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A new salenioid echinoid, *Salenia sigillata pozaryskae* subsp. n., from the uppermost Maastrichtian of the Middle Vistula Valley, Central Poland

ABSTRACT: A specimen of a rare species of the salenioid echinoids has been discovered in the uppermost Maastrichtian "Opoka" at Kazimierz-on-Vistula, Central Poland. It turns out to represent a new taxon of the subspecies rank, for which the name *Salenia sigillata pozaryskae* subsp. n. is proposed.

INTRODUCTION

A remarkably well preserved salenioid echinoid has been found by the junior author in the uppermost Maastrichtian deposits at Kazimierz-on-Vistula, Central Poland. The salenioid echinoids are extremely rare in the Upper Cretaceous deposits of Poland, what is in sharp contrast with their abundance in the coeval deposits of neighboring countries, e.g. in the Maastrichtian deposits of the Isle of Rügen (see HAGENOW 1840, KRENCKEL 1928, NESTLER 1965, KUTSCHER 1983) and in the Campanian of southern Sweden (MORTENSEN 1932).

Up to now, there have been described and/or reported only five species of the family Saleniidae from Poland. They are listed and arranged in their stratigraphic order as follows:

Salenia pygmaea HAGENOW, 1840; Cenomanian (?); Wolin Island in the Szczecin Bight (KRENCKEL 1928); it is noteworthy that this specimen has probably been derived from the Maastrichtian chalk of the nearby Isle of Rügen, where this species occurs commonly (see NESTLER 1965; KUTSCHER 1973, 1983);

Salenia sp. cf. *scutigera* MÜNSTER in GOLDFUSS, 1826; Cenomanian; Głanów, Polish Jura Chain (KONGIEL 1939; for geological details of the locality see MARCINOWSKI 1974);

Salenia granulosa FORBES in MORRIS, 1854; Lower Turonian of the same locality Głanów (KONGIEL 1939);

Salenia obnupta SCHLÖTER, 1892; Lower Campanian of Bibice and Młodziejowice, Cracow Upland (KONGIEL 1939) as well as of Cracow-Bonarka locality (BARCZYK 1956);

Salenidia bonissenti (COTTEAU, 1866); uppermost Maastrichtian/Danian Greensand exposed at Nasitów near Kazimierz-on-Vistula, just across the Vistula Valley (KONGIEL 1950; for geological details see MACHALSKI & WALASZCZYK 1987).

The collected specimen from Kazimierz-on-Vistula does not belong to any of these species, and it even deviates from all the hitherto described taxa. Thus, the present contribution offers a supplementary entry to the knowledge of the Cretaceous echinoid faunas not only of Poland.

GEOLOGIC SETTING

The studied specimen has been found in 1976 in the outer wall of the building, presently used by the Museum of Goldsmithery, in the center of Kazimierz-on-Vistula. The house is built of "Opoka" (local name for marly siliceous chalk) containing numerous fossils, i.a. *Belemnella kazimiroviensis* SKOŁOZDRÓWNA, *Lyropecten acuteplicatus* (ALTH), *Pycnodonte vesiculare* (LAMARCK), *Neoliothyra obesa* (DAVIDSON), *Carneithyrus* spp., sponges and serpulids. There is no doubt that this building stone comes from the uppermost Maastrichtian (*Belemnella kazimiroviensis* Zone) "Opoka" sequence exposed in the environs of Kazimierz-on-Vistula (for detailed stratigraphy and geology see BŁASZKIEWICZ 1980 and ABDEL-GAWAD 1986).

The uppermost Maastrichtian "Opoka" contains very rich fauna of sponges, brachiopods, gastropods, bivalves, cephalopods and other groups (for the most comprehensive review see ABDEL-GAWAD 1986). In contrast, echinoids, both the regulars and irregulars, are surprisingly rare in these deposits. During many years of intensive collecting, the junior author merely recovered a few tests of *Echinocorys* sp., some unidentified Micrasteridae and a limited number of spines, belonging probably to the Stereocidarinae and the Phymosomatidae. Only a single specimen of *Hemicara pomeranum* SCHLÜTER has been studied by KONGIEL (1935) and MAĆZYŃSKA (1972).

SYSTEMATIC ACCOUNT

Order Salenioida DELAGE & HÉROUARD, 1903

Family Saleniidae L. AGASSIZ, 1838

Subfamily Saleniinae L. AGASSIZ, 1838

Genus *Salenia* GRAY, 1835

Salenia sigillata pozaryskae subsp. n. (Pl. 1, Figs 1a-1e)

1892. *Salenia heberti* COTTEAU, 1861; C. SCHLÜTER, pp. 251-257, Pl. 18, Figs 7-11; Pl. 19, Fig. 8; Pl. 20, Figs 6-10

1974. *Salenia heberti* COTTEAU, 1861; M. KAERER, K. OEKENTORP & P. SIEGFRIED, p. 276, Pl. 1, Fig. 5.

HOLOTYPE: The specimen presented in Pl. 1, Figs 1a-1e, registered as ZPAL E. VII/1, and housed at the Institute of Palaeobiology of the Polish Academy of Sciences, Warsaw.

TYPE LOCALITY: Kazimierz-on-Vistula near Puławy, Central Poland.

TYPE HORIZON: Upper Maastrichtian "Opoka" (*Belemnella kazimiroviensis* Zone).

DERIVATION OF THE NAME: In honour to the late Professor K. POZARYSKA for her contributions to the geology and micropaleontology of the Cretaceous/Danian sequence exposed along the Middle Vistula Valley.

DIMENSIONS: Ambital diameter: $D = 24.5$ mm;

Height of the test: $h = 16.5$ mm; h/D ratio = 0.67;

Diameter of the apical system: $ds = 15.9$ mm; ds/D ratio = 0.65;

Diameter of the peristome: $dp = 9.5$ mm; dp/D ratio = 0.39.

DESCRIPTION: Large *Salenia* with a hemispherical test, inflated apical system and concave lower surface. The peristome is slightly sunken. Gill slits are very small.

The apical system is large and covers nearly 2/3 of the adapical surface. Its shape is conical and swollen. The 11 plates are convex and separated by deep sutural grooves. Sutural depressions are very small or absent. All the plates show an ornamentation of irregular radial grooves, which are of unequal length and which sometimes bifurcate. Ocular plates are triangular to arrowhead-shaped. The ocellar pores are not visible. Genital plates are heptagonal and show a centrally positioned genital pore, which is surrounded by a low, circular ridge. The madreporite shows a small poriferous depression, but does not differ significantly from other genital plates. A moderately large, oval periproct is surrounded by a clearly defined, prominent, triangular ridge, the corners of which are positioned close to the centers of the suranal plate and of genital plates 1 and 5.

Interambulacral tubercles are crenulate, non-perforate. An interambulacral series consists of five such tubercles. The bosses are smooth and conical. Scrobicular rings consist of up to 11 small tubercles. These rings are open towards the adradial suture. Adjacent scrobicules of the same series are merely separated by a single, narrow row of scrobicular tubercles. However, they are not confluent. Interradial extrascrobicular surfaces are wide and covered by a dense and moderately coarse granulation.

Ambulacra are almost straight. Ambulacral series consist of 20 or 21 tubercles, which are non-crenulate, non-perforate. Almost all ambulacral plates are bigeminate, simple plates being inserted only here and there. Pore-pairs are surrounded by a low ridge; pores are separated by a prominent granuliform interporous partition. Perradial miliary surfaces are moderately wide and covered by an irregular granulation, with granules of different sizes.

DISCUSSION: Whereas many species of *Salenia* and *Salenidia* show a sculpture of radiating ridges on the plates of their apical system (e.g., *S. belgica* LAMBERT, 1897; *S. radians* ARNAUD in COTTEAU, 1890; *S. trigonata* AGASSIZ, 1838), species with the grooved apical system are few in the Boreal Upper Cretaceous of Europe. Species with a sculptured apical system, which does not show distinct sutural depressions, are even fewer. To the authors' knowledge, only *Salenia sigillata* SCHLÖTER, 1892, has these characteristics.

The investigated specimen from Kazimierz-on-Vistula has even more in common with specimens of *S. sigillata*, as described formerly by the senior author from the Gulpen Chalk of Belgium and the Netherlands (GEYS 1979). Both the Gulpen Chalk specimens and the specimen under consideration, have a sunken peristome, a conical apical system, a subtriangular periproct surrounded by a prominent sharp ridge, 4 or 5 plates in each interambulacral series, scrobicules open towards the adradial suture, moderately wide and granulated perradial miliary surfaces, etc. Moreover, both have pore-pairs, which are surrounded by low ridges, while the pores are separated by a distinct poriferous partition.

Yet, important differences can be noticed between the specimen under discussion and typical *S. sigillata*, as described in the literature. Most striking are differences in their shape. The test of typical *S. sigillata* is very globular and almost as high as wide. It is one of the highest, most spherical saleniids known. Some specimens from the Upper Cretaceous of Westphalia and Lower Saxony, described by SCHLÖTER (1892) as *Salenia heberti*, and considered as atypical *S. sigillata* by the senior author (GEYS 1979), have a lower h/D ratio (0.65 to 0.75). The same parameter for the specimen from Kazimierz-on-Vistula falls into this range. The difference in shape between typical *S. sigillata* on one hand and specimens from Germany and Poland on the other, are entirely due to the smaller height of the corona of the latter. The apical system is just as conical in one form as in the other. Another difference is the size of the peristome, the relative diameter of which (dp/D ratio) is smaller in typical *S. sigillata* (0.31) than in specimens from Germany and Poland (0.39).

The periproct, which is huge in typical *S. sigillata* is less so in "the eastern form". Perforations on the ocular plates of typical *S. sigillata* cannot be seen in "the eastern form".

Typical *S. sigillata* has been reported from the Upper Cretaceous of England, France, Belgium and the Netherlands (GEYS 1979). It may also occur in the Upper Cretaceous of the Baltic region, although it has never been reported, either from Sweden and Denmark, or from the Isle of Rügen. Yet, the holotype of the species, which has been found in glacial deposits at Potsdam near Berlin may be derived from those areas.

FINAL REMARKS

The specimens of *S. sigillata* from Central and Eastern Europe ("the eastern form"), such as the specimens misidentified by SCHLÜTER (1892) as *S. heberti*, as well as the Polish specimen described herein, have much in common with typical specimens, yet showing some minor differences. To the authors' opinion, these differences do not warrant the distinction of a new species, but are enough to establish a new subspecies.

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REFERENCES

- ABDEL-GAWAD, G. I. 1986. Maastrichtian non-cephalopod mollusks (Scaphopoda, Gastropoda and Bivalvia) of the Middle Vistula Valley, Central Poland. *Acta Geol. Polon.*, **36** (1-3), 69-224. Warszawa.
- AGASSIZ, L. 1838. Monographie d'échinoderms vivants et fossiles. I. des Salénies, pp 1-32. Neuchâtel.
- BARCZYK, W. 1956. On the Upper Chalk deposits on Bonarka near Cracow. *Studia Soc. Sci. Torunensis, Sect. C*, **3** (2), 23-48. Toruń.
- BŁASZKIEWICZ, A. 1980. Campanian and Maastrichtian ammonites of the Middle Vistula River Valley, Poland; A stratigraphic-palaeontological study. *Prace Inst. Geol.*, **42**, 1-63. Warszawa.
- COTTEAU, G. 1890. Echinides nouveaux ou peu connus, 9. *Mém. Soc. Zool. France*, **3**, 537-550. Paris.
- GEYS, J. F. 1979. Salenioid echinoids from the Maastrichtian (Upper Cretaceous) of Belgium and the Netherlands. *Paläont. Zt.*, **53**, 296-322. Stuttgart.
- GOLDFUSS, A. (1826-1844). *Petrafacta Germaniae. Abbildungen und Beschreibungen der Petrefacten Deutschlands und der angrenzenden Länder I*, pp. 1-252. Düsseldorf.
- HAGENOW, F. von. 1840. Monographie der Rügenschon Kreideversteinerungen. II. Abteilung: Radiarien und Annulaten. *N. Jb. Min.* 1840, 631-672. Stuttgart.

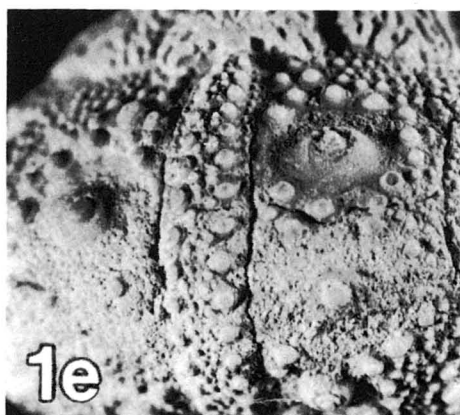
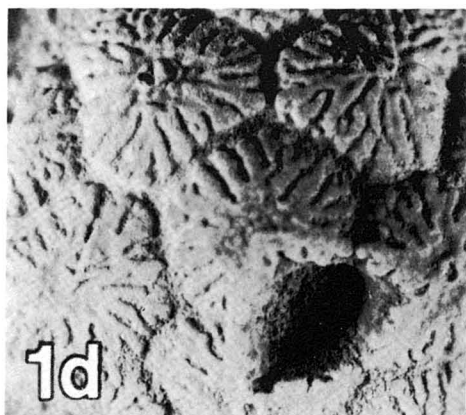
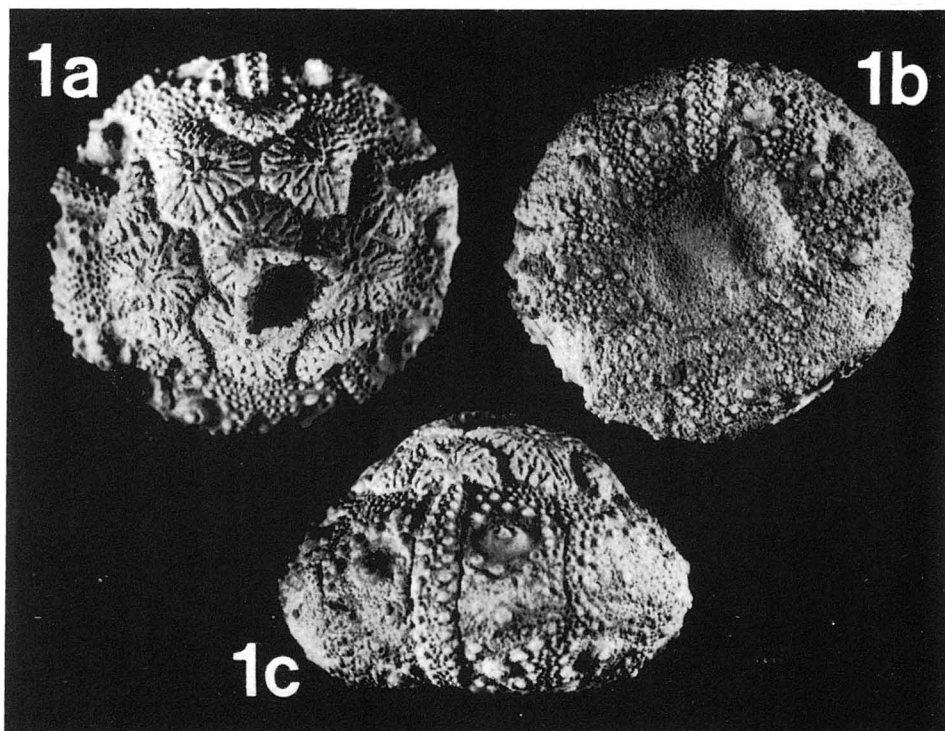
- KAEVER, M., OEKENTORP, K. & SIEGFRIED, P. 1974. Fossilien Westfalens. I. Invertebraten der Kreide. *Münst. Forsch. Geol. Paläont.*, 33/34, pp. 1-364.
- KONGIEL, R. 1935. Contribution à l'étude du "siwak" dans les environs de Puławy (plateau de Lublin). *Prace Tow. Przyj. Nauk w Wilnie*, 9, 171-227. Wilno.
- 1939. Notes pour servir à l'étude des Echinides crétacés de Pologne. *Prace Tow. Przyj. Nauk w Wilnie*, 13, 1-54. Wilno.
- 1950. Sur quelques échinides nouveaux du Maestrichtien supérieur des environs de Puławy. *Acta Geol. Polon.*, 1 (3), 311-329. Warszawa.
- KRENCKEL, H. 1928. Die regulären Echiniden der pommerschen Kreide. *Abh. Geol.-Paläont. Inst. Univ. Greifswald*, 7, 32 pp. Greifswald.
- KUTSCHER, M. 1973. Die regulären Echiniden der weissen Schreibkreide (Unter-Maastricht) der Insel Rügen. *Der Aufschluss*, 24, 107-115.
- 1983. Neue Echiniden aus dem Unter-Maastricht der Insel Rügen. IV. Salenidae AGASSIZ, 1838. *Zt. Geol. Wiss.*, 7, 889-903. Berlin.
- LAMBERT, J. 1897. Note sur les échinides de la Craie de Ciplu. *Bull. Soc. Belg. Géol. Paléont. Hydrol.*, 11, 141-190. Bruxelles.
- MACHALSKI, M. & WALASZCZYK, I. 1987. Faunal condensation and mixing in the uppermost Maastrichtian/Danian Greensand (Middle Vistula Valley, Central Poland). *Acta Geol. Polon.*, 37 (1/2), 75-91. Warszawa.
- MARCINOWSKI, R. 1974. The transgressive Cretaceous (Upper Albian through Turonian) deposits of the Polish Jura Chain. *Acta Geol. Polon.*, 24 (1), 117-217. Warszawa.
- MACZYŃSKA, S. 1972. *Hemicara pomeranum* SCHLÜTER, 1902 (Echinoids) from the Maastrichtian of Bochoznica near Puławy, Central Poland. *Prace Muzeum Ziemi*, 20, 163-171. Warszawa.
- MORRIS, J. 1854. A catalogue of British fossils: comprising the genera and species hitherto described; with references to their geological distribution and to the localities in which they have been found, pp. 1-372. London.
- MORTENSEN, T. 1932. On the Salenidae of the Upper Cretaceous deposits of Scania, Southern Sweden. *Geol. Fören. Förhandl.*, 54, 471-496. Stockholm.
- NESTLER, H. 1965. Echiniden aus dem Unter-Maastricht der Insel Rügen. I. Die Saleniden. *Geologie*, 14, 982-1003. Berlin.
- SCHLÜTER, C. 1892. Die Regulären Echiniden der norddeutschen Kreide. II. Cidaridae, Salenidae. *Abh. Kön. Preuss. Geol. Landesanst.*, 5, 1-243. Berlin.

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**NOWY PODGATUNEK JEŻOWCA, *Salenia sigillata pozaryskae* subsp. n.,
Z NAJWYŻSZEGO MASTRYCHTU KAZIMIERZA NAD WISŁĄ**

(Streszczenie)

Przedmiotem pracy jest opis pojedynczego okazu jeżowca znalezionej w opokach najwyższego mastychtu w Kazimierzu nad Wisłą i zaliczonego do nowego podgatunku *Salenia sigillata pozaryskae* subsp. n. (patrz pl. 1, fig. 1a-1e). Okaz ten jest godny uwagi zważywszy, iż jakiegokolwiek jeżowce, zarówno regularne jak i nieregularne, są bardzo rzadkim elementem faunistycznym w opokach górnego mastychtu okolic Kazimierza.



Salenia sigillata pozaryskae subsp. n. (specimen ZPAL E. VI/1); uppermost Maastrichtian "Opoka", Kazimierz-on-Vistula, Central Poland

1a – aboral view, 1b – oral view, 1c – lateral view; all $\times 2$

1d – apical system, 1e – ambulacrum; both $\times 4$