



# First Record of *Nereiphylla castanea* (Marenzeller, 1879) (Polychaeta: Phyllodocidae) from Ras Juddi, Makran Coast, Northern Arabian Sea

Ateeqa Baloch<sup>1\*</sup>, Qadeer Mohammad Ali<sup>1</sup>, Quratulan Ahmed<sup>1</sup>, Oscar Díaz-Díaz<sup>2</sup>,  
Shumaila Mubarak<sup>1</sup>, Levent Bat<sup>3</sup>

<sup>1</sup>The Marine Reference Collection and Resource Centre, 75270, University of Karachi, Pakistan

<sup>2</sup>Postgrado en Ciencias Marinas, Instituto Oceanográfico de Venezuela, Sucre, Venezuela

<sup>3</sup>Department of Hydrobiology, Faculty of Fisheries, Sinop University, TR57000 Sinop, Türkiye

\*Corresponding author, Email address: [balochateeqa@gmail.com](mailto:balochateeqa@gmail.com)

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**Abstract:** This study presents the first record of the genus *Nereiphylla* and its species *Nereiphylla castanea* (Marenzeller, 1879) from Pakistan, associated with the bryozoan colony *Watersipora subtorquata* on the intertidal rocky shore of Ras Juddi, Makran coast, Northern Arabian Sea collected on October 24, 2022. Previously, only the phyllodocid *Eulalia viridis* (Aziz, 1938), had been reported in Pakistan. This research provides a comprehensive analysis of the morphological and taxonomic characteristics of *Nereiphylla castanea*, contributing significantly to the knowledge of polychaete diversity in Pakistan. The study highlights the importance of continued exploration in the region, indicating the potential for discovering additional new species and enhancing the knowledge of marine biodiversity along the Makran coast.

**Keywords:** *Nereiphylla castanea*; Polychaeta; Phyllodocidae; Taxonomy

## 1. Introduction

Phyllodocidae Örsted, 1843 is a family of polychaete worms commonly referred as “paddle worms”, derives its name from distinctive features, particularly the large and flattened dorsal cirri, giving them a paddle-like appearance. Phyllodocids are typically long and slender worms showing conspicuously bright green or yellow or even red colours and distinctive colour patterns on the body (Blake, 1994; Tzetlin, 1998). Phyllodocids are benthic worms common in several types of sediments, most of them live in crevices, on hard substrates or under stones except *Eteone* spp., these are typical sand dweller. They are almost exclusively marine or estuarine; the only known freshwater phyllodocids are species of *Eteone* from the north-west Pacific (Wu and Chen, 1963; Volova, 1969). The family Phyllodocidae Örsted, 1843 is easily distinguishable from other families in the Phyllodocida by the enlarged tentacular cirri, an eversible papillated pharynx with no jaws and leaflike dorsal cirri (Rouse and Pleijel, 2001; Eklof et al. 2007). The first two or three body segments may be partly fused and have up to four pairs of tentacular cirri. The remaining body segments have leaf-like dorsal and ventral cirri, the dorsal ones being larger. Chaetae are present on all but the first segment.

Family Phyllodocidae comprises over 488 species in 34 genera worldwide (Pamungkas *et al.* 2019). Currently, a total of 11 valid species are known in the genus *Nereiphylla* (Read and Fauchald, 2024). Species of *Nereiphylla* are found from the intertidal to bathyal zones (0-500m), and from the bottoms of mud, sand, gravel, stones, or shells (Kato and Mawatari, 1999) from tropical, temperate and polar localities throughout the world, mostly in shallow water (Salazar-Vallejo, 2022; Nasri *et al.*, 2024). Only a single species of *Nereiphylla*, e.g. *Nereiphylla castanea* is known to occur in Indian Ocean (Fauvel, 1953; Okuda and Yamada, 1954; Day, 1967; Wehe and Fiege, 2002; Sivadas and Carvalho, 2020). *Nereiphylla castanea* was initially documented from Enoshima, central Honshu, and is frequently encountered in the intertidal fauna of southern Japan by Marenzeller, (1879).

Pakistan has reported only one species in the family Phyllodocidae so far, e.g. *Eulalia viridis* (Aziz, 1938). Thus, the present paper provides the first record of the genus *Nereiphylla* its species *Nereiphylla castanea* associated with bryozoan colony *Watersipora subtorquata* from the intertidal rocky shore of Ras Juddi, Makran coast of Pakistan, the Northern Arabian Sea. The present research reviewed the specific morphological and taxonomic characteristics of the reported species, gives a further contribution to increasing the number of polychaete fauna of Pakistan.

## 2. Methodology

The polychaete specimens were found associated with the bryozoan colony (*Watersipora subtorquata*) on rocky intertidal shore of Ras Juddi, Pasni (25°13'25''N 63°30'15''E) on October 27, 2022 (-0.11m, 5:26 pm) Figure. 1. The colony was preserved in 5% formaldehyde with seawater and brought to the MRC&RC laboratory. In the laboratory, the colony was carefully broken up and the polychaetes were removed and preserved in 70% ethanol for further study. The specimens were measured and photographed. The specimens were dissected and examined using a stereo-zoom microscope (Wild 181300, Switzerland) at 10x50 magnification. Temporary slides of parapodia were prepared using glycerine and observed under the upright microscope (Nikon LABOPHOT-2) at 10x4, 10x10 magnifications and illustrations were made with the help of assorted drawing tube microscope. The specimens were identified up to the species level using the literature of (Marenzeller, 1879; Gardiner, 1976; Blake, 1994; Choi *et al.* 2015). The specimens are catalogued (MRC&RC-UOK-ANNE-32) and deposited in the repository of the Marine Reference Collection and Resource Centre, University of Karachi, Pakistan.

## 3. Results

### *Taxonomic Account*

Class Polychaeta Grube, 1850

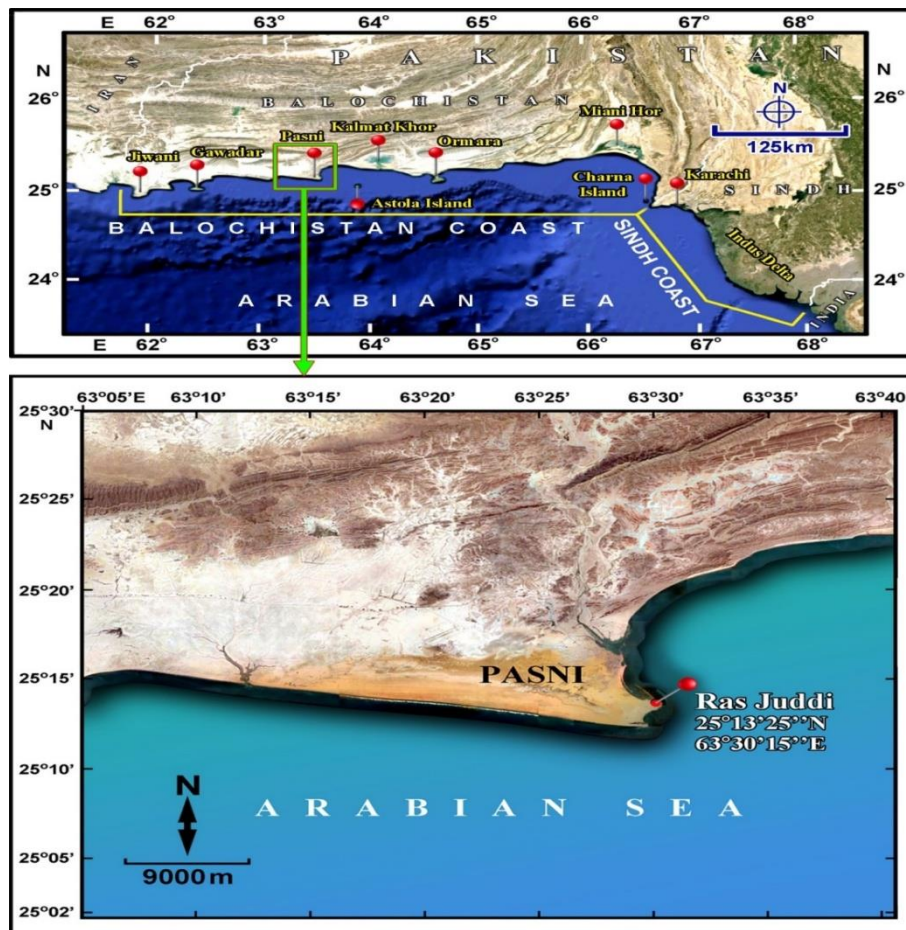
Subclass Errantia Audouin & Milne-Edwards, 1832

Order Phyllodocida Dales, 1962

Family Phyllodocidae Orsted, 1843

**Genus *Nereiphylla*** Blainville, 1828

**Diagnosis:** Prostomium rounded with 4 frontal antennae, without median antenna or nuchal papilla; 2 large eyes present; proboscis with soft papillae diffusely distributed. Segments 1 and 2 fused dorsally and reduced. Four pairs tentacular cirri present, either cylindrical or flattened: 1 pair on segment 1, 2 pairs on segment 2; 1 pair and normal ventral cirrus on segment 3; Parapodia uniramous. Dorsal cirri cordiform and longer than broad, or, rarely, broader than long. Ventral cirri large, obliquely attached to neuropodia, usually covering neuropodia in posterior view. Pygidial cirri cylindrical, pointed.



**Figure 1.** Study area map, Ras Juddi, Makran coast (25°13'25"N 63°30'15" E)

*Nereiphylla castanea* Marenzeller, 1879

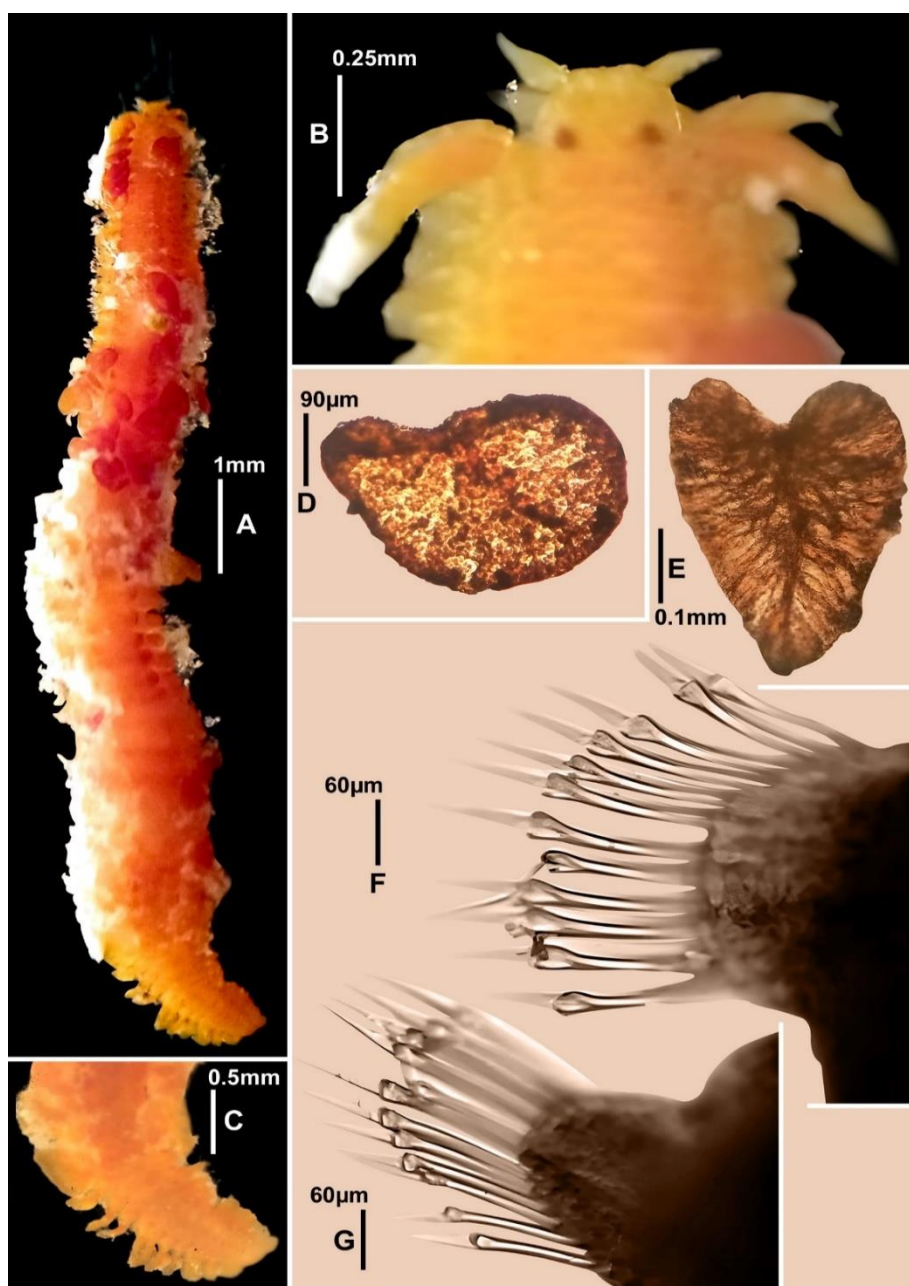
(Figure 1 & 2)

**Material examined:** Catalogue no: (MRC&RC-UOK-ANNE-32); Ras Juddi, Pasni, Makran Coast, Balochistan (25°13'25"N 63°30'15" E), collectors, Ateeqa Baloch and Shumaila Mubarak, 2 specimens, October 27, 2022, intertidal zone (-0.11m, 5:26 pm).

### Description:

Body long and slender with tapering posterior segments, measuring 8-10 mm total body length with 102-110 chaetigers. Dark red or orange colour in alcohol, dark orange-brown stripes across dorsum of each segment (Figure 2A). Prostomium elongated, rounded anteriorly. 4 antennae on anterior margin, large, thickened, tapering. One pair of eyes; large, rounded located nearly lateral margins (Figure 2B, 3A). Tentacular segments separate from the prostomium. Segment 1 and 2 fused but not forming a collar and only the third separate and distinct dorsally. Tentacular cirri 4 pairs, round with dorsal cirri of segments 2 and 3 weakly compressed, but not greatly flattened; tentacular cirri on segment 1 slightly short, extending to segment 5; dorsal tentacular cirri of segment 2 longest, extending posteriorly for about segments 10; ventral tentacular cirri on segment 2, extending to segment 6; tentacular cirri on segment 3 extending to segment 6. Parapodia uniramous with neuropodia and well developed dorsal and ventral cirri (Figure 2F-G, 3D). Dorsal cirri heart-shaped and reddish, as long as or longer than wide, paired cirri sometimes large enough to nearly conceal dorsum (Figure 2E, 3B).





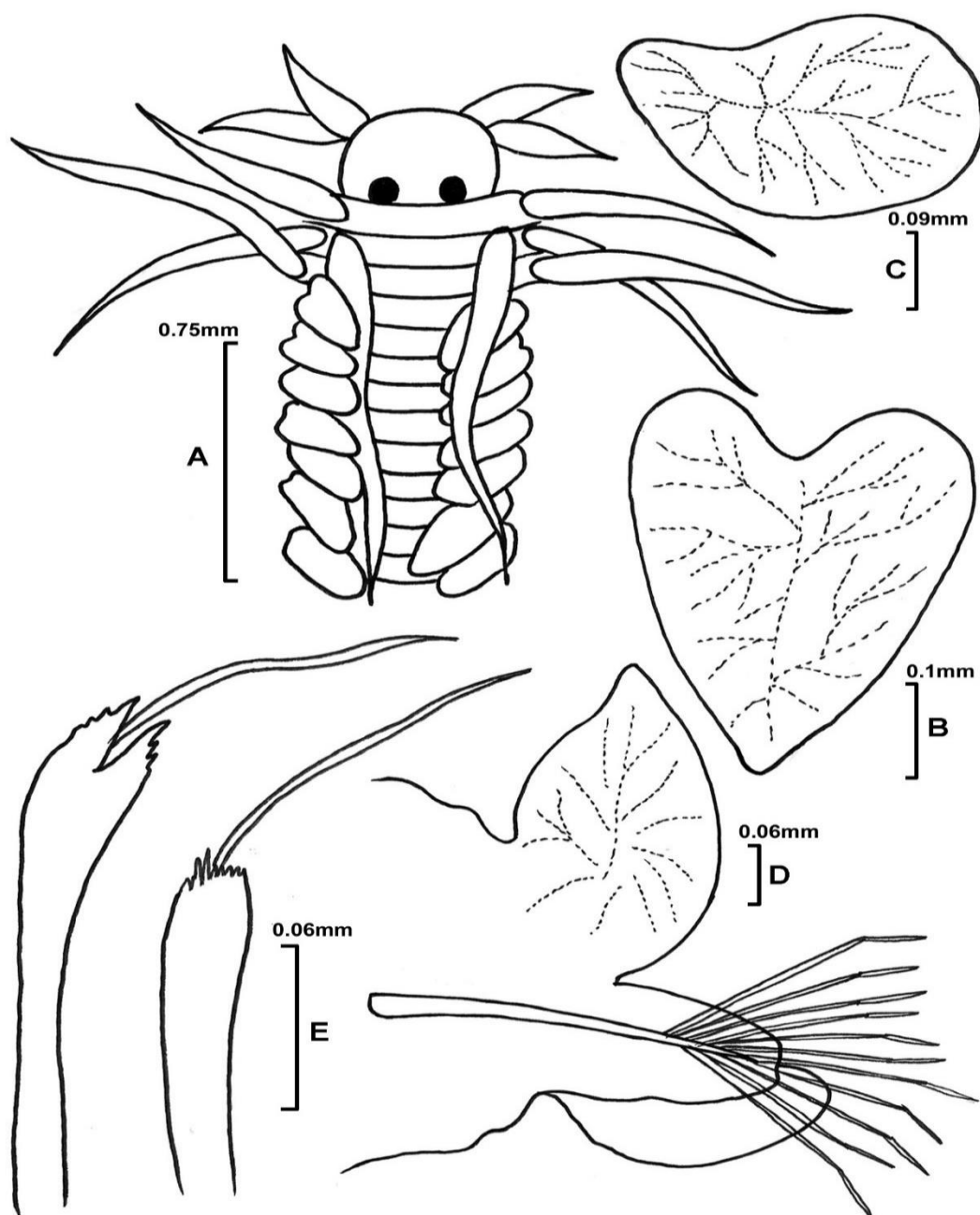
**Figure 2.** A) *Nereiphylla castanea*; B) anterior end, dorsal view; C) posterior end, dorsal view; D) ventral cirrus; E) dorsal cirrus; F) Setae, chaetiger 25, right parapodium; G) Setae, chaetiger 38, right parapodium

Neuropodium relatively short, with 2 small rounded distal lobes, ventral cirri broadly oval, larger than podial lobe and attached on posterior side of neuropodia (Figure 2D, 3C). Setae with expanded tip of shaft bearing numerous small teeth, blade unusually short, with fine denticles along one edge (Figure 2F-G, 3E). Pygidium (Figure 2C) with 2 cirri slightly flattened, 3 to 4 times longer than wide.

**Habitat:** Rocky shores found associated to bryozoan colony (*Watersipora subtorquata*).

**Type locality:** Japan (Marenzeller, 1879)

**Distribution:** Arabian Sea, Arabian Gulf, Caribbean Sea, Gulf of Mexico, Gulf of Aden, Myanmar, Madagascar, Mozambique, North Atlantic Ocean, New Zealand, Suez Canal, South Africa, South China Sea, Sri Lanka, India (Blake, 1994) and now in Pakistan.



**Figure 3.** *Nereiphylla castanea*; **A**, Anterior end, dorsal view; **B**, Dorsal cirrus; **C**, Ventral cirrus; **D**, Chaetiger 25 with dorsal and ventral cirri, right parapodium; **E**, Setae, chaetiger 25, right parapodium.

#### 4. Discussion

The current research involves a comprehensive analysis of the morphological and taxonomic characteristics of *Nereiphylla castanea* (Marenzeller, 1879) from the family Phyllodocidae (Örsted, 1843). This polychaete worm is being formally described for the first time, with specimens collected in association with bryozoan colony *Watersipora subtorquata* at Ras Juddi, Pasni, situated along the Makran coast of Pakistan in the Northern Arabian Sea.

Family Phyllodocidae comprises over 488 species in 34 genera worldwide (Pamungkas *et al.*, 2019). Only one species in the family Phyllodocidae e.g. *Eulalia viridis* (Aziz, 1938) has been reported from Pakistan so far. *Nereiphylla castanea* was originally described by Marenzeller, (1879) from Enoshima, Japan, as *Carobia castanea*. It has a wide global distribution including Indo-Pacific and Western

Central Atlantic. From Indian Ocean *Nereiphylla castanea* was reported by Fauvel (1953); Okuda and Yamada, (1954); Day, (1967); Wehe and Fiege, (2002) and Sivadas and Carvalho, (2020) and the present study expands its known distribution to Pakistan.

The shape of tentacular cirri has been a key taxonomic character in differentiating *Nereiphylla* species. According to Pleijel, (1991), this characteristic, particularly the flattening of tentacular cirri, increases in larger specimens, suggesting that this feature alone might not be sufficient for maintaining the genus's distinction. *Nereiphylla* species, including *Nereiphylla castanea*, are characterized by certain morphological features that set them apart from related genera like *Phyllodoce*. These include the shape of the prostomium, the presence or absence of a nuchal papilla, and the distribution of proboscideal papillae on the proboscis.

*Nereiphylla castanea* can be distinguished based on several characteristics from other species within the genus e.g. *N. hera*, as well as *N. crassa* recorded from East Asia. The distinguishing features of *N. acastanea* include cylindrical tentacular cirri and shorter, rounded dorsal cirri. *N. hera* differs from *N. castanea* in the morphology of its tentacular and dorsal cirri. Specifically, the tentacular cirri of *N. hera* and *N. crassa* are flattened and reach segments 4-6, while those of *N. castanea* are cylindrical and extend to segments 7-13 (Choi *et al.* 2015). Additionally, the dorsal cirri of *N. hera* are much longer than broad, whereas those of *N. castanea* are slightly longer than broad (Blake, 1994; Kato and Mawatari, 1999; Imajima, 2003). Moreover, the dorsal cirri of *N. castanea* tend to become detached from the body of fixed specimens, whereas the dorsal cirri of *N. hera* remain attached to the body following fixation (Kato and Mawatari, 1999).

The holotype of *Nereiphylla castanea*, described by (Marenzeller, 1879) as *Carobia castanea* from Japan, features a cordate prostomium and oval ventral cirri with 154 segments. Gardiner, (1976) from North Carolina noted that the lateral antennae are 1/3 the prostomial width, the prostomium is oval, longest tentacular cirri reaching chaetiger 5 and the ventral cirri are longer than the neurochaetal lobe. Salazar-Vallejo, (1996) from the Grand Caribbean described specimens as 11 mm long and 1.2 mm wide, including the setae, with about 75 setigers. These specimens have large eyes, 1/4 the prostomial width, tapered lateral antennae, and ventral cirri as long as the neurochaetal lobe. According to Blake, (1997) from California, the tentacular cirri are round with weakly compressed dorsal cirri on segments 2 and 3 that are not greatly flattened. The longest tentacular cirri reach segments 8-9, and the lateral antennae are longer than the prostomial width. Alós, (2004) from the Iberian Peninsula observed that the longest tentacular cirri reach segment 7, the prostomium has an entire posterior margin, and the dorsal cirri are reddish to orange brown. *N. castanea*, from Korean waters with tentacular cirri cylindrical, reaching to segment 7-13; dorsal cirri slightly longer than width (Choi *et al.* 2015). The present specimens agree well with previous descriptions with cylindrical tentacular cirri with dorsal tentacular cirri of segment 2 longest, extending posteriorly for about segments 10, reddish heart-shaped dorsal cirri and ventral cirri broadly oval. According to Eibye-Jacobsen, (1992), the type specimen of *N. castanea* from Japan has flattened dorsal tentacular cirri on segments 2 and 3. In contrast, present specimens do not exhibit such flattening of the tentacular cirri, although they may be slightly compressed.

The primary objective of this research was to document a new record of the polychaete species *Nereiphylla castanea* from the family Phyllodocidae, at Ras Juddi, Pasni along the Makran coast which was found associated with the bryozoan colony *Watersipora subtorquata*. This comprehensive study significantly enhances the knowledge of polychaete diversity in Pakistan by adding to the known fauna of the region. The findings highlight the need for further research and suggest the potential for discovering additional new species in the area.

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**Disclosure statement:** *Conflict of Interest:* The authors declare that there are no conflicts of interest.

*Compliance with Ethical Standards:* This article does not contain any studies involving human subjects.

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