Halina ŻAKOWA

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

Here were described 8 taxons of genera: Bollandites with B. kielensis sp. n., Goniatites, Girtyoceras and Nomismoceras. These goniatites documented the occurrence of the G. crenisria Zone and subzones: G. crenisria schmidtianus, G. crenisria 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. falcanus Roemer. The descriptions of specimens of the group G. crenisria 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 (Philibole) cf. aprathensis 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 clayslates (sample 13). Specimens from the trenches IVa and IVb were
found only within claystones and clayslates (H. Žakowa, 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 (Lc, Tab. 2). Other representatives of molluscs as: Gastropoda, Bivalvia, Nautiloidea, Calyptopomatida, 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 tables, "x" means reconstructed data correspond to ones used in works of M. Gordon Jr. (1964) and H. Žakowa (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.
Locus typicus: Kielce, the Holy Cross Mts, Poland.
Stratum typicum: Upper Visean — Goniatites crenisaria Zone (Goa4 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:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>OS-199</th>
<th>D</th>
<th>U</th>
<th>W</th>
<th>H</th>
<th>U/D</th>
<th>W/D</th>
<th>W/H</th>
</tr>
</thead>
<tbody>
<tr>
<td>paratypus</td>
<td>91</td>
<td>12.3</td>
<td>4.2</td>
<td>6.4</td>
<td>4.3</td>
<td>0.34</td>
<td>0.52</td>
<td>1.58</td>
</tr>
<tr>
<td>holotypus</td>
<td>3</td>
<td>13.2</td>
<td>4.5</td>
<td>7.5</td>
<td>5.0</td>
<td>0.34</td>
<td>0.57</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Diagnosis. 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
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.

Remarks. 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. sulphatum Bisat, coming from the Goniatites crenistria Zone of the Rheinish 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.

Occurrence. Type locality. Upper Visean — Goniatites crenistria Zone (Goc2-4 subzones).

Fig. 1. Suture lines: A — Bollandites kielcensis sp. n., B — Girtyoceras cf. moorei Nicolaus, C — Goniatites crenistria schmidtianus Nicolaus
Linie przegrodowe: A — Bollandites kielcensis sp. n., B — Girtyoceras cf. moorei Nicolaus, C — Goniatites crenistria schmidtianus Nicolaus
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. Žakowa: p. 121, Tab. 9, Fig. 3.
7 1962 Goniatites intermedius Kobold; H. Zakowa, C. Zak: p. 215, Tab. 21, Fig. 1.
1966 Goniatites crenistria Phillips; H. Žakowa: p. 115, Tab. 19, Fig. 13 (non Fig. 12; Tab. 20, Figs 2, 7).
1963 Goniatites crenistria intermediusUSKobold; H. J. Nicolaus: p. 105, Tab. 1, Figs 4–5; Tab. 7, Fig. 1.
1964b Goniatites crenisnia Phillips; H. Žakowa: p. 8, Tab. 1, Fig. 7 (non Figs 5–6, text Fig. 3).

Material: 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.

Dimensions of 2 specimens, in mm:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>D</th>
<th>U</th>
<th>W</th>
<th>H</th>
<th>U/D</th>
<th>W/D</th>
<th>W/H</th>
</tr>
</thead>
<tbody>
<tr>
<td>cast</td>
<td>60.0</td>
<td>9.0</td>
<td>48.0</td>
<td>27.0</td>
<td>0.18</td>
<td>0.20</td>
<td>1.50</td>
</tr>
<tr>
<td>shell</td>
<td>63.0x</td>
<td>12.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description. 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.

Remarks. 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 (particular 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. Žakowa, 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. Žakowa, 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.
Goniatites from the Upper Visean (Kielce Syncline) 331

**Occurrence.** Upper Visean: Poland — the Holy Cross Mts (synclines of: Kielce, Łągów, Gałęzice), Sudetes (?Kamionki, Jugów — Gocα Zone), ?the Fore-Sudetic Monocline (borehole Sulów 1 — Gocα Zone, after K. Korejwo, L. Teller, 1967); Germany — Harz, Rheinish Slate Mountains (Gocα3–Gocβ3 subzones, index for Gocα4 Subzone); Tchecho-Slovakia — Niski Jesenik (Gocα4–Gocβ3t–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 crenisandra 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. Czarnecki: p. 352, Tab. 23, Figs 1–3, text Fig. 3/1.
 **e. p.** 1974 Goniatites crenistria Phillipps; H. Zakowa: p. 8, Tab. 1, Fig. 5, 6 (non Fig. 7), text Fig. 3.

**Material:** 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.

**Dimensions** of 4 specimens, in mm:

<table>
<thead>
<tr>
<th>OS–199</th>
<th>D</th>
<th>U</th>
<th>W</th>
<th>H</th>
<th>U/D</th>
<th>W/D</th>
<th>W/H</th>
<th>Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>16.4</td>
<td>1.4</td>
<td>17.9</td>
<td>8.7</td>
<td>0.09</td>
<td>1.09</td>
<td>2.06</td>
<td>shell</td>
</tr>
<tr>
<td>83</td>
<td>17.2</td>
<td>1.6</td>
<td>18.6</td>
<td>9.6</td>
<td>0.09</td>
<td>1.08</td>
<td>1.94</td>
<td>mould</td>
</tr>
<tr>
<td>82</td>
<td>23.4</td>
<td>1.8</td>
<td>22.2</td>
<td>12.8</td>
<td>0.08</td>
<td>0.95</td>
<td>1.73</td>
<td>mould</td>
</tr>
<tr>
<td>94a</td>
<td>37.0</td>
<td>5.6</td>
<td>24.0</td>
<td>18.0</td>
<td>0.15?</td>
<td>0.64?</td>
<td>1.53</td>
<td>mould</td>
</tr>
</tbody>
</table>

**Description.** 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.

**Remarks.** 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. Zakowa (1974b). S. Czarnecki (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).

**Occurrence.** Upper Visean: Poland — the Holy Cross Mts (synclines of: Kielce, Gałęzice); England B2 Subzone; Germany — Rheinish Slate Mountains (Goç1–2 subzones, index for Goç2 Subzone); Tchecho-Slovakia — Niski Jesenik (Goç2–3 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.

**Material:** 3 specimens — fragments of imprints and casts of whorls with ornamentation; they are from the trench IVa — northern part; OS–199/31.

**Dimensions in mm:** H? is between 30–40.

**Remarks.** In ornamentation the double-bowed rib-like growth lines with relatively deep hyponomic sinus; between them distinct spiral lines visible on the whole whorl.


*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.

**Material:** 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.

**Dimensions in mm:** H? about 40.

*According to D. Korn (1988, Geol. Paläont. Westf., 11). These taxons belong now to genera *Arnsbergites* and *Paraglyphioceras.*
Remarks. Densely arranged spiral lines cover whole side without traces of rib-like growth lines or growth lines.

Occurrence. Upper Visian: Poland — the Holy Cross Mts (Kielce Syncline), Sudetes (Walbrych, Konradow — Goβst-fa subzones, H. Żakowa, 1966), Miechów Trough (K. Korejwo, L. Teller, 1968), Upper Silesian Coal Basin; Germany — Harz, Rheinish Slate Mountains (Goβst-е subzones); Ireland, England (P1b Subzone); Belgium, Marocco, Tchecho-Slovakia — Niski Jesenik (Goβst-fa subzones, O. Kumpera, 1977).

Subfamily Gistyocemtinae Wedekind, 1918
Genus Gistyoceras Wedekind, 1918
Gistyoceras cf. moorei Nicolaus, 1963
(Fig. 1B; Pl. I, Figs 2, 3a, b)

Material: 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.

Dimensions of 3 specimens, in mm:

<table>
<thead>
<tr>
<th>OS–199</th>
<th>Dx</th>
<th>U</th>
<th>W</th>
<th>H</th>
<th>U/D</th>
<th>W/D</th>
<th>W/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>33.0</td>
<td>5.0</td>
<td>14.0</td>
<td>17.5</td>
<td>0.15?</td>
<td>0.42?</td>
<td>0.80</td>
</tr>
<tr>
<td>86</td>
<td>35.0</td>
<td>—</td>
<td>13.5x</td>
<td>22.0</td>
<td>—</td>
<td>0.38?</td>
<td>0.61?</td>
</tr>
<tr>
<td>87</td>
<td>50.0</td>
<td>—</td>
<td>21.5</td>
<td>—</td>
<td>—</td>
<td>0.43?</td>
<td>—</td>
</tr>
</tbody>
</table>

Description. Shell subdiscoidal in shape, with parallel, flat flanks and narrow, semicircularly 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 lenght 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 sigmoidaly bent; traces of spiral lines on ventrolateral area.

Remarks. Bad presservation stage and doubtful value of specimens dimensions unfavoured their determination. The described features of our specimens are most similar to ones of the species Gistyoceras moorei Nicolaus, known from the Goniatites crenistria Zone (may be also from lower part of the G. striatus Zone) from Rheinish 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.
Occurrence. Upper Visean: Poland — Holy Cross Mts (Kielce Syncline).

Girynoceras premesserianum Moore, 1946
(Pl. I, Fig. 5a–c)

1946 Girynoceras premesserianum Moore; E. W. J. Moore: p. 401, Tab. 25, Fig. 4; Tab. 26, Fig. 6; text — Fig. 10.
1973 Girynoceras sp.; S. Czarniecki: p. 236, Tab. 23, Fig. 4.
Material: 2 specimens — 1 shell with ornamentation and 1 mould; they are from the trench IVb — sample 4; OS-199; 92–93.
Dimensions of 2 specimens, in mm:

<table>
<thead>
<tr>
<th>OS-199</th>
<th>D</th>
<th>U</th>
<th>W</th>
<th>H</th>
<th>U/D</th>
<th>W/D</th>
<th>W/H</th>
<th>Specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>92</td>
<td>11.0</td>
<td>2.2</td>
<td>5.6</td>
<td>6.1</td>
<td>0.20</td>
<td>0.56</td>
<td>0.92</td>
<td>shell</td>
</tr>
<tr>
<td>93</td>
<td>22.0</td>
<td>4.0</td>
<td>11.4</td>
<td>11.6</td>
<td>0.18</td>
<td>0.52</td>
<td>0.98</td>
<td>mould</td>
</tr>
</tbody>
</table>

Description. 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 ventrolateral part of shell: 7 on 1 mm.

Remarks. 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 Galęźice (S. Czarniecki, 1973).


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. Źakowa: p. 19, Tab. 1, Fig. 4; Tab. 3, Fig. 2.
1979 Nomismoceras vittiger (Phillips); K. Bojkowski: p. 30, Tab. 3, Fig. 1.
Goniatites from the Upper Visean (Kielce Syncline)

Material: 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.

Dimensions in mm: D up to 10.

Remarks. All gerontic specimens have on the last whorl a distinc marginal keel but sometimes also slightly undulated growth lines.


BIOSTRATIGRAPHICAL REMARKS

Most of described here taxa 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. falculatus Roemer, G. striatus (Sowerby), Girtyoceras preseslerianum Moore and — due to co-occurrence with mentioned species — Nomismoceras vitiger (Phillips) and Bollandites kielcensis sp. n. Parallely these described taxa documented 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 preseslerianum and of specimen very similar to typical species of this zone. After author the occurrence of Goα2 and Goα4 subzones documented with index taxa, is undoubtful. The overlaid G. striatus Zone, is defined by: G. striatus (Sowerby), G. falculatus Roemer and G. cf. falculatus 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. Źakowa, 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 Goα4 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 the upper part of profile. It is sure that the sample 4 from the trench IVb comes from lower part of *G. crenista*ria Zone. *G. crenista*ria *schmidtianus* Nicolaus (accompanied by *Giryceras premesestrianum* Moore), found there, suggests to distinguish the Goα Subzone of undefined thickness. Fauna from neighboring claystones (samples 1, 2) allows to include them in general to *G. crenista*ria Zone. The age criterions of claystones, cut by transversal dislocation and exposed far to north on a distance of several meters in profile 3 of trench IVb, are analogous. There were found *Protecanites cf. serpeninus* (Phillips) and index trilobites for the Goα Zone. From higher laying, steeply inclined claystones in the same profile

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**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. — *Neoglycytoceras*, E. — *Entogonites*

Biostratygrafia goniatytowa profilów wizenu górnego w Górach Świętokrzyskich (stan obecny)

1 — poziom ogólne; 2 — podpoziom; 3 — przynależność prawdopodobna; P. — *Peytonoceras*, D. — *Dombarites*, N. — *Neoglycytoceras*, 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. Zakowa, 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 Goy1 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. crenisria* 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 Łagów and Gałęźice synclines. In first of it among specimens generally described as *Goniatites crenisria* Phillips is found an index form of the Gox4 Subzone. The distinguishing of this unit does not change the earlier settled stratigraphic sequence of the Upper Viséan (H. Zakowa, 1962) because *G. crenisria intermedius* Kobold comes from the slates of the test pit II, which belong to the interval included to the *G. crenisria* Zone. Still actual is an opinion that higher laid deposits of the Upper Viséan in the Łagów Syncline are younger and they belong no less than to *G. striatus* Zone. Some suggestions (H. Zakowa, 1974b) about occurrence of index taxons of Gox2 and Gox4 subzones in the Gałęźice Syncline, were confirmed. Both *G. crenisria schmiditianus* Nicolaus and *G. crenisria intermedius* Kobold come from the lower part of series (first one from organodetritical limestones, second — from carbonate-claystone series from the Gałęźice IG 3 borehole), interpreted lately as submarine gravitational flows (Z. Belka, S. Skompski, 1988). After author opinion *Giryoceeras premesletianum* Moore, known from Gałęźice, was also found in bottom part of the Upper Viséan profile. Occurrence of other, earlier settled units of goniatite zonation in Gałęźice (Go3, Goy, Goy1) is still actual.

The current konowledge 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 (Pe5, Gox21) 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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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 – nieznaných z synkliny kielceckiej, ważnych dla biostratigrafii — goniatytów. Pochodzą one z 3 przekopów zlokalizowanych w jadrowej 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 (kroniki żelaziste) z czimnoszarych iłówcew i ilołupków. Goniatytom towarzyszą inne nieliczne, nieliczne ramienioniogi, 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, Girycoceras i Nomiscoeras (tabl. I–II). Okazy zachowały się jako muszle, ośrodki, odlewy i odciski, często z linią przegrodową (fig. 1) i rzeźbą. Większość taksonów potwierdza niezbiecie występowanie wizenu górnego, co już sygnalizowano w podstawie obecnosci Nomiscoeras viitger (Phillips) i trylobita — Archeogenus (Phillibole) cf. aprathensis R. et E. Richrter (H. Żakowa, 1974a). Obecnie znalezione taksony wyznaczają w synklinie kielceckiej ogółem sześć różnych rangi jednostek w podziale goniatytywym i po raz pierwszy w Górah Świętokrzyskich poziom Goniatites sritius (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 (odśnieżenie na ogół fragmenty jednostek biostratigraficznych) i zaburzenia tektoniczne obszaru badań.

Poziom Goniatites crenisria stwierdzono na podstawie dwóch podgatunków z grupy G. crenisria Phillips, Girycoceras premedelianum Moore i G. cf. crenisria crenisria Phillips. Występuje on w przekopach: I, IVa
(część południowa) i IVb (próbki 1, 2, 4, część profile 3). W opinii autorki wyraźnie zaznaczają się, wskazane taksonami przewodnimi, podpozycjami Goc2 (przekop IVb — próba 4) i Goc4 (przekop I, południowa część przekopu IVa).


Rewizja oznaczeń okazów świetokrzyskich z grupy *Goniatites crenistia* Phillips uściśla zonację goniaty-

**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 — 3 x, c — 4 x; Goc4 Subzone
Holotyp, muszla, przekop l — próbka 13: a, c — boki, b — strona brzuszna; a, b — x3, c — x4; podpozjim Goc4
Fig. 2. *Girnoceras* cf. *moorei* Nicolaus
Fragment of a whorl — side view, OS—199/86, trench IVb , sample 4; ca x1.9; Goc2 Subzone
Fragment skrétu z boku, przekop IVb — próbka 4; ok. 1,9 x; podpozjim Goc2
Fig. 3a, b. *Girnoceras* cf. *moorei* Nicolaus
Fragments of two whorls — side view, trench IV b — sample 4: a — OS—199/87, ca x2, b — OS—199/85, 1.5 x; Goc2 Subzone
Fragmenty dwóch skrétów z boku, przekop IVb — próba 4: a — ok. 2 x, b — 1,5x ; podpozjim Goc2
Fig. 4. *Nonisonoceras vittiger* (Phillips)
Imprint of shell — side view, OS—199/7a, trench IVa — southern part, x 3; Goc4 Subzone
Odcisk muszli z boku, przekop IVa — część południowa, 3 x; podpozjim Goc4
Fig. 5a—c. *Girnoceras proneslerianum* Moore
Shell, OS—199/92, trench IVb — sample 4: a, b — sides, c — venter, ca x 2.7; Goc2 Subzone
Muszla, przekop IV b — próbka 4: a, b — boki, c — strona brzuszna, ok. 2,7 x; podpozjim Goc2
Fig. 6. *Goniatites sriatus* (Sowerby)
Crushed cast of a whorl — side view, OS—199/28a, trench IVa — northern part, natural size; Goc3s6-ta subzones
Zgnięcony odlów skrétu z boku, przekop IVa — część północna, wielkość naturalna; podpozjimy Goc3s6-ta
Fig. 7a, b. *Goniatites falcatum* Roemer
Fragments of two whorl imprints — side view, OS—199/31a—b, trench IVa — northern part, natural size; Goc3s6-ta subzones
Fragmenty dwóch odcisków skrétów z boku, przekop IVa — część północna, wielkość naturalna; podpozjimy Goc3s6-ta
All the specimens illustrated on Plates I—II come from the Upper Visean deposits (H. Żakowa, J. Malec, 1992, Fig. 1 — b area)
Wszystkie okazy ilustrowane na tabl. I—II pochodzą z utworów wizenu 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)
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; Goa2 Subzone
Muszla, przekop IVb — próbyka 4: a — bok, ok. 2.5 x, b — strona brzuszna, ok. 2.2 x; podpoziom Goa2

Fig. 2a, b. *Goniatites crenistria schmidtianus* Nicolaus
Damaged mould, OS–199/94a, trench IVb — sample 4: a — side, b — venter, ca x 1.3; Goa2 Subzone
Uszkodzona ośródka, przekop IVb — próbyka 4: a — bok, b — strona brzuszna; ok. 1.3 x; podpoziom Goa2

Fig. 3a–c. *Goniatites crenistria schmidtianus* Nicolaus
Mould, OS–199/83, trench IVb — sample 4: a, b — venter, c — side, ca x 2.2; Goa2 Subzone
Ośródka, przekop IVb — próbyka 4: a, b — strony brzuszne, c — bok; ok. 2.2 x; podpoziom Goa2

Fig. 4a, b. *Goniatites crenistria intermedius* Kobold
Damaged shell, OS–199/2a–b, trench I — sample 4: a — side, b — venter, ca natural size; Goa4 Subzone
Uszkodzona muszla, przekop I — próbyka 4: a — bok, b — strona brzuszna, ok. wielkość naturalna; podpoziom Goa4

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; Goa4 Subzone
Odlew niekompletnej i nieco zgniętej muszli z boku, przekop IVa — część południowa, ok. 1.2 x; podpoziom Goa4

Fig. 6. *Nomismoceras vitiger* (Phillips)
Cast, OS–199/7b, trench IVa — southern part, x 4; Goa4 Subzone
Odlew, przekop IVa — część południowa, 4 x; podpoziom Goa4

Fig. 7. *Nomismoceras vitiger* (Phillips), *Coleolus sturi* (v. Klebelsberg)
Casts of shells, OS–199/20a, trench IVa — northern part, natural size; Goβh6-fa subzones
Odlewymuszl, przekop IVa — część północna, wielkość naturalna; podpoziom Goβh6-fa
Halina ŻAKOWA — Goniatites from the Upper Visean (Kielce Syncline, The Holy Cross Mts, Poland)