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First record of a burrowing mole crab *Emerita emeritus* (Decapoda: Anomura: Hippidae) from Chilika Lake, East coast of India

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This paper provides the first information regarding the first record of a burrowing crab *Emerita emeritus* Linnaeus, 1767 (Family**:** Hippidae) from the Chilika lake. It is first ever to record mole crab from a brackish water coastal ecosystem. The extensive sandy intertidal region of outer channel area becomes the suitable habitat for the preponderance of this crab species.

[**Key words**: first record, mole crab, *Emerita emeritus* Chilika Lake]

Introduction

The Genus *Emerita* comprises of nine species[1,2,3] throughout the world. However, in India, only two species of the genus *Emerita* namely, *E. emeritus* and *E. holthuisi* have been reported. The *E. holthuisi* is exclusively observed in the west coast of India, in Kovalam beach[4,5,6] whereas the distribution of *E. emeritus* was restricted from Pondichery beach[3] and up to the Visakhapatanam coast[7]. However, review of literature described very meager information related to mole crab species in the central and northern east coast of India[8-12]. The present communication reports occurrence of *Emerita emeritus* Linnaeus, 1767 from Chilika Lake, east coast of India which is the first record from this brackish water lagoon ecosystem and further reports the range extension from south-east coast of India towards north-east coast of India.

Materials and Methods

Multiple specimens of mole crab *Emerita emeritus* were collected from the outer channel sector of Chilika lake (19°20'13.06" - 19°54'47.02" N and 85°06'49.15" - 85°35'32.87" E) on 25th May 2014 during the regular lake monitoring program. The outer channel sector of Chilika is a crisscross channel of 32 km long. It connects the Bay of Bengal through couple of lagoon inlets and exhibits marine conditions throughout the year except monsoon. The lake receives the marine water through tidal incursion semi-diurnally. It is also acted as a exchange of materials from the lake premises to the sea. Recent live specimens were collected from the eastern sandy bank of outer channel sector during sampling for macro-zoobenthic fauna using a van-veen type of grab sampler (Surface area 0.04 m^2). It was identified as *Emerita emeritus* Linnaeus,1767.

Morphometric measurements of the mole crab were made with digital caliper recorded to the nearest 0.1 mm. Figure one shows the sampling station and the region of collection of mole crab.

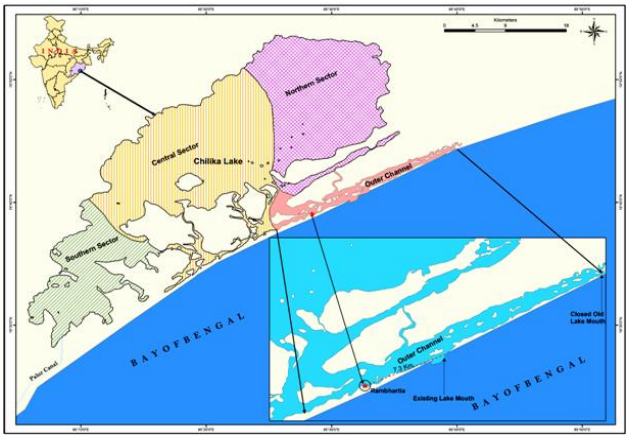

Fig.1–Map of Chilika Lake showing the location of collection of mole crab specimen in red dot round marked.

Results and Discussion

Identification and classification

The diagnostic characters (Table 1, Fig. 2) are described here after referring to relevant literatures[2,3,7,]. The collected specimen (Fig. 3) had a dorso-ventrally cylindricep and convex carapace with a total body length of 4.5 cm, 5 pairs of legs with hairy structures, soft exoskeleton, elongated antennules, a pair of stalked eyes, longer ocular peduncles, longer flagella on the antennae, smoother lateral margins of the carapace and uropods. The carapace is longer than broad and convex from side to side. The dorsal profile of the carapace rises behind the frontal lobes and runs more or less straight to the posterior end. Presence of a spine (Tail spine) on the ventral side is used in borrowing the sandy substratum. But, the body coloration of the animal in living condition looks like milky white, turning slightly brownish red on

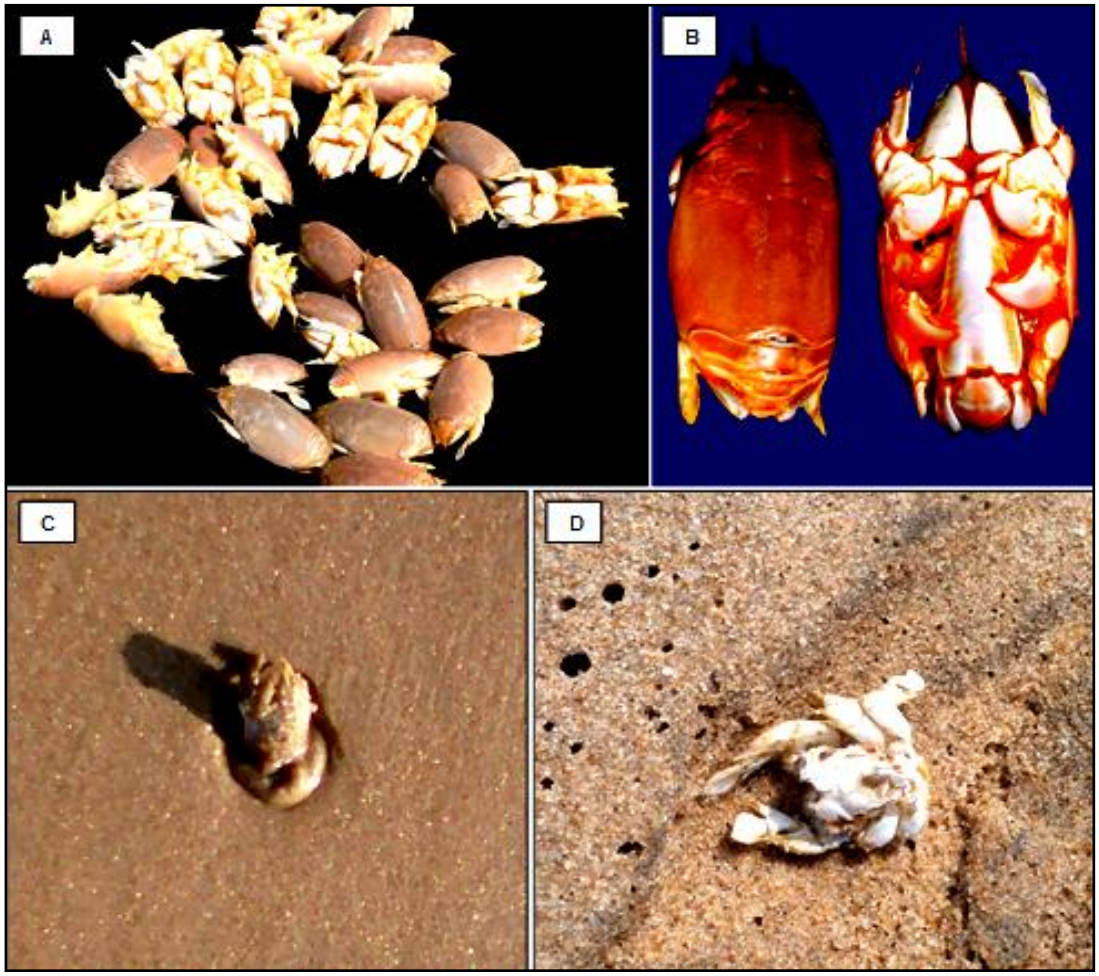

Fig. 2A- Bunch of mole crab collected from Chilika lagoon, B- Dorsal and Ventral view of mole crab, C- Burrowing activity of mole crab showing in the inter tidal zone during low tide period of Chilika lagoon D- Dead exoskeleton of mole crab after preyed by shorebirds.

preservation. The pereopods is used to scrape the sand from underneath its body along with the telson part. The external morphological characteristics (Table 1) suggest that *Hippa* and *Emerita* are sister genera[3]. The species *Emerita emeritus* is placed in the following taxonomic classification.

Kingdom	: Animalia
Phylum	: Athropoda
Subphylum	: Crustacea
Class	: Malacostraca
Order	: Decapoda
Infraorder	: Anomura Macleay, 1838
Subfamily	: Hippoidea Latreilli, 1825
Family	: Hippidae
Genus	: *Emerita*
Species	: *Emerita emeritus* Linnaeus, 1767 (Fig. 2B)

Mole crabs those were collected from Chilika lake and Rushikulya estuary found relatively smaller in size as compared to the samples from Gopalpur coast of south Odisha (Fig. 3 and Table 1). At the time of collection from Chilika the water salinity was 26.7 psu and the bottom soil contained medium to fine sand. Earlier reported specimens also recorded from similar habitats i.e. marine with bottom containing fine sands (Table 1). It is believed that higher salinity and medium sandy texture of the intertidal beach favored for a better growth of mole crab as observed in the Gopalpur coast of Odisha.

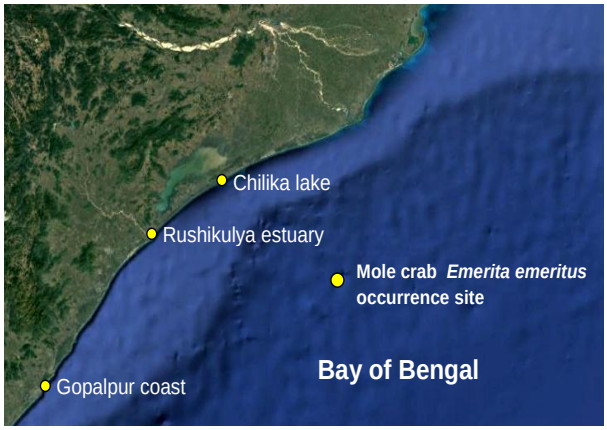

Fig. 3– Map showing the three locations of occurrence of mole crab (Gopalpur, Rushikulya estuary and Chilika Lake) along Odisha coast.

The mole crabs of the Genus *Emerita*, are medium sized benthic crustacean that live in intertidal and upper subtidal sandy marine environments[3]. In Miers[13] revision of the family Hippidae, all of the species referred are belonging to genus *Hippa* now belong to the genus *Emerita*. Although ten species under the genus *Emerita* were reported earlier including *Emerita karachiensis*[1,14], the molecular phylogenetics study of mole crabs (Hippidae: Emerita) by Haye[3] further described nine species which are rarely sympatric and most are endemic to broad biogeographic regimes. The earlier reported *Emerita karachiensis*[14] and *Emerita holthuisi* were later confirmed to be one and the same. One species (*Emerita austrofricana*) occurs in southern Africa and Madagascar coasts. Two species namely, *Emerita emeritus* and *Emerita holthuisi* occur in south Asia and south East Asia coast and western India and Persian Gulf region including Pakistan[7] (Table 2). In India, *Emerita holthuisi* restricts its range to south west coast of India up to Bombay coast[15] while *Emerita emeritus* (= *Emerita asiatica*) inhabits mostly the south east coast of India[7]. But reports regarding its occurrence along north east cost of India are meager (Table 2). Thus, the biogeography distribution of *Emerita emeritus* suggest that it might be occurring in good number along Odisha coast up to Paradip area which provides intertidal sandy marine environments which suggest further exploration. The long shore movements of the sand crab, *Emerita emeritus* might have taken place in the east coast of India as it was observed in *Emerita analoga* from north and South American coasts[16]. Occurrence of two mole crab species *Emerita holthuisi* and *Emerita emeritus* in the west and south east and east coast of India respectively suggest that the different sandy beach ecology of both west and east coast of India perhaps provides a different ecological niche that favors such distribution of these two species. Occurrence of *Emerita emeritus* in Chilika lake in less number further suggest that the population density might be more in the sandy beach of Gopalpur-on-Sea along Odisha coast due to favorable beach gradient, salinity, tidal prism and higher water temperature approaching 30° C for most part of the year[6]. The tough exoskeleton and appendages being closed to be body of mole crab, allows it to roll in the tidal currents, waves and its feathery antennae are used to filter plankton and detritus from the wash region[17]. The burrowing and swash behavior of the species[17,18] might have caused long shore migration up to Odisha coast

Table 1 – Morphometric characters of Mole crab *Emerita emeritus* from three different locations along Odisha Coast
N= number (Measurements in mm)

	Chilika lake Specimen (N= 7) (Brackish water)	**Rushikulya estuary** Specimen (N= 4) (Estuarine)	**Gopalpur coast** Specimen (N= 59) (Marine)
Morphometric characters			
Body color (in live)	White	White	Pale white
Maximum length	4.5	4.2	5.5
Maximum width	1	1.2	1.5
Length of maxilliped	1.2	1	1.4
First pair of pereopod	3	2.8	3.3
Second pair of pereopod	1.8	1.6	2
Third pair of pereopod	1.5	1.2	1.8
Fourth pair of pereopod	1.4	1.1	1.6
Fifth pair of pereopod	1.2	0.9	1.3
Pleopod	1	0.7	1.2
Length of primary antenna	2.5	2.2	3
Length of secondary antenna	4	3.5	4.4
Length of eye stalk	0.7	0.4	1.2
Diameter of compound eye	0.1	0.1	0.2
Width at the head region	1.3	1	1.6
Width at thorax region	1.6	1.2	2
width at the tail region	1.2	1	1.4
Telson	1.8	1.6	2.1
Period of observation	December to June	February to June	Round the year
Nature of sand	Medium to fine sand	Medium to fine sand	Medium sand
Salinity	26.7 psu	22.6 psu	28.9 psu

from southern part to northern region adjacent to Chilika Lake. The outer channel sector of Chilika Lake exhibits marine condition during post winter through summer and its eastern bank exhibits the similar sandy beach environment like Gopalpur beach with intertidal zone due to semi-diurnal tidal influx from the Bay of Bengal through lake mouth which is situated 7.3 km away from the specimen collection site. The mole crab might have entered into the outer channel sector during flow tides. But occurrence of few no. of juveniles suggested that it might have populated gradually in the lake.

The newly recorded mole crab (*E. emeritus*) from Chilika Lake acts as an important trophic link between producers and predators. Because, it feeds on planktonic materials, benthic algae and on the other hand it is grazed by shorebirds and predator fishes, shellfishes. Since, the previous reports regarding its occurrence only to the coastal beaches, the present study confirmed the occurrence of mole crab (*Emerita emeritus*) species in a brackish water lake environment, which is perhaps the first time to record in the entire Indian subcontinent.

Table 2 – List of mole crab species and their global distribution

Sl. No.	**Genus-Species**	**Distribution**
1	*Emerita emeritus* Linnaeus,1767	Chilika lake, (Present study) South Asia, South east coast
2	*Emerita holthusi* Sankolli,1965	West coast of India, Persian gulf and Red sea
3	*Emerita analoga* Stimpson 1857	Western north America and Western south America
4	*Emerita astroafricana* Schmitt, 1935	South eastern Africa and Madagascar
5	*Emerita brasiliensis* Schmitt, 1935	South eastern Brazil
6	*Emerita talpoida* Say, 1817	Eastern north America
7	*Emerita rathbunae* Schmitt, 1935	Western central America
8	*Emerita portoricensis* Schmitt, 1935	Caribbean sea
9	*Emerita benedicti* Schmitt, 1935	Gulf of Mexico

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