# *EUNICELLA* SP., OCTOCORALLIA FROM THE RED BLUFF FORMATION, LOWER OLIGOCENE, MISSISSIPPI

M. JOHN KOCURKO
*DEPARTMENT OF GEOLOGY, MIDWESTERN STATE UNIVERSITY*
*WICHITA FALLS, TEXAS*

## ABSTRACT

This report represents the first occurrence of *Eunicella* sp., either fossil or modern, found in deposits associated with the Gulf of Mexico. Extension of the distribution of the South African *E. albicans* alliance into the Gulf region is also suggested. The geologic range of Plexauridae is here established as Lower Oligocene to Recent.

## INTRODUCTION

Reports of fossil octocorals are becoming more noticeable in the literature as investigators become aware of their presence. Only a few members of the Octocorallia have been recorded from the fossil record. As pointed out by Grasshoff and Zimbrowius (1983, p.112), most "are stored misidentified or as 'enigmatica' in paleontological collections." Occasionally fossil octocorals are recovered that can be assigned to a proper taxonomic position.

The oldest reported octocoral is a sea pen (Pennatulacea), according to Glaessner (1959, 1961). These fossils are part of the late-Precambrian Ediacara fauna and are preserved as impressions. As with many of the Precambrian fossils, some questions still arise as to the true affinity of these forms.

More recently, Lindstrom (1978) reported the oldest gorgonacean from the Lower Ordovician of Sweden. Prior to his article, the geologic range of Gorgonacea was Cretaceous to Recent (Bayer, 1956). For additional information on pre-1956 reports, the reader is referred to Bayer (1956).

Accounts of fossil octocorals from the Cenozoic of the Gulf of Mexico are even more limited. To my knowledge, seven references previously have been made to systematics of fossil octocorals from the Gulf region (Table 1). Representative samples range from sclerites, to axial fragments, to holdfasts. Several octocoral holdfasts have been reported from the Red Bluff Formation (Kocurko, 1988; Kocurko and Kocurko, 1992) but none have been identified.

A perplexing problem for most investigators is the systematic relationships between fossil and modern octocorals. Identification of modern Octocorallia is based primarily on various types of sclerites found in the tissues of the organism. In most cases, a suite of sclerites is needed to identify a single species. Fossil octocorals, however, may not have their sclerite suite intact and their systematic position may be difficult to determine. Fortunately, the genus noted here, from the Red Bluff Formation, is represented by a single, diagnostic sclerite.

## STRATIGRAPHY AND SEDIMENTATION

The Red Bluff Formation underlies the Vicksburg Group (Figure 1) and is Lower Oligocene in age (Hazel *et al.*, 1980). The formation has been interpreted as representing a shelf environment based on studies of Bryozoa, Ostracoda, and Octocorallia (MacNeil, 1944; Cheetham, 1963; Hazel *et al.*, 1980; Kocurko and Kocurko, 1992). The study area is located on the east bank of the Chickasawhay River in the SW 1/4 of section 28, T10N, R7W, approximately one km southwest of Hiwannee, Wayne County, Mississippi. Samples were recovered from a fossiliferous, sandy, calcareous shale layer, approximately 2 metres above the base of the formation. The layer contained abundant sandstone and claystone pebbles. The pebbles served as hard substrate on which octocorals attached. Numerous calcified, discoidal holdfasts were recovered from this horizon for subsequent study.

The particular holdfast, here noted, is approximately 9 mm in width and 1.5 mm

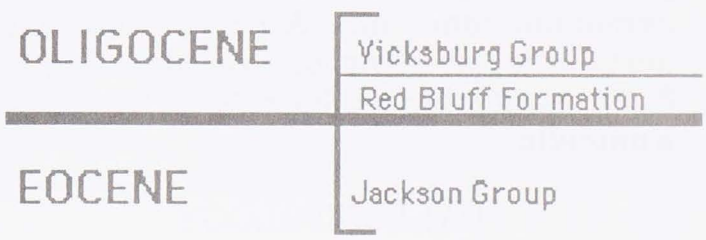


Figure 1. Stratigraphic relationships of the Red Bluff Formation.

TABLE 1. Reports of Cenozoic Octocorallia from the Gulf of Mexico region.

| Stratigraphic Unit | Age/Location | Reference |
|---|---|---|
| Unknown | U. Pleist., Yucatan | Kocurko (1988) |
| Key Largo Ls. | Pleist., Fla. | Kocurko (1988) |
| Red Bluff Fm. | L. Oligo., Miss. | Kocurko (this report) |
| Red Bluff Fm. | L. Oligo., Miss. | Kocurko *et al.* (1992) |
| Red Bluff Fm. | L. Oligo., Miss. | Kocurko (1988) |
| Jackson Fm. (Gp.) | U. Eocene, Ala. | Cheetham (1963) |
| Danville Landing Fm. | U. Eocene, La. | Kocurko (1988) |
| Moodys Branch Fm. | U. Eocene, Miss. | Hickson (1938) |
| Stone City Fm. | M. Eocene, Tex. | Stenzel *et al.* (1957) |
| Stone City Fm. | M. Eocene, Tex. | Giammona *et al.* (1980) |
| Unknown | Eocene, Ala. | Gregorio (1890) |

in height. The original specimen was approximately 15 mm in diameter, but only fragments are now available. Microstructures of the holdfast are observable, but poorly preserved.

Associated sclerites were detected after sectioning of the holdfast. Examples were found between laminae of calcium carbonate. During preparation and thin sectioning of the specimen, various laminae of the holdfast were inadvertently disaggregated. The breaking of the specimen exposed numerous sclerites that previously were concealed between the laminae. Sclerites probably were incorporated in the holdfast during sedimentation, after death of the original colony.

Sclerites associated with the holdfast consist of spindles (Figures 2.1-2.4), torches (Figures 2.5-2.6), leaf clubs (Figures 2.7-2.11), a balloon club (Figure 2.12), and wart clubs (Figures 2.13-2.17). Terminology used here is after Bayer *et al.* (1983).

The holdfast was found to contain numerous sclerites that could represent various genera. Sclerite forms suggest similarities to the *Eunicea tourneforti* complex and the *E. mammosa* complex (Bayer, personnal commun.). A particularly diagnostic sclerite is the balloon club (Figure 2.12), assignable exclusively to the genus *Eunicella*.

## PALEONTOLOGY

*Eunicella* is a plexaurid of the order Gorgonacea. The genus is represented by 13 modern species ranging from the Indo-Pacific and western Atlantic (Bayer, 1961) to the Mediterranean (Carpine and Grasshoff, 1975) to southern Africa (Grasshoff, personnal commun.). Fossil representatives of this genus have not been reported from any region or strata prior to this investigation. The geologic range of Plexauridae, and *Eunicella* in particular, is established as Lower Oligocene to Recent.

*Eunicella* is distinguishable from other octocoral genera on the basis of a unique sclerite referred to as a "balloon club" (Figure 2.12). In general, balloon clubs are smooth to sculptured, domal sclerites. The Red Bluff sclerite, however, has a distinct, medial rim and sculptured dome or head similar to balloon clubs of the modern *E. albicans* complex (Grasshoff, personal commun.). Members of the *E. albicans* alliance, however, presently are found living only in the South African region at a depth of 10 metres (Bayer, personal commun.). It should be noted that there is a discrepancy in the use of the term *alba* vs. *albicans*. It is not within the scope of this investigation to settle a point of nomenclature, and *E. albicans* will be used here. According to Grasshoff (personal commun.) the Red Bluff sclerite is also similar, but not equal, to a deep-water species of the African area. *Eunicella papillosa* has a similar collar structure, but is found in water depths from 25 to 300 metres (Bayer, personal commun.). Sclerites reported from other modern species of *Eunicella* have been compared to the Red Bluff specimen. The collared balloon club clearly can be used to distinguish the sclerite from all other spe-


Figure 2. Sclerites associated with a fossil holdfast from the Red Bluff Formation.

cies except those of the *E. albicans* / *E. papillosa* group.

Relating species on the basis of a single sclerite is at best tenuous but, considering the unique sclerite form, a correlation is suggested. It is likely that *Eunicella* sp. from the Red Bluff Formation represents an equivalent or possible ancestral form of the African group, and should be associated with *E. albicans* and *E. papillosa*.

## ENVIRONMENTAL IMPLICATIONS

A previous report of *Eunicella* by Bayer (1961) indicates that modern forms from the western Atlantic are typically found in water depths greater than 360 metres, and none are reported from shallow water. To my knowledge, no species of *Eunicella* has been documented from the Gulf of Mexico (either shallow or deep). This is supported by reports by Giammona (1978) and Bayer (1957). According to Grasshoff (personal commun.), no shallow water species have been reported, accept those of modern Africa.

*Eunicella*, in the Red Bluff Formation, attached to pebbles by means of a calcified, discoidal holdfast similar to modern forms. The environment of deposition is interpreted to be a moderately shallow shelf with high-energy currents. Most fine-grain sediments apparently were winnowed, resulting in a shelf bottom littered with exposed pebbles and cobbles. Seas of the area, during Tertiary time, have been interpreted as being warmer and more like the Caribbean of today (Giammona, 1978).

## CONCLUSIONS

The sclerite described for *Eunicella* sp. differs from most modern forms of the genus. Species that are similar belong to the *E. albicans/E. papillosa* group, and the Red Bluff sclerite may represent an equivalent or ancestral form of this complex. The geologic range of both the genus and the family are extended back to the Lower Oligocene. No reports were found of occurrences of *E. albicans* or *E. papillosa* in the western Atlantic or Gulf of Mexico. The existence of this genus (or these species) in the Gulf of Mexico would indicate that the members of this association were more wide spread during Tertiary time than the modern forms would indicate.

## ACKNOWLEDGMENTS

Gratitude is extended to Mr. J. Ketler of Hiwannee, Mississippi for his assistance in locating the study site on his property along the Chickasawhay River. I thank Dr. F. M. Bayer, U.S. National Museum, for his opinions concerning selected sclerites from the Red Bluff Formation. Appreciation is also extended to M. Grasshoff, Senckenberg Museum, for his constructive comments concerning sclerites of the species. I would like to recognize the support and information given by Drs. H. E. and E. H. Vokes, Tulane University.

This investigation was supported by a grant from the Charles and Elizabeth Prothro Distinguished Professorship of Geological Sciences, endowed by the Perkins-Prothro Foundation.

## REFERENCES CITED

BAYER, F. M., 1956, Octocorallia, p. 166-231. *In* R. C. MOORE (Ed.), Treatise on Invertebrate Paleontology, Part F. Coelenterata: Geological Society of America and University of Kansas Press, Lawrence.

BAYER, F. M., 1957, Additional records of western Atlantic octocorals: Journal of the Washington Academy of Sciences, v. 47, p. 379-390.

BAYER, F. M., 1961, The Shallow-Water Octocorallia of the West Indian Region: Martinus Nijhoff, The Hague, 373 p.

BAYER, F. M., M. GRASSHOFF, and J. VERSEVELDT, 1983, Illustrated trilingual glossary of morphological and anatomical terms applied to Octocorallia: E. J. Brill, Leiden, 75 p.

CARPINE, C. and M. GRASSHOFF, 1975, Les Gorgonaires de la Mediterranee: Bulletin, Institute of Oceanography, Monoco, v. 71, 140 p.

CHEETHAM, A. J., 1963, Late Eocene zoogeography of the eastern Gulf Coast region: Geological Society of America, Memoirs, v. 91, 113 p.

GIAMMONA, C. P., 1978, Octocorals in the Gulf of Mexico; their taxonomy and distribution with remarks on their paleontology. Unpublished Ph.D. Dissertation, Texas A. & M. University, College Station, 272 p.

GIAMMONA, C. P. and R. J. STANTON, 1980, Octocorals from the Middle Eocene Stone City Formation, Texas: Journal of Paleontology, v. 54, p. 71-80.

GLAESSNER, M. F., 1959, Precambrian Coelenterata from Australia, Africa and England: Nature, v. 183, p. 1472-1473.

GLAESSNER, M. F., 1961, Precambrian animals: Scientific American, v. 204, p. 72-78.

GRASSHOFF, M. and H. ZIMBROWIUS, 1983, Kalkkrusten auf Achsen von Hornkorallen, rezent unt fossil (Cnidaria, Anthozoa, Gorgonaria): Senckenbergiana Maritima, v. 15, p. 11-145.

GREGORIO, M. A. De, 1890, Monographie de la faune Eocene de Alabama: Annales de Geologie et de Paleontologie, v. 7, 316 p.

HAZEL, J. E., M. D. MUMMA, and W. J. HUFF, 1980, Ostracode biostratigraphy of the Lower Oligocene (Vicksburgian) of Mississippi and Alabama: Gulf Coast Association of Geological Societies, Transactions, v. 30, p. 361-401.

HICKSON, S. J., 1938, An alcyonarian from the Eocene of Mississippi: Journal of the Washington Academy of Science, v. 28, p. 49-51.

KOCURKO, M. J., 1988, Notes on fossil octocorals and comparisons of some modern and ancient octocoral remains: Tulane Studies in Geology and Paleontology, v. 21, p. 105-115.

KOCURKO, M. J. and D. J. KOCURKO, 1992, Fossil Octocorallia of the Red Bluff Formation, Lower Oligocene, Mississippi: Journal of Paleontology, v. 66, p. 602-610.

LINDSTROM, M., 1978, An octocoral from the Lower Ordovician of Sweden: Geologica et Paleontologica, v. 12, p. 41-47.

MACNEIL, F. S., 1944, Oligocene stratigraphy of southeastern United States: American Association of Petroleum Geologists, Bulletin, v. 28, p. 1313-1354.

STENZEL, H. B., E. K. KRAUSE, and J. T. TWINING, 1957, Pelecypods from the type locality of the Stone City Beds (Middle Eocene) of Texas: University of Texas, Bulletin 5704, 197 p.

December 29, 1993