HANNA GÓRKA, LIDIA ŁUSZCZEWSKA

HOLOTHURIAN SCLERITES FROM THE POLISH JURASSIC
AND TERTIARY
(Pl. LXVIII—LXXIX)

Skleryty holoturi z jury i trzeciorzędu Polski
(Tabl. LXVIII—LXXIX)

Abstract. Holothurian sclerites from the Polish Jurassic and Tertiary, assigned to the families: Synaptitidae, Priscopedatidae, Calcinamnidae, Theeliidae and Achistridae have been described. Ten genera, including a new one, Priscolongatus n. gen. and 30 species, including 13 new ones, have been distinguished. The new species are: Croneisites polonicus n. sp., Priscopedatus triangularis n. sp., P. bato-
niensis n. sp., P. jaworznicensis n. sp., P. pentaradiatus n. sp., P. denticulatus n. sp.,
P. bolkowiensis n. sp., P. octoperforatus n. sp., Priscolongatus quadriperforatus n. sp.,
P. obliquobrachiatus n. sp., Paracucumarites similis n. sp., Theelia dentata n. sp.
and Hemisphaeranthos ogrodzieciecensis n. sp.

INTRODUCTION

As compared with the Foraminifera and the Ostracoda, the calcareous skeletal elements of the Holothuroidea occur in sediments rather sporadically. The materials for the present paper have been collected over several years. They come from the Jurassic and Tertiary deposits. Their descriptions from the stratigraphic and micropalaeontological points of view either have been already published or are housed in the Archives of the Geological Institute in Warsaw.

Boring I.G.¹ Gałkówek 3. Lower Vesulian (Kuiavian), Garantiana tetragona zone and Middle Vesulian (Kuiavian), Parkinsonia subarietis zone (Archives of I.G.).

Boring I.G. Jarocin 1. Middle Vesulian (Kuiavian), Parkinsonia schlo-
enbach zone (Zn o s k o, 1959).


O g r o d z i e n i e c b r i c k y a r d — an outcrop in the southern region of the Cracow—Częstochowa Jurassic. Middle Bathonian, Morrisiceras morrisi zone (Błaszyk, 1967; K op i k, 1967; P a zd r o w a, 1967).

Boring I.G. Jaworzyk. Middle Vesulian (Kuiavian), Parkinsonia par-
kinsoni zone, Upper Vesulian (Kuiavian), Parkinsonia compressa zone, Lower Bathonian, Asphinctites tenuiplicatus zone, Middle Bathonian.

* Dr Hanna Górska, Lidia Łuszczewska, Zakład Paleontologii Uni-
wersytetu, Warszawa 22, al. Zwirki i Wigury 93, Poland.

¹ I.G. — Geological Institute.
Morrisiceras morrisi zone, Upper Bathonian, Paroecotraustes heterocostatus zone (Znasko, 1954, Archives of G.I.; Błaszyk, 1967).


Boring I.G. Choszczno I. Middle Oligocene (Lower Rupelian), Ceratobulimina contraria zone (Gortyńska, 1962; Wolańska, 1962).


Holothurian sclerites are not rather met with in the Cretaceous deposits of Poland. Among a few hundred samples examined from the Cretaceous materials, one Upper Maestrichtian specimen only was found in an upper marly layer at Kazimierz on the Vistula. This specimen, probably belonging to the genus Theelia Schlumberger, has not been taken into account in the present paper.

The holothurian sclerites described are assigned to the following five families: Synaptitidae Frizzel & Exline, emend. Frizzel & Exline, Priscopedatidæ Frizzel & Exline, Calcclamnidae Frizzel & Exline, Theeliidae Frizzel & Exline and Achistridae Frizzel & Exline. Ten genera, including a new one, i.e., Priscolonogatus n. gen. and 30 species, including 13 new ones, have been distinguished. The new species are as follows: Croneisites polonicus, Priscopedatus triangularis, P. batoniensis, P. jaworznicensis, P. pentaradiatus, P. denticulatus, P. bolkovienis, P. octoperforatus, Priscolonogatus quadriperforatus, P. obliquobrachiatius, Paracucumarites similis, Theelia dentata and Hemisphaeranthos ogrodzieńcensis.

The present writers had at their disposal many specimens, in particular those of the families Priscopedatidæ Frizzel & Exline and Achistridae Frizzel & Exline, which were well-preserved and occurred only in an isolated state. The material which came from a relatively long period (Jurassic-Tertiary) enabled the conclusion that the sclerites of the Holothuroidea formed certain assemblages of particular species and even genera characteristic of definite epochs and geological stages (Table 1).


In Poland, the sclerites of the Jurassic Holothuroidea were first described by Garbowska & Wierzbowski (1967).

A stereomicroscope, made by the Leitz Company, was used for the observation and drawing of the Holothurian sclerites, whereas the photographs of sclerites assigned to the genus Croneisites Frizzel & Exline were taken by means of a biomicroscope made by Zeiss Co. Photographs were taken in a transmitted light, except for a single specimen (Pl. LXIX, Fig. 9) which was photographed in a reflected light. Since test photographs of the remaining sclerites (which were small, glossy, relatively thick and with many, small details) were hardly legible, the present writers gave up their photographic documentation.

The specimens are housed in the collections of the Micropalaeontological Laboratory of the University of Warsaw where they have been marked with numbers ranging from H-I-1-1 to H-I-4-508. The letter H designates the Holothuroidea, the Roman numeral I — the first elabora-
tion, the first Arabic numeral — the successive number of a folder and the last Arabic numeral — the successive numbers of individual specimens.

The present writers would like to express their special gratitude to Professor O. Pazdro from the Micropalaeontological Laboratory of the Polish Academy of Sciences Department of Geological Sciences in Warsaw, to Doctor E. Łuczewska from the Chair of Palaeontology of the Mining and Metallurgy Academy in Cracow, as well as to the Directors of the Geological Institute in Warsaw for supplying samples and specimens for the elaboration.

Likewise, the present writers are indebted to Professor G. De flandre and Doctor M. De flandre-Rigaud from the Laboratoire de Micropaléontologie de l'Ecole Pratique des Hautes Etudes in Paris who, during the authors' work at that Laboratory, allowed them to study both their own and C. Schlu me rger's collections and discussed a few problems in the domain of taxonomy.

SYSTEMATIC DESCRIPTION

Family Synaptitidae Frizzel & Exline, 1955 emend. Frizzel & Exline, 1957

Genus Croneisites Frizzel & Exline, 1957

Types species: Croneisites oligozaenicus (Spa ndel). Syn. Synapta oligocaenic a Spa ndel from Oligocene of Germany (Spa ndel, 1900, pp. 50—51, Figs. 3—9).

Diagnosis of the genus: Sclerites in the form of perforated, concavo-convex plates, oval to elliptical in outline, with a narrow, arcuate strap connecting the peripheries of the sclerite at its narrower end on the concave side. Ten to twenty perforations, round or elliptical in outline, with even or denticulate edges, larger in the middle and smaller in the upper part of the plate.

Croneisites insignis Kristan-Tollmann, 1964
(Pl. LXVIII, Figs. 1, 2, 4, 6; Pl. LXIX, Fig. 9; Pl. LXX, Fig. 1)

1964 Croneisites insignis n. sp.: E. Kristan-Tollmann, Holothurien Sklerite..., pp. 92—93, Pl. 1, Figs. 3 and 4, Pl. 3, Figs. 1—4.

Material: Eighteen complete, well-preserved plates.

Dimensions (in mm): Length 0.21—0.28, width 0.19—0.24, cardinal perforations ab. 0.04×0.05 to 0.06×0.07.

Description: A perforated, concavo-convex plate, hexagonal in outline, elongate in the plane of symmetry and contracted in the upper part. Edge of plate even. Six cardinal perforations distributed in three longitudinal rows, more or less oval in outline. Their edges are finely denticulate, the denticles of one side of periphery being distributed in the plane of the convex side of plate and those of the other side of periphery — on the opposite side, i.e., in the plane of the concave side of plate. Among cardinal perforations, almost uniform in size and shape, conspicuous are the upper perforations of the middle row, distinguished by its subround shape and the smallest, denticulate perforations usually occurring over the last-named and being shaped like a rounded triangle.
## Occurrence of the Holothurian Sclerites in the Jurassic and Tertiary Sediments of Poland

<table>
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<th>Localities</th>
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<tr>
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<td>Turów</td>
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<tr>
<td>Jaworzynk</td>
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<td></td>
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<td></td>
<td>/Kuiavian/</td>
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<td>Gałków 3</td>
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<td></td>
<td>/Kuiavian/</td>
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Over the denticulate one, there occur two, symmetrically arranged, perforations shaped like elongate ellipses and devoid of denticles. An arcuate, smooth strap with one or more denticles on its most conspicuous curvature is attached to the edges of the elliptical perforations which are the nearest to the periphery of the plate. A single, small, round hole occurs in the apical, narrowed part of plate. In most specimens, the surface of plate is smooth, glossy and almost transparent, except for the denticles which are white and opaque. Three white, completely opaque plates have been found (Pl. LXIX, Fig. 9).

Variability: Variability is observed in the outer outline of plates. It may be pronouncedly hexagonal (Pl. LXVIII, Fig. 4), more rounded (Pl. LXVIII, Fig. 1) and elongate (Pl. LXIX, Fig. 9) or with its width equalling length (Pl. LXVIII, Fig. 6). Apical part is sometimes asymmetric with a larger or smaller hole and with a wider or narrower space between upper perforations devoid of denticles.

Remarks: Croneisites insignis Kristan-Tollmann from Poland differs from the specimens of this species, described by Kristan-Tollmann from Austria in almost twice as large dimensions and a smaller surface of the plate between cardinal perforations. Occurrence: Middle Tortonian of Austria (Kristan-Tollmann, 1964). Poland: Lower Sarmatian of Żrecze 3 (depths, 64.80—64.90 m and 59.30—59.40 m).

Croneisites cf. insignis Kristan-Tollmann, 1964
(Pl. LXVIII, Figs. 3 and 5; Pl. LXX, Figs. 2 and 3)

Material: Two complete, well-preserved and two damaged plates.

Dimensions (in mm): length, 0.23—0.28, with, 0.23—0.25, cardinal perforations, ab. 0.05×0.06 to 0.06×0.07.

Description: (cf. C. insignis Kristan-Tollmann). Half-way the length of the plate, a small, oval, finely denticulate depression occurs on one edge of the periphery.

Variability: On one of the plates (Pl. LXVIII, Fig. 5), there occurs a process which grows out of the periphery of the smallest, denticulate perforations of the middle row.

Remarks: Croneisites cf. insignis Kristan-Tollmann differs from C. insignis Kristan-Tollmann described above (p. 363) in the presence of a denticulate socket which occurs on the periphery of the plate and in almost twice as large dimensions.

Occurrence: Lower Sarmatian of Żrecze 3 (depth, 64.80—64.90 m).

Croneisites polonicus n. sp.
(Pl. LXVIII, Fig. 7; Pl. LXIX, Figs. 1—6, 8 and 10; Pl. LXX, Fig. 4)

Holotypus: Pl. LXVIII, Fig. 7 (H-I-4-408).

Locus typicus: Żrecze 3 (depth, 64.80—64.90 m).

Stratum typicum: Lower Sarmatian.

Derivatio nominis: Lat. polonicus, from Poland.

Material: Seventeen complete, well-preserved and four damaged plates.

Dimensions (in mm): holotype, length, 0.23, width, 0.20, cardinal perforations, ab. 0.007×0.008; paratypes, length, 0.24—0.26, width, 0.21—0.22, cardinal perforations, 0.005—0.008.
Diagnosis: Plate perforate, concavo-convex, hexagonal in outline, with an even edge. Six cardinal perforations are denticulate. Above them, in the apical part, there occur three smaller perforations with an arcuate strap.

Description: A perforate, concavo-convex plate, hexagonal in outline, with rounded sides, elongate in the plane of symmetry. Edge of plate even. Six cardinal perforations are distributed in three longitudinal rows. They are oval in outline and have finely denticulate peripheries. Denticles of one side of periphery are distributed in the plane of the convex side of plate and those of the opposite side of periphery — in the plane of the concave side of plate. Among the cardinal perforations, the upper one of the middle row is distinguished by its rounded sub-triangular shape. It is smaller but also denticulate. Two perforations shaped like an elongate ellipsis and devoid of denticles are symmetrically arranged over it. An arcuate strap grows out of their edges which are nearer the periphery of the plate. Three, very regularly distributed, small perforations occur in the apical part of plate. The surface of plate is smooth and glossy.

Variability: The plates of Croneisites polonicus n. sp. differ from each other in their outer outline which is either markedly hexagonal (holotype) or rounded (Pl. LXIX, Fig. 8) or more elongate (Pl. LXIX, Fig. 1) and in the thickness of the strap which in some cases is covered with tubercles (Pl. LXIX, Fig. 1). A specimen was also found which had only two small perforations in its apical part.

Remarks: Croneisites polonicus n. sp. is similar to C. insignis Kristan-Tollmann described above (p. 366) in the shape and situation of its cardinal perforations and in the presence of a strap occurring in the apical part. On the other hand, it differs from this species in smaller dimensions and greater number of small perforations in the apical part. In the last-named character Polish specimens resemble the plates of the Recent Holothuroidea, i.e., Synapta recta Semper described from the Philippine Islands (Semper, 1868, p. 14, Pl. 4, Figs. 2 and 3) and Polyplectana kefersteinii (Seleńka) (fide Clark, 1907, p. 77, Pl. 4, Fig. 20). C. polonicus n. sp. is also similar in its general shape to Synaptes laevigatus (Schlumberger) Deflandre-Rigaud from Eocene of France (fide Frizzel & Exline, 1955, p. 147, Pl. 9, Fig. 11), except for the fact that the latter species has smaller and more numerous perforations, irregularly distributed in the apical part of the plate.

Occurrence: Lower Sarmatian of Żrecze 3 (depth 64.80—64.90 m).

Croneisites sp.
(Pl. LXIX, Fig. 7; LXX, Fig. 5)

Material: One well-preserved specimen.
Dimensions (in mm): length, 0.22, width, 0.20, cardinal perforations, ab. 0.04×0.05.
Description: An asymmetric plate, irregularly hexagonal in outline, concavo-convex. Six cardinal perforations, oval in outline, are distributed in three longitudinal rows. Their peripheries are finely denticulate, the denticles of one side of the periphery being distributed in the plane of the convex part of plate and those of the opposite side of the periphery — in the plane of the concave part of plate. A small perforation, shaped
like a rounded triangle and devoid of denticles occurs over cardinal perforations of the middle row. Above this triangular perforation, there are distributed two other perforations, devoid of denticles, somewhat than the cardinal ones and shaped like an elongate ellipsis, one of them being slightly deformed. On their edges nearer the periphery of the plate, a small arcuate strap with a fine denticle, occurring at the point of the strongest curvature, is attached to the concave side of the plate. A very small, round hole occurs axially in the apical part of the plate. Half-way the length of the plate, another oval perforation devoid of denticles and half the size of cardinal ones occurs on one of the sides of the plate. On the same side, in the lower part of the periphery of the plate, a fairly large, oval depression is observed which in the side is limited by a small convexity and, on the other, by a massive, hooklike protuberance.

Remarks: Croneisites sp. differs from C. insignis Kristan-Tollmann and C. polonicus n. sp. described above in an asymmetric structure which, however, cannot be considered a symptom of variability.

Occurrence: Lower Sarmatian of Žrecze 3 (depth, 59.30—59.40 m).

Family Priscopedatidae Frizzel & Exline, 1955

Genus Priscopedatus (Schlumberger, 1890) emend.

Deflandre-Rigaud, 1961

Typespecies: Priscopedatus pyramidalis Schlumb. from Eocene of France (Schlumberger, 1890, p. 201, Figs. 26—29).

Diagnosis of the genus: A sclerite in the form of a perforate plate, variable in shape, i.e. circular, oval, stellate or more or less regularly polygonal. On one side of the plate, there occurs an elevation in the form of a cone or crossed straps, which may be either smooth or denticle, low or high and covering one or four central perforations. Perforations smooth, elliptical or polygonal.

Priscopedatus triangularis n. sp.

(Pl. LXXI, Figs. 1—6)

Holotypus: Pl. LXXI, Fig. 5 (H-I-1-52).

Locustypicus: Jaworznik (depth, 21.50 m).

Stratumtypicum: Middle Bathonian.

Derivatio nominis: Lat. triangularis = triangular.

Material: Thirty well-preserved specimens.

Dimensions (in mm): holotype, length 0.26, width 0.20; paratypes, length 0.21—0.23, width 0.18—0.22.

Diagnosis: A plate triangular in outline, with rounded corners and three perforations. A conical elevation, consisting of four pillars and covering a central perforation, occurs in the middle of the plate.

Description: A plate shaped like a triangle with rounded corners and with one side always more or less concave. Round perforations, usually more or less uniform in size, are regularly distributed near the corners. In the middle of one side of the plate, a conical elevation with rounded apex is formed by four pillars and covers a central perforation, usually larger than the rest of them. Plates glossy, almost transparent.

Variability: Slight differences are observed in the outer outline of plates. The conical elevation more or less completely covers the central
perforation. Two plates have been found having five and not three perforations varying in length and irregularly distributed (Pl. LXXI, Figs. 4 and 6).

Remarks: A plate of *Priscopedatus triangularis* n. sp. does not resemble any other of the species of this genus described so far.

Occurrence: Middle (depths, 34.0 and 21.5 m) and Upper Bathonian (depth, 19.0 m) of Jaworzniak.

*Priscopedatus batoniensis* n. sp.

(Pl. LXXI, Figs. 7–10; Pl. LXXII, Figs. 1–7)

**Holotypus:** Pl. LXXI, Fig. 7 (H-I-2-67).

**Locus typicus:** Jaworzniak (depth, 19.0 m).

**Stratum typicum:** Upper Bathonian.

**Derivatio nominis:** Lat. batoniensis — from the Bathonian.

**Material:** Fifteen well-preserved plates.

**Dimensions** (in mm): Holotype, length 0.32, width 0.23; paratypes, length 0.23–0.30, width 0.23–0.27.

**Diagnosis:** A perforate, triangular plate with a process. It has a central perforation covered with a conical elevation.

**Description:** A perforate plate, having three arms narrowing towards a rounded apex and a projecting process. A conical elevation with a rounded apex, consisting of four pillars covering the central perforation occurs in the middle on one side of the plate. This perforation, twice as large as the rest of them, is clearly visible from the opposite of the plate. Usually, it is surrounded by three round, fairly regularly distributed, perforations. The surface of the plate is smooth and glossy.

**Variability:** The plates of *Priscopedatus batoniensis* n. sp. are marked by a considerable degree of variability in the outer outline and distributions of perforations. An angle of deflection of the process from the axis of symmetry of the plate and the thickness of pillars which, in some cases, are so massive and fused together that they form a solid cone, are other variable characters.

Remarks: *Priscopedatus batoniensis* n. sp. differs from *P. triangularis* n. sp., described above, in outer outline of the plate and in the presence of not more than one only solid process.

Occurrence: Middle (depths, 34.0, 29.2, 23.0 and 21.5 m) and Upper (depths, 20.5 and 19.0 m) Bathonian of Jaworzniak.

*Priscopedatus jaworznicensis* n. sp.

(Pl. LXXII, Figs. 8–10; Pl. LXXIII, Figs. 1–8)

**Holotypus:** Pl. LXXIII, Fig. 1 (H-I-2-74).

**Locus typicus:** Jaworzniak (depth, 19.0 m).

**Stratum typicum:** Upper Bathonian.

**Derivatio nominis:** Lat. jaworznicensis — from Jaworzniak.

**Material.** Twenty well-preserved specimens.

**Dimensions** (in mm): Holotype, length 0.25, width 0.19; paratypes, length 0.19–0.29, width 0.19–0.27.

**Diagnosis:** A quadrilateral plate with undulate sides. A large, central perforation, covered by a conical elevation, is surrounded by eight smaller, oval perforations.

**Description:** A perforate plate, fairly regular in structure. Its outer outline is approximating that of a tetragon with undulate sides. The
undulation is formed by convexities which correspond to the situation
of perforations surrounding the middle of the plate. A conical elevation
consisting of four pillars, having a common apex, which is more slender
than the entire cone, occurs in the middle of one side of the plate. It
covers a fairly large central perforation which is surrounded by eight
oval, marginally distributed perforations which are almost uniform in
size but each of them is about half the size of the central one. Surface
smooth, glossy.

Variability: The outer outline of the plate may be more or
less undulate. Sometimes, the width of the plate equals the length
(Pl. LXXII, Fig. 9a; Pl. LXXXIII, Fig. 3).
Remarks: In its general outline, Priscopedatus jaworznicensis n. sp.
slightly resembles P. pyramidalis Schlumberger, from Eocene of France
(Schlumberger, 1888, p. 440, Figs. 8—11, in particular Fig. 8),
first described as Thyonidium sp. and then as Priscopedatus Schlumberger,
(1890, p. 201, Figs. 26—29). This specimen is housed
in the collections of the Micropalaeontological Laboratory of the E.P.H.E.
in Paris under No. AV62. Our new species differs from this specimen
in the shape of the apex of the conical elevation which, in cross section,
is not quadrilateral and has not characteristic longitudinal incisions. In
addition, all specimens of P. jaworznicensis n. sp. have eight marginal
perforations and the dimensions of a specimen are twice as large.
Occurrence: Lower (depth, 43.0 m), Middle (depths, 29.2, 24.0 and
21.5 m) and Upper (depths, 20.5 and 19.0 m) Bathonian of Jaworznik.

Priscopedatus pentaradiatus n. sp.
(Pl. LXXXIII, Figs. 9—11)

Holotypus: Pl. LXXIII, Fig. 9 (H-I-2-71).
Locus typicus: Jaworznik (depth, 19.0 m).
Stratum typicum: Upper Bathonian.
Derivatio nominis: pentaradiatus, Greek penta — five, Lat.
radiatus — radiate, having five radii or being pentaradial.
Material: Ten well-preserved specimens.
Dimensions (in mm): Holotype, length 0.30, width 0.22; paratypes,
length 0.24—0.28, width 0.16—0.20.
Diagnosis: Plate pentaradial with five oval, marginal perforations
and a central perforation, covered with a conical elevation formed by
four pillars.
Description: A perforate, pentaradial plate, fairly regular in struc-
ture. Outer outline determined by five incisions and five bulges slightly
narrowing towards apexes. Each bulge corresponds to one of the five
oval, marginal perforations which regularly surround the middle of the
plate. In the middle, on one side of the plate, a conical elevation occurs
which consists of four solid pillars completely covering the central per-
fusion. The latter is visible only on the opposite side of the plate. The
basics of pillars are, in all cases, oriented towards the largest three inci-
sions of the outer outline of the plate which in turn are oriented towards
each other at a right angle.

Variability: Plates slightly differ from each other in the depth
of incisions and size of bulges.
Occurrence: Middle (depth, 21.5 m) and Upper (depth, 19.0 m) Ba-
thonian of Jaworznik.
Priscopedatus denticulatus n. sp.
(Pl. LXXIV, Figs. 1—4)

Holotypus: Pl. LXXIV, Fig. 1 (H-I-1-49).
Locustypicums: Jaworzniak (depth, 65.5 m).
Stratumtypicum: Middle Vesulian (Kulavian).
Derivation nominis: Lat. denticulatus — denticulate.
Material: Ten specimens, including two well-preserved.
Dimensions (in mm): Holotype, length 0.21, width 0.18; paratypes,
length 0.25—0.26, width 0.20—0.22.
Diagnosis: A pentaradial plate with five oval perforations and a
central perforation covered with a conical elevation formed by four
denticulate pillars.
Description: A perforate plate, fairly regular in structure, almost
symmetrical. The outer outline is determined by an undulate line form-
ing what looks like five arms connected with five oval perforations sur-
rounding a central, larger perforation, which — on one side of the plate —
is covered with a conical elevation formed by four solid pillars. One or
two denticles occur on the edges of the pillars. Bases of pillars are, in
all cases, oriented towards the surrounding perforations. Surface smooth,
glossy.

Variability: Plates differ from each other in their outline which
may be more or less undulate. The height of conical elevations is also
variable. In addition, the denticles on the edges of pillars may be more
or less conspicuous.
Remarks: Priscopedatus denticulatus n. sp. differs from P. pentara-
diatus n. sp., described above (p. 370) in a different orientation of these
bases of pillars which form a conical elevation and which are shifted
by 45°. In addition, in all specimens of P. denticulatus n. sp., denticles
occur on the edges of pillars.
Occurrence: Middle Vesulian (Kulavian) (depth, 65.60 m), Middle
(depths, 35.0, 34.2 and 27.0 m) and Upper (depth, 19.0 m) Bathonian of
Jaworzniak.

Priscopedatus boltkowiensis n. sp.
(Pl. LXX, Figs. 6—9)

Holotypus: Pl. LXX, Fig. 6 (H-I-2-118).
Locustypicums: Bolków (depth, 50.3 m).
Stratumtypicum: Kimmeridgian.
Derivation nominis:boltkowiensis — from Bolków.
Material: Fourteen well-preserved plates.
Dimensions (in mm): Holotype, length 0.17, width 0.15; paratypes,
length 0.19—0.23, width 0.12—0.14.
Diagnosis: An irregular plate, with scalloped margins, with or without
marginal perforations, provided with a conical elevation covering the
central perforation.
Description: A plate with outer outline irregular, scalloped, slightly
perforate or devoid of perforations. In the middle of one side of the plate,
there occurs a fairly large, clearly predominant conical elevation com-
pletely covering the central perforation which is larger than the remain-
ing ones — if any of them are present — and visible on the opposite side.
The plane of a horizontal section through the conical elevation is shaped
like a strongly rounded tetragon. Plate is fairly thin, its surface smooth.
Variability: Variability concerns the outer outline of the plate and the presence of marginal perforations.

Remarks: In all specimens of *Priscopedatus bolkoviensis* n. sp. the apex of conical elevation is broken off. The central perforation is mostly filled with sediment, the same as the conical elevation which seems to be hollow and thin-walled. This species does not resemble any representative of this genus described so far.

Occurrence: Kimmeridgian of Bolków (depth, 50.3 m).

*Priscopedatus octoperforatus* n. sp.

(Pl. LXXXIV, Figs. 5—8)

Holotypus: Pl. LXXIV, Fig. 5 (H-I-1-12).
Locus typicus: Jaworznik (depth, 50.3 m).
Stratum typicum: Lower Bathonian.
Derivatio nominis: octoperforatus, Greek octo — eight, Lat. perforatus — perforate; having eight perforations.
Material: Twelve well-preserved specimens.
Dimensions (in mm): Holotype, length 0.21, width 0.16; paratypes, length 0.24—0.28, width 0.16—0.23.
Diagnosis: An irregular plate, with outer outline undulate and with eight oval perforations. Central perforation covered with a conical elevation consisting of four pillars.

Description: A perforate plate, more or less undulate in outline, with small incisions and bulges, two of which, facing each other, are usually the most elongate. In the middle of one side of the plate, a conical elevation formed by four solid pillars covers the central perforation which is clearly visible from the opposite side of the plate. The conical elevation is surrounded by eight, regularly distributed, oval perforations. Four of them, situated at the bases of pillars, are usually smaller than the remaining ones. Surface smooth, glossy.

Variability: The outer outline of the plates is variable. The difference in size between the perforations situated at the bases of pillars and the remaining ones is either considerable or small. One of the plates (Pl. LXXXIV, Figs. 7a, b) has an additional, ninth perforation situated nearer the periphery of the plate and outside the circle of perforations which surround the conical elevation.

Occurrence: Middle Vesuvian (Kuiavian) of Gałkówek (depth, 112.60 m), Lower (depth, 50.30 m) and Middle (depths, 39.20 and 34.0 m) Bathonian of Jaworznik.

*Priscopedatus* sp.

(Pl. LXXXV, Figs. 1—6)

Material: Many specimens in which the perforate plate is strongly damaged and the conical elevation very well—preserved.
Dimensions: The height of the conical elevation amounts to 0.05—0.10 mm.
Description: A conical elevation formed by four solid pillars which on their margins have mostly one or two denticles. Apex of the conical elevation elongate and, in all cases, terminating in a finely denticulate crown.
Remarks: A considerable degree of damage done to the plates prevents an accurate determination of the plan of their structure and of their specific assignment. It is possible, however, that the specimens of the
species *P. jaworznicensis* n. sp. and *P. denticulatus* n. sp., described above, are characterized by precisely such conical elevations. It seems in turn that, in these specimens, as a result of fossilization, the conical elevations have not been preserved, to such an extent.

**Occurrence:** Middle Bathonian of Ogrodzieniec, as well as Middle (depths, 29.20, 27.0, 24.0 and 23.0) and Upper (depths, 20.5 and 19.0 m) Bathonian of Jaworzynik.

**Genus Priscolongatus** n. gen.

**Type species:** *Priscolongatus quadriperforatus* n. gen., n. sp. from the Middle Oligocene of Choszczno 1. boring.

**Derivatio nominis:** *Priscolongatus*, Lat. priscus — old, ancient, longatus — elongate.

**Diagnosis:** An elongate, concavo-convex sclerite, with two or four arms. A conical elevation, mostly surrounded by four perforations, occurs in the central part.

**Remarks:** Despite the fact that this genus is similar to *Priscopedatus* (Schlumberger) emend. Deflandre-Rigaud, 1961 and *Calc glamnella* Frizzel & Exline, 1955, it seems right to erect a new genus, *Priscolongatus* within the family Priscopedatidae Frizzel & Exline. It differs from *Priscopedatus* in its always elongate shape and in the lack of central perforation and from *Calc glamnella* Frizzel & Exline — in the presence, in the central part, of a characteristic conical convexity and in a different arrangement of perforations.

**Priscolongatus quadriperforatus** n. sp.

*(Pl. LXXV, Figs. 7—12)*

**Holotypus:** Pl. LXXV, Fig. 7 (H-I-3-215).

**Locus typicus:** Choszczno 1 (depth, 148.8 m).

**Stratum typicum:** Middle Oligocene.

**Derivatio nominis:** Quadriperforatus: Lat. quadri — four, perforatus — perforate; having four perforations.

**Material:** — Many, well-preserved specimens, some of them having perforations filled with sediment.

**Dimensions** (in mm): Holotype, length 1.03, width 0.47; paratypes, length 0.75—1.0, width 0.20—0.41.

**Diagnosis:** An elongate sclerite, rhomboidal in outline, with a small conical elevation and four perforations occurring in the central part.

**Description:** An elongate sclerite, rhomboidal in outline, more or less rounded, with two arms which are elongate and narrowing towards rounded apexes. On one side of the plate, in the middle of the central, extended part, a small conical elevation is surrounded by four, oval, regularly distributed, perforations. The plate is slightly concavo-convex, the lumen of perforation being narrower on the concave side.

**Variability:** Variability is observed in the elongation of arms, extension of the central part and size of perforations.

**Remarks:** In the general shape and the presence of four perforations in the central part, *Priscolongatus quadriperforatus* n. sp. resembles a sclerite of the Recent *Molpadia musculus* (Risso) — fide Cronelis & Cormanck (1932, pp. 121—122, Pl. 17, Figs. 11—13 and 18—23) and Clark (1907, Pl. 11, Fig. 13), from which it differs, however, in the presence of a convexity in the central part and in larger dimensions. In
their outline and concavo-convex shape, some specimens of *P. quadriperforatus* n. sp. (H-I-3-218) also resemble *Calclamnella fusiformis De fl.-Rig.* from the Middle Oligocene of Halstein (De flandre-Rigaud, 1959, Pl. 1, Figs. 8 and 9, Pl. 2, Fig. 11), but differ from it in having a conical elevation in the central part (a generic character) and in a different distribution of perforations.

**Occurrence:** Lower Rupelian of Choszczno 1 (depth, 154.0, 153.7 and 148.8 m) and Gorzów Wielkopolski 1 (depth, 167.7 m).

*Priscolonogatus obliquobrachiatius* n. sp.
(Pl. LXXV, Fig. 13; Pl. LXXVI, Figs. 1—3)

**Holotypus:** Pl. LXXV, Fig. 13 (H-I-3-207).
**Locus typicus:** Choszczno 1 (depth, 148.8 m).
**Stratum typicum:** Middle Oligocene.
**Derivatio nominis:** obliquobrachiatius, Lat. obliquus = oblique, brachiatius = branched.
**Material.** — Twelve well-preserved specimens; in some of them perforations are filled with sediment.
**Dimensions** (in mm): Holotype, length 0.90, width 0.49; paratypes, length 0.64—1.05, width 0.45—0.61.
**Diagnosis:** An elongate sclerite, with four arms, having in the central part a conical elevation and four perforations.
**Description:** A sclerite subquadrilateral in outline, with four, elongate and rounded arms, two of which, larger and more solid, are situated along the same axis. The remaining two are shorted and situated not axially but obliquely to the former two, the angles of intersection of their axes amounting to ab. 60°. A conical elevation, surrounded by four oval perforations regularly distributed along the axis of arms, occurs in the central part. The plate is slightly concavo-convex. On the concave side, the lumens of perforations are narrower.
**Variability:** Variability is observed in the thickness of arms, degree of their elongation and rounding, as well as in the size of perforations.

**Occurrence:** Lower Rupelian of Choszczno 1 (depths, 150.1 and 148.8 m) and Gorzów Wielkopolski 1 (depth, 176.0 m).

*Priscolonogatus* sp. 1
(Pl. LXXVI, Fig. 4)

**Material:** One very well-preserved specimen.
**Dimensions** (in mm): length, 0.73, width, 0.16.
**Description:** A sclerite in the form of an elongate, thick concavo-convex plate, fusiform in outline. On the convex side, a conical elevation shaped like a 5-pointed star occurs in the central, extended part. Five oval, very small perforations are distributed between the arms of this star. On the opposite side of plate which is concave the lumens of perforations are narrower.
**Remarks:** *Priscolonogatus* sp. 1 does not resemble any holothurian sclerite described so far.

**Occurrence:** Lower Rupelian of Choszczno 1 (depth, 148.8 m).

*Priscolonogatus* sp. 2
(Pl. LXXVI, Figs. 5 and 6)

**Material:** Two specimens, one well-preserved and one damaged.
**Dimensions** (in mm): length, 0.64—0.70, width 0.39—0.41.
Description: An asymmetric sclerite, in the form of a thick plate subtetragonal in outline, with three narrowing arms, having rounded apexes and two of which are situated along the same axis. An elevation occurs instead of the fourth arm. The central part is provided, on one side of the plate, with a conical elevation, four oval perforations at the bases of arms and a fifth, crescentiform, which occurs laterally.

Variability is observed in the size of perforations.
Occurrence: Lower Rupelian of Choszczno 1 (depth, 148.8 m).

Family Calclamnidae Frizzel & Exline, 1955

Genus Calclamnella Frizzel & Exline, 1955

Type species: Calclamnella irregularis (Schlumb.) Frizzel & Exline from Eocene of France (Schlumberger, 1890, pp. 199—200, Text-figs. 20 and 21).

Diagnosis: A sclerite in the form of a perforate, flat plate rectangularly to elliptically elongate with two longitudinal rows of perforations; periphery even or incised and irregular.

Calclamnella sp.
(Pl. LXXVI, Fig. 7)

Material: One very well-preserved specimen.
Dimensions (in mm): length, 0.70, width, 0.22.
Description: A sclerite in the form of an elongate plate with two arms along one axis and with rounded apexes. Three oval perforations occur in the central, extended part. Two of them are situated one over another and the third — to one side. Edges even.
Remarks: In its shape and in the presence of perforations arranged in two rows, Calclamnella sp. resembles C. fusiformis Defl. - Rigaud, from the Middle Oligocene of Holstein (Deflandre - Rigaud, 1959, p. 192, Pl. 1, Figs. 8 and 9, Pl. 2, Fig. 11), from which it differs, however, in larger dimensions and different number of perforations. In its shape, Calclamnella sp. also resembles the Recent sclerites of Molpadia musculus (Risso), discussed above (p. 373) from which it differs in the number of perforations.
Occurrence: Lower Rupelian of Gorzów Wielkopolski 1 (depth, 170.6 m).

Genus Calclamma Frizzel & Exline, 1955

Type species: Calclamma germanica Frizzel & Exline from the Lias of Germany and England (Frizzel & Exline, 1955, pp. 76—77, Pl. 2, Figs. 1—5).
Diagnosis: A sclerite in the form of a perforate plate, frequently with a bilateral symmetry, rectangular or subrectangular, relatively wide. Perforations varying in size, arranged in more than two rows or forming a cruciform pattern.

Calclamma sp. 1
(Pl. LXXVI, Fig. 9)

Material: One well-preserved specimen.
Dimensions (in mm): length, 0.22, width, 0.18.
Description. A sclerite in the form of a concave-convex, perforate
plate, subrectangular and slightly undulate in outline. Perforations round, almost uniform in size, arranged in three rows. The fourth row consists of four smaller perforations distributed in pairs.

Remarks: *Calcclama* sp. 1 does not resemble any representative of this genus described so far.

Occurrence: Lower Sarmatian of Žrecze 3 (depths, 64.8—64.9 m).

*Calcclama* sp. 2

(Pl. LXXVI, Fig. 8)

Material: One well-preserved specimen.

Dimensions (in mm): length, 0.22, width, 0.20.

Description: A sclerite in the form of a concave-convex, perforate plate with an outline resembling a rounded rectangle with deep, undulate incisions. Perforations round, more or less identical in size, arranged in three rows.

Remarks: *Calcclama* sp. 2 does not resemble any representative of this genus described so far.

Occurrence: Lower Sarmatian of Žrecze 3 (depths, 64.8—64.9 m).

Genus *Cucumarites* De fl andr e - R i g a u d, 1949


Type species: *Cucumarites mortensi* (Frizzel & Exline) Rioult = Syn. Eoecaudina mortensi Frizzel & Exline from Lias of Germany (De fl andr e - R i g a u d, 1959, p. 191).

Diagnosis: A sclerite in the form of a flat or slightly convex plate varying in shape from round to elliptical, rounded or polygonally rounded. Periphery of the plate smooth, incised, denticulate, or scalloped. Perforations round or polygonal, devoid of denticulations, irregularly distributed.

Remarks: This genus was discussed by De fl andr e - R i g a u d (1959, p. 191) and Rioult (1960, pp. 134—135).

*Cucumarites mortensi* (Frizzel & Exline)

De fl andr e - R i g a u d, 1959

(Pl. LXXVI, Figs. 10—13)

1937 Spicules of dendrochirote holothurians (in part); T. Mortensen, Some echinoderm remains..., p. 24, Pl. 4, Fig. 5 (not Fig. 4).

1955 *Eoecaudina mortensi* n. sp.; L. Frizzel & H. Exline, Monograph of Fossil Holothurian..., p. 88, Pl. 3, Fig. 10.

1959 *Cucumarites mortensi* (Frizzel & Exline); M. De fl andr e - R i g a u d, Sur quelques sclérites..., p. 191.

1960 *Cucumarites mortensi* (Frizzel & Exline); M. Rioult, Les sclérites d'Holothuries..., p. 135.

1961 *Cucumarites mortensi* (Frizzel & Exline) De fl andr e - R i g a u d; M. De fl andr e - R i g a u d, Contribution..., p. 62, Fig. 37—42, Pl. 1, Fig. 8.

Material: Many, incomplete specimens.

Dimensions (in mm): diameter, 0.30—0.40, perforations, 0.04—0.06.

Description: A sclerite in the form of a flat and thin plate irregularly rounded in outline. Perforations more or less round, varying in size and arranged in rows. Edge of plate slightly incised.
Variability is observed in the shape of plate and perforations, size of the latter and degree of incision of the edge of plate. Remarks: In its general outline, Cucumarites mortensenii (Frizzel & Exline) Deflandre-Rigaud resembles Eoaulina subtrigonalis Kristan-Tollmann from the Middle Tortonian of Austria (Kristan-Tollmann, 1964, p. 86, Pl. 6, Figs. 1 and 2) from which it differs in a greater number of perforations. Occurrence: Lias of Germany and England (Frizzel & Exline, 1955), Oxfordian of France (Deflandre-Rigaud, 1961). Poland: Middle Vesulian (Kuiavian) (depths, 66.7 and 62.4 m), Middle (depths, 29.2 and 21.0 m) and Upper (depths, 20.0 and 19.0 m) Bathonian of Jaworzniık.

Cucumarites robustus Deflandre-Rigaud, 1961
(Pl. LXXVII, Figs. 1—4)

1961 Cucumarites robustus cent. nov. vel parasp. nov.; M. Deflandre-Rigaud, Contribution..., p. 64, Figs. 50 and 51.

Material: Many, well-preserved but incomplete specimens.
Dimensions (in mm): diameter, 0.21—0.34, perforations, 0.02—0.07.
Description: A sclerite in the form of an irregular, thick plate. Perforations round. Periphery of plate incised.
Remarks: Specimens of Cucumarites robustus Defl.-Rig., including a holotype, described by Deflandre-Rigaud (1961) were also incomplete and, therefore, it is difficult to determine what their shape was like.

Occurrence: Oxfordian of France (Deflandre-Rigaud, 1961). Poland: Upper Vesulian (Kuiavian) (depth, 57.9 m), Lower (depths, 53.3, 48.0, 39.0 and 36.2 m), Middle (depths, 34.0 and 27.0 m) and Upper (depth, 19.0 m) Bathonian of Jaworzniık, as well as Lower Sarmatian (depths, 64.8—64.9 m) of Żrecze 3.

Genus Paracucumarites Deflandre-Rigaud, 1961 emend.

Type species: Paracucumarites hamptoni Defl.-Rig. from the Oxfordian of France (Deflandre-Rigaud, 1961, p. 68, Figs. 57—60). The diagnosis (given by Deflandre-Rigaud, 1961, p. 67) is as follows: „Scléri tes en plaques perforées à double couche, la seconde occupant d’abord la partie centrale et pouvant éventuellement s’étendre jusqu’au bord.”

Remarks: The present writers suggest to supplement the above diagnosis by the introduction of the following terms: the upper and lower layer (or plate) and the more or less incised outline.

Paracucumarites similis n. sp.
(Pl. LXXVII, Figs. 5—8)

Holotypus: Pl. LXXVII, Fig. 6 (H-I-3-351).
Locutypicus: Jaworzniık (depth, 24.5 m).
Stratum typicum: Middle Bathonian.
Determination nominis: Lat. similis = similar.
Material: Eight specimens varying in their state of preservation.
Dimensions (in mm): Holotype, diameter ab. 0.32; paratypes, 0.20—0.25.
Diagnosis: A bilamellate perforate plate, with an incised outline similar to a rounded rectangle. Perforations round to oval.

Description: A plate with an incised outline, similar to a rounded rectangle, consisting of two layers. The lower layer has round to oval perforations, more or less uniform in size and forming a regular network. Perforations of the upper layer, which incompletely covers the lower one, are identical in shape and size or slightly larger than those of the lower layer.

Variability is observed in the relation of the size of both layers and their perforations, as well as in the extent to which the outline of plate is incised.

Remarks: In the characters of its perforations (their shape, size and distribution) and the incised outline of its plate, Paracucumarites similis n. sp. is similar to Cucumarites mortensenii (Frizzel & Exline) Deflandre-Rigaud described above (p. 376). Our new species may be compared with P. hamptoni Deflandre-Rigaud from Oxfordian of France (Deflandre-Rigaud, 1961, p. 68, Figs. 57—60) and particularly to those specimens in which, according to the author of this species, the upper layer resembles C. mortensenii (Frizzel & Exline) Defl.-Rigaud. Our species differs, however, from these specimens in larger and more numerous perforations, as well as in a more strongly incised outline.

Occurrence: Lower (depth, 43.0 m), Middle (depths, 24.0, 23.0 and 22.5 m) and Upper (depth, 19.0 m) Bathonian of Jaworznik.

Paracucumarites sp.
(Pl. LXXVII, Fig. 9)

Material: One specimen.

Dimensions (in mm): length, 0.37, width, 0.27.

Description: An irregular plate, with an incised outline and consisting of two perforate layers, the lower, relatively thick and with densely, regularly distributed, round perforations and the upper which covers 3/4 of the surface of the lower. Perforations of the upper layer are large, irregular and polygonal in outline.

Remarks: In its polygonal perforations of the upper layer and in its outer outline, Paracucumarites sp. resembles P. anceps Deflandre-Rigaud from Oxfordian of France (Deflandre-Rigaud, 1961, pp. 68—69, Figs. 62, 63), particularly the specimen shown in Pl. 2, Fig. 9, from which it differs, however, in more numerous perforations of the lower layer and in the lack, on one side, of a Y-shaped ,,bride.”

Occurrence: Middle Bathonian (depth, 22.5 m) of Jaworznik.

Family Theelidae Frizzel & Exline, 1955

Genus Theelia Schlumberger, 1890. Syn. Chiridotites
Deflandre-Rigaud, 1949

Types species: Chiridota undulata Schlumb. from Eocene of France (Schlumberger, 1888, p. 439, Text-fig. 7 not Fig. 6).

Diagnosis: A sclerite in the form of a wheel with 6—12 spokes connecting the central part with the outer rim, which is denticulate. A star with the number of arms corresponding to that of spokes occurs in the middle of the lower side.
Theelia heptalampra (Bartenstein, 1936)  
Frizzel & Exline  
(Pl. LXXVIII, Figs. 1–3)

1936 Chiridota heptalampra n. sp.; H. Bartenstein, Kalk-Körper von Holothurien..., pp. 6–8, texte-fig. 10ab–11ab.
1950 Chiridotites heptalampra (Bartenstein); M. Deflandre-Rigaud, Les sclérites rotiformes..., pp. 27–28, Fig. 49–50.
1952 Chiridotites heptalampra (Bartenstein); M. Deflandre-Rigaud, Contribution à la systématique..., p. 9.
1955 Theelia heptalampra (Bartenstein); L. Frizzel & H. Exline, Monograph..., pp. 120–121, Pl. 7, Fig. 1.
1960 Chiridotites heptalampra (Bartenstein); M. Rioult, Les sclérites d’Holothuries..., pp. 142–143, Pl. 1, Fig. 21.
1967 Theelia heptalampra (Bartenstein); J. Garbowska & A. Wierzbowski, Holothurian sclerites..., pp. 533–534, Fig. 6A–C, Pl. 1, Fig. 1.

Material: Very numerous, well-preserved specimen.
Dimensions: Diameter, 0.18—0.22 mm.
Description: A wheel-like sclerite which also may resemble in outline a strongly rounded heptagon, consisting of a central part, seven radial spokes and an outer rim. On the upper side (Pl. LXXVIII, Fig. 1b), the central part of the sclerite is convex (Pl. LXXVIII, Figs. 1c, 2b and 3b). On the lower side (Pl. LXXVIII, Fig. 1a—3a), a seven-pointed star with its arms situated in the extension of the axes of spokes, occurs in the middle of the central part. Spokes are convex and tapering towards both the middle of the sclerite and the outer rim. In transverse section they are more or less arcuate or, less frequently, flat. A fairly wide outer rim has its edges curved towards the middle and, on the upper side, finely denticulate. Variability is observed in the outer outline which may be round (Pl. LXXVIII, Figs. 1a, b) or more or less heptagonal (Pl. LXXVIII, Fig. 3a).
Remarks: Theelia heptalampra (Bartenstein) Frizzel & Exline is compared by many authors with various species of this genus but there is not a single species which might simultaneously represent such important characters as, the shape, the presence of seven spokes and — in the central part — of a markedly regular seven-pointed star.
Occurrence: Middle Lias of Northern Germany (Bartenstein, 1936; Deflandre-Rigaud, 1950; Frizzel & Exline, 1955) and Lias of France (Rioult, 1960). Poland: Upper Oxfordian (Idoceras planula zone) of Wieluń Upland (Garbowska & Wierzbowski, 1967); Middle Vesulian (Kuiauvian) of Jarocin 1 (depth, 254.0 m); Lower (depth, 39.2 m) and Middle (depth, 29.2 m) Bathonian of Jaworzniak and Middle Bathonian of Ogrodzieniec.

Theelia dentata n. sp.  
(Pl. LXXVIII, Figs. 4 and 5)

Holotypus: Pl. LXXVIII, Fig. 4 (H-I-4-464).  
Locutus typicus: Jaworzniak (depth, 64.4 m).  
Stratum typicum: Middle Vesulian (Kuiauvian).  
Derivation nominis: dentata, Lat. dentatus = denticulate.  
Material: A dozen or so well-preserved specimens.
Dimensions (in mm): Holotype, diameter 0.180; paratypes, 0.175—0.190.

Diagnosis: A sclerite hexagonal in outline, consisting of a central part, six spokes and an outer rim. On the lower side, a tetraradial elevation occurs in the central part. Edges of the rim and spokes are denticulate.

Description: A sclerite shaped like a wheel, more or less hexagonal in outline and consisting of a central part, six radially arranged spokes and an outer rim. The upper side of the central part of the sclerite is convex (Pl. LXXVIII, Figs. 4b and 5b). A slight tetraradial elevation occurs on the lower side (Pl. LXXVIII, Figs. 4a and 5a) of the central part. Spokes are slightly convex. The upper part of the edge of the rim and the edges of spokes are finely denticulate.

Remarks: In its general shape and the presence of six spokes, Theelia dentata n. sp. resembles T. angulata (Defl.-Rig.) from Bathonian of France (Deflandre-Rigaud, 1951, pp. 24—25, Text-figs. 25—28), from which it differs, however, in smaller dimensions, in the presence of denticles on spokes and edges of the rim, as well as in a different appearance of the central part of the sclerite which, maybe on account of a poor state of preservation of the specimen, has in fact been omitted in Deflandre-Rigaud’s description. In its outline and in the presence of six radial spokes, our species is slightly similar to T. wartensis Garbowska & Wierzbow ski from the Lower Kimmeridgian of Dworszowice Kościelne (Garbowska & Wierzbow ski, 1967, pp. 534—536, Figs. 7A—H, Pl. 1, Figs. 2—4), from which it differs in the presence of a tetraradial elevation and denticles which occur on the edges of spokes.

Occurrence: Middle Vesuvian (Kuiavian) of Jaworznik (depths, 66.7 and 64.4 m).

Genus Hemisphaeranthos Terquem & Berthelin, 1875 emend. Frizzel & Exline, 1966

Syn. Myriotrochites Deflandre-Rigaud, 1949

Type species: Hemisphaeranthos costifera Terquem & Berthelin from Lies of France (Terquem & Berthelin, 1875, pp. 115—116, Pl. 20, Figs. 13, 15 and 16, not Figs. 12 and 14).

Diagnosis: A wheel-like sclerite consisting of a central part, usually 9—17 spokes and a characteristically denticulate outer rim.

Hemisphaeranthos malmensis Frizzel & Exline, 1955

(Pl. LXXVII, Fig. 10)

1937 Myriotrochus sp.; Th. Mortensen, Some echinoderm remains..., p. 20, Pl. 3, Figs. 1—2.

1950 Myriotrochus sieboldi (Schwager); M. Deflandre-Rigaud, Les sclérites rotiformes..., pp. 35—37, text-fig. 94 (not text-fig. 75—83, 85—87).

1950 Myriotrochus costiferus (Terquem & Berthelin); M. Deflandre-Rigaud, Les sclérites rotiformes..., pp. 37—38, text-fig. 93 (not text-fig. 88—92, 94).


1955 Hemisphaeranthos malmensis n. sp.; L. Frizzel & H. Exline, Monograph of Fossil Holothurian..., pp. 133—134, Pl. 8, Fig. 7—8.
Material: Five specimens in part filled with sediment.
Dimensions: Diameter, 0.81—0.90 mm.
Description: A wheel-like sclerite consisting of a central part, 9—17 straight spokes radially diverging from the center and an outer rim. On the upper side, the edge of the outer rim terminates in 27—29 large, slender teeth whose apexes point towards the middle of the sclerite. They reach about 1/3 or 1/2 of the length of a spoke. Usually two teeth occur in the space between successive two spokes and one tooth — opposite each spoke. On the lower side, the outer rim forms a fairly wide peripheral margin with characteristic perpendicular lines, their number corresponding to that of teeth. Central part rather small.
Remarks: In its general shape and number of spokes, *Hemisphaeranthos malmensis* Frizzel & Exline resembles the specimens of *H. mirabilis* (Deflandre-Rigaud) from the Middle Oligocene of Germany (Deflandre-Rigaud, 1959, pp. 194—195, Pl. 1, Figs. 18—20), from which it differs in a greater number of teeth on the outer rim and in a different shape and arrangement of these teeth.
Occurrence: Middle Lias of Northern Germany (Mortensen, 1937; Deflandre-Rigaud, 1950; Frizzel & Exline, 1955) and Lias of France (Rioult, 1960). Poland: Middle Vesulian (Kuiavian) of Jarocin 1 (depths, 254.0 m), Lower (depths, 39.2 and 36.2 m) Bathonian of Jaworznik, as well as Middle Bathonian of Ogrodziec.

*Hemisphaeranthos ogrodziecensis* n. sp.
(Pl. LXXVIII, Figs. 6 and 7)

Holotypus: Pl. LXXVIII, Fig. 6 (H-I-4-466).
Locus typicus: Ogrodziec.
Stratum typicum: Middle Bathonian.
Derivation nominis: ogrodziecensis from Ogrodziec.
Material: A few well-preserved specimens.
Dimensions (in mm): Holotype, diameter 0.18; paratypes, 0.17—0.19.
Diagnosis: A wheel-like sclerite, polygonal in outline, consisting of a central part, 6—9 spokes and an outer rim with teeth the number of which corresponds to that of spokes.
Description: A wheel-like sclerite, polygonal in outline, consisting of a central part, 6—9 spokes radially diverging from the center and an outer rim. On the upper side of the sclerite, an edge of the outer rim is formed by teeth with wide bases and the number of which corresponds to that of spokes. The apexes of teeth are situated in the space between spokes. The upper side of the central part of the sclerite is concave, the lower — convex. Spokes, narrower near the middle, extend towards the outer rim.
Remarks: In its morphology, *Hemisphaeranthos ogrodziecensis* n. sp. does not resemble any species of this genus described so far.
Occurrence: Middle Bathonian of Ogrodziec.

Family Achistridae Frizzel & Exline, 1955

Genus Achistrum Etheridge, 1881 emend. Frizzel & Exline, 1955

Type species: *Achistrum nicholsoni* Etheridge, 1881 from the Lower Carboniferous of Scotland (Etheridge, 1881, p. 95, Pl. 5, Figs. 7a, b).
Diagnosis: A hooklike sclerite consisting of a terminal loop, shank and spear.

Remarks: The division of the genus Achistrum Frizzel & Exline into a few morphological groups corresponding to subfamilies successively erected by Hodson, Harris & Lawson (1956), Hampton (1958) and Riout (1960) has been discussed by Garbowska & Wierzbowski (1967, pp. 528—529).

Achistrum (Achistrum) issleri (Cronies, 1932) Hodson, Harris & Lawson
(Pl. LXXIX, Fig. 1)

1960 Achistrum (Achistrum) issleri (Cronies); M. Riout, Les sclérites d'Holothuries..., p. 139, Pl. 1, Fig. 1 (earlier synonymy enclosed).
1967 Achistrum (Achistrum) issleri (Cronies); J. Garbowska & A. Wierzbowski, Holothurian sclerites..., pp. 529—530, Figs. 3A—F.

Material: Very numerous but mostly incomplete (lacking spear) specimens.

Dimensions (in mm): length, 0.40—0.62.

Description: A hooklike sclerite with an empty, round or oval terminal loop, situated centrally in relation to the axis of the sclerite. Shank straight or arcuate. Spear arcuate.

Variability is observed in the shape of the opening of the shank, as well as in the length and degree of curvature of the shank and spear. Remarks: In its general morphology, Achistrum (Achistrum) issleri (Cronies) Hodson, Harris and Lawson may be compared to A. brownwoodensis (Cronies) from Permian of Texas and A. bathonianum Frizzel & Exline from Jurassic of France (fide Frizzel & Exline, 1955, pp. 95—97).

Occurrence: Jurassic of Germany (Eichenberg, 1935; Mertens, 1937), France (Terquem & Berthelin, 1875; Issler, 1908; Deflandre-Rigaud, 1952; Riout, 1960) and England (Hodson, Harris & Lawson, 1956), Poland: Upper Oxfordian (Idoceras planula zone) and Lower Kimmeridgian (Sutneria platynota? and Ataxioceras hypselocyclum zone) of Wieluń Upland (Garbowska & Wierzbowski, 1967). Lower (depth, 38.4 m) Bathonian of Jaworznik and Middle Bathonian of Ogrodzieniec.

Achistrum (Cancellrum) monochordata Hodson, Harris & Lawson, 1956
(Pl. LXXXIX, Figs. 2—6)

1960 Achistrum (Cancellrum) monochordata Hodson, Harris & Lawson; M. Riout, Les sclérites d'Holothuries..., pp. 139—140, Pl. 1, Fig. 2 (earlier synonymy enclosed).
1962 Achistrum (Cancellrum) monochordata Hodson, Harris & Lawson; B.N. Fletcher, Some holothurian..., p. 325, Figs. 6, 7.
1967 Achistrum (Cancellrum) monochordata Hodson, Harris & Lawson; J. Garbowska & Wierzbowski, Some holothurian sclerites..., pp. 530—531, Figs. 4A—M.

Material: Very numerous, frequently damaged specimens.

Dimensions: Length, 1.25—2.0 mm.

Description: A hooklike sclerite consisting of a terminal loop, shank
and spear. Terminal loop round or elliptical, provided with a straight, thin crossbar directed along the axis of the sclerite. It may be situated either centrally or laterally or, sometimes, it may completely adhere to the wall. Shank straight or arcuate. Spear arcuate, its bent part being perpendicular to the terminal loop. In most specimens, four to five denticles, pointing towards the end of the sclerite, occur on the outer edge of the shank.

Variability: Variability is observed in the situation and thickness of the crossbar within the terminal loop, in the shape of the loop and in a more or less arcuate shape of shank and spear. Remarks: The presence of 4—5 denticles in the lower part of spear has been revealed owing to the application of strongly magnifying microscopes used during the studies. Probably, these denticles also occurred in other specimens of this species, described by previous authors, but they were missed by them.

In the case, in which the crossbar of the terminal loop is damaged, it leaves a trace in the form of two slight convexities or processes.

Achistrum (Cancellrum) monochorda Hodson, Harris & Lawson, 1956 differs from A. (Cancellrum) gamma Hodson, Harris and Lawson, described below, in a straight shape of the crossbar in the terminal loop.

Occurrence: Upper Jurassic of North America (Frizzel & Exline, 1955; Hampton, 1957), England (Hodson, Harris & Lawson, 1956; Fletcher, 1962), France (Rioult, 1960) and Germany (Eichenberg, 1935; Bartenstein, 1936). Poland: Upper Oxfordian (Idoceras Planula zone) and Lower Kimmeridgian (Sutneria platynota? and Ataxioceras hypselocyclum zone) of Wieluń Upland (Garbowska & Wierzbowski, 1967). Lower Vesulian (Kulavian) of Gałkówek 3 (depth, 134.0 m) and Middle Vesulian (Kulavian) of Jarocin 1 (depth, 252.0 m), Lower Bathonian of Jaworzniak (depths, 36.2 and 31.5 m) and Turów (depths, 352.7—353.7 m) and Middle Bathonian of Ogdziencie.

Achistrum (Cancellrum) gamma Hodson, Harris & Lawson, 1956 (Pl. LXXIX, Figs. 7—9)

1967 Achistrum (Cancellrum) gamma Hodson, Harris & Lawson; J. Garbowska & W. Wierzbowski, Some holothurian..., pp. 531—532, Fig. 5 (earlier synonymy enclosed).

Material: Many incomplete (lacking spears) specimens.

Dimensions: Length, 0.50—0.66 mm.

Description: A hooklike sclerite, consisting of a terminal loop, shank and spear. The terminal loop is oval and filled with a bifurcate, Y-shaped crossbar, two arms of which are, in all cases, directed upwards. The shank is straight or slightly arcuate.

Variability is observed in the size of the terminal loop, as well as in the length and thickness of the shank.

Remarks. In some specimens, the crossbar filling the terminal loop is somewhat thinner halfway its length (Fletcher, 1962, Text-fig. 2). This phenomenon was also confirmed by the appearance of the specimens from Poland.

Occurrence: Bathonian and Oxfordian of England (Hodson, Harris & Lawson, 1956; Hampton, 1958 and Fletcher, 1962,
Text-fig. 2. Poland: Callovian of Łuków (Garbowska & Wierzbowski, 1967), as well as Lower (depth, 36.2 m) and Middle (depth, 31.5 m) Bathonian of Jaworznik.

Micropalaeontological Laboratory,
University of Warszawa

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STRESZCZENIE

Opracowano sklerety holoturii z utworów jurajskich i trzeciorzędowych Polski należące do 5 rodzin: Synapitidae, Priscopedatidae, Calclammitidae, Theelidae i Achistridae. Wyróżniono 10 rodzin, z tego 1 nowy: Priscolongatus oraz 30 gatunków, w tym 13 nowych. Są to: Cronesisites polonicus, Priscopedatus triangularis, P. batoniensis, P. jaworznicensis, P. pentaradiatus, P. denticulatus, P. bolkoviensis, P. octoperforatus, Priscolongatus quadraperforatus, P. obliquobrachiatus, Paracucumimarites similis, Theelia dentata i Hemisphaeranthos ogrodzieniecensis.

EXPLANATION OF PLATES

Plate LXVIII

Figs. 1a, b, 2, 4, 6. Cronesisites insignis Kristan-Tollmann.
(a) convex side,
(b) concave side;
1 — (H-I-4-400), 2 — (H-I-4-402),
4 — (H-I-4-403), 6 — (H-I-4-404)
Figs. 3a, b, 5a, b. Cronesisites cf. insignis Kristan-Tollmann.
(a) convex side,
(b) concave side;
3 — (H-I-4-406), 5 — (H-I-4-407)
Figs. 7a, b. Cronesisites polonicus n. sp., holotype.
(a) convex side, (b) concave side (H-I-4-408).
All specimens come from Żrecze 3 boring, depth, 64.8—64.9 m. Lower Sarmatian. X175

Plate LXIX

Figs. 1a, b—6, 8, 10. Cronesisites polonicus n. sp., paratypes.
(a) convex side,
(b) concave side;
1 — (H-I-4-409), 2 — (H-I-4-410),
3 — (H-I-4-411), 4 — (H-I-4-412),
5 — (H-I-4-413), 6 — (H-I-4-414),
8 — (H-I-4-415), 10 — (H-I-4-416). Żrecze 3, depth, 64.8—64.9 m, Lower Sarmatian
Figs. 7a, b. Cronesisites sp. (a) convex side, (b) concave side (H-I-4-417), Żrecze 3, depth, 59.3—59.4 m, Lower Sarmatian
Fig. 9. *Croneisites insignis* Kristian-Tollmann (H-I-4-405), Zrecze 3, depth, 64.8—64.9 m, Lower Sarmatian. X175

Plate LXX

Figs. 1a, b. *Croneisites insignis* Kristian-Tollmann. (a) convex side, (b) concave side; (H-I-4-414), Zrecze 3, depth, 64.8—64.9 m. Lower Sarmatian
Figs. 2a, b, 3. *Croneisites cf. insignis* Kristian-Tollmann
(a) convex side,
(b) concave side;
2 — (H-I-4-407),
3 — (H-I-4-406), Zrecze 3, depth, 64.8—64.9 m, Lower Sarmatian
Figs. 4a, b. *Croneisites polonicus* n. sp., holotype. (a) convex side, (b) concave side;
(H-I-4-408), Zrecze 3, depth, 64.8—64.9 m, Lower Sarmatian
Figs. 5a, b. *Croneisites* sp. (a) convex side, (b) concave side; (H-I-4-417), Zrecze 3, depth, 59.3—59.4 m, Lower Sarmatian
Figs. 6a-c—9a-c. *Priscopedatus bolkoviensis* n. sp., holotype. (a) top view, (b) bottom view, (c) lateral view; 8 — (H-I-2-118); paratypes: 7 — (H-I-2-116), 8 — (a) top view, (b) lateral view; (H-I-2-117), 9 — (a) top view, (b) bottom view, (c) lateral view, (H-I-2-115). All specimens of *Priscopedatus bolkoviensis* n. sp. are from Bolków, depth, 50.3 m, Kimmeridgian.
Figs. 1—5 ab. X150; Figs. 6—9 ab. X200

Plate LXXI

Figs. 1a, b—6a, b. *Priscopedatus triangularis* n. sp. (a) top view, (b) lateral view; 1 — paratype (H-I-2-53), Jaworzyn, depth, 19.0 m, Upper Bathonian, 2 — paratype (H-I-2-54), Jaworzyn, depth, 19.0 m, Upper Bathonian, 3 — paratype (H-I-1-51), Jaworzyn, depth, 34.0 m, Middle Bathonian, 4 — paratype (H-I-1-30), Jaworzyn, depth, 19.0 m, Upper Bathonian, 5 — holotype (H-I-1-32), Jaworzyn, depth, 19.0 m, Upper Bathonian
Figs. 7a, b—10a, b. *Priscopedatus batoniensis* n. sp. (a) top view, (b) lateral view; 7 — holotype (H-I-2-67), Jaworzyn, depth, 19.0 m, Upper Bathonian; paratypes: 8 — (H-I-2-56), Jaworzyn, depth, 19.0 m, Upper Bathonian, 9 — (H-I-2-64), Jaworzyn, depth, 34.0 m, Middle Bathonian, 10 — (H-I-2-63), Jaworzyn, depth, 34.0 m, Middle Bathonian. X150

Plate LXXII

Figs. 1a, b—7a, b. *Priscopedatus batoniensis* n. sp., paratypes, (a) top view, (b) lateral view
1 — (H-I-2-86), Jaworzyn, depth, 23.0 m, Middle Bathonian,
2 — (H-I-1-34), Jaworzyn, depth, 19.0 m, Upper Bathonian,
3 — (H-I-1-41), Jaworzyn, depth, 21.5 m, Middle Bathonian,
4 — (H-I-2-62), Jaworzyn, depth, 29.2 m, Middle Bathonian,
5 — (H-I-1-43), Jaworzyn, depth, 21.5 m, Middle Bathonian,
6 — (H-I-2-68), Jaworzyn, depth, 19.0 m, Upper Bathonian,
7 — (H-I-1-6), Jaworzyn, depth, 31.5 m, Middle Bathonian
Figs. 8a, b—10a, b. *Priscopedatus jaworznicensis* n. sp., paratypes, (a) top view, (b) lateral view
8 — (H-I-1-76), Jaworzyn, depth, 20.5 m, Upper Bathonian,
9 — (H-I-2-75), Jaworzyn, depth, 19.0 m, Upper Bathonian,
10 — (H-I-1-39), Jaworzyn, depth, 24.0 m, Middle Bathonian. X150
Plate LXXIII

Figs. 1a, b—8a, b. *Priscopedatus jaworznicensis* n. sp.

(a) top view, (b) lateral view; 1 — holotype (H-I-2-74), Jaworzyn, depth, 19.0 m, Upper Bathonian, paratypes:
2 — (H-I-2-90), Jaworzyn, depth, 19.0 m, Upper Bathonian,
3 — (H-I-1-25), Jaworzyn, depth, 29.2 m, Middle Bathonian,
4 — (H-I-1-23), Jaworzyn, depth, 21.5 m, Middle Bathonian,
5 — (H-I-2-73), Jaworzyn, depth, 19.0 m, Upper Bathonian,
6 — (H-I-1-26), Jaworzyn, depth, 29.2 m, Middle Bathonian,
7 — (H-I-1-48), Jaworzyn, depth, 43.0 m, Lower Bathonian,
8 — (H-I-2-21), Jaworzyn, depth, 20.5 m, Upper Bathonian

Figs. 9a, b—11a, b. *Priscopedatus pentaradiatus* n. sp. (a) top view, (b) lateral view;
9 — holotype (H-I-2-71), Jaworzyn, depth, 19.0 m, Upper Bathonian,
10 — paratype (H-I-1-1), Jaworzyn, depth, 19.0 m, Upper Bathonian, 11 — paratype (H-I-2-88), Jaworzyn, depth, 19.0 m, Upper Bathonian. ×150

Plate LXXIV

Figs. 1a, b—4a, b. *Priscopedatus denticulatus* n. sp. (a) top view, (b) lateral view;
1 — holotype (H-I-1-49), Jaworzyn, depth, 65.6 m, Middle Vesuvian (Kulian); paratypes: 2 — (H-I-1-11), Jaworzyn, depth, 27.0 m, Middle Bathonian,
3 — (H-I-1-38), Jaworzyn, depth, 34.2 m, Middle Bathonian, 4 — (H-I-2-69), Jaworzyn, depth, 19.0 m, Upper Bathonian

Figs. 5a, b—8a, b. *Priscopedatus octoperforatus* n. sp. (a) top view, (b) lateral view;
5 — holotype (H-I-1-12), Jaworzyn, depth, 50.3 m, Lower Bathonian, paratypes:
6 — (H-I-1-18), Jaworzyn, depth, 39.2 m, Lower Bathonian,
7 — (H-I-2-119), Gałkówek 3, depth, 112.6 m, Middle Vesuvian,
8 — (H-I-1-14), Jaworzyn, depth, 34.0 m, Middle Bathonian. ×150

Plate LXXV

Figs. 1—6. *Priscopedatus* sp. (conical elevation)
1 — (H-I-2-107), Jaworzyn, depth, 24.0 m, Middle Bathonian,
2 — (H-I-2-103), Jaworzyn, depth, 39.2 m, Lower Bathonian,
3 — (H-I-2-108), Jaworzyn, depth, 19.0 m, Upper Bathonian,
4 — (H-I-2-100), Jaworzyn, depth, 24.0 m, Middle Bathonian,
5 — (H-I-2-110), Jaworzyn, depth, 23.0 m, Middle Bathonian,
6 — (H-I-2-112), Ogrodnieniec, outcrop, Middle Bathonian

Figs. 7a, b—12. *Priscocolongatus quadriferforatus* n. gen., n. sp. (a) top view, (b) lateral view; 7 — holotype (H-I-3-215), Choszczoń 1, depth, 148.8 m, Lower Rupelian, paratypes: 8 — (H-I-3-216), Choszczoń 1, depth, 148.8 m, Lower Rupelian,
9 — (H-I-3-218), Choszczoń 1, depth, 148.8 m, Lower Rupelian, 10 — (H-I-3-217), Choszczoń 1, depth, 148.8 m, Lower Rupelian, 11 — (H-I-3-212), Choszczoń 1, depth, 153.7 m, Lower Rupelian, 12 — (H-I-3-219), Gorzów Wielkopolski 1, depth, 167.7 m, Lower Rupelian

Fig. 13. *Priscocolongatus obliquobrachiatus* n. gen., n. sp., holotype, (a) top view, (b) lateral view (H-I-3-207), Choszczoń 1, depth, 148.8 m, Lower Rupelian. Figs. 1—6 ×150; Figs. 7—13 ×60

Plate LXXVI

Figs. 1—3. *Priscocolongatus obliquobrachiatus* n. gen., n. sp., paratypes: 1 — (H-I-3-222), Gorzów Wielkopolski 1, depth, 176.0 m, Lower Rupelian, 2 — (H-
Fig. 4. *Priscolongatus* sp. 1 (H-I-3-201), Choszczno 1, depth, 148.8 m, Lower Rupelian

Figs. 5 and 6. *Priscolongatus* sp. 2, 5 — (H-I-3-210), 6 — (H-I-3-208), Choszczno 1, depth, 148.8 m, Lower Rupelian

Fig. 7. *Calclamnella* sp. (H-I-3-220), Gorzów Wielkopolski 1, depth, 170.6 m, Lower Rupelian

Fig. 8. *Calclamna* sp. 2 (H-I-3-301), Żrecze 3, depth, 64.8—64.9 m, Lower Sarmatian

Fig. 9. *Calclamna* sp. 1 (H-I-3-303), Żrecze 3, depth, 64.8—64.9 m, Lower Sarmatian

Figs. 10—13. *Cucumarites mortenseni* (Frizzel & Exline) Deflandre-Rigaud. 10 — (H-I-3-316), Jaworzyn, depth, 29.2 m, Middle Bathonian, 11 — (H-I-3-304), Jaworzyn, depth, 19.0 m, Upper Bathonian, 12 — (H-I-3-306), Jaworzyn, depth, 19.0 m, Upper Bathonian, 13 — (H-I-3-324), Jaworzyn, depth, 62.4 m, Middle Vesulian (Kulavian)

Figs. 1—7 ×60; Figs. 8—13 ×110

Plate LXXVII

Figs. 1—4. *Cucumarites robustus* Deflandre-Rigaud.

1 — (H-I-3-329), Jaworzyn, depth, 27.0 m, Middle Bathonian,

2 — (H-I-3-331), Jaworzyn, depth, 53.3 m, Lower Bathonian,

3 — (H-I-3-330), Jaworzyn, depth, 36.2 m, Lower Bathonian,

4 — (H-I-3-310), Jaworzyn, depth, 19.0 m, Upper Bathonian

Figs. 5—8. *Paracucumarites similis* n. sp.

5 — paratype, (H-I-3-350), Jaworzyn, depth, 22.5 m, Middle Bathonian,

6 — holotype, (H-I-3-351), Jaworzyn, depth, 24.5 m, Middle Bathonian,

7 — paratype, (H-I-3-309), Jaworzyn, depth, 19.0 m, Upper Bathonian,

8 — paratype, (H-I-3-352), Jaworzyn, depth, 43.0 m, Lower Bathonian

Fig. 9. *Paracucumarites* sp. (H-I-3-360) Jaworzyn, depth, 22.5 m, Middle Bathonian

Fig. 10a-c. *Hemisphaeranthos malmensis* Frizzel & Exline (H-I-4-460), Ogrodzieniec, outcrop, Middle Bathonian.

Figs. 1—4, 7, 9 ×110; Figs. 5, 6, 8, 10 ×150

Plate LXXVIII

Figs. 1a-c—3a, b. *Theelia heptalampra* (Bartenstein) Frizzel & Exline.

(a) lower side, (b) upper side, (c) lateral view; 1 — (H-I-4-461), Jaworzyn, depth, 39.2 m, Lower Bathonian, 2 — (a) lower side, (b) lateral view; (H-I-1-4-462), Jaworzyn, depth, 29.2 m, Middle Bathonian, 3 — (H-I-4-463), Ogrodzieniec, outcrop, Middle Bathonian

Figs. 4a, b, 5a, b. *Theelia dentata* n. sp. (a) lower side, (b) lateral view; 4 — holotype, (H-I-4-464), Jaworzyn, depth, 64.4 m, Middle Vesulian (Kulavian), 5 — paratype, (H-I-4-465), Jaworzyn, depth, 66.7 m, Middle Vesulian (Kulavian)

Figs. 6a-c, 7a-c. *Hemisphaeranthos ogrodzieniecensis* n. sp. (a) upper side, (b) lower side, (c) lateral view, 6 — holotype (H-I-4-466), 7 — paratype (H-I-4-467), Ogrodzieniec, outcrop, Middle Bathonian. ×200

Plate LXXIX

Figs. 1a, b. *Achistrum* (Achistrum) issleri (Croneis) Hodson, Harris & Lawson. (a) viewed from the loop, (b) lateral view, (H-I-1-4-500), Jaworzyn, depth, 38.4 m, Lower Bathonian.
Figs. 2—6. *Achistrum (Cancellrum) monochordata* Hodson, Harris & Lawson. 2 — (H-I-4-505), Gałkówek 3, depth, 134.0 m, Lower Vesulian (Kulavian), 3 — (H-I-4-504), Ogrodzeniec, outcrop, Middle Bathonian, 4 — (H-I-4-502), Ogrodzeniec, outcrop, Middle Bathonian, 5 — (H-I-4-503), Ogrodzeniec, outcrop, Middle Bathonian, 6 — (H-I-4-501), Ogrodzeniec, outcrop, Middle Bathonian.

Figs. 7—9. *Achistrum (Cancellrum) gamma* Hodson, Harris & Lawson. 7 — (H-I-4-507), Jaworznik, depth, 31.5 m, Middle Bathonian, 8 — (H-I-4-508), Jaworznik, depth, 31.8 m, Middle Bathonian, 9 — (H-I-4-506), Jaworznik, depth, 36.2 m, Middle Bathonian.

Figs. 1, 2, 7—9 ×110; Figs. 3—6 ×50
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H. Górka, L. Łuszczewska