First report of a hermit crab Clibanarius longitarsus (De Haan, 1849) (Crustacea: Anomura) from sunderbans, India

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Abstract
Hermit crabs play a crucial role in the mangrove ecosystem; being scavenger in nature, they help in the quick removal of dead materials to soil. Hermit crabs belong to the Decapoda and superfamily Paguridae of the subphylum Crustacea. In India a total of 114 species of hermit crabs have been recorded, of which 20 species are reported so far from West Bengal. During the recent survey at Sunderban Biosphere Reserve, a hermit crab Clibanarius longitarsus De Han, 1849 was recorded which is not hitherto reported from West Bengal. Detailed characters of the species along with the list of hermit crabs reported from West Bengal are given in this work.

Keywords: Anomura, biosphere reserve, Clibanarius, diogenidae, Lothian, sunderban

Introduction
Hermit crabs belong to the order Decapoda and superfamily Paguridae of the subphylum Crustacea. Due to the soft, non-calcified abdomen of hermit crabs, they inhabit empty molluscan shells; mainly bivalve, scaphopod shells and hollowed wooden logs (Lemaire, 1995; McLaughlin and Lemaire, 1997; Forest, 1987) [15, 10, 19], hollowed outer parts of stones (Pope, 1953; Mayo, 1973) [12], hollowed tubes of vermitid gastropods (Markham, 1977; Gherardi and Cassidy, 1994; Gherardi, 1996; Rodrigues et al., 2000) [13, 18, 17], corals (McLaughlin and Lemaire, 1993) [11] and sponges (Forest, 1987) [19]. But there are also exceptions, where fully calcified body is observed in adult hermit crabs, for example Birgus latro, (Linnaeus, 1767), commonly known as Coconut Crab, lives without inhabiting any shells as they possess fully calcified body. Worldwide there are about 1,106 species of hermit crabs reported among which the greatest number of species are in family Paguridae containing 75 genera and 542 species followed by Diogenidae containing 20 genera and 428 species; Parapaguridae containing 10 genera and 76 species; Pylochelidae containing 10 genera and 52 species; Coenobitidae containing 11 genera and 79 species; Cirolanidae containing 2 genera and 17 species (McLaughlin et al., 2010) [9]. Except Arctic and Antarctic seas hermit crabs have a wide range of distribution throughout the world from freshwater region of river mouth to mangrove intertidal swamps, corals, subtidal shores (Mostafa, 2015).

In India a total of 114 species of hermit crabs of 27 genera have been reported among which the highest number of species belong to family Diogenidae containing 11 genera and 79 species followed by Paguridae containing 7 genera and 19 species; Coenobitidae containing 2 genera and 7 species; Parapaguridae containing 3 genera and 4 species and Pylochelidae containing 3 genera and 3 species. Among the 114 species reported from India, highest number of species are found in Tamil Nadu (50 species belonging to 13 genera and 4 families) and the lowest number of species are found in the state of Maharashtra (7 species belonging to 4 genera and 2 families). Amongst the 7,156 Km long Indian coastline, east coast and Andaman and Nicobar island group is reported to be more diverse than the west coast and Lakshadweep island group (Trivedi et al., 2017; Behera et al. 2021) [2, 22].

Sunderban is considered as the largest single mangrove belt in the world which constitutes about 9,827 Km² among which 4,264 Km² is part of the Indian subcontinent. A total of 548 species of Subphylum crustacea are reported from West Bengal among which 334 species are found in the Sunderban region (Chandra, et al., 2017) [29]. A total of 16 species have been reported so far from West Bengal belonging to 5 genera and 3 families (Trivedi et al., 2017) [2]...
among which 14 species belonging to 5 genera and 3 families have been reported from Sunderban region of India (Chandra et al., 2017) [20].

**Material and Methods**

The specimens were collected from the northern part of Lothian Island Wildlife Sanctuary (88°18.696'E, 21°42.340'N), situated at the confluence of river Saptamukhi and the Bay of Bengal on 12.10.2019 (Figure 1). The specimens were obtained from the vacant shells of *Telescopium* Montfort, 1810. Specimens along with the molluscan shells were collected by handpicking and the hermit crab samples were separated, photographed and preserved in 10% Formalin – freshwater solution. In laboratory, the specimens were measured using a slide calliper with a minimum measurement capacity of 0.1mm. Specimens and the host molluscan shells were identified in the lab. Identification keys used for identification of the hermit crabs were as per Thomas, 1989 [3]. Voucher specimens are deposited in the National Zoological Collections of ZSI-Sunderban Regional Centre.

**Results**

During the survey, a total of 10 specimens were collected and they were identified to three species belonging to two genera such as *Clibanarius longitarsus* De Han, 1849; *Clibanarius infraspinatus* Hilgendorf, 1869 and *Coenobita cavipes* Stimpson, 1858. Among this, *C. longitarsus* was not hitherto reported from the Sunderban Biosphere Reserve. Details of the newly recorded species *C. longitarsus* are given below:

**Systematic account**

Phylum: Arthropoda von Siebold, 1848
Subphylum: Crustacea Brunich, 1772
Class: Malacostraca Latreille, 1802
Order: Decapoda Latreille, 1802
Infraorder: Anomura MacLeay, 1838
Superfamily: Paguroidea Latreille, 1802
Family: Diogenidae Ortmann, 1892
Genus: *Clibanarius* Dana, 1852

*Clibanarius longitarsus* (De Haan, 1849)  
Figure 2 (A, B)  
*Pagurus longitarsus* de Haan 1950, p. 211, pi. 50, fig. 3.  
*Clibanarius longitarsis* Dana 1852, p. 464; Fize and Serene 1955, pp. 83-90, fig. 1 A, B, C, pi. 3, 1, 7, 10, 13 (Synonymy).  
*Clibanarius longitarsus* de Man 1902, p. 741; Sundara Raj 1927, p. 130; Sewell and Anandale 1928 p. 695; Reddi 1935, p. 562; Gravely 1941, p. 77; Lewinsohn 1969, 18-19.

**Diagnostic characters:** Well developed carapace with spines projecting outwards and the carapace is broader at the proximal end of the body. Eye stalk is as long as the antennular peduncle. Chelipeds are equal in length; left cheliped is slightly larger than the left. Both chelipeds are with dark corneous tips. One or two rows of spines are present on chelipeds and irregularly placed spines are present on palm. Dactylus of the third walking leg is longer than the...
propodus. Ambulatory legs with two stripes; stripes are olive green or brown in colour. Antennae dull brown on olive green in colour.

Material examined: 2 ♀ and 2 juveniles, Lothian Island, Sunderban Biosphere Reserve (21°42.266’N, 88°18.703’E), 12.10.2019, Collector: Sayan Kr. Mukhopadhyay, Accession Number: ZSI/SbRC/KN 2695 (Deposited in the National Zoological Collections of ZSI-Sunderban Regional Centre).

Distribution India: Kerula, Andrha Pradesh, Odisha, Andaman and Nicobar, West Bengal (Current Study).

Elsewhere: Red Sea, Singapore, Vietnam, China, Japan, East coast of Africa.

Remarks: C. longitarsus is described here, on the basis of 2 female examples collected from Sundarban. In the present study the specimen described agress with all the descriptive characteristics described by Thomas (1989) [3]. C. longitarsus was earlier reported from the east coast of India except the coast of West Bengal. This is the first report of from Sunderban Biosphere Reserve as well as from West Bengal (India). In this study C. longitarsus specimens were collected from their natural habitat (Figure 3) and observed that they inhabit vacant shells of Telescopium spp.

Discussions and Conclusion

In India a total 114 species of hermit crabs were reported among which 20 species have been reported from West Bengal (Trivedi et al., 2017; Behera et al. 2021) [2, 22] [Table 1]. With this report, a total 15 species of hermit crabs are now reported from Sunderban as well as West Bengal. Hermit crabs ecologically play a crucial role in mangrove ecosystem. They are scavenger in nature and help in quick removal of dead materials in soil in their natural habitat. Some of the hermit crab species like Clibanarius longitarsus (De Haan, 1849) also have a propensity to accumulate heavy metals (Lyla and Khan, 2011) [14] which makes them a prospective agent for ecotoxicological survey for heavy metal toxicity. All these data thus suggest the ecological importance of hermit crabs. In India, Crustacean fauna is one of the least studied major phyla. Sunderban Mangrove is the largest single mangrove belt in the world. Mangroves are well known for their rich biodiversity. The Indian part of Sunderban is the largest mangrove ecosystem in India also. But due to lack of study of crustacean biodiversity nationwide as well as in Sunderban, a little is only known about the species present here. Worldwide 1,106 hermit crabs are reported but in India only 112 species are reported as of now, which is about 10 percent of the worldwide population of hermit crabs. This shows the lack of exploration in this group and also throws light onto the prospect of future research. Hence in future more detailed research regarding the biodiversity, distribution and behaviour of hermit crabs need to be undertaken to glean the knowledge of these conspicuous organisms and their distribution pattern in Sunderban Biosphere Reserve as well as Indian subcontinent.

Table 1: Checklist of Hermit crab Species reported from West Bengal

| Sl. No. | Family | Species | Reference |
|---------|--------|---------|-----------|
| 1       | Coenobitidae | Coenobita capivae, Stimpson, 1858 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 2       | Diogenidae | Clibanarius ciliatius, Herbst, 1791 | Alcock 1905; Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 3       | Diogenidae | Clibanarius infraspinitus, Hilgendorf, 1869 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 4       | Clibanarius olivaceus, Henderson, 1915 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 5       | Clibanarius padavensis, De Man, 1888 | Alcock 1905; Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 6       | Dardanus hessi, Miers,1884 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 7       | Diogenes alias, McLaughlin & Holthuis,2001 | Alcock 1905; Reddy 1995b [2, 5] |
| 8       | Diogenes avarus, Heller 1865 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 9       | Diogenes costatus, Henderson, 1893 | Alcock 1905; Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 10      | Diogenes castos, Fabricius,1798 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 11      | Diogenes dubius, Herbst, 1804 | Alcock 1905 [22] |
| 12      | Diogenes investigatoris, Alcock, 1905 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 13      | Diogenes miles, Herbst, 1791 | Ramakrishna et al 2003 [5, 6] |
| 14      | Diogenes planimanus, Henderson, 1893 | Reddy 1995b; Ramakrishna et al 2003 [5, 6] |
| 15      | Diogenes rectimana, Miers, 1884 | Ramakrishna et al 2003 [6] |
| 16      | Paguristes balanophilus Alcock, 1905 | Behera et al. 2021 [22] |
| 17      | Paguristes calvus Alcock, 1905 | Behera et al. 2021 [22] |
| 18      | Paguridae | Spiropagurus spiriger, De Haan, 1849 | Reddy 1995b [3] |
| 19      | Parapaguridae | Parapagurus pilosimanus Smith, 1879 | Behera et al. 2021 [22] |
| 20      | Pylochelidae | Bathycyprés macgilchristi (Alcock, 1905) | Behera et al. 2021 [22] |

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Authors Contribution

Author SKM collected, preserved and identified the specimen & prepared the draft manuscript, Author AS assisted during survey and manuscript preparation, Author SCR confird the identification and finalized the manuscript. Author CR overall coordination of the research.
Competing Interest
All the authors declare that they do not have any competing interest.

References
1. WoRMS Editorial Board. World Register of Marine Species, 2020. http://www.marinespecies.org at VLIZ Accessed 2 Nov 2020.
2. Trivedi JN, Vachhirajani KD. An annotated checklist of hermit crabs (Crustacea: Decapoda, Anomura) of Indian waters with three new records. Journal of Asia-Pacific Biodiversity. 2017;10(2):175-182.
3. Thomas MM. On a collection of hermit crabs from the Indian waters. Journal of the Marine Biological Association of India. 1989;31(1-2):59-79.
4. Ghosh AK. Hugli Matla Estuary, West Bengal. Hugli Matla Estuary, West Bengal. 1995.
5. Reddy KN. Hermit Crabs (Crustacea: Decapoda). In: Ghosh. A. K. (ed.). Hugli Matla Estuary, Wetland Ecosystem Series, 2, Zoological Survey of India, Calcutta, 1995, 199-215.
6. Ramakrishna SJ, Talukdar S. Marine invertebrates of Digha coast and some recommendations on their conservation. Records of the Zoological Survey of India. 2003;101(3-4):1-23.
7. Rahayu DL, Shih HT, Ng PK. A new species of land hermit crab in the genus Coenobita Latreille, 1829 from Singapore, Malaysia and Indonesia, previously confused with C. cavipes Stimpson, 1858 (Crustacea: Decapoda: Anomura: Coenobitidae). Raffles Bull. Zool. Suppl. 2016;34:470-488.
8. Nirmal T, Jaiswar A, Chakraborty SK, Kumar A, Kantharajan G, Nuzaba PM. New Records of Hermit Crab (Crustacea: Decapoda: Anomura) From Maharashtra Coast of India. International Journal of Current Microbiology and Applied Sciences. 2017;6:2871-2878.
9. McLaughlin PA, Tomoyuki K, Lemaitre R, Rahayu DL, Martyn EY, Low Tan SH (eds.). Annotated checklist of anomuran decapod crustaceans of the world (exclusive of the Kiwaoidea and families Chiroyiidae and Galatheidae of the Galatheoidea) - Chapter: Part I – Lithodeidea, Lomisoidea and Paguroidea. Zootaxa. Suppl. 2010;23:5-107.
10. McLaughlin PA, Lemaitre R. Carcinzation in the Anomura—fact or fiction? I. Evidence from adult morphology. Contrib. Zool. 1997;67:79-123.
11. McLaughlin PA, Lemaitre R. A review of the hermit crab genus Paguritta (Decapoda: Anomura: Paguridae) with description of three new species. Raffles Bull. Zool. 1993;41:1-29.
12. Mayo B. A review of the genus Cancellus (Crustacea: Diogenidae) with the description of a new species from the Caribbean Sea. Smithsonian. Contrib. Zool. 1973;150:1-63.
13. Markham JC. Preliminary note on the ecology of Calcinus verrilli, an endemic Bermuda hermit crab occupying attached vermetid shells. J Zool. (London). 1977;181:131-136.
14. Lyla PS, Khan SA. Patterns of accumulation of heavy metals (Copper and Zinc) in the estuarine hermit crab Clibanarius longitarsus (De Haan). Indian Journal of Geo-Marine Sciences. 2011;40(1):117-120.
15. Lemaitre R. A review of the hermit crabs of the genus Xylopogurus A. Milne Edwards, 1880 (Crustacea: Decapoda: Paguridae), including descriptions of two new species. Smithsonian. Contrib. Zool. 1995;570:1-27.
16. Hossain M. First record of the blue striped hermit crab, Clibanarius longitarsus (Decapoda, crustacea) from sunderbans mangrove forest, Bangladesh. Bangladesh Journal of Zoology. 2015;43:131-135.
17. Gherardi F. Non-conventional hermit crabs: pros and cons of sessile, tube-dwelling life in Discorsopagurus schmitti. J Exp. Mar. Biol. Ecol. 1996;202:119-136.
18. Gherardi F, Cassidy PM. Sabellarian tubes as the housing of Discorsopagurus schmitti. Can. J Zool. 1994;72:526-532.
19. Forest J. Les Pylochelidae ou Pagures symetriques (Crustacea: Coenobitoidea). Mem. Mus. Natl. Hist. Nat., Ser. A Zool. 1987;137:1-254.
20. Chandra K, Alfred JRB, Mitra B, Chowdhury BR. Fauna of Sundarban Biosphere Reserve, 2017, 179-196.
21. Alcock Anomura A, Fasce Pagurides I. Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum 2. Indian Museum, Calcutta, 1905, 197.
22. Behera A, Padhi SK, Roy S, Patro S, Mitra S. Biodiversity of hermit crabs in Odisha, east coast and their distribution in other coastal states of India. Indian Journal of Geo Marine Sciences. 2021;50(5):385-390.