

Late Famennian (Devonian) Balviinae (Ammonoidea) from the Holy Cross Mountains, Poland

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ABSTRACT:

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Five species of the Late Famennian family Balviinae Korn 2002, *Effenbergia lens* Korn, 1992, *E. minutula* Korn, 1992, *Kenseyoceras nucleus* (Schmidt, 1924), *K. biforme* (Schindewolf, 1937), and *Balvia globularis* (Schmidt, 1924), are described from the Holy Cross Mountains, Central Poland. The material comes from the “*Wocklumeria* Beds” of the Kowala, Ostrówka and Besówka sections, possibly from the *Effenbergia lens* – *Parawocklumeria paradoxa* zones and from the upper part of the *Wocklumeria sphaeroides* Zone – *Epiwocklumeria applanata* Subzone of the Late Famennian.

Key words: Ammonoidea; Balviinae; Late Devonian; Famennian; Holy Cross Mountains; Poland.

INTRODUCTION

The members of the goniatid subfamily Balviinae, belonging to the Late Devonian–Permian family Prionoceratidae, are known mainly from the Late Devonian *Wocklumeria* Zone. The appearance of *Effenbergia lens* (Korn) and other species of *Effenbergia* without ventrolateral furrows marks the base of the UD VI-B Zone (Becker 1996), whereas the appearance of *Kenseyoceras nucleus* (Schmidt), possessing ventrolateral furrows, indicates the base of the UD VI-C2 Zone (Becker *et al.* 2002). So far, representatives of the Balviinae have been reported from Germany (Schmidt 1924; Lange 1929; Schindewolf 1937; Bartsch and Weyer 1982; Korn 1992, 1994; Becker 1996; Becker and House 2000, etc.), England (Selwood 1960), Morocco (Korn 1999; Becker *et al.* 2002), Algeria (Peter 1959), China (Ruan 1981), the Ural Mountains, Russia (Bogoslovsky 1971; Nikolaeva and Bogoslovsky 2005), and from the Sudetes (Schindewolf 1937; Lewowocki 1959; Dzik 2006). In Poland, besides the Sudetes, a single species of the Balviinae (*B. minutula*

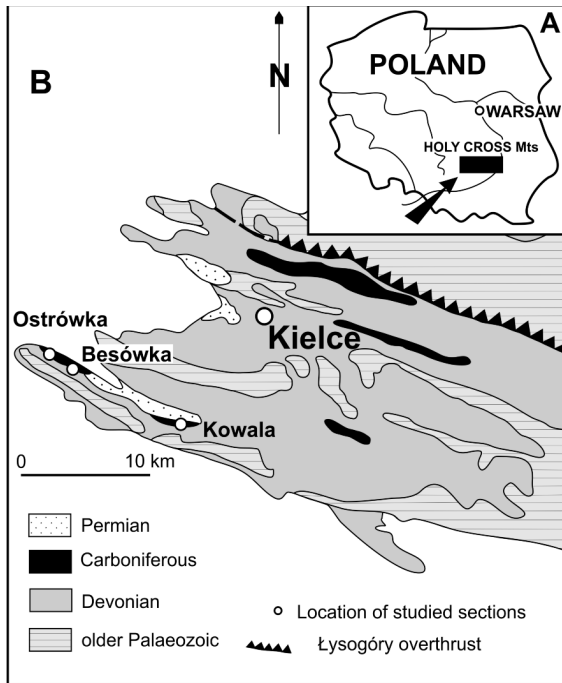
Korn), was reported by Dzik (2006) from the *Wocklumeria* Genozone of the Holy Cross Mountains. Recent examination of the Jan Czarnocki Collection (housed at the Geological Museum of the Polish Geological Institute; collection number MUZ PIG 284.II.), comprising the material from the “*Gonioclymenia*” and “*Wocklumeria*” beds of the Holy Cross Mountains, revealed, however, the presence of other Balviinae species [*Effenbergia lens* (Korn, 1992), *Kenseyoceras nucleus* (Schmidt, 1924), *K. biforme* (Schindewolf, 1937), *Balvia globularis* (Schmidt, 1924)], not previously recorded from that area. The taxonomic description and geographical discussion of these forms is the aim of the present paper.

MATERIAL

The Balviinae material in the Czarnocki Collection comes from the Kowala, Ostrówka and Besówka sections of the Gałęzice Syncline, located in the southern region of the Holy Cross Mountains (Text-fig. 1). The

material comprises 25 well-preserved specimens. [Where several specimens are registered under a single number in the collection; particular specimens are indicated herein by a small letter, which follows the main number]

Czarnocki never formally described and/or illustrated this material but, according to the original museum labels,



Text-fig. 1. Geological sketch-map of the western part of the Holy Cross Mts. (B), showing location of the Kowala, Ostrówka and Besówka sections, and its location on map of Poland (A)

he distinguished four new species: *Prionoceras discoideum* (284.II.385), *Pr. galęzicensis* (284.II.334), *Pr. globosoideum* (284.II.333 and 728), and *Pr. nasutum* (284.II.727). Consequently, all these taxa are *nomina nuda* (Pajchłowa 1972 and Zwieryż 1974). The specimens from Kowala, referred by Czarnocki to his new species *Pr. nasutum* (284.II.727), should be referred to *Kenseyoceras nucleus* (Schmidt, 1924) and *K. biforme* (Schindewolf, 1937), and those assigned by him to his new species *Pr. globosoideum* (284.II.728, 333), represent *K. biforme* and *Mimimitoceras fuerstenbergi* Korn. The specimens referred by Czarnocki to his new species *Pr. discoideum* (284.II.385) are assigned herein to *Effenbergia lens* (Korn), and his *Pr. galęzicensis* (284.II.334) to *E. minutula* (Korn).






STRATIGRAPHIC POSITION OF THE SPECIMENS INVESTIGATED

According to the original labels, the specimens come from the Upper Fammenian “*Gonioclymenia* Beds” and “*Wocklumeria* Beds” of the Kowala section, and from the “*Gonioclymenia* Beds” of the Ostrówka and Besówka sections (Text-fig. 2 and Table 1). With the exception of *B. prima* (Dzik 2006), all the species under discussion are known exclusively from the *Wocklumeria* Genozone (Table 1; see Becker, 1996; Korn 1992, 1994; Korn and Klug 2002).

There is a problem, however, with specimen 284.II.385, from the Kowala section, and specimen 284.II.334, from the Besówka section. The original labels

Sections	Kowala		Ostrówka	Besówka	
Stratigraphic position of samples according to the labels in the collection	“ <i>Wocklumeria</i> Beds”		“ <i>Gonioclymenia</i> Beds”		
Ammonoid Zones (Becker and House 2000; Korn 2002)	<i>Wocklumeria</i>				
	<i>Epiwocklumeria applanata</i>		<i>Effenbergia lens-Parawocklumeria paradoxa</i>		
Conodont Zones: (Becker and House 2000) (Dzik 2006)	L.–M. <i>praesulcata</i>		Lower <i>praesulcata</i>		
	<i>Dasbergina trigonica</i>				
Sample	284.II.727	284.II.728	284.II.385	284.II.333	284.II.334
<i>Sporadoceras terminus</i> Dzik	1				
<i>Effenbergia lens</i> (Korn)			7		
<i>Effenbergia minutula</i> (Korn)	1				1
<i>Kenseyoceras nucleus</i> (Schmidt)	2				
<i>K. biforme</i> (Schindewolf)	5	2			
<i>Balvia globularis</i> (Schmidt)	1				
<i>Mimimitoceras fuerstenbergi</i> Korn				2	
<i>Epiwocklumeria applanata</i> (Wedekind)		3			

Table 1. Stratigraphic distribution of the studied species of Balviinae from the collection MUZ PIG 284.II. and their frequencies in samples

BECKER & HOUSE 2000, KORN 2002		Kowala section (CZARNOCKI 1989)							
		Stufe	Genozone	Sub- genozone	Species	Trench I			
						Litolog. essemb.	Number of samples	Ammonoid assemblages	
<i>Cymaclymenia nigra</i>	Wocklumeria	Wocklumeria	Upper	<i>Wocklumeria sphaeroides</i> , <i>Wocklumeria plana</i> , <i>Epiwocklumeria applanata</i>	2	284.II. 727, 728	<i>Epiwocklumeria applanata</i> (Wedekind), <i>Parawocklumeria</i> , <i>Kielcensia</i>		
1								<i>Wocklumeria sphaeroides</i> (Richter), <i>Kielcensia</i>	
<i>Parawocklumeria paradoxa</i>					Lower	<i>Dimeroclymenia semicostata</i> <i>Kielcensia bohdanowiczi</i> <i>bohdanowiczi</i>	3	284.II. 385	<i>Parawocklumeria distorta</i> (Tietze), <i>P. distributa</i> Czarnocki, <i>Liroclymenia fundifera</i> Czarnocki
<i>Kamptoclymenia endogona</i>							2		
<i>Effenbergia lens</i>							1		
		 nodular limestone	 marly shale	 black shale	 clay and claystone	 a grey and greenish (a), b red (b) colored rocks			

Text-fig. 2. Stratigraphic position of the studied species in the Upper Famennian of the Kowala section (Trench I; after Czarnocki 1989, table 2, pp. 28–30)

with these specimens indicate the “*Gonioclymenia* Beds” (both are from red nodular limestone). However, the other taxa from these localities [*Kallochlymenia pessoides* (von Buch), *Liroclymenia* sp., *Kosmoclymenia undulata* (Münster) and other clymenids], similarly labelled “*Gonioclymenia* Beds”, are invariably characteristic of the *Wocklumeria* and not the *Gonioclymenia* Genozone. Consequently, a *Wocklumeria* Beds age is accepted herein for both specimens. The erroneous assignment of fauna from the *Wocklumeria* Genozone to the “*Gonioclymenia* Beds” in the notes of Jan Czarnocki has already been mentioned by the editors of the posthumous edition of his clymenid paper (see Makowski and Pawłowska in Czarnocki 1989). *Effenbergia lens* (Korn) and *E. minutula* (Korn) are known mainly from the *Effenbergia lens* to *Parawocklumeria paradoxa* zones of Germany (Korn 1994, 2002; Becker 1996; Becker and House 2000; Korn and Klug 2002), and from the *Effenbergia lens* Zone of Morocco (Becker *et al.* 2002).

Out of the five specimens with number 284.II.728, preserved in grey nodular limestone, two belong to *Kensyoceras*, while the remaining three represent *Epiwocklumeria applanata* Wedekind (Text-fig. 5M-P). The latter species is one of the most characteristic species of the middle part of the Upper *paradoxa* Zone or upper part of the *Wocklumeria sphaeroides* Zone (Korn 1995, 2000; Korn and Klug 2002; Becker and House 2000, Becker *et al.* 2002). Dzik (2006, fig. 223) located this species in the upper part of the *Dasbergina trigonica* conodont Zone.

The material belonging to number 284.II.727, preserved in grey nodular limestone, comprises representatives of the Balviinae and a single specimen of *Sporadoceras terminus* Dzik (Text-fig. 5K-L). This latter species was described originally from Kowala and Dzikowiec (Dzik 2006) and dated as possibly from the *D. trigonica* conodont Zone. The Balviinae species, *Kensyoceras nucleus* (Schmidt), *K. biforme* (Schindewolf, 1937), and

Balvia globularis (Schmidt), are known from the *Para-wocklumeria paradoxa* and *Wocklumeria sphaeroides* zones of Germany (Korn 1994, 2002; Becker 1996; Becker and House 2000; Korn and Klug 2002) and from the *nucleus* Zone of Morocco (Becker *et al.* 2002). They are also known from the Kiya Section of the South Urals, Russia (Nikolaeva and Bogoslovsky 2005).

TAXONOMIC DESCRIPTION

In the descriptions the following shell parameters (given in millimetres) are used: dm – shell diameter; wh – whorl height; ah – aperture height; ww – whorl width; uw – umbilicus width.

Mimimitoceras fuerstenbergi Korn, 1992, which represents the adult form from the Ostrówka section is described to supplement the description of the embryonic form (see Dzik 2006, fig. 178).

Oder Goniatitida Hyatt, 1884

Suboder Tornoceratina Wedekind, 1914

Superfamily Prionocerataceae Hyatt, 1884

Family Prionoceratidae Hyatt, 1884

Subfamily Balviinae Korn in Korn and Klug,
2002

REMARKS: The subfamily Balviinae Korn (in Korn and Klug, 2002) includes three genera: *Effenbergia* Korn, 2002, *Kenseyoceras* Selwood, 1960 and *Balvia* Lange, 1929 and at least eight species. The Balviinae are characterized by small shells not exceeding 20 mm in diameter. The shells vary from discoid to almost globose, and the whorl sides bear distinct radial constrictions, which are bent towards the aperture just below the ventrolateral margin and on the venter.

Schmidt (1924) figured two new species, *Glatziella nucleus* and *Gattendorfia globularis* from the Upper Devonian of the Sauerland in Germany, without designating the holotypes of either species. Lange (1929) discovered that *G. globularis* was quite distinct from other *Gattendorfia* species and assigned it to a new subgenus, *Gattendorfia (Balvia)*, whereas *Glatziella nucleus* was placed by Schindewolf (1937) in the genus *Prionoceras*, as with his new species *Prionoceras bifforme* Schindewolf, 1937. The species *G. globularis* Schindewolf (1937) interpreted as a characteristic member of the genus *Gattendorfia*. In 1960, two species, *K. (Kenseyoceras) rostrata* Selwood (junior synonym of *Prionoceras bifforme* Schindewolf) and *K. (Mayneoceras) nucleus* (Schmidt), which were earlier referred by Schindewolf (1937) to the genus *Priono-*

ceras, were both placed by Selwood in the genus *Kenseyoceras*. Selwood (1960), like Schindewolf (1937), believed that *G. globularis* represented a true *Gattendorfia*, and consequently regarded the subgenus *Balvia* as a subjective synonym of *Gattendorfia*.

More recently, *Balvia* was treated by Korn (1992, 1994) as a separate genus, to which he referred *Glatziella nucleus*, *Gattendorfia globularis* and *Prionoceras bifforme*, as well as a number of his new species. Subsequently, Becker (1996) placed Selwood's (1960) subgenera within the genus *Balvia*, recognising: *Balvia (Kenseyoceras)*, *Balvia (Mayneoceras)* and *Balvia (Balvia)*. Becker (1996) referred *P. bifforme* Schindewolf to *Balvia (Kenseyoceras)* and the majority of known species of Balviinae to *Balvia (Mayneoceras)*; in *Balvia (Balvia)* only a single species, *B. (B.) globularis* Lange, was recognised. Later, Becker (2000, 2002) raised particular subgenera to independent genera and, at the same time, Korn (in Korn and Klug 2002) established a new subfamily Balviinae Korn, to include: *Effenbergia* Korn, 2002, *Kenseyoceras* Selwood, 1960 and *Balvia* Lange, 1929. The Korn concept (in Korn and Klug 2002) is followed herein.

The genus *Kenseyoceras* Selwood is used herein according to its original definition by Selwood (1960). In contrast to *Balvia* Lange, both *Effenbergia* Korn and *Kenseyoceras* Selwood are involute. *Effenbergia* differs from *Kenseyoceras* and *Balvia* in the absence of ventrolateral grooves, which in the latter two genera are very conspicuous. Some of the species of *Effenbergia* (e.g. *E. lens* and *E. obesa*), may have a slight keel, bounded by poorly marked grooves, in the adult stage.

Genus *Effenbergia* Korn in Korn and Klug, 2002

TYPE SPECIES: *Balvia lens* Korn, 1992, p. 35, fig. 2A.

REMARKS: *Effenbergia* is separated from *Kenseyoceras* and *Balvia* by the absence of ventrolateral grooves, which in the latter two genera are very conspicuous.

Effenbergia lens (Korn, 1992)
(Text-figs 3A–E, I)

1992. *Balvia lens* sp. nov.; D. Korn, p. 35, fig. 2A.
1994. *Balvia lens* Korn; D. Korn, p. 33, figs 26G–I, 27C.
1996. *Balvia (Mayneoceras) lens* Korn; R.T. Becker, pp. 33–34, pl. 1: 6–9
2002. *Effenbergia lens* (Korn); D. Korn and C. Klug, p. 196.
2006. *Balvia lens* Korn; J. Dzik, p. 245, figs 179K–L, 181.

MATERIAL: MUZ PIG 284.II.385(a–g); 7 specimens (labelled as *Prionoceras discoideum* sp. n. Czarnocki, 1936).

DESCRIPTION: Shell discoid, with venter becoming sharper with ontogeny, resulting in a lenticular cross-section; typically, shells wider in diameter are flatter (see shell parameters). Umbilicus closed. Three constrictions per whorl, distinct on shell flanks and disappearing on the venter, bending forwards. Ventral keel indistinct, bounded by poorly marked grooves. Suture with deep and rounded ventral lobe. First lateral saddle rounded, passing into v-shaped first lateral lobe; second lateral saddle wide, of the same height as first lateral saddle.

Shell parameters in *Effenbergia lens* (Korn, 1992)

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.385h	9.5	6.1	–	5.0	–	0.64	–	0.53	–
284.II.385c	11.4	7.0	2.2	5.3	–	0.61	0.19	0.46	–
284.II.385b	11.7	6.8	2.0	4.0	–	0.58	0.17	0.34	–
284.II.385a	12.8	7.6	–	5.0	–	0.59	–	0.39	–
284.II.727e	8.5	5.3	–	4.5	–	0.62	–	0.53	–

OCCURRENCE: Holy Cross Mountains, Poland; uppermost Fammenian, *Effenbergia lens*–*Parawocklumeria paradoxa* zones.

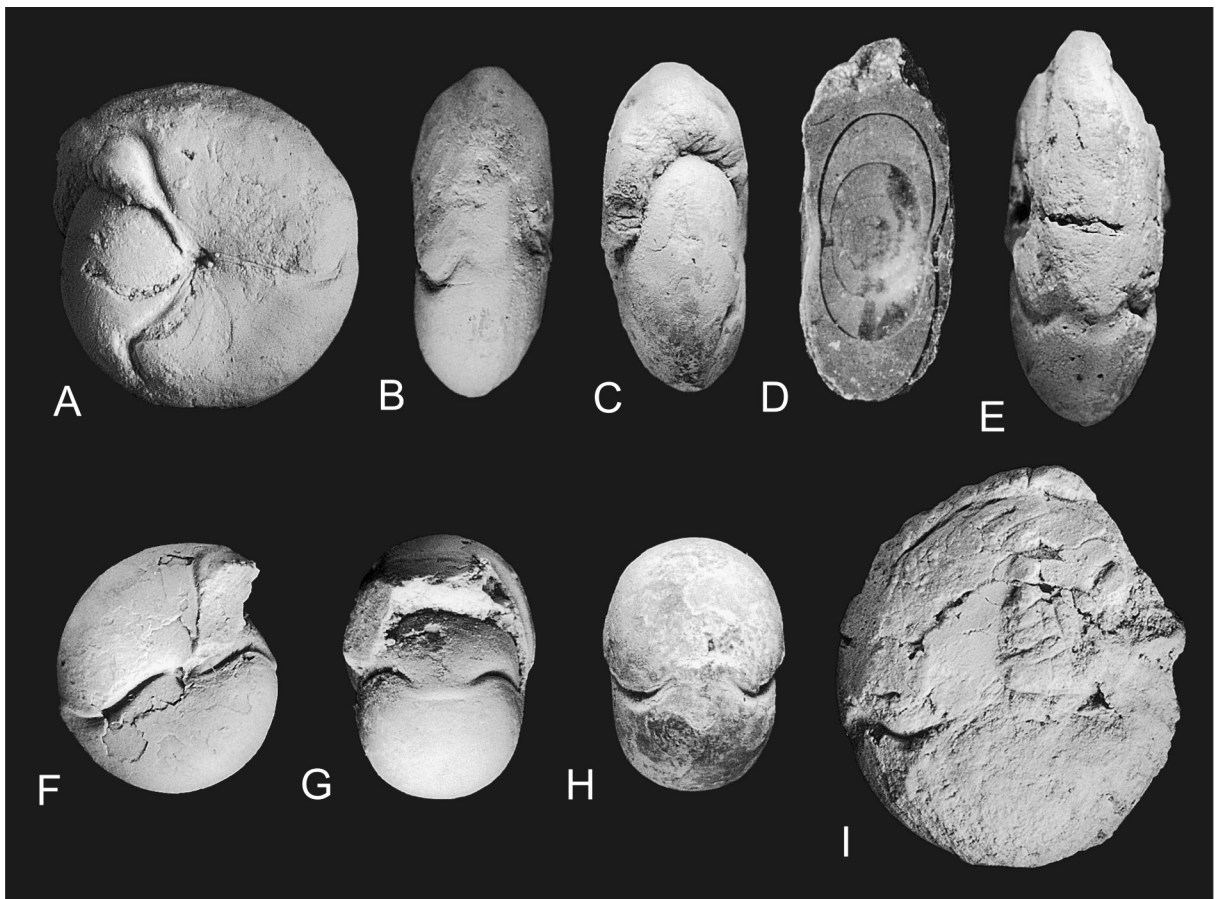
Effenbergia minutula (Korn, 1992)
(Text-figs 3F–H)

1992. *Balvia minutula* sp. nov.; D. Korn, p. 34, fig. 2C.

1994. *Balvia minutula* Korn; D. Korn, p. 33, pl. 26A–C, 27 B.

2002. *Effenbergia minutula* (Korn); D. Korn and C. Klug, p. 196.

2006. *Balvia minutula* Korn; J. Dzik, p. 243, figs 179B–G, 181.



Text-fig. 3. *Effenbergia* from Kowala. A–E, I – *Effenbergia lens* Korn, 1992: A–C – specimen MUZ PIG 284.II.385b, $\times 4$; D – MUZ PIG 284.II.385c, $\times 4.5$; E, I – MUZ PIG 284.II.385a, $\times 4$; F–H – *Effenbergia minutula* Korn, 1992, specimen MUZ PIG 284.II.334, $\times 3.5$

MATERIAL: MUZ PIG 284.II.334; 1 specimen (section between Besówka and Stokówka hills, labelled *Prionoceras gałęzicensis* sp. n. Czarnocki, 1936). MUZ 284.II.727k; 1 specimen (Kowala section, labelled *Prionoceras nasutum* sp. n. Czarnocki, 1936).

REMARKS: The specimen 284.II.334 was described and illustrated by Dzik (2006). It is supplemented by the 284.II.727k specimen, from Kowala.

OCCURRENCE: Holy Cross Mountains, Poland; uppermost Fammenian, *Effenbergia lens*–*Parawocklumeria paradoxa* zones.

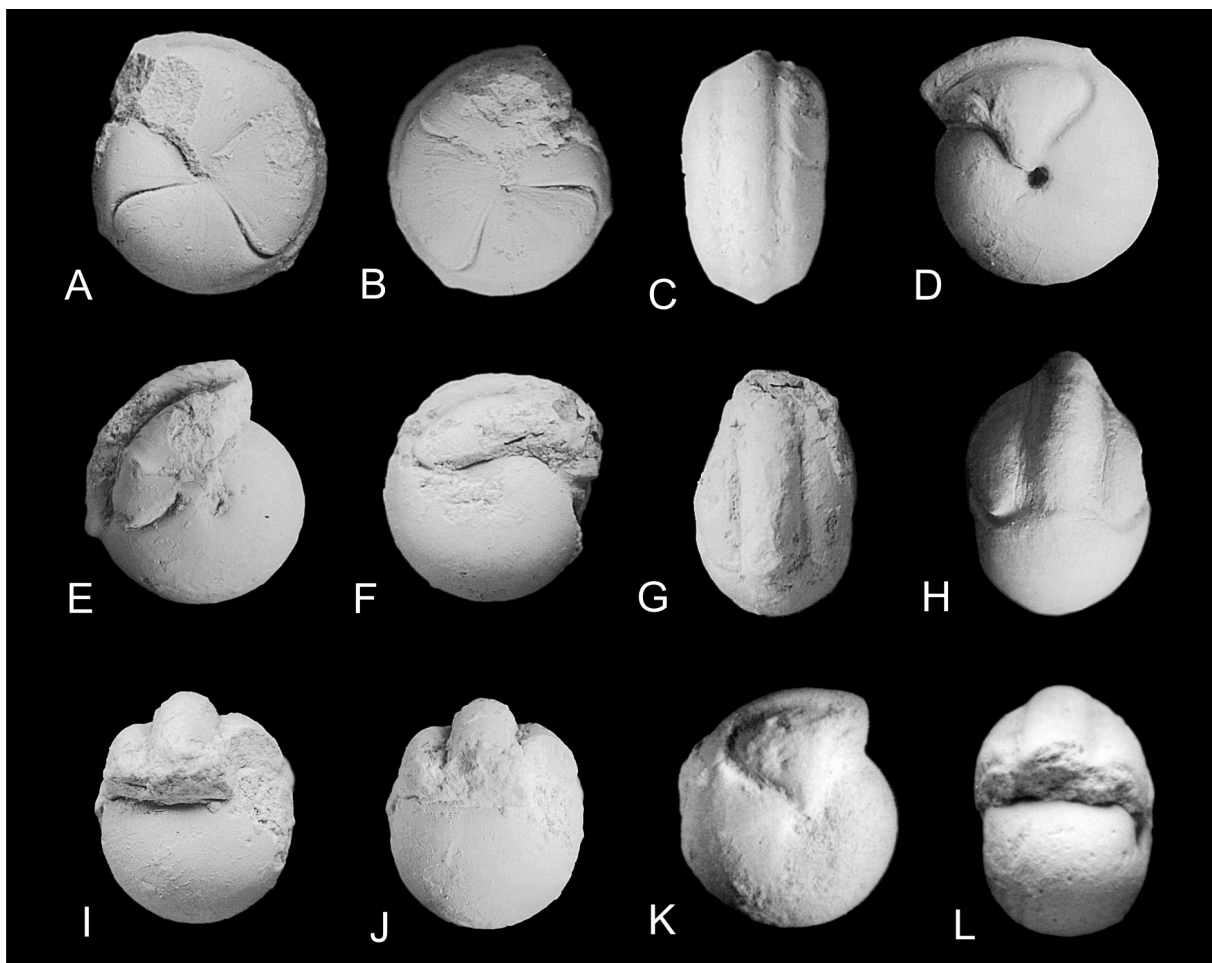
Shell parameters in *Effenbergia minutula* (Korn, 1992)

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.334	9.7	5.6	2.0	6.7	–	0.58	0.21	0.69	–
284.II.727k	8.8	5.1	1.7	5.7	–	0.58	0.19	0.65	–

Genus *Kenseyoceras* Selwood, 1960

TYPE SPECIES: *Kenseyoceras (Kenseyoceras) rosstrata* Selwood, 1960, pp. 171–172, pl. 28, figs 4–10, text-fig. 5A (= *Prionoceras bifforme* Schindewolf, 1937).

DIAGNOSIS: “Shell discoidal to subglobose, completely involute. Flanks marked by deep radial constrictions which swing forwards at the venter to form grooves bounding a median keel. Suture-line consists of a ventral saddle divided by a deep parallel-sided lobe, lateral lobe bell-shaped, passing into a gently arched lateral saddle.”



Text-fig. 4. Specimens of *Kenseyoceras* from Kowala and Besówka. A–C – *Kenseyoceras nucleus* (Schmidt, 1924), specimen MUZ PIG 284.II.727b, $\times 3.5$; D–L – *Kenseyoceras bifforme* (Schindewolf, 1937): D, H – specimen MUZ PIG 284.II.727a, $\times 2.8$; E, I, J – specimen MUZ PIG 284.II.728b, $\times 2.8$; F, G – specimen MUZ PIG 284.II.728a, $\times 3.8$; K, L – specimen MUZ PIG 284.II.727g, $\times 4.5$

Kenceyoceras nucleus (Schmidt, 1924)
(Text-figs 4A–C)

1924. *Glatziella nucleus* Schmidt; H. Schmidt, p. 119, pl. 6, figs 10, 10a.
1960. *Kenceyoceras* (*Mayneoceras*) *nucleus* (Schmidt); E.B. Selwood, p. 172, pl. 28, figs 11–17, text-figs 5b, 6.
1992. *Balvia nucleus* (Schmidt); D. Korn, p. 32, fig. 2E.
1994. *Balvia nucleus* (Schmidt); D. Korn, p. 33, pl. 24H–L.
1996. *Balvia* (*Mayneoceras*) *nucleus* (Schmidt); R.T. Becker, p. 34, pl. 3, figs 4, 5.
2002. *Kenceyoceras nucleus* (Schmidt); D. Korn and C. Klug, p. 196.

MATERIAL: MUZ PIG 284.II.727(b, e, j); three specimens (Kowala section; labelled *Prionoceras nasutum* sp. n. Czarnocki, 1936); j – incomplete.

DESCRIPTION: Discoid shell, with flattened flanks. Umbilicus closed. Three constrictions on flanks; distinct, rounded keel bounded by grooves along entire length of venter of last whorl. Constrictions straight on flanks, bending forwards near venter, forming distinct but shallow grooves.

OCCURRENCE: Holy Cross Mountains, Poland; uppermost Fammenian, *Epiwocklumeria applanata* Subzone.

Kenceyoceras bifforme (Schindewolf, 1937)
(Text-figs 4D–L, 5A–B, E)

1937. *Prionoceras bifforme* sp. nov.; O.H. Schindewolf, p. 15.
1960. *Kenceyoceras* (*Kenceyoceras*) *rostrata* sp. nov.; E.B. Selwood, p. 171–172, pl. 28, figs 4–10, text-fig. 5A.
1960. *Kenceyoceras* (*Mayneoceras*) *sinuconstricta* sp. nov.; E.B. Selwood, p. 173, pl. 28, figs 18–20.

Shell parameters in *Kenceyoceras nucleus* (Schmidt, 1924)

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.727b	10.5	6.1	2.4	6.2	–	0.58	0.23	0.59	–

Shell parameters of *Kenceyoceras bifforme* (Schindewolf, 1937)

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.727a	12.4	7.2	2.46	8.1	–	0.58	0.20	0.65	–
284.II.727f	11.5	6.9	2.2	7.3	–	0.60	0.19	0.63	–
284.II.727g	7.3	4.3	1.7	4.7	–	0.59	0.23	0.64	–
284.II.727h	10.5	6.2	2.3	6.9	–	0.59	0.22	0.66	–
284.II.727i	8.6	5.8	1.5	6.2	–	0.67	0.17	0.72	–
284.II.728a	8.9	5.6	1.4	5.6	–	0.63	0.16	0.63	–
284.II.728b	11.7	7.7	2.4	9.0	–	0.66	0.21	0.77	–

1994. *Balvia bifforme* (Schindewolf); D. Korn, p. 29, pl. 24A–C, 27D.

2006. *Balvia bifformis* (Schindewolf); J. Dzik, p. 243, figs 179H, 181.

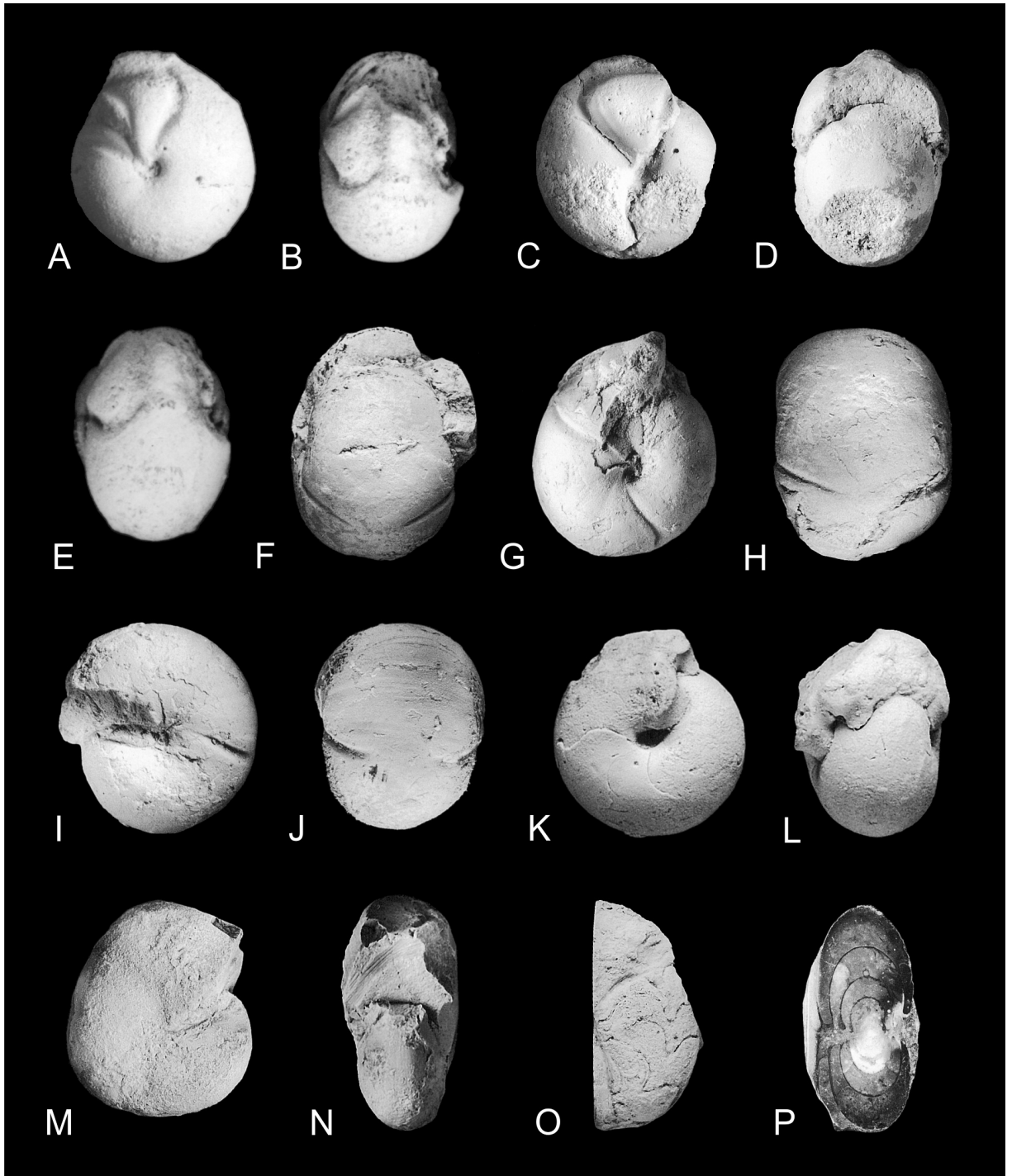
MATERIAL: MUZ PIG 284.II.728(a, b); 2 specimens (Kowala section; labelled *Prionoceras globosoideum* sp. n. Czarnocki, 1936); MUZ 284.II.727(a, f, g, h, i) 5 specimens (Kowala section; labelled *Prionoceras nasutum* sp. n. Czarnocki, 1936).

DESCRIPTION: Shells small, subglobose, 7 to 15 mm in diameter with very low, sub-rounded whorls, with slow height increase. Whorls slightly flattened on flanks, venter rounded and wide. Umbilicus slightly concave, punctose, closed in adult forms. Two to three distinct constrictions on the last third of the body chamber, curved backwards on the ventrolateral side, and forwards on the venter; constrictions connected in longitudinal grooves bounding a raised keel. On flanks of last whorl the constrictions limited only to the keel area. In two specimens (284.II.727a and f), distinct constriction are seen on the preceding whorl, underneath the last whorl with keel, with the same pattern as those on the body chamber, but disappearing on the venter (Text-fig. 6A).

REMARKS: Two distinct groups of morphotypes can be distinguished in *Kenceyoceras bifforme*: a group with globose shells (ww/dm: 0.70–0.77), and a group with laterally compressed shells (ww/dm: 0.63–0.66). In most forms the keel length does not exceed one-third the length of the last whorl. Only in a few cases does the keel encompass half of the last whorl (284.II.728a, Text-fig. 4F, G), which may be linked with completeness of specimens. Due to this fact, *Kenceyoceras* (*Mayneoceras*) *sinuconstricta* Selwood with compressed shells, represent-

ing the second morphotype group, has been included in the synonymy of *Kenseyoceras biforme* (Schindewolf).

OCCURRENCE: Holy Cross Mountains; uppermost Fammenian, *Epiwocklumeria applanata* Sub-zone.



Text-fig. 5. Specimens of *Kenseyoceras*, *Balvia*, *Sporadoceras* and *Epiwocklumeria* from Kowala and of *Mimimitoceras* from Ostrówka. **A, B, E** – *Kenseyoceras biforme* (Schindewolf, 1937), specimen MUZ PIG 284.II.727f, $\times 3$; **C, D** – *Balvia globularis* (Schmidt, 1924), specimen MUZ PIG 284.II.727c, $\times 2.7$; **F-J** – *Mimimitoceras fuerstenbergi* Korn, 1992): F-H – specimen MUZ PIG 284.II.333a, $\times 3$; I, J – specimen MUZ PIG 284.II.333b, $\times 3$; **K, L** – *Sporadoceras terminus* Dzik, 2006, specimen MUZ PIG 284.II.727d, $\times 4$; **M-P** – *Epiwocklumeria applanata* (Wedekind, 1918), $\times 1$: M, N – specimen MUZ PIG 284.II.728e; O, P – specimen MUZ PIG 284.II.728e

Genus *Balvia* Lange, 1929

TYPE SPECIES: *Gattendorfia globularis* Schmidt, 1924, p. 120, pl. 6, figs 13, 13a.

DIAGNOSIS: Balviinae with acute lobes. Shell almost globose, evolute. Flanks marked by constrictions, which swing forwards at the venter to form grooves bounding a median keel.

Balvia globularis (Schmidt, 1924)
(Text-fig. 5C, D)

1924. *Gattendorfia globularis* Schmidt; H. Schmidt, p. 120, pl. 6, figs 13, 13a
1992. *Balvia globularis* (Schmidt); D. Korn, p. 32, fig. 2D.
1994. *Balvia globularis* (Schmidt); D. Korn, p. 26, pl. 24D, E, F–G; 25C, D; 27E; 29L–N.
1996. *Balvia (Balvia) globularis* (Schmidt); R.T. Becker, p. 33.
2006. *Balvia globularis* (Schmidt); J. Dzik, p. 245, figs 179M, 181.

MATERIAL: MUZ PIG 284.II.727c; 1 specimen (Kowala section; labelled *Prionoceras nasutum* sp. n. Czarnocki, 1936).

DESCRIPTION: Shell almost globose, with convex flanks and rounded venter. Umbilicus punctose, concave. Two constrictions visible, connected into longitudinal grooves bounding low and flattened keel on venter. Third constriction present on whorl beyond keel area.

REMARKS: From the morphologically similar *Kensyoceras biforme* this species differs in the flattened low keel and the presence of constrictions beyond the keel area.

OCCURRENCE: Holy Cross Mountains, Poland; uppermost Fammenian, *Epiwocklumeria applanata* Subzone.

Shell parameters of *Balvia globularis* (Schmidt, 1924)

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.727c	12.2	7.5	2.4	8.7	–	0.61	0.20	0.71	–

Shell parameters of *Mimimitoceras fuerstenbergi* Korn, 1992

Specimen no.	dm	wh	ah	ww	uw	wh/dm	ah/dm	ww/dm	uw/dm
284.II.333a	12.0	7.8	2.4	9.5	–	0.65	0.20	0.79	–
284.II.333b	11.0	6.7	2.7	8,6	–	0.61	0.25	0.78	–

Subfamily Prionoceratinae Hyatt, 1884

Genus *Mimimitoceras* Korn, 1988

TYPE SPECIES: *Mimimitoceras trizonatum* Korn, 1988, p. 607, text-figs 1a–d, 2.

Mimimitoceras fuerstenbergi Korn, 1992
(Text-fig. 5F–J)

1992. *Mimimitoceras fuerstenbergi* sp. nov.; D. Korn, p. 32, fig. IG.
1994. *Mimimitoceras fuerstenbergi* Korn; D. Korn, p. 16, pl. 15C–E; 16A, B; 21B; 30C.
2006. *Prionoceras fuerstenbergi* (Korn); J. Dzik, p. 243, fig. 178.

MATERIAL: MUZ PIG 284.II.333(a, b); 2 specimens (Ostrówka section; labelled *Prionoceras globosoideum* sp. n. Czarnocki, 1936).

DESCRIPTION: Shell almost globose, with wide and rounded venter and slightly flattened flanks; ww/dm: 0.78–0.80. Umbilicus concave and closed. Growth lines thin, slightly convex on flanks and venter; constrictions distinct only on flanks of whorls.

REMARKS: Dzik (2006) presented only a “larval (or embryonic)” form of this species from the Kowala section (his fig. 178I), whereas the species description (Dzik 2006, p. 243) does not fit the other specimens illustrated from the Dzikowiec section (his fig. 178C–G). This might have resulted from an erroneous caption to his fig. 178: the species illustrated as fig. 178C–G fits the description of *Prionoceras lentum* (Korn).

OCCURRENCE: Holy Cross Mountains, Poland; uppermost Fammenian, *Effenbergia lens*–*Parawocklumeria paradoxa* Zones.

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