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The genus *Eocaudina* Martin (Holothuroidea) from the Devonian of Poland

ABSTRACT: The holothurian sclerites are here described for the first time from the Upper Devonian the world over and also for the first time from the Devonian of Poland. The sclerites found are assigned to the genus *Eocaudina* Martin. Several so far known species have been analyzed critically and three new ones, viz. *Eocaudina gornensis* sp. n., *E. ovalis* sp. n. and *E. quinqueordinata* sp. n. erected. The stratigraphic occurrences of particular species from the Upper Devonian are compared with the conodont zonation.

INTRODUCTION

Although fossil holothurian sclerites had first been described in the mid-19*th* century (Münster 1843, *fide* Frizzell & Exline 1955), it was as late as a hundred years afterwards that the first sclerites of the Devonian holothurians were found in the Branik Limestones (Middle Devonian) of Bohemia (Prantl 1947). At present, both the sclerites and the holothurians themselves are known from the Devonian (Seilacher 1961) although the number of publication devoted to them is not yet very high (Martin 1952, Beckmann 1965, Gutschick & Canis 1971).

The genus *Eocaudina* to which the present paper is devoted was erected by Martin (1952). The discussion on this genus, the most abundant material representing it so far and the current state of knowledge of the Devonian sclerites of holothurians were presented by Gutschick & Canis (1971).

Describing for the first time the sclerites of the Upper Devonian holothurians, the present paper fills a gap in the knowledge of Early Paleozoic holothurian sclerites, and presents the richest assemblage of species of the genus *Eocaudina*.

The material collected comes from both the surface outcrops and the subsurface of various areas of Poland (Fig. 1). All the outcrops (Grzegorzowice, Górno, Kadzielnia and Dalnia) are located in the Holy Cross

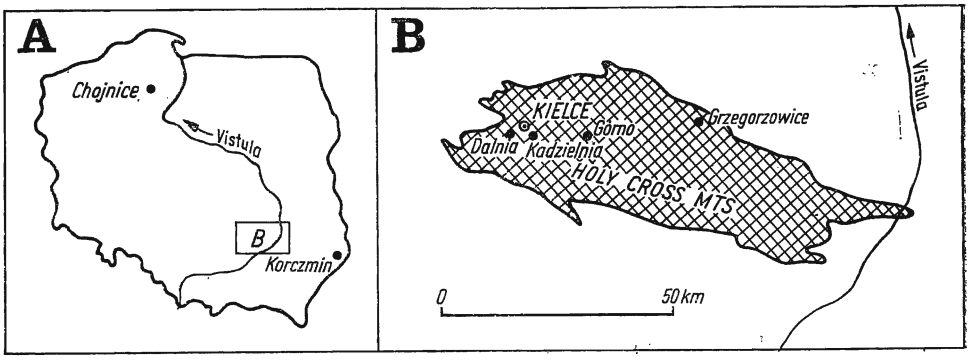

Fig. 1

General map of Poland (*A*) and geological sketch map of the Holy Cross Mts (*B* — crossed is the Paleozoic massif) showing the Devonian holothurian-sclerite bearing exposures or boreholes

Mts, Central Poland, and their age is contained between the Eifelian and the Famennian-Tournaisian indeterminate interval. Of the two boreholes which supplied the material, Chojnice *2* is situated in Western Pomerania, and Korczmin *IG-1* in the Lublin Upland. Conodonts in the two boreholes come from the Upper Devonian. The former boring was made by the Oil Prospections Enterprise in Piła and the latter by the Polish Geological Survey. Both these institutions allowed the present writers to do their sampling. As the result of dissolving rocks in a 15 per cent acetic acid, sclerites were obtained as an accessory material in the exploration of conodonts.

The authors are grateful to K. Małkowski, M. Sc., who furnished the sclerites from Górno.

FOSSIL OCCURRENCE

A relatively accurate dating of sclerites with reference to the standard conodont zonation was possible in the localities in which they concurred with conodonts. Where conodonts were lacking such a precise age determination was not possible. The dating of samples from particular localities is presented below in a stratigraphic order.

Grzegorzowice. The material comes from dark limestones with *Spirifer dombroviensis* Gürich (outcrop no. *48* of Pajchlowa, 1957), which belong to the lower part of the Eifelian (Gürich 1896, Sobolev 1904).

Górno. The material comes from beds outcroping at Józefka Hill (Małkowski 1971). The range of concurring conodonts (*cf.* Małkowski 1971) indicates that these beds represent an interval between the Upper Schmidtognathus hermanni — Polygnathus cristatus Zone (*to Iα*) and the Middle Polygnathus asymmetricus Zone (*to Iα*).

Kadzielnia. A sample with sclerites but very poor in conodonts comes from the Manticoceras Limestone (Szulczewski 1971, p. 64). This unit represents, however, as a whole (Bryńczyński & Szulczewski, *in preparation*) the Lower and Upper or even Uppermost Palmatolepis gigas Zones (*to Iγ-δ*).

Korczmin. Sclerites were found in the borehole Korczmin *IG-1* at a depth of 1,932.7 m in the uppermost part of what is called Coral Limestones, which make up the regional development of the Frasnian (Miłaczewski 1968).

Chojnice. Sclerites occur here in the borehole Chojnice *2* in four samples, all of them coming from an interval of 3,117.5—3,148.5 m. According to Matyja (1972), the sample from a depth of 3,142.3—3,148.5 m undoubtedly represents the upper part of the Palmatolepis rhomboidea Zone (*to IIβ*). The remaining samples come from stratigraphically higher beds of an indeterminate age which, however, do not exceed the Lower Scaphignathus velifer Zone (*to IIβ—IIIβ*).

Dalnia. The sample comes from a neptunian dyke and contains a mixed conodont fauna (Szulczewski 1973, Table 1, sample *6*). Its oldest elements come from the Upper Palmatolepis quadrantinodosa Zone (*to IIIα*). Conodonts from the Spathognathodus costatus Zone (*to V/VI?—VI*) and from the Tournaisian zones older than the Scaliognathus anchoralis Zone (*cu IIβ*) concur with them.

The material of *Eocaudina* collected comes from the deposits which represent different calcareous facies. The Frasnian Coral Limestones from the Korczmin *IG-1* borehole are the biostrome coral-stromatoporoid limestones; they are a biolithite corresponding to bank facies.

On the other hand, at Górno the holothurians occur in thin-bedded marly limestones containing a rich and differentiated autochthonous assemblage of benthic forms, consisting of rugose and tabulate corals, brachiopods (including atrypids and lingulids), gastropods, crinoids and *Receptaculites*. These limestones are the biolithite, but they are the product of a neritic shallow-water sedimentation.

Similar in character, particularly in their lithological development, are sclerite-bearing deposits in the Chojnice *2* borehole, but they contain a much less differentiated assemblage of macrofossils, represented almost exclusively by brachiopods, mainly cyrtospiriferids.

The limestone which forms the neptunian dyke on the Dalnia Hill was formed in another environment. It corresponds to the original condensed sequence formed on a submarine rise (Szulczewski 1973) and contains a rich assemblage of coral-trilobite macrofossils. The assemblage of corals is of the nature of the Cyathaxonia fauna and the trilobites resemble the faunas of trilobites characteristic of what is known as "cephalopod facies".

In the cephalopod facies, although not displaying condensation, the holothurian sclerites occur in the Manticoceras limestones at Kadzielnia. In addition to cephalopods, they contain benthic fossils, mostly brachiopods and small gastropods, but are already devoid of coelenterates.

Although holothurians are mostly benthic organisms, the diversity of presented environments, in which the *Eocaudina* sclerites have been found, indicates that the occurrence of at least this genus does not depend on the character of deposit and does not display bathymetric restrictions to such an extent which would enable the existence of a benthic form. The limited amount of the material does not allow the writers to conduct a similar analysis of particular species.

SYSTEMATIC DESCRIPTION

Family **Calclamnidae** Frizzell & Exline, 1955
Genus *EOCAUDINA* Martin, 1952, emend. Gutschick & Canis, 1971

The discussion concerning the generic name, under which the sclerites would be grouped in the form of multilayered, perforate plates, has now been twenty-year old. In the present writers' opinion, this discussion was closed by Gutschick & Canis (1971).

The fragmentarily preserved holotype of the species *Eocaudina septaforaminalis*, which is a type species of the genus *Eocaudina* and the rather not very correctly selected terminology used with the original description of this species by Martin (1952), became a source of subsequent taxonomic difficulties. Gutschick & Canis (1971), having at their disposal a rich topotypic material, solved the existing doubts concerning the morphology of the species *Eocaudina septaforaminalis*, suggested a neotype for this species and constructed for it a morphogenetic series.

Accepting one of the morphological forms as a basic form (Gutschick & Canis 1971, Text-fig. 3) and constructing the morphogenetic series, these authors adopted a certain model of the formation of new perforations. It consisted in the increase in the number of perforations together with the growth of the sclerite. However, no obvious relation between the increase in the number of perforations and the increase in the diameter of sclerite is visible in the material they presented. On the other hand, it may be observed that some forms with a lower number of perforations (less advanced in the morphogenetic development) reach larger dimensions than the forms which are placed higher morphogenetically (*e.g.* Gutschick & Canis 1971, Pl. 48, Figs 38, 45 and 51). It can be also observed that there are forms which considerably differ in size and are identical in the degree of their morphogenetic development (*e.g.* Gutschick & Canis 1971, Pl. 47, Fig. 14 and Pl. 48, Figs 31 and 38). In the present writers' opinion, continuing to regard these forms as belonging to the species *Eocaudina septaforaminalis*, we should be aware of the possibility of the existence within its range of two groups of sclerites very similar to each other in initial morphogenetic stages, but differing from each other in further stages. In one of these groups, the development takes place only by the growth of sclerite, without changes in the number of perforations, while the development of the other consists precisely in an increase in the number of perforations which accompanies the growth.

The genus *Eocaudina* is usually considered as ranging from the Devonian, but Mostler (1968c) found that it also occurs as early as the Silurian. Mostler's find makes up a link between the Early Paleozoic *Eocaudina* and some of the Ordovician forms so far described as *Thuroholia*.

Eocaudina gornensis sp. n.
(Pl. 1, Figs 12—14)

1971. *Eocaudina septaforaminalis* Martin, emend. Gutschick & Canis; R. C. Gutschick & W. F. Canis, p. 335, Pl. 48, Fig. 50 [only].

Holotype: specimen presented in Pl. 1, Fig. 13.
Type horizon: lower part of the Frasnian (to *Iα*).
Type locality: Józefka Hill near Górno village, Holy Cross Mts.
Derivation of the name: after the village Górno, in the vicinity of which the holotype was found.

Diagnosis. — Sclerites in the form of hexagonal plates, flat to slightly arched. Perforations uniform, circular to oval.

Material. — Three well preserved specimens.

Dimensions. — Plates — 0.50 to 0.57 mm; diameter of perforations — 0.05 to 0.07 mm.

Description. — Sclerites in the form of perforated plates, hexagonal in outline. Plates slightly arched. Perforations uniform in size and arranged in rows intersecting at 60° and 120°, circular with a tendency to oval at the margin of plate. Plates having seven rows of perforations most frequent arrangement of which is as follows: 3-4-5-6-5-4-3.

Remarks. — The species differs from *Eocaudina subhexagona* in the outline of perforations, which in the latter is hexagonal; from *Eocaudina gutschicki* and *Eocaudina* sp. *A* in the outline of plate and from *E. septaforaminalis* in a not differentiated size of perforations. The form, placed within the synonymy precisely due to its uniform size of all perforations, should belong to the species *E. gornensis.*

Occurrence. — Upper Middle Devonian (Icriodus latericrescens latericrescens Range Zone) of Iowa (Gutschick & Canis 1971); Górno — Frasnian (*to Iα*).

Eocaudina mccormacki Frizzell & Exline, 1955
(Pl. 1, Figs 3—10, 16, 21, 23; Pl. 2, Figs 5, 16—17)

1932. *Ancistrum* ? sp.; C. Croneis & J. Mc Cormack, Pl. 18, Fig. 29; Pl. 20, Figs 29, 38.
1955. *Eocaudina mccormacki* Frizzell & Exline, new species; D. L. Frizzell & H. Exline, p. 87, Pl. 3, Fig. 9.
1958. *Thuroholia mccormacki* (Frizzell & Exline); C. H. Summerson & L. J. Campbell, p. 964, Pl. 125, Fig. 2.
1959. *Thuroholia mccormacki* (Frizzell & Exline); R. C. Gutschick, p. 131, Pl. 25, Figs 1, 5.
1967. *Eocaudina mccormacki* Frizzell & Exline; R. C. Gutschick, W. F. Canis & K. G. Brill; p. 1468, Pl. 186, Figs 33—34; Pl. 187, Fig. 22.
1971. *Eocaudina mccormacki* Frizzell & Exline; R. C. Gutschick & W. F. Canis, p. 334, Pl. 47, Figs 26, 28; Pl. 48, Figs 19—20, 23, 25—28 [only].

Material. — A dozen or so specimens.

Dimensions. — Plates — 0.15 to 0.30 mm.

Remarks. — Having relatively many rows and perforations per row, this species may be easily distinguished from other ones. Debatable may be only the forms which, fitting within the range of variability of the species, have less rows and perforations per row. In such cases, *E. mccormacki* resembles *E. gutschicki.* Figure 2 gives a chart illustrating the ranges of variability within the species *E. mccormacki* and *E. gutschicki,* based on the specimens which were illustrated in literature. On account of the adopted variability range of the species *E. mccormacki,* some of the forms presented by Gutschick & Canis (1971, *viz.* Pl. 48, Figs 17—18, 21—22, 24, 29—30) have been excluded from this species.

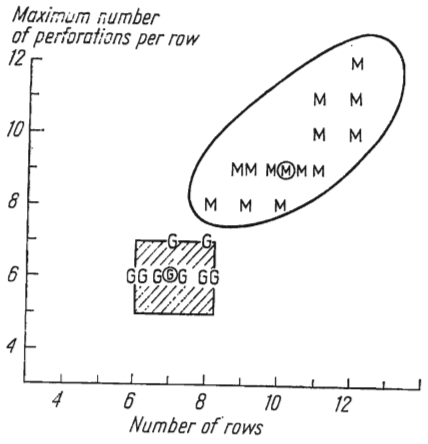

Fig. 2

Diagram of variability of the species: G — *Eocaudina gutschicki* Frizzell & Exline (variability area *after* Mostler, 1968a), M — *Eocaudina mccormacki* Frizzell & Exline

Circled are holotypes of the species; the diagram compiled on the data from referenced papers (Croneis & Mc Cormack 1932; Frizzell & Exline 1955; Gutschick 1959; Gutschick, Canis & Brill 1967; Mostler 1968a, 1971; Gutschick & Canis 1971)

Occurrence. — Upper Middle Devonian (Icriodus latericrescens latericrescens Range Zone) of Iowa (Gutschick & Canis 1971); Lower Mississippian of Indiana (Gutschick 1959), Montana and Missouri (Gutschick, Canis & Brill 1967); Pennsylvanian of Kentucky (Summerson & Campbell 1958) and Texas (Croneis & Mc Cormack 1932); Lower Carboniferous of Scotland (Etheridge 1881 — *fide* Frizzell & Exline 1955); borehole Korczmin *IG-1* (depth 1,932.7 m) — Frasnian (Pl. 1, Figs 3—4, 6, 8, 10, 21, 23; Pl. 2, Figs 5, 16—17); borehole Chojnice *2* (depth 3,142.3—3,148.5 m) — Palmatolepis rhomboidea Zone = *to IIβ* (Pl. 1, Figs 7, 16); Grzegorzowice — Eifelian (Pl. 1, Fig. 9); Kadzielnia — Palmatolepis gigas Zone = *to Iγ-δ* (Pl. 1, Fig. 5).

Eocaudina marginata (Langenheim & Epis, 1957)
(Pl. 2, Figs 6, 8—10, 15)

1957. *Thuroholia marginata* Langenheim and Epis, new species; R. L. Langenheim & R. C. Epis, p. 167, Pl. 1, Figs 7—16.
1959. *Thuroholia marginata* Langenheim & Epis; R. C. Gutschick, p. 131, Pl. 25, Fig. 2 [only].
1971. *Eocaudina mccormacki* Frizzell & Exline; R. C. Gutschick & W. F. Canis, Pl. 48, Fig. 30 [only].

Material. — A few fragmentary specimens.

Remarks. — Despite a considerable variability in shape of sclerites the entire material available has been assigned to *E. marginata*. A strongly elliptical form (Pl. 2, Fig. 8) should be regarded as presenting the variability of the species.

Occurrence. — Lower Mississippian of Arizona (Langenheim & Epis 1957) and North Indiana (Gutschick 1959); Upper Middle Devonian (Icriodus latericrescens latericrescens Range Zone) of Iowa (Gutschick & Canis 1971); borehole Chojnice *2* (depth 3,123.7—3,129.9 m) — *to IIβ—IIIβ* (Pl. 2, Figs 8—10, 15); borehole Korczmin *IG-1* (depth 1,932.7 m) — Frasnian (Pl. 2, Fig. 6).

Eocaudina ovalis sp. n.
(Pl. 2, Figs 1—3, 7)

1971. *Eocaudina septaforaminalis* Martin, emend. Gutschick & Canis; R. C. Gutschick & W. F. Canis, p. 334, Pl. 47, Fig. 20 [only].

Holotype: specimen presented in Pl. 2, Fig. 2.
Type horizon: lower part of the Frasnian (*to Iα*).

Type locality: Józefka Hill near Górno village, Holy Cross Mts.
Derivation of the name: Lat. *ovalis* — oval.

Diagnosis. — Sclerites in the form of oval plates, slightly convex. Perforations of two dimensions, circular. Large perforations confined to the central part of a sclerite. Small ones situated near the edge of a sclerite.

Material. — A few well preserved specimens.

Dimensions. — Plates — 1.22 to 0.57 mm; mean diameter of large perforations — 0.11 mm; mean diameter of small perforations — 0.05 mm; width/length ratio of a sclerite — 0.78 to 0.86.

Description. — Sclerites in the form of perforated plates oval in outline. Perforations varying in size: larger ones concentrated in the central part of a sclerite and arranged in rows intersecting at 60° and 120°, smaller concentrated near the edge of a sclerite. Perforations of both sizes round. Edge even, distinctly developed. Sclerites slightly flattened in the marginal part.

Remarks. — Having plates oval in outline and, at the same time, a characteristic mutual arrangement of large and small perforations, this species distinctly differs from other species of the genus *Eocaudina*.

Occurrence. — Upper Middle Devonian (Icriodus latericrescens latericrescens Range Zone) of Iowa (Gutschick & Canis 1971); Górno — Frasnian, to *Iα* (Pl. 2, Figs 1—2); borehole Korczmin *IG-1* (depth 1,932.7 m) — Frasnian (Pl. 2, Figs 3, 7).

Eocaudina quinqueordinata sp. n.
(Pl. 1, Figs 1—2, 17, 19)

1971. *Eocaudina mccormacki* Frizzell & Exline; R. C. Gutschick & W. F. Canis, Pl. 48, Figs 17—18 [only].

Holotype: specimen presented in Pl. 1, Fig. 1.
Type horizon: Eifelian.
Type locality: Grzegorzowice village, Holy Cross Mts.
Derivation of the name: Lat. *quinque* — five, *ordinatus* — arranged in rows.

Diagnosis. — Sclerites in the form of circular to hexagonal plates, flat to slightly arched. Perforations circular to elliptical, arranged in five rows.

Material. — A few specimens.

Dimensions. — Plates — 0.13 to 0.26 mm.

Description. — Sclerites in the form of perforated plates, circular to hexagonal in outline, flat to slightly arched. Perforations circular to elliptical, arranged in rows intersecting a 60° and 120°. Sclerites bear five rows with perforations arranged mostly 3-4-5-4-3 in a row. A slight undulation of the margin of plate corresponds to the marginal perforations.

Remarks. — Having perforations arranged in five rows, the species is close to the forms placed in the synonymy, but departs from the remaining ones known so far.

Occurrence. — Upper Middle Devonian (Icriodus latericrescens latericrescens Range Zone) of Iowa (Gutschick & Canis 1971); Grzegorzowice — Eifelian (Pl. 1, Figs 1—2, 19); Górno — Frasnian, to *Iα* (Pl. 1, Fig. 17).

Eocaudina subhexagona Gutschick, Canis & Brill, 1967
(Pl. 1, Figs 22, 24—29; Pl. 2, Fig. 4)

1967. *Eocaudina subhexagona* Gutschick, Canis & Brill, n. sp.; R. C. Gutschick, W. F. Canis & K. G. Brill, p. 1487, Pl. 186, Figs 16—21; Pl. 187, Fig. 18.
1968a. *Eocaudina subhexagona* Gutschick, Canis & Brill; H. Mostler, p. 12, Pl. 2, Fig. 4.

1968a. *Eocaudina marginata* (Langenheim & Epis); H. Mostler, p. 11, Pl. 2, Fig. 2.
1968a. *Eocaudina* cf. *marginata* (Langenheim & Epis); H. Mostler, p. 11, Pl. 2, Fig. 3.
1968b. *Eocaudina subhexagona* Gutschick, Canis & Brill, 1967; H. Mostler, p. 55, Pl.2, Figs 1—4.
1971. *Eocaudina subhexagona* Gutschick, Canis & Brill, 1967; K. Zawidzka, p. 433, Pl. 1, Fig. 11 [only].

Material. — A dozen or so specimens.

Dimensions. — Plates — 0.22 to 0.31 mm.

Remarks. — Among the specimens available, *E. subhexagona* is the only form (Pl. 1, Fig. 22), which in its strong concavo-convex plate and fine structure of the net most strongly resembles the specimens presented by Gutschick, Canis & Brill (1967). The remaining specimens of the collection are marked by a somewhat more robust structure, but also have all characters of the species *E. subhexagona*. Forms described and illustrated by Mostler (1968a) as *E. marginata* (*cf.* Mostler 1968a, Pl. 2, Fig. 2), as well as *E.* cf. *marginata* (*cf.* Mostler 1968a, Pl. 2, Fig. 3) are similar to *E. subhexagona* in the shape of perforations. Due to the character of four central perforations, forms illustrated by Zawidzka (1971, Pl. 1, Figs 8—10) seem to belong to *E. septaforaminalis* Martin, emend. Gutschick & Canis.

Occurrence. — Lower Mississippian of Montana, Missouri and Texas (Gutschick, Canis & Brill 1967); Upper Anisian (Illyr) of the Eastern Alps, Bosna and Turkey (Mostler 1968a); Anisian of the Northern Alps (Mostler 1968b); Triassic of the Tatra Mts (Zawidzka 1971); borehole Chojnice *2* — *to IIβ—IIIβ* (depth 3,123.7—3,129.9 m — Pl.1, Fig. 22; and depth 3,117.5—3,123.7 m — Pl. 1, Figs 24—29); Dalnia — Famennian through Tournaisian (Pl. 2, Fig. 4).

Eocaudina aff. *croneisi* (Gutschick, 1954)
(Pl. 2, Fig. 18)

Material. — One specimen.

Dimensions. — Plate — *c.* 1.5 mm.

Description. — A large sclerite in the from of a perforated, slightly arched plate oval in outline. Margin distinctly developed, irregularly undulate. Many (more than 100) circular or subcircular perforations are arranged in rows intersecting at

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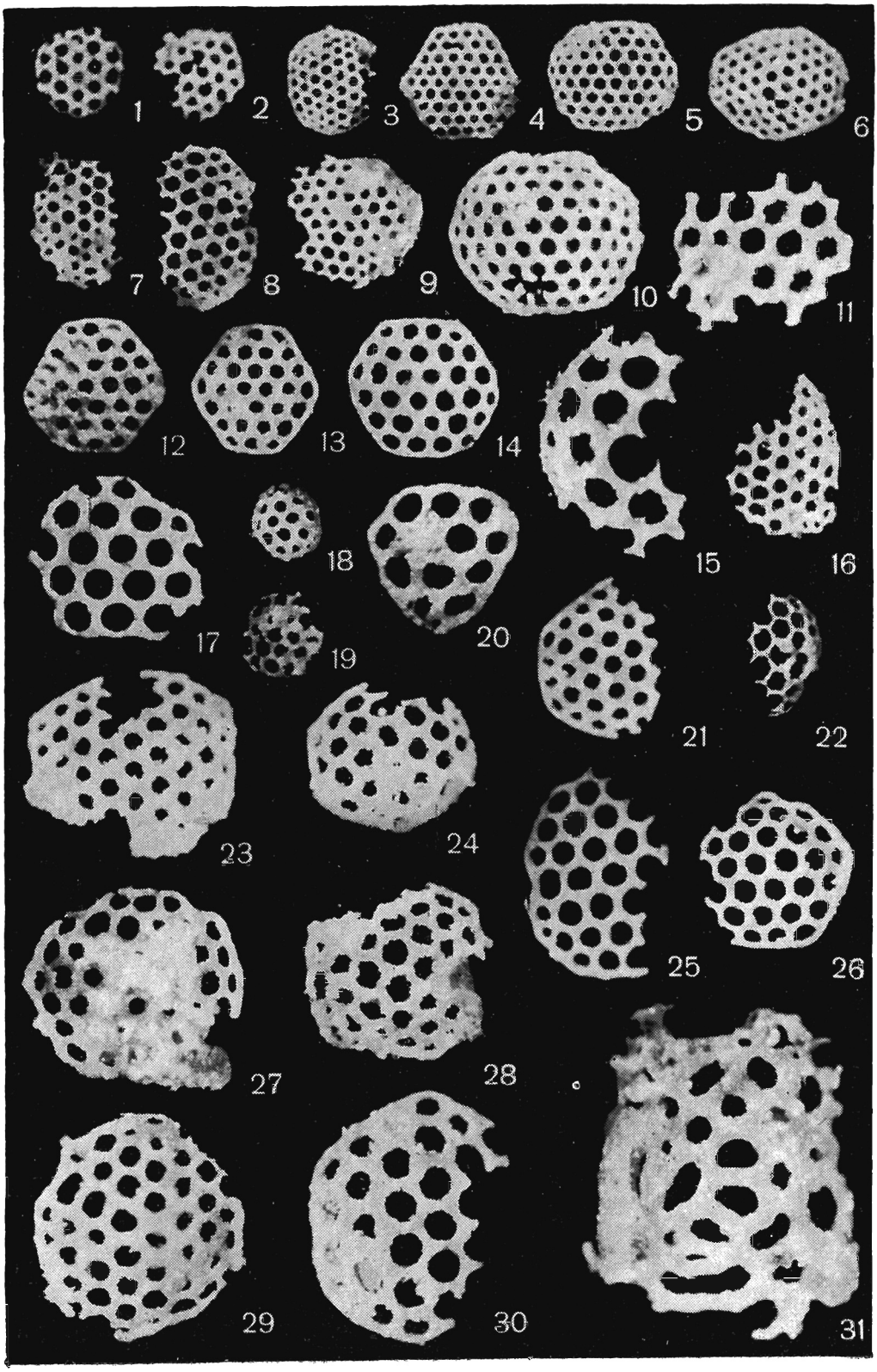
PLATE 1

1, 2, 17, 19 — *Eocaudina quinqueordinata* sp. n.; *1, 2, 19* — Grzegorzowice (*1* presents the holotype); *17* — Górno.
3-10, 16, 21, 23 — *Eocaudina mccormacki* Frizzell & Exline; *3, 4, 6, 8, 10, 21, 23* — borehole Korczmin; *5* — Kadzielnia; *7, 16* — borehole Chojnice; *9* — Grzegorzowice.
11 — *Eocaudina* cf. *hexagona* Kristan-Tollmann; Dalnia.
12-14 — *Eocaudina gornensis* sp. n.; Górno (*13* presents the holotype).
15, 30 — *Eocaudina* sp. *A; 15* — borehole Chojnice, *30* — Górno.
18 — *Protocaudina* sp.; Grzegorzowice.
20 — *Eocaudina* sp. *B;* Górno.
22, 24-29 — *Eocaudina subhexagona* Gutschick, Canis & Brill; borehole Chojnice.
31 — *Eocaudina* sp. *C;* borehole Chojnice.

All photographs are × 40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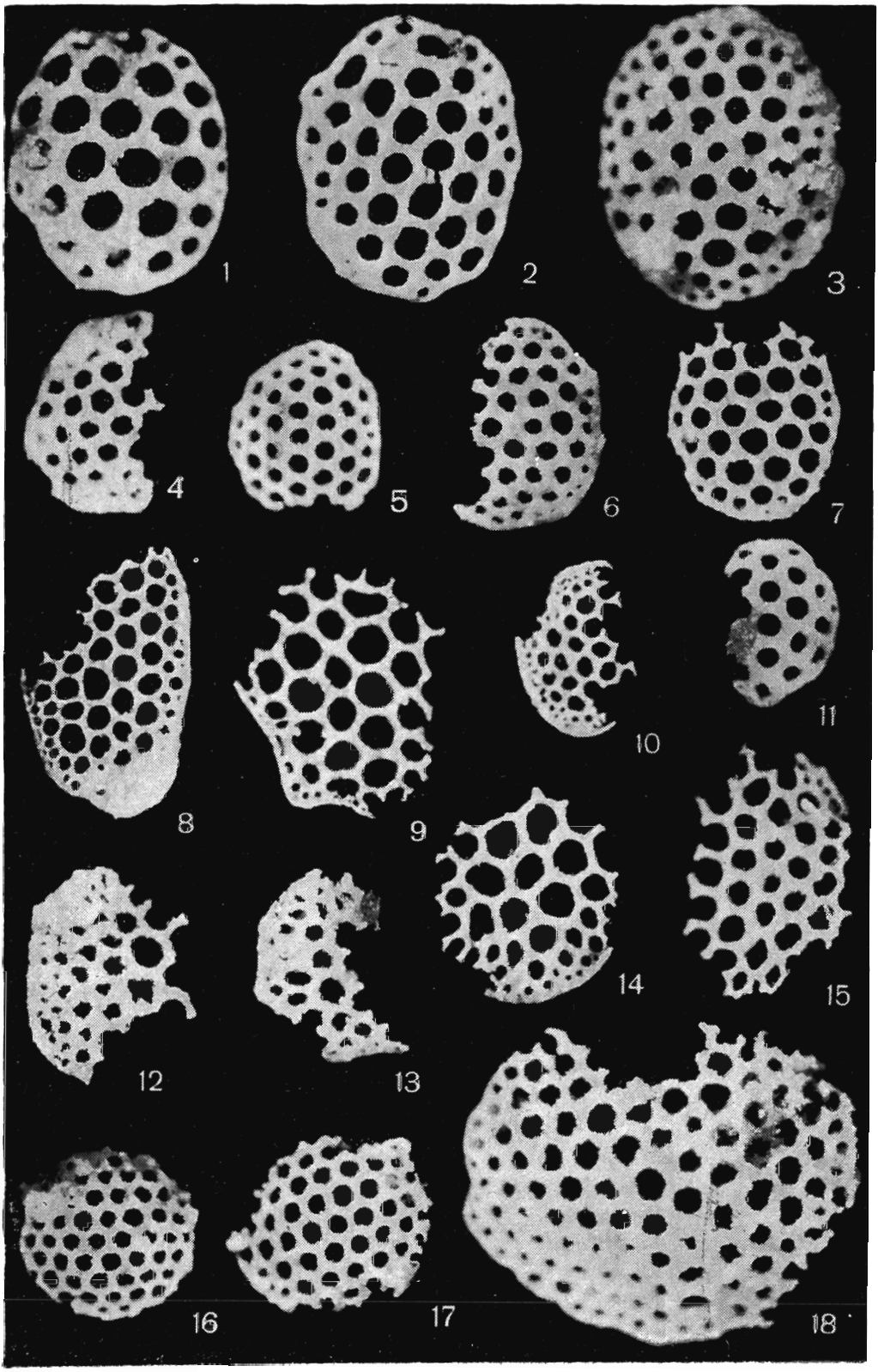
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60° and 120°, but due to the fact that the central perforations is surrounded by 7 and not 6 smaller perforations the geometry of the arrangement becomes distorted near the central part of sclerite.

Remarks. — The specimen described differs from *E. croneisi* in a somewhat larger diameter, larger number of perforations and their slightly different arrangement, but in the remaining characters it is most similar to the species mentioned above.

Occurrence. — Borehole Korczmin *IG-1* (depth 1,932.7 m) — Frasnian.

Eocaudina cf. *hexagona* Kristan-Tollmann, 1963
(Pl. 1, Fig. 11)

Material. — A fragmentary specimen.

Description. — A fragmentary sclerite in the form of a flat, perforate plate. Perforations uniform in size, hexagonal and arranged in rows intersecting at 60° and 120°. Skeleton of plate massive. Margin of sclerite not preserved.

Remarks. — The specimen resembles the holotype presented by Kristan-Tollmann (1963, p. 374, Pl. 9, Fig. 7), but due to the incomplete preservation of both the holotype and the specimen described it is impossible to say with a certainty whether or not they make up fragments belonging to one and the same species.

Occurrence. — Dalnia: Famennian through Tournaisian.

Eocaudina sp. *A*
(Pl. 1, Figs 15, 30; Pl. 2, Fig. 11)

Material. — Three fragmentary specimens.

Description. — Sclerites in the form of concavo-convex, perforate plates, varying in shape from circular through subhexagonal to oval. Perforations round, uniform in size and arranged in rows intersecting at 60° and 120°.

Remarks. — The specimens described have several characters of the species *E. subhexagona* such as the outline and convexity of plate and arrangement of perforations. On the other hand, the round perforations indicate a dissimilarity of the specimens described from forms typical of *E. subhexagona*. The last-named character makes these specimens similar to *E. gutschicki*. The possibility of the existence of

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PLATE 2

1-3, 7 — *Eocaudina ovalis* sp. n.; *1, 2* — Górno (*2* presents the holotype); *3, 7* — borehole Korczmin.
4 — *Eocaudina subhexagona* Gutschick, Canis & Brill; Dalnia.
5, 16, 17 — *Eocaudina mccormacki* Frizzell & Exline; borehole Korczmin.
6, 8-10, 15 — *Eocaudina marginata* (Langenheim & Epis); *6* — borehole Korczmin; *8-10, 15* — borehole Chojnice.
11 — *Eocaudina* sp. *A;* Kadzielnia.
12-14 — *Eocaudina* sp. *D;* borehole Chojnice.
18 — *Eocaudina* aff. *croneisi* (Gutschick); borehole Korczmin.

All photographs are × 40

forms transitional from *E. gutschicki* to *E. subhexagona* have already been discussed in literature (Mostler 1968a).

Occurrence. — Borehole Chojnice *2* (depth 3,142.3—3,148.5 m) — Palmatolepis rhomboidea Zone = *to IIβ* (Pl. 1, Fig. 15); Górno — Frasnian, *to Iα* (Pl. 1, Fig. 30); Kadzielnia — Palmatolepis gigas Zone = *to Iγ-δ* (Pl. 2, Fig. 11).

Eocaudina sp. *B*
(Pl. 1, Fig. 20)

Material. — One well preserved specimen.

Dimensions. — Plate — 0.21 mm; diameter of perforations — 0.04 mm.

Description. — Sclerites in the form of slightly arched, perforate, subtriangular plates. Perforations round, tending to oval near the margin of sclerite, uniform in size and arranged in rows intersecting at 60° and 120°. Margin distinctly developed with marginal perforations indistinctly marked on it and locally making its outline undulate. Perforations arranged in four rows according to the pattern 2-3-4-3.

Remarks. — In the outline of sclerite, number of rows of perforation and arrangement of perforations in rows the form described does not resemble any of so far known species.

Occurrence. — Górno — Frasnian (*to Iα*).

Eocaudina sp. *C*
(Pl. 1, Fig. 31)

Material. — One specimen.

Dimensions. — Plate — 1.05 ×0.94 mm.

Description. — Sclerite in the form of a perforate, slightly arched plate. The incompletely preserved plate is probably oval or subrectangular. Most perforations oval, reniform or strongly elongate, few subcircular. The long axis of perforations tend to a concentric arrangement along the margin of plate.

Remarks. — A massive plate and an elongate outline of perforations long axis of which is arranged concentrically clearly distinguish the species from all the other species of this genus.

Occurrence. — Borehole Chojnice *2* (depth 3,117.5—3,123.7 m) — *to IIβ—IIIβ.*

Eocaudina sp. *D*
(Pl. 2, Figs 12—14)

1967. *Eocaudina marginata* (Langenheim & Epis); R. C. Gutschick, W. F. Canis & K. G. Brill, p. 1468, Pl. 186, Figs 22—31; Pl. 187, Fig. 34.

Material. — Three fragmentary specimens.

Description. — Sclerites in the form of flat, perforate plates. Perforations varying in size and shape. Larger ones, concentrated in the central part of sclerite, are oval with their long axis radially diverging from the center of sclerite. Smaller ones are concentrated near the center and are oval to round. Margin distinctly developed, even.

Remarks. — Specimens illustrated and described by Gutschick, Canis & Brill (1967 — *cf.* synonymy), as well as those here examined may be clearly separated from the forms belonging to *E. marginata* despite a certain similarity to this species

they display. As a criterion of this separation we should adopt the shape and arrangement of central perforations which in *E. marginata* are round or subround and do not display any regularity, while in *Eocaudina* sp. *B* they are distinctly oval and are arranged radially from the center of sclerite. The fragmentarily preserved specimens do not entitle the writers to erect a new species, although there is such a necessity.

Occurrence. — Lower Mississippian of Montana, Missouri and Indiana (Gutschick, Canis & Brill 1967); borehole Chojnice *2* — *to IIβ—IIIβ* (depth 3,123.7—3,129.9 m — Pl. 2, Figs 12, 14; and depth 3,129.9—3,136.1 m — Pl. 2, Fig. 13).

Genus *PROTOCAUDINA* Croneis, 1932

Protocaudina sp.

(Pl. 1, Fig. 18)

Material. — A well preserved specimen.

Description. — Sclerite in the form of a subcircular, concavo-convex cup. Margin of sclerite distinctly developed and deflected inwards. Four circular to oval perforations occupy the center of sclerite and are surrounded by ten other perforations situated near its margin. The edges bordering each of these ten perforations are slightly bent towards the convex side of sclerite. Three closely spaced, tiny perforations occur between one of the ten perforations and the margin of sclerite.

Remarks. — This is the only specimen under study not assigned to the genus *Eocaudina*. Having its margin bent towards the center, being concavo-convex in shape and having four central perforations, it falls well in the genus *Protocaudina*. Since it has three small accessory perforations on the margin of sclerite, in contrast to the remaining representatives of this genus, this is probably an aberrant form.

Occurrence. — Grzegorzowice — Eifelian.

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SKLERYTY STRZYKW Z DEWONU POLSKI

(Streszczenie)

Przedmiotem pracy jest analiza sklerytów strzykw znalezionych w niektórych próbkach mikropaleontologicznych z utworów wapiennych środkowego i górnego dewonu aż po pogranicze z turnejem Gór Świętokrzyskich (profile Kadzielni, Dalni, Górna i Grzegorzowic) oraz górnego dewonu osiągniętego w wierceniach na Pomorzu i Lubelszczyźnie (*por.* fig. 1*A, B*).

W badanym materiale (*por.* fig. 2 oraz pl. 1—2) rozpoznano obecność 13 form, należących prawie wyłącznie do rodzaju *Eocaudina* Martin, w obrębie którego wyróżniono m. in. 3 gatunki nowe: *Eocaudina gornensis* sp. n., *E. ovalis* sp. n. oraz *E. quinqueordinata* sp. n. Obecność rozważanych sklerytów w nielicznych tylko próbkach pozwala sądzić, iż rozprzestrzenienie ich na dnie morza dewońskiego uwarunkowane było raczej przypadkowymi przyczynami tafonomicznymi.

Skleryty napotkane w osadach górnodewońskich są pierwszymi formami rozpoznanymi w osadach tego wieku.

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