A note on spinosity in Afrobolivina afra (Foraminifera)

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We report that a few specimens of *Afrobolivina afra* from one sample from a borehole in the Upper Cretaceous of western Nigeria bear a spine on the proloculus; this has not been observed before in this widely distributed West African species. The spine-formation may be an ecophenotypic response to the physical or chemical properties of the sediment, or, possibly the outcome of special bathymetric conditions.

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1. Introduction

The Late Campanian to Early Paleocene species *Afrobolivina afra* Reyment has been the object of many detailed studies (see references in Reyment, 1982, 1983). Reyment (1959) described the special properties of this interesting bolivinid and the ornamental variants it displays. Castelain *et al.* (1962) documented the wide occurrence of the species in West Africa, where it is endemic and ranges from Senegal, in the north, to Angola in the south. Reyment and Reyment (1979) described the pores of the species; they recorded a coarser variety and a significantly finer category. Reyment (1982b) further investigated ornamental variants manifested by the species and concluded that the three ornamental varieties occurring in the lateral development of the species (to wit, smooth, costate, reticulate) were the product of threshold polymorphism.

Phenotypic evolution in the species was probed by means of a multivariate morphometrical analysis (Reyment, 1982a) in which the secular variation in nine characters measured on the test was related to the palaeo-environment using determinations on chemical composition of the sediment and from electrical borehole logs.

In all, many thousands of specimens of *A. afra* from both boreholes as well as outcrops have been studied in great detail under the scanning electron microscope. The specimens recorded here are, however, the ones that possess a prolocular spinosity.

2. Descriptive Notes

The spines (Plate 1, Figs. A–G) are of variable length. They may be sharply pointed (Figs. F and G) or bulbous (Fig. B) and occur in microspheric (Fig. E) and megalospheric (Figs. A and C) individuals. The proloculus in microspheres is completely encased in the spinal structure (Fig. F).

The spine is hollow (Fig. D) and is formed from the outer layer of test; it occurs in the regularly ornamented (reticulated) morphotype shown in Fig. E, and the longitudinally costate morph (Fig. A).

The age of the sole sample in which a few spined specimens was found is Late Maastrichtian. The sample is from the borehole Gbekebo I, from a depth of 3056 – 3059 ft.

3. Discussion

The question arising out of the present observation is whether the occurrence of spinose specimens in an isolated sample is significant. Some shell-bearing organisms produce ornamental accessories of this type (e.g. crustaceans) as a response to depth-conditions, carbonate-saturation and temperature, and the development of an initial spine has been noted for other bolivinids, for example, *Bolivina robusta* Brady (personal communication from Johanna Resig-letter of November 10th, 1988).

From what we know of the palaeoecology of coastal Nigeria in the Late Maastrichtian, it is possible to infer a connexion with bathymetric conditions, as there was a gradual eustatic shallowing of the sea at that time. Reyment and Sturesson (1987) described the geochemistry of the Gbekebo I borehole and the electrical properties of the sediments penetrated were reviewed by Reyment (1982b). Although there does not seem to be an obvious chemical environmental origin for the ornamental variation recorded here, examination of the electrical resistivity log for

the section 3056 – 3059 ft in the borehole indicates a value of 0.5 mV to prevail, which is very low compared to the rest of the logged sequence. Electrical logs are often good indicators of the redox conditions of a sediment during periods of regression and transgression and it is therefore possible that the appearance of a spine in the history of the species could have resulted from regressional sedimentation registering as low electrical resistivity in the host-sediment.

REFERENCES

Castelain, J., Faulkner, J. S., Klasz, I. De, Meijer, M., Rérat, D. 1962. Répartition stratigraphique d'*Afrobolivina afra* Reyment dans quelques bassins côtiers de l'Afrique Occidentale. *Revue de Micropaléontologie,* 5: 54–58.

Reyment, R. A. 1959. The foraminiferal genera *Afrobolivina* gen. nov. and *Bolivina* in the Upper Cretaceous and Lower Tertiary of West Africa. *Stockholm Contributions in Geology,* 3: 1–57.

Reyment, R. A. 1982a. Threshold characters in a Cretaceous foraminifer. *Palaeogeogr., Palaeoclimat., Palaeoecol.* 38: 1–7.

Reyment, R. A. 1982b. Phenotypic evolution in a Cretaceous foraminifer. *Evolution,* 36: 1182–1199.

Reyment, R. A. 1983. Internal structure of *Bolivina* and *Afrobolivina: Micropaleontology,* 29: 50–59.

Reyment, R. A. and Reyment, E. R. 1979. Pore variations in *Afrobolivina* Reyment. *Micropaleontology,* 25: 44–49.

Reyment, R. A. and Sturesson, U. 1987. Correlations of chemical and physical environmental fluctuations in a Late Cretaceous borehole sequence – a multivariate study. *Sedimentary Geology,* 53: 311–325.

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PLATE

Plate 1

A. Megalospheric test of the costate variant. × 60. PMAfl32 (st. 236).

B. Detail of the prolocular region of specimen PMAf132 (Fig. A) showing the bulbous development of the spine. × 400.

C. Megalospheric test of the hexagonally ornamented variant. × 60. PMAf133 (St. 236).

D. Damaged spine showing hollow structure. × 800. PMAf134 (St. 236).

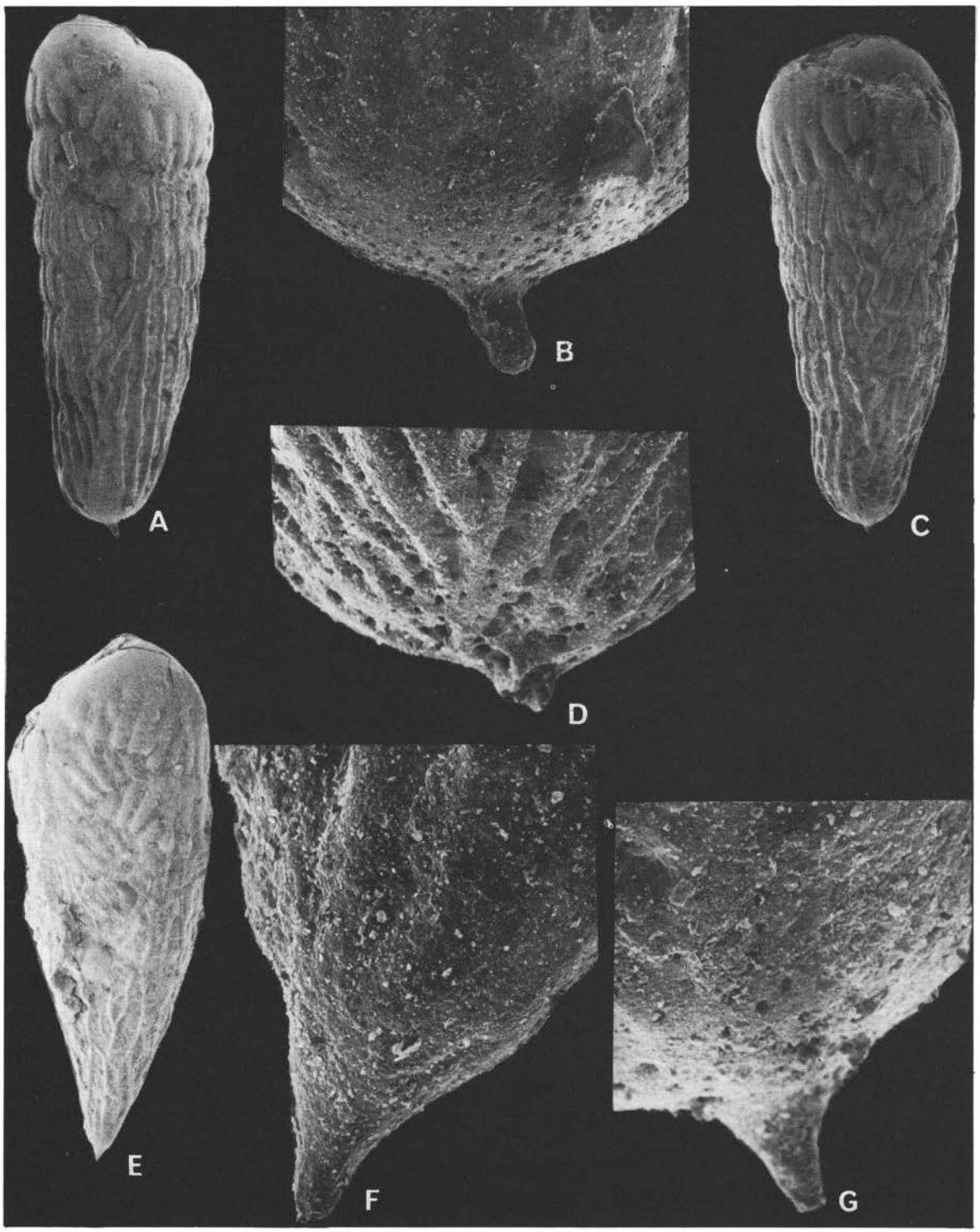
E. Microspheric test of the costate variant. × 60. PMAf135 (St. 236).

F. Enlarged view of the spine on the microspheric test figured in Fig. E. × 800.

G. Detail of the spine of specimen PMAf133 (Fig. C). × 800.

All specimens from core-sample 3056–3059 in the borehole Gbekebo I, Western Nigeria (Shell-D'Arcy Petroleum Exploration Company of Nigeria Ltd).

St denotes the SEM stub-number.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