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NEOKILIANINA CONCAVA RAMALHO, 2015 AND *NEOKILIANINA RAHONENSIS* (FOURY & VINCENT, 1967): A DIMORPHIC PAIR OF UPPER JURASSIC LARGER BENTHIC FORAMINIFERA?

Felix Schlagintweit

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Abstract The species *Neokilianina concava* Ramalho was described from the Kimmeridgian of Portugal found in the same (isochronous) levels as *Neokilianina rahonensis* (Foury & Vincent). The external morphology was indicated as the only difference between the two taxa, notably a pronounced concavity in the middle part of the cone base and a wider apical angle in *N. concava* against *N. rahonensis*. These differences can reasonably be considered as intraspecific variations, reflecting adult test dimorphism between the megalospheric (*N. rahonensis*) and microspheric specimens (*N. concava*), also suggested by their isochronous occurrence. The morphological features that were used for species discrimination are well recorded from the two generations (A-, B-forms) of other larger benthic foraminifera including the Orbitolinidae.

Keywords: Larger benthic foraminifera, dimorphism, Upper Jurassic, Portugal

INTRODUCTION

Dimorphism in benthic foraminifera is defined as the '*coexistence of two discrete morphotypes representing different generations in the life cycle of a single species. They are expressed in the adult growth stages and/or in the protoconch and in the following nepionic chambers*' (Hottinger, 2006, p. 16). In the megalospheric specimen (gamonts or A-form), the protoconch is larger than in the microspheric specimen (agamont or B-form). The latter instead is usually characterized by larger test dimensions (Hottinger, 2006, '*adult oversize of the microspheric generation*'). The greater abundance of megalospheric specimens within an assemblage refers to the '*much higher survival rate of young gamonts. The proportions between generations depend on the species, but vary from 1 agamont per 100 gamonts down to 1 agamont per 1000 gamonts in larger foraminifera*' (Hohenegger, 2011, p. 10). Test dimorphism is well reported from fossil and extant taxa of small and large-sized benthic foraminifera (e.g., Leutenegger, 1977; Goldstein, 1999; Hohenegger, 2011; Consorti et al., 2020). The present short contribution deals with the example of *Neokilianina rahonensis* (Foury & Vincent, 1967) and *N. concava* Ramalho, 2015, Upper Jurassic larger benthic foraminifera along with a re-interpretation of their taxonomic status.

THE CASE STUDY OF *NEOKILIANINA RAHONENSIS* (FOURY & VINCENT, 1967) AND *NEOKILIANINA CONCAVA* RAMALHO, 2015

Generalities

The genus *Neokilianina* Septfontaine (type-species *Kilianina rahonensis* Foury & Vincent, 1967), not included in the recent classification of agglutinated foraminifera (Kaminski, 2014), is considered a valid genus (Schlagintweit, 2014; Septfontaine, 2020). The taxonomic history respectively has been summarized by Schlagintweit (2014, p. 28) as follows: '*In an abstract for the Benthos ´86 Meeting in Geneva, Septfontaine (1986) excluded it from the genus* Kilianina *and assigned it to a new taxon* Neokilianina *n. gen. Loeblich and Tappan (1987: p. 721) treated* Neokilianina *as invalid, since in the abstract of Septfontaine (1986) no description was provided and no type species was designated. The topic of the Geneva abstract was published two years after the meeting introducing* Neokilianina rahonensis *(Septfontaine, 1988, p. 249). As type species Septfontaine (1988: p. 249) explicitely named* Kilianina rahonensis *and concerning the description reference was made to that given by Foury and Vincent (1967)*.' The reference to Foury & Vincent (1967) however needs to be corrected as the morphology of '*Kilianina*' *rahonensis* has been originally described as orbitoliniform with uniserial adult chambers that follow the trochospirally coiled early stage. The genus *Neokilianina* has been assigned by Septfontaine (1988) to the family Valvulinidae Berthelin, 1880, subfamily Parurgonininae Septfontaine, 1988 with trochospirally coiled chambers throughout ontogeny. It comprises the two species *Neokilianina* (ex *Kilianina*) *rahonensis* (Foury & Vincent, 1967) from the Kimmeridgian of France and *N. concava* Ramalho, 2015 from the Kimmeridgian of Portugal. It is worth mentioning that the stratigraphic distribution of *N. rahonensis* comprises the uppermost Oxfordian to lowermost Tithonian interval (Pleş et al., 2019).

Taxonomic interpretation

In the description and diagnosis of the new species *Neokilianina concava*, occurring in the same (isochronous)

[1]Lerchenauerstr. 167, 80935 Munich, Germany, felix.schlagintweit@gmx.de

levels with *N. rahonensis*, Ramalho (2015, p. 41) stressed the two main specific characteristics of the external morphology as a greater apical angle and a conspicuous basal concavity. '*Both species exhibit the same type of internal structure*' (Ramalho, 2015, p. 42). Herein, it is suggested to not consider them as two different species but instead as a dimorphic pair as reported from various other Jurassic-Cretaceous larger benthic foraminifera. A well-known cross-reference for example is represented by the (Lower) Cretaceous trocho- to uniserial Orbitolinidae Martin, 1890 (e.g., Hofker, 1966). Examples of the much rarer microspheric forms displaying wider apical cone angles along with greater test diameter, often also with a central concave depression at the base and including final annular chambers include the genera *Neorbitolinopsis* Schroeder, 1964 (Berthou & Schroeder, 1978), *Montseciella* Cherchi & Schroeder (1999) (Schroeder et al., 2010; this work), or *Calveziconus* Caus & Cornella, 1981 (Fig. 1a-d). An equivalent interpretation can be applied to the two morphotypes of *Neokilianina* with *N. rahonensis* referring to the high-conical specimens described by Foury & Vincent (1967) as the megalospheric form (Fig. 1g) and the low-conical *N. concava* as the microspheric form (Fig. 1h). The fact that the latter occurs in the same levels as forms designated as *N. rahonenensis* and that there are no internal structural differences between both supports such a conclusion. The co-occurrence of both morphotypes seems to exclude an interpretation as eco-morphotypes (difference on test shape given by adaptation to different ecological variables). With the preferred interpretation, the genus *Neokilianina* Septfontaine becomes reduced to its sole type-species *N. rahonensis* (Foury & Vincent). Although Foury & Vincent (1967, p. 39) mention two morphological different types that might be related to different generations, all of the illustrated specimens have been referred to high-conical megalospheric specimens and also the diameter-height diagram illustrated in figure 5 therein does not show two discriminatory fields. In addition, details about morphological and dimensional differences have not been provided and do therefore not allow further comments. Foury & Vincent (1967, p. 40) reported a biloculine embryo consisting of a spherical protoconch enveloped by the deuteroconch and situated at the apex of the test. It is followed by 5 to 6 whorls of 'helicospiral' chambers (= informal praevalvulinid stage sensu Septfontaine, 2020). The megalospheric embryo has neither been illustrated by Foury & Vincent (1967) nor have dimensions been provided. Details on the proloculi of the two generations are therefore still pending, so that the observed dimorphism refers to the adult test morphologies. Finally, it should be mentioned, that an equivalent dimorphism as in *Neokilianina rahonensis* as assumed herein has been illustrated by Foury & Vincent (1967) from the middle Jurassic species *Kilianina blancheti* Pfender, 1933 (Fig. 1e-f).

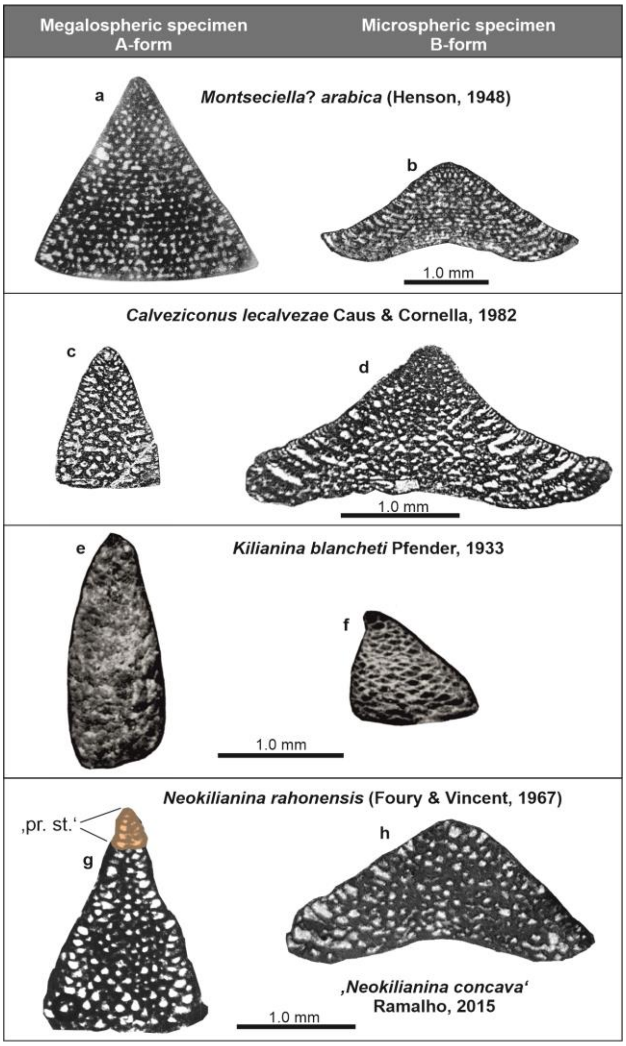

Fig. 1 Examples of dimorphic pairs in Orbitolinidae (**a-d**), the paravalvulinid *Kilianina blancheti* Pfender (**e-f**), and the parurgoninid *Neokilianina rahonensis* (Foury & Vincent) (**g-h**), with the interpretation of *N. concava* Ramalho as representing the B-form of the former. **a** *Montseciella*? *arabica* (Henson), paratype of Henson, 1948, pl. 14, fig. 1, as *Dictyoconus arabicus*, upper Barremian of Qatar; **b** thin-section material from Alteneiji, 2021, upper Barremian Kharaib Formation, United Arabian Emirates; **c-d** *Calveziconus lecalvezae* from Caus & Cornella (1981, pl. 1, figs. 1 and 5, Campanian of Spain). **e-f** from Foury & Vincent (1967, fig. 1, neotype and paratype). **g** from Foury & Vincent (1967, pl. 1, fig. 1, holotype, Kimmeridgian of France) modified; 'pr. st.' = informal praevalvulinid stage sensu Septfontaine, 2020 = 'helicospiral' chambers sensu Foury & Vincent, 1967; **h** from Ramalho (2015, pl. 2, fig. 5, paratype, Kimmeridgian of Portugal).

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