acta
geologica
polonica

Vol. 22, No. 2 Warszawa 1972

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Holothurian sclerites from the Oxfordian limestones of the Holy Cross Mts

ABSTRACT: Holothurian sclerites are described for the first time from the limestones of the Polish Jurassic. The sclerites found are assigned to 12 species of 4 families: Calclamnidae, Priscopedatidae, Theeliidae and Protocaudinidae. Five species are new: *Cucumarites tokarniensis* sp. n., *Priscopedatus pompatus* sp. n., *Theelia polonica* sp. n., *Stueria horrida* sp. n., and *Protocaudina acmaea* sp. n. The stratigraphical ranges of particular species are compared with ammonite zonation of the Oxfordian.

INTRODUCTION

Fossil holothurian sclerites were described for the first time in the 1840's by G. Münster (1843 *fide* Frizzell & Exline 1955), but not until the 1930's and 1950's did they become the subject of greater interest (Croneis & Mc Cormack 1932; Deflandre-Rigaud 1950, 1952, 1962; Frizzell & Exline 1955, 1966). Recently, there is a marked tendency to use the holothurian sclerites for stratigraphical purposes (Mostler 1967, 1968, 1969; Kozur & Mostler 1970; Kozur 1971). In Poland, the first successful attempt to use these fossils in local stratigraphy was made by Garbowska & Wierzbowski (1967), who described sclerites from marly deposits of the Upper Oxfordian and Lower Kimmeridgian of the Wieluń Upland and from Callovian clays of the erratic mass at Łuków, Polish Lowland. Moreover, some sclerites were described from different deposits of the Jurassic and Tertiary (Górka & Łuszczewska 1969), and more recently from the Namurian of the Upper Silesia (Alexandrowicz 1971) and the Triassic of the Tatra Mts (Zawidzka 1971).

The present paper deals with holothurian sclerites found in Oxfordian limestones of the SW margin of the Holy Cross Mts. The area studied is located c. 18 km to SW of Kielce, between Tokarnia and Wolica villages. The stratigraphy, as well as lithological development of the Oxfordian in this area were the subject of a separate paper (Matyja 1970).

STRATIGRAPHICAL SETTING

The Oxfordian rocks attain a few hundred meters in thickness in the area studied. Twenty five samples, at an average of 0.20 kg in weight, were taken; 12 of them appeared to be positive.

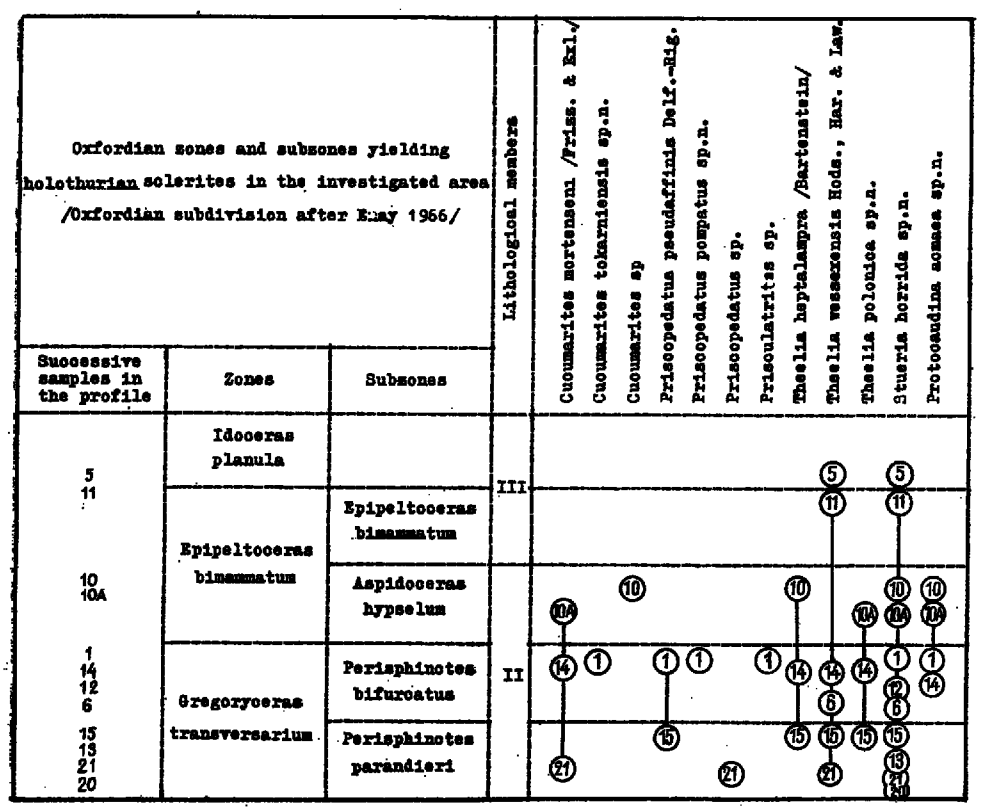
The lithological succession and stratigraphy of the Oxfordian in the area under discussion may be roughly presented as follows:

(*I*) overlying calcareous gaizes of the Callovian is a member of alternating limestones and marly shales, 6 m thick, belonging to the Lower Oxfordian (Quenstedtoceras mariae and Cardioceras cordatum Zones);

(*II*) member of tuberolite limestones, 150 m thick (Matyja 1970), belonging to the Perisphinctes plicatilis and Gregoryceras transversarium Zones and the lower part of the Epipeltoceras bimammatum Zone;

(*III*) member of thick-bedded, micritic and chalky (lumpy-micritic) limestones (Matyja 1970), a few hundred meters thick, belonging to the upper part of the Epipeltoceras bimammatum and Idoceras planula Zones. The boundary between the Oxfordian and Kimmeridgian continues within the chalky limestones of this member (Kutek 1968).

Table 1



Holothurian sclerites were found in members *II* and *III*, in deposits belonging to the Gregoryceras transversarium and younger zones (Table 1). In the case of samples *5* and *11* (*vide* Table 1), it is uncertain whether they belong to the upper part of the Epipeltoceras bimammatum Zone or to the Idoceras planula Zone.

SYSTEMATIC DESCRIPTION

The systematics of fossil holothurian sclerites, being artificial, is based on their morphological features. Croneis (1938 *vide* Frizzell & Exline 1955), proposed a so-called "Ordo militaris" (military order) to distinguish classification of skeletal fragments, unrelated to the systematics of organisms yielding them. Such classification was accepted for holothurian sclerites by French authors (Deflandre-Rigaud 1950, 1952, 1962; Rioult 1960); however, the majority of authors accepted the traditional Linnean system.

The systematics of holothurian sclerites includes parataxonomic families and lower ranks, *i.e.* genera and species.

The systematics and terminology concerning morphological elements of sclerites is accepted after Frizzell & Exline (1966), with some modifications. Morphological description is made more precise as a result of quantitative treatment of proportions between particular sclerite elements, suggested by Zankl (1966) and Kozur & Mostler (1970).

Family **Calclamnidae** Frizzell & Exline, 1955
Genus *CUCUMARITES* Deflandre-Rigaud, 1948
Cucumarites mortenseni (Frizzell & Exline, 1955)
(Fig. 1)

1955. *Eocaudina mortenseni* Frizzell & Exline, new species; D. L. Frizzell & H. Exline, p. 88, Pl. 3, Fig. 10.
1959. *Cucumarites mortenseni* (Frizzell & Exline); M. Deflandre-Rigaud, p. 191.
1960. *Cucumarites mortenseni* (Frizzell & Exline); M. Rioult, p. 136.
1962. *Cucumarites mortensent* (Frizzell & Exline) Deflandre-Rigaud; M. Deflandre-Rigaud, p. 57, Figs 37—42; Pl. 1, Fig. 8.
1969. *Cucumarites mortenseni* (Frizzell & Exline) Deflandre-Rigaud, 1959; H. Górka & L. Łuszczewska, p. 376, Pl. 76, Figs 10—13.

Dimensions. — Diameter — 0.16 to 0.29 mm; diameters of perforations — 0.006—0.019 mm.

Description. — Sclerite in the from of flat, perforated plate, irregular in outline. Perforations more or less circular, variable in size, regularly distributed. Every perforation, except those located close to the sclerite margins, is surrounded by 6 others.

Remarks. — Irregular outline of the sclerites is a result of their incomplete preservation. In case where original plate margin is preserved, the edge is almost smooth and original subcircular outline of the sclerite may be inferred.

Occurrence. — Germany and Great Britain: Liassic (Frizzell & Exline 1955); France: Sinemurian (Rioult 1960) and Oxfordian (Deflandre-Rigaud 1962); Poland: Upper Bojocian, Middle-Upper Bathonian (Górka & Łuszczewska 1969).

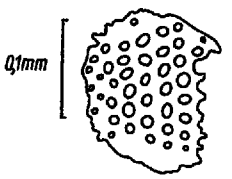


Fig. 1

Cucumarites mortenseni (Frizzell & Exline)

The investigated specimens were found in the Oxfordian, Gregoryceras transversarium Zone and Epipeltoceras bimammatum Zone, Aspidoceras hypselum Subzone (samples *10A, 14, 21* — *vide* Table 1).

Cucumarites tokarniensis sp. n.
(Fig. 2)

Holotype: the specimen presented in Fig. 2.

Type locality: Tokarnia village, 18 km to SW of Kielce.

Type stratum: Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *1* — *vide* Table 1).

Derivation of name: from the village Tokarnia, in the vicinity of which the holotype was found.

Diagnosis. — Sclerite thin, flat, with large, hexagonal perforations, arranged in three rows as 3-4-3.

Dimensions. — Plate — 0.13 × 0.21 mm; diameters of perforations — 0.03—0.04 mm.

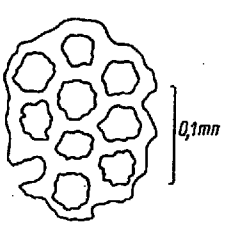


Fig. 2

Cucumarites tokarniensis sp. n., holotype

Description. — Plate flat, perforated, subhexagonal in outline, with two longest sides parallel to each other. Perforations uniform in size, subhexagonal in outline and arranged in three parallel rows. Two marginal rows consist of three perforations, as opposed to four in the median row. Elongation of perforation rows conformable to longest axis of the sclerite. All the perforations of uniform size, the shape of which is subhexagonal.

Occurrence. — Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *1* — *vide* Table 1).

Cucumarites sp.
(Fig. 3)

Dimensions. — Diameter 0.29 mm; diameter of large perforations — 0.019 to 0.027 mm; diameters of small perforations — 0.007 to 0.012 mm.

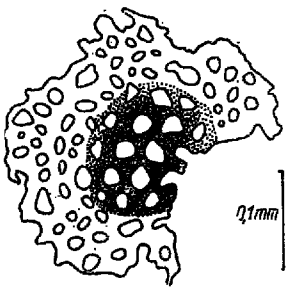


Fig. 3

Cucumarites sp.

Description. — Sclerite in the form of perforated, subcircular plate with irregular, fringed margins. Central part of the sclerite somewhat convex. Perforations numerous, angular in outline, and of two basic types: larger perforations, appearing in central part and arranged somewhat similarly as in *Cucumarites mortenseni*, and smaller perforations, randomly distributed over the area surrounding central convexity.

Remarks. — The form described differs from those hitherto described, but it is insufficiently preserved for establishing a new species.

Occurrence. — The form described was found in the Oxfordian, Epipeltoceras bimammatum Zone, Aspidoceras hypselum Subzone (sample *10* — *vide* Table 1).

Family **Priscopedatidae** Frizzell & Exline, 1955
Genus *PRISCOPEDATUS* Schlumberger, 1890, emend. Deflandre-Rigaud, 1962
Priscopedatus pseudaffinis Deflandre-Rigaud, 1962
(Fig. 4)

1962. *Priscopedatus pseudaffinis* cent. nov. vel parasp. nov.; M. Deflandre-Rigaud, p. 73, Figs 106—110.

Dimensions. — Diameter — 0.109—0.144 mm; diameters of perforations — 0.019 to 0.035 mm.

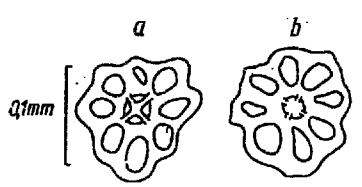


Fig. 4

Specific variability of *Priscopedatus pseudaffinis* Deflandre-Rigaud

Description. — Sclerite in the form of plate with turret rising from the centre of plate. Eight perforations, ovate in outline and oriented with their narrower ends towards the middle of the plate. Shape and arrangement of perforations de-

termined by the external shape of the whole plate. Plate centre occupied by circular perforation, over which turred rises, being attached by 4 feet.

Remarks. — The discussed species is close to *Priscopedatus affinis* Deflandre-Rigaud, 1946, differing in plate outline, which is largely influenced by distribution of perforation, and in smooth external margins, devoid of projections.

Occurrence. — France (Villers-sur-Mer): Oxfordian (Deflandre-Rigaud 1962).

The investigated specimens were found in the Oxfordian, Gregoryceras transversarium Zone, Perisphinctes parandieri and P. bifurcatus Subzones (samples *1, 15 — vide* Table 1).

Priscopedatus pompatus sp. n.
(Fig. 5)

Holotype: the specimen presented in Fig. 5.
Type locality: Tokarnia village, 18 km to SW of Kielce.
Type stratum: Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *1 — vide* Table 1).
Derivation of name: Latin *pompatus* — solemn, magnificent.

Diagnosis. — Sclerite in the form of helmet with turret at the top. The turret in the top view is of the Maltese-cross shape.

Dimensions. — Width at the base — 0.252 mm; sclerite height — 0.18 mm; turret height — 0.12 mm.

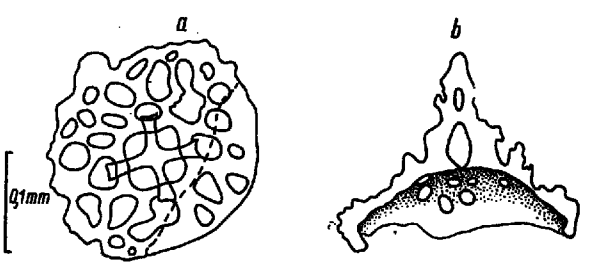


Fig. 5

Priscopedatus pompatus sp. n.; holotype — *a* upper view, *b* cross-section along the dashed line in fig. *a*

Description. — Sclerite of a helmet shape, bearing a turret at its top. Lateral sclerite walls perforated. Perforations variable in size and outline, from elliptical to rounded, but never angular. Smaller perforations concentrated close to external margins. Perforation located centrally at the helmet summit, subquadrangular in outline, but with rounded corners, and it is four times larger than other perforations. Turriform construction attached by 4 feet to every side of the subquadrangular central perforation, in its middle. The construction narrows towards its top and is perforated with two elliptical perforations, with longest axes oriented concordantly with the main axis of the construction.

Remarks. — Part of the sclerite separated by a dashed line in Fig. 5, is broken off during extraction.

Occurrence. — Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *1 — vide* Table 1).

Priscopedatus sp.
(Fig. 6)

Dimensions. — Width at the base — 0.117—0.136 mm.

Description. — Sclerite in the form of plate with small stirrup rising from its centre. Plate circular in outline, perforated, with irregular, fringed margins.

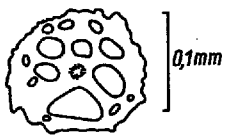


Fig. 6

Priscopedatus sp.

Perforations variable in size, subovate in outline; larger perforations concentrated in the central part of the plate. Single, large perforation, subtriangular in outline and with rounded corners seems to be characteristic for this species. Centre of the plate occupied by small perforation, to the margins of which the stirrup is attached by 4 feet.

Remarks. — The form described differs from those hitherto described, but it is insufficiently preserved for establishing a new species.

Occurrence. — Oxfordian, Gregoryceras transversarium Zone, Perisphinctes parandieri Subzone (sample *21* — *vide* Table 1).

Genus *PRISCULATRITES* Deflandre-Rigaud, 1962
Prisculatrites sp.
(Fig. 7)

Dimensions. — Plate diameter c. 0.18 mm.

Description. — Sclerite in the form of plate with small stirrup rising from its centre. Plate subcircular in outline, but its margins irregularly fringed. Perforations variable in size, angular. Six larger perforations regularly arranged around

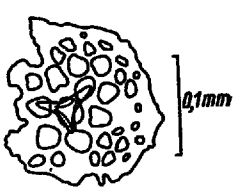


Fig. 7

Prisculatrites sp.

the seventh one, which is situated in the centre of the plate. Smaller perforations randomly distributed. Small stirrup rises in the centre, being attached by three feet to margins of the central perforation.

Remarks. — The discussed form is characterized by one central perforation, to which stirrup feet are attached, in comparison to three central perforations, typical for specimens of the genus *Prisculatrites*, figured by Deflandre-Rigaud (1962). It differs from specimens hitherto described, but is insufficiently preserved for establishing a new species.

Occurrence. — Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *1* — *vide* Table 1).

Family **Theeliidae** Frizzell & Exline, 1955
Genus *THEELIA* Schlumberger, 1890
Theelia heptalampra (Bartenstein, 1836)
(Fig. 8)

1950. *Chiridotites heptalampra* (Bartenstein); M. Deflandre-Rigaud, p. 27, Figs 49, 50.
1952. *Chiridotites heptalampra* (Bartenstein); M. Deflandre-Rigaud, p. 9.
1955. *Theelia heptalampra* (Bartenstein); D. L. Frizzell & H. Exline, p. 120, Pl. 7, Fig. 1.
1960. *Chiridotites heptalampra* (Bartenstein); M. Rioult, p. 142; Pl. 1, Fig. 21.
1964. *Chiridota heptalampra* Bartenstein; K. Frentzen, p. 43; Pl. 4, Figs 18—21.
1965. *Theelia heptalampra* (Bartenstein); E. Kristan-Tollmann, p. 18.
1967. *Theelia heptalampra* (Bartenstein, 1936); J. Garbowska & A. Wierzbowski, p. 533, Fig. 6; Pl. 1, Fig. 1.
1969. *Theelia heptalampra* (Bartenstein, 1936) Frizzell & Exline; H. Górka & L. Łuszczewska, p. 379, Pl. 78, Figs 1—3.

Dimensions. — External diameter of the sclerite (*DA*) = 0.14—0.30 mm, internal diameter of sclerite (*DI*) = 0.098—0.246 mm, hub diameter (*DN*) = 0.053—0.082 mm; U = DA/DI = 1.22—1.39 and DNI = DA/DN = 2.57—3.7.

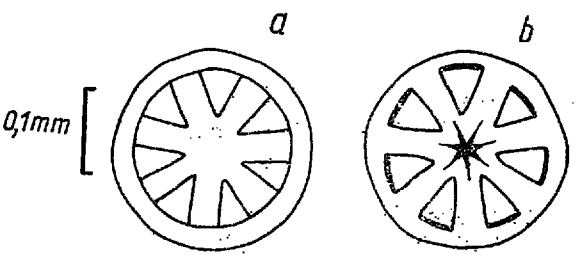


Fig. 8

Theelia heptalampra (Bartenstein); *a* upper view, *b* lower view

Description. — The sclerite wheel-shaped; its centre occupied by the hub, connected to external rim by 7 radial spokes. Central part, *i.e.* the hub and adjoining parts of spokes, domed upwardly and projecting above rim edge in some specimens. Rim margin curved upward and inward. Seven-pointed star is located on lower side of the hub; every point of the star is directed towards corresponding spoke. Spokes lanceolate in small forms, becoming uniform in width in bigger forms.

Occurrence. — Germany: Liassic (Deflandre-Rigaud 1950, Frizzell & Exline 1955), Liassic, Dogger and Malm α (Frentzen 1964); France: Liassic (Rioult 1960); Poland — Upper Oxfordian of the Wieluń Upland (Garbowska & Wierzbowski 1967), Upper Bajocian to Middle Bathonian of whole the Polish Jura Chain (Górka & Łuszczewska 1969).

The investigated specimens were found in the Oxfordian, Gregoryceras transversarium and Epipeltoceras bimammatum Zones (samples *10, 14, 15 — vide* Table 1).

Theelia wessexensis Hodson, Harris & Lawson, 1956
(Fig. 9)

1956. *Theelia wessexensis* sp. nov.; F. Hodson, B. Harris & L. Lawson, p. 338, Figs 1—3.
1962. *Chiridotites wessexensis;* M. Deflandre-Rigaud, p. 111.

Dimensions. — *DA* = 0.12—0.257 mm, *DI* = 0.082—0.199 mm, *DN* = 0.039—0.1 mm, *U* = 1.21—1.63, *DNI* = 2.52—3.64.

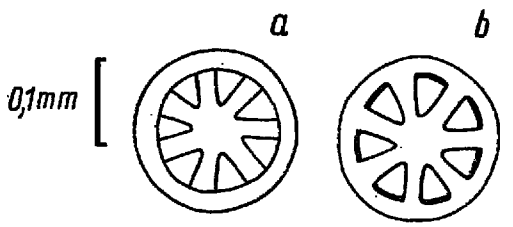


Fig. 9

Theelia wessexensis Hodson, Harris & Lawson; *a* upper view, *b* lower view

Description. — The sclerite wheel-shaped; its centre occupied by the hub, connected to external rim by 7 spokes. Rim margin curved upward and inward, undenticulated. Spokes uniform in width along entire length. Central part of the sclerite, *i.e.* the hub and adjoining parts of spokes are strongly incurved upwardly. Lower part of the hub totally devoid of ornamentation.

Occurrence. — Great Britain, Oxford Clay at Redcliff: Oxfordian, Cardioceras cordatum Zone (Hodson, Harris & Lawson 1956).

The investigated specimens were found in the Gregoryceras transversarium and Epipeltoceras bimammatum Zones (samples *21, 15, 6, 14, 11, 5* — *vide* Table 1).

Theelia polonica sp. n.
(Fig. 10)

Holotype: the specimen presented in Fig. 10a—b.
Type locality: Tokarnia village, 18 km to SW of Kielce.
Type stratum: Oxfordian, Epipeltoceras bimammatum Zone, Aspidoceras hypselum Subzone (sample *10A* — *vide* Table 1).
Derivation of name: from Poland.

Diagnosis. — Sclerite in the form of a wheel, with the rim slightly incurved interiorly and with a wide hub; 10—17 spokes, widest at the rim.

Dimensions. — *DA* = 0.183—0.234 mm, *DI* = 0.158—0.205 mm, *DN* = 0.058—0.072 mm, *U* = 1.14—1.19, *DNI* = 3.16—3.43.

Description. — The sclerite wheel-shaped; its centre occupied by the wide hub, connected to external rim by 10—17 spokes. Rim margin curved upward and somewhat inward; edge of the rim margin undenticulated. Hub and adjoining parts of spokes slightly domed upwardly, and devoid of ornamentation. Spokes straight, becoming wider towards the rim.

Occurrence. — The investigated specimens were found in the Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone, and Epipeltoceras bimammatum Zone, Aspidoceras hypselum Subzone (samples *15, 14, 10A* — *vide* Table 1).

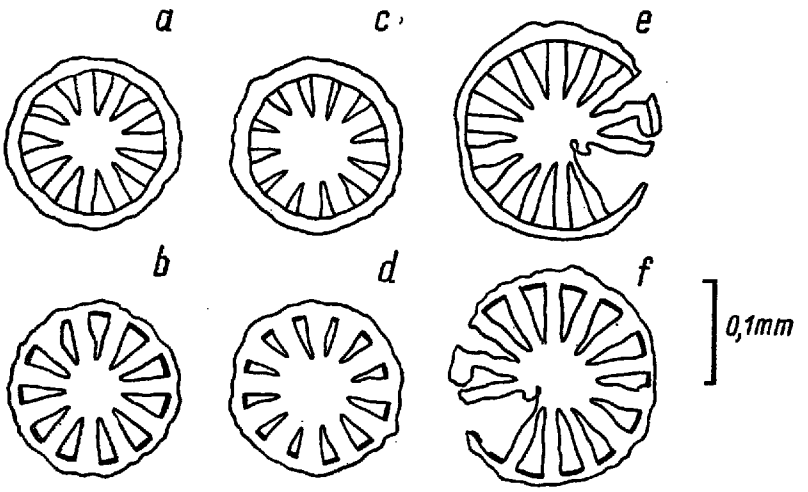


Fig. 10

Theelia polonica sp. n.; *a, b* holotype in upper (*a*) and lower (*b*) views, *c, d* paratype in upper (*c*) and lower (*d*) views, *e, f* another paratype in upper (*e*) and lower (*f*) views

Genus *STUERIA* Schlumberger, 1888

Stueria horrida sp. n.

(Fig. 11)

Holotype: the specimen presented in Fig. 11*a*—*c*.

Type locality: Wolica village, 20 km to SW of Kielce.

Type stratum: Oxfordian, Epipeltoceras bimammatum Zone, Aspidoceras hypselum Subzone (sample *10A* — *vide* Table 1).

Derivation of name: Latin *horridus* — horrible, jagged.

Diagnosis. — Sclerite wheel-shaped, and its hub with button on lower side. Spokes, 11—17 in number, connecting the rim and hub. Upper edge of rim ornamented with frill-like denticles, typical for the genus; number of denticles variable, varying from 22 to 32. Lower parts of spokes and upper parts of denticles strongly fringed, resulting in a jagged appearance of the sclerite.

Dimensions. — *DA* = 0.187—0.32 mm, *DI* = 0.130—0.226 mm, *DN* = 0.072—0.132 mm, *U* = 1.45—1.61, *DNI* = 2.4—3.6.

Description. — The sclerite wheel-shaped with a hub, spokes and a rim. Centre of the sclerite occupied by wide hub with radial spokes. Small, central button marked on the lower side of the hub. Spokes, 11 to 17 in number, uniformly wide along entire length; upper surface of spokes smooth, whereas lower ornamented with sharp projections, resulting in its jagged appearance. Spokes connect the hub and rim. The rim is wide, with fringed lower margin, and upper one ornamented with frill-like denticles; number of denticles variable, 22 to 32, in some relation to the number of spokes; denticle/spoke ratio is not constant, but close to 2. Denticles gently rounded at their ends, somewhat wider at base, and approach the rim edge. Upper parts of denticles with horn-like projections. The hub and adjoining spokes slightly domed upwards.

Occurrence. — Oxfordian, Gregoryceras transversarium and Epipeltoceras bimammatum Zones (samples *20, 21, 13, 15, 6, 12, 1, 10A, 10, 11, 5* — *vide* Table 1).

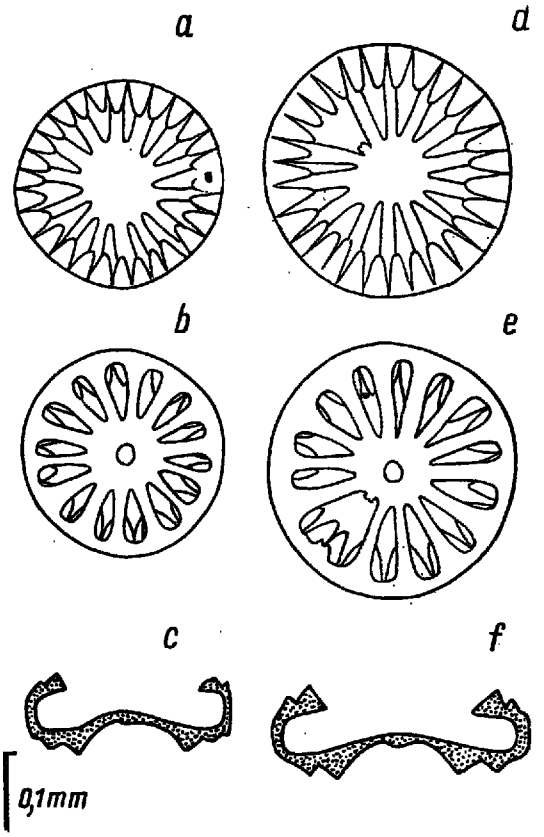


Fig. 11

Stueria horrida sp. n.; *a—c* holotype in upper (*a*), lower (*b*) views, and cross-section (*c*), *d—f* paratype in upper (*d*), lower (*e*) views, and cross-section (*f*)

Family **Protocaudinidae** Deflandre-Rigaud, 1962
Genus *PROTOCAUDINA* Croneis, 1932

Remarks. — The genus *Protocaudina* has hitherto been known from the Devonian till Permian (Frizzell & Exline 1966). Although Deflandre-Rigaud (1962) had described two species, *Protacaudina mortenseni* and *P. paucispinosa*, from the Jurassic (Oxfordian), their generic affinity was subsequently, apparently validly, questioned by Frizzell & Exline (1966).

Protocaudina acmaea sp. n.
(Fig. 12)

Holotype: the specimen presented in Fig. 12.
Type locality: Tokarnia village, 18 km to SW of Kielce.
Type stratum: Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (sample *10A* — *vide* Table 1).
Derivation of name: Greek *akmaios* — mature, bursting into the bloom.

Diagnosis. — Wheel-shaped scrlerite with quadriplicate perforation in the centre. Central plate, perforated in this way, is connected to the rim by 8 wide, lanceolate spokes. Both edges of lower margins of every spoke roll-like thickened.

Dimensions. — *DA* = 0.157—0.261 mm, *DI* = 0.132—0.204 mm, *DN* (herein: diameter of central plate) = 0.120—0.174 mm, *U* = 1.19—1.28, *DNI* = 1.3—1.5.

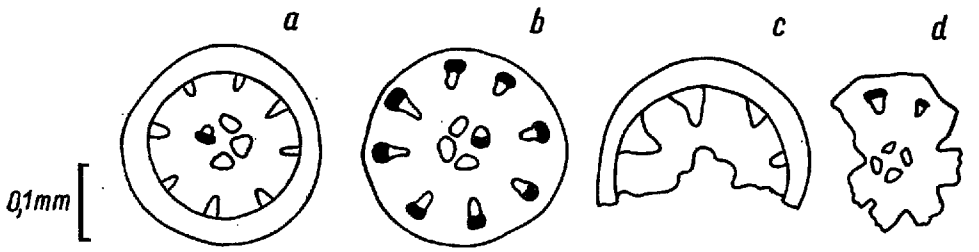


Fig. 12

Protocaudina acmaea sp. n.; *a, b* holotype in upper (*a*) and lower (*b*) views, *c, d* fragments of other sclerites

Description. — The sclerite circular in outline, in the form of concave-convex bowl with bottom slightly convex upwards. The rim curved upward and inward. Bottom formed by central plate, the central part of which is occupied by quadriplicate perforation, typical for the genus. Central plate and rim connected by 8 wide spokes, maximally wide in the middle, which results in their lanceolate shape. Lower side of every spoke roll-like thickened on both margins along entire length of the spoke.

Occurrence. — Oxfordian, Gregoryceras transversarium Zone, Perisphinctes bifurcatus Subzone (samples *14, 1, 10A, 10* — *vide* Table 1).

FINAL REMARKS

As a result of the presented investigations it may be noted that there are no other microfossils of the limy deposits of Oxfordian age from the Holy Cross Mts, that would be so numerous, easy to extract from the rock and to identify, as the holothurian sclerites.

The author takes into account that such a number of samples and resulting number of sclerites, as investigated, is unsufficient to establish an accurate distribution of the holothurian sclerites in Oxfordian profiles, as well as entire stratigraphical ranges of the species. Nevertheless, while recognizing a few species which are the new ones, the author presents this contribution as a first report of his investigations.

Acknowledgements. The author is greatly indebted to Dr. J. Garbowska for a critical reading of the typescript and helpful remarks.

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SKLERYTY HOLOTURII Z WAPIENI OKSFORDU GÓR ŚWIĘTOKRZYSKICH

(Streszczenie)

Z wapieni oksfordu południowo-zachodniego obrzeżenia mezozoicznego Gór Świętokrzyskich opisano skleryty holoturii. Są to pierwsze skleryty znalezione w wapiennych utworach jury Polski. Należą one do 4 rodzin: Calclamnidae, Priscopedatidae, Theeliidae i Protocaudinidae. Wśród opisanych 12 form pięć stanowi gatunki nowe: *Cucumarites tokarniensis* sp. n., *Priscopedatus pompatus* sp. n., *Theelia polonica* sp. n., *Stueria horrida* sp. n. i *Protocaudina acmaea* sp. n.

Badane skleryty holoturii pochodzą z poziomów Gregoryceras transversarium (próbki *20, 21, 13, 15, 6, 12, 14, 1*) oraz Epipeltoceras bimammatum (próbki *10* i *10A*), a być może także z najniższej części poziomu Idoceras planula (próbki *5* i *11*). Rozmieszczenie poszczególnych gatunków sklerytów w kolejnych poziomach i podpoziomach oksfordu na badanym terenie (tab. 1) wskazuje, że skamieniałości te mogą być użyteczne nie tylko dla lokalnej korelacji, ale także dla szerszych celów biostratygraficznych.

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