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***Research Article** (Open Access)*

THE MORPHOLOGICAL KEY FEATURES OF THE FIRST DOCUMENTATION OF NON-NATIVE *NAMALYCASTIS* SPECIES (FAMILY: NEREDIDA) FROM CUDDALORE, TAMIL NADU, SOUTHEAST COAST OF INDIA

Anupama Vijay, Madhavi Mookkan*, Janani Sridhar and Zainab Fathima Kareem
Aquatic Sciences and Biotechnology Laboratory (ASBL), PG & Research Department of Zoology, Ethiraj College for Women (Autonomous), Affiliated to University of Madras, Chennai - 600 008, Tamil Nadu, India
**Author for Correspondence*: *madhavisuccess@gmail.com*

ABSTRACT
The present study documents the novel occurrence of *Namalycastis arista* (Glasby, 1999) for the first time in Cuddalore, Tamil Nadu, India. The key traits of this species are that notochaetae are present in all the chaetigers and that it has four pairs of tentacular cirri; the jaw has a single robust tooth with 4-6 subterminal teeth; supra-neuroacicular falcigers from chaetiger 10 and subneuroacicular spinigers from chaetiger 105 -250 were observed. Most of the characteristics of *Namalycastis arista* resemble those of *Namalycastis jaya, Namalycastis glasbyi and Namalycastis abiuma*. The study provides insight into the exploration of biodiversity and taxonomic analysis using unique characteristics with cryptic species. This sheds light on a broad area of uncovering taxonomic diversity and interconnectedness of the organisms within the particular habitat.

Keywords: *Namalycastis arista, Taxonomic Analysis, cryptic species, notochaetae, supra-neuroacicular falcigers, Cuddalore*

INTRODUCTION

Polychaetes are considered an ancient and diverse group within the family Nereididae of the phylum Annelida, with about 43 genera and around 535 species (Fauchald and Rouse, 1997; Beesley *et al*., 2000; Bakken, 2004). Polychaetes are used as a feed for prawns and fish, rich in protein, EPA and DHA fatty acids and also play a significant role in the nutrient cycle, which is essential for gonad development (Duijns *et al*, 2013; Sato, 2017; Jerónimo *et al*. 2021; Yang *et al*., 2022).

Traditionally, polychaetes were categorised into two large separate groups: Errantia and Sedentaria. Errentia encompass active, free-moving polychaetes, whereas Sedentaria are tube dwellers and live in burrows. The classification system mainly depends on these divisions and further polychaetes were divided into several orders, each with one or more families. But this classification does not clarify the evolutionary connection (Fauchald, 1977). Well-developed eyes and sensory outgrowths are seen in mobile polychaetes, along with the jaw used for prey capture and consumption. However, species that live intact in tube-like structures are mostly sessile; they are filter feeders and also can collect food from appendages (Rouse, 2004).

Namalycastis serves as a bioindicator within the subfamily Namanereidinae (Glasby, 1999), yet the taxonomy and morphology of most species remain unclear and unexplored. Mostly, *Namalycastis* species are cryptic and these species can reach up to inches (Sarker *et al*., 2024).

The general morphological characteristics of *Namalycastis* species include a segmented body with chaetae present on the parapodia of each segment. The absence of chaetae and notopodia, in comparison with other members of the family Nereididae, represents a notable morphological variation (Magesh *et*

al., 2012). Other identification features include antennae, the proportion of eyes and the length of tentacular cirri (Glasby, 1999; Magesh *et al*., 2012; Alves & Santos, 2016). The details on the pygidium, whether it is a multi-incised rim in *Namalycastis jaya* (Magesh *et al*., 2012), *Namalycastis borealis* or a tripartite pygidium in *Namalycastis elobeyensis* (Glasby, 1999). also plays a vital role in taxonomical identification. The main objective of the present study, we concentrate on the morphological identification of *Namalycastis* species with the help of the key characteristics available.

MATERIALS AND METHODS

Sampling Location

Polychaete samples were handpicked alive after digging at a depth of 7-10 cm below the sediment from Pachayankuppam (11˚41’42.34” N, 79°46′01.68″ E), Cuddalore district, Tamil Nadu, India, in April 2026. The visual representation of the map is depicted in Fig.1 using QGIS. At the site, the samples were sieved using a mesh with 0.5 mm (Lisitskaya 2023). The sample was rinsed thoroughly and then transferred into a container containing 95% ethanol. After collection, the sample was taken to the Aquatic Sciences & Biotechnology Laboratory (ASBL) for the analysis of species.

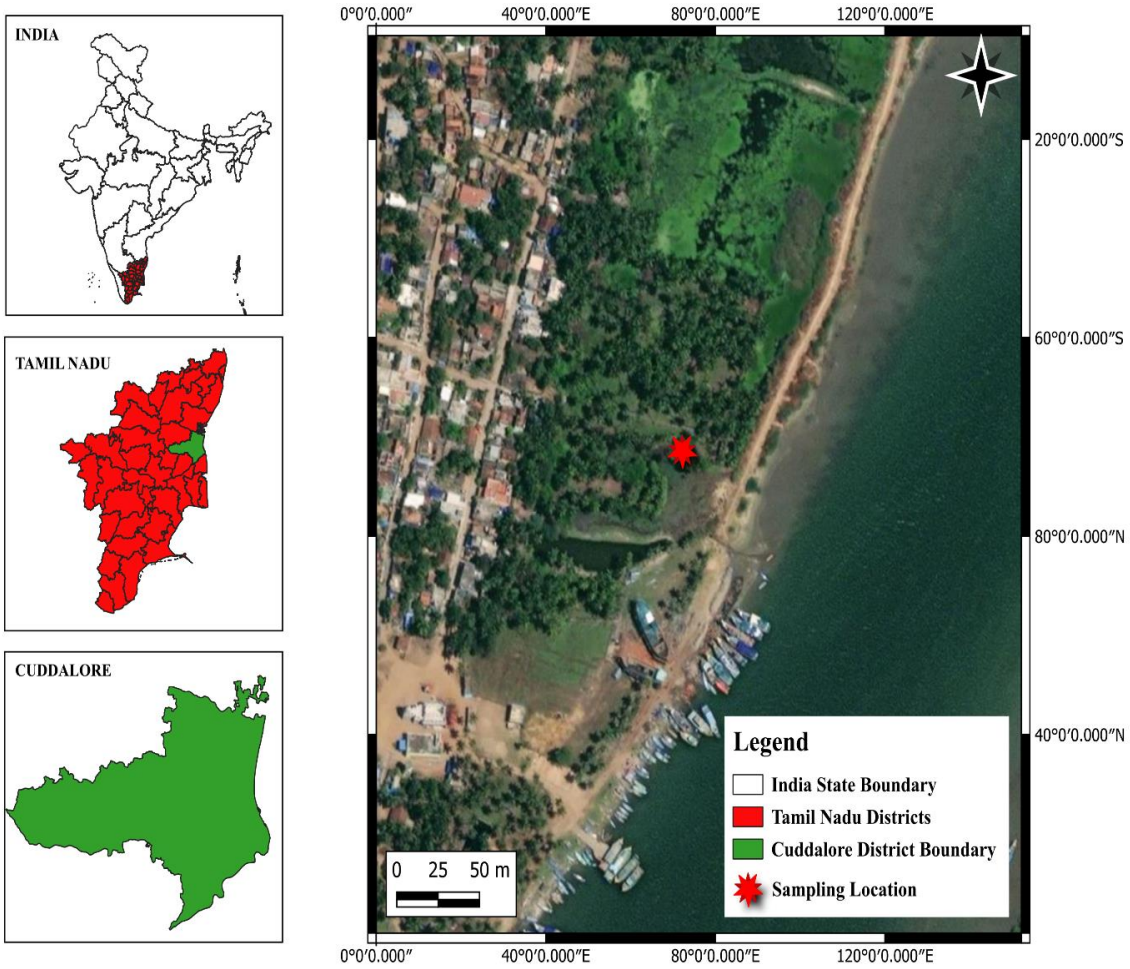


Fig.1. The sampling locations of polychaete samples are represented on the map.

Morphological Analysis

First, the samples were rinsed with ultrapure water in order to remove the unwanted debris. The morphological identification was carried out using a bright-field microscope (Magnus MLXi Plus), with 4x and 10x to examine the anterior and posterior regions, and 40X magnification to study chaetae types. Key diagnostic features like body structure, parapodia, and groove presence, structure of chaetae, and absence or presence of notopodia and pygidium type were carefully analysed to aid in accurate morphological identification.

RESULTS AND DISCUSSION

The first record of a new species was identified and compared with Glasbyi (1999). The identified species was *Namalycastis arista,* collected at Pachayankuppam, Cuddalore district, Tamil Nadu, India. The 'non-native species' *N. arista* is not historically or biogeographically indigenous to the estuarine waters of Cuddalore, Tamil Nadu. Its presence in this region likely represents an introduction via ballast water discharge, aquaculture activities or international shipping vectors and vessel biofouling are recognized pathways for the introduction of non-indigenous marine organisms (Bailey *et al*., 2020). Following a comprehensive literature and database search (including WoRMS and GBIF), it was confirmed that *N. arista* has no prior documented field records or museum voucher collections from any Indian estuary or coastline. Its previously known distribution was strictly restricted to its type locality in Guyana, South America (Glasby, 1999).

The salient difference is that the notochaetae in *N. abiuma* were present in large numbers from the chaetiger mid region till the anterior body; sometimes 1 or 2 per notochaetae were also observed by Magesh *et al*. (2014a). But in *N. jaya* notochaetae are completely absent (Magesh *et al*., 2012). In the present investigation, notochaetae were present in all the chaetigers. The notopodial sesquigomph spinigers were observed anteriorly in chaetigers, distinguishing them from *N. glasbyi*, in which notochaetae are present in the anterior and mid-body chaetigers, but they are absent in the posterior-most chaetigers (Mahesh *et al*., 2014 b). But the spinigers in *N. abiuma* were observed in the mid region and started from chaetiger 5-11, not the posterior region (Mahesh *et al*., 2014 a).

In the present studied specimens, the supra-neuroacicular falcigers were observed from chaetiger 10 onwards, with blades bearing five teeth and fine serrations (Fig. 2G, 2H). This feature distinguishes the specimens from *N. abiuma*, which has 11 teeth and moderate serrations; *N. jaya*, which has 9–12 teeth and coarse serrations; and *N. glasbyi*, which has 15–17 teeth and fine serrations.

Sub-neuroacicular spinigers were also finely serrated and found after parapodia of chaetiger 105 -250 in the present study (Fig.2 G). Whereas the report shows that in *N. abiuma* sub-neuroacicular spinigers were found after chaetiger 18; in *N. jaya,* they were seen till chaetiger 50, were again noticed after the 70th segment, sub-neuroacicular spinigers were seen in the mid to posterior region. In *N. glasbyi*, the subneuroacicular spinigers begin at chaetiger 10. All the species mentioned above, along with the study species are finely serrated.

The pygidium in *N. arista* (Fig. 2 I)*, N. abiuma and N. jaya* has a multi-incised rim, while the pygidium for *N. glasbyi* is tripartite. Anus is dorsoterminal in *N. arista, N. abiuma* and terminal in *N. glasbyi*, whereas there are two lateral annal cirri in *N. jaya* and a smooth, conical-shaped ventrolateral cirrus in *N. arista,* the first ever analysed species from India (Fig.2 J); the anal cirri arise laterally in *N. glasbyi;* the dorsoterminal anal cirri in *N. abiuma* (Glasby, 1999; Magesh *et al*., 2012; Magesh *et al*., 2014a; Magesh *et al*., 2014b). The occurrence of *N. arista* along the Cuddalore coast holds significant biogeographical relevance, representing a crucial range extension into South Indian estuarine ecosystems from its South American type locality. Its presence underscores human-mediated introduction pathways, primarily driven by international shipping operations and maritime transport in coastal port habitats (López and Richter, 2017). The remarkable physiological resilience of *N. arista* to fluctuating salinity and organic pollution

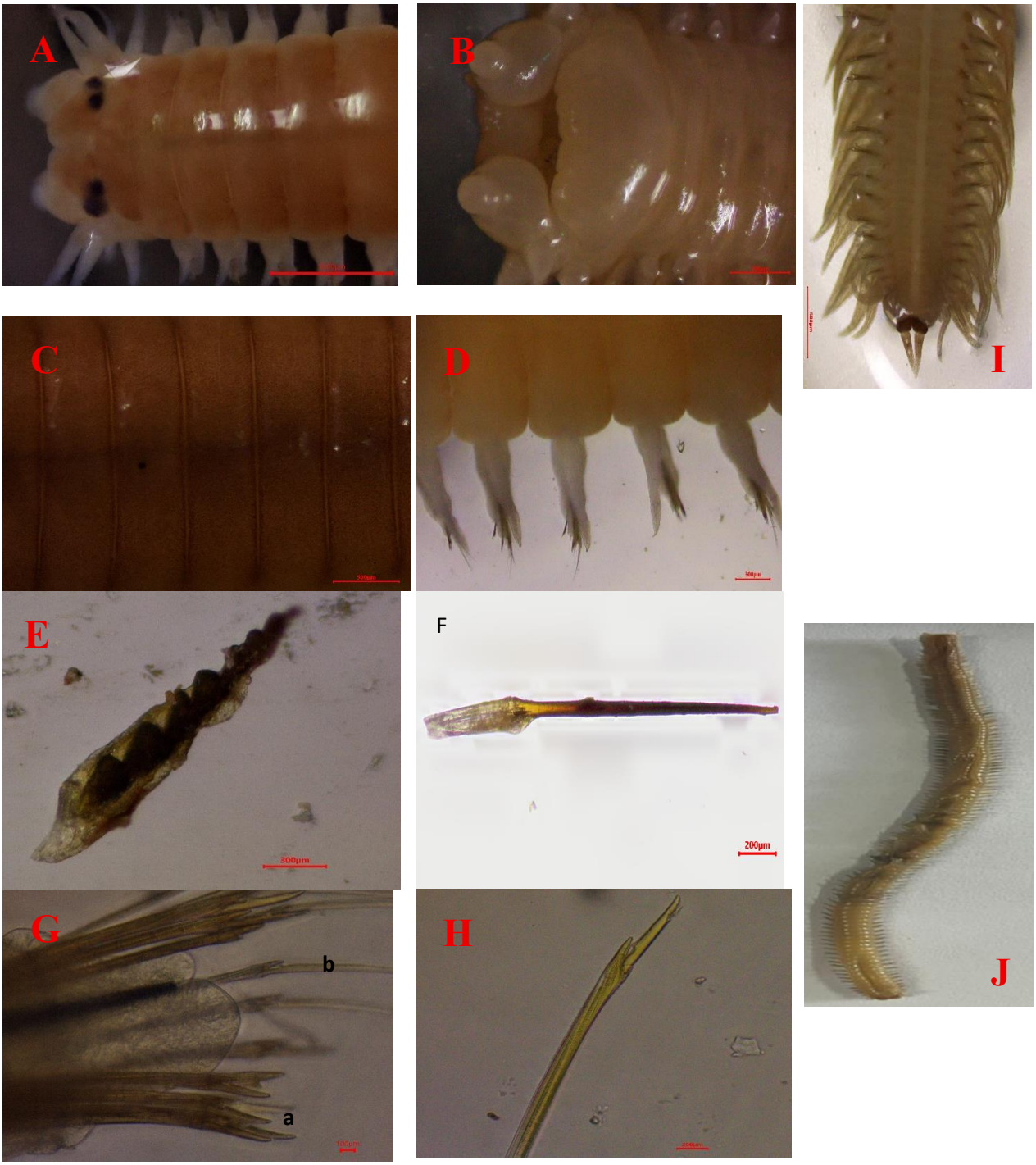


Fig. 2. A. Anterior region, dorsal view of head and eyes; B. Anterior region, ventral view with palp; C. Body segment; D. Parapodia; E. Jaw; F. 12th segment parapodium's aciculum; G. a)Sub-neuroacicular falciger b) Sub-neuroacicular spiniger; H. Sub-neuroacicular falciger ; I. Posterior region, multi-incised rim pygidium and anal cirri; J. Whole Species.

makes it an effective bioindicator for monitoring coastal environmental stress. Furthermore, documenting this newly recorded taxon provides vital baseline data to evaluate its competitive interactions with local benthic fauna and track species shifts across the Bay of Bengal.

CONCLUSION

The current study reported the new discovery of *N. arista* from South India. The morphological traits of the studied specimens were comparatively examined with previously identified and published species of *Namalycastis*. This discovery contributes to a clear understanding of benthic diversity. The morphology of chaetae, structure of parapodia and shape of pygidium are important diagnostic features. The closely related congeners were compared with the earlier descriptions along with the available data; likewise, each trait was compared and analysed. The findings provide a valuable contribution for the taxonomic identification of *N. arista*.

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