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Short Communication

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SHORT COMMUNICATION

Three new distribution records of Conidae (Gastropoda: Neogastropoda: Conoidea) from the Andaman Islands, India

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Abstract: This study documents new distribution records of three species of the family Conidae in the Andaman Islands: *Conus augur* [Lightfoot], 1786, *C. sponsalis* Hwass in Bruguière, 1792, and *C. varius* Linnaeus, 1758. The latter two records are first reports for India.

Keywords: Andaman Islands, cone snails, *Conus augur, Conus sponsalis, Conus varius,* new records.

Abbreviations: BNHS—Bombay Natural History Society, Hornbill House, Mumbai, India | CBW—*Conus* Biodiversity Website | ZSI—Zoological Survey of India, Calcutta, India | ZSI/ANRC—Zoological Survey of India/Andaman & Nicobar Regional Centre, Port Blair, India | LSL—Linnaean Collection, Linnaean Society, London, United Kingdom | NHMUK—The Natural History Museum, London, United Kingdom | MNHN—Muséum national d'Histoire naturelle, Paris, France | SL—Shell length | SW—Shell width.

Conidae is a large family of marine gastropod molluscs with more than 800 extant species worldwide (MolluscaBase eds. 2020). They occur throughout the tropical and subtropical oceans and are most diverse in the Indo-West Pacific region (Filmer 2001). The members of Conidae contribute substantially to high molluscan diversity, especially in the inter-tropical zone and are important ecologically, because a maximum of 36 species co-occur on a single reef platform (Kohn 2001); evolutionarily, since its diversification rate is high among gastropods (Stanley 2007); and medically, as the venom produced by these snails promise new drug discoveries (Puillandre et al. 2011). In addition, each species count (biodiversity) adds knowledge of 100–200 venom peptides (chemical diversity) with potential applications in human health (Franklin et al. 2009).

In India, Kohn (1978) reported 48 species and then increased to 77 species with 29 new records (Kohn 2001). Later, Franklin et al. (2009) recorded 60 species from Tamil Nadu (south-east) coast of India that increased the number of Indian Conidae species from 77 to 81. Towards the west sea, 78 species are so far known from the Lakshadweep Islands (Smith 1906; Hornell 1921; Nagabhushanam & Rao 1972; Appukuttan et al. 1989; Rao & Rao 1991; Apte 1998; Rao 2003; Ravinesh & Bijukumar 2015). Of the 78 species, Ravinesh et al. (2018) recently confirmed the presence of 48 species from the seas around 10 inhabited Islands of Lakshadweep Islands.

Similarly, in the Andaman & Nicobar Islands, Smith (1878) followed by Melvill & Sykes (1898) and Preston (1908) reported 10 species of Conidae. Rao

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(1980) studied this group during three oceanic surveys conducted between 1970 and 1972 and that includes 51 species compiled after going through the named and unnamed collections of Conidae present in the Zoological Survey of India and also from the literature. Of this, 49 species were newly recorded from the Andaman & Nicobar Islands. Subsequently, Rao & Dey (2000) and Rao (2003) updated the number of species to 53. Franklin et al. (2013) added the records of four species to the Conidae of the Andaman & Nicobar Islands.

This study documents new distribution records of three species (*Conus augur* [Lightfoot], 1786, *C. sponsalis* Hwass in Bruguière, 1792, and *C. varius* Linnaeus, 1758) of the family Conidae from the Andaman Islands.

Materials and methods

Specimens were collected from the shoreline to a depth of approximately five meters from two sites of South Andaman District of Andaman & Nicobar Islands by hand picking and snorkeling during regular field visits. Details of shell size, date of collection, voucher numbers, habitats, localities (coordinates) of collection sites, type & material, and type locality information are presented in materials examined section of each species account. Documented distributions of species globally and in India and shell description are given. Morphological measurements, viz., shell length (SL) and shell width (SW) are recorded to the nearest millimeter. One or more specimens of each species were deposited in institutional repositories as indicated and voucher numbers are provided. Color photographs of the shells deposited in the institutional repositories are provided.

Results

Systematic account

Order: Neogastropoda Wenz, 1938
Superfamily: Conoidea Fleming, 1822
Family: Conidae Fleming, 1822
Genus: *Conus* Linnaeus, 1758

Conus augur [Lightfoot], 1786 (Common name: Augur Snail) (Images 1, 2)

Type material: Specimen illustrated by Knorr (1772, pl. 13, fig. 6); size: 65.5 x 35 mm; selected as lectotype by Kohn (1964a).

Type locality: Unknown, Coomans et al. (1981) designated as "Island of Ceylon" (Sri Lanka).

IUCN Red List status: Least Concern.

Materials examined: BNHS-GASTRO-2074 (Images 1 and 2), 8.ii.2020, 3 (1 living, 2 shells) specimens, SL 50×28 SW mm, intertidal, Burmanallah (11.574N, 92.737E), South Andaman, Andaman & Nicobar Islands, coll. J.B. Franklin.

Distribution: *Conus augur* occur in shallow waters and is widely distributed across the Indian Ocean; from the southern coast of Natal along eastern Africa to western Thailand, probably Moluccas (Röckel et al. 1995; Franklin et al. 2009; CBW 2020). Coomans et al. (1981) reported its distribution from eastern Africa to western Indonesia.

Documented distributions are from Sri Lanka (Kohn 1960; from the records of previous authors, Hanley 1859; Standen & leicester 1906), Tanzania (Spry 1961), Aldabra Atoll (Taylor 1973), Thailand (da Motta & Lenavat 1979), Zanzibar, Mozambique, Tanzania (Dar es Salaam), Kenya, Madagascar (Tulear), the Andaman Sea (western Thailand) (Coomans et al. 1981), Mayotte (Deuss et al. 2013), and southern Madagascar (Monnier et al. 2018).

In India, previous reports are from Vellapatti, Gulf of Mannar (Kohn 2001; Hylleberg & Kilburn 2002). Yerwadi, Keelakarai, and Vembar (Franklin et al. 2009) of Gulf of Mannar. Venkitesan et al. (2019) reported its occurrence from Tamil Nadu and Karnataka based on the materials present in National Zoological Collections of ZSI without precise locality data or catalog numbers.

Description: Shell moderately large (55–80 mm). Body whorl broadly conical; sides nearly straight. Shoulder sub-angulate, weakly tuberculate. Spire of moderate height (0.12–0.23 mm); outline convex. Body whorl with weak spiral ribs at base in small specimens, ribs granulose in moderately large specimens.

Ground colour white. Body whorl with numerous spiral rows of fine reddish-brown dots from base to shoulder, with two interrupted reddish-brown transverse bands on either side of the centre. The posterior band extends irregularly towards the shoulder. Aperture white, outer lip thick.

Habitat: In the Andaman Islands, this species inhabits sand substrates and lives beneath rocks on intertidal benches. Röckel et al. (1995) and Franklin et al. (2009) have reported this species from similar habitats; the latter collected specimens from sand at depths of 8–15 m in the Gulf of Mannar. In Mayotte, specimens were observed at 0–5 m in the intertidal region on sand, mud and sea grass associated habitats (Deuss et al. 2013). In Madagascar, the specimens were collected from intertidal zones and depths up to 18m (Monnier et al. 2018).

Habit: No observation on feeding has been reported to date and thus necessitates further study. Nevertheless, the teeth morphology supports this species as a worm

eater (Franklin et al. 2007).

Remarks: Uncommon in the Andaman Islands. Shell pattern similar between specimens of mainland India and the Andaman Islands. Coomans et al. (1981) reported the distribution of this species (from the collections of Saesen, Wils) from eastern Africa to western Thailand and Indonesia that includes Andaman Sea. Yet, there have been no reports on the occurrence of *C. augur* from the Andaman & Nicobar Islands. This is the first report from the Andaman Islands.

***Conus sponsalis* Hwass in Bruguière, 1792 (Common name: Sponsal Cone) (Images 3–7)**

Type material: Specimen illustrated by Bruguière (1792: pl. 322, fig. 1), selected as lectotype by Kohn (1968); size: 29 x 20 mm.

Type locality: "Iles Saint-George" [said by Hwass to be in the Pacific Ocean; present name of the island unknown]. Nevertheless, Lee & Park (2014) mentioned as 'Indo-West Pacific; Rowley Shoals, New South Wales'.

IUCN Red List Status: Least Concern.

Materials examined: BNHS-GASTRO-2075 (wet preservation), 8.ii.2020, 4 (3 living, 1 shell) specimens, size range—SL 17×10 SW (Images 3, 4); SL 15×10 SW to SL 20×15 SW mm; (SL 20×15 SW mm; Images 5, 6), Burmanallah (11.523N, 92.740E), South Andaman, Andaman & Nicobar Islands, coll. J.B. Franklin.

Distribution: *Conus sponsalis* occurs throughout the Indo-Pacific (Kohn 1968).

Documented distributions are from Dar es Salaam, Tanzania (Spry 1961), Hawaii (Kohn 1959a,b, 1966; Kohn & Weaver 1962), Maldives (Kohn & Robertson 1966), Chaos Archipelago (Liénard 1877; Kohn & Robertson 1966), Eilat, Gulf of Aquba & Sinai Peninsula (Kohn 1964b), Aldabra Atoll (Taylor 1973), Thailand (da Motta & Lenavat 1979), Mascarene Basin (Drivas & Jay 1987), Rottnest Island, western Australia (Kohn 1993), New Caledonia (Héros et al. 2007), Moreton Bay, Queensland (Healy et al. 2007), Philippines (Massilia 2008), Australia, Papua New Guinea, Philippines, China, Japan, & Korea (Jeju-do) (Lee & Park 2014), Christmas Island & the Cocos (Keeling) Islands (Abbott 1950; Maes 1967; Wells et al. 1990; Wells 1994; Wells & Slack-Smith 2000; Tan & Low 2014), American Samoa, Fiji, French Polynesia, Guam, Palau, Papua New Guinea, & Reunion (Duda et al. 2008), Mayotte (Deuss et al. 2013), Mauritius (de Billot & Touitou 2014), Seychelles Island (Kohn 2015), and Mozambique, Papua New Guinea, & southern Madagascar (Monnier et al. 2018). Pleistocene fossils are also known from the Oahu and Molokai (Kohn 1959a).

This is the first report of *C. sponsalis* for India from the Andaman Islands.

Description: Shell small, thick and solid. Body whorl conical; outline convex at adapical half and straight below. Body whorl with fine granulose ribs; pronounced basally. Shoulder coronated with small tubercles. Spire low, eroded; inner whorls looks like coronated, outline convex. Spire low, outline convex. Aperture narrow.

Ground colour white with blue shade. Body whorl with brown reduced axial flames arranged in rows; above and below center. Basal part of columella purplish-blue. Aperture ivory in color, interior purplish-blue; inner lip brown spot on white, outer lip yellowish to white. Periostracum yellow, thin, translucent, and smooth.

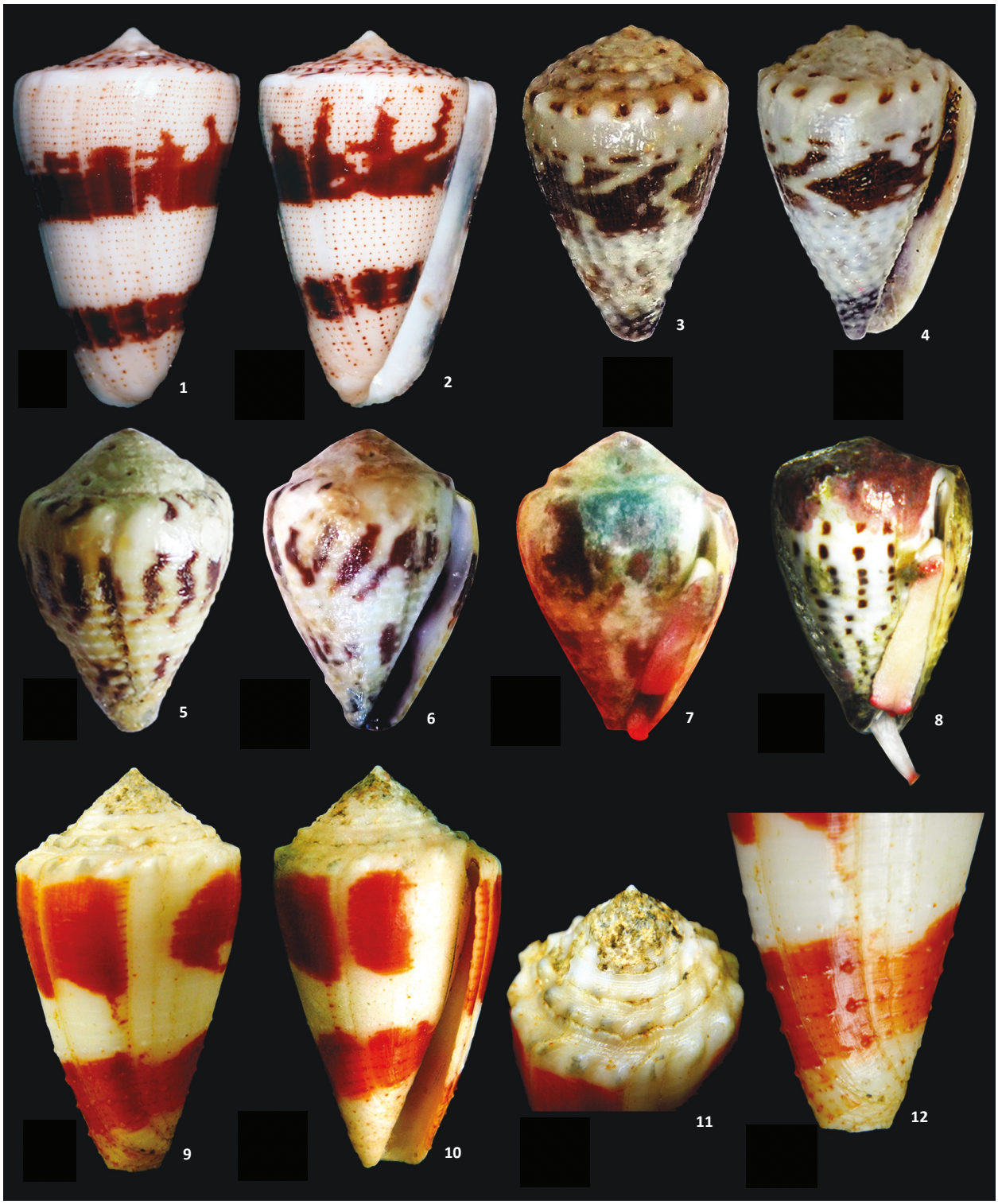
Living animal: Foot narrow and sole of foot pink; dorsum pale pink. Tentacles red, siphon pink (Fig. 7).

Habitat: In the Andaman Islands; collected beneath rock on intertidal bench.

Elsewhere, this species is common on intertidal benches; some specimens dredged in 100m depths (CBW 2020). Usually found in protected and exposed sites; on beach rock and limestone benches, in sand, sand-filled depressions, coral rubble, & rock crevices (Röckel et al. 1995), and on rocks & pebbles (Lee & Park 2014). Sub tidally, on reef flats, lagoon pinnacles and deeper reef habitats up to 18m depth, inhabiting sand or limestone with algal turf, coral rubble, and crevices of dead coral (Röckel et al. 1995; Lee & Park 2014). *Conus sponsalis* is common on the intertidal and shallow waters in the lagoon, reefs, and shore reefs in Mayotte (Deuss et al. 2013). This species is very common in shallow waters of lagoons in Mauritius (Billot & Touitou 2014). In Seychelles on main and coralline island reefs on thin layer of sand on limestone bench (Kohn 2015). Monnier et al. (2018) reported it in 0–14 m depths from Mozambique, Papua New Guinea, and southern Madagascar.

Habit: *Conus sponsalis* feeds exclusively on errant polychaetes (Ragworms) (Kohn 1959b; Kohn & Nybakken 1975; Reichelt & Kohn 1985; Kohn & Almasi 1993) nereids, and eunicids (Duda et al. 2001).

Remarks: Uncommon in Andaman Islands. *Conus sponsalis* resembles *C. parvatus* (Walls, 1979) in size, but differs in shell colour pattern; the former has axial flames while the latter has a distinct small dotted pattern in the body whorl. Further, the shell shape in *C. parvatus* is almost conical with a flat spire (Fig. 8) and the outline of the body whorl is almost straight. However, the outline of the body whorl is convex in *C. sponsalis*. The anterior and posterior tips of the foot and siphon in *C. parvatus* is tinged with pink, sole ivory (Fig. 8); in *C. sponsalis* the



Images 1–12. 1 & 2—*Conus augur* [Lightfoot], 1786 (BNHS-GASTRO-2074; 45×24 mm) | 3 & 4—*Conus sponsalis* Hwass in Bruguière, 1792 (17×10 mm) | 5 & 6—*Conus sponsalis* Hwass in Bruguière, 1792 (BNHS-GASTRO-2075; 20×15 mm) | 7—*Conus sponsalis* Hwass in Bruguière, 1792 (18 ×15 mm); shows foot sole and siphon colour | 8—*Conus parvatus* (20 ×14 mm); shows foot sole and siphon colour | 9 & 10—*Conus varius* Linnaeus, 1758 (ZSI/ANRC-11274; 48×25 mm) | 11—*Conus varius* Linnaeus, 1758; shows shell granulose in abapical third | 12—*Conus varius* Linnaeus, 1758; shows tuberculate shoulder & spire. © J.B. Franklin

entire sole pink or red (Fig. 7). Similarly, *Conus musicus* Hwass in Bruguière, 1792 (= *Conus ceylanensis* Hwass in Bruguière, 1792) resembles *C. sponsalis* in the shell characters. But it could be differentiated. The colour pattern of *C. sponsalis* lacks dotted spiral lines and the markings between the tubercles in *C. musicus* are blackish-brown; spiral rows of brown dots and dashes extend from base to shoulder, varying in number and arrangement. Dark dots may alternate with white dashes or dots. The pronounced double row of red-brown axial flames in *C. sponsalis* is absent in *C. musicus.*

***Conus varius* Linnaeus, 1758 (Common name: Freckled Cone) (Images 9–12)**

Type material: Lectotype selected by Kohn (1963a) in LSL; size: 33.5 x 16 mm (Cat. no: 312).

Type locality: Banda, Moluccas, Indonesia; Kohn (1963a).

IUCN Red List status: Least Concern.

Materials examined: ZSI/ANRC-11274, 9.x.2014, 3 (2 living, 1 shell) specimens; size range from SL 48×25 SW mm to SL 50× 25 SW mm, (Images 9, 10; SL 48×25 SW mm), Aberdeen Bay (11.669N, 92.749E), South Andaman, Andaman & Nicobar Islands, coll. J.B. Franklin.

Distribution: *Conus varius* is believed to be from southern and eastern Africa to Marshall Islands and Tuamotu Archipelago; absent from Red Sea, India, and Sri Lanka (Röckel et al. 1995).

Documented distributions are from Dar es Salaam, Tanzania (Spry 1961), Maldives (Kohn & Robertson 1966), Chaos Archipelago (Liénard 1877; Kohn & Robertson 1966), Aldabra Atoll (Taylor 1973), Thailand (da Motta 1979), Mascarene Basin (Drivas & Jay 1987), Philippines (Massilia 2008), Christmas Island, Cocos (Keeling) Island (as *C. hevassii*; Maes, 1967; Wells et al. 1990; Wells 1994; Wells & Slack-Smith 2000; Tan & Low 2014), New Caledonia (Héros et al. 2007), Moreton Bay, Queensland (Healy et al. 2007), Mayotte (Deuss et al. 2013), Mauritius (Billot & Touitou 2014), and southern Madagascar (Monnier et al. 2018).

This is the first report of *C. varius* from India (A.J. Kohn pers. comm.).

Description: Shell moderately large (55–80 mm), thick and solid (0.30–0.80 g/mm). Body whorl slightly conical; outline evenly convex. Shoulder angulate, strongly tuberculate. Spire of moderate height (0.12–0.23 mm), outline slightly convex (Fig. 11). Last whorl with evenly spaced ribs, heavily granulose in abapical third (Fig. 12), weak granulose ribs around abapical fourth of last whorl.

Ground colour white. Last whorl tinged with brown, irregularly-shaped or axial blotches within adapical and abapical third. Blotches variable in size and number, fusing into two spiral bands. Evenly spaced spiral rows of dark brown dashes extend from base to shoulder. Larval whorls white. Aperture white, pale orange behind a white marginal zone. Periostracum yellowish-brown, thin, translucent, and smooth.

Habitat: *Conus varius* occurs on coral reef platforms and fore-reefs in or under dead corals, on limestone benches and in sand often beneath coral rocks (CBW 2020).

In the Andaman Islands, it is found on coral reef platforms under dead corals in sand. *T*his species occurs in the intertidal zones up to about 30m depth and there's a note on a specimen dredged up from about 240m depth in the Philippines (Röckel et al. 1995). Specimens were observed in lagoons, reefs, lagoon pinnacles, and shore reefs in the intertidal region (0–5 m depth) in sand, mud, and sea grass (Deuss et al. 2013). They occur on coral debris in the lagoon in Mauritius (Billot & Touitou 2014). Monnier et al. (2018) reported this species at 19–20 m depth in southern Madagascar.

Habit: *Conus varius* is known to feed on polychaete worms (Duda et al. 2001).

Living animal: Dorsum of foot pale yellow; a small black fleck in anterior part beneath the operculum; sole of foot pale yellow to white. Siphon pale yellow with a brown ring just behind the tip (Röckel et al. 1995).

Remarks: The shell of *C. varius* is very unique from other species of family Conidae. Röckel et al. (1995) stated this species as 'absent from India'. Nevertheless, this study reports *C. varius* for the first time from India.

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