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## Brachiopods from the Jurassic/Cretaceous boundary of Rogoźnik and Czorsztyn in the Pieniny Klippen Belt

**ABSTRACT:** Terebratulid and dallinid brachiopods are described from the Upper Tithonian brachiopod layer exposed at the Castle Klippe at Czorsztyn and the Lower Berriasian limestones of Rogoźnik, Pieniny Klippen Belt. Previous identifications are revised and original descriptions supplemented with internal-structural description for two species of the genus *Karadagithyris*, one of *Dictyothyropsis*, and one of *Zittelina*.

### INTRODUCTION

The brachiopod fauna of Pieniny Klippen Belt was investigated first by Zeuschner (1846) and Zittel (1870) who erected and described several new, endemic species. Shell internal structure of those species has thus far remained unknown which induced a need for further collecting at the type locality and paleontological revision of the fauna.

The present study of the brachiopods from the Jurassic/Cretaceous boundary of Pieniny Klippen Belt started in 1965, at the suggestion of Professor K. Birkenmajer. The Castle Klippe at Czorsztyn (Text-fig. 1) was investigated at first, which exposure yielded a rich brachiopod collection from the Upper Tithonian brachiopod and crinoid-brachiopod limestones (cf. Birkenmajer 1963, section 18, layers 8, 9 and 11, pp. 78 and 146). Thereafter, the world-famous exposure at Rogoźnik by Nowy Targ was also sampled.

Thus far, the following brachiopod genera have been revised and their descriptions supplemented (Barczyk 1971, 1972a, b, 1979): *Pygope*, *Antinomia*, *Nucleata*, *Camerothyris*, *Monticlarella*, and *Lacunosella*. In the present paper, the remaining brachiopod species recorded in the collection of over 3,000 specimens are described; these are representat-

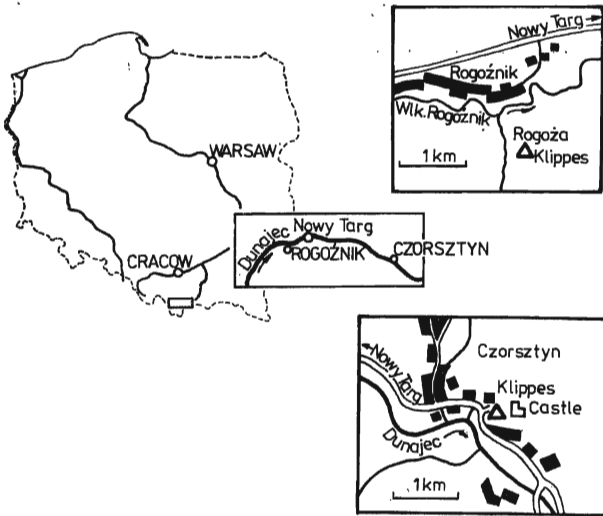


Fig. 1. Location map, to show the situation of the exposures at Rogoźnik and Czorsztyn in the Pieniny Klippen Belt

ives of the genera *Karadagithyris*, *Dictyothyropsis*, and *Zittelina*. The Upper Tithonian to Lower Berriasian brachiopod fauna of Czorsztyn and Rogoźnik, comprising totally 17 species of 9 genera of 6 families (Tab. 1), becomes thus entirely revised.

Table 1

Brachiopods from the Jurassic/Cretaceous boundary of the Pieniny Klippen Belt; localities Czorsztyn and Rogoźnik

	Upper Tithonian	Lower Berriasian
<b>Family Dimerellidae</b> Buckman, 1918		
<i>Monticlairella agassizi</i> (Zeuschner, 1846)	+	+
<i>Monticlairella capillata</i> (Zittel, 1870)	+	+
<b>Family Wellerellidae</b> Likhariiev, 1965		
<i>Lacunosella atropa</i> (Zittel, 1870)		+
<i>Lacunosella hoheneggeri</i> (Suess, 1858)	+	
<i>Lacunosella zeuschneri</i> (Zittel, 1870)	+	
<b>Family Terebratulidae</b> Gray, 1840		
<i>Karadagithyris bilimeki</i> (Suess, 1858)	+	
<i>Karadagithyris carpathica</i> (Zittel, 1870)	+	+
<b>Family Pygopidae</b> Muir-Wood, 1965		
<i>Pygope diphya</i> (Colonna, 1616)	+	
<i>Pygope janitor</i> (Pictet, 1867)	+	
<i>Antinomina sima</i> (Zeuschner, 1846)	+	
<i>Nucleata bouei</i> (Zejszner [=Zeuschner], 1846)	+	+
<i>Nucleata nucleata</i> (Schlotheim, 1820)	+	
<i>Nucleata planulata</i> (Zejszner [=Zeuschner], 1846)	+	+
<i>Nucleata rupicola</i> (Zittel, 1870)	+	+
<b>Family Zeilleridae</b> Rollier, 1915		
<i>Camerothyris wahlenbergi</i> (Zejszner [=Zeuschner], 1846)	+	+
<b>Family Dallinidae</b> Beecher, 1893		
<i>Dictyothyropsis tatica</i> (Zittel, 1870)	+	
<i>Zittelina pinguicula</i> (Zittel, 1870)	+	

All the illustrated specimens (Pls 1—2) are housed at the Museum of the Faculty of Geology of the Warsaw University.

*Acknowledgements.* The author is greatly indebted to the Management of the Pieniny National Park at Krościenko for permission to collect the fossils, to Professor K. Birkenmajer for indicating the brachiopod-bearing exposures, and to Dr. A. Wierzbowski for age determination of the Berriasian limestones of Rogoźnik.

#### DESCRIPTION OF THE MATERIAL

Family *Terebratulidae* Gray, 1840  
 Subfamily *Karadagithyridinae* Tchorschhevsky, 1974  
 Genus *KARADAGITHYRIS* Tchorschhevsky, 1974  
*Karadagithyris bilimeki* (Suess, 1858)  
 (Text-fig. 2 and Pl. 1, Figs 1—4)

1858. *Terebratula Bilimeki* Suess; E. Suess, p. 26, Pl. 1, Figs 7—9.

1870. *Terebratula Bilimeki* Suess; K. A. Zittel, p. 138, Pl. 14, Fig. 9.

1899. *Terebratula Bilimeki* Suess; M. Remeš, p. 214.

*Material:* 25 well preserved specimens and 47 damaged ones.

*Dimensions* (in mm):

	Length	Width	Thickness
MWGUW 6a	18.9	17.2	10.1
MWGUW 5c	17.8	17.1	10.0
MWGUW 6b	17.0	15.5	9.4
MWGUW 5b	15.3	14.6	8.7
MWGUW 6c	10.8	10.1	6.0

*Supplementary description.* — Shell is circular in outline, with its pedicle valve more convex than the brachial one. Lateral commissures are straight and anterior commissure is rectimarginate. Considerably arched, small beak bear a narrow pedicle foramen of mezothyrid type. Symphytium is low and narrow. Shell is smooth with distinct growth lines.

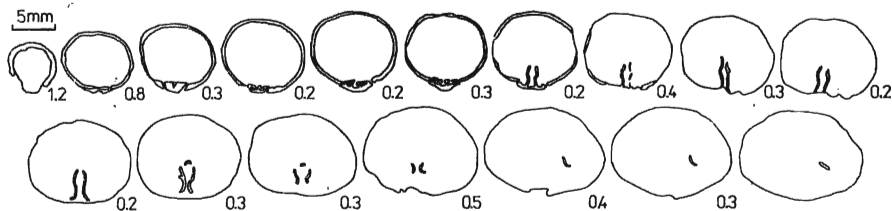


Fig. 2. Serial transverse sections of *Karadagithyris bilimeki* (Suess) from Czorsztyn; Upper Tithonian

Shell internal structure is typical of the genus. Cardinal process is small-sized and ovate in outline. Massive hinge plates are slightly concave to almost flat, supported by massive buttressing plates at the junction with crura. Wide and massive crura and crural processes are attached to the buttressing plates of hinge plates. Long loop is of terebratulid type.

*Remarks.* — The species *Karadagithyris bilimeki* (Suess) resembles very closely in shell outline, shape, and internal structure *K. babanovi* Tchorszhevsky which may actually be its junior synonym.

*Occurrence.* — Tithonian of Stramberk. Czechoslovakia (Zittel 1870. Remes 1899); Upper Tithonian and Lower Berriasian of Czorsztyń and Rogoźnik, Poland (Zittel 1870).

*Karadagithyris carpathica* (Zittel, 1870)  
(Text-fig. 3 and Pl. 1, Figs 5—7)

1870. *Terebratula Carpathica* Zittel; K. A. Zittel, p. 137, Pl. 14, Figs 6—8.  
1973. *Karadagithyris carpathica* (Zittel); E. S. Tchorszhevsky, p. 22.

*Material:* 6 well preserved specimens.

*Dimensions* (in mm):

	Length	Width	Thickness
MWGÜW 7a	19.4	15.8	11.5
MWGÜW 7c	17.6	14.7	9.9
MWGÜW 7b	16.5	12.3	9.1
MWGÜW 3a	14.3	11.7	7.5
MWGÜW 3b	14.0	11.0	7.2

*Supplementary description.* — Shell is elongate olate to subpentagonal in outline, with its pedicle valve more convex than the brachial one. Lateral commissures are straight and anterior commissure is rectimarginate. Massive, erect beak shows a narrow pedicle foramen of mezothyrid type. Symphytium is narrow, elongate triangular in shape. Smooth shell shows very distinct concentric growth lines.

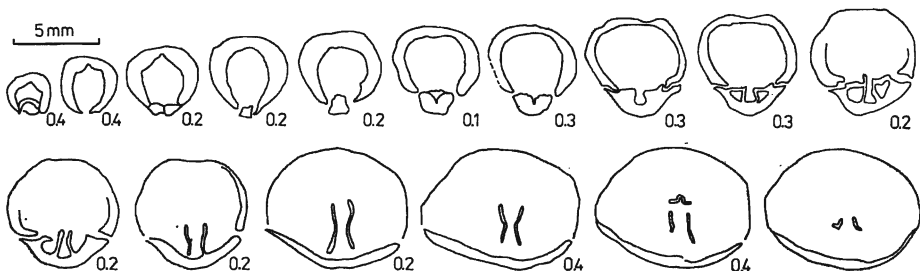


Fig. 3. Serial transverse sections of *Karadagithyris carpathica* (Zittel) from Czorsztyń; Upper Tithonian

Internal structure of shell is typical of the genus. Well developed cardinal processus is straight. Massive hinge teeth are clubbed. Massive, almost straight hinge plates are supported by buttressing plates attached to crura. Crural processes are long and wide, and loop is of terebratulid type.

*Remarks.* — During the last decade, the species *Terebratula carpathica* Zittel was attributed to three distinct genera, namely *Karadagithyris*, *Svaljavithyris*, and *Trepeothyris*, which makes its proper generic assignment a rather difficult task. Tchorszhevsky (1973) was the first to assign *T. carpathica* Zittel to the genus *Karadagithyris* but the published abstract of his thesis lacks a complete description and illustration of the newly proposed genus. The genera *Karadagithyris* gen. nov. and *Svaljavithyris* gen. nov. (*in litt.*) were subsequently re-

described by Tchorszhevsky (1974) but the latter genus has still not been provided with formal description and hence, remains to be *nomen nudum*; in fact, the only indication that *Svaljavithyris* was distinguished basing upon the species *T. carpathica* Zittel appeared in discussion of the other genus (cf. Tchorszhevsky 1974, p. 55).

Smirnova (1975) assigned the considered species to *Trepeothyris* Smirnova. However, the specimens of *Trepeothyris carpathica* (Zittel) described by her from Inwald, Polish Carpathians, are to be regarded as another, possibly new species because their internal structure (see Smirnova 1975, p. 125, Text-fig. 8) considerably differs from that observed in specimens derived from the type locality (Text-fig. 3). Both the latter specimens and those described by Tchorszhevsky (1974) display their internal structure typical of the genus *Karadagithyris*.

*Occurrence.* — Tithonian of the Soviet part of Pieniny Klippen Belt (Tchorszhevsky 1973); Upper Tithonian of Czorsztyn and Rogoźnik, Lower Berriasian of Rogoźnik, Poland (Zittel 1870).

Family **Dallinidae** Becher, 1893  
Subfamily **Kingeninae** Elliott, 1948  
Genus **DICTYOTHYROPSIS** Barczyk, 1969  
*Dictyothyropsis tatrca* (Zittel, 1870)  
(Text-fig. 4 and Pl. 2, Figs 1—3)

1870. *Megerlea Tatrca* Zittel; K. A. Zittel, p. 143, Pl. 14, Figs 21—22.

1899. *Megerlea proloricata* Remeš; M. Remeš, p. 226, Pl. 7 (1), Fig. 9.

*Material:* 7 complete specimens.

*Dimensions* (in mm):

	Length	Width	Thickness
MWGUW 8a	10.1	10.6	6.7
MWGUW 8b	9.0	9.6	6.1
MWGUW 8c	8.7	8.9	5.9
MWGUW 10a	8.2	9.2	4.7
MWGUW 10c	8.0	8.9	5.0

*Supplementary description.* — Shell is triangular in outline, slightly rounded at the anterior margin with its brachial valve more convex than the pedicle one.

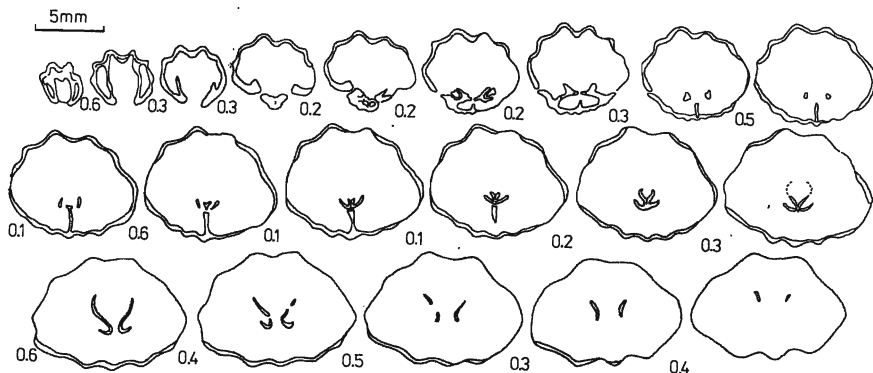


Fig. 4. Serial transverse sections of *Dictyothyropsis tatrca* (Zittel) from Czorsztyn; Upper Tithonian

Lateral commissures are straight, while anterior commissure shows a single distinct sinus. Massive, erect beak bears a large, ovate pedicle foramen of mezothyrid type. Symphytium is triangular in outline and high. Shell is ornamented with 5–7 distinct and thick radial ribs two of which delimit a depression at the pedicle valve. Shell surface shows also a distinct concentric growth lines.

Shell internal structure is typical of the genus, with kingeniform brachidium. Dental plates are distinct but thin, almost parallel to each other. Cardinal process is poorly developed, attached to the hinge plates and medial septum.

*Remarks.* — The species *Dictyothyropsis tatrlica* (Zittel) resembles in internal structure its congeners *D. loricata* (Schlotheim) and *D. pectunculoides* (Schlotheim) but it shows less numerous and more prominent ribs, and more smooth shell surface inbetween.

*Occurrence.* — Upper Tithonian of Czorsztyn and Lower Berriasian of Rożoźnik, Poland (Zittel 1870, Remeš 1899).

Genus *ZITTELINA* Rollier, 1919  
*Zittelina pinguicula* (Zittel, 1870)  
(Text-fig. 5 and Pl. 2, Figs 4–6)

1870. *Waldheimia pinguicula* Zittel; K. A. Zittel, p. 139, Pl. 14, Figs 10–14.

*Material:* 8 complete specimens and 13 damaged ones.

*Dimensions* (in mm):

	Length	Width	Thickness
MWG UW 12a	15.7	15.5	10.0
MWG UW 13b	15.0	15.0	10.0
MWG UW 12b	14.8	14.6	9.8
MWG UW 13a	13.6	12.8	9.4
MWG UW 12c	10.9	10.3	8.2

*Supplementary description.* — Shell is circular to subpentagonal in outline, with its pedicle valve more convex than the brachial one. Lateral commissures are close to straight, while anterior commissure is parasulcate or episulcate. Two prominent short ribs make distinct a depression at the pedicle valve at mid-

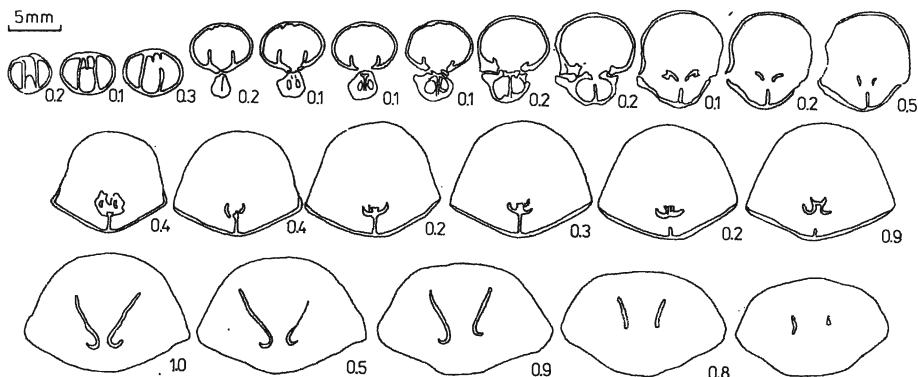


Fig. 5. Serial transverse sections of *Zittelina pinguicula* (Zittel) from Czorsztyn; Upper Tithonian

-length of adult shell. Beak is strongly arched, with a circular pedicle foramen of mezothyrid type. Shell surface is smooth, with concentric growth lines.

Shell internal structure is typical of the genus. Dental plates are massive and subparallel to each other. Slightly concave hinge plates are attached to a long and massive medial septum; the latter joins a loop. Campagiform brachidium changes into kingeniform one in adults.

*Remarks.* — The species *Zittelina pinguicula* (Zittel) is endemic for the Pieniny Klippen Belt, with no relatives known thus far from the Tethyan Realm.

*Occurrence.* — Upper Tithonian of Czorsztyn and Biała Woda, Poland (Zittel 1870).

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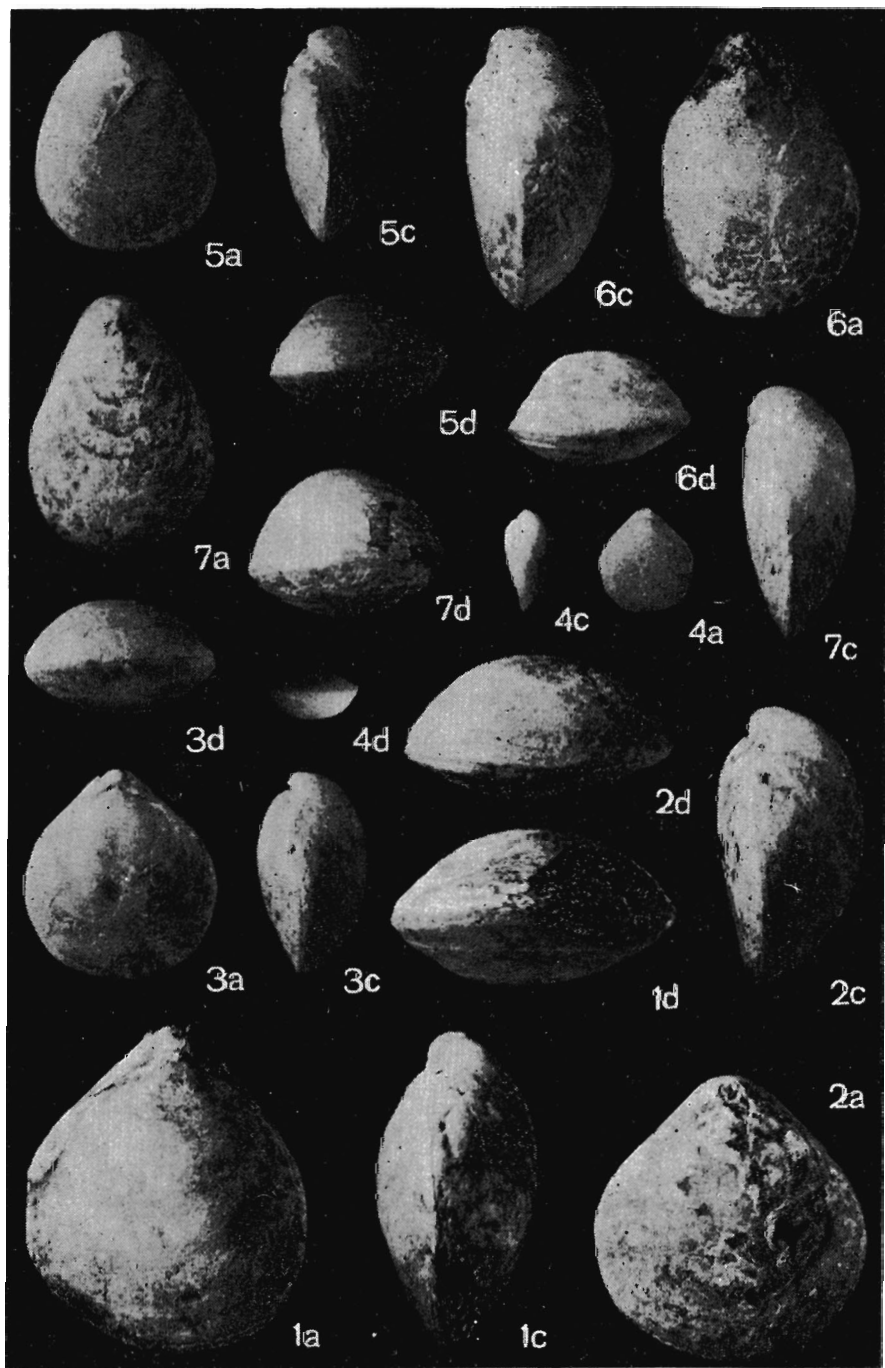
### BRACHIOPODY Z POGRANICZA JURY I KREDY PIENIŃSKIEGO PASA SKAŁKOWEGO POLSKI

(Streszczenie)

Przedmiotem niniejszego opracowania są rodzaje *Karadagithyris*, *Dictyothyropsis* i *Zittelina*, zebrane przez autora wraz z bogatą kolekcją brachiopodów (liczącą ponad 3000 okazów) z wapieni brachiopodowych i krynoidowo-brachiopodowych górnego tytonu oraz dolnego beriasu, odsłaniających się pod zamkiem w Czorsztynie oraz w skałkach Rogoźnika (*patrz* fig. 1). Badaniami objęto cechy morfologii zewnętrznej i budowy wewnętrznej (*patrz* fig. 2—5 oraz pl. 1—2) czterech gatunków: *Karadagithyris bilimeki* (Suess), *K. carpathica* (Zittel), *Dictyothyropsis tatica* (Zittel) oraz *Zittelina pinguicula* (Zittel).

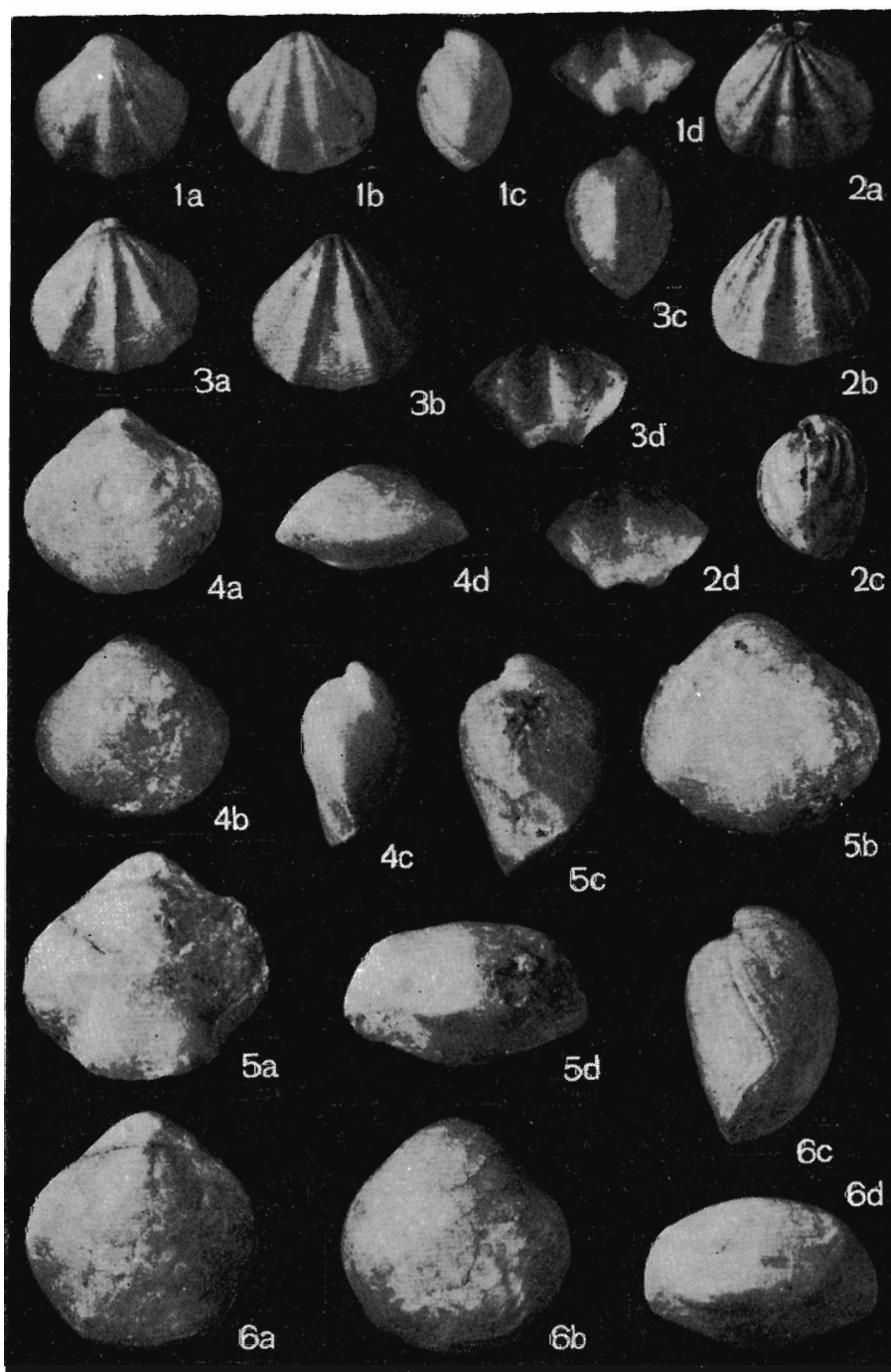
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1-4 — *Karadagithyris bilimeki* (Suess); Czorsztyn, Upper Tithonian  
 5-7 — *Karadagithyris carpathica* (Zittel); 5-6 from Czorsztyn, Upper Tithonian;  
 7 from Rogoźnik, Lower Berriasian

In all figures: a brachial-valve view, b pedicle-valve view, c lateral view, d anterior view,  
 all taken X 2



1—3 — *Dictyothyropsis tatrica* (Zittel); Czorsztyn, Upper Tithonian  
 4--6 -- *Zittelina pingvicala* (Zittel); Czorsztyn, Upper Tithonian

In all figures: a brachial-valve view, b pedicle-valve view, c lateral view, d anterior view;  
 all taken X 2