recumbent and flask-shaped, with the neck (distal tube) bent at a 90° angle. In deep tangential sections, zooecial chambers appear as diagonally elongate ovals; the elongation of the disto-lateral end increases in shallower sections so that the zooecial axis becomes curved, with the distal end pointed toward the adjacent fenestrule. In yet shallower sections each zooecium is cut in two areas, an elliptical section through the proximal inflated portion and, lateral to the proximal end of the next-distal zooecium, a circular section

TABLE 2. Measurements of species of *Utropora, Semicoscinium,* and *Cyclopelta* (see page 7 for definitions of abbreviations).

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
Utropora nobilis **(Barrande)**					
BRS	20	130	0.600–1.763	1.138	0.191
BRW	20	123	0.351–0.583	0.460	0.052
CW	5	50	0.095–0.171	0.138	0.018
DS	19	87	1.600–4.350	2.789	0.549
DTS	20	193	0.230–0.458	0.326	0.035
DTW	20	195	0.077–0.141	0.111	0.008
Utropora parallela **(Barrande)**					
BRS	22	189	0.406–0.705	0.585	0.054
BRW	22	163	0.223–0.398	0.280	0.030
CW	5	50	0.108–0.196	0.147	0.017
DS	21	170	0.627–1.023	0.889	0.118
DTS	22	208	0.220–0.372	0.325	0.040
DTW	22	213	0.080–0.116	0.095	0.003
Semicoscinium subacta **(Počta)**					
BRS	4	20	0.580–1.000	0.788	0.098
BRW	4	16	0.270–0.500	0.369	0.065
CW	3	30	0.131–0.224	0.181	0.023
DS	4	16	0.680–2.000	1.476	0.126
DTS	4	40	0.220–0.320	0.289	0.009
DTW	4	31	0.100–0.120	0.110	0.010
Semicoscinium discreta **(Prantl)**					
BRS	10	73	0.392–1.124	0.662	0.109
BRW	10	51	0.260–0.658	0.331	0.039
CW	5	50	0.111–0.277	0.177	0.040
DS	10	80	0.460–1.639	1.113	0.202
DTS	10	100	0.211–0.326	0.265	0.017
DTW	10	88	0.091–0.153	0.108	0.013
Cyclopelta sacculus **(Barrande)**					
BRS	16	92	0.351–0.900	0.657	0.089
BRW	16	73	0.262–0.520	0.354	0.075
CW	5	50	0.129–0.321	0.194	0.038
DS	16	136	0.750–1.300	1.014	0.116
DTS	16	156	0.230–0.347	0.263	0.017
DTW	16	149	0.095–0.153	0.123	0.014
Cyclopelta victrola **McKinney & Kříž**					
BRS	4	38	0.550–0.960	0.688	0.065
BRW	4	38	0.353–0.490	0.398	0.066
CW	4	40	0.141–0.274	0.197	0.034
DS	4	31	0.950–1.652	1.106	0.038
DTS	4	32	0.230–0.310	0.251	0.004
DTW	4	30	0.090–0.140	0.124	0.006
Cyclopelta bohemica **(Prantl)**					
BRS	7	53	0.313–0.792	0.676	0.107
BRW	7	39	0.266–0.524	0.393	0.060
CW	5	50	0.110–0.237	0.157	0.026
DS	7	69	0.710–1.300	1.141	0.309
DTS	7	70	0.182–0.341	0.264	0.026
DTW	7	53	0.081–0.120	0.107	0.016

through the distal tube. At the end of the short, frontally-directed portion of the distal tube is the aperture, which is therefore located on the side of the branch. The ends of distal tubes are inclined slightly towards the adjacent fenestrules so that apertures are not quite parallel with the frontal plane.

The basal plate is about 0.04–0.05 mm thick and virtually flat to slightly curved transversely, with a few large longitudinal ridges on the reverse. Lamellar skeleton is normally up to 0.05 mm thick on the reverse side and builds sides sloped at about a 45° angle against the granular core of the pronounced frontal keel, but is very thin on the lateral sides of zooecia except near colony bases.

DISTINGUISHING FEATURES—*Utropora parallela* is characterized by its branch, dissepiment, and zooecial spacing; zooecial length; and relatively short lateral overlap of zooecia with next-distal neighbors. It differs from *U. nobilis* in all these characters.

DISCUSSION—*Utropora parallela* is one of the most common fenestrates in the Koněprusy Limestone, yet only two specimens were found in the Zlíchov Limestone. Externally it resembles a typical *Fenestella s.l.,* with densely spaced branches and dissepiments. Its chamber shape, however, is that of *Utropora.*

MEASUREMENTS—See Table 2.

TYPE MATERIAL—Holotype, NM L18587; additional registered material, NM L18488; NM L18524; NM L18527; NM L18542; NM L18578; NM L21338; NM L24652; NM L24653.

LOCALITIES—Koněprusy; Kaplička.

Semicoscinium Prout, 1859

TYPE SPECIES—*Semicoscinium rhomboideum* Prout, 1859.

DIAGNOSIS—Zoarium narrowly to broadly conical, longitudinal folds common in broadly flaring zoaria; apertures typically on outer surface of cone; slightly to moderately sinuous branches bearing two rows of zooecia, connected by short dissepiments, with very high granular-cored keel extending along center of frontal side; zooecia inflated laterally, side toward branch axial plane flat to sigmoid, depending on degree of offset of the two rows along the branch; length greater than width in most zooecia, but width may be equal to or greater than length where adjacent branches im-

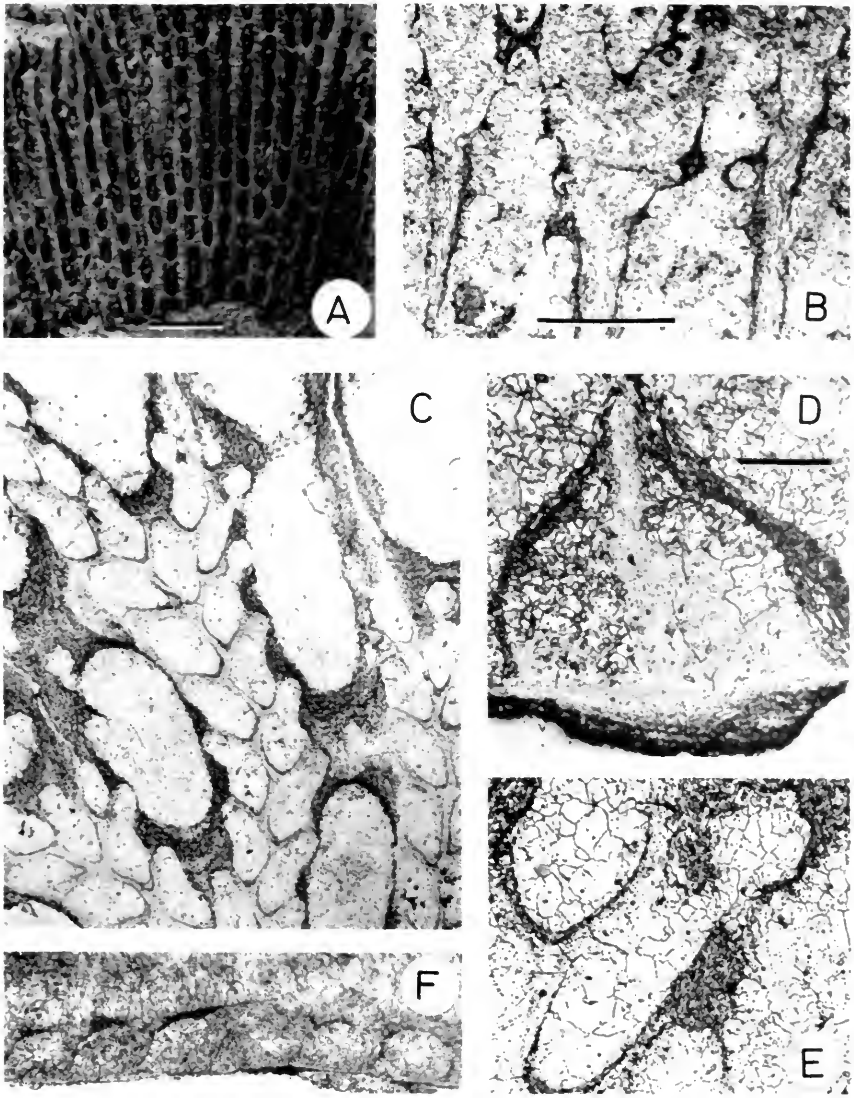

FIG. 19. *Utropora parallela* (Barrande). **A**, exterior of funnel-shaped or pleated fan-shaped zoarium; holotype, NM L18587, Koněprusy. **B**, tangential section through partially recrystallized branches; note isolated distal tubes at top left and right center; holotype, NM L18587. **C**, tangential section through several bifurcations, shallowest at top right; note stellate cross sections of distal tubes; NM L24652, Koněprusy. **D**, cross section of single branch; NM L18488, Koněprusy. **E**, shallow tangential section, cutting a single zooecium through main part of chamber (lower left) and distal tube with stellate cross section (top right); NM L24652. **F**, longitudinal section, closest to branch axial plane at right; NM L24653, Koněprusy. Scale bar in A = 2 mm; in B = 0.5 mm; and in D = 0.1 mm. C and F are to same scale as B; E is at same scale as D.

pinge; distal tubes and apertures adjacent to or very close to axial wall; hemisepta lacking; lamellar skeleton on high keel commonly scalloped, with indentations centered over zooecial apertures; keel narrow-crested, granular core a single thin sheet not divided apically.

Semicoscinium subacta (Počta). Figure 20.

Fenestella subacta (pars) Počta, 1894, Syst. Sil. VIII, pp. 74, 75, pl. 12, figs. 5, 7–9, ?4, ?10 (not 6, 11).
Fenestella subacta Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 10, pl. 1, fig. 10, pl. 2, figs. 6, 7 (not 8).

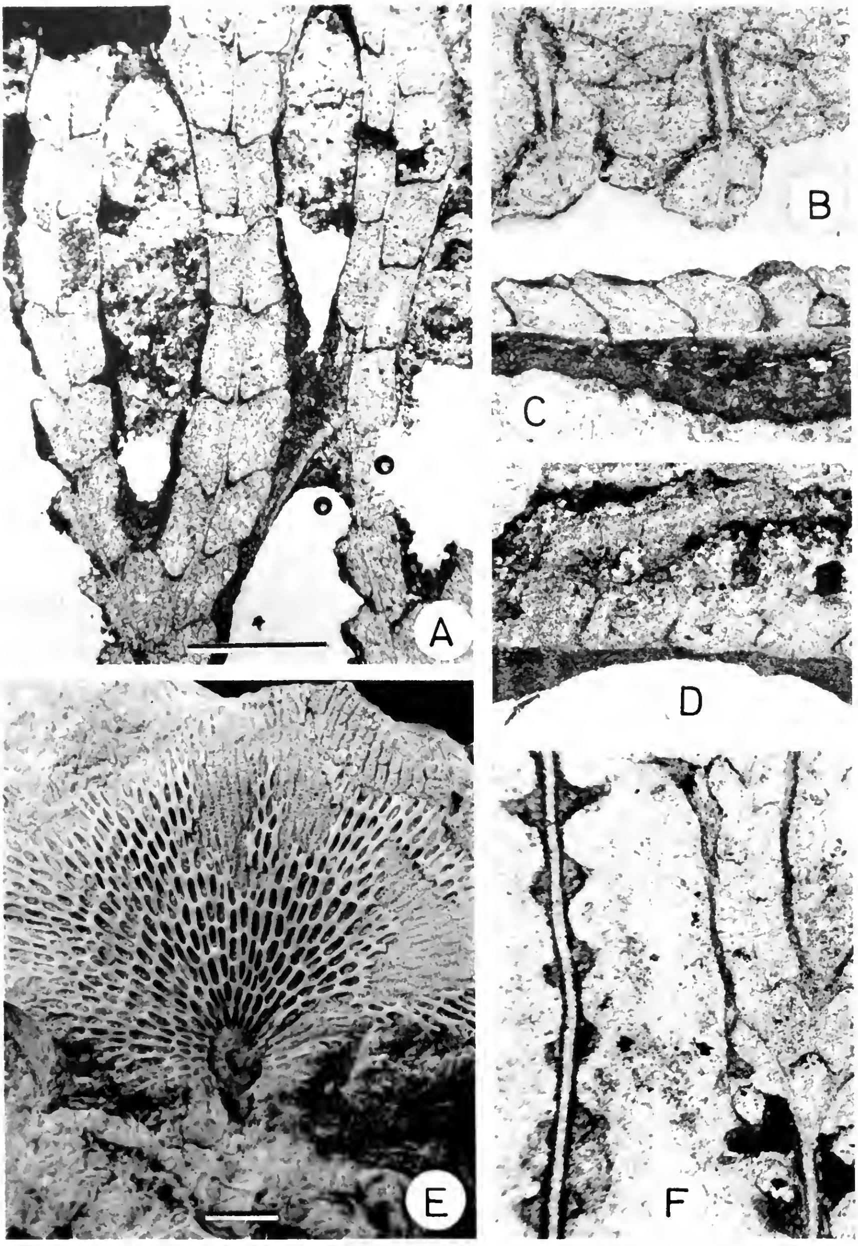

FIG. 20. *Semicoscinium subacta* (Počta). **A,** deep tangential section; lectotype, NM L18504, Koněprusy. **B,** transverse section through two branches with high keels and intervening vesiculose deposits; NM L18505, Koněprusy. **C,** longitudinal section through single row of zooecia, distal direction toward left; lectotype, NM L18504. **D,** longitudinal section, cutting center of branch and keel at left with keel margin continuing distally above branch to right; NM L18506, Koněprusy. **E,** exterior of flaring conical zoarium with frontal surface on outer surface of cone; paralectotype, NM L18586, Koněprusy. **F,** shallow tangential section cutting high in zooecia on right and through keel on left; NM L18509, Koněprusy. Scale bar in A = 0.5 mm and in E = 5 mm. B–D and F are at same scale as A.

DIAGNOSIS—Sinuous branches about 0.37 mm wide, spaced 0.79 mm center to center on average, connected by regularly spaced dissepiments averaging 1.48 mm center to center; high keel scalloped along base; zooecial chambers appear as parallelograms in tangential sections, with distally inclined distal tubes about 0.11 mm in diameter and spaced about 0.30 mm center to center.

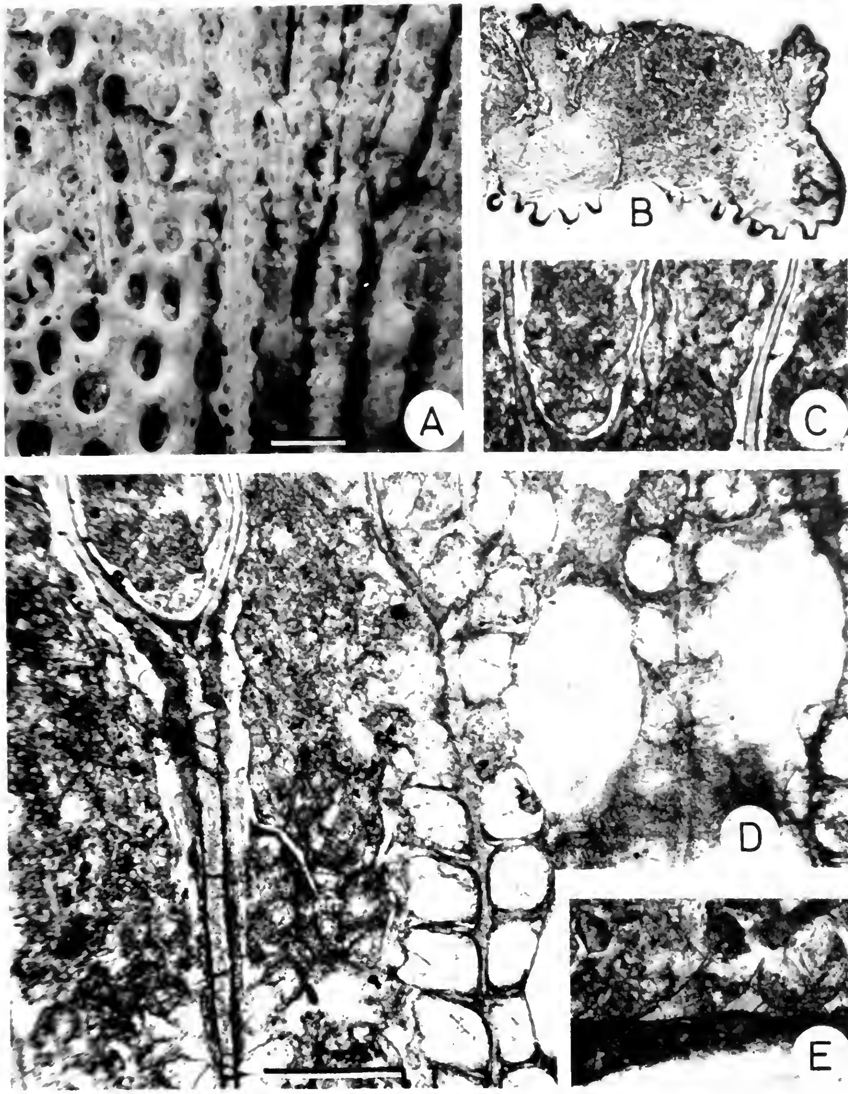

FIG. 21. *Semicoscinium discreta* (Prantl). **A,** weathered specimen with reverse surface preserved at lower left, interior of eroded branches at top left and center, and enlarged mold of keel on right; lectotype, NM L18476, Kaplička. **B,** transverse section through two recrystallized branches with reverse side eroded to level of ridges on reverse side of basal plate; NM L21436, Kaplička. **C,** shallow tangential section through three keels with scalloped lamellar skeleton; NM L24654, Kaplička. **D,** tangential section through three branches, the left branch cut only through keel, the middle and left branches bifurcated near top of figure; NM L24654. **E,** longitudinal section along branch of partially recrystallized specimen; NM L24655, Kaplička. Scale bar in A = 1 mm and in D = 0.5 mm. B–C and E are at same scale as D.

DESCRIPTION—Zoaria are broadly conical and slightly pleated, with an angle of divergence up to 90° or more. Some begin with lesser divergence and flare outwardly with growth. Frontal surface and superstructure are on the outside of the cone. The largest zoarium in the collection is almost original size, about 26 mm high and 48 mm wide.

Branches are gently sinuous but not anastomosed. Dissepiments are narrow and have almost the same thickness as branches, and their spacing averages about twice that of branches. Many dissepiments are oblique to branches and contain a sheet of granular skeleton perpendicular to the frontal plane.

The superstructure is a high keel that consists of a sheet of granular skeleton up to about 0.08

mm thick and tapers toward both the frontal edge and the branch surface. Lamellar skeleton forms a veneer on the keel surface closest to the branch, but thickens up to almost 0.25 mm near the frontal edge; it is always thinner than the underlying branches. Lamellar skeleton on the keel near the branch surface is scalloped, with indentations corresponding with, but of larger diameter than, underlying zooecial apertures.

Autozooecia are wedge-shaped, with a cylindrical portion arising along the distal margin. Zooecial chambers are parallelograms in deep tangential section near the budding plate; their length is about one and three-quarters to twice their width. They are side-by-side along each branch, separated by a flat axial wall. Transverse walls are oriented at an angle of about 60° to the axial wall and to the budding plate. Distal tubes are inclined distally at an angle of about 45°, and also appear to be tilted slightly toward the adjacent fenestrules. The inclination of the distal tubes and narrowing of zooecia frontally give them a vague kidney shape in shallow sections. Apertures are inclined somewhat downward disto-laterally. Zooecia adjacent to dissepiments are about 20% wider than those that intervene.

The basal plate is about 0.02–0.03 mm thick and has a few large longitudinal ridges on the reverse side. Lamellar skeleton is thickest on reverse sides of branches and where lining proximal and distal walls of fenestrules; it is thinnest on frontal surfaces of branches.

Discussion—The specimen originally illustrated by Počta (1894) as plate 12, figure 5 (NM L18504), is here designated as lectotype.

Measurements—See Table 2.

Type Material—Lectotype, NM L18504; paralectotypes, NM L18586; NM L21328; NM L21330; ?NM L21327; ?NM L21329; NM L18505; NM L18506; NM L18509; NM L21436.

Locality—Koněprusy.

Semicoscinium discreta (Prantl). Figure 21.

Isotrypa discreta (pars) Prantl, 1932, Palaeontogr. Bohemiae XV, p. 25, pl. 4, fig. 11 (not 10), pl. 5, fig. 18.

Fenestella capillosa Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 1, fig. 11 (not pl. 2, fig. 5).

Fenestella pannosa Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 9 (not pl. 1, fig. 4, pl. 2, fig. 8).

Semicoscinium sacculus sacculus (Barrande) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 18 (not pl. 2, fig. 17, pl. 3, figs. 6–7).

Diagnosis—Straight to gently sinuous branches 0.33 mm wide, spaced about 0.66 mm apart, connected by regularly spaced dissepiments about 1.11 mm apart; zooecia four-sided, skewed, box-shaped; width almost equal length between dissepiments but greater than length at dissepiments; distal tubes about 0.11 mm in diameter, directed frontally from distal ends of box-shaped chambers, and spaced about 0.26 mm center to center.

Description—Zoarium is conical, perhaps fan-shaped. Frontal surface and superstructure are on outside of the cone. Branches are linear to very gently sinuous, connected by dissepiments that have slightly smaller diameters than do branches. Dissepiments show spacing of about one and one-half to two times that of branches; most are perpendicular to branches, but some are oblique.

The superstructure is a high keel that consists of a sheet of granular skeleton up to about 0.08 mm thick, tapered toward both the frontal edge and the branch surface; thickness of lamellar skeleton on the keel parallels that of the granular skeleton. Scallops in lamellar skeleton on the keel, centered over apertures on the branches below, are locally preserved.

Autozooecia are box-shaped, with a cylindrical portion arising along the distal margin. Zooecial chambers are almost equiaxial parallelograms in deep tangential sections near the basal plate. Zooecia are largest and have width greater than length at dissepiments, resulting in maximum branch width there. They are side-by-side along each branch, separated by a flat axial wall. Transverse walls are oriented at an angle of about 60° to the axial wall. Distal tubes are essentially perpendicular to the frontal plane. Zooecia adjacent to dissepiments are up to 50% wider than those that intervene. There are a few large longitudinal ridges on the reverse side of the basal plate. Lamellar skeleton is thickest on reverse sides of branches and thinnest on frontal sides.

Distinguishing Features—*Semicoscinium discreta* differs from *S. subacta* in the shape of zooecia, which are roughly equidimensional rather than elongate in deep tangential section; in the orientation of the distal tube; and in the spacing of skeletal elements. It differs from *S. kurjensis* Nekhoroshev, 1960, from the upper Lower Devonian of Altai (in Nekhoroshev, 1977, pp. 106, 107, pl. 20, fig. 1), in slightly closer branch and dissepiment spacing and in substantially closer zooecial spacing.

Measurements—See Table 2.

Type Material—Lectotype, NM L18476; additional registered material, NM L18526; NM L18544; NM L18579; NM L21435; NM L21436; NM L21439; NM L21441; NM L24654; NM L24655.

LOCALITIES—Kaplička; Srbsko.

Cyclopelta Bornemann, 1884

TYPE SPECIES—*Cyclopelta winteri* Bornemann, 1884.

DIAGNOSIS—Zoaria narrow or broadly conical, composed of linear to sinuous branches bearing two rows of zooecia; outer surface of conical zoarium is the frontal; short, broad dissepiments tend to be aligned transverse to growth direction, each row and corresponding parts of branches thickened on the reverse side into a continuous annular band that projects into the cone beyond normal branch level; cylindrical to irregularly polygonal zooecia in alternating rows overlapped axially so that axial wall is zigzag to sinuous; maximum zooecial length perpendicular to basal plate, with short distal tube that may be almost the same in diameter as lower portions of zooecia; zooecial diameters greater at dissepiment level, where width may be greater than length; superstructure consists of high keel with sheet of granular skeleton as core that divides apically into two divergent sheets to form apical lath; sheath of lamellar skeleton on keel thickens apically and forms transversely concave to convex deposit on outer side of lath.

DISCUSSION—Prout's (1859) original material for the type species of *Semicoscinium, S. rhomboideum,* from the "Devonian Shell-beds" of the falls of the Ohio River, has been lost, and no neotype has been designated. Silicified specimens from the type locality that fit the description, however, have a very high keel with an undivided sheet of core material, forming a slightly raised median ridge which projects beyond the lateral scalloped lamellar skeleton that secondarily thickens the keel. In contrast, Kräusel (1953) found, in a restudy of Bornemann's holotype and additional topotype material of *Cyclopelta winteri* based in large part on careful work with thin sections, that the keel of *C. winteri* consists of a divided sheet of lamellar skeleton that is Y-shaped in cross section. *Cyclopelta* may be further distinguished from *Semicoscinium* by chamber shape and orientation, and the tendency for dissepiments to be laterally aligned and thickened into continuous ridges on the reverse sides of branches.

Cyclopelta sacculus (Barrande). Figures 22–24.

Retepora sacculus Barrande. Bigsby, 1868, Thesaurus Siluricus, p. 200 (*nomen nudum*).
Hemitrypa sacculus Barrande in Počta, 1894, Syst. Sil. VIII, pp. 100, 101, pl. 11, figs. 1–20.
Semicoscinium sacculus sacculus (Barrande) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 52–54, pl. 2, fig. 17 (not 18), pl. 3, fig. 7 (not 6).
Semicoscinium sacculus ornatus Prantl, 1932, Palaeontogr. Bohemiae XV, p. 54, pl. 3, fig. 8.

DIAGNOSIS—Conical zoaria of straight to sinuous anastomosed branches of variable width averaging 0.35 mm wide, spaced about 0.66 mm center to center, connected by anastomosis or dissepiments averaging 1.01 mm center to center; zooecial chambers erect, inflated, sac-shaped, with distal tubes about 0.12 mm in diameter and spaced about 0.26 mm center to center.

DESCRIPTION—Zoaria are narrow to moderately widening cones, with angle of spread typically between 30° and 60°. Narrow cones have circular cross sections, but broader cones are folded longitudinally into gentle to moderately strong pleats. The superstructure of keels and laths is always on the outer surface of the cones, and zooecial apertures under the keels face outwardly also. Zoaria are up to at least 42 mm high and 20 mm wide at distal ends.

Branches are straight to sinuous and are anastomosed in many zoaria. Anastomosis occurs even in some zoaria with straight branches, but with large zooecia at the level of junction. Spacing of branch junctions is, on the average, almost one and one-half times that of branches. Dissepiments and anastomosis levels are aligned laterally. Their frontal surfaces are roughly level with frontal surfaces of, and their width is about equal to that of, branches; moreover, they are thickened and laterally coalesced into concentric bands on reverse sides, where they may extend as distally deflected wedges around the inner surfaces of the conical zoaria. Some dissepiments consist in large part of several cysts rather than being completely skeletal.

The superstructure consists of a high keel with a core sheet of granular calcite that bifurcates into two flaring sheets to form a lath at the frontal edge. The keel and undersides of the lath are covered by lamellar skeleton up to 0.10 mm thick, but generally much thinner; the outer surface of the lath consists of a domed ridge of concentric lamellar skeleton. Laths are broader than the underlying branches.

Autozooecia alternate along the branches and

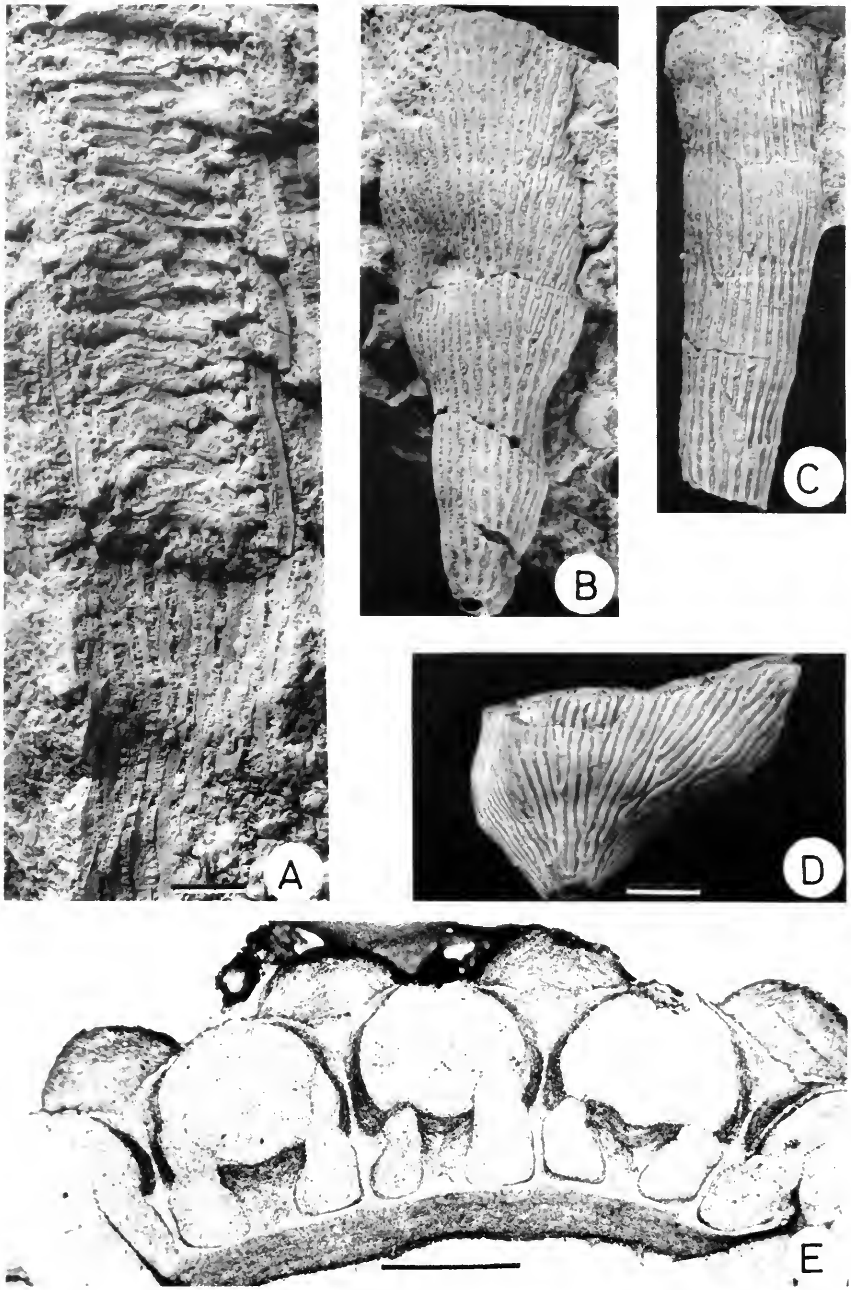

FIG. 22. *Cyclopelta sacculus* (Barrande). **A,** high conical specimen, longitudinally broken at level of keel laths (bottom) and along inside of cone to expose upwardly angled ridges formed by inwardly thickened and laterally joined branches and dissepiments; UUG specimen, Koněprusy. **B,** exterior of slightly undulose, high conical zoarium with only keel laths visible; paralectotype, NM L18478, Koněprusy. **C,** exterior of narrow, high conical zoarium with only keel laths visible; lectotype, NM L18479, Koněprusy. **D,** exterior of irregularly broadened zoarium with only keel laths visible; paralectotype, NM L18481, Koněprusy. **E,** transverse section through four laterally joined branches; each branch is centered on the high keel that supports an expanded lath at top (outer surface of specimen); lectotype, NM L18479. Scale bar in A = 2 mm; in D = 5 mm; and in E = 0.5 mm. B–C are at same scale as D.

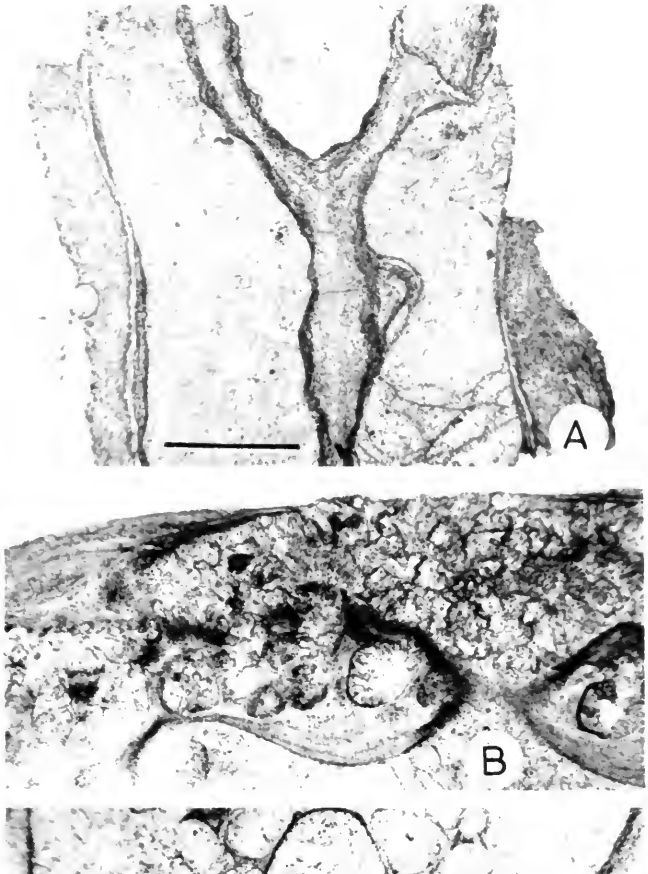

FIG. 23. *Cyclopelta sacculus* (Barrande). **A,** very shallow section through level of keel laths; lectotype, NM L18479, Koněprusy. **B,** longitudinal section through sinuous branches; NM L24656, Koněprusy. **C,** section centered on and encompassing same area as A but somewhat deeper, cutting level of zooecial chambers (central bifurcated branch) and apertures (lateral two branches); lectotype, NM L18479. Scale bar in A = 0.5 mm; all figures at same scale.

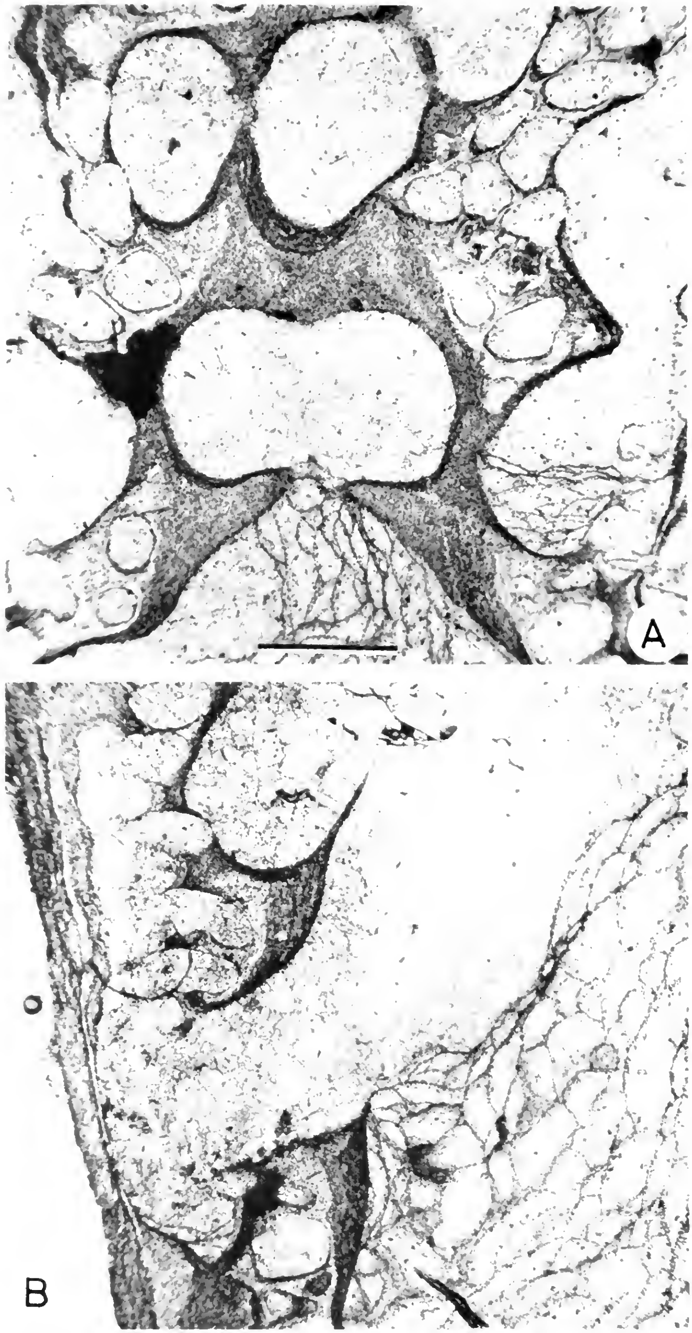

FIG. 24. *Cyclopelta sacculus* (Barrande). Lectotype, NM L18479, Koněprusy. **A,** deep tangential section in same place on zoarium as shallower sections illustrated in Figure 23, cutting into inner portions of distally tapered dissepiments and vesiculose deposits inside the conical zoarium. **B,** longitudinal section, cutting two inwardly and distally tapered dissepiment levels and, on right, vesiculose deposits inside the conical zoarium. Scale bar in A = 0.5 mm; both figures at same scale.

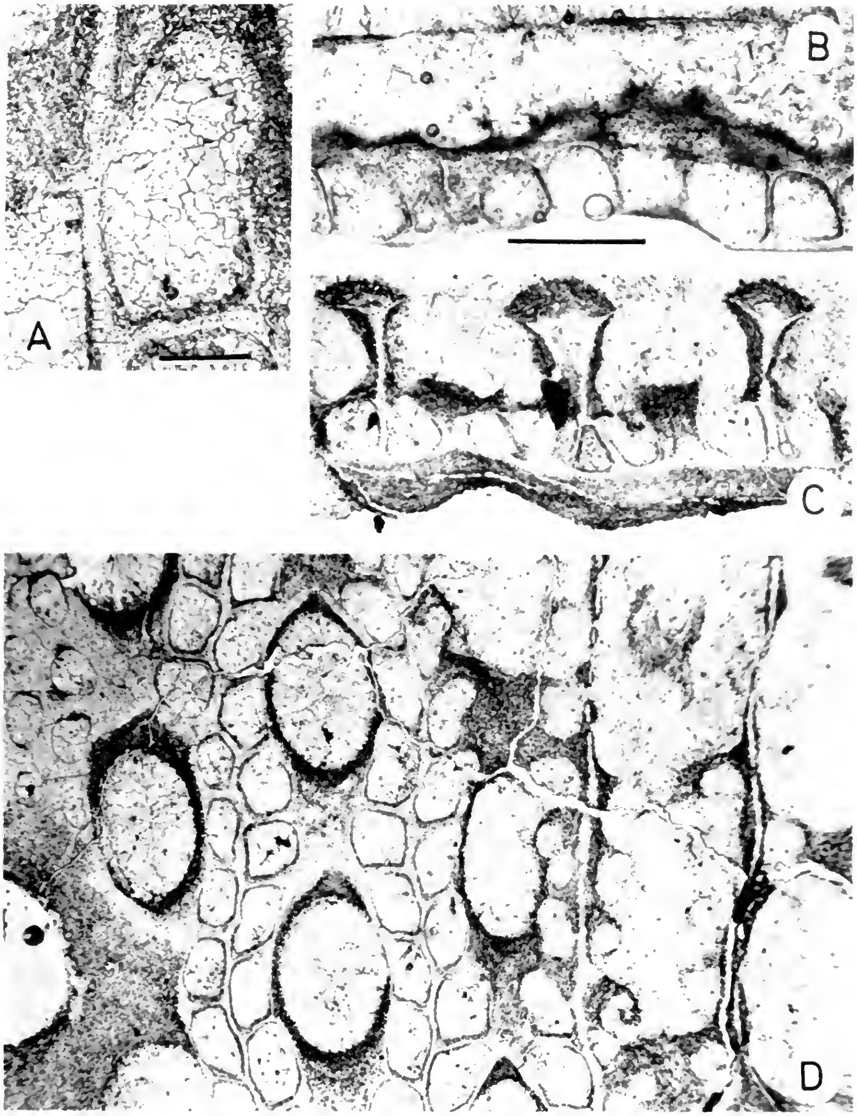

FIG. 25. *Cyclopelta victrola* McKinney & Kříž. **A,** shallow tangential section through single zooecium and axial wall (left), with granular wall lacking around disto-lateral portion of zooecium; holotype, NM L15512, Koněprusy. **B,** longitudinal section, cutting thin margin of lath along upper edge; paratype, NM L24657, Koněprusy. **C,** transverse section through three branches joined by short dissepiments; holotype, NM L15512. **D,** tangential section, shallowest at right and deepest (below basal plate) at left; holotype, NM L15512. Scale bar in A = 0.1 mm and in B = 0.5 mm. C–D are at same scale as B.

overlap axially so that the axial wall is zigzag. They are erect, inflated, and sack-shaped, with no portion recumbent on the basal plate; their maximum diameter occurs near the basal plate. Zooecial chambers vary from rounded to subrounded in deep tangential section, depending on whether the granular walls between adjacent zooecia are thin in the middle of the plane of contact or retain uniform thickness from the corners. Granular wall surrounds most of the zooecial chamber but is lacking in lateral and frontal areas. Chambers appear roughly equidimensional in deep tangential section, and those adjacent to dissepiments may have over 50% greater diameter than those between.

The basal plate is about 0.01–0.02 mm thick

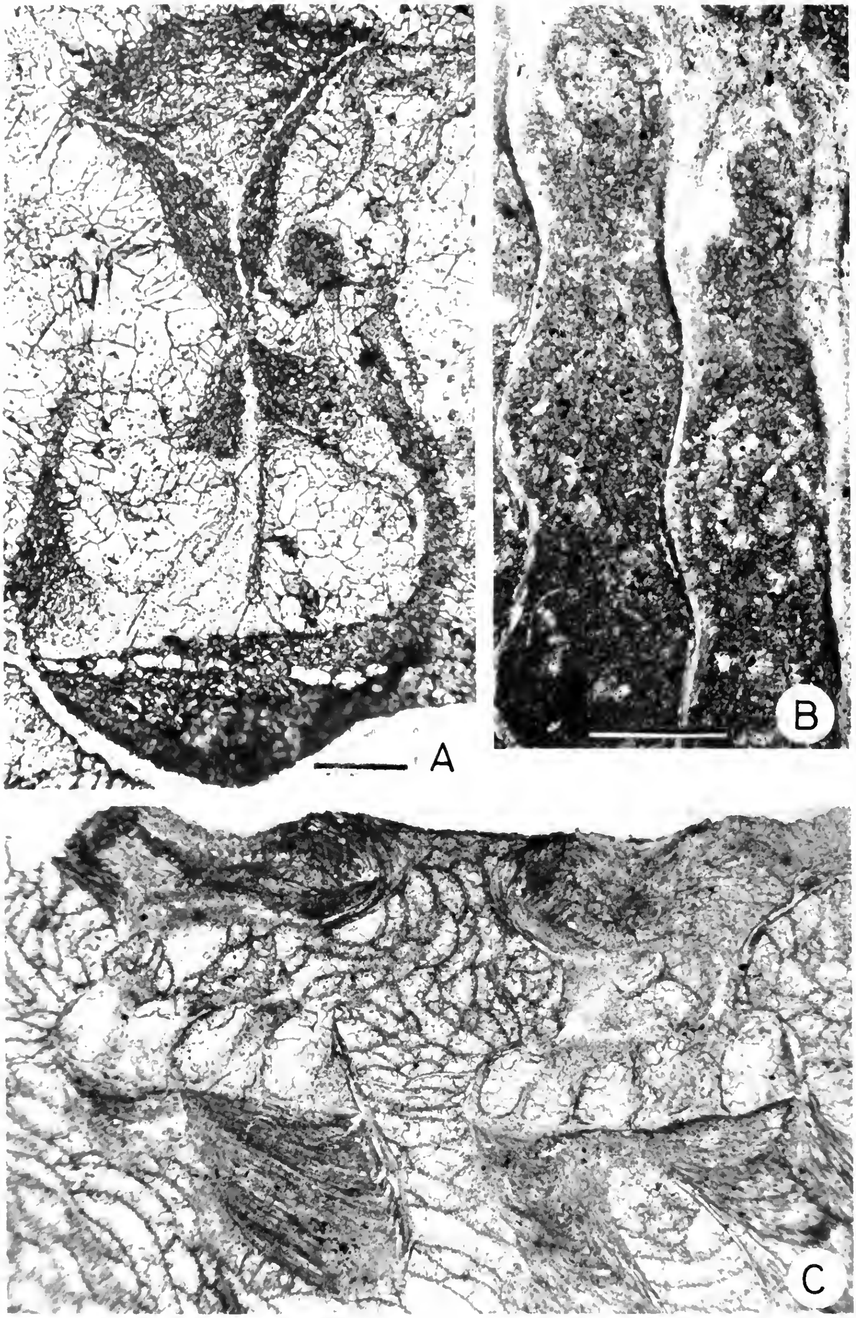

FIG. 26. **A.** *Cyclopelta victrola* McKinney & Kříž. Holotype, NM L15512, Koněprusy. Transverse section through single branch, showing local absence of basal plate (right); local absence of granular wall in lateral zooecial wall (left); and thin sheet of granular wall in keel, bifurcating into lath. **B-C.** *Cyclopelta bohemica* (Prantl). **B,** shallow tangential section through keel, lower three-fourths below level of lateral links along keel crests; NM L24658, Kaplička. **C,** longitudinal section near base of conical colony where vesicles fill from superstructure (top margin) to interior of cone (bottom margin); three concentric skeletal bands extend obliquely in the distal direction from the reverse side of branches; NM L18576, Kaplička. Scale bar in A = 0.1 mm and in B = 0.5 mm. C is at same scale as B.

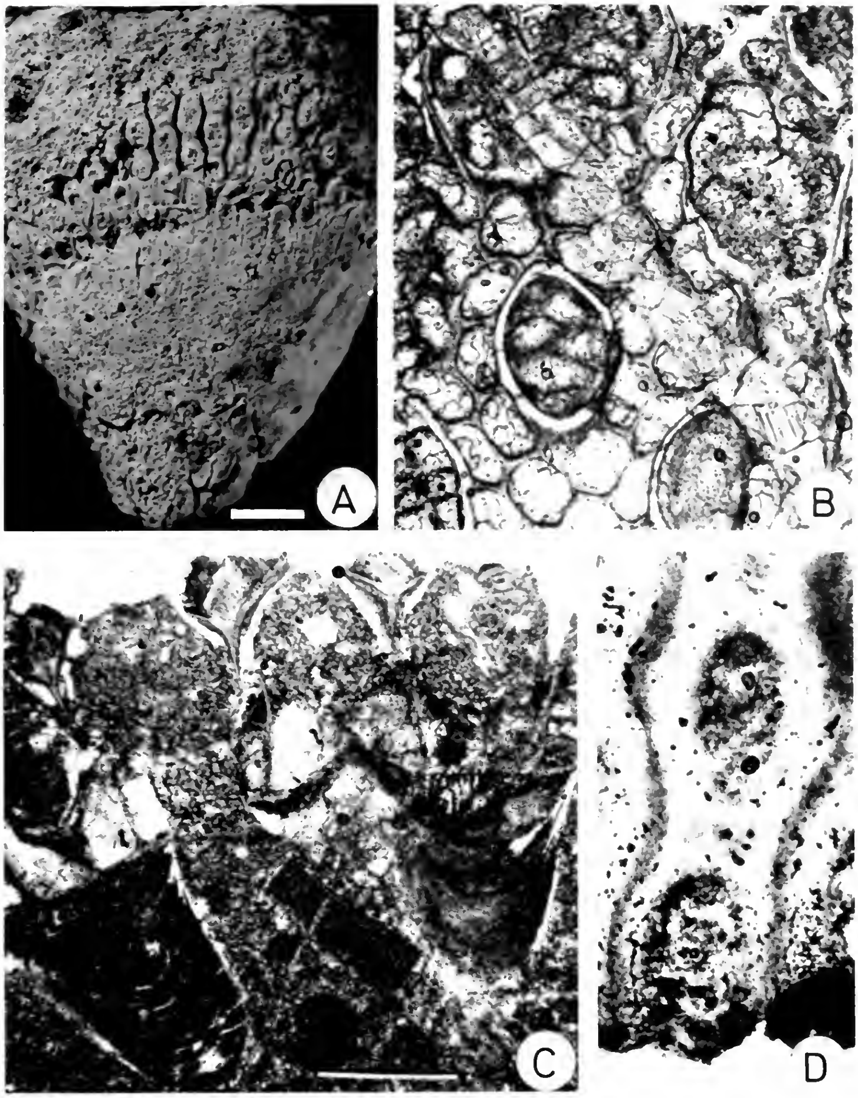

FIG. 27. *Cyclopelta bohemica* (Prantl). **A,** exterior of eroded conical zoarium; lectotype, NM L15489, Kaplička. **B,** tangential section, shallowest at top right; NM L24659, Kaplička. **C,** transverse section through several branches with very thick lamellar skeleton on reverse surfaces where branches are anastomosed; NM L24659. **D,** shallow tangential section through lateral linkages of light-colored lamellar skeleton extending from two keel crests (dark sinuous lines); paralectotype, NM L21448, Kaplička. Scale bar in A = 5 mm and in C = 0.5 mm. B and D are at same scale as C.

and lacks longitudinal ridges on reverse surfaces. It is arc-shaped in cross sections of individual branches, but is coalesced and flat where branches impinge and dissepiments are formed. Lamellar skeleton is up to about 0.10 mm thick on the reverse side of isolated branches, but may be produced into transverse, distally deflected narrow ridges over 0.5 mm high at the level of dissepiments. Cystose skeleton may fill space between branches and superstructure and within the cone in proximal parts of the colony. It generally forms as an asymmetrical deposit, higher on one side of the colony than on the other.

DISCUSSION—The specimen illustrated in Počta (1894) as plate 11, figure 7 (NM L18479), is here designated lectotype.

MEASUREMENTS—See Table 2.

TYPE MATERIAL—Lectotype, NM L18479;

paralectotypes, NM L18478; NM L18480; NM L18481; NM L21316–L21326; additional registered material, NM L18570; NM L24656.

LOCALITY—Koněprusy.

Cyclopelta victrola McKinney & Kříž, sp. nov. Figures 25, 26A.

Fenestella subacta (pars) Počta, 1894, Syst. Sil. VIII, pl. 12, fig. 11 (not figs. 4–10).
Seriopora petala (pars) Počta, 1894, Syst. Sil. VIII, pl. 13, fig. 11 (not figs. 8–10).
Semicoscinium sacculus sacculus (Barrande) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 3, fig. 6 (not pl. 2, figs. 17, 18, pl. 3, fig. 7).

DIAGNOSIS—Conical, flaring zoaria of slightly sinuous branches 0.40 mm wide, spaced about 0.69 mm center to center, connected by regularly spaced dissepiments about 1.11 mm center to center; zooecial chambers rectangular near base to bean-shaped frontally, with short, frontally-directed distal tubes about 0.12 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are conical, with sides diverging at an angle of 90° or less near the colony base but flaring to 180° or more within 2–3 cm. Cones are slightly to moderately pleated parallel with the growth direction. The superstructure of keels and laths is on the outer surface of the cones. The largest specimen is broken longitudinally, and about one-half of the zoarium is preserved; it is about 40 mm high and 80 mm in diameter.

Branches are slightly sinuous and connected by short dissepiments with spacing about one and one-half times that of branches. Dissepiments have about the same width and thickness as branches.

The superstructure consists of a high keel with a thin median sheet of granular skeleton divided into two sheets with about a 135° angle between them, thus forming the frontal lath. The granular core of each keel and lath has a flattened Y-shape in cross section. Lamellar skeleton forms a thin veneer on the keel sides and undersurfaces, but it forms a domed ridge of concentric lamellae on the outer surface of the laths. The laths are narrower than the underlying branches.

Autozooecia most commonly alternate along the branches, but locally they are side-by-side. The axial wall is generally straight but may be zigzag for short distances. Zooecia are loaf-shaped, appearing subrounded and rectangular in deep tangential sections and bean-shaped in sections closer to the frontal surface. Granular skeletal walls are lacking along parts of the lateral, frontal, and basal surfaces. Distal tubes are short, arising from the disto-lateral corner; they are perpendicular to the frontal plane. Length of chamber cross sections is about one and one-half their width at fenestrule midpoints, grading to the inverse relationship for zooecia adjacent to dissepiments.

The basal plates vary from 0–0.05 mm thick, are planar or gently curved transversely, and lack longitudinal ridges on the reverse. Lamellar skeleton is up to at least 0.8 mm thick on reverse surfaces but is thin on lateral and frontal surfaces.

DISTINGUISHING FEATURES—*Cyclopelta victrola* does not differ significantly from *C. sacculus* in measured features, although branches in specimens available are slightly wider and are set slightly further apart; primary differences are a straighter axial wall, shorter zooecia that appear more angular in section, and less elevated superstructure. *Cyclopelta victrola* differs from *C. winteri* Bornemann, 1884, in having less distance between branch junctions, broader branches, and less difference in width of zooecia at branch junctions and in those portions of branches between dissepiments.

ETYMOLOGY—Named for resemblance to flared speakers on early phonograph players.

MEASUREMENTS—See Table 2.

TYPE MATERIAL—Holotype, NM L15512; paratypes, NM L18482; NM L18598; NM L24657.

LOCALITY—Koněprusy.

Cyclopelta bohemica (Prantl). Figures 26B–C, 27.

Pseudoisotrypa bohemica Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 26, 27, pl. 5, figs. 4, 5, 7, 8, ?6, ?9–11.
Pseudoisotrypa cancellata (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 5, fig. 4 (not 12–14, 17).

DIAGNOSIS—Sinuous branches about 0.39 mm wide, spaced about 0.68 mm apart, connected by somewhat variably spaced anastomosis or short dissepiments averaging 1.14 mm apart; zooecia short, erect, rounded, sack-shaped, capped by short distal tube about 0.11 mm wide and spaced about 0.26 mm center to center.

DESCRIPTION—Zoaria are narrow to moderately widening cones, with angle of spread from less than 20° to over 60°. Narrow cones have circular cross sections, but broader cones are folded longitudinally into pleats. The frontal surface and the superstructure of keels and anastomosed laths are always on the outer surface of the cones.

Branches are sinuous and are anastomosed in some zoaria, but are connected by short dissepiments in most. Spacing of branch junctions is, on the average, a little less than one and one-half times that of branches. Dissepiments and anastomosis are aligned laterally or alternate. Their frontal surfaces are roughly level with frontal surfaces of branches, and their width is about equal to that of branches; in many instances, they are thickened and laterally coalesced into concentric or diagonal bands on reverse sides.

The superstructure consists of a high keel above branches but not dissepiments. It has a core sheet of granular calcite that bifurcates into two flaring sheets to form a lath at the frontal edge. The keel and lath are covered by lamellar skeleton that makes a domed ridge on the outer surface of the lath. Keels are sinuous, and laths above adjacent branches touch and fuse to form an anastomosed network that resembles the superstructure of *Isotrypa,* except for lack of a vertical sheet of skeleton connecting dissepiments and overlying superstructure.

Autozooecia alternate along the branches and overlap axially so that the axial wall is zigzag. They are short, erect, inflated, and sack-shaped, with no portion recumbent on the budding plate, near which their maximum diameter occurs. Zooecial chambers vary from rounded to subrounded in deep tangential section, depending on variation in wall thickness. Chambers appear roughly equidimensional in deep tangential section, and those adjacent to dissepiments or at anastomosis points may be up to twice the diameter of those between.

The basal plate is about 0.01–0.02 mm thick and lacks longitudinal ridges on reverse surfaces. It is gently arc-shaped to flat in cross sections. Lamellar skeleton is up to 1 mm thick on reverse sides. Cystose skeleton may fill space between branches and superstructure and within the cone in proximal parts of the colony.

Distinguishing Features—*Cyclopelta bohemica* differs from *Cyclopelta winteri* Bornemann, 1884, *C. sacculus,* and *C. victrola* in anastomosis of keel laths, relative shortness of zooecia, and smaller diameter of distal tubes.

Discussion—The *Isotrypa*-like frontal appearance of *C. bohemica* caused Prantl (1932, p. 26) to erect the new genus *Pseudoisotrypa* for the species. Its otherwise close resemblance to other species in *Cyclopelta,* however, and the rather simple step in changing from a sinuous, nonfused state to the fused state of the expanded summit suggest to us that it should belong to *Cyclopelta.* The specimen illustrated by Prantl (1932) as plate 5, figure 7 (NM L15489), is here designated lectotype.

Measurements—See Table 2.

Type Material—Lectotype, NM L15489; paralectotypes, NM L21448; NM L15490–NM L15491 (two parts of one zoarium); additional material, NM L18576; NM L24658; NM L24659.

Localities—Kaplička; Srbsko.

Isotrypa Hall, 1885

Type Species—*Fenestella* (*Hemitrypa*) *conjunctiva* Hall, 1881.

Diagnosis—Zoaria conical or fan-shaped, consisting of linear to moderately sinuous branches connected by dissepiments; zooecia not strongly inflated laterally except at dissepiments, generally quadrangular in deep tangential sections, varying in some to rounded quadrangular at dissepiments; distal tube typically short; hemisepta absent; axial wall typically flat, continuing unbroken into superstructure; superstructure corresponding with underlying branches and dissepiments, consisting of laterally expanded laths borne on continuous skeletal sheets from branches and dissepiments.

Isotrypa pannosa (Počta). Figures 28, 29.

Fenestella pannosa (pars) Počta, 1894, Syst. Sil. VIII, pp. 68, 69, pl. 14, figs. 12, 14, 15 (not 13).
Fenestella acris Počta, 1894, Syst. Sil. VIII, p. 57, pl. 16, figs. 4–8.
Fenestella rustica (pars) Počta, 1894, Syst. Sil. VIII, pl. 16, figs. 2, 3 (not fig. 1). Equals *Pseudoisotrypa cancellata* (Počta) in Prantl, 1932, Palaeontogr. Bohemiae XV, p. 27.
Fenestella sportula (pars) Počta, 1894, Syst. Sil. VIII, pl. 16, figs. 17–19 (not 16).
Fenestella lineolata (pars) Počta, 1894, Syst. Sil. VIII, pl. 16, figs. 21, 22 (not fig. 23).
Fenestella pannosa Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 8–9 (not pl. 1, fig. 4, pl. 2, figs. 8, 9).
Isotrypa acris (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 23–24, ?pl. 4, fig. 12 (not 13).
Pseudoisotrypa cancellata (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 5, fig. 14 (not figs. 4, 12, 13, 17).

Diagnosis—Straight to sinuous branches about 0.33 mm wide, spaced about 0.60 mm center to

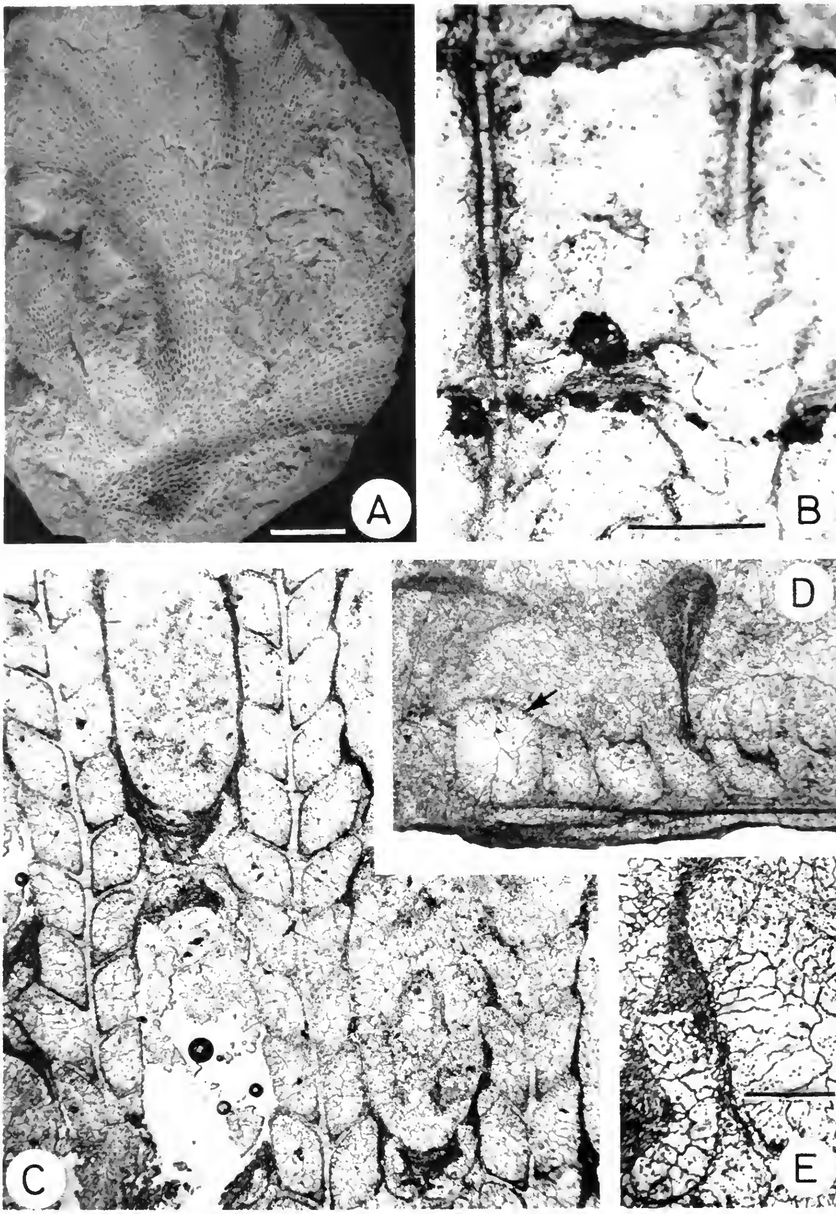

FIG. 28. *Isotrypa pannosa* (Počta). **A,** exterior of longitudinally pleated, fan-shaped zoarium; lectotype, NM L18584, Koněprusy. **B,** tangential section through frontal edges of branches (bottom) and superstructure (top); lectotype, NM L18584. **C,** tangential section through zooecial chamber mid-levels and possible small polymorphs in dissepiments; lectotype, NM L18584. **D,** longitudinal section, including apparent gonozooid (arrow), cutting branch axial plane at left and branch margin at right; NM L24660, Koněprusy. **E,** tangential section through zooecial chamber (right) and small vermiform chamber of possible polymorph (bottom left) in dissepiment; lectotype, NM L18584. Scale bar in A = 10 mm; in B = 0.5 mm; and in E = 0.1 mm. C–D are at same scale as B.

center, connected by fairly regularly spaced dissepiments 1.01 mm apart on the average; zooecia side-by-side, wedge-shaped, narrowing frontally, with frontally directed distal tubes about 0.10 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are conical, initially widening at an angle of about 60° to 150°. Larger zoaria

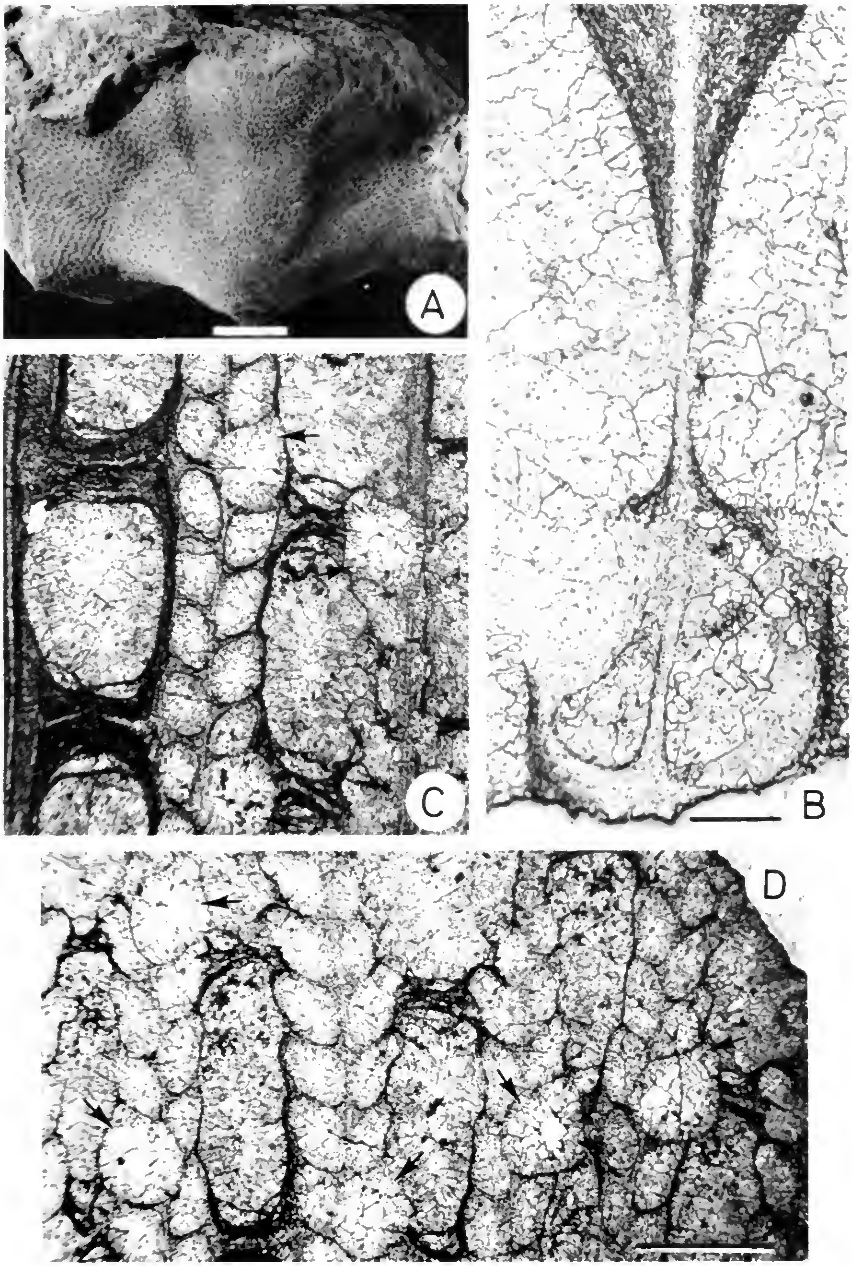

FIG. 29. *Isotrypa pannosa* (Počta). **A,** exterior of broadly conical, longitudinally pleated zoarium; NM L18585, Koněprusy. **B,** transverse section through single branch; NM L18545, Koněprusy. **C, D,** tangential sections, cutting various levels of inflated zooecia (arrows) associated with dissepiments and interpreted as gonozooids; NM L24661, Koněprusy. Scale bar in A = 10 mm; in B = 0.1 mm; and in D = 0.5 mm. C is at same scale as D.

are broadly warped to pleated along the growth direction in distal portions. The largest specimen, approximately one-fourth of a broad, flaring, deeply pleated zoarium, is about 83 mm long and 65 mm wide.

Branches are straight to moderately sinuous but are not an astomosed. Diameter of dissepiments is slightly less than that of branches. Dissepiments have locally small vermiform polymorphs and, typically, about one and two-thirds the spacing of branches.

The superstructure is supported by a high keel

TABLE 3. Measurements of species of *Isotrypa* and *Hemitrypa* (see page 7 for definitions of abbreviations).

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
Isotrypa pannosa **(Počta)**					
BRS	22	180	0.403–0.953	0.603	0.075
BRW	21	145	0.234–0.500	0.331	0.053
CW	5	50	0.103–0.192	0.138	0.021
DS	21	192	0.682–1.515	1.010	0.116
DTS	20	185	0.181–0.368	0.247	0.028
DTW	17	146	0.075–0.152	0.103	0.009
Isotrypa lineolata **(Počta)**					
BRS	4	38	0.477–1.058	0.740	0.135
BRW	4	36	0.278–0.515	0.402	0.052
CW	4	40	0.114–0.277	0.189	0.038
DS	4	40	0.888–1.684	1.222	0.148
DTS	4	40	0.203–0.414	0.299	0.027
DTW	4	37	0.078–0.172	0.124	0.023
Isotrypa bifrons **(Barrande)**					
BRS	11	87	0.485–1.021	0.780	0.077
BRW	10	60	0.288–0.494	0.392	0.039
CW	5	50	0.123–0.214	0.162	0.026
DS	11	91	0.826–2.026	1.341	0.216
DTS	9	82	0.239–0.415	0.290	0.023
DTW	9	65	0.085–0.148	0.114	0.011
Isotrypa cancellata **(Počta)**					
BRS	12	103	0.291–0.887	0.556	0.092
BRW	12	84	0.225–0.516	0.305	0.048
CW	5	50	0.087–0.181	0.135	0.027
DS	12	119	0.536–1.220	0.854	0.125
DTS	12	115	0.145–0.364	0.250	0.029
DTW	12	88	0.068–0.142	0.093	0.010
Isotrypa sportula **(Počta)**					
BRS	3	29	0.395–0.800	0.580	0.050
BRW	3	24	0.256–0.417	0.325	0.043
CW	3	30	0.102–0.188	0.137	0.023
DS	3	30	0.634–1.181	0.910	0.143
DTS	3	24	0.211–0.312	0.252	0.017
DTW	3	24	0.070–0.132	0.095	0.011
Hemitrypa tenella **Barrande**					
BRS	27	254	0.267–0.600	0.390	0.030
BRW	27	231	0.167–0.310	0.211	0.014
CW	5	50	0.081–0.124	0.103	0.010
DS	27	243	0.260–0.730	0.503	0.046
DTS	27	254	0.170–0.300	0.226	0.011
DTW	27	253	0.060–0.090	0.078	0.003
Hemitrypa mimicra **McKinney & Kříž**					
BRS	24	211	0.286–0.620	0.449	0.049
BRW	23	171	0.138–0.404	0.239	0.041
CW	5	50	0.080–0.147	0.113	0.014
DS	23	206	0.303–1.000	0.551	0.071
DTS	24	230	0.170–0.346	0.235	0.023
DTW	24	201	0.068–0.121	0.086	0.004
Hemitrypa bohemica **Barrande**					
BRS	6	42	0.430–0.758	0.614	0.048
BRW	6	35	0.300–0.530	0.384	0.050

TABLE 3. *Continued.*

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
CW	5	50	0.106–0.248	0.172	0.034
DS	5	50	0.748–1.076	0.920	0.031
DTS	5	50	0.190–0.380	0.291	0.022
DTW	4	40	0.108–0.160	0.136	0.013
Hemitrypa linotheras **McKinney & Kříž**					
BRS	4	36	0.380–0.630	0.512	0.028
BRW	4	32	0.220–0.320	0.243	0.008
CW	5	50	0.101–0.191	0.142	0.024
DS	4	33	0.570–0.800	0.723	0.051
DTS	4	40	0.220–0.300	0.254	0.004
DTW	4	30	0.100–0.150	0.128	0.008

of granular skeleton that thickens slightly near its frontal edge but rarely extends as lateral sheets into the superstructure. The keel is veneered by lamellar skeleton that increases in thickness near the frontal edge to form a wedge-shaped, flat-topped to gently rounded lath. The laths are narrower than the underlying branches.

Autozooecia are typically side-by-side rather than in alternate positions along a branch. The axial wall is straight. Chambers are wedge-shaped with an erect cylinder at the distal end. In deep tangential sections, chambers appear as slightly elongated parallelograms with length about one and one-half times width near the basal plate; in shallower sections, they are progressively narrower and confined against the axial wall. The transverse granular walls between zooecia in a row incline at an angle of about 60° from the basal plate. The transverse and adjacent portions of other granular walls may be thinly covered by lamellar skeleton in proximal portions of zooecia. The distal tube arises along the disto-lateral corner of the chamber and is perpendicular to the frontal plane or inclined slightly toward the adjacent fenestrule. Chamber sections cut along the top of the proximal chamber and through the distal tube are roughly bean-shaped. Apertures are along margins of frontal surfaces of branches and incline downward slightly in the disto-lateral direction. Autozooecia at dissepiments are up to 30% wider than those that intervene.

The basal plate is prominent—up to 0.05 mm thick—and has a few large longitudinal ridges on the reverse side. Lamellar skeleton may be thick on the reverse side of the branch, but has not been seen to accumulate substantially on lateral and frontal zooecial surfaces.

Apparent gonozooids have large, spherically inflated living chambers that were probably ovicells. Where they occur, each gonozooid is situated at a dissepiment and its aperture opens into the proximal part of the next-distal fenestrule. Gonozooids crowd and cause reduced size of the adjacent zooids because they have a diameter of about 0.33 mm at the level of maximum inflation; they project farther into the fenestrules than autozooids.

Distinguishing Features—For comparison with other species of *Isotrypa* from the Koněprusy Limestone, see Tables 3 and 4. *Isotrypa pannosa* is similar to *Isotrypa sibirica* Krasnopeeva, 1935, from the Middle Devonian of Gornoi Altai as reported in Volkova (1974, pp. 75, 76, pl. 38, fig. 2), in branch and dissepiment spacing, basal cross-sectional shape of autozooecia, and gonozooid shape and distribution; but *I. sibirica* has greater spacing between apertures and greater branch sinuosity. *Isotrypa troposomena* Deiss, 1932 (pp. 248, 249, pl. 4, figs. 4, 6), from the Middle Devonian of Michigan, resembles *I. pannosa* in branch and dissepiment spacing and in aperture size and spacing, but differs in having more sinuous branches and more robust superstructure laths; its zooecial shape is unknown.

Discussion—The specimen illustrated in Počta (1894) as plate 14, figure 12 (NM L18584), is here designated lectotype.

Measurements—See Table 3.

Type Material—Lectotype, NM L18584; paralectotype, NM L21305; additional registered material, NM L18484; NM L18485; NM L18545; NM L18583; NM L18585; NM L18595; NM L21301–L21304; NM L21306; NM L24660; NM L24661.

Locality—Koněprusy.

Isotrypa lineolata (Počta). Figures 30, 31A.

Fenestella lineolata (pars) Počta, 1894, Syst. Sil. VIII, pp. 66–67, pl. 16, fig. 23, ?fig. 20 (not 21, 22).

Diagnosis—Generally straight branches about 0.40 mm wide, spaced about 0.74 mm center to center, connected by fairly regularly spaced dissepiments averaging 1.22 mm center to center; zooecial chambers appear elliptical in sections near base, narrowing frontally, with laterally tilted distal tubes about 0.12 mm wide and spaced about 0.30 mm center to center.

Description—Zoaria are conical, widening at an angle up to about 150°, and are pleated along the growth direction. They are up to 40 mm high and 57 mm wide. Branches are straight to locally sinuous, particularly where immediately distal to bifurcations. Dissepiments have larger diameters than do branches, with about one and two-thirds times their spacing.

The superstructure is supported by a high keel of granular skeleton that is thick above branches and very thin above dissepiments. The keel is veneered by lamellar skeleton that thickens frontally to form the laths of the superstructure. The laths are narrower than the underlying branches.

Autozooecia are typically offset along a branch but are locally side-by-side. The axial wall is straight. Zooecia are sack-shaped, with their long axis oriented almost normal to the frontal plane but tilted in a disto-lateral direction. In deep tangential sections, zooecial chambers typically appear elliptical, slightly elongate parallel with the branch axis where cut near the budding plate. The elliptical appearance of chambers is due to the variable thickness of transverse granular walls, which are thin near their midportions but thicker toward the axial and lateral margins. Chamber sections are narrower and bean-shaped near the frontal side. The distal tube arises along the distal margin of the zooecium and tilts slightly toward the adjacent fenestrule, so that branch edges are crenulate in shallow tangential sections. Apertures are along frontal surfaces of branches and incline slightly downward in the distal lateral direction. Zooecia at branch-dissepiment junctions are up to 50% wider than those in the middle of fenestrules. Progressive change in the size of zooecia between mid-level of fenestrules and dissepiments results in spindle-shaped branches. Some zooecia beside dissepiments are equidimensional or are broader than long in sections.

The basal plate is about 0.04 mm thick and has only one or two longitudinal ridges along the reverse side. Lamellar skeleton may be moderately thick on the reverse sides of branches, and may lap up onto lateral sides of zooecia. It has not been seen to accumulate substantially on frontal zooecial surfaces.

Distinguishing Features—For comparison with other species of *Isotrypa* from the Koněprusy Limestone, see Tables 3 and 4. *Isotrypa lineolata* is unique among described Devonian *Isotrypa* in branch and dissepiment spacing, zooecial chamber shape, and large variations in chamber size.

Discussion—The specimen illustrated in Počta

TABLE 4. Comparison of morphological features of species of *Isotrypa* from the Devonian of Bohemia.

Features	*pannosa*	*lineolata*	*bifrons*	*cancellata*	*sportula*
Zoarial shape	Pleated cones	Pleated cones	Flat to pleated sheets	Cones	Narrow cones
Branch sinuosity	Straight	Straight to sinuous	Slightly sinuous	Straight	Sinuous
Superstructure	Narrow laths	Narrow laths, two modes of construction	Same width as branches	Narrow laths, two modes of construction	Same width as branches
Zooecial distribution	Side-by-side	Alternating	Side-by-side	Side-by-side	Variable
Axial wall	Straight	Straight	Straight	Straight	Straight to sinuous
Chamber cross section	Parallelograms	Elliptical	Parallelograms	Parallelograms	Parallelograms to pentagonal

(1894) as plate 16, figure 23 (NM L18491), is here designated lectotype.

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Lectotype, NM L18491; additional registered material, NM L24662.

LOCALITY—Koněprusy.

Isotrypa bifrons (Barrande). Figures 31B, 32.

Fenestella bifrons Barrande in Bigsby, 1868, Thesaurus Siluricus, p. 200 (*nomen nudum*).
Fenestella bifrons Barrande in Počta, 1894, Syst. Sil. VIII, pp. 58, 59, pl. 17, figs. 1–3.
Isotrypa bifrons (Barrande). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 24, pl. 5, fig. 1.
Fenestella gracilis Barrande in Počta, 1894, Syst. Sil. VIII, pp. 63, 64, pl. 14, figs. 8–11.
Isotrypa gracilis (Barrande). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 1, fig. 12, pl. 5, fig. 2.
Fenestella rustica (pars) Počta, 1894, Syst. Sil. VIII, pl. 16, fig. 1 (not figs. 2, 3).
Pseudoisotrypa cancellata (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 27.

DIAGNOSIS—Slightly sinuous branches about 0.39 mm wide, spaced about 0.78 mm center to center, connected by variably spaced dissepiments averaging 1.34 mm center to center; zooecial chambers wedge-shaped, narrowing frontally with distal tubes slightly inclined laterally, about 0.11 mm in diameter and spaced about 0.29 mm from center to center.

DESCRIPTION—Zoarial fragments are large, relatively flat to broadly pleated sheets, the largest being 48 mm high and 82 mm wide. Curvature of some fragments suggests that they may be conical zoaria. Branches are slightly sinuous and are connected by short dissepiments, not anastomosed. Dissepiments have about the same width as branches but are not as thick. Their typical spacing is about one and three-quarters times that of branches. In a few colonies there are local cysts, with large gaps between laminae, in dissepiments.

The superstructure is supported by a high keel of granular skeleton that may thicken slightly toward its frontal edge but more commonly tapers to a very thin edge at the upper surface. The keel is covered by lamellar skeleton that increases in thickness near the frontal edge to form a broad, wedge-shaped, flat-topped to acutely crested lath. The laths have about the same width as underlying branches and dissepiments.

Autozooecia are typically side-by-side but may alternate along a branch. The axial wall is straight in most places but is gently zigzag where zooecia are offset from one another. Zooecial chambers are wedge-shaped with an erect cylinder at the distal end. In deep tangential sections, zooecial chambers appear as slightly elongate parallelograms near the basal plate, but in shallower sections are narrower and confined against the axial wall. Transverse walls between zooecia are inclined at an angle of about 60° from the basal plate; they are planar near their base, but are distally convex closer to the frontal surface where the distal tubes are differentiated and more proximal parts of the zooecia are roofed over. Distal tubes arise from the center or slightly lateral to the center of distal walls of the zooecia and lean slightly toward the adjacent fenestrules. Zooecial apertures are on frontal surfaces of branches, and their closest margin is at a distance equal to about half their diameter from the branch axis. Apertures are roughly parallel with the frontal plane. Autozooecia at dissepiments are about 20% wider than those that intervene.

The basal plate is about 0.02 mm thick and has a few large ridges on the reverse side. Lamellar

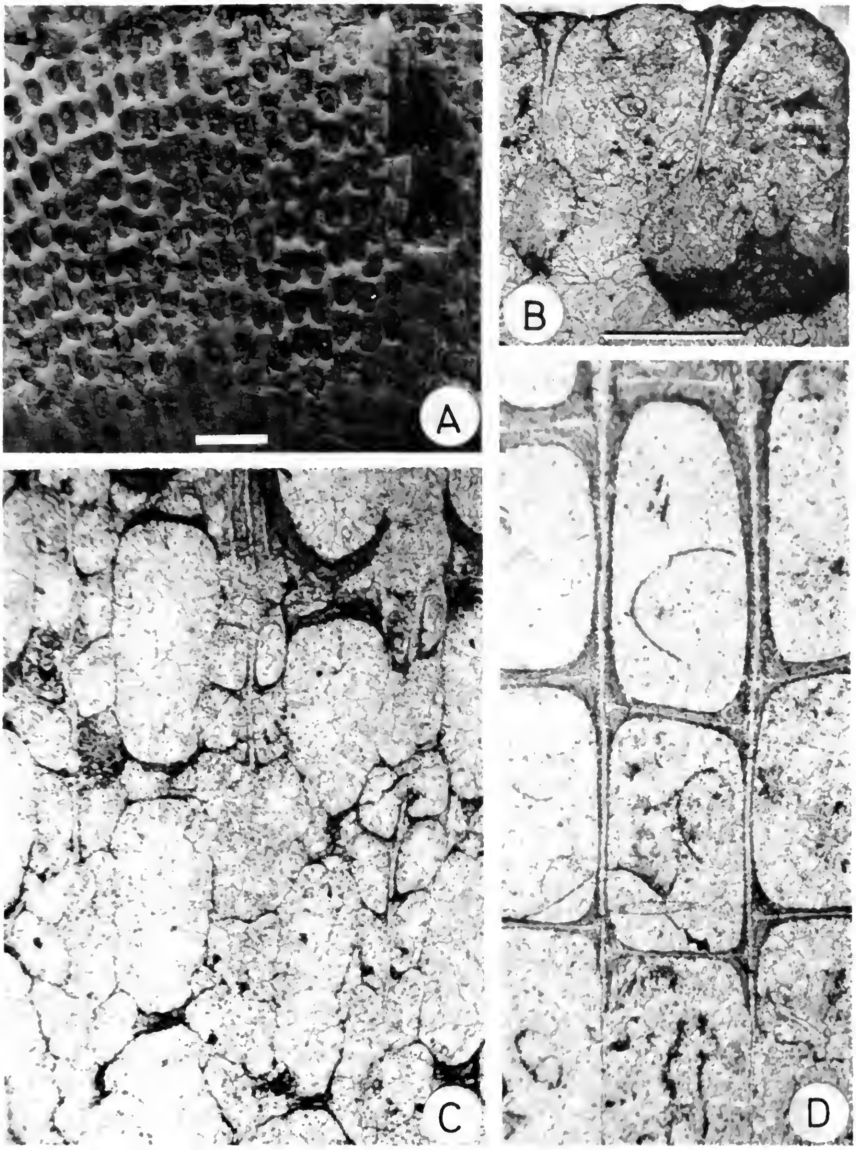

FIG. 30. *Isotrypa lineolata* (Počta). Lectotype, NM L18491, Koněprusy. **A,** partially sanded exterior of zoarial fragment. **B,** transverse section through two partially recrystallized branches, and part of a third. **C,** tangential section through three branches, cutting below basal plate at top right and high in zooecia along bottom. **D,** tangential section through superstructure, shallowest at top. Scale bar in A = 2 mm and in B = 0.5 mm. C–D are at same scale as B.

skeleton may be thick on reverse sides of branches, but it has not been seen to accumulate substantially on lateral and frontal zooecial surfaces.

DISTINGUISHING FEATURES—For comparison with other species of *Isotrypa* from the Koněprusy Limestone, see Tables 3 and 4. *Isotrypa bifrons* has substantially greater branch and dissepiment spacing than any other described Devonian species of the genus.

DISCUSSION—The specimen illustrated in Počta (1894) as plate 17, figure 1 (NM L18475), is here designated lectotype.

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Lectotype, NM L18475; paralectotype, NM L21306; additional registered material, NM L18483; NM L18582; NM L18599; NM L24663.

LOCALITIES—Koněprusy; Kaplička; Srbsko.

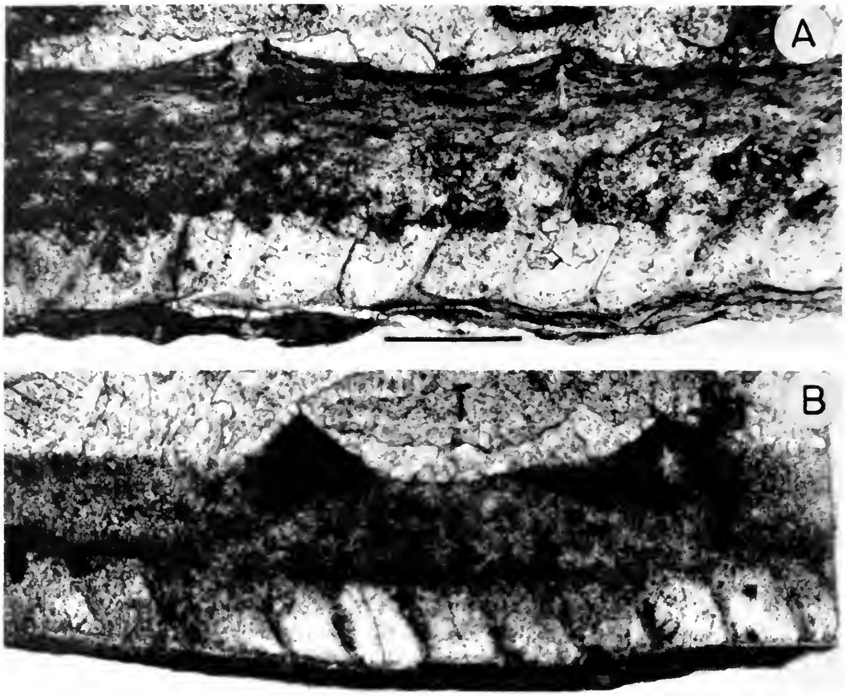

FIG. 31. **A.** *Isotrypa lineolata* (Počta). NM L24662, Koněprusy. Longitudinal section near branch midplane, also cutting lamellar portion of longitudinal part of superstructure, including junction with two crossbars (peaks in superstructure centered on vertically oriented granular skeleton). **B.** *Isotrypa bifrons* (Barrande). NM L24663, Koněprusy. Longitudinal section along branch midplane, cutting exactly through entire height of superstructure, including junction with two crossbars, as in A. Scale bar in A = 0.5 mm. B is at same scale.

Isotrypa cancellata (Počta). Figures 33, 34A.

Fenestella cancellata Počta, 1894, Syst. Sil. VIII, p. 60, pl. 16, figs. 9–12.
Pseudoisotrypa cancellata (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 27, 28, pl. 5, figs. 12, 13, 17 (not figs. 4, 14).
Fenestella pannosa Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 8 (left) (not fig. 9).

DIAGNOSIS—Slightly sinuous branches about 0.30 mm wide, spaced about 0.56 mm center to center, connected by variably spaced dissepiments averaging 0.85 mm center to center; superstructure has granular core only above branches; zooecial chambers side-by-side, wedge- to sack-shaped, narrowing frontally, with very short frontally-directed distal tubes about 0.09 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are conical, widening at a 60° to 90° angle. They may be smoothly conical, pleated, or irregularly pinched and swollen. All zoaria are broken on at least one end; the largest is 25 mm high. Branches are slightly sinuous but are not anastomosed. Dissepiment width may be equal to or slightly greater than branch width. Spacing of dissepiments is typically almost one and one-half times that of branches.

The superstructure is supported by a high keel of granular skeleton that is not developed above dissepiments. Where the granular skeleton is lacking above dissepiments, a vertical, planar to sinuous sheet of variable thickness is constructed of lamellar skeleton. Granular skeleton in the keels above branches thickens slightly near its frontal edge but rarely if ever extends as lateral sheets into the superstructure. The keel is veneered by lamellar skeleton that may be only locally developed near the base but increases in thickness near the frontal edge to form a wedge-shaped lath. The laths are slightly narrower than the underlying branches.

Autozooecia are typically side-by-side rather than in alternate positions along a branch. The axial wall is predominantly straight but locally deflected around individual robust zooecia. Zooecial chambers are wedge-shaped to sack-shaped. In deep tangential sections, zooecial chambers are slightly elongated parallelograms to locally ellip-

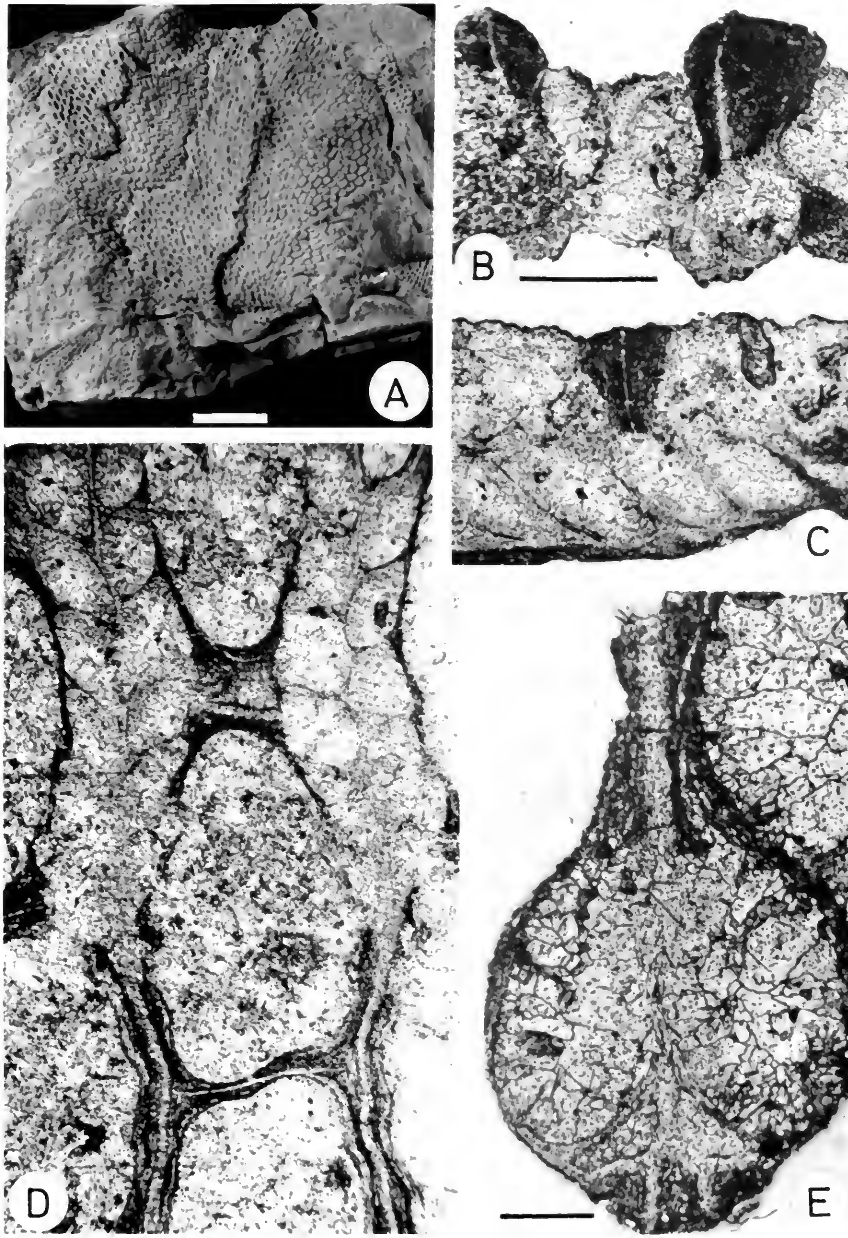

FIG. 32. *Isotrypa bifrons* (Barrande). Lectotype, NM L18475, Koněprusy. **A**, exterior of fan-shaped zoarial fragment. **B**, transverse section of two branches, the one on left partially eroded. **C**, longitudinal section along a row of zooids, closer to edge of branch at right, cutting transverse element of superstructure at top center. **D**, tangential section, near level of basal plate at top and cutting superstructure at bottom. **E**, transverse section through single branch. Scale bar in A = 10 mm; in B = 0.5 mm; and in E = 0.1 mm. C–D are at same scale as B.

tical shapes with slightly rounded proximal ends near the basal plate. Toward the frontal surface, chambers become constricted on the proximal end until they are pyriform just below the level where the distal tube terminates as the aperture. Apertures are on the frontal surface of branches, located against the axial wall and essentially parallel with the frontal plane. Zooecia at dissepiments are up to 35% wider than those that intervene.

The basal plate is about 0.03 mm thick and has

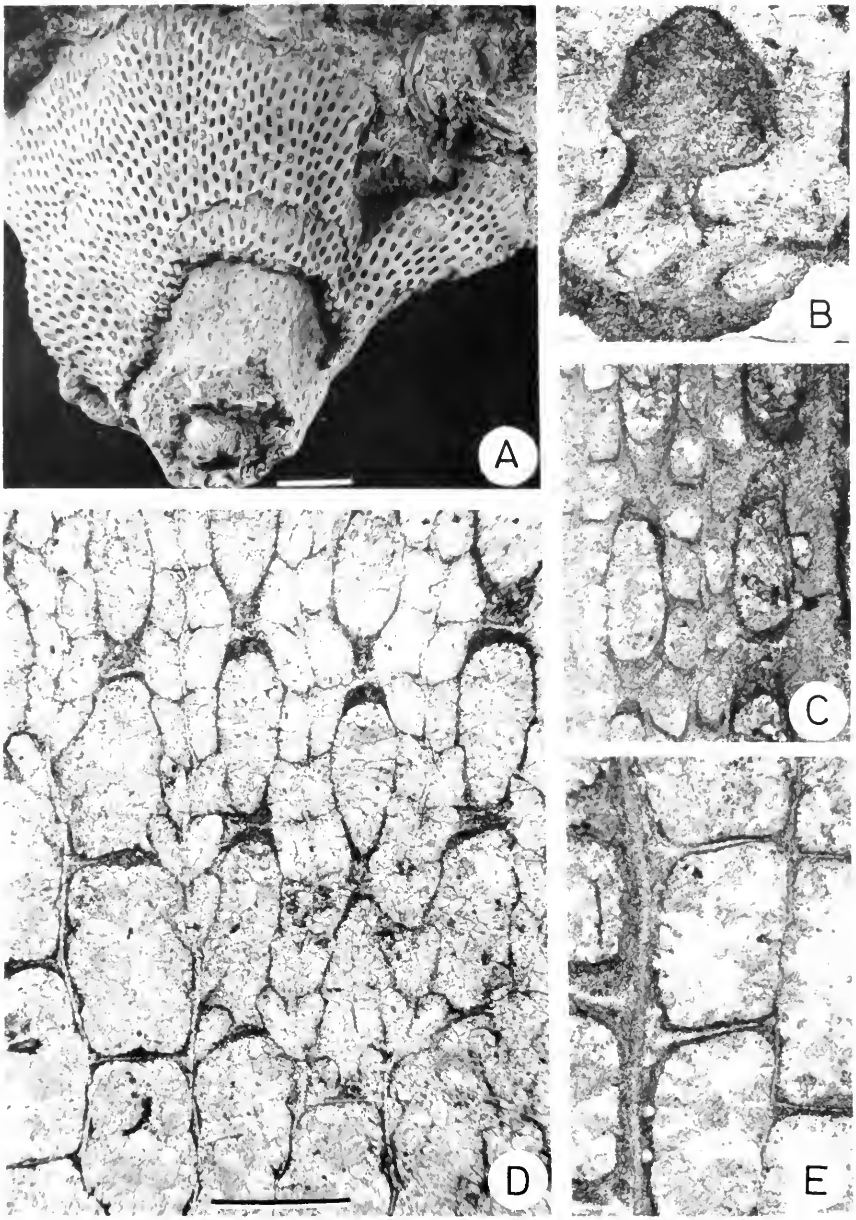

FIG. 33. *Isotrypa cancellata* (Počta). **A,** exterior of conical zoarium; paralectotype, NM L18581, Koněprusy. **B,** oblique longitudinal section through branch and superstructure; NM L18493, Koněprusy. **C,** deep tangential section through zooecial bases (center and left) and basal plate (right); lectotype NM L18492, Koněprusy. **D,** shallow tangential section through zooecial chambers and lower portions of superstructure; NM L24664, Koněprusy. **E,** shallow tangential section through outermost portion of superstructure (left); lectotype, NM L18492. Scale bar in A = 5 mm and in D = 0.5 mm. B–C and E are at same scale as D.

several small longitudinal ridges on the reverse side. Lamellar skeleton may be thick on the reverse side of the basal plate and moderately developed along the fenestrules lateral to zooecia, but it has not been seen to accumulate substantially on frontal zooecial surfaces.

DISTINGUISHING FEATURES—For comparison with other species of *Isotrypa* from the Koněprusy

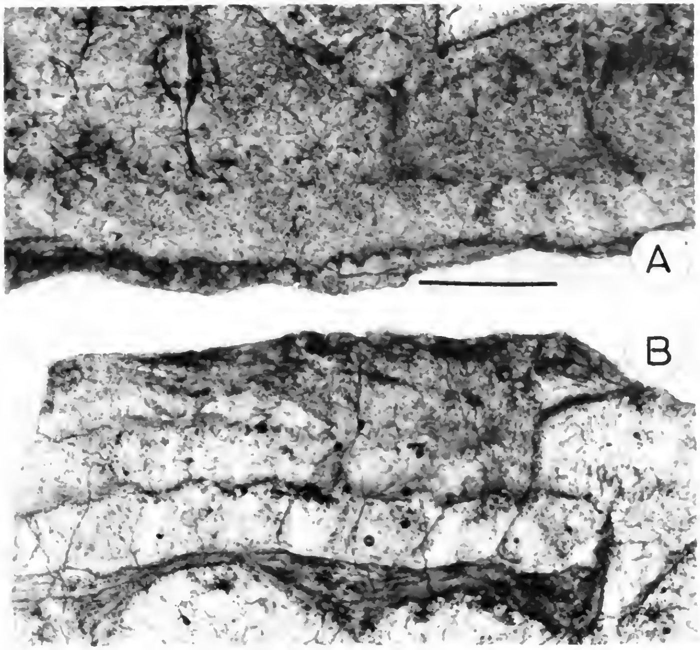

FIG. 34. **A.** *Isotrypa cancellata* (Počta). Longitudinal section of specimen in which recrystallization has virtually obscured walls between chambers; distal direction toward left; NM L24665, Koněprusy. **B.** *Isotrypa sportula* (Počta). Longitudinal section; lectotype, NM L18503, Koněprusy. Scale bar in A = 0.5 mm. B is at same scale.

Limestone, see Tables 3 and 4. Branch, dissepiment, and aperture spacing in *I. cancellata* is approximately equal to that in *I. angulata* Deiss, 1932; *I. rara* Deiss, 1932; *I. ovata* Deiss, 1932; *I. hexagona* Deiss, 1932; and *I. vibratula* Deiss, 1932, all from the Middle Devonian of Michigan. The latter three, however, are possibly only one species and differ in that they have anastomosed branches, while *I. rara* has much more inflated zooecial chambers. Internal characters of *I. angulata* are unknown.

DISCUSSION—The specimen illustrated in Počta (1894) as plate 16, figures 11 and 12 (NM L18492), is here designated lectotype.

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Lectotype, NM L18492; paralectotype, NM L18581; additional registered material, NM L18493; NM L21438; NM L24664; NM L24665.

LOCALITIES—Koněprusy; Kaplička; Srbsko.

Isotrypa sportula (Počta). Figures 34B, 35.

Fenestella sportula (pars) Počta, 1894, Syst. Sil. VIII, pp. 72, 73, pl. 16, figs. 15, 16 (not 17–19).

Isotrypa acris (Počta) (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 23 (not pl. 4, figs. 12, 13).

DIAGNOSIS—Narrow conical zoaria of sinuous, locally anastomosed branches about 0.32 mm in diameter, spaced about 0.58 mm center to center, connected by anastomosis or dissepiments at about 0.91 mm intervals; superstructure with granular core divided into three sheets along outer margin; zooecial chambers wedge-shaped, narrowing frontally with distal tubes placed disto-laterally and oriented frontally, about 0.10 mm in diameter and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are high, narrow cones widening at less than a 30° angle. Height may be up to at least 20 mm. Branches are slightly to strongly sinuous and are locally anastomosed. Where dissepiments are present, they have slightly smaller diameter than branches. Branch linkages typically have spacing of about one and two-thirds times that of branches.

A high keel of granular skeleton divides along its frontal edge into three sheets that are the core for the superstructure and have a trident-appearing cross section. The keel is veneered by lamellar skeleton that entirely covers the granular core and fills in the region on the frontal side of the divided portion, making rounded laths with a low, median keel which is the outer edge of the granular skel-

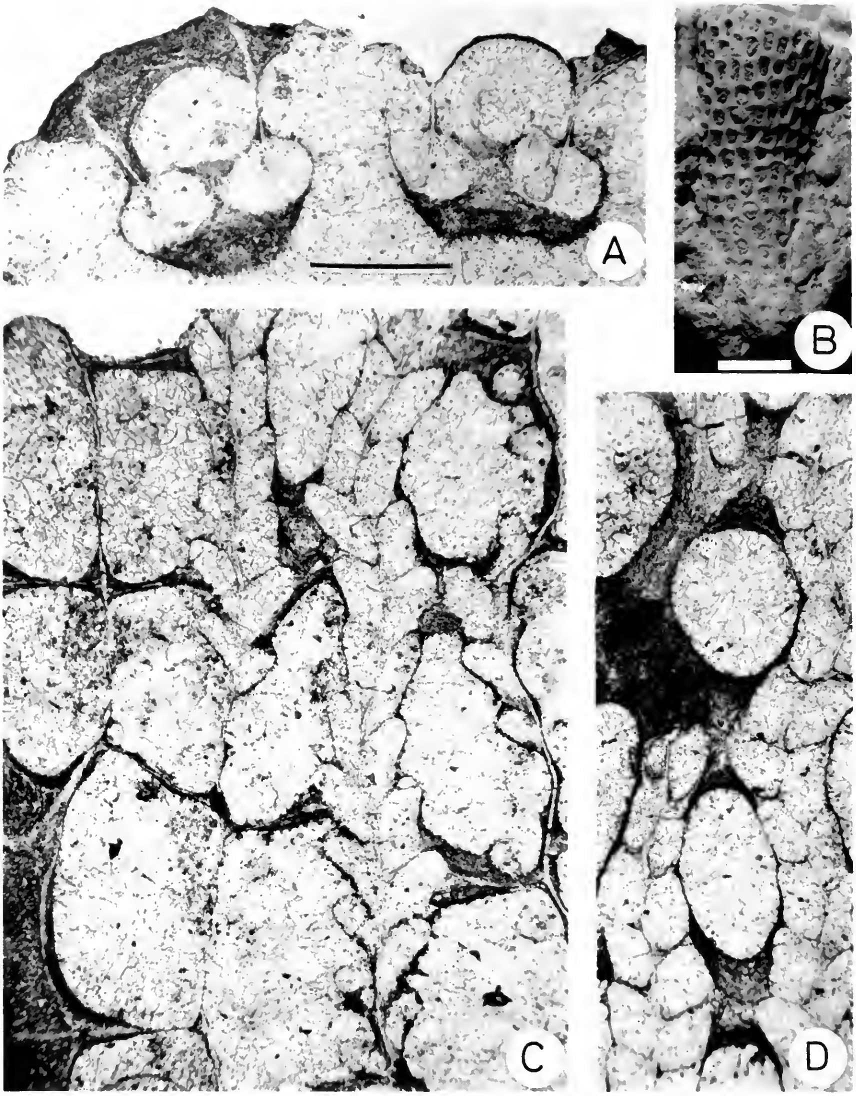

FIG. 35. *Isotrypa sportula* (Počta). Lectotype, NM L18503, Koněprusy. **A,** transverse section through four branches linked in pairs by dissepiments. **B,** exterior of narrowly conical zoarium. **C,** shallow tangential section cutting superstructure (left) and various levels of zooecia (right) from distal tubes to near basal plate. **D,** deep tangential section through zooecial bases and cutting below basal plate at top left. Scale bar in A = 0.5 mm and in B = 5 mm. C–D are at same scale as A.

eton. The laths are about equal in width to the underlying branches and dissepiments.

Autozooecia may be side-by-side or in alternating positions along a branch: if the former, the axial wall is straight; if the latter, the axial wall is very slightly zigzag. Zooecial chambers are wedge-shaped, with an erect cylinder at the distal end. In deep tangential sections, zooecial sections are slightly elongated parallelograms to weakly developed pentagons near the basal plate, but become narrower and confined frontally against the axial wall. The axial wall becomes more strongly zigzag frontally where zooecia are alternating. Around the proximal ends of zooecial chambers, there may be a thin lining of lamellar skeleton coating the granular walls. The distal tube in each zooecium arises along the disto-lateral corner of the chamber and maintains uniform distance from the axial wall. Chamber sections are typically crescent-shaped, with rounded distal end in shallow

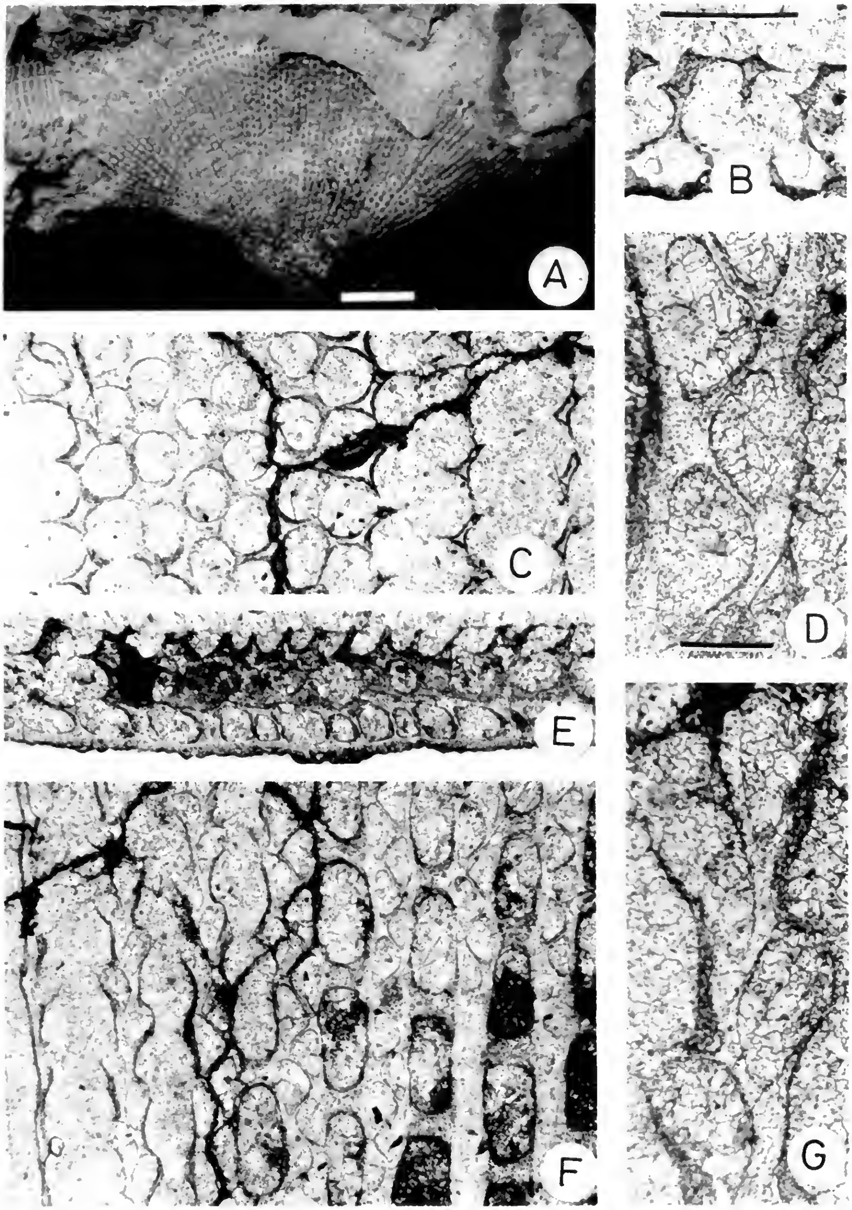

FIG. 36. *Hemitrypa tenella* Barrande. **A,** conical colony, majority preserved as mold of interior of cone, skeleton preserved only along upper margin; lectotype, NM L18454, Koněprusy. **B,** cross section of two branches and superstructure; NM L18459, Koněprusy. **C,** shallow tangential section through superstructure meshwork (center) and supporting spines (right and left); lectotype, NM L18454. **D,** deep tangential section through three zooecia, passing just above basal plate; lectotype, NM L18454. **E,** slightly oblique longitudinal section cutting branch margin at left and right and branch axial plane in center; NM L18456, Koněprusy. **F,** tangential section through various levels of branches, deepest on right; lectotype, NM L18454. **G,** shallow tangential section through frontal portions of zooecia; lectotype, NM L18454. Scale bar in A = 5 mm; in B = 0.5 mm; and in D = 0.1 mm. C, E–F are at same scale as B; G is at same scale as D.

frontal sections. Apertures project above frontal surfaces of branches and are essentially parallel with the frontal plane. Zooecia at dissepiments are up to 20% wider than those that intervene.

The basal plate is about 0.05 mm thick and has several small ridges on the reverse side. Lamellar skeleton may be thick on the reverse side of the basal plate, but it has not been seen to accumulate

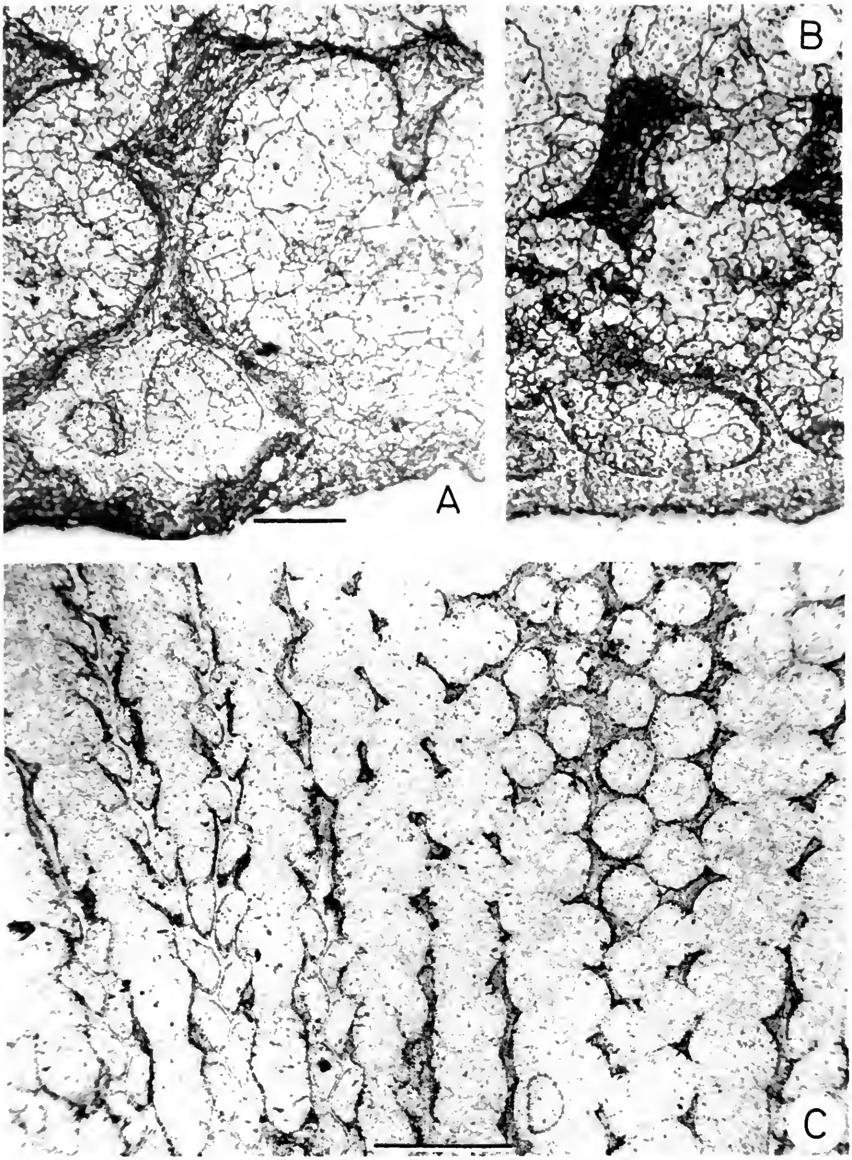

FIG. 37. *Hemitrypa tenella* Barrande. **A,** cross section through single branch, superstructure, and supporting frontal spine; NM L18459, Koněprusy. **B,** longitudinal section through zooid and unsupported portion of superstructure; NM L18456, Koněprusy. **C,** tangential section through branches (left), superstructure-supporting spines (center), and meshwork of superstructure (right); NM L18558–A, Koněprusy. Scale bar in A = 0.1 mm and in C = 0.5 mm. B is at same scale as A.

substantially on lateral and frontal zooecial surfaces.

DISTINGUISHING FEATURES—For comparison with other species of *Isotrypa* from the Koněprusy Limestone, see Tables 3 and 4. Branch, dissepiment, and aperture spacing in *I. sportula* most closely resembles that of *I. nekhoroshevi* Krasnopeeva, 1935 (pp. 62, 63, pl. 13, figs. 38–41, pl. 19, figs. 77, 78), from the Middle Devonian of Altai, but the species differ in that *I. nekhoroshevi* has smaller apertures and much narrower anastomosed branches.

DISCUSSION—The specimen originally figured by Počta as plate 16, figure 16 (NM L18503), is here designated lectotype, and that illustrated as plate 16, figure 15 (NM L18502), paralectotype.

TABLE 5. Comparison of morphological features of species of *Hemitrypa* from the Devonian of Bohemia.

Features	*bohemica*	*linotheras*	*tenella*	*mimicra*
Zoarial shape	Flaring cones	Small cones	Broadly flaring cones	Broadly flaring cones
Branch sinuosity	Straight to slightly sinuous	Sinuous	Straight	Straight
Aperture orientation	Frontal	Frontal	Disto-lateral	Disto-lateral
Axial wall	Zigzag	Zigzag	Zigzag basally, sinuous frontally	Zigzag basally, sinuous frontally
Chamber cross section	Pentagonal to elliptical	Concave proximally, rounded distally	Pentagonal to triangular	Triangular to semicircular

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Lectotype, NM L18503; paralectotype, NM L18502.

LOCALITY—Koněprusy.

Hemitrypa Phillips, 1841

TYPE SPECIES—*Hemitrypa oculata* Phillips, 1841.

DIAGNOSIS—Zoaria conical or fan-shaped, consisting of branches bearing two rows of typically alternating zooecia, regularly spaced dissepiments, and fine-textured superstructure; zooecial chambers not strongly inflated laterally, commonly quadrangular or pentagonal in deep sections, opening frontally through short distal tube; hemisepta commonly present; axial wall flat or zigzag in deep sections, bearing a single row of closely spaced high spines with granular core; lamellar wall extends laterally from tips of keel spines as a few short, inclined sheets that fuse with those from neighbors to form a meshwork of polygonal openings, each opening centered over a zooecial aperture in the branch below.

Hemitrypa tenella Barrande. Figures 36, 37.

Hemitrypa tenella (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pp. 101, 102, pl. 15, figs. 1, 4, 6, 7 (not 2, 3, 5).

Fenestella minuscula Počta, 1894, Syst. Sil. VIII, p. 67, pl. 16, figs. 24, 25.

DIAGNOSIS—Straight branches about 0.21 mm wide, spaced about 0.39 mm center to center, connected by regularly spaced dissepiments about 0.50 mm center to center, superstructure borne by tabular spines with concave sides; zooecial chambers alternating, with variably shaped basal sections, tapering frontally into laterally and distally inclined short distal tube about 0.08 mm in diameter and spaced about 0.23 mm center to center.

DESCRIPTION—Zoaria are conical, broadly flaring at an angle of 90° to over 180°; they are circular to elliptical in cross section. Longitudinal pleats are characteristic but are not present in all. The superstructure is on the outside of the cone. Branches are very thin and are straight, joined by dissepiments whose diameters are slightly less than those of branches. Dissepiment spacing is on average about 20% greater than branch spacing.

Autozooecia alternate in position along the branches. The axial wall is highly zigzag near the basal plate, generally touching both sides of it; but nearer the frontal surface it is sinuous rather than bending sharply, and nearly straight in the frontal keel. Zooecia are inclined and sack-shaped, with their bases closely appressed. Zooecial chambers are triangular, pentagonal, or semicircular in deep tangential sections near the basal plate, with length being only slightly greater than width and height. They are short, obliquely oriented and bean-shaped in more frontal sections, becoming narrower in some areas but generally shorter and also more rounded. Distal tubes are very short and small in diameter; they are located on the frontal surface but are tilted both distally and toward adjacent fenestrules. Apertures are directly against the sinuous axial wall.

The basal plate varies from 0.01 to about 0.05 mm in thickness, with a few low longitudinal ridges on the reverse. Except where very close to colony bases, lamellar skeleton is thin on all outer surfaces of branches.

The superstructure is borne on closely spaced, tabular spines whose long axis is diagonal in shallow tangential sections. Lamellar skeleton on the spines is sculpted into concave faces and peaks that correspond with superstructure openings and

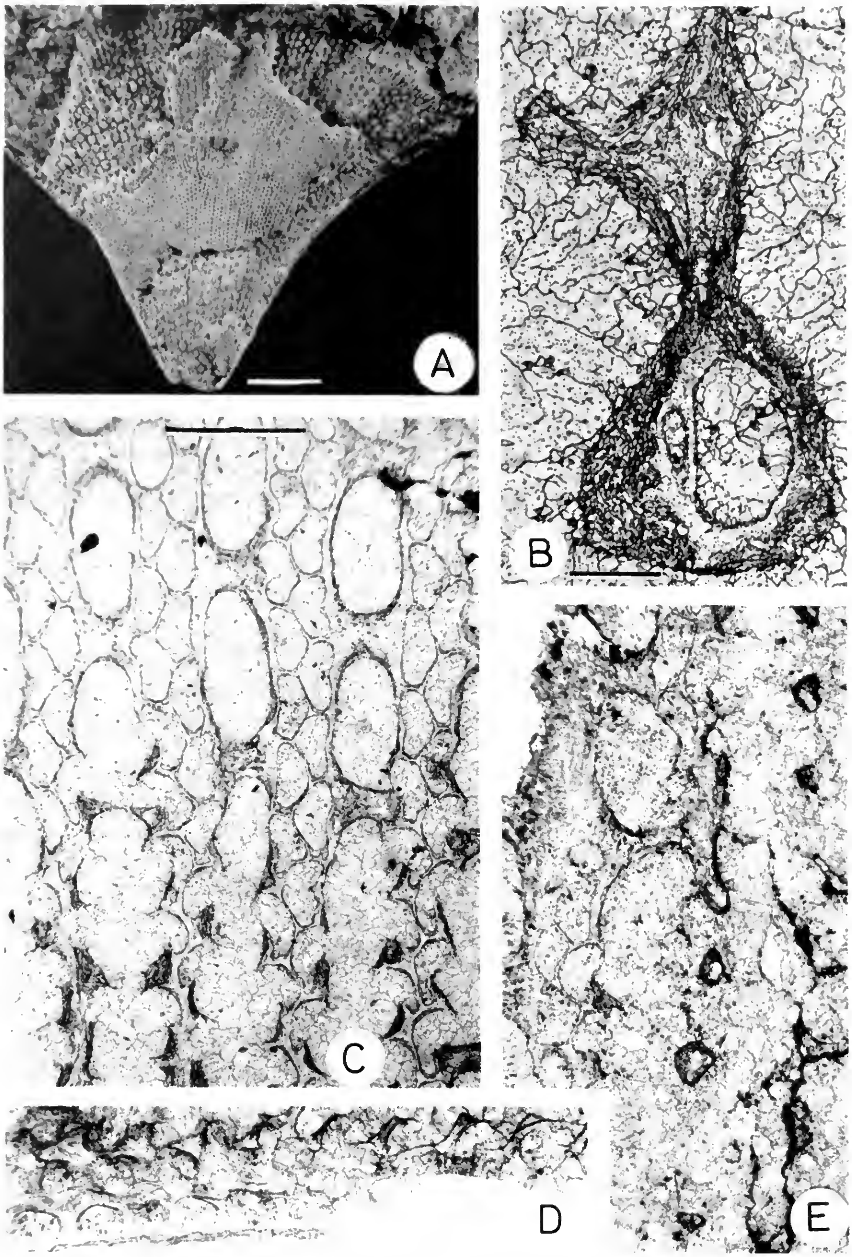

FIG. 38. *Hemitrypa mimicra* McKinney & Kříž. **A**, conical zoarium preserved in large part as interior mold, but with large central area of skeleton remaining; holotype, NM L18452, Koněprusy. **B**, cross section of single branch and superstructure; paratype, NM L18531, Koněprusy. **C**, tangential section through branches, deepest at top of figure; paratype, NM L18558–B, Koněprusy. **D**, longitudinal section through branch (lower left) and superstructure (top margin); paratype, NM L24666. **E**, tangential section through branches (left and top center) and superstructure-supporting spines (right and bottom center); holotype, NM L18452. Scale bar in A = 5 mm; in B = 0.1 mm; and in C = 0.5 mm. D–E are at same scale as C.

meshwork, respectively. The superstructure generally lacks extra ridgelike calcification above the branch centers.

DISTINGUISHING FEATURES—For comparison with other species of *Hemitrypa* from the Koněprusy Limestone, see Tables 3 and 5. *Hemitrypa tenella* resembles *H. bugusunica* Nekhoroshev, 1948 (pp. 97, 98, pl. 28, figs. 5–7, pl. 29, fig. 3a,b),

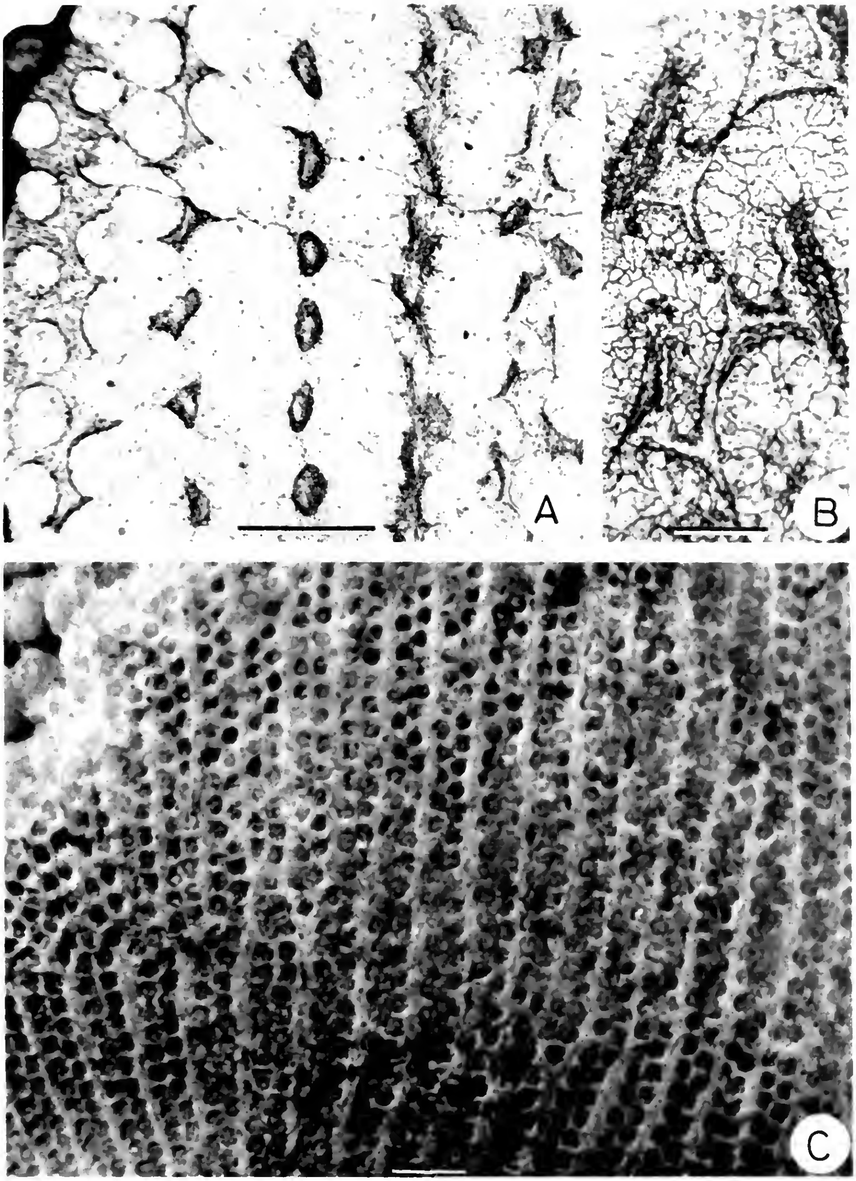

Fig. 39. *Hemitrypa mimicra* McKinney & Kříž. Paratype, NM L18558–B, Koněprusy. **A**, tangential section through superstructure meshwork (left); supporting spines (center); and frontal edge of branches (right). **B**, tangential section through frontal edge of branch, cutting zooecial chambers and apertures and axial wall. **C**, *Hemitrypa linotheras* McKinney & Kříž. Exterior surface of superstructure meshwork, with skeletal ridges centered over branches; paratype, NM L18588, Koněprusy. Scale bar in A = 0.5 mm; in B = 0.1 mm; and in C = 1 mm.

from the Middle Devonian of the Altai, in branch and dissepiment spacing, but differs in zooecial spacing and in orientation and placement of zooecial apertures. It also resembles *H. devonica heitaiensis* Yang, 1956 (pp. 782, 783, pl. 9, fig. 3a–d), from the Middle Devonian of Kirin Province, China, in branch and dissepiment spacing, but differs in zooecial spacing, chamber shape, and placement and orientation of apertures. *Hemitrypa tenella* resembles *H. variosa* Deiss, 1932, (pp. 247, 248, pl. 4, figs. 2, 5), from the Middle Devonian of Michigan, in branch spacing and lateral orientation of apertures, but differs in dissepiment spacing, chamber shape, and zooecial spacing.

DISCUSSION—The specimen illustrated in Počta (1894) as plate 15, figure 1 (NM L18454), is here selected as lectotype.

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Lectotype, NM L18454; paralectotypes, NM L21312; NM L21313; additional registered material, NM L18456; NM L18459; NM L18558–A.

LOCALITY—Koněprusy.

Hemitrypa mimicra McKinney & Kříž, sp. nov. Figures 38, 39A–B.

Hemitrypa tenella (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pl. 15, figs. 2, 3, 5 (not figs. 1, 4, 6, 7).
Hemitrypa tenella Barrande. Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 3, figs. 11, 12, ?9, ?10.
Fenestella exilis Počta (pars). Prantl, 1932, Palaeontogr. Bohemiae XV, pl. 2, fig. 4 (not fig. 3).

DIAGNOSIS—Straight branches about 0.24 mm wide, spaced about 0.45 mm apart, connected by regularly spaced dissepiments averaging 0.55 mm apart; zooecia closely spaced, equidimensional, polygonal at bases, elongate oval nearer frontal surface, merging into distal tube, about 0.09 mm in diameter and spaced about 0.24 mm center to center.

DESCRIPTION—Zoaria are flattened to rounded funnels, broadly flaring, some to an angle of about 90° but others recurved to over 180°. Longitudinal pleats are characteristic but are not present in all. The superstructure is on the outside of the funnel. Branches are straight, joined by dissepiments whose diameters are slightly less than those of branches. Dissepiment spacing is almost one and one-half times that of branches.

Autozooecia alternate in position along the branches. The axial wall is zigzag near the basal plate but is much straighter at the frontal keel. Zooecia are budded in a single line in each branch and diverge alternately to right and left sides of the branch as sinuous tubes, closely appressed at bases. Zooecial chambers appear trapezoidal at the basal plate in deep tangential sections, with length and width approximately equal. Just above the basal plate, chambers are pentagonal to triangular in section, with length about one and one-half times width. They are bean-shaped in more frontal sections, becoming narrower than in deeper sections. The entire distal end changes into a laterally and distally tilted distal tube of small diameter where sections cut above the proximal portions of zooecia. Apertures, which are near but not directly against the branch axial plane, are level with the branch surface.

The basal plate is about 0.02 mm thick and has a few conspicuous longitudinal ridges on the reverse side. Lamellar skeleton is moderately thick on the reverse sides of branches but forms only a thin veneer on lateral and frontal sides of zooecia.

The superstructure is borne on closely spaced, slightly tabular spines. Lamellar skeleton on the spines is sculpted into concave faces and peaks that correspond with superstructure openings and meshwork, respectively. The superstructure lacks conspicuous extra external calcification above branch centers.

DISTINGUISHING FEATURES—For comparison with other species of *Hemitrypa* from the Koněprusy Limestone, see Tables 3 and 5. *Hemitrypa mimicra* is similar to *H. mongolica* Nekhoroshev, 1926b (p. 21, pl. 1, figs. 12, 13), from the Middle Devonian of northwestern Mongolia, in branch, dissepiment, and zooecial spacing and in general zooecial shape. It differs from *H. mongolica* in having trapezoidal and triangular cross sections near the basal plate; in lacking hemisepta; and in having laterally directed apertures. *Hemitrypa mimicra* differs from other species of the genus in the combination of branch, dissepiment, and zooecial spacing, zooecial shape, and placement and size of apertures.

ETYMOLOGY—From Czech *mimicr*, to mimic.

MEASUREMENTS—See Table 3.

TYPE MATERIAL—Holotype, NM L18452; paratypes, NM L18451; NM L18453; NM L18457; NM L18458; NM L18531; NM L18534; NM L18547; NM L18548; NM L18553; NM L18557; NM L18558–B; NM L21449; NM L24666; NM L24681–L24689; FMNH PE39308–PE39317.

LOCALITIES—Koněprusy; Kaplička; Srbsko.

Hemitrypa bohemica Barrande. Figure 40.

Hemitrypa Bohemica (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pp. 98, 99, pl. 15, figs. 12–19 (not figs. 8–11).
Hemitrypa bohemica Barrande. Prantl, 1932, Palaeontogr. Bohemiae XV, p. 21, pl. 3, figs. 13, 14, pl. 4, figs. 2, 3.

DIAGNOSIS—Straight to sinuous branches about 0.38 mm wide, spaced about 0.61 mm center to center, connected by regularly spaced dissepiments averaging 0.92 mm center to center; zooe-

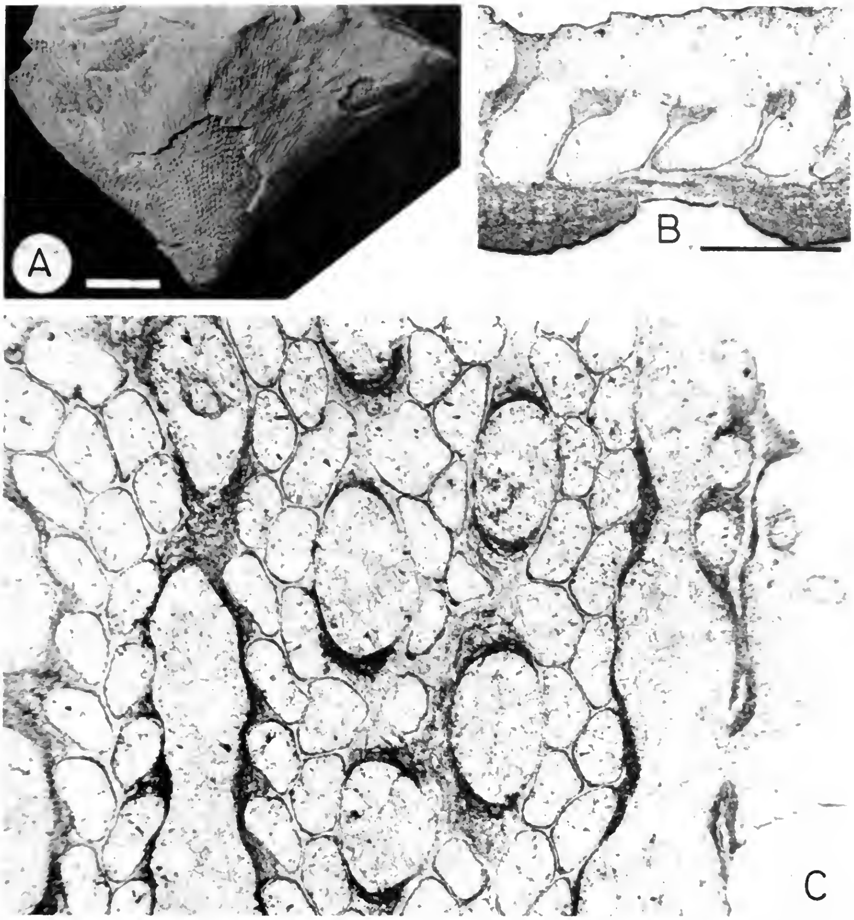

FIG. 40. *Hemitrypa bohemica* Barrande. Lectotype, NM L18472, Koněprusy. **A,** conical specimen with skeleton adhering at top and right but preserved as mold of inner surface at bottom and left. **B,** longitudinal section through several zooecia and supporting spine for superstructure, but majority of superstructure broken off along top surface of specimen. **C,** longitudinal section through several branches, deepest at center of illustration and shallowest at bottom right. Scale bar in A = 10 mm and in B = 0.5 mm. C is at same scale as B.

cial chambers appressed against proximal zooecia basally, rounded distally, constricted frontally into frontally-directed distal tube about 0.14 mm in diameter and spaced about 0.29 mm center to center.

DESCRIPTION—Zoaria are conical, with a proximal, cylindrical to gently widening portion; but gradually or abruptly they flare distally, in an arc of spread up to about 120°. Zoarial cross sections are circular to elliptical, generally smoothly curved but with slight pleating in some. Branches are straight to slightly sinuous and are joined by short dissepiments whose diameters are slightly smaller than those of branches. Spacing of dissepiments is about one and one-quarter to one and one-half times that of branches, which are locally triserial preceding bifurcations.

Autozooecia are in alternating positions along the branches. The axial wall is zigzag, with planar to crescentic segments. Zooecia are elliptoid, with proximal portions conforming to the shape of the next-proximal zooids. In deep tangential section, zooecial chambers are about twice as long as wide, and vary in shape from distally rounded and pentagonal to proximally indented and elliptical. Zooecial sections are diagonally oriented and elliptical or teardrop-shaped toward the frontal surface. Closest to the frontal surface of the branch the distal end forms a frontally-directed tube; the proximal portion is roofed over. The large zooecial

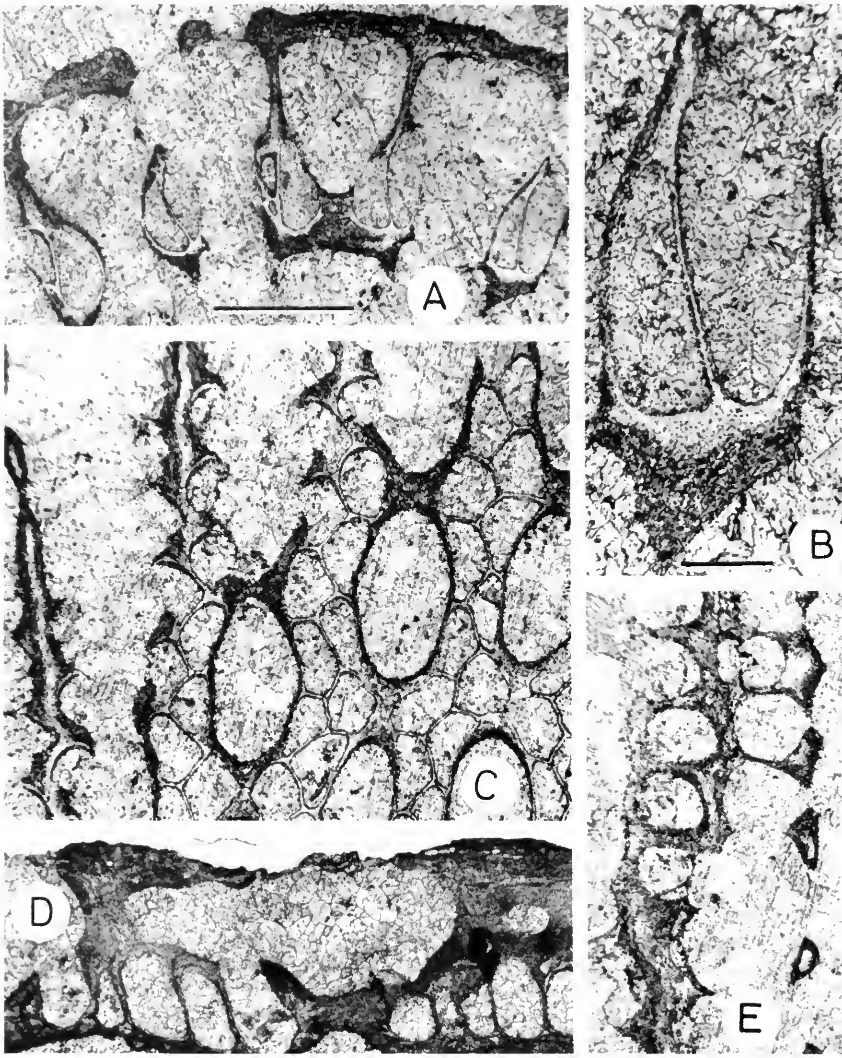

FIG. 41. *Hemitrypa linotheras* McKinney & Kříž. **A,** transverse section through conical specimen, cutting several high, thin branches and superstructure on outer surface; holotype, NM L18561, Koněprusy. **B,** transverse section through single branch; note keel on reverse surface; holotype, NM L18561. **C,** tangential section through several branches, shallowest at left; holotype, NM L18561. **D,** longitudinal section; paratype, NM L18575, Koněprusy. **E,** shallow tangential section through meshwork of superstructure (left) and supporting spines (right); holotype, NM L18561. Scale bar in A = 0.5 mm and in B = 0.1 mm. C–E are at same scale as A.

apertures are adjacent to the frontal keel but do not overlap the branch axis. Apertures are inclined laterally toward fenestrules.

The basal plate is about 0.03–0.05 mm thick, with a few low, broad ridges on the reverse side. Lamellar skeleton is thickest on the reverse sides of branches but also has up to 0.05 mm thickness on lateral and frontal sides of zooecia. The superstructure is borne by large tabular spines that arise from the pronounced frontal keel. The spines are slightly offset laterally into two rows along each branch. A low ridge of lamellar skeleton develops over branch centers on the outer surface of the superstructure.

DISTINGUISHING FEATURES—For comparison with other species of *Hemitrypa* from the Koněprusy Limestone, see Tables 3 and 5. *Hemitrypa bohemica* is unique among Lower and Middle Devonian species of the genus in the spacing of its branches and dissepiments, size of zooecial apertures, and perhaps in the presence of triserial portions of branches.

Discussion—NM L18472, originally figured in Počta (1894) as plate 15, figures 17–19, is here selected as lectotype.

Measurements—See Table 3.

Type Material—Lectotype, NM L18472; paralectotypes, NM L18473; NM L21307–L21310; additional registered material, NM L18474; NM L18520; NM L18552; NM L18554; NM L21442.

Localities—Koněprusy; Kaplička.

Hemitrypa linotheras McKinney & Kříž, sp. nov. Figures 39C, 41.

Hemitrypa Bohemica (pars) Barrande in Počta, 1894, Syst. Sil. VIII, pl. 15, figs. 8–11 (not figs. 12–19).

Diagnosis—Sinuous branches about 0.24 mm wide, spaced about 0.51 mm apart, connected by dissepiments or locally by anastomosis at 0.72 mm intervals; zooecial chambers short, curved tubes compressed against proximal neighbors, with distal tubes about 0.13 mm wide opening on frontal side and very regularly spaced about 0.25 mm center to center.

Description—Zoaria are conical, initially widening at an angle of about 30° to 60°. Colonies with high angle of spread near the base have paraboloid profiles, becoming irregularly cylindrical about 1 cm above the base. Maximum observed height of zoaria is 22 mm, and maximum width is 19 mm. The superstructure is on the outside of each cone, with interior surfaces of cones being the reverse sides of branches.

Branches are sinuous, in most places joined by dissepiments of varying length, but locally anastomosed. Spacing of dissepiments and points of anastomosis is about one and one-half times that of branches. Branches occasionally terminate where a cone diminishes in diameter distally.

Autozooecia alternate in position along branches. The axial wall is zigzag with crescentic segments. Zooecial chambers are short, curved tubes, with proximal portions conforming to the shape of next-proximal zooids and a large opening on the distal end of the frontal side. Chamber length in deep tangential sections is one and one-half to two times chamber width. Chamber sections are distally rounded, but sides against proximal and proximal-lateral neighbors are concave. At dissepiments or points of anastomosis, chambers are irregular in shape and size, varying up to almost twice normal area in deep sections and tending toward circular or laterally extended shapes. Distal tubes are short and have relatively large diameters, being the upturned ends of the entire zooecia rather than constricted portions. Apertures are on the frontal surface of the branches, immediately adjacent to the frontal keel and slightly overlapping the branch axis. Higher distal-axial edges give the apertures an oblique proximal and fenestrule-directed orientation.

The basal plate is about 0.02 mm thick with few or no ridges on the reverse side. Lamellar skeleton is relatively thin, only about 0.05 mm thick on reverse sides of the specimens studied. Lamellar skeleton on reverse sides of branches may form an acute keel down the center of each branch. The frontal keel gives rise to tabular spines that are elongate longitudinally in shallow tangential sections. The superstructure tends to have low ridges extending along the outer surface, each centered over a branch.

Distinguishing Features—For comparison with other species of *Hemitrypa* from the Koněprusy Limestone, see Tables 3 and 5. Beyond the Prague Basin, *H. linotheras* resembles *H. megafenestrula* Yang, 1956 (pp. 783, 784, pl. 9, fig. 2a,b), from the Middle Devonian of Kirin Province, China, and *H. cornea* Nekhoroshev, 1948 (pp. 95, 96, pl. 26, fig. 4a–c, pl. 27, figs. 1–4, pl. 29, figs. 1, 2), from the Lower Middle Devonian of the Altai, in branch and dissepiment spacing; but it differs from both in zooecial chamber shape and lack of thickened, laterally fused dissepiments on the reverse side of zoaria, and from *H. cornea* in zooecial spacing. *Hemitrypa linotheras* is unique in its combination of branch and dissepiment spacing, branch sinuosity, zooecial aperture size, zooecial chamber shape, and zooecial spacing.

Etymology—From Greek *linotheras,* net-user.

Measurements—See Table 3.

Type Material—Holotype, NM L18561; paratypes, NM L18560; NM L18575; NM L18588; NM L18589; FMNH PE39318–PE39320.

Locality—Koněprusy.

Reteporina d'Orbigny, 1849

Type Species—*Retepora prisca* Goldfuss, 1826.

Diagnosis—Zoaria simple or complexly fan-shaped; sinuous branches bearing two rows of zooecia joined by anastomosis; low but distinct keel lacking spines or nodes present on frontal surface; zooecia side-by-side or offset, axial wall straight; lateral sides of zooecia straight between

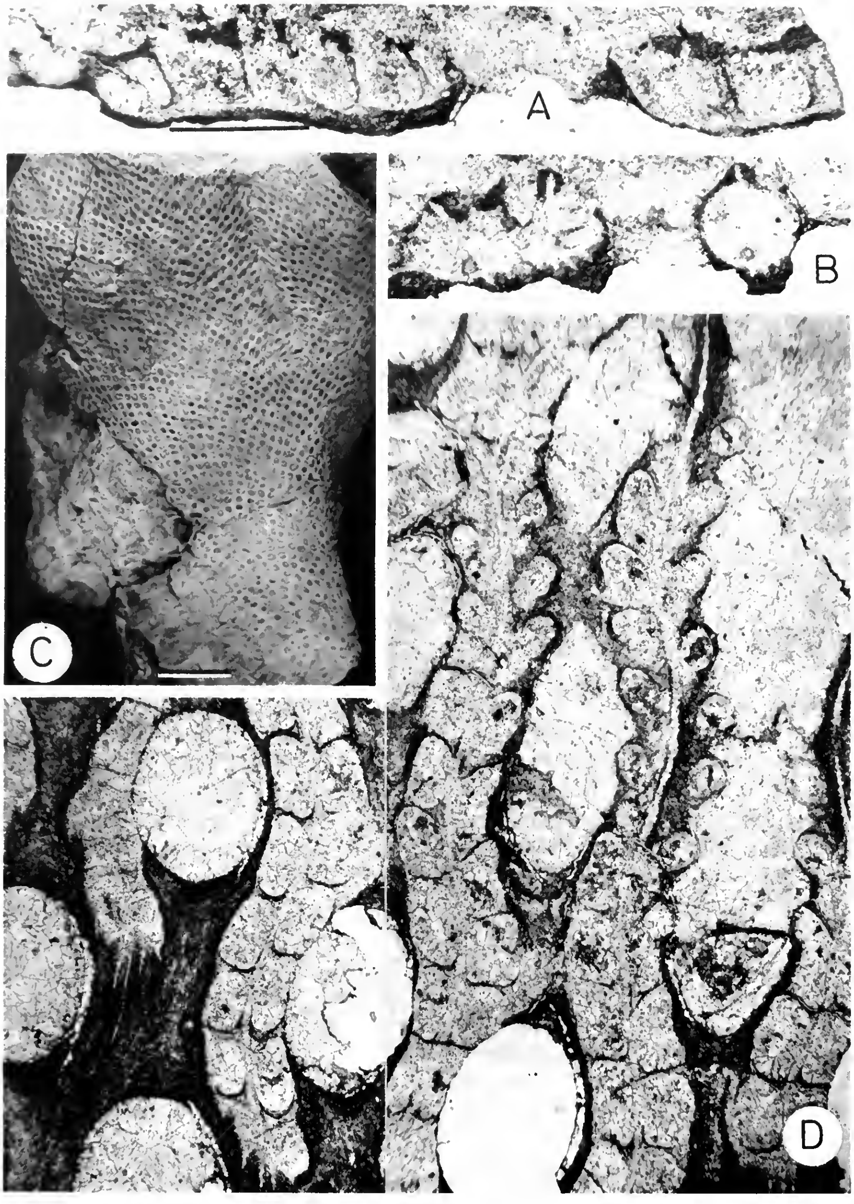

FIG. 42. *Reteporina petala* (Počta). **A,** longitudinal section intersecting sinuous branches at right and left; lectotype, NM L15511, Koněprusy. **B,** transverse section through three branches, two of which have impinged at a point of anastomosis; lectotype, NM L15511. **C,** exterior of portion of large, complexly folded, fan-shaped zoarium; paralectotype, NM L15510, Koněprusy. **D,** composite photograph of tangential section through keel and distal tubes (top right) to skeleton on reverse side of basal plate (bottom left); lectotype, NM L15511. Scale bar in A = 0.5 mm and in C = 10 mm. B and D are at same scale as A.

points of anastomosis, grading to laterally inflated where branches join; zooecial chambers elongate between anastomoses, but may be equidimensional at branch junctions; hemisepta absent or weakly developed; distal tube typically short or moderately long; basal plate flat to gently curved transversely, with prominent ridges on reverse side; irregularly distributed cyclozooecia may be present on reverse sides of branches; superstructure absent.

TABLE 6. Measurements of species of *Reteporina, Polyporella,* and *Polypora* (see page 7 for definitions of abbreviations).

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
Reteporina petala **(Počta)**					
BRSM	10	67	0.590–1.080	0.791	0.059
BRW	11	69	0.270–0.440	0.371	0.027
CW	5	50	0.115–0.209	0.145	0.020
DS	3	30	0.744–1.302	1.111	0.103
DTS	9	80	0.220–0.300	0.252	0.011
DTW	9	67	0.089–0.150	0.114	0.008
Reteporina transiens **(Počta)**					
BRSM	26	228	0.736–1.558	1.034	0.204
BRW	25	198	0.336–0.572	0.440	0.039
CW	5	50	0.119–0.189	0.152	0.014
DS	26	213	1.218–2.334	1.655	0.188
DTS	25	248	0.195–0.370	0.287	0.020
DTW	25	217	0.100–0.159	0.125	0.008
Polyporella incerta **(Prantl)**					
BRS	1	2	0.887–0.933	0.910	–
BRW	1	2	0.367–0.379	0.373	–
CW	1	10	0.115–0.145	0.127	0.011
DS	1	2	1.453–1.670	1.561	–
DTS	1	10	0.237–0.351	0.278	0.029
DTW	1	4	0.074–0.108	0.094	0.008
Polypora hanusi **Prantl**					
BRS	4	16	0.609–1.205	0.897	0.182
BRW	4	19	0.295–0.542	0.402	0.068
CW	6	53	0.083–0.174	0.127	0.017
DS	4	14	0.814–2.437	1.570	0.609
DTS	4	30	0.204–0.405	0.295	0.035
DTW	4	28	0.081–0.111	0.098	0.006
Polypora inusitata **McKinney & Kříž**					
BRS	4	21	0.544–1.402	1.058	0.196
BRW	4	23	0.442–0.859	0.628	0.108
CW	5	50	0.092–0.182	0.135	0.024
DS	4	22	0.854–2.670	1.741	0.576
DTS	4	38	0.228–0.431	0.307	0.043
DTW	4	36	0.078–0.132	0.105	0.013
NN	3	26	0.171–0.264	0.210	0.035

Reteporina petala (Počta). Figure 42.

Seriopora petala (pars) Počta, 1894, Syst. Sil. VIII, p. 79, pl. 13, figs. 8–10 (not figs. 11, 12).
Reteporina petala (Počta). Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 14, 15, pl. 4, fig. 1.

DIAGNOSIS—Branches about 0.37 mm wide, spaced at maximum about 0.79 mm center to center, connected by anastomosis at about 1.11 mm intervals; zooecial chambers high, loaf-shaped, with distal tubes variably inclined both laterally and distally, about 0.11 mm in diameter, and spaced about 0.25 mm center to center.

DESCRIPTION—Zoaria are broadly curved sheets that are variously warped or are gently to deeply pleated longitudinally. Many curve transversely through at least a 90° arc, but there is no evidence that any were complete cones. Zooecial apertures are located on the concave face. The largest specimen is 74 mm high and 60 mm wide.

The branches are sinuous and anastomosed. Most typically the regions of anastomosis retain the four rows of zooecia from the fused biserial branches, but locally some anastomosis points retain only three rows; one branch rarely terminates against the other. Spacing of midpoints of anastomosis is about twice the average spacing of branches. A low, distinct keel extends down the middle of the frontal surface of each branch.

Autozooecia within a branch vary from side-by-side to alternating positions. The axial wall is straight. Zooecial chambers are loaf-shaped and higher than broad, with a moderately long distal tube arising from the frontal side at the distal end. Zooecial length is about one and two-thirds the width. In tangential sections, zooecial chambers appear as parallelograms from the base up to the level where only the distal tube is cut, although the transverse walls become convex distally near the frontal surface. Transverse walls are at a 60° to 90° angle to the axial wall and at about a 75° angle to the basal wall. Distal tubes either continue at about a 75° angle to the frontal surface or become more highly inclined distally. They vary from parallel to the axial wall to inclined laterally up to a 45° angle toward the adjacent fenestrule.

The basal plate is about 0.03 mm thick and gently curved transversely; it has a few large longitudinal ridges on the reverse. Lamellar skeleton is up to at least 0.10 mm thick on reverse sides of branches and may be almost as thick on frontal and lateral sides. The distal tubes project above the lateral margins of frontal sides of branches, so that branches are serrated in shallowest tangential sections.

DISCUSSION—Prantl (1932, pp. 13, 14) reassigned *Seriopora petala* to *Reteporina,* a reassignment with which we agree. *Seriopora* Počta, 1894, is therefore a junior objective synonym of *Reteporina* d'Orbigny, 1849. The only conspicuous structural differences between *S. petala* and *Retepora prisca* Goldfuss, 1826, are the apparent absence of cyclozooecia in the former and their presence in the latter.

The specimen illustrated by Počta (1894) as plate

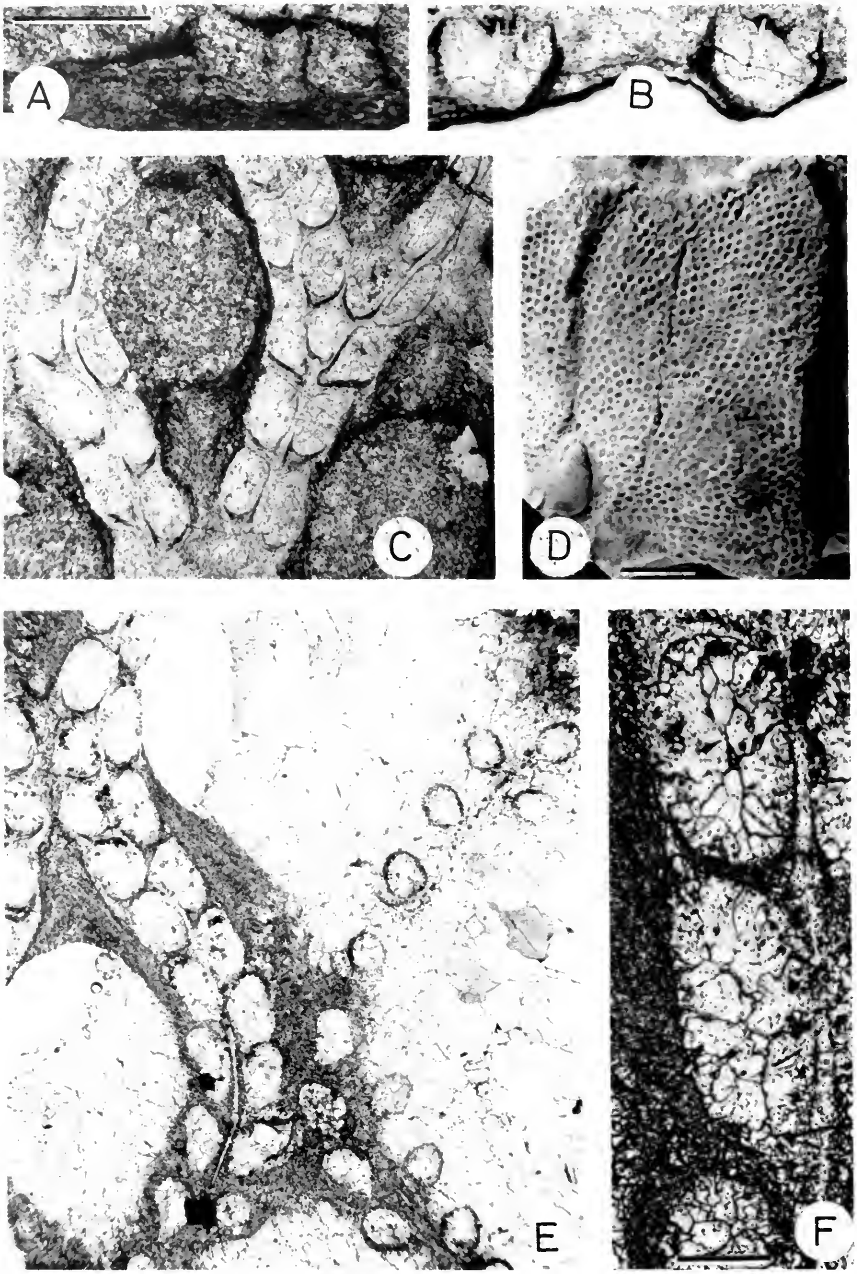

FIG. 43. *Reteporina transiens* (Počta). **A,** longitudinal section through sinuous branch; NM L24667, Koněprusy. **B,** transverse section through two branches; lectotype, NM L18571, Koněprusy. **C,** deep tangential section cutting near zooecial bases; note branch bifurcation on right; lectotype, NM L18571. **D,** reverse side of zoarial fragment; lectotype, NM L18571. **E,** shallow tangential section that grazes aperture level in right branch and passes through zooecial chambers in left branch; NM L24668, Koněprusy. **F,** tangential section through axial wall (right) and two chambers, cutting deeper into chambers (through granular skeleton of transverse wall) at top and passing through a distal tube at bottom margin; NM L24668. Bar scale in A = 0.5 mm; in D = 10 mm; and in G = 0.1 mm. B–C and E are at same scale as A.

13, figure 10 (NM L15511), is here designated lectotype.

MEASUREMENTS—See Table 6.

TYPE MATERIAL—Lectotype, NM L15511; paralectotypes, NM L15509; NM L15510; NM L18523.

LOCALITY—Koněprusy.

Reteporina transiens (Počta). Figure 43.

Seriopora transiens Počta, 1894, Syst. Sil. VIII, pp. 79, 80, pl. 11, figs. 21–28.
Reteporina transiens (Počta). Prantl, 1932, Palaeontogr. Bohemiae XV, p. 15, pl. 4, figs. 4, 5.
Reteporina formosa Prantl, 1932, Palaeontogr. Bohemiae XV, p. 15, pl. 4, figs. 4, 5.

DIAGNOSIS—Branches about 0.44 mm wide, spaced at maximum about 1.00 mm center to center, connected at about 1.66 mm intervals by anastomosis; zooecial chambers side-by-side, loaf-shaped with longest diameter perpendicular to the basal plate, and frontally-directed; distal tubes about 0.12 mm in diameter and spaced about 0.29 mm center to center.

DESCRIPTION—Zoaria are most commonly broad sheets, varying from almost flat to irregularly undulating. Less commonly small zoaria are strongly curved into a basket shape. The largest specimen is 65 mm wide by 60 mm high.

The branches are sinuous and anastomosed. Regions of anastomosis are various, retaining the four rows of zooecia from the fused biserial branches, reducing symmetrically to three or two rows, or, less commonly, having one branch terminating against the other. Spacing of midpoints of anastomosis is about three times average spacing of branches. Where present, the keel down the middle of the frontal surface of branches is so low that zooecial apertures may be higher.

Autozooecia are most commonly side-by-side within branches. The axial wall is straight. Zooecial chambers are loaf-shaped, about twice as high and one and one-half times as long as they are broad. A moderately long distal tube arises from the frontal side at the distal end. In tangential sections, zooecial chambers appear as parallelograms from the base up to the level where only the distal tube is cut, although the transverse walls become distally convex near the frontal surface. Transverse walls are at a 60° or, more commonly, up to a 90° angle to the axial wall and are essentially perpendicular to the basal plate. Distal tubes may be inclined slightly toward adjacent fenestrules, but are almost perpendicular to the frontal plane.

The basal plate is up to 0.04 mm thick, flat to curved, and apparently lacking longitudinal ridges on the reverse side. Lamellar skeleton is up to at least 0.15 mm thick on reverse sides of branches but thins on lateral sides to less than 0.02 mm thick. Lamellar skeleton is, on the average, only slightly thicker than 0.02 mm on frontal sides.

Distal tubes project above the general level of skeleton on the frontal surface. In shallow tangential sections they give branches a serrated margin, and in shallowest sections branches are marked by only two rows of thin-walled distal tubes in cross section.

DISCUSSION—The specimen originally illustrated by Počta (1894) in plate 11, figure 23 (NM L18571), is here designated lectotype.

Reteporina transiens differs from *R. petala* in its much larger skeletal measures (Table 6) and in its apertures, being typically above rather than below keel crests.

MEASUREMENTS—See Table 6.

TYPE MATERIAL—Lectotype, NM L18571; paralectotypes, NM L21341–L21344; additional registered material, NM L21345; NM L21346; NM L21444–L21446; NM L24667; NM L24668.

LOCALITIES—Koněprusy; Kaplička.

Polyporella Simpson, 1895

TYPE SPECIES—*Fenestella fistulata* Hall, 1884.

DIAGNOSIS—Zoaria fan-shaped; branches connected by regularly spaced dissepiments with diameters slightly less than those of branches; branches bear two rows of zooecia distal to bifurcations and three rows preceding bifurcations; zooecial chambers elongate, quadrangular to hexagonal, box-shaped, with typically short distal tube; hemisepta absent or weakly developed on proximal wall; keel present in branch segments with two rows of zooecia; superstructure absent.

Polyporella incerta (Prantl). Figure 44.

Polypora incerta Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 18, 51, 52, pl. 2, fig. 16.

DIAGNOSIS—Straight branches about 0.37 mm wide, spaced about 0.91 mm center to center, con-

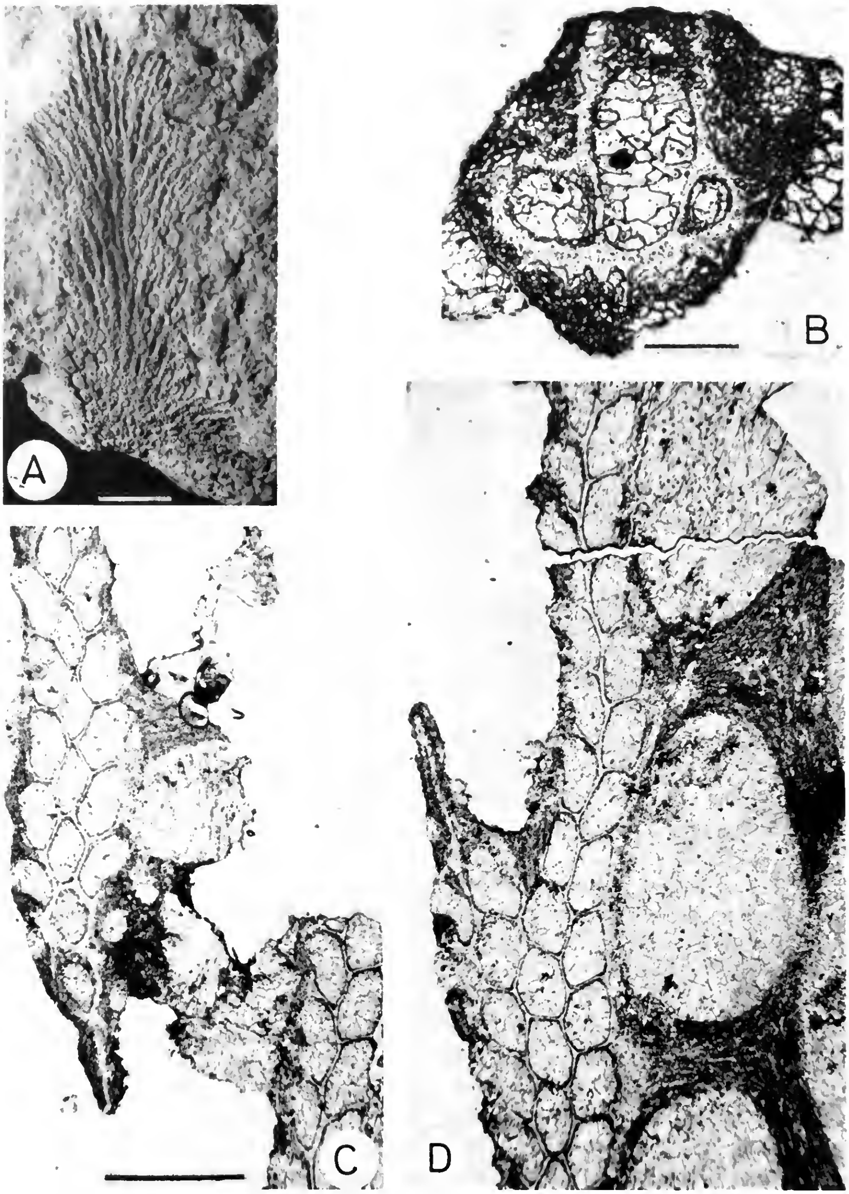

FIG. 44. *Polyporella incerta* (Prantl). Holotype, NM L18514, Koněprusy. **A,** frontal view of fan-shaped colony. **B,** transverse section of a single branch. **C,** shallow transverse section; note keel at lower left. **D,** tangential section, continued from bottom of C, cutting below basal plate on right up to level of keel on far left. Scale bar in A = 5 mm; B = 0.1 mm; and in C = 0.5 mm. D is at same scale as C.

nected by dissepiments spaced about 1.56 mm center to center; zooecial chambers appear four- to six-sided in tangential sections, with distal tubes of lateral zooecia strongly inclined laterally, about 0.09 mm in diameter and spaced about 0.28 mm center to center.

DESCRIPTION—The incomplete zoarium is an erect, recurved narrow fan, 40 mm high and 12 mm wide. Bifurcations are frequent in the region of the colony axis, so that branches curve out toward the lateral colony margins.

Branch segments are straight between bifurcations, connected by dissepiments of about the same width. Branches are triserial for several zooecial

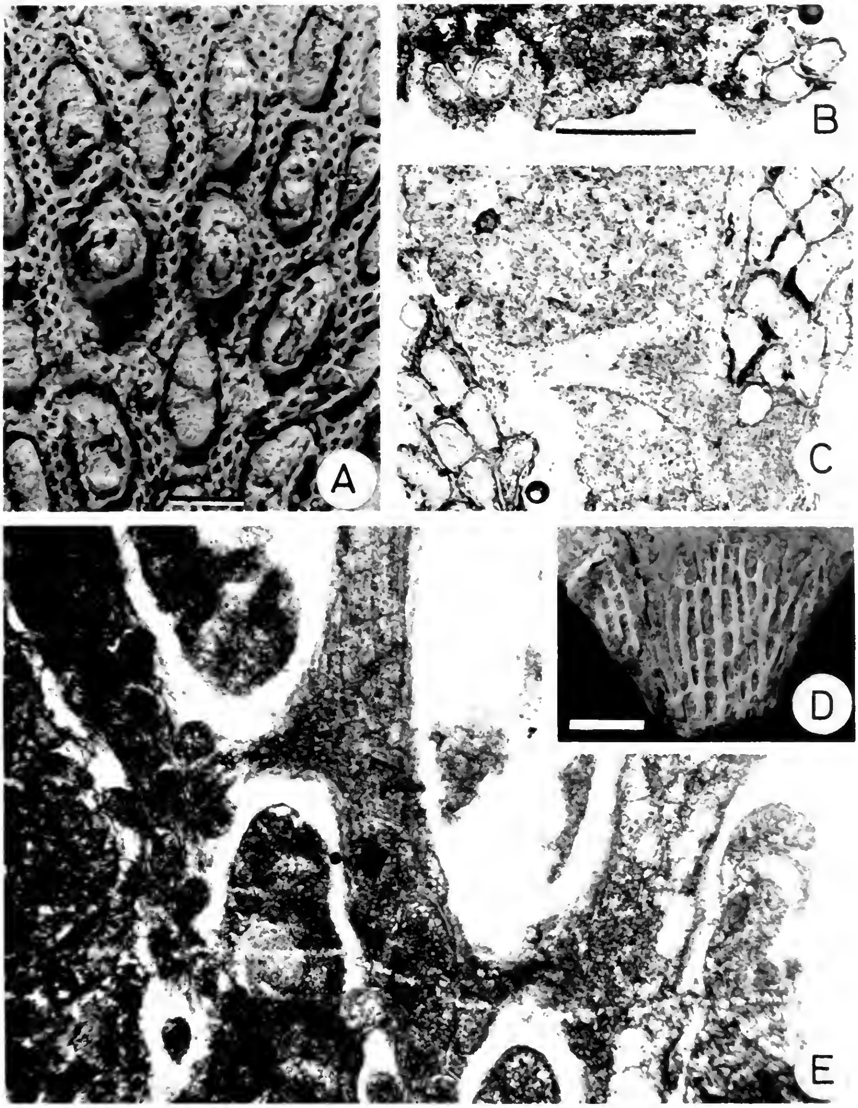

FIG. 45. *Polypora hanusi* Prantl. **A,** frontal view of fan-shaped zoarium from which most lamellar skeleton has weathered away; paralectotype, NM L18501, Kaplička. **B,** transverse section through two eroded and partially silicified branches; lectotype, NM L18500, Kaplička. **C,** deep tangential section through two branches and a dissepiment; lectotype, NM L18500. **D,** exterior of apparently conical zoarium; lectotype, NM L18500. **E,** tangential section through three weathered branches, cutting through and below basal plate at top center and grazing frontal surface at bottom of left branch; NM L24669, Kaplička. Scale bar in A = 1 mm; in B = 0.5 mm; and in D = 5 mm. C and E are at same scale as B.

lengths proximal to bifurcations and are biserial distal to bifurcations, until the change back to triserial that presages another bifurcation.

Autozooecia alternate in position along branches in both biserial and triserial portions. The axial wall is straight to zigzag where branches are biserial, and lateral zooecial boundaries are zigzag where branches are triserial. Zooecia are four-, five-, or six-sided and box-shaped, with a wide, short cylinder extending at right angles from the distal end. Where branches are biserial, and in lateral zooecia where branches are triserial, zooecial chambers appear in tangential sections as parallelograms or pentagons, with transverse walls oriented at about a 55° to 60° angle to the branch axial plane. Their distal tubes tilt strongly toward the adjacent fenestrules and open at the junction of the sides and frontal surfaces of the branches.

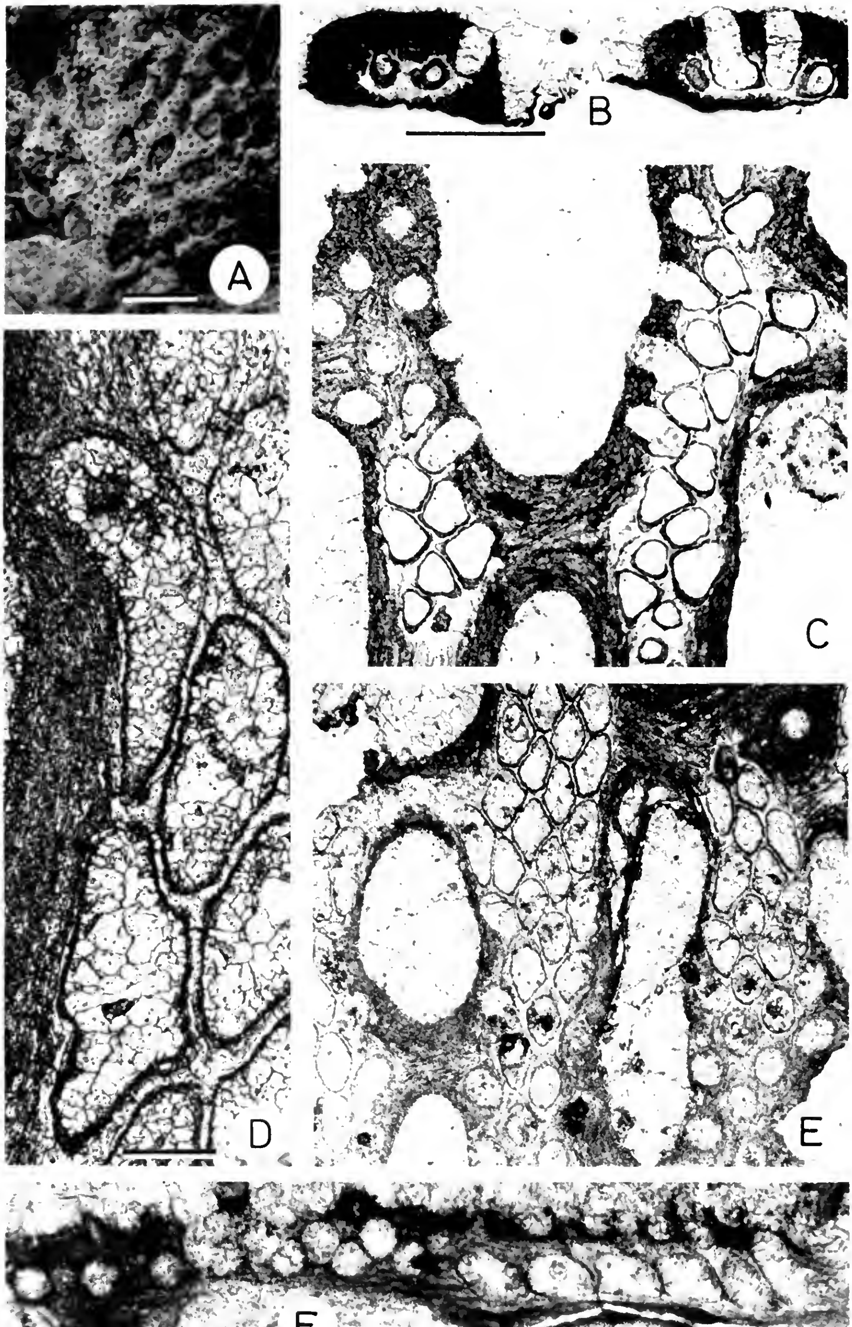

FIG. 46. *Polypora inusitata* McKinney & Kříž. **A,** frontal exterior of fan-shaped zoarial fragment; holotype, NM L24670, Koněprusy. **B,** transverse section through two branches; paratype, NM L24671, Koněprusy. **C,** tangential section through branches with few rows of zooecia, deepest at bottom of figure; paratype, NM L24671. **D,** deep tangential section through endozonal parts of several zooecia; holotype, NM L24670. **E,** tangential section through two branches, and part of a third, deepest at top left; holotype, NM L24670. **F,** longitudinal section, cutting deeper on right and grazing branch on left; paratype, NM L24671. Scale bar in A = 2 mm; in B = 0.5 mm; and in D = 0.1 mm. C, E–F are at same scale as B.

Where branches are triserial, the median zooecia are hexagonal in tangential sections and their distal tubes are perpendicular to the frontal plane. Apertures are slightly elevated above branch surfaces on peristomes.

The basal plate is about 0.02–0.03 mm thick, strongly curved transversely, and corrugated on the reverse into several large longitudinal ridges. Lamellar skeleton is about 0.10 mm thick on reverse and frontal sides of branches but is less than half that thick on lateral sides of zooecia. Where branches are biserial, there is a prominent frontal keel with a thin axis of granular skeleton that is not produced into spines.

MEASUREMENTS—See Table 6.

TYPE MATERIAL—Holotype, NM L18514.

LOCALITY—Koněprusy.

Polypora M'Coy, 1844

TYPE SPECIES—*Polypora dendroides* M'Coy, 1844.

DIAGNOSIS—Zoaria conical or fan-shaped; branches, connected by regularly to irregularly spaced dissepiments, bearing three or more rows of zooecia; zooecia rhomboidal, hexagonal, or irregularly polygonal in deep tangential section, recumbent on budding plate, or with long axis inclined distally and frontally; length of distal tube typically moderate to long; hemiseptum may be present on proximal wall; keel and superstructure absent.

Polypora hanusi Prantl. Figure 45.

Polypora hanuši Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 17, 18, pl. 2, figs. 14, 15.

DIAGNOSIS—Slightly sinuous branches about 0.40 mm wide, spaced 0.90 mm center to center on the average, connected by variably spaced dissepiments averaging 1.57 mm center to center; zooecia are distally inclined, erect tubes, triangular or rhombic below hemiseptum; rounded distal tube above hemiseptum, about 0.10 mm in diameter and spaced about 0.30 mm center to center.

DESCRIPTION—Zoarial fragments are warped and fan-shaped; they may be up to at least 15 mm high and 20 mm wide. Branch segments are slightly sinuous and connected by distinctly narrower dissepiments whose spacing is almost twice that of branches. Branches bear from four to at least six rows of zooecia.

Autozooecia alternate in adjacent rows. They are distally inclined, erect tubes that are elongate and rhombic to triangular in section near their bases. Near their distal end, at the base of the exozone, they are constricted by a well-developed hemiseptum on the proximal wall, beyond which they continue as a rounded distal tube more nearly perpendicular to the branch surface. In deep tangential section, zooecial chambers are rhombic in the middle rows and triangular in the lateral rows on each side. In shallower tangential sections, zooecial chambers often appear vase- or apostrophe-shaped where the level of the hemiseptum is cut.

The basal plate is transversely curved and less than 0.02 mm thick; it has several small ridges on the reverse side. Lamellar skeleton is up to at least 0.10 mm thick on reverse sides but less than half that thick on lateral and frontal sides. Low pustulose ridges of lamellar skeleton separate zooecial apertures, but keels with cores of granular skeleton are absent.

DISCUSSION—The specimen illustrated in Prantl (1932) as plate 2, figure 14 (NM L18500), is here designated lectotype.

MEASUREMENTS—See Table 6.

TYPE MATERIAL—Lectotype, NM L18500; paralectotype, NM L18501; additional registered material, NM L24669.

LOCALITIES—Kaplička; Solopysky.

Polypora inusitata McKinney & Kříž, sp. nov. Figure 46.

DIAGNOSIS—Straight to slightly sinuous branches about 0.63 mm wide, spaced 1.06 mm apart on the average, connected by variably spaced dissepiments 1.74 mm apart on the average; autozooecia recumbent on basal plate for short distance, then turned perpendicular to branch surface, irregularly polygonal to rhombic or hexagonal in endozone; cylindrical distal tube in exozone about 0.10 mm wide, spaced about 0.31 mm center to center in longitudinal rows and about 0.21 mm from nearest neighbors.

DESCRIPTION—Zoaria are small, erect fans, the largest fragment being 11 mm high by 11 mm wide. Linear to slightly sinuous branches are connected at variable intervals by dissepiments whose diameters are somewhat smaller than those of

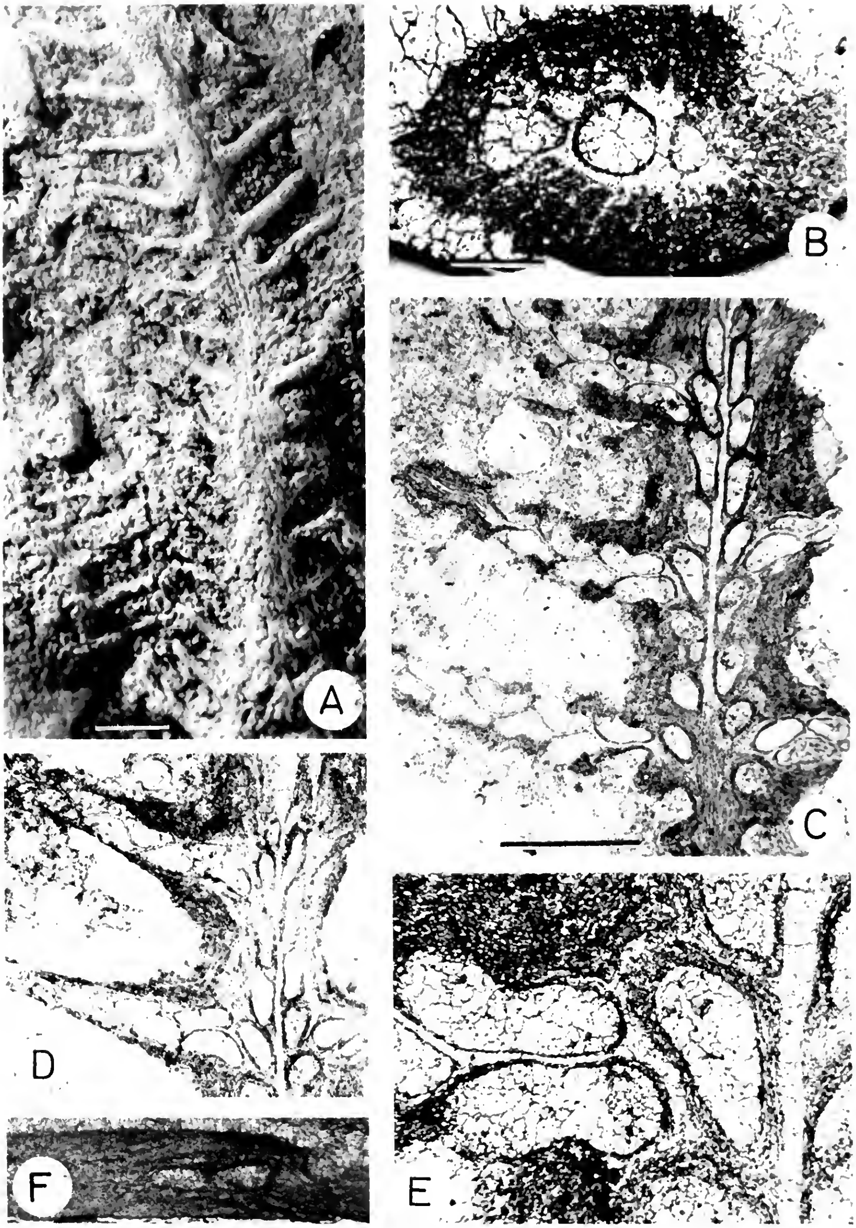

FIG. 47. *Penniretepora spinosa* (Počta). **A,** reverse side of zoarium; holotype, NM L18597, Koněprusy. **B,** transverse section through single branch; NM L24672, Koněprusy. **C,** tangential section through main branch and pinnae, shallowest in main branch at bottom and deepest at top, cutting shallowly through all three pinnae on left; holotype, NM L18597. **D,** tangential section covering same area as top half of C, but cut at deeper plane; holotype, NM L18597. **E,** tangential section through axial wall (right) of main branch and base of a pinna that originates lateral to zooecia of main branch; holotype, NM L18597. **F,** slightly oblique longitudinal section cutting axial plane of main branch on left and outer edge of distal tube on right; NM L24672. Scale bar in A = 1 mm; in B = 0.1 mm; and in C = 0.5 mm. D and F are at same scale as C; E is at same scale as B.

branches. Branches carry from four to at least six rows of zooecia.

Autozooecia are in alternating rows along branches. They are recumbent along the basal plate for only a short distance, with their distal end turned up to extend perpendicularly to the branch surface through the thick lamellar skeleton of the exozone. In deep tangential sections, zooecial chambers are irregularly polygonal to rhombic or hexagonal in the thin-walled endozone. The diameter is reduced and zooecial chambers are round where shallower sections cut the zooecia as distal tubes in the exozone. Distal tubes are longer than the thin-walled endozonal portions of zooecia. Hemisepta are absent or are weakly developed. Apertures are level with the branch surface or are slightly elevated.

The basal plate is flat to gently curved transversely for most of its width, but turns up to wrap around a large part of the lateral zooecia. It varies in thickness from 0.01 to 0.04 mm and has numerous small ridges on the reverse side. Lamellar skeleton is thickly developed on all surfaces of the branches, up to at least 0.20 mm thick. No keels or superstructure are present.

DISTINGUISHING FEATURES—*Polypora inusitata* differs from *P. hanusi* in its greater branch width and spacing and in the shape of its zooecia. It differs from *P. gracilis* Nekhoroshev, 1977 (pp. 119–120, pl. 25, fig. 1; not Prout, 1860, p. 580), from the upper Lower Devonian of Kazakhstan, because of more closely spaced branches, dissepiments, and zooecia within rows, and the shape of its zooecia. *Polypora inusitata* most closely resembles *P. una* Morozova, 1960 (p. 136, pl. 33, fig. 3), from Givetian deposits of the Kuznets Basin, but differs in having wider spacing of branches, closer spacing of dissepiments, and a greater distance between distal tubes within a row. The several species of *Polypora* from the Middle Devonian of the North American midcontinent that were characterized by Stratton and Horowitz (1977) all have more closely spaced branches and dissepiments than *P. inusitata*—among other differences.

ETYMOLOGY—From Latin *inusitatus*, rare or unusual.

MEASUREMENTS—See Table 6.

TYPE MATERIAL—Holotype, NM L24670; paratypes, NM L24690; NM L24671; UUG 990.

LOCALITIES—Koněprusy; Srbsko.

Penniretepora d'Orbigny, 1849

TYPE SPECIES—*Retepora pluma* Phillips, 1836.

DIAGNOSIS—Zoaria fan-shaped, consisting of one or more main branches from which short branches (pinnae) arise laterally at an oblique angle; main branches and pinnae bearing two rows of zooecia; zooecia not strongly inflated laterally, alternating in position along branches, proximal portion recumbent on budding plate, distal end turned abruptly toward frontal; prominent hemiseptum on proximal wall at base of distal tube; axial wall zigzag along center of branch or extended alternately from side to side of basal plate; zooecia at base of pinnae abut those of main branch without influencing chamber shape of zooecia in main branch; apertures flush with or elevated slightly above branch surface; low keel bearing nodes or spines frequently present.

Penniretepora spinosa (Počta). Figure 47.

Filites spinosus Počta, 1894, Syst. Sil. VIII, p. 112, pl. 10, figs. 30, 31.

DIAGNOSIS—Main branches about 0.58 mm wide; lateral branches about 0.29 mm wide, spaced about 0.75 mm center to center, at about a 60° angle with main branch; zooecia in main branch are distally widening tubes with cylindrical, erect distal ends, and in lateral branches are appressed and triangular basally and extend diagonally with frontally directed aperture at distal end; distal tubes about 0.10 mm in diameter and spaced about 0.23 mm center to center.

DESCRIPTION—Zoaria are delicate, pinnate fans consisting of up to several diverging main branches. The largest zoarium is about 35 mm high and 25 mm wide. Main branches divide at irregular lengths and pinnae are only about 1 mm long, so the zoarium does not fill all the space encompassed by the branches. Pinnae are side-by-side rather than alternating, and diverge from the main branch at about a 60° angle. The pinnae are slightly tilted in their distal directions toward the frontal side of the zoarium.

Autozooecia in main branches are distally widening tubes, with a linear, recumbent proximal portion and an erect distal portion (the distal tube). In deep tangential sections, zooecial chambers are narrow, straight-sided parallelograms with transverse walls intersecting the axial wall at about a 45° angle. In shallower sections, zooecial chambers are kidney-shaped, with the distal portion larger than the proximal; in still shallower sections, only the distal tubes are cut as ovals or circles. Hemisepta are weakly developed on proximal walls.

Autozooecia in lateral branches appear as overlapped, elongate triangles in sections that cut near the budding plate. In shallower sections they are curved, with their proximal tip near the branch axial plane and the distal end opening at an aperture laterally placed in the branch near the frontal edge. Distal tubes are shorter in zooecia of lateral branches than in those of main branches. Hemisepta are weakly developed on proximal walls. The axial walls of main branches are planar and thick, while those of pinnae are zigzag and thin.

The basal plate is continuous, about 0.01–0.03 mm thick in main branches; several narrow but high longitudinal ridges occur on the reverse side. Basal plates of pinnae are generally thinner. Lamellar skeleton is up to at least 0.10 mm thick on all surfaces of the main branch, but is much thinner—only up to about 0.03 mm thick—on pinnae.

MEASUREMENTS—See Table 7.

TYPE MATERIAL—Holotype, NM L18597; additional registered material, NM L24672.

LOCALITY—Koněprusy.

Penniretepora bohemica (Prantl). Figure 48.

Glauconome bohemica Prantl, 1932, Palaeontogr. Bohemiae XV, pp. 29, 30, pl. 3, figs. 15, 16.

DIAGNOSIS—Main branches about 0.47 mm wide; lateral branches about 0.27 mm wide, spaced about 0.92 mm center to center, at 60–90° angles to main branch; zooecia are pentagonal boxes, with inclined distal tubes about 0.10 mm wide and spaced about 0.28 mm center to center.

DESCRIPTION—Zoaria are relatively robust pinnate forms. Only broken fragments of single main branches and associated pinnae were found, the longest being 11 mm. Pinnae are up to 1 mm long; they are generally side-by-side but may be alternating, and diverge from the main branch at 60° to almost 90° angles. In many zoaria the pinnae are slightly tilted in their distal directions toward the reverse side of the zoarium.

Autozooecia in main branches and pinnae are pentagonal boxes from which an inclined tube arises distally. In deep tangential sections, zooecial chambers are slightly elongated triangles to pentagons arranged in two alternating rows, overlapped along the branch axis and with almost straight lateral sides. In shallower sections they are kidney-shaped, inflected by a well-developed hemiseptum on the proximal wall at the base of the distal tube. In still shallower sections the short, inclined distal tubes have oval outlines. The axial walls of main branches and of pinnae are strongly zigzag. Locally they cross from side to side of the basal plate.

TABLE 7. Measurements of species of *Penniretepora*, *Ptylopora*, and *Filites* (see page 7 for definitions of abbreviations).

Character measurements	No. of specimens measured	No. of measurements	Range (mm)	Mean (mm)	Standard deviation
***Penniretepora spinosa* (Počta)**					
BRS	5	39	0.549–0.995	0.748	0.048
BRW	5	5	0.425–0.805	0.582	0.143
CW	5	50	0.057–0.115	0.087	0.010
LBRW	5	37	0.189–0.424	0.291	0.052
DTS	4	37	0.195–0.295	0.230	0.011
DTW	4	34	0.077–0.124	0.096	0.005
***Penniretepora bohemica* (Prantl)**					
BRS	5	20	0.681–1.127	0.920	0.064
BRW	4	4	0.422–0.532	0.470	0.048
CW	3	30	0.112–0.162	0.136	0.011
LBRW	5	15	0.231–0.306	0.271	0.015
DTS	5	19	0.247–0.344	0.284	0.017
DTW	3	14	0.084–0.118	0.096	0.005
***Ptylopora bohemica* Prantl**					
BRS	1	10	0.674–1.082	0.912	0.135
BRW	1	1	1.041	1.041	—
CW	1	10	0.090–0.131	0.108	0.014
LBRW	1	10	0.292–0.515	0.389	0.072
DTS	1	10	0.221–0.258	0.237	0.011
DTW	1	10	0.098–0.121	0.110	0.006
***Filites bohemicus* Barrande**					
BRS	14	95	0.547–0.884	0.709	0.041
BRW	4	23	0.315–0.433	0.369	0.027
CWL	5	49	0.103–0.188	0.141	0.019
CWM	5	45	0.127–0.177	0.151	0.013
DTS	4	24	0.136–0.309	0.214	0.057
DTW	3	11	0.089–0.119	0.101	0.008

The basal plate in both main branches and pinnae is continuous and has several longitudinal ridges on the reverse side; thickness was not determined. Lamellar skeleton, which is thickly developed on main branches and less so on pinnae, is penetrated by numerous small styles.

DISCUSSION—The specimen illustrated in Prantl (1932) as plate 3, figure 15 (NM L18592), is here designated lectotype.

MEASUREMENTS—See Table 7.

TYPE MATERIAL—Lectotype, NM L18592; paralectotype, NM L18593; additional registered material, NM L24673–L24675.

LOCALITIES—Kaplička; Srbsko.

Ptylopora M'Coy, 1844

TYPE SPECIES—*Ptylopora pluma* M'Coy, 1844.

DIAGNOSIS—Zoaria fan-shaped, composed of

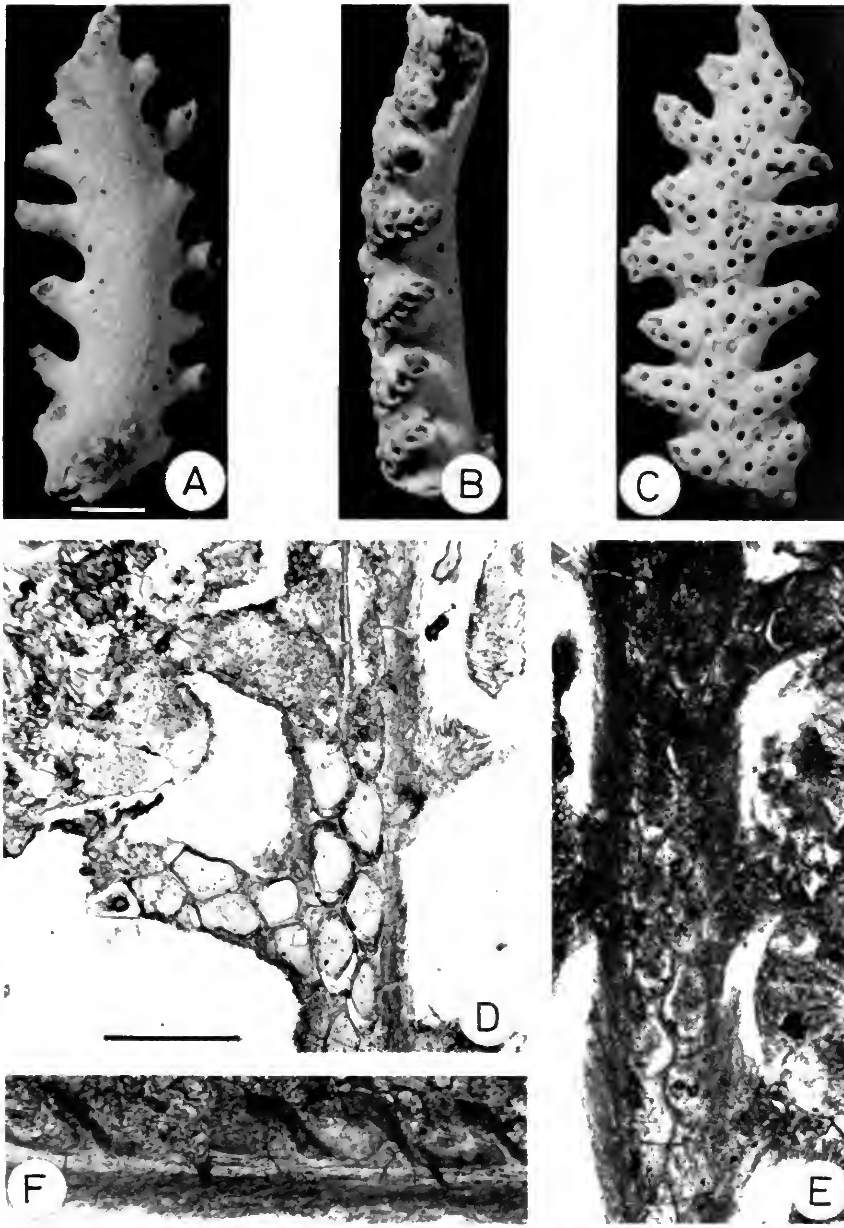

FIG. 48. *Penniretepora bohemica* (Prantl). **A-C,** reverse, lateral, and frontal views of zoarial fragment; lectotype, NM L18592, Kaplička. **D,** tangential section of weathered and partially silicified specimen, cutting basal plate of main branch at bottom and frontal keel of main branch at top; two pinnae cut on left side; NM L24673, Kaplička. **E,** tangential section through overlapped zooecial chambers in main branch; three pinnae cut on right side; NM L24674, Kaplička. **F,** longitudinal section through single row of zooecia in main branch; NM L24675, Kaplička. Scale bar in A = 1 mm and in D = 0.5 mm. B–C are at same scale as A; E–F are at same scale as D.

linear main branch(es) and linear to slightly sinuous pinnate lateral branches; main branch(es) typically thickened on reverse and widened by more lamellar skeleton than on lateral branches; lateral branches connected by narrow dissepiments; two rows of alternating zooecia on main and lateral branches; zooecial chambers elongate, pentagonal, box-shaped, continuing frontally as short, erect distal tube, lateral sides of chambers planar or only slightly inflated; axial wall strongly zigzag at budding plate, becoming straighter frontally into distinct keel that bears regularly spaced nodes; superstructure absent.

Ptylopora bohemica Prantl. Figure 49.

Ptilopora (sic) *bohemica* Prantl, 1928, Rozpravy II, Třídy České Akademie, Ročník 37 (10), pp. 2, 3, 1 pl.
Ptilopora (sic) *bohemica-bohemica* Prantl, 1932, Palaeontogr. Bohemiae XV, p. 30, pl. 5, fig. 15.
Ptilopora (sic) *bohemica minor* Prantl, 1932, Palaeontogr. Bohemiae XV, p. 30, pl. 5, fig. 16.

DIAGNOSIS—Main branch 1.04 mm wide; lateral branches 0.40 mm wide, spaced about 0.91 mm center to center; zooecia pentagonal, box-shaped, with disto-laterally directed distal tubes about 0.11 mm wide and spaced about 0.24 mm center to center.

DESCRIPTION—Zoaria are broad fans with one central main branch. The largest fragmentary zoarium is 35 mm high and 29 mm wide. Lateral branches are commonly bifurcated and, where crowded, occasionally terminated. The main branch is stoutly thickened by lamellar skeleton on the reverse side, and lateral branches are less so. Two rows of alternating zooecia occupy the main branch and lateral branches.

Autozooecia are pentagonal, box-shaped, about one and one-half times longer than broad, and very slightly inflated laterally, ending distally as a tube directed disto-laterally toward the frontal surface. In tangential sections zooecial chambers are pentagonal near the budding plate, elongate and oval in shallower sections, and short and obliquely oval where only the distal tube is cut near the frontal surface.

The axial wall is strongly zigzag in deep sections due to the overlap of alternating zooecia along the branch midplane, but is nearly straight along the frontal surface, where it forms a low, linear keel. Hemisepta are absent. Distal tubes are short; the aperture is parallel with the frontal plane and flush with the branch surface near the keel, but is elevated laterally above the rounded branch.

The basal plate apparently lacks longitudinal ridges on the reverse side. Lamellar skeleton is much thicker on the reverse than on lateral and frontal surfaces.

DISCUSSION—*Ptylopora bohemica* is one of the earliest known species of the genus. It differs from *P. pluma* M'Coy (1844), the type species, in spacing and width of branches, chamber size and diameter of distal tubes, lack of longitudinal ridges on the reverse of the budding plate, apparent absence of keel nodes, and more frequent bifurcation of lateral branches.

Specimens from the Lower Devonian of the Armoricain Massif referred to as *Ptilopora* aff. *bohemica* by Bigey (1972b) are similar to *P. bohemica*, but differ because of greater spacing between lateral branches, less calcification of main branches, and smaller zooecial apertures.

MEASUREMENTS—See Table 7.

TYPE MATERIAL—Holotype, NM L21335; paratypes, NM L18594; NM L21340.

LOCALITY—Koněprusy.

Filites Barrande, 1894

TYPE SPECIES—*Filites bohemicus* Barrande, 1894.

DIAGNOSIS—Zoaria loosely organized fans of dichotomous branches with proximally recurved, fused pinnae; two rows of alternating zooecia on branches and pinnae; zooecia roughly equidimensional, inflated, sack-shaped, with short distal tube of only slightly reduced diameter; zooecia in branches triangular to trapezoidal in deep tangential sections, those in pinnae less regular; axial wall strongly zigzag from base to crest, not projecting as frontal keel; superstructure absent.

Filites bohemicus Barrande. Figure 50.

Filites bohemicus Barrande in Počta, 1894, Syst. Sil. VIII, p. 110, pl. 10, figs. 26–29.
Filites cribrosus Počta, 1894, Syst. Sil. VIII, pp. 110, 111, pl. 10, figs. 19–25.

DIAGNOSIS—Branches about 0.40 mm wide, increasing toward colony bases; recumbent pinnae about 0.37 mm wide, spaced about 0.71 mm center to center; zooecia L-shaped, slightly inflated laterally in short, recumbent endozonal portion; distal tubes directed toward frontal surface, about 0.10 mm in diameter and spaced about 0.21 mm center to center.

DESCRIPTION—Zoaria are composed of pinnate branches that divide at irregular lengths, locally dividing at intervals less than 1 mm but in other places extending up to 30 mm without division.

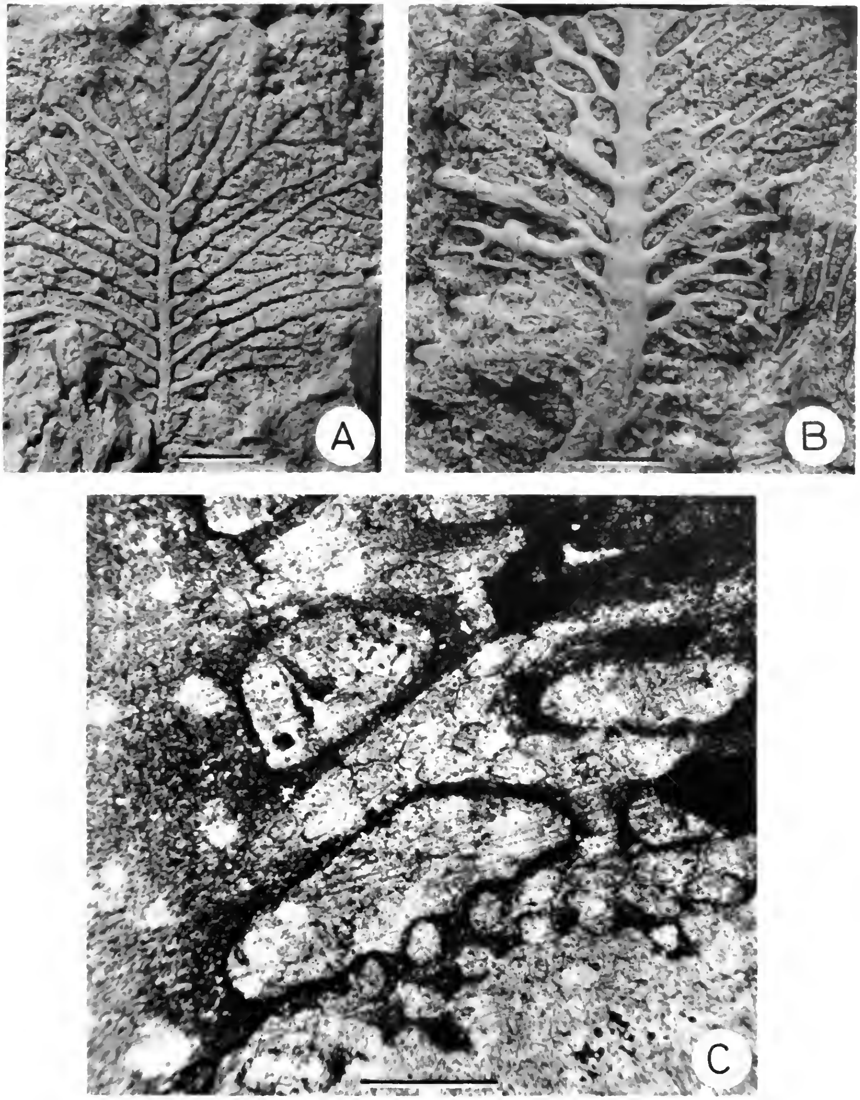

FIG. 49. *Ptylopora bohemica* Prantl. **A**, reverse surface and frontal mold of fan-shaped zoarium; paratype, NM L18594, Koněprusy. **B**, reverse surface of fan-shaped zoarium; holotype, NM L21335, Koněprusy. **C**, longitudinal section through lamellar skeleton on reverse side of main branch on the left and, on the right, various levels from deep (top) to shallow (bottom) of lateral branches; holotype, NM L21335. Scale bar in A = 5 mm; in B = 2 mm; and in C = 0.5 mm.

Width of branches is about 0.4 mm near growing tips, but up to at least 2 mm near bases of large colonies. Pinnae occur alternately on opposite sides of branches; they are short, recurved toward the reverse side, and fused with the main branches. Each pinna extends through an arc of about 90°.

Autozooecia are short and slightly inflated. Zooecial chambers are triangular or trapezoidal in deep tangential section at and near the basal plate, but become restricted as distal tubes where they approach the frontal surface. Distal tubes arise at a high angle, about 80°, to the frontal surface, and they constitute up to half the length of the L-shaped zooecia. Zooecia are inclined laterally to a small degree so that apertures are aligned alternately in two closely spaced rows, although the triangular-trapezoidal bases of zooecia are imbricated in a single line. Lateral sides of zooecia are linear in

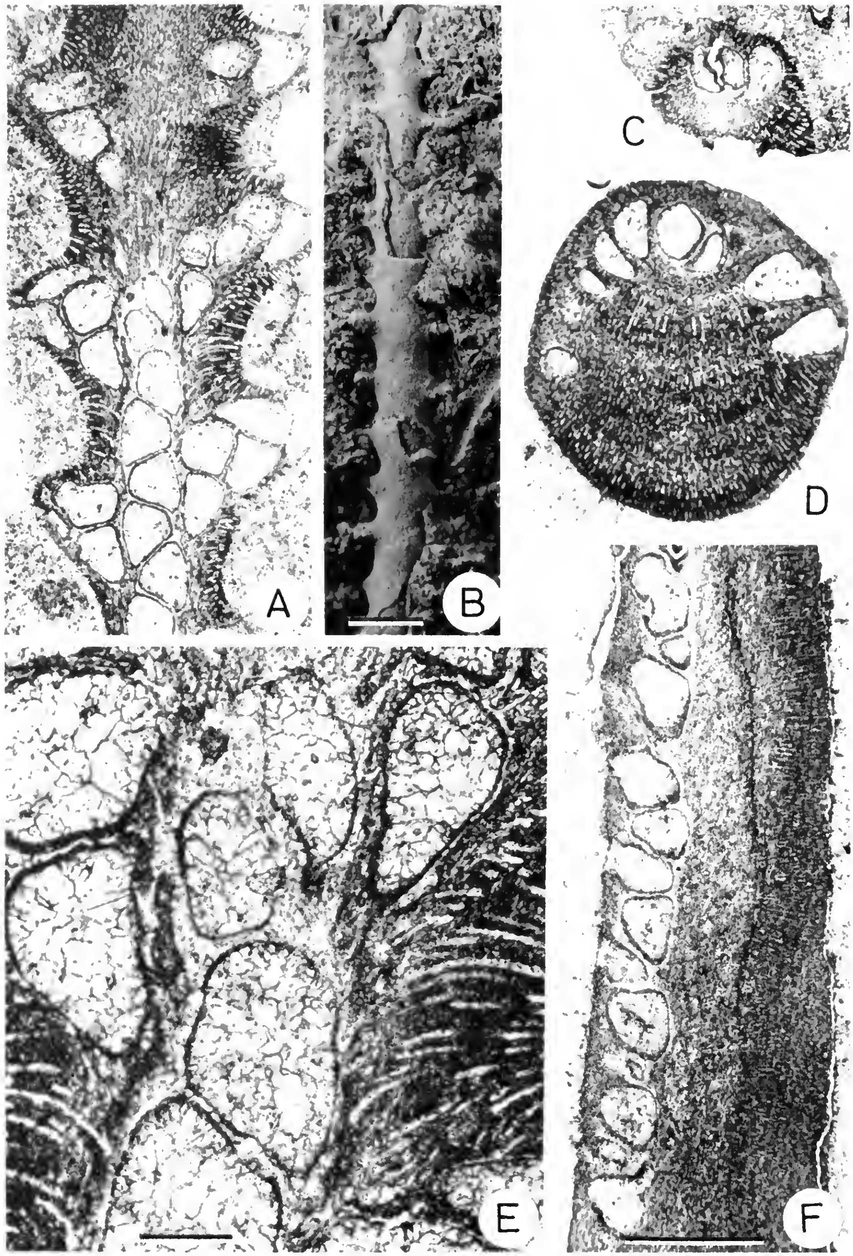

FIG. 50. *Filites bohemicus* Barrande. **A,** tangential section deep through zooecia of branch (lower two-thirds of branch), reverse side of branch behind basal plate (upper one-third of branch), and three pinnae on each side; lectotype, NM L21336, Koněprusy. **B,** reverse side of zoarium; lectotype, NM L21336. **C,** transverse section through branch, cutting two zooecia in branch and only the basal zooecium of a pinna on the right; lectotype, NM L21336. **D,** transverse section through branch, cutting zooecia of pinnae on both sides; NM L24676, Koněprusy. **E,** tangential section through zooids of branch, basal zooids of two pinnae, and style-laden extrazooidal lamellar skeleton; lectotype, NM L21336. **F,** longitudinal section through zooecia (left) and thick, style-bearing skeleton on reverse side of zooecia; NM L24677, Koněprusy. Scale bar in B = 1 mm; in E = 0.1 mm; and in F = 0.5 mm. A, C–D are at same scale as F.

deep sections, and the proximal zooecia of the pinnae abut the linear wall. Zooecia in pinnae are less regularly shaped than are those in main branches; they are frequently sack-shaped, with an inflated distal side and the proximal side taking the shape of the outside of the next-proximal zooecia. Apertures in pinnae are circular to subcircular, spaced alternately and very closely in two rows.

The basal plate is continuous but only about 0.01–0.02 mm thick; several small longitudinal ridges occur on the reverse side. In pinnae the basal plate is apparently not developed, the zooecial bases being composed of lamellar skeleton. Lamellar skeleton is thickly developed, particularly on reverse sides of branches, and is crossed by abundant styles about 0.01 mm in diameter.

DISCUSSION—The specimen illustrated in Počta (1894) as plate 10, figure 26 (NM L21336), is here designated lectotype.

MEASUREMENTS—See Table 7.

TYPE MATERIAL—Lectotype, NM L21336; paralectotypes, NM L15492–L15496; NM L21348; NM L21349; additional registered material, NM L24676; NM L24677.

LOCALITIES—Koněprusy, Srbsko.

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Appendix I: Sequential Listing of Specimens Illustrated by Barrande and Počta

The list below is for the Devonian fenestrates illustrated in volume VIII, part I of *Système Silurien du Centre de la Bohême par Joachim Barrande* (Počta, 1894); it includes the original plate and figure number, original name, National Museum (Prague) catalog number, and taxon to which each specimen is assigned in this monograph.

Plate and figure	Original name	Catalog No.	Current assignment
Pl. 7, fig. 15	*Fenestella inclara* Počta	L21452	*Spinofenestella inclara* (Počta)
16	*Fenestella inclara* Počta	L21452	*Spinofenestella inclara* (Počta)
Pl. 10, fig. 19	*Filites cribrosus* Počta	L15493	*Filites bohemicus* Barrande
20	*Filites cribrosus* Počta	L15492	*Filites bohemicus* Barrande
21	*Filites cribrosus* Počta	L15494	*Filites bohemicus* Barrande
22	*Filites cribrosus* Počta	L15495	*Filites bohemicus* Barrande
23	*Filites cribrosus* Počta	L15496	*Filites bohemicus* Barrande
24	*Filites cribrosus* Počta	L15495	*Filites bohemicus* Barrande
25	*Filites cribrosus* Počta	L15495	*Filites bohemicus* Barrande
26	*Filites bohemicus* Barrande	L21336	*Filites bohemicus* Barrande
27	*Filites bohemicus* Barrande	L21348	*Filites bohemicus* Barrande
28	*Filites bohemicus* Barrande	L21349	*Filites bohemicus* Barrande
29	*Filites bohemicus* Barrande	L21349	*Filites bohemicus* Barrande
30	*Filites spinosus* Počta	L18597	*Penniretepora spinosa* (Počta)
31	*Filites spinosus* Počta	L18597	*Penniretepora spinosa* (Počta)
Pl. 11, fig. 1	*Hemitrypa sacculus* Barrande	L18480	*Cyclopelta sacculus* (Barrande)
2	*Hemitrypa sacculus* Barrande	L21318	*Cyclopelta sacculus* (Barrande)
3	*Hemitrypa sacculus* Barrande	L21318	*Cyclopelta sacculus* (Barrande)
4	*Hemitrypa sacculus* Barrande	L21317	*Cyclopelta sacculus* (Barrande)
5	*Hemitrypa sacculus* Barrande	L21319	*Cyclopelta sacculus* (Barrande)
6	*Hemitrypa sacculus* Barrande	L21319	*Cyclopelta sacculus* (Barrande)
7	*Hemitrypa sacculus* Barrande	L18479	*Cyclopelta sacculus* (Barrande)
8	*Hemitrypa sacculus* Barrande	L21323	*Cyclopelta sacculus* (Barrande)
9	*Hemitrypa sacculus* Barrande	L18478	*Cyclopelta sacculus* (Barrande)
10	*Hemitrypa sacculus* Barrande	L21324	*Cyclopelta sacculus* (Barrande)
11	*Hemitrypa sacculus* Barrande	L21320	*Cyclopelta sacculus* (Barrande)
12	*Hemitrypa sacculus* Barrande	L21321	*Cyclopelta sacculus* (Barrande)
13	*Hemitrypa sacculus* Barrande	L21322	*Cyclopelta sacculus* (Barrande)
14	*Hemitrypa sacculus* Barrande	L21325	*Cyclopelta sacculus* (Barrande)
15	*Hemitrypa sacculus* Barrande	L18481	*Cyclopelta sacculus* (Barrande)
16	*Hemitrypa sacculus* Barrande	L21316	*Cyclopelta sacculus* (Barrande)
17	*Hemitrypa sacculus* Barrande	L21316	*Cyclopelta sacculus* (Barrande)
18	*Hemitrypa sacculus* Barrande	L21326	*Cyclopelta sacculus* (Barrande)
19	*Hemitrypa sacculus* Barrande	L21326	*Cyclopelta sacculus* (Barrande)
20	*Hemitrypa sacculus* Barrande	L21326	*Cyclopelta sacculus* (Barrande)
21	*Seriopora transiens* Počta	L21341	*Reteporina transiens* (Počta)
22	*Seriopora transiens* Počta	L21342	*Reteporina transiens* (Počta)
23	*Seriopora transiens* Počta	L18571	*Reteporina transiens* (Počta)
24	*Seriopora transiens* Počta	L21344	*Reteporina transiens* (Počta)
25	*Seriopora transiens* Počta	L21344	*Reteporina transiens* (Počta)
26	*Seriopora transiens* Počta	L21344	*Reteporina transiens* (Počta)
27	*Seriopora transiens* Počta	L21344	*Reteporina transiens* (Počta)
28	*Seriopora transiens* Počta	L21343	*Reteporina transiens* (Počta)
Pl. 12, fig. 1	*Fenestella capillosa* Počta	L21337	*Laxifenestella capillosa* (Počta)
2	*Fenestella capillosa* Počta	L18516	*Laxifenestella capillosa* (Počta)
3	*Fenestella capillosa* Počta	L18515	*Fenestella* sp.
4	*Fenestella subacta* Počta	L21327	?*Semicoscinium subacta* (Počta)
5	*Fenestella subacta* Počta	L18504	*Semicoscinium subacta* (Počta)
6	*Fenestella subacta* Počta	L21334	*Laxifenestella capillosa* (Počta)
7	*Fenestella subacta* Počta	L21330	*Semicoscinium subacta* (Počta)
8	*Fenestella subacta* Počta	L18586	*Semicoscinium subacta* (Počta)
9	*Fenestella subacta* Počta	L21328	*Semicoscinium subacta* (Počta)
10	*Fenestella subacta* Počta	L21329	?*Semicoscinium subacta* (Počta)
11	*Fenestella subacta* Počta	L18598	*Cyclopelta victrola* McKinney & Kříž

Pl. 13, fig.	1	*Fenestella exilis* Počta	L21339	*Laxifenestella capillosa* (Počta)
	2	*Fenestella exilis* Počta	L18525	*Rectifenestella exilis* (Počta)
	3	*Fenestella exilis* Počta	L21332	*Fabifenestella joachimi* McKinney & Kříž
	4	*Fenestella exilis* Počta	(lost)	. . .
	5	*Fenestella exilis* Počta	(lost)	. . .
	6	*Fenestella exilis* Počta	L18524	*Utropora parallela* (Barrande)
	7	*Fenestella exilis* Počta	L18524	*Utropora parallela* (Barrande)
	8	*Seriopora petala* Počta	L15509	*Reteporina petala* (Počta)
	9	*Seriopora petala* Počta	L15510	*Reteporina petala* (Počta)
	10	*Seriopora petala* Počta	L15511	*Reteporina petala* (Počta)
	11	*Seriopora petala* Počta	L15512	*Cyclopelta victrola* McKinney & Kříž
	12	*Seriopora petala* Počta	L15512	*Cyclopelta victrola* McKinney & Kříž
Pl. 14, fig.	1	*Reteporina gracilis* Barrande	L21338	*Fenestella gracilis* (Barrande)
	2	*Reteporina gracilis* Barrande	L21338	*Fenestella gracilis* (Barrande)
	3	*Reteporina gracilis* Barrande	L21333	*Fenestella gracilis* (Barrande)
	4	*Reteporina gracilis* Barrande	L21333	*Fenestella gracilis* (Barrande)
	5	*Reteporina gracilis* Barrande	L18498	*Fenestella gracilis* (Barrande)
	6	*Reteporina gracilis* Barrande	L18498	*Fenestella gracilis* (Barrande)
	7	*Reteporina gracilis* Barrande	L21331	*Rectifenestella exilis* (Počta)
	8	*Fenestella gracilis* Barrande	L18483	*Isotrypa bifrons* (Barrande)
	9	*Fenestella gracilis* Barrande	L18582	*Isotrypa bifrons* (Barrande)
	10	*Fenestella gracilis* Barrande	L18582	*Isotrypa bifrons* (Barrande)
	11	*Fenestella gracilis* Barrande	L18582	*Isotrypa bifrons* (Barrande)
	12	*Fenestella pannosa* Počta	L18584	*Isotrypa pannosa* (Počta)
	13	*Fenestella pannosa* Počta	L18542	*Utropora parallela* (Barrande)
	14	*Fenestella pannosa* Počta	L21305	*Isotrypa pannosa* (Počta)
	15	*Fenestella pannosa* Počta	L21305	*Isotrypa pannosa* (Počta)
Pl. 15, fig.	1	*Hemitrypa tenella* Barrande	L18454	*Hemitrypa tenella* Barrande
	2	*Hemitrypa tenella* Barrande	L18451	*Hemitrypa mimicra* McKinney & Kříž
	3	*Hemitrypa tenella* Barrande	L18452	*Hemitrypa mimicra* McKinney & Kříž
	4	*Hemitrypa tenella* Barrande	L21312	*Hemitrypa tenella* Barrande
	5	*Hemitrypa tenella* Barrande	L21449	*Hemitrypa mimicra* McKinney & Kříž
	6	*Hemitrypa tenella* Barrande	L21313	*Hemitrypa tenella* Barrande
	7	*Hemitrypa tenella* Barrande	L21313	*Hemitrypa tenella* Barrande
	8	*Hemitrypa Bohemica* Barrande	L18591	*Hemitrypa linotheras* McKinney & Kříž
	9	*Hemitrypa Bohemica* Barrande	L18589	*Hemitrypa linotheras* McKinney & Kříž
	10	*Hemitrypa Bohemica* Barrande	L18588	*Hemitrypa linotheras* McKinney & Kříž
	11	*Hemitrypa Bohemica* Barrande	L18591	*Hemitrypa linotheras* McKinney & Kříž
	12	*Hemitrypa Bohemica* Barrande	L21310	*Hemitrypa bohemica* Barrande
	13	*Hemitrypa Bohemica* Barrande	L18573	*Hemitrypa bohemica* Barrande
	14	*Hemitrypa Bohemica* Barrande	L21308	*Hemitrypa bohemica* Barrande
	15	*Hemitrypa Bohemica* Barrande	L21307	*Hemitrypa bohemica* Barrande
	16	*Hemitrypa Bohemica* Barrande	L21309	*Hemitrypa bohemica* Barrande
	17	*Hemitrypa Bohemica* Barrande	L18472	*Hemitrypa bohemica* Barrande
	18	*Hemitrypa Bohemica* Barrande	L18472	*Hemitrypa bohemica* Barrande
	19	*Hemitrypa Bohemica* Barrande	L18472	*Hemitrypa bohemica* Barrande
Pl. 16, fig.	1	*Fenestella rustica* Počta	L18495	*Isotrypa bifrons* (Barrande)
	2	*Fenestella rustica* Počta	L18595	*Isotrypa pannosa* (Počta)
	3	*Fenestella rustica* Počta	L18595	*Isotrypa pannosa* (Počta)
	4	*Fenestella acris* Počta	L18484	*Isotrypa pannosa* (Počta)
	5	*Fenestella acris* Počta	L21302	*Isotrypa pannosa* (Počta)
	5a	*Fenestella acris* Počta	L21301	*Isotrypa pannosa* (Počta)
	6	*Fenestella acris* Počta	L21303	*Isotrypa pannosa* (Počta)
	7	*Fenestella acris* Počta	L18484	*Isotrypa pannosa* (Počta)
	8	*Fenestella acris* Počta	L18484	*Isotrypa pannosa* (Počta)
	9	*Fenestella cancellata* Počta	L18581	*Isotrypa cancellata* (Počta)
	10	*Fenestella cancellata* Počta	L18581	*Isotrypa cancellata* (Počta)
	11	*Fenestella cancellata* Počta	L18492	*Isotrypa cancellata* (Počta)
	12	*Fenestella cancellata* Počta	L18492	*Isotrypa cancellata* (Počta)
	13	*Fenestella parallela* Barrande	L18587	*Utropora parallela* (Barrande)
	14	*Fenestella parallela* Barrande	L18587	*Utropora parallela* (Barrande)
	15	*Fenestella sportula* Počta	L18502	*Isotrypa sportula* (Počta)
	16	*Fenestella sportula* Počta	L18503	*Isotrypa sportula* (Počta)
	17	*Fenestella sportula* Počta	L21306	*Isotrypa pannosa* (Počta)
	18	*Fenestella sportula* Počta	L18583	*Isotrypa pannosa* (Počta)
	19	*Fenestella sportula* Počta	L18583	*Isotrypa pannosa* (Počta)

	20	*Fenestella lineolata* Počta	(lost)	...
	21	*Fenestella lineolata* Počta	L21304	*Isotrypa pannosa* (Počta)
	22	*Fenestella lineolata* Počta	L18585	*Isotrypa pannosa* (Počta)
	23	*Fenestella lineolata* Počta	L18491	*Isotrypa lineolata* (Počta)
	24	*Fenestella minuscula* Počta	L21315	*Hemitrypa tenella* Barrande
	25	*Fenestella minuscula* Počta	L21315	*Hemitrypa tenella* Barrande
Pl. 17, fig.	1	*Fenestella bifrons* Barrande	L18475	*Isotrypa bifrons* (Barrande)
	2	*Fenestella bifrons* Barrande	L21306	*Isotrypa bifrons* (Barrande)
	3	*Fenestella bifrons* Barrande	L21306	*Isotrypa bifrons* (Barrande)
	4	*Utropora nobilis* (Barrande)	L15498	*Utropora nobilis* (Barrande)
	5	*Utropora nobilis* (Barrande)	L15497	*Utropora nobilis* (Barrande)
	6	*Utropora nobilis* (Barrande)	L15499	*Utropora nobilis* (Barrande)
	7	*Utropora nobilis* (Barrande)	L15500	*Utropora nobilis* (Barrande)
	8	*Utropora nobilis* (Barrande)	L15501	*Utropora nobilis* (Barrande)
	9	*Utropora nobilis* (Barrande)	L15502	*Utropora nobilis* (Barrande)
	10	*Utropora nobilis* (Barrande)	L15503	*Utropora nobilis* (Barrande)
	11	*Utropora nobilis* (Barrande)	L15504	*Utropora nobilis* (Barrande)
	12	*Utropora nobilis* (Barrande)	L15505	*Utropora nobilis* (Barrande)
	13	*Utropora nobilis* (Barrande)	L15506	*Utropora nobilis* (Barrande)
	14	*Utropora nobilis* (Barrande)	L15508	*Utropora nobilis* (Barrande)
	15	*Utropora nobilis* (Barrande)	L15507	*Utropora nobilis* (Barrande)

Appendix II: Sequential Listing of Specimens Illustrated by Prantl

The list below is for the Devonian fenestrates illustrated by Prantl in *Palaeontographica Bohemiae*, XV (1932); it includes the original plate and figure number, original name, National Museum (Prague) catalog number, and taxon to which each specimen is assigned in this monograph.

Plate and figure		Original name	Catalog No.	Current assignment
Pl. 1, fig.	1	*Fenestella spinulosa* Prantl	L18562	*Laxifenestella digittata* (Prantl)
	2	*Fenestella spinulosa* Prantl	L18562	*Laxifenestella digittata* (Prantl)
	3	*Fenestella spinulosa* Prantl	L18562	*Laxifenestella digittata* (Prantl)
	4	*Fenestella pannosa* Počta	L18542	*Utropora parallela* (Barrande)
	5	*Fenestella pannosa* Počta	L21434	...
	6	*Fenestella pannosa* Počta	L18543	...
	7	*Fenestella gracilis* (Barrande)	L21338	*Fenestella gracilis* (Barrande)
	8	*Fenestella gracilis* (Barrande)	L18535	*Fenestella gracilis* (Barrande)
	9	*Fenestella gracilis* (Barrande)	L21333	*Fenestella gracilis* (Barrande)
	10	*Fenestella subacta* Počta	L21328	*Semicoscinium subacta* (Počta)
	11	*Fenestella capillosa* Počta	L21436	*Semicoscinium discreta* (Prantl)
	12	*Isotrypa gracilis* Barrande	L18599	*Isotrypa bifrons* (Barrande)
Pl. 2, fig.	1	*Fenestella exilis* Počta	...	...
	2	*Fenestella exilis* Počta	...	...
	3	*Fenestella exilis* Počta	L21437	*Laxifenestella digittata* (Prantl)
	4	*Fenestella exilis* Počta	L21311	*Hemitrypa mimicra* McKinney & Kříž
	5	*Fenestella capillosa* Počta	L21337	*Laxifenestella capillosa* (Počta)
	6	*Fenestella subacta* Počta	L18586	*Semicoscinium subacta* (Počta)
	7	*Fenestella subacta* Počta	L21330	*Semicoscinium subacta* (Počta)
(right)	8	*Fenestella subacta* Počta	L21334	*Laxifenestella capillosa* (Počta)
(left)	8	*Fenestella pannosa* Počta	L21438	*Isotrypa cancellata* (Počta)
	9	*Fenestella pannosa* Počta	L21439	*Semicoscinium discreta* (Prantl)
	10	*Fenestella spinulosa* Prantl	L18562	*Laxifenestella digittata* (Prantl)
	11	*Fenestella digittata* Prantl	...	(unrecognizable)
	12	*Fenestella digittata* Prantl	L21440	*Laxifenestella digittata* (Prantl)
	13	*Fenestella gracilis* (Barrande)	...	*Fenestella gracilis* (Barrande)
	14	*Polypora hanuši* Prantl	L18500	*Polypora hanusi* Prantl
	15	*Polypora hanuši* Prantl	L18501	*Polypora hanusi* Prantl
	16	*Polypora incerta* Prantl	L18514	*Polyporella incerta* (Prantl)
	17	*Semicoscinium sacculus sacculus* (Barrande)	L21323	*Cyclopelta sacculus* (Barrande)
	18	*Semicoscinium sacculus sacculus* (Barrande)	L21441	*Semicoscinium discreta* (Prantl)
Pl. 3, fig.	1	*Utropora nobilis* (Barrande)	L15503	*Utropora nobilis* (Barrande)
	2	*Utropora nobilis* (Barrande)	L15503	*Utropora nobilis* (Barrande)
	3	*Utropora nobilis* (Barrande)	L21347	*Utropora nobilis* (Barrande)
	4	*Utropora nobilis* (Barrande)	L21314	...
	5	*Utropora nobilis* (Barrande)	...	...
	6	*Semicoscinium sacculus sacculus*	L18482	*Cyclopelta victrola* McKinney & Kříž
	7	*Semicoscinium sacculus sacculus*	L21316	*Cyclopelta sacculus* (Barrande)
	8	*Semicoscinium sacculus ornatus* Prantl	L18570	*Cyclopelta sacculus* (Barrande)
	9	*Hemitrypa tenella* Barrande	...	?*Hemitrypa mimicra* McKinnney & Kříž
	10	*Hemitrypa tenella* Barrande	L21450	?*Hemitrypa mimicra* McKinnney & Kříž
	11	*Hemitrypa tenella* Barrande	L18453	*Hemitrypa mimicra* McKinney & Kříž
	12	*Hemitrypa tenella* Barrande	L18452	*Hemitrypa mimicra* McKinney & Kříž
	13	*Hemitrypa bohemica* Barrande	L18472	*Hemitrypa bohemica* Barrande
	14	*Hemitrypa bohemica* Barrande	L21442	*Hemitrypa bohemica* Barrande
	15	*Glauconome bohemica* Prantl	L18592	*Penniretepora bohemica* (Prantl)
	16	*Glauconome bohemica* Prantl	L18593	*Penniretepora bohemica* (Prantl)
	17	*Fenestella spinulosa* Prantl	L21443	*Alternifenestella estrellita* McKinney & Kříž
Pl. 4, fig.	1	*Reteporina petala* (Počta)	L18523	*Reteporina petala* (Počta)
	2	*Hemitrypa bohemica* Barrande	L18474	*Hemitrypa bohemica* Barrande
	3	*Hemitrypa bohemica* Barrande	L21444	*Hemitrypa bohemica* Barrande

	4	*Reteporina transiens* (Počta)	L21445	*Reteporina transiens* (Počta)
	5	*Reteporina transiens* (Počta)	L21344	*Reteporina transiens* (Počta)
	6	*Reteporina formosa* Prantl	L18499	*Reteporina transiens* (Počta)
	7	*Reteporina formosa* Prantl	L21446	*Reteporina transiens* (Počta)
	8	*Reteporina formosa* Prantl	L21345	*Reteporina transiens* (Počta)
	9	*Reteporina formosa* Prantl	L21346	*Reteporina transiens* (Počta)
	10	*Isotrypa discreta* Prantl	L18580	...
	11	*Isotrypa discreta* Prantl	L18476	*Semicoscinium discreta* (Prantl)
	12	*Isotrypa acris* (Počta)	...	?*Isotrypa pannosa* (Počta)
	13	*Isotrypa acris* (Počta)	L21447	*Laxifenestella capillosa* (Počta)
	14	*Plaquettes basales des Fenestellidés*	...	...
	15	*Plaquettes basales des Fenestellidés*	...	...
	16	*Plaquettes basales des Fenestellidés*	...	...
Pl. 5, fig.	1	*Isotrypa bifrons* (Barrande)	L21306	*Isotrypa bifrons* (Barrande)
	2	*Isotrypa gracilis* (Barrande)	L18483	*Isotrypa bifrons* (Barrande)
	3	*Isotrypa gracilis* (Barrande)	...	...
	4	*Pseudoisotrypa cancellata* (Počta)	L21448	*Cyclopelta bohemica* (Prantl)
	5	*Pseudoisotrypa bohemica* Prantl	...	*Cyclopelta bohemica* (Prantl)
	6	*Pseudoisotrypa bohemica* Prantl	...	?*Cyclopelta bohemica* (Prantl)
	7	*Pseudoisotrypa bohemica* Prantl	L15489	*Cyclopelta bohemica* (Prantl)
	8	*Pseudoisotrypa bohemica* Prantl	L15490, L15491	*Cyclopelta bohemica* (Prantl)
	9	*Pseudoisotrypa bohemica* Prantl	...	?*Cyclopelta bohemica* (Prantl)
	10	*Pseudoisotrypa bohemica* Prantl	...	?*Cyclopelta bohemica* (Prantl)
	11	*Pseudoisotrypa bohemica* Prantl	...	?*Cyclopelta bohemica* (Prantl)
	12	*Pseudoisotrypa cancellata* (Počta)	L18581	*Isotrypa cancellata* (Počta)
	13	*Pseudoisotrypa cancellata* (Počta)	L18492	*Isotrypa cancellata* (Počta)
	14	*Pseudoisotrypa cancellata* (Počta)	L18583	*Isotrypa pannosa* (Počta)
	15	*Ptilopora bohemica-bohemica* Prantl	L21335	*Ptylopora bohemica* Prantl
	16	*Ptilopora bohemica minor* Prantl	L18592	*Ptylopora bohemica* Prantl
	17	*Pseudoisotrypa cancellata* (Počta)	L18493	*Isotrypa cancellata* (Počta)
	18	*Isotrypa discreta* Prantl	L18476	*Semicoscinium discreta* (Prantl)

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