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ANTALYNA KORAYI n. sp. IN THE PHYLETIC LINEAGE **OF THE NEZZAZATIDAE (FORAMINIFERA)**

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ABSTRACT. - The new genus Antalyna and its position in the evolutionary lineage of the Miliolid group are discussed. Antalyna korayi n. sp. has been found in the lagoonal facies of the Late Maastrichtian, Taurids, Turkey.

Key-words : Foraminifera, Miliolids, Evolution, Maastrichtian, Turkey.

RESUME. - Le nouveau genre Antalyna et sa position dans la ligne évolutive du groupe des Miliolides sont discutés. Antalyna korayi n. sp. a été trouvé dans le faciès lagunaire du Maastrichtien supérieur des Toros (Turquie).

Mots-clés : Foraminifères, Miliolidae, Evolution, Maastrichtien, Turquie.

EVOLUTIONARY TRENDS IN THE NEZZAZATIDAE

We think that a family in paleontology of one or more genera may be defined as are common characteristics of two categories :

1) characteristics developed for the first time by an ancestor of the family and without manifest evolutionary changes inside the family;

2) characteristics changing in the same evolution pattern having manifestly different adaptable responses.

Furthermore the evolutionary trend of the family gravitates around the first type of characteristics and is limited by them. Possibilities of realizing changes in a large number of directions are conditioned by family lineage features as a whole.

We can recognize in this way, among the first type characteristics inside the family, the characters conditioning the changes of the immediately inferior taxon. It is not easy to recognize these characters, normally they are one or a few.

But whether the first type characters of a family change, a new family starts, being still stable the first type characters of the superfamily remain within it. Normally the changes in this case are more abrupt and the pauses longer.

WIDESPREADING MILIOLIDS

Foraminifera belonging to the superfamily Miliolacea experienced à major burst of evolution and spreading during Cretaceous times.

Their differentiation started from Cenomanian, when a rise in sea level changed the restricted lagoonal environments and many shelf-lagoons were opened up by the early Cenomanian transgression (Farinacci and Köylüoğlu, 1982). Miliolids had begun long before, but the time of their beginning is uncertain.

Later on, in the Maastrichtian, their taxonomic diversification into a considerable number of families was achieved.

Many changes in facies took place during Maastrichtian times in shallow-water environments, accompanying the effects of geodynamic and other events. Carbonate shelves were divided into different basins of deposition and many foraminifers were forced to inhabit the new ecological niches just formed.

But in the latest Maastrichtian also Miliolacea, like many other living things, incurred some extinctions and their evolutionary progress decreased.

The few first type characters of the superfamily Miliolacea, which had inclined evolution into the

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differentiation of lateral branches of familiar rank, did not lead to the development of well-adapted combinations for the newly arrived conditions in the latest Maastrichtian, and some families died out.

THE RISE OF THE NEZZAZATIDAE

It often happens that the alteration of some minor factors characterizing the environment is not recorded in the sediments.

Only when many minor factors or one or few major factors were changed, the lithofacies also shows differences because a new type of environment is developed.

But fossil assemblages also deeply experienced the effects of small changes of minor factors and the species reacted by disappearance or by development of new forms.

This argument is drawn from observations of assemblages modifying through time. This happened especially when modifications in the assemblage were realized by forms well adapted, and at the present time well known in their optimum environment. In this way small changes in the factors characterizing the environment may be recorded exclusively by modifications of the fossil assemblages.

The existence of a link between evolution of a population and the environment seems to be verified by the evidence.

Probably new ecological niches are colonized through immigrations of species in evolution, from whose, changing the familiar characters, by a new genus, a new family is realized.

It is not easy to recognize the ancestor of a family. But we can recognize the form, which precedes a new family, by an unspecialized or very little specialized species, in which many characters are slightly sketched together and only later developed and diversified during the evolutionary burst of the family.

The family Nezzazatidae started in the Cenomanian. The detachment from the main trunk of the family Miliolidae was realized by *Nezzazata* assuming a trochospiral coiling; the tooth-plate was just achieved by Miliolidae having the function to reduce the opening. The ancestor of the Nezzazatidae, still belonging to the family Miliolidae, seems to be the genus Nummoloculina, with the characters of Nummoloculina heimi BONET, but the ancestor, just inside the family Nezzazatidae, is recognizable into the genus Nezzazata.

So, Nummoloculina and Nezzazata are inter-related. Nummoloculina having "announced" the jump and the future realizations of Nezzazata. Nummoloculina from the milioline arrangement with 2 chambers to whorl in its ontogenetic development, later becomes planispiral with 3 chambers to a whorl, increasing in the adult to 5 or 6 low, broad chambers to a whorl. Its aperture is semicircular, filled by a toothplate extending upward from the base of the opening.

Nezzazata realizes one of the evolution trends of the Cenomanian miliolids, becoming trochospiral with more than 6 chambers (8-10) to a whorl. We consider the coiling and the number of the chambers, in this moment of the evolution of the Miliolacea, as first type characters. Therefore the changes of the coiling, from milioline to planispiral, as reached by Nummoloculina, to trochospiral, as realized in Nezzazata, lead into a new family by the renewal of the Miliolacea characters and specialization in a lateral branch.

The first type character, that is the coiling type of the family, is changed and the new family Nezzazatidae starts.

The family Nezzazatidae erected by Hamaoui and Saint-Marc (1970) collected together 7 genera : Nezzazata, Trochospira, Merlingina, Biconcava, Biplanata, Coxites and Rabanitina.

We agree with them because we easily recognize those characteristics linking genera inside the family with its evolutionary trend. But we are not so sure about the separation of the seven genera of the Nezzazatidae into two subfamilies, Nezzazatinae and Coxitinae.

Therefore we prefer now to consider only the individualization of the genera inside the family, bearing in mind that many of these genera are monotypic and we do not know the intrageneric variability.

The new genus Antalyna, here described, seems to be the last of the family, being Maastrichtian in age.

PLATE 1

1-6. Antalyna korayi n. gen. n. sp. Demre Çay section, Antalya region, Turkey. Late Maastrichtian. 1 : Holotype, NS 33-1, \times 75.

2-6 : Paratypes. 2) NS 33-2, × 90; 3) NS 33-3, × 75; 4) NS 33-4, × 90; 5) NS 33-5, × 90; 6) NS 33-6, × 75.



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The first one, *Nezzazata*, was perhaps not older than Cenomanian.

SYSTEMATIC DESCRIPTION

Ordo FORAMINIFERIDA EICHWALD, 1830

Superfamilia MILIOLACEA EHRENBERG, 1839

Familia NEZZAZATIDAE HAMAOUI et SAINT-MARC, 1970

Genus Antalyna n. gen.

Description : Test trochospiral, two-three whorls of chambers increasing in height rapidly as uncoiling. Evolute in both sides. Early stages have a milioline coil. Dorsal side convex, ventrally concave with a low umbilical depression sculptured by a depressed indented spiral suture along the ventral margin of the chamber floors. Chamber septa depressed.

Wall calcareous, microgranular, imperforate with subepidermal well-developed partitions to form a reticulate layer. Septal wall single without structure. Aperture an opening on the apertural face with extended tooth-plate.

Type species : Antalyna korayi n. sp.

Antalyna korayi n. sp.

Description : Test trochospiral, asymmetrically oval to squared in basal view. Dorsal side convex, ventrally concave with a low umbilical depression in which the two whorls of the chambers are visible.

The umbilical portion is sculptured by a broad, depressed spiral suture forming a deep concave spiral indentation inside the umbilical hole, along the ventral margin of the chambers floors.

The small chambers of the early stage have a milioline arrangement with the chambers trochospirally arranged; in the last whorl these enlarge rapidly in height without uncoiling. Suture depressed.

Wall calcareous, microgranulas, imperforate with subepidermal well developed partitions to form a

reticulate layer. Septal wall single without reticulate structure.

Aperture ventral, central on the apertural face, formed by an elongated opening, probably curved, with a extended tooth-plate.

Dimensions : Maximum measured diameter of the test : mm 1.12.

Diameter of early milioline stage : μ 34-40.

Height of the first chamber after milioline stage : μ 46-58.

Size of the last chambers : about ten-twelve times the first chamber after milioline stage.

Number of chambers : 20-24.

Derivatio nominis : The name Antalyna derives from Antalya region, Southwestern Turkey. The species korayi is dedicated to the Köylüoğlu's baby who was born when this new species was found. The significance of the Turkish name Koray : kor means glowing coal of a fire or embers : ay means moon.

Type level: Late Maastrichtian. Together with Rhapydionina liburnica (STACHE), Laffitteina mengaudi (ASTRE), Dictyoconella complanata HENSON.

Type locality : Demre Çayi section, Antalya region, Southwestern Turkey. Sample n° 74, m 608 from the base of the sequence

collected along the Demre Cayi stream. Occurrence : D. Altiner (personal communication) has found Antalyna in the Garzan Formation (Upper

has found *Antalyna* in the Garzan Formation (Upper Maastrichtian) of the Southeastern Anatolia near the Gercüs area (Turkey).

Depository : Paleontological Museum, University of Rome.

Holotype : NS 33/1; paratypes : NS 33/2-9.

Remarks : A well ordered reticulate subepidermal layer is the prevailing diagnostic character by which *Antalyna korayi* is easily distinguished from other allied species inside the family Nezzazatidae.

Outside the family, the reticulate wall is a homeomorphic character that may be developed in different groups of benthic foraminifers without phyletic relationships.

PLATE 2

- 1-4. Antalyna korayi n. gen. n. sp. Demre Çayi section, Antalya region, Turkey. Late Maastrichtian.
- 1: Elargement of a portion of the holotype figured in Pl. 1, fig. 1, × 190.
- 2-4 : Paratypes. 2) NS 33-7, \times 145; 3) NS 33-8, \times 90; 4) NS 33-9, \times 55.



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For instance, the subepidermal reticulate layer is present independently in *Reticulina reicheli* CUVIL-LIER *et al.*, 1969 (pl. 10, fig. 2; pl. 13, fig. 2) and in *Praereticulinella cuvillieri* DELOFFRE and HAMAOUI, 1970, both in the family Lituolidae. But in those genera, partitions have a function of subdividing chambers in chamberlets.

According to Cuvillier *et al.* (1969), the presence of a reticulate subepidermal layer is not characteristic of the family, but is a generic feature. Therefore we can find genera with a reticulate layer also in those families with genera without this type of wall.

Phyletic lineage : Antalyna seems to have been derived from Coxites directly or through intermediaries still unknown. Coxites in fact is considered Turonian in age, Antalyna late Maastrichtian and till now there is a gap in our knowledge. Moreover a cleares connection between both genera may be possible when better preserved specimens of Coxites are found and the aperture and the internal structure will be known. If more than one species of Coxites are developed in time and changes inside the genus reach Maastrichtian, the derivation of Antalyna from Coxites will become more sure.

The derivation of *Coxites* from *Trochospira* and *Nezzazata* has been deeply discussed by Hamaoui and Saint-Marc (1970).

Therefore tentatively the following phyletic lineage is proposed :

 $Nezzazata \rightarrow Trochospira \rightarrow Coxites \rightarrow Antalyna$ Cenomanian — Late Cenomanian — Turonian — Late Maastrichtian

In the family Nezzazatidae, other genera were developed starting from *Nezzazata* or *Trochospira*, as lateral branches in respect to the main *Nezzazata* — *Trochospira* lineage; being also *Coxites* — *Antalyna*, considered here as the late lateral branch with which, at the end of the Maastrichtian, the family came to an end.

Nevertheless, considering the family Nezzazatidae, in *Nezzazata* (Omara, 1956; pl. 102, fig. 12, 13) very small and irregular subepidermal partitions were already roughly developed.

Also the tooth-plate is regarded by the authors as an advanced apertural feature developed independently in various lines. But tooth-plate must be considered as a familiar feature.

Besides the reticulate subepidermal layer, acquired the rise of the genus, *Antalyna* inherits the character of the family : the trochospiral coiling, emphasizing the tendency towards uncoiling, without reaching that stage. This tendency, typical of the family, is evident also in *Merlingina* and *Trochospira*. In *Coxites* too some morphological features are similar to those of *Antalyna*, such as coiling and the presence of partitions, but the similarity must be regarded as features of two related genera belonging to the same family.

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