

# “*Globigerina ciproensis*”, atypically giant planktonic foraminifers from the Oligocene of the Haute-Savoie, France

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(With 1 textfigure and 2 plates)

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## Summary

Very rare giant planktonic foraminifers which are here provisionally attributed to “*Globigerina ciproensis*” have been discovered in flysch sediments from the Oligocene (*Globigerina ampliapertura* planktonic foraminiferal P20 zone) of the Haute-Savoie in France. These forms attain a diameter of 650  $\mu\text{m}$  (at least two times larger than “normal”-sized *Globigerina ciproensis* specimens) and possess a *Turborotalia*-like extra-umbilical aperture. The limited number of specimens prevent us from creating a new formal taxon. The composition and diversity of the associated foraminiferal assemblage indicate a low oxygenated, deep marine, middle bathyal environment.

**Key words:** Planktonic foraminifera, Oligocene, Flysch, Haute-Savoie/France.

## Zusammenfassung

Äußerst seltene Formen sehr großer planktonischer Foraminiferen, die hier vorläufig der Gruppe “*Globigerina ciproensis*” zugeordnet werden, wurden in oligozänen (*Globigerina ampliapertura*, P20 Foraminiferen-Zone) Flyschsedimenten, im Haute-Savoie/Frankreich, gefunden. Die Foraminiferen haben einen Durchmesser von 650  $\mu\text{m}$  (etwa doppelt so groß wie “normale” *Globigerina ciproensis*) und besitzen eine *Turborotalia*-ähnliche Extra-Umbilikalmündung. Aufgrund der geringen Anzahl gefundener Individuen zögern wir eine neue Spezies einzuführen. Die weitere Foraminiferen-Vergesellschaftung weist auf ein sauerstoffarmes, tiefmarines, mittelbathyales Milieu hin.

**Schlüsselwörter:** Planktonische Foraminiferen, Oligozän, Flysch, Haute-Savoie/Frankreich.

## Introduction

The purpose of this article is to report the discovery of atypically large “*Globigerina ciproensis*” forms from the Haute-Savoie, France. These very rare, aberrant globigerinids attain an overall size 2–3 times greater than BOLLI’s (1957) original type specimens from the Oligocene of Trinidad.

Rare, moderately to well preserved individuals were recovered from 5 samples belonging to two outcrops. Both sections are situated about 20 km SE of Geneva in the Voirons massif,

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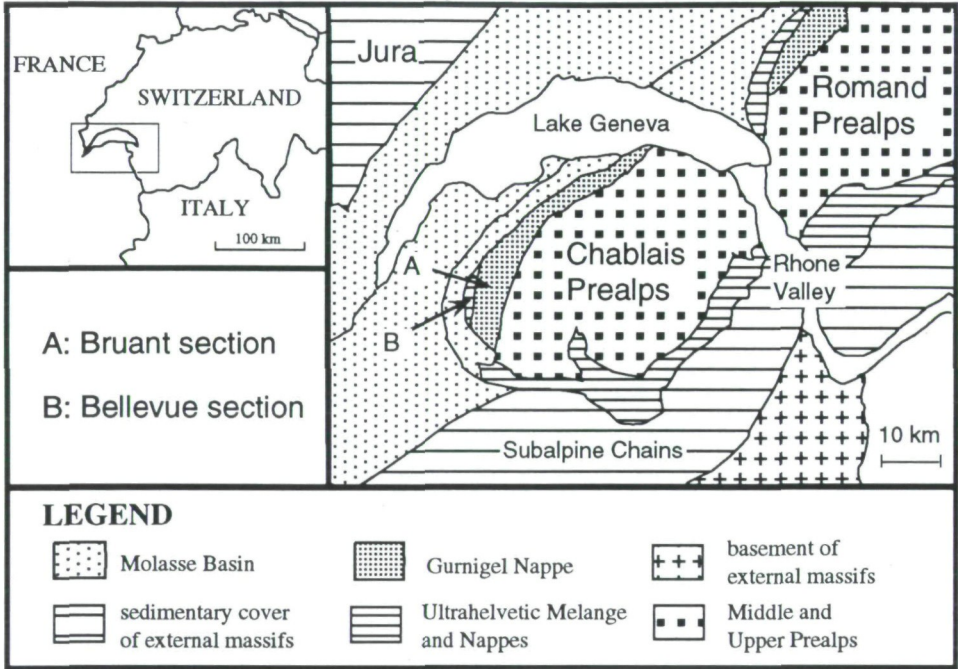


Fig. 1. Study area with outcrop localities.

located in the Chablais Prealps (Fig. 1). The first outcrop, the “Bellevue” section, is attributed to the “Formation du Val d’Illiez” (Val d’Illiez Formation, North Helvetic or Subalpine Flysch) and the other, “Ruisseau du Bruant” section, to the “Grès des Voirons” (Voirons sandstones). Both sections contain a succession of turbiditic shales, sandstones and conglomerates and are thought to represent an early Oligocene filling phase of the North Alpine Foreland basin (HOMEWOOD et al. 1986, UJETZ in prep.).

### Morphological description

This description is based on 6 individuals (3 sinistrally and 3 dextrally coiled specimens). The limited number of specimens prevents us from creating a new taxon using formal nomenclature. Large differences between individuals can be observed, especially relating to variation in the growth and size of chambers and the height of the trochospire. Some specimens possess a small, poorly developed, abortive last chamber. Despite this “variation”, we can provide the following general description:

#### Umbilical view

The test is subcircular, pentalobulate and consists of 4.5–5 chambers in the final whorl. The chambers are very globular, increase slowly in size and are loosely arranged. The intercameral sutures are well depressed, straight and radial. The umbilicus is large, open, very deep, and polygonal in outline and is limited by the internal, rounded flanks of the chambers. The

final chamber is relatively detached from the test, wider (tangentially) than higher (radially). It may be smaller than previous chambers, displaying an abortive or stunted growth appearance.

The aperture is very wide, umbilical to extra-umbilical without a lip. It extends from the penultimate chamber to the periphery of the first chamber in the final whorl. The aperture is not clearly visible on the umbilical side as it merges radially with the umbilicus. It closely resembles the aperture of *Neogloboquadrina dutertrei blowi* (RÖGL & BOLLI 1973). Although here we have described the last aperture, it cannot be excluded that previous apertures may show a different form and position. However, this would only be visible with dissection.

### Spiral view

The test outline is subcircular and pentalobulate. The test consists of 10–12 very globular chambers which are trochospirally arranged in 2.5 whorls. Chambers increase regularly in size, such that the last chamber (if normal) reaches a diameter twice as large as the first chamber of the last whorl. The sutures are depressed, straight and almost radial.

### Peripheral view

The test is low trochospirally coiled and planar to slightly convex on the spiral side. From this view, the ratio between the axial height and the maximum diameter for these individuals are as follows: 0.58 – 0.60 – 0.61 – 0.64 – 0.68 – 0.71

The initial chambers of the last whorl are perfectly globular and loosely arranged with slightly depressed sutures. The last normal chamber is wider (axially) than higher (radially) and clearly shows a very wide aperture merging into a large umbilicus. Considering the general morphology, the periphery may possess an aperture similar to *Globorotalia* and our individuals could be attributed to the genus *Globorotalia* (*Turborotalia*) using classical nomenclature. However, with recent advances in wall surface nomenclature, some specimens may be designated to *Globigerina* or *Globigerinella* if they could be proven to be spinose.

### The wall

The wall is relatively well preserved, finely perforated and possesses slightly elevated interporal ridges. Twelve to thirteen pores were counted over a distance of 100 µm, which gave an interporal space of about 8 µm. We also obtained a similar result for the last chamber of an internal mould (Pl. 1, Fig. 2). The wall of the last chamber appears to be very thin (less than 10 µm).

## Comparisons and differences

Our individuals, although resembling *G. ciperoensis*, are clearly larger, reaching a diameter of 650 µm. *G. ciperoensis* s.s is two times smaller, possessing a diameter around 300 µm. TOURMAKINE (1978: pl. 8, fig. 10–11) illustrated a large specimen of 330 µm from the upper Oligocene of the Walvis Ridge (SE Atlantic). CHAPRONIERE (1981: fig. 4, nos. I a–c) figured a large individual of 450 µm in diameter. It should be noted that these so-called “G.

*ciperoensis ciperoensis*” specimens were retrieved from younger sediments corresponding to zones N3-N7 and therefore could be attributed to *G. concinna* or *G. praebulloides pseudociperoensis*. These two taxa are relatively large and similar to our forms but possess a clearly intra-umbilical aperture. They are also restricted to the lower-middle Miocene.

It is well known that the form and position of the aperture can change during ontogenesis. As we possess only a few individuals, the difficult decortication process of specimens was avoided. However, our forms consist of about 12–13 chambers producing a diameter of 600  $\mu\text{m}$ , whereas *G. ciperoensis* s.s. consisting of the same number of chambers attains a diameter of 300  $\mu\text{m}$ . This implies that the ontogenic developments are different. Therefore, our forms most likely belong to a completely new taxon.

Recently in the literature, a number of atypical specimens have been described as belonging to the “*G. ciperoensis*” group. REISER (1987) recognized large forms belonging to the “*G. ciperoensis*” aberrant group in late Oligocene sediments (*Globorotalia opima opima* planktonic foraminiferal P21 zone) from the Molasse Basin. He considered that these individuals, although displaying great variation (probably due to ecological factors), belong to the same species. Although his specimens are similarly large as those identified in this study, their juvenile stages are distinctly different. The early stage possesses very small chambers which are low trochospirally to streptospirally coiled. DOHMANN (1991) also recorded relatively large (350–450  $\mu\text{m}$ ) *G. ciperoensis ciperoensis* specimens from the Molasse Basin.

SPEZZAFERRI & PREMOLI SILVA (1991) recorded large *G. ciperoensis ciperoensis* specimens from the Gulf of Mexico (P19–P22 zones) which possess maximum diameters of 400–500  $\mu\text{m}$ . They noted increases in abundance and in overall size within the “*G. ciperoensis*” group throughout the P21 zone.

RÖGL (pers. comm. 1993) has recorded this form in abundance within thick dysaerobic shales throughout the Molasse Basin and western part of the Carpathian arc. He has recorded its presence from NP23 to NP24 Nannoplankton zones (= P21 zone) within similar foraminiferal assemblages to those studied here from the northern margin of the Alps.

### Age

Our studied “*G. ciperoensis*” specimens were derived from lower-middle Oligocene sediments, corresponding to the *G. ampliapertura* planktonic foraminiferal P20 zone (BOLLI & SAUNDERS 1985). This was defined by the presence of small (normal sized) *G. ciperoensis ciperoensis* and *G. ouachitaensis gnauki* individuals.

Associated planktonic foraminifers consist predominantly of small globular globigerinid-like forms such as: *G. ciperoensis anguliofficialis*, *G. ampliapertura*, *G. officinalis*, *G. chipolensis*, *Globorotalia opima nana*, *G. spp.*, *G. praebulloides* group and *G. ouachitaensis ouachitaensis*.

### Paleoecology

The studied aberrant “*G. ciperoensis*” specimens were principally retrieved from foraminiferal assemblages possessing low species diversities and low numbers of planktonic foraminifers. This is indicative of low oxygen conditions (MURRAY 1991). The assemblages

were dominated by *Bulimina* species but also contained other well defined, deep marine, oxygen minimum zone (OMZ), benthonic foraminiferal species of *Uvigerina*, *Chilostomella* and *Nonionella*. A number of recent studies have demonstrated that assemblages predominantly consisting of a few small, hyaline, thin-walled, unornamented *Bulimina* and *Uvigerina* species are typical of middle bathyal oxygen minimum zones (QUINTERNO & GARDNER 1987, MÜLLER-MERZ & OBERHÄNSLI 1991, SEN GUPTA & MACHIAN-CASTILLO 1993). Specimens often occur as pyritised moulds, which may further suggest the presence of dysaerobic conditions.

### Conclusions

The planktonic foraminifers studied here may be considered as abnormally giant varieties pertaining to the "*G. ciperoensis*" group. That is, they could be considered as ecological variants of the same species. However, the possibility of describing this form as a new species should not be disregarded. Nevertheless, a limited number of specimens prevents us from describing this form as a new species. It probably represents a new taxon even if it superficially resembles *G. ciperoensis ciperoensis*.

This species has been recovered from middle Oligocene sediments pertaining to the *G. ampliapertura* planktonic foraminiferal P20 zone (BOLLI & SAUNDERS 1985). This species may be associated with low oxygenated, deep marine, middle bathyal conditions.

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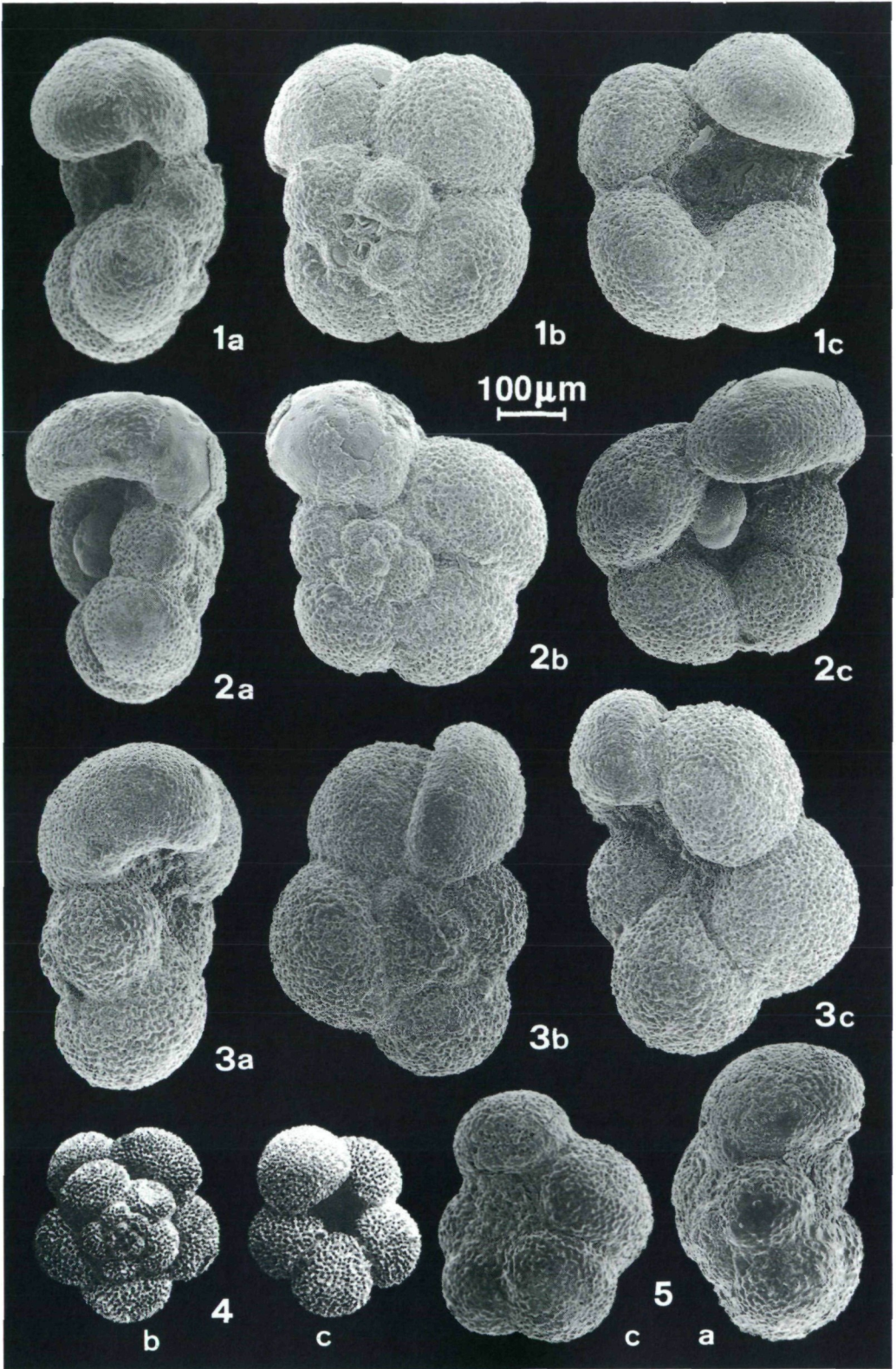
### References

- BOLLI, H. M. (1957): Planktonic foraminifera from the Oligocene-Miocene Cipero and Lengua formations of Trinidad. – B. W. J. Bull. U.S. natl. Mus., **215**: 97–123.
- & J. B. SAUNDERS (1985): Oligocene to Holocene low latitude planktic foraminifera. – In: BOLLI, H.M., SAUNDERS, J. B., & K. PERCH-NIELSEN (eds.): Plankton Stratigraphy, p. 87–154. – Cambridge University Press.
- CHAPRONIÈRE, G. C. H. (1981): Late Oligocene to Early Miocene planktic Foraminiferida from Ashmore Reef no. 1 Well, northwest Australia. – Alcheringa, **5**: 103–131, 13 figs.
- DOHMANN, L. (1991): Unteroligozäne Fischeschiefer im Molassebecken: Sedimentologie, Nannoplankton, Foraminiferen, Paläogeographie. – Doktorarbeit, Universität München: 365 pp, 21 Taf.
- HOMWOOD, P., ALLEN, P. A., & G. D. WILLIAMS (1986): Dynamics of the Molasse Basin of Western Switzerland. – Spec. Publs. int. Ass. Sediment., **8**: 199–217.
- MÜLLER-MERZ, E., & H. OBERHÄNSLI (1991): Eocene bathyal and abyssal benthic foraminifera from a South Atlantic transect at 20–30°S. – Palaeogeogr. Palaeoclimatol. Palaeoecol., **83**: 117–171.
- MURRAY, J. W. (1991): Ecology and Palaeoecology of Benthic Foraminifera. – 97pp. – Longman Scientific & Technical.
- QUINTERNO, P. J., & J. V. GARDNER (1987): Benthic foraminifers on the continental shelf and upper slope, Russian River area, northern California. – Journ. Foram. Res., **17/2**: 132–152.
- REISER, H. (1987): Die Foraminiferen der bayerischen Oligozän-Molasse Systematik, Stratigraphie und Paläobathymetrie. – Zitteliana, **16**: 3–131.

- RÖGL, F., & H. M. BOLLI (1973): Holocene to Pleistocene planktonic foraminifera of Leg 15, site 147 (Cariaco Basin Trench, Caribbean Sea) and their climatic interpretation. – In: EDGAR, N.T., SAUNDERS, J.B. et al.: Initial reports of Deep Sea Drilling Project, **15**: 150, 1 fig.
- SEN GUPTA, B. K., & M. L. MACHAIN-CASTILLO (1993): Benthic foraminifera in oxygen-poor habitats. – In: M. R. LANGER (Ed.): Foraminiferal Microhabitats. – Marine Micropaleontology, **20**: 183–201.
- SPEZZAFERRI, S., & I. PREMOLI SILVA (1991): Oligocene planktonic foraminiferal biostratigraphy and paleoclimatic interpretation from Hole 538A, DSDP leg 77, Gulf of Mexico. – Palaeogeogr. Palaeoclimatol. Palaeoecol., **83**: 217–263.
- TOURMAKINE, M. (1978): Planktonic foraminiferal biostratigraphy of the Paleogene of sites 360 to 364 and the Neogene of sites 362a, 363 and 364 Leg 40. – In: BOLLI, H.M., RYAN, W.B.F., et. al.: Initial Reports Deep Sea Drilling Project, **40**: 679–721, 11 figs., 11 plates.

#### Plate 1

All figures x100 magnification, for all views: a = peripheral view, b = spiral view, c = umbilical view.  
Figs. 1–3, 5. Giant *Globigerina* “*ciperoensis*”, sample An3s9c, “Bellevue” section, “Formation du Val d’Illiez”.  
Fig. 4. *Globigerina ciperoensis ciperoensis* from BOLLI & SAUNDERS (1985), fig. 13, nos. 2–3.



## Plate 2

All figures x100 magnification, for all views: a = peripheral view, b = spiral view, c = umbilical view.

Figs. 1–3. Giant *Globigerina* “*ciperoensis*”

Fig. 1. Sample An4n38, “Ruisseau du Bruant” section, “Grès des Voirons”

Figs. 2–3. Sample An3s9c, “Bellevue” section, “Formation du Val d’Illiez”



