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Taxonomy and Biometry (Applied to the Eocene Corals from the Island of Krk - Croatia)

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Abstract ~ -

Numerous solitary corals have been collected from the Eocene sediments at the island of Krk. The great abundance of specimens, along with the good preservation, allowed the implementation of biometrical analysis. At scatter diagrams two distinct clusters can be distinguished, confirming existence of two coral species: *Nicaeotrochus cyclolitoides* (BELLARDI) and *Chevalieriphyllia costata* (D' ACHIARDI). Greater variability of parameters occurs in *C. costata* specimens, which is probably caused by stronger sensitivity of species regarding the changes in environmental conditions.

INTRODUCTION

The abundant coral fauna, composed of the numerous solitary corals and several coral colonies has been collected from the Eocene marls and sandstones at the localities Risika, Baška Nova and Bašćanska Draga on the island of Krk. This fauna is a part of the large fossil collection of the Croatian Natural History Museum in Zagreb.

The existance of corals from this area has been known for the long time (OPPENHEIM, 1914; MATOUSEK, 1924), but the fauna has not been studied in detail.

During the postgraduate studies, N. Prlj-Šimić (1994) has determined coral taxa on the basis of macrostructural and microstructural elements.

Dominant forms are *Nicaeotrochus cyclolitoides* (BELLARDI) with over 200 specimens, and *Chevalieriphyllia costata* (D'ACHIARDIJ with over 20 specimens.

The existance of such large number of specimens muiated the biometrical study.

MATERIALS AND METHODS

Coral specimens have been extracted from the clastic sediment mechanically with boring tools, and chemically cleaned with the diluted hydrochloric acid. Longitudinal and transverse sections have been exposed through the thin sections or acetate peels for the purposes of microstructural analysis. Several polished specimens have been stained with Indian Ink in order to accentuate the difference between the skeleton and the infillings or secondary calcite overgrowths.

For biometrical analysis the following parameters have been measured (Fig. 1):

- the largest diameter of the calyx (D);
- the smallest diameter of the calyx (d);
- the total height of the calyx (H).

The obtained data have been plotted in scatter diagrams and histograms.

TAXONOMY

For the long time the determination of corals has been based exclusively upon the external morphology (shape of the calyx, number and shape of the costae, number and arrangement of the septa). Recent investigations of the benthos in general have shown the great dependence of the external morphology to the environmental conditions (water energy, light penetration, nutrients).

Therefore, the need for the more reliable criteria in taxonomy has appeared. In coral taxonomy the analysis of microstructure became unavoidable. Dissepiments, pali, trabeculae and other internal skeleton elements should be examined from longitudinal or transverse sections of the calyx.

Among the numerous coral specimens collected at the island of Krk, small (1-3 cm in diameter) cone-shaped scleractinian corallites with small basal portion prevail. Dominant form has been determined as *Nicaeotrochus cyclolitoides* (BELLARDI), (BARTA-CALMUS, 1973, 1987), with 210 specimens. Corallites

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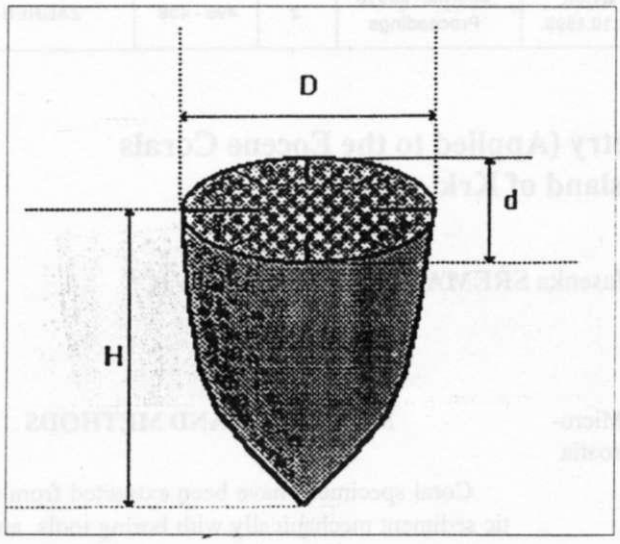

Fig. 1. Schematic reconstruction of' coral calyx showing the way of measuring the parameters H (the total height of the calyx), d (the smallest diameter of the calyx) and D (the largest diameter of the calyx) (not in scale).

resemble the acorn-cap in outline. The external surface is covered with longitudinal costae. The transverse section is circular with about 120 septa arranged in 5 to 6 cycles. Columella and pali are absent. Disssepiments, synapticulae and complex trabeculae are visible. Column wall is paraseptothecal. This species is widely distributed at three localities (Baška Nova, Bašćanska Draga and Risika).

At Risika locality /*N. cyclolitoides* specimens are accompanied with similar cone-shaped corallites (22 specimens); elliptical in transverse section and with slighty curved basal-portion. These specimens have been determined as *Chevalieriphyllia costata* (D' ACHIARDIj (RUSSO, 1979). Their external surface is ornamented with two orders of longitudinal costae. More than 100 septa are arranged in 6 cycles. Pali and dissepiments are absent. Columella is parietal and trabeculae are complex. Column wall is septothecal.

BIOMETRY

In the last decade the application of biometrical studies in corals has been introduced (BARTA-CALMUS, 1987) in order to complement the taxonomical criteria.

The authors have applied this method for the first time to the coral specimens from Croatia. The method has been improved by introducing a new parameter - total calyx height - in biometrical studies.

Pairs of parameters (the largest diameter versus the smallest diameter of calyx; the largest diameter against the total calyx height and the smallest diameter against the total calyx height) yielded the scatter diagrams in which the two separate clusters can be distinguished. The means of the size parameters of calyx are invariably well correlated (some of the combinations are

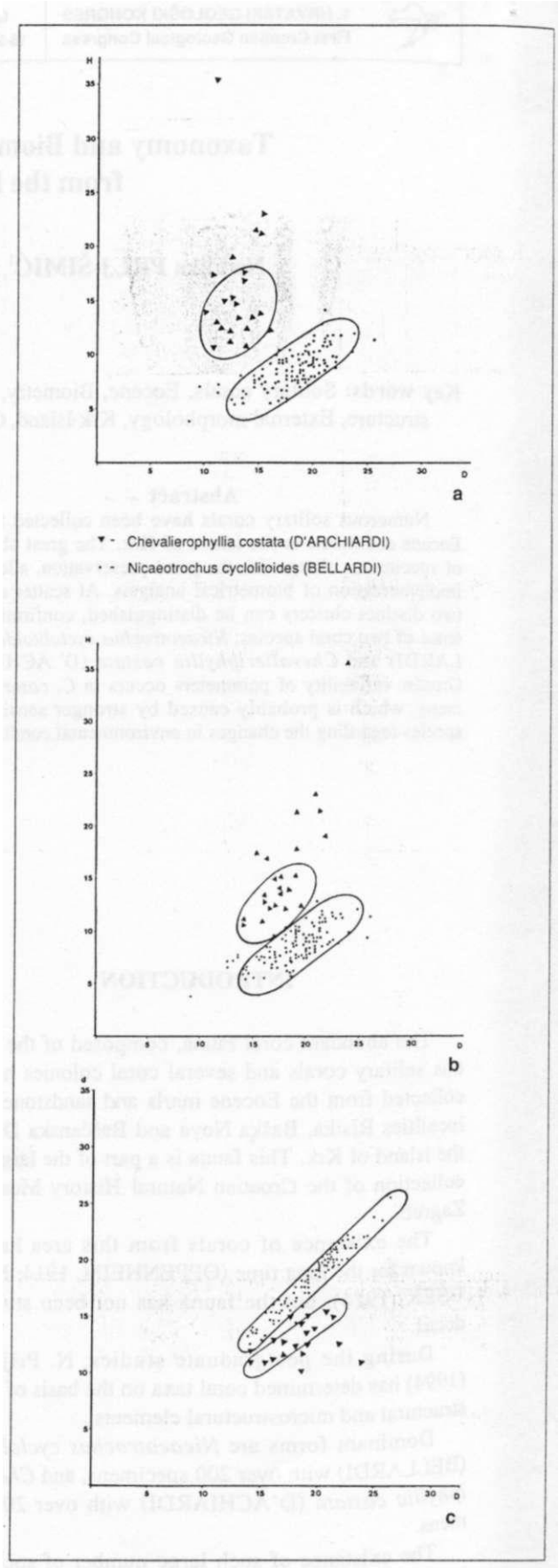

Fig. 2 a-c. Scatter diagrams of H, d and D and combinations for *N. cyclolitoides* and *C. costata* specimens (all measurements in mm) from the Risika site.

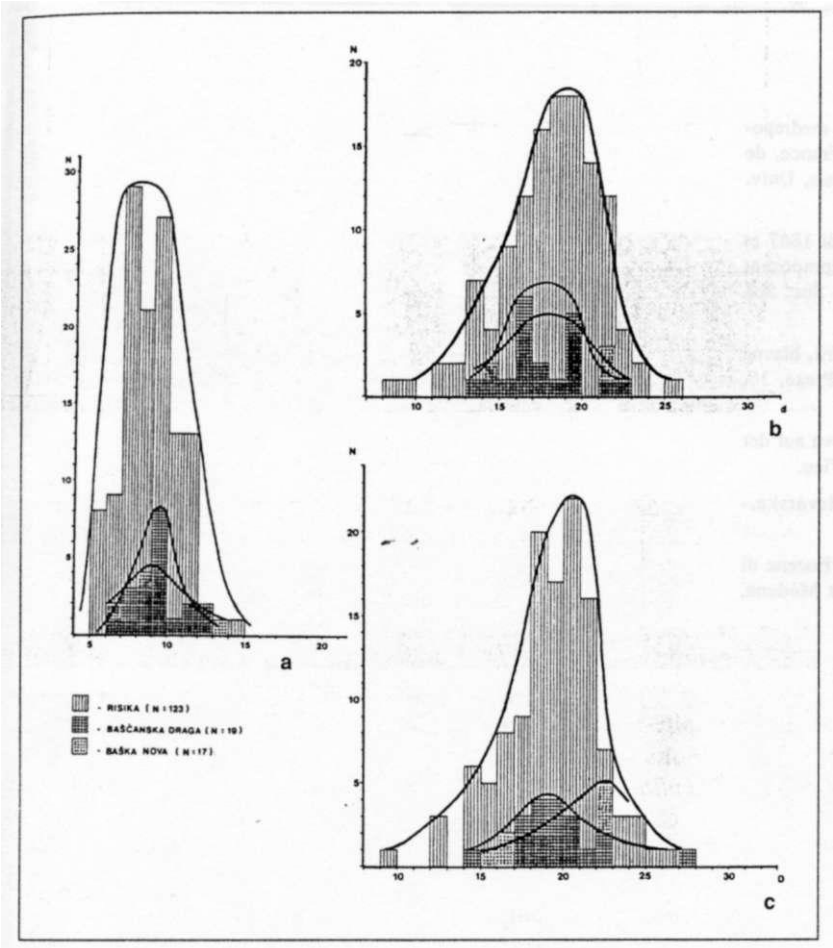

Fig. 3 a-c. Histograms of H, d and D for the species *N. cycloliloides* from three studied localities (N - indicates the number of individuals). Frequency distribution reflects homogeneous populations.

shown in fig. 2 a-c). The clusters of *C. costata* species are relatively wide compared to the more elongate clusters of the pairs of parameter means in *N. cyclolitoides* specimens. The overlap between the clusters of these two species is almost excluded. The poorer positive correlation in clusters related to the species *C. costata* gave us the opportunity to consider the environmental conditions (substrate, depth, salinity,...) as the factor influencing the final external morphology in *C. costata* individuals.

The frequency distribution (Fig. 3 a-c) of all observed parameters in *N. cyclolitoides* specimens from the three different sites indicates fairly normal distribution in unimodal pattern.

CONCLUSIONS

Abundant, but uniform coral fauna has been collected at three localities at the island of Krk. The two scleractinian species *Nicaeotrochus cyclolitoides* (BELLARDI) (210 specimens) and *Chevalieriphyllia costata* (D'ACHIARDI) (22 specimens) have been determined on the basis of external morphology and microstructure.

Biometrical analysis has been applied considering the largest and the smallest diameter as well as the total height of the calyx. Two separate clusters confirming the existance of the two species can be clearly distinguished at scatter diagrams (fig. 2 a-c). The less correlative clusters of *C. costata* indicate the higher sensitivity of this species to the environmental factors. Thus can be explained the smaller number of specimens and the limited distribution of this species. Unimodal pattern of the frequency distribution for *N. cyclolitoides* corallites refers to the fairly normal distribution, and in situ character of the coral fauna.

Monospecific or duospecific fauna at Risika, Baška Nova and Bašćanska Draga localities provides the evidence for unfavourable environmental conditions.

Considering the recent distribution of solitary corals in warm seas, depth of over 100 meters can be presumed.

REFERENCES

BARTA-CALMUS, S. (1973): Revision de coiections de medreporaires provenant du Numulitique du Sud-Est de la France, de l'Italie e delà Yugoslavie septentrionales.- PhD Thesis, Univ. Paris VI, 1 - 695, Paris.

BARTA-CALMUS, S. (1987): Pattalophyllia D'Achiardi 1867 et Nicaeotrochus nov. gen. Definition des taxons les composant (Scleractiniaires, Caryophlliidae) au Tertiare.- Bull. Soc. Sci. hist, nat., 118, 69-93, Paris.

MATOUSEK, O. (1924): Geologicke Studie v severni Adrii, hlavne na ostrove Krku.- Spisy Prir. fak. Karlovy univ. v Praze, 36, Praha.

OPPENHEIM, P. (1914): Die Eozänfauna von Besca Nuova auf der Insel Veglia.- Verh. Geol. Reichsanst., 7/8, 189-202, Wien.

PRLJ-SIMIC, N. (1994): Eocenska koraljna fauna Hrvatske.- Unpublished M.Sc. Thesis, University of Zagreb, 72p.

RUSSO, A. (1979): Studio monografico sui Coralli dell'Eocene di Possagno (Trevisio, Italia).- Acc. Naz. Sc. Lett. Art Modena, 6/21, 1-87, Modena.