THE PROBLEM OF TRIASSIC GONDOLELLID CONODONT SYSTEMATICS (CONODONTOPHORIDA, CONODONTA)

T. KLETS AND A. KOPYLOVA
Novosibirsk State University, Pirogova Street 2, Novosibirsk, Russia, email: fossil@lab.nsru.ru

Abstract—We discuss the problems of systematics of Triassic gondolellid conodontophorids. The basic trends in development of morphological characters are shown.

INTRODUCTION

The taxonomy of gondolellid elements is one of the problems in the study of conodontophorids. Their morphological similarity originally led researchers to a conclusion about Carboniferous, Permian and Triassic pectiniform elements belonging to a uniform Gondolella Stauffer & Plummer, 1932. N. Bender and D. Stoppel for the first time established that the Triassic forms referred to Gondolella mombergensis Tatge actually differ from the Paleozoic species of Gondolella by a more rounded basal cavity and more extended lanceolate form of platform. Therefore, it is most logical that all Middle and Late Triassic gondolellid elements be consolidated in the new genus Neogondolella (type species Gondolella mombergensis Tatge), which appeared at the base of the Middle Triassic from spathognathidiform elements (Bender and Stoppel, 1965). Then, contrary to the initial value of the genus, all Early Triassic, Permian, and also unsculptured smooth Carboniferous elements began to be referred to Neogondolella, understanding it in a broad sense (s. l. = sensu lato), and only sculptured Upper Carboniferous conodontophorids were considered as Gondolella (type species Gondolella elegantula Stauffer & Plummer 1932) in a narrow sense (s. str. = sensu strictiore) (Ziegler, 1973). Further research indicates morphological distinctions and phylomorphogenetic connections between genera of gondolellid conodontophorids (Mosher, 1968b; Hayashi, 1968; Budurov, 1976; Buriy, 1989; Kozur, 1989; Orchard, 1991; Buriy, 1996). However, the conventional systematics does not exist now. H. Kozur, considering the taxonomy of Permian and Triassic gondolellid conodontophorids in detail, considered that Neogondolella Bender & Stoppel had evolved from platform-less Neospathodus Mosher through the transitional forms of Chiosella Kozur from the end of the Olenekian Stage to the beginning of the Anisian Stage and that Neogondolella is the basic group of the Middle to the beginning of the Late Triassic (Kozur, 1989). It is necessary to note that the author made these conclusions based on research on of the Tethyan region.

Recently, the geography of locations of the Triassic conodontophorids has been considerably expanded due to new finds in areas of the Russian Arctic (Dagys, 1984; Konstantinov etc., 1997; Klets, 2000; Klets and Yadrenkin, 2001; Klets and Kopylova, 2006). The locations of the Olenekian forms in the up-stream of the Lena River, on Kotelny island (Novosibirsk islands), and in the basin of the Dzhugadzhak River (Omolon massif) has been established. It was documented by many specimens that allowed specific the stratigraphic distribution of Neogondolella. Research has shown that in northern latitudes in the Early Olenekian endemic Neogondolella buarenensis, N. composita, N. jakutensis, N. taimyrensis, N. sibirica, having characteristics of Neogondolella in the form of the basal cavity and in platform microstructure (honey comb structure) were widely distributed (Dagys, 1984, tab. I, figs. 8-12; tab. II, figs. 1-16; tab. III, figs. 1-2; tab. V, figs. 4; tab. XI, figs. 1-4; tab. XII, figs. 1-2; tab. IV, figs. 1-8; Fig. 1). Therefore, specimens of Neogondolella buarenensis from A. A. Dagys’ collection had been referred by Kozur (1989, pl. 15, fig. 6-7) to Paragondolella sweeti, perhaps, wrongly. Records of Early Olenekian neogondolells (Neogondolella elongata Sweet) are known also in British Columbia, Western Pakistan, India and Svalbard (Sweet, 1970; Mosher, 1973; Goel, 1977; Dagys and Korchinskaya, 1989). Therefore, most probably, the genus Neogondolella had evolved from Neospathodus already by the beginning of the Early Olenekian and was widely distributed in southern and northern latitudes (Fig. 1).

The study of conodontophorids in the north of Middle Siberia, the Northeast and the Far East of Russia, and also the analysis of numerous references shows that gondolellids are a rather conservative group, in spite of high enough rates of transformations of platform and blade-like elements. This feature of the group extremely complicates establishment of genera. It also originally formed the basis for their reference to one genus, Gondolella Stauffë & Plummer 1932. There are some trends established during research on the evolution of the Triassic forms where both irreversible and reversible morphological changes are recognized. As the research shows, a character on the upper or lower side of an element taken separately is a poor indicator of closely related genera. In connection with the reversibility of many morphological characters in evolutionary trends, according to separately taken characters, for example the structure of a platform, Early Triassic Neogondolella are similar to Middle Triassic Paragondolella and Late Triassic Norigondolella (Fig. 1). The structure of the basal cavity of platform-less Early Triassic Neospathodus is rather like the structure of the basal cavity of Anisian Nicoraella and Rhaetian Misikella. Therefore, for diagnoses of genera it is necessary to take into consideration the structure of both sides. For more correct and reliable evolutionary constructions, all morphological changes are tracked on adult ontogenetic stages. In establishing genera, we use as a basis the morphological terminology developed by I. Barskov with colleagues (Barskov et al., 1975, Barskov, 1985).

BASIC TRENDS IN DEVELOPMENT OF MORPHOLOGICAL CHARACTERS

Platform

During certain times, the platform of gondolellids was evolving from platform-less conodonts, for example: Neospathodus → Pseudogondolella → Paragondolella, Neospathodus → Chiosella, Neospathodus → Neogondolella. Also, the platform could disappear completely: Clarkina → Neospathodus, Mockina → Parvigonollae, Neogondolella → Celsigondolella. There was no similar trend in the occurrence and (or) disappearance of the platform in the evolutionary line Neospathodus → Nicoraella → Mosherella → Misikella.

Sculpture of Platform

The sculpture consists of nodes, grooves and ribs developed only on the platform of gondolellids. Sculptured conodontophorids such as Scythogondolella and Icriospathodus appeared for the first time in the Triassic during the Olenekian Stage. Strongly- sculptured gondolellids arose in the Ladinian (Budurovignathus and Pseudofurnishius) and became very widely distributed in the Late Carnian-Norian (Metapolygnathus → Epigondolella → Mockina).
FIGURE 1. Scheme of phylomorphogenesis of Triassic conodontophorids.
The main similarity of gondolellid conodontophorids is in the carina, but in some cases, being combined with other characters, its development can be used to establish genera. In spite of variety of carina morphology even within a species, it is possible to identify three basic types:

1. Anterior denticles are the highest. Denticles in the posterior part of a carina are also high. Denticles in the middle part of an element are the lowest and frequently merged. This type of carina is most typical of Neogondolella and Norigondolella.

2. All denticles are high and equal or nearly equal in height. This type is especially shown in elements with a reduced or completely missing platform—Chiosella, Parvigondolella—but can be characteristic of platform-bearing Scythogondolella and some Neogondolella.

3. Denticles in the anterior part of a carina are very high, merged almost along all of the height and are also compressed from the sides. Denticles are gradually reduced in the direction of the posterior edge and become more rounded. This type is well shown in Paragondolella and its descendants Metapolygnathus—Epigondolella—Mockina. It is also characteristic of some species of Budurovignathus.

An important morphological character is the keel—a longitudinal axial eminence on the upper surface of conodonts. Trends in the change of its morphological features are connected to trends in the development of a platform and presence of a free blade. The structure of the lower surface changes in platform-less elements in the lines Neospathodus—Chiosella and Neospathodus—Norigondolella, with the lowest and frequently merged. In an anterior direction, the basal cavity of all genera is narrowed (different genera have various degrees of narrowing) and the deepening always has a V-shaped form.

The form of the keel of platform-bearing conodonts not having a free blade (or in which the blade is poorly advanced) is a convertible character. In the line Pseudogondolella—Paragondolella—Norigondolella Induan conodonts with a poorly advanced platform have a V-shaped keel, younger Paragondolella has a straight lower surface, and Norian Norigondolella has a V-shaped keel again. The similar trends (transition from V-shaped keel to straight) are traced in the lines Neospathodus—Neogondolella—Budurovignathus, Neospathodus—Neogondolella—Pseudofurnishius, and Pseudogondolella—Paragondolella—Gladiogondolella.

In the Late Triassic conodonts Metapolygnathus—Epigondolella—Mockina—Parvigondolella with a well advanced free blade, the form of keel varies in the opposite direction from almost straight up to V-shaped.

Thus, for the establishment of genera of gondolellids it is important to use all characters, as during evolution morphological features have changed in parallel and were not independent from each other. Probably, some changes could be connected functional morphologically.

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REFERENCES


