

Triassic Foraminifera in North-Bulgaria

von

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Anschrift:

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The first Triassic Foraminifera described in Bulgaria were those from the Eastern Balkan Range — in the environs of the town of Kotel (Trifanova Ek., 1962). The outcrop samples studied were derived from the Carnian limestones and Norian marls and limestones. An abundant and relatively well preserved microfauna were found in washing residues. Some of species were new. In general, this fauna was quite different from the foraminiferal fauna in Upper Triassic sediments, elsewhere in Europe. Later on, only a few species of microfossils in a thin section from Middle and Upper Triassic rocks in North Bulgaria were published (Trifanova Ek., 1965, 1967).

This paper reports the examination of many hundred of bore-hole samples from North Bulgaria. The Foraminifera have been found in strata, ranging in age from the Campilian to the Carnian. The foraminiferal assemblages are of considerable interest because they possess not only a local practical stratigraphic value, but also may serve in comparing with faunas already known in other areas in Europe. It should be noted that Campilian, Anisian, Ladinian and Carnian contain characteristic foraminiferal assemblages. Besides that, there are differences between the Foraminifera from the lower, middle and upper part of the Anisian. The analysis of the vertical distribution of the Foraminifera shows that several foraminiferal species may be differentiated in the complete micropaleontological profile. The opinion is put forward that additional studies are needed for such a zonation.

Lower Triassic Skythian

The Foraminifera found in Lower Triassic sediments from North Bulgaria are restricted only to the Campilian. Lithologically the Campilian sediments are formed by shales, siltstones, limestones and dolomites. The majority of foraminiferal specimens are arenaceous and are represented chiefly by such long lived genera as *Nodosinella*, *Ammodiscus* and *Glomospirella*, most of which are difficult to distinguish. The foraminiferal assemblage consists of the following species: *Nodosinella siliqua* TRIFANOVA, *Ammodiscus* sp., *Glomospirella* sp., *Gaudryinella vallis* TRIFANOVA, *Tetrataxis* ex. gr. *conica* EHRENBERG, *Meandrospira iulia* (PREMOLI SILVA) and *Spirillina gurgitata* TAPPAN. In certain samples from Campilian sediments *Meandrospira iulia* (PREMOLI SILVA) is abundant and no other Foraminifera are present. Along with Foraminifera, the microfauna assemblages include very often Ostracods, Megaspore and Characean oogonien.

Based on the presence of *Meandrospira iulia* (PREMOLI SILVA), the foraminiferal assemblage is determined as *Meandrospira iulia*-zone. This zone may be compared with that in the Campilian from the Carpathians (Salaj I. 1969).

Middle Triassic Anisian

The Anisian deposits in North Bulgaria consist of limestones, marly limestones, dolomitic limestones and dolomites. The microfauna in these sediments occurs chiefly in the limestones. These assemblages possess greater variety than those from the Campilian, although some genera — *Glomospira*, *Glomospirella* and *Nodosinella* pass from the

Campilian into the Anisian, too. The first definite occurrence of *Arenovidalina* species with *Meandrospira insolita* (HO) mark the beginning of the Anisian. In an previous work, on the base of the presence of *Arenovidalina chialingchiangensis* HO, sediments at the boundary with the Campilian have been determined as *Arenovidalina chialingchiangensis*-zone (Trifonova Ek. in Iovtscheva P. and Ek. Trifonova, 1965). Doubtlessly the *Arenovidalina chialingchiangensis*-zone corresponds to the *Meandrospira insolita* zone from the Carpathians.

The foraminiferal fauna in the lower part of the Anisian in North Bulgaria is represented by the following taxons: *Glomospira sinensis* HO, *Glomospirella irregularis* (MÖLLER), *Nodosinella rostrata* TRIFONOVA, *Nodosinella siliqua* TRIFONOVA, *Meandrospira deformata* SALAJ, *Meandrospira dinarica* KOCHANSKY-DEVIDE et PANTIĆ, *Meandrospira insolita* (HO) *Meandrospira pussilla* (HO), *Spirillina gurgitata* TAPPAN, *Arenovidalina amylovoluta* HO and *Arenovidalina chialingchiangensis* HO.

Higher up in the middle part of the Anisian, the Foraminifera become more common and varied. The first appearance of the following species is observed there: *Pilamina densa* PANTIĆ, *Pilamina friedli* (KRISTAN), *Pilamina grandis* SALAJ, *Endothyrella bicamerata* SALAJ, *Agathammina austroalpina* KRISTAN and *Arenovidalina pragsoides* OBERHAUSER. The species of the genera *Glomospira* and *Glomospirella* are more numerous: *Glomospira articulosa* PLUMMER, *Glomospira gordialis* (PARKER et IONES), *Glomospira irregularis* LIPINA, *Glomospira sinensis* HO, *Glomospirella hoi* KRISTAN, *Glomospirella regularis* (MÖLLER), *Glomospirella spirillinoides* (GROZDILOVA et GLEBOVSKA) and *Glomospirella tenuifistula* (HO). With the exception of *Meandrospira insolita* HO, the other species of the genus *Meandrospira* continue throughout these sediments, and *Meandrospira dinarica* KOCHANSKY-DEVIDE et PANTIĆ occurs more often than in the lower part of the Anisian deposits.

In the Upper part of the Anisian, the foraminiferal fauna develops further. Besides most of the above-mentioned species other Foraminifera appear as a new element in the microfauna. These species are: *Gaudryina triassica* TRIFONOVA, *Meandrospiranella* cf. *planispira* ORAVEZ, *Ophthalmidium* sp., *Duostomina alta* KRISTAN and *Variostoma* sp.

In general, the Foraminifera of the Anisian in North Bulgaria resemble much those found in the Anisian from the Carpathians. The detailed micropaleontological zonation, a comparison of macrofossils and paleontological descriptions will be subject of further investigations.

Ladinian

The lithological differences between the Anisian and the Ladinian are insignificant. In addition to limestones, marly limestones and dolomites in the Ladinian black shales are of sporadic occurrence there.

In the Ladinian the change in the foraminiferal assemblage becomes more marked. The species of the genera, *Glomospirella*, *Pilamina* and *Meandrospira* constitute no longer the most important group. Their variability is reduced. Instead of them, Foraminifera of the genus *Trocholina* play an important part in calcareous rocks of a Ladinian age. Several species have been found: *Trocholina acuta* OBERHAUSER, *Trocholina biconvexa major* OBERHAUSER, *Trocholina cordevolica* OBERHAUSER, *Trocholina crassa* KRISTAN, *Trocholina procera* (LIEBUS) and *Trocholina* sp.

In the Ladinian the representatives of the genus *Austrocolomia* – *Austrocolomia cordevolica* OBERHAUSER and *Austrocolomia* sp., mark their first appearance. The following foraminiferal species: *Ammobaculites* sp., *Trochammina* aff. *globigeriniformis* (PARKER et IONES), *Tetrataxis humilis* KRISTAN, *Neoendothyra keuperi* OBERHAUSER and *Lenticulina karnica* (OBERHAUSER), have been also found for the first time.

A small number of Foraminifera pass from the Anisian into the Ladinian and become accessory elements of the microfauna: *Glomospirella irregularis* (MÖLLER), *Pilamina friedli* (KRISTAN), *Endothyranella bicamerata* SALAJ, *Agathammina austroalpina* KRISTAN, *Meandrospira pussila* (HO), *Meandrospiranella* cf. *planispira* ORAVEZ, *Nodosaria ordinata* TRIFONOVA, *Dentalina hoi* TRIFONOVA and *Lenticulina karnica* (OBERHAUSER). Along with Foraminifera, the microfauna assemblages include often Algae and Ostracoda.

Upper Triassic Carnian

The Carnian sediments in North Bulgaria are built up of limestones and dolomites. Among the Carnian Foraminifera, the Lagenidae are dominant in number by genera, species and individuals. Most of these are referred to the genera *Nodosaria*, *Austrocolomia*, *Rectoglandulina*, *Lingulina* etc. They include: *Nodosaria ordinata* TRIFONOVA, *Austrocolomia canaliculata* (KRISTAN), *Austrocolomia* sp. *Rectoglandulina simpsonensis* TAPPAN, *Lingulina* cf. *borealis* TAPPAN, *Lingulina* sp., as well as the species: *Dentalina hoi* TRIFONOVA, *Frondicularia* cf. *nitida* BORNEMAN and *Marginulinopsis* sp. The presence of certain species of the family Polymorphinidae is also characteristic of the Carnian in North Bulgaria. So far, only *Eoguttulina bulgella* TAPPAN has been determined. *Trocholina multispira* OBERHAUSER and *Pilamina kuthani* SALAJ appear for the first time in the Carnian. Other Foraminifera such as: *Glomospirella hoi* KRISTAN, *Meandrospira deformata* SALAJ and *Arenovidalina pragsoides* OBERHAUSER are represented by single specimens and only Ophthalmidiidae are locally common.

Norian + Rhaetian

Micropaleontological investigations show that the sediments which are believed to be of Norian and Rhaetian ages contain only Characeen oogonies and Ostracoda. This fact is undoubtedly due to different environmental conditions. The geological sections are represented by sediments of no typical marine facies.

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**Lower Anisic Foraminifera from
Boukhovtzi village, North-East Bulgaria**

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Results from micropaleontological studies of the Triassic rocks in the area of Boukhovtzi village, are reported. On the base of these studies the following foraminiferal taxons have been determined:

Nodosinella rostrata n. sp.

Nodosinella siliqua n. sp.

Nodosinella sp.

Meandrospira deformata SALAJ

Meandrospira insolita (HO)

Meandrospira pusilla (HO)

Arenovidalina amylovoluta HO

Arenovidalina chialingchiangensis HO

Nodosaria sp.

This assemblage belongs to the *Arenovidalina chialingchiangensis*-zone and characterizes the lowest part of the Anisian sediments (Ek. Trifanova in Iovtscheva-Michailova P. et Ek. Trifanova, 1965). It was found in the limestones and marly limestones of the Anisian rocks, intersected by drilling. Several metres deeper, the megafossil *Costatoria costata* (ZENK) has been found (by M. Enceva – Kanceva). Along with Foraminifera, the microfauna assemblage includes often Ostracoda remains.

In general, the Foraminifera found of Boukhovtzu village locality, resembles known Anisian faunas. A comparison with the Anisian assemblages of neighbouring region reveals an analogy with the Lower Anisian from the Carpathians-zone *Meandrospira insolita* (SALAJ, BIELY and BYSTRICKY 1967, SALAJ 1969). The difference is chiefly in a relatively larger number of *Arenovidalina* and *Nodosinella* species and specimens represented in the material studied. This fact is doubtlessly the result of a local environment.

Paleontological Description

Genus *Nodosinella* BRADY, 1876

Nodosinella rostrata n. sp.

Pl. I, figs. 1-4

Derivatio nominis: After the sharpness of the initial part of the test.

Holotypus 1): The specimen in plate I, fig. I (thin section).

Locus typicus: North-East Bulgaria, v. Boukhovtzi (Borehole)

Stratum typicum: The limestones of the Lower Anisian

Material: Five specimens

Dimensions:

Length 0,40 mm – 0,53 mm; of the holotyp 0,53 mm

Breadth 0,04 mm – 0,08 mm, Greatest breadth of the holotype 0,08 mm.

Description: Test elongated, less or more tapered, slightly curved or straight. It consists of 6-9 simple chambers. The initial chamber is small and tapered, followed by a series of subcircular chambers, increasing in size rapidly. In some specimens the last two chambers are almost twice as long as the previous chambers. In the initial part of the test the chambers are more compactly joined one to the other. The sutures are straight and slightly depressed. The wall is finely arenaceous. The aperture is a rounded opening as the terminal end of the last chamber.

Remarks. Some specimens from *Nodosinella rostrata* n. sp. are similar to *Nodosinella libera* TRIFONOVA from the Lower Karnian in the Eastern Balkan Range, but have fewer chambers not so compactly joined one to the other and a more tapered initial part of the test.

Occurrence: In the limestones of Lower Anisian Boukhovtzi village (Borehole).

Collection: Central Board of Geology, T-hol222

Nodosinella siliqua n. sp.

Pl. I, figs. 5-9

Derivatio nominis: After the shape of the test

Holotypus: The specimen in pl. I, fig. 6 (thin section)

Locus typicus: North-East Bulgaria, v. Boukhovtzi (Borehole)

Stratum typicum: The limestones of the Lower Anisian

Material: Nine specimens

Dimensions:

Length 0,24 mm – 0,46 mm; of the holotype 0,24 mm

Breadth 0,04 mm – 0,08 mm: Greatest breadth of the holotype 0,06 mm.

Description: Test elongated, of medium size. The chambers are 5-7 usually increasing very slowly in size. In some specimens the last, or before the last chambers increase more rapidly in height and are comparatively longer, about twice the length of the immediately preceding chambers. The proloculus is relatively large, globular. The sutures are straight and slightly depressed. The wall is finely arenaceous. The aperture is obviously terminal, rounded.

1) The holotypes are kept in the collection of the Micropaleontological Laboratory at the Central Board of Geology, 22 Gueorgui Dimitrov Blvd., Sofia.

Occurrence: In the limestones of the Lower Anisian Boukhovtzi village (Borehole)

Collection: Central Board of Geology, T-hol223

Nodosinella sp.

Pl. I, fig. 10

Dimensions:

Length 0,45 mm

Greatest breadth 0,05 mm

Description: Test straight, elongate. It consists of 6 chambers, but the last chamber is broken off. The proloculus is spheroidal, the following chambers are irregular in size and shape. The sutures are straight, depressed. The wall is finely arenaceous.

Occurrence: In the limestones of the Lower Anisian Boukhovtzi village (Borehole).

Genus *Meandrospira* LOEBLICH and TAPPAN, 1946

Meandrospira deformata SALAJ

Pl. II, fig. 4, 5.

1967 *Meandrospira deformata* SALAJ – SALAJ, BIELY and BYSTRICKY, S. 122, taf. II, fig. 3 a, b, c, d.

Dimensions: Diameter of the test 0,20 mm.

Description: Test medium to large in size, irregular in section. The proloculus is sphaeroidal, followed by subphaeroidal, slightly irregular in shape and size chambers. They are few in number, arranged irregularly in the planispiral plane. The wall is thin.

Occurrence: Upper Anisian from the West Carpathians. In the Lower Anisian near Boukhovtzi village (Borehole).

Meandrospira insolita (HO)

Pl. II, fig. 1

1959 *Trochamminoides insolitus* HO – p. 416, pl VII, fig. 11-15

1969 *Meandrospira insolita* (HO) – SALAJ, pl. I, fig. 2 and 3.

Dimensions: Diameter of the test –0,18 mm.

Description: Test medium in size, planispirally coiled, whorls about 3 in number. The proloculus is spheroidal, followed by a series of chambers irregular in shape and size. Some of them are twice or thrice as long as the others, forming a more elongated chamber. Two whorls with five chambers in the last whorl. The wall is thin.

Occurrence: In T³₂₋₃, T⁴₂₋₃ from China and in the Lower Anisian from the Carpathians (zone *Meandrospira insolita*). In the Lower Anisian – Boukhovtzi village (Borehole).

Meandrospira pusilla (HO)

Pl. II figs. 2, 3

1959 *Trochamminoides pusillus* HO – p. 416, pl. VII, fig. 18-29;

Pl. VIII, figs. 1-5

1969 *Meandrospira pusilla* (HO) – SALAJ, pl. I, fig. 2

Dimensions: Diameter of the test –0,10 mm

Description: Test minute, planispirally coiled, consisting of about two whorls, periphery broadly rounded, slightly lobulate. The chambers are numerous – nine in the last whorl. They are small and subglobular. The wall is thin.

Occurrence: In T³₂₋₃, T⁴₂₋₃ from China and in the Lower Anisian from the Carpathians. In the limestones of the Lower Anisian from Boukhovtzi village (Borehole).

Genus *Arenovidalina* HO 1959 emend. SALAJ 1967

Arenovidalina amylovoluta HO

Pl. II, fig. 6-8

1959 *Arenovidalina amylovoluta* HO – p. 415, pl. VII, fig. 10-17

Dimensions: Diameter of the test 0,22 mm – 0,26 mm

Thickness, center 0,06 mm – 0,10 mm

Descriptions: Test medium in size, lenticular, formed by two chambers. The proloculus is sphaeroidal, tubular chamber is closely wound. The coils are 5-6 in number. The central part of the test is more or less thickened. The aperture is obscure but apparently at the end of the tube.

Remarks: Our specimens of this species are often filled with pyrite. They differ from the holotype and paratypes described by HO in having 6 coils, instead of 6-8. On the other hand, our specimens are very similar to *Arenovidalina chialingchiangensis* HO, but have one or two coils more, and are less thicker in central part of the test.

Occurrence: In T³₂₋₃ from China. In the Lower Anisian from Boukhovtzi village (Borehole).

Arenovidalina chialingchiangensis HO

Pl. II, fig. 9

1959 *Arenovidalina chialingchiangensis* HO – p. 414, pl. VI, figs. 14-28, pl. VII, figs. 1-9

Dimensions: Diameter of the test 0,22 mm – 0,24 mm

Thickness center 0,06 mm – 0,08 mm

Descriptions: Test small, lenticular, formed by two chambers. The proloculus is obscure, the tubular chamber is closely wound. The coils are about 4 in number. The central part of the test is thickened. The aperture is obscure, but apparently at the end of the tube.

Occurrence: In T³₂₋₃ from China. In the Lower Anisian Boukhovtzi village (Borehole).

Genus *Nodosaria* LAMARCK, 1812

Nodosaria sp.

Pl. II, fig. 10

Only two imperfect and poorly preserved specimens have been found. The chambers are few, slightly increasing in size as added, sutures distinct.

Occurrence: In the Lower Anisian, Boukhovtzi village (Borehole).

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PLATE I

- Figs. 1-4 *Nodosinella rostrata* n. sp.
fig. 1 — holotype x 70
figs. 2-4 paratypus x 70
- Figs. 5-9 *Nodosinella siliqua* n. sp.
fig. 6 — holotype x 100
figs. 5, 8 — paratypes x 70
fig. 7 — paratype x 100
fig. 9 — paratype x 80
- Fig. 10 *Nodosinella* sp. x 70

PLATE II

- Fig. 1 *Meandrospira insolita* (HO) x 60
- Figs. 2, 3 *Meandrospira pusilla* (HO) x 100
- Figs. 4, 5 *Meandrospira deformata* SALAJ x 70
- Figs. 6-8 *Arenovidalina amylovoluta* HO x 80
- Fig. 9 *Arenovidalina chialingchiangensis* HO x 70
- Fig. 10 *Nodosaria* sp. x 70

Plate I

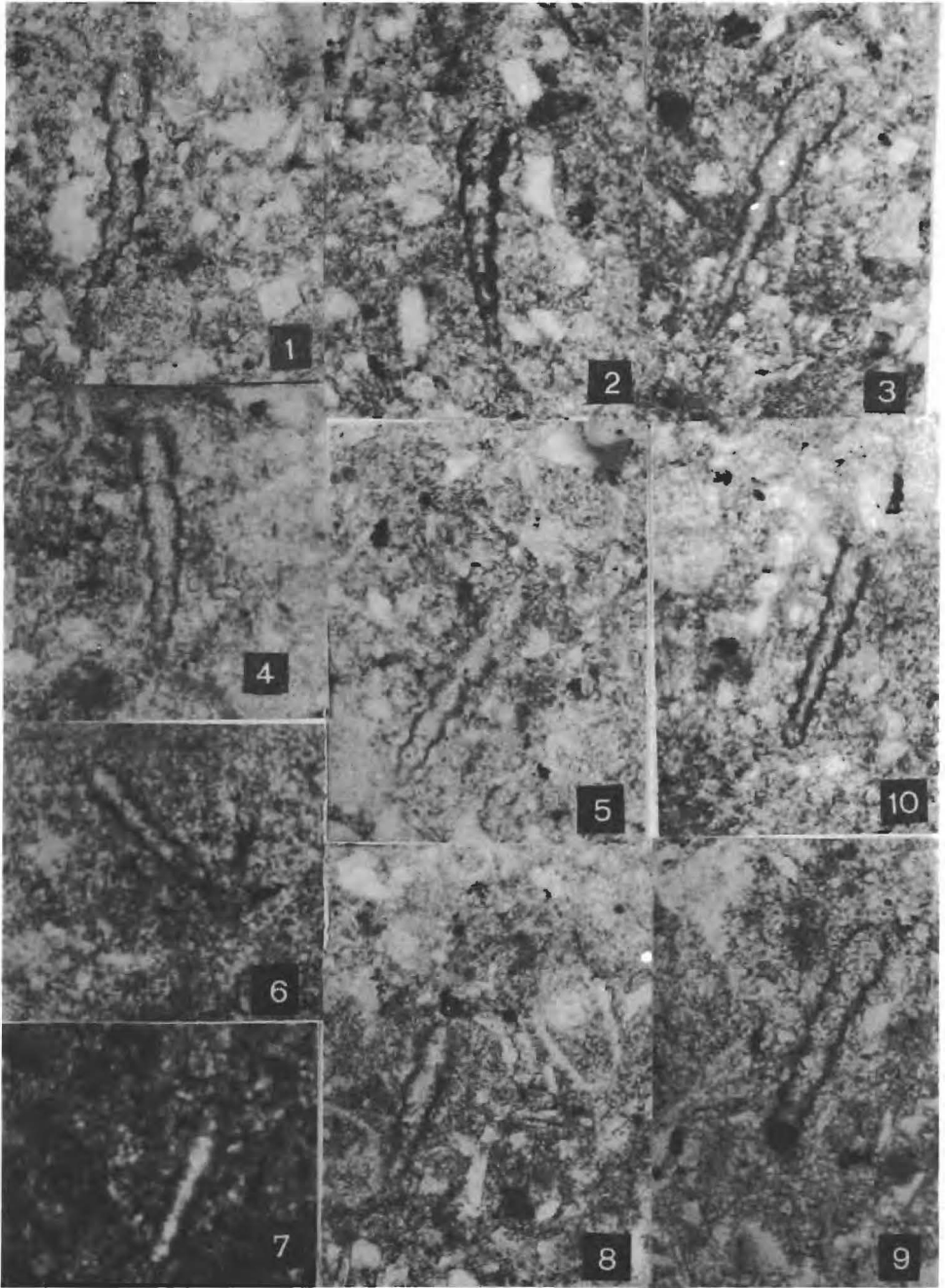


Plate II

