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Diversity of Polychaetes in India and Its Importance in Aquaculture

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Polychaetes, also called bristle worms, belong to the phylum Annelida and class Polychaeta. They are generally identified based on the presence of numerous bristles and have segmented bodies, with each segment possessing a pair of appendages called parapodia. They also exhibit bilateral symmetry (Murugesan and Swain, 2025). They constitute around 80% of the overall macro benthic population and ingest both organic and meiobial materials as well as microbial food particles (Shou et al., 2009). They play important ecological roles in marine ecosystems and are widely recognized as indicators of environmental change (Murugesan & Swain, 2025).

Polychaetes are present worldwide in almost all estuaries and sea beds at various depths where they serve as a major food source for benthic fishes and play a vital role in the population of planktons, finfish and shellfish (Parulekar et al., 1980). They are preferred as food by snails, crustaceans, fish, and birds, and thus form an essential component of the complex food chain both in their adult as well as larval stages (Willey 1905). Additionally, bioactive compounds extracted from polychaetes have been reported to possess antimicrobial properties (Wu et al., 2021).

Taxonomic Diversity and Species Richness of Polychaetes in India

According to the World Register of Marine Species (WoRMS), 12,299 recognised species of polychaetes have been identified worldwide (Read and Fauchald, 2022). In India, Balakrishnan et al. (2024) reported a total of 762 species belonging to the class Polychaeta, representing 12 orders and approximately 63 families (Table 1). Among these, the order Phyllodocida is the most species-rich, comprising 24 families and 334 species. This is followed by the order Terebellida, which includes 8 families and 92 species, and Eunicida, with 5 families and 86 species. In contrast, orders such as Amphinomida, Tubificida, Echiuroidea, and Myzostomida are represented by relatively few species.

Table 1. Details of the polychaete species available in India under the class Polychaeta (Balakrishnan et al., 2024)

Class	Order	Family	No. of species
Polychaeta	Phyllodocida	Acoetidae	8
		Aphroditidae	9
		Chrysopetalidae	7
		Goniadidae	12
		Glyceridae	14
		Hesionidae	13
		Microphthalmidae	12
		Iospilidae	1
		Lopadorrhynchidae	4
		Nephtyidae	15
		Nereididae	84
		Paralacydoniidae	3
		Phyllodocidae	29
		Polynoidae	31
		Sigalionidae	20
		Syllidae	32
		Pilargidae	11
		Typhloscolecidae	1
		Tomopteridae	1
		Lopadorrhynchidae	1
		Sigalionidae	1
		Iphionidae	2
		Sphaerodoridae	2
		Eulepethidae	2
	Eunicida	Eunicidae	37
		Lumbrineridae	18
		Oenonidae	3
		Onuphidae	20
		Dorvilleidae	8
	Spionida	Trochochaetidae	2
	Sabellida	Sabellidae	27
		Serpulidae	36
		Fabriciidae	5

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	Spionida	Spionidae	38
		Poecilochaetidae	2
	Amphinomida	Amphinomidae	21
		Euphrosinidae	3
	Terebellida	Cirratulidae	25
		Flabelligeridae	12
		Pectinariidae	7
		Sternaspidae	2
		Trichobranchidae	2
		Terebellidae	35
		Ampharetidae	7
		Melinnidae	2
	Tubificida	Naididae	2
	Echiuroidea	Thalassematidae	1
	Myzostomida	Myzostomidae	3
	NA	Sabellariidae	13
		Arenicolidae	4
		Maldanidae	17
		Oweniidae	3
		Capitellidae	19
		Cossuridae	4
		Magelonidae	7
		Opheliidae	13
		Travisiidae	1
		Scalibregamtidae	4
		Chaetopteridae	7
		Paraonidae	13
		Orbiniidae	15
		Polygordiidae	2
		Protodrolidae	2
		Saccocirridae	4
		Longosomatidae	1

Analysis of species richness further reveals that several polychaete families dominate the dataset. Among them, Nereididae is the most species-rich family with 84 species and is widely recognized as a dominant group in intertidal habitats. Other families with high species

representation include Spionidae (38 species), commonly found in sandy and muddy sediments; Eunicidae (37 species), known for their predatory behavior; Serpulidae (36 species), which are tube-dwelling filter feeders; Terebellidae (35 species), mainly sediment deposit feeders; Syllidae (32 species), consisting of small and active polychaetes; and Polynoidae (31 species), commonly referred to as scale worms. These families play a significant role in maintaining benthic biodiversity and contribute substantially to the functioning of coastal ecosystems.

In contrast, several families show very low species representation, with only one or two species recorded. These include Iospilidae, Typhloscolecidae, Tomopteridae, Travisiidae, and Longosomatidae. The limited occurrence of these families may be attributed to their rarity, specialized ecological requirements, or limited sampling efforts in certain habitats.

The predominance of orders such as Phyllodocida, Eunicida, and Terebellida suggests that the coastal habitat supports a highly diverse benthic community composed of multiple trophic groups. These include predatory polychaetes such as Eunicidae and Glyceridae, deposit feeders like Terebellidae and Cirratulidae, filter feeders such as Sabellidae and Serpulidae, and burrowing detritivores including Capitellidae and Maldanidae. The presence of these diverse feeding guilds indicates high ecological productivity and considerable heterogeneity in the sediment environment.

Overall, the data indicate that Nereididae is the most species-rich family, while Phyllodocida represents the most diverse order in terms of family representation. The occurrence of several families with very low species numbers also suggests the presence of rare or habitat-specific taxa. Furthermore, the coexistence of tube builders, burrowers, and active predators highlights the presence of a complex and well-structured benthic food web within the coastal ecosystem.

Role of polychaete in aquaculture

Due to their high protein content, polychaetes are considered a valuable source of live feed in the aquaculture industry (Murugesan and Swain, 2025). Species such as *Perinereis* sp. and *Marphysa* sp. are widely used as broodstock feed in the shrimp industry because of their rich nutritional composition, which enhances growth, maturation and reproductive performance of cultured shrimp.

coastal and estuarine environments. It belongs to the family Nereididae. The worms under this family are an excellent source of polyunsaturated fatty acids (PUFAs), especially omega-3 fatty acids and are often referred to as “omega worms” (Murugesan et al., 2011).

Owing to its rich biochemical composition, it is considered a valuable live feed resource in aquaculture.

Previous studies by Jayaseelan et al. (2021) have shown that *P. cultrifera* possesses high nutritional quality, with a moisture content of about 5.60 g and a high protein content of 53.62 g, indicating its potential as a protein-rich feed organism. The species also contains total fatty acids of 11.99 g, with saturated fatty acids predominating over monounsaturated and polyunsaturated fatty acids. In addition, it has a moderate ash content (10.91 g) and a comparatively higher carbohydrate content (17.53 g). The amino acid profile reveals that essential amino acids are present in higher proportions than non-essential amino acids, particularly lysine, arginine, and isoleucine, which are important for growth and metabolism in aquatic organisms (Jayaseelan et al., 2021). Furthermore, the species contains appreciable amounts of vitamins A, B_1, and E, while vitamin C occurs in smaller quantities, and chloride is the dominant mineral component (Jayaseelan et al., 2021). These nutritional attributes highlight the significance of P. cultrifera as a promising natural feed resource for aquaculture. Perinereis cultrifera is a nutritionally important polychaete species widely distributed in Marphysa gravelyi, commonly known as the mud worm, is a polychaete belonging to the family Eunicidae and is widely distributed in the brackishwater ecosystems of India. It is known for its rich biochemical and nutritional composition. Kannappan et al. (2020) reported that the nutrient profile of adult M. gravelyi revealed protein, carbohydrate and lipid to be 33, 14 and 40 g% respectively. They also mentioned that it contains a variety of fatty acids, with α-linolenic acid and linolenic acid being the most dominant, along with oleic, stearic and palmitic acids. The species is also characterized by a high content of amino acids, including ten essential and eight non-essential amino acids. Among the essential amino acids, leucine and lysine are present in higher concentrations, while cysteine and proline are the major non-essential amino acids. In addition, M. gravelyi contains important trace elements such as calcium, magnesium, sodium, potassium, copper and chromium. Biochemical screening has revealed the presence of carbohydrates, proteins, fats and oils, as well as phenolic and flavonoid compounds that contribute to its antioxidant properties. Extracts of M. gravelyi have also demonstrated antibacterial activity against several bacterial species, highlighting its potential nutritional and bioactive significance (Kannappan et al., 2020). Due to these characteristics, the genus Marphysa has been recognized as a potential candidate for commercial aquaculture due to its ecological and economic importance (Mandario, 2020; Pombo et al., 2018).

Conclusion

Polychaetes are ecologically significant benthic organisms that play an important role in marine and estuarine ecosystems through nutrient cycling, sediment turnover and their position in the aquatic food web. Their high species diversity in Indian coastal waters reflects the richness and complexity of benthic communities. In addition to their ecological importance, several polychaete species possess high nutritional value, including rich protein, essential amino acids and fatty acids, making them valuable live feed in aquaculture, particularly for shrimp broodstock nutrition. Therefore, polychaetes represent an important biological resource with both ecological and economic significance, highlighting the need for further research and sustainable utilization.

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