

# New Distribution Record of Anomiid Species (Bivalvia: Anomiidae) from Vizhinjam, Kerala, Southwest Coast of India

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**Abstract:** The southwest coast of India is rich in marine diversity. A new report of species from anomiidae family from the west coast of India is included in this paper. Three anomids namely *Anomia simplex*, d'Orbigny, 1853, *Anomia cytaeum* Gray, 1850 and *Anomia ehippium* Linnaeus, 1758. are newly reported from the Vizhinjam Bay. In which two species, *Anomia simplex*, (d'Orbigny, 1853) and *Anomia cytaeum* (Gray, 1850) are reported for the first time from India. *Anomia ehippium* Linnaeus was reported by Dey and Ramakrishna (2007) and Subba Rao (2000) from Andhra Pradesh, Andaman and Nicobar Islands. Anomid bivalves are highly brittle group of oysters. These are attached onto the hard substratum including the surface of molluscan shells. The single valve of the species was collected from the Vizhinjam bay and the full specimens were found to be attached onto the gastropod shells. Due to its brittle nature and the firmness in their attachment to the substratum, it is very difficult to detach them completely and fully from the substratum. These three species are deposited in the Marine Biodiversity Museum, Central Marine Fisheries Research Institute (CMFRI), Kochi.

**Keywords:** Bivalvia, Indian anomiidae, , *Anomia simplex*, *Anomia cytaeum*, *Anomia ehippium*

## 1. Introduction

Bivalves are economically important groups of molluscs. However, many of the species are unexploited, under exploited or neglected because of the lack of awareness about the species, their economic importance and their habitat. Anomiidae are small family of bivalves. They are the most primitive living genus. Their geological range is from Jurassic to Holocene Period (Yonge, 1977). They are mainly distributed in warmer waters. Approximately ten anomia species were identified and reported (Huber, 2010). Literature reveals that it is a neglected family in Bivalvia. Globally very few reports are available on the study of anomiid bivalves. Its shell characters are like that of Ostreidae. Like true oysters one of the valves of this species is firmly attached onto the hard substratum. It is characterised by a large rounded opening on the hinge side. The living animal produces a chalky stalk that extrudes through this opening in the shell in order to fix the animal securely to a firm substratum. Sometimes it is like a rock or otherwise it can be another living mollusc or an empty shell. This species is commonly found attached on the oysters. The shell shape is moulded to that of the object to which it is attached. So it is commonly known as saddle oysters. It is also named as jingle shells because a handful of these thin; translucent shell halves make a jingling sound when shaken together. Another name for the jingle shell is 'mermaid's toenails'.

The shells are pretty and fragile. They are highly fond of warmer waters. They are translucent and slightly pearly and valves are inequivalve. The right valve is thinner often distorted and assuming contour of substrate. This species represents its own superfamily, Anomiacea. The two shells differ greatly. Animal possesses only one adductor muscle and, in contrast to the primitive position, the internal organs are shifted to one side. The short byssus becomes calcified into a bone-like structure. The thin, almost transparent right

valve contours itself around all irregularities of the substratum during subsequent growth, and a deep saddle-shaped bay forms around the calcareous byssus. The left upper valve is only slightly thicker but is more convex than the lower one. The upper valve only conforms to the substrate contours at its margin (Grzimek, 1974).

*Anomia* species were reported from Singapore, Gulf of Thailand, Philippines, Vietnam, China and Honshu, Sagami Bay. From India, as per the record of Zoological Survey of India, three species namely *Anomia achaeus* Gray, *Anomia ehippium* Linnaeus and *Anomia scabra* Reeve were reported from different regions. *Anomia achaeus* Gray was reported from Andhra Pradesh, Gujarat, Kerala, Maharashtra and West Bengal. *Anomia ehippium* Linnaeus was reported from Andhra Pradesh, Andaman and Nicobar Islands and *Anomia scabra* Reeve was reported from Andaman Islands, Maharashtra and Orissa (Ramakrishna and Dey, 2010).

## 2. Materials and Methods

Specimens were collected from the Vizhinjam bay ((08°22'45"N 76°59'29"E) (Fig.1). Only the left valve was collected from the shore. The firmly attached right valve can be seen in the hard surface of shell as shown in Figs. 2a and 2b. The collected shell valves were washed and photographed. The taxonomic identification was done using online data, published literature and other identification keys. Systematics were done using WoRMS (*World Register of Marine Species*). Specimens were deposited in the Marine Biodiversity Museum, Central Marine Fisheries Research Institute (CMFRI) Kochi dated 01. 11. 2014. The accession ID numbers of the specimens are shown in Table. I.

Table 1

S.No.	Name of species	Accession numbers
1.	<i>Anomia cytaeum</i> Gray, 1850	DC. 10. 1. 2
2.	<i>Anomia ephippium</i> Linnaeus, 1758	DC. 10. 1. 3
3.	<i>Anomia simplex</i> , d'Orbigny, 1853	DC. 10. 1. 4



Figure1: Study site

### 3.Results and Discussion

The shells of anomidae superficially resemble as true oysters, however, their mode of attachment is different, as its byssal plug passing through an opening in the right valve. Their shell is delicate and translucent. Shells are orbicular, irregular, distorted and thin. The upper shell is somewhat convex and milky white, beige or pale green in color. The shells have scale like, concentric lamellae sculpturing with slanting radiating threads. Many individuals are commonly found piled one on top of the other in the fouling community (Kay, 1979). From the Vizhinjam bay the upper valve or left valve of the shell was collected from the sea shore and live specimens are seen attached onto the surface of the shells (Fig.2b) and they can also be seen in the inner side of the Anomia shell (Fig. 2a). Because of the greater fragility of the lower valves, these are much less commonly found on beaches than are the convex upper valves. If the living animal attaches itself to another shell, the sculpture and shape of the

upper (left) valve may resemble that of the shell to which it is attached. The shell may reach 75 mm in diameter, but is more typically half that size (Gosner 1978; Rehder, 1981). "The species of this genus are attached to rocks, shells or other objects and often acquire sculpture corresponding to that of the object to which they are attached. Often only upper valves are found as fossils, because those become loose and are washed away, whereas the lower valve remains attached by the byssal plug of members of this genus apparently corrodes surfaces to which it is attached and as a result the shell often lies sunk into a pit of its own making." (Hertlein and Grant, 1972).

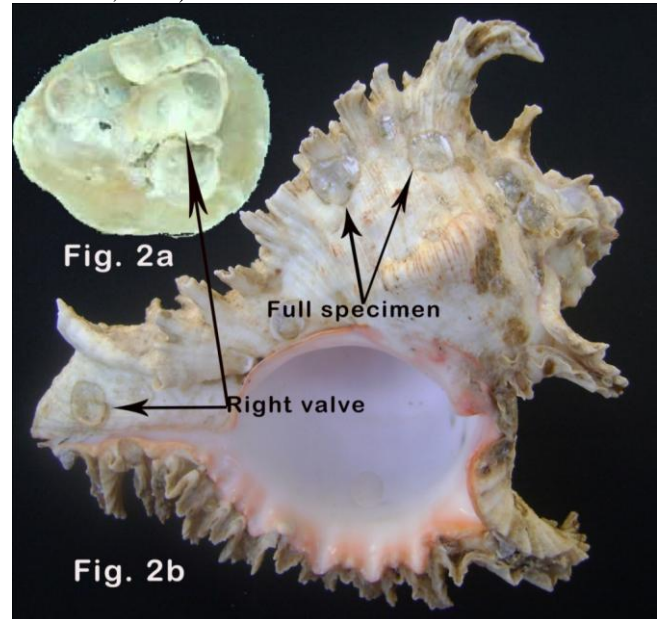
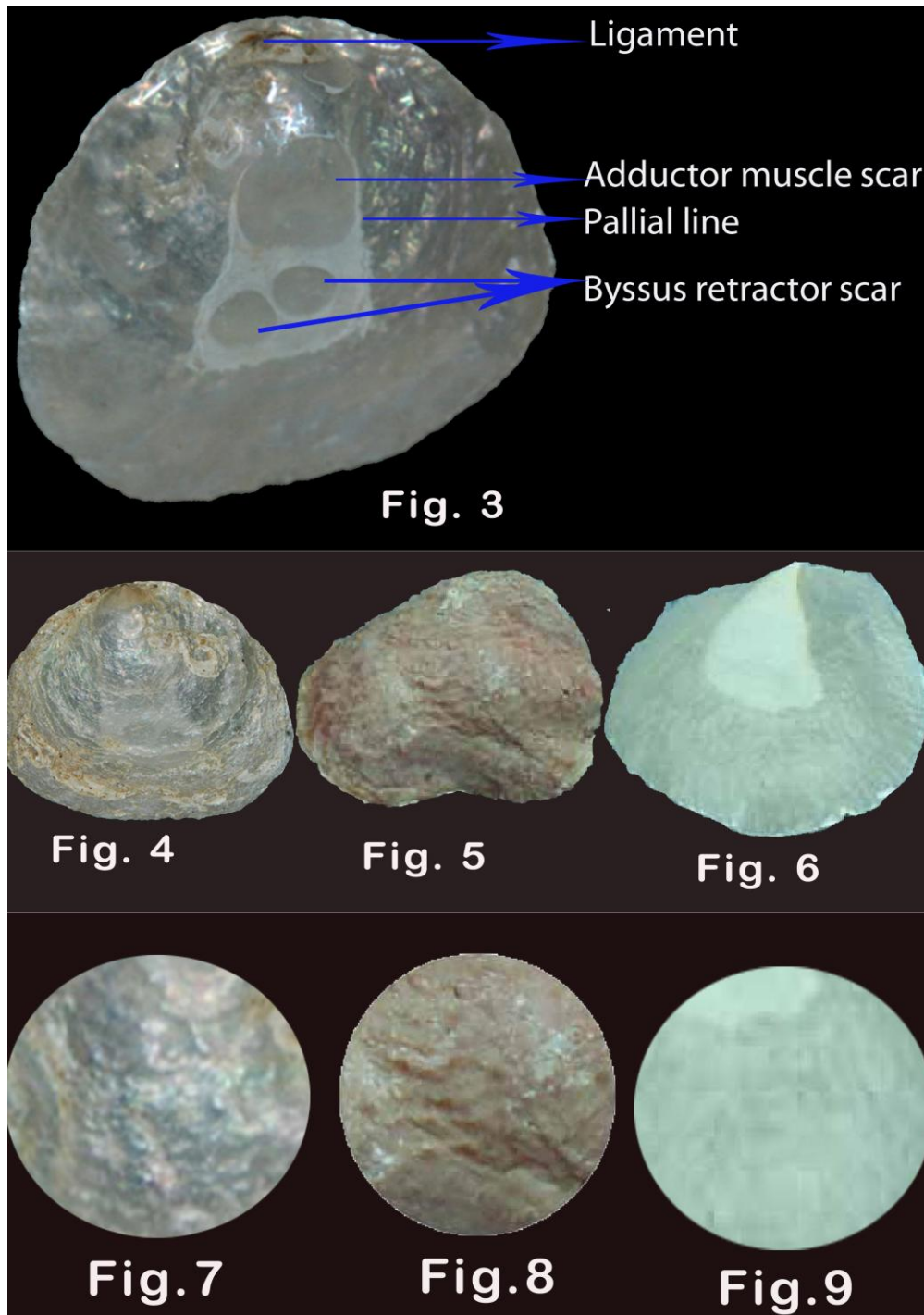


Figure 2a-2b: Right valve attached inside the dead shell of *Anomia cytaeum* and Right valve and full live specimen of *Anomia cytaeum* attached onto the gastropod shell.

*Anomia* shell is distinguished from other oysters by its translucent nature. The main identification marks are three scars present inside the shell as shown in Fig. 3. The large scar is the adductor muscle scar and the two small scars are the byssal retractor scar. Pallial line is seen as a white line. Three species are classified upto their species level based on their shell thickness and some periostracum features. The *Anomia simplex* is very soft and paper thin. Their transparent shell show a triangle shaped pallial line. *Anomia cytaeum* is glass type shell with glossy inner surface. It is harder than *Anomia simplex*. *Anomia ephippium* is seen in different colors from light yellow to black. The shell of *Anomia ephippium* is characterised by numerous irregular ridges on the surface makes them hard. This is the most dominant anomia species in the Vizhinjam bay. Only one left valve of *Anomia simplex* is obtained along with the other species.



**Figure 3:** Image of *Anomia* species with identification marks; Fig. 4. *Anomia cytaeum*, Fig. 5. *Anomia ephippium*, Fig. 6. *Anomia simplex*. Figs.7-9 Enlarged portion of the shell

***Anomia cytaeum* Gray, 1850**

**Parent:** *Anomia Linnaeus, 1758*

**Class :** Bivalvia

**Subclass :** Pteriomorpha

**Order :** Pectinoida

**Superfamily :** Anomioidea

**Family :** Anomiidae

**Genus :** *Anomia*

**Locality :** Vizhinjam, Kerala, India

**Synonym:** *Anomia rubella* Philippi in (Kuster, 1868)

*Anomia nipponensis* (Yokoyama, 1920); *Anomia*

*nipponensis*. var. *cuticula* (Grabau and King, 1928); *Anomia*

*nipponensis* var. *obsoletocostata* (Grabau and King, 1928);

*Anomia placentella* (Reeve, 1859); *Anomia plana* (Grabau and King, 1928); *Anomia lischkei* (Dautzenberg and H. Fischer, 1907)

**Description:** The shell is highly fragile. They are paper like shells. The collected shell color ranged from pale yellow to milky white. The shell size ranges from 2 mm to 1.8 cm. The inner part of the shell is glossy, white color and pallial line is present. Inside the pallial line three scars are present. The large scar is the adductor muscle scar and another two scars are seen below are smaller than the adductor muscle scar. They are more or less equal in size called byssus retractor scar. A narrow brownish black color ligament is seen in the



umbo region. The left valve of the specimen and a portion of the shell enlarged is shown in Figs. 4 and 7.

**Remark:** The major difference is the shell which is thinner and highly brittle than *Anomia ephippium*. It is reported for the first time from India. Previously it was reported from China and Japan (Higo *et al.*, 1999).

***Anomia ephippium* Linnaeus, 1758**

**Parent: *Anomia* Linnaeus, 1758**

**Class :** Bivalvia

**Subclass :** Pteriomorpha

**Order :** Pectinoida

**Superfamily:** Anomioidea

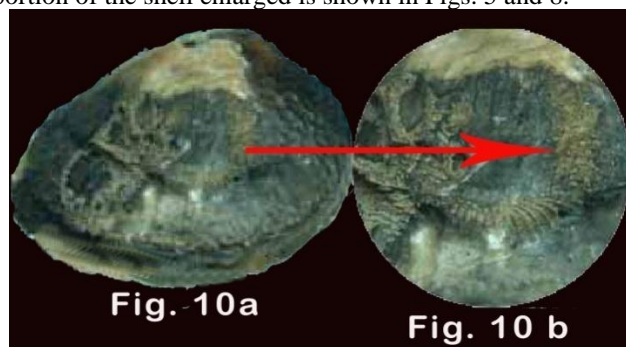
**Family :** Anomiidae

**Genus :** *Anomia*

**Locality :** Vizhinjam, Kerala, India

**Synonym :** *Anomia ephippium rugulosostrata* (Csepregy, 1950); *Anomia ephippium* var. *argentina* (Monterosato, 1915), *Anomia ephippium* var. *cuprea* (Monterosato, 1915), *Anomia ephippium* var. *sanguinea* (Monterosato, 1915)

**Description:** The shell is thicker and less transparent than other two species due to the presence of irregular ridges on the surface. The collected shell color ranges from light brown to black. The blackening of the shell may be due to the attachment of fouling organisms onto the shell surface as shown in Figs. 10a and 10b. Inside the pallial line three scars are present. The large scar is the adductor muscle scar and another two scars are seen below are smaller than the adductor muscle scar. The left valve of the specimen and a portion of the shell enlarged is shown in Figs. 5 and 8.



**Remark:** It is for the first time this species is reported from west coast of India. It is reported earlier from Andhra

Pradesh, Andaman and Nicobar Islands (Dey and Ramakrishna, 2007 and Subba Rao, 2000). It is already reported from Mediterranean Sea, France, Italy, Mexico, North Atlantic Ocean, Italy, Colombia and Belgium (WoRMS).

***Anomia simplex* d'Orbigny, 1853**

**Parent: *Anomia* Linnaeus, 1758**

**Class :** Bivalvia

**Subclass :** Pteriomorpha

**Order :** Pectinoida

**Superfamily:** Anomioidea

**Family :** Anomiidae

**Genus :** *Anomia*

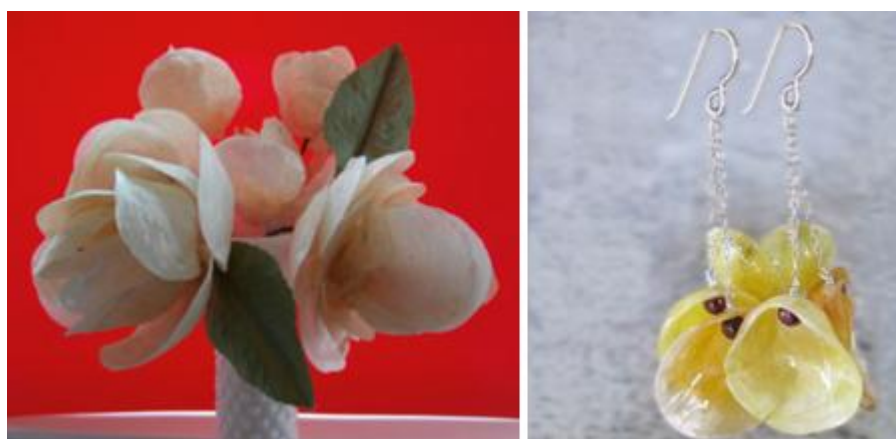
**Locality :** Vizhinjam, Kerala, India

**Synonym :** *Anomia aconites* Gray, 1850; *Anomia glabra* Verrill, 1872

#### **Description:**

The shell is paper thin and milky white in colour. The shell size ranges from 1.3 cm to 1.8 cm. The inner part of the shell is glossy, white color and pallial line is present. The shell size ranges from 1.4 cm to 1.6 cm. The inner part of the shell is glossy, white color pallial line is present. From the upper view the pallial area can be seen which is triangular in shape. Inside the pallial line three scars are present. The large scar is the adductor muscle scar and another two scars are seen below are smaller than the adductor muscle scar. The left valve of the specimen and a portion of the shell enlarged is shown in Figs. 6 and 9.

**Remark:** It is reported for the first time from India. This is already reported from east coast of North America from Cape Cod to the Caribbean (Gosner, 1978) and Brazil (Rehder, 1981). Jingle shells are important commercially. Fishermen disperse them over oyster beds by a process generally known as shelling. Covering an area with jingle shells provides a good surface upon which juvenile American oysters can settle. The shell is used in jewelry or wind chimes. (<http://www.edc.uri.edu/restoration/html/gallery/invert/jingle.htm>). The valuable jewellery include ear rings and show case materials priced from 27USD (<https://maidstonejewelry.wordpress.com/2009/10/06/jingle-shells>).



**Figure 11:** Articles made from anomia shells. (<https://maidstonejewelry.wordpress.com/2009/10/06/jingle-shells>)

## 4. Conclusion

The bivalves are abundantly seen in the Indian coastal waters. But the full exploitation of all these species are not reported. The consumption of these species from our shore will definitely give an opportunity for the coastal people to get their livelihood. The raw meat of this bivalve is sharply bitter to taste, hence it is not used as food item. However it can be considered as a good raw material used for the enrichment of handicraft cottage industry in our country. The exploitation and export of these materials is definitely fetch a good revenue for India. The knowledge on the occurrence, distribution and the utilization of such marine resources are very much needed so that these resources can be properly tapped for foreign exchange earner by the fishing industry of the country.

## 5. Acknowledgement

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## Author Profile



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