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Two New Records of Polychaetes (Annelida) from Makran Coast of Balochistan, Pakistan (Northern Arabian Sea)

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Research Article

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Abstract
The Makran coast of Balochistan (Pakistan) is rich in terms of biodiversity particularly marine invertebrates. The study based on comprehensive assessment of the morphological and taxonomical description of two polychaete species (*Eunice petersi* Fauchald, 1992 and Hesione intertexta Grube, 1878). The newly recorded polychaete species for the coast of Pakistan belong to the Eunicidae and Hesionidae families and were identified in benthic samples collected from the intertidal zone on Garyan and Bandari beaches at Jiwani of the Makran coast (Northern Arabian Sea). The descriptions, photographs, and drawings of the taxonomic characters of species and their distribution are provided. The specimens are deposited in the repository of the Marine Reference Collection and Resource Centre, University of Karachi.

Keywords: Polychaeta, new records, invertebrate, description, taxonomy

Balochistan'ın Makran Kıyısından Pakistan (Kuzey Arap Denizi) İki Yeni Poliket (Annelida) Kaydı

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Öz
Balochistan 'ın (Pakistan) Makran kıyıları biyoçeşitlilik, özellikle de deniz omurgasızları açısından oldukça zengindir. Bu çalışma, iki poliket türünün (*Eunice petersi* Fauchald, 1992 ve *Hesione intertexta* Grube, 1878) morfolojik ve taksonomik tanımlarının kapsamlı bir değerlendirmesine dayanmaktadır. Pakistan kıyıları için yeni kaydedilen poliket türleri Eunicidae ve Hesionidae familyalarına aittir ve Makran kıyısındaki (Kuzey Arap Denizi) Jiwanio'daki Garyan ve Bandari plajlarındaki gelgit bölgesinden toplanan bentik örneklerde tanımlanmıştır. Türlerin tanımları, fotoğrafları, taksonomik karakterlerinin çizimleri ve dağılımları verilmiştir. Örnekler, Karachi Üniversitesi Deniz Referans Koleksiyonu ve Kaynak Merkezi deposunda saklanmaktadır.

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Anahtar Kelimeler: Polychaeta, yeni kayıtlar, omurgasız, tanımlama, taksonomi

Introduction

The coast of Balochistan with a coastline of 645 km, stretches from the east of the Hub River to the mid of the Gwatar Bay to the west. The coast is primarily deserted, with unusual landforms such as sandy beaches, mudflats, rocky cliffs, headlands, bays, and deltas. The Balochistan coast is known for its rocky shores and cliffs at Jiwani, Pishukan, Gwadar, Pasni and Ormara with magnificent headlands. The coast of Makran is one of just a few coastlines in the world that experiences high rates of tectonic uplift and manifests interesting interactions between active sedimentation, erosion and tectonics. Jiwani is situated at Makran coast of Balochistan, in the extreme southwest, close to the border between Pakistan and Iran. The region is a genuine delegate of a dry environment. It has freshwater, desert, marine, tropical thorn forests, mangroves, and a scrub zone, among other habitats.

Over 12,000 species of polychaetes have been identified to far [1]. The family Hesionidae presently contains about 175 species in 28 genera [2], whereas the family Eunicidae currently includes 460 species and 33 genera that have been described 11 of which have been taxonomically recognised [3]. In the previous studies, the family Hesionidae only had two genera and four species, while just 12 species belonging to five genera of the Eunicidae were known to reside in Pakistan [4]. Information on the polychaete fauna of the Makran coast was lacking until when Ali *et al*. [5, 6] reported the distribution of polychaete worms from several rocky areas at the Makran coast. Polychaetes due to their extra ordinary resilience are referred as predominant metazoans in the marine benthic environment and are important representatives of the benthic macrofauna. These versatile creatures can be found in nearly all marine and estuarine sediment types [7]. They frequently dominate the macrobenthos community in terms of both species diversity and population numbers [8, 9]. Due to their diverse presence and abundance, polychaetes have frequently been employed in environmental monitoring programs to assess potential disturbances in the environment [10]. Eunicidae family stands out as one of the larger groups within Polychaeta, and its members are known to inhabit various types of substrates, including hard structures like reefs and rocks, as well as softer materials like sand [2]. Within marine benthic environments, these species primarily exhibit carnivorous or omnivorous tendencies and are equipped with well-developed jaws [11]. Their feeding habits encompass predation on different invertebrates, scavenging, and herbivorous behaviour [2]. Eunicids, in their ecological role, serve as significant contributors to coral block destruction and are instrumental in bioerosion processes. They are renowned for their ability to bore into the calcareous skeletons of hard corals using their implicated and exceptionally durable apparatus of jaws [12]. Some species within this family have been observed in association with other non-stalked invertebrates, particularly soft corals, and sponges [13], while others have specialized in the excavation of seagrass fronds [14]. Hesionids are benthic polychaetes known for

their distinctive cephalization and typically possess several anterior segments bearing long tentacular and dorsal cirri. They can vary greatly in size, with some species having small bodies, while larger ones can reach up to 55 mm in length and possess up to 80 segments. However, due to their delicate nature and diminutive size, many species of hesionids lack comprehensive descriptions [15]. Hesionidae species are commonly found in a wide range of habitats, including rocky or sandy bottoms, spanning from subtidal areas, which encompass both solid substrates and pliable sediments, to the depths of the deep sea. They are less frequently encountered in intertidal zones, except in the form of interstitial individuals [16]. They are predominantly free-living and are generally considered carnivorous or microphagous, particularly in the case of a few symbiotic formations. However, most species have limited data available [11]. *Hesione* species feature striking patterns of colour that may be sufficient to distinguish between species; however, since the pigments in these species rapidly become paler when kept in ethanol as early indicated by Grube [17], pigmentation is not a characteristic utilized for diagnosis. The present study reports two new records of Polychaeta species for the coast of Pakistan belonging to the families Eunicidae and Hesionidae collected from Garyan and Bandari beaches at Jiwani, along the Makran coast.

Materials and Methods:

Polychaetes were randomly and qualitatively collected at low tide from the intertidal zones at two stations of Jiwani, along the Makran coast [Garyan (25º00’57’’N, 61º46’40’’E) and Bandari beach (25°03’09’’N 61°44’36’’E)] (Figure 1) on 30.01.2022. Samples were obtained from study areas under rocks using forceps. After sorting benthic material, the samples were preserved with 5% formaldehyde in the field. In the laboratory, the samples were rinsed with water, and transferred into the tubes containing 70% ethanol for taxonomic studies. Measurements were recorded and photographs were taken. The samples were dissected and examined at a magnification of 10x50 using a stereo-zoom microscope (Wild 181300, Switzerland). Temporary mounts of parapodia were prepared and examined using an upright microscope (Nikon LABOPHOT-2) at 10x4and 10x10 magnifications. The specimens were identified up to the species level with the help of available literatures [18, 19, 20]. The specimens were catalogued (MRC&RC-UOK-ANNE-27; MRC&RC-UOK-ANNE-28) and deposited in the University of Karachi's Marine Reference Collection and Resource Centre repository.

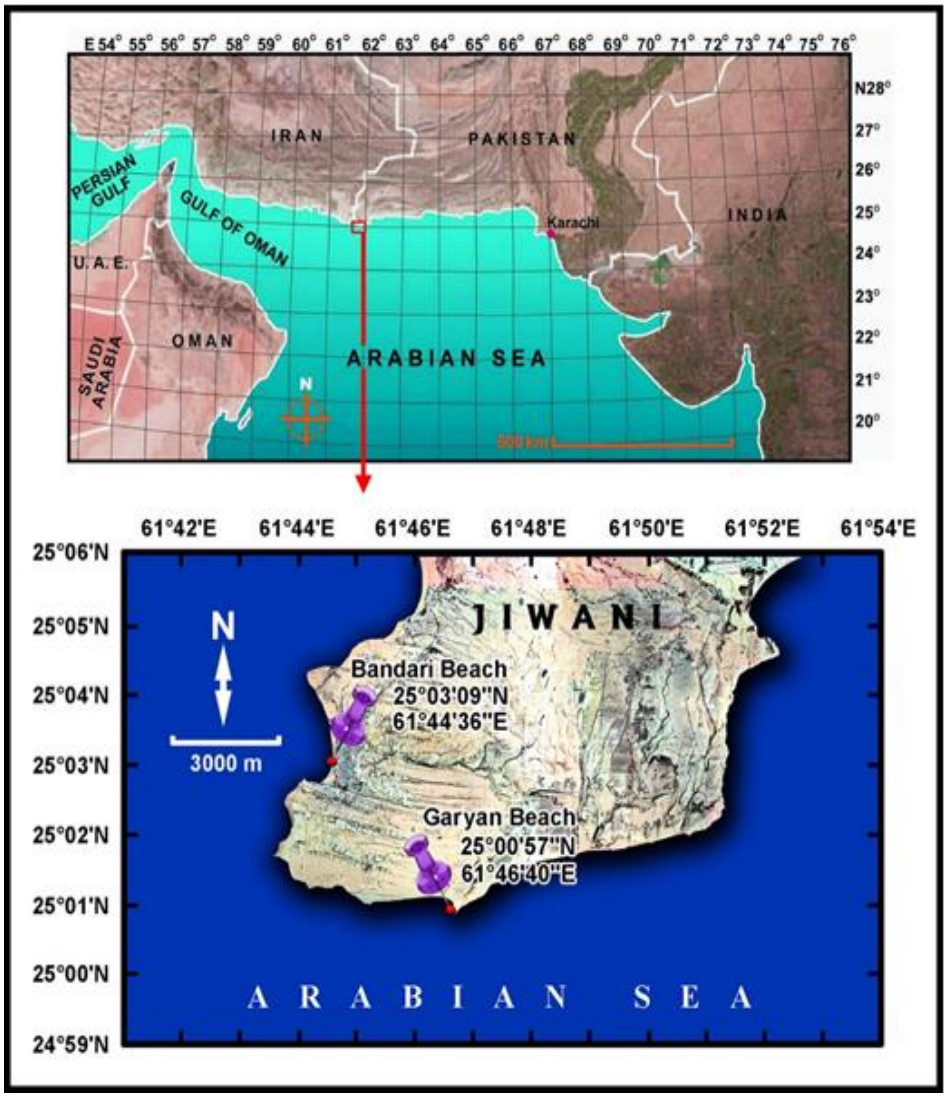

Figure 1. *Map showing study areas: [Garyan (25º00'57''N, 61°46'40''E) and Bandari Beach (25°03'09''N 61°44'36''E).*

Results

Taxonomic Account:

Class: Polychaeta (Grube, 1850)

Subclass: Errantia (Audouin & H Milne-Edwards, 1832)

Order: Eunicida

Family: Eunicidae (Berthold, 1827)

Genus: *Eunice* (Cuvier, 1817)

Species: ***Eunice petersi*** **Fauchald, 1992** (Figures 2 & 3)

Material Examined: 2 specimens, Garyan, (25º01'57''N, 61º46'38''E), intertidal rocky shores, 30.01.2022, Catalogue no: (MRC&RC-UOK-ANNE-27)

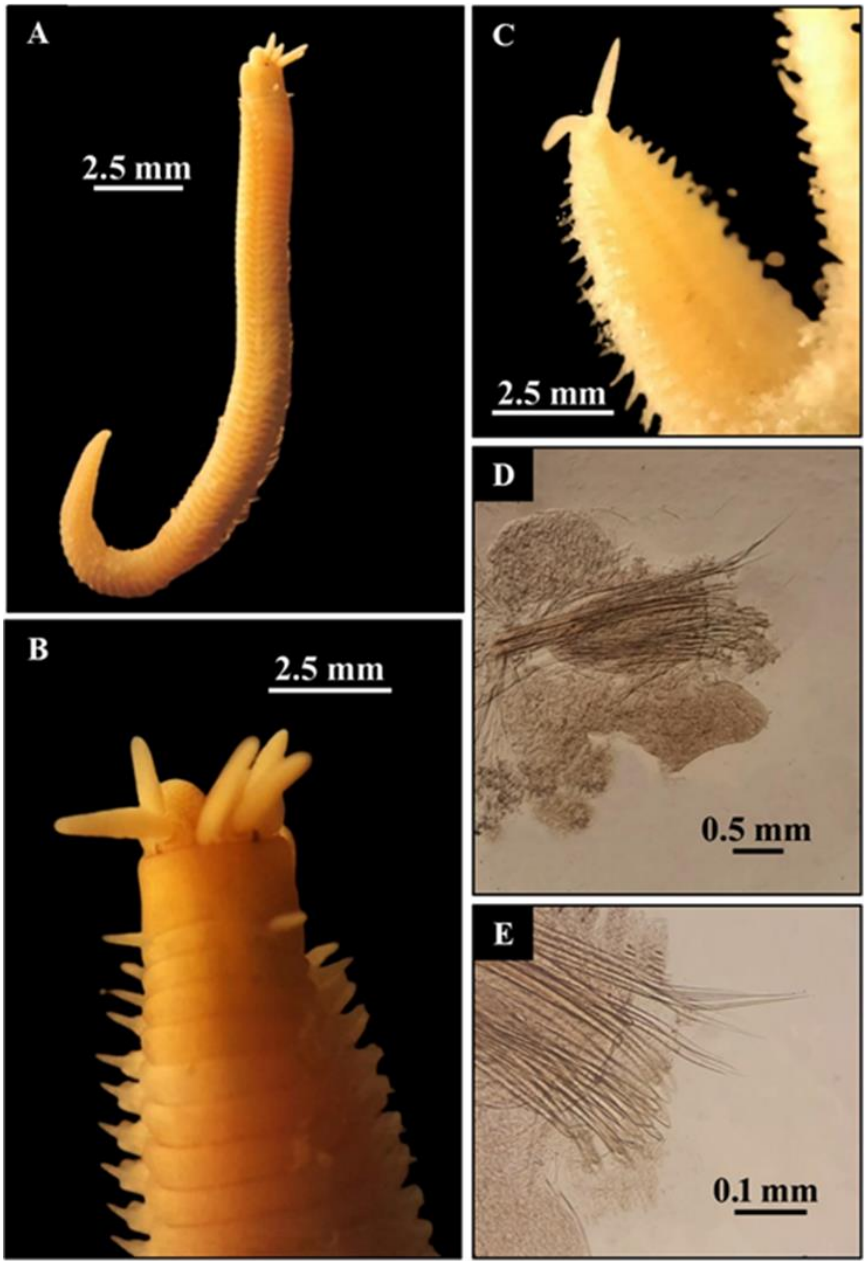

Figure 2. A. *Eunice petersi;* ***B.*** *Anterior end, dorsal view,* ***C.*** *Posterior end, dorsal view,* ***D.*** *Parapodium (chaetiger 17),* ***E.*** *Compound falciger and limbate chaetae.*

Description: Body small and cylindrical, measuring 1.5-2 cm in total length with 72-85 segments (Figures 2A, 2C) and colour creamish yellow in ethanol. Prostomium (Figures 2B, 3A) is notably shorter than peristomium and approximately as wide. Prostomial lobes frontally rounded, dorsally overstated, middle sulcus profound. Antennae in a straight line, alike in width and consistently spaced. Branchiae pectinate, clearly longer than notopodial cirri, and preliminary from chaetiger15 to chaetiger 65. Parapodium 17 (Figures 2D, 3B) with digitate chaetal lobes in anterior chaetiger, narrowing in the middle segments. Cirro style bases cylindrical, connected completely; dorsal cirri with tips mislaid, smaller than body breadth. Ventral cirri flat at the base and often ridged, medially, and distally frequently, extending further than chaetal lobes. Limbate chaeta slender, faintly flattened. Pectinate

chaeta narrowing flatly (Figure 3E). One marginal tooth longer than other teeth (Figures 2E, 3C) clearly inflates, slightly ragged or flat. Pseudo-composite falcigers and compound spinigers not present. Aciculae single, with brown cores and clear sheaths, slender, straight, and tapering with a round cross-section. Subacicular hooks (Figure 3D) with brown cores and noticeable sheaths, bidentate hooks slender, narrow, with diminutive heads. Proximal teeth bigger than distal teeth, narrowing, across directed. Distal teeth slender, distally intended obliquely.

Type locality: Indian Ocean, Mozambique.

Habitat: Rocky shores, found in crevices and areas under the rocks.

Distribution: Indo-West Pacific: Mozambique and New Caledonia; Red Sea.

Remarks: *Eunice petersi* is a new addition to the polychaete fauna of Pakistan. The present species was synonymized as *E. afra punctata* Peters, 1854 and was particularly found in the Indian Ocean. The descriptions of the species agreed with Fauchald [19].

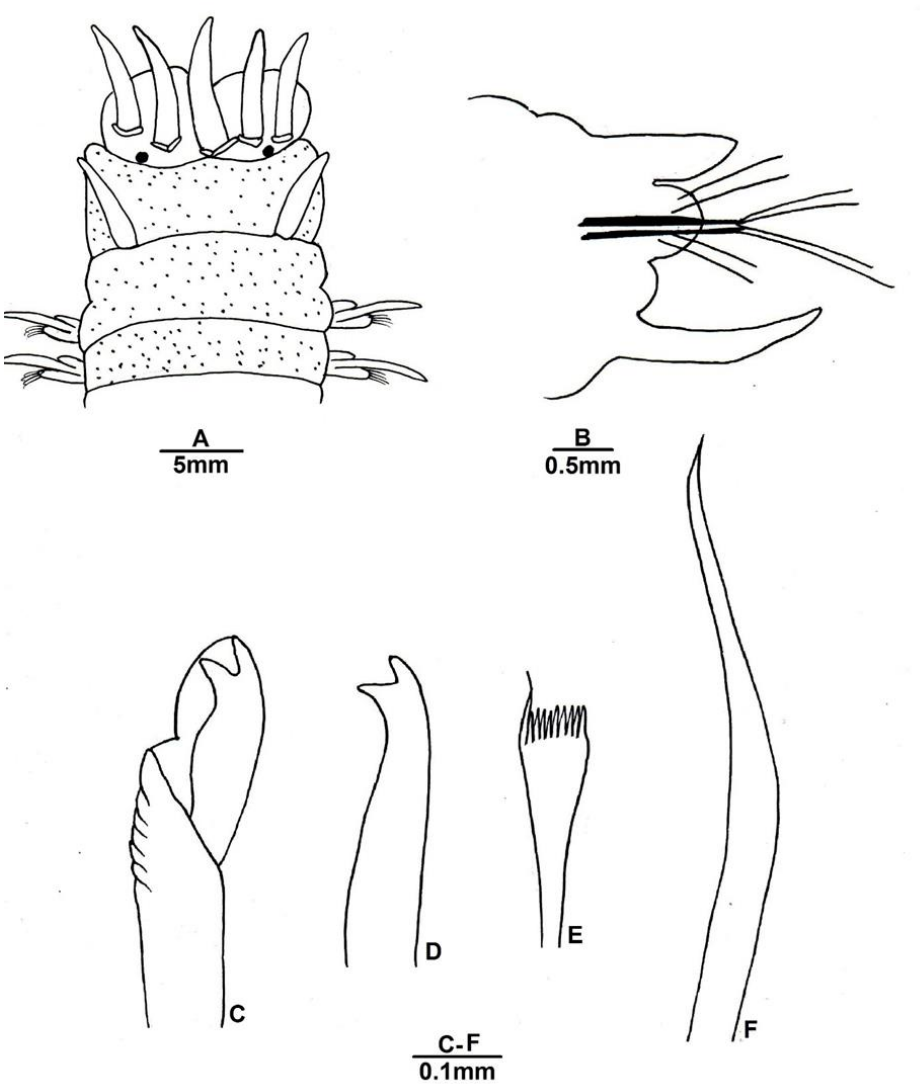

Figure 3. *Eunice petersi* ***A.*** *Anterior end, dorsal view,* ***B.*** *Parapodium (chaetiger 17),* ***C.*** *Compound falciger,* ***D.*** *Subacicular hooks,* ***E.*** *Pectinate chaeta,* ***F.*** *Limbate chaeta.*

Order: Phyllodocida

Family: Hesionidae Grube, 1850

Genus: *Hesione* Lamarck, 1818

Species: ***Hesione intertexta* Grube, 1878** (Figures 4, 5).

Material Examined: 2 specimens, Bandari (25°03’09’’N 61°44’36’’E) collected from intertidal rocky shore on 30-1-2022, Catalogue no: (MRC&RC-UOK-ANNE-28)

Description: Body slightly bent ventrally, subcylindrical, slightly tapered posteriorly measuring 5.5 and 6.0 cm in total body length, with 16 chaetigers (Figures 4A, 4D). Living specimens brownish to reddish-brown; creamish in ethanol. Pigmentation pattern with sub-continuous elongated lateral bands, along with smaller, lightly darker mid-dorsal bands intermittent by erratically oval, pale areas of equal length and width. Prostomium (Figures 4B-C, 5A) wide, with anterior margin projecting forward, rounded lateral margins, and exposed posterior margin. Antennae digitate, measuring 3-4 times their width. Frontal eyes black and brownish posteriorly; frontal eyes faintly bigger than posterior ones. Tentacular cirri entire, varying in contraction, with the longest one reaching chaetiger 5. Parapodium 8 (Figures 4E, 5B) with digitate chaetal lobes in anterior chaetiger, tapering in median segments. Cirro style bases cylindrical, expressed completely, dorsal cirri with lost tips, smaller than body width. Ventral cirriusually ridged, have a flat base, reach more distally and medially than chaetal lobes. Two neuraciculae per neuropodium; whitish in anterior chaetigers and blackish in median and posterior ones. Single, digitate to tapering acicular lobe. Neurochaetal blades bidentate (Figures 4F-H, 5C-F), with longer chaetal blades in anterior parapodia, 5-6 times their width, and shorter blades in median chaetigers, 3-4 times their width. While some anterior chaetigers' upper neurochaetae with lateral teeth and a slighter subdistal denticle that guards the distal tooth, others with lateral teeth and a lesser subdistal denticle. The posterior region tapered, narrowed into a blunt tube, with a distended pygidium, terminal anus and 12 slight anal papillae (Figure 4D).

Type locality: Western Pacific, Philippines.

Habitat: Rocky shores, found under rocks.

Distribution: New Caledonia; Philippine Islands; Australia; Arabian Sea, Indian Ocean [18].

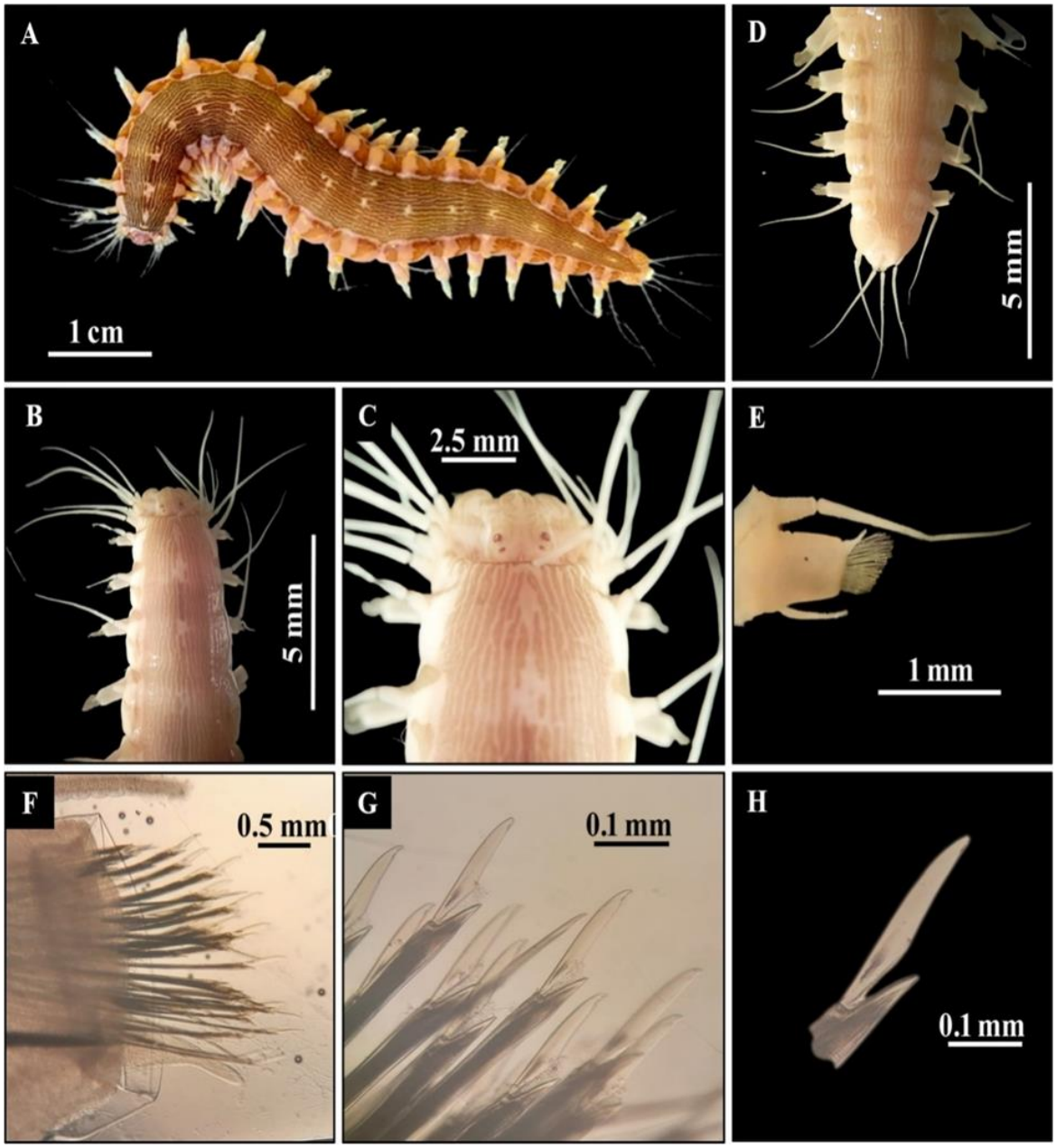

Figure 4. A. *Hesione intertexta, Live specimen,* ***B-C.*** *Anterior end, dorsal view,* ***D.*** *Posterior end, dorsal view,* ***E.*** *Parapodium (chaetiger 8),* ***F-G.*** *Neurochaetal bundle,* ***H.****Tip of neurochaetal blade.*

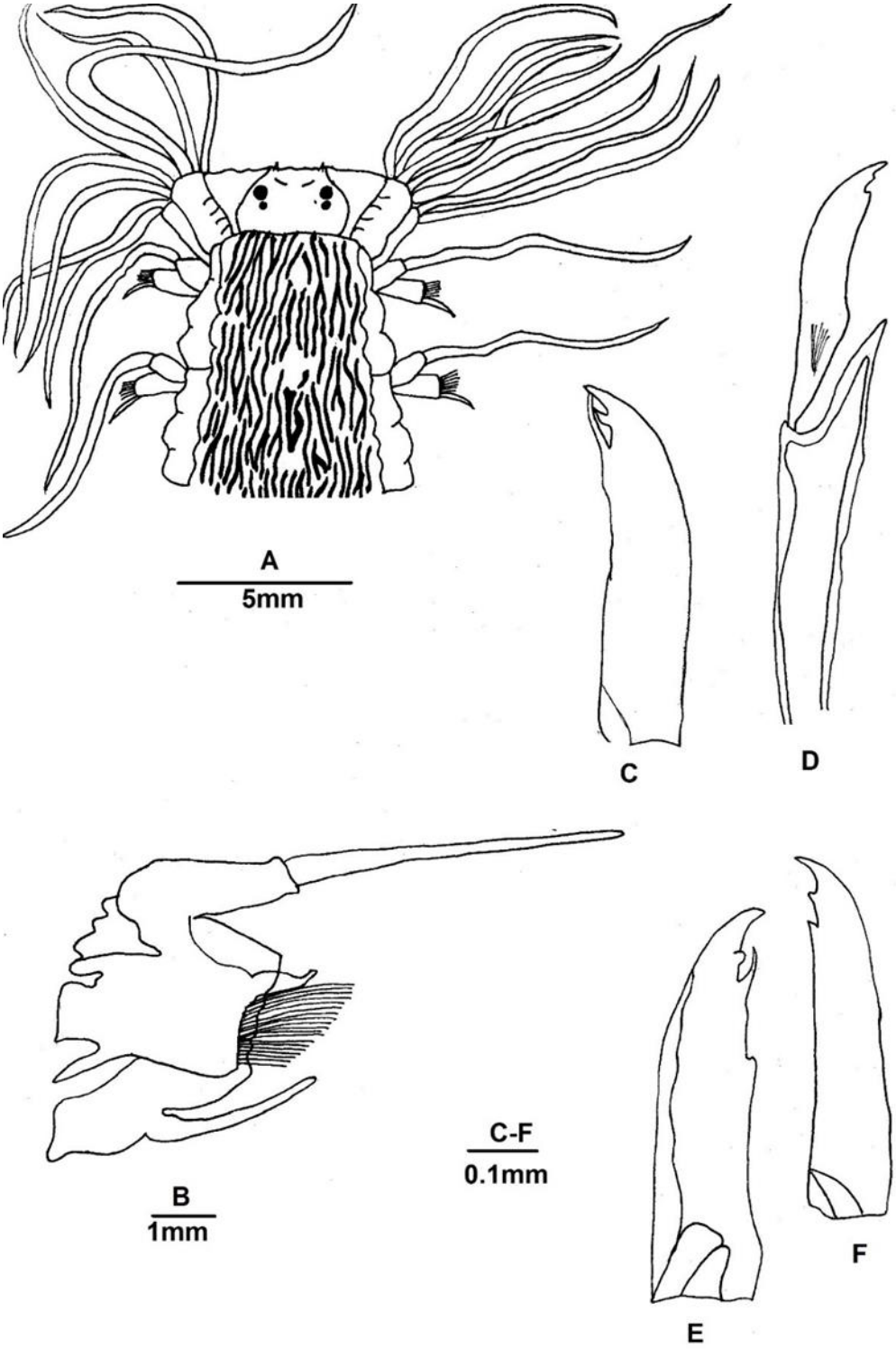

Figure 5. A. *Hesione intertexta; Anterior end, dorsal view,* ***B.*** *Parapodium (chaetiger 8),* ***C, E, F.*** *Tip of neurochaetal blades,* ***D.*** *Neurochaeta.*

Discussion

The research paper presents a detailed study based on inclusive assessment of the morphological and taxonomical descriptions of *Eunice petersi* and *Hesione intertexta* belonging to the families Eunicidae and Hesionidae, respectively, collected for the first time from Garyan and Bandari beach of Jiwani,

along Makran coast, Balochistan (Northern Arabian Sea). There have been several reports of the genus *Eunice* worldwide. Only two species of genus *Eunice* (*Eunice manorae* Aziz, 1938 and *Eunice indica* Kinberg, 1865) have been reported from Pakistan [21]. According to the World Register of Marine Species (WoRMS) [22] *E. petersi* is now valid name for the *E. afra punctata*. In 1957, Day [23] categorized *E. punctata* as a subspecies of *E. afra* (Peters, 1854). However, Fauchald, [19] renamed *E. punctata* to *E. petersi* due to its status as a junior secondary homonym to *E. punctata* (Risso, 1826) and recognized it as a valid species. *Eunice petersi* pays tribute to the scientist who described a highly valuable and early collection from its type locality Mozambique. *Eunice afra punctata* was also comparatively examined by many scientists [21-24]. Based on Fauchald's holotype, the specimens of Arabian Sea agree well with the descriptions of *E. petersi* [19]. The specimen's branchial distribution reported by Day, [23] from South Africa started from the 15th-17th chaetigers, Miura [25, 26] from Ishigaki Island and Veeramuthu *et al.* [27] from Great Nicobar Islands discussed that the first branchia occurs on chaetiger 16 whereas Fauchald [19] reported branchia from chaetiger 13 to chaetiger 200. The present studied specimens correspond to Day, [23] in terms of branchial distribution starting from chaetiger 15. According to Fauchald [19] and Veeramuthu *et al.* [27] the specimens had distally rounded guards on the bidentate compound falcigers which are similar the present observations. The genus *Hesione* has several nominal species found all over the world, the first of which is *Hesione splendid* Lamarck, 1818 from the Red Sea [28]. Only two species of the genus *Hesione* have been documented from Pakistan, including *H. splendida* and *H. pantherina* Risso, 1826 [21]. The type locality of *H. intertexta* is Philippines, Western Pacific and it was also recorded from Gulf of Mannar, Arabian Sea [18]. *Hesione intertexta* was comparatively examined by [17, 18, 20, 29, 30]. Species from similar forms, including *H. splendida*, *H. pantherina*, *H. intertexta* and *H. ceylonica* Grube, 1874 involve the colour pattern on the dorsal surface. *Hesione pantherina* and *H. intertexta* have longitudinal lines, whereas bright greyish in *H. splendida*, transverse bands, as in *Hesione genetta* Grube, 1866 long and wide pale patches, as in *H. ceylonica*, and middorsal oval to foliose. *Hesione pantherina* and *H. intertexta* differ in the size of the neurochaetal guards in relation to the teeth of blades, which gets close to *H. intertexta* apical tooth and *H. pantherina* subapical tooth. The examined specimen matches the descriptions of *H. intertexta* based on the holotype by [17, 18, 20]. Grube [17] highlighted how the original description and images combined longitudinal pigment lines with transverse annulations or striae. Usually connected to dorsal surfaces, these characteristics do not extend to lateral cushions; yet, in the original description of *H. intertexta*, even the lateral cushions appear to be granular in texture as opposed to smooth texture. Recent illustrations by Lee and Ong [30] established to each of these characteristics.

Documenting new records of Eunicidae and Hesionidae polychaete inhabiting unexplored locations along the Makran coast was the main goal of this research endeavour. This comprehensive investigation has produced an invaluable compilation of information about the distribution and character of the

polychaete fauna on the Makran coastal areas, which is a noteworthy accomplishment. These results emphasize the necessity of more research and the possibility of identifying new species in the area.

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Authors Contribution All authors read and approved the final manuscript.

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