



Note

Sediment transport and bioinvasion - Possible impact of Tsunami - *Protodriloides chaetifer* an example

G. Priyalakshmi and N. R. Menon*

Dept. of Zoology, Bharata Mata College, Thrikkakara, Cochin - 682021, India. E-mail:priyalakshmi@yahoo.co.in
*IMCOZ, School of Marine Sciences, Cochin University of Science and Technology, Fine Arts Avenue, Cochin- 682016, India. E-mail:dnrnm@yahoo.com

Abstract

The occurrence of *Protodriloides chaetifer* (Remane, 1926) on the Indian coast is recorded for the first time from the sandy beaches of Fort Kochi (9°48' N and 76°5' E) and Arthungal (9°30'N and 76°23'E). These interstitial polychaetes are characterized by the presence of segmented vermiform body, non- canaliculated tentacles, greenish and colourless epidermal glands, paired, segmentally arranged S- shaped bifid chaetae and bilobed pygidium bearing adhesive glands. Massive transportation of marine sediments brought about by the devastating tsunami might have led to the bioinvasion of this species to this tropical coast. This species was conspicuously absent in the samples collected from the same localities during the pre-monsoon period of 2003-2004.

Protodriloidae (Purschke and Jouin, 1988) is a recently erected family to include the genus *Protodriloides* under which two species such as *Protodriloides chaetifer* (Remane, 1926) and *Protodriloides symbioticus* (Giard, 1904) described earlier have been assigned by Purschke and Jouin (1988). These were earlier placed in the genus *Protodrilus* with no specific status. Jouin (1966) felt the necessity to introduce the genus *Protodriloides* to place these species owing to very clear cut morphological peculiarities not encountered in the group of aberrant psammophilous polychaetes. Species belonging to the family Protodriloidae have been recorded previously from the North Sea, English Channel, Irish Sea, French Atlantic Coast, West Greenland, Mediterranean, Atlantic Coast of North America, Pacific Coast of North America and Indian Ocean (South Africa, Natal). However, no species has ever been recorded from the tropical coast of Indian Ocean. The present record implies cosmopolitanism, which is interesting since the species is without a pelagic larval stage. The present finding probably indicates bioinvasion of *P. chaetifer*, to the tropical coast.

Materials and methods

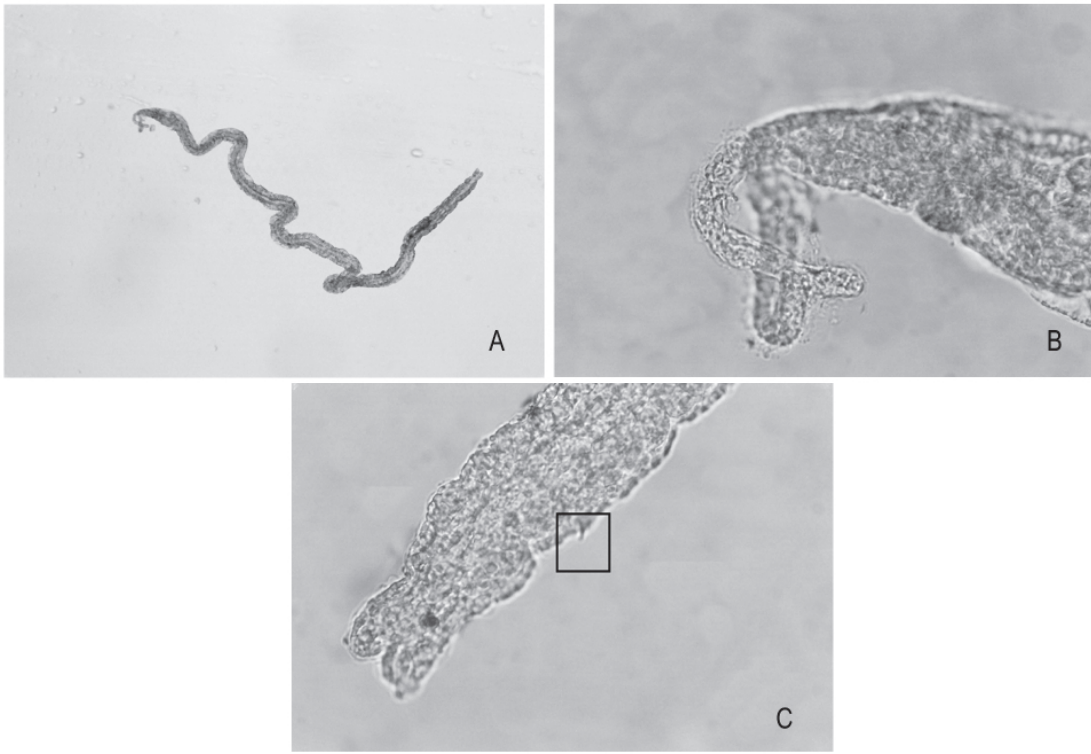
Beach sediment samples collected after the tsunami from Fort Kochi (lat. 9° 48' N; long. 76° 5' E) and Arthungal (lat. 9°30' N; long. 76° 23'E) on the south-west coast of Kerala, revealed the occurrence of several interstitial polychaetes. The fauna in the samples were narcotized *in situ* by adding 7% MgCl₂.6H₂O and subsequently fixed in 5% buffered formalin. Rose Bengal stained organisms were extracted by decantation technique

(Pfannkuche and Thiel, 1988). Semi-permanent slides were made by impregnating the specimens in glycerol. Morphological studies were carried out using 100X oil immersion objective of Magnus microscope. Sediment textural analysis was carried out by Dry Sieving Method (Buchanan, 1984). Sediment organic carbon was measured with CHN analyzer. Hydrographic parameters like temperature, pH, salinity and dissolved oxygen were also recorded.

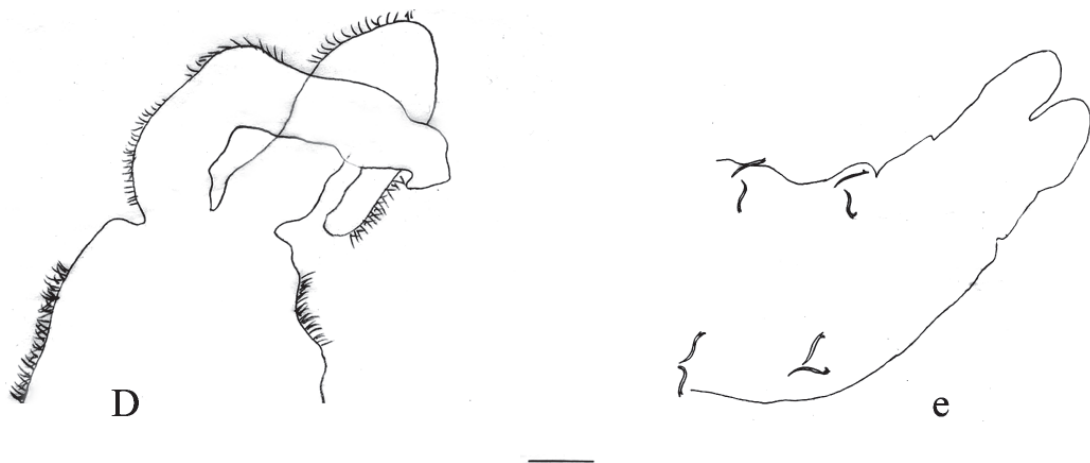
Results

Of the several interstitial polychaete families hitherto known, Protodriloidae has not been recorded so far from Indian Coast. The present study reveals the occurrence of *P. chaetifer* in the sediment samples collected along the coast of Kerala (Figs. 1&2). Textural analysis indicated that the sediments were constituted of medium sand and a mixture of coarse and medium sand. The organic carbon content of sand measured 0.18% - 0.4%. The interstitial water was typically marine.

Diagnosis: The specimens of *P. chaetifer* measured 2-3mm with a diameter ranging from 70µm to 125µm. Body surface characteristically wrinkled. Numerous globular greenish or colourless epidermal glands seen all over the body. Number of segments, 20. A pair of non-caliculated tentacles, 105µm to 115µm long, originates from the prostomium anteriorly. Numerous short cilia present on either sides of the head and tentacles. Pharyngeal bulb present. First body segment much shorter than the remaining segments. Two pairs each of S-shaped chaetae approxi-



1) Fig. 1. Photomicrographs of *Protodriloides chaetifer*
A Entire, B. Anterior end, C. Posterior end



2) Fig. 2. Camera Lucida drawings of *Protodriloides chaetifer*
D. Anterior end. E. Posterior end. Scale bar: 30 μm

mately 20m long, present from the second segment onwards. The chaetae are bifid at the tip and originate from the posterior half of the segments. Pygidium bilobed with adhesive gland openings. The adhesive glands concentrated in the pygidium enable the organisms to remain attached to the substrate even when the sediment is eroded by the wave action. The chaetae are stretched out and form points of attachment of momentary duration. Regular tidal migrations have been observed in *P. chaetifer* (Meinke and Westheide, 1979).

Discussion

Kerala, with a remarkable straight coastline of 560km, is oriented in NNW – SSE direction. The beaches are generally surf beaten characterized by fine to coarse grained sands. Extensive samplings done during the pre-tsunami period along the beaches of Fort Kochi and Arthungal has not yielded specimens of *P. chaetifer*. However, collections made on 14.03.05 from these beaches showed a density distribution of 600 and 10 individuals/ 100 cc. sediments respectively. Tsunamis are major geomorphic crisis, since they cause extensive erosion, sediment transport and deposition. The occurrence of several individuals of *P. chaetifer* from these beaches after the Tsunami probably indicates bioinvasion of a subtle nature due to this bizarre oceanographic phenomenon, which resulted in the massive transport of marine sediments from archibenthal areas to the tidal belts of the affected beaches of various geographic areas. The peculiar morphology of

the animal facilitates fast adhesion to sand grains and transport to wider geographical areas by massive sediment transport, that occurred during the recent tsunami. Subsequent collections done during the monsoon and post-monsoon seasons did not reveal the presence of this species.

References

- Buchanan, J.B. 1984. In: Holme, N.A. and McIntyre, A.D.(Eds.) *Methods for the study of Marine Benthos*, 2nd. Blackwell Scientific Publications, Oxford. p.41-66.
- Giard, A. 1904. *C.R.Soc. Biol.*, 56: 295 – 298.
- Jouin, C. 1966. *Cah. Biol. Mar.*, 7: 139 – 155
- Meineke, T. and H. Westheide. W. 1979. *Mikrofauna Meeresboden.*, 75: 1 – 36.
- Pfannkuche, O. and H. Thiel. 1988. Sample processing. In: Higgins, R.P. and Thiel, H. (Eds.). *Introduction to the study of meiofauna*. Smithsonian Inst. Press, Washington DC. p. 134 – 145.
- Purschke, G. and C. Jouin. 1988. *J. Zool. (Lond.)*, 215: 405 – 432.
- Remane, A. 1926. *Zool. Anz.*, 67: 119 – 125.
- Westheide, W. 1990. *Polychaetes: Interstitial Families*. Universal Book Services/Dr.W.Backhuys Oegstgeest, The Netherlands. 152pp.

Received: 28 May 2007
Accepted: 14 August 2007