



First report of *Ovamina opaca*, Dahlgren 1962, a saccaminid benthic foraminiferal species from the sediments of Arabian Sea

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Short Communication

Abstract

A monothalamous saccaminid, *Ovamina opaca* Dahlgren, 1962, is being reported for the first time from the recent sediments of Arabian Sea. The species was found abundant in the shelf sediments along the southwest coast of India. Generally this group of foraminifera has been recorded earlier from the cold water environments, but has always been overlooked in shallower marginal regions. In the present study, the occurrence of the species has been presented in shallower water shelf sediments.

Keywords: Saccaminid, monothalamous foraminifera

Introduction

Benthic foraminifera have dominated the marine realms right from the Cambrian period. Based on the wall structure, they can be grouped into calcareous, agglutinated and organic. However, the organic walled foraminifera have always been ignored due to their morphological inconspicuousness and

taphonomic fragility. Foraminiferal diversity and abundance in defined environments with reference to saccaminid group is rarely explored as against the multilocular calcareous forms. There is a growing interest among the researchers in elucidating the significance of monothalamous foraminifera in both shelf (Habura *et al.*, 2008) and benthic (Gooday, 2002; Gooday *et al.*, 2004; Cedhagen *et al.*, 2002) regions. Among the monothalamous foraminifera, saccaminids generally possess simple tests with soft and flexible walls. The saccaminids with their agglutinated flask shaped test and single terminal aperture constitute the most important group. These widespread components of benthic meiofauna that often dominate the size fraction remain least explored (Gooday, 2002). Based on the morphological specifications and conventional taxonomy, the monothalamous groups of foraminifera are classified based on composition of the test (Loeblich and Tappan, 1987; Lee *et al.*, 2000). The saccaminids are characterized by the test which is either free or attached, globular or elongate; possessing single, multiple, rounded or slit like apertures. Members of the subfamily Saccamininae (Brady, 1884) have a distinctive organic oral apparatus. This apparatus consists of "an inward projecting tube enclosing a gel like capsule" (Loeblich and Tappan, 1987; Lee *et al.*, 2000). However, the systematic division of higher taxa based on morphology has little support from molecular

studies (Pawlowski *et al.*, 2002). The species *Ovammina opaca* Dahlgren 1962, although widely reported was hitherto not recorded from the Arabian Sea.

Physiographic and Oceanographic settings of the study area

Arabian Sea known for its unique richness in biodiversity has a greater seasonal variability than any other oceanic region around the globe. The seasonally reversing monsoon winds invert the circulation pattern completely on a biannual basis. The reversal of winds leads to strong seasonal upwelling of nutrient rich water from the depths along the narrow continental shelf resulting in high surface productivity and high export particle flux from the euphotic zone (Qasim, 1982; Sen Gupta and Naqvi, 1984). The monsoon winds mix deep nutrient rich waters with surface water thereby causing the profuse phytoplankton growth resulting in large algal blooms which crash and sink through the water. The bacterial decomposition reduces the oxygen concentration giving rise to a permanent oxygen minimum zone between 100 and 1000 m water depths in the Arabian Sea. Furthermore, the presence of this oxygen minimum zone, and possibly even of free hydrogen sulphide in the upper part of a layer down to 600 m (Ivanenkov and Rozanov, 1961), play a direct impact on the distribution of bottom-living organisms. Despite the fascinating novelty in the benthic environment uncovered by previous studies the deep-water benthic biology continued to suffer neglect, even if valuable studies have been undertaken using foraminiferans as paleo-indicators of oceanic hypoxia (Hermelin and Shimmield, 1990; Cannariato *et al.*, 1999). Elsewhere, the powerful effect on the deep-sea benthos of oxygen minima impinging on the continental margin was first noted in the benchmark investigations of deep-sea benthic community structure in the Atlantic by Sanders and his colleagues at the Woods Hole Oceanographic Institution in the 1960s.

Material and methods

During the present study, 52 surface sediment samples were analysed. The material was obtained from 148/15b from the FORV *Sagar Sampada* cruise, 148/6, *Sagar Kanya* cruise and cruise 162 FORV *Sagar Sampada* a few surface grab samples from various depths along the continental shelf of Arabian Sea (Fig.1). The collected samples were processed using the conventional micropaleontological technique. Twenty grams of sediment sample was soaked in 30% hydrogen peroxide solution overnight and boiled for 2-3 minutes. After cooling, the material was wet sieved over 63 μ m and 100 μ m screens. The residue was dried and kept in plastic tubes for the microfaunal analysis. The dried samples were subsampled using a micro otto splitter to obtain representative samples. One gram dry sediment was analysed under binocular stereozoom microscopes (WILD MZ 12.5 and MZ8) and the microfaunal assemblage

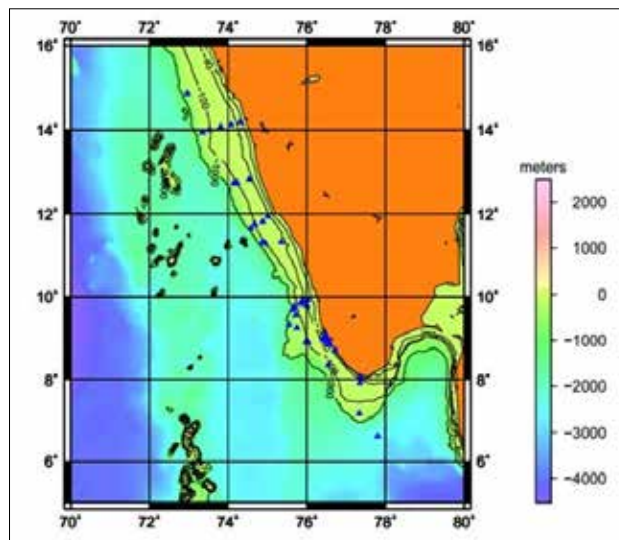


Fig. 1. Map showing the sampling stations with bathymetry

slides were prepared for the identification of the specimens. The taxonomic key of Loeblich and Tappan (1987) was used. The identification was confirmed using the Scanning electron micrograph (VEGA3 TESCAN).

Results

The saccaminid *Ovammina opaca*, Dahlgren 1962 (Fig. 2 and 3) is reported for the first time from the shelf sediments of Arabian Sea. Saccaminids are free living foraminiferans that are infaunal components in marine environments. They are well known for their detritivorous feeding habit and are confined

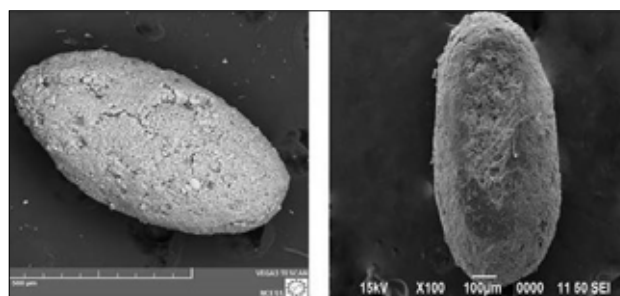


Fig. 2. Scanning electron micrographs of *Ovammina opaca*, Dahlgren 1962



Fig. 3. *Ovammina opaca*, under binocular stereozoom microscope (WILD MZ.12.5)

to the water depth upto 100m, making the group a typical inner-mid shelf fauna.

Systematics

Order : Foraminiferida Eichwald, 1830
 Sub Order : Textulariina Delage and Herouard, 1896
 Family : Saccaminidae Brady, 1884
 Genus : *Ovammmina* Dahlgren, 1962
 Species : *Ovammmina opaca*, Dahlgren 1962

Description

Test ovoid, outer wall finely agglutinated. The test grayish brown in colour. Single round aperture at the end of a very short neck seen as a short projection. The length of the specimens ranged from 2.336 mm to 2.7 mm and the width was between 1.265 mm and 1.4 mm. There is a single circular aperture at the end of a very short neck. Feeble reticulations are visible on the test, probably indicating growth rings. The porous nature of the test is another interesting aspect of this species which probably indicates its capacity of trapping molecular particles using its granuloreticulate pseudopodia.

Remarks

Ovammmina opaca was first described in 1962 by Dahlgren. The specimen described by Loeblich and Tappan (1987) closely resembles the specimen described in the present study in having an ovoid appearance, but has more coarse grains on the surface. This species described here was found to occur in high abundance at 30m and 50m water depths off Cochin and Bhatkal and was comparatively very less abundant at deeper waters indicating that this particular species prefers shallow waters.

In the present study, this species showed maximum abundance in the mid continental shelf from Cochin to Kannur region, followed by Mangalore to Ratnagiri regions. This species was less abundant in the Cape Comorin to Alapad regions. The relative abundance recorded was 35.7% in the 50m water depth off Cochin, 19.6% in 30m water depth off Cochin, 7% off Kollam and 7.87 % off Bhatkal in 101m depth.

Discussion

Although in recent years detailed studies conducted on the monothalamous groups have confirmed their presence at Explorers Cove, Antarctica and at deepwater sites in north eastern Atlantic, Indian and Pacific Oceans (Gooday *et al.*, 2001; Gooday *et al.*, 2004). They remain overlooked at shallow water habitats. This species was recorded previously from the Gullmar Fjord from Sweden, that too from 1m water depth, and from Puerto Deseada in Argentina. This is the first report of *Ovammmina opaca* from Arabian Sea. The abundance of the

species at 30m and 50m water depth off Cochin and in 101 m off Bhatkal are high and this could be attributed to the high organic matter content at these stations as compared to the Cape Comorin to Alapad regions where their abundance is low. The silt content was found to be 66.3% in Cochin at 50m water depth where the occurrence of *Ovammmina opaca* was maximum. The distribution of this species suggest that they are abundant in regions where silt content is high in the sediments and are very rare in sandy sediments.

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