

## NEW DATA ON THE LATE TRIASSIC (NORIAN-RHAETIAN) FORAMINIFERANS OF THE WESTERN PRECAUCASUS (RUSSIA)

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The Upper Triassic successions of the Western Precaucasus are very interesting because it occupies a key geographic and geological position between the Caucasus, Central Asia and Europe (Fig. 1.). The uppermost part of the Upper Triassic in the Western Precaucasus is the limestone-clay unit in the Regional Stratigraphical Scheme of the Western Precaucasus and Caucasus (Oleynikov and Rostovtsev, 1979). It correlates to the Upper Norian (Upper Triassic). These deposits lie with unconformity on Paleozoic or Triassic deposits (Ladinian-Carnian, Chelbasskaya Formation) and are unconformably overlain by Jurassic or Lower Cretaceous rocks. Bivalves (*Monotis salinaria* (Schloth.) and others) and brachiopods (*Oxycolpella*) occur in the limestone-clay unit. Besides this unit, there are deposits in several wells of the Western Precaucasus, which correspond to the Upper Triassic or Upper Triassic/Lower Jurassic. In some unpublished reports there are some references to the Late Triassic and Late Triassic/Early Jurassic foraminiferal assemblages. The first paper with references to foraminifera from the different areas of the Western Precaucasus and levels of the Triassic was published by Bigun and Pinchuk (2003), but some data in this paper are not complete.

In the framework of this research, diverse foraminiferal assemblages were found in three wells of the Western Precaucasus: Severo-Nekrasovskaya N 1, Chernigovskaya N 1 and Molodezhninskaya N 4. In the Severo-Nekrasovskaya area, well N 1 (depth 3555-3560 m), I have found a foraminiferal assemblage from the Triassic-Jurassic stratigraphical interval. This level is represented by limestone and clay beds. Foraminifera were studied in thin-sections from limestones. This assemblage consists of *Cornuspira?* sp., *Cornuloculina* ex gr. *C. orbiculare* (Burbach), *Ophthalmidium lucidum* (Trifonova), *Quinqueloculina?* ex gr. *Q. kunaensis* Antonova, *Dentalina subsiliqua* Franke, *Nodosaria* ex gr. *N. nitidana* Brand, *N. spp.*, *Fronidularia* ex gr. *F. xiphoidea*, *F. spp.*, *Lenticulina subquadrata* (Terquem), *L. sp.* and *Astacolus* sp. From the Chernigovskaya area, well N 1, foraminiferal assemblages were studied in thin-sections from two limestone levels (depths 3484-3490 m and 3514-3519 m). Bigun and Pinchuk (2003) correlate these levels to the Norian. *Permodiscus* ex gr. *P. pragsoides* Oberhauser, *Semiinvoluta clari* Kristan, *S. violae* Blau, *Trocholina turris* Frentzen, *Sigmoilina?* sp., *Nodosaria* spp., *Pseudonodosaria vulgata multicamerata* Kristan-Tollmann and *Fronidularia?* sp. were found in the first limestone level, and the second level contain *Semiinvoluta clari* Kristan, *S. violae* Blau, *Trocholina turris* Frentzen, *Piriniella blindi* Blau, *Sigmoilina?* sp., *Nodosaria* spp., *Pseudonodosaria* sp. and *Lenticulina* sp. The genera and species composition of these two assemblages are very similar. In the Molodezhninskaya area, well N 4 (depth 2409-2414 m), there are diverse foraminiferal assemblages, which were studied in thin-sections from one limestone level. Bigun and Pinchuk (2003) correlate these rocks to the Middle Triassic and list only three foraminiferal genera. This assemblage consists of *Auloconus permodiscoides* (Oberhauser), *Triasina?* sp. (*T. ex gr. T. oberhauseri* Koehn-Zaninetti et Broennimann), *Coronipora austriaca* Kristan, *C. etrusca* (Pirini), *Trocholina turris* Frentzen, *Ophthalmidium lucidum* (Trifonova), *Quinqueloculina nucleiformis* Kristan-Tollmann, *Sigmoilina schaeferae* Zaninetti, Altiner, Dager et Ducret, *Lenticulina varians typica* Franke and *Duostomina?* ex gr. *D. rotundata* Kristan-Tollmann.

The assemblage from the Severo-Nekrasovskaya N 1 has many species that occur in the Lower Jurassic and Upper Triassic of Europe (Antonova and Pinchuk, 1991; Efimova, 1991; Kristan-Tollmann, 1964; Salaj et al., 1983). Therefore, the above mentioned beds with this assem-



FIGURE 1. Studied area of the Late Triassic of the Western Precaucasus.

blage can be correlated to the Lower Jurassic and Upper Triassic. The assemblage of the Chernigovskaya N 1 consists of foraminifera that are more characteristic of the Upper Triassic and has some Early Jurassic species (Antonova and Pinchuk, 1991; Blau, 1987a, 1987b; Efimova, 1991; Kristan-Tollmann, 1964; Salaj et al, 1983; Vuks, 2000). So, this assemblage can correspond to coeval assemblages from the Lower Jurassic and Upper Triassic of Europe. In the Molodezhninskaya N 4 well, foraminifera are more typical of the Upper Triassic (Norian-Rhaetian) (Kristan-Tollmann, 1964; Salaj et al, 1983; Efimova, 1991; Vuks, 2000). *Triasina?* sp. (*T. ex gr. T. oberhauseri* Koehn-Zaninetti et Broennimann) and *Duostomina?* ex gr. *D. rotundata* Kristan-Tollmann are the most important species for the definition of age, but they are not well preserved. Nevertheless, this assemblage is similar to the Norian-Rhaetian assemblages from the Western Caucasus and other regions of Europe, and it can be correlated to the Norian-Rhaetian.

The studied deposits correspond to different stratigraphic levels of the Triassic and Triassic-Jurassic according to these results. The studied rocks from well N 1 of the Severo-Nekrasovskaya area and well N 1 of the Chernigovskaya area correspond with the Upper Triassic and Lower Jurassic. First, the Norian-Rhaetian foraminiferal assemblage is found in well N 4 of the Molodezhninskaya area. Two of the above-mentioned levels with foraminifera are very good relative levels for interregional correlation of the described beds from the Upper Triassic and Upper Triassic/Lower Jurassic of the Western Precaucasus. The generic compositions of the presented foraminiferal assemblages are similar to the composition of the assemblages from the Upper Triassic of the Western Caucasus, Western Carpathians, and Alps.

So, the present research demonstrates more completed lists of foraminifera and more precise correlation than were presented by Bigun and Pinchuk (2003).

In the general picture of Triassic foraminiferal evolution in the world there are several points of radiations and development of rich foraminiferal communities. Among them there is one point in the Norian-Rhaetian, which has a place in the Western Precaucasus, too, according to the results of this research. Besides, data of this study partly confirm the

results of previous researchers, which are in unpublished reports. The existence of similar foraminiferal assemblages from the Caucasus and Precaucasus to Alps and Carpathians allows us to mark the possibility of migration of the benthic foraminiferans between these paleobasins. Finally, in the territory under consideration there are diverse foraminiferal communities, which indicate a good paleoenvironmental situation for the development of the benthic fauna. So, the results of this study allow us to obtain more detail data about the distribution of foraminifer-

ans in the Triassic and Triassic/Jurassic of the Western Precaucasus. Thus, these data are a new contribution to the creation of a more complete picture of biotic evolution in this territory.

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