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SHORT COMMUNICATION

A Report on Penaeid Prawn Diversity in Digha Coast, Bay of Bengal, India

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Abstract: Prawn community in the coastal habitat of Digha is predominantly composed of the family Penaeidae. The present study evaluates the diversity of Penaeidae species in the Digha coast. Penaeidae species were obtained from the Digha Coast between January 2022 and January 2024. A total of 26 species from 8 genera were documented from the Digha Coast and five species represent the first observation from the study area. The Penaeid prawn diversity in Digha Coast, West Bengal of India is substantial. This study will provide valuable insights for prawn fisheries managers and researchers in the study region.

Anahtar kelimeler:

Çeşitlilik
Digha sahili
Penaeid karides
Rapor
Batı Bengal

Digha Kıyısı'ndaki (Bengal Körfezi, Hindistan) Penaeid Karides Çeşitliliği Üzerine Bir Rapor

Öz: Digha kıyı habitatındaki karides topluluğu, ağırlıklı olarak Penaeidae familyasından oluşmaktadır. Bu çalışma, Digha kıyısında Penaeidae türlerinin çeşitliliğini değerlendirmektedir. Penaeidae türleri, Ocak 2022 ile Ocak 2024 arasında Digha Kıyısı'ndan toplanmıştır. Toplamda, Digha Kıyısı'ndan 8 cinsten 26 tür belgelenmiştir ve bunlardan 5 tür, çalışma alanından ilk kez gözlemlenmiştir. Batı Bengal, Hindistan'da Digha Sahili'ndeki Penaeid karides çeşitliliği oldukça zengindir. Bu çalışma, bölgedeki karides balıkçılığı yöneticileri ve araştırmacıları için değerli bilgiler sunacaktır.

Introduction

India's marine and coastal habitats harbours significant natural resources that support the livelihoods of millions of people living in coastal areas. Among a myriad of aquatic organisms, crustaceans have a significant impact on the structure and function of tropical ecosystems in benthic communities, as stated by Hendrickx (1995). Decapod crustaceans, in particular, are a significant source of shellfish and play a crucial role in connecting benthic microorganisms with higher vertebrates in the coastal food chain and food web (Trayer et al., 1984, Huh and An, 1997). Penaeid prawns constitute about 70% of the global prawn catch, and their nutritional value contributes significantly to a thriving commerce and export industry in India (FAO, 2008). Penaeid prawns have rapid growth and have a relatively short lifespan (Rao et al., 2013). Their life cycle typically lasts one year (Rao et al., 2013). The majority of aquaculture is primarily focused on Penaeid prawns, particularly those belonging to the genus *Penaeus* (Rath et al., 2016). This is due to their ease of cultivation

from eggs, rapid growth rate, and high population numbers (Chanda 2016). The fishing industry generates the highest amount of foreign currency, serving as the primary source of income for millions of individuals engaged in direct or indirect fishing-related activities (Rashed-Un-Nabi & Ullah, 2012). The Penaeid prawns that are crucial for industrial fishing along the Indian coast are also present along the Digha Coast, as documented by Chanda (2002, 2014). Digha coast in West Bengal is widely recognized for its extensive beaches that sustain a wide range of aquatic animals. It is located in the Purba Medinipur district, situated at the northernmost point of the Bay of Bengal (21°38'18"N and 87°30'35"E). In the Digha Coast, Penaeidae consists of 8 genera and 26 species (Chanda, 2014). Chanda and Bhattacharya (2002) identified and documented three previously unknown species of prawn from the waters of India. Siva Rama Krishnan (2012) has provided a description of the survey conducted on trawl fishing of Penaeid prawns at the Northern Mandapam

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Coast of Palk Bay. Radhakrishnan (2012) published a comprehensive list with explanatory notes of the Penaeoid, Sergestoid, Tenopoid, and Caridean prawn species found in India. In addition to these, numerous taxonomic studies have been conducted on the group, including those by Fischer and Bianchi (1984), Paulinose (1986), Achuthankutty and Parulekar (1986), Reddy (1995), Pathan and Jalihal (1997), Chanda and Bhattacharya (2002, 2003, 2004, 2009, 2014), Chanda and Roy (2004, 2005), Chanda (2015), Kunju (1967), and Kurian (1993). The aim of this study is to report the diversity of penaeid species found along the Digha Coast between January 2022 to January 2024.

Material and Methods

Study area

The Digha Coast is situated in the Purba Medinipur district of West Bengal. The route extends from Udaipur to Shankarpur. The study was undertaken at four separate study sites: Udaipur (87° 29' 5.751" 21°37'0.994"N), Old Digha (87°31'24.95"E, 21°37'25.621"N), Digha Mohana (87°32'35.898"E, 21°37'48.21"N), and Shankarpur (87°34'17.149"E, 21°38'29.327"). These locations are depicted in Figure 1.

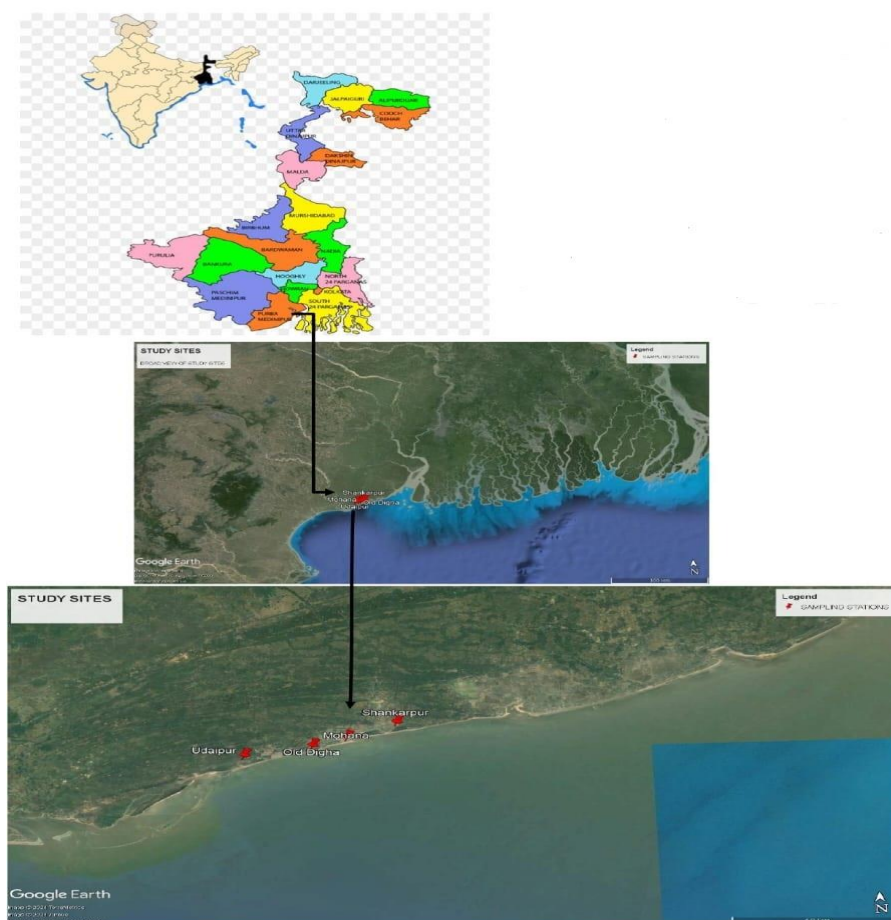


Figure 1. Study area and sampling stations.

Specimens Collection

The samples were collected on a monthly basis during the pre-monsoon, monsoon, and post-monsoon periods in the early morning throughout the study period from January 2022 to January 2024. Prawn samples were obtained from each site through shore fishing (gillnet), trawl fishing, and fish landing centers.

Preservation

The collected samples were kept in a formalin solution with a concentration of 2-4% and were properly catalogued in the laboratory of Raja N.L. Khan Women's College (Autonomous) to ensure accurate identification.

Identification

The specimens in the laboratory were identified, classified by sex, and different taxonomical parameters were measured for easy identification. The overall length was determined by measuring from the tip of the rostrum to the end of the telson, the carapace length was measured from the posterior margin of the orbit to the posterior-median margin of the carapace, and the total weight was measured as wet weight. The identification and categorization of all species were based on Alcock's (1901, 1905 and 1906), FAO species identification sheet (1984), Farfante & Kensley (1997), Flegel (2007 & 2008), and Ma

et al., (2011). The WoRMS Register has been used to verify the valid genus and species name.

Results

In the present study twenty-six penaeid prawn species from eight genera were identified, with *Parapenaeopsis coromandolica* (Alock,1906), *Metapenaeus lysianassa* (De Man,1888), *Helleropenaeopsis sculptilis* (Heller,1862), *Parapenaeopsis stylifera* (H. Milne Edwards, 1837), and *Metapenaeus brevicornis* (H. Milne Edwards,1837) being the most abundant species. Other species present includes *Helleropenaeopsis hardwickii* (Miers,1878), *Kishinouyepenaeopsis maxillipedo* (Alock,1905), *Megokris granulatus* (Haswell,1879), *Metapenaeopsis toloensis* Hall,1962, *Metapenaeus dobsoni* (Miers,1878), *Metapenaeus elegans* De Man,1907, *Metapenaeus ensis* (De Haan,1844), *Metapenaeus stebbingi* Nobili,1904, *Penaeus monodon* Fabricius,1798, *Penaeus japonicus* Spence Bate,1888, *Penaeus semisulcatus* De Haan,1844, *Penaeus latisulcatus* Kishinouye,1896, *Penaeus indicus*

H.Milne Edwards,1837, *Penaeus merguensis* De Man,1888, *Alockpenaeopsis uncta* Alcock,1905, *Metapenaeus monoceros* (Fabricius,1798), *Metapenaeus affinis* (H. Milne Edwards,1837), *Metapenaeus stridulans* (Alock,1905), *Kishinouyepenaeopsis cornuta* (Kishinouye,1900), *Penaeus penicillatus* Alock,1905, *Penaeus canaliculatus* (Olivier,1811). The information regarding various species of the Penaeidae family, observed from January 2022 to January 2024 along the Digha Coast, is presented in Figure 2 and Table 1. In this study, several prawn species that had not been previously reported and observed in Digha, such as *Metapenaeopsis toloensis* Hall, 1962, *Metapenaeus elegans* De Man, 1907, *Metapenaeus stebbingi* Nobili, 1904, *Penaeus latisulcatus* Kishinouye, 1896, and *Kishinouyepenaeopsis cornuta* (Kishinouye, 1900) are reported for the first time. The distinctive morphological characteristics of the newly reported species collected from Digha coast are outlined in Table 2.

Table 1. List of prawn species of Digha Coast collected during January 2022 – January 2024

Genus	Species	Common Name
1. <i>Helleropenaeopsis</i>	1. <i>Helleropenaeopsis sculptilis</i> (Heller,1862)	Rainbow shrimp
	2. <i>Helleropenaeopsis hardwickii</i> (Miers,1878)	Spear shrimp
2. <i>Parapenaeopsis</i>	3. <i>Parapenaeopsis coromandolica</i> (Alock,1906)	Coromandel shrimp
	4. <i>Parapenaeopsis stylifera</i> (H.Milne Edwards, 1837)	Karikkadi shrimp
3. <i>Kishinouyepenaeopsis</i>	5. <i>Kishinouyepenaeopsis maxillipedo</i> (Alock,1905)	Torpedo shrimp
	6. <i>Kishinouyepenaeopsis cornuta</i> (Kishinouye,1900)	Coral shrimp
4. <i>Megokris</i>	7. <i>Megokris granulatus</i> (Haswell,1879)	Coarse shrimp
5. <i>Metapenaeopsis</i>	8. <i>Metapenaeopsis toloensis</i> Hall,1962	Tolo velvet shrimp
6. <i>Metapenaeus</i>	9. <i>Metapenaeus lysianassa</i> (De Man,1888)	Bird shrimp
	10. <i>Metapenaeus brevicornis</i> (H.Milne Edwards,1837)	Yellow shrimp
	11. <i>Metapenaeus dobsoni</i> (Miers,1878)	Kadal shrimp
	12. <i>Metapenaeus elegans</i> De Man,1907	Fine shrimp
	13. <i>Metapenaeus ensis</i> (De Haan,1844)	Greasyback shrimp
	14. <i>Metapenaeus stebbingi</i> Nobili,1904	Peregrine shrimp
	15. <i>Metapenaeus stridulans</i> (Alock,1905)	Fiddler shrimp
7. <i>Alcockpenaeopsis</i>	16. <i>Metapenaeus monoceros</i> (Fabricius,1798)	Speckled shrimp
	17. <i>Metapenaeus affinis</i> (H. Milne Edwards,1837)	Jinga prawn
8. <i>Penaeus</i>	18. <i>Alockpenaeopsis uncta</i> Alcock ,1905	Uncta shrimp
	19. <i>Penaeus merguensis</i> De Man,1888	Banana prawn
	20. <i>Penaeus japonicus</i> Spence Bate,1888	Kuruma prawn
	21. <i>Penaeus semisulcatus</i> De Haan,1844	Green tiger prawn
	22. <i>Penaeus latisulcatus</i> Kishinouye,1896	Western king prawn
	23. <i>Penaeus indicus</i> H.Milne Edwards,1837	Indian prawn
	24. <i>Penaeus penicillatus</i> Alock,1905	Redtail prawn
	25. <i>Penaeus canaliculatus</i> (Olivier,1811)	Witch prawn
	26. <i>Penaeus monodon</i> Fabricius,1798	Giant tiger prawn



Figure 2. Photographs of Penaeidae species collected during January 2022 – January 2024 from Digha Coast



Figure 2 continued. Photographs of Penaeidae species collected during January 2022 – January 2024 from Digha Coast

Table 2. Diagnosis of newly reported prawn species obtained from Digha Coast during January 2022 - January 2024

Sl.	Penaeidae species	Diagnosis
1	<i>Metapenaeopsis toloensis</i>	Rostrum straight, dorsal teeth 9, stridulating organ with 14 small ridges in a curved at ¼ of carapace, body densely sexual maturity, asymmetrical petasma, right distoventral projection shorter with small apical processes, left distoventral projection broadly swollen, outer intermediate strip lightly shorter and subdivided distally, distomedian libule longer, thelycum subquadrate with circled.
2	<i>Metapenaeus elegans</i>	Number of dorsal teeth 9, telson arm consists of spinules and has a distomedian projection of the petasma that is directed anterolaterally. The petasma is leaf-like in shape and has a longitudinal groove.
3	<i>Metapenaeus stebbingi</i>	Number of dorsal teeth 8, telson arm consists of a row of tiny, moveable spines. The distomedian projection of the petasma has a stiff, styliform appendix that is directed forward and ventrally indented.
4	<i>Penaeus latisulcatus</i>	Number of upper rostral teeth is 12, while the number of ventral teeth is 1. The ischial spine on the first pereopod is not present. In the petasma, the distomedian projection reaches to or slightly intended the distal margins of the costae. The thelycum has an anterior process with raised anterolateral edges, forming two ringlike projections. The posterior process is triangular.
5	<i>Kishinouyepenaeopsis cornuta</i>	The rostrum is slightly sigmoidal or straight, with eight dorsal teeth. There is a basal spine on both the first and second pereopods. The petasma has long and slender horn-like distolateral projections that diverge proximally and curve inward distally. Each projection has a small dorsal spiniform process. The anterior plate of the thelycum is oval and hollow, and it is fused posteromedially with the posterior plate. The posterior plate has a pair of lateral depressions. Behind the thelycum, there is a median tuft of long setae.

Table 3. Comparative checklist of Penaeid prawn found in Digha Coast

Sl.No.	Species Name	Goswami (1992)	Chanda and Bhattacharya (2002)	Sarkar and Talukdar (2003)	Present Study (2024)
1	<i>Helleropenaeopsis sculptilis</i> (Heller,1862)	+	+	+	+
2	<i>Helleropenaeopsis hardwickii</i> (Miers,1878)	-	+	+	+
3	<i>Parapenaeopsis coromandolica</i> (Alock,1906)	+	+	+	+
4	<i>Parapenaeopsis stylifera</i> (H.Milne Edwards, 1837)	-	-	+	+
5	<i>Kishinouyepenaeopsis maxillipedo</i> (Alock,1905)	+	-	+	+
6	<i>Megokris granulosus</i> (Haswell,1879)	-	+	-	+
7	* <i>Metapenaeopsis toloensis</i> Hall,1962	-	-	-	+
8	<i>Metapenaeus lysianassa</i> (De Man,1888)	+	-	+	+
9	<i>Metapenaeus brevicornis</i> (H.Milne Edwards,1837)	+	+	+	+
10	<i>Metapenaeus dobsoni</i> (Miers,1878)	+	-	+	+
11	* <i>Metapenaeus elegans</i> De Man,1907	-	-	-	+
12	<i>Metapenaeus ensis</i> (De Haan,1844)	-	+	-	+
13	* <i>Metapenaeus stebbingi</i> Nobili,1904	-	-	-	+
14	<i>Penaeus monodon</i> Fabricius,1798	+	+	+	+
15	<i>Penaeus japonicus</i> Spence Bate,1888	-	-	+	+
16	<i>Penaeus semisulcatus</i> De Haan,1844	+	-	+	+
17	* <i>Penaeus latisulcatus</i> Kishinouye,1896	-	-	-	+
18	<i>Penaeus indicus</i> H.Milne Edwards,1837	+	+	+	+
19	<i>Alockpenaeopsis uncta</i> Alcock ,1905	+	+	+	+
20	<i>Penaeus merguensis</i> De Man,1888	-	-	+	+
21	<i>Penaeus penicillatus</i> Alock,1905	-	-	+	+
22	<i>Metapenaeus monoceros</i> (Fabricius,1798)	+	-	+	+
23	<i>Metapenaeus stridulans</i> (Alock,1905)	-	+	-	+
24	* <i>Kishinouyepenaeopsis cornuta</i> (Kishinouye,1900)	-	-	-	+
25	<i>Metapenaeus affinis</i> (H. Milne Edwards,1837)	+	+	+	+
26	<i>Penaeus canaliculatus</i> (Olivier,1811)	+	-	+	+
27	<i>Trachysalambria curvirostris</i> (Stimpson,1860)	+	-	+	-
28	<i>Atypopenaeus stenodactylus</i> (Stimpson,1860)	+	-	+	-
29	<i>Parapenaeopsis longipes</i> Alcock,1905	+	-	+	-
30	<i>Parapenaeopsis acclivirostris</i> (Alock,1905)	+	-	+	-
Total		17	11	22	26

*New report from the region

Discussion

In the present study twenty-six penaeid prawn species belonging to eight genera under Penaeidae were identified, with *Parapenaeopsis coromandolica* (Alock, 1906), *Metapenaeus lysianassa* (De Man, 1888), *Helleropenaeopsis sculptilis* (Heller, 1862), *Parapenaeopsis stylifera* (H. Milne Edwards, 1837), and *Metapenaeus brevicornis* (H. Milne Edwards, 1837) being the most abundant species (Table 1 and Figure 2). Among the 26 reported species, five species, namely *Metapenaeopsis toloensis*, *Metapenaeus elegans*, *Metapenaeus stebbingi*, *Penaeus latisulcatus*, and *Kishinouyepenaeopsis cornuta* are reported for the first time from Digha coast (Table 3). Previously, *M. toloensis*, *M. elegans* and *K. cornuta* were reported from Andaman and Andhra Pradesh coasts and *P. latisulcatus* and *M. stebbingi* were reported from the Gulf of Kutch and Maharashtra coasts of India (Chanda, 2017). The distinct morphological traits exhibited by these species are given in Table 2.

The initial investigation of marine biodiversity along the Digha coast was conducted by Goswami between 1975 and 1987 (Bharati Goswami, 1992). A total of 17 species belonging to 8 different genera of the Penaeidae family have been documented in the Digha region and its nearby coastlines (Bharati Goswami, 1992). From Digha and its nearby coasts, 11 species belonging to 6 genera of the Penaeidae family have been identified by Chanda and Bhattacharya (2002). Digha and its neighbouring coast have 22 species belonging to 8 genera of the Penaeidae family were reported by Sarkar and Talukdar (2003). Farfante and Kensley (1997) provided a comprehensive list of 26 genera that belong to the Penaeidae. Later, Flegel (2007, 2008) expressed significant doubts regarding the categorization of the genus *Penaeus* into six genera and finally Ma et al. (2011), refuted the six-genus classification of *Penaeus* and strongly suggested to retain the old *Penaeus* genus which is still the valid classification and as such, family Penaeidae has 21 valid genera. Indian waters are represented by 17 genera (Chanda, 2017) and Digha waters are represented by 26 species under 6 genera.

Conclusion

Penaeid prawns are one of the most economically significant taxa in estuaries and coastal waters, and they play an important role in regulating the structure and function of tropical ecosystems. The prawn fishery makes a considerable contribution to the national fishing sector in terms of gross output, gross revenue profits, and exports. The uncontrolled harvesting of juveniles in inshore and deep sea areas, as well as the disposal of numerous species, are diminishing Penaeidae diversity. The present study found 26 Penaeidae species from eight genera and five species represent the first observation from the study area. Fishing is a major economic component for the region investigated in the present study and is one of the most important sources of income for residents of the Digha coastal belt and the adjacent area. As a result,

conservation efforts are often adopted for Penaeidae species of the Digha coast to protect the existing Penaeidae diversity in West Bengal of India.

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Conflict of interest

The authors declare that there are no conflicts of interest.

Author Contributions

Angsuman Chanda & Arun Jana Designing, Monitoring, Communication, Reviewing; Sanchita Nayak Tripathi & Godhuli Sit- Specimen collection, Identification, Data analysis, Manuscript preparation and finally all authors discussed the results and contributed to the final manuscript.

Ethics Approval

Ethical clearance from Institutional Animal Ethics Committee (IAEC), Approval no. 16/IAEC (1)/RNLKWC/2023, dated-15/06/2023

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