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Goniatites from the Upper Visean (Kielce Syncline, the Holy Cross Mts, Poland)

Here were described 8 taxons of genera: *Bollandites* with *B. kielcensis* sp. n., *Goniatites*, *Girtyoceras* and *Nomismoceras*. These goniatites documented the occurrence of the *G. crenistria* Zone and subzones: *G. crenistria schmidtianus*, *G. crenistria intermedius* and — the first time in the Holy Cross Mts — lower part of the *G. striatus* Zone which was indicated by findings of *G. striatus* (Sowerby) and *G. falcatus* Roemer. The descriptions of specimens of the group *G. crenistria* Phillips from the Holy Cross Mts were revised and current goniatite zonation of the Upper Visean deposits there was discussed.

INTRODUCTION

The studied fauna was collected from the Upper Visean deposits, exposed in trenches during erection of the oncological hospital in Kielce in 1985–1989. The Upper Visean clastic deposits were noticed earlier on this area (H. Żakowa, 1974a). Only goniatites of species *Nomismoceras vittiger* (Phillips) and trilobite *Archegonus (Phillibole)* cf. *apraathensis* R. et E. Richter, found there that time, suggested their Upper Visean age. Farther intensive field works on this area allowed to continue studies and collect more fauna of significant biostratigraphic value (H. Żakowa, J. Malec, 1990).

The goniatites, described here, were found in 3 trenches — I, IVa (southern and northern parts) and IVb (samples 1, 4, profile 3). In the first trench goniatites occurred in ferriferous concretions, about 15 cm in diameter (sample 4) and in dark- -grey claystones and claylates (sample 13). Specimens from the trenches IVa and IVb were

found only within claystones and clayslates (H. Żakowa, J. Malec, 1992; fig. 1 — area b).

Also other, less preserved fragments of goniatites were collected from the Upper Visean deposits but they were fixed to species, genus or described in general as *Goniatitidae* (*l.c.*, Tab. 2). Other representatives of molluscs as: *Gastropoda*, *Bivalvia*, *Nautiloidea*, *Calypptomatida*, *Coleolidae*, besides rare *Brachiopoda*, *Trilobita*, detritus of *Crinoidea*, radiolaria, ostracods and locally micro- and macroflora accompanied this goniatite assemblage.

The goniatite collection (cat. no. OS-199) was saved in the Oddział Świętokrzyski, Państwowy Instytut Geologiczny in Kielce. Author thanks Mr Mieczysław Studencki for specimens photos and Mrs Hanna Stec for drawing of figures.

SYSTEMATIC PART

Applied here terminology of morphological features, ornamentation and individual shell dimensions (symbols in tabels, "x" means reconstructed data correspond to ones used in works of M. Gordon Jr. (1964) and H. Żakowa (1971, 1974b).

Subfamily Muensteroceratinae Gordon, 1964

Genus *Bollandites* Bisat, 1952

Bollandites kielcensis sp. n.

(Fig. 1A; Pl. I, Fig. 1a-c)

Holotypus: OS-199/3; Fig. 1A, Pl. I, Fig. 1a-c.

Paratypus: OS-199/90-91.

Locus typicus: Kielce, the Holy Cross Mts, Poland.

Stratum typicum: Upper Visean — *Goniatites crenistria* Zone (Goz4 Subzone).

Derivatio nominis: after the name of town Kielce — type locality.

Material: 3 shells (one is slightly crumpled) with suture line and ornamentation traces; specimens come from the trench I — sample 13, trench IVb — sample 4; OS-199/3, OS-199/90-91.

Dimensions of 2 specimens, in mm:

OS-199	D	U	W	H	U/D	W/D	W/H	Specimen
91	12.3	4.2	6.4	4.3	0.34	0.52	1.58	paratypus
3	13.2	4.5	7.5	5.0	0.34	0.57	1.50	holotypus

D i a g n o s i s. Shell thick-discoidal in shape; widely open umbilicus with relatively acute edge; width of umbilicus equal 1/3 of shell diameter. Venter sufficiently broad, gently rounded; sides of shell flat and parallel; on whole surface of last whorl three straight, distinct and deep constrictions; suture line has a comparatively broad ventral lobe with imperceptibly diverged sides in apical part and low median saddle (its height about 1/3 of the length of ventral lobe). First lateral saddle well rounded

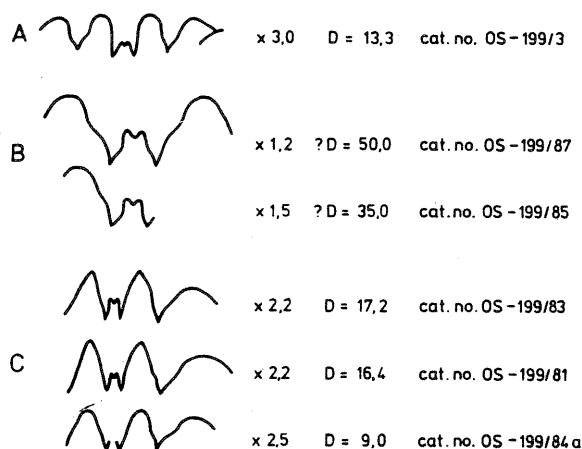


Fig. 1. Suture lines: A — *Bollandites kielcensis* sp. n., B — *Giryoceas* cf. *moorei* Nicolaus, C — *Goniatites crenistria schmidtianus* Nicolaus

Linie przegrodowe: A — *Bollandites kielcensis* sp. n., B — *Giryoceas* cf. *moorei* Nicolaus, C — *Goniatites crenistria schmidtianus* Nicolaus

but first lateral lobe narrower than ventral lobe, sharply pointed with bent sides; second lateral saddle moderately broad. Nearly straight growth lines visible on venter — non-crenulated, indistinctly marked and arranged not so densely.

R e m a r k s . The morphological features of new species, except of the number of constrictions, are comparable with *Beyrichoceras* sp. (*B. castletonense* Bisat ?), coming from the lowermost Upper Visean of Belgium (G. Delépine, 1940, p. 70, Pl. 3, Figs 21–23; E. Paproth et al., 1983) Outline of growth line and development of constrictions are analogous to ones noted in juvenile specimen *B. aff. sulcatum* Bisat, coming from the *Goniatites crenistria* Zone of the Rheinisch Slate Mountains (H. J. Nicolaus, 1963, p. 120, Pl. 6, Fig. 9). This specimen differs in ratio U/D. *B. kielcensis* sp. n., in its main morphological features, is most similar to taxons of so called "castletonense group" sensu Bisat 1954, that was marked by numbering it to the genus *Ballandites* (W. S. Bisat, 1934, 1952). It differs from other described species of this genus from Western Europe in: course of growth lines, amount and development of constrictions, venter shape, umbilicus width, shape of sides of ventral lobe and of first lateral lobe as well as in its occurrence in other (higher) stratigraphic position.

O c c u r r e n c e . Type locality. Upper Visean — *Goniatites crenistria* Zone (Go α ₂₋₄ subzones).

Subfamily Goniatitinae de Haan, 1825
Genus *Goniatites* de Haan, 1825
Goniatites crenistria intermedius Kobold, 1933
(Pl. II, Figs 4a, b, 5)

- non 1958 *Goniatites intermedius* Kobold; H. Żakowa: p. 121, Tab. 9, Fig. 3.
? 1962 *Goniatites intermedius* Kobold; H. Żakowa, C. Żak: p. 215, Tab. 21, Fig. 1.
1962 *Goniatites crenistria* Phillips; H. Żakowa: p. 390, Tab. 7, Figs 24–25.
1963 *Goniatites crenistria intermedius* Kobold; H. J. Nicolaus: p. 105, Tab. 1, Figs 4–5; Tab. 7, Fig. 1.
e.p. 1966 *Goniatites crenistria* Phillips; H. Żakowa: p. 115, Tab. 19, Fig. 13 (non Fig. 12; Tab. 20, Figs 2, 7).
e.p. 1974b *Goniatites crenistria* Phillips; H. Żakowa: p. 8, Tab. 1, Fig. 7 (non Figs 5–6, text Fig. 3).

M a t e r i a l : 2 specimens — damaged shell and cast of slightly crumpled, incomplete shell with traces of ornamentation; specimens come from the trench I — sample 4 and from trench IVa — southern part; OS-199/2, 6.

D i m e n s i o n s of 2 specimens, in mm:

OS-199	D	U	W	H	U/D	W/D	W/H	Specimen
6	50.0	9.0	—	27.0	0.18	—	—	cast
2a	63.0x	12.6	48.0	32.0	0.20	0.76	1.50	shell

D e s c r i p t i o n . Shell involute, in cross section has nearly square outline, with flat, almost parallel sides. Venter slightly rounded and wide, relatively wide umbilicus with size about 1/5 of shell diameter. Densely arranged, crenulated growth lines, gently curved on the juvenile whorl but distinctly double-bowed on the last one (2 lines for 1 mm), nearby venter, where they form fine lingua and not so deep hyponomic sinus; spiral lines marked nearby umbilicus and close to lingua.

R e m a r k s . The morphological features and ratio U/D similar to noticed for specimens from Germany but curvature of growth line on the specimens from Kielce is less intensive (particularly hyponomic sinus) and spiral lines are more distinct nearby umbilicus. More detail comparison with the specimens of subspecies from Bohemia (O. Kumpera, 1972, 1975, 1977) is unable due to lack of their descriptions. As it was indicated in synonymy (H. Żakowa, 1962) only illustrated specimens from the Łagów Syncline corresponded to features of subspecies due their ratio U/D, shape and ornamentation. Other specimens from Lechówek, fixed as *Goniatites crenistria* Phillips, are less preserved and their more detail description are impossible. Such situation refers to the specimens from the Sudetes (H. Żakowa, 1966); the features of only two specimens from Jugów are similar to those ones, characterized described subspecies. Author agrees with opinion that *G. concentricus* Hodson et Moore differs from so called late form of *G. crenistria* Phillips (W. S. Bisat, 1952; F. Hodson, E. W. J. Moore, 1959). More detail comparisons of studied material with the last "form" as well as with specimens of *G. crenistria dinckleyense* Bisat (? synonym of here discussed subspecies) were impossible due to various size and preservation of specimens from England (W. S. Bisat, 1928) and Poland. Similar reasons, beside of nomenclature doubts, unable to precise by author if is possible identification of *G. concentricus* Hodson et Moore with specimens of subspecies creator.

O c c u r r e n c e . Upper Viséan: Poland — the Holy Cross Mts (synclines of Kielce, Łągów, Gałęzice), Sudetes (?Kamionki, Jugów — $Go\alpha$ Zone), ?the Fore-Sudetic Monocline (borehole Sułów 1 — $Go\alpha$ Zone, after K. Korejwo, L. Teller, 1967); Germany — Harz, Rheinisch Slate Mountains ($Go\alpha_3$ – $Go\beta_{fa}$ subzones, index for $Go\alpha_4$ Subzone); Tchecho-Slovakia — Niski Jeseník ($Go\alpha_4$ – $Go\beta_{st-fa}$ subzones).

Goniatites crenistria schmidtianus Nicolaus, 1963
(Fig. 1C; Pl. II, Figs 1a, b, 2a, b, 3a–c)

- e.p. 1952 *Goniatites crenistria* Phillips; W. S. Bisat: p. 173, Tab. 1, Figs 5, 6 (non Fig. 4).
1963 *Goniatites crenistria schmidtianus* Nicolaus; H. J. Nicolaus: p. 103, Tab. 1, Fig. 2; Tab. 4, Figs 4–6, text Figs 27–29, 30b, 31.
1973 *Goniatites crenistria* Phillips; S. Czarniecki: p. 352, Tab. 23, Figs 1–3, text Fig. 3/1.
e. p. 1974b *Goniatites crenistria* Phillips; H. Żakowa: p. 8, Tab. 1, Fig. 5, 6 (non Fig. 7), text Fig. 3.

M a t e r i a l : 8 specimens — 2 shells (complete and damaged), 3 moulds with suture line and 3 incomplete imprints with ornamentation traces; specimens are from the trench IVb — sample 4; OS-199/81–84, OS-199/94.

D i m e n s i o n s of 4 specimens, in mm:

OS-199	D	U	W	H	U/D	W/D	W/H	Specimen
81	16.4	1.4	17.9	8.7	0.09	1.09	2.06	shell
83	17.2	1.6	18.6	9.6	0.09	1.08	1.94	mould
82	23.4	1.8	22.2	12.8	0.08	0.95	1.73	mould
94a	37.0x	5.6	24.0	18.0	0.15?	0.64?	1.33	mould

D e s c r i p t i o n . Juvenile shell globose, during growth it becomes slightly flattened (subglobose to thick-discoidal), involute, with narrow umbilicus of width 1/10–1/15 of shell diameter. Venter well rounded, distinctly broad, by D under 20 mm, narrowing for the larger specimens and passing into slightly convex shell sides: 6 constrictions (remoted each from other for about 35°), marked on the whole whorl, slightly bent on venter and sides. In suture line sharply cutted and relatively broad lateral lobe with divergent sides low median saddle in ventral lobe lateral saddle, sharply pointed during shell growth. On the largest specimens crenulated growth lines (15–20 for 5 mm), straight on venter, slightly curved on the shell sides, by D = 37.0 mm but more curved on the larger forms.

R e m a r k s . Variability of shell shape, particularly its width of venter and umbilicus, locates within interval, noticed by the creator of this subspecies. The gerontic specimens from Kielce have wider umbilicus and are more flattened (less globose). From the gerontic specimens of *Goniatites crenistria crenistria* Phillips they differ with: more constrictions, condensing of growth lines and their straight outline on venter as well as with umbilicus widening. The suture line is similar to ones, visible on specimens of comparable shell diameter, illustrated by W. S. Bisat (1952) and H. Żakowa (1974b). S. Czarniecki (1973) noticed the concordance of diagnostic features of his specimens with discussed subspecies but he misunderstood opinion of the taxon creator. The first

author indicated that so called early form of *G. crenistria* Phillips was the juvenile stage of this species but not — as is known — the individual, independent form, characteristic for older beds. It seems that the W/D ratios of specimens, collected by S. Czarniecki, suggest more intense flattening of them. Lack of descriptions and very bad illustrations unable their comparison with specimens of *G. crenistria schmidtianus* Nicolaus from Bohemia (O. Kumpera, 1972).

O c c u r r e n c e . Upper Visean: Poland — the Holy Cross Mts (synclines of: Kielce, Gałęzice); England B₂ Subzone; Germany — Rheinisch Slate Mountains (Go α ₁₋₂ subzones, index for Go α ₂ Subzone); Tchecho-Slovakia — Niski Jeseník (Go α ₂₋₃ subzones).

Goniatites falcatus Roemer, 1850*

(Pl. I, Fig. 7a, b)

1959 *Goniatites falcatus* Roemer; F. Hodson, E. W. J. Moore: p. 392, Tab. 65, Fig. 5; Tab. 68, Fig. 3; Tab. 69, Fig. 1-6.

1979 *Goniatites striatus falcatus* Roemer; K. Bojkowski: p. 49, Tab. 4, Figs 4, 5.

M a t e r i a l : 3 specimens — fragments of imprints and casts of whorls with ornamentation; they are from the trench IVa — northern part; OS-199/31.

D i m e n s i o n s in mm: H? is between 30-40.

R e m a r k s . In ornamentation the double-bowed rib-like growth lines with relatively deep hyponomic sinus; between them distinct spiral lines visible on the whole whorl.

O c c u r r e n c e . Upper Visean: Poland — the Holy Cross Mts (Kielce Syncline), Sudetes (Wałbrzych, Konradów — Go β _{st-fa} subzones, H. Żakowa, 1966), Miechów Trough (K. Korejwo, L. Teller, 1968), Upper Silesian Coal Basin, Lublin Coal Basin (K. Bojkowski, 1966; A. M. Żelichowski, 1972); Germany — Harz, Rheinisch Slate Mountains (Go β _{fa-el} subzones); Ireland, England (P1b Subzone); ?Belgium, ?Marocco, Tchecho-Slovakia — Niski Jeseník (Go β _{st-el} subzones, O. Kumpera, 1977).

Goniatites striatus (Sowerby, 1814)*

(Pl. I, Fig. 6)

1959 *Goniatites striatus* (Sowerby); F. Hodson, E. W. J. Moore: p. 388, Tab. 65, Figs 1-3.

1979 *Goniatites striatus* (Sowerby); K. Bojkowski: p. 49, Tab. 9, Figs 4, 5.

M a t e r i a l : 13 specimens — casts and imprints of flattened and incomplete shells and fragments of last whorls with ornamentation; specimens are from the trench IVa — northern part; OS-199/22, 28, 37, 38, 40, 43.

D i m e n s i o n s in mm: H? about 40.

*According to D. Korn (1988, Geol. Paläont. Westf., 11). These taxons belong now to genera *Amsbergites* and *Paraglyptioceras*.

R e m a r k s . Densely arranged spiral lines cover whole side without traces of rib-like growth lines or growth lines.

O c c u r r e n c e . Upper Viséan: Poland — the Holy Cross Mts (Kielce Syncline), Sudetes (Wałbrzych, Konradów — $Go\beta_{st-fa}$ subzones, H. Żakowa, 1966), Miechów Trough (K. Korejwo, L. Teller, 1968), Upper Silesian Coal Basin; Germany — Harz, Rheinisch Slate Mountains ($Go\beta_{st-el}$ subzones); Ireland, England (P1b Subzone); Belgium, Marocco, Tchecho-Slovakia — Niski Jeseník ($Go\beta_{st-fa}$ subzones, O. Kumpéra, 1977).

Subfamily Girtyoceratinae Wedekind, 1918

Genus *Girtyoceras* Wedekind, 1918

***Girtyoceras* cf. *moorei* Nicolaus, 1963**

(Fig. 1B; Pl. I, Figs 2, 3a, b)

M a t e r i a l : 8 specimens — 7 fragments of last whorls with suture line or ornamentation and 1 slightly damaged mould; they are from the trench IVb, sample 4; OS-199/85-89.

D i m e n s i o n s of 3 specimens, in mm:

OS-199	Dx	U	W	H	U/D	W/D	W/h
89	33.0	5.0	14.0	17.5	0.15?	0.42?	0.80
86	35.0	—	13.5x	22.0	—	0.38?	0.61?
87	50.0	—	21.5	—	—	0.43?	—

D e s c r i p t i o n . Shell subdiscoidal in shape, with parallel, flat flanks and narrow, semicircular rounded venter and narrow umbilicus (about 1/15 of shell diameter); in suture line very broad ventral lobe with highly diverging sides. First lateral saddle with wide base but later tongue-like narrowing, in its apical part rounded; median saddle with height up to 1/2 of length of ventral lobe and its sides oblique but later straight, parallel, ended with gentle curvature of apex. Growth lines subtly crenulated in ventrolateral part where is visible distinct lingua passing into deep hyponomic sinus on venter; these line on whorl sides are gently sigmoidally bent; traces of spiral lines on ventrolateral area.

R e m a r k s . Bad preservation stage and doubtful value of specimens dimensions unfavoured their determination. The described features of our specimens are most similar to ones of the species *Girtyoceras moorei* Nicolaus, known from the *Goniatites crenistria* Zone (may be also from lower part of the *G. striatus* Zone) from Rheinisch Slate Mountains (H. J. Nicolaus, 1963, p. 121, Pl. 1, Figs 7-8; Pl. 2, Figs 1, 5; Pl. 7, Fig. 5). There are similarities in development of growth lines, shell shape and ratio U/D but are noticed differences in outline of suture line and — particularly — in structure of medium saddle, which could result from the fact that the specimens from Kielce represent so called "stadium discus". The descriptions of the species creator contain no informations about suture line of this stadium but data about the ornamentation are quite similar to those ones, found on the specimens from Kielce.

O c c u r r e n c e . Upper Visean: Poland — Holy Cross Mts (Kielce Syncline).

Girtyoceras premeslerianum Moore, 1946
(Pl. I, Fig. 5a–c)

1946 *Girtyoceras premeslerianum* Moore; E. W. J. Moore: p. 401, Tab. 25, Fig. 4; Tab. 26, Fig. 6; text — Fig. 10.

1973 *Girtyoceras* sp.; S. Czarniecki: p. 236, Tab. 23, Fig. 4.

M a t e r i a l : 2 specimens — 1 shell with ornamentation and 1 mould; they are from the trench IVb — sample 4; OS-199/92–93.

D i m e n s i o n s of 2 specimens, in mm:

OS-199	D	U	W	H	U/D	W/D	W/H	Specimen
92	11.0	2.2	5.6	6.1	0.20	0.56	0.92	shell
93	22.0	4.0	11.4	11.6	0.18	0.52	0.98	mould

D e s c r i p t i o n . Shell rather of thick-discoidal shape, involute, with broad umbilicus, having blunt edge (umbilicus width equal to 1/5 of shell diameter). Venter rounded and rounded its transition into shell sides, which are slightly bowed. Three constrictions on sides and venter, marked already from umbilicus edge and located one from other for about 50–60°. Growth lines straight, their density on the ventro-lateral part of shell: 7 on 1 mm.

R e m a r k s . Outline of growth line of juvenile specimen corresponds to data of the creator for the specimens with similar shell diameter, which however characterize more broad umbilicus. The larger specimen has wider venter than the specimens from England with shell diameter over 20 mm. Despite of unpreserved suture line the morphological and ornamentation features of the specimens from Kielce correspond with the species features, as was also concerned for the specimens from Gałęzice (S. Czarniecki, 1973).

O c c u r r e n c e . Upper Visean: Poland — Holy Cross Mts (synclines of: Kielce and Gałęzice); England (P1a Subzone).

Subfamily *Nomismoceratinae* Ruzhencev, 1957
Genus *Nomismoceras* Hyatt, 1884
Nomismoceras vittiger (Phillips)
(Pl. I, Fig. 4; Pl. II, Figs 6, 7)

1963 *Nomismoceras vittiger* (Phillips); H. J. Nicolaus: p. 128, Tab. 2, Fig. 13; Tab. 3, Fig. 1–4; Tab. 7, Fig. 6–7.

1974b *Nomismoceras vittiger* (Phillips); H. Żakowa: p. 19, Tab. 1, Fig. 4; Tab. 3, Fig. 2.

1979 *Nomismoceras vittiger* (Phillips); K. Bojkowski: p. 30, Tab. 3, Fig. 1.

M a t e r i a l: 83 specimens — casts and imprints, mainly of complete shells, with traces of ornamentation, sometimes flattened; specimens are from the trenches: I — sample 13; IVb — sample 1, profile 3; IVa — southern and northern parts; OS-199/5, 7, 10-13, 15, 17-25, 27, 29, 32-37, 41, 43, 45-47, 52, 56, 68-71.

D i m e n s i o n s in mm: D up to 10.

R e m a r k s. All gerontic specimens have on the last whorl a distinct marginal keel but sometimes also slightly undulated growth lines.

O c c u r r e n c e. Lower Visean: Germany — Rheinisch Slate Mountains; France, Belgium. Upper Visean: Poland — the Holy Cross Mts (synclines of: Kielce, Gałęzice, Radlin, Miedziana Góra, Łagów, Piotrów), Sudetes (Walbrzych, Konradów, Glinno, Kamionki, Sokolec, Jugów — $Go\alpha$ Zone and $Go\beta_{st-fa}$ subzones, H. Żakowa, 1966), Miechów Trough (J. Kicuła, H. Żakowa, 1972), Fore-Sudetic Monocline (K. Korejwo, L. Teller, 1967), Upper Silesian Coal Basin with its margin, Carpathians Foreland (J. Kicuła, H. Żakowa, 1972); Germany — Rheinisch Slate Mountains (Peł, $Go\alpha$, $Go\beta$ zones); England (B₂, P1a subzones), Tchecho-Slovakia — Niski Jeseník ($Go\alpha_{2-4}$, $Go\beta_{st-el}$ subzones, O. Kumpéra, 1977), ?Marocco.

BIOSTRATIGRAPHICAL REMARKS

Most of described here taxons confirmed surely the occurrence of the Upper Visean deposits in studied trenches. Among index forms are: *Goniatites crenistria intermedius* Kobold, *G. crenistria schmidtianus* Nicolaus, *G. falcatus* Roemer, *G. striatus* (Sowerby), *Girtyoceras premeslerianum* Moore and — due to co-occurrence with mentioned species — *Nomismoceras vittiger* (Phillips) and *Bollandites kielcensis* sp. n. Parallely these described taxons document firstly the units of goniatite division (6 units in general but of varied range, Fig. 2), up till now not distinguished in the Upper Visean of the Kielce Syncline.

The *Goniatites crenistria* Zone was discerned due finding of two subspecies from the group *G. crenistria* Phillips, *Girtyoceras premeslerianum* and of specimen very similar to typical species of this zone. After author the occurrence of $Go\alpha_2$ and $Go\alpha_4$ subzones documented with index taxons, is undoubtful. The overlaid *G. striatus* Zone, is defined by: *G. striatus* (Sowerby), *G. falcatus* Roemer and *G. cf. falcatus* Roemer, which forms restricted vertical range of this zone to its lower part. Occurrence continuity of these units, their boundaries and thickness as well as existence of other subzones are still undisolved problem. The reasons of such situation are; the stratigraphic documentation regards often the point samples, accidental location of trenches (there outcropped the fragments of discussed units) but firstly — the tectonic disturbances, complicated the geological structure of studied area (H. Żakowa, J. Malec, 1992, Tab. 2, Fig. 3, 4).

In the trench I, in bottom of anticlinally bent layers occurs *Goniatites crenistria intermedius* Kobold (sample 4) but in the upper part (sample 13) also *G. cf. crenistria crenistria* Phillips. It was stated that interval, limited with these samples (11.6 m thick), corresponds to the $Go\alpha_4$ Subzone. It is possible that lowerlaid clastic deposits (2.2 m thick) and another ones exposed in the trench top (about 4.0 m) belong to it. Only fragment of this subzone deposits was noticed in the southern part of trench IVa, where *G. crenistria intermedius* Kobold was found in lowermost claystone bed of about

3.0 m thick. In laying higher clastic deposits (northern part of the trench), exposed on a distance of 37.5 m (their thickness is 19.6 m) the undoubtful indicators of *G. striatus* Zone were noted not till in the upper part of profile. It is sure that the sample 4 from the trench IVb comes from lower part of *G. crenistria* Zone. *G. crenistria schmidtianus* Nicolaus (accompanied by *Girtyoceras premeslerianum* Moore), found there, suggests to distinguish the $Go\alpha_2$ Subzone of undefined thickness. Fauna from neighbouring claystones (samples 1, 2) allows to include them in general to *G. crenistria* Zone. The age criterions of claystones, cutted by transversal dislocation and exposed far to north on a distance of several meters in profile 3 of trech IVb, are analogous. There were found *Prolecanites* cf. *serpentinus* (Phillips) and index trilobites for the $Go\alpha$ Zone. From higher laying, steeply inclined claystones in the same profile

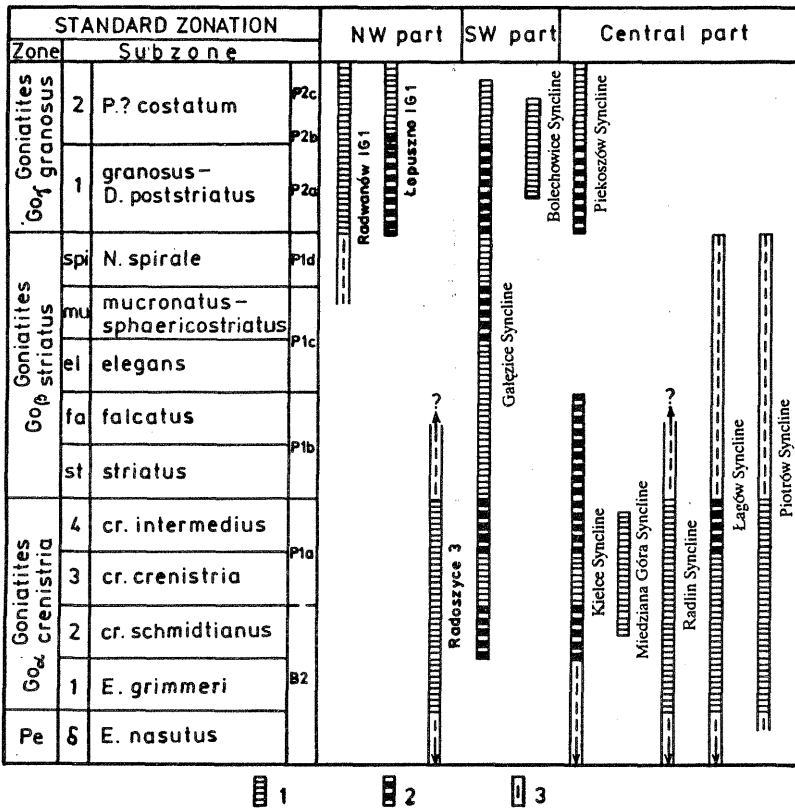


Fig. 2. Goniatite biostratigraphy of the Upper Visean profiles in the Holy Cross Mts (state actual)
 1 — zone generally; 2 — subzone; 3 — probably assigned; P. — *Peytonoceras*, D. — *Dombarites*, N. — *Neoglyphioceras*, E. — *Entogonites*
 Biostratygrafia goniatytowa profilów wizenu górnego w Górach Świętokrzyskich (stan obecny)
 1 — poziom ogólnie; 2 — podpoziom; 3 — przynależność prawdopodobna; P. — *Peytonoceras*, D. — *Dombarites*, N. — *Neoglyphioceras*, E. — *Entogonites*

was noticed *G. cf. falcatus* Roemer that suggests an occurrence there of lower part of the *G. striatus* Zone with estimated thickness up to 9.0 m.

The Upper Viséan deposits are known in central part of the Holy Cross Mts, except of the Kielce Syncline, from area of 5 geological units; from 2 units in SW part and from 3 boreholes in NW part (Fig. 2; H. Żakowa, 1962; 1971, Figs 13, 14; 1989, Figs 1, 2, 6; 1982, Figs 1, 2 — in these works some data about references). The proofs for dating the deposits from boreholes in synclines of Piekoszów and Bolechowice were unchanged. Except of the Radoszyce 3 borehole these deposits belong to the *Goniatites granosus* Zone and to Goy_1 Subzone. The Upper Viséan deposits from synclines of: Miedziana Góra, Radlin i Piotrów have no detail goniatite zonation. The further studies of these profiles are not carried and preservation stage of found there goniatites excludes possibility of more detail specimen description. The deposits of these 3 geological units are included to the *G. crenistria* Zone or — with limitation — to the *G. striatus* one.

The revision goniatite descriptions defines the goniatite zonation of 2 profiles of the Upper Viséan; from the Łągów and Gałęzice synclines. In first of it among specimens generally described as *Goniatites crenistria* Phillips is found an index form of the $Go\alpha_4$ Subzone. The distinguishing of this unit does not change the earlier settled stratigraphic sequence of the Upper Viséan (H. Żakowa, 1962) because *G. crenistria intermedius* Kobold comes from the slates of the test pit II, which belong to the interval included to the *G. crenistria* Zone. Still actual is an opinion that higher laid deposits of the Upper Viséan in the Łągów Syncline are younger and they belong no less than to *G. striatus* Zone. Some suggestions (H. Żakowa, 1974b) about occurrence of index taxons of $Go\alpha_2$ and $Go\alpha_4$ subzones in the Gałęzice Syncline, were confirmed. Both *G. crenistria schmidtianus* Nicolaus and *G. crenistria intermedius* Kobold come from the lower part of series (first one from organodetrirical limestones, second — from carbonate-claystone series from the Gałęzice IG 3 borehole), interpreted lately as submarine gravitational flows (Z. Belka, S. Skompski, 1988). After author opinion *Girtyoceras premeslerianum* Moore, known from Gałęzice, was also found in bottom part of the Upper Viséan profile. Occurrence of other, earlier settled units of goniatite zonation in Gałęzice ($Go\beta_{mu}$, Goy , Goy_1) is still actual.

The current knowledge about the Upper Viséan profiles in the Holy Cross Mts allows to distinguish within them up to 9 units of goniatite division — 3 zones and 6 subzones. Almost all units were found in central and SW part of this region but every profile in the Holy Cross Mts has incomplete stratigraphic sequence (Fig. 2). In whole studied region the bottom subzones ($Pe\delta$, $Go\alpha_1$) were not documented with index fauna. Their equivalents are probably hidden in profiles of no less than 4 geological

units (also in the Radoszyce 3 borehole?), where the continuity of sedimentation from Middle to Upper Visean is supposed.

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Halina ŻAKOWA

GONIATYTY GÓRNEGO WIZENU SYNKLINY KIELCECKIEJ (GÓRY ŚWIĘTOKRZYSKIE)

Streszczenie

Intensyfikacja prac ziemnych w latach 1985–1989 na terenie budowy szpitala onkologicznego w Kielcach umożliwiła zebranie dużej ilości fauny w tym — nieznanych z synkliny kieleckiej, ważnych dla biostratygrafii — goniatytów. Pochodzą one z 3 przekopów zlokalizowanych w jądrowej części synkliny, tzn. z przekopu I (próbki 4, 13), przekopu IVa i przekopu IVb (próbki 1, 4, profil 3). Okazy zebrano, z wyjątkiem próbki 4 z przekopu I (konkrekcje żelaziste) z ciemnoszarych ilowców i iłupków. Goniatytom towarzyszą inne mięczaki, nieliczne ramienionogi, trylobity, detrytus liliowców, mikrofauna, mikro- i makroflora (H. Żakowa, J. Malec, 1992, fig. 1 — obszar badań b; fig. 3–4, tab.2).

Opisano 8 taksonów z rodzajów: *Bollandites* w tym *B. kielcensis* sp. n., *Goniatites*, *Girtyoceras* i *Nomismoceras* (tabl. I–II). Okazy zachowały się jako muszle, ośrodki, odlewy i odciski, często z linią przegrodową (fig. 1) i rzeźbą. Większość taksonów potwierdza niezbitcie występowanie wizenu górnego, co już sygnalizowano na podstawie obecności *Nomismoceras viutiger* (Phillips) i trylobita — *Archegeonus (Phillibole)* cf. *apraathensis* R. et E. Richter (H. Żakowa, 1974a). Obecnie znalezione taksony wyznaczają w syklinie kieleckiej ogółem sześć różnej rangi jednostek w podziale goniatytowym i po raz pierwszy w Górach Świętokrzyskich poziom *Goniatites striatus* (fig. 2). Granice i miąższości jednostek, jak i występowanie innych poziomów i podpoziomów pozostają problemem otwartym. Uzasadniają to: dokumentacja stratygraficzna (często punktowe znaleziska), lokalizacja przekopów (odsłonięte na ogół fragmenty jednostek biostratygraficznych) i zaburzenia tektoniczne obszaru badań.

Poziom *Goniatites crenistria* stwierdzono na podstawie dwóch podgatunków z grupy *G. crenistria* Phillips, *Girtyoceras premerlerianum* Moore i *G. cf. crenistria crenistria* Phillips. Występuje on w przekopach: I, IVa

(część południowa) i IVb (próbki 1, 2, 4, część profilu 3). W opinii autorki wyraźnie zaznaczają się, wskazane taksonami przewodnimi, podpoziomy Go α 2 (przekop IVb — próbka 4) i Go α 4 (przekop I, południowa część przekopu IVa).

Poziom nadległy — *Goniatites striatus* — definiują: *G. striatus* (Sowerby), *G. falcaus* Roemer i *G. cf. falcaus* Roemer, które zawężają zasięg pionowy poziomu do dolnej jego części. Występuje ona w północnej części przekopu IVa i w profilu 3 (część) przekopu IVb.

Rewizja oznaczeń okazów świetokrzyskich z grupy *Goniatites crenistria* Phillips uściśla zonację goniatytową wżenu górnego w synklinie łagowskiej i gałęzickiej. W pierwszej obecność *G. crenistria intermedius* Kobold wyznacza podpoziom Go α 4, co nie zakłóca ustalonej już sekwencji stratygraficznej profilu (H. Żakowa, 1962). Potwierdzono wcześniejsze sugestie (H. Żakowa, 1974b) o występowaniu w Gałęzicach taksonów indeksowych podpoziomów Go α 2 i Go α 4, które znaleziono w niższej części wapieni organodetrytycznych i serii wapienno-iłowcowej w otworze Gałęzice IG 3. Aktualne jest występowanie w Gałęzicach innych, już opisanych jednostek zonacji goniatytowej (Go β _{mu}, Goy, Goy₁), co dotyczy również profili wżenu górnego w pozostałych jednostkach geologicznych oraz w otworach wiertniczych (fig. 2). Tak więc stan rozpoznania wszystkich profili wżenu górnego w regionie świetokrzyskim, mimo że każdy z nich nie przedstawia pełnej sekwencji stratygraficznej, pozwala na zaliczenie tych osadów ogółem do 9 jednostek podziału goniatytowego — 3 poziomów i 6 podpoziomów. W całym regionie spągowe podpoziomy wżenu górnego — Pe δ , Go α 1 nie są udowodnione fauną przewodnią.

PLATE I

Fig. 1a–c. *Bollandites kielcensis* sp. n.

Holotype, shell, OS–199/3, trench I, — sample 13: a, c — sides, b — venter; a, b — 3x, c — 4x; Go α 4 Subzone
Holotyp, muszla, przekop I — próbka 13: a, c — boki, b — strona brzuszna; a, b — x3, c — x4; podpoziom Go α 4

Fig. 2. *Girtyoceras cf. moorei* Nicolaus

Fragment of a whorl — side view, OS–199/86, trench IVb, sample 4; ca x1.9; Go α 2 Subzone

Fragment skrzętu z boku, przekop IVb — próbka 4; ok. 1,9x; podpoziom Go α 2

Fig. 3a, b. *Girtyoceras cf. moorei* Nicolaus

Fragments of two whorls — side view, trench IV b — sample 4: a — OS–199/87, ca x2, b — OS–199/85, 1.5x; Go α 2 Subzone

Fragmenty dwóch skrzętów z boku, przekop IVb — próbka 4: a — ok. 2x, b — 1,5x; podpoziom Go α 2

Fig. 4. *Nomismoceras vittiger* (Phillips)

Imprint of shell — side view, OS–199/7a, trench IVa — southern part, x3; Go α 4 Subzone

Odcisk muszli z boku, przekop IVa — część południowa, 3x; podpoziom Go α 4

Fig. 5a–c. *Girtyoceras premeslerianum* Moore

Shell, OS–199/92, trench IVb — sample 4: a, b — sides, c — venter, ca x2.7; Go α 2 Subzone

Muszla, przekop IV b — próbka 4: a, b — boki, c — strona brzuszna, ok. 2,7x; podpoziom Go α 2

Fig. 6. *Goniatites striatus* (Sowerby)

Crushed cast of a whorl — side view, OS–199/28a, trench IVa — northern part, natural size; Go β _{st-fa} subzones

Zgnieciony odlew skrzętu z boku, przekop IVa — część północna, wielkość naturalna; podpoziomy Go β _{st-fa}

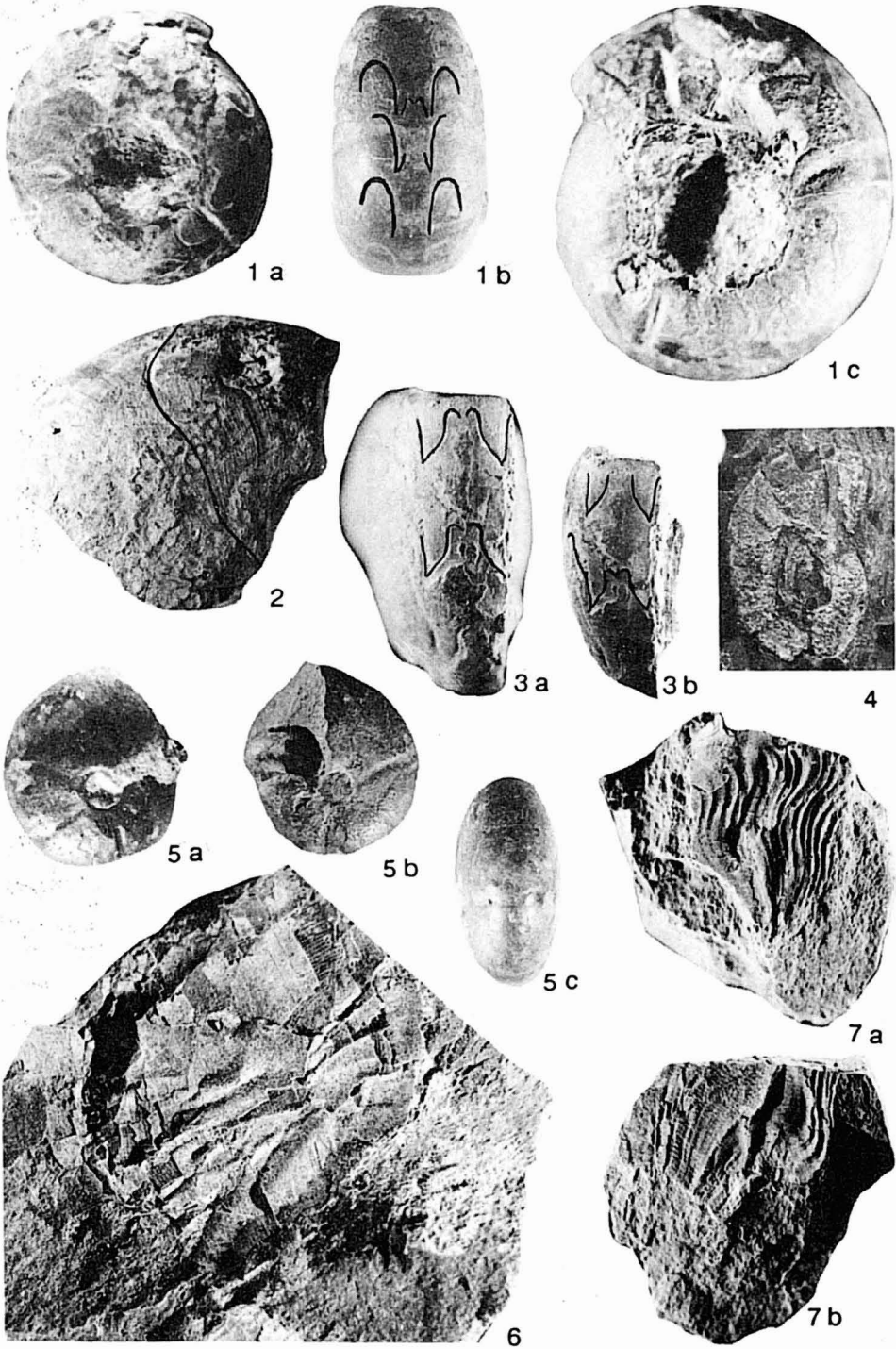
Fig. 7a, b. *Goniatites falcaus* Roemer

Fragments of two whorl imprints — side view, OS–199/31a–b, trench IVa — northern part, natural size; Go β _{st-fa} subzones

Fragmenty dwóch odcisków skrzętów z boku, przekop IVa — część północna, wielkość naturalna; podpoziomy Go β _{st-fa}

All the specimens illustrated on Plates I–II come from the Upper Viséan deposits (H. Żakowa, J. Malec, 1992, Fig. 1 — b area)

Wszystkie okazy ilustrowane na tabl. I–II pochodzą z utworów wżenu górnego (H. Żakowa, J. Malec, 1992, fig. 1 — obszar badań b)



Halina ŻAKOWA — Goniatites from the Upper Visean (Kielce Syncline, The Holy Cross Mts, Poland)

PLATE II

Fig. 1a, b. *Goniatites crenistria schmidtianus* Nicolaus

Shell, OS-199/81, trench IVb — sample 4: a — side, ca x 2.5, b — venter, ca x 2.2; Go α ₂ Subzone
Muszla, przekop IVb — próbka 4: a — bok, ok. 2,5 x, b — strona brzuszna, ok. 2,2 x; podpoziom Go α ₂

Fig. 2a, b. *Goniatites crenistria schmidtianus* Nicolaus

Damaged mould, OS-199/94a, trench IVb — sample 4: a — side, b — venter, ca x 1.3; Go α ₂ Subzone
Uszkodzona ośródkka, przekop IVb — próbka 4: a — bok, b — strona brzuszna; ok. 1,3 x; podpoziom Go α ₂

Fig. 3a-c. *Goniatites crenistria schmidtianus* Nicolaus

Mould, OS-199/83, trench IVb — sample 4: a, b — venter, c — side, ca x 2.2; Go α ₂ Subzone
Ośródkka, przekop IVb — próbka 4: a, b — strony brzuszne, c — bok; ok. 2,2 x; podpoziom Go α ₂

Fig. 4a, b. *Goniatites crenistria intermedius* Kobold

Damaged shell, OS-199/2a-b, trench I — sample 4: a — side, b — venter, ca natural size; Go α ₄ Subzone
Uszkodzona muszla, przekop I — próbka 4: a — bok, b — strona brzuszna, ok. wielkość naturalna; podpoziom Go α ₄

Fig. 5. *Goniatites crenistria intermedius* Kobold

Cast of an incomplete and slightly crushed shell — side view, OS-199/6, trench IVa — southern part; ca x 1.2; Go α ₄ Subzone

Odlew niekompletnej i nieco zgniecionej muszli z boku, przekop IVa — część południowa, ok. 1,2 x; podpoziom Go α ₄

Fig. 6. *Nomismoceras vittiger* (Phillips)

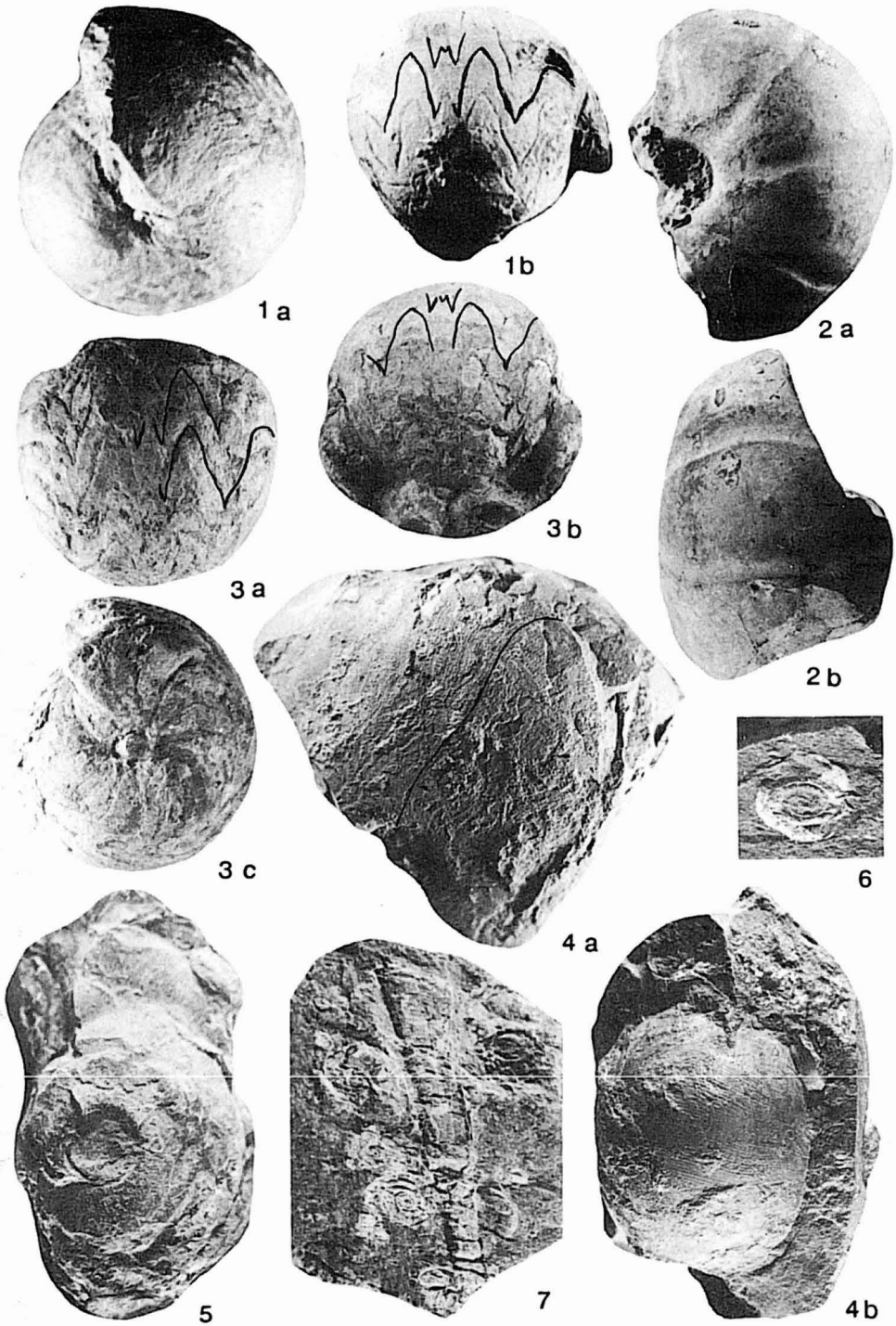
Cast, OS-199/7b, trench IVa — southern part, x 4; Go α ₄ Subzone

Odlew, przekop IVa — część południowa, 4 x; podpoziom Go α ₄

Fig. 7. *Nomismoceras vittiger* (Phillips), *Coleolus sturi* (v. Klebelsberg)

Casts of shells, OS-199/20a, trench IVa — northern part, natural size; Go β _{st-fa} subzones

Odlewy muszli, przekop IVa — część północna, wielkość naturalna; podpoziomy Go β _{st-fa}



Halina ŻAKOWA — Goniatites from the Upper Viséan (Kielce Syncline, The Holy Cross Mts, Poland)