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ON THE OCCURRENCE OF *ARENICOLA BRASILIENSIS* NONATO (FAMILY : ARENICOLIDAE, POLYCHAETA) IN INDIAN WATERS*

By P. R. S. Tampi and K. Rangarajan

Central Marine Fisheries Research Institute, Mandapam Camp

The genus *Arenicola* enjoys a wide distribution and is generally divided into cold water and warm water species. *A. marina* and *A. claparedii* dominate the cold waters of the northern hemisphere and *A. assimilis* is more common in the southern hemisphere. In the tropical and sub-tropical regions *A. cristata* is the dominant species while *A. caroledna, A. glasselli, A. loveni* and *A. bombayensis* have also been reported.

Bhatti and Soofi (1949) have recorded *A. cristata* from Karachi (as reported by Wells, 1962) and Ranade (1952) reported the occurrence of *Arenicola* in Bombay (later described as a new species *A. bombayensis* by Kewalramani *et al.* 1959), although Fauvel (1953) does not mention these in his compilation of the Polychaete Fauna of India. Apart from these records the genus has not been known so far from any other part of India.

During a collection tour to the Andaman and Nicobar Islands in February-March 1960, one of us (P.R.S.T.) observed that certain areas along the intertidal regions were littered with prominent heaps of worm castings. Four to six heaps were seen in an approximate area of one square meter. Several specimens of *Arenicola* were dug out from the burrows, 12 to 18 inches deep, on the sandy shores of Malacca Bay in Car Nicobar. The presence of the worms could be readily detected by the characteristic coiled castings (inset in the Plate I) as the receding tide leaves the sand exposed and invariably the worms were caught underneath the castings with their head end pointing downwards. This particular locality in Car Nicobar seems to be an ideal collection centre for these polychaetes and incidentally it might also be mentioned that the same habitat harbours hemichordates, incomplete specimens of which were obtained from these areas. *Arenicola* seems to occur in other localities along the Andaman coast, particularly in Aberdeen Bay in Port Blair and the north-western shores of Neill Island, as indicated by the numerous castings on the sands where the habitat seems to be suitable for these worms although actual collections have not been tried.

Although over a dozen specimens were collected only three worms were preserved for later study. Since then the worms have been identified as *Arenicola brasiliensis* Nonato and as this is the first record of this species in Indian waters, a brief description is given below.

Arenicola brasiliensis Nonato

The colour of the worms vary from reddish brown to nearly yellowish black. The length of the worms excluding the tail ranges from 90 to 127 mm. in the preserved

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condition. In one worm measuring 90 mm. in length, the ' tail ' measured 57 mm. and in another with 98 mm. it measured 109 mm. The third worm in the collection measuring 127 mm. in length had a tail measuring only 52 mm. Evidently the posterior portion of the tail of this worm had broken off at the time of collection.

In the majority of the worms there are 17 setigers (Plate I, top figure). An adult female worm with 18 setigers measuring 127 mm. in length, (Plate I, bottom figure) shows some unique features, as will be described later. The prostomium in the contracted condition appears as a small, round, whitish structure on the mid-dorsal line. Between the prostomium and the first setiger there are four annuli. There are two annuli between the first and second setiger and three between the second and third setiger. Further back, behind the third setiger up to the seventeenth setiger, four annuli are seen between two setigers.

Several rows of short, curved, conical papillae could be seen on an everted proboscis.

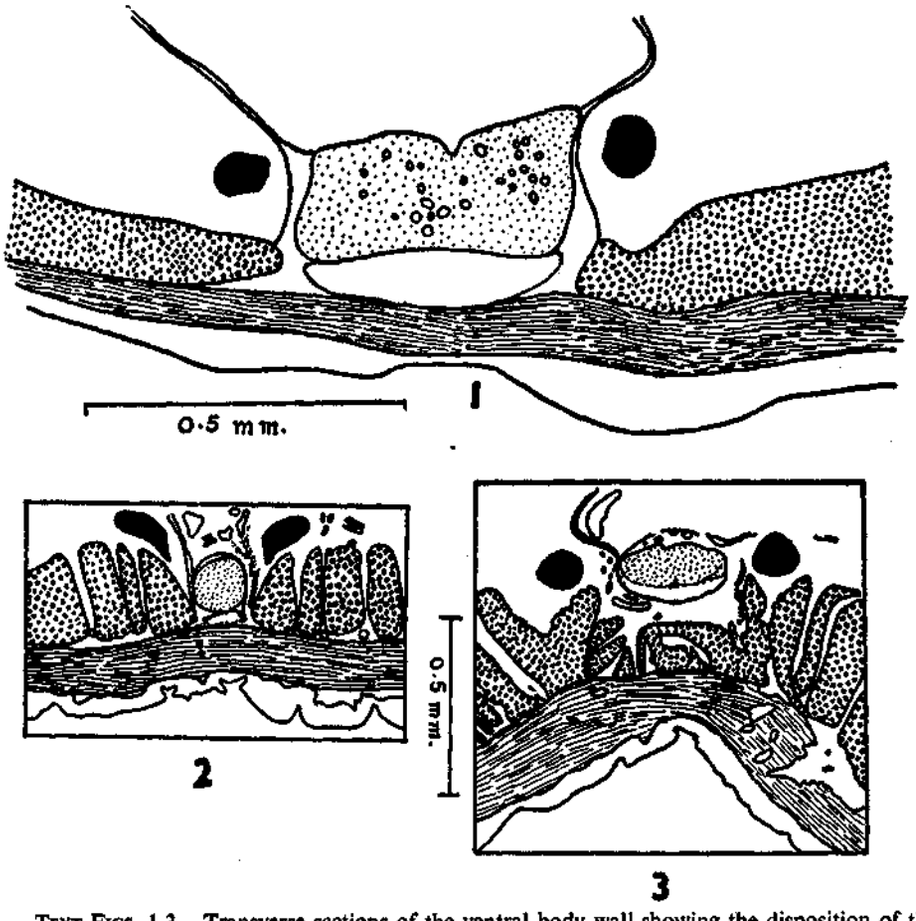
The gills are long and highly pinnate and begin on the seventh setiger. In the anterior setigers they are comparatively shorter and have a few main stems in the gills, but attain the maximum development in the 12th , 13th and 14th setigers. A slight variation in the number of main stems in the gills was, however, noticed on the right and left side in a worm measuring 90 mm. in length excluding the tail, as given in the following Table:

Setiger number	Main stems in gills	
	Left	Right
VII	10	9
VIII	10	10
IX	11	9
X	12	10
XI	12	12
XII	12	13
XIII	13	13
XIV	13	13
XV	10	10
XVI	12	11
XVII	11	11

The notopoidial setae are slender, long capillaries ending in a fine point. In a worm of 90 mm. length, the neuropodia with a single row of sigmoid hooks, appear on the 3rd setiger on right and 4th setiger on left. In another worm measuring 98 mm. the neuropodium is clearly seen on the 3rd setiger on both sides.

There are six pairs of nephridia opening on setigers five to ten. Internally the nephridial funnel is large with its dorsal lip fringed. The nephridiopores are hooded and are seen externally as elongated, raised, whitish structures ventro-lateral to the notopodia. It is prolonged ventrally into a sharp point and extends much below the dorsal end of the neuropodium of the same segment. The true nephridiopore opens into a thin-walled atrium which communicates to the exterior through a small, round hole at the dorsal end. In the worm with 18 setigers, seven nephridia are

clearly seen opening on setigers five to eleven. The occurrence of extra nephridia in *A. cristata* has already been pointed out by Gamble and Ashworth (1900). They have found an extra nephridium on the right side of 11th setiger. Wells (1961) also has come across a specimen with small nephrostomial funnels on both sides of 11th setiger and on the left side of 12th. The dissection of the worm with 18 setigers and 12 pairs of gills in our collection clearly shows the presence of a well-developed extra nephridium on both sides of the 11th setiger. As far as we are aware this is the first time the occurrence of an extra pair of nephridia in *A. brasiliensis* is recorded.



TEXT FIGS. 1-3. Transverse sections of the ventral body wall showing the disposition of the longitudinal muscle layer in (1) the Andaman specimen of *A. brasiliensis*. Figs. 2 & 3 are reproduced from Wells (1961) to show the structure in *A. caroledna* (=*A. brasiliensis*) and *A. cristata* respectively.

The position of the nerve cord in relation to the muscle layers has assumed greater importance in the taxonomy of arenicolids in recent years, since it has been demonstrated to vary in different species. Text-fig. 1 shows the transverse section of the body wall between the thirteenth and fourteenth setiger of a worm measuring 90 mm. in length. It clearly shows that the longitudinal muscle layer is interrupted

and is not continuous on the ventral side of the nerve cord. A small gap is noticed between the nerve cord and the circular muscle layer. A critical examination of thin slices of body wall of the other two worms at about the same level reveals the absence of the longitudinal muscle layer between the nerve cord and the circular muscle layer. Text-figs. 2 and 3 are copied from Wells' paper (1961) to show the position of nerve cord in relation to muscle layers in *A. caroledna* (=*A. brasiliensis*) and *A. cristata*. Fig. 2 shows a transverse section passing through the 14th setiger of *A. caroledna* measuring 107 mm. in length and fig. 3 of *A. cristata* of 100 mm. in length through the same setiger. A comparison of figs. 1 and 2 clearly shows a striking similarity and reveals that the condition noticed in our specimens is exactly similar to the one noticed in *A. caroledna*.

Remarks

Nonato (1958) observed certain peculiarities in the statocyst of a local variety of *A. cristata* collected from the Brazil coast and described the form as *A. cristata* var. *brasiliensis*. Later, Wells (1961) was able to distinguish a new species different from *A. cristata*, based on a number of important anatomical characters such as the number of main stems in the gills, the nature of the neuropodium and the nephridiopores and the disposition of the longitudinal muscle layer of the body wall. To this new species he coined the name *A. caroledna*. However, since this included the variety described by Nonato, the varietal name has gained precedence and the new species is now known by the name *A. brasiliensis* Nonato. In most of the specific characters the specimens at our disposal resemble *A. brasiliensis* and differ from other warm water species. *A. brasiliensis* is said to prefer sandy beaches and is known to throw off abundant cylindrical castings unlike *cristata* which only smears its faecal sand in films around the caudal opening of the burrow or inside the walls.

A. brasiliensis has so far been reported from Woods Hole, Hawaii and California in North America, Peru in South America, Japan, south west coast of Australia and Suez. Thus the present discovery of this species in the Andaman coast, while not surprising, extends its distribution to the Indian region.

Summary

The paper records for the first time the occurrence of *Arenicola brasiliensis* Nonato in Indian waters and discusses briefly its specific characters which help for comparison with the other species recorded from the tropical and sub-tropical beaches of the world.

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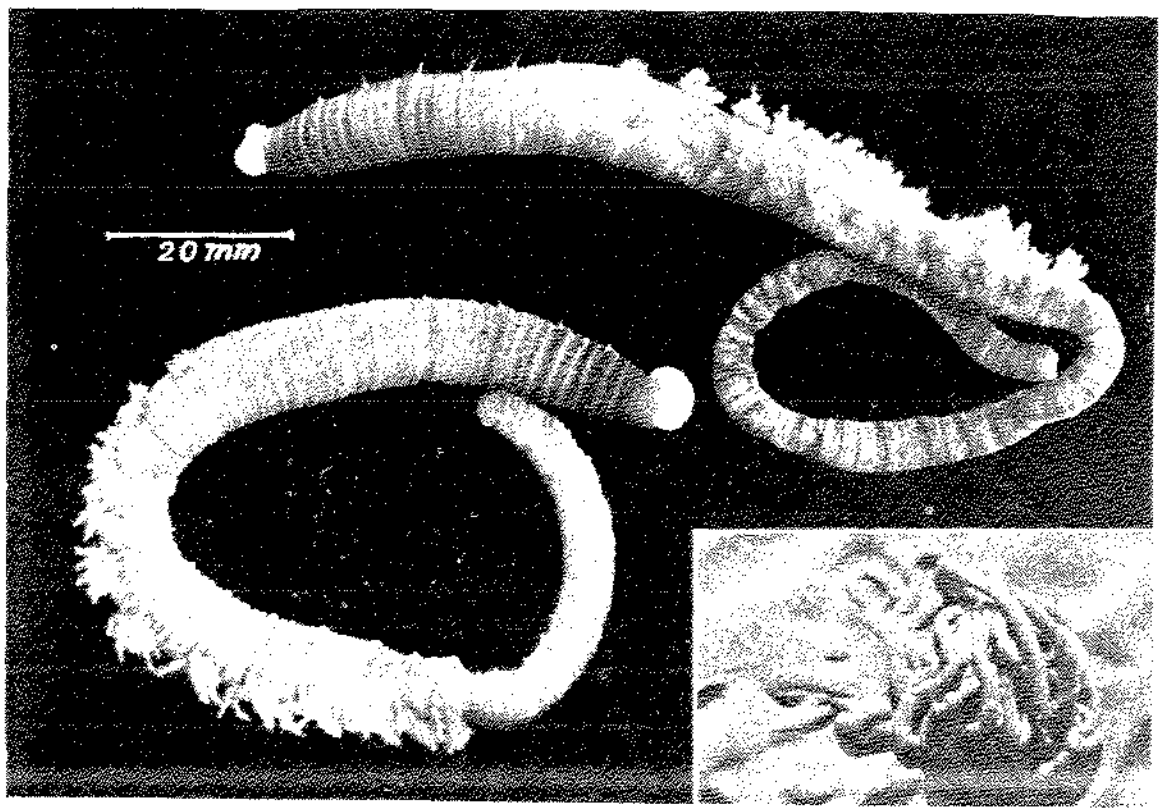

PLATE I. *Arenicola brasiliensis* Nonato from Andamans Coast. The specimen at the top has 17 setigers and the other has 18 setigers. The inset at the bottom right corner shows the typical castings of the worm, reduced to about 3/4 natural size.