

## *Globorotalia bouregregensis*, a new species of planktonic foraminifer from the latest Miocene–early Pliocene of the Rifian Seaway (northwest Morocco)

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**ABSTRACT** – *Globorotalia bouregregensis*, n. sp., is described and documented from the latest Miocene–early Pliocene sequence of the Rifian Seaway, northwest Morocco. By its short stratigraphic distribution, persistence and distinctive morphologic features, the new taxon is well differentiated within the scituline assemblage. *J. Micropalaeontol.* 16(2): 175–178, October 1997.

### INTRODUCTION

Planktonic foraminifera from the marly succession which outcrops east of Rabat ('Marnes de Salé' of the local literature) have been studied by a number of biostratigraphers, most notably by Wernli (1988). Current investigations on the benthic and planktonic foraminifera from the Atlantic side of the Rifian Seaway reveal extremely diverse assemblages. The planktonic assemblage, in particular, is characterized by a well documented development of some globorotalid stocks (i.e. the menardine and scituline lineages) and by the rare but persistent occurrence of tropical-warm subtropical taxa, which have yet to be reported in the literature. Another significant group of neglected taxa are the smaller planktonic species, where adult tests do not exceed 125 µm of maximum dimension. An example, is *Streptochilus Brönnimann & Resig*, a biserial genus largely reported from the Indo-Pacific area. This taxon has been recovered in the whole succession and is frequent in the Pliocene portion of the study section.

The new globorotalid here described is included in the still incomplete description of the species present in these assemblages. Although peculiar in terms of morphology, *Globorotalia bouregregensis* was mainly recovered in the small size fraction.

### MATERIALS

Materials used for this study are from the Bou Regreg section, a road cutting located about 25 km east of Rabat, along the road from the village of Larba to the Bou Regreg reservoir (Fig. 1). The complete exposure is about 26 m thick and consists of orange–brown marls that grade up-sequence to marls with interbedded silty sandstones. A total of 46 specimens of the new taxon were found from eight samples collected in the lower half of the section. Additional specimens come from the marls of the nearby Oued Raba section (about 10 km NE of the Bou Regreg section), end-of-Miocene to early Pliocene in age.

### AGE DETERMINATION

The samples investigated yielded abundant foraminiferal assemblages and provide a means for improved biostratigraphic calibration. Figure 2 shows the distribution in the Bou Regreg section of selected age-diagnostic planktonic foraminifera. The range of *G. bouregregensis* straddles the Miocene–Pliocene boundary, here approximated by the last occurrence of *Globoquadrina dehiscens* (Chapman, Parr & Collins). Within the Bou Regreg section, the first evolutionary occurrence of

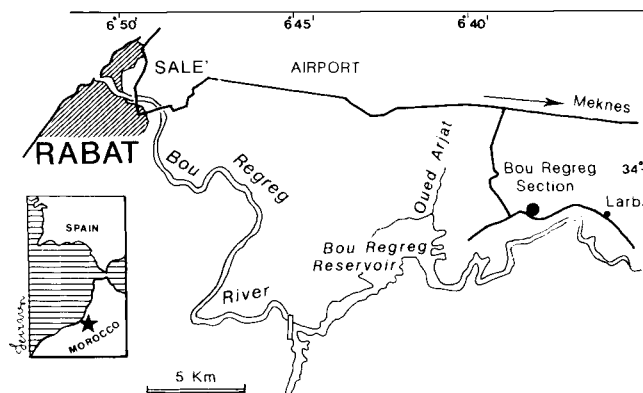


Fig. 1. Location map of the Bou Regreg section.

*Globorotalia margaritae evoluta* Cita was also noted. In its lower range, the new species is associated with *Globorotalia juanai* Bermudez & Bolli, *G. martinezi* Perconig, *G. andalusiana* Perconig, Martinez & Granados, *G. margaritae primitiva* Cita, *G. margaritae margaritae* Bolli & Bermudez, *Globigerinoides kennetti* Keller & Poore, *G. seigliei* Bermudez & Bolli and *Globoquadrina dehiscens*. All these species, with the exception of the *G. margaritae* group, have their last occurrence in this interval and suggest placement from the uppermost part of the late Miocene to the lowermost part of the early Pliocene. Within the upper range of *G. bouregregensis* are species like *Globigerina venezuelana* Hedberg, *Dentoglobigerina altispira altispira* (Cushman & Jarvis), *Globorotalia prae-hirsuta* Blow, *Globorotalia margaritae evoluta*, *Sphaeroidinella dehiscens immatura* (Cushman) and *S. dehiscens dehiscens* (Parker & Jones). By the presence of the above-mentioned taxa, the interval is placed in the early Pliocene.

### SYSTEMATIC PALAEOLOGY

Suborder *Globigerinina* Delage & Hérouard, 1896

Family *Globorotaliidae* Cushman, 1927

Genus *Globorotalia* Cushman, 1927

*Globorotalia bouregregensis*, n. sp.

Plate 1, figs 1–15

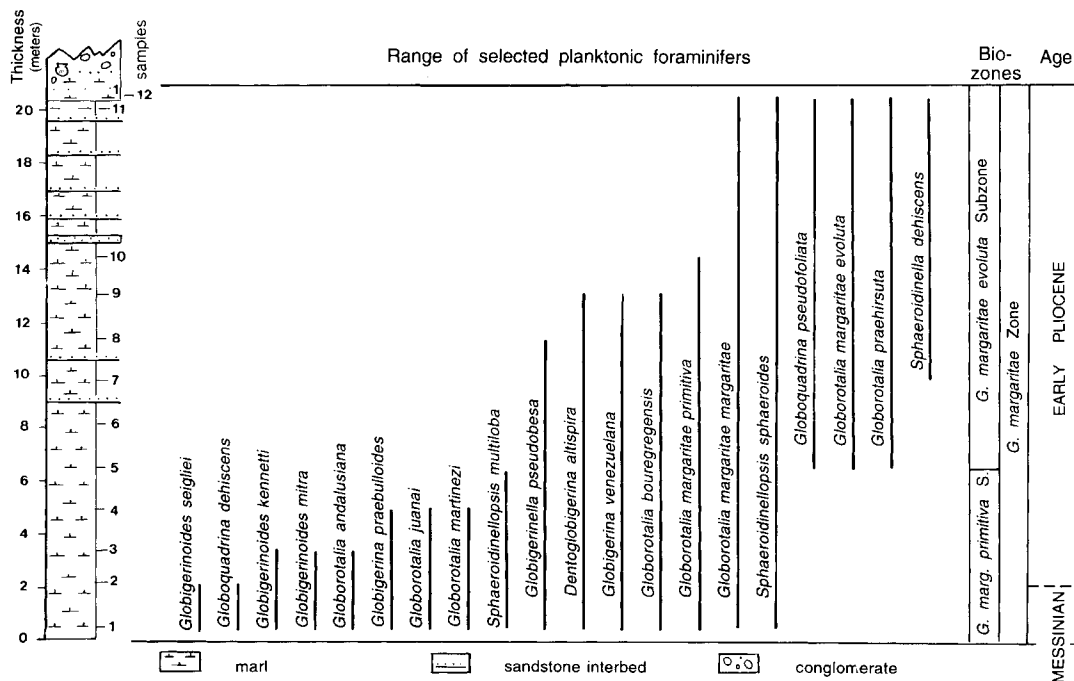


Fig. 2. Lithologic log of the Bou Regreg section and stratigraphic distribution of some age-dagnostic planktonic foraminifers. Biozones definition is according to Bolli & Saunders (1985).

**Derivation of name.** With reference to the type locality, in a section outcropping along the Bou Regreg River, northwest Morocco.

**Diagnosis.** A species of *Globorotalia* of medium to small size compared with other species of the genus. Most of the specimens exhibit a relatively small size, being recovered from the 125–250  $\mu\text{m}$  size-fraction. The species is chiefly characterized by the flaring arrangement of the tangentially elongated chambers making up the last whorl. This is a stable morphocharacter, well developed also on small specimens (Plate 1, fig. 7). In some individuals, the wide umbilical area is partially covered by the translation of the last-formed chamber, which is sometimes smaller than the penultimate one (Plate 1, figs 10–11, 12–13). The aperture is always a very low arch, bordered by a distinct but thin lip and extending from the umbilicus most of the way to the periphery. Eighty-two per cent of the recovered population coils to the right.

**Description of holotype.** The inequally biconvex, medium-sized test consists of a low trochospire with 14 chambers arranged in about three whorls. The last whorl shows four and a half chambers. The four final chambers are equidimensional and flare remarkably. Measured on the spiral side, they are about 160  $\mu\text{m}$  in tangential and 97  $\mu\text{m}$  in radial direction. The test exhibits a strongly lobate outline with an acute, imperforate peripheral margin. The spiral view is moderately convex and chambers appears crescentic in the early ontogenetic stage and kidney-shaped in the last whorl. The cameral and spiral sutures are depressed and curved. The umbilical side is strongly convex with well-incised, radial sutures ending in a deep and wide umbilicus of about 69  $\mu\text{m}$  diameter, measured at the opening of the umbilical cavity. The apertural area of the holotype is partially masked by sedimentary material, therefore the low-arched opening cannot be described in detail. The calcareous

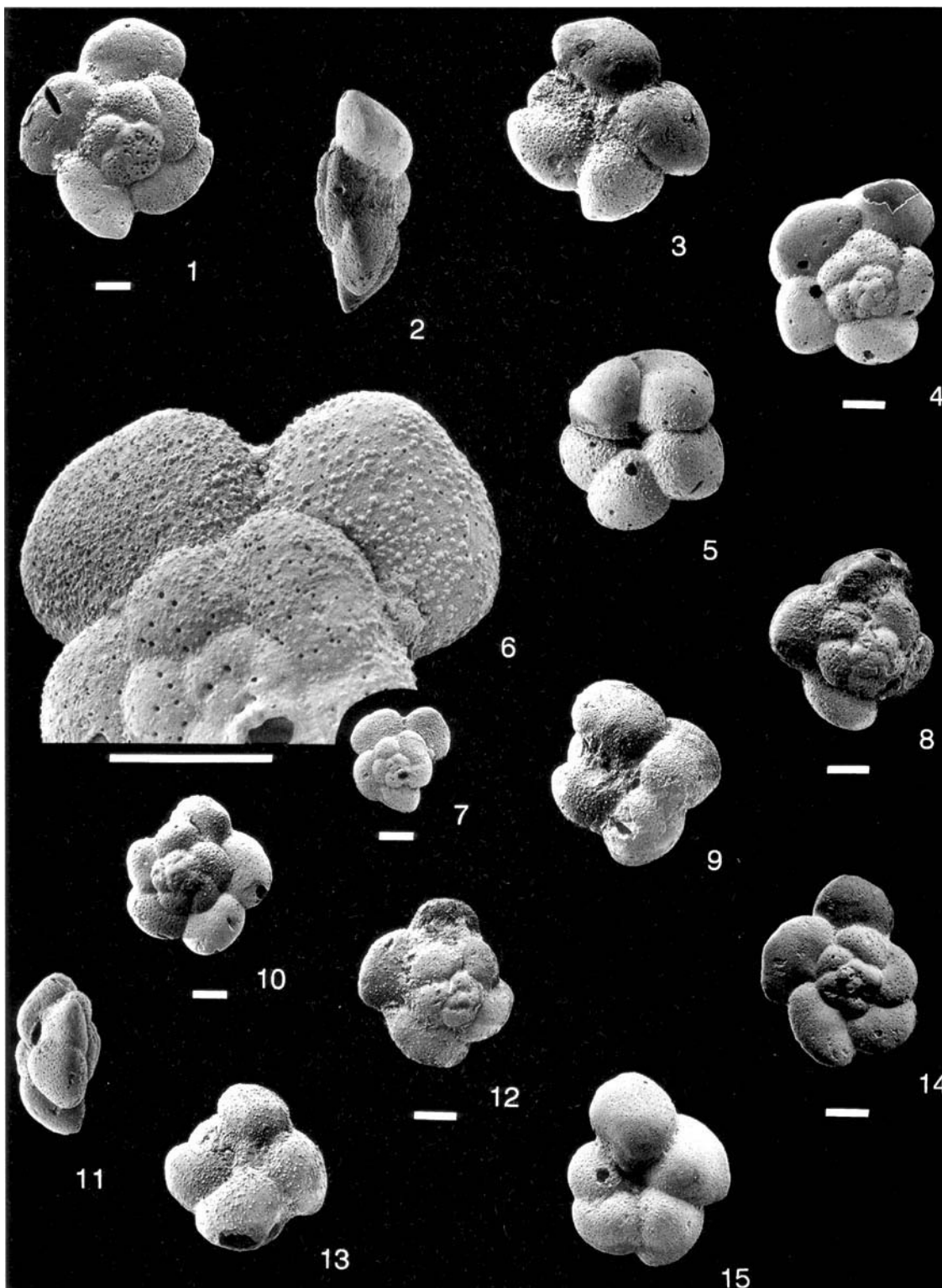
wall is thin. Under the binocular microscope, it appears non-pustulate and smooth. Scanning microscope analysis reveals irregularly distributed, irregular-sized pustules on the wall surface. Wall pores are larger (about 3  $\mu\text{m}$ ) in the early coil becoming smaller (less than 1  $\mu\text{m}$ ) on both sides of the final chambers.

The maximum diameter of the holotype is 555  $\mu\text{m}$ , its axial height is 230  $\mu\text{m}$ . The specimen coils to the right.

**Holotype and paratypes.** The holotype, figured in Plate 1, figs. 1–3, paratype and several topotypes are curated at the micropalaeontological collection of the Department of Earth Sciences, University of Bologna, slides number TT113 (holotype), TT114 (paratype), TT115 and TT116 (topotypes). The stratigraphic level of the holotype is 5 m above the base of the Bou Regreg section (sample 4, Fig. 2), within the lower part of the early Pliocene.

**Remarks.** The holotype, paratype and the additional specimens figured in Plate 1 provide a complete range of variation encountered for this taxon in the Bou Regreg area. Because of the high morphological variability of the *Globorotalia scitula* plexus, especially in the upper Miocene, it is fairly common to record morphotypes exhibiting non-genetic adaptations. In the upper Miocene–Pliocene sequence of northwest Morocco, morphological variations in these ecophenotypes include the degree of chamber inflation, the partial development of faint keels and the variable position of the last-formed chamber. In the attempt to establish stable characters useful in identifying a given taxon, the stratigraphic evidence is still the best approach in the material studied. The new taxon is persistent during a limited but appreciable time span, whereas ecophenotypic morphologies have as a rule only a capricious distribution in a few or just in one sample.

In establishing a lineage membership for the scitulines, at least



**Explanation of Plate 1**

*Globorotalia bouregregensis* n. sp. Scale bars = 50  $\mu$ m. **figs 1-3**, holotype: spiral, lateral and umbilical views; Bou Regreg section, sample 4. **figs 4-5**, spiral and umbilical views; Oued Raba section, *G. margaritae evoluta* Subzone. **figs 6-7**, small-sized specimen, spiral view; Bou Regreg section, sample 8. **figs 8-9**, paratype: spiral and umbilical views; Bou Regreg section, sample 8. **figs 10-11**, spiral and lateral views; Bou Regreg section, sample 8. **figs 12-13**, spiral and umbilical views; Oued Raba section, *G. margaritae evoluta* Subzone. **figs 14-15**, spiral and umbilical views; Oued Raba section, *G. margaritae evoluta* Subzone.

two morphocharacters seem to be significant: the wall surface and the shape of the chambers (Cifelli & Scott, 1986). Even by taking into account only these characters, the new taxon appears to be different from the following morphologically close taxa: *Globorotalia hirsuta eastropacia* Boltovskoy, *G. petaliformis* Boltovskoy, *G. scitula subscitula* Conato and *G. (Hirsutella) theieri* Fleisher. The main differences include:

(1) *G. eastropacia*, which according to Srinivasan & Kennett (1983) is the senior synonym of *G. theieri*, differs from the new taxon in having a more regular chambers development in the final whorl and a wall surface densely and regularly perforate.

(2) Compared with *G. petaliformis*, a very distinctive middle-upper Miocene taxon having as type locality the Ninetyeast Ridge (eastern Indian Ocean), *G. bouregensis* exhibits some resemblance with the paratypes illustrated in figs 13–16 (Boltovskoy, 1974), but it differs by lacking limbate dorsal sutures, by a more random perforation and being stratigraphically younger. A population identified as *G. petaliformis* from upper Miocene deposits off the Azores Islands (Miles, 1977) more likely belongs to *G. miotumida explicationis* Jenkins, which also is a persistent taxon in coeval rocks of northwest Morocco.

(3) Easily observable differences between *G. subscitula* and *G. bouregensis* include a less strongly lobate outline for *G. subscitula*, the lack of any umbilical migration of the final chamber and globose to crescentic-shaped chambers of the last coil.

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