



## Calpionellid zonation of the Tithonian, Berriassian and Valangian around the village of Gintsi, West Balkan Mountains

### Калпионелидно зонирание на Титонския, Бериаския и Валанжинския етаж в околностите на с. Гинци, Софийска област, Западна Стара планина

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#### Introduction

The Tithonian to Lower Cretaceous pelagic to hemipelagic carbonate sequence cropping out around the village of Gintsi (West Balkan Mountains) consists of pink to grey nodular limestones (Gintsi Formation), micritic regularly bedded limestones (Glozhene Formation) and alternation of micritic and clayey limestones (Salash Formation). In the same area, Sapunov (1977) established Tithonian ammonite zonation of the Gintsi Formation and Mandov (1971) provided ammonite evidence on Late Berriassian and Valangian age of the Salash Formation. Bakalova (1977) established in the Gintsi section five standard calpionellid zones from *Chitinoidea* to *Calpionellites*. Bakalova (1986) divided the *Calpionella* Zone into three subzones – *alpina*, *Remaniella* and *elliptica*.

The purpose of this work is to re-study the calpionellid successions at Gintsi sections and to achieve a more detailed and precise zonation and age determination.

#### Results

The sections studied are located around the village of Gintsi, Sofia District, on the right bank of the Nishava River (Fig. 1), the distance between them being 1.5–2.0 km. The sampled sections comprise the uppermost 10–15 m of the Gintsi Formation, the whole Glozhene Formation, 25–37 m thick, and the lowermost 30 m of the Salash Formation. The sampling interval is about 0.5–1.0 m. Gintsi 2 is the type section of the Gintsi Formation (Sapunov,

Ziegler, 1976) and was described by Nikolov, Sapunov (1977).

The calpionellid zonation herein established consists of six zones:

***Chitinoidea* Zone** (Middle–Upper Tithonian). Uppermost part of the Gintsi Formation and lowermost part of the Glozhene Formation, 13–15 m thick. The base is defined at the first occurrence (FO) of *Longicollaria dobeni* and related species. The zone is divided into two subzones – *dobeni* and *boneti*.

***Praetintinnopsella* Zone** (Upper Tithonian). Lower part of the Glozhene Formation, the thickness is 2 m. The base is defined at the FO of *Praetintinnopsella andrusovi*.

***Crassicollaria* Zone** (Upper Tithonian). Lower part of the Glozhene Formation, the thickness is 9–10 m. The base is defined at the FO of the small form of *Tintinnopsella carparhica*. The zone is divided into two subzones – *remanei* and *massutiniana*.

***Calpionella* Zone** (Lower Berriassian). Upper half of the Glozhene Formation, the thickness of the zone reaching up to 20 m. The base is defined at the FO of the medium-sized spherical form of *Calpionella alpina*. Three subzones are established: *alpina*, *Remaniella* and *elliptica*.

***Calpionellopsis* Zone** (Upper Berriassian). Represented in the lowermost part of the Salash Formation, the thickness reaching up to 6 m. The lower Simplex Subzone is missing. The upper Oblonga Subzone is defined at the FO of the index-species.

***Calpionellites* Zone** (Lower valangianian). Lower part of the Salash Formation, the thickness is about 25 m. The base is defined at the FO of *Calpionellites darderi*. The zone includes two subzones: *darderi* and *major*.

## Discussion

We apply a slightly modified version (Lakova et al., 1997) of the calpionellid zonal and subzonal subdivision by Pop (1997). It is based on selected well documented bioevents in the calpionellid evolution. The lower boundaries of the zones and the subzones (from the Tithonian to the Lower Valanginian) are defined on the basis of 11 events of FO. Correlations with calpionellid zonations from other Mediterranean region are made, as well as with the closely located sections at Komshtitsa and Barlya in the West Balkan Mountains.

The Tithonian/Berriasian boundary is determined at the base of the *Calpionella* Zone on the “explosion” of *Calpionella alpina* and the LO of *Calpionella elliptalpina*. The Berriasian/Valanginian boundary is determined at the base of the *Calpionellites* Zone on the FO of the *Calpionellites darderi*.

A certain stratigraphic unconformity has been recorded in this study between the Glozhene and Salash Formations. The top of the former is assigned to *Calpionella elliptica* Subzone, and the base of the latter – to *Calpionellopsis oblonga* Subzone. Thus, *Calpionellopsis simplex* Subzone (lower part of the Upper Berriasian) is absent. Мандов (1971) first reported field observations on such an unconformity.

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## Conclusions

46 calpionellid species belonging to 16 genera have been identified. The family Chitinoideidae is represented by 13 species and 8 genera and the family Calpionellidae – by 33 species of 8 genera. The application of updated taxonomy of Chitinoideidae proposed by Reháková (2002) resulted in the recognition of the Tithonian genera *Longicollaria*, *Borziella*, *Dobeniella*, *Daciella*, *Carpathella*, *Almajella* for the first time in Bulgaria. The genera of the family Calpionellidae recorded are *Crassicollaria*, *Tintinnopsella*, *Calpionella*, *Remaniella*, *Calpionellopsis*, *Lorenziella*, *Praecalpionellites* and *Calpionellites*.

Six calpionellid zones and eleven subzones are documented within the Middle – Upper Tithonian to the Lower Valanginian. In the two studied sections, a stratigraphic gap between the Glozhene and Salash Formations has been established corresponding to *Calpionellopsis simplex* Subzone in the Upper Berriasian.

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