

## Oligocene Scleractinian Corals from CRP-3 Drillhole, Victoria Land Basin, Antarctica

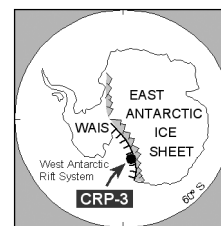
J. STOLARSKI<sup>1</sup> & M. TAVIANI<sup>2\*</sup>

<sup>1</sup>Instytut Paleobiologii PAN, Twarda 51/55, 00-818 Warszawa - Poland

<sup>2</sup>Istituto di Geologia Marina, Consiglio Nazionale delle Ricerche, via Gobetti 101, I-40129 Bologna - Italy

Received 13 February 2001; accepted in revised form 13 November 2001

**Abstract** - The solitary scleractinian coral *Flabellum rariseptatum* Roniewicz & Morycowa, 1985 has been identified in CRP-3 drill core within mudstone lithologies in Unit LSU 3.1. The coral-bearing macrobenthic assemblages include infaunal and epifaunal suspension feeders suggesting a deep muddy shelf environment, characterized by moderate hydrodynamism and turbidity and enrichment in organic matter. *Flabellum rariseptatum* belongs to the Recent *Flabellum thoursii* group and has a known stratigraphic range extending from the early Oligocene to the early Miocene of Antarctica. This is the first known occurrence of *Flabellum rariseptatum* from the Antarctic mainland.



### INTRODUCTION

Cape Roberts Project CRP-3 retrieved core at 77.011° S and 163.640° E, about 14 km east of Cape Roberts, Ross Sea, down to 939 m below seafloor (mbsf). The cored strata consist of a thick early Oligocene succession resting on sedimentary deposits of unknown age and Devonian rocks and sediments belonging to the Beacon Supergroup (Cape Roberts Science Team, 2000). The Oligocene succession is rich in macrofossiliferous horizons hosting marine invertebrates discussed in detail by Taviani & Beu (this volume). In particular, solitary corals (Cnidaria, Scleractinia) have been identified in Oligocene strata and tentatively attributed to *Flabellum* (Cape Roberts Science Team, 2000). Solitary corals of Miocene age were also recovered in CRP-2 drillhole (Cape Roberts Science Team, 1999) but their extremely poor preservation did not allow identification beyond a general recognition as *Flabellum*-like corals (Taviani et al., in press). Corals from CRP-3, however, are reasonably well preserved (Cape Roberts Science Team, 2000, Fig. 5.9e) and suitable for taxonomic description.

This paper is, therefore, based upon the systematics of CRP-3 scleractinian coral material which represents a new source of palaeontological information for this group from a poorly known sector of Antarctica.

### MATERIAL

The material under study was obtained from mudstone lithologies of Lithostratigraphic Unit LSU

3.1, between 137.21 and 140.74 mbsf (Fig. 1). The single specimen collected at 137.21 is poorly preserved and displays a sugar-like texture.

The best material available for the present study consists of two specimens recorded at 140.69 mbsf (Cape Roberts Science Team, 2000, Fig. 5.9e: hereafter referred to as CRP3-SCL). One specimen is nearly complete whereas the second one has been partially sectioned by drilling operations (see Fig. 2a, d). The coral-bearing assemblages also contain infaunal suspension-feeding bivalves, mostly carditids, plus scaphopods and terebratulid brachiopods (Cape Roberts Science Team, 2000, Taviani & Beu, in press).

### TAXONOMY

Order: Scleractinia BOURNE, 1900

Suborder:

Caryophylliina VAUGHAN & WELLS, 1943

Family: Flabellidae BOURNE, 1905

Genus: *Flabellum* LESSON, 1831

*Flabellum rariseptatum*

RONIEWICZ & MORYCOWA, 1985

(Fig. 2)

*Flabellum cf. cuneiforme wailesi* Conrad; Malumian et al. 1978, pl. 1, fig. 8 a, b

solitary coral *Flabellum*; Gazdzicki & Wrona 1982, fig. 6a, b

solitary coral of the genus *Flabellum*; Birkenmajer et al., fig. 4b, c

*Flabellum rariseptatum* sp.n., Roniewicz & Morycowa 1985, 101, figs. 2-4, pl. 1 figs 1-6, pl. 2 figs. 1-7.

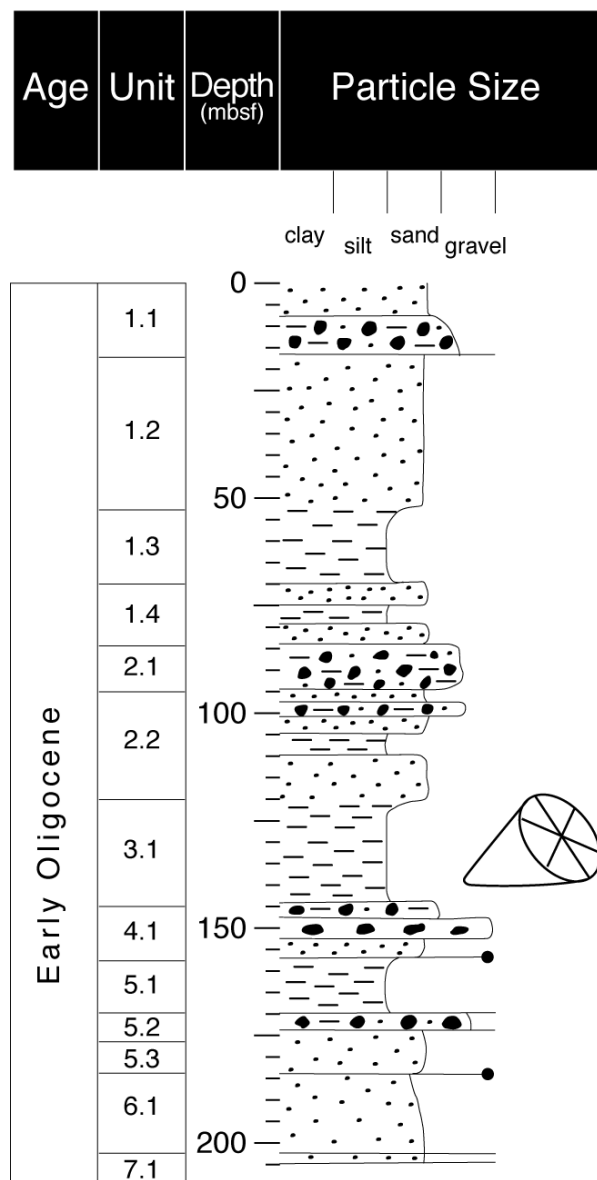


Fig. 1 - Lithostratigraphical log of the upper part of CRP-3 drill core showing position where *Flabellum rariseptatum* corals have been found (log slightly simplified from Cape Roberts Science Team, 2000).

*Flabellum rariseptatum* Roniewicz & Morycowa; Roniewicz & Morycowa 1987, 89-96, figs. 3-10, pls. 19-24.

**Remarks:** Unlike descriptions of many other fossil scleractinian species, the original description of *Flabellum rariseptatum* Roniewicz & Morycowa, 1985 is based on large number of specimens (ca. 320 coralla). The wide range of shape variation of coralla from the collection was ascribed to species variability (similar to that observed in some other extant *Flabellum* species reported from Subantarctic and Antarctic areas; see Cairns, 1982).

According to the corallum dimensions both specimens described here fit well with the size-range of the type specimens (Roniewicz & Morycowa, 1987, fig. 8). The largest (CRP3-SCL/01, see Fig. 2a-

h) is a flattened conical corallum, ca 30 x 24 mm in calicular diameter and ca 19 mm in height. The smaller specimen (CRP3-SCL/01, see Fig. 2a, b, d, i-k) is more trochoid, ca 20 x 16 mm in calicular diameter and ca. 10 mm in height (the specimen is broken at the proximal end).

Diagnostic of this species is the low septal density (about 9-12 per 10 mm) and both specimens exhibit this character. The external wall of CRP3-SCL/01 is partly abraded and probably the small, higher-cycle septa have been damaged. Nevertheless, impressions of septa are still clearly visible allow determination of septal density as ca 11 per 10 mm. A similar septal density (ca 10 per 10 mm) is shown also by specimen CRP3-SCL/02 (Fig. 2k) as well as, to judge by its septal impressions, by a strongly disintegrated single specimen collected at 137.21 mbsf.

Protocorallites are damaged in both specimens examined: in CRP3-SCL/01 the youngest, restricted to the stereome part has 24 septa (Fig. 2f) whereas in CRP3-SCL/02 the proximal part is broken at > 24 septal stage (Fig. 2i). The presence of twelve principal septa (e.g., Fig. 2c, i) suggests the same organization of the septal apparatus as in all twelve-protoseptate *Flabellum* species from Antarctic region (see Gazdzicki & Stolarski, 1992).

We suspect that the indeterminable solitary corals, with strongly recrystallised corallites, observed in Lower Miocene strata of CRP-2/2A (Cape Roberts Science Team, 1999: fig. 5.15h), probably belong to the same species.

## BIOGEOGRAPHICAL AND CHRONOLOGICAL IMPLICATIONS

Cnidarians have a relatively scant fossil record in Antarctica, although Cretaceous scleractinian corals are among the first fossils recorded from this continent (Felix, 1909). Most reports of fossil cnidarians are related to Cretaceous-Palaeogene strata of the James Ross Basin, Antarctic Peninsula, and King George Island, South Shetland archipelago. The palaeontological record of Seymour and Snow Hill islands includes stylasterid hydrozoans (Stolarski, 1998) and scleractinians (Felix, 1909; Bibby, 1966; Macellari, 1988; Stilwell & Zinsmeister, 1992; Filkorn & Feldmann, 1992; Filkorn, 1994; Stolarski, 1996). Scleractinian corals occur in the Oligocene beds of the Cape Melville Formation of King George Island (Birkenmajer et al., 1983; Roniewicz & Morycowa, 1985, 1987).

Outside this area, documentation of Antarctic fossil corals *s.l.* is very sparse. Undetermined corals (presumably scleractinians) have been noted in one erratic block of Eocene age at Minna Bluff, McMurdo area (Harwood & Levy, 2000). Geologically younger records of cnidarians in the Ross Sea region refer to mid-Pleistocene octocorals in the CRP-1 drill core

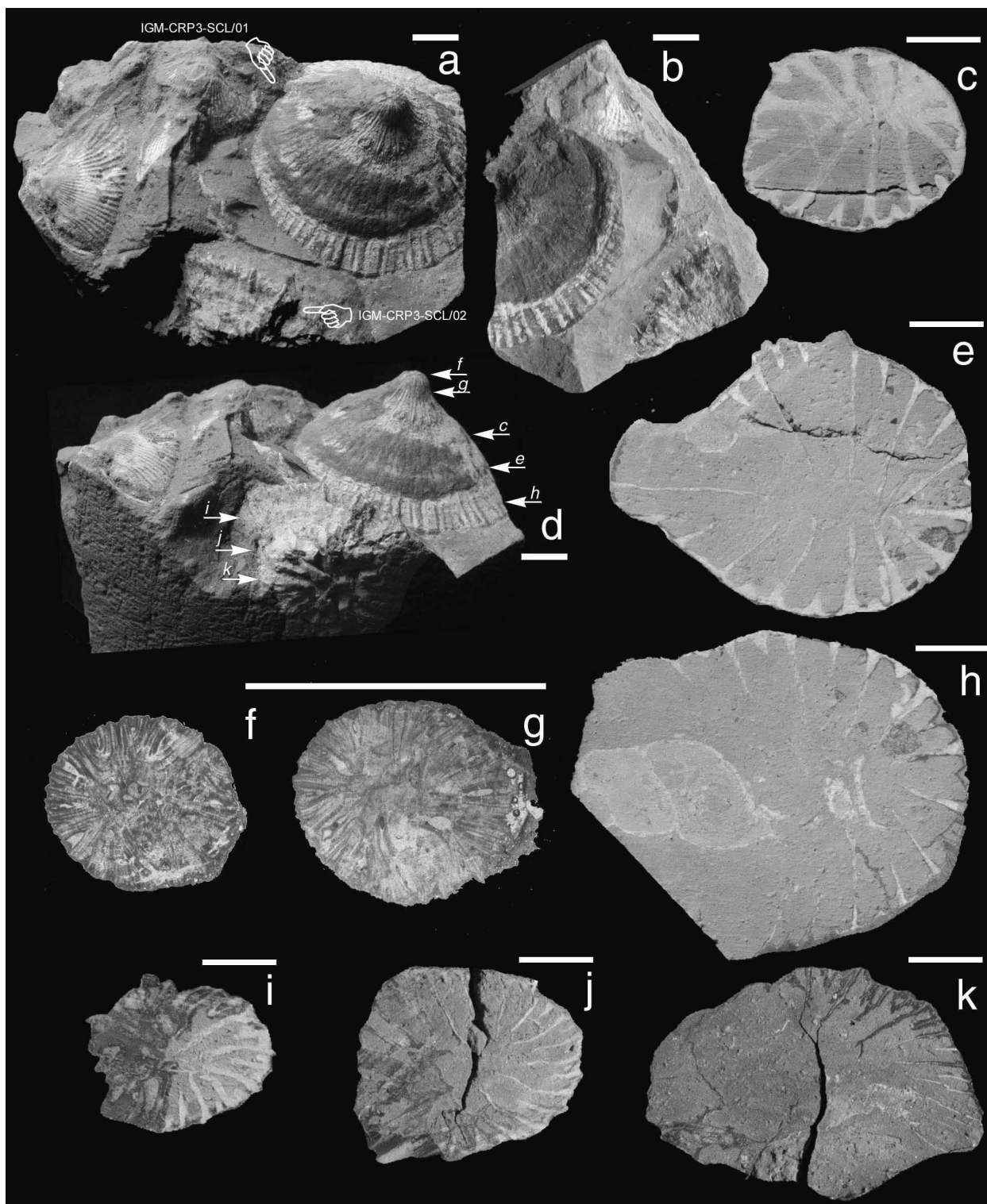


Fig. 2 - *Flabellum rariseptatum* Roniewicz & Morycowa, 1985. a, b, d) Specimens CRP3-SCL/01 and CRP3-SCL/02 as found in mudstone of the drill core CRP-3, Unit LSU 3.1, between 140.69 and 140.74 mbsf. a) Basal view of the CRP3-SCL/01 and lateral view of partly destroyed CRP3-SCL/02 (indicated respectively by hand symbols). Note indet. arcoid bivalve shell on the left side of the slab. b) Impressions of the CRP3-SCL/01 (left) and CRP3-SCL/02 (right) on the counterpart slab. d) Lateral view of the CRP3-SCL/01 (right-upper part) and basal view of partly destroyed CRP3-SCL/02 (center-lower part). Position of illustrated sections indicated with arrow. f, g) Thin sections from the earliest (probably 24 septate) preserved part of the CRP3-SCL/01. Interseptal space filled with the stereome. c, e, h) Polished sections of CRP3-SCL/01. i, j, k) Polished sections of CRP3-SCL/02. Scale bars = 5 mm.

(Taviani et al., 1998; Taviani & Claps, 1998), scleractinians from raised Holocene deposits (e.g., Baroni & Orombelli, 1987; Baroni et al., 1991), and Pleistocene corals from deep-sea cores (Taviani et al.,

1993). Furthermore, well-preserved scleractinian solitary corals occur in the Pleistocene sponge-carbonate sediments of Cape Barne, Ross Island (Taviani, unpublished).

*Flabellum rariseptatum* is probably the most abundant Tertiary coral of Antarctica and the sub-Antarctic region, and it also occurs in Tierra del Fuego, South America (Carmen Silva Formation, Lower Miocene: Malumian et al., 1978).

Thus far, only Lower Miocene samples from King George Island have yielded determinable specimens. The occurrence of *F. rariseptatum* in the Oligocene of King George Island was not certain because only fragmentary specimens were available for study (Gazdzicki & Stolarski, 1992). The specimens reported here comprise the first unquestionable finding of *F. rariseptatum* in the Oligocene of the Antarctic mainland. Many Recent taxa from the *Flabellum thouarsii* group have circumpolar distribution (see Cairns, 1982) and the relatively wide geographic distribution of *F. rariseptatum* (from Tierra del Fuego, South America to the Ross Sea) suggests a similar circumpolar distribution of this species. However, a more detailed mapping of each stratigraphical series is needed to confirm this hypothesis.

ACKNOWLEDGEMENTS - We are grateful to: all on-ice colleagues during the CRP-3 drilling season; Alessandro Remia, Mauro Alberti, Jacqueline Müller, Stefano Parisini and Barbara Gualandi for help in editing text and figures; David Harwood and Scott Borg for the organization of field work at Cape Barne in December 1999. Critical reviews by two anonymous reviewers and Mike Thomson are gratefully acknowledged. This study was partially supported by the Italian *Programma Nazionale di Ricerche in Antartide* (PNRA). This is IGM scientific contribution n. 1268.

#### REFERENCES

- Baroni C. & Orombelli G., 1987. Indagini geomorfologiche e glaciologiche nella Terra Vittoria (Seconda Spedizione del Programma Nazionale di Ricerche in Antartide, 1986-1987). *Geographie Fisique et Dynamique du Quaternaire*, **10**, 321-336.
- Baroni C., Stenni B. & Longinelli A., 1991. Isotopic composition of Holocene shells from raised beaches and ice shelves of Terra Nova Bay (Victoria Land, Antarctica). *Memorie della Società Geologica Italiana*, **46**, 7-16.
- Bibby J.S., 1966. The stratigraphy of part of north-east Graham Land and the James Ross Island Group. *British Antarctic Survey Scientific Report*, **53**, 1-37.
- Birkenmajer K., Gazdzicki A. & Wrona R., 1983. Cretaceous and Tertiary fossils in glacio-marine strata at Cape Melville, Antarctica. *Nature*, **303**, 56-59.
- Cairns S. D., 1982. Antarctic and Subantarctic Scleractinia. *Antarctic Research Series*, **34**, 1-74.
- Cape Roberts Science Team, 1999. Studies from the Cape Roberts Project, Ross Sea, Antarctica. Initial Report on CRP-2/A. *Terra Antarctica*, **6**, 1-173.
- Cape Roberts Science Team, 2000. Studies from the Cape Roberts Project, Ross Sea, Antarctica. Initial Report on CRP-3. *Terra Antarctica*, **7**, 1-209.
- Felix J., 1909. Ueber die fossilen Korallen der Snow Hill-Inseln und der Seymour-Inseln. *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901-1903*, **3**, 1-15.
- Filkorn H.F., 1994. Fossil Scleractinian corals from James Ross Basin, Antarctica. American Geophysical Union, Washington, D.C., *Antarctic Research Series*, **65**, 96 p.
- Filkorn H.F. & Feldmann R. M., 1992. Fossil corals from Seymour Island, Antarctica. *Antarctic Journal of the United States*, **27**, 20-21.
- Gazdzicki A. & Stolarski J., 1992. An Oligocene record of the coral *Flabellum* from Antarctica. *Polish Polar Research*, **13**, 265-272.
- Gazdzicki A. & Wrona R. 1982. Skamieniałości górnej kredy i trzeciorzędu z osadów talasoglacjalnych na półwyspie Melville'a, Wyspa Króla Jerzego (Zachodnia Antarktyka). *Przegląd Geologiczny*, **8**, 395-404.
- Harwood D.M. & Levy R.H., 2000. The McMurdo Erratics: introduction and overview. In: Stilwell J.D. & Feldmann R.M. (eds.), *Palaeobiology and palaeoenvironments of Eocene rocks, McMurdo Sound, East Antarctica*. *Antarctic Research Series*, **76**, 1-18.
- Macellari C.E., 1988. Stratigraphy, sedimentology, and palaeoecology of Upper Cretaceous/Palaeocene shelf-deltaic sediments of Seymour Island. *Geological Society of America Memoir*, **169**, 25-53.
- Malumian N., Camacho H.H. & Gorgoño R., 1978. Moluscos del Terciario inferior ("Magallanense") de la Isla Grande de Tierra del Fuego (República Argentina). *Ameghiniana*, **15**, 265-284.
- Roniewicz E. & Morycowa E., 1985. Fossil *Flabellum* (Scleractinia) of Antarctica. *Acta Palaeontologica Polonica*, **30**, 99-106.
- Roniewicz E. & Morycowa E., 1987. Development and variability of Tertiary *Flabellum rariseptatum* (Scleractinia), King George Island, West Antarctica. *Palaeontologia Polonica*, **43**, 83-103.
- Squires D. F., 1963. *Flabellum rubrum* (Quoy and Gaimard). *Bulletin of the New Zealand Department of Scientific and Industrial Research*, **154**, 1-44.
- Stilwell J. D. & Zinsmeister W. J., 1992. Molluscan Systematics and Biostratigraphy, Lower Tertiary, La Meseta Formation, Seymour Island, Antarctic Peninsula. *Antarctic Research Series*, **55**, 192 p.
- Stolarski J., 1996. Palaeogene corals from Seymour island, Antarctic Peninsula. *Palaeontologia Polonica*, **55**, 51-63.
- Stolarski J., 1998. *Conopora* (Stylasteridae, Hydrozoa) from the Eocene of Seymour Island. *Antarctic Science*, **10**, 487-492.
- Taviani M., Reid D.E. & Anderson J. B., 1993. Skeletal and isotopic composition and palaeoclimatic significance of Late Pleistocene carbonates, Ross Sea, Antarctica. *Journal of Sedimentary Petrology*, **63**, 84-90.
- Taviani M. & Claps M., 1998. Biogenic Quaternary Carbonates in the CRP-1 Drillhole, Victoria Land Basin, Antarctica. *Terra Antarctica*, **5**, 411-418.
- Taviani M., Beu A, Lombardo C., 1998. Pleistocene Macrofossils from CRP-1 Drillhole, Victoria Land Basin, Antarctica. *Terra Antarctica*, **5**, 485-491.
- Taviani M., Beu A.G. & Jonkers H.A., 2000. Macrofossils from CRP-2/A, Victoria Land Basin, Antarctica. *Terra Antarctica*, **7**, 513-526.
- Taviani M. & Beu A.G., 2001. Palaeogene macrofossils from CRP-3 Drillhole, Victoria Land Basin, Antarctica. This volume.