



New biostratigraphic data based on inoceramid bivalves from the interval Upper Turonian – Coniacian in Breznik, West Srednogorie Mountains, Bulgaria

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Introduction

A relatively abundant and varied in species inoceramid bivalve fauna has been found in the Upper Cretaceous sediments near the town of Breznik. Most numerous inoceramid bivalves appear in the upper Turonian and Coniacian rocks.

Inoceramid bivalve faunas is very indicative for the stratigraphic subdivision of the Upper Cretaceous sedimentary sequences. Inoceramid bivalves occur individually, or with other macrofossil groups, such as ammonites, echinoids, other bivalves, etc.

General remarks

Not many Bulgarian authors have taken into account this important fossil group for the Upper Cretaceous stratigraphy until now. It has mostly been used for stratigraphic purposes in Campanian and Maastriichtian sediments (Stephanoff, 1931; Tzankov, 1947; Tzankov et al., 1960; Jolkicev, 1962; Jolkicev, Karagiuleva, 1962). Jolkicev et al. (1968) have used inoceramid bivalves for stratigraphic subdivision of Coniacian and Santonian sediments in the area of the town of Dragoman. Tzankov (1968) has applied a list of inoceramid bivalves in Upper Cretaceous sediments and later has described them taxonomically (Tzankov et al., 1981).

In Bulgarian geological literature has not been done biostratigraphic zoning of Turonian and Coniacian sediments on the basis of inoceramid bivalves, until now. Different biostratigraphic schemes according to this fossil group have been introduced in different parts of the world, depending on the presence and the abundance of taxons. Such zoning is known in Poland (Walaszczyk, 1992), Austria (Tröger, Summesberger, 1994), Germany (Kaufman et al., 1996), Kazakhstan (Marcinowski et al., 1996), Germany and Poland (Walaszczyk, Wood, 1999), Unit-

ed States (Walaszczyk, Cobban, 2000), Madagascar (Walaszczyk et al., 2004) and etc.

In the present investigation for the biostratigraphic zoning is used the scheme of Walaszczyk and Wood (1999) proposed for Poland and Germany. The zone *Mytiloides insertus* is characterised by Walaszczyk and Cobban (2000) (fig. 1). The proposed scheme by Walaszczyk and Wood (1999) is almost identical with the latter, introduced for the Western Interior of the USA.

The aim of this study is to make an attempt for zoning of Middle Turonian and Coniacian sediments according to inoceramid bivalves. This fossil group is considered with a classification approach which is new for Bulgaria. The following genus is established: *Mytiloides* Brongniart, 1822, *Inoceramus* Sowerby, 1814, *Cremnoceramus* Cox, 1969 and *Tethyoceramus* Sornay, 1980.

The two stages contain different inoceramid assemblages. At the Turonian stage dominate inoceramid bivalves represented by *Mytiloides* and *Inoceramus*, where in the Coniacian sediments the fauna is dominated by *Cremnoceramus* and *Tethyoceramus*.

The fossil specimens are collected from different rock successions near the villages Rebro, Ljalintzi, Izvor, Filipovtzi and the town of Dragoman. These sequence represent a marlstone-limestone unit (Middle Turonian and Lower Coniacian) (Kostadinov, 1995). The fossil material occurs mainly in grey, pale grey and beige allochemic limestones and marls in the studied areas.

Some of the zones are not presented in the studied sections due to no characteristic taxons or assemblages have been found (fig. 1). Three of the zones are indicated in the rock succession and one is established through the interception of its lower and upper boundaries.

Stage	Substage	INOCERAMID ZONATIONS		
		Walaszczyk & Wood 1999	Walaszczyk & Cobban 2000 (partially)	Zonation applied herein
CONIACIAN	Lower	<i>C. crassus crassus</i> / <i>C. deformis deformis</i>	<i>Cremnoceramus crassus</i> <i>crassus</i>	<i>C. crassus crassus</i> / <i>C. deformis deformis</i>
		<i>C. crassus inconstans</i>	<i>C. deformis dobrogensis</i>	<i>C. inconstans</i>
		<i>C. waltersdorfensis hannovrensis</i>		<i>C. crassus inconstans</i>
		<i>Cremnoceramus deformis erectus</i>	<i>Cremnoceramus deformis erectus</i>	
TURONIAN	Upper	<i>Cremnoceramus waltersdorfensis waltersdorfensis</i>	<i>Cremnoceramus waltersdorfensis waltersdorfensis</i>	
		<i>Mytiloides scupini</i>	<i>Mytiloides scupini</i>	<i>Mytiloides scupini</i>
			<i>Mytiloides incertus</i>	<i>Mytiloides incertus</i>

Fig. 1. Correlation of the inoceramid zonation proposed here with the published schemes of Walaszczyk and Wood (1999) and partially Walaszczyk and Cobban (2000)

Description of the inoceramid zones

Mytiloides incertus Interval Zone

Definition and character: The base of the zone is defined by the first occurrence of the taxon *Mytiloides incertus* (Jimbo, 1894) and its upper boundary by the first occurrence of the *Mytiloides scupini* (Heinz, 1930). The taxon *Mytiloides incertus* is particularly common in the upper part of the zone, and continues its occurrence in the upper zone *Mytiloides scupini*.

Walaszczyk and Cobban (2000) mentioned that the lower part of the zone is dominated by the inoceramid taxon *M. mytiloidiformis* and species of the *lamarcki* group, which are not found in the rocks studied. The zone ranges over the middle and part of the upper part of the Upper Turonian.

This zone is indicated in the sediments near the villages of Rebro and Izvor. Near the village of Izvor *Mytiloides incertus* occurs with *Mytiloides costellatus* (Woods, 1912), whereas near Rebro it is accompanied by the ammonitic taxon *Gaudryceras* (Gros-souvre, 1894).

Mytiloides scupini Interval Zone

Definition and character: The base of the zone is marked by the first appearance of the taxon *Mytiloides scupini*. Its upper boundary is defined by the appearance of the first representatives of the *Cremnoceramus waltersdorfensis waltersdorfensis* lineage.

Walaszczyk and Wood (1999) mentioned that in the upper part of the zone is marked by a relative abundance of the associated species *Mytiloides herbichi* (Atebekian, 1969).

The zone ranges over the upper part of the Upper Turonian.

This zone is indicated in the sediments near the village of Filipovtzi. In the studied rocks in the lower part of the zone is characterised by inoceramid fauna with abundance of specimens of *Mytiloides scupini* (Heinz, 1930) and individuals of *Mytiloides herbichi* (Atebekian, 1969), occurrence of representatives of *Mytiloides labiatoidiformis* (Tröger, 1968) were observed also.

Cremnoceramus crassus inconstans Interval Zone

Definition and character: The base of the zone is marked by the first appearance datum of the *Cremnoceramus crassus inconstans*, the earliest representative of the *crassus* lineage. The upper boundary is placed in the appearance level of either *Cremnoceramus crassus crassus* or *Cremnoceramus deformis deformis*.

The presence of this zone is proved to the West of the village of Rebro. Together with the index taxon occur also *Tethyoceramus madagaskarinensis* Heinz, 1933, and *Tethyoceramus ernsti* (Heinz, 1928). The zone is characteristic for the middle parts of the Lower Coniacian.

Cremonoceramus crassus crassus/*Cremonoceramus deformis deformis* Parallel zone

Definition and character: The base of the zone is marked by the appearance of *Cremonoceramus crassus crassus* (Petraschek), and the coincident, but usually less regular occurrence of *Cremonoceramus deformis deformis* (Meek). Both index form of the zone are members of phyletic lineage, and the lower boundary of the zone may consequently be relatively difficult to define, due the imprecise delimitation of both subspecies from their respective phyletic ancestors, i.e. *Cremonoceramus deformis erectus* and *Cremonoceramus crassus inconstans*. The upper boundary is marked by the first appearance from the representatives of *Volviceramus Stoliczka*, 1871.

This zone is indicated in two areas — to the West of the village of Rebro and near the town of Dragoman. In the Coniacian sediments near the village of Rebro occur only representatives of *C. crassus crassus* and not specimens of *C. deformis deformis*. In the same rocks also occur relatively well preserved and abundant specimens of *Tethyoceramus mada-*

gaskarinensis Heinz, 1933, and *Tethyoceramus ernsti* (Heinz, 1928). On the basis of the representatives of the latter, Walaszczyk et al. (2004) proposed zoning scheme for Madagascar and compared it with the scheme based on the cremonoceramids.

Near the town of Dragoman, on Kondel hill were found representatives of the two index subspecies — *C. crassus crassus* and *C. deformis deformis*, and individual ammonite taxons occurred also. This zone is characteristic for the uppermost part of the Lower Coniacian (fig. 1).

Results

In the studied area were established 10 species of inoceramid bivalves possessed to 4 genus.

A contemporary classification of inoceramid bivalves is applied for the first time in Bulgaria.

Four inoceramid zones were established and identified.

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Нови биостратиграфски данни по иноцерамидни бивалвии в интервала горен турон — кониас (горна креда) в част от Западното Средногорие

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Резюме. Горнокредната серия в България съдържа сравнително изобилна иноцерамидна фауна. В част от Западното Средногорие в областа на гр. Брезник в туронски и кониаски седименти попаднахме на такава фауна. Иноцерамидните бивалвии могат успешно да се използват за биостратиграфски цели. Изследвани са 5 разрези, в интервала турон — кониас (горна креда), които попадат в обхвата на мергелно-варовиковата задруга (Костадинов, 1995). Те съдържат следните представители: *Inoceramus* Sowerby, 1814,

Mytiloides Brongniart, 1822, *Cremnoceramus* Cox, 1969 и *Tethyoceramus* Sornay, 1980. При таксономията на тази фосилна група е използвана съвременна класификация на иноцерамидните бивалвии. Установени и индикирани са 4 иноцерамидни зони: зона *Mytiloides incertus*, зона *Mytiloides scupini*, зона *Cremnoceramus crassus inconstans*, зона *Cremnoceramus crassus crassus*/*Cremnoceramus deformis deformis* в горнотуронски и долнокониаски седименти.