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NOTE ON SOME CRANIAS FROM CENTRAL POLAND

Abstract. — Two kinds of *Cranias* have been collected between 193 m. and 207 m. in a boring at Boryszew, central Poland. Most valves represent a new member of the "*Crania tuberculata* group". For members of this group, comprising species from the Maastrichtian, Danian, Paleocene and ?Eocene, a new subgenus of *Crania* — *C. (Danocrania)* n.subg. is erected with *Crania tuberculata* Nilsson as type species. The Polish representatives are named: *C. (Danocrania) polonica* n.sp. and *C. (Danocrania) polonica semicostulata* n.subsp. The subspecies shows a peculiar outer sculpture very similar to that shown by a *C. (Danocrania)* from the upper Middle Danian of Faxø (Denmark). The remaining *Cranias* all belong to the subgenus *C. (Isocrania)*, known only in association with *C. (Danocrania)* in Danian strata. The Polish form is related to *C. (Isocrania) posselti* Rkz. from the Upper Danian of Denmark. The age of the *Crania*-bearing strata at Boryszew is estimated to be upper Middle Danian. If the strata are younger, their Danian fossil content, e.g. the *Cranias*, *Tylocidaris masoviensis* Kongiel and *Stereocidaris rosenkrantzi* (Ravn), must be considered as derived fossils. A ventral valve of the Upper Senonian *C. (Isocrania) paucicostata* Bosquet in Lower Paleocene strata at Bochothnica shows that derived fossils may occur in the Lower Paleocene of central Poland.

INTRODUCTION

Some years ago Prof. Dr Krystyna Pożaryska, from the Palaeozoological Institute of the Polish Academy of Sciences, Warsaw, sent me two *Cranias* from a boring at Boryszew in the neighbourhood of Sochaczew (central Poland), asking for my opinion on their specific determination. Later I received more *Crania* material from the same boring, and in 1963 Prof. Pożaryska sent me a specimen from the same locality together with a *Crania* from Bochothnica, belonging to Dr A. Radwański's collection (Laboratory of Dynamic Geology of the Warsaw University).

Rózkowska (1955) and Kongiel (1958) have used the designation *Crania tuberculata* Nilsson for the Polish specimens from Boryszew, but at my first look at this material I immediately realized that the outer sculpture differed considerably from the true *C. tuberculata* from the uppermost Danian of southern Scandinavia. Nevertheless the shells belonged to the

group of *C. tuberculata*¹, known from Holland, south Germany, Austria, Crimea and Bulgaria. In the Polish material sent to me the subgenus *C. (Isocrania)* Jaekel is also represented.

Since receiving the first *Cranias* from Poland I have attempted to revise the *Crania tuberculata* group whose members belong to the Danian, Paleocene and ?Eocene. While describing the Polish *Cranias* of this group I take the opportunity of presenting some of my results. I gratefully acknowledge the receipt of material sent me from Professors Pożaryska and Pożaryski (Crimea, Bulgaria), Prof. Naidin (Crimea), Prof. Dehm (southern Germany), Dr Traub (Austria), Dr Meijer and Dr Wienberg Rasmussen (Holland).

Vassilenko (1955) referred the members of the *Crania tuberculata* group to the subgenus *C. (Ancistrocrania)* Dall, 1877, type *C. parisiensis* Defrance. However, in this subgenus the two internal apophyses diverging from the apex in the dorsal valve and carrying the attachments of the anterior adductor muscles are connected in an elevated transverse ridge. This is not the case in the dorsal valve of members of the *tuberculata* group where the apophyses are separated by a distinct groove with a pronounced mesial septum which is totally lacking in *C. (Ancistrocrania)*.

The members of the *tuberculata* group form a well defined *Crania* assembly and therefore deserve to be treated as constituting a new subgenus for which I propose the name *C. (Danocrania)*.

Specimens from Boryszew boring belong to the collections of the Palaeozoological Institute of the Polish Academy of Sciences in Warsaw (*Crania*) and of Prof. R. Kongiel, 1958 (*Tylocidaris*). They are marked: Bp. VIII/1-52 and E. II/42 respectively.

¹ It seems to me most unfortunate that Carlsson in 1958 replaced the well known name *Crania tuberculata* Nilsson, 1826—27, with *Craniolites brattenburgicus* Schlotheim, 1820. *Crania tuberculata* had then been used for about 132 years by all palaeontologists and moreover as designation for a zone: the zone with *C. tuberculata* of the Upper Danian, and for a group of *Cranias*: the *C. tuberculata* group. Schlotheim delivered in 1820 bad figures of the fossil in question and no description at all. It is possible to establish that Schlotheim himself from a label in his collection, which since 1833 has been preserved in the Geological-Palaeontological Institute of Humboldt University in Berlin, for unknown reasons had given up the name *brattenburgicus* and replaced it with *tuberculata*. Maybe Lundgren was right in 1884 when he wrote that *brattenburgicus* was a misspelling for *brattenburgensis* (Stobaeus, Retzius, a synonym of *craniolaris* Linné). Then there is reason to believe that Schlotheim to begin with thought that his *Crania* was identical with *Crania brattenburgensis*, but later saw he was wrong and then referred his valves to Nilsson's species *tuberculata*. Consequently, Hoeninghaus in 1828, describing and figuring Schlotheim's specimens, put them under Nilsson's name. (Schlotheim died in 1832). Thus there is good reason for not using Schlotheim's name *brattenburgica* and so it has been for 132 years until Carlsson, 1958, dug it up and since followed by Kruytzer & Meijer the same year. Therefore I think it most reasonable to preserve the old name *Crania tuberculata* Nilsson and hope to have it sanctioned by the International Commission on Zoological Nomenclature before publishing my final results on *C. (Danocrania)*.

SYSTEMATIC DESCRIPTIONS

Genus *Crania* Retzius, 1781

Type species: *Anomia craniolaris* Linné, 1758 = *Crania brattenburgensis* Retzius, 1781

Crania (*Danocrania*) subg. nov.

Derivation of name: *Danocrania* — Lat. *Dania* = Denmark.

Type species: *Crania tuberculata* Nilsson, 1826-27.

Species assigned to *Crania* (*Danocrania*) subg. nov.:

1820. *Craniolithes brattenburgicus* Schlotheim non *brattenburgensis* Stobaeus 1732, Linné 1751. Copenhagen.
1826-27. *Crania tuberculata* Nilsson. Scania.
1828. *Crania tuberculata* Nilsson Hoeninghaus based on Schlotheim's specimens of *Craniolithes brattenburgicus*. Copenhagen.
1834-40. *Crania tuberculata* Nilsson. Goldfuss (Pl. 162). Copenhagen.
Crania spinulosa Goldfuss non Nilsson (Pl. 162). Holland = *Crania hagenowi* de Koninck.
Crania spinulosa Goldfuss non Nilsson (Pl. 163). Holland = *Crania geulhemensis* Kruytzer & Meijer.
1854 (1863). *Crania tuberculata* Schafhütel non Nilsson = *C. kressenbergensis* Gümbel. Bavaria.
1854. *Crania hagenowi* de Koninck. Limburg.
1857. *Crania spinulosa* Baily non Nilsson. Crimea. = *C. tuberculata* Nilsson.
1861. *Crania kressenbergensis* Gümbel. Bavaria.
1867. *Crania spinulosa* Lundgren non Nilsson. Scania. = *C. transversa* Lundgren.
1885. *Crania transversa* Lundgren. Scania.
1885. *Crania tuberculata* Nilsson. Lundgren. Scania.
1894. *Crania tuberculata* Nilsson. Posselt. Denmark.
1894. *Crania transversa* Lundgren. Posselt. Denmark.
1896. *Crania subtuberculata* Reis. Austria. = ? *C. kressenbergensis* Gümbel.
1909. *Crania tuberculata* Nilsson (incl. *C. transversa* Lundgren) Br. Nielsen. Denmark.
1920. *Crania tuberculata* Nilsson. Rosenkrantz. Copenhagen.
1938. *Crania austriaca* Traub. Austria.
1939. *Crania tuberculata* Tzankov non Nilsson. Bulgaria. Presumably a new species.
1955. *Crania (Ancistrocrania) tuberculata* Nilsson. Vassilenko. Crimea.
1955. *Crania (Ancistrocrania) spinulosa* Vassilenko non Nilsson. Crimea. Presumably a new species.
1955. *Crania (Ancistrocrania) sp.* Vassilenko. Crimea.
1958. *Crania brattenburgica geulhemensis* Kruytzer & Meijer. Holland.
1958. *Crania brattenburgica geulhemensis* Kruytzer & Meijer. Holland.

Diagnosis. — Small to rather big, mostly thin-shelled *Crania*. Shell inequivalve. Ventral valve weakly convex, flat to concave, only cemented to a support (never preserved) by a very small area around the apex. Test in the older species covered with flat-lying, scattered spinules. In the younger species the spinules develop in two ways: either the spinules are arranged in intersecting arcs or they are arranged along undulating, flat ribs radiating from the apex and ramifying towards the shell margin. Outline oval to subcircular or subrectangular narrowing against the

evenly rounded, straight or slightly incised, posterior margin. The adductor muscles have deposited calcareous matter forming projections. Rostellum sharp and prominent. Mesial septum in dorsal valve prominent, swollen or arrow-shaped in front of the anterior adductor impressions.

Description. — *Ventral valve* slightly convex to nearly flat. Apex situated close to the posterior margin, in some species placed as the point of a triangular body (beak) protruding the posterior margin. Interior with four adductor impressions. The posterior adductors strongly marked, variably oval to circular, formed as projections produced by the muscles depositing calcareous matter. One or both of these projections may exceptionally not be preserved, leaving deeply excavated markings in the shell. Pallial secretions formed as more or less prominent, curved rims are seen in front of the anterior adductor impressions. These impressions are more or less widely separated by an area carrying two tapering granulated ridges forming extensions of the granulated rim round the margin of the shell. The anterior adductor impressions, placed subcentrally, are oval, oblique, depressed in low projections and smaller and more close-set than the posterior. They are separated by a nose-shaped, prominent rostellum the tip of which reaches to the anterior border of the anterior adductor impressions. In front of these there is a well delimited heart-shaped area with its tip approaching the anterior margin of the valve. On both sides of this area the pallial sinuses may be recognized depending on the extent of granulation on this part of the valve. The thickened border of the valve is provided with numerous granulae, increasing in size inwardly and often extending to and covering more or less the whole disk in the anterior half of the valve. Within the same species population there may be all transitions from granulation restricted to the border to specimens where the anterior half of the valve is covered by granulae obscuring the impressions of the pallial sinuses and the anterior part of the heart-shaped area.

Dorsal valve conical, apex rather close to the posterior margin and directed posteriorly. Sculpture similar to that of the ventral valve. Interior with four prominent adductor impressions. The posterior adductor markings mostly formed as oval, more or less oblique projections separated by a rather wide area carrying one elevated, granulated, tapering ridge formed by the granulated rim of the valve. The anterior adductor muscles larger than the posterior, subcentral to central, attached to oblique strong ridges or circular to oval prominent pedestals with a central notch in each. Between the anterior adductor pedestals there is a mesial septum, in front of the pedestals it is more or less swollen or with its tip combined with nearly parallel extensions of the pedestals forming an arrow-like figure. Impressions of the pallial sinuses are recognizable symmetrical to the septum, but as in the ventral valve they may be more or less obscured by granulation.

Dimensions. The Danocranias may attain a rather considerable size which is rather unusual within the Craniidae. The largest species are:

| | Length (mm.) | Breadth (mm.) |
|---|-----------------|------------------|
| <i>Crania (Danocrania) spinulosa</i> Vassilenko non Nilsson. Danian, Crimea. | 17.10 16.70 | 16.40 16.70 |
| <i>C. (Danocrania) kressenbergensis</i> Gümbel. Eocene?, Bavaria. | 15.95 14.80 | 15.50 13.70 |
| <i>C. (Danocrania) tuberculata</i> Nilsson. Danian, Denmark. | 15.25 14.60 | 15.70 14.00 |

Remarks. — The genera and subgenera of Craniidae so far known from the Cretaceous and Tertiary differ from *C. (Danocrania)* inter alia in the following way:

Crania (Crania) Retzius, 1781

Type species: *Crania craniolaris* Linné, 1758

Diagnosis. — Test cemented with most of the surface of the ventral valve attached to different kinds of supports. Free surface almost smooth with pronounced growth-lines. Posterior adductors in the ventral valve show deep grooves, in some cases with perforation of the valve. The anterior adductors attached to grooves coalesced to form a single, broad, deep groove only covered by a thin, calcareous roof that is mostly broken down. No prominent rostellum developed.

Crania (Ancistrocrania) Dall, 1877

Type species: *Crania parisiensis* Defrance, 1819

Diagnosis. — As *Crania (Crania)* fixed over most of the surface of the ventral valve. Sculpture as in *Crania (Crania)*. The anterior adductors of the dorsal valve attached to an unbroken transverse ridge. Mesial septum totally lacking in this valve.

Crania (Isocrania) Jaekel, 1902

Type species: *Crania egnabergensis* Retzius, 1787

Diagnosis. — Rather small, thick-shelled Cranias, the two valves nearly equally convex. Apex in both valves subcentral. Sculpture consisting of rather coarse, straight or weakly curved ribs overlapping the shell border. Between the principal ribs secondary and tertiary ribs may be intercalated.

I consider *C. (Ancistrocrania)*, *C. (Isocrania)* and *C. (Danocrania)* as subgenera of *Crania*.

Genus *Craniscus* Dall, 1871Type species: *Crania tripartita* Münster, 1840

Diagnosis. — Ventral valve subconical, apex central, surface smooth with pronounced growth markings. Mesial septum of the dorsal valve, not developed behind the elevated ridges carrying the anterior adductor attachments and not swollen or arrow-shaped in front.

Discussion

It is considered that *Crania* (*Danocrania*) developed from the Senonian *Crania* (*Crania*). *Crania spinulosa* Nilsson from the Senonian shows some features reminiscent of *C. (Danocrania)*, viz. a rather small area of attachment, but not as small as in *C. (Danocrania)* and a sculpture consisting of scattered granulae and flat lying spinules. The details of the interior are, however, the same as in *C. (Crania)*. The oldest member of *C. (Danocrania)* seems to be the small species *hagenowi* (de Koninck MS) Davidson from the lowermost Maastrichtian of Holland and Belgium. *C. (Danocrania)* is a characteristic member of the Danian faunas of Denmark, Scania, Holland and the Crimea, where it occurs together with the last members of the Senonian subgenus *C. (Isocrania)*. In the Paleocene of Austria presumably Lower Thanetian, the species *austriaca* Traub. (Pl. I, fig. 5), a typical *C. (Danocrania)*, occurs abundantly. The species *kressenbergensis* Gümbel also a true *C. (Danocrania)* from the Eocene, Landenian or Cuisian of Bavaria may be derived from older deposits being rather similar to older species. So it seems that the range of the subgenus *C. (Danocrania)* is: Maastrichtian — Danian — Thanetian — ?Eocene, culminating in the Danian.

The oldest representatives of *C. (Danocrania)*: *hagenowi* from the Maastrichtian, *transversa* from the Lower and Middle Danian, and *geulhemensis* (Pl. I, fig. 3) from the Middle Danian, possess a sculpture consisting of scattered spinules, while in *C. (Danocrania) tuberculata* (Pl. I, figs. 1—2) of the Upper Danian the spinules are arranged in intersecting arcs. The sculpture of the older forms may totally, or in part, transform into undulating, flat, ramifying ribs radiating from the apex. The oldest forms carrying this type of sculpture occur in the Middle Danian of Faxe, Denmark and they also occur in the Upper Danian of the Crimea and the Danian of Bulgaria. The youngest known representatives of *C. (Danocrania)*: *austriaca* and *kressenbergensis* of the Paleocene and ?Eocene are both sculptured in this way. In some cases the test surfaces appear quite smooth due to wear produced by transportation of the shells. Examples of this are known inter alia from Geulhem in Holland and Faxe in Denmark.

DESCRIPTION OF SPECIES

Crania (Danocrania) polonica n.sp.

(Plates: II, figs. 1-3; III, fig. 1; IV, figs. 1-2)

Holotype: A ventral valve; Pl. II, fig. 1 (Coll. Bp. VIII/1).*Type locality*: Boryszew at Sochaczew, central Poland.*Type stratum*: Arenaceous, glauconitic marl from a boring at a depth of 202 m. Strata termed Lower Paleocene.*Diagnosis*. — Medium-sized *C. (Danocrania)*. Anterior part of disk not granulated. Sculpture consisting of very coarse well-spaced granules and large flat-lying, radiating spines.*Description*. — *Ventral valve*: shell with more or less projecting beak. Coarse granulation restricted to the rim. Two rather short, tapering prolongations of the granulated rim between the posterior muscular impressions which are oval and broader than the rather small, oblique anterior muscle impressions. The posterior and anterior muscle impressions consist of brown coloured shelly matter forming pedestals. The tip of the sharply marked rostellum is also built up of the same brown material connecting the anterior pedestals and forming the base of a muscle producing shelly matter as the adductors. Pallial sinuses well developed on both sides of the weakly marked heart-shaped area. Exterior showing a very small mark of attachment. The sculpture consisting of very coarse, flat-lying, scattered, radially arranged spines somewhat varying in size in the different specimens.*Dorsal valve* conical, apex rather close to the cardinal margin. Granulation restricted to the rim producing a broad, truncate insertion between the posterior adductor projections. The posterior and anterior muscle impressions equally spaced consisting of brown coloured shelly material. Between the anterior impressions a marked septum swollen in the anterior part and connected with the anterior muscle pedestals by thin sub-parallel crests joining at the anterior tip of the septum. Pallial sinuses well developed. Exterior ornamentation as in ventral valve.*Dimensions*. Holotype — length 12.0 mm., breadth 11.3 mm. (see Text-fig. 1).*Crania (Danocrania) polonica semicostulata* n.subsp.

(Plate III, figs. 2-4; Text-fig. 1)

Holotype: A ventral valve; Pl. III, fig. 3 (Coll. Bp. VIII/45).*Type locality*: Boryszew at Sochaczew, central Poland.*Type stratum*: Arenaceous, glauconitic marl from a boring at a depth of 202.8—205.8 m. Strata termed Lower Paleocene.*Diagnosis*. — Subspecies of *C. (Danocrania) polonica*. Anterior part of disk wholly or partly granulated. Sculpture in the older part of the shell consisting of undulating ramifying ribs radiating from the apex, in the younger part consisting of coarse scattered granules.

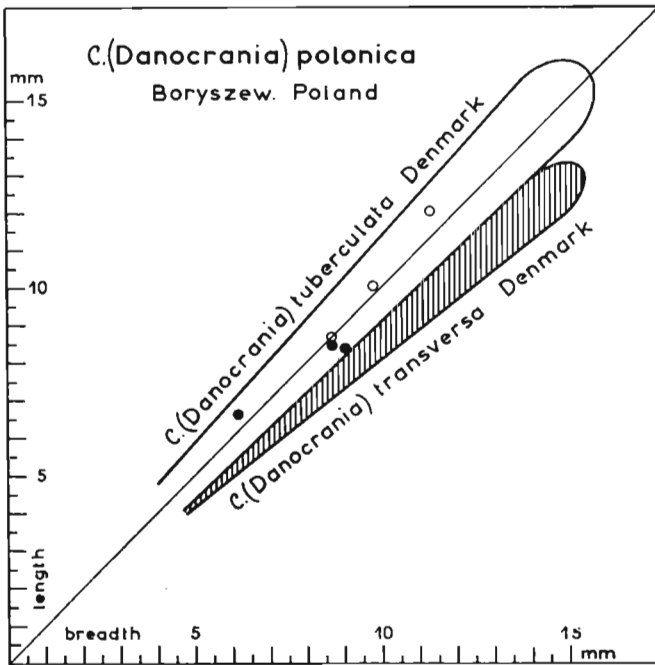


Fig. 1. — The two areas marked in the diagram were obtained from a large number of length/breadth ratios of *C. (Danocrania) transversa* from the Lower Danian, and *C. (Danocrania) tuberculata* from the uppermost Danian of Denmark. The two areas do not overlap indicating that the length/breadth ratios are diagnostic for the separation of the species. On this diagram has been plotted the results obtained from the most complete valves of *C. (Danocrania) polonica*. They are all confined to the *tuberculata* area. Open circles: *C. (Danocrania) polonica polonica*. Filled circles: *C. (Danocrania) polonica semicostulata*.

Remarks. — Only ventral valves are known with certainty in this variety. Apart from the details mentioned in the diagnosis the valves agree with *C. (Danocrania) polonica polonica*.

Dimensions. Holotype — length 6.6 mm., breadth 6.2 mm. (see Text-fig. 1).

The *C. (Danocrania)* material from the boring at Boryszew consists of the following:

Crania (Danocrania) polonica polonica n.subsp.

193—207 m.: 35 ventral valves and several fragments; 12 fragmentary dorsal valves.

202 m.: 2 ventral valves including the holotype.

Crania (Danocrania) polonica semicostulata n.subsp.

193 —207 m.: 5 ventral valves; 1 ?dorsal valve.

202.8—205.8 m.: 1 ventral valve, holotype.

The outer sculpture in the subspecies *semicostulata* consists initially of flat, undulating, ramifying ribs radiating from the apex just as in the species from the Paleocene of Austria, the ?Eocene of Bavaria and the Danian of Bulgaria and the Crimea. But then in *semicostulata* the sculpture on the younger parts of the valve alters to coarse, scattered spinules as in *C. (Danocrania) polonica polonica*. This double sculpture is also seen on Cranias from the uppermost part of the Middle Danian at Faxe and in some specimens of *C. (Danocrania) spinulosa* Vassilenko non Nilsson from the Danian of the Crimea.

The stratigraphical distribution of *C. (Danocrania) polonica polonica* and its subspecies *semicostulata* is not quite clear. Two of the specimens of *C. (Danocrania) polonica polonica* including the holotype have been taken at a level of 202 m. and the holotype of *C. (Danocrania) polonica semicostulata* n.subsp. has been obtained from a level between 202.8 m. and 205.8 m. All the rest of the *Crania* material from Boryszew consisting of a mixture of both forms are labelled as coming from levels between 193 m. and 207 m. So there is a slight possibility that *semicostulata* occurs in the strata above 202 m. and if so represents a further development of the *C. (Danocrania) polonica polonica* restricted to the strata below 202 m. Another explanation is that the sculpture development has taken place in the same population (as is the case at Faxe) so that both forms coexist.

Subgenus *Crania (Isocrania)* Jaekel, 1902

Type species: *Crania egnabergensis* Retzius, 1787

Crania (Isocrania) aff. *posselti* Rosenkrantz, 1920

(Plate IV, figs. 3-8)

1920. *Crania (Isocrania) posselti* Rosenkrantz; A. Rosenkrantz, Craniakalk..., p. 29, Pl. 2, figs. 5-7.

Among the Cranias from the Boryszew boring between 193 and 207 m., two ventral and two dorsal valves of *C. (Isocrania)* were found belonging to a species nearly related to the Upper Danian *C. (Isocrania) posselti*. Possibly these shells represent a new species, but as the material is so scarce and the valves are rather worn I do not venture to propose a new name. On Plate IV three valves of *C. (Isocrania) posselti* from Copenhagen have been figured for comparison with the Polish species.

The ventral valve differs from *C. (Isocrania) posselti* in having a narrower rim covered with coarser granules. Posterior and anterior adductor impressions, protractor and retractor impressions and the pallial sinuses seem to agree very well with *C. (Isocrania) posselti*. This is also the case when the position of the apex and the character and number of primary, secondary and tertiary ribs are taken into consideration.

The dorsal valve seems to be more oval in shape, the rim narrower and the granular ornamentation coarser than in *C. (Isocrania) posselti*.

The protractor and retractor impressions are well developed and in close agreement with the corresponding impressions in *C. (Isocrania) posselti*.

The ventral valve figured as Fig. 7 on Plate IV agrees in shape with *C. (Isocrania) posselti*, whereas the ventral valve (Fig. 6) and the dorsal valve (Fig. 8) are more oval in outline. These valves, however, seem to be somewhat deformed.

Crania (Isocrania) paucicostata Bosquet, 1859

(Plate V, fig. 1)

1859. *Crania egnabergensis* Retz. var. *paucicostata* Bosquet; J. Bosquet, Monographie..., p. 15, Pl. I, figs. 5-6.
 1902. *Isocrania bosqueti* Jaekel; O. Jaekel, Über verschiedene Wege..., p. 1063, fig. 5.
 1955. *Crania (Isocrania) bosqueti* Jaekel; V. K. Vassilenko, The genus *Crania*..., p. 68, Pl. II, fig. 5.

A ventral valve of this megalomorph *C. (Isocrania)* originates from the locality Bochoznica (collection A. Radwański) and has been collected in strata referred to the Lower Paleocene. The valve measures: length 14 mm., breadth 15 mm., and in this respect agrees very well with Bosquet's species (12.5 mm. and 13.0 mm. respectively). The exterior shows 15 strong, primary ribs, radiating from a small well defined area of attachment near the posterior margin, and 7 intersecting secondary ribs. All ribs overlap the shell border forming strong protuberances. Bosquet's type (1859, Pl. 1, figs. 5, 6) possess 12 primary ribs and 8 secondary ribs, the number of primary ribs being smaller along the posterior border as in the Polish specimen. Further the anterior part of the disk is finely granulated in the Polish valve effacing the pallial sinuses. In Bosquet's type specimen this part of the shell is quite smooth. Otherwise the interior details are in full agreement with Bosquet's specimen. The three ventral valves figured by Jaekel (1902, p. 1063, fig. 5) from Maastricht as *C. (Isocrania) bosqueti* Jaekel (a synonym of *C. (Isocrania) paucicostata* Bosquet) show respectively 14, 14 and 15 primary ribs, and 9, 8 and 8 secondary ribs. Vassilenko's specimen from the Maastrichtian of the Crimea shows about 15 primary and about 10 secondary ribs. Thus the variability of ribbing within *C. (Isocrania) paucicostata*, originating from the Lower Maastrichtian of Maastricht is so considerable that the Polish specimen fits very well. Therefore there is good reason for considering this fossil of Maastrichtian age. Consequently since it occurs in a Lower Paleocene deposit it must be a derived fossil.

AGE OF THE DESCRIBED FAUNA

The strata at Boryszew which have delivered the *Cranias* described here have been assigned by Różkowska (1955) to the Montian based on the numerous corals found, inter alia *Caryophyllia calcitrapa* (von Koe-

nen) also known from the Lower Selandian of Copenhagen. This species has previously been mentioned as also occurring in the Danish Upper Danian, but according to Søren Floris this determination is questionable. In 1957 Brotzen and Pożaryska, on the evidence of the Foraminifera, also assigned the strata at Boryszew to the Montian. However, Kongiel in 1958 said that the echinoid content *Stereocidaris rosenkrantzi* (Ravn), *Tylocidaris pomifer* (Boll) var. *masoviensis* Kongiel and *Balanocidaris? harduini* (Desor)? of the strata indicate a Danian age. In addition to the echinoids Kongiel also mentions the occurrence of the Danian species *Crania tuberculata* Nilsson, *Ditrupa schlotheimi* Rkz, *Glomerula gordialis* (Schloth.) and a *Cementula*. Recently Voigt (1964) from his studies on the bryozoans from Boryszew concluded that the age of the strata must be Upper Danian or Montian.

The difference of opinion on the age of the deposits is possibly not so marked as it appears. Vincent in 1930 showed by means of the Mollusca, and Wienberg Rasmussen in 1962 on other macrofossils, especially echinoids, that the Tuffeau de Cibly corresponds in age with the Danian in Denmark. Moreover the guide fossil of the Middle Danian, *Tylocidaris bruennichi* Ravn, has been found by Wienberg Rasmussen in the Tuffeau de Cibly. The Calcaire grossier de Mons, representing the true Montian, rests unconformably on the Tuffeau de Cibly and, as mentioned by me at the Colloquium on the Palaeogene at Bordeaux 1962, may therefore represent the Upper Danian of Denmark and possibly also the Lower Selandian comprising the famous strata from Copenhagen (Vestre Gasvaerk) and the Lellinge Greensand. The Lower Selandian of Denmark is faunistically closely connected with the Upper Danian, when macrofossils are taken into consideration and therefore I prefer to designate the complex Lower Selandian + Danian with the provisional name Dano-Paleocene and let this complex constitute the lowermost stage of the Tertiary followed by the Thanetian. The finding of an extremely fossiliferous. Dano-Paleocene series in West Greenland seems to strengthen this view.

By means of the macrofossils at my disposal from the *Crania* beds I am inclined to fix the age of the beds as Danian for the following reasons:

- 1) The *C. (Danocrania) polonica polonica* has a sculpture of scattered spinules which is only known in Danocranias from the Lower and Middle Danian. Some of the specimens from Boryszew *C. (Danocrania) polonica semicostulata* n.subsp. show a development of the sculpture into undulating, ramifying, flat ribs radiating from the apex. This type of sculpture is characteristic for the Danocranias ranging from the upper part of the Middle Danian (Faxe) to the ?Eocene (Text-fig. 2).

- 2) In the *Crania* strata at Boryszew the subgenus *C. (Isocrania)* is also represented. *C. (Isocrania)* is unknown from strata younger than the Danian. The association of *C. (Danocrania)* with *C. (Isocrania)* is known from the Danian of Denmark and the Crimea.













| Range of <i>Danocrania</i> | | | | |
|----------------------------|---|---|---|---|
| Sculpture |  |  |  | Crania (<i>Danocrania</i>) <i>polonica</i> |
| Stages | | | | |
| ? Eocene | | |  | |
| Paleocene | | |  | |
| Upper Danian | |  |  | |
| Middle Danian |  | |  |  |
| Lower Danian |  | | | |
| Maastrichtian |  | | | |

Fig. 2. — The position of *C. (Danocrania) polonica* in the stratigraphical sequence according to its sculpture.

3) The echinoids *Stereocidaris rosenkrantzi* (Ravn) and *Tylocidaris masoviensis* Kongiel also indicate a Danian age. Prof. Pożaryska has sent me some echinoid fragments from the *Crania* beds at Boryszew which includes these two species together with spines of *Phymosoma* and *Palaeodiadema* which are closely related to spines in the Danish Danian. There is only one well preserved specimen of *Tylocidaris masoviensis* in the material sent to me which corresponds closely with spines from the Middle Danian of Faxe (Pl. V, fig. 3). This species, not previously recorded from Denmark, occurs here abundantly together with *Tylocidaris bruennichi* Ravn, the guide fossil for the Middle Danian. All the spine types of *T. masoviensis* illustrated by Kongiel (1958, Pl. 1) may be found in the Middle Danian at Faxe.

If the Polish *Crania* beds are younger than the Danian, as the Foraminifera evidence of Brotzen and Pożaryska (1957) seems to indicate, it is necessary to explain the occurrence of the Danian element in the beds.

As already mentioned, some of the *Cranias* from Boryszew are in a fine state of preservation (the original colour markings are preserved), but many of the macrofossils are more or less worn and therefore possibly derived from an older deposit. This possibility also exists for the well preserved specimens. Nevertheless it must be emphasized that the state of preservation of fossils gives no decisive proof as to whether the specimens are derived or not. The possibility that Danian forms really may have been derived from older strata at Boryszew is strongly indicated

by the presence of a Senonian *C. (Isocrania) paucicostata* in the Lower Paleocene beds at Bochotnica which can only be explained as a derived fossil.

ACKNOWLEDGEMENTS

I am very grateful to Prof. Dr Krystyna Pożaryska for providing me with the interesting Polish material which started my attempts at a complete revision of the *Crania tuberculata* group. For drawing the diagrams I am indebted to Mrs Ragna Larsen and Mrs Erna Nordmann, and for the photographs to Mr A. Kiilerich. For correcting the English text my thanks are due to Mr Stuart Watt of the Geological Survey of Greenland.

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ALFRED ROSENKRANTZ

O PEWNYCH KRANIACH Z POLSKI ŚRODKOWEJ

Streszczenie

Praca poświęcona jest przedstawicielom brachiopodów z rodzaju *Crania* z wiercenią w Boryszewie (193—207 m), powierzonym do zbadania autorowi przez prof. K. Pożaryską. Zbiór zawiera liczne skorupki nowych gatunków i podgatun-

ków "grupy *Crania tuberculata*" i kilka okazów *C. (Isocrania)*. Przedstawiciele grupy *C. tuberculata* występują w masyrach, danie, paleocenie i ?eocenie, i tworzą dobrze zdefiniowane zbiorowisko, które autor proponuje wydzielić w podrodzaj *C. (Danocrania)* n.subg. w obrębie rodzaju *Crania (Crania)*. Gatunkiem typowym tego podrodzaju jest *Crania tuberculata* Nilsson z górnego danu południowej Skandynawii. Autor uzasadnia, że niewłaściwe jest używanie starej nazwy *Craniolithes brattenburgicus* Schlotheim (użytej w 1858 r. przez Carlssona), która nie była używana przez paleontologów w ciągu 132 lat. Są dostateczne przesłanki aby sądzić, że sam Schlotheim nadał nazwę *brattenburgicus* jako niewłaściwą pisownię nazwy *brattenburgensis*, która jest synonimem *Crania craniolaris* Linné — typ rodzaju *Crania*.

Podrodzaj *C. (Danocrania)* obejmuje małe i dość duże kranie, przeważnie cienkoskorupkowe. Skorupka wentralna jest lekko wypukła, płaska lub wklęsła, przytwierdzona do podłoża (nigdy nie zachowanego) bardzo małą powierzchnią wokoło szczytu. Skorupka dorsalna jest stożkowata. Szczyty obu skorupki są zbliżone do brzegu tylnego lub, u niektórych gatunków, szczyt skorupki wentralnej położony jest na trójkątnym wzniesieniu tylnego brzegu. U starszych geologicznie gatunków powierzchnia pokryta jest drobnymi, płasko leżącymi, rozszianymi kolcami. U młodszych natomiast kolce są ułożone na przecinających się łukach, lub też wzdłuż falistych, płaskich żeber, promieniujących od szczytu i rozgałęziających się ku brzegowi skorupki. Zarys jest owalny — do okrągłego lub czworokątnego, zwięzający się ku zaokrąglonemu, prostemu lub zlekka wciętemu brzegowi tylnemu. Mięśniom zwierającym odpowiadają wyniosłości. Rostellum jest ostre i wyniosłe. Septum środkowe skorupki dorsalnej jest wysokie, nabrzmiałe lub w kształcie strzałki z przodu odcisków zwieraczy przednich.

Autor jest zdania, że *C. (Danocrania)* rozwinęła się z senońskiej *Crania (Crania)* (typ *Crania craniolaris* L.). Potwierdzeniem tej opinii jest fakt, że *Crania spinulosa* Nilsson z senonu wykazuje pewne cechy przejściowe ku *C. (Danocrania)*, tj. ornamentację podobną do starszych gatunków *C. (Danocrania)*, takich jak *hagenowi*, *transversa* i *geulhemensis* z masyrchtu-danu środkowego, lecz pod innymi względami odpowiada *Crania (Crania)*.

Crania (Danocrania) polonica n.sp.

Diagnoza. — Skorupka średniej wielkości, o przedniej części dysku niegranulowanej. Ornamentacja złożona z grubych, luźno rozmieszczonych granulacji i szerokich, płaskich, promieniście ułożonych kolców.

Crania (Danocrania) polonica semicostulata n.subsp.

Diagnoza. — Podgatunek ten różni się od poprzedniego gatunku obecnością granulacji na przedniej części dysku oraz inną ornamentacją. Ta ostatnia składa się z płaskich, rozgałęziających się, falistych żeber, promieniujących od szczytu tak, jak to jest u gatunków z paleocenu Austrii, z ?eocenu Bawarii i z danu Bułgarii i Krymu. U *semicostata* jednak ornamentacja młodocianej części skorupki

składa się z grubych, rozsianych kolców, jak u *C. (Danocrania) polonica*. Ta podwójna ornamentacja znana jest u kranii z najwyższej części środkowego danu Faxe oraz u pewnych okazów *C. (Danocrania) spinulosa* Vassilenko (non Nilsson) z danu Krymu.

Jest prawdopodobne, że podgatunek *semicostulata* odpowiada dalszej ewolucji *C. (Danocrania) polonica*, lecz nie jest wykluczone również, że ewolucja ornamentacji odbyła się w jednej i tej samej populacji (jak w Faxe), tak że obie formy mogły współżyć.

Crania (Isocrania) aff. posselti Rosenkrantz, 1920

Pośród kranii z Boryszewa, dwie skorupki wentralne i jedna dorsalna, należące do *C. (Isocrania)*, są zbliżone do *C. (Isocrania) posselti*. Być może reprezentują one nowy gatunek, lecz autor nie wprowadza dla nich nowej nazwy, gdyż nie pozwala na to niewystarczający i nie najlepiej zachowany materiał. Na Pl. IV, fig. 3 przedstawione są 3 skorupki *C. (Isocrania) posselti* z Kopenhagi dla porównania z okazami z Polski.

Crania (Isocrania) paucicostata Bosquet 1859

Skorupka brzuszna gatunku pochodzi z dolnego paleocenu Bochołtnicy. Mieści się ona w granicach zmienności tego mastrychckiego gatunku. Różnice zapatrywań, dotyczące wielu warstw z kraniami z Boryszewa między montem (Różkowska, 1955; Brotzen & Pożaryska, 1957), górnym danem, montem (Voigt, 1964) a danem (Kongiel 1958), nie są więc zbyt duże. Wienberg Rasmussen (1962) wykazał, że Tuffeau de Ciply, na którym spoczywa niezgodnie prawdziwy mont (Calcaire grossier de Mons), należy do środkowego danu — do poziomu z *Tylocidaris bruennichi*. A zatem mont może być odpowiednikiem górnego danu i ewent. dolnego selandu Danii, który bywa często zaliczany do montu.

Niektóre liczne gatunki dańskie występują w Boryszewie wspólnie z kraniami, jak np. *Tylocidaris masoviensis* Kongiel (obecność tego gatunku została stwierdzona przez autora w górnej części środkowego danu Faxe), *Stereocidaris rosenkrantzi* (Ravn), *Ditrupa schlotheimi* Rkz. i *Glomerula gordialis* Scholth. Prócz tego, współistnienie podrodzajów *C. (Danocrania)* i *C. (Isocrania)* nie zostało stwierdzone w warstwach młodszych, aniżeli dan. Według opinii autora, ten zespół wskazuje na górną część środkowego danu.

Gdyby polskie osady z kraniami były młodsze od danu, na co zdają się wskazywać otwornice, trzeba by przyjąć, że wszystkie skamieniałości tych warstw byłyby na wtórnym złożu i pochodziłyby z osadów starszych. Za taką możliwością przemawia występowanie typowej mastrychckiej *C. (Isocrania) paucicostata* w warstwach dolnego paleocenu Bochołtnicy.

АЛЬФРЕД РОЗЕНКРАНЦ

О НЕКОТОРЫХ КРАНИЯХ ИЗ ЦЕНТРАЛЬНОЙ ПОЛЬШИ

Резюме

Настоящая работа посвящена представителям брахиопод рода *Crania* из скважины Борышев (193—207 м.). Материал для изучения передала автору проф. Крыстына Пожарыска. Коллекция вмещает многочисленные створки новых видов и подвидов из „группы *Crania tuberculata*” и несколько створок *C. (Isocrania)*. Представители группы *C. tuberculata* известны из маастрихта, дата, палеоцена и ?эоцена; они образуют хорошо определенную группу, которую автор предлагает выделить в подрод *C. (Danocrania)* n. subg. в пределах рода *Crania (Crania)*. Типичным видом этого подрода является *Crania tuberculata* Nilsson из верхнего дата южной Скандинавии. Автор обосновывает неуместное употребление старого названия *Craniolithes brattenburgicus* Schlotheim (принятого Карльссоном) (Carlsson) в 1858 г., которое не употреблялось палеонтологами в течении 132 лет. Существуют достаточные предпосылки чтобы предполагать, что сам Шлётгейм (Schlotheim) ввел название *brattenburgicus* как неуместное правописание названия *brattenburgensis*, которое является синонимом *Crania cranio-laris* Linné — тип рода *Crania*.

Пород *C. (Danocrania)* вмещает мелкие и довольно крупные крании, по большей части с тонкими створками. Вентральная створка немного выпуклая, плоская или же вогнутая, прирастающая к субстрату (который не сохраняется) очень незначительной поверхностью вокруг макушки. Дорзальная створка коническая. Макушки обеих створок находятся вблизи заднего края. У некоторых видов макушка вентральной створки находится на треугольной возвышенности заднего края. У старых видов, в отношении геологического возраста, поверхность покрыта мелкими, плоско лежащими, рассеянными шипами. У более молодых зато шипы расположены на пересекающихся дугах, или же вдоль волнообразных, плоских ребрышек, которые расходятся радиально от макушки и дихотомируются по направлению к краям створки. Очертание створки овально-округленное или же четырехугольное, суживающееся в сторону округленного, прямого, либо слегка врезанного заднего края. Аддукторам соответствуют приподнятия. Ростэллом острое и возвышенное. Срединная септа дорзальной створки высокая, вздутая или же в виде стрелки впереди отпечатков передних аддукторов.

По мнению автора *C. (Danocrania)* возникала из сенонских *Crania (Crania)* (тип *Crania cranio-laris* L.). Это мнение утверждает факт, что *Crania spinulosa* Nilsson из сенона обнаруживает некоторые переходные признаки к *C. (Danocrania)*, т. е. скульптуру похожую как у старших видов *C. (Danocrania)*, таких как *hagenowi*, *transversa* и *geulhemensis* из маастрихта-среднего дата, но в иных отношениях она соответствует *Crania (Crania)*.

Crania (Danocrania) polonica n. sp.

Диагноз. — Створка средних размеров. Передняя часть диска негранулированная. Скульптура состоит из толстых, свободно расположенных грануляций и широких, плоских, радиально уложенных шипов.

Crania (Danocrania) polonica semicostulata n. subsp.

Диагноз. — Этот подвид отличается от предыдущего вида присутствием грануляции в передней части диска и иной скульптурой. Состоит она из плоских, дихотомирующихся, волнообразных ребрышек, которые отходят радиально от макушки, так как это наблюдается у видов палеоценовых Австрии, ?оценовых Баварии, датских Болгарии и Крыма. Однако у *semicostulata* скульптура юной части створки состоит из толстых, рассеянных шипов как у *C. (Danocrania) polonica*. Эту двойную скульптуру имеют крании из самой верхней части среднего дата Фахе и некоторые датские формы *C. (Danocrania) spinulosa* Vassilenko (non Nilsson) из Крыма.

Возможно что подвид *semicostulata* представляет дальнейший этап эволюции *C. (Danocrania) polonica*, но не исключено также, что эволюция скульптуры состоялась в одной и той же популяции (как Фахе) таким образом, что обе формы могли сосуществовать.

Crania (Isocrania) aff. posselti Rosenkrantz, 1920

Между краниями из Борышева две створки вентральные и одна дорзальная принадлежащие к *C. (Isocrania)* близки к *C. (Isocrania) posselti*. Возможно, что это представители нового вида, но автор не вводит для них нового названия по поводу недостаточного и не наилучшей сохранности материала. На Пл. 4, фиг. 3 представлены 3 створки *C. (Isocrania) posselti* из Копенгагена для сравнения с образцами из Польши.

Crania (Isocrania) paucicostata Bosquet, 1859

Вентральная створка этого вида найдена в палеоценовых отложениях Борхотницы. Находится она в пределах изменчивости этого вида из маастрихта. Разногласия во мнениях касающихся возраста слоев с краниями из Борышева между монтским (Ружковска, 1955; Броцен & Пожарыска, 1957), верхне-датским или монтским (Фогт, 1964) и датекием (Конгель, 1958), — стало быть небольшие. Винберг Расмуссен (1962) доказал, что Tuffeau de Ciplu, на котором несогласно залегают достоверно монтские отложения (Calcaire grossier de Mons), принадлежит к горизонту *Tylocidaris bruennichi* среднего дата. Следовательно монт может быть эквивалентом верхнего дата и быть может нижнего селанда Дании, часто причисляемого к монту.

Некоторые обильные виды Дании известны в Борышеве вместе с краниями, как например *Tylocidaris masoviensis* Kongiel (присутствие этого вида подтверж-

дено автором в верхней части среднего дата Faxe), *Stereocidaris rosenkrantzi* (Ravn), *Ditrupa schlotheimi* Rkz. и *Glomerula gordialis* Schloth. Кроме этого существование подродов *C. (Danocrania)* и *C. (Isocrania)* не констатировалось в отложениях моложе датских. По мнению автора, это сообщество указывает на верхнюю часть среднего дата.

Если бы отложения с краниями из Польши были моложе датских, на что указывают фораминиферы, надо было бы принять, что все окаменелости из этих слоев находятся на вторичном залегании и происходят из старших осадков. В пользу такой возможности свидетельствует присутствие типичной для маастрихта *C. (Isocrania) paucicostata* в слоях нижнего палеоцена Бохотницы.

PLATES

Plate I

- Fig. 1 a-b. *Crania (Danocrania) tuberculata* Nilsson, ventral valve. Uppermost Danian; Vodrofgaard, Copenhagen.
- Fig. 2. *C. (Danocrania) tuberculata* Nilsson, dorsal valve. From Upper Danian in the Selandian basal conglomerate; Vestre Gasvaerk, Copenhagen.
- Fig. 3. *C. (Danocrania) geulhemensis* Kruytzer & Meijer, ventral valve. Middle Danian; Grube Curts, Geulhem, Holland. Showing a sculpture (I) consisting of scattered granules and flat-lying spinules.
- Fig. 4. *C. (Danocrania) sp.*, ventral valve. Upper Danian, 25—27 m. above the top of the Maastrichtian; Ulakly, the Crimea. Showing a sculpture (II) consisting of spinules arranged in intersecting arcs.
- Fig. 5. *C. (Danocrania) austriaca* Traub., ventral valve, Paleocene; *Crania* sandstone, 250 m. north of the church in St. Pankraz, Haunsberg north of Salzburg, Austria. Showing a sculpture (III) consisting of flat, undulating, ramifying ribs radiating from the apex.

All valves $\times 5$, from the collection of the Mineralogical and Geological Museum of the University, Copenhagen.



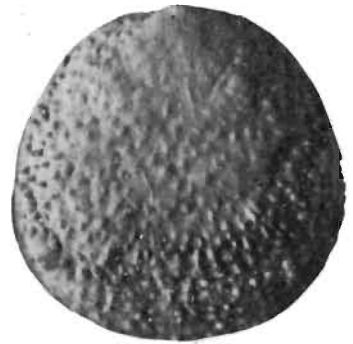
1a



1b



2



3



4



5



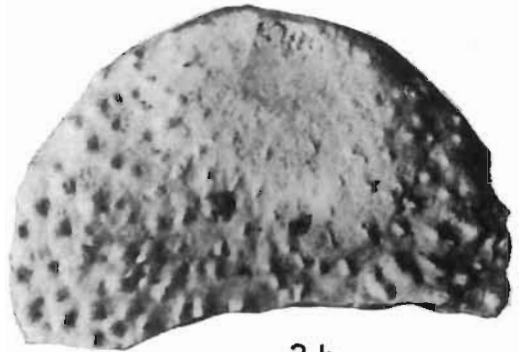
1a



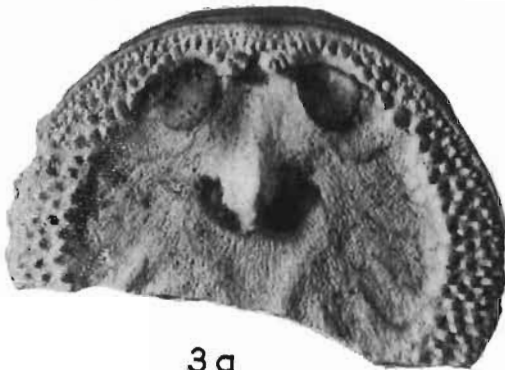
1b



2a



3b



3a



2b

Plate II

Crania (Danocrania) polonica n.sp.

Fig. 1 *a-b*. Ventral valve; holotype. Boryszew boring, 202 m. (Bp. VIII/1).

Fig. 2 *a-b*. Ventral valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/2).

Fig. 3 *a-b*. Ventral valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/3).

All valves $\times 5$, from the collection of the Palaeozoological Institute of the Polish Academy of Sciences, Warsaw.

Plate III

Fig. 1 a-b. *Crania (Danocrania) polonica* n.sp., ventral valve; paratype. Boryszew boring, 202 m. (Bp. VIII/4).

Crania (Danocrania) polonica semicostulata n.subsp.

Fig. 2 a-b. Ventral valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/46).

Fig. 3 a-b. Ventral valve; holotype. Boryszew boring, 202.8—205.8 m. (Bp. VIII/45).

Fig. 4 a-b. Ventral valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/47).

All valves $\times 5$, from the collection of the Palaeozoological Institute of the Polish Academy of Sciences, Warsaw.



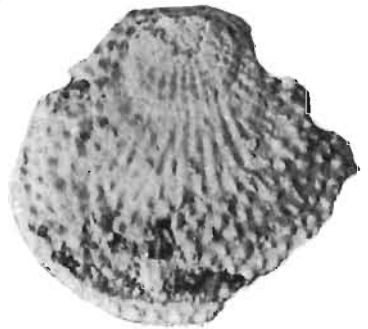
2a

2b



3a

3b



4a

4b



1a



2a



2b



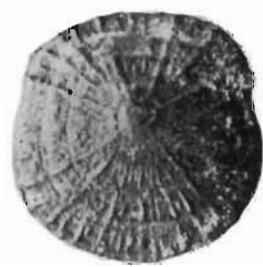
1b



3



4a



5



6a



4b



8a



6b



7a



7b



8b

Plate IV

Crania (Danocrania) polonica n.sp.

- Fig. 1 *a-b*. Dorsal valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/5).
Fig. 2 *a-b*. Dorsal valve; paratype. Boryszew boring, 193—207 m. (Bp. VIII/6).

Crania (Isocrania) posselti Rosenkrantz

- Fig. 3. Ventral valve. Uppermost Danian, Copenhagen.
Fig. 4 *a-b*. Dorsal valve. Uppermost Danian, Copenhagen.
Fig. 5. Ventral valve. Uppermost Danian, Copenhagen.

Crania (Isocrania) aff. posselti Rosenkrantz

- Fig. 6 *a-b*. Ventral valve. Boryszew boring, 193—207 m. (Bp. VIII/49).
Fig. 7 *a-b*. Ventral valve. Boryszew boring, 193—207 m. (Bp. VIII/50).
Fig. 8 *a-b*. Dorsal valve. Boryszew boring, 193—207 m. (Bp. VIII/51).

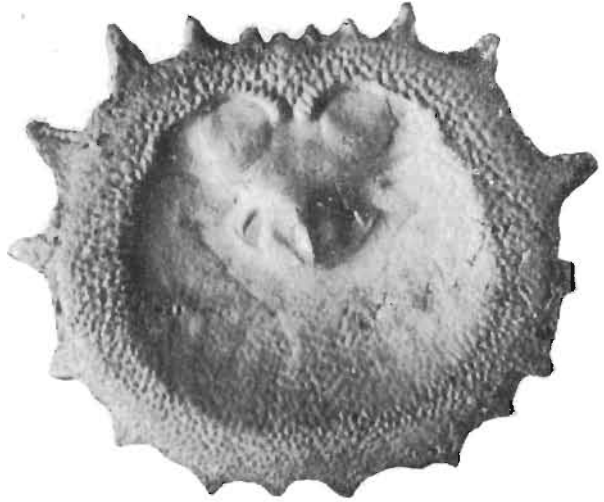
All valves $\times 5$. The originals to Figs. 3, 4 and 5 from the collection of the Mineralogical and Geological Museum of the University, Copenhagen. The originals to Figs. 1, 2, 6, 7 and 8 from the collection of the Palaeozoological Institute of the Polish Academy of Sciences, Warsaw.

Plate V

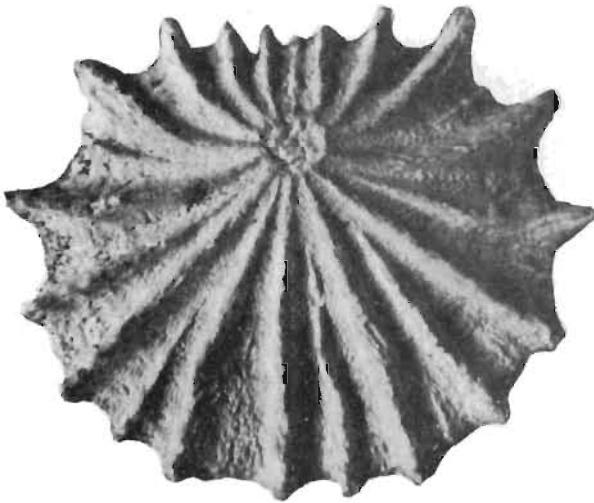
- Fig. 1 a-b. *Crania (Isocrania) paucicostata* Bosquet, ventral valve, $\times 5$; Bochoznica. Coll. A. Radwański.
- Fig. 2. *Tylocidaris masoviensis* Kongiel, spine, $\times 10$; Sochaczew boring, 212.3—215 m. Coll. R. Kongiel, No. E. II/42.
- Fig. 3. *Tylocidaris masoviensis* Kongiel, spine, $\times 10$; Middle Danian, Faxe (Denmark). Coll. Miner. and Geol. Museum Univ. Copenhagen.



2



1a



1b



3