Table 10

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XXX, Fig. 2*	–	47.0	13.5?	21.4	9.6	44	22.5	12.3	54	19.3?	–	–
Pl. XV, Figs. 2–3*	58.5?	47.7	14.0	20.4	11.5	56	22.7	12.4	57	20.0?	11.0	55?
Pl. XIV, Figs. 1, 4	62.8	53.9	–	22.5	22.7	100	32.0	31?	96?	–	–	–
Pl. XIV, Figs. 2–3	64.0	67.4	24.5	22.5	16.4	72	20.3	22.4	119	25.0	25.5	102**
Pl. XIV, Figs. 5–7	83.7	62.8	33.8	29.8?	29.5	98?	30.0	30.2	100	27.5	28.4	103**

* Specimens assigned, with a reservation, to *Trachyscaphites spiniger posterior* subsp. nov.
** A coil displaying a secondary asymmetric deformation.

As compared with the type, the specimens, illustrated on Pl. XIII, Fig. 4 and Pl. XIV, Figs. 1–2, display similarities or insignificant differences in the development of particular elements of their ornamentation and in their shape.

The specimen, presented in Pl. XIV, Figs. 2–3, decidedly differs from the group of the specimens discussed above in flattened sides of the entire body chamber and ventral side of shaft, development of a distinct umbilical margin on a later part of body chamber, occurrence of a strong costulation and, finally, a decidedly stronger curve of ribs on the sides of shaft. The lack of other specimens of this type and of a sufficient basis for assuming the existence of stratigraphic differences as compared with the type, allows one to treat this specimen as an extreme morphological variant of the subspecies described (in its stratigraphic position, this specimen may accurately correspond to the type).

The specimens, illustrated on Pl. XV, Figs. 2–3 and Pl. XXX, Fig. 2, belong to a group distinctly differing from the type in their decidedly smaller coil and displaying small, but constant differences in the development of ornamentation and, on the whole, in the stratigraphic position (the lower stratigraphic position and frequent presence of ribs between the tubercles of the same row on body chamber).

Remarks. *Trachyscaphites spiniger posterior* subsp. nov. is interpreted by the present writer as a temporary subspecies, later in relation to the nominative one. The differences it displays in relation to *T. spiniger spiniger* (Schlüter) include: a smaller number of ribs running between the tubercles of the same row on the exposed part of normal spiral and the presence of the lateroumbilical tuberculation on earlier sectors of the exposed, normal spiral. It also differs on the whole in a smaller degree of freeing the shaft from phragmocone and in a frequent lack of ribs between the tubercles of the same row on the shaft.

The greatest similarity to specimens of the nominative subspecies is displayed by the morphological group, represented by those illustrated on Pl. XV, Figs. 2–3 and Pl. XXX, Fig. 2.

As compared with *T. spiniger porchi* (Adkins) and *T. spiniger levatinensis* Lewy, interpreted as geographical subspecies (l.c.), the taxon described differs in the presence of a distinct costulation occurring on the later part of coil (above the normal spiral). As follows from the remarks on the nominative subspecies given above, there also occur other differences. The species *T. rebirdensis* Cobban et Scott (W.A. Cobban and G.R. Scott, 1964, Pl. 1, Figs. 1–7), related with the taxon described, is marked primarily by the presence of five rows of tubercles and a smaller degree of involution of phragmocone.

The illustration of a specimen assigned by F.A. Roemer (1840–1841, Pl. 14, Fig. 4) to his species *Scaphites pulcherrimus*, allows one to identify this specimen rather with *Trachyscaphites spiniger posterior* subsp. nov. (cf. the description of the type of *T. pulcherrimus* (Roemer) and to compare the two taxons, p. 33). The fragmentary state of preservation or indistinct illustrations of the remaining material, taken into account in the synonymy, make up the reason why its taxonomic position cannot be unequivocally settled.

Distribution: Upper Campanian, *Bostrychoceras polyplocum* Zone, the Vistula river valley. Upper Campanian of the U.S.S.R. (?) and the Federal Republic of Germany (?).

Trachyscaphites (?) *gibbus* (Schlüter, 1872)

(Pl. XIII, Figs. 6 and 8)

1871–1976 *Scaphites gibbus* Schlüter; Schlüter C., p. 87, Pl. 26, Figs. 6–9.
1894 *Scaphites gibbus* Schlüter; Grossouvre A., p. 251, Pl. 32, Figs. 10a–b.
? 1951 *Discoscaphites gibbus* (Schlüter); Mikhailov N.P., p. 94, Pl. 8, Figs. 86–87.
? 1959 *Discoscaphites gibbus* (Schlüter); Naidin D.P., p. 197, Pl. 6, Figs. 9–11.
1966 *Trachyscaphites* (?) *gibbus* (Schlüter); Blaszkiewicz A., table.

Type. C. Schlüter's (1871–1876, Pl. 26, Figs. 7–9) specimen has been designated by the present writer as a lectotype.

Material: IG 1,310. II. 261.

Remarks. As compared with the lectotype, the specimen presented differs in its decidedly thinner external costulation of the terminal part of normal spiral and in a conspicuous occurrence of the fifth row of tubercles (the illustration of the lectotype allows one only for conjectures concerning the existence of this row). More distinct differences are observed in C. Schlüter's (1871–1876, Pl. 26, Fig. 7) second specimen, which is marked by the presence of only three rows of tubercles on the coil above the normal spiral, pronouncedly more widely spaced tubercles on the shaft and the development of claviform swellings of internal ribs in higher parts of the sides of the earlier sector of the exposed normal spiral. Decidedly smaller dimensions of its coil make up another difference.

As compared with the specimen described, A. Grossouvre's specimen differs only in a coarser costula-

tion of the ventral side of the late part of normal spiral and of the early part of shaft.

The fragmentarily and poorly preserved or indistinctly illustrated material, presented in N.P. Mikhailov's and D.P. Naidin's works, seems to be contained within or slightly exceed the limits of variability, determined by the characters of the specimens discussed above. The relation of *Trachyscaphites* (?) *gibbus* (Schlüter) to other species of the genus *Trachyscaphites* Cobban et Scott, has been discussed in the remarks on this genus.

Distribution: Upper Campanian, *Neancyloceras phaleratum* Zone, the Vistula river valley. Upper Campanian of the Federal Republic of Germany, France and the U.S.S.R. (?)

Trachyscaphites pulcherrimus (Roemer, 1841)

(Pl. XV, Figs. 1, 4–11)

1840–1841 *Scaphites pulcherrimus* Roemer; Roemer F.A., p. 91, non-Pl. 14, Fig. 4.
1871–1876 *Scaphites pulcherrimus* Roemer; Schlüter C., p. 85, Pl. 26, Figs. 1–5.
1894 *Scaphites pulcherrimus* Roemer; Grossouvre A., p. 250, Pl. 32, Figs. 6, 9.
? 1951 *Acanthoscaphites pulcherrimus* (Roemer); Mikhailov N.P., p. 96, Pl. 18, Figs. 83–84.
1959 *Acanthoscaphites pulcherrimus* (Roemer); Naidin D.P., p. 159, Pl. 6, Fig. 14.
1966 *Trachyscaphites pulcherrimus* (Roemer); Blaszkiewicz A., table.

Type. Finding the inconformity of an original description of the species with its original illustration, C. Schlüter (1871–1876, p. 85) assumed, as a basis, the description and identified the specimen illustrated with his new species, that is, *Scaphites spiniger*. In later publications, specimens illustrated by C. Schlüter (1871–1876, Pl. 25, Figs. 1–5), were assumed to be type specimens of F.A. Roemer's species (A. de Grossouvre, 1894, p. 250; N.P. Mikhailov, 1951, p. 95; D.P. Naidin, 1959, p. 195). The last-named interpretation has also been accepted by the present writer.

Material: IG 234. II. 28; IG 889. II. 62, 76; IG 1,310. II. 11, 262–269; Mz VIII Mc 235–236, 314, 318, 321, 323, 1,332/1–2.

Dimensions in mm. (Table 11)

Remarks. Despite the existence of distinct mutual differences in the development of some elements of ornamentation of the sector of coil above the normal spiral and related differences in the stratigraphic position, the specimens presented display permanent characters in which they differ from type specimens, that is, the development of a high and steep umbilical wall on the later part of shaft and the occurrence of the maximum height of whorls in the hooked sector (in type specimens, it occurs on the shaft).

In the shape of coil, most of Polish specimens accurately correspond to A. Grossouvre's specimen. The Aquitanian form seems, however, to differ from all Polish specimens in its lack of costulation on the hooked sector. Distinct differences are also displayed by Polish specimens as compared with N.P. Mikhailov's specimen. In addition to the differences mentioned in connection with type specimens, the last-named one is marked by a very narrow umbilicus of phragmocone, contact of the whole body chamber with phragmocone and a presumably almost permanent presence of one or more ribs between the tubercles of the same row on the sides of shaft.

Distinct differences displayed by the material related with *Trachyscaphites pulcherrimus* (Roemer), are probably the result of subspecific (geographical, temporary) differentiation. The scarcity of the material and poor state of preservation of most specimens, preclude the possibility of evaluating definitely the taxonomic significance of the occurring differences. As compared with the related taxon *T. spiniger posterior* subsp. nov., F.A. Roemer's species differs in a larger number of rows of tubercles, at least on the normal spiral, in narrower sections and a higher stratigraphic position. In addition, it differs very frequently in a lower degree of the involution of phragmocone, development of a higher umbilical wall and distinct umbilical margin on the later part of shaft, coarser costulation and smaller degree of the development, or even disappearance, of lateral tuberculation above the normal spiral. *T. rebirdensis* Cobban and Scott (*l.c.*), also a very closely related taxon, differs from the species described in wider sections and a less strongly developed tuberculation of the lowermost row.

Distribution: Upper Campanian, *Bostrychoceras polyplocum* and *Didymoceras donezianum* zones, the Middle Vistula river valley. Upper Campanian of France, the Federal Republic of Germany and the U.S.S.R.

Genus *Hoploscaphites* Nowak, 1911
Type species *Scaphites constrictus* Sowerby, 1818

Diagnosis. See C.W. Wright, 1957, p. L 229; T. Birkelund, 1965, p. 102.

Hoploscaphites greenlandicus (Donovan, 1953)

(Pl. XVI, Figs. 4, 6–7, 9–10; Pl. XVII, Figs. 2, 3)

1871–1876 *Scaphites Römeri* d'Orbigny; Schlüter C., p. 89 (pars), Pl. 27, Fig. 4, Pl. 42, Fig. 4 (?).
1897 *Scaphites Roemeri* d'Orbigny; Madsen V., p. 49, Pl. Figs. 1, 2a–b, 3a–b (holotype).
1918 *Scaphites Nicolletii* Morton; Ravn J.P.J., p. 363, Pl. 8, Fig. 18, Pl. 9, Figs. 1–2, Text-fig. 2.
1951 *Scaphites greenlandiscus* Donovan; Donovan D.T., p. 121, Pl. 24, Figs. 9, 10 (?).
1965 *Scaphites* (*Hoploscaphites*) *greenlandiscus* Donovan; Birkelund T., p. 110, Pl. 28, Figs. 2–3, Pl. 29, Fig. 2, Pl. 30, Figs. 1–3,

Table 11

Specimen	LS	WS	Th	H_1	W_1	$W_1 H_1^{-1}$%	H_2	W_2	$W_2 H_2^{-1}$%	H_3	W_3	$W_3 H_3^{-1}$%
Pl. XV, Figs. 4–5*	52.0	42?	11.3?	15.0	7.0	46	18.5	9.3	50	–	–	–
Pl. XV, Figs. 10–11*	63.5?	48?	17.0?	–	–	–	17.6	14.2	80	–	–	–
Pl. XV, Figs. 8–9	72.0?	54?	19.0?	–	–	–	24.0	12?	50	–	–	–

* The coil displays a secondary lateral deformation.

Pl. 31, Figs. 1–2, Pl. 32, Fig. 1, Pl. 33, Fig. 1, Text-figs. 64–66, 98–100, 121(6).

1966 *Hoploscaphites greenlandicus* (Donovan); Błaszkiewicz A., table.

Material: IG 13. II. 13; IG 889. II. 75; IG 890. II. 121; IG 1,310. II. 270–272; MZ VIII Mc 1,393.

Dimensions in mm. (Table 12)

Remarks. The holotype, as well as the remaining illustrated specimens of *Hoploscaphites greenlandicus* (Donovan) from Niakornat, Greenland (V. Madson, 1897, Figs. 1–3; J.P.J. Ravn, 1918, Pl. 8, Fig. 18, Pl. 9, Figs. 1–2; T. Birkelund, 1965, Pl. 28, Figs. 2–3, Pl. 29, Fig. 2, Pl. 30, Figs. 1–3, Pl. 31, Figs. 1–2, Pl. 32, Fig. 1, Pl. 33, Fig. 1) make up a morphologically uniform group.

The specimen, shown on Pl. XVII, Figs. 2–3, on the whole displays morphological characters contained within the limits of variability determined by the specimens from Niakornat, Greenland. It differs from the specimens of this group only in a coarser and more widely spaced costulation of the exposed parts of coil, except for the lower parts of the sides of shaft. In the dimensions of ribs and their spacing on this part of coil, this specimen displays a larger similarity to those of *H. ikorfatentis* Birkelund, which may be interpreted as a taxon most closely related phylogenetically. According to the interpretation accepted, the taxon described differs from T. Birkelund's last-named species in narrower sections, a more undulating costulation and a higher stratigraphic position. In addition, it differs in mostly thinner and more closely spaced ribs and a lack of lateral tuberculation on body chamber (T. Birkelund, 1965).

On the other hand, the specimen, presented on Pl. XVI, Figs. 4, 6, 7, differs from those from Niakornat, Greenland in thicker and more widely spaced ribs occurring on the periumbilical parts of body chamber, smaller dimensions of coil and a larger umbilicus of phragmocone. In the dimensions of umbilicus and the development of costulation of periumbilical parts, it resembles specimens of *H. gilli* Cobban and Jeletzky (W.A. Cobban and J.A. Jeletzky, 1965), which in turn differs from the species described in having a widely spaced and coarser costulation of phragmocone and a smaller coil. Additional differences are: a generally larger apertural angle, larger umbilicus of phragmocone, coarser and more widely spaced costulation of both periumbilical and higher parts of body chamber and, finally, internal ribs, which, as compared with external ones, are thicker and more widely spaced.

Distribution: Upper Campanian, *Bostrychoceras polyplocum* and *Didymoceras donezianum* Zones, the Vistula river valley. Upper Campanian of the Federal Republic of Germany and Greenland.

Hoploscaphites (?) sp.

(Pl. XVII, Figs. 1 and 7)

Material: IG 1,310. II. 273.

Remarks. Displaying similarities in the development of costulation to specimens of *Hoploscaphites greenlandicus* (Donovan), the form described seems also to take a stratigraphic position, which is contained within the range of this species or, at least, to occur only slightly above the upper boundary of this range. This form departs, however, from *Hoploscaphites greenlandicus* (Donovan) in having a decidedly wider outline of sections and in the occurrence of a lateroumbilical tuberculation presumably on the whole exposed part of coil (the earlier, exposed part of coil is not preserved). The occurrence of lateroumbilical tuberculation over the whole exposed part of coil is also known in *Acanthoscaphites* (?) *tuberculatus* (Giebel), the lower boundary of whose range, found in the Middle Vistula river valley, runs almost directly above the stratigraphic position of the form described. However, *A.* (?) *tuberculatus* (Giebel) differs from the last-named form in having, over the entire exposed part of coil, a lateroventral tuberculation and a usually coarser and more widely spaced costulation of body chamber.

Distribution: Upper Campanian, *Didymoceras donezianum* Zone, the Vistula river valley.

Hoploscaphites vistulensis sp. nov.

(Pl. XVII, Figs. 4, 6, 8–9)

1966 *Hoploscaphites* sp. nov. Błaszkiewicz; Błaszkiewicz A., table.

Holotypus. Pl. XVII, Figs. 8–9 (IG 1,310. II. 12).
Stratum typicum. Upper Campanian, *Nostoceras pozaryskii* Zone.
Locus typicus. The Middle Vistula river valley, Piotrawin, outcrop I.
Derivatio nominis. *Vistulensis* (Lat.) – after the name of the Vistula River.

Diagnosis. Coil large. Shaft slightly exceeding phragmocone. Dorsal margin of shaft curved outwards. Umbilicus of phragmocone very narrow. Ribs undulating, fairly thin and on the whole rather closely spaced. Lateroumbilical and lateroventral tubercles occur beginning with the last part of normal spiral.

Material: IG 1,310. II. 12; MZ VIII Mc 468.

Dimensions in mm. (Table 13)

Description. Holotype devoid of aperture, 64 mm. long. Shaft slightly exceeding phragmocone. Dorsal margin of shaft slightly curved outwards. Umbilicus of phragmocone very small. Sections of the exposed parts of coil very narrow, which to a certain extent seems to result from a secondary deformation. The highest section occurs in the shaft, the thickest – in the hooked sector. Sides of the exposed part of coil flattened, particularly strongly on the shaft. Ventral side rounded. Ribs undulating, fairly thin and, very frequently, fairly closely spaced. In lower parts of the sides of the late part of normal spiral, ribs are distinctly more widely spaced than on the remaining parts of coil. In higher parts of the sides of the earlier sector

Table 12

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XVI, Figs. 4, 6, 7*	54.0	53.3	14.4	–	–	–	22.2	10.8	48	18.0	13.7	76
Pl. XVII, Figs. 2–3*	54.5	60.0	18.8	29.5	14.6	49	–	–	–	–	–	–

* The coil displays a slight, asymmetric secondary deformation.

Table 13

Specimen	LS	WS	Th	H_1	W_1	$W_1 H_1$"	H_2	W_2	$W_2 H_2$"	H_3	W_3	$W_3 H_3$"
Pl. XVII, Figs. 8–9	64.8	53.5	16.7	30.3	11.0	36	34.5	14.2	41	–	–	–
Pl. XVII, Figs. 4, 6	54.0	62.8	22.0	15.8?	15.0	58	34.0	20.0	58	21.5?	–	–

of shaft, ribs disappear locally. Lateroventral and lateroumbilical tubercles, which cover the entire remaining part of coil appear on the final part of normal spiral. On the shaft, the lateroventral tubercles are fairly large, widely spaced and sometimes distinctly assuming the "clavi" type. The lateroumbilical tubercles are smaller and rather elongated concordantly with the course of ribs.

The apertural angle of the remaining specimen amounts to 80°. The very small value of this angle seems to be related with the secondary deformation. In addition to the differences shown in the table of dimensions, this specimen differs from the holotype in a slightly thinner and more closely spaced costulation of low and periventral parts of the sides and of the ventral area of shaft, complete disappearance of costulation on the remaining parts of the sides of shaft and in an earlier appearance of differentiation in the spacing of internal ribs, as compared with the external ones, on the normally coiled sector of shell. The stratigraphic position of this specimen may also be somewhat higher than that of the holotype.

Remarks. The set of characters which differ *Hoploscaphites vistulensis* sp. nov. from all species of the genus *Hoploscaphites* Nowak known thus far includes the presence of lateroventral and lateroumbilical tuberculation and a fairly dense and thin costulation of shaft (cf. a detailed comparison with *H. minimus* sp. nov., a taxon which displays close relationships it, see below).

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone and (?) Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, the Vistula river valley.

Hoploscaphites angulatus (Łopuski, 1911)

1911 *Scaphites angulatus* Łopuski, Łopuski C., p. 119, Pl. 3, Figs. 8–10.

1966 *Hoploscaphites angulatus* Łopuski; Błaszkiewicz A. (pars), table.

Remarks. In a current interpretation, accepted by the present writer, C. Łopuski's species is known only on the basis of an original illustration and description. This species has originally been based on only one specimen, now missing. Specimens, identified in the present work as *Hoploscaphites minimus* sp. nov., were related by the present writer, in his former elaborations, (cf. synonymy), with C. Łopuski's species.

Distribution: As follows from C. Łopuski's work, the specimen which served him as a basis for erecting his species, comes from the beds of Kaliszany, which are included in the boundaries of the *Nostoceras pozaryskii* Zone.

Hoploscaphites minimus sp. nov.

(Pl. XXIII, Fig. 4, Pl. XXIV, Fig. 3, Pl. XXV, Figs. 3, 4)

1966 *Hoploscaphites angulatus* Łopuski; Błaszkiewicz A. (pars), table.

Holotypus. Pl. XXV, Figs. 3–4 (IG 1.310. II. 13).

Stratum typicum. Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone.

Locus typicus. The Middle Vistula river valley, Piotrawin, outcrop 166.

Derivatio nomini. *Minimus* (Lat.) – the smallest.

Diagnosis. Coil very small. Umbilicus of phragmocone fairly narrow. Shaft conspicuously exceeding phragmocone. Apertural angle amounting to about 120°. External costulation fairly thin and dense to thin and dense. As compared with the siphonal area, the costulation on the sides of shaft is decidedly more widely spaced. The lateroventral tuberculation covering most part of shaft.

Material: IG 12. II. 11; IG 889. II. 146–147; IG 890. II. 177; IG 1.310. II. 13, 274–279, MZ VIII Mc 447, 1.396–1.397, 1.399.

Dimensions in mm. (Table 14)

Description. Coil within limits of 29 and 34 mm. Umbilicus of phragmocone fairly narrow. Shaft distinctly exceeding phragmocone. Dorsal margin of shaft incurved. Apertural angle amounting to about 120°. Sections of exposed parts of shaft higher than thick. The highest section falls in a transitional area between shaft and the hooked sector, the thickest – in the hooked sector. Sides of the exposed part of coil flattened, most distinctly so on shaft; ventral side rounded, less so on shaft. Costulation of the exposed normal spiral undulating, fairly thin and dense. External ribs thinner and more closely spaced on the final part of normal spiral. On the sides of shaft, costulation is decidedly thinner and less closely spaced than on the normal spiral. Ventral side of shaft and the hooked sector of coil also display, more or less distinctly, a closer costulation than that on the sides of shaft (the difference between specimens). A lateroventral tuberculation, covering most part of shaft, appears in the transitional sector between the normal spiral and shaft. Tubercles small, closely spaced, on the shaft rather distinctly elongated perpendicularly to the course of ribs.

Remarks. *Hoploscaphites minimus* sp. nov. displays a distinct relationship with *H. angulatus* (Łopuski).

The stratigraphic position of the only known representative of C. Łopuski's species is perhaps included in the lower part of the range of the taxon described and, at any rate, it is situated within the same stratigraphic zone (these doubts result from the lack of an exact localization of both C. Łopuski's specimen and part of the specimens described). The systematic separation of the specimens described and C. Łopuski's specimen is based primarily on the existence of a conspicuous morphological discontinuity. The specimens under study differ from C. Łopuski's specimen in a pronouncedly larger apertural angle and (?) umbilicus of phragmocone, in the presence of tuberculation, marked by a constantly advancing development and, finally, in a conspicuously thinner costulation of shaft.

As compared with the concurring *Hoploscaphites*

Table 14

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1%	H_2	W_2	W_2/H_2%	H_3	W_3	W_3/H_3%
Pl. XXV, Figs. 3–4*	29.0	24.9	6.1	10.5	3.0	28	11.8	4.4	37	11.7	5.8	49
Pl. XXIV, Fig. 3**	34.4	25.7	5.6?	10.0	3.5	35	10.2	4.0	39	–	–	–

* Secondary lateral flattening of the specimen.
** Secondary asymmetric deformations of the specimen.

vistulensis sp. nov., the species under study differs primarily in a wider umbilicus of phragmocone, lack of an outward curve of the dorsal margin of shaft, larger apertural angle, smaller coil, absence of lateroumbilical tuberculation and less closely spaced ribs on the sides of shaft.

Distribution: Upper Campanian – *Nostoceras pozaryskii* Zone – and Lower Maastrichtian – *Belemnella lanceolata lanceolata* Zone, the Vistula river valley.

Hoploscaphites constrictus anterior subsp. nov.

(Pl. XVII, Fig. 5, Pl. XVIII, Figs. 4–10)

1869 *Scaphites constrictus* Sowerby; Favre E., Pl. 5, Figs. 2, 4, 1 (?).
1951 *Discoscaphites constrictus* (Sowerby); Mikhailov N.P., Pl. 18, Figs. 79–80.
1959 *Discoscaphites constrictus* (Sowerby); Naidin D.P., Pl. 6, Figs. 7–8.
1966 *Hoploscaphites constrictus* (Sowerby) subsp. nov. Błaszkiewicz; Błaszkiewicz A., p. 1,064.

Holotypus. Pl. XVIII, Figs. 4–6 (IG 1,310. II. 14).
Stratum typicum. Lower Maastrichtian.
Locus typicus. Miechów trough, environs of Pińczów, Polichno.
Derivatio nominis. *Anterior* (Lat.) – earlier.

Diagnosis. Coil small. Umbilicus of phragmocone very narrow. Shaft in contact with phragmocone. Apertural angle amounting to about 95°. Sides of the exposed part of coil flattened. Ventral side rounded except for the ventral side of shaft which is slightly flattened. Internal and external costulation fairly thick and widely spaced. On the shaft, ribs become reduced and even locally disappear at all. Lateroventral and lateroumbilical tubercles appear in the transitional area between the shaft and normal spiral.

Material: IG 12. II. 12; IG 1,310. II. 280. The region situated west of the described one – Wólka Maziarska: IG 12. II. 13–14. Miechów trough: IG 1,310. II. 14, 281–284; IG 1,410. II. 1–3.

Dimensions in mm. (Table 15)

Description. Shell within limits of 40 and 47 mm. Umbilicus of phragmocone very narrow. Shaft in contact with phragmocone. Dorsal margin of shaft fairly distinctly curved outwards. Apertural angle about 95°. The highest section falls in the shaft, the thickest – in the hooked sector. Sections of the exposed parts of coil narrow. Sides flattened, especially on the shaft, ventral side rounded, except for the ventral side of shaft which is slightly flattened. Costulation of the exposed, normal sector of coil fairly thick and widely spaced. Ribs undulating.

In periumbilical parts of the sides of shaft, ribs are fairly thick and closely spaced, frequently reduced over some sectors of their course. In the middle and upper parts of the sides of shaft, ribs are distinctly reduced and locally disappear at all. On the ventral side of shaft, except for its final sector, costulation is absent or very indistinct. Ribs of the remaining part of body chamber are fairly thick and widely spaced. Both the lateroventral and lateroumbilical tuberculation appear in the transitional area between the shaft and normal spiral.

Tubercles and tubercular swellings of ribs make up elements of tuberculation of the lower row. The lateroventral elements of tuberculation on the shaft usually reach fairly large dimensions and some of them assume the "clavi" type (which is relatively best visible in the specimen illustrated on Pl. XVIII, Figs. 9–10).

Remarks. The new subspecies differs on the whole from the nominate one in a smaller apertural angle, not so close contact of body chamber and phragmocone and a smaller degree of flattening of the ventral side of shaft (J. Sowerby, 1841–1842, Pl. 184a, Fig. 1; A. Grossouvre, 1894, Pl. 31, Figs. 1a–c, 7). In addition, its stratigraphic position seems to be lower.

As compared with *Hoploscaphites constrictus crassus* (Łopuski), described below, the new taxon differs, in addition, in its costulation, which does not disappear on the shaft.

E. Favre's specimen, included in the synonymy with a certain reservation, differs from those described in a tendency to uncurve the dorsal side of shaft and a larger umbilical index. These differences relate it with most specimens which were related by N.P. Mikhailov (1951, Pl. 17, Figs. 81–82, Pl. 18, Fig. 85) and D.P. Naydin (1959, Pl. 6, Figs. 1–4) with *H. constrictus niedzwiedzkii* (Uhlig). The last-named specimens are, however, marked by a smaller coil, larger apertural angle and a stronger tendency to incurve the dorsal margin of its shaft.

According to the present writer's opinion, the distinct identity observed at a subspecific level with V. Uhlig's specimen (V. Uhlig, 1895, p. 220, Fig. 2) occurs only in the case of a specimen illustrated in J. Nowak's work (1911, Pl. 33, Fig. 15). V. Uhlig's taxon is marked by a very small coil, large apertural angle, almost in-

Table 15

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1%	H_2	W_2	W_2/H_2%	H_3	W_3	W_3/H_3%
Pl. XVIII, Figs. 4–6	42.2	38.5	17.0?	18.1	9.1	50	22.2	13.4?	60?	16.2	16.0?	98?
Pl. XVIII, Figs. 9–10	42.8	39.3	10.7	11.5	7.4	64	20.7	10.0	43	14.5	9.5?	65?

visible development of shaft (the dorsal margin of body chamber parallel to the ventral one and strongly incurved), considerably evolute shape of phragmocone and a conspicuously bundle-like form of costulation over the final sector of body chamber.

Distribution: Lower Maastrichtian – *Belemnella occidentalis* Zone – of the Lublin trough and Lower Maastrichtian (upper part) of the Miechów trough. Maastrichtian of the U.S.S.R.

Hoploscaphites constrictus crassus (Łopuski, 1911)

(Pl. XVIII, Figs. 1–3, 11–14)

1837 *Ammonites constrictus* Sowerby; Pusch J., p. 159, Pl. 14, Fig. 3a–c.
? 1871–1876 *Scaphites constrictus* Sowerby; Schlüter C. (pars), p. 92, Pl. 28, Fig. 7.
? 1908 *Scaphites constrictus* Sowerby; Grossouvre A. (pars), p. 36, Pl. 14, Figs. 3, 4a.
1911 *Scaphites constrictus* Sowerby var. *crassus* Łopuski; Łopuski C., p. 113, Pl. 2, Figs. 5, 6, 3–4 (?), Pl. 3, Figs. 1–2.
1911 *Hoploscaphites constrictus* Sowerby *vulgaris* Nowak; Nowak J. (pars), p. 583, Pl. 33, Figs. 8–9.
1963 *Scaphites constrictus* (Sowerby); Makowski H., Pl. 4 in the text, Fig. 3.
1966 *Hoploscaphites constrictus crassus* (Łopuski); Błaszkiewicz A., p. 1,065.

Type. C. Łopuski's specimen (1911, Pl. 2, Fig. 5), presumably coming from the *Hoploscaphites constrictus crassus* Zone of Kazimierz, has been designated by the present writer as a lectotype.

Material: IG 1,310. II. 15, 285–312, MZ VIII Mc 451, 453, 508, 531, 575–577, 581–582, 619, 624, 638.

Dimensions in mm. (Table 16)

Table 16

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XVIII, Figs. 1–2*	57.0	41.7	14.9	22.4	9.4	41	24.0	12.5	52	19.0	14.0	73
Pl. XVIII, Figs. 11–12	58.0	47.7	15.8	26.7	10.0	37	31.2	12.0	38	19.0?	15.7	82?
Pl. XVIII, Figs. 13–14*	63.5	53.8	14.3	26.0	10.7	41	35.5	13.6	38	19.6	13.2	67
Pl. XVIII, Fig. 3**	59.8	51.5?	13.5	24.5	6.7	27	34.3	9.5	27	–	12.7	–

* Secondary asymmetric deformations of the specimen.
** A specimen related with a reservation only; secondarily laterally flattened

Remarks. The subspecies here presented differs from the nominate one (J. Sowerby, 1841–1842, Pl. 184a, Fig. 1; A. Grossouvre, 1894, Pl. 31, Figs. 1a–c, 7, 8a–b) in a lack of costulation on the shaft and considerable part of the hooked sector. Besides, the data available allow one to interpret C. Łopuski's subspecies as stratigraphically higher than the nominate one.

A specimen, found in the Vistula river valley and illustrated on Pl. XVIII, Fig. 3, is a transitional form. This specimen, related with a reservation with C. Łopuski's taxon, differs from those described above in fairly distinct elements of costulation, occurring on the sides of its shaft. These elements are, however, decidedly more widely spaced and lower than the ribs of the nominate subspecies and the stratigraphic position of this specimen is still contained within the range of the specimens described above (formerly, this specimen was identified with a reservation by the present writer with J. Sowerby's taxon; then, the present writer had not, however, at his disposal specimens of C. Łopuski's taxon coming from the outcrop, in which the specimen under study was found).

In the shape of its coil and character of costulation occurring on the normally coiled part of shell, the taxon described is also comparable with *Hoploscaphites tenuistriatus* (Kner). The latter differs from *H. constrictus crassus* (Łopuski) in the absence of tuberculation and occurrence of a conspicuously fine costulation on the shaft (R. Kner, 1850, Pl. 1, Fig. 5; A. Alth, 1850, Pl. 10, Figs. 28 and 31; E. Favre, 1869, Pl. 5, Figs. 6 and 7; J. Nowak, 1909, Figs. 2, 4 and 5, 1911, Pl. 33, Fig. 13; D. Wolansky, 1932, Pl. 1, Fig. 6; T. Birkelund, 1967, Pl., Fig. 6). In addition, the stratigraphic position of R. Kner's species is undoubtedly lower than that of C. Łopuski's taxon. A. Grossouvre's specimens (cf. synonymy) display a more distinct development of lateroumbilical tuberculation and, on the whole, a smaller coil. C. Schlüter's specimen differs from those from the Vistula river valley in a distinct differentiation in the thickness of umbilical ribs as compared with the siphonal ones in the normal part of coil and in the presence of strongly developed ribs occurring on the sides of the hooked sector. The available data seems to indicate, in addition, a lower stratigraphic position of this specimen. The reservations, concerning the identification of Nowak's specimens with the taxon under study, result from their indistinct illustration and poor state of preservation.

Distribution: Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone, the Vistula river valley. Upper Maastrichtian of the U.S.S.R. (?) and the Netherlands. Maastrichtian of France (?).

Genus *Acanthoscaphites* Nowak, 1911

Type species *Scaphites tridens* Kner, 1850

Diagnosis. See C.W. Wright, 1957, p. L 230.

Remarks. The generic classification of *Acanthoscaphites* (?) *tuberculatus* (Giebel), a species found in the Middle Vistula river valley, varies in particular contemporary works. C. Giebel's species is related either with *Scaphites s.s.* (T. Birkelund, 1965), or *Hoploscaphites* Nowak (W.A. Cobban and J.A. Jeletzky, 1965). It is marked by an undoubtedly mixed set of characters, but it is primarily a transitional form between those of *Scaphites sensu stricto* and *Acanthoscaphites* Nowak. *Acanthoscaphites praequadrispinosus* sp. nov., described from the Middle Vistula river valley, is a species, which both morphologically and stratigraphically links *A.* (?) *tuberculatus* (Giebel) with typical representatives of the genus *Acanthoscaphites* Nowak.

Acanthoscaphites (?) *tuberculatus* (Giebel, 1849)

(Pl. XVI, Figs. 1–3, 5 and 8; Pl. XIX, Figs. 1, 4 and 5; Pl. XX, Figs. 4–5)

1840–1841 *Scaphites compressus* Roemer; Roemer F.A., p. 91, Pl. 15, Fig. 1.
1850 *Scaphites Römeri* d'Orbigny; d'Orbigny A., p. 214.
1915 *Scaphites tuberculatus* Giebel; Frech F., p. 566, Text-fig. 14.
non 1951 *Acanthoscaphites roemeri* (d'Orbigny) var. *tuberculata* (Giebel); Mikhailov N.P., p. 99, Pl. 16, Figs. 74, 75.
1966 *Acanthoscaphites tuberculatus* (Giebel); Błaszkiewicz A., table.

Type. Finding that the name *Scaphites compressus*, given to the species under study by F.A. Roemer, was preoccupied, C. Giebel (according to C. Schlüter, 1871–1876, p. 99; F. Frech, 1915, p. 566) replaced it by that of *S. tuberculatus*.

Of two specimens, fused together, illustrated in F. Frech's work (1915, p. 567, Fig. 14) as those, on which F.A. Roemer's (1840–1841, Pl. 15, Fig. 1) drawing was once based, one actually corresponds exactly to the illustrated sector, which follows the normally coiled part of shell. The other differs, however, from the normal spiral illustrated in a lack of tuberculation and a more distinctly undulating ribs. Under such circumstances, the specimen, illustrated by F. Frech (1915, p. 567, Fig. 14) and representing a later part of coil, is interpreted by the present writer as a type specimen.

Material: IG 12. II. 15; 889. II. 81; IG 890. II. 147, 151–152; IG 1,310. II. 16, 313–317; MZ VIII Mc 353, 380, 408.

Dimensions in mm. (Table 17)

Remarks. The type specimen is closely comparable with a group of those illustrated in Pl. XVI, Figs. 1, 2 and 8.

The material from the Vistula river valley also includes several other specimens, related by this writer with C. Giebel's species. However, these specimens represent as a rule a distinctly different morphological type and are related, with a reservation, with C. Giebel's taxon.

This morphotype, represented by the specimens shown in Pl. XVI, Figs. 3 and 5, Pl. XIX, Figs. 4 and 5 and Pl. XX, Figs. 4 and 5, is marked, as compared with the type form by, among other things, the presence of a steep umbilical wall in the last part of body chamber, an inward curve of the dorsal margin of shaft, a decidedly lower value of the height-to-width ratio of whorl sections and decidedly smaller dimensions of coil. The preserved phragmocone of one of the specimens of this group (Pl. XX, Figs. 4 and 5) also displays differences in relation to those comparable with the type specimen, that is, a wider umbilicus and appearance of tuberculation only in the final part of phragmocone.

The specimens of this group display a distinct similarity to *Scaphites elegans* Tate. In addition, exact analogies in the stratigraphic position may here also occur. The material illustrated, concerning the last-named species is unfortunately limited to a drawing of the holotype, which makes up a sector of the coil above the normal spiral (R. Tate, 1865, Pl. 3, Fig. 3).

N.P. Mikhailov's specimen is interpreted as a separate species. From the whole of the material, discussed above, it differs by the occurrence of both the lateroventral and lateroumbilical tuberculation limited to the body chamber only, as well as by a conspicuously fine external costulation on the earlier, exposed part of normal spiral.

Distribution: Upper Campanian, *Didymoceras donezianum* Zone, the Vistula river valley. Upper Campanian of the Federal Republic of Germany.

Acanthoscaphites praequadrispinosus sp. nov.

(Pl. XIX, Figs. 2, 3, 6–8; Pl. XX, Figs. 1–3, 6–8, Pl. XXI, Figs. 1–6)

1911 *Scaphites ornatus* Roemer; Łopuski C., p. 118, Pl. 3, Fig. 7.
1966 *Acanthoscaphites* sp. nov. Błaszkiewicz; Błaszkiewicz A., table.

Holotypus. Pl. XIX, Figs. 6–8 (IG 1,310. II. 17).
Stratum typicum. Upper Campanian, *Nostoceras pozaryskii* Zone.
Locus typicus. The Middle Vistula river valley, Piotrawin, outcrop I.
Derivatio nominis. *Prae* (Lat.) – before.

Diagnosis. Coil on the whole large to very large. Umbilicus of phragmocone narrow. Shaft very slightly exceeding phragmocone. Dorsal margin of shaft rectilinear, sometimes with a slight tendency to curve in- or outwardly. Apertural angle amounting on the whole to about 110°. Costulation of the exposed part of coil thick and widely spaced. Lateroventral and lateroumbilical tubercles occurring as a rule over the entire exposed part of coil. Lateroventral tubercles of shaft large.

Material: IG 12. II. 16–22; IG 889. II. 87, 100, 117–119; IG 1,310. II. 17, 318–357; MZ VIII Mc 454, 633–635, 1,377.

Dimensions in mm. (Table 18)

Description. Shell within limits of 80 and 180 mm. in diameter. Diameters smaller than 90 mm. occur, however, only sporadically. Umbilicus of normal spiral very narrow to narrow. Shaft very slightly exceeding phragmocone. Dorsal margin of shaft more or less rectilinear. Some specimens display a slight tendency to curve their dorsal margin inwardly (Pl. XX, Figs. 6 and 7) or outwardly (Pl. XX, Figs. 3 and 8). Apertural angle within limits of 100° and 115°. Sections of the exposed part of coil fairly narrow to wide. Sides convex; ventral one rounded. Maximum height of body chamber observed on shaft or in the transitional area between

Table 17

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XIX, Figs. 4–5*	44.8	42.3	18.6	–	–	–	19.3	16.5	86	18.8	17.0	90
Pl. XVI, Figs. 1–2	81.7	79.8	24.0?	32.8	17.0	51	36.4?	–	–	32.0	23.0?	71?
Pl. XVI, Fig. 8	89.2	73.2	–	28.1?	–	–	–	–	–	30.0?	–	–

* Specimen assigned with a reservation to C. Giebel's taxon.

Table 18

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XXI, Figs. 3–4*	–	–	24.4	–	–	–	37.8	22.7	60	–	–	–
Pl. XXI, Figs. 1–2	130.9	106.9	39?	43.7	32.0	75	53.0	–	–	40.8	33.2	81
Pl. XX, Figs. 6–7**	133.5	121.6	43.5	41.6	33.0	29	50.5	34.0	67	50.0	41.7	83
Pl. XIX, Figs. 6–8**	182.6	158.0	63.8	54.8	49.5	90	76.8	62.0	80	66.0	47.0	71

* Secondary, slight, lateral deformations of the specimen.
** Secondary, slight, asymmetric deformations of the specimen.

it and the hooked sector; maximum thickness – in the transitional area between shaft and the hooked sector or in the latter. Traces of suture reaching the limits of normal spiral. Costulation of body chamber coarse to very coarse. The course of ribs almost rectilinear or slightly undulating. Lateroventral tuberculation covers the entire exposed part of coil, except, sporadically, for the hooked sector (Pl. XX, Figs. 1–2). Lateroumbilical tuberculation is visible in most specimens also on the entire exposed part of coil. In some cases, however, it appears only on the final, exposed part of phragmocone. On the shaft, lateroventral tubercles are large and conspicuously represent the "clavi" type. The dimensions of these tubercles violently diminish over the hooked sector of some specimens. Lateroumbilical tubercles of shaft are as a rule small.

Remarks. A considerable similarity to the new taxon is displayed by *Acanthoscaphites rugosus* (Stephenson) (L.W. Stephenson, 1941, p. 425, Pl. 89, Figs. 15–18). The holotype of the latter, being an only specimen allowing one for a comparison of later developmental stages, differs from the specimens described in a smaller diameter of coil, wider umbilicus of phragmocone, a less distinctly developed shaft and a more irregular course of ribs. Stratigraphic differences also seem to occur here. In the development of considerable part of morphological elements and stratigraphic range, the new taxon occupies a transitional position between *A. quadrispinosus* (Geinitz) and *A.* (?) *tuberculatus* (Giebel).

As compared to the stratigraphically lower situated *A.* (?) *tuberculatus* (Giebel), it differs in a more widely spaced and coarser costulation, more massive lateroventral tuberculation, slighter contact between shaft and phragmocone, larger apertural angle and larger diameter of shell. From *A. quadrispinosus* (Geinitz) it differs in turn in a smaller umbilicus of phragmocone, more distinct development of shaft, smaller apertural angle, lack of differences between the external and internal costulation on the exposed part of phragmocone, as well as, on the whole, a larger size of shell.

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone, the Vistula river valley.

Acanthoscaphites quadrispinosus (Geinitz, 1850)

(Pl. XXII, Figs. 1–10)

1850 *Scaphites quadrispinosus* Geinitz; Geinitz H.B., explanations of plates, Pl. 7, Fig. 2 (holotype), Pl. 8, Fig. 2 (holotype).
? 1911 *Acanthoscaphites tridens – quadrispinosus* Geinitz; Nowak J., p. 557, Pl. 33, Fig. 28.
1932 *Acanthoscaphites tridens* var. *quadrispinosus* Nowak; Wolansky D., p. 10, Pl. 2, Fig. 3.
1951 *Acanthoscaphites tridens* var. *quadrispinosa* (Geinitz); Mikhailov N.P., p. 104, Pl. 19, Fig. 93.
1966 *Acanthoscaphites quadrispinosus* (Geinitz); Blaszkiewicz A., p. 1,064.

Material: IG 12. II. 23; IG 890. II. 185, 189–190; IG 1,310. II. 358–361; MZ VIII Mc 478, 486; a specimen from H. Makowski's collection. Miechów trough: IG 1,310. II. 18, 362.

Dimensions in mm. (Table 19)

Remarks. As follows from the description, part of specimens (represented by those on Pl. XXII, Figs. 6–9) displays, in relation to the rest of the material, qualitative differences in the development of tuberculation, that is, the presence of a siphonal tuberculation on the later part of body chamber. This part of specimens is grouped in the upper part of beds containing *Acanthoscaphites quadrispinosus* (Geinitz).

Apart from the missing small apertural part of coil, the lack of a description of the holotype and of an illustration of the siphonal side of the later part of its body chamber, precludes any possibility of stating for certain whether or not this character occurred in the type form. The lack of a siphonal tuberculation in the specimens described which are most similar to the holotype (Pl. XXII, Fig. 10), gives ample evidence in favor of the second variant.

The species described differs from R. Kner's taxon (R. Kner, 1850, Pl. 2, Fig. 2c; H.B. Geinitz, 1850, Pl. 8, Fig. 1a–b; E. Favre, 1869, Pl. 5, Fig. 8a–b; J. Nowak, 1911, Pl. 23, Figs.25 and 26; N.P. Mikhailov, 1951, Pl. 18, Fig. 88, Pl. 19, Figs.90–91 (?); D.P. Naidin, 1959, Pl. 7, Fig. 5; C. Schlüter, 1871–1876, Pl. 28, Figs.4 (?) and 3 (?); D. Wolansky, 1932, Pl. 1, Fig. 11) in a lack of siphonal tuberculation on the exposed

Table 19

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XXII, Figs. 6–7	–	–	–	28.0	21.2	75	–		–	–	–	–
Pl. XXII, Figs. 4–5	69.5	66.5	14.6	22.2	11.0	49	25.0	12.5	50	25.7	–	–
Pl. XXII, Figs. 1, 3	84	–	29.6	30.3	21.6	71	32.0	26.1	81	–	–	–
Pl. XXII, Figs. 8–9	94.4	75.2	34.7	30.8	26.7	86	31.7	31.4	99	31	–	–

part of normal spiral and on the early part of shaft. It also seems to be a taxon which appears much earlier.

As compared with the undoubtedly considerably more concurrent *A. bispinosus* Nowak, H.B. Geinitz's species differs in smaller dimensions, less involute phragmocone, occurrence of lateroventral tuberculation on phragmocone and initial part of shaft, varying spacing and thickness of internal and external ribs on the exposed part of phragmocone and a lack of differentiation in costulation on the shaft. Nowak's specimen, representing only a body chamber, is distinctly similar in its size to *A. bispinosus* Nowak, in particular to its form having a developed laterumbilical tuberculation (cf. comparison with *A. praequadrispinosus* sp. nov., a stratigraphically lower species, found in the Middle Vistula river valley, p. 39).

Distribution: Lower Maastrichtian – *Belemnella lanceolata lanceolata* Zone – of the Vistula river valley. Lower Maastrichtian of the Miechów trough, the U.S.S.R. and the German Democratic Republic.

Acanthoscaphites bispinosus Nowak, 1911

(Pl. XXIII, Figs. 1–3, 5–7; Pl. XXIV, Figs. 1, 2, 4, 5)

1911 *Acanthoscaphites tridens-bispinosus* Nowak; Nowak J., p. 577, Pl. 32, Figs. 1–3.
1932 *Acanthoscaphites tridens* Kner var. *bispinosus* Nowak; Wolansky D., p. 10, Pl. 2, Figs 1, 2.
1959 *Acanthoscaphites tridens* var. *bispinosa* Nowak; Naidin D.P., p. 196, Pl. 7, Fig. 4.
1966 *Acanthoscaphites bispinosus* Nowak; Blaszkiewicz A., table.

Material: IG 12. II. 24–27; IG 890. II. 188; IG 1.310. II. 363–367; MZ VIII Mc 480, 483, 701; a specimen from H. Makowski's collection. Miechów trough: IG 1.310. II. 19, 368.

Dimensions in mm. (Table 20)

Remarks. Considerable part of the material here described (represented by specimens on Pl. XXIII, Figs. 3 and 5–7, Pl. XXIV, Figs.1 and 4–5), displays a common character, which differs it from the remaining part, as well as from the holotype and other, better preserved specimens described so far (cf. synonymy). This part of the material is marked by the presence of laterumbilical elements of tuberculation, which, although less strongly developed, on the whole cover all exposed parts of coil. Despite the lack of any indications of differences in the stratigraphic position, these distinctive features may be interpreted as a subspecific differentiation (an ecological subspecies ?).

Considerable similarity to the taxon described is displayed by *Acanthoscaphites tridens* (Kner) (R. Kner, 1850, Pl. 2, Fig. 1; M.B. Geinitz, 1850, Pl. 7, Fig. 1; E. Favre, 1869, Pl. 6; J. Nowak, 1911, Pl. 32, Figs. 5 and 7. The two species form a fairly distinct morphological sequence tending to the development of tuberculation and being – as it may be presumed on the basis of available data – in conformity with their stratigraphic sequence. R. Kner's species, which probably appears only in the upper part of beds containing *A. bispinosus* Nowak, differs only in the presence of siphonal tuberculation, occurring in later developmental stages. More differences are marked in the cases of the remaining, concurrent taxons, that is, *A. quadrispinosus* (Geinitz) and *A. trinodosus* (Kner) (*l.c.*). The two species differ in a less involute phragmocone, earlier appearance of lateroventral tuberculation, constant presence of lateroumbilical tubercles and smaller size of shell.

Distribution: Lower Maastrichtian of the Vistula river valley and Miechów trough. Lower Maastrichtian of the U.S.S.R. Maastrichtian of the German Democratic Republic.

Acanthoscaphites varians (Łopuski, 1911)

(Pl. XXV, Figs. 1, 2, 5, 6)

1911 *Scaphites varians* Łopuski; Łopuski C., p. 120, Pl. 4, Figs.1–3, (holotype).
non 1911 *Acanthoscaphites tridens varians* Łopuski; Nowak J., Pl. 33, Fig. 29.
non 1951 *Acanthoscaphites tridens* (Kner) var. *varians* (Łopuski); Mikhailov N.P., p. 104, Pl. 16, Figs. 72, 73.
1965 *Acanthoscaphites tridens varians* (Łopuski); Schmid F., p. 684, Pl. 62, 63.

Material: A specimen from R. Marcinkowski's collection.

Remarks. The holotype comes perhaps from the same outcrop as the specimen under study.

As shown by the analysis of an illustration and description, the holotype is devoid of the later part of body chamber. In its diameter, degree of involution and development of ornamentation, it corresponds, or seems to correspond accurately to the sector of coil of the specimen described, which makes up a phragmocone and an earlier part of body chamber. Reservations are aroused by a rather indistinct illustration and a not very detailed description of the holotype. The distinct differences observed in the outline of sections, probably result only from the deformation visible in both cases.

Nowak's specimen, also identified by N.P. Mikhailov (1951) and F. Schmid (1965) with C. Łopuski's taxon, has been interpreted by the present writer as a separate species, which differs, among other things, in a massive lateroventral tuberculation, covering the whole of body chamber, lack – on the exposed part of coil – of a tuberculation which might take a distinctly lateral position and decidedly smaller size of

Table 20

Specimen	LS	WS	Th	H_1	W_1	W_1/H_1 %	H_2	W_2	W_2/H_2 %	H_3	W_3	W_3/H_3 %
Pl. XXIII, Figs. 5–7	140.8	111.0	36.3	51.0	32.5	63	54.6	35.0	64	50.0?	30.0	60?
Pl. XXIII Figs. 1, 2*	141.9	113.5	26.4	48.1	17.4	36	58.0	24.2	41	45.0	20.0?	44?
Pl. XXIII, Fig. 3, Pl. XXIV, Fig. 4	–	120.0	39.5	52.1	34.0	63	55.8	38.1	68	–	–	–

* A secondary lateral flattening of the specimen.

coil. Conspicuous differences in stratigraphic position are also most likely to occur here. This form displays a distinctly closer similarity to *Acanthoscaphites trinodosus* (Kner) (*l.c.*) than to C. Łopuski's species. Similar relationships may also occur in the case of a specimen illustrated by N.P. Mikhailov (cf. synonymy) and representing mostly a phragmocone.

In regard to Schmid's specimens, it seems that there may occur subspecific differences. As follows from the description, fairly large part of the last whorl of the specimen, allowing one for a more accurate comparative analysis, is assumed as being part of body chamber (F. Schmid, 1965, p. 684, Pl. 62, Pl. 63, Fig. 1). Assuming that this is a final chamber, the specimen from Hemmoor, the Federal Republic of Germany undoubtedly differs from that described at least in a later disappearance of polytuberculation and a different form of external ribs. It should be emphasized that the stratigraphic position of the material from Hemmoor may be decidedly lower. The specimen from Hemmoor is likely, however, not to include the last chamber, as indicated by an analysis of the shape of coil, since on the basis of the illustration no tendency to develop the shaft may be found for certain.

C. Łopuski's species differs from all taxons of the genus *Acanthoscaphites* Nowak in the presence of seven rows of tubercles.

Distribution: Upper Maastrichtian – *Hoploscaphites constrictus* crassus Zone – the Vistula river valley. Lower Maastrichtian of the Federal Republic of Germany.

Family DESMOCERATIDAE Zittel, 1895

Genus *Haericeras* Grossouvre, 1894

Type species *Ammonites pseudogardeni* Schlüter, 1872

Diagnosis. See C.W. Wright, 1957, p. L 371.

Haericeras sulcatum (Kner, 1850)

(Pl. LIV, Fig. 3)

1850 *Ammonites sulcatus* Kner, p. 8, Pl. 1, Fig. 3a – b.
1913a *Haericeras Gardeni* Baily; Nowak J., p. 371, Pl. 41, Fig. 12, Pl. 43, Fig. 34, Pl. 45, Figs. 44 and 45.
1964 *Haericeras sulcatum* Kner; Tsankov C.V., p. 153, Pl. 8, Fig. 2, Pl. 9, Figs. 2, 3, Pl. 10, Fig. 1 (cum synonimica).
1966 *Haericeras sulcatum* Kner; Blaszkiewicz A., table.

Material: MZ VIII Mc 521.

Dimensions in mm. (Table 21)

Table 21

Specimen	D	DF	U	U/D %	H	W	W/H %	Remarks
Pl. LIV Fig. 3	83.0	–	31.1	37	32.0	9.0	28	A laterally flattened (?) specimen

Remarks. A specimen, making up a half of a coil and displaying characters which are distinctly contained within the range of variability of *Haericeras sulcatum* (Kner) determined by specimens given in the synonymy.

Distribution: Lower Maastrichtian – *Belemnella occidentalis* Zone – the Vistula river valley. Maastrichtian of the U.S.S.R. and Bulgaria.

Haericeras sp.

Material: IG 1,310. II. 369.

Remarks. This very small fragment of whorl displays, in its section, a similarity to *Haericeras sulcatum* (Kner), undoubtedly differing to a considerable extent from specimens of this species in its stratigraphic position.

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone, the Vistula river valley.

Family KOSSMATICERATIDAE Spath, 1922

Genus *Pseudokossmaticeras* Spath, 1922

Type species *Ammonites pacyficus* Stoliczka, 1865

Diagnosis. See C.W. Wright, 1957, p. L 375.

Pseudokossmaticeras galicianum (Favre, 1869)

(Pl. LVI, Figs. 1 – 3)

1869 *Ammonites galicianus* Favre, p. 16, Pl. 3, Fig. 5a – b.
1890 *Pachydiscus Galicianus* Favre; Seunes J., Pl. 9, Fig. 5.
1913 *Kossmaticeras galicianum* Favre; Nowak J., p. 365, Pl. 41, Fig. 17, Pl. 43, Fig. 33, Pl. 44, Fig. 41.
1964 *Pseudokossmaticeras galicianum* (Favre); Tsankov C.V., p. 157, Pl. 4, Fig. 1, Pl. 5, Fig. 2 (cum synonimica).
1964 *Pseudokossmaticeras galicianum tercenense* (Seunes); Tsankov C.V., p. 158, Pl. 6, Fig. 1, Pl. 7, Fig. 2 (cum synonimica).
1970 *Pseudokossmaticeras* cf. *galicianum* (Favre); Atabekyan A.A. and Akopyan V.T., p. 36, Pl. 1, Fig. 4.

Material: IG 1,310. II. 370; MZ VIII Mc 697.

Dimensions in mm. (Table 22)

Remarks. In its closer and thinner costulation the species described differs from the related *Pseudokossmaticeras brandti* (Redtenbacher) (A. Redtenbacher, 1873, p. 106, Pl. 14, Fig. 1a – c; R.A. Reyment, 1959, p. 34, Pl. 10, Fig. 1a – c).

P. aturicum (Seunes) (J. Seunes, 1891, p. 17, Pl. 6, Figs. 2a – b, 3a – b) is marked by a low outline of whorl sections, distinct constrictions and a less strongly developed costulation in late developmental stages.

P. cerevicianum (Pethö) (J. Pethö, 1906, p. 95, Pl. 6, Figs. 2, 2a and 3) has very few, but very strongly developed ribs and tubercles.

Distribution: Upper Campanian – *Nostoceras pozaryskii* Zone – and Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, the Vistula river valley. Maastrichtian of Bulgaria, France and the U.S.S.R.

Family PACHYDISCIDAE Spath, 1922

Genus *Eupachydiscus* Spath, 1922

Type species *Ammonites isculensis* Redtenbacher, 1873

Diagnosis. See C.W. Wright (1957, p. L 380).

Eupachydiscus levyi (Grossouvre, 1894)

(Pl. XXXIV, Figs. 1, 2)

1894 *Pachydiscus Levyi* Grossouvre; Grossouvre A., p. 178, Pl. 21 (holotype), Pl. 30, Figs. 1, 2.
? 1913 *Pachydiscus stanislaopolitanus* Łomnicki; Nowak J. (pars), p. 358, Pl. 40, Fig. 3.
1922 *Eupachydiscus levyi* Grossouvre; Spath L.F., p. 124.
1966 *Eupachydiscus levyi* Grossouvre; Blaszkiewicz A., p. 1,063.
1969 *Eupachydiscus levyi* Grossouvre; Thomel G., p. 114, Pl. B.

Table 22

Specimen	D	DF	U	U/D"„	H	W	W/H"„	RI	RE	Remarks
Pl. LVI, Fig. 2	72.8	–	31.5	24	26.5	17.7	67	10*	23*	Dimensions concerning a maximum measurable diameter
Pl. LVI, Fig. 1, 3	131.5	106.6	49.6	37	50.0	25.1	50	22	37	A secondary lateral deformation of the specimen

* The number of elements on the earlier part of whorl.

Material: IG 1.310. II. 371.

Remarks. As compared with part of holotype, corresponding to it in diameter, the specimen here presented displays only insignificant differences, that is, a smaller number of primary ribs (eleven as compared with the holotype's thirteen ribs) and a larger upper limit of the number of intercalatory elements (four as compared with three). There is also no sufficient basis for accepting the existence of some more distinct stratigraphic differences.

Certain reservations may only concern the outline of whorl sections. In the light of M. Collignon's (1955, p. 35) remarks, based on a direct analysis of A. Grossouvre's collection and rectifying original findings concerning whorl sections of this species, it seems, however, that no distinct discordance occurs also in this case. As compared with the phragmocone of the specimen from the Vistula river valley, Thomel's completely septate specimen (cf. synonymy) displays a distinct difference in diameter. In the development of the remaining elements it does not, however, seem to differ to any significant extent.

The name *Ammonites stanislaopolitanus* Łomnicki, considered by J. Nowak (1913a) as a possible earlier synonym of *Pachydiscus levyi* Grossouvre, may, in the light of published data, be interpreted as a nomen dubium. The specimen, on which M. Łomnicki's species was based, is preserved fragmentarily and seems to have a strongly destroyed ornamentation (M. Łomnicki, 1871, Fig. 1 (?); J. Nowak, 1913a, Pl. 40, Fig. 2). J. Nowak's (1913a, Pl. 40, Fig. 5) fragmentary specimen, representing earlier developmental stages and identified with M. Łomnicki's species, differs from specimens of *Eupachydiscus levyi* (Grossouvre) in a narrower umbilicus only.

Distribution: Lower Campanian, *Gonioteuthis quadrata* Zone, the Vistula river valley, Lower Campanian of France and the U.S.S.R.

Genus *Pachydiscus* Zittel, 1884

Type species *Ammonites neubergicus* Hauer, 1858 (A. de Grossouvre's designation, 1894, p. 117)

Synonym *Parapachydiscus* Hyatt, 1900

Diagnosis. See C.W. Wright (1957, p. L 380); T. Matsumoto (1959–1960, p. 41).

Pachydiscus koeneni Grossouvre, 1894

(Pl. XXVI, Figs. 1–2; Pl. XXVII, Figs. 1–4; Pl. XXVIII, Figs. 1–4; Pl. XXXIV, Figs. 3, 4)

1871–1876 *Ammonites Galicianus* Favre; Schlüter C., p. 63, Pl. 13, Figs. 3–5, Pl. 20, Fig. 9.
1885 *Ammonites Oldhami* Sharpe; Moberg J.C., p. 23, Pl. 3, Fig. 1.
1894 *Pachydiscus Koeneni* Grossouvre; Grossouvre A., p. 178.
1894 *Pachydiscus Oldhami* Sharpe; Grossouvre A., Pl. 22, Fig. 1.
1913 *Pachydiscus Oldhami* Sharpe; Nowak J., p. 362, Pl. 41, Fig. 16, P. 43, Fig. 31, Pl. 45, Fig. 43.
1959 *Pachydiscus koeneni* Grossouvre; Naidin D.P., p. 185, Pl. 9, Fig. 1.
1966 *Pachydiscus koeneni* Grossouvre; Blaszkiewicz A., table.

Material: IG 12. II. 28; IG 890. II. 35, 45; IG 1,310. II. 23, 372–393.

Dimensions in mm. (Table 23)

Remarks. In the shape of coil and development of the elements of ornamentation, C. Schlüter's (1871–1876, Pl. 19, Figs. 3–4) smaller, completely septate specimen, is contained within limits determined by the variability of the specimens presented having approximately the same or similar diameters. The larger specimen (C. Schlüter, 1871–1876, Pl. 19, Fig. 5) selected by Grossouvre (1894, p. 178) as a type and which consists of a phragmocone and a fragmentary body chamber, differs from the specimens presented, which are similar in diameters, in a sudden disappearance of its intercalatory ribs and in the occurrence of umbilical ribs in the stage preceding their complete disappearance. In the specimen from Westphalia, the last-named ribs form wide folds without distinct limits. Differences are here also observed in the width of umbilicus, which is wider in the Westphalian specimen. In present-day state of knowledge, these differences may be interpreted as subspecific ones.

Naidin's specimen, which is small, presumably completely septate and having, in the early part of its last whorl, a very widely spaced internal costulation, may be interpreted as an early part of phragmocone of A. Grossouvre's species. In the costulation of the final part of last whorl and the outline of whorl sections, it displays an indubitable and considerable similarity to the early, exposed part of coil of the specimens described, having relatively smallest diameters. Its umbilical index only slightly exceeds a maximum umbilical index of this group of specimens.

Distribution: Upper Campanian, *Neancyloceras phaleratum* and *Bostrychoceras polyplocum* Zones, the Vistula river valley. Upper Campanian of the Federal Republic of Germany, France and Sweden.

Pachydiscus cf. *oldhami* (Sharpe, 1855)

(Pl. XXVI, Figs. 3 and 4; Pl. XXXVII, Fig. 4; Pl. XLIX, Fig. 2)

1966 *Pachydiscus oldhami* (Sharpe); Blaszkiewicz A., table.

Material: IG 1.310. II. 394–400.

Dimensions in mm. (Table 24)

Remarks. *Pachydiscus oldhami* (Sharpe) has originally been based on one specimen only (D.P. Sharpe,

Table 23

Specimen	D	DF	U	U/D%	H	W	W/H%	RI	RE
Pl. XXVII, Figs. 2–3*	140.0	–	38.7	26	64.3	31	48	10**	24**
Pl. XXXIV, Figs. 3–4	148.5	–	39.6	26	62.1	29.5	47	9**	24**
Pl. XXVI, Figs. 1–2	149.5	–	36.4	24	67.6	34.0	52	20	45
Pl. XXVII, Figs. 1, 4*	219.0	215.3	35.5	25	97.7	42.0?	44	6	13

* Secondary lateral flattening of coil.
** The number of ribs on a half of whorl.

Table 24

Specimen	D	DF	U	U/D%	H	W	W/H%	RI	RE
Pl. XLIX, Fig. 2	116.0	–	34.1	29	48.7	25.5	52	10*	28*
Pl. XXXVII, Fig. 4	210.5	–	53.2	25	94.5	42?	44?	9**	28**
Pl. XXVI, Figs. 3–4	213.0	–	59.3	28	90.3	40.5	44	11	53

* The number of ribs on the earlier half of whorl.
** The number of ribs on the later half of whorl.

1853–1857, P. 32, Pl. 14, Fig. 2a–c). Sharpe's specimen probably represents earlier septate stages of the species described from the Vistula river valley. This specimen, as follows from the original description, is corroded and its illustration is to a considerable extent a reconstruction. Distinctly marked differences in the width of external ribs (in the illustration of Sharpe's specimen, these ribs are on the whole pronouncedly narrower as compared with the external ribs of the internal part of the coil, illustrated in Pl. XXXVIII, Fig. 4) are ascribed by the present writer to a faulty reconstruction rather. The conclusions presented above are also based on the data on the stratigraphic position, which may be contained within the stratigraphic range of the specimens from the Vistula river valley.

The greatest similarity to the species described is displayed by *P. koeneni* Grossouvre. Here, it should be emphasized that C. Schlüter (1871–1872, p. 65) mentioned the probability that the specimens from Westphalia, on which his species was later based by A. Grossouvre, were specifically identical with D.P. Sharpe's specimen. The species described differs here in having a reduced and disappearing internal, and not external, costulation in the later developmental stages of phragmocone. It also displays a larger number of external ribs and, on the whole, a wider umbilicus. Besides, it differs in a higher stratigraphic position.

Distribution: Upper Campanian, *Didymoceras donezianum* Zone, the Vistula river valley.

Pachydiscus perfidus Grossouvre, 1894

(Pl. XXIX, Figs 1–4; Pl. XXX, Figs. 1, 3, 4; Pl. XXXI, Figs. 1–3; Pl. XXXII, Figs. 1–3; Pl. XXXIII, Figs. 3, 4, Pl. XXXVII, Figs. 1, 2)

1894 *Pachydiscus perfidus* Grossouvre: Grossouvre A., p. 213, Pl. 34, Fig. 1.
1911 *Pachydiscus perfidus* Grossouvre: Łopuski C., p. 107, Pl. 1, Figs. 1–3, Pl. 2, Fig. 1.
1966 *Pachydiscus perfidus* Grossouvre: Błaszkiewicz A., table.

Material: IG 889. II. 121–133; IG 1,310. II. 24, 401–419, Lublin trough: IG 12. II. 29; IG 1,310. II. 420.

Dimensions in mm. (Table 25)

Remarks. Grossouvre's only illustrated specimen, which makes up an internal part of a complete coil, is contained within the range of variability in phragmocones of the specimens from the Vistula river valley. Łopuski's specimens have exact equivalents within limits of the specimens described whose predominant part is most likely to come from this same quarry. As compared with the closely related *Pachydiscus neubergicus* (Hauer), the taxon described differs in an on the whole smaller number of siphonal ribs and a stronger costulation of the middle and upper parts of sides and of the siphonal part, starting with late septate stages, as well as in larger dimensions of the coil. Besides, the stratigraphic position of this taxon is lower.

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone, the Lublin trough. Upper Campanian of France.

Pachydiscus neubergicus raricostatus subsp. nov.

(Pl. XXXV, Figs. 6–8; Pl. XXXVI, Figs. 1–4 and 7–10)

1871–1876 *Ammonites Neubergicus* Hauer: Schlüter C., p. 39, Pl. 18, Figs. 1–2.
? 1894 *Pachydiscus neubergicus* Hauer; Grossouvre A., p. 207 (pars), Pl. 38, Fig. 3.
? 1951 *Pachydiscus gollevillensis* (d'Orbigny); Mikhailov N.P., p. 66 (pars), Pl. 8, Fig. 39.
1965 *Pachydiscus neubergicus* (Hauer); Błaszkiewicz A., p. 151, Pl. 1, Figs. 1–2, Pl. 2, Fig. 1.
1966 *Pachydiscus neubergicus* (Hauer) subsp. nov. Błaszkiewicz; Błaszkiewicz A., table.
1969 *Pachydiscus gollevillensis neubergicus* (Hauer); Atabekyan A.A. and Akopyan W.T., p. 7, Pl. 2, Fig. 1.

Holotypus. Pl. XXXVI, Figs. 3–4 and 8 (MZ VIII Mc 501).
Stratum typicum. Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone.
Locus typicus. The Middle Vistula river valley, Kamień, Zone *u*.
Derivatio nominis. *Rarus* (Lat.) – rare, *costatus* (Lat.) – costate.

Diagnosis. Shell fairly large. Umbilical index large. Whorls decidedly higher than thick. Earlier stages display a similarity in ornamentation to septate stages of *Pachydiscus perfidus* Grossouvre. In later stages,

Table 25

Specimen	D	DF	U	U/D"„	H	W	W/H"„	RI	RE
Pl. XXXVII, Figs. 1–2*	114	–	29.7	26	50.0	26.0?	52?	6**	20**
Pl. XXIX, Figs. 1–2*	136.0	–	36.5	26	56.4	33.1	58	13	39
Pl. XXXI, Fig. 2	163.0?	136.8	41.5	25?	62.5	34.0?	54	6**	11**
Pl. XXIX, Figs. 3–4	206.8	–	63.4	30	82.5	51.8	62	15	32
Pl. XXXII, Figs. 1–2*	214.3	195.4	62.4	29	83.5	46.5?	55?	12	26
Pl. XXXII, Fig. 3	266?	180?	81.5	30?	104.5	–	–	7**	8**
Pl. XXXI, Figs. 1, 3	222.5	216.4	64.0	28	91.6	50.6?	55?	13	26

* Secondary, slightly outlined asymmetric deformations of the coil.
** The number of ribs on the later half of the whorl.

ornamentation disappears, at first on a wide area on the sides and, later, on the remaining parts of the whorl.

Material: IG 889. II. 159; IG 1,310. II. 421–423; MZ VIII Mc 499–501. Lublin trough: IG 12. II. 30–31. Miechów trough: IG 1,310. II. 424–432.

Dimensions in mm. (Table 26)

Description. Diameter of phragmocone within limits of 100 mm. (Pl. XXXV, Figs. 7, 9 and 10) and 150 mm. (Pl. XXXVI, Figs. 1, 2). Body chamber preserved fragmentarily. Whorls overlapping preceding ones more than to a half of height. Umbilical index within limits of 27 and 29. Sections of whorls narrow. Maximum thickness of whorls occurs below midheight. Ventral area rounded, sides on the whole slightly convex.

In the observed middle developmental stages (diameter to 110 mm.), costulation is differentiated into simple (also differentiated into primary and intercalatory), as well as, infrequently, rather bifurcate ribs. In the middle parts of sides, ribs are poorly visible, locally even imperceptible at all. As compared with external, the umbilical sectors of ribs are raised. Spaces between internal ribs are on the whole contained within an interval of 1.5 to 2 widths of a rib, while those between external ribs are more or less equal to their width. There occur 11 to 15 internal and 30 to 40 external ribs. In later developmental stages of the shell, the number of intercalatory ribs decreases. Besides, there also occurs a larger increase in the width of external ribs as compared to that of internal ones, with a simultaneous slighter separation of all costular elements. A general reduction in and disappearance of costulation is visible on body chamber.

Remarks. In its septate stages, the new subspecies displays a lower number of both internal and external ribs as compared with the nominate one (13 to 15 and 33 to 40 as compared with 16 to 17 and 49–50). In addition, it is interpreted as stratigraphically lower situated.

From *Pachydiscus neubergicus armenicus* Atabekyan et Akopyan (A.A. Atabekyan and V.T. Akopyan, Pl. 1, Figs. 1, 2, Pl. 3, Figs. 1, 2; cf. also p. 45), as in the case of the nominate subspecies, the taxon under study differs primarily in a smaller number of both external and internal ribs, but with a much greater extent of these differences. There is also a difference which consists in the occurrence, in the new subspecies, of the tendency to a decrease in the number of external ribs during the ontogenetic development, with which a larger increase in their width is connected.

In the development of costulation, Grossouvre's specimen (cf. synonymy) resembles *P. perfidus* Grossouvre. In addition, we cannot preclude the possibility of a close similarity in the stratigraphic position.

According to the present writer's previous interpretation (A. Błaszkiewicz, 1965) and A.A. Atabekyan's and V.T. Akopyan's presentation, Mikhailov's specimen (cf. synonymy) displays a larger similarity to the type of *P. neubergicus* (Hauer) than to that of *P. gollevillensis* (d'Orbigny).

Distribution: Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, the Vistula river valley. Lower Maastrichtian (lower part) of the Miechów trough. Lower Maastrichtian of the Federal Republic of Germany. Maastrichtian of France (?) and the U.S.S.R. (?).

Pachydiscus neubergicus neubergicus (Hauer, 1858)

(Pl. XXXV, Figs. 4, 5, 10; Pl. XXXVI, Figs. 5 and 6)

1858 *Ammonites neubergicus* Hauer; Hauer F., p. 12, Pl. 2, Figs. 1–3 (lectotype – A. Grossouvre, 1894, p. 208) non Pl. 3.
1966 *Pachydiscus neubergicus neubergicus* (Hauer); Błaszkiewicz A., table.

Material: MZ VIII Mc 492. Miechów trough: IG 1,310. II. 433.

Table 26

Specimen	D	DF	U	U/D"„	H	W	W/H"„	RI	RE
Pl. XXXV, Figs. 6–7*	96.1	–	27.3	28	43.0	20.0?	46?	11	30
Pl. XXXV, Fig. 8**	129.9	127.0	37.9	29	51.2	–	–	15	37
Pl. XXXVI, Figs. 3–4	112.4	–	32.0	27	48.0	20.9	47	13	39
Pl. XXXVI, Fig. 8	141.5	141.5	41.0	28	60.0	–	–	14?	38
Pl. XXXVI, Figs. 1–2	155.8	155?	46.0	29	62.0	23.5	37	6***	16***

* Secondary asymmetric deformations of the coil.
** A secondary, slight dorsoventral flattening of the coil.
*** The number of ribs on a half of a whorl.

Remarks. A type specimen distinctly corresponding in diameter to the specimen illustrated on Pl. XXXV, Figs. 4, 5, 10 (S = 94.1 mm., P = 25.5 mm., G = =40 mm., W = 18 (?) mm.), and having the same number of internal and larger, by one, number of external ribs. A conformability or at least a lack of distinct differences is also observed in the development of particular elements of the shape of coil and the remaining elements of ornamentation. The occurrence of essential differences between the specimens, identified so far at the specific level with the type specimen has been suggested in the present writer's work of 1965. Now, he separates, also on the basis of new materials, a new subspecies, *Pachydiscus neubergicus raricostatus*.

Specimens, separated as *P. gollevillensis armenicus* Atabekyan et Hacobyan (A.A. Atabekyan and V.T. Akopyan, 1969, p. 8, Pl. 1, Fig. 2, Pl. 3, Figs. 1–2), are considered by the present writer as a separate taxon also at the subspecific level, contained within the scope of *P. neubergicus* (Hauer). As compared with the described one, this taxon differs in a larger number of external ribs (more than 60), larger width of umbilicus and, in earlier developmental stages, also in a smaller number of internal ribs. Maybe, it also differs in the development of body chamber, unknown in the taxon described[11].

A narrower umbilicus of coil and a more distinct disappearance of costulation in middle areas of the sides are the most important differences displayed by *P. neubergicus* (Hauer) as compared with *P. gollevillensis* (d'Orbigny). The last-named is fairly similar to *P. neubergicus* (Hauer) and sporadically interpreted in some contemporary works (A.A. Atabekyan and V.T. Akopyan, 1969) as identical with it specifically. In addition, it is marked on the whole by a larger number of internal ribs (cf. the comparison of subspecies of *P. gollevillensis* (d'Orbigny) in the remarks on *P. gollevillensis nowaki* Mikhailov).

P. jacquoti Seunes[12] differs in turn in a more distinct differentiation in the thickness of internal ribs as compared with the external ribs, smaller number of the latter and, on the whole, also former, as well as, usually, a disappearance of external costulation in later developmental stages. In addition, the sections of its whorls are as a rule wider in outline.

Considerable part of the differences mentioned above seems also to occur in a comparison between *P. neubergicus* (Hauer) and *P. egertoni* (Forbes) (E. Forbes, 1846, Pl. 9, Fig. 1; F. Kossmat, 1898, Pl. 15, Fig. 4; T. Matsumoto, 1959–1960, Text-fig. 17). For these reasons, *P. jacquoti* Suenes may be, in conformity with part of contemporary presentations and suggestions, included in the range of E. Forbes' species (T. Matsumoto, 1959–1960, p. 44; A.A. Atabekyan and V.T. Akopyan, 1969, p. 4).

In the present writer's opinion, the taxonomic position of a fairly numerous group of specimens from the environs of Belogorsk, Crimea, the U.S.S.R., thus far related with *P. neubergicus* (Hauer) (N.P. Mikhailov, 1951, Pl. 7, Figs. 36 and 37; D.P. Naidin, 1959, Pl. 10, Figs. 1–3; A.A. Atabekyan and V.T. Akopyan, 1969, p. 7) is rather obscure. As compared with the specimens of all the three species here discussed, they are marked as a rule by larger dimensions of their coils. In the shape of coil and character of ornamentation, they seem, however, to be considerably similar to the specimens of *P. jacquoti* Seunes and to differ from them mostly in a larger number of internal ribs (these reservations result from the indistinct illustration and lack of an accurate description).

Distribution: Lower Maastrichtian, *Belemnella occidentalis* Zone, the Vistula river valley. Lower Maastrichtian (upper part) of the Miechów trough. Maastrichtian of the Eastern Alps.

Pachydiscus gollevillensis nowaki Mikhailov, 1951

(Pl. XXXV, Figs. 1–3 and 9)

1869 *Ammonites neubergicus* Hauer; Favre E., p. 14, Pl. 4, Figs. 2, 3.
1913a *Parspachydiscus Egertoni* Forbes; Nowak J., p. 354, Pl. 41, Fig. 13 (holotype – N.P. Mikhailov, 1951), Pl. 43, Fig. 28, Pl. 44, Fig. 39.
1951 *Pachydiscus neubergicus* (Hauer) var. *nowaki* Mikhailov; Mikhailov N.P., p. 65.
1964 *Pachydiscus gollevillensis* (d'Orbigny); Tsankov C.V., p. 160, Pl. 6, Fig. 3, Pl. 7, Fig. 4, Pl. 9, Fig. 1.
1966 *Pachydiscus gollevillensis nowaki* Mikhailov; Błaszkiewicz A., table.

Material: MZ VIII Mc 491. Lublin trough: IG 12. II. 32.

Dimensions in mm. (Table 27)

Remarks. The specimen illustrated on Pl. XXX, Figs. 2–3, related unqualifiedly with N.P. Mikhailov's taxon, almost equals in diameter the holotype and is closely comparable with it also in the development of ornamentation and shape of coil. The other specimen (Pl. XXXV, Figs. 1 and 9) is, in the development of ornamentation, transitional to *Pachydiscus neubergicus raricostatus* subsp. nov.

The occurrence of a larger similarity of the specimens, on which the taxon described has originally been based, to the type of *P. gollevillensis* (d'Orbigny) than to that of *P. neubergicus* (Hauer), has already been assumed by the present writer in his previous elaborations (A. Błaszkiewicz, 1965, 1966). Such an interpretation in also given in the recent publication of other authors (A.A. Atabekyan and V.T. Akopyan, 1969, p. 8). As compared with the nominate subspecies (A. d'Orbigny, 1840–1842, Pl. 101; J. Seunes, 1891, Pl. 10, Figs. 1–3; A. Grossouvre, 1894, Pl. 39, Fig. 4, Pl. 31, Fig. 9, 1908, Pl. 9, Figs. 1–2) the described one differs in a larger number of internal ribs, on the whole larger umbilicus and a more conspicuously reduced costulation in the central parts of sides. *P. compressus* Spath (F. Kossmat, 1898, Pl. 21, Fig. 1; M. Collignon, 1951, Pl. 5, Fig. 4; D.P. Naidin, 1959, Pl. 11, Fig. 3),

[11] In addition to the specimens, on which A.A. Atabekyan's and V.T. Akopyan's taxon has originally been based, the present writer includes here a specimen, which was described by A.A. Atabekyan and V.T. Akopyan as *Pachydiscus gollevillensis gollevillensis* (d'Orbigny) having the same geographical and stratigraphic location (A.A. Atabekyan and V.T. Akopyan, 1969, p. 4, Pl. 1, Fig. 1). In contrast to other ones, this specimen is, as follows from the analysis of an illustration, completely septate and closely comparable in the number of internal ribs with the earlier part of the coil of holotype, with an only slightly larger diameter and a lack of any basis for assuming distinct differences in the development of the remaining morphological elements.

[12] J. Seunes, 1890–91, Pl. 2, Figs. 1–3, Pl. 3, Fig. 4. 1890, Pl. 9, Figs. 1–4; A. Grossouvre, 1894, Pl. 26, Fig. 3, Pl. 30, Fig. 4; M. Collignon, 1938, Pl. 9, Fig. 1; A.A. Atabekyan and V.T. Akopyan, 1969, Pl. 1, Fig. 3, Pl. II, Fig. 2, Pl. IV, Fig. 1.

Table 27

Specimen	D	DF	U	U/D"„	H	W	W/H"„	RI	RE
Pl. XXXV, Figs. 2 – 3*	112.3	112.3?	29.9	26	49.5	18.1	36	12 + 1**	49 + 2***
Pl. XXXV, Figs. 1, 9****	115.8	–	30.5	26	51.0	25.5	50	12	44

* Secondary lateral flattening of the coil.
** Presumable number of ribs on the corroded initial part of the whorl.
*** Presumable number of ribs on the external, not preserved, final part of the whorl
**** Secondary asymmetric deformation of the coil.

interpreted, in conformity with contemporary presentations, as the subspecies *P. gollevillensis* (d'Orbigny), differs from the taxon described in having a wider area of the disappearance of costulation on the sides, smaller number of both external and internal ribs and, on the whole, a smaller umbilicus.

Distribution: Lower Maastrichtian, *Belemnella occidentalis* Zone, the Vistula river valley. Lower Maastrichtian of the U.S.S.R. Maastrichtian of Bulgaria.

Pachydiscus cf. *colligatus latiumbilicatus* subsp. nov.

(Pl. LIV, Fig. 5, Pl. LV, Fig. 1)

1966 *Pachydiscus colligatum* (Binckhorst) subsp. nov. Błaszkiewicz: Błaszkiewicz A., (pars), table.

Material: IG 1,310. II. 434.

Descriptive remarks. In the development of its ornamentation the form presented displays distinct similarities to *P. colligatus latiumbilicatus* subsp. nov. Certain similarity may also occur here in the original shape of the coil, which cannot be, however, definitely estimated because of a secondary deformation, distorting the bilateral symmetry of the coil. The stratigraphic position of this form is, however, pronouncedly lower than that of the material related with *P. colligatus latiumbilicatus* subsp. nov. In addition, a poor state of preservation of the specimen precludes the possibility of analyzing the ornamentation of the part of coil with a small diameter, which in *P. colligatus latiumbilicatus* subsp. nov. is marked by a distinctly different ornamentation than that on the later part of the coil.

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone, the Vistula river valley.

Pachydiscus colligatus latiumbilicatus subsp. nov.

(Pl. XXXVII, Fig. 3; Pl. XXXVIII, Figs. 1 – 4 Pl. L, Fig. 1)

1965 *Pachydiscus colligatus* (Binkhorst): Błaszkiewicz A., p. 153, Pl. 3, Fig. 1.
1966 *Pachydiscus colligatus* (Binkhorst) subsp. nov. Błaszkiewicz: Błaszkiewicz A., (pars), table.

Holotypus. Pl. XXXVIII, Figs. 1 – 2, 4 (IG 1,310. II. 8).
Stratum typicum. Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone.
Locus typicus. The Middle Vistula river valley, Kamień, outcrop 172.
Derivatio nominis. *Latus* (Lat.) – wide, *umbilicus* (Lat.) – umbilicus.

Diagnosis. Shell large. Whorl moderately higher than thick. In early septate stages, umbilical index medium. Costulation composed of elements diverging in pairs from periumbilical tubercles and of one or two intercalatory ribs. Five tubercles, decidedly wider than ribs, occur on a half of a whorl. Intertubercular spaces decidedly wider than tubercles. Intercostular spaces on the whole more or less equalling the ribs in width. In further stages, tuberculation disappears and costulation is composed of single primary and intercalatory elements. In yet further stages, the internal costulation disappears at all. In the final stage, also the external costulation disappears and the umbilical index decreases.

Material: IG 889. II. 156, 158; IG 1,310. II. 8. 435 – 438.

Dimensions in mm. (Table 28)

Description. Distinct morphological changes occurring during the ontogenetic development can be traced on the holotype (Pl. XXXVIII, Figs. 1 – 2 and 4), whose earlier part (Pl. XXXVIII, Figs. 1 – 2) is 106 mm. in diameter and has an umbilical index of 23. The last whorl of this part overlaps the preceding one more than to midheight. Sections of whorl not very narrow. Maximum thickness of whorl occurs below midheight. Ventral area rounded, sides convex. Ribs diverging in pairs from periumbilical tubercles are visible on the initial sector of whorl (about one-third of whorl). One to two ribs, which may start at the level of tubercles enter the spaces between these pairs of ribs. Diameters of tubercles distinctly larger than widths of ribs. Intertubercular spaces decidedly wider than the diameters of tubercles. Intercostular spaces on the whole more or less equalling the width of ribs.

Tuberculation disappears over a further sector (about one-third) of a whorl. Tubercles, occurring on the initial part of this sector of whorl, are less distinctly separated and are starting points of simple ribs. Only tabercular swellings of umbilical ribs are observed on the remaining part of this sector. They disappear at the end of this part. One to two intercalatory ribs also occur on this sector of a whorl. Spaces between external and internal ribs also do not differ here distinctly in width from ribs.

On the remaining, last sector of the whorl, umbilical ribs become reduced and more widely spaced and intercalatory ribs appear higher on the sides, while – in the uppermost parts of sides – the character of costulation remains more or less unchanged. The number of siphonal ribs on the whole whorl amounts to 36, more of them occurring on the later than earlier half of a whorl.

The remaining part of the coil of holotype (about three-quarters of a whorl) is completely septate and to 203 mm. in diameter. Umbilicus of this part of coil is narrower (22 per cent). Ornamentation is composed of external ribs only. The number of ribs on a half of a whorl slightly increases. On the initial sector (about a quarter of a whorl) of this part of coil, some external ribs descend below the midheight of sides. On the further sector costulation is visible only in the upper areas of

Table 28

Specimen	D	DF	U	U/D%	H	W	W/H%	TI_1+TI_2	RI_1	RE
Pl. XXXVII, Fig. 3	71.2	–	18.0	25	31.0	21.1	68	9+0	–	32
Pl. L, Fig. 1*										
Pl. XXXVIII, Figs. 1–2	108.0	–	26.0	23	47.0	33.6	71	3+?2	7	36
Pl. XXXVIII, Fig. 4*	203.1	–	44.8	22	93.2	–	–	–	2	21**

* Secondary, slight, asymmetric deformations.
** Number of ribs on the earlier half of the whorl.

sides. The final sector of this part of coil (about $\frac{1}{8}$ of a whorl) is devoid of ornamentation.

The specimen, illustrated in Pl. XXXVIII, Fig. 3; Pl. L, Fig. 1, is completely septate and closely comparable with the sector of an internal coil of holotype (Pl. XXXVIII, Figs. 1–2), corresponding to it in diameter.

Remarks. The present writer assignes without reservation to the nominate subspecies the specimens separated from J.T. Binkhorst's material by A. Grossouvre (1894, p. 202, 1908, p. 28) as being representative of J.T. Binkhorst's species, as well as the specimens described by A. Grossouvre (1908, p. 28, Pls. 4–6), coming, as J.T. Binkhors's almost all specimens from limestones of Kunraed, the Netherlands.

As compared with the nominate subspecies, the new one differs in a narrower section of whorls and slighter development of costulation in non-tuberculate stages. In addition, its stratigraphic position seems to be lower.

Much the same differences are observed in relation to the specimens separated as *Pachydiscus colligatus mikhailovi* Atabekyan et Akobyan (A.A. Atabekyan and V.T. Akopyan, 1969, p. 14, Pl. 5, Fig. 2, Pl. 6, Fig. 2, Pl. 7, Fig. 2).

In the present writer's opinion, reservations as to the identification of the last-named specimens with the nominate subspecies are mostly aroused by the fact that the holotype, reaching the relatively largest diameter corresponding to that of the tuberculate stages of the taxon described, is not septate up to its end and may represent a mature form.

Distribution: Lower Maastrichtian. *Belemnella lanceolata lanceolata* Zone, the Vistula river valley. Lower Maastrichtian of the Miechów trough.

Genus *Menuites* Spath, 1922

Type species *Ammonites menu* Forbes, 1846

Diagnosis. See T. Matsumoto, 1955, p. 156; C.W. Wright, 1957, p. L 380.

Menuites portlocki portlocki (Sharpe, 1855)

(Pl. XXXIX, Fig. 1, 4, 6, 7, 9, 12; Pl. XL, Figs. 5–8)

1853–1857 *Ammonites Portlocki* Sharpe; Sharpe D., p. 30, Pl. 13, Figs. 2, 3a–c.
1889 *Ammonites* (*Pachydiscus*) *Portlocki* Sharpe; Griepenkerl O., p. 401, Pl. 45, Fig. 2a–b.
1902 *Pachydiscus portlocki* Sharpe; Wollemann A., p. 104, Pl. 6, Figs. 2, 3.
1922 *Menuites portlocki* Sharpe; Spath L.F., p. 123.
1966 *Menuites portlocki portlocki* (Sharpe); Błaszkiewicz A., table.

Type: D. Sharpe's (1853–1857, Pl. 13, Fig. 2) specimen has been designated by the present writer as a lectotype.

Material: IG 13. II. 14; IG 889. II. 70, 74; IG 1,310. II. 21, 439–443; MZ VIII Mc 325.

Dimensions in mm. (Table 29)

Remarks. Specimens from the Vistula river valley are on the whole closely comparable with the lectotype, except for that illustrated on Pl. XXXIX, Figs. 1 and 4, which is marked by a decidedly smaller umbilical index and most similar to those of the new subspecies *Menuites portlocki posterior*. A more distinct relationship with the latter may, however, occur in the case of a specimen, illustrated on Pl.XL, Figs. 7 and 8, assigned with a certain reservation to D. Sharpe's taxon. This specimen seems to be marked, in addition to a conspicuously higher umbilicus (23 per cent), also by higher than thick sections. It can, however, be strongly deformed secondarily.

The specimens described are on the whole closely comparable with the remaining material published and so far assigned to D. Sharpe's species. Part of this material includes a presumably almost complete gerontic body chamber, which, on its later part, is devoid of both costulation and tuberculation (O. Griepenkerl, 1889, p. 401, Pl. 45, Fig. 2a, b).

As compared with the most closely related and formally erected species *M. mcgowani* Haughton (S.A. Haughton, 1924, p. 87, Pl. 2, Figs. 1–3) and *M. stephensoni* Young (K. Young, 1963, p. 57, Pl. 15, Figs. 1–2, Text-figs. 7 and 9), *M. portlocki* (Sharpe) differs primarily in the lack of a distinctly developed costulation in its bituberculate stage.

From the type species *M. menu* (Forbes) (E. Forbes, 1846, p. 111, Pl. 10, Fig. 1; T. Matsumoto, 1955, p. 157, Text-figs. 1–3) and *M. sturi* (Redtenbacher) (A. Redtenbacher, 1873, p. 129, Pl. 30, Fig. 10), the species *M. portlocki* (Sharpe) differs in larger dimensions of its coil, stronger development of the ribs of phragmocone and a lack of constrictions on body chamber. The stratigraphic position of A. Redtenbacher's, and probably also of E. Forbes' taxons, is decidedly higher. Smaller dimensions of coil and distinct differences in the development of costulation are also found in comparing *M. portlocki* (Sharpe) with stratigraphically much lower Santonian species *M. japonicus* Matsumoto, *M. naibutiensis* Matsumoto and *M. pusillus* Matsumoto (T. Matsumoto, 1955, Pl. 31, Pl. 32, Figs. 1–4, Pl. 33, Text-figs.4 and 5). The appearance of the external tuberculation, with smaller diameters of coil, is a feature distinguishing, in relation to that described, the North African taxon, *M. selbiensis* (Pervinquière) (L. Pervinquière, 1907, p. 177, Pl. 7, Figs. 13–22).

Distribution: Upper Campanian, *Bostrychoceras po-*

Table 29

Specimen	D	DF	U	U/D%	H	W	W/H%	TI	TE	RE
Pl. XXXIX, Figs. 6–7*	63.0?	63	16	25	30.0?	41.0	136	4**	–	11**
Pl. XXXIX, Figs. 1, 4*	86.6	77	20.6	23	41.0	46.4	113	7	1	13
Pl. XXXIX, Figs. 9, 12*	92.9	75	25.3	27	40.0	–	–	5**	2**	7**

* Secondary asymmetric deformations of the coil.
** Number of elements on the later half of the whorl.

lyplocum Zone, the Vistula river valley. Upper Campanian of Ireland and the Federal Republic of Germany.

Menuites portlocki posterior subsp. nov.

(Pl. XXXIII, Figs. 1–2; Pl. XXXIV, Figs. 5–6; Pl. XXXIX, Figs. 2–3, 5, 8, 10–11; Pl. XL, Figs. 1–4, 9–11; Pl. XLI, Figs. 1–6)

1966 *Menuites portlocki* (Sharpe) subsp. nov. Błaszkiewicz; Błaszkiewicz A., table.
1966 *Menuites* sp. nov. Błaszkiewicz; Błaszkiewicz A., table.

Holotypus. Pl. XL, Figs. 1–4, 11 (IG 1,310. II. 22).
Stratum typicum. Upper Campanian, *Didymoceras donezianum* Zone.
Locus typicus. The Middle Vistula river valley, Kolonia Ciszyca village, outcrop 48.
Derivatio nominis. Posterior (Lat.) – later.

Diagnosis. Shell fairly small. Umbilical index medium. Whorls higher than thick. Sides of the later part of coil flattened. Umbilical wall separated. In septate stages, except for late ones, ornamentation composed of ribs diverging, on the whole in pairs, from latero-umbilical tubercles and of one to two free ribs, not connected with tubercles. Four tubercles, larger in diameter than the width of ribs occur on a half of a whorl. Intercostular spaces on the siphonal side are twice as wide as ribs. There may also occur additional, very poorly visible and fragmentary elements of costulation. No tuberculation occurs on the remaining part of coil, where also ribs are at first reduced and, afterwards disappear more or less completely. External tuberculation appears in the area transitional between phragmocone and body chamber, where it is represented by the elements of the "clavi" type.

Material: IG 1,310. II. 22, 444–455; MZ VIII Mc 332, 338, 366, 372, 393, 398, 405–406, 428. Miechów trough, 456.

Dimensions in mm. (Table 30)

Description. Phragmocone 90 to 100 mm. in diameter, which only sporadically amounts to 70 mm. (Pl. XXXIX, Figs. 5 and 8). Body chamber, preserved without aperture, makes up at least three-quarters of the whorl (Pl. XLI, Figs. 1 and 2). Whorls overlap the preceding ones less than to midheight. Umbilical index within limits of 20 and 24, decreasing in later developmental stages of the shell. Whorls higher than thick. Maximum thickness of whorls occurs below midheight. Ventral area rounded, sides, in earlier developmental stages, convex, in later (gerontic) – more flattened, which is connected with a distinct separation of the umbilical wall.

Ribs connected (single or in pairs) with latero-umbilical tubercles are visible in the observed, earlier, septate developmental stages (the diameters of the whorls observed are not less than 50 mm.). One or two intercalatory ribs are also recorded. Some of them, occurring on the other side of the coil, are connected with tubercles. In the middle parts of the siphonal area, the ribs become conspicuously reduced and some of them disappear at all. In addition to normal ribs, there also occur slightly separated (visible only in an appropriate light) and distinctly fragmentary elements of costulation. As compared with earlier developmental stages of the nominate subspecies no permanent differences are also observed here in the number of normal ribs and tubercles, as well as in the proportions between the width of these elements and that of intercostular and intertubercular spaces.

On the remaining part of phragmocone, corresponding to about a half of a whorl, the tubercular elements either disappear suddenly (Pl. XL, Fig. 1–4 and 11, Pl. XXXIX, Figs. 5 and 8), or occur decidedly less frequently and on the whole in the form of tubercular swellings of ribs. The costulation is here also subject to reduction. No normal ribs are observed any more at the end of this sector of phragmocone in most speci-

Table 30

Specimen	D	DF	U	U/D%	H	W	W/H%	TI	TE	RE
Pl. XXXIX, Figs. 2–3*	54.1	–	12.7	23	22.5	21.4	95	7	–	19
Pl. XXXIX, Figs. 5, 8*	95.0	70	21.5	22	37.6	28.0?	77?	4	2	11
Pl. XXXIV, Figs. 5–6*	110.0	86	25	22	52.5	35.0?	66?	1**	3**	4**
Pl. XXXIII, Figs. 1–2	114.0	88	26.5	23	57	–	–	–	3	14
Pl. XL, Figs. 2–4	83.4	–	19.9	23	37.7	25.0	66	5	–	21
Pl. XL, Fig. 11	116.5	97	24.7	21	57.0	–	–	2	3	16
Pl. XLI, Figs. 4, 6*	129.0	91	27.0	20	59	50.0	84	–	2	–
Pl. XLI, Figs. 1–2	142.5	96?	33.7	23	70.0	59.5	85	1	1	2
Pl. XL, Figs. 9–10*	95.0	–	22.8	22	42.0	46.5	110	8	1	21
Pl. XLI, Figs. 3, 5*	90.0?	63	21.0	23	40.0	45.5	113	–	1**	5**

* Secondary asymmetric deformations of the coil.
** Number of elements occurring on the later half of the whorl.

mens. The number of costular elements may, however, increase in the initial part of this sector (Pl. XLI, Figs. 1–4 and 11).

On the body chamber and, in some specimens, also in the transitional area between it and phragmocone, there occur lateroventral tubercular elements. On the body chamber, they occur in the form of spines and in the transitional area they may be much less separated (Pl. XL, Figs 1–4 and 11). The number of these elements is variable from one (Pl. XLI, Figs 1–2) to at least three pairs (Pl. XXXIII, Figs 1–2). In most specimens, no internal elements of tuberculation are observed on body chamber. No traces of costulation are visible on some chambers (Pl. XL, Figs 1–4 and 11, Pl. XXXIII, Figs 1–2, Pl. XXXIV, Figs 5 and 6). The remaining chambers are devoid of normal ribs. There occur, however, fragmentary, very irregularly distributed and as a rule very poorly visible costular elements. In addition, the constant presence of two to three listlike costular elements, appearing on the umbilical margin, disappearing in upper parts of sides and forming a periapertural ornamentation (Pl. XLI, Figs. 1–2, 4, 6) is observed in the specimens in which a distinctly later sector of chamber has been preserved.

Remarks. *Menuites portlocki posterior* subsp. nov. is interpreted by the present writer as a temporary subspecies, later than the nominate one. More or less constant differences it displays include a larger size of coil, narrower umbilicus, higher than thick whorls and a larger degree of flattening of the sides of body chamber, with which a more distinct separation of umbilical wall is connected. It is also marked by the lack of lateroumbilical tuberculation in a late developmental stage.

Specimens not included in the above description (Pl. XL, Figs. 9 and 10, Pl. XLI, Figs. 3 and 5) are transitional to the nominate subspecies.

The first of these specimens is completely septate and displays a distinct predominance of thickness over height (cf. table of dimensions) and the presence of a pair of tiny lateroventral tubercles at the end of whorl, with a simultaneously not reduced lateroumbilical tuberculation. The remaining characters and its stratigraphic position relate it, on the other hand, with the taxon described.

The second specimen is similar to the nominate subspecies in the thickness-height ratio of whorls and in the size of coil (cf. table of dimensions). The remaining characters and its stratigraphic position are, on the other hand, typical of the subspecies described (cf. the comparison of *Menuites portlocki* (Sharpe) with other taxons in the remarks on the nominate subspecies).

Distribution: Upper Campanian, *Didymoceras donezianum* Zone, the Vistula river valley. Upper Campanian (middle part) of the Miechów trough.

Genus *Anapachydiscus* Yabe and Shimizu, 1926

Type species *Pachydiscus (Parapachydiscus) fascicostatus* Yabe, 1921

Anapachydiscus vistulensis sp. nov.

(Pl. XLII, Figs.3 and 4; Pl. XLIII, Figs.1 and 3; Pl. XLVIII, Figs.1–2)

1871–1876 *Ammonites robustus* Schlüter; Schlüter C., (pars), p. 67, Pl. 21, Figs. 1–4.
1871–1876 *Ammonites wittekindi* Schlüter; Schlüter C., (pars), p. 160.
1966 *Anapachydiscus* sp. nov. Błaszkiewicz; Błaszkiewicz A., table
Holotypus. Pl. XLII, Figs. 3–4 (IG 1.310. II. 20).
Stratum typicum. Upper Campanian, *Bostrychoceras polyplocum* Zone.
Locus typicus. The Middle Vistula river valley, Janów, outcrop 60.
Derivatio nominis. *Vistulensis* (Lat.) – after the name of the Vistula River.

Diagnosis. Coil large. Umbilical index medium. In early stages, whorl sections are slightly thicker than height, in later stages this relation is, maybe, opposite. In earlier septate stages, ornamentation is composed of ribs diverging in pairs from lateroumbilical tubercles and, possibly, of single, primary elements. About 10 tubercles and about 30 siphonal ribs occur per one whole whorl. Intertubercular spaces do not differ in width to any larger extent from the diameters of tubercles. Similar relations are observed in regard to intercostular spaces and the width of ribs on the siphonal side. In the remaining stages, tuberculation does not occur and costulation is composed of single primary or intercalatory elements (not more than one). Ribs reach considerable heights.

Material: IG 889. II. 63; IG 1,310. II. 20, 457–464.

Dimensions in mm. (Table 31)

Description. Diameter of phragmocone, measurable in two specimens (Pl. XLII, Figs 3–4 and Pl. XLIII, Figs 1 and 3), within limits of 130 and 150 mm. Body chamber preserved incomplete, in the better preserved specimen including about a half of a whorl (Pl. XLIII, Figs. 1 and 3, the final part of this specimen's body chamber is made up of the lower parts of whorl only). In specimens with the body chamber preserved, umbilical index between 24 and 27; in a specimen 94 mm. in diameter (Pl. XLVIII, Figs. 1 and 2) it amounts to 25. Sections of whorls in the latter specimen are lower than thick. Similar relations are observed in fragmentary, not illustrated specimens, while opposite proportions are displayed by those having their body chambers preserved and which seem to be, however, secondarily flattened laterally. Maximum thickness of whorls occurs

Table 31

Specimen	D	DF	U	U/D"„	H	W	W/H"„	TI	RI_1	RE
Pl. XLVIII, Figs. 1–2*	94.6?	–	24.2?	25?	42.0	47.0	111	11	1	26+3**
Pl. XLIII, Figs. 1, 3	166?	about 130	45?	27?	77.0	67.0	87	–	6***	15***
Pl. XLII, Figs. 3–4*	166?	about 150	41?	24?	80.0	75.5	94	1	13	30

* Secondary deformations of the coil.
** Presumable number of elements occurring on the destroyed parts of the whorl.
*** Number of elements occurring on the later half of the whorl.

below midheight. Ventral area rounded, sides convex.

In midle, septate stages (represented by the last whorl of a specimen illustrated on Pl. XLVIII, Figs. 1 and 2 and the initial part of the last whorl of the holotype – Pl. XLII, Figs. 3 and 4) there occur ribs diverging in pairs from lateroumbilical tubercles. Single ribs, not connected with tubercles and which begin appearing at the level of the row of tubercles, which are fragmentary and very poorly visible (and only in an appropriate light) may in addition occur sporadically. About 10 tubercles and about 30 siphonal ribs occur on the surface of a whole whorl. Intertubercular spaces more or less equal to the diameter of tubercles. Similar relations are observed in regard to the width of siphonal ribs and spaces between them.

No tuberculation occurs in later septate stages, which display costular elements diverging directly from the umbilical margin and intercalatory elements, appearing at various levels of the sides. The proportions of the width of external ribs to spaces between them are not subject to any distinct change. The spaces between internal ribs are also more or less equal to the width of ribs. Costulation becomes reduced in the middle area of the siphonal side of the last part of phragmocone.

As compared with phragmocone, the body chamber of holotype does not display any distinct changes in the development of ornamentation. In the second specimen, body chamber differs, on the other hand, in a lack of normal intercalatory ribs and a frequent occurrence of very slightly separated and fragmentary costular elements.

Remarks. In the development of all morphological elements, here included C. Schlüter's specimens, constituting part of a series of specimens on which that author based his species *Ammonites wittekindi*, do not exceed to any significant extent the range of variability determined by the specimens from the Middle Vistula river valley.

As compared with *Anapachydiscus wittekindi* (Schlüter) which displays considerable relationship with *A. vistulensis* sp. nov., the latter differs primarily in conspicuously smaller dimensions of coil and in the fact that the ornamentation does not reappear in its ontogenetic development. It is also marked, in its tuberculate stages, by a more massive costulation and its stratigraphic range seems to be lower.

Distribution: Upper Campanian, *Bostrychoceras polyplocum* Zone, the Vistula river valley. Upper Campanian of the Federal Republic of Germany.

Anapachydiscus wittekindi (Schlüter, 1872)

(Pl. XLII, Figs. 1–2; Pl. XLIII, Fig. 2; Pl. XLIV; Pl. XLV; Pl. XLVI; Pl. XLVII; Pl. XLVIII, Figs. 3–4; Pl. XLIX, Figs. 1, 3; Pl. L, Figs. 2–3; Pl. LI; Pl. LII; Pl. LIII)

1871–1876 *Ammonites robustus* Schlüter, p. 67, Pl. 21, Figs. 1–8, Pl. 22, Figs. 1–3.
1871–1876 *Ammonites wittekindi* Schlüter, p. 160.
1911 *Pachydiscus wittekindi* Schlüter; Łopuski C., p. 110, Pl. 1, Figs. 4–6, Pl. 2, Fig. 2.
non 1931 *Pachydiscus* (*Anapachydiscus*) *wittekindi* Schlüter; Basse E., p. 27, Pl. 4, Figs. 10–11.
? 1951 *Pachydiscus wittekindi* (Schlüter); Mikhailov N.P., p. 73, Pl. 6, Figs. 34, 35.
1955 *Anapachydiscus wittekindi* (Schlüter); Collignon M., p. 80.
non 1955 *Anapachydiscus wittekindi* (Schlüter); Collignon M., p. 51, Pl. 13, Fig. 1, Pl. 14, Fig. 1, Pl. 18, Figs 1, 2.
1966 *Anapachydiscus wittekindi* (Schlüter); Blaszkiewicz A., table.

Type. C. Schlüter's specimen (1871–1876, Pl. 22, Figs. 1–3) has been designated by the present writer as a lectotype.

Material: IG 216. II. 1–2; IG 889. II. 69, 71–72; IG 1,310. II. 465–485.

Dimensions in mm. (Table 32)

Remarks. The lectotype includes part of a gerontic chamber, equalling one-quarter of a whorl. An exact conformity in the number of ribs on a later half of whorl is observed between the lectotype and a specimen from the Middle Vistula river valley, which also represents a gerontic body chamber (Pl. LII, Figs. 1, 2). A far-reaching similarity is also recorded in the outline of sections (in the light of the whole of information given in C. Schlüter's work and data concerning the material from the Middle Vistula river valley, the present writer has resolved to reject C. Schlüter's assumption on the occurrence of a secondary lateral flattening of the lectotype). In regard to the remaining morphological elements, the extent of the differences observed is of the same order as those occurring between the remaining specimens from the Middle Vistula river valley.

C. Schlüter's (1871–1876, Pl. 21, Figs. 5 and 6) second specimen, about 220 mm. in diameter, differs from those from the Middle Vistula river valley in a decidedly later disappearance of costulation (it disappears in it with a diameter of about 160 mm.). In the development of all remaining elements, it is contained, however, within the range of variability of the material from the Middle Vistula river valley.

Like the specimens from the Middle Vistula river valley, C. Schlüter's material displays a distinct differentiation in the outline of sections of whorls. In the material from the Middle Vistula river valley, these differences are on the whole connected with those in its stratigraphic position, that is, specimens which are higher than thick mostly occupy a higher stratigraphic position. In all likelihood, we have here to do with a subspecific differentiation.

The reservations, concerning the systematic position of Mikhailov's specimen, which is more than 60 mm. in diameter, result from the fact that the costulation of this form seems to be coarser and its umbilical index larger than those of the specimens from the Middle Vistula river valley corresponding to it in diameter.

In addition to those from the Middle Vistula river valley, described and discussed above, two specimens (represented by a specimen in Pl. XLII, Figs. 1, 2 and Pl. XLIII, Fig. 2), being in conformity in the shape, size and development of ornamentation with whorls constituting very early parts of the coil, but whose septation does not reach their final part, have also been related by the present writer with C. Schlüter's species. The fact that the boundary of phragmocone in the two species occurs in almost the same place in relation to changes in ornamentation (at a distance, equalling about a half of a whorl, from the place of the disappearance of tuberculation) may indicate that we have here to do with adult individuals, making up a separate developmentsl group and not with juvenile specimens.

As compared with the remaining taxons of the genus *Anapachydiscus*, C. Schlüter's taxon differs in a lack

Table 32

Specimen	D	DF	U	U/D%	H	W	W/H%	TI	RE	RI_2
Pl. XLV, Figs. 2, 4	70.5?	–	16.8?	23?	29.5?	35.0?	118?	10	23	–
Pl. XLV, Figs. 1, 3	115.0?	–	25.5?	22?	45.0?	45.0?	111?	6	21	–
Pl. XLV, Figs. 5–6*	146.8?	–	32.8?	22?	67.5?	75.0?	111?	3	15	–
Pl. XLIV, Figs. 1, 3	91.0?	–	21.1?	23?	40.5?	42.6?	105?	8	21	–
Pl. XLIV, Figs. 2, 4	103.0	–	24.2	23	44.5?	50.5?	113?	7	18	–
Pl. XLIV, Figs. 5–6*	221.8?	–	57.0?	25?	88.5?	101.8?	115?	–	–	–
Pl. XLVI, Figs. 1–2	150.0	–	32.3	21	67.0	78	116	3	12	–
Pl. XLVI, Figs. 3	285	–	63?	22?	136.5	–	–	–	–	2
Pl. XLVII, Figs. 1–2	290	–	76	26	127	135?	106	–	–	1
Pl. XLIX, Figs. 1, 3	418	–	115	27	172	–		–	–	9
Pl. LI, Fig. 1 Pl. LIII, Fig. 1	496?	–	143?	29	194	213	109	–	–	7
Pl. L, Figs. 2–3	391	–	100	25	163	153?	93?	–	–	12
Pl. LIII, Fig. 2	592	512?	148	28	240	–	–	–	–	14
Pl. LII, Figs. 1–2	677	527	213	30	250	220?	88	–	–	16
Pl. XLII, Figs. 1–2*	122.5?	122?	27.0?	22	51.5?	57.0?	–	4	15	–

* Secondary asymmetric deformations of the coil.

of ornamentation in middle development stages and conspicuously large dimensions of the coil. None of these characters are observed in forms coming from Madagascar and assigned to C. Schlüter's species (E. Basse, 1931; M. Collignon, 1955, cf. synonymy). These differences seem to be connected in all cases with considerably varying stratigraphic positions.

Distribution: Upper Campanian, *Bostrychoceras polyplocum* and *Didymoceras donezianum* Zones, the Vistula river valley. Upper Campanian of the Federal Republic of Germany and U.S.S.R. (?).

Family PLACENTICERATIDAE Hyatt, 1900

Genus *Placenticeras* Meek, 1870

Type species *Ammonites placenta* Dekay, 1828

Diagnosis. See C.W. Wright, 1957, p. L 390.

Placenticeras meeki Böhm, 1898

1876 *Placenticeras placenta* Dekay: Meek F.B., p. 466, Text-fig. 65, Pl. 24, Fig. 2a, b.
1941 *Placenticeras meeki* Böhm: Stephenson L.W., p. 431, Pl. 91, Fig. 1, Pl. 92 (cum synonimica).
1953 *Placenticeras whitefieldi* Hyatt: Pożaryska K., p. 141, Figs. 3–4

Remarks. Specimens of J. Böhm's species, known to the present writer from the Middle Vistula river valley, are limited exclusively to the material, described, illustrated and compared in detail by K. Pożaryska (cf. synonymy) with the related taxons of *Placenticeras* Meek. This material comes from a quarry at Piotrawin (outcrop I). The name *Placenticeras whitefieldi* Hyatt, applied previously to these specimens, is a junior, objective synonym of the name *P. meeki* Böhm.

Distribution: Upper Campanian, *Nostoceras pozaryskii* Zone, the Vistula river valley. Senonian of the U.S.A. and Canada.

Family SPHENODISCIDAE Hyatt, 1900

Genus *Sphenodiscus* Meek, 1871

Type species *Ammonites lenticularis* Owen, 1852

Diagnosis. See C.W. Wright, 1957, p. L 437.

Sphenodiscus binkhorsti Böhm, 1898

1953 *Sphenodiscus binkhorsti* Böhm: Pożaryska K., p. 137, Figs. 1–2 (cum synonimica).

Remarks. The only known specimen of *Sphenodiscus binkhorsti* Böhm from the Middle Vistula river valley, coming from the final bed of a Maastrichtian profile at Nasiłów (Zone γ), was described in detail by K. Pożaryska (cf. synonymy).

Distribution: Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone of the Vistula river valley. Upper Maastrichtian, the Netherlands and Bulgaria.

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STUDIUM STRATYGRAFICZNO-PALEONTOLOGICZNE AMONITÓW KAMPANU I MASTRYCHTU (DOLINA ŚRODKOWEJ WISŁY)

STRESZCZENIE

Abstrakt. W części paleontologicznej przedstawiono monograficzne opracowanie amonitów kampanu i mastrychtu doliny środkowej Wisły. W części stratygraficznej dokonano rewizji dotychczas przedstawianych sekwencji amonitów i belemnitów kampanu i mastrychtu doliny środkowej Wisły i uaktualnienia wydzieleń biostratygraficznych pod kątem ich przydatności do podziałów chronostratygraficznych.

Wyróżnione poziomy biostratygraficzne zinterpretowano jako podstawę podziału chronostratygraficznego dla obszaru Polski pozakarpackiej. Część wydzielonych poziomów kampanu górnego jednak przyjęto jednocześnie jako mające szersze znaczenie. Proponowane współcześnie dla wyższej części kampanu górnego wzorcowe europejskie schematy stratygraficzne zinterpretowano jako zbyt ogólne, które powinny być zastąpione schematem opartym na wydzieleniach biostratygraficznych z doliny środkowej Wisły. Przedyskutowano i przedstawiono również koncepcje wzorców granic pięter i podpięter.

Przeprowadzone badania miały na celu rewizję przyjmowanych dotychczas sekwencji amonitów i belemnitów kampanu i mastrychtu doliny środkowej Wisły i uaktualnienie wyróżnień biostratygraficznych pod kątem ich przydatności dla podziałów chronostratygraficznych. Przedstawione wyniki badań obejmują także monograficzne, paleontologiczne opracowanie amonitów, których dotychczasowa znajomość była oparta na przyczynkowych publikacjach taksonomicznych. Część opisów oparto także na materiałach z Roztocza i niecki miechowskiej, koniecznych do dokumentacji przedstawionych koncepcji taksonomicznych.

Na wykorzystane materiały paleontologiczne składają się również zbiory szeregu innych osób, jak: R. Kongiela, A. Mazurka, S. Mączyńskiej, Z. Modlińskiego, E. Popiel-Barczyk, K. Pożaryskiej, W. Pożaryskiego, A. Sokołowskiego, I. Żnińskiej, znajdujące się w Instytucie Geologicznym, w Muzeum Ziemi PAN i w Zakładzie Mikropaleontologii UW. Ponadto autor wykorzystał okazy S. Cieślińskiego, H. Makowskiego, R. Marcinowskiego, H. Pugaczewskiej i J. Stochlaka.

Wprowadzone zmiany w stosunku do poprzednich rozwiązań stratygraficznych z doliny środkowej Wisły (tab. 1), wiążą się ze zmianą przyjmowanych zasad klasyfikacji, terminologii i nomenklatury stratygraficznej, zmianą koncepcji rzeczywistych zasięgów i wprowadzeniem nowych taksonów paleontologicznych, w tym nowo ustanowionych. Dokonane wyróżnienia biostratygraficzne reprezentują odmianę określoną w „Zasadach polskiej klasyfikacji, terminologii i nomenklatury stratygraficznej" jako poziom, którego dolna granica jest zdefiniowana na podstawie tej samej cechy, na której jest oparta górna granica niżej leżącego poziomu.

Problem wzorców granic pięter i podpięter sprowadzono, zgodnie z częścią współczesnych wysuwanych propozycji zasad formalnej klasyfikacji stratygraficznej, wyłącznie do problemu wzorców dolnych granic tych jednostek, a mianowicie przyjęty wzorzec dolnej granicy danej jednostki definiuje automatycznie górną granicę poprzedniej jednostki. Przy wyborze wzorców granic tych jednostek wzięto pod uwagę przede wszystkim zgodność z jednej strony z istotnymi zmianami faunistycznymi, z drugiej z przyjmowanymi aktualnie pozycjami tych granic w klasycznych profilach europejskich.

Przedstawiony podział jest interpretowany jako podstawa do podziału chronostratygraficznego dla obszaru Polski pozakarpackiej. Wyróżnione poziomy biostratygraficzne kampanu górnego – poziomy *Bostrychoceras polyplocum*, *Didymoceras donezianum*, *Nostoceras pozaryskii* – przyjęto jednocześnie jako mające szersze znaczenie. Wymienione poziomy oparto na amonitach należących do rodzin najlepiej poznanych i najszerzej rozprzestrzenionych i w związku z tym najmniej, jak można sądzić, uzależnionych od czynników ekologicznych (rodziny Nostoceratidae, Scaphitidae, Pachydiscidae). Z drugiej strony znajomość aktualna klasycznych sekwencji europejskich, reprezentujących odpowiedni przedział czasowy jest niewątpliwie słabsza a sekwencje te mogą należeć w całości do mniej korzystnie wykształconych. W świetle wyników badań w dolinie środkowej Wisły proponowane współcześnie schematy stratygraficzne, jako powszechnie europejskie ujęcia (J.A. Jeletzky, 1958, 1968; T. Birkelund, 1965; W.D. Ilin, 1969), są interpretowane jako zbyt ogólne, które powinny być przynajmniej w przypadku centralnej europejskiej borealnej strefy paleozoogeograficznej zastąpione schematem opartym na wydzieleniach w dolinie środkowej Wisły. Różnica ujęć wiąże się z odmienną koncepcją gatunku *Bostrychoceras polyplocum* (Roemer), który w przypadku wszystkich ujęć jest wskaźnikowym gatunkiem a w przypadku wymienionych schematów jego nazwą obejmowane są różne gatunki i rodzaje Nostoceratidae, wykazujące znaczne zróżnicowanie rozprzestrzenienia pionowego. Część systematyczna pracy obejmuje opisy przeszło 50 taksonów na szczeblu gatunku i podgatunku. W tej ilości mieści się 9 gatunków i 5 podgatunków nowo ustanowionych.

СТРАТИГРАФО-ПАЛЕОНТОЛОГИЧЕСКОЕ ИЗУЧЕНИЕ АММОНИТОВ КАМПАНА И МААСТРИХТА (ДОЛИНА СРЕДНЕГО ТЕЧЕНИЯ ВИСЛЫ)

РЕЗЮМЕ

Содержание. В палеонтологической части дается монографическое описание аммонитов кампана и маастрихта долины среднего течения Вислы. В стратиграфической части излагаются результаты ревизии ранее принятых последовательностей аммонитов и белемнитов кампана и маастрихта долины среднего течения Вислы и уточняются биостратиграфические выделения с точки зрения их пригодности для хроностратиграфических подразделений.

Выделенные биостратиграфические зоны интерпретируются как основа хроностратиграфического подразделения для территории Польши за исключением Карпат. Однако некоторым выделенным зонам верхнего кампана придается одновременно более широкое значение. Эталонные европейские стратиграфические схемы, предлагаемые в настоящее время для верхней части верхнего кампана, рассматриваются как слишком общие, которые следует заменить схемой основанной на биостратиграфических выделениях по долине среднего течения Вислы. Обсуждаются и излагаются также концепции эталонов границ ярусов и подъярусов.

Целью проведенных исследований являлись равизия ранее принимаемых последовательностей аммонитов и белемнитов кампана и маастрихта долины среднего течения Вислы и уточнение биостратиграфических выделений с точки зрения их

пригодности для хроностратиграфических подразделений. Представленные результаты исследований включают также монографическое палеонтологическое описание аммонитов, знакомство которых до сих пор было основано на неполных таксономических публикациях. Часть описаний, необходимых для обоснования изложенных таксономических концепций, дается также по материалам по Розточу и Мехувской мульде.

На использованные палеонтологические материалы сложились также коллекций ряда других исследователей: Р. Конгеля, А. Мазурека, С. Мончиньской, З. Модлиньского, Э. Попель-Барчик, К. Пожарыской, В. Пожарыского, А. Соколовского, И. Жниньской, хранящиеся в Геологическом институте, в Музее земли Польской академии наук и в Микропалеонтологической лаборатории Варшавского университета. Кроме того, автором использованы экземпляры С. Цесьлиньского, Х. Маковского, Р. Марциновского, Х. Пугачевской и Я. Стохляка.

Уточения по отношению к предыдущим стратиграфическим решениям по долине среднего течения Вислы (табл. 1) проводятся в связи с изменением принимаемых принципов стратиграфической классификации, терминологии и номенклатуры, изменением концепции действительных границ распространения и введением новых, в том числе новоустановленных палеонтологических таксонов. Биостратиграфические выделения представляют собой разновидность, принимаемую в „Принципах польской стратиграфической классификации, терминологии и номенклатуры" в качестве зоны, нижняя граница которой определяется той же особенностью по которой проводится верхняя граница подстилающей зоны.

В соответствии с некоторыми выдвигаемыми в настоящее время предложениями по принципам формальной стратиграфической классификации вопрос эталонных границ ярусов и подъярусов сводится исключительно к проблеме эталонов нижних границ этих подразделений, т.е. принятый эталон нижней границы данной единицы автоматически определяет верхнюю границу предыдущей единицы. При подборе эталонов границ этих единиц прежде всего учитывалось их совпадение с существенными фаунистическими изменениями с одной стороны, и с принимаемыми в настоящее время предложениями по этим границам в классических разрезах — с другой.

Представленные подразделения интерпретируются как основа хроностратиграфических единиц для территории Польши за исключением Карпат. Выделяемым биостратиграфическим горизонтам верхнего кампана — зоны *Bostrychoceras polyplocum*, *Didymoceras donezianum*, *Nostoceras pozaryskii* — придается одновременно более широкое значение. Указанные зоны основаны на аммонитах, относящихся к лучше изученным и наиболее широко распространенным семействам и в связи с тем, должно быть, наименее зависящим от экологических факторов (семейства Nostoceratidae, Scaphitidae, Pachydiscidae). С другой стороны в настоящее время классические европейские последовательности слоев, представляющие собой соответствующий временный интервал, несомненно менее изучены и в целом могут относится к менее благоприятно развитым. В свете результатов исследований по долине среднего течения Вислы, как слишком общие, интерпретируются предлагаемые в настоящее время стратиграфические схемы в качестве общепринятого европейского подхода (А. Елетцки, 1958, 1968; Т. Биркелунд, 1965; В.Д. Илин, 1969), которые в случае центральной европейской палеозоогеографической бореальной зоны, должны быть, по меньшей мере, заменены схемой основанной на подразделениях по долине среднего течения Вислы. Различия в подходе связаны с разным пониманием вида *Bostrychoceras polyplocum* (Roemer), который для всех концепций является видом-индексом, а в случае указанных схем его названием охватываются разные виды и роды Nostoceratidae, проявляющие значительную дифференцированность распространения по профилю. Систематическая часть работы включает описания более 50 таксонов на уровне вида и подвида, в том числе 9 видов и 5 подвидов новоустановленных.

Перевод Станислав Чижевски

EXPLANATIONS OF PLATES

PLATE I

Bostrychoceras polyplocum polyplocum (Roemer)

Figs. 1 and 2. Dorotka, outcrop 46(?), Upper Campanian, *Bostrychoceras polyplocum* Zone, MZ VIII Mc 421; 1 – final part of whorl (× about 0.85), 2 – initial part of whorl (× about 0.70)

Figs. 3, 4 and 7. Roztocze, Nowiny on the Sopot River, Upper Campanian, upper part, IG 1.40.7 II. 1; 3 – apical view (× about 0.65), 4 – lateral view (× about 0.65), 7 – basal view (× about 0.70)

Figs. 5 and 6. Dorotka, outcrop 46(?), Upper Campanian, *B. polyplocum* Zone, MZ VIII Mc 417; 5 – lateral view (× about 0.70), 6 – apical view (× about 0.75)

Bostrychoceras polyplocum polyplocum (?) (Roemer)

Figs. 8 and 9. Okół, outcrop 126, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 44; 8 – lateral view (× about 0.65), 9 – apical view (× about 0.65)

Legend: IG – collections of the Geological Institute's Museum in Warsaw. MZ – collections of the Polish Academy of Sciences' Museum of the Eearth in Warsaw.

PLATE II

Bostrychoceras polyplocum schlueteri subsp. nov.

Fig. 1. Okół, outcrop 125, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1.310. II. 30; lateral view (× about 0.70)

Fig. 4. Janów, outcrop 83, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 28; lateral view (× about 0.70)

Figs. 9 to 11. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, holotype, IG 1.310. II. 1; 9 and 11 – lateral view (× about 0.70), 10 – apical view (× about 0.70)

Bostrychoceras polyplocum polyplocum (Roemer)

Figs. 2 and 5. Dorotka, outcrop 46, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 39; 2 – lateral view (× about 0.70), 5 – apical view (× about 0.70)

Figs. 3 and 6. Janów, outcrop 56, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 43; 3 – lateral view (× about 0.70), 6 – basal view (× about 0.70)

Nostoceras sp.

Figs. 7 and 8. Kamień, horizon *u*, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, IG 12. II. 8; 7 – ventral view (× about 0.70), 8 – lateral view (× about 0.65)

PLATE III

Bostrychoceras unituberculatum sp. nov.

Fig. 1. Okół, general localization, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 75; lateral view (× about 0.70)

Fig. 2. Basonia, outcrop 42, Upper Campanian, *B. polyplocum* Zone, IG 889. II. 55; lateral view (× about 0.70)

Figs. 3 and 6. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, holotype, IG 1.310. II. 3; 3 – lateral view (× about 0.65), 6 – basal view (× about 0.70)

Fig. 4. Janów, outcrop 90, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 67; lateral view (× about 0.75)

Fig. 5. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 52; lateral view (× about 0.75)

Figs. 7 and 8. Okół, outcrop 127, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 73; 7 – apical view (× about 0.75), 8 – lateral view (× about 0.80)

PLATE IV

Didymoceras sp.

Figs. 1 and 2. Okół, outcrop 125, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 79; 1 – lateral view (× about 0.75), 2 – apical view (× about 0.75)

Bostrychoceras unituberculatum sp. nov.

Fig. 3. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 53; lateral view (× about 0.65)

Figs. 4 and 6. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 54; 4 – apical view (× about 0.75), 6 – lateral view (× about 0.70)

Fig. 5. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, a pathological specimen, IG 1.310. II. 55; lateral view (× about 0.70)

PLATE V

Didymoceras donezianum donezianum (Mikhailov)

Fig. 1. Ciszyca (in general), Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc – 1.870; lateral view (× about 1)

Nostoceras sp.

Fig. 2. Kamień – horizon *u*, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, a latex cast, IG 1.310. II. 5; lateral view (× about 0.80)

Didymoceras cf. *beecheri* (Hyatt)

Figs. 3 and 5. Janów, outcrop 67, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1.310. II. 80; 3 – apical view (× about 0.75), 5 – lateral view (× about 0.70)

Didymoceras cf. *secoense* (Young)

Figs. 4 and 6. Kolonia Ciszyca, horizon *p*, Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc – 369; 4 – basal view (× about 0.75), 6 – lateral view (× about 0.80)

Didymoceras sp.

Fig. 7. Sulejów, outcrop 22, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1.310. II. 78; lateral view (× about 0.70)

PLATE VI

Didymoceras varium sp. nov.

Figs. 1 and 2. Dorotka, outcrop 43, Upper Campanian, *Bostrychoceras polyplocum* Zone, holotype, IG 1.310. II. 4; 1 – apical view (× about 0.75), 2 – lateral view (× about 0.65)

Figs. 3 and 4. Dorotka, general localization, Upper Campanian, *B. polyplocum* Zone, MZ VIII Mc – 687; 3 – basal view (× about 0.65), 4 – lateral view (× about 0.70)

Fig. 5. Janów, outcrop 92, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 91; lateral view (× about 0.85)

Figs. 6 and 7. Basonia E, outcrop 41, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 82; 6 – lateral view (× about 0.75), 7 – basal view (× about 0.70)

PLATE VII

Didymoceras donezianum (Mikhailov) subsp.

Figs. 1 and 6. Kolonia Ciszyca, outcrop 52, Upper Campanian, *Didymoceras donezianum* Zone, IG 1.310. II. 105; 1 – basal view (× about 0.70), 6 – lateral view (× about 0.70)

Fig. 5. Kolonia Ciszyca, outcrop 52, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 106; lateral view (× about 0.65)

Figs. 7 and 8. Kolonia Ciszyca, outcrop 52, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 107; 7 – lateral view (× about 0.70), 8 – basal view (× about 0.70)

Didymoceras densecostatum (Wiedmann)

Figs. 2 to 4. Kolonia Ciszyca, general localization, Upper Campanian, *D. donezianum* Zone, MZ VIII Mc 371; 2 – basal view (× about 0.65), 3 – lateral view (× about 0.65), 4 – apical view (× about 0.75)

Didymoceras donezianum donezianum (Mikhailov)

Fig. 9. Kolonia Ciszyca, outcrop 50, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 101; lateral view (× about 0.70)

Fig. 10. Ciszyca (in general), Upper Campanian, *D. donezianum* Zone, MZ VIII Mc 472/2; lateral view (× about 0.70)

Figs. 11 and 14. Kolonia Ciszyca, outcrop 51, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 103; 11 – basal view (× about 0.65), 14 – lateral view (× about 0.65)

Figs. 12 and 15. Ciszyca (in general), Upper Campanian, *D. donezianum* Zone, MZ VIII Mc 426; 12 – apical view (× about 0.70), 15 – lateral view (× about 0.70)

Figs. 13 and 18. Kolonia Ciszyca, horizon *p*, Upper Campanian *D. donezianum* Zone, IG 12. II. 92; 13 – lateral view (× about 0.75), 18 – basal view (× about 0.60)

Didymoceras cf. *secoense* (Young)

Figs. 16 and 19. Janów, outcrop 63, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1.310. II. 100; 16 – lateral view (× about 0.75), 19 – basal view (× about 0.70)

Didymoceras donezianum donezianum (?) (Mikhailov)

Figs. 17 and 20. Kolonia Ciszyca, outcrop 50, Upper Campanian, *Didymoceras donezianum* Zone, IG 1.310. II. 104; 17 – apical view (× about 0.70), 20 – lateral view (× about 0.65)

Didymoceras varium sp. nov.

Fig. 21. Janów, outcrop 92, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1.310. II. 93; lateral view (× about 0.65)

Fig. 22. Dorotka, outcrop 45, Upper Campanian, *B. polyplocum* Zone, IG 1.310. II. 86; basal view (× about 0.65)

PLATE VIII

Didymoceras postremum sp. nov.

Fig. 1. Ciszyca Górna, outcrop 107, Upper Campanian, *Didymoceras donezianum* Zone, IG 1.310. II. 109; lateral view (× about 0.80)

Figs. 2 and 5. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, holotype, IG 1.310. II. 6; 2 – basal view (× about 0.75), 5 – lateral view (× about 0.70)

Fig. 3. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 110; lateral view (× about 0.70)

Fig. 4. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 111; lateral view (× about 0.55)

Fig. 6. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 112; lateral view (× about 0.70)

PLATE IX

Didymoceras postremum sp. nov.

Figs. 1 and 3. Ciszyca Górna, outcrop 107, Upper Campanian, *Didymoceras donezianum* Zone, IG 1.310. II. 113; 1 – lateral view (× about 0.65), 3 – basal view (× about 0.70)

Figs. 2 and 5. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 114; 2 and 5 – lateral view (× about 0.65)

Figs. 4 and 6. Ciszyca Górna, outcrop 109, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 137; 4 – basal view (× about 0.70), 6 – lateral view (× about 0.70)

PLATE X

Nostoceras pozaryskii sp. nov.

Figs 1 to 5. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, holotype, IG 1.310. II. 7; 1 and 3 to 5 – lateral view (1 – × about 0.70, 3 – × about 0.75; 4 and 5 – × about 0.65), 2 – basal view (× about 0.70)

Figs. 8, 9 and 12. Helenów, east of the village. Upper Campanian, *N. pozaryskii* Zone. IG 1.310. II. 160; 8, 9 – lateral view (× about 0.75), 12 – basal view (× about 0.70)

Figs. 11, 13 and 15. Piotrawin, outcrop 1. Upper Campanian, *N. pozaryskii* Zone. IG 1.310. II. 153; 11 and 15 – lateral view (11 – × about 0.70; 15 – × about 0.75), 13 – basal view (× about 0.65)

Fig. 14. Piotrawin, outcrop 1, Upper Campanian, *N. pozaryskii* Zone. IG 1.310. II. 156; lateral view (× about 0.80)

Nostoceras (?) *schloenbachi* (Favre)

Figs. 6, 7 and 10. Wierzchowiska, outcrop 197, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone? IG 1.310. II. 161; 6 – basal view (× about 0.75), 7 – lateral view (× about 0.65), 10 – apical view (× about 0.70)

PLATE XI

Neancyloceras phaleratum (Griepenkerl)

Figs. 1 and 4. Bliskowice - Popów, outcrop 7, Upper Campanian, *Neancyloceras phaleratum* Zone. IG 1.310. II. 167; 1 – lateral view (× about 0.85), 4 – lateral view, a latex cast (× about 0.85)

Fig. 2. Janów, outcrop 74, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 176; lateral view (× about 1.05)

Fig. 5. Bliskowice – Popów, outcrop 4, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 2; lateral view (× about 1.05)

Figs. 6 and 8. Sulejów, outcrop 17, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 170; 6 – lateral view (× about 1), 8 – ventral view (× about 1)

Fig. 7. Janów, outcrop 78, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 200; lateral view (× about 0.95)

Neancyloceras aff. *bipunctatum* (Schlüter)

Fig. 3. Zapusta, outcrop 144, Upper Campanian, *Didymoceras donezianum* Zone. IG 1.310. II. 210; ventral view (× about 0.85)

PLATE XII

Neancyloceras phaleratum (Griepenkerl)

Figs. 1 and 2. Janów, outcrop 74, Upper Campanian, *Neancyloceras phaleratum* Zone. IG 1.310. II. 177; 1 – ventral view (× about 1), 2 – lateral view (× about 1)

Fig. 3. Bliskowice – Popów, outcrop 5, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 165; lateral view (× about 1)

Fig. 4. Janów, outcrop 74, Upper Campanian, *N. phaleratum* Zone, IG 1.310. II. 178; lateral view (× about 1.05)

Figs. 6 and 7. Okół, outcrop 122, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 206; 6 – lateral view (× about 1), 7 – dorsal side (× about 1)

Figs. 8 and 9. Sulejów, outcrop 19, Upper Campanian, *N. phaleratum* Zone. IG 1.310. II. 171; 8 – lateral view (× about 0.80), 9 – ventral view (× about 0.90)

Neancyloceras bipunctatum (Schlüter)

Fig. 5. Ciszyca Górna, outcrop 103, Upper Campanian, *Didymoceras donezianum* Zone. IG 1.310. II. 209; lateral view (× about 1.05)

PLATE XIII

Trachyscaphites spiniger spiniger (Schlüter)

Figs. 1 and 2. Hieronimów forest, Upper Campanian, lower part. IG 12. II. 86; 1 – lateral view (× about 1.05), 2 – rear view (× about 1)

Fig. 3. Sulejów, outcrop 15 (?), Upper Campanian, *Neancyloceras phaleratum* Zone. MZ VIII Mc 363; lateral view (× about 1)

Fig. 5. Okół, outcrop 113, Upper Campanian, *N. phaleratum*, IG 1.310. II. 211; rear view (× about 1.05)

Fig. 7. Przybysławice, Miechów Region, Upper Campanian, lowermost part, latex cast, IG 1.310. II. 213; lateral view (× about 1)

Trachyscaphites spiniger posterior subsp. nov.

Fig. 4. Janów, outcrop 92, Upper Campanian, *Bostrychoceras polyplocum* Zone. IG 1.310. II. 246; rear view (× about 1)

Trachyscaphites (?) *gibbus* (Schlüter)

Figs. 6 and 8. Okół, outcrop 113, Upper Campanian, *Neancyloceras phaleratum* Zone. IG 1.310. II. 261; 6 – lateral view (× about 1.05), 8 – rear view (× about 1)

PLATE XIV

Trachyscaphites spiniger posterior subsp. nov.

Figs. 1 and 4. Okół, outcrop 128, Upper Campanian, *Bostrychoceras polyplocum* Zone. IG 890. II. 72; 1 – frontal view (× about 1.05), 4 – lateral view (× about 1)

Figs. 2 and 3. Environs of Janów, Upper Campanian, *B. polyplocum* Zone?. IG 1.310. II. 251; 2 – lateral view (× about 1), 3 – frontal view (× about 1)

Figs 5 to 7. Sulejów, outcrop 22, Upper Campanian, *B. polyplocum* Zone, holotype, IG 1.310. II. 10; 5 – frontal view (× about 1.05), 6 – lateral view (× about 1.05), 7 – rear view (× about 1.05)

PLATE XV

Trachyscaphites pulcherrimus (Roemer)

Fig. 1. Dorotka – horizon *n*, Upper Campanian, *Bostrychoceras polyplocum* Zone. MZ VIII Mc 323; lateral view (× about 1)

Figs. 4 and 5. Dorotka – horizon *o*, Upper Campanian, *B. polyplocum* Zone. MZ VIII Mc 321; 4 – lateral view (× about 1), 5 – rear view (× about 1)

Fig. 6. Dorotka, general localization, Upper Campanian, *B. polyplocum* Zone, MZ VIII Mc 424; lateral view (× about 1)

Fig. 7. Kolonia Ciszyca – horizon *p*, Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc 336; lateral view (× about 0.95)

Figs. 8 and 9. Dorotka, outcrop 45, Upper Campanian, *Bostrychoceras polyplocum* Zone. IG 1.310. II. 11; 8 – lateral view (× about 1), 9 – rear view (× about 1)

Figs. 10 and 11. Dorotka, outcrop 39, Upper Campanian, *B. polyplocum* Zone. IG 1.310. II. 262; 10 – lateral view (× about 1), 11 – rear view (× about 1)

Trachyscaphites spiniger posterior (?) subsp. nov.

Figs 2 and 3. Janów, outcrop 57, Upper Campanian, *B. polyplocum* Zone, IG 890. II. 31; 2 – rear view (× about 1.05), 3 – lateral view (× about 1.05)

PLATE XVI

Acanthoscaphites (?) *tuberculatus* (Giebel)

Figs. 1 and 2. Ciszyca Górna, outcrop 103, Upper Campanian, *Didymoceras donezianum* Zone. IG 1.310. II. 314; 1 – frontal view (× about 1), 2 – lateral view (× about 1)

Figs. 3 and 5. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone. IG 1.310. II. 316; 3 – rear view (× about 1), 5 – lateral view (× about 1)

Fig. 8. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, latex cast, IG 1.310. II. 16; lateral view (× about 1)

Hoploscaphites greenlandicus (Donovan)

Figs. 4, 6 and 7. Ciszyca (in general), Upper Campanian, *D. donezianum* Zone. MZ VIII Mc 691; 4 and 6 – lateral view (4 – × about 1; 6 – × about 1.05), 7 – rear view (× about 1)

Figs 9 and 10. Janów, outcrop 81, Upper Campanian, *Bostrychoceras polyplocum* Zone. IG 1.310. II. 270; 9 – rear view (× about 1.05), 10 – lateral view (× about 1.05)

PLATE XVII

Hoploscaphites (?) sp.

Figs. 1 and 7. Kolonia Ciszyca, outcrop 50, Upper Campanian, *Didymoceras donezianum* Zone. IG 1.310.II.273; 1 – rear view (× about 1), 7 – lateral view (× about 1)

Hoploscaphites greenlandicus (Donovan)

Figs. 2 and 3. Basonia – eastern part, outcrop 47, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 889. II. 75; 2 – lateral view (× about 1.05), 3 – frontal view (× about 0.95)

Hoploscaphites vistulensis sp. nov.

Figs. 4 and 6. Piotrawin – horizon *t*, Upper Campanian – *Nostoceras pozaryskii* Zone?, MZ VIII Mc 468; 4 – rear view (× about 1.05), 6 – lateral view (× about 1)

Figs. 8 and 9. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, holotype, IG 1.310. II. 12; 8 – rear view (× about 1), 9 – lateral view (× about 0.95)

Hoploscaphites constrictus anterior subsp. nov.

Fig. 5. Lublin trough, Wólka Maziarska, Lower Maastrichtian, upper part?, latex cast, IG 12. II. 14/1; lateral view (× about 1)

PLATE XVIII

Hoploscaphites constrictus crassus (Łopuski)

Figs. 1 and 2. Bochotnica – horizon *x*, Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone, MZ VIII Mc 577; 1 – lateral view (× about 1.05), 2 – rear view (× about 1.05)

Figs. 11 and 12. Bochotnica, outcrop 220 – horizon *y*, Upper Maastrichtian, *H. constrictus crassus* Zone, IG 1.310. II. 15; 11 – lateral view (× about 1.05), 12 – rear view (× about 1.10)

Figs. 13 and 14. Bochotnica, outcrop 220 – horizon *x*, Upper Maastrichtian, *H. constrictus crassus* Zone, IG 1.310. II. 285; 13 – lateral view (× about 0.95), 14 – frontal view (× about 1)

Hoploscaphites constrictus crassus (?) (Łopuski)

Fig. 3. Okale, outcrop II – horizon *w*, Upper Maastrichtian, *H. constrictus crassus* Zone, MZ VIII Mc 508; lateral view (× about 1.10)

Hoploscaphites constrictus anterior subsp. nov.

Figs. 4 to 6. Polichno, Pińczów Rejon, Lower Maastrichtian, upper part, holotype, IG 1.310. II. 14; 4 – rear view (× about 1), 5 – lateral view (× about 1), 6 – frontal view (× about 1)

Fig. 7. Polichno, Pińczów Region, Lower Maastrichtian, upper part, IG 1.310. II. 281; lateral view (× about 0.95)

Fig. 8. Lublin trough, Wólka Maziarska, Lower Maastrichtian, upper (?) part, latex cast, IG 12. II. 14/2; lateral view (× about 1)

Figs. 9 and 10. Śladów, Miechów Region, Lower Maastrichtian, upper part, IG 1.310. II. 283; 9 – frontal view (× about 1), 10 – lateral view (× about 1)

PLATE XIX

Acanthoscaphites (?) *tuberculatus* (Giebel)

Fig. 1. Ciszyca Górna, outcrop 107, Upper Campanian, *Didymoceras donezianum* Zone, IG 890. II. 151; lateral view (× about 1)

Figs. 4 and 5. Ciszyca Górna, outcrop 107, Upper Campanian, *D. donezianum* Zone, IG 1.310. II. 317; 4 – lateral view (× about 1.05), 5 – rear view (× about 1.05)

Acanthoscaphites praequadrispinosus sp. nov.

Figs. 2 and 3. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1.310. II. 321; 2 – rear view (× about 0.70), 3 – lateral view (× about 0.70)

Figs. 6 to 8. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, holotype, IG 1.310. II. 17; 6 – rear view (× about 0.50), 7 – lateral view (× about 0.50), 8 – frontal view (× about 0.50)

PLATE XX

Acanthoscaphites praequadrispinosus sp. nov.

Figs. 1 and 2. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1.310. II. 322; 1 – lateral view (× about 0.70), 2 – rear view (× about 0.70)

Figs. 3 and 8. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, IG 1.310. II. 323; 3 – lateral view (× about 0.70), 8 – frontal view (× about 0.70)

Figs. 6 and 7. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, IG 1.310. II. 324; 6 – frontal view (× about 0.60), 7 – lateral view (× about 0.60)

Acanthoscaphites (?) *tuberculatus* (Giebel)

Figs. 4 and 5. Ciszyca Górna, outcrop 103, Upper Campanian, *Didymoceras donezianum* Zone, IG 1.310. II. 313; 4 – rear view (× about 1.05), 5 – lateral view (× about 1)

PLATE XXI

Acanthoscaphites praequadrispinosus sp. nov.

Figs. 1 and 2. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1.310. II. 325; 1 – rear view (× about 0.75), 2 – lateral view (× about 0.70)

Figs. 3 and 4. Maruszów, outcrop 147, Upper Campanian, *N. pozaryskii* Zone, IG 1.310. II. 350; 3 – rear view (× about 0.70), 4 – lateral view (× about 0.70)

Figs. 5 and 6. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, IG 1.310. II. 326; 5 – lateral view (× about 0.70), 6 – frontal view (× about 0.65)

PLATE XXII

Acanthoscaphites quadrispinosus (Geinitz)

Figs. 1 and 3. Łysaków, Jędrzejów Region, Lower Maastrichtian, IG 1.310. II. 18; 1 – rear view (× about 0.80), 3 – lateral view (× about 0.80)

Fig. 2. Jawór Solecki, outcrop 194, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, IG 1.310. II. 361; lateral view (× about 0.70)

Figs. 4 and 5. Jawór Solecki, outcrop 194, Lower Maastrichtian, *B. lanceolata lanceolata* Zone, IG 1.310. II. 360; 4 – lateral view (× about 0.75), 5 – rear view (× about 0.75)

Figs. 6 and 7. Solec (Bliższe Przedmieście – Nearer Suburb) – horizon *u*, Lower Maastrichtian, *B. lanceolata lanceolata* Zone, MZ VIII Mc 481; 6 – lateral view (× about 0.70), 7 – rear view (× about 0.75)

Figs. 8 and 9. Environs of Solec, Lower Maastrichtian, H. Makowski's collection; 8 – lateral view (× about 0.70), 9 – rear view (× about 0.70)

Fig. 10. Locality unknown, IG 1.310. II. 362; lateral view (× about 0.70)

PLATE XXIII

Acanthoscaphites bispinosus Nowak

Figs. 1 and 2. Łysaków, Jędrzejów Region, Lower Maastrichtian, IG 1.310. II. 368; 1 – rear view (× about 0.70), 2 – lateral view (× about 0.70)

Fig. 3. Environs of Solec, Lower Maastrichtian, H. Makowski's collection; rear view of the specimen shown on Pl. XXIV, Fig. 4 (× about 0.70)

Figs. 5 to 7. Sosnówka, Miechów Region, Lower Maastrichtian, upper part, IG 1.310. II. 19; 5 – frontal view (× about 0.65), 6 – lateral view (× about 0.65), 7 – rear view (× about 0.65)

Hoploscaphites minimus sp. nov.

Fig. 4. Sadkowice, outcrop 167, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1.310. II. 177; lateral view (× about 1.05)

PLATE XXIV

Acanthoscaphites bispinosus Nowak

Figs. 1 and 5. Jawór Solecki (general localization), Lower Maastrichtian, IG 1.310. II. 25; 1 – lateral view (× about 0.70), 5 – rear view (× about 0.70)

Fig. 2. Kludzie, outcrop 202a, Lower Maastrichtian, *Belemnella occidentalis* Zone, IG 1.310. II. 363; lateral view (× about 1)

Fig. 4. Environs of Solec, Lower Maastrichtian, H. Makowski's collection; lateral view (× about 0.70) (cf. Pl. XXIII, Fig. 3)

Hoploscaphites minimus sp. nov.

Fig. 3. Piotrawin, outcrop 166, Lower Maastrichtian, *B. lanceolata lanceolata* Zone, IG 1,310. II. 274; lateral view (× about 1)

PLATE XXV

Acanthoscaphites varians (Łopuski)

Figs. 1, 2, 5 and 6. Kazimierz, outcrop III, Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone, R. Marcinkowski's collection; 1 and 6 – lateral view (× about 0.60), 2 – rear view (× about 0.60), 5 – frontal view (× about 0.75)

Hoploscaphites minimus sp. nov.

Figs. 3 and 4. Piotrawin, outcrop 166, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, holotype, IG 1,310. II. 13; 3 – rear view (× about 1.05), 4 – lateral view (× about 1)

PLATE XXVI

Pachydiscus koeneni Grossouvre

Figs. 1 and 2. Okół, outcrop 112, Upper Campanian, *Neancyloceras phaleratum* Zone, IG 1,310. II. 385; 1 – lateral view (× about 0.65), 2 – frontal view (× about 0.65)

Pachydiscus cf. *oldhami* (Sharpe)

Figs. 3 and 4. Kolonia Ciszyca, outcrop 50 (?), Upper Campanian, *Didymoceras donezianum* Zone, IG 1,310. II. 396; 3 – frontal view (× about 0.60), 4 – lateral view (× about 0.60)

PLATE XXVII

Pachydiscus koeneni Grossouvre

Figs. 1 and 4. Janów, outcrop 88, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 23; 1 – rear view (× about 0.60), 4 – lateral view (× about 0.60)

Figs. 2 and 3. Janów, outcrop 96, Upper Campanian, *B. polyplocum* Zone, IG 1,310. II. 384; 2 – lateral view (× about 0.70), 3 – rear view (× about 0.70)

PLATE XXVIII

Pachydiscus koeneni Grossouvre

Figs. 1 and 4. Janów, outcrop 77, Upper Campanian, *Neancyloceras phaleratum* Zone, IG 1,310. II. 381; 1 – lateral view (× about 0.65), 4 – rear view (× about 0.65)

Figs. 2 and 3. Okół, outcrop 115, Upper Campanian, *N. phaleratum* Zone, IG 1,310. II. 387; 2 – lateral view (× about 0.65), 3 – rear view (× about 0.65)

PLATE XXIX

Pachydiscus perfidus Grossouvre

Figs. 1 and 2. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 405; 1 – frontal view (× about 0.70), 2 – lateral view (× about 0.70)

Figs. 3 and 4. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, IG 1,310. II. 406; 3 – lateral view (× about 0.60), 4 – rear view (× about 0.60)

PLATE XXX

Pachydiscus perfidus Grossouvre

Figs. 1 and 3. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 402; 1 – lateral view (× about 0.55), 3 – rear view (× about 0.55)

Fig. 4. Lublin trough, Urzędów, Upper Campanian, IG 1,310. II. 420; lateral view (× about 0.55) (cf. Pl. XXXII, Figs 1–2)

Trachyscaphites spiniger posterior (?) subsp. nov.

Fig. 2. Wałowice, outcrop 29, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 226; lateral view (× about 1.05)

PLATE XXXI

Pachydiscus perfidus Grossouvre

Figs. 1 and 3. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 407; 1 – rear view (× about 0.60), 3 – lateral view (× about 0.60)

Fig. 2. Piotrawin, outcrop I, Upper Campanian, *N. pozaryskii* Zone, IG 1,310. II. 403; lateral view (× about 0.65)

PLATE XXXII

Pachydiscus perfidus Grossouvre

Figs. 1 and 2. Lublin trough, Urzędów, Upper Campanian, an earlier part of coil of the specimen shown on Pl. XXX, Fig. 4, IG 1,310. II. 420; 1 – frontal view (× about 0.55), 2 – lateral view (× about 0.55)

Fig. 3. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 24; lateral view (× about 0.45)

PLATE XXXIII

Menuites portlocki posterior subsp. nov.

Figs. 1 and 2. Ciszyca (in general), Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc 405; 1 – lateral view (× about 0.75), 2 – rear view (× about 0.75)

Pachydiscus perfidus Grossouvre

Figs. 3 and 4. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 401; 3 – rear view (× about 0.55), 4 – lateral view (× about 0.55)

PLATE XXXIV

Eupachydiscus levyi (Grossouvre)

Figs. 1 and 2. Świeciechów, outcrop 1, Lower Campanian, *Gonioteuthis quadrata* Zone, IG 1,310. II. 371; 1 – frontal view (× about 0.50), 2 – lateral view (× about 0.50)

Pachydiscus koeneni Grossouvre

Figs. 3 and 4. Okół, outcrop 115, Upper Campanian, *Neancyloceras phaleratum* Zone, IG 1,310. II. 388; 3 – rear view (× about 0.70), 4 – lateral view (× about 0.70)

Menuites portlocki posterior subsp. nov.

Figs. 5 and 6. Ciszyca (in general), Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc 372; 5 – rear view (× about 0.75), 6 – lateral view (× about 0.75)

PLATE XXXV

Pachydiscus gollevillensis nowaki (?) (Mikhailov)

Figs. 1 and 9. Lublin trough, Wólka Maziarska, Lower Maastrichtian, upper (?) part, IG 12. II. 32; 1 – lateral view (× about 0.75), 9 – frontal view (× about 0.70)

Pachydiscus gollevillensis nowaki (Mikhailov)

Figs. 2 and 3. Kludzie – horizon *v*, Lower Maastrichtian, *Belemnella occidentalis* Zone, MZ VIII Mc 491; 2 – rear view (× about 0.70), 3 – lateral view (× about 0.70)

Pachydiscus neubergicus neubergicus (Hauer)

Figs. 4, 5 and 10. Kalina Mała, Miechów Region, Lower Maastrichtian, upper part, IG 1,310. II. 433; 4 – lateral view of an earlier part of coil (× about 0.70), 5 – frontal view of a part of coil in Fig. 4 (× about 0.70), 10 – lateral view (× about 0.65)

Pachydiscus neubergicus raricostatus subsp. nov.

Figs. 6 and 7. Kamień, outcrop 172, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, IG 889. II. 159; 6 – lateral view (× about 0.70), 7 – rear view (× about 0.70)

Fig. 8. Włoszczowa, Lower Maastrichtian, IG 1,310. II. 429; lateral view (× about 0.70)

PLATE XXXVI

Pachydiscus neubergicus raricostatus subsp. nov.

Figs. 1 and 2. Włoszczowa, Lower Maastrichtian, IG 1,310. II. 430; 1 – lateral view (× about 0.65), 2 – rear view (× about 0.65)

Figs. 3, 4 and 8. Kamień – horizon *u*, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, holotype, MZ VIII Mc 501; 3 – lateral view of an earlier part of coil (× about 0.70), 4 – frontal view of a part of coil in Fig. 3 (× about 0.70), 8 – lateral view (× about 0.70)

Figs. 7, 9 and 10. Włoszczowa, Lower Maastrichtian, IG 1,310. II. 431; 7 – lateral view (× about 0.65), 9 – lateral view of an earlier part of coil (× about 0.70), 10 – rear view of a part of coil in Fig. 9 (× about 0.70)

Pachydiscus neubergicus neubergicus (Hauer)

Figs. 5 and 6. Kłudzie – horizon *v*, Lower Maastrichtian, *Belemnella occidentalis* Zone, MZ VIII Mc 492; 5 – lateral view (× about 0.70), 6 – rear view (× about 0.70)

PLATE XXXVII

Pachydiscus perfidus Grossouvre

Figs. 1 and 2. Piotrawin, outcrop I, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 408; 1 – rear view (× about 0.70), 2 – lateral view (× about 0.70)

Pachydiscus colligatus latiumbilicatus subsp. nov.

Fig. 3. Kamień, outcrop 172, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, IG 1,310. II. 435; frontal view of a part of coil in Pl. L, Fig. 1 (× about 1.05)

Pachydiscus cf. *oldhami* (Sharpe)

Fig. 4. Kolonia Ciszyca, outcrop 50, Upper Campanian, *Didymoceras donezianum* Zone, cf. Pl. XLIX, Fig. 2, IG 1,310. II. 395; lateral view (× about 0.75)

PLATE XXXVIII

Pachydiscus colligatus latiumbilicatus subsp. nov.

Figs. 1, 2 and 4. Kamień, outcrop 172, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, holotype, IG 1,310. II. 8; 1 – lateral view of an earlier part of coil (× about 0.85), 2 – frontal view of a part of coil in Fig. 1 (× about 0.85), 4 – lateral view (× about 0.60)

Fig. 3. Kamień, outcrop 172, Lower Maastrichtian, *B. lanceolata lanceolata* Zone – cf. Pl. XXXVII, Fig. 3; Pl. L, Fig. 1, IG 1,310. II. 435; lateral view (× about 0.70)

PLATE XXXIX

Menuites portlocki portlocki (Sharpe)

Figs. 1 and 4. Janów, outcrop 63, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 441; 1 – frontal view (× about 0.75), 4 – lateral view (× about 0.75)

Figs. 6 and 7. Janów, outcrop 63, Upper Campanian, *B. polyplocum* Zone, IG 1,310. II. 440; 6 – rear view (× about 0.75), 7 – lateral view (× about 0.75)

Figs. 9 and 12. Environs of Janów, Upper Campanian, IG 1,310. II. 21; 9 – rear view (× about 0.70), 12 – lateral view (× about 0.70)

Menuites portlocki posterior subsp. nov.

Figs. 2 and 3. Janów, outcrop 72, Upper Campanian, *Didymoceras donezianum* Zone, IG 1,310. II. 454; 2 – rear view (× about 0.70), 3 – lateral view (× about 0.70)

Figs. 5 and 8. Kolonia Ciszyca – horizon *p*, Upper Campanian, *D. donezianum* Zone, MZ VIII Mc 338; 5 – lateral view (× about 0.75), 8 – rear view (× about 0.75)

Figs. 10 and 11. Janów, outcrop 72, Upper Campanian, *D. donezianum* Zone, IG 1,310. II. 455; 10 – lateral view (× about 0.70), 11 – rear view (× about 0.70)

PLATE XL

Menuites portlocki posterior subsp. nov.

Figs. 1 to 4 and 11. Kolonia Ciszyca, outcrop 48, Upper Campanian, *Didymoceras donezianum* Zone, holotype, IG 1,310. II. 22; 1 – lateral view of an earlier part of the coil in Fig. 11 (× about 0.70), 2 – frontal view of the coil in Fig. 4 (× about 0.75), 3 – rear view of the coil in Fig. 4 (× about 0.75), 4 – lateral view of an earlier part of the coil in Fig. 1 (× about 0.75), 11 – lateral view (× about 0.70)

Figs. 9 and 10. Kolonia Ciszyca – horizon *p*, Upper Campanian, *D. donezianum* Zone, IG 1,310. II. 453; 9 – lateral view (× about 0.65), 10 – frontal view (× about 0.65)

Menuites portlocki portlocki (Sharpe)

Figs. 5 and 6. Janów, outcrop 99, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 443; 5 – lateral view (× about 0.75), 6 – rear view (× about 0.75)

Menuites portlocki portlocki (?) (Sharpe)

Figs. 7 and 8. Janów, outcrop 81, Upper Campanian, *B. polyplocum* Zone, IG 1,310. II. 442; 7 – frontal view (× about 0.70), 8 – lateral view (× about 0.75)

PLATE XLI

Menuites portlocki posterior subsp. nov.

Figs. 1 and 2. Ciszyca (in general), Upper Campanian, *Didymoceras donezianum* Zone, MZ VIII Mc 406; 1 – frontal view (× about 0.75), 2 – lateral view (× about 0.70)

Figs. 3 and 5. Ciszyca (in general), Upper Campanian, *D. donezianum* Zone, MZ VIII Mc 428; 3 – lateral view (× about 0.75), 5 – rear view (× about 0.80)

Figs. 4 and 6. Kolonia Ciszyca, outcrop 49, Upper Campanian, *D. donezianum* Zone, IG 1,310. II. 445. 4 – lateral view (× about 0.70), 6 – rear view (× about 0.70)

PLATE XLII

Anapachydiscus wittekindi (?) (Schlüter)

Figs. 1 and 2. Basonia east, outcrop 47, Upper Campanian, *Bostrychoceras polyplocum* Zone, an earlier part of the coil in Pl. XLIII, Fig. 2, IG 889. II. 72; 1 – frontal view (× about 0.75), 2 – lateral view (× about 0.75)

Anapachydiscus vistulensis sp. nov.

Figs. 3 and 4. Janów, outcrop 60, Upper Campanian, *B. polyplocum* Zone, holotype, IG 1,310. II. 20; 3 – frontal view (× about 0.70), 4 – lateral view (× about 0.75)

PLATE XLIII

Anapachydiscus vistulensis sp. nov.

Figs. 1 and 3. Janów, outcrop 94, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 462; 1 – rear view (× about 0.65), 3 – lateral view (× about 0.70)

Anapachydiscus wittekindi (?) (Schlüter)

Fig. 2. Basonia east, outcrop 47, Upper Campanian, *B. polyplocum* Zone, cf. Pl. XLII, Figs. 1 and 2, IG 889. II. 72; lateral view (× about 0.70)

PLATE XLIV

Anapachydiscus wittekindi (Schlüter)

Figs. 1 to 6. Janów, outcrop 58, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 480; 1 – lateral view of an earlier part of the coil in Fig. 2 (× about 0.70), 2 – lateral view of an earlier part of the coil in Fig. 6 (× about 0.65), 3 – frontal view of the coil in Fig. 1 (× about 0.70), 4 – frontal view of the coil in Fig. 2 (× about 0.65), 5 – frontal view of the coil in Fig. 6 (× about 0.50), 6 – lateral view (× about 0.50)

PLATE XLV

Anapachydiscus wittekindi (Schlüter)

Figs. 1 to 6. Janów, outcrop 58, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 479; 1 – frontal view of the coil in Fig. 3 (× about 0.75), 2 – frontal view of the coil in Fig. 4 (× about 0.75), 3 – lateral view of an earlier part of the coil in Fig. 5 (× about 0.75), 4 – lateral view of an earlier part of the coil in Fig. 3 (× about 0.75), 5 – lateral view (× about 0.70), 6 – frontal view of the coil in Fig. 5 (× about 0.75)

PLATE XLVI

Anapachydiscus wittekindi (Schlüter)

Figs. 1 to 3. Dorotka, outcrop 39, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 465; 1 – frontal view of the coil in Fig. 2 (× about 0.60), 2 – lateral view of an earlier part of the coil in Fig. 3 (× about 0.65), 3 – lateral view (× about 0.45)

PLATE XLVII

Anapachydiscus wittekindi (Schlüter)

Figs. 1 and 2. Janów, outcrop 56, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 478; 1 – frontal view (× about 0.50), 2 – lateral view (× about 0.50)

PLATE XLVIII

Anapachydiscus vistulensis sp. nov.

Figs. 1 and 2. Janów, outcrop 91, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 459; 1 – lateral view (× about 0.70), 2 – rear view (× about 0.70)

Anapachydiscus wittekindi (Schlüter)

Figs. 3 and 4. Janów, outcrop 58, Upper Campanian, *B. polyplocum* Zone, IG 1,310. II. 481; 3 – frontal view (× about 0.50), 4 – lateral view (× about 0.50)

PLATE XLIX

Anapachydiscus wittekindi (Schlüter)

Figs. 1 and 3. Kolonia Ciszyca, outcrop 49, Upper Campanian, *Didymoceras donezianum* Zone, IG 1,310. II. 469; 1 – frontal view (× about 0.30), 3 – lateral view (× about 0.30)

Pachydiscus cf. *oldhami* (Sharpe)

Fig. 2. Kolonia Ciszyca, outcrop 50, Upper Campanian, *D. donezianum* Zone, an earlier part of the coil in Pl. XXXVII, Fig. 4, IG 1,310. II. 395; lateral view (× about 0.85)

PLATE L

Pachydiscus colligatus latiumbilicatus subsp. nov.

Fig. 1. Kamień, outcrop 172, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, an earlier part of the coil in Pl. XXXVIII, Fig. 3, IG 1,310. II. 435; lateral view (× about 1)

Anapachydiscus wittekindi (Schlüter)

Figs. 2 and 3. Kolonia Ciszyca, outcrop 52, Upper Campanian, *Didymoceras donezianum* Zone, an earlier part of the coil in Pl. LIII, Fig. 2, IG 1,310. II. 476; 2 – frontal view (× about 0.35), 3 – lateral view (× about 0.35)

PLATE LI

Anapachydiscus wittekindi (Schlüter)

Fig. 1. Dorotka, outcrop 39, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 466; frontal view of the specimen in Pl. LIII, Fig. 1 (× about 0.30)

Fig. 2. Kolonia Ciszyca, outcrop 50, Upper Campanian, *Didymoceras donezianum* Zone, IG 1,310. II. 473; lateral view (× about 0.35)

PLATE LII

Anapachydiscus wittekindi (Schlüter)

Figs. 1 and 2. Kolonia Ciszyca – horizon *p*, Upper Campanian, *Didymoceras donezianum* Zone, IG 216. II. 1; 1 – rear view (× about 0.20), 2 – lateral view (× about 0.20)

PLATE LIII

Anapachydiscus wittekindi (Schlüter)

Fig. 1. Dorotka, outcrop 39, Upper Campanian, *Bostrychoceras polyplocum* Zone, cf. Pl. LI, Fig. 1, IG 1,310. II. 466; lateral view (× about 0.30)

Fig. 2. Kolonia Ciszyca, outcrop 52, Upper Campanian, *Didymoceras donezianum* Zone, cf. Pl. L, Figs. 2 and 3, IG 1,310. II. 476; lateral view (× about 0.30)

PLATE LIV

Gaudryceras cf. *mite* (Hauer)

Fig. 1. Ciszyca Górna, outcrop 107, Upper Campanian, *Didymoceras donezianum* Zone, a latex cast, IG 1,310. II. 486; lateral view (× about 0.95)

Diplomoceras cylindraceum cylindraceum (Defrance)

Fig. 2. Kazimierz, horizon *x* – upper part, Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone, MZ VIII Mc 530; lateral view (× about 1)

Hauericeras sulcatum (Kner)

Fig. 3. Kludzie – horizon *w*, Lower Maastrichtian, *Belemnella occidentalis* Zone, MZ VIII Mc 521; lateral view (× about 0.95)

Diplomoceras cylindraceum lvoviense (Mikhailov)

Fig. 4. Solec – horizon *v*, Lower Maastrichtian, *B. lanceolata lanceolata* Zone, MZ VIII Mc 1,390; lateral view (× about 1)

Pachydiscus cf. *colligatus latiumbilicatus* subsp. nov.

Fig. 5. Piotrawin, outcrop 1, Upper Campanian, *Nostoceras pozaryskii* Zone, an earlier part of the coil in Pl. LV, Fig. 1, IG 1,310. II. 434; lateral view (× about 0.65)

PLATE LV

Pachydiscus cf. *colligatus latiumbilicatus* subsp. nov.

Fig. 1. Piotrawin, outcrop 1, Upper Campanian, *Nostoceras pozaryskii* Zone, cf. Pl. LIV, Fig. 5, IG 1,310. II. 434; lateral view (× about 0.55)

Neancyloceras sp.

Fig. 2. Sulejów, outcrop 22, Upper Campanian, *Bostrychoceras polyplocum* Zone, IG 1,310. II. 208; lateral view (× about 1.15)

Glyptoxoceras retrorsum (Schlüter)

Figs. 3 to 5. Sulejów, outcrop 13, Lower Campanian, *Gonioteuthis quadrata* Zone, specimens representing one and the same individual, IG 1,310. II. 162; 3 and 4 – lateral views (× about 0.80), 5 – rear view (× about 0.80)

Diplomoceras cylindraceum cylindraceum (Defrance)

Figs. 6 and 7. Kazimierz, outcrop 213, Upper Maastrichtian, *Hoploscaphites constrictus crassus* Zone, specimens representing one and the same individual, IG 1,310. II. 9; 6 and 7 – lateral views (× about 0.55)

PLATE LVI

Pseudokossmaticeras galicianum (Favre)

Figs. 1 and 3. Piotrawin, outcrop 1, Upper Campanian, *Nostoceras pozaryskii* Zone, IG 1,310. II. 370; 1 – lateral view (× about 0.70), 3 – rear view (× about 0.75)

Fig. 2. Dziurków, horizon *u*, Lower Maastrichtian, *Belemnella lanceolata lanceolata* Zone, MZ VIII Mc 697; lateral view (× about 0.75)

Pseudophyllites indra (Forbes)

Figs. 4 and 5. Piotrawin, outcrop 1, Upper Campanian, *N. pozaryskii* Zone, IG 1,310. II. 27; 4 – lateral view (× about 0.70), 5 – frontal view (× about 0.70)