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Biostratigraphy and magnetostratigraphy of the upper Tithonian–Berriasian of the Crimean Mountains

Vladimir Arkadiev [a], Andrey Guzhikov [b], Evgenyi Baraboshkin [c], Juliya Savelieva [d], Anna Feodorova [d], Olga Shurekova [d, *], Egor Platonov [d], Aleksey Manikin [b]

[a] Saint Petersburg State University, University Embankment 7/9, 199034 Saint Petersburg, Russia
[b] Saratov State University, Astrahanskaya Street 83, 410012 Saratov, Russia
[c] Moscow State University, Leninskie Gory Street 1, 119991 Moscow, Russia
[d] AO 'Geologorazvedka', Knipovich Street 11/2, 192019 Saint Petersburg, Russia

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ABSTRACT

Our data from studies over many years on upper Tithonian–Berriasian strata of the Crimean Mountains are summarised. Their zonal subdivision has been significantly refined using ammonites and foraminifera, as well as on the basis of calpionellid, ostracod and dinocyst distributions. We have been able to document the presence of all standard Tethyan zones in the Berriasian, i.e., the Jacobi, Occitanica and Boissieri Zones, identified on the basis of foraminifera, ostracods and dinocysts. Based on calpionellids (families Chitinoidellidae and Calpionellidae) in Eastern Crimea, three standard zones were identified: Chitinoidella (Dobeni and Boneti Subzones; Tithonian), Crassicollaria (Remanei and Massutiniana subzones; Tithonian) and Calpionella (Alpina and Elliptica subzones; Berriasian). Tithonian and Berriasian calpionellid assemblages were identified in Southwestern Crimea. A magnetostratigraphic scale for the upper Tithonian–Berriasian has been also developed, thus corroborating a continuous succession of magnetic chrons from M20 through M14. The existence of the M16n.1r subchron ('Feodosiya') is substantiated; it should be included into the Geomagnetic Polarity Time Scale. The base of polarity chron M18r appears to be the most likely choice among other palaeomagnetic intervals to determine the lower boundary of the Cretaceous System, because it is close to the base of the Grandis Subzone in Tethyan sections and the Chetae Zone in Boreal sections.

1. Introduction

The Tithonian–Berriasian boundary interval in the Crimean Mountains (Fig. 1) is known to extend from the northeast (Feodosiya) to the southwest (Sevastopol). The main features of these sections include significant facies variations, a wide range of variation with respect to thickness of deposits and the incomplete stratigraphical record. The Crimean Mountains are characterised by complex tectonics. Continuous sections of Berriasian strata are missing. A detailed historical review of the various approaches towards subdivision of these deposits has been recently published (Arkadiev et al., 2012).

Numerous scientists have previously studied the Berriasian of the Crimea, including Retowski (1893), Druschits (1975), Kvantaliani and Lysenko (1979), Bogdanova et al. (1981, 1984), Bogdanova and Kvantaliani (1983), Kuznetsova (1983), Glushkov (1997), Arkadiev et al. (2006), Arkadiev et al. (2015a,b), Platonov and Arkadiev (2011), Platonov et al. (2013), Platonov (2014), Arkadiev and Guzhikov (2016), Arkadiev et al. (2016) and others.

During their research several problematic issues have been encountered by ourselves, as follows:

1) a clarification of ammonite and foraminiferal zonations; 2) an improvement of calpionellid, ostracod and dinocyst zonations and comparison with the ammonite-based subdivision; 3) development of a magnetostratigraphic scheme for the upper Tithonian–Berriasian and correlation with the ammonite zones; 4) to provide biostratigraphic and magnetostratigraphic justification of the Jurassic–Cretaceous (Tithonian–Berriasian) boundary in the

* Corresponding author.
E-mail addresses: arkadievvv@mail.ru (V. Arkadiev), aguzhikov@yandex.ru (A. Guzhikov), ejbaraboshkin@mail.ru (E. Baraboshkin), Julia-savelieva7@mail.ru (J. Savelieva), annafedoroff@yandex.ru (A. Feodorova), o.antonen@gmail.com (O. Shurekova), platonov_egor@inbox.ru (E. Platonov), agmanikin@mail.ru (A. Manikin).

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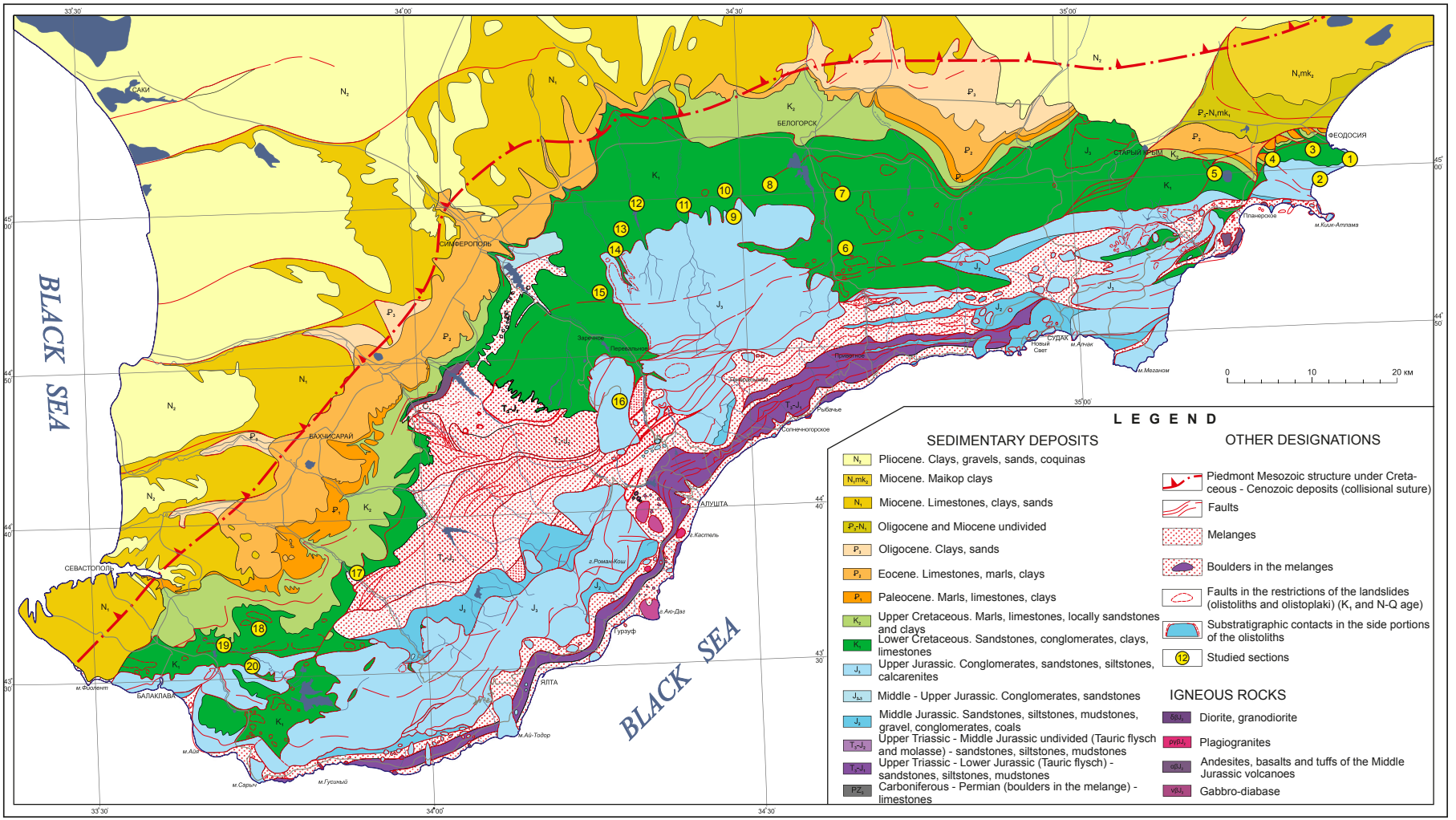

Fig. 1. Location of the sections studied (geological map by Yudin, 2009). 1 – Feodosiya and Saint Elias Cape; 2 – Dvuyakornaya Bay; 3 – Zavodskaya Balka; 4 – Sultanovka Village; 5 – Nanikovo Village, Koklyuk Mountain; 6 – Tonas River Basin, Krasnoselovka Village; 7 – Tonas River Basin, Alekseevka Village; 8 – Sary-Su River Basin, Novoklenovo, Kozlovka Villages; 9 – Karaby Yaila; 10 – Sary-Su River Basin, Balki Village, Enisaray Ravine; 11 – Mezhgor'e Village, Baksan Mountain, 12 – Zuya River Basin, Lesnoye Village; 13 – Fundukly River Basin, Petrovo Village; 14 – Beshterek River Basin; 15 – Maly Salgir River Basin; 16 – Chatyr Dag, Mramornoye Village; 17 – Belbek River Basin; 18 – Chernaya River Basin, Rodnoye and Kuchki Villages; 19 – Chernaya River Basin; 20 – Minester Ravine.