Depth distribution of *Amphistegina* from Lamu Archipelago (Kenya)

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**INTRODUCTION**

The Amphisteginidae is one of the most studied families among the symbiont-bearing larger foraminifers. They live on firm substrates, both reefal and phytal (HAllock, 1999), and may also occur on sandy substrates (HOHENEGGER, 1994). In the Indo-Pacific region, *Amphistegina* spp. shows a distinct depth zonation, following the depth distribution of the different species according to the test morphology (LARSEN, 1976; LARSEN & DROOGER, 1977; HALLOCK, 1979; HALLOCK & HANSEN, 1979; HALLOCK et alii, 1986).

The aim of this work is to analyse the depth distribution and the relative percentage of abundance of the amphistegines from the shallow-water continental platform of an oligotrophic environment with carbonatic sedimentation, and subordinate siliciclastic supply from the continent.

**PREVIOUS STUDIES**

The depth distribution of *Amphistegina* and the test and wall thickness are influenced by several factors such as temperature (HOLLAUS & HOTTINGER, 1997), salinity of the bottom water and illumination (e.g., HOTTINGER, 1997); for example the shallow-water dwelling species *A. lobifera* requires higher light intensity than other species for reproduction (HALLOCK, 1981).

Moreover, the test and wall thickness reach their maximum in shallower water where biomineralization is favored by light intensity and water motion (HALLOCK et alii, 1986), and the thicker walls prevent the photoinhibition of symbiont algae (HALLOCK, 1981).

The shallowest-dwelling Indo-Pacific taxon, *A. lobifera*, is the most robust, reaching the highest values of the thickness/diameter ratio (t/d>0.6) (HALLOCK, 1999). This species dominate in shallow backreef and reef-margin environments at depths typically < 10 m, and it is uncommon to rare below 40 m of depth, becoming absent at about 80 m (HANSEN & BUCHARDT, 1977).

The range of *A. lessonii* (t/d=0.35-0.5) usually overlaps with that of *A. lobifera*, with known optimum depths at 10-40 m (HANSEN & BUCHARDT, 1977; HOHENEGGER 1994; HALLOCK 1999), reaching 85 m in the Gulf of Elat (HANSEN & BUCHARDT, 1977; REISS & HOTTINGER, 1984).

Living *A. lessonii* can range from the shallow subtidal depths down to depths of 100 m according to water transparency (HALLOCK, 1999).

*Amphistegina radiata* (Fichtel & Moll) is common from 20 to 50 m, and occurs down to 100 m depth (HALLOCK, 1999; HOHENEGGER, 1994), but it is absent in the Gulf of Elat; HOTTINGER et alii (1993) reported a very small *A. radiata*-like form, living at deeper habitats than those found in the western Pacific.

*A. bicirculata* Larsen has a thin test (t/d=0.2-0.35) (LARSEN, 1976; HALLOCK, 1979); it is commonly absent at depths < 30 m, and can be easily recovered at depths > 100 m.

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Amphistegina papillosa Said is the deepest dwelling form of the genus with a test flat with several papillae on test surface, and lives at depths > 100 m where the availability of light is minimal (Larsen, 1976).

THE INVESTIGATED AREA

The investigated 55 samples were collected in the 1990’s from researchers of the Earth Sciences Department of “Sapienza” University of Rome, and of the Centro di Studi per il Quaternario e l’Evoluzione ambientale (C.N.R.) from the Lamu Archipelago, north-eastern Kenya (Fig. 1), not far from the Somalian border. This area had never been studied previously and a single work exists on the microfaunas of its littoral environments (Pignatti et alii, 2012).

Lamu, Pate and Manda, the main islands of the archipelago, are characterized by a level land with mangrove-dominated coasts, and are branched by some canals scoured by powerful tidal currents which reach inner areas from the bays. These canals have a coarse and well-washed quartz-dominated floor, and the turbidity of the water is always high because of the organic matter decay, due to the mangroves activity (Carboni & Accorsi, 2000).

The continental shelf is covered by bioclastic carbonatic sand with local patch reefs and fringing reefs parallel to the coast-line at about 0.5-2 km.

MATERIALS AND METHODS

Sediments were washed in freshwater, sieved at 125 µm and air dried. Where possible, about 300 foraminifers were picked from each sample, the foraminifers were counted and identified to species level using mainly the illustrated inventory of Hottinger et alii (1993), and the results are reported in Pignatti et alii (2012).

From each assemblages we provide to isolate and count all the Amphistegina bicirculata, A. lessonii, A. lobifera, A. papillosa and A. radiata specimens in order to note their relative abundance.

RESULTS

The five recovered species co-occur in most of the investigated samples, as summarized in Fig. 2.

In the Lamu embayment, the amount of skeletal carbonate production is low near channel mouth areas and the accumulation rates are linked to water energy conditions; moreover, from the shelf towards the coastline there is a progressive increase of quartz grains within the sediments (Pignatti et alii, 2012).
In the open shelf, between the coast and the island alignments, a shallow-water carbonate sedimentation prevails, with bottom sediments formed of sand and muddy bioclastic sand.

The relative frequency of the five species reveals a compressed depth distribution range, as a consequence of water turbidity, sediment transport, nutrient input linked to tidal or water current effects, and especially to terrigenous supply from the continent; these factors affect the interpretation of depth signals in recent and fossils larger foraminiferal assemblages (HOTTINGER, 1997). Mangroves play also a key role of sediment trapping, reducing terrigenous input to the carbonate factory, and all the above mentioned factors involve in the contraction of the trophic resources continuum (HALLOCK, 1987).

Amphistegina lobifera is well represented in the shallowest samples, down to 25 m. In particular, the distribution depth of Amphistegina papillosa and A. bivinculata is much shallower than that recorded from the Gulf of Elat (REISS & HOTTINGER, 1984) (Fig. 3).

REFERENCES


