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Succession of the Tithonian to Berriasian brachiopod faunas at Rogoźnik, Pieniny Klippen Belt

ABSTRACT: A succession of the brachiopod faunas within the Tithonian to Berriasian strata exposed in the classical section at the Rogoża Klippes of Rogoźnik in the Pieniny Klippen Belt, southern Poland, is recognized. A bed-by-bed analysis of particular strata reveals the dominance of the family Pygopidae in the Lower and Middle Tithonian, and the families Wellerellidae and Dallinidae in the Upper Tithonian and Berriasian.

INTRODUCTION

The classical Tithonian locality of Rogoźnik in the Pieniny Klippen Belt, southern Poland (*see* Text-fig. 1) has long been known to yield ubiquitous fossils, primarily ammonites and brachiopods (ZEUSCHNER 1846; ZITTEL 1870; NEUMAYR 1871; ZARĘCZNY 1876; UHLIG 1890; ARKELL 1956; BIRKENMAJER 1963; BARCZYK 1971, 1972a, b, 1979a, b). The stratigraphic subdivision of the section exposed in the Rogoża Klippes at Rogoźnik has been recognized quite recently. It was BIRKENMAJER (1960, 1963) who first presented precisely the lithological sequence and its stratigraphic attribution within the Rogoża Klippes. A detailed study of this section was performed by KUTEK & WIERZBOWSKI (1979; 1986a, b) who distinguished the Lower and Middle Tithonian ammonite zones within the sparry coquinas and those of the Upper Tithonian and Berriasian within the micritic coquinas (*see* Text-fig. 2).

The aim of this paper is to report on the distribution of brachiopod faunas in successive units of the sequence, accordingly with the stratigraphic scheme established by KUTEK & WIERZBOWSKI (1979; 1986a, b). The discussed material was collected by Professor J. KUTEK and Professor A. WIERZBOWSKI during their study of the section, and thus the bed numeration is kept the same as used in their papers (*see* Text-figs 2-3).

THE BRACHIOPOD FAUNAS

The Rogoża Klippes in which the investigated section is exposed, have recently been promoted as a geological monument (*see* BIRKENMAJER 1962). These Klippes, protected by law, stretch above the quarry at Rogoźnik (*see* Text-fig. 2), now abandoned, and formerly known as the famous fossiliferous Tithonian locality.

Within the section of the Rogoża Klippes, KUTEK & WIERZBOWSKI (1979, 1986a, b) distinguished 23 beds, a part of which (beds *1* - *6*) represent the Berriasian, and another one (beds *7a* - *23*) the Tithonian (*see* Text-fig. 2). A small portion of the sequence (beds *13* - *14*) was recognized by KUTEK & WIERZBOWSKI (1979; 1986a, b) as a subhorizontal neptunian dyke filled with deposits of uppermost Tithonian and lowermost Berriasian age.

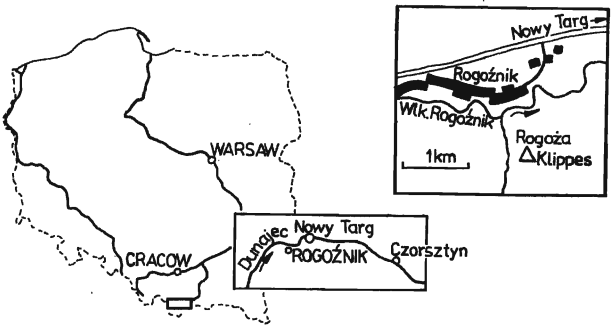


Fig. 1. Location map, to show the investigated exposure of the Rogoża Klippes at Rogoźnik in the Pieniny Klippen Belt, southern Poland

The brachiopod faunas distributed in the section are hereafter characterized in their stratigraphic succession as follows.

The sparry coquinas of the beds No. *23* - *21* (Lower Tithonian, Hybonoticeras hybonotum Zone) yielded 7 brachiopod species belonging to 4 genera, viz.: *Monticlarella agassizi* (ZEUSCHNER), *M. capillata* (ZITTEL), *Pygope janitor* (PICTET), *Antinomia sima* (ZEUSCHNER), *Nucleata bouei* (ZEUSCHNER), *N. nucleata* (SCHLOTHEIM), and *N. fraudulosa* (ZITTEL).

The bed No. *20* (Lower Tithonian, Neochetoceras darwini Zone) contained 7 species of 3 genera, viz.: *Monticlarella agassizi* (ZEUSCHNER), *Pygope diphya* (COLONNA), *P. janitor* (PICTET), *Nucleata bouei* (ZEUSCHNER), *N. nucleata* (SCHLOTHEIM), *N. planulata* (ZEUSCHNER), and *N. fraudulosa* (ZITTEL).

The beds No. *19* - *17*, representing the darwini and/or semiforme zones (uppermost Lower and/or lowermost Middle Tithonian), displayed an occurrence of 6 species of 2 genera, viz.: *Pygope diphya* (COLONNA), *P. janitor* (PICTET), *Nucleata bouei* (ZEUSCHNER), *N. nucleata* (SCHLOTHEIM), *N. planulata* (ZEUSCHNER), and *N. fraudulosa* (ZITTEL).

The beds No. *16* - *15*, and *12* which represent a lower part of the Middle Tithonian (Semiformiceras semiforme Zone) yielded 10 species of 6 genera, viz.: *Monticlarella capillata* (ZITTEL), *Karadagithyris bilimeki* (SUESS), *Pygope diphya* (COLONNA), *P. janitor* (PICTET), *Nucleata bouei* (ZEUSCHNER), *N. nucleata* (SCHLOTHEIM), *N. planulata* (ZEUSCHNER), *N. fraudulosa* (ZITTEL), *Camerothyris wahlenbergi* (ZEUSCHNER), and *Zittelina pinguicula* (ZITTEL).

The beds No. *11* - *7b* attributed to the middle part of the Middle Tithonian (Semiformiceras fallauxi Zone), contain 11 species of 6 genera, viz.: *Monticlarella agassizi* (ZEUSCHNER), *M. capillata* (ZITTEL), *Karadagithyris bilimeki* (SUESS), *Pygope diphya* (COLONNA), *P. janitor* (PICTET), *Nucleata bouei* (ZEUSCHNER), *N. nucleata* (SCHLOTHEIM), *N. planulata* (ZEUSCHNER), *N. fraudulosa* (ZITTEL), *Camerothyris wahlenbergi* (ZEUSCHNER), and *Zittelina pinguicula* (ZITTEL).

The beds No. *13* and *14*, composed of micritic limestones with scattered bioclasts, constitute a subhorizontal neptunian dyke in which only a calpionellid fauna typical of the Zone "A" = *Crassicollaria* of uppermost Tithonian and of the Zone "B" = *Calpionella* of lowermost Berriasian age has been found (*see* KUTEK & WIERZBOWSKI 1986, p. 292). Unfortunately, this neptunian dyke is devoid of any brachiopod fauna.

The bed No. *7a*, composed of micritic coquinas with undeterminable ammonites and with the calpionellids (Upper Tithonian, calpionellid Zone "A" = *Crassicollaria*), displayed a content of 10 brachiopod species of 7 genera, viz.: *Lacunosella hoheneggeri* (SUESS), *L. zeuschneri* (ZITTEL), *Monticlarella agassizi*

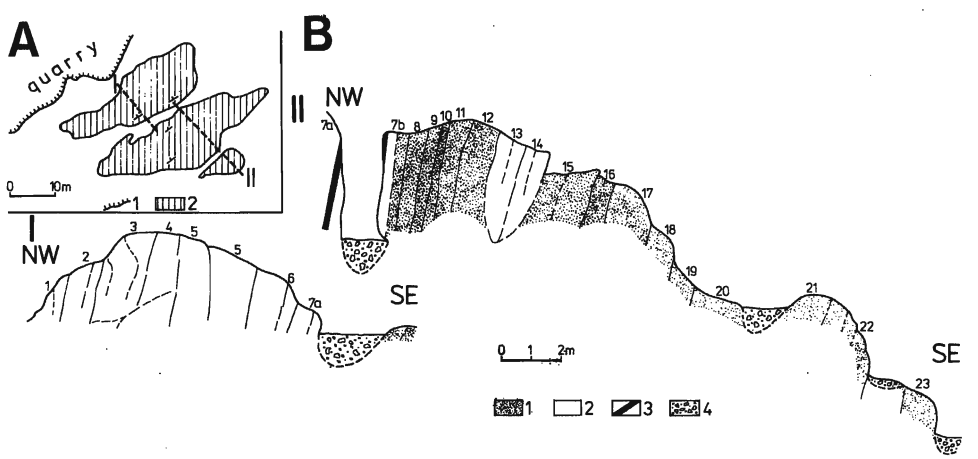


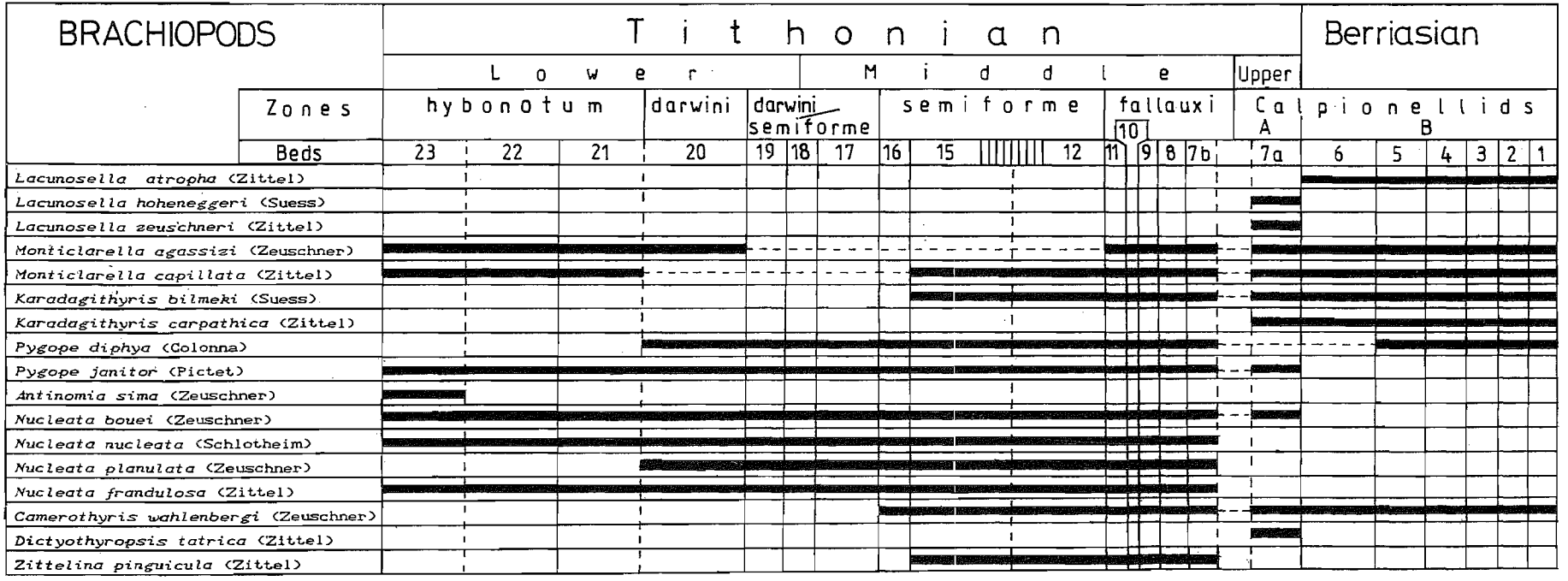
Fig. 2. Section exposed in the Rogoża Klippes at Rogoźnik (*taken from*: KUTEK & WIERZBOWSKI 1986a, Fig.1)

A — Sketch map of the klippes with lines of sections (*I* and *II*) indicated: *1* quarry, *2* outcrops of the Rogoźnik Coquina Member

B — Cross-sections of the klippes: *1* sparry coquinas (Lower-Middle Tithonian), *2* micritic coquinas, also in neptunian dykes (Upper Tithonian — Barriasian), *3* crinoid-detrital limestones in neptunian dykes (? uppermost Berriasian — Valanginian), *4* rubble

Stratigraphic distribution of brachiopods in the Rogoża Klippes section at Rogoźnik

Numbers of the beds the same as in Text-fig. 2; horizontal scale corresponds to the thickness of particular beds



(ZEUSCHNER), *M. capillata* (ZITTEL), *Karadagithyris bilimeki* (SUESS), *K. carpathica* (ZITTEL), *Pygope janitor* (PICTET), *Nucleata bouei* (ZEUSCHNER), *Camerothyris wahlenbergi* (ZEUSCHNER), and *Dictyothyropsis tatrica* (ZITTEL).

The beds No. *6 - 1*, composed of white micritic limestones with scattered fine detritus of ammonite shells and crinoids, contain fairly well preserved ammonites of the family Berriasellidae and brachiopods. The age attribution of these beds is the Lower Berriasian, the calpionellid Zone "B" = *Calpionella*. The brachiopod content of these beds is featured by the presence of 7 species belonging to 5 genera, viz.: *Lacunosella atropha* (ZITTEL), *Monticlarella agassizi* (ZEUSCHNER), *M. capillata* (ZITTEL), *Karadagithyris bilimeki* (SUESS), *K. carpathica* (ZITTEL), *Pygope diphya* (COLONNA), and *Camerothyris wahlenbergi* (ZEUSCHNER).

GENERAL CHARACTERISTICS OF THE BRACHIOPOD FAUNAS

The collected brachiopod faunas of the Rogoża Klippes at Rogoźnik clearly demonstrate their ununiform distribution throughout particular parts of the exposed section (*see* Text-figs 3-4). The brachiopod spectrum for the lower part of the section (Lower to Middle Tithonian strata) much differs from that of the upper part of the section (Upper Tithonian and Berriasian).

In the Lower and Middle Tithonian strata (*see* Text-fig. 4*A*) the representatives of the family **Pygopidae** predominate (genera *Pygope* and *Nucleata*; 84%

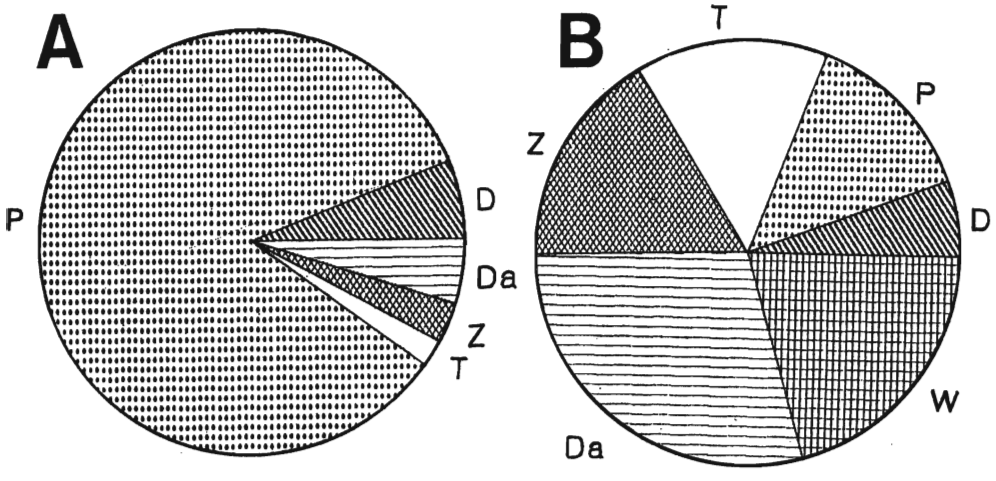


Fig. 4. Brachiopod spectra of the Tithonian and Berriasian strata exposed in the Rogoża Klippes at Rogoźnik

A — Lower part of the section: Beds *7b-12* and *15-23* (Lower and Middle Tithonian)

B — Upper part of the section: Beds *7a* (Upper Tithonian) and *1-6* (Berriasian)

Brachiopod families: **D** — Dimerellidae, **W** — Wellerellidae, **T** — Terebratulidae, **P** — Pygopidae, **Z** — Zeilleridae, **Da** — Dallinidae

of the assemblage), which are associated with the family **Dimerellidae** (genus *Monticlarella*; 6%), **Terebratulidae** (genus *Karadagithyris*; 2%), **Dallinidae** (genera *Dictyothyropsis* and *Zittelina*; 5%), and **Zeilleridae** (genus *Camerothyris*; 3%).

On the contrary, the Upper Tithonian and Berriasian strata (*see* Text-fig. 4*B*) are characterized by a uniform share in the presence of such families as: **Wellerellidae** (genus *Lacunosella*; 21%), **Dimerellidae** (genus *Monticlarella*; 6%), **Terebratulidae** (genus *Karadagithyris*; 12%), **Pygopidae** (genera *Pygope* and *Nucleata*; 14%), **Zeilleridae** (genus *Camerothyris*; 17%), **Dallinidae** (genera *Dictyothyropsis* and *Zittelina*; 30%).

REMARKS ON ENVIRONMENTAL CONDITIONS

The environmental conditions under which the investigated brachiopods have lived within the frames of the ancient Tethyan Ocean may be characterized as generally good. This has been manifested by a rather remarkable number of genera and species which are recognized throughout the sequence (*see* Text-fig. 3).

In the Lower Tithonian, an influence may be inferred of environmental stress of unidentified nature which was responsible for a relative scarcity of the brachiopod fauna and for its partial endemism. The latter is revealed by the common occurrence of the endemic species *Antinomia sima* (ZEUSCHNER) which is typical of the lower part of the Hybonoticeras hybonotum Zone.

In the Middle Tithonian, an amelioration of the life conditions is recognizable by the specific differentiation of the brachiopod faunas, and by the increasing frequency of specimens. An increase in the number of brachiopod specimens equals 90% in relation to the Lower Tithonian strata. It is also to note that several new species of the families Terebratulidae, Zeilleridae, and Dallinidae have appeared at that time.

A change of environmental conditions in the Upper Tithonian and Berriasian has been displayed by the brachiopod assemblage in which the rhynchonellids have begun to dominate upon the terebratulids. Moreover, such terebratulid genera as *Pygope* and *Nucleata* disappear, and the rhynchonellid genus *Lacunosella* associated with the terebratulid *Dictyothyropsis* come to the existence in the bottom habitats (*see* Text-fig. 3). This change is thought to have been controlled by a new pattern of hydrodynamic conditions due to which pelitic ooze was deposited instead of the former organodetrital material.

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SUKCESJA FAUNY RAMIENIONOGÓW W PROFILU ROGOŹNIKA W PIENINACH

(Streszczenie)

W pracy przedstawiono wyniki analizy fauny ramienionogów występujących w klasycznym profilu Skałki Rogoży w Rogoźniku. W oparciu o materiał zebrany w czasie prac nad biostratygrafią tego profilu (*patrz* KUTEK & WIERZBOWSKI 1979; 1986a, b) prześledzono następstwo zespołów ramienionogów w poszczególnych warstwach, przy zachowaniu ich numeracji stosowanej przez poprzednich autorów (*patrz* fig. 1-3). W odniesieniu do szerszych interwałów stratygraficznych stwierdzono przewagę przedstawicieli rodziny Pygopide nad pozostałymi ramienionogami w utworach tytonu dolnego i środkowego, oraz rodziny Wellerellidae i Dallinidae w utworach tytonu górnego i beriasu (*patrz* fig. 4).