

ON THE CONIDAE OF ANDAMAN AND NICOBAR ISLANDS

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INTRODUCTION

Andaman and Nicobar Islands can be considered as biological laboratories, housing a varied fauna, especially in the marine environment. The complex coral reef system fringing these islands offer micro and macroclimatic niches supporting a rich and conspicuous molluscan fauna. Although several papers have appeared in the past, none of them present a comprehensive picture of molluscs of the islands.

Recently, Rajagopal and Subba Rao (1974) dealt in detail on the chitons of these Bay Islands. The present paper is another in the series on the family Conidae, which includes a large number of sympatric species.

Cones are generally abundant in the shallow waters of tropical seas. The members of this genus possess a venom apparatus for paralysing the prey. They are carnivorous and feed on other molluscs, polychaetes or fishes. Depending on their feeding habits they can be classified as molluscivorous, vermivorous or piscivorous.

The author had an opportunity to participate in three surveys of these Islands during the period from 1970 to 1972. General notes were made on the habitats of some common cones. No observations could, however, be made on their feeding habits, because of their nocturnal activities and short durations of the tours.

A complete list of species of cones occurring on these islands with notes on the habitats of some common species is presented here. The list which includes 51 species is compiled after going through the named and unnamed collections of conidae present in the Zoological Survey of India and also from literature. Only 10 species were mentioned in the published records (E. A. Smith, 1878 ; Melvill & Sykes, 1898 ; Preston, 1908) and as such the rest of the species are reported for the first time from these islands.

HABITATS OF CONES

The coral reefs around Andaman and Nicobar Islands are fringing type. Benches or platforms formed around shore rocks of sand stone

and conglomerate are common features on many sloping shores (Reddiah, 1977). Molluscs constitute an important faunal element of these reefs.

Cones were collected mainly from reefs around Car Nicobar and Kamorta in the Nicobar group of Islands and leeward shores at Chiriatapu, Neil and Havelock islands in the Andaman group from the sands, sand under coral rocks and dead coral rocks or boulders covered with sand and Halimeda clumps.

Cones were seen in abundance on the windward reef platforms of Malacca, Car Nicobar (Sta. 9—K. Reddiah, 1972). The reef flat of about 70 m. width was exposed during low tide. It consisted of conglomerate rock in a beach formation. The flat was grooved by surge channels from about its middle to the reef front and occasionally reaching up to sandy beach. Maximum width of surge channel near sloping reef edge was one metre narrowing towards beach and merging in rock pools. The rock pools were wide and shallow with very little fauna except the usual brittle stars. The calcareous algae were growing on the periphery of the surge channels. Corals-*Acropora* sp. and *Favia* sp. and sea mats were noticed on the exposed flat adjoining surge channel. *Conus miles* Linnaeus was collected from the sandy patches and among the algae near the surf beaten zone near the surge channels. None of the specimens were collected out of water. Even during low tide specimens were found with 5 to 10 cms. of water above them. The other two species *Conus ebraeus* and *Conus lividus* were found extending further beachwards and were collected out of water. These were common on the flats exposed during low tide.

In Andamans the surge channels of the type found in Nicobars are absent, but there are wide erosion channels, some 20 m. in width intersecting the reef platforms at various places (Reddiah, 1977).

In Andamans also near Chiriatapu, and Neil Island *Conus litteratus* and *Conus ebraeus* were the common species. The former was always found slightly buried in sand in 0.5 m. depth of water. The shell was coated with sand and algae. *Conus ebraeus* was collected on the exposed flats and out of water.

Species of *Conus* known to occur in Andaman and Nicobar Islands.

Conus achatinus Hwass in Bruguiere

Conus adansoni Lamarck

Conus amadis Gmelin

**Conus andamanensis* Smith

Conus araneosus Solander (Syn : *Conus arachnoides* Gmelin)

- Conus arenatus* Hwass in Bruguiere
- **Conus aulicus* Linnaeus
- Conus bandanus* Hwass in Bruguiere
- Conus canonicus* Hwass in Bruguiere
- Conus chaldaeus* (Roeding)
- **Conus capitaneus* Linnaeus
- Conus characteristicus* Fischer
- Conus catus* Hwass in Bruguiere
- **Conus ceylanensis* Hwass in Bruguiere
- Conus coronatus* Gmelin
- Conus distans* Hwass in Bruguiere
- **Conus ebraeus* Linnaeus
- Conus eburneus* Hwass in Bruguiere
- **Conus edwardi* Preston
- Conus emaciatus* Reeve
- Conus episcopus* Hwass in Bruguiere
- Conus figulinus* Linnaeus
- Conus flavidus* Lamarck
- Conus generaiis* Linnaeus
- Conus geographus* Linnaeus
- Conus insculptus* Kiener
- Conus janus* Hwass in Bruguiere
- Conus litteratus* Linnaeus
- Conus lividus* Hwass in Bruguiere
- **Conus masoni* G. & H. Nevill
- Conus miles* Linnaeus
- Conus miliaris* Hwass in Bruguiere
- Conus millepunctatus* Lamarck
- Conus mitratus* Hwass in Bruguiere
- Conus monile* Hwass in Bruguiere
- Conus mutabilis* Reeve
- Conus nicobaricus* Hwass in Bruguiere (= *Conus araneosus* Solamder)

- **Conus nobilis* Linnaeus
- Conus nussatella* Linnaeus
- Conus pennaceus* Born
- Conus piperatus* Dillwyn
- Conus pretiosus* G. & H. Nevill
- **Conus scabriusculus* Chemnitz
- Conus straturatus* Sowerby
- Conus striatus* Linnaeus
- Conus terebra* Born
- Conus tessulatus* Born
- Conus textile* Linnaeus
- Conus tulipa* Linnaeus
- Conus virgo* Linnaeus
- **Conus zonatus* Hwass in Bruguiere
- * Previous records

Some Common Species and Their Identity

Although, 51 species of *Conus* have been listed above majority are known by dead shells. Kohn (1960) listed a total of 70 species as occurring in Sri Lanka, and Kohn and Robertson (1966) listed 64 species from Maldivian and Chagos Islands. When compared to these lists, Andaman and Nicobar Islands therefore present a poor picture. A further search may bring out more species to light. The cones of these Islands are imperfectly known hence the characters of identification of some common species only are given below. It is hoped that this paper will provide the incentive for further work on the bioecology of *Conus* of these Islands.

SYSTEMATIC ACCOUNT

1. *Conus araneosus* Solander in (Lightfoot), 1786

Conus araneosus Solander in Lightfoot, 1786, *Portland Catalogue*, p. 76, no. 1714. Type-locality : China. Kohn, 1964, *J. Linn. Soc. Lond.*, Zoology, **45** : 160, fig. 14.

Conus araneosus Hwass, Reeve, 1843 *Conch. Icon.*, I, *Conus*, sp. no. 44. pl. VIII fig. 44. Tryon, 1884, *Man. Conch.*, 6 : 8, pl. I, figs. 8-10.

Conus arachnoideus Gmelin, 1791, *Syst. Nat.*, ed. 13 : 3388. no. 34. Type-locality : Not mentioned.

Conus nicobaricus Hwass in Bruguiere, *Encyclopede Methodique*, Vers, 1 (2) : 612. Reeve, 1843. *Conch. Icon. 1*, *Conus*, sp. no. 41, pl. viii, figs. 41a, b.

Remarks.—Shell is reticulated with yellowish white and light chocolate brown. The body whorl is encircled with three interrupted or irregular bands of chocolate brown, which are usually well defined.

Kohn (1966) considered *Conus arachnoideus* Gmelin as a junior synonym of *C. araneosus* Solander.

Reeve (1843) maintained *Conus nicobaricus* Hwass and *Conus araneosus* as two distinct species while Tryon (1884) treated the former as a variety of the latter species. But the distinguishing characters between these two species is hardly recognizable and can be treated as conspecific. The collection studied shows characters of both the species. There are specimens with three bands and the upper one is broader than the rest. In some the upper two bands have coalesced together forming a broader one. In general the bands are well defined.

Distribution.—It is a common species in the Andaman and Nicobar Islands.

It occurs in Indo Malayan region and eastern Indian Ocean.

2. *Conus arenatus* Hwass in Bruguiere, 1792

Conus arenatus Hwass in Bruguiere, 1792, *Encyclopede Methodique*, Vers., 6 (2) : 621. Reeve, 1843, *Conch. Icon. 1*, *Conus* sp. no. 92, pl. xvii, fig. 92: Tryon, 1884, *Man. Conch.*, 6 : 18, pl. 4, fig. 66, pl. 27, fig. 2.

Remarks.—The shell may be stoutly turbinated or cylindrical, covered with numerous small reddish brown dots. These dots are sometimes arranged into bands. The spire may be convexly flat or slightly elevated. The body whorl is strongly coronated at the shoulders.

It exhibits variation in the general shape of the shell and in spire.

3. *Conus capitaneus* Linnaeus

Conus capitaneus Linnaeus, 1758, *Syst. Nat. ed. 10* : 713, No. 254, Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 54, pl. xi, fig. 54, Tryon, 1884, *Man. Conch.*, 6 : 40, pl. 12, figs. 21-24, pl. 11, figs. 17-18.

Remarks.—Body whorl is encircled with two reddish brown spotted bands. Spire is low and striate. Aperture is bluish purple

within. According to Reeve (1843) it offers innumerable varieties, differing in size, colour and chest-nut painting. But in the present collection the species exhibits uniform colouration.

Kohn (1963) discussed the nomenclature of this species.

Distribution.—Tropical Indo-West Pacific, Mauritius to Polynesia.

4. *Conus distans* Hwass in Bruguiere, 1792

Conus distans Hwass in Bruguiere, 1792, *Encyclopede Methodique*, Vers., 1 (2) : 634. Reeve, 1843, *Conch Iocn.* 1, *Conus*, sp. no. 174, pl. xxxi, fig. 174. Tryon, 1884, *Man. Conch.*, 6 : 40.

Remarks.—Shell is elongately turbinated, and in the middle narrow. In the majority of specimens the shell is brownish yellow and encircled by distant, somewhat obsolete, impressed lines. The base of the body whorl is stained blackish violet. The spire is convexly exerted and apex is characteristically and flatly truncated. The shoulder is coronated with obtuse white knobs with yellowish brown interstices.

Distribution.—Tropical Indo-West Pacific.

5. *Conus ebraeus* Linnaeus, 1758

Conus ebraeus Linnaeus, 1758, *Syst. Nat.* ed. 10 : 715, no. 268. Type-locality: India. Kohn, 1963, *J. Linn. Soc. Lond.*, 44 : 748.

Conus hebraeus Linnaeus, Reeve, 1843, *Conch. Icon.* 1 : sp. no, 104, pl. xix, figs. 104a, b, Tryon, 1884, *Man. Conch.*, 6 : 20, pl. 5, figs. 75-77, pl. 27, fig. 13.

Remarks.—The shell can be very easily distinguished by its characteristic colour pattern. Shell brownish white with bands of irregular longitudinal or rhomboidal dark chocolate or black markings. The surface more or less striated through out but the striations are more prominent towards the dark stained base.

In the collection of 100 specimens, there are two specimens where the black markings are more continuous so as to cover the entire length of the shell. The specimens with this colour pattern were treated as a variety, namely *vermiculatus* Lamarck by Reeve (1843) and Tryon (1884). This may be a case of colour polymorphism, which occurs sporadically in a population.

It can tolerate exposure to air and half of the individuals were observed above the datum in Maldive and Chagos Islands where it was common at all intertidal stations and was dominant on smooth limestone pavement and beach rock (Kohn, 1968). In Andaman and

Nicobar Islands also it is a common species on the flats of beach rock exposed during low tide. They generally abound in places, where there is an abundance of polychaetes. Majority of the specimens were collected out of water.

Distribution.—Indo-Pacific.

6. *Conus geographus* Linnaeus, 1758

Conus geographus Linnaeus, 1758, *Syst. Nat.* ed. 10 : 718, no. 283. Type-locality : Indies. Reve, 1843, *Conch. Icon.*, 1, *Conus*, sp. no. 130, pl. xxiii, fig. 130. Tryon, 1884, *Man. Conch.*, 6 : 88, pl. xxviii, fig. 84, pl. xxix, pl. 85.

Remarks.—This cone is not very common in the Islands. However, it is included in this category, because it is known as a dangerous species.

The species can be distinguished by its oblong, thin and inflated shell. It is stained with flesh colour. The spire is concave and slightly canaliculated. It is spirally striated and coronated with rather prominent tubercles. The apex is rose tinted.

Distribution.—It occurs throughout tropical Indo-Pacific.

7. *Conus litteratus* Linnaeus

Conus litteratus Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 712, no. 252. Type-locality : Asiatic Ocean. Kohn, 1963, *J. Linn. Lond.*, Zoology, 44 : 751.

Conus litteratus Linnaeus, Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 183. pl. xxxiii, fig. 183 ; Tryon, 1884, *Man. Conch.*, 6 : 10, pl. 2, figs. 17-19.

Remarks.—Shell is usually encircled with two to three broad indistinct light yellow or orange-brown bands, and a number of rows of large and small dark chocolate or black, round, square or triangular spots. The spots are sometimes elongated longitudinally. The spire is flat and a little depressed.

It bears close resemblance to *Conus millepunctatus* Lamarck, which Tryon (1884) treated as a variety of this species. *C. millepunctatus* differs from this species in the absence of yellow bands and the presence of more numerous spots.

It is the largest among cones occurring in the Islands. A specimen collected from Neil Island measured 141.50 mm. in height, 92.6 mm. maximum width and 18.8 mm. minimum width. In the older specimens the colouration is completely covered by brownish periostracum.

Specimens were found partly buried in sand, in knee-deep water, near Chiriatapu. Shells were always coated with sand and in a few specimens algae was found growing on them.

Distribution.—Tropical Indo Pacific from Zanzibar to Viti Island.

8. *Conus lividus* Hwass in Bruguiere, 1292

Conus lividus Hwass in Bruguiere, *Encyclopede Methodique*, Vers., 1 (2) : 630, pl. 321, fig. 5 Reeve, 1843, *Conch. Icon.*, 1 : sp ; no. 211, pl. Tryon, 1885, *Man. Conch.*, 6 : 45, pl. 13, figs. 54-57. Cernohorsky, 1967, Marine shells of the Pacific, p. 222, pl. 57. fig. 422.

Remarks.—Shell is transversely striated, lower striæ are often granulose. It is generally livid green encircled round the middle with a pale indistinct narrow belt. Spire is depressed and conical ; shoulder and spire are coronated with tubercles and apex tinged with pale rose colour. Interior of aperture is deeply stained at the upper and lower parts with purple violet.

It exhibits variation in shell morphology. Some of the specimens are without any tubercles, and the granulations on the body whorl are not prominent or some times even absent. This phenomenon of occurrence of smooth and granulated shells in the same species in Conidae has been discussed by Coomans (1973).

It may be conspecific with *C. flavidus* ; Reeve (1843) and Tryon (1884) expressed doubts about the distinction between the two speies.

Distribution.—Indo-Pacific, Red Sea to Polynesia. It is a common species in Andaman and Nicobor Islands. It is the commonest species in Maldive and Chagos Islands, where it occurs on a greater diversity of substrates (Kohn, 1962).

9. *Conus miles* Linnaeus, 1758

Conus miles Linnaeus, 1758. *Syst. Nat.*, ed. 10 : 713, no. 255. Type-locality : India.

Reeve, 1843, *Conch. Icon.*, 1 : sp. no. 9, pl. II. fig. 9. Tryon, 1884, *Man. Conch.*, 6 : 40, pl. 11, fig. 16, pl. 27, fig. 11.

Remarks.—Shell is pale yellowish with two dark transverse ferruginous bands on the body whorl, one slightly above the middle region and another above the basal region, longitudinally with undulating threadlike lines of light brown colour. Basal region of body whorl blackish-brown. Spire is flatly obtuse and yellow.

In some of the specimens the shell is encircled with hairy and distantly placed transverse striae.

It occurs in sandy patches of coral reefs and generally in water.

Distribution.—East Africa to Central Polynesia.

10. *Conus miliaris* Hwass in Bruguiere, 1792

Conus miliaris Hwass in Brugüiere, 1792, *Encyclopede Methodique* Vers., 1 (2) : 629. Reeve, 1843, *Conch. Icon.*, 1, *Conus* sp. no. 198, pl. xxxvi, fig. 198. Tryon, 1884, *Man. Conch.*, 6 : 21, pl. figs. 84-90, pl. 27, fig. 12

Remarks.—Shell is shortly turbinated. The body whorl is ornamented with two irregular bands of white colour above and below the middle region. It is encirbled throughout with a very fine dot-interrupted reddish brown lines of striae. The striae towards the base are usually granular and sometimes throughout.

The shells are generally small in size and shows considerable variation in the height and coronation of the spire, as well as in the colour and pattern of markings.

Distribution.—Red Sea to Sandwich and Galapagos Islands.

11. *Conus striatus* Linnaeus, 1752

Conus striatus Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 716, no. 277. Type-locality : Hitoe, Amboina. Reeve, 1843, *Conch. Icon.* 1, *Conus*, sp. no. 179, pl. xxxii, fig. 179a.

Remarks.—Shell is cylindrically turbinated with deep and prominent striae. Colour is usually yellowish being more or less variegated and spotted with brownish black. The spire is obtusely convex and canaliculated with a rose tinted apex.

The species is not very common, but is important being a poisonous one. In fresh condition the coloration is brownish-black. but in older and worn out shells the colour becomes more blackish. The specimens in the Reserve Collections show variations in shell colour and height of the spire.

Distribution.—Occurs throughout tropical Indo-Pacific.

12. *Conus textile* Linnaeus, 1752

Conus textile Linnaeus, 1758, *Syst. Nat.*, ed. 10 : 717, no. 278. Type-locality :

Banda. Reeve, 1843, *Conus. Icon.*, 1, *Conus. sp. no. 209*, pl. xxxviii, fig. 209.
Tryon, 188, *Wan. Conch.*, 6 : 89, pl. xxix, figs. 92-99.

Remarks.—Shell is cylindrically ovate, smooth or striated towards the base. The colour is generally yellow, encircled with two rows of large irregular orange blotches, and with orange brown triangular reticulations in other places. The spire is acuminate, the body whorl strongly shouldered towards the spire.

The species is known for its beautiful colouration. Although different colour variants were recorded in this species, the present collection is of uniform colouration.

Only dead shells washed ashore were collected during all the surveys. It is also known to be a poisonous one.

Distribution.—Indo-Pacific.

SUMMARY

All the species listed above are reported from the Indian Ocean previously, and are widely distributed throughout tropical Indo-West Pacific. There are however four exceptions to this general rule. The species *C. andamanensis* Smith, *C. masoni* G. & H. Nevill, *C. pretiosus* G. & H. Nevill and *C. edwardi* Preston are known from their type-localities only. The latter mentioned two species are however, not recorded subsequently from the Islands.

Conus arenatus, *Conus lividus* and *Conus miliaris* show intra-specific diversity. But the small sample size precludes the possibility of commenting on the variations within populations, Coomans (1973) reported the occurrence of smooth and granulated shells in certain species in Conidae. In the present study, diversity was in the shape of spire and shell (*C. arenatus*), in the height and coronation of the spire (*C. miliaris*). The occurrence of smooth and granulated shells were noticed in *C. lividus* only. Colour morphs were seen in *C. ebraeus* and *C. miliaris*.

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