

NOTES ON THE FAUNA OF THE CHIPOLA FORMATION - XXX  
ON THE PRESENCE OF *EUDOLIUM* (*GALEODOLIUM*) *SUBFASCIATUM* SACCO  
(GASTROPODA: TONNIDAE)

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In the exposures of the Chipola Formation along Tenmile Creek, Calhoun County, Florida, we have taken a number of specimens of a genus hitherto unreported in the fossil record of the Western Hemisphere, although it is widespread in the Tertiary beds of the Old World. In the Recent waters of the western Atlantic there are but two species referred to this genus, both occurring in moderately deep water. Thus, the identification of specimens of *Eudolium subfasciatum* Sacco, 1890, in the Chipola Formation is of more than routine interest.

Sacco named *Eudolium subfasciatum*, along with twelve varieties, from the "Elveziano" (mid-Miocene) beds of northern Italy and Austria, but it is obvious that all of his specimens are referable to one variable species. Turner, in her study of the family Tonnidae (1948, p. 166), observed: "All species [in this family] appear to be exceedingly variable, not only to size, but also in coloration, sculpture and general shape of the shell." Certainly, this is the case in *E. subfasciatum* in the Chipola Formation, where we have some two dozen examples from seven localities. The number and strength of the spiral cords is different, not only among different specimens, but also in different growth stages of the same specimen. The strength of the nodes on the major cords and the number of noded cords also varies, there being from one to four such ornamented spiral cords, although the usual number is three.

In the Recent fauna of the western Atlantic there are only two species of *Eudolium*, both referable to *Eudolium* s.s. (*E. crosseanum*, the type of the genus, and *E. thompsoni* McGinty, 1955). Both are inhabitants of moderately deep water and neither is particularly similar to the fossil species. Sacco erected a subgenus *Galeodolium* for *E. subfasciatum* and the writer feels that there is a valid need for this taxon. Dr. Alan Beu, of the New Zealand Geological Survey and leading student of the Tonnacea, is of the opinion (*in litt.* 20 Dec. 1985) that *Galeodolium* (as well as Sacco's other supraspecific taxa proposed

at the same time) and *Eudolium* are synonyms, with the differences between the forms being of specific rank only. However, it would appear that there are two distinct lineages within the *Eudolium* line. True *Eudolium* is first seen in the Oligocene with *E. antiquum* Sacco (referred by him to "*Tuberculodolium*"), continues through the Mio-Pliocene with (probably) two species placed by Sacco in "*Tuberculodolium*" and "*Simplicodolium*," respectively, and finally into the Recent with the two species here referred to *Eudolium* s.s. All of these forms have a very thin inner lip, little more than a callus wash; whereas, the two Oligo-Miocene species placed by Sacco in *Galeodolium* have a much heavier inner lip, with the posterior portion expanded into a flaring inductura, bearing numerous elongate rugae, and with another group of enlarged rugae at the posterior end, forming an anal notch.

In the western Pacific there are also species of *Eudolium* s.s., which are presumed to have descended from the Middle Miocene *E. biornatum* (Tate, 1893) from Muddy Creek, Victoria, Australia. However, in the Early Miocene of New Zealand there is another species referable to *Galeodolium*; indeed, *E. aoteanum* Beu (1970, p. 127, pl. 3, figs. 19-26) is so similar in appearance to *E. (Galeodolium) muticum* (Michelotti, 1861) from the Italian Oligocene that it must be a direct descendant. Both of these latter species differ from *E. subfasciatum* in having coarser axial nodules and in having the back of the outer lip less deeply excavated.

Occurring in the same area along Tenmile Creek is the superficially similar *Phalium (Semicassis) aldrichi* (Dall, 1890), which also has a noded shoulder and a pustulose inductura. However, the sharply recurved siphonal canal is an unmistakable identifier of the *Phalium*; furthermore, there is but one row of nodes always present on the shoulder of *P. aldrichi* and (usually) three cords on *E. subfasciatum*. The protoconch of *E. subfasciatum* is about four times the size of that of *P. aldrichi*.

As noted above, the species of *Eudolium* s.s. live in relatively deep water (*E. crosseanum* from 40 to 450 fms [73 to 822 m], *fide* Turner, 1948, pp. 179-180; *E. thompsoni* in 75 fms [137 m], *fide* McGinty, 1955, p. 80; the Pacific species *E. pyriforme* in 50-80 fms [91-146 m] and *E. inflatum* in 100 fms [183 m], *fide* Kira, 1962, p. 59) but there is no evidence that the beds along Tenmile Creek were deposited in water anywhere near that deep. According to Scolaro (1968, pp. 46-47), the water depth at Tenmile Creek during Chipola time was about 20 meters, an interpretation that is corroborated by the molluscan fauna in general. In view of the fact that the species occurs only along Tenmile Creek and has been taken nowhere else in the Chipola beds, possibly bottom sediment type had a greater control over the distribution of the animal than did water depth. The beds along Tenmile Creek are generally lower in carbonates and of finer grain size toward the western end (TU localities 70 and 655); localities toward the eastern end (TU 546, 830, and 998) are not different in any measurable parameter from those along the Chipola River (Furlong, 1980) and yet the species occurs at both ends of the Tenmile section in approximately equal numbers (see *Occurrence*, below) but not on the Chipola River. This problem has been encountered in other molluscan species (see Vokes, 1977, p. 146, for a discussion), and so far, no satisfactory answer has been achieved.

#### ACKNOWLEDGMENTS

The writer wishes to acknowledge the contribution of the late Mrs. Shirley E. Hoerle, who originally recognized our species as being the same as the European one. Alan Beu also made numerous suggestions as to the improvement of the manuscript, and the fact that the writer does not entirely agree with his generic concept of the group (while hastening to admit that he knows a whole lot more about the group than she does!), in no way diminishes her gratitude to him.

#### SYSTEMATIC PALEONTOLOGY

Superfamily TONNACEA Suter, 1913  
Family TONNIDEA Suter, 1913  
Genus EUDOLIUM Dall, 1889

*Eudolium* DALL, 1889, Harvard Mus. Comp. Zool., Bull., v. 18, p. 232 (new name for *Doliopsis* Monterosato, 1872, not Vogt. 1852, nor Conrad, 1865).

Type species: *Dolium crosseanum* Monterosato, 1869, by monotypy.

#### Subgenus GALEODOLIUM Sacco, 1891

*Eudolium* (*Galeodolium*) SACCO, 1891, Moll. Terr. Terz. Piemonte e Liguria, pt. 8, p. 4.

Type species: *Cassidaria mutica* Michelotti, 1861, by subsequent designation, Cossmann, 1903.

*Discussion:* Sacco named *Galeodolium* as a "Sezione" of the genus *Eudolium*, including two nominal species: *E. muticum* (Michelotti), with three varieties; and *E. subfasciatum*, n. sp., with twelve varieties. He did not designate a type species but Cossmann (1903, p. 139) in a confusing account of the family Doliidae (*i.e.*, he places Sacco's *Galeodolium*, *Tuberculodolium*, and *Simplicodolium* in synonymy with *Dolium*, but includes the species Sacco assigned to these groups in the subgenus *Eudolium*), noted that in the Oligocene there are two species of *Eudolium*: "type de *Galeodolium* et de *Tuberculodolium*: *E. antiquum* Sacco, *Cassid. mutica* Michelotti." This is considered a valid designation of the type species for both taxa, even though the order of the two names is reversed.

#### EUDOLIUM (GALEODOLIUM)

##### SUBFASCIATUM Sacco

Text figs. 1-3

*Eudolium subfasciatum* SACCO, 1890, Soc. Geol. Ital., Bol., v. 9, p. 201 (including 12 varieties and subvarieties; all nude names, list only); 1890, Mus. Zool. e Anat. Comp. Torino, Bol., v. 5, no. 86, p. 22 (including described varieties: *supratuberculifera*, *unituberculifera*, *percostata*; and nine undescribed varieties).

*Eudolium* (*Galeodolium*) *subfasciatum* SACCO, 1891, Moll. Terr. Terz. Piemonte e Liguria, pt. 8, p. 6, pl. 1, fig. 4 (+ varieties *subtuberculata*, p. 7, pl. 1, fig. 5; *magnovoidea*, p. 7; *conica*, p. 7; *supratuberculifera*, p. 8, pl. 1, fig. 6; *oblongata*, p. 8, *pantavensis*, p. 8; *unituberculifera*, p. 8, pl. 1, fig. 7; *percostata*, p. 8, pl. 1, fig. 8; "subvariety" *crassilabiata*, p. 9; *tuberculifera*, p. 9; and *inflata*, p. 9, all from the Turin Hills; and *trilatetuberculata*, p. 7, from Grund, Vienna Basin, Austria).

*Dolium (Eudolium) subfasciatum* (Sacco).  
COSSMANN, 1903, Essais Paléoconch.  
Comp., v. 5, p. 138, pl. 5, fig. 18.

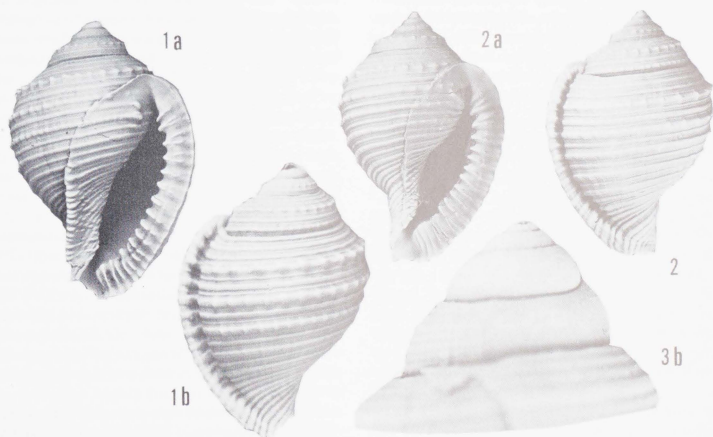
**Discussion:** This species occurs in the "Helvetian" of northern Italy and the Vienna Basin, and is here reported from the Burdigalian of northwestern Florida. Other than the Oligocene *E. muticum* and the New Zealand Miocene *E. aoteanum* there are no other members of *Galeodolium* presently known anywhere. All of the other species (including those referred by Sacco to *Tuberculodolium*, which lack the reflexed and denticulated outer lip, and *Simplicodolium*, which lack both the outer lip and the nodulose spiral cords) are placed in *Eudolium* s.s., the type of which has a reflected outer lip but no strong inner lip. The true extent of generic variation is uncertain due to the fact that entire specimens are rare in the fossil record; because of the extremely thin shells most are broken. In the Chipola material we have many more broken shells, or fragments, than entire specimens.

The wide distribution of *E. subfasciatum* is not unexpected in view of the fact that the type species of *Eudolium*, *E. cross-eatum*, occurs from the Mediterranean, the south Atlantic and Indian Ocean to as far north as Natal, South Africa (Barnard, 1963, p. 8) and the western Atlantic, with records in the latter from New Jersey to Barbados (Turner, 1948, p. 180).

**Occurrence in the Chipola Formation** (number of specimens in parentheses): all localities on Tenmile Creek, between Florida Highway 70 and the base of the formation - from west to east - TU locality numbers 70(2), 655(4), 456(2), 546(5), 998(2), 951(4), 830(8).

#### LITERATURE CITED

- BARNARD, K. H., 1963, Contributions to the knowledge of South African marine mollusca. Part III. Gastropoda: Prosobranchiata: Taenioglossa: Ann. South Afr. Mus., v. 47, pt. 1, p. 1-99, text figs. 1-37.  
BEU, A. G., 1970, Descriptions of new species and notes on taxonomy of New Zealand Mol-



Text figure 1 (X 1 1/4), USNM 404594; height 36.8 mm, diameter 26.1 mm; locality TU 998. Text figure 2 (X 1), USNM 404595; height 44.4 mm, diameter 31.4 mm; locality TU 655. Text figure 3 (X 10), USNM 404596; height 14.7 mm, diameter 8.9 mm; locality TU 546. All localities on Tenmile Creek, Calhoun County, Florida.

- lusca: Roy. Soc. New Zealand (Earth Sciences), Trans., v. 7, no. 8, p. 113-136, pls. 1-5.
- COSSMANN, A. E. M., 1903, Essais de paléontologie comparée, v. 5. Paris. 215 p., 9 pls.
- FURLONG, W. J., 1980, Depositional environment of the Chipola Formation, Calhoun County, Florida: Unpubl. thesis, Tulane University, 40 p., 7 text figs.
- KIRA, TETSUAKI, 1962, Shells of the western Pacific in color, v. 1. Osaka, Japan. 224 p., 72 color plates.
- MCGINTY, T. L., 1955, New marine mollusks from Florida: Acad. Nat. Sci. Phila., Proc., v. 108, p. 75-85, pls. 1, 2, 1 text fig.
- SACCO, FEDERICO, 1891, I Molluschi dei terreni Terziarii del Piemonte e della Liguria, Part 8. Galeodoliidae, Doliidae, Ficulidae and Naticidae: (ex R. Accad. Sci. Torino. Mem., Ser. 2, v. 41), p. 1-114, pls. 1, 2.
- SCOLARO, R. J., 1968, Paleocology of the Bryozoa of the Chipola Formation, Clarksville area, Florida: Unpubl. dissertation, Tulane University, 251 p., 20 pls., 2 maps.
- TURNER, R. D., 1948, The family Tonnidae in the western Atlantic: Johnsonia, v. 2, no. 26, p. 165-192, pls. 74-85.
- VOKES, H. E., 1977, Cardiidae (Mollusca: Bivalvia) from the Chipola Formation, Calhoun County, Florida: Tulane Stud. Geol. Paleont., v. 13, no. 4, p. 143-189, 10 pls., 1 text fig., 6 tables.

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## REVIEW

**PALAEOFLORA OF SOUTHERN AFRICA:** Prodrum of South African Megaflores, Devonian to Lower Cretaceous, by John M. Anderson and Heidi M. Anderson. Published by A. A. Balkema, Rotterdam, The Netherlands, for the Botanical Research Institute, 1985, 423 pp., 8 1/2 x 12 inches, illus., atlas of 226 pls., index, \$55.00

This study is concerned with the floras and evolutionary trends preserved in the fossil record of South Africa from the Devonian to the Lower Cretaceous (from the appearance of vascular land plants to the rise of the flowering plants) which coincides broadly with the Pangaeic phase of Earth history. Specimens of land plants have been collected actively since 1845 by at least 35 individuals; succinct biographies of these collectors are included in the volume, as a record of the history of collecting. It is mainly a pictorial catalogue, but is divided into seven distinct sections, as follows: 1) Global & African Setting, in which a global and continental fabric, against which to visualise the successive South African megaflores is developed (with maps of the drifting continents, phylogenetic charts depicting the evolution of vascular plants and the evolution of vertebrate

faunas, and a sequence of locality maps for each geological period, Devonian to Cretaceous); 2) Localities, Assemblages, Associations, Environment (with floristic tables, locality maps, and photos of localities for the eighteen successive megaflores recognized and documented); 3) Pre-Angiosperm Megafloral Succession (with the principal features of megafloral evolution outlined for South Africa, compared and contrasted with patterns for Gondwana and Pangaea); 4) Collectors (with biographical sketches intended to give a succinct account of the history of megaplant fossil collecting in South Africa); 5) Taxonomic Revision (with systematic revision undertaken for 91 genera and 263 species of South African megafloral taxa); 6) Photographic Catalogue (with 226 plates, 1888 individual photos, 111 genera, and 259 species); and, 7) Bibliography (nearly 500 references, classified and detailed). A glossary and an index are appended.

This comprehensive compilation is impressive and should be most useful for the specialized student of the megaflores of South Africa. It appears so comprehensive that there should be little need for future attention to this subject.

--H.C.S.