

# Nine new records of Neogastropod snails (Mollusca: Gastropoda) from Kerala, southwest coast of India

Sary P.S. and Pramod Kiran R.B.\*

Dept. of Aquatic Biology and Fisheries, University of Kerala, Karyavattom,  
Thiruvananthapuram-695581, Kerala, India

\*E.mail: [pramodkiranrb@keralauniversity.ac.in](mailto:pramodkiranrb@keralauniversity.ac.in)

## ABSTRACT

The paper records the occurrence of nine neogastropod species, *Vermeijius pallidus* (Kuroda & Habe, 1961) and *Latirus nassoides* (Reeve, 1847) of the Fascioliidae family; three species of olive snails, namely *Ancilla chrysoma* Kilburn, 1981, *Oliva todosina* Duclos, 1835 and *Oliva irisans* Lamarck, 1811; four species of mitrid snails namely *Calcimitra triplicata* (E. von Martens, 1904), *Strigatella subruppelli* (Finlay, 1927), *Domiporta circula* (Kiener, 1838) and *Imbricaria insculpta* (A. Adams, 1853) from the Kerala coast, southwest coast of India.

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## 1. Introduction

Neogastropoda is a very large molluscan order with about 5,000 species; the majority of them are marine, benthic and carnivorous in nature; very few species occupy freshwaters; herbivory, scavenging, and parasitism are also rare (Kohn, 2000). Neogastropoda consists of seven superfamilies, including Buccinoidea, Volutoidea, Muricoidea, Turbinelloidea, Mitroidea, Olivoidea and Conoidea (Bouchet *et al.*, 2017). Buccinoidea are present in oceans across the globe, spanning from the Arctic ocean to the Antarctic seas; they are recorded from various water depths, ranging from shallow intertidal areas to deep oceanic regions of over 8000 m (Kantor *et al.*, 2020), many of them enter brackish water and some of them occupy even freshwater (Strong *et al.*, 2017). This superfamily covers 3351 species, in 337 genera (Kantor *et al.*, 2022). According to Bouchet *et al.* (2017), Buccinoidea Rafinesque, 1815 consists of eight families namely Buccinidae, Belomitridae, Colubrariidae, Columbidae, Fascioliidae, Melongenidae, Nassariidae and Pisanidae. Fascioliidae is one of the important neogastropod family, commonly called horse conch or spindle shells, with global distribution; some of them are deep water organisms, while a number of them occur in shallow intertidal areas (Poutiers, 1998; Rao, 2003). Spindle shells are usually distinguished by their long, slender siphonal canal, low columellar folds, the bright red colour of the animal (Poutiers, 1998) and horny as well as fairly thick and brown coloured operculum (Rao, 2003). They are active predators and carnivorous in habit, feeding on worms, vermetids, and other molluscs; they are dioecious, and fertilization is internal (Poutiers, 1998). According to Tripathy & Mukhopadhyay (2015), the family consists of four subfamilies, within 32 genera and 18 subgenera; among them, 4 subfamilies with six genera, one subgenus, and 26 species are reported from India.

Olive snails are one of the easily identifiable groups of neogastropod molluscs belonging to the family Olividae within the superfamily Olivoidea. They are sand-dwelling active animals, residing in the intertidal as well as shallow sublittoral areas of most tropical or subtropical seas

(Poutiers, 1998). They include about 30 recent genera and 460 accepted species (Kantor *et al.*, 2017); the superfamily consists of five families namely Belloliviidae fam. nov., Benthobiidae fam. nov., Olividae, Pseudolividae and Ancillariidae. A total number of 33 species of olivids within five genera are recorded from the Indian coast (Tripathy & Mukhopadhyay, 2015). Olives are carnivorous and feed on living and dead tissue (Rao, 2003); most feed on bivalves, crustaceans and other invertebrates. The shells exhibit attractive colours and are regularly sought for their glossy and brightly coloured shells which shell collectors much favour (Poutiers, 1998); sometimes they are also collected for food. The shells are cylindrical or subcylindrical in shape with a short, elevated spire; grooved or channeled sutures (Rao, 2003); the aperture is elongated to ovate in outline with a short and deep anterior canal and an indistinct posterior canal. The outer lip is thick and smooth. Columellar callus has anterior folds, which are obliquely plicated. Sometimes a fasciole may also be present. Periostracum and operculum usually are absent. Sexes are separate.

Mitrid snails are another easily distinguishable and commonly occurring neogastropod molluscs belonging to the family mitridae within the superfamily Mitroidea and are commonly referred to as miters or miter shells (Fedosov *et al.*, 2018); generally characterized by the solid, fusiform and beautifully coloured shell with well developed spiral sculpture, conspicuous columellar folds, internally smooth outer lip. They are tropical as well as temperate inhabitants within all major geographical regions; nevertheless, species concentration is highest in tropical and subtropical areas, mostly the Indo-Pacific (Cernohorsky, 1976), the majority of them dwell in the shallow water zones of the intertidal area more often buried in clean, muddy or silty coral sand, or under rocks and corals, and in crevices of coral reefs. A few species occur beyond the littoral zone, at depths up to 80 fathoms (Rao and Dey, 1984). A few may occur on the rocky coasts, while a few are sand-burrowers. The rock and reef dwellers are usually detritus feeders, but the sand dwellers are carnivores or carrion-feeders, mostly feeding

on sipunculid worms and other gastropods (Rao, 2003). Sexes are separate, and fertilisation is internal (Poutiers, 1998; Rao, 2003). The family consists of about 402 extant species (Fedosov *et al.*, 2018), among which 56 species are reported from India (Tripathy & Mukhopadhyay, 2015). The miters closely resemble Costellariidae, except for the spiral sculpture and aperture not lirated interiorly (Poutiers, 1998).

According to the previous reports, six species of fascioliariid snails were reported from the Kerala coast (Appukuttan and Ramadoss, 2000; Deepthi, 2008; Kumar, 2012; Franklin and Laladhas, 2014; Preetha *et al.*, 2014; Preetha, 2016; Venkatesan *et al.*, 2015). The previously reported olive snails are *Oliva oliva*, *O. vidua* and *Agaronia gibbosa* (Deepthi, 2008; Kumar, 2012; Preetha, 2016; Franklin and Laladhas, 2014). Rao and Dey (1984) & Rao (2003) listed the species diversity of mitrids along the Indian coast; both the studies were concentrated in Tamil Nadu, Andaman and Nicobar Islands, Goa, Gujarat and Maharashtra, and there have been no particular reports mentioning the availability of mitrids off Kerala coast. Trawl fisheries bring large quantities of gastropods as bycatch to the Neendakara and Sakthikulangara fishing harbours in the Kollam district, providing an opportunity for studying their diversity. These shells are also widely collected by the shell craft industries for conversion to decoratives. The paper aims to report the new records of fascioliariids, olive snails and mitrids collected from the trawl bycatch landed in the Neendakara fish landing centre along the Kerala coast.

## 2. Materials and Methods

**2.1 Location:** The specimens were collected from the bycatch landed by shrimp trawlers operating in the Neendakara fish landing centre (8°35'2 N and 75°38'2 E) along the southwest coast of India.

**2.2 Collection and preservation:** The shells were cleaned and photographed; colouration and morphometric measurements (Aerospace digital calliper, USA) were recorded immediately after the collection.

**2.3 Taxonomic studies:** The specimens were identified by following Menon *et al.* (1961), Cernohorsky (1976), Kilburn (1981), Rao and Dey (1984), Pinn (1990), Rao and Rao (1991), Wilson (1994), Apte (1998, 2014), Hylleberg and Kilburn (2002), Rao (2003), and Robin (2008). The identifications were verified and confirmed by the experts.

## 3. Results

### 3.1 Systematics

Superfamily: Buccinoidea Rafinesque, 1815

Family: Fascioliariidae Gray, 1853

***Latirus nassoides* (Reeve, 1847)** (Fig. 1a-e)

Material Examined: One specimen; Date of collection: 21.11.2014; Morphometric measurements (Shell Length 35.77mm; Shell Width 20.84mm).

Remarks: *Latirus nassoides* was formerly reported from Pondicherry (Pinn, 1990), Andaman & Nicobar Islands (Apte, 2014) and Lakshadweep (Ravinesh, 2016). Based on these published records, this is the first report of the species from the southwest coast of India.

Superfamily: Buccinoidea Rafinesque, 1815

Family: Fascioliariidae Gray, 1853

***Vermeijius pallidus* (Kuroda & Habe, 1961)** (Fig. 2. a-e)

Materials Examined: One specimen; Date of collection: 18.12.2013; Morphometric measurements (Shell Length 40.35mm; Shell Width 13.74mm).

Remarks: The species *Vermeijius pallidus* (Kuroda & Habe, 1961) was previously recorded only from Australia and Japan (Wilson, 1994; Robin, 2008), and this is the first report of the species from the Indian coast.

Superfamily: Olivoidea Latreille, 1825

Family: Ancillariidae Swainson, 1840

***Ancilla chrysoma* Kilburn, 1981** (Fig. 3. a-e)

Material Examined: 31 specimens; Date of collection: 05.03.2013, 15.01.2014, 16.10.2014 & 21.05.2014; Morphometric measurements (Shell Length 26.45 - 40.14mm; Shell Width 11.30 - 17.04mm).

Remarks: The species *Ancilla chrysoma* was previously reported from the southeast coast of India (Kilburn, 1981). This published report shows this is the first record of the species from the Arabian Sea.

Family: Olividae Latreille, 1825

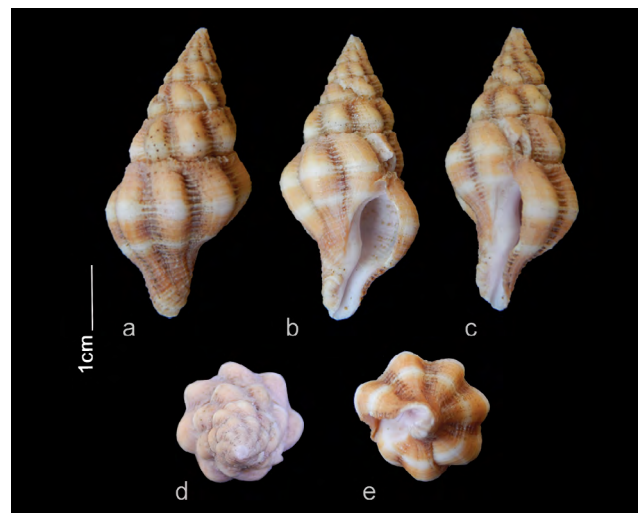
***Oliva irisans* Lamarck, 1811** (Fig. 4. a-e)

Materials Examined: Seven specimens; Date of collection: 05.03.2013 & 15.01.2014; Morphometric measurements (Shell Length 45.01 - 54.78mm; Shell Width 17.97 - 21.80mm).

Remarks: The species *Oliva irisans* was formerly reported from the Andaman & Nicobar Islands (Tikader *et al.*, 1986; Venkataraman *et al.*, 2004), Gulf of Mannar (Hylleberg and Kilburn, 2002; Samuel, 2016) and Lakshadweep (Venkataraman *et al.*, 2004). Based on these reports, this is the first record of the species from the southwest coast of India.

***Oliva todosina* Duclos, 1835** (Fig. 5. a-e)

Materials Examined: One specimen; Date of collection: 16.10.2014; Morphometric measurements (Shell Length 21.15mm; Shell Width 10.01mm).



**Fig. 1.** *Latirus nassoides* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)

Remarks: *Oliva todosina* was previously reported from the Gulf of Mannar (Hylleberg and Kilburn, 2002; Samuel, 2016) and Maharashtra (Pati and Sharma, 2012). The species was also reported as *Oliva lepida* from the Gulf of Kutch (Menon *et al.*, 1961; Venkataraman *et al.*, 2004; Rao and Sastry, 2005) and Gujarat (Rao *et al.*, 2004). Based on these published reports, this is the first report of the species from the Kerala coast.

Superfamily : Mitroidea

Family : Mitridae

***Calcimitra triplicata* (E. von Martens, 1904)** (Fig. 6. a-e)

Materials examined: Two Specimens; Date of collection: 05.03.2013 & 15.03.2013; Morphometric measurements

(Shell Length 58.05 - 59.98 mm; Shell Width 16.84 - 19.87 mm).

Remarks: *Calcimitra triplicata* (E. von Martens, 1904) was formerly reported from Philippine Islands, East Africa and Indonesia (Cernohorsky, 1976); Thorsson and Salisbury (2002) collected the species from off Tulear, Madagascar and Durban, South Africa. Based on these published reports, this is the first report of the species from the Indian coast.

***Strigatella subruppelli* (Finlay, 1927)** (Fig. 7. a-e)

Material Examined: One Specimen; Date of collection: 05.03.2013; Morphometric measurements (Shell Length 31.42mm; Shell Width 12.55mm)



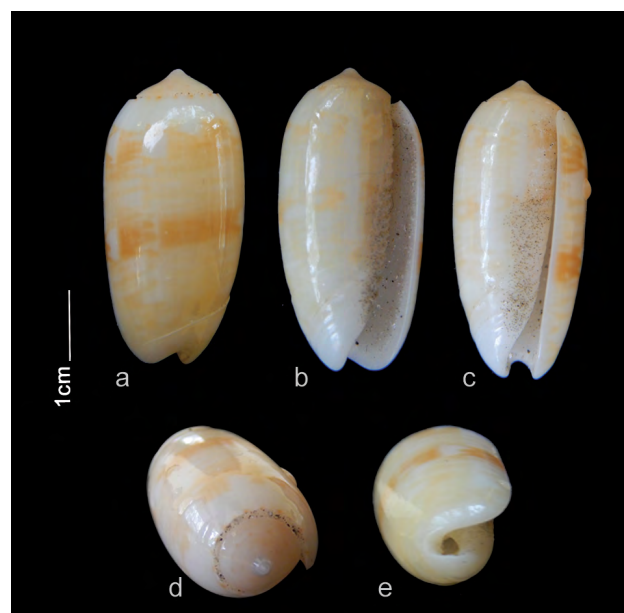
**Fig. 2.** *Vermeijius pallidus* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)



**Fig. 3.** *Ancilla chrysoma* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)

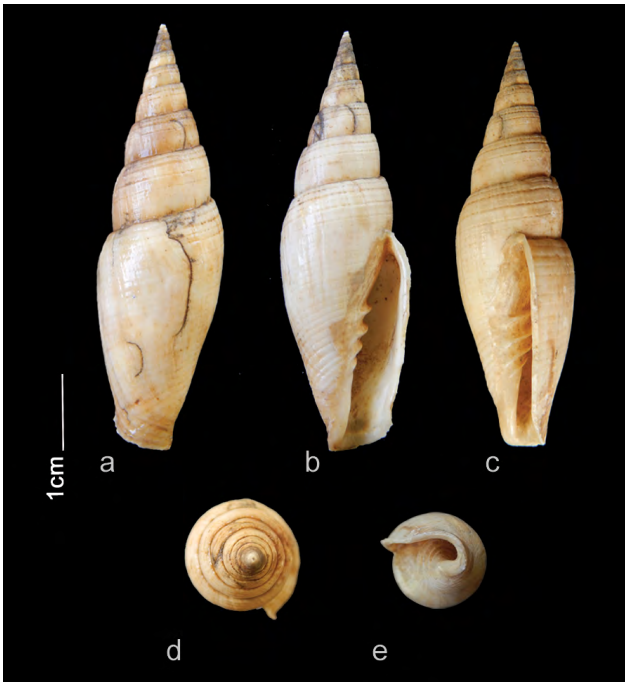


**Fig. 4.** *Oliva irisans* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)



**Fig. 5.** *Oliva todosina* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)





**Fig. 6.** *Calcimitra triplicata* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)

Remarks: *Mitra subruppelli* was previously recorded from Gujarat (Rao and Dey, 1984; Rao, 2003) and Goa (Rao and Dey, 1984). Based on these published reports, this is the first report of the species from the Kerala coast.

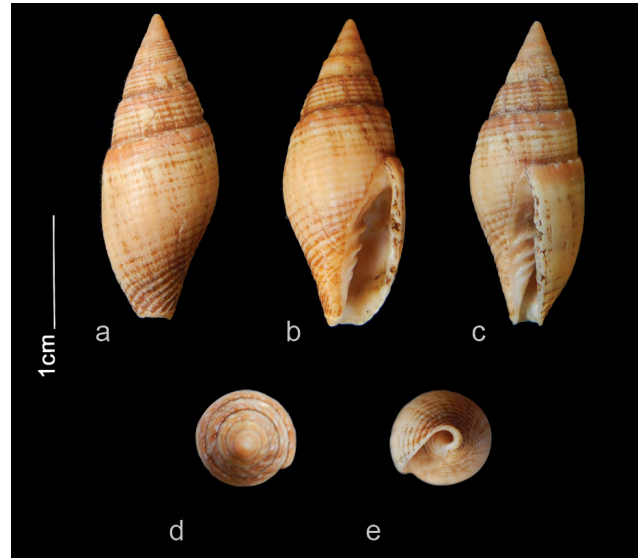
***Domiporta circula* (Kiener, 1838)** (Fig. 8. a-e)

Material Examined: One Specimen; Date of collection: 21.05.2014; Morphometric measurements (Shell Length 39.98 mm; Shell Width 15.38 mm)

Remarks: The earlier records of the species *Domiporta circula* (Kiener, 1838) showed its occurrence in the Gulf of Mannar (Satyamurti, 1952), Andaman and Nicobar Islands (Tikader *et al.*, 1986; Rao and Dey, 2000; Venkataraman *et al.*, 2004), Pondicherry (Pinn, 1990), Orissa (Rao *et al.*, 1991), Andhra Pradesh (Ramakrishna *et al.*, 2007)



**Fig. 8.** *Domiporta circula* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)



**Fig. 7.** *Strigatella subruppelli* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)

and Maharashtra (Pati and Sharma, 2012). Rao and Dey (1984) also reported the species from Tamil Nadu and Andaman and Nicobar Islands. Apte (2014) noted that the species was commonly found on the east and west coasts of India. Rao (2003) reported the occurrence of the species in Maharashtra, Tamil Nadu and Andaman and Nicobar Islands. Based on these published reports, this is the first report of the species from the Kerala coast.

***Imbricaria insculpta* (A. Adams, 1853)** (Fig. 9. a-e)

Materials examined: 12 Specimens; Date of collection: 05.03.2013, 15.01.2014 & 16.10.2014; Morphometric measurements (Shell Length 13.29 - 31.98 mm; Shell Width 4.79 - 9.16 mm)

Remarks: *Imbricaria insculpta* (A. Adams, 1853) was formerly reported from Andaman and Nicobar Islands (Venkataraman *et al.*, 2004) and Lakshadweep (Rao and Rao, 1991; KSCSTE, 2012). This is the first report of the species from the southwest coast of India.



**Fig. 9.** *Imbricaria insculpta* (a. dorsal, b. apertural, c. lateral, d. apical, e. umbilical)

#### 4. Discussion

The species, *Vermeijius pallidus* (Kuroda & Habe, 1961) was first described by Habe (1961) from Japan; later Kantor *et al.* (2018) conducted a thorough investigation on phylogenetic relations of 10 recent *Pseudolatirus*-like species and introduced two new fusinine genera, *Okutanius* gen. nov. (type species *Fusolatirus kuroseanus* Okutani, 1975) and *Vermeijius* gen. nov. (type species *Pseudolatirus pallidus* Kuroda & Habe, 1961). The study also noted its occurrence from Japan to New Caledonia, at 384–647 m. Based on this report *Pseudolatirus pallidus* was changed to *Vermeijius pallidus*. The species *Latirus nassoides* was originally described as *Turbinella nassoides* (Reeve, 1847). Regarding *Imbricaria insculpta* (A. Adams, 1853), Adams (1853) originally described the species as *Mitra insculpta* and noted Ceylon as a habitat for this species. *Calcimitra triplicata* (E. von Martens, 1904) was previously reported from the Indian Ocean by Cernohorsky (1976) as *Mitra triplicata*. The study also noted the occurrence of this deep water species from 260–745 fathom depth. The original description of the species *Strigatella subruppelli* was given by Finlay (1927) as *Mitra subruppelli*. *Oliva irisans* was originally described by Lamarck (1811). The species *Oliva todosina* was initially reported by Duclos (1840).

Neogastropods are diversified marine gastropod molluscs and are predatory in nature. They are well-known for their

unique shell shapes as well as feeding habits. Kerala coast is rich in gastropod diversity and forms bycatch in shrimp trawlers operating along the coast, which are landed in Sakthikulangara/Neendakara fishing harbours located in the Kollam district along the southwest coast of India. Usually, large numbers of mitrids are landed as part of the bycatch and are discarded due to their poor economic value. Despite the beautiful colouration of these shells, they are not utilized by the shell craft industry presently. Among the olive shells reported, *Oliva irisans* and *Ancilla chrysoma* species are widely collected by the shell collectors of Neendakara/ Sakthikulangara area, and are transported as raw materials to the shell craft industries located in Tamil Nadu. The documentation of new species occurrences helps to understand the overall diversity and distribution pattern of these groups in the seas around us in addition to expanding our knowledge on the ecology of these species, and underscores the significance of ongoing research efforts for the documentation and conservation of marine biodiversity. Many ornamental gastropods, including fascioliids, olive snails and mitrids, are landed as part of bycatch, and they are discarded due to poor economic value. The present study points to the need for more systematic efforts to document the diversity of these three groups along the Kerala coast and explore the possibility of their utilization by the shell craft industry.

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