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JEŽOVKY EPIASTER SUBLACUNOSUS (GEINITZ, 1872) Z KŘÍDY STŘEDNÍ EVROPY (STŘEDNÍ TURON)

THE ECHINOID EPIASTER SUBLACUNOSUS (GEINITZ, 1872) FROM THE CRETACEOUS OF CENTRAL EUROPE (MIDDLE TURONIAN)

Určení a stratigrafické vymezení nálezů druhu *Epiaster distinctus* (AGASSIZ) vynutilo si také revizi nálezů, které se od druhu *E. distinctus* (AG.) liší.

Otomar Novák r. 1882 a 1887 uvedl v seznamech ježovek z české křídy jím stanovený nový druh *Epiaster cotteauanus* NOV. Protože však nepodal ani diagnózu, ani vyobrazení, je toto označení *nomen nudum*. Při zpracování druhu *Epiaster distinctus* (AG.) uvedl jsem za synonymy toto označení s pochybou. V geologicko-paleontologickém oddělení Národního muzea je nedokončený rukopis práce O. Nováka. V něm je také rozpracován druh *E. cotteauanus* NOV. i s vyobrazením a je k němu dokonce i nátisk tabule. Z tohoto nátisku je u vystaveného exempláře, který by byl holotypem, vyobrazení připojeno.

Teprve další studium ukázalo, že nálezy ze středního turonu se liší od spodnoturonského druhu *E. distinctus* (AG.) a že tedy záznamy O. Nováka nelze klást do synonym druhu *E. distinctus*. Ukázalo se, že H. B. Geinitzem uvedený *Hemiaster sublacunosus* a Novákův *E. cotteauanus* jsou totožny. Došel jsem dále k závěru, že Geinitzem uvedené nálezy ze saské křídy náleží do rodu *Epiaster* a že Geinitzem uvedený nález z Rathen je tedy *Epiaster sublacunosus* (GEIN.). O. Novákem zaznamenaný druh *E. cotteauanus* je tedy synonymem druhu *E. sublacunosus* (GEIN.).

Jako lektotyp druhu *Epiaster sublacunosus* (GEIN.) může být stanoven pouze exemplář vyobrazený Geinitzem (1872, Elbthalgeb. II) na tabuli 4, obr. 6. — Exemplář vyobrazený na tab. 4, obr. 5, nepřichází v úvahu. Je z kvádrovců Annenbergu u Haltern ve Vestfálsku. Tato lokalita stratigraficky náleží spodnímu kampánu. Jde tedy o odlišný chorotyp i chronotyp a spadá do rámce hodnocení kampánské fauny

Vestfálska. Protože jde o jádro, nadto neúplné a vězící v matečné hornině, v křemencích, nelze zjistit nic, co by nějak mohlo vyznačovat fascioly. Bližší určení je proto velmi nesnadné. Může jít stejně o taxon blízký druhu *Diplodetus cretaceus* SCHLÜTER, jako o taxon jiný. Bral jsem v úvahu také popis a vyobrazení druhu *Plesiaster (?) cavifer* SCHLÜTER (Cl. Schlüter, 1900. Pg. 371, tab. XVII (v textu je chybně tab. VII), obr. 3, 4). Jádro ježovky z Annabergu u Haltern je místy vyplněno jádry serpul. Snad náleží druhu *Potamoceros triangularis* (MÜNSTER). (A. Goldfuss: Petrefacta Germaniae. I. Str. 236, tab. 70, obr. 4a, b). H. Regenhardt, 1961, uvedl na str. 50 nesprávně *P. triangularis* (GOLDFUSS, 1833).

Exemplář, který uvedl O. Novák, je z Mělníka. S největší pravděpodobností je z poloh Zahálkova pásma VI. V každém případě je ze spodní části středního turonu. — Exemplář vyobrazený Geinitzem na tab. 4, obr. 6, podle vysvětlivek je ze svrchních kvádrovců od Schulhainbrüche nad Rathen v údolí Labe. Čeněk Zahálka (1924) Rathen, Schulhain Stbr. zařadil do svých pásem VI—VIII. K. Wanderer 1909 vyobrazil na tab. II, obr. 13, 13 a zřejmě týž exemplář jako Geinitz a uvedl ho rovněž jako *Hemiaster sublacunosus* GEINITZ. Na str. 15 uvedl naleziště: střední turon, Rathen, Königstein aj. V tabulce Mittel-Turon uvedl jako Brongniarti-Quader (Haupt- oder Ober-Quader). Saský výskyt tedy i stratigraficky lze srovnávat s nálezem z Mělníka.

Geinitzův *Hemiaster sublacunosus* byl nesprávně citován jako *Micraster sublacunosus* GEIN. J. Lambertem v Grossouvrově díle z r. 1901. Ke druhu *E. sublacunosus* (GEIN.) nemůže být řazen Fričův záznam v Chlomeckých vrstvách. Frič uvádí: „Hemiaster sublacunosus, GEIN. (Geinitz, Elbthalgeb. II. p. 14. Taf. 4. Fig. 5, 6.). Podle Geinitze i v Kieslingswaldě." Na lokalitě Kieslingswalde, nyní Idzików, nemůže být druh *E. sublacunosus*. Jde zřejmě o omyl. Geinitz na str. 14 uvedl poznámku, že skutečný *Hemiaster lacunosus* má Drážďanské muzeum z glaukonitických pískovců z Kieslingswaldy v Kladsku (původně jím zaznamenaný 1849—1850, str. 224 jako *Micraster lacunosus*). To je ovšem něco zcela jiného. Geinitzův záznam druhu *Hemiaster lacunosus* bude však účelnější porovnávat s A. Goldfussem, I, str. 158 a 159, tab. 49, obr. 3, kde je *Spatangus lacunosus* (LINNÉ) (sub. *Echinus*) od Aachen a Quedlinburgu. Frič nerozlišil *lacunosus* a *sublacunosus*. Tím došlo k záměně pojmů.

The study of irregular echinoids from the Cretaceous of Bohemia requires inevitably a revision of all data concerning the Upper Cretaceous of Bohemia and Moravia and also of Saxony, Silesia and Bavaria.

The determination and stratigraphic definition of the finds of the species *Epiaster distinctus* (AG.) also made it necessary to revise the biotaxonomy of those finds which differ from the species *E. distinctus*. Otomar Novák has left an unfinished manuscript devoted to irregular echinoids of the Bohemian Cretaceous. The manuscript is more than eighty years old. O. Novák published from it only conclusions, mostly brief data only and names of species newly introduced in the manu-

script. The manuscript also contains plates or parts of plates with illustrations carefully drawn with pencil by O. Novák with meticulous accuracy. Novák evidently prepared publication of a monograph as even proof press pulls of some of the drawings exist. Some of the plates are unfinished or have not been begun at all. In the manuscript there are only rule borders designated as plates with numbers. Some of the plates were badly treated by Antonín Frič. He reproduced these drawings in his papers published in the review Archiv pro přírodovědecký výzkum Čech (Archives of Natural Historical Investigation of Bohemia). The manuscript plate VII, Fig. 3, 3 a — f has been preserved. In the designation written by Novák below the plate explanation "Fig. 3 — *Epiaster Cotteauanus* NOV." is given. Then a Novák's note jotted down with pencil follows: "unbestimmbar". To the Novák's manuscript a proof press pull of the whole plate designated as Pl. IV is appended. His *Epiaster Cotteauanus* NOVÁK is illustrated in fig. 9 a—g. On the top there is the following text: "O. Novák: Studien an böhm. Kreideechinodermen II." Below the plate the text is as follows: "O. Novák ad nat. delin. Druck Farský, Prag. Abhandlungen der k. böhm. Gesell. d. Wissenschaften 1887." It is evident that the author worked on the paper, that for some plates drawings were not begun and others were ready in part only. The completed plates were lithographed. The unfinished paper, however, has not been published. Nor the Abhandlungen d. k. böhm. Ges. d. Wissenschaften 1887 were published. Antonín Frič stroke out the printed designation and wrote with pencil "Pl. I." — The Novák's illness and death (1892) were the end of all his effort.

In the Novák's preliminary report from 1882 we find the name of a new species *Epiaster Cotteauanus* NOV. The preliminary report (p. 370—378 is, however, devoted to echinoids from the Jizera beds of Bohemia, but on p. 371 — 372 there is a survey of the Bohemian echinoids sofar known among which the genus *Epiaster* is given as No. 12. Within it *Cotteauanus* NOV. is placed as 24th species and cf. *gibbus* SCHLÜT. as 25th one. As on p. 372 Novák noted that from 38 species given by him only 15 derive from the Jizera beds and the species cited are not given among these indicated by names, it follows that these derive from other beds. The same list was reprinted by O. Novák in 1887 on p. 23. The echinoids from the Jizera beds are designated here by an asterisk. *Epiaster* is not included among them. On p. 25 O. Novák quotes the work by I. de Morgan from 1882 where the species *Epiaster gibbus* SCHLÜT. is given as occurring in the Teplice-, Březno- and Chlomek beds. — It is difficult to decide with which genus and species we are concerned here. It is evident that it is not *Micraster gibbus* BUVIGNIER (non AGASSIZ), 1852: S. géol. du dép. de la Meuse, p. 542 = *Epiaster distinctus,* AGASSIZ (s. *Micraster*) — Lambert p. 256, but more probably *Micraster senonensis* LAMBERT, 1895 — p. 239 and 263 — J. Lambert in A. de Grossouvre, 1901.

In the collections of the Geological paleontological department of the National Museum, Prague, a specimen of irregular echinoid is exhibited under designation ČL 2213 *Epiaster cotteauanus* NOV. On the label of the specimen a proof press of the Novák's drawing is pasted.

On the accompanying ticket there is the note: Taf. — Fig. 9. On the lower face of the specimen there is the inscription "Mělník" written with Chinese ink. Below this there is the letter P (which means Pražák). That is all. — In the Novák's manuscript under the heading *Epiaster Cotteauanus* NOVÁK there is the description and on the appended plate the Novák's drawing on the exhibition specimen reproduced in press proof pull. In the manuscript the mere indication of occurrence, namely Mělník, is given. As donor the deputy J. Pražák is named.

In revising all the finds, determinations and dates the species *E. distinctus* (AG.), the data on their stratigraphic assignment from the Cretaceous of Saxony indicate that they exceeded the stratigraphic range of the finds from Bohemia and Moravia. The data and especially the illustrations given by Geinitz and Wanderer differed from the conclusions drawn for finds of the Lower Turonian.

Originally I assumed that the finds from the Lower and Middle Turonian belong to the same species; in that case the Novák's *E. cotteauanus* would belong to the species *E. distinctus* (AG.) as its synonym. When I had established by further study that *Hemiaster sublacunosus* given by H. B. Geinitz and *E. cotteauanus* given by Novák are identical, it became clear that the finds from the Saxonian Cretaceous mentioned by Geinitz belong to the genus *Epiaster* and that we are therefore concerned here with *Epiaser sublacunosus* (GEINITZ, 1872). Thus the species *E. cotteauanus* given by O. Novák is a synonym of *E. sublacunosus* (GEIN.).

As lectotype of the species *Epiaster sublacunosus* (GEINITZ, 1872) only the specimen illustrated by Geinitz in Elbthalgeb. II, Pl. 4, fig. 6 can be admitted. This specimen — as can be gathered from the explanation — derives from the upper thick bedded sandstones (Quadersandsteine) from Schulhainbrüche above Rathen in the Labe (Elbe) valley, i. e. from the quarries seen from the railway station Rathen (first railway station N of Bad Schandau) on the right bank of the Labe (Čeněk Zahálka, 1924, Rathen (Hrádek), Schulhain Stbr. VI — VIII). The same specimen illustrated by H. B. Geinitz's drawing was refigured by K. Wanderer in 1909, Pl. II, figs. 13, 13a, again as *Hemiaster sublacunosus* GEINITZ. K. Wanderer (p. 15) gives as occurrence: "Middle Turonian, Rathen, Königstein and other places". The Middle Turonian, Mittel-Turon, in the table by K. Wanderer is given as "Brongniarti-Quader (Haupt- oder Ober-Quader)". Čeněk Zahálka, 1924, p. 41 presents the following data: "15. Die Schulhain Steinbrüche. Fig. 17. — In an extensive quarry of that area (in 1906) zone VII was fully exposed. This zone was given as composed of thick bedded fine-grained kaolinic sandstones (Quadersandsteine) with *Inoceramus Brongniarti* which are 50 m thick and lie between 150—200 m above sea-level". This is evidently the lower part of the Middle Turonian with *Inoceramus brongniarti,* i. e. *Inoceramus lamarcki* PARK.

I asked the Staatliches Museum für Mineralogie und Geologie zu Dresden for loan of the specimens described and illustrated by H. B. Geinitz. I wish to express my thanks for the kindness with which my wish was satisfied. I have established that the specimen figured on pl. 4, fig. 6

is an internal mould of fine-grained, compact kaolinic finely micaceous sandstone tinted by limonite to light brown colour. The specimen from Rathen is somewhat deformed in its frontal part due to the pressure of rock during diagenesis. The test in the ambitus was somewhat broken. In spite of this the internal mould has preserved its shape differing from the species *Epiaster distinctus* (AG.). Width of the mould — 43.5 mm., length — 43.9 mm. Index — 1.01. It is, however, to be taken into consideration, that the data of the corona length is somewhat higher due to the broken test at the frontal part of the ambitus at area III of the (anterior non-paired) ambulacrum. — Below the ambitus the mould is broken off on the anterior right-hand (2nd) interambulacrum. All further proportions of the mould fully correspond to the data followed on the test from Mělník. The rounded or more accurately moderately elliptical anal aperture is well-preserved. It is placed in the upper part of the area. The area is three times broken in the direction from the anal aperture. On the lower face of the mould the plastron and the reniform transversal oral aperture are well-marked. The lip is somewhat disturbed. The anal area, due to the compression of the mould, attains only 16.2 mm. height. — Although ambulacral pores of paired ambulacra are distinguishable they are so indistinct that nothing certain can be reported on them with satisfactory accuracy.

As far as the find given by O. Novák from the Bohemian Cretaceous is concerned attention should be paid to its stratigraphic assignment. It is not sufficient to give only M ě l n í k as occurrence. In the O. Novák's manuscript there is the note: "Das abgebildete Exemplar stammt aus dem Plaener der Weissenberger Schichten von M e l n i k und wurde mir vom Herrn Landtagsabgeordneten J. P r a ž á k übergeben." (The specimen figured derives from the argillite (Plaener) of the Bílá hora (Weissenberg) beds of Mělník and it has been given to me by the deputy J. Pražák).

When the treatises by Čeněk Zahálka, Antonín Frič, Břetislav Zahálka (1941) and Josef Soukup (1956) are examined the occurrence belongs to the lower part of the Middle Turonian. In the paper dealing the IVth zone of Dřínov, Č. Zahálka (1893 — „Pojednání o Pásmu IV. — Dřínovském") indicates on p. 25 under point 14 the occurrence at Mělník. He gives that on the slope of the Labe valley on the Mělník side above the IIIrd zone the IVth zone 29 m. thick is to be found. He did not yet divide the zone IV established by him. Thus, he included in it the later IVa and IVb zones. Č. Zahálka mentioned that Frič had recorded from here the fossils dealt with in the review Archiv on p. 61. Frič (1879) wrote then on p. 81: "On the right-hand bank of the river Labe the spheres of Dřínov are to be found just under the town of Mělník where I succeeded to collect them". In the following list of fossils he gave explicitly *Inoceramus Brongniarti,* i. e. *Inoceramus lamarcki* PARK. It is evident that the place of occurrence belongs to IVb, i. e. the lowest part of the Middle Turonian. But it is not excluded that the find of the echinoid derives only from the Zahálka's zone IV which is also exposed in that area. Describing the zone V (of Roudnice) Č. Zahálka wrote on p. 59, point 22, Mělník: "In the uppermost part of the Mělník

slope the whole zone V is developed between the zones IV and VI. The latter is, however, covered by bushes." According to the cross section it begins at the isohypsis 217.2 m. above sea-level. In describing the VI. zone (of Vehlovice) on p. 16, point 21, Mělník, Č. Zahálka reported: "On the slope below the Mělník castle beds lying above coarse grained marl V.h.2 (see there) were not accessible. I sought them therefore in cellars of the houses on the Mělník square, ... In the cellar of Mr. Štěpán Vodička, house no. 33, grey sandy marl bedded in thick plates was found." Břetislav Zahálka (1941) in his geological sketch map recorded at the altitude 217.2 — 219 m. above sea-level the same beds as those given by Č. Zahálka. It is necessary to search in the collections for some fossils given by A. Frič (1879) on p. 79 where in the list of various Lower and Middle Turonian species among others *Inoc. labiatus, I. Brongniarti* and *Micraster* also appear. It is necessary to check up whether some of these species is not *Epiaster.*

In evaluating the finds of echinoids which I assign to the species *Epiaster distinctus* (AG.) from the Cretaceous of Bohemia and Moravia the authors gave localities (A. Frič, 1885 — the Jizera beds, localities in the O. Novák's manuscript) which are not of Lower Turonian age. This was pointed out by Č. Zahálka as early as in 1921. A. Frič (1885) dealing with the Jizera beds mentioned on p. 61 the Česká Třebová area and wrote: "One instructive cross-section is drawn from Třebovice to Rybníky; nobody will meet with difficulties in interpreting it. — At the northern end of Třebovice on the right-hand bank of the brook above the last cottages yellowish argillite ("opuka" — Pläner) with *Epiaster* sp. occurs (no. 5 of the cross-section at Ústí nad Orlicí — drawing no. 37, 1.)". Č. Zahálka (1921) objects that it is a mistake to state that "The layers of this valley slope belong to the VIII. and IX. zones and that the real horizon of the Frič's beds with *Epiaster,* i. e. our uppermost layer of the zone IIIb lies much farer, in the upper portion of the Damník slope 2½ km from here towards NE ...". Thus, Frič assumed that near Třebovice a Lower Turonian equivalent of beds occurring at Sázava near Lanškroun is developed and did not notice that the upper part of the Middle Turonian is here developed in the same facies. This does not naturally mean that near Třebovice echinoids of the genus *Epiaster* do not occur. This was, therefore, a Frič's assumption only that the beds in question are beds with *Epiaster,* i. e. an equivalent of beds in which in the Lanškroun and Ústí nad Orlicí areas internal moulds of the representatives of the genus *Epiaster* occur. In this sense the record by Fr. Zvejška (1934) is to be corrected. It is cited on p. 8 as follows: "From the VIII. zone *Epiaster* sp. is given by Č. Zahálka and A. Frič from the Třebovice (Bohemia) area."

It should be mentioned that from the species *Epiaster sublacunosus* (GEIN.) is to be excluded *Hemiaster sublacunosus,* which was included by H. B. Geinitz in his species and was figured by him on pl. 4, fig. 5. It derives from the thick bedded sandstones of Annenberg near Haltern in Westfalen. This locality belongs stratigraphically to the Lower Campanian. It cannot even be assumed that the specimen could belong to the same species. Even if the specimen figured by Geinitz could still be

assigned to the genus *Epiaster* it would be a specifically differing chorotype and especially a differing chronotype.

The specimen figured by Geinitz on pl. 4, fig. 5 and described on p. 14, found in the upper thick bedded sandstones of Annenberg near Haltern in Westfalen is an internal mould in a very compact slightly bluish grey quartzite tinted in places by limonite to brown. The surface of the fossil is also brown.

The internal mould of the echinoid. The lower part is lacking. Below the ambitus only the part between the IInd and IIIrd ambulacrum (the anterior unpaired ambulacrum) has been preserved. The mould does not attain the ambitus between the IVth and Ist ambulacrum. Ambulacra are petaloid lying in deep furrows. The anterior unpaired ambulacrum is also subpetaloid reaching up to 3/5 of the upper face. The anterior paired ambulacra also reach up to 3/5 of the surface from the apex. The posterior paired ambulacra are much shorter than the anterior ones. IIIrd ambulacrum from the centre to the last ambulacral fused pores attains 17.3 mm., IInd and IVth ambulacra 17.2 mm., Ist and Vth ambulacra 12.5 mm. The suture on the posterior unpaired interambulacrum (5th) is straight and distinctly marked on the mould. This area runs sharply towards the apex between the Vth and Ist ambulacra. The interambulacral areas 2nd and 3rd are bounded against ambulacra. The sutures on the mould are depressed. On the anterior edge of the anterior paired ambulacra nodes are sligthly marked. Ambulacral furrows on the mould are roundedly terminated. Ist interambulacral area shows the boundaries of interambulacral plates. As on the mould nothing can be established what could in some way indicate fascioles, a detailed identification is difficult. A taxon related to the species *Diplodetus cretaceus* SCHLÜTER or another taxon can be taken into account. A specimen described and figured as *Plesiaster* (?) *cavifer* SCHLÜTER (Cl. Schlüter, 1900, Pg. 371, tab. XVII [in the text erroneously tab. VII], figs. 3, 4) was also taken into consideration.

The internal mould of the echinoid from Annenberg near Haltern is in places filled by moulds of serpulae. In one place a part of silicified tube has been preserved; it has a gentle dorsal carina, partly it shows marked transversal grooves. On two impressions of the outer surface of the tubes an impression of an undulated dorsal carina is distinctly marked. We may suppose that after withering away of the echinoid the corona was disturbed and deposited on the sea bottom with the apical side in sand. The oral part was lacking. Within the test serpulae grew in a relatively quiet environment, perhaps belonging to the species *Potamoceros triangularis* (MÜNSTER, 1833) (A. GOLDFUSS: Petrefacta Germaniae, Erster Theil, Düsseldorf, 1826—1833, p. 236, tab. 70, figs. 4a. b). HORST REGENHARDT (1961) gives on p. 50 incorrectly *P. triangularis* (GOLDFUSS, 1833).

To the species *Epiaster sublacunosus* (GEIN.) quite naturally *Micraster sublacunosus* GEIN., quoted from Geinitz by J. Lambert in the Grossouvre's work (1901), belongs. It has been pointed out (p. 969) that Quenstedt (1874) — without giving reasons for it — introduced this

species as *Micraster sublacunosus* (p. 211 *M.* cf. *sublacunosus* is given), while Geinitz determined it as *Hemiaster sublacunosus.*

The finds given by H. B. Geinitz as *Hemiaster lacunosus* (GOLDF.) from Kieslingswalda (now Idzików), and from the Upper Cretaceous of Schonen (Geinitz, II, 1872, p. 14), however, do not belong to the species *Epiaster sublacunosus* (GEIN.). Goldfuss (I, p. 158 and 159), however, gives *Spatangus lacunosus* (LINNÉ) (sub. *Echinus)* from Aachen and Quedlinburg. It was really very audacious to compare the illustration in Goldfuss (on pl. 49, fig. 3) with our finds. A. Frič (1898 — the Chlomek beds) quotes (on p. 69) the Geinitz's notice (recorded on p. 14) that the real *Hemiaster lacunosus* in the Museum of Dresden derives from glauconitic sandstones of Kieslingswalda (now Idzików) in Kłódzko as follows: *"Hemiaster sublacunosus,* GEIN. (Geinitz, Elbthalgeb. II., p. 14, Taf. 4, Figs. 5, 6.). According to Geinitz found also in Kieslingswalda" (now Idzików).

The items in the Cl. Schlüter's (1871—1876, p. 242) list of fossils from the Dülmen area in Westfalen, namely *Hemiaster* cf. *Ligeriensis* D'ORB. and *Hemiaster* cf. *sublacunosus* GEIN. must be unsubstantiated. Schlüter, without doubt, was influenced by the fact that Geinitz had given and figured the specimen from Haltern as *Hemiaster sublacunosus* GEIN. Schlüter, however, was mistrustful and gave only cf. I think it is not possible that in stratigraphically so high positions the species *Epiaster sublacunosus* (GEIN.) could occur thus; a relation of any find from this area to the Middle Turonian species under consideration is also impossible.

Epiaster sublacunosus (Geinitz, 1872)

1849—1850. *Micraster cor anguinum.* Gein. Quad. Deutschland, pg. 224 partim.

1872. *Hemiaster sublacunosus,* GEIN. H. B. Geinitz, Das Elbthalgeb. II, p. 14, pl. 4, fig. 6 *(non* fig. 5).

1882. *Epiaster Cotteauanus* NOVÁK. Sitzungsberichte d. k. böhm. Ges. d. Wissenschaften, p. 371, No. 12, 24.

1887. *Epiaster Cotteauanus* NOVÁK. Studien an Echinodermen. No. I. p. 23.

1909. *Hemiaster sublacunosus* GEIN. K. Wanderer, Die wichtigsten Tierversteinrungen. p. 15, pl. II, figs. 13, 13a.

1964. *Epiaster cotteauanus* NOVÁK. V. Zázvorka, Ježovky *Epiaster distinctus* (AGASSIZ) v křídě střední Evropy. Časopis Národního muzea v Praze, roč. 133, No. 1. Odd. přírodovědný, p. 32, pl. 1, figs. 5, 6.

non 1872, Hemiaster sublacunosus GEIN. H. B. Geinitz, Das Elbthalgeb. II, p. 14, pl. 4, fig. 5.

non 1897. *Hemiaster sublacunosus* GEIN. Ant. Frič, Die Chlomeker Schichten. Archiv der naturw. Landesdurchf. von Böhmen. X. 4, p. 71.

non 1898. *Hemiaster sublacunosus* GEIN. Ant. Frič, Chlomecké vrstvy. Archiv pro přír. výzkum Čech. X. 4. p. 69.

D i a g n o s i s . Irregular echinoid of medium size, heart-shaped, polygonal in outline. The apex is in the centre of the dorsal face. Circular

anal aperture lies in the upper third of the vertical anal area. The anterior unpaired ambulacral area is placed in a broad furrow. Its ambulacral pores are developed up to the half distance between apex and ambitus; they disappear fairly suddently. The anterior pair of ambulacra is longer by a third than the posterior one which distinctly forms petalodia gently deflecting backwards towards the plane of symmetry. Fasciola is not developed. The transverse reniform oral aperture is about 1/5 distant from the anterior margin of the ambitus on the ventral face. The plastron overlaps it by the lip. Minute tubercles are coarser on the ventral face of the corona, and finer on its dorsal surface. Between the tubercles the test is finely granulated. The unpaired interambulacrum (5) on the dorsal face forms moderate keel at the apex.

D e s c r i p t i o n . The test heart-shaped, polygonal in outline, wider than long, probably in consequence of a moderate deformation due to pressure from above, as is perceptible disjoined interambulacral plates on the ambitus (length 44.5 mm., width 46.5 mm., index 0.957). Apex in the centre of the dorsal face of corona. The test attains its widest dimension close to apex, at the line connecting ambitus with the edges above lateral rows of posterior zones on the anterior paired ambulacral areas (II, IV). At the back the test is vertically cut off. On the test somewhat deformed by pressure the anal area attains a height of 21 mm.

The anterior unpaired ambulacral area (III) lies in a wide furrow gradually broadening forwards, towards the ambitus. The ambulacral zones of this ambulacral area do not converge towards the plane of symmetry, rather the opposite is the case. The ambulacral pores reach to about a half of the distance between apex and ambitus and fairly suddenly disappear.

Paired ambulacra are fairly deep and unequally long. The anterior pair of ambulacra exceeds by one third the posterior one (14.8 mm. and 10.8 mm.). The posterior pair of ambulacral areas (V, I) distinctly forms petalodia; on the anterior pair of ambulacral areas the ambulacral zones converge only moderately. They are not even subpetaloid. In this case it can also be stated that one pair of ambulacral zones is terminated fairly suddenly. The ambulacral pores of the anterior paired ambulacral zones suddenly dissappear. They never reach the ambitus. On the anterior paired ambulacra they reach to 2/3 furrow length from the apex, on the posterior paired ambulacra to more than a half length of the dorsal side of the ambulacral area. The anterior paired ambulacra are straight, the posterior ones deflected somewhat backwards towards the (Lovén's) plane of symmetry.

On the ventral face of the test the anterior unpaired ambulacrum (III) is marked by a furrow up to oral aperture. The latter is transverse, reniform, placed at about one fifth from the ambitus towards the lower face. Plastron overlaps it partly by the lip. On both sides of the oral aperture the anterior paired ambulacral areas are marked by furrows which, however, soon die out. The plastron is marked by wide shallow furrows of posterior zones of the posterior paired ambulacral areas up to ambitus. Anal aperture lies in the upper third of the anal area. The surface of the test is covered by tubercles which are much finer on the

dorsal face of corona than on the ventral. They are coarsest in the anterior part round the oral aperture on sterns and on the paired interambulacral areas. They are very fine on the anal area. The surface of the test between the tubercles is very finely granulated. Fasciola is not developed. The posterior unpaired interambulacral area (5) on the upper face of corona forms a moderate keel at the apex.

R e l a t i o n s . *Epiaster sublacunosus* (GEIN.) is very closely related to the species *E. distinctus* (AG.) which was described from the Upper Cenomanian of France and from the Lower Turonian of Central Europe. It is a member of the series *Epiaster guerangeri* COTTEAU, 1859 (Cenomanian of France), *E. distinctus* (AG., 1840) and *E. sublacunosus* (GEIN., 1872). In my previous paper I designated it *E. cotteauanus* NOV. The species mentioned appear gradually as always wider and shorter. *E. guerangeri* is the slenderest. In the species *E. distinctus* the length still exceeds width, so that the index exceeds 1.0. In the species *E. sublacunosus* the width already exceeds the length and the index is thus less than 1.0. The broadening of corona in relation to its length shows itself — as far as the configuration of the test is concerned — in the expressivenes of all features. In this series *E. guerangeri* is the most, and *E. sublacunosus* the least marked.

As to priority, it is to be attributed to the designation *Epiaster sublacunosus* (GEINITZ), although this species has been established as *Hemiaster.* Geinitz has given diagnosis and illustrated the species, while O. Novák recorded it only in the list of fossils. I have given the O. Novák's designation among the synonyms as we precisely know what Novák has determined, i. e. I included it in order to elucidate what Novák listed in his survey.

In the Novák's manuscript in the synonyms of his species *E. cotteauanus* the following species were also included: 1849. *Micraster cor anguinum* (pars) REUSS. Versteinerungen d. böhm. Kreideformation, p. 56; 1855. *Micraster cor anguinum* REUSS. Denkschriften der Kais. Akad. d. Wiss. Math. Naturw. C. Band X., pag. 84; *Micraster cor anguinum* PAUL. Jahrb. d. k. k. geolog. Reichanstalt, p. 456 and Verhandlung p. 3.

R e m a r k s . In his manuscript O. Novák dealing with species *Epiaster cotteauanus* NOV., 1882 gave among the synonyms also 1878 (recte 1877) *Micraster* sp. — Fritsch (recte Frič). Die Weissenberger und Malnitzer Schichten, (Archiv, IV, 1.), p. 147 (Czech edition of 1879, p. 138) — and made the following note: "Poorly preserved internal moulds which may belong to this species were found in many places of the Bílá hora (Weissenberger) and Malnice (Malnitz) beds". Novák did not notice that the finds were of Lower Turonian and Middle Turonian age. This note evidently concerns — if not completely, so to a considerable extent — the species *Epiaster distinctus* (AG.) and to a much lesser extent the species *E. sublacunosus* (GEIN.) (= *E. cotteauanus* NOV.).

J. Lambert (in Grossouvre) 1891 quoting Geinitz and the species *Hemiaster sublacunosus* determined by him in 1872 gave incorrect data which are not to be found in the Geinitz's work. He wrote on p. 211 "Cette espèce du Planersandstein de Schonheugst, créée par Geinitz en 1872 (Das Elbthalgeb. in Sachs. II, tab. IV, fig. 5), a été reproduite en

1874 par Quenstedt sous le nom de *M.* cf. *sublacunosus.*" In this quotation there are several incorect statements. Firstly, only the specimen illustrated by Geinitz on pl. 4, fig. 6 can be designated as lectotype, as only this specimen derives from the Saxonian Cretaceous and the Turonian, while the specimen figured on pl. 4, fig. 5 derives from the Cretaceous of Westfalen of Campanian age. Secondly, the quotation of „Planersandstein de Schonheugst" does not occur in the H. B. Geinitz's work nor can be there. The "Plänersandstein de Schönhengst" relates to the community Hřebeč on the cadastre of the village Koclířov, Svitavy district. The "Plänersandstein" represents marly spongilites III b 3 which have been described from this region by Čeněk Zahálka 1918 in his paper on the Cretaceous of eastern Bohemia (Východočeský útvar křídový. Část jižní.), p. 69—70. On p. 70 he mentioned that in the uppermost layers III b 3 preserved, in the uppermost place called "Horní lom", he had found "remains of Inoceramus only and well-known internal moulds of echinoids which at other localities (for instance, at Luže and Ústí nad Orlicí) of the same horizon have been described by F r i č as E p i a s t e r sp.". This would be, however, *Epiaster distinctus* (AG.).

It is necessary to assign to the species *Epiaster distictus* (AG.) also the finds from the lower part of zone III b from the elevation "Čížovky" near Boskovice designated by Břetislav Zahálka (1935) as *Hemiaster sublacunosus* GEIN. and which he compared with Geinitz's illustrations on pl. IV. figs 5, 6. The following Břetislav Zahálka's (1935) note (p. 5 of the reprint) evidently bears upon the finds from Koclířov (given by Č. Zahálka 1918 and Lambert (in Grossouvre, 1901) vaguely from Hřebečov): "According to the kind communication of my collegue Dr. V. Smetana this species (i. e., *Hemiaster sublacunosus* GEIN.) also occurs in spongilites of zone IIIb near Kočířov E of Svitavy". These finds, however, cannot be assigned to the species *Epiaster sublacunosus* (GEIN.). It is *Epiaster distinctus* (AGASSIZ).

I also have to call again attention to the remark by E. Desor (1858) on p. 361 of his paper that *Epiaster acutus* (AG.) and *Epiaster distinctus* (AG.) could be varieties only. If this comment will prove to be justified, the species *E. acutus* (AG.) would include, in addition to the subspecies *E. acutus acutus* (AG.) also the subspecies *E. acutus distinctus* (AG.) and further the subspecies *E. acutus sublacunosus* (GEIN.) which I have designated (1964) as *E. a. cotteauanus* NOVÁK.

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EXPLANATION OF PLATES

PLATE 1

Epiaster sublacunosus (GEINITZ)
Mělník. Middle Turonian. Inv. No. ČL. 2213. 1 ×
Fig. 1. Upper surface.
Fig. 2. Lower surface.
Rathen. Saxony. Middle Turonian. Internal mould. 1 ×
Lectotype, here designated, the specimen figured by H. B. Geinitz, Elbthalgebirge, II, pl., 4, fig. 6.
Fig. 3. Upper surface.
Fig. 4. Lower surface.
Fig. 5. Posterior view.

IRREGULAR ECHINOID
Annenberg near Haltern, Westfalen. Lower Campanian. Internal mould. 1×
The specimen figured by H. B. Geinitz, Elbthalgeb., II, pl. 4, fig. 5.
Fig. 6. Upper surface. The specimen related to the species *Diplodetus cretaceus* SCHLÜTER or *Plesiaster (?) cavifer* SCHLÜTER with internal moulds of serpulae *Potamoceros triangularis* (MÜNSTER).

PLATE 2

Epiaster sublacunosus (GEINITZ)
Mělník. Middle Turonian.
Original drawings from the manuscript by O. Novák.
Fig. 1. Upper surface. The same specimen as on plate 1, fig. 1.
Fig. 2. Lower surface. The same specimen as on pl. 1, fig. 2.
Fig. 3. Side view of the specimen on pl. 1, fig. 1.
Rathen, Saxony. Middle Turonian. Internal mould.
Fig. 4. Upper surface. The same specimen as on pl. 1, fig. 3.
Refigured from H. B. Geinitz, Elbth., II, pl. 4, fig. 6.
Fig. 5. Posterior view. The same specimen.
Fig. 6. Upper surface. Refigured from K. Wanderer, pl. II, figs. 13, 13b.
Fig. 7. Posterior view. The same specimen.

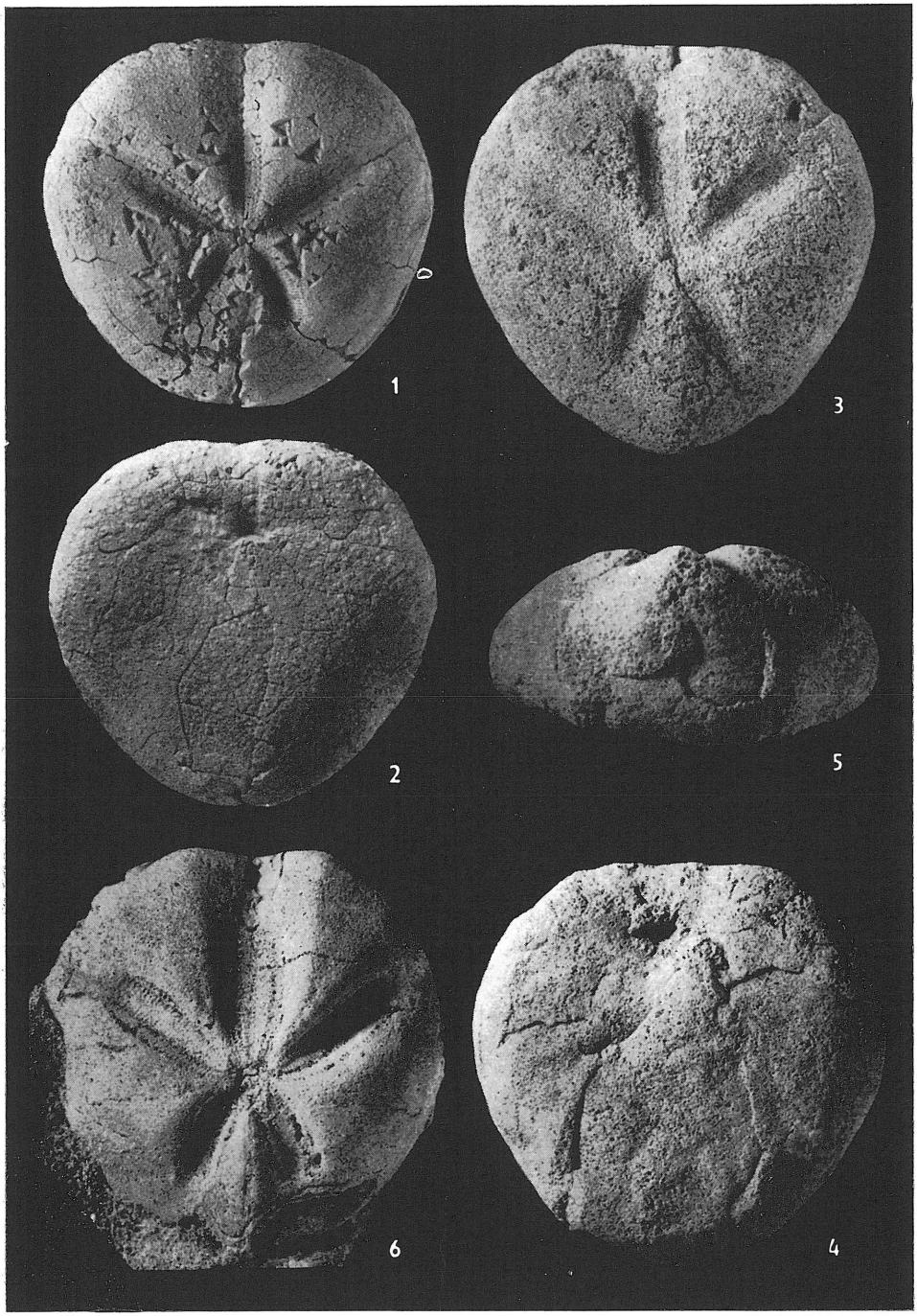
PLATE 3

Epiaster sublacunosus (GEINITZ)
Mělník. Middle Turonian.
Figs. 1—2. Magnified photographs of the specimen figured here on pl. 1, figs. 1, 2.
Fig. 1. Upper surface.
Fig. 2. Lower surface.

Photo Radvan Horný

The specimen pl. 1, figs. 1, 2 has been deposited in the collections of the Geological-Paleontological Department of the National Museum, Praha.

The specimens pl. 1, figs. 3—5 and fig. 6 have been deposited in the collections of the Staatliches Museum zu Dresden.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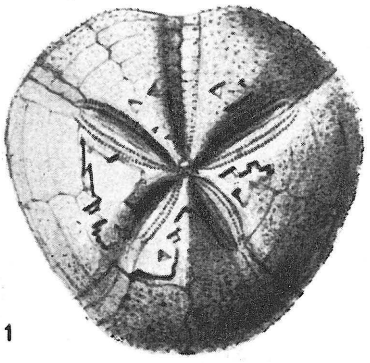

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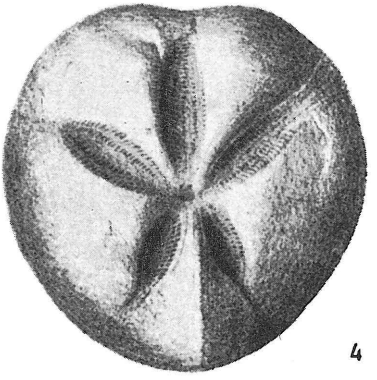

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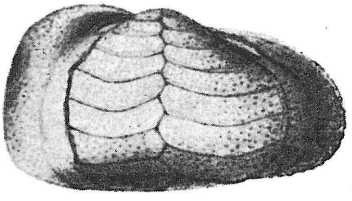

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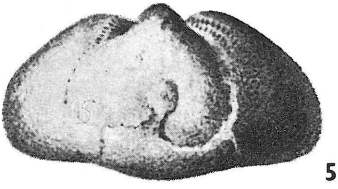

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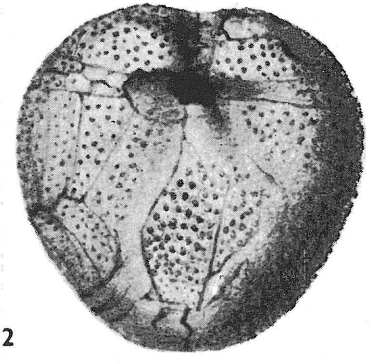

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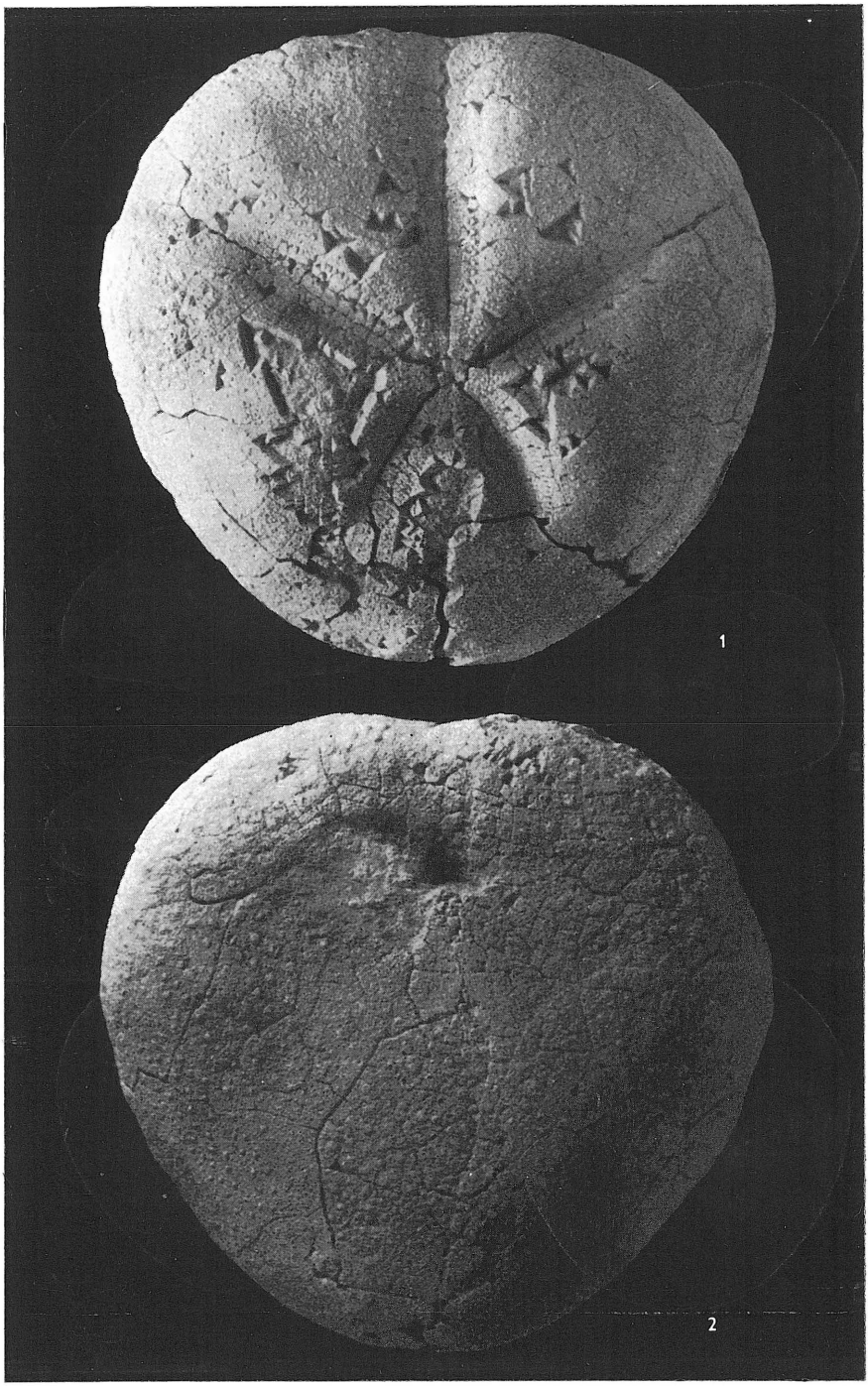
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