THE CONTINENTAL TRIASSIC BIOSTRATIGRAPHY OF THE TIMAN-NORTH URALS REGION FROM TETRAPOD DATA

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ABSTRACT

A biostratigraphy based on Triassic tetrapods in the Timan-North Urals region recognizes six successive faunal assemblages. Four of these (I, II, IV, and VI) correspond to biostratigraphic subdivisions of the Early and Middle Triassic of the East European Platform and the South Cis-Uralas defined by Shishkin and Ochev (1985): I, the *Tupilakosaurus* and *Benthosuchus* groupings of the Neorhachitome fauna, II, the *Wetlugasaurus* grouping, IV, the *Parotosuchus* fauna, and VI, the *Mastodonsaurus* fauna. Assemblage III (early Olenekian) lies between the *Wetlugasaurus* grouping and the *Parotosuchus* fauna. Assemblage V (Anisian) resembles the *Heptasaurus-Eocyclotosaurus* fauna (early Anisian) of Central Europe but may represent a greater interval of time.

INTRODUCTION

The Timan-North Urals region is bounded on the east by the North Arctic Urals and Pay-Khoy and in the west by the Timan Ridge. Triassic deposits are widespread but isolated in the area. These include the Bolshaya Synya, Verkhnyaya Pechora, Korotaikha, and Kosyu-Rogovaya depressions of the Cis-Urals marginal trough and the Chernyshev Ridge and Pechora syneclise.

At present, in the Bolshaya Synya and Verkhnyaya Pechora depressions, Triassic sediments are subdivided into the following stratigraphic units (in ascending order): the Ust-Berezovka Formation, Byzovaya Formation, Krasny Kamen Formation, Keryamayol Formation, and Synya Formation. The Korotaikha depression includes the Lestanshor and Nyadeita formations, and the Pechora syneclise comprises the Charkabozhskaya, Kharaley (Lower Triassic), Anguran (Middle Triassic), and Naryanmar (Middle and Upper Triassic) formations.

BIOSTRATIGRAPHY

Correlation of tetrapod faunas provides a reliable basis for the unification of the local Triassic stratigraphy, heretofore based only on lithology and palynology. Shishkin and Ochev (1985) show that tetrapod faunas provide a basis for identification of two biostratigraphic units in Lower Triassic strata of the East European Platform and South Cis-Urals. These units are known as *the Benthosuchus-Wetlugasaurus* (or Neorhachitome) and the *Parotosuchus* faunas, which respectively typify the Wetlugian superhorizon (Induan and early Olenekian) and the Yarenskian horizon (late Olenekian) of the East European Platform. In the Middle Triassic of the South Cis-Urals, the *Eryosuchus* fauna and *Mastodonsaurus* fauna were also detailed by Shishkin and Ochev (1985). The former is present in the upper part of the Donguz Formation, which is of early Ladinian age. The latter is found in the late Ladinian Bukobay Formation. The Early Triassic Neorhachitome fauna consists of three groups. The lowermost of them (the *Tupilakosaurus* grouping) is Induan in age and originates from the Vokhmian horizon. The middle group (the *Benthosuchus* grouping) occurs in the early Olenekian Rybinskian horizon. The latest member of the sequence is the *Wetlugasaurus* group. It is early Olenekian in age and lies in the Sludkian horizon.

Timan-North Urals

Triassic vertebrates of the Timan-North Urals region were poorly known before the early 1970's, but during the last 20 years, more than 30 localities of tetrapods have been discovered. A study of the stratigraphic distribution of these forms has resulted in the recognition of six successive faunal assemblages.

Assemblage I

This assemblage occurs in the lower part of the Charkabozhskaya Formation of Pechora syneclise. It includes the theriodont *Scalopognathus multituberculatus*, and the procolophonids of the genus *Tichvinskia* (*Tichvinskia sp.* and *T.* cf. *jugensis*). This assemblage is Induan (?) and early Olenekian in age and may correspond to the *Tupilakosaurus* and *Benthosuchus* group of the Neorhachitome fauna of Shishkin and Ochev (1985).

Assemblage II

This assemblage occurs in the lower part of the Byzovaya Formation of the Bolshaya Synya depression and the middle part of the Charkabozhskaya Formation of Pechora syneclise. It is characterized by the presence of the capitosaurid temnospondyl *Wetlugasaurus*, the pseudosuchian *Tsylmosuchus*, the procolophonids *Tichvinskia* and *Insulophon* (*I. morakhovskayae*), and the prolacertilian *Microcnemus*. This assemblage is similar to the *Wetlugasaurus* group of the early Olenekian.

Assemblage III

Assemblage III is known as the "tsylmenskian" assemblage. It occurs in the upper part of the Charkabozhskaya Formation and the lower part of the Lestanshor Formation of the Korotaikha depression. The assemblage includes such forms as *Wetlugasaurus* (*W. malachovi*), *Angusaurus* (*A. tsylmensis*), *Vyborosaurus* (*V. mirus*) among the temnospondyls; the procolophonids *Orenburgia* (*O. sp.* and *O. bruma*), *Lestanshoria* (*L. massiva*), and *Timanophon* (*T. raridentatus*); the prolacertilians *Boreopricea* (*B. funerea*) and *Microcnemus*; the pseudosuchians *Chasmatosuchus* and *Tsylmosuchus* (*T. jakovlevi*); and the rhynchoce-

phalian *Scharschengia*.

Fish remains occur with the "tsylmenskian" assemblage of tetrapods. There are the actinopterygians *Tungusichthys(?)* and dipnoans *Gnathorhiza triassica beresnikiensis* and *G. otschevi*. The last two forms are typical of the so-called "Bereznikian" assemblage of dipnoans. This unique fish assemblage is known from the uppermost part of the Sludka Formation ("Bereznikian beds" of Lozovsky et al., 1984) of the Moscow syneclise. Assemblage III is very close to the *Wetlugasaurus* grouping of the Neorhachitome fauna, but some peculiarities indicate it represents an intermediate stage between the Sludkian (*Wetlugasaurus* grouping) and Yarenskian (*Parotosuchus* fauna) stages.

Assemblage IV

This assemblage occurs in the middle part of the Lestanshor Formation of the Korotaikha depression and the upper part of the Byzovaya Formation of Bolshaya Synya depression. The principal localities of this assemblage lie in the basin of the Korotaikha River. It is characterized by the capitosaurid *Parotosuchus* cf. *komiensis*, the trematosaurid *Inflectsaurus(?)*, the brachopid *Batrachosuchoides impressus* (temnospondyls), the procolophonid *Tichvinskia(?)*, and undetermined remains of prolacertilians and rauisuchids. Assemblage IV also includes remains of a large thecodont of the family Erythrosuchidae from the Bolshaya Synya River Basin (Bolshaya Synya depression) and the dipnoan *Ceratodus(?)* from the basin of the Pechora River (Bolshaya Synya depression). The tetrapod fauna of assemblage IV corresponds to the late Olenekian *Parotosuchus* fauna.

Assemblage V

Assemblage V occurs in the uppermost part of the Lestanshor Formation, the lowermost part of the Nyadeita Formation of Korotaikha depression, and the Krasny Kamen Formation of the Bolshaya Synya depression. The capitosauroid *Komatosuchus chalyshevi* and the plagiosaurs *Plagiosternum(?)* and *Aranetsia* are the principle elements of this assemblage. Comparison of assemblage V with other Middle Triassic tetrapod faunas is difficult. Nevertheless, it resembles the *Heptasaurus-Eocyclotosaurus* (early Anisian) fauna of Central Europe but may represent a greater interval of time.

Assemblage VI

This assemblage occurs in the upper part of the Karyamayol Formation and the lowermost part of the Synya Formation of the Bolshaya Synya depression and is of late Ladinian age. The major localities of the assemblage lie in the basin of the Bolshaya Synya River, where the capitosauroid *Bukobaja(?)*, a new anthracosaur genus, the sauropterygian *Nothosaur(?)*, the prolacertilian *Malutinisuchus*, the rauisuchid *Energosuchus(?)*, undetermined remains of a cyclotosaurid temnospondyl, and anomodonts are found. Assemblage VI is close to the *Mastodonsaurus* fauna based on the presence of some specific forms such as *Malutinisuchus, Energosuchus*, and cyclotosaurid temnospondyls.

CONCLUSIONS

Of the six assemblages, the "tsylmenskian" assemblage III the most importantly elucidates the Triassic tetrapod history and stratigraphy of East Europe. It is more advanced than the *Wetlugasaurus* group of the Neorhachitome fauna (Sludkian horizon) but more primitive than the *Parotosuchus* fauna and is recognized here as a new Ust-Mylian horizon that occupies a position between those of the Sludkian and Yarenskian (Lozovsky, this volume, and Shishkin, this volume). Additional characteristics of the new horizon are the "Bereznikian" assemblage of dipnoans and the reversed magnetic polarity of the rocks.

A number of local stratigraphic problem of the Triassic of the Timan-North Urals region and contiguous territories were resolved. An Olenekian rather than an Induan age was indicated for the Byzoaya Formation of the Bolshaya Synya depression and the major part of the Lestanshor Formation of the Korotaikha depression. An Anisian age was determined for the Krasny Kamen Formation of the Bolshaya Synya depression and upper part of the Lestanshor Formation. These two formations are now considered part of the Middle rather than the Lower Triassic. An early Olenekian (late Wetlugian) age of the Pyzhma Mezenskaya Formation of Mezen syneclise was demonstrated. This formation was formerly thought to be of late Olenekian (Yarenskian) age.

Among unsolved stratigraphic questions in the region, the most important is concerned with the presence of an analogue of the Induan stage.

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