



The “switching” in early ontogeny type of some Miocene gastropods of the Paratethys reveals a periodic character

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At the dawn of XX century the concept of cyclic development of the Tertiary malacofauna in the Ponto-Caspian area has been proposed by Andrusov (1918) and nowadays is widely accepted among paleontologists and geologists as “Andrusov cycles”.

It was shown recently that "Andrusov cycles" (namely his 3 cycles) cannot be interpreted as cycles of faunal development. They were rather cycles of basin salinity fluctuation or development of hydrologic-geologic conditions of a basin. Each cycle starts with a marine ingression from the Mediterranean and progresses to geographical isolation which results in decreasing salinity up to almost freshwater conditions.

The concept of periodicity in the development of the Tertiary malacofauna in the Eastern Paratethys has been offered: “In a sequential series of Tertiary basins of the Eastern Paratethys there are regular viz. *periodical* alternations of the molluscan faunal associations” (Anistratenko 2002). According to the concept proposed *the repetitions of faunae types* are considered as *repetition of the history of development* of these faunae.

The periodicity coincides with "Andrusov's cycles" rhythmically and is characterized by significant repetition of the fauna composition at some stages of the cycles. It is determined by the sequential recurrences of the Mediterranean fauna in the Ponto-Caspian Basin, but not exhausted by them.

According to data obtained is also demonstrated that the faunal periods are synchronous with three Andrusov cycles (1); in the beginning and the middle part of all three periods (when salinity of basins was not less than 17-18 ‰) the species

with planktonic type of development are predominated among gastropods (2), and at the end of the periods (when salinity strongly reduced and overcomes a boundary of 13-15 ‰), the species with lecithotrophic type of development were appeared (3).

Some concrete examples are presented here. In the Tarkhanian-Karaganian cycle/period were found species with typically planktonic development (e.g. Chokrakian *Mohrensternia* from rissoids) whereas some Karaganian rissoid gastropods had a clear lecithotrophic early ontogeny (e.g. *Archaschenia*).

Regarding the Konkian-Sarmatian cycle/period it was discovered that Sarmatian "Tecturids" are characterized by a protoconch indicative of lecithotrophic type of early development lacking even a short free-swimming larval stage. In contrary the protoconch morphology of Badenian *Tectura* demonstrates features of the shell typical for planktonic larva (Anistratenko and Anistratenko 2005).

The phenomenon of changing in ontogenetic strategy is reported in different groups of gastropods and occurred during time of lowered salinity in the Paratethys. We suggest that this drastic change in the early development not only coincided in time with decreased salinity but was actually triggered by this change of environmental conditions. Although we cannot present more direct evidence a similar phenomenon was also observed in the Middle Sarmatian (versus Badenian) nassariids (Harzhauser and Kowalke 2004).

There is also the reliable example of change in the early development of snails during the Maeotian period. Early Maeotian *Rissoa* definitely had a planktonic larva, but *Coelacanthia* was definitely lecithotrophic form.

For the gastropods of the Paratethys, the "switching" of the early ontogeny type (clearly lecithotrophic versus planktonic) is now reported for the first time. This "switching" is discovered within all three "Andrusov cycles" and considered as phenomenon which evolve the concept of periodicity and add it with an idea of periodic switching of the early ontogeny development, at least, within some molluscs.