

The Malleidae (Mollusca: Bivalve) of India with a new distributional record of *Malleus albus* (Lamarck, 1819), from southeast coast of India-Nellore, Andhra Pradesh

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ABSTRACT

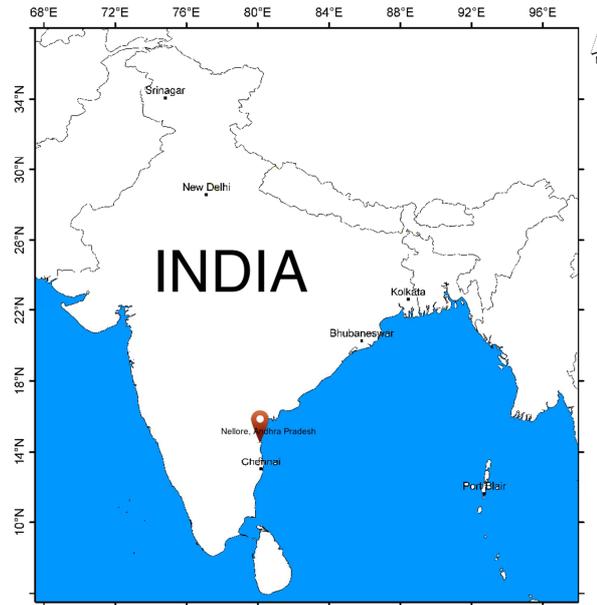
*Occurrence of a lesser-known but interesting bivalve, *Malleus albus* (Lamarck, 1819), is reported here for the first-time from state of Andhra Pradesh (southeast coast of India). Confirmed records of four Malleidae species in the region are presented in this article along with a systematic description of the species.*

Key words: Bivalve, Pennera river, *Malleus*, India.

INTRODUCTION

Oysters under the family Malleidae are commonly known as hammer oysters. They belong to family of salt-water clams, and classified under two genera namely, *Malleus* and *Neoaviculovalsa*. In 1758, Linnaeus placed the first reported species of this family under the genus *Ostrea malleus*. Later on, Lamarck proposed the Genus *Malleus* in 1799 for the inclusion of *Malleus malleus* and *Malleus albus*. In case of another Genus namely *Neoaviculovalsa*, only one species have been reported so far, *N. Coraliocola* [1]. The first species reported under this genus by Hornell in 1921 [2] from India was Black hammer oyster. Subsequently Tikader *et al* in 1986 [3] reports the presence of three Malleus species (*M. malleus*, *M. albus* and *M. regula*) from Andaman and Nicobar Islands. Again, Nagabhushanam and Rao [4] reported the presence of *M. anatinus* at Mminicoy atoll (Laccadive Archipelago) in Arabian sea during 1972.

The shells of most of *Malleus* are T-shaped, with the hinge at the top of the T, and with the byssus emerging from the hinge. The term *Malleus*, signifying a mallet or hammer, aptly describes this form. Most hammer oysters live in tropical coral reef areas. These shells were highly prized by early collectors. A total of eight species have been reported under the Genus *Malleus* [5] from all over the world. Young in 1968 [6] reported an in-depth study on the form and the habitat of the various species. So far from Indian sub-continent, four species of the Genus *Mallus* under the Family *Malleidae* have had confirmed records, they are *Malleus malleus* (Linnaeus, 1758), *Malleus albus* (Lamarck, 1819), *Malleus regula* (Forsskal, 1775), and *Malleus anatinus* (Gmelin, 1791). In the present study, a broad description with figures and distribution of the species along with three other species reported by earlier worker from India has been dealt in details.



Map 1: The location of Pennera estuary at Utukuru Nellore, Andhra Pradesh, India from where the species was collected (Latitude: 14°34' 56.40" N, Longitude: 80°10' 6.87" E)

MATERIALS AND METHODS

During a survey at Pennera estuary, Nellore, Andhra Pradesh, four valves and one example of the *Malleus albus* Lamarck 1819 were found lying on shore area near Utukuru, Nellore (Figure 1). The location of Pennera estuary at Utukuru Nellore, Andhra Pradesh, India from where the species was collected (Latitude: 14°34' 56.40" N, Longitude: 80°10' 6.87" E) is indicated with a pin symbol on the map (Map 1). The valves collected were dead but undamaged and empty. The shells collected from this area probably were carried by the trawl net used by the fishermen. As such *Malleus* species generally are found in substrate of muddy sand on the ocean floor at depth of approximately 30 feet [6, 7]. The samples collected were deposited in the Estuarine Biology Regional Centre, Zoological Survey of India, Ganjam, Odisha.

Diagnostic characters of the Family Malleidae

Shell is somewhat compressed, irregular in form and more or less strongly elongated dorsoventrally. Dorsal margin is straight, often produced at both ends into long, wing-like ears. Shell subequivalve to inequivalve, with left valve somewhat more inflated than right valve. Outer surface often with irregular concentric lamellations, radial sculpture fine to absent. Umbones small, prosogyrate to opisthogyrate, on top of a relatively wide cardinal area. Ligament external to internal. Hinge narrow, without teeth. Interior of shell partly nacreous, sometimes with median longitudinal ridge. Only one large posterior abductor muscle scar present, usually with a well developed posterior pedal retractor scar next to it or fused to it. Pallial line without a sinus [7]. Most species of a malleid genus *Malleus* are irregularly shaped to conform to narrow crevices in hard coral and rocky substrata, and develop elongated extensions of the hinge for stabilization in soft sediment [8].

Scientific classification (WoRMS)

Kingdom	Animalia
Phylum	Mollusca
Class	Bivalvia
Subclass	Pteriomorpha
Order	Pterioida
Super family	Pterioidea
Family	Malleidae
Genus	<i>Malleus</i>

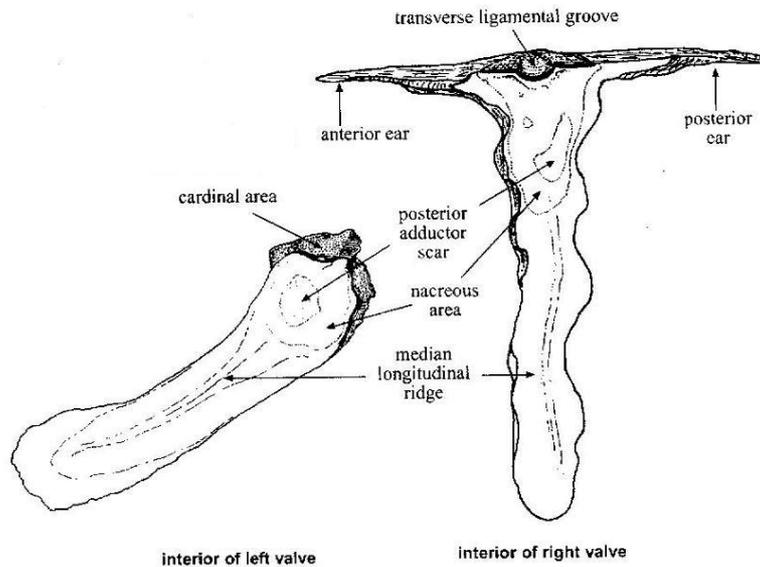


Fig. 1 Diagrams of *Malleus* showing diversity in shape (Poutiers, 1998)

***Malleus albus* Lamarck, 1819**

1819 *Malleus albus* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 6 (1): 144.

1941 *Malleus albus*: Gravely, *Bull. Madas Govt. Mus. New Ser.* (Nat. Hist.), 5 (1):37.

1968 *Malleus albus*: Tikader, Daniel and Subha Rao, Sea shore animals of Andaman and Nicobar Islands, *Zool. Surv. India*, p.175.

2000. *Malleus albus*: Subha Rao and Dey, *Rec. Zool. Surv. India*, Occ. Paper No. 187:218.

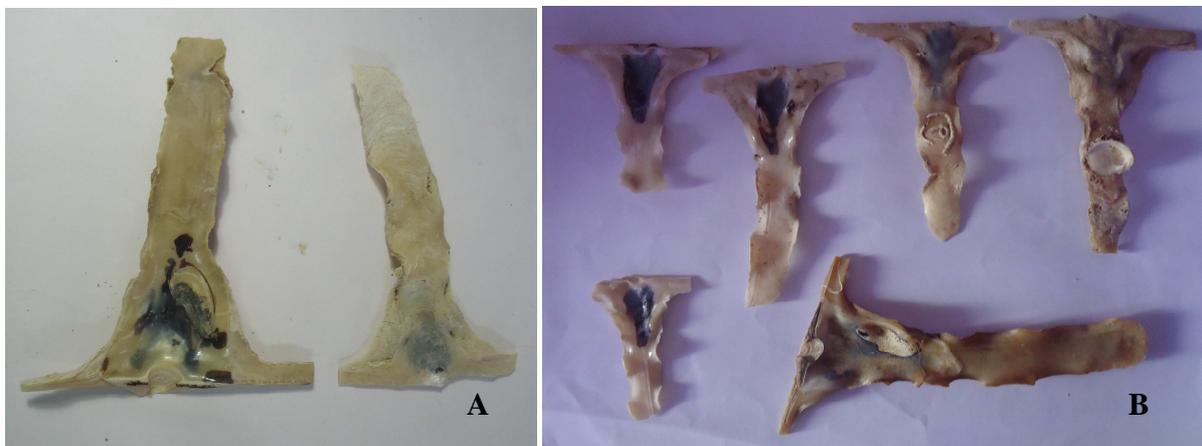


Fig. 1A & B. *Malleus albus* Lamarck, 1819 from Pennera estuary

Material examined: 4 valves+ 1 example

Palipalam canal: 10.06.2011/Reg. No. EBRC/ZSI/M/7724.

Measurements: Length : 5-8.5 Height: 6.3-16 cm

Malleus albus, also known as the white hammer shell, (Fig. 1A and 1B) is yellowish white in colour. Shell is hammer like, somewhat compressed, irregular in form and strongly elongate dorsoventrally; with only one large posterior muscle scar, hinge narrow, without teeth, interior of shell partly nacreous; outer surface of shell pale coloured. The prismatic layer is heavily calcified and the shells are less irregular and much stouter in comparison to

M. malleus. Maximum shell length is 24.5 cm. with a hinge line of 25 cm. The shell margins are deeply folded and the two valves precisely interlocked. The adult shell lacks the byssal notch and muscle scar disappeared in adult. The animal anchored in the substrate exclusively by the anterior and posterior extensions of the shell and inhabits muddy sand [6]. The species have only been reported from Andaman and Nicobar Island till Sethi and Poovannan in 2011 [9] recorded from Chennai coast.

***Malleus malleus* (Linnaeus, 1758)**

1758. *Ostrea malleus* Linnaeus, *Syst. Nat. ed.*, 10:699.

1921. *Malleus malleus*: Hornell, *Madras Fish.Bull.*, 14:167.

1956. *Malleus malleus*: Satyamurti, *Bull. Madras Govt. Mus. New Ser. (Nat. Hist)*, 1 (2), pt.:7:47,pl.6, Fig. 1

1986. *Malleus malleus*: Tikader, Daniel and Subha Rao, Sea shore animals of Andaman and Nichobar Islands, *Zool. Surv. India*, p.175.

2000. *Malleus malleus*: Subha Rao and Dey, *Rec. Zool. Surv. India*, Occ. Paper No. 187:218



Fig. 2 *Malleus malleus* (Linnaeus, 1758), Photo courtesy idscaro.net seashells

The oyster is known as black hammer oyster and it is the longest species of all (Fig 1). Maximum shell length is 21 cm with breath up to 21cm. They live in relatively clean sandy bottoms in which they were largely buried vertically, projecting only the most distal region. There is a well-developed byssus and both valves are notched, although to a greater depth on the right. Shells are usually excessively irregular due to the great exposure to. On the inner side of the valve there is a nacreous region and four muscle scars [6]. The species can be distinguished from *M. albus* by its intense purple-black colouring, and by its very rude, roughly blistered, tumid, contorted growth [10].

***Malleus regula* (Forsskal, 1775)**

1775. *Ostrea regula* Forsskal, *Des. Anim.*, 1975:124.

1986. *Malleus regula*: Tikader, Daniel and Subha Rao, Seashore animals of Andaman and Nichobar Islands, *Zool. Surv. India*, p.175.

2000. *Malleus regula*: 2000. *Malleus albus*: Subha Rao and Dey, *Rec. Zool. Surv. India*, Occ. Paper No. 187:218.

The shell of the species is straight (Fig 3), about four times as long as it is broad, depressed, sometimes wave-distorted, concentrically ridge-laminated near the umboes, laminae irregular, more or less decorticated, base slightly winged on the posterior side; purple-black [10]. There is no extension of dorsal margin on both the sides however present a well developed byssus. This species is widely distributed and very common in the tropical Indo-Pacific. Maximum shell length is 12 cm. The animal attached themselves firmly by strong byssus threads to rocky, often partially mud-covered surface with the shell vertically disposed and they often live in dense colonies [6].



Fig. 3 *Malleus regula* (Forskal, 1775), Photo courtesy Bishogai Data Base

***Malleus anatinus* (Gmelin, 1791)**

1791. *Ostrea anatinus* Gmelin, *Syst. Nat.*, ed. 13:3333.

1972. *Malleus anatinus*, Nagabhushanam and Rao, *Mitt. Zool. Mus. Berlin*, 48(2):287.

2009. *Malleus anatinus* Stella C., A. Murugan and S. Vijayalakshmi *European Journal of Biological Sciences* 1 (2): 15-16.

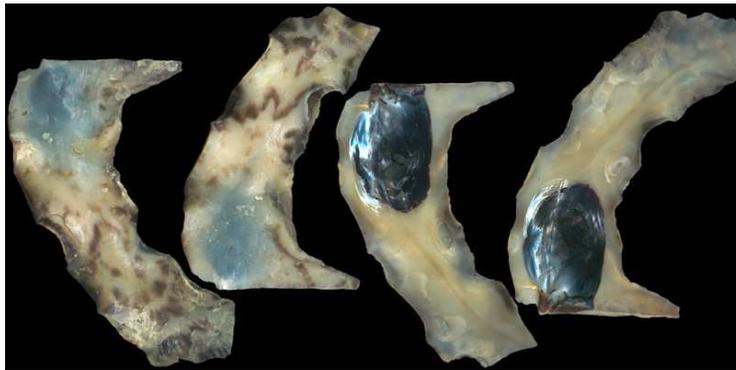


Fig. 4 *Malleus anatinus* (Gmelin, 1791)
Photo courtesy idscaro.net seashells



Fig. 5 *Malleus anatinus* collected
by Stella et al., 2009

This species of *Malleus* is known as Duck malleus (Fig. 4). This species is recognizable by purple-blotched coloring. Shell is elongated, obliquely rudely twisted, somewhat waved at the sides, base wing-lobed on the posterior side, there is no outline of hammer structure; livid-white, sub transparent, sprinkled with purple-black spots [10]. Hammer oyster of this species is the shortest of all the four species reported from the subcontinent.

While collecting the literature on *Malleus*, the author comes across a publication on new distributional records of *Malleus anatinus* by Stella et al, 2009 [11] from the south east coast of India (Fig. 5). However, the figure given by them suggests it to be *Isognomon* species rather than *Malleus anatinus*. One of the important characteristics of the Family Malleidae is the absent of hinge teeth. Furthermore Stella et al [11] mentioned this point clearly in their paper. However, the author again mentioned the presence of hinge teeth in the description of the shell collected by them contradicting their previous statement. There is no mention of the presence of purple black spots on the shell surface by them, which is one of the important visible identifying characteristic of the *Malleus* species. The published photograph indicates no such spots on the shell either (Fig. 5). These points render the identification of the species collected by Stella et al. [11] to be doubtful.

CONCLUSION

So far the family Malleidae is represented by four species in India, namely *Malleus malleus*, *M. albus* and *M. regula* and *M. anatinus*. *Malleus albus* which is commonly known as White Hammer Oyster is reported for the first time from the state of Andhra Pradesh. The species is stouter and inhabits muddy sand and anchored in the substrate by means of the long anterior and posterior extensions of dorsal margin. A summary of the review of the species under the genus *Malleus* available in India with distributional records is given in Table 1.

Acknowledgement

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Table 1. Indian Malleidae names and their synonyms with distributional records

Scientific name	Synonymised taxa (source WoRMS)	Distribution in India
<i>Malleus albus</i> Lamarck, 1819	<i>Malleus maculatus</i> Donovan, 1823 <i>Malleus normalis</i> var. <i>albida</i> Lamarck, 1819 <i>Malleus novelesianus</i> Iredale, 1931 <i>Malleus savignyi</i> Jousseume in Lamy, 1919	Andaman and Nicobar Island, Tamil Nadu, Andhra Pradesh
<i>Malleus malleus</i> Linnaeus, 1758	<i>Himantopoda vulgaris</i> Schumacher, 1817 <i>Malleus vulgaris</i> Lamarck, 1801 <i>Ostrea malleus</i> Linnaeus, 1758	Andaman and Nicobar Island, Tamil Nadu
<i>Malleus regula</i> (Forsskal, 1775)	<i>Fundella lioyi</i> Gregorio, 1884 <i>Himantopoda truncata</i> Schumacher, 1817 <i>Malleus aquatilis</i> Reeve, 1858 <i>Malleus decurtatus</i> Lamarck, 1819 <i>Malleus maculosus</i> Reeve, 1858 <i>Malleus obvolutus</i> de Folin in de Folin & Périer, 1867 <i>Malleus panamensis</i> Mörch, 1861 <i>Malleus rufipunctatus</i> Reeve, 1858 <i>Malleus solitarius</i> Reeve, 1858 <i>Malleus vesiculatus</i> Reeve, 1858 <i>Malleus vulsellatus</i> Lamarck, 1819 <i>Ostrea regula</i> Forsskal in Niebuhr, 1775 <i>Ostrea valsella</i> Gmelin, 1791 <i>Parimalleus cursator</i> Iredale, 1931	Andaman and Nicobar Island
<i>Malleus anatinus</i> (Gmelin, 1791)	<i>Malleus figuratus</i> Lyngø, 1909 <i>Malleus normalis</i> Lamarck, 1819 <i>Malleus tigrinus</i> Reeve, 1858 <i>Ostrea figurata</i> Reeve, 1858 <i>Ostrea ligo</i> Schreibers, 1793 <i>Ostrea anatinus</i> Gmelin, 1791	Lakshadweep, Nicobar Island

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