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New paleontological data from the Turonian and Coniacian of the Opole Trough (SW Poland)

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Abstract This report is on the first Micrabaciidae (*Micrabacia* sp.) solitary corals to have been found in the Upper Cretaceous deposits of the Opole Trough. We also present descriptions of the first nautilids *(Cymatoceras* sp.; smooth-shelled Nautilidae), regular echinoids (*Gauthieria radiata* (Sorignet, 1850)) and solitary corals (*Parasmilia* sp.) to have been found in the Lower Coniacian of the Opole region.

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INTRODUCTION

The Cretaceous sedimentary rocks in the Opole Trough range in age from the Middle Cenomanian to the Middle Coniacian (Tarkowski, 1991; Walaszczyk, 1992; Walaszczyk & Wood, 1998; Niedźwiedzki & Kalina, 2003). The best exposures occur in the vicinity of Opole (Fig. 1). The Turonian and Lower Coniacian deposits are represented predominantly by marls and marly limestones, while the Cenomanian and Middle Coniacian units are composed of sandstones and mudstones. An informal lithostratigraphic subdivision of the Turonian and Lower Coniacian (Fig. 2) and the paleoenvironment of the Opole Basin were described by Alexandrowicz & Radwan (1973), Tarkowski (1991) and Kędzierski & Uchman (2001). The sedimentation of the Opole Cretaceous took place in an epicontinental sea, with the maximum floodings during the Middle Turonian and Early Coniacian (Kędzierski & Uchman, 2001; Niedźwiedzki & Kalina, 2003).

The Upper Cretaceous deposits of the Opole Trough contain a rich marine macrofauna. However, there is variability in the macrofaunal frequency in the succession. Ammonoids, brachiopods (Articulata) and irregular echinoids commonly occur in distinct fossiliferous horizons that are especially numerous in the Marly Limestones Unit, while the other parts of the succession have a relatively very low fossil content. The biostratigraphy of the Opole sections is based on a high resolution inoceramid zonation (Walaszczyk, 1988, 1992; and revision of the inoceramid zonation by Walaszczyk & Wood, 1998; Walaszczyk & Cobban, 2000). Other common macrofossils in these deposits include sponges and the bivalve genus *Spondylus* Linnaeus, 1758 (for a list of the fossils see: Roemer, 1870; Leonhard, 1898; Tarkowski, 1991). Encrusting forms are common but poorly studied. We found inoceramid shells and *Micraster* tests encrusted by serpulids (e.g. *Spirorbis* sp., Fig. 3.3), bryozoans (mostly Cheilostomata), and oysters (see also Godlewska, 2005).

The other groups of macrofauna (corals, crinoids, gastropods, nautiloids, regular echinoids and sharks) in these rocks were described as rare and taxonomically indiverse. The solitary coral *Parasmilia centralis* is the most common of the Scleractinia present (Mantell 1822). The corals of the Opole Trough were first described from the Turonian deposits by Roemer (1870) and Wegner (1913). Their precise stratigraphic location is unknown. Leonhard (1898) reported *P. centralis* from the upper part of the Turonian. A single specimen of the new species *Stylotrochus volzi* Leonhard, 1898, was described by Leonhard (1898) from the Middle Turonian of the Groszowice Quarry. The only representatives of the colonial corals in the Opole Basin are a single fragment of *Isastrea* sp. (Roemer, 1870), and *Pleurocora felicis* Wegner, 1913 (Wegner, 1913). Only two species of nautilids occur in the Opole Trough. There are few specimens of *Deltocymatoceras rugatus* (Fritsch & Schloenbach, 1872) and *Eutrephoceras sublaevigatum* (d'Orbigny, 1850), but their stratigraphic extent is the whole of the Turonian succession (Roemer, 1870; Leonhard, 1898; Tar-

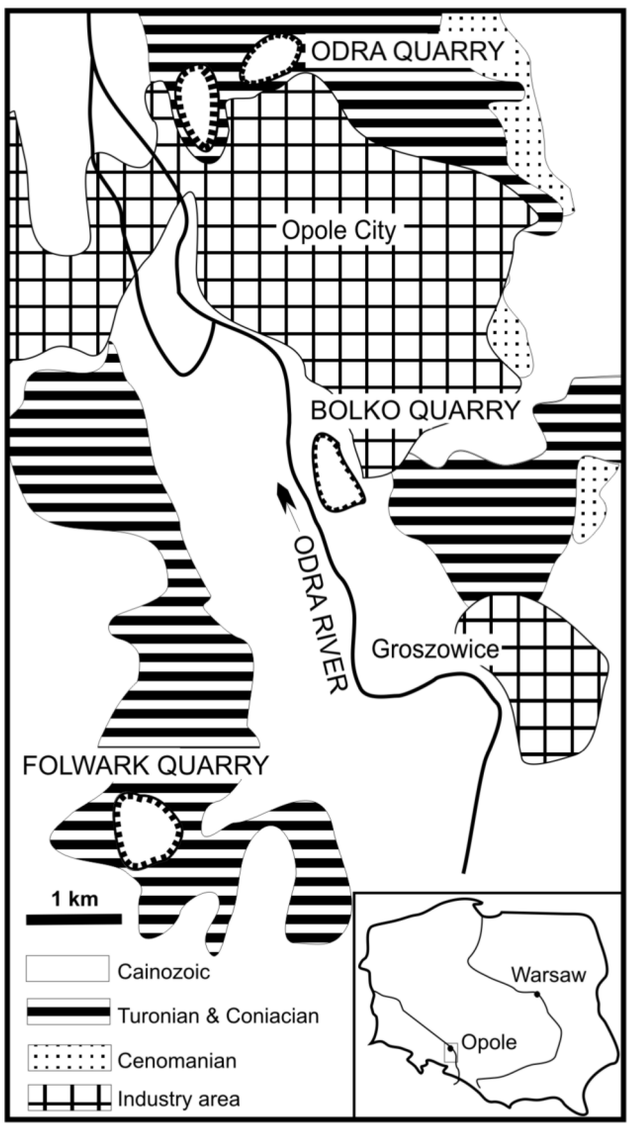


Fig. 1. Geological sketch-map of the Opole area (after Walaszczyk, 1988; *fide* Niedźwiedzki & Kalina, 2003).

kowski, 1991). The regular echinoids from Opole were first described by Schlüter (1892). He found a complete echinoid test, and described it as a new species, *Stereocidaris silesiaca* Schlüter (1892). He (1883) also mentioned finding *Gauthiera radiata* (Sorignet, 1850) in the Upper Turonian deposits of Opole. The new species *Stereocidaris oppoliensis* Leonhard, 1898, was described by its discoverer on the basis of a fragment of a single spine.

New data on the crinoids (bourgueticrinids; see Jagt & Salamon, in press) and on the sharks (Niedźwiedzki & Kalina, 2003; Niedźwiedzki, 2005) shows that the diversity of fossils from the Opole Basin is greater than was estimated in earlier papers. This study presents new data on the rare taxa of the Turonian and Lower Coniacian from Opole.

MATERIAL

The studied material was collected in the Odra and Folwark quarries (Fig. 1).

In this paper, we describe new specimens of *Parasmilia* sp. from the Lower Marls and Upper Marls units (Middle and Upper Turonian) and specimens of *Parasmilia* sp. described for the first time from the Lower Coniacian of the Opole region (Folwark Quarry); additionally, three specimens of *Micrabacia* sp. were found in the marls of the Lower Argillaceous Marls Unit (lower part of the Middle Turonian) of the Odra Quarry. This is the first record of representatives of the Micrabaciidae family for the Opole Trough. We also present descriptions of the first specimens of nautilids from the Lower Coniacian of the Opole region (Folwark Quarry). The specimen of *Cymatoceras* sp. and the nautilids, unidentified at the generic level (CAN/OD1-1), were found by A. Kin in the Lower Marls Unit (Middle Turonian). We found rare spines of regular echinoids, unidentified at the generic level, throughout the Turonian and Lower Coniacian succession, and only a single complete echinoid test (*Gauthiera radiata*). The latter comes from the Upper Argillaceous Marls Unit. This is the first finding of the mentioned species in the Lower Coniacian of the Opole Basin.

TAXONOMIC DESCRIPTION

The specimens used in this study are housed at the Geological Museum of the Institute of Geological Sciences of Wrocław University (MGUWr), the Institute of Paleobiology of the Polish Academy of Sciences, Warsaw (ZPAL), and the Pawłowscy Memorial Museum of Natural History, Łódź (CAN).

Phylum Cnidaria Hatscheck, 1888
Class Anthozoa Ehrenberg, 1834
Order Scleractinia Bourne, 1900
Family Micrabaciidae Vaughan, 1905
Genus *Micrabacia* Milne-Edwards & Haime, 1849

Micrabacia sp.
(Fig. 3.1)

Material. Three well-preserved specimens: MGUWr 5555s; ZPAL H.II/4; ZPAL H.II/5

Description. Corallum solitary, cupuloid and circular in outline with a highly convex oral surface. Base slightly concave, up to 9.8 mm in diameter (ZPAL H.II/4; in MGUWr 5555s, 8 mm in diameter; in ZPAL H.II/5, 6.8 mm in diameter). Horizontal wall-forming perforate basal disk. Costae alternating with septa, equally wide (no cycle larger than any other), slightly narrower than intercostal loculi, each ornamented with a row of rounded granules. Septa imperforate, hexamerally arranged in 5 complete cycles (96 septa). Septal faces covered by granules aligned in rows. All septal edges entire, without septal spines. Fossa elongate, filled up with sediment (no details of columella are recognizable). Calicular diameter/height ratios of 2.1 (ZPAL H.II/5) to 2.7 (ZPAL H.II/4).

Occurrence of genus. The genus *Micrabacia* is cosmopolitan in distribution, ranging from the Cretaceous to the Eocene (Cairns, 1989). The type species *Micrabacia coronula* (Goldfuss, 1826) is from the Cenomanian and Turonian of

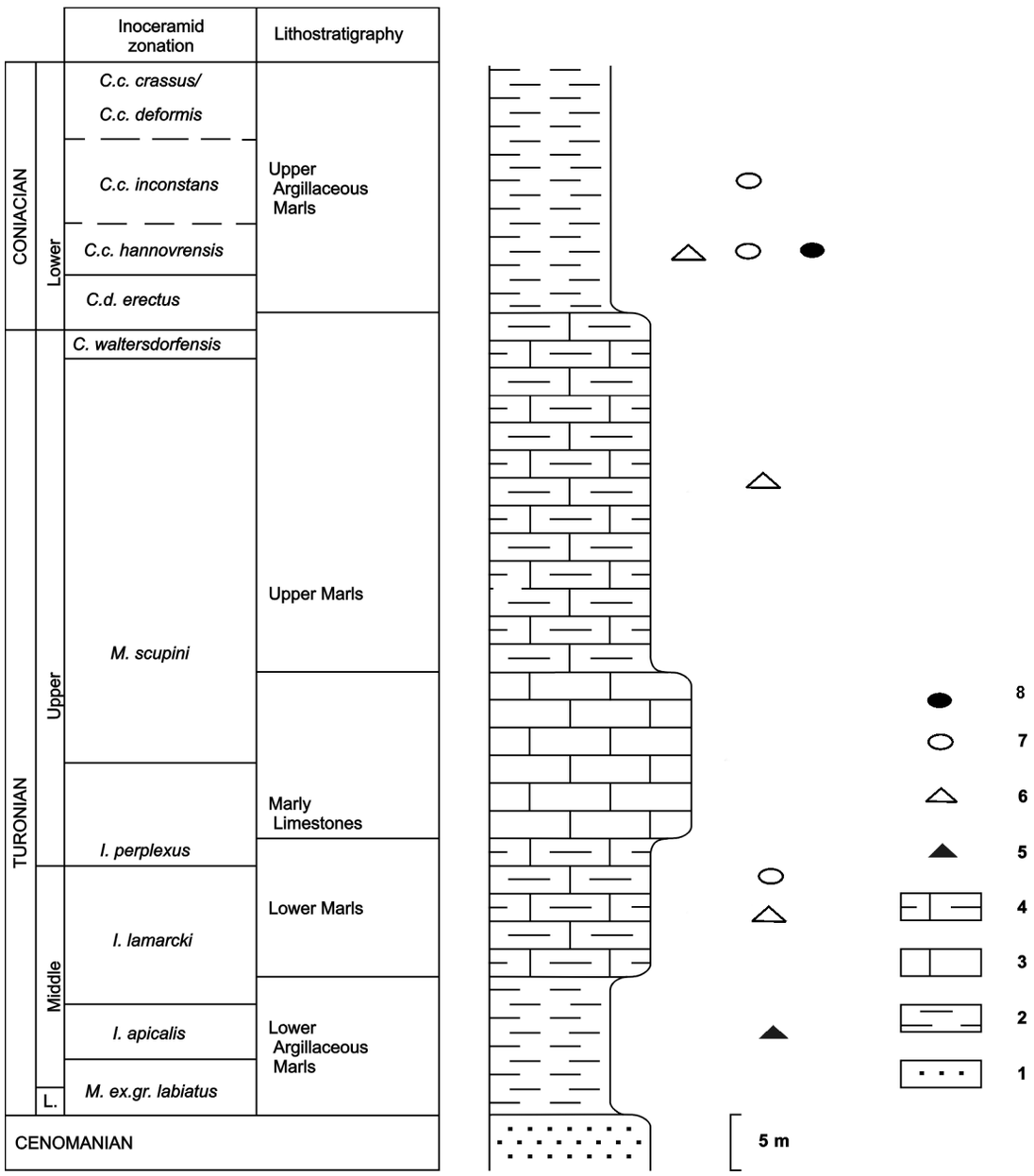


Fig. 2. Lithostratigraphic and biostratigraphic subdivisions of the Opole Cretaceous (compiled after Alexandrowicz & Radwan, 1973; Walaszczyk, 1988, 1992; Kaczorowski, 1997; Walaszczyk & Wood, 1998; Walaszczyk & Cobban, 2000; Kędzierski & Uchman, 2001). *1* – sandstones; *2* – argillaceous marls; *3* – marly limestones; *4* – marls; *5* – *Micrabacia* sp. solitary corals; *6* – *Parasmilia* sp. solitary corals; *7* – nautilids; *8* – regular echinoid *Gauthiera radiata*.

Germany and England and the Cenomanian of the Netherlands. This species also occurs in the lowermost Turonian of the North Sudetic Basin (Scupin, 1912–1913). Other Cretaceous species have been described from the USA, Mexico and Europe (Bayer *et al.*, 1956; Tröger, 2003; Bernecker & Weidlich, 2003; Ifrim *et al.*, 2004).

Family Caryophylliidae Gray, 1847
Genus Parasmilia Milne-Edwards & Haime, 1848

Parasmilia sp.
(Fig. 3.2.)

Material. Three fragmentarily preserved specimens: MGUWr 5556/1s - 5556/3s

Description. Corallum solitary, trochoid, 11 mm in diameter. Columella trabecular.

Occurrence of genus. This genus ranges in age from Cretaceous to Miocene and occurs in the Upper Cretaceous deposits of the USA, England, Denmark, Germany and Poland (e.g. Andert, 1934; Bayer *et al.*, 1956; Bernecker & Weidlich, 2003; Kommritz & Hillmer, 2004). *Parasmilia centralis* occurs in the Turonian of the North Sudetic Basin (Scupin, 1912–1913).

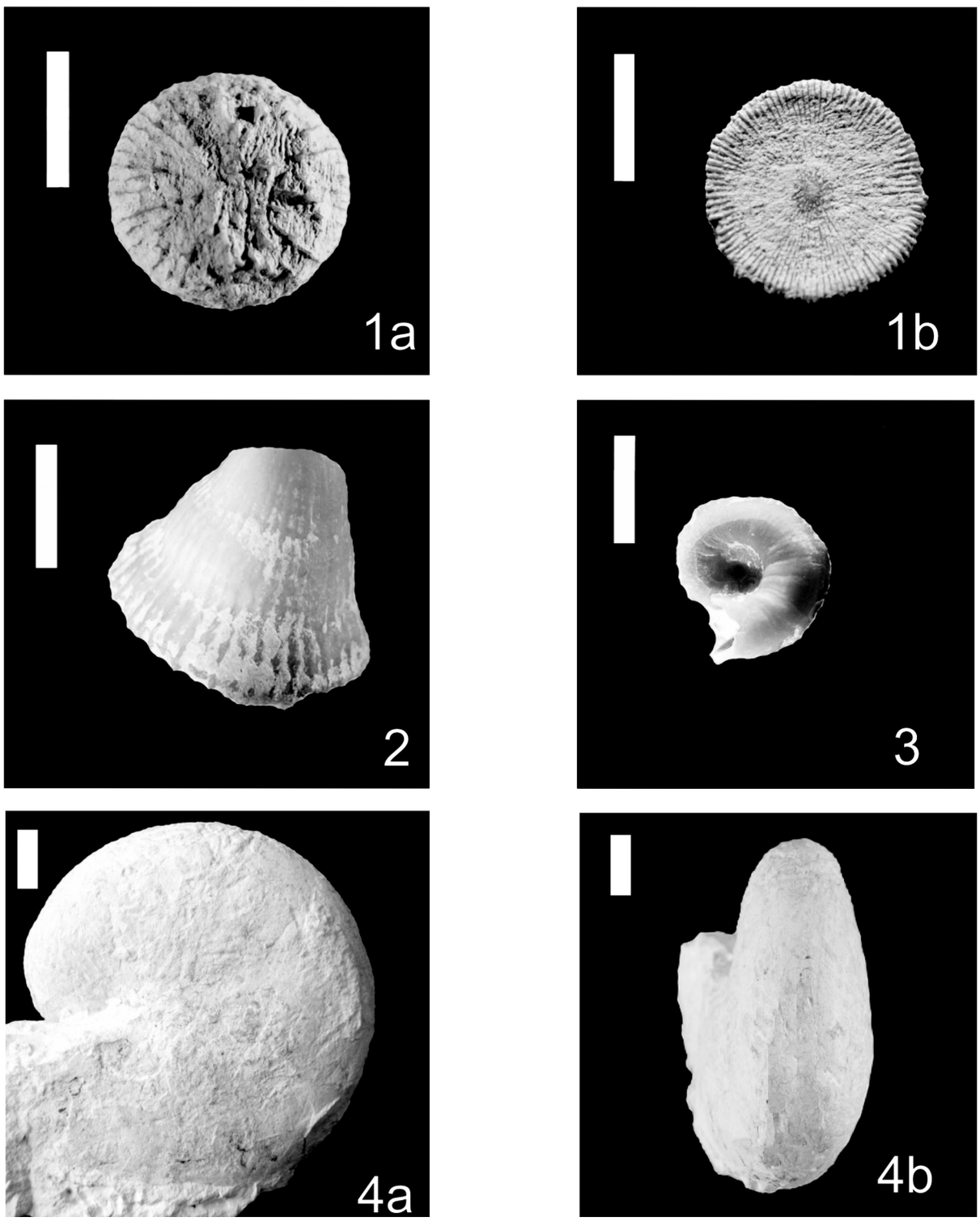


Fig. 3. Solitary corals and nautilids from the Opole Trough. **1.** *Micrabacia* sp. 1a – distal view; 1b – proximal view. MGUWr 5555s. Odra Quarry; Middle Turonian (Lower Argillaceous Marls Unit). Scale bar: 0.5 cm. **2.** *Parasmilia* sp. MGUWr 5556/1s. Lateral view. Folwark Quarry; Lower Coniacian (Upper Argillaceous Marls Unit). Scale bar 1 cm. **3**. *Spirorbi*s sp. MGUWr 5557s. Folwark Quarry; Middle Turonian (Lower Marls Unit). Scale bar 1 cm. **4.** *Cymatoceras* sp. 4a – lateral view, 4b – ventral view. CAN/OD1-2. Odra Quarry; Middle Turonian (Lower Marls Unit). Scale bar 3 cm.

Phylum Mollusca Linne, 1758
Class Cephalopoda Cuvier, 1797
Subclass Nautiloidea Agassiz, 1848
Order Nautilida de Blainville, 1825
Family Nautilidae de Blainville, 1825
Genus *Cymatoceras* Hyatt, 1884

Cymatoceras sp.
(Fig. 3.4.)

Material. One relatively well-preserved mould: CAN/OD1-2

Description. Specimen diameter 114 mm; whorl height 76 mm and whorl width 49 mm. Mould very involute. Whorl section subrectangular, higher than wide. Flanks slightly convex. Maximum breadth on the lower flanks close to the umbilical shoulder. Venter rounded and relatively narrow. Fine ribs only partially visible on the venter and upper part of the flank. Ribs curve backwards.

Remarks. Species determination is not possible due to the poor preservation of the ornamentation and the suture.

Occurrence of genus. The genus is cosmopolitan in distribution, ranging from the Upper Jurassic into the Oligocene (Kummel, 1964). Cretaceous species occur in Europe, Sakhalin (Far East Russia), Japan and the USA (Kummel, 1964; Miller & Garner, 1962; Wilmsen & Yazykova, 2003).

Nautilidae sp. et gen. indet.
(Fig. 4.1.)

Material. Two poorly preserved moulds compressed by compaction: MGUWr 5559/1; MGUWr 5559/2.

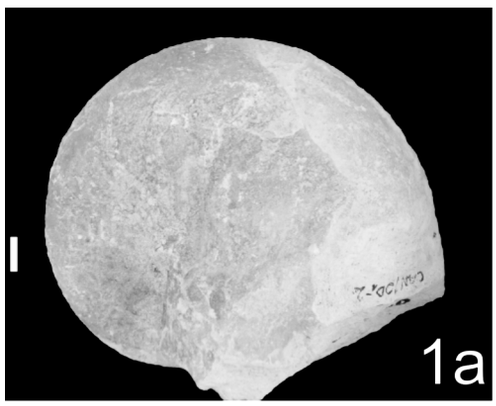
Description. Diameter of MGUWr 5559/1 60 mm; whorl height (H) 43 mm and whorl width (W) 27 mm. MGUWr 5559/2 deformed and compressed. Moulds involute, subglobular and smooth. Whorl section subrectangular, venter slightly rounded and not very broad. Suture not visible.

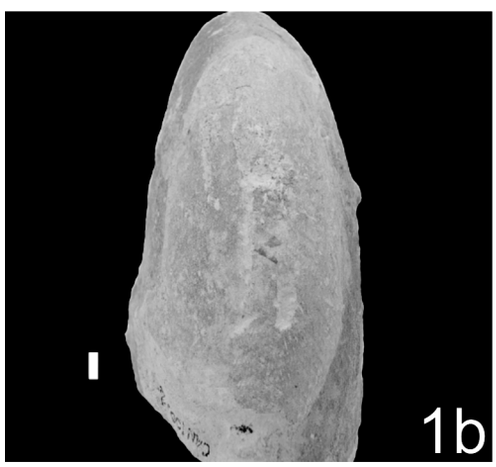
Remarks. Due to the poor preservation, genus determination is not possible. The described specimens differ from *Eutrephoceras* in having a narrow and rounded venter (W/H = 0.63), and differ from *Deltocymatoceras* and *Cymatoceras* in lacking ornamentation and in having a narrow whorl section.

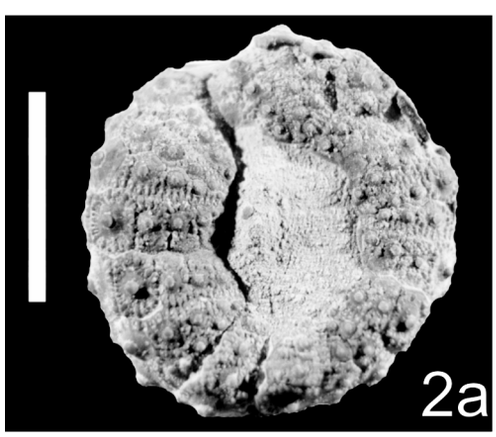
Phylum Echinodermata Bruguiere, 1791
Class Echinoidea Leske, 1778
Order Phymosomatoida Mortensen, 1904
Family Phymosomatidae Pomel, 1883
Genus *Gauthieria* Lambert, 1888

Gauthieria radiata (Sorignet, 1850)
(Fig. 4.2.)

1850 *Cyphosoma radiatum* Sorignet, p.28







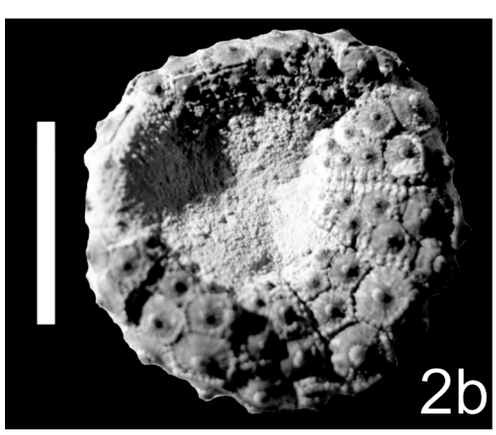


Fig. 4. Nautilid and echinoid from the Opole Trough. **1.** Smooth-shelled Nautilidae. 1a – lateral view, 1b – ventral view. MGUWr 5559/1s. Folwark Quarry; Lower Coniacian (Upper Argillaceous Marls Unit). Scale bar 3 cm. **2.** *Gauthieria radiata* (Sorignet, 1850). 2a – aboral view; 2b – oral view. MGUWr 5560s. Folwark Quarry; Lower Coniacian (Upper Argillaceous Marls Unit). Scale bar 1 cm.

1877 *Cyphosoma radiatum* Frič, p. 147, Fig. 151
1934 *Gauthieria radiata* Andert, p. 73
1996 *Gauthieria radiata* Smith & Wright, p. 290-294, Fig. 101 (1-14), 102 (1, 6-12), 103 (4-6)

Material. One well-preserved specimen, slightly compressed by compaction: MGUWr 5560s.

Description. Only corona preserved; spines and lantern, and apical, periproctal and peristomial plates lost. Test diameter 16 mm. Test low and flattened with small peristome. Interambulacra narrow, 1.25 times as wide as the ambulacra. Ambulacral and interambulacral plates each have a non-contiguous, circular, prominent areole and a large imperforate primary tubercle surrounded by a small mamelon. Tubercles become rapidly smaller towards the periproct and the peristome. Areoles of interamb plates marked by a series of short radial ribs. Primary tubercles crenulate, forming regular series.

Occurrence. Turonian to Early Santonian of Great Britain, Turonian of France, Germany, Poland, Ukraine, Russia and Algeria (Frič, 1877; Andert, 1934; Krymgolc, 1974; Smith & Wright, 1996). *Gauthieria radiata* occurs in the lowermost Turonian of the North Sudetic Basin (Scupin, 1912-1913).

CONCLUSIONS

Solitary corals of the Micrabaciidae were found in the Middle Turonian. This is the first published record of this family from the Opole Trough. *Parasmilia* sp. solitary corals, nautilids, and regular echinoids *Gauthieria radiata* were found for the first time in the Lower Coniacian of the Opole region. The echinoids and corals represent autochthonous faunas, and the latter point to warm water habitat. The presence of nautilids is also consistent with such an environment, however, the bad state of preservation and scarce occurrence do not allow to conclude whether they were autochthonous or allochthonous in the Opole Trough.

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