

SYSTEMATIC COMPOSITION AND DEVELOPMENT STAGES OF ECHINOIDS IN THE MARINE BASINS OF THE LESSER CAUCASUS (AZERBAIJANI PART) IN THE CENOMANIAN-SANTONIAN AGES

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Abstract

Based on the study of the systematic composition, morphological features, habitat conditions, the time of appearance and disappearance of echinoids in the Cenomanian-Santonian time in the Lesser Caucasus, the Cenomanian-Santonian stage is distinguished, including the Cenomanian, Turonian, Coniacian and Santonian phases. It has been established that each distinguished phase corresponds to complex moments, differing from each other in their evolutionary changes of a particular taxon during a certain geological time, that is, appearance and disappearance, lush reproduction and frequency of appearance in sections.

Keywords: stage, morphology, Mesozoic, transgression, phase.

INTRODUCTION

The Lesser Caucasus region, located in the central part of the Mediterranean mobile-orogenic belt, is original in its geological structure. The Upper Cretaceous deposits in the Azerbaijan part of the region consist mainly (more than 80%) of pelitomorphic limestones and writing chalk. The Late Cretaceous section is represented by all stages and substages - from the Cenomanian to the Maastrichtian inclusive. In clay and carbonate deposits, often and in numerous specimens, there are remains of foraminifera, radiolarians, corals, mollusks, brachiopods, echinoderms, etc. Echinoderms are represented almost exclusively by the remains of Regularia. Less common are well-preserved skeletal fragments and remains of whole shells of Regularia, sea lilies and starfish. In the Lesser Caucasus, the most ancient finds of echinids in the form of single specimens are found in the Lower Jurassic and Lower Cretaceous deposits [4].

The study of echinids of the Late Cretaceous of the Azerbaijan part of the Lesser Caucasus was carried out at different times by V.P. Rengarten [6], R.B. Askerov and R.N. Mamedzade [1], O.H. Melikov [3], O.H. Melikov and R.B. Askerov [4], A.H. Khalilov and O.H. Melikov [7], O.H. Melikov and R.N. Mamedzade [5], A.M. Mamedalizade [2] and others.

The Late Cretaceous in the Lesser Caucasus differs from the early and subsequent stages of geological development of the Earth in the abundance and diversity of the organic world. Here a number

of new, rapidly evolving and space-conquering groups of organisms appear, including echinids, many of which (*Conulus*, *Echinocorys*, *Micraster*, *Galeola*, *Seunaster*, *Stegaster*, etc.) form clear rows of successively replacing each other species and make it possible to establish fractional stratigraphic divisions in the Upper Cretaceous.

MATERIAL

This study is based on the author's own collection of Cenomanian, Turonian, Coniacian and Santonian deposits collected during field expeditions in the Caucasus. Up to 200 specimens of echinids belonging to *Echinoneoidea*, *Diadematoidea*, *Holasteroidea*, *Cassiduloidea*, *Spatangoida* and *Clypeasteroidea* were collected. In addition, the collection of O.H. Melikov, which is stored in the Natural History Museum named after G. Zardobi (Baku) and the Geological Museum of the Institute of Geology and Geophysics of the Ministry of Science and Education of the Republic of Azerbaijan, was also used.

DISCUSSION

Based on the study of changes in taxonomic composition, features of horizontal and vertical distribution, taking into account the data of micro- and macromorphology, history of settlement and development, appearance and disappearance of echinids in the Cenomanian-Santonian basins of the Azerbaijani part of the Lesser Caucasus, it is possible to distinguish in the history of their development: the Cenomanian-Santonian stage, which includes the Cenomanian, Turonian, Coniacian and Santonian phases.

When describing the nature of the change in the stage of development, information was collected not only about the fauna, along with them, at the same time, attention was also paid to the nature of sedimentation and tectonic movements in the basin, which can provide information on the main factors influencing the conditions of existence of a particular group of fauna.

The Cenomanian-Santonian stage is characterized by the appearance of new representatives of echinids within the Lesser Caucasus paleogeographic subprovince in the Cenomanian, Turonian, Coniacian and Santonian times. The deposits of these stages are dominated by the genera *Holectypus*, *Conulus*, *Nucleolites*, *Catopygus*, *Cardiotaxis*, *Holaster*, *Echinocorys*, *Micraster* and *Isomicraster*, common with Western Europe, and mainly with its northern (Anglo-Parisian basin, Northern Germany), as well as the southern part of Eastern Europe and Transcaspia.

Taking into account the change in taxonomic composition and features of horizontal and vertical distribution, four phases are distinguished within the stage: Cenomanian, Turonian, Coniacian, Santonian.

1. Cenomanian phase

The community of echinids of the Late Cretaceous of the Lesser Caucasus differs from the Early Cretaceous in systematic composition and morphology. These differences are clearly evident, starting with the Cenomanian phase, which is characterized by the appearance of representatives with spherical-cone-shaped and spherical-flat forms.

In the deposits of the Upper Cenomanian, of *Holaster subglobosus* LESKE is found, as single specimens which is known from the coeval layers of the Northern Caucasus, Transcaspia and Western

Europe. Along with *Holaster subglobosus*, the poor fauna of echinoids of the Cenomanian stage includes *Holectypus exciscus* COTTEAU, *H. cenomanensis* GUERANGER, *Conulus laevis* AGASSIZ, *Nucleolites morrisoni* d'ORBIGNY, *Catopygus columbaris* (LAMARCK), etc. The complex is characteristic of the European paleozoographic region and has a wide range, from the Anglo-Paris basin to the southeastern part of the Lesser Caucasus. There are four genera and five species (Fig. 1).

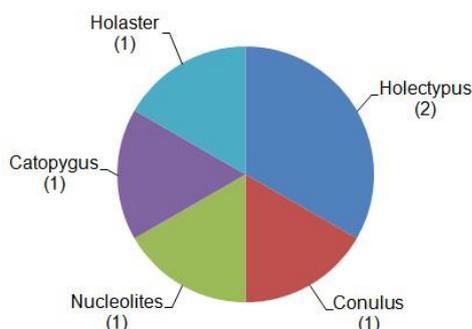


Fig. 1. Number of genera and species of Echinoidea in the Cenomanian in the Azerbaijan part of the Lesser Caucasus (number of species in brackets).

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2. Turonian phase

The phase is characterized by the reappearance of representatives of the genera *Conulus* and *Holaster*. It is also characterized by the first appearance of the genera *Echinocorys* and *Micraster*. The bulk of the complex is represented by cone-shaped (*Conulus*) and dome-shaped (*Echinocorys*) forms. Here, in the lower horizons, there are *Conulus subconicus* (d'ORBIGNY), in the upper horizons, *Conulus subrotundus* (MANTELL), *Holaster planus* MANTELL, *Echinocorys sphaericus* (SCHLÜTER), *Ech. gravesi* DESOR, *Ech. gibbus* (LAMARCK), *Micraster leskei* d'ORBIGNY. Of these, only two species - *Conulus rhotomagensis* (SISMONDA) and *C. ellipticus* (ZARECZNY) are common to the early and late Turonian. All species (except *Conulus ellipticus*) have a wide range - from the Anglo-Paris basin and Germany to the eastern outskirts of Turkmenistan. The total number of genera is four, species - nine (Fig. 2).

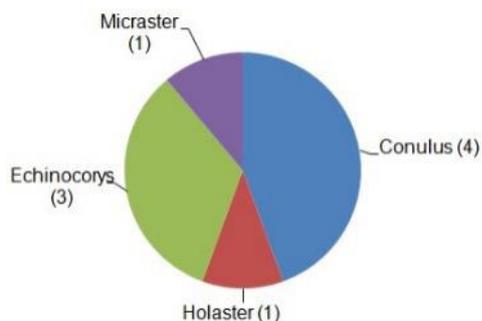


Fig. 2. Number of genera and species of Echinoidea in the Turonian in the Azerbaijani part of the Lesser Caucasus (number of species in brackets).

3. Coniacian phase

The Coniacian phase is characterized by the reappearance of representatives of *Conulus* and *Micraster*, represented by the species *Conulus ovulum* Lamarck, *C. raulini* Cotteau, *Micraster coranguinum* Klein, *Micraster cortestudinarium* Goldfuus. The phase is also characterized by the first appearance of representatives of the genus *Cardiotaxis* (*Cardiotaxis maximus* Schlüter, *C. bicarinatus* d'Orbigny). Along with them, species that are transitional from the Turonian continue to exist - *Conulus subconicus*,

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Echinocorys gibbus, *E. gravesi*. Here, in the lower horizons, there are *Conulus subconicus*, *Echinocorys gravesi*, *E. gibbus*, *Micraster cortestudinarium*, in the upper horizons, *Conulus raulini*, *Cardiotaxis maximus*, *Micraster coranguinum*. All species are characterized by a wide distribution - from the Anglo-Paris basin to the eastern edge of Turkmenistan. Echinoids of this phase are represented by four genera and ten species (Fig. 3).

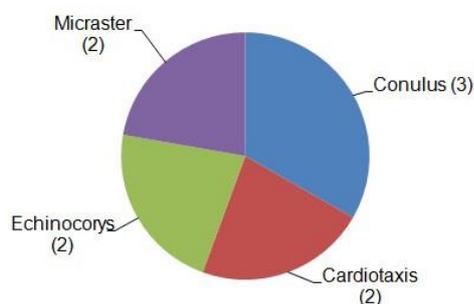


Fig. 3. Number of genera and species of Echinoidea in the Coniacian Age in the Azerbaijani part of the Lesser Caucasus (number of species in brackets).

4. Santonian phase

Echinoids in the Santonian are represented by twelve species belonging to five genera (Fig. 4). The phase is characterized by the reappearance of representatives of *Conulus*, *Cardiotaxis*, *Echinocorys* and *Micraster*. The new complex is represented by the species *Conulus albogalerus* KLEIN, *C. oblongus* d'ORBIGNY, *Cardiotaxis mundus* RENGARTEN, *Echinocorys vulgaris* BREYNIUS, *Ech. striata* SMISER, *Ech. scutatus* LESKE, *Micraster turonensis* BAYLE and *M. rostratus* (MANTELL). Transitional from the Coniacian phase are *Conulus raulini*, *Cardiotaxis maximus*, and *Micraster coranguinum*. The phase is also characterized by the first appearance of *Isomicraster senonensis* LAMBERT. The main mass consists of newly appeared species of *Conulus*, *Echinocorys* and *Micraster*. They are contained in numerous specimens in pelitomorphitic and slightly sandy limestones. The forms of the Santonian phase are relatively large, cone-shaped, dome-shaped and heart-shaped in appearance. In comparison with the Cenomanian, Turonian and Coniacian phases, the

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Santonian contains significantly more cone-shaped forms (*Conulus*). At the end of the phase, all characteristic species disappear and the event marks the end of the Cenomanian-Santonian stage in the waters of the Lesser Caucasus.

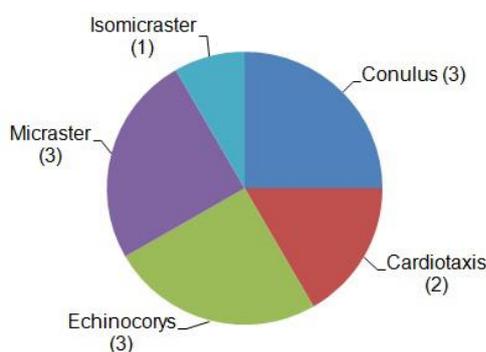


Fig. 4. Number of genera and species of Echinoidea in the Santonian in the Azerbaijani part of the Lesser Caucasus (number of species in brackets).

In the deposits of the Cenomanian, Turonian, Coniacian and Santonian stages in the Azerbaijani part of the Lesser Caucasus, species common to North-Western and Southern Europe (*Holactypus*, *Conulus*, *Nucleolites*, *Catopygus*, *Cardiotaxis*, *Holaster*, *Echinocorys*, *Micraster*, *Isomicraster*) prevail. Mainly with its northern part - the Anglo-Parisian Basin and Northern Germany.

CONCLUSIONS

1. Based on the systematic composition, morphological features, time of appearance and disappearance of echinids in the Cenomanian-Santonian time, it is possible to distinguish the Cenomanian-Santonian stage with the Cenomanian, Turonian, Coniacian and Santonian phases.

2. Based on the above, it can be noted that the most important genera of echinids of the Late Cretaceous of the Azerbaijan part of the Lesser Caucasus ended their existence in the following order:

- genera that ended their existence at the end of the Cenomanian Age - *Holactypus* and *Nucleolites*;
- genus that ended its existence in the Turonian Age - *Sternotaxis*.

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