LOWER TRIASSIC VERTEBRATES FROM THE NORTH OF CENTRAL SIBERIA

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ABSTRACT

The Lower Olenekian nearshore marine deposits of the Olenek Basin (Buur-Olenek facies zone) are represented by the Teryutekh Formation, which belongs to the *Hedenstroemia hedenstroemi* local zone. They have been shown to contain a vertebrate assemblage of sharks (*Acrodus sp., Polyacrodus sp.*), coelacanths and palaeoniscoids (*Saurichthys (?) sp., Birgeria sp., Boreosomus sp.*), and labyrinthodont amphibians (*Boreopelta vavilovi, Sadssenisaurus (?) sp.*).

Close similarity of the terrestrial (tetrapod) component of the assemblage to that of the contemporaneous Spitzbergen fauna from the Sticky Keep Formation indicates zoogeographical connections along the northern Laurasia borderland by Early Triassic time. Especially remarkable is the occurrence of peltostegid rhytidosteoids (*Peltostega* in Spitzbergen and *Boreopelta* in Siberia), which are unknown outside of these areas.

INTRODUCTION

Stratigraphic correlation of marine and continental deposits may be difficult, but a number of Early Triassic sites are recorded that produce nearshore marine invertebrate faunas associated with terrestrial tetrapods. This association facilitates correlation as exemplified by the continental Scythian of the East European Platform whose subdivisions may be calibrated against the marine subdivisions (Ochev and Shishkin, 1989).

Along the Arctic margin of the Laurasian supercontinent, two such mixed faunas are the Wordy Creek Formation, in East Greenland, and Sticky Keep Formation, in Spitsbergen, both of which yield vertebrate fossils. The Wordy Creek Formation is Induan and the Sticky Keep Formation is Lower Olenekian (Smithian) in age. Another group of similar localities has recently been discovered in the northern part of Central Siberia. These belong to the Teryutekh Formation, which developed along the southern side of the Lena-Anabar Depression and forms an outcrop belt across the middle part of the Olenek River basin.

TERYUTEKH FORMATION

The Teryutekh Formation is about 20 m thick and is composed mainly of clay, silt, and shale. These nearshore deposits contain an abundant ceratite fauna. Fossils of the Teryutekh Formation belong to the *Hedenstroemia hedenstroemi* local zone (lower part of Lower Olenekian) (Dagys and Kazakov, 1984). Vertebrate material from here includes fishes and labyrinthodont amphibians. Originally, specimens were collected by government field geologists, and subsequently collections were made by researchers of the Paleontological Institute of the Russian Academy of Sciences.

The type section is exposed along the right bank of the Kyrah-Khos-Teryutekh Stream. Here, the Teryutekh Formation is divisible into three informal members (Fig.1).

Lower Member

This member occurs in exposures up to 5 m thick and is mainly composed of dark gray clay and layers of greenish gray silt with small elongate phosphatic nodules in its basal part. The top half of the member contains carbonatized clayey concretions, often fossiliferous, which are round or elliptical in shape and range up to 20 cm in diameter. Ceratites (some crushed and fragmented) occur in both clay layers and in concretions. Fish and plant remains occur mainly in concretions that are dominated by the teeth of hybodontid sharks (*Acrodus* and *Polyacrodus*). Sometimes, the concretions include noncompressed skulls of palaeonisciform actinopterygians (*Boreosomus sp.* and *?Saurichthys sp.*). Bony detritus, containing small palaeoniscoid scales, teeth, and bone fragments, often occur on the surface of these concretions as well as in the chambers of crushed ceratite shells. Abundant bony detritus, hybodontid teeth, and bivalve and ammonoid shell breccia are yielded by a layer of sandy limestone in the upper part of the member. Teeth are often somewhat waterworn. This type of fossil preservation indicates a high-energy shallow-water depositional environment characterized by intense wave and current action.

Middle Member

The middle member is up to 2.5 m thick and represents three to four small sedimentary cycles separated by erosional contacts. The base of each cycle is represented by a dark clay-rich layer with clay balls produced by washing and reworking of the embedded matrix. Toward the top, the clay becomes more silty and more evenly bedded, and its yellowish colour change is evidence of weathering under subaerial conditions. This sequence exhibits evidence of higher depositional energy than the underlying lower member and may represent inshore deposits formed in or near the littoral zone. Fossils are mostly found in flattened concretions of silty limestone in the basal part of each cycle. These concretions include detritus, fragments of mollusc shells, and vertebrate bones that are limited to the most coarse-grained layers. Vertebrate fossils, other than fishes, include small, isolated labyrinthodont bones, usually

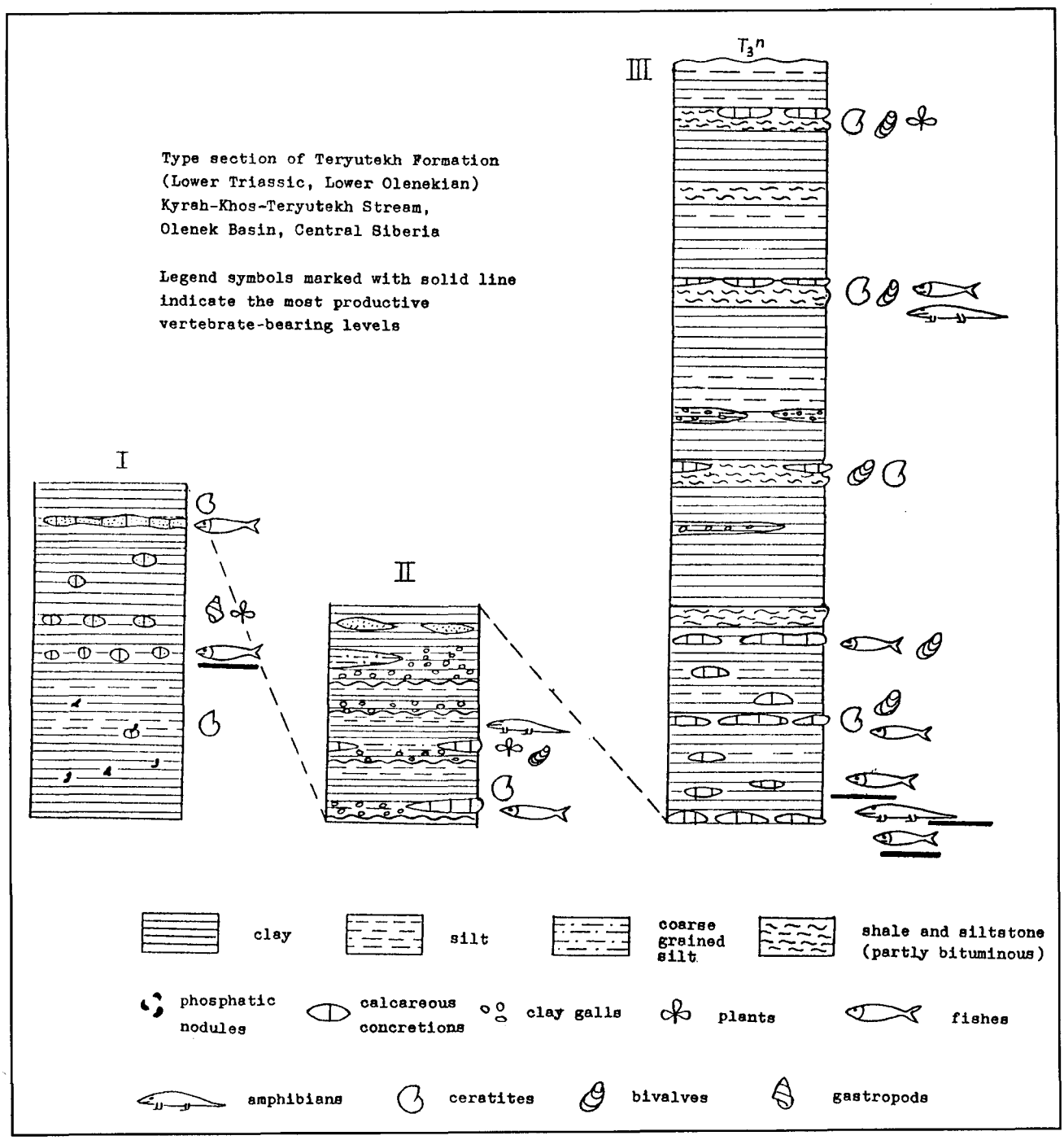

Fig.1. Type section of the Teryutekh Formation.

fragmented and waterworn. Silt lenses and limestone concretions were deposited as bank sediments in small local depressions during scouring of the bottom surface.

Upper Member

The upper member is up to 10 m thick and dominated by dark, indurated clay. It includes thin layers of bituminous shale and laminar carbonatized siltstone. Concretions of clayey limestone are most common in the lower part of the unit where they are isolated or form traceable punctuated horizons. Compared with the lower members, the depositional environment of these sediments was clearly one of lower energy indicating deposition in deeper, quieter water. Evidence supporting this conclusion is the bitumenization of sediments, more regular bedding, lack of the intraformational erosional boundaries, and paucity of reworked fossil material. Ceratites, bivalves, and plants (*Pleuromeia*) specimens occur in a number of levels throughout the member. Most vertebrate fossils come from the basal concretional layer of limestone. The assemblage collected here forms

the bulk of the characteristic vertebrates of the Teryutekh Formation, including two labyrinthodonts amphibians (the rhytidosteoid and capitosauroid), a number of actinopterygians, and a coelacanth crossopterygian [*?Wimania sp.*] Their mode of preservation indicates the lower energy of sedimentation for this member. Bones, albeit often disassociated, are not waterworn and often preserved to the finest detail. In some cases, nearly complete amphibian skulls are found, or even the associated bodies of fishes with the skin intact.

RESULTS

The vertebrate assemblage of the Teryutekh Formation includes the following forms:

- Elasmobranchii, Hybodontidae: *Acrodus sp., Polyacrodus sp.*
- Actinopterygii, Palaeonisciformes: *Boreosomus sp., Pteronisculus sp., (?)Birgeria sp.*, and *Saurichthys sp.*
- Crossopterygii, Coelacanthiformes: *(?)Wimania sp.*
- Amphibia, Temnospondyli, Rhytidosteoidea: *Boreopelta vavilovi*; Capitosauroidea: *(?)Sassenisaurus sp.*

CONCLUSIONS

The Triassic vertebrates of northern Asia are still very poorly known. Possible zoogeographical implications derived from the faunal list above are as follows. The fish component of the Central Siberian assemblage represents an Early Triassic nearshore, brackish-water biota that has been previously recorded from both Laurasian marginal sites (Greenland and Spitzbergen) and from Southern Gondwana (Madagascar). The presumed worldwide dispersal of fishes, however, does not mean that land vertebrate fauna was also uniform, indicated by the comparison of the well-known Lower Triassic tetrapod assemblages of South Africa and Europe. Thus, we should stress the terrestrial or nearshore component of the Siberian community. The only nearshore Siberain forms accurately identified are the rhytidosteoids, a small short-lived group known from nearly all the continents. They populated mostly the borderland areas and are principally confined to the Smithian. Of their two families, Rhytidosteidae and Peltostegidae (Shishkin, 1987), the Siberian genus should be assigned to the Peltostegidae on the basis of its cranial structure (large palatal fenestrae, deep emargination of occipital border, etc.). Peltostegids are believed to occur both in Laurasia and Gondwana, but advanced forms like *Peltostega* (displaying the total loss of the palatal shagreen and noncontact of the pterygoid and palatal bone) are unknown outside of Spitzbergen. The Siberian *Boreopelta* is very closely related to *Peltostega* in sharing the above (and many other) characteristics with that genus. This evidence of linkage between two Arctic tetrapod assemblages is further strengthened by the occurrence in the Siberian fauna of a capitosauroid amphibian that resembles *Sassenisaurus*, a poorly known genus from the Sticky Keep Formation of Spitzbergen.

These facts seem to provide some basis for suggestion that the Early Triassic tetrapod fauna known from Spitsbergen, dominated by trematosauroid amphibians, had spread by that time far eastward along the northern Laurasian borderland. More fossil data are needed to test this suggestion.

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