

Limited distribution of Devil snail *Faunus ater* (Linnaeus, 1758) in tropical mangrove habitats of India

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Received 15 February 2017; revised 02 June 2017

Our study reports the occurrence of devil snail, *Faunus ater* from a mangrove habitat of Sindhudurg District, Maharashtra, India. The density of the aggregation of devil snail in the study area ranged from 100 to 640/m². Out of the 46 mangrove patches surveyed, this species was observed only in Aadbandar. Significantly, this study provides baseline information regarding the abundance and distribution of devil snail from the Indian subcontinent.

[**Keywords:** Devil snail, *Faunus ater*, mangroves, Maharashtra]

Introduction

Molluscan diversity in the tropical Indo-West Pacific region is regarded to be highly diverse and rich; especially in the mangrove ecosystems where various factors greatly influence the distribution of malacofauna¹. The devil snail, *Faunus ater* (Linnaeus 1758), a single species of the genus is distributed in tropical freshwater/brackish water habitats like lagoons and estuaries¹, river mouths²⁻⁵, mangroves⁶, seagrass beds⁷ and intertidal areas⁸. This species has a very poorly studied ecology^{4,5} and in the Indian subcontinent, it has been reported from various terrestrial and freshwater habitats⁹⁻¹⁴. However, its detailed distribution and abundance related studies are still lacking from this region.

Our study reports the distribution, abundance and density of *F. ater* from a localized mangrove habitat situated on the west coast of India.

Materials and Methods

Study area

The study was undertaken in the state of Maharashtra, as a part of a national project, which aimed to assess the conservation value of ecologically sensitive areas along the coast of India. Forty-Six contiguous mangrove patches* along the coastal districts of Maharashtra viz., Thane, Mumbai sub-

urban and Sindhudurg were assessed during April and May 2015 (Fig. 1). In each patch, 3-4 quadrats (each of 10m² size) were laid along a 100 m line transect¹⁵ in order to document the mangrove and associated species and to assess their diversity and abundance.

The area of devil snail aggregation Aadbandar (16°13'30.62"N73°25'51.11"E; Sindhudurg District, Maharashtra) is about 700 m from the coast. The area is a brackish water mangrove habitat, where the depth ranged from 0.3 to 1 m.

The mouth adjoining the Arabian Sea is a bar built type estuary, which is replenished by seawater during spring tides. The substratum is sandy with gravel, silt clay, coarse and fine sand. The area acts as a transit route for the local communities, while the banks act as a grazing ground for domesticated livestock.

Collection

Specimens of devil snail were hand-picked and preserved in 10% formalin for taxonomic identification and morphological analyses. Specimens were identified following Nevill (1878)¹⁶ and Houbrick (1991)² and, later confirmed by Dr. Mauro Doneddu, Molluscan Researcher, Italy (Doneddu M, pers. comm.). The abundance of devil snail at the specific site was assessed using quadrats (10 x 1m²). Thirty-three specimens were used for morphological analysis and measurements were carried out using Vernier callipers. Salinity was measured in the

*An aerial unit of Ecologically Sensitive Area (ESA)

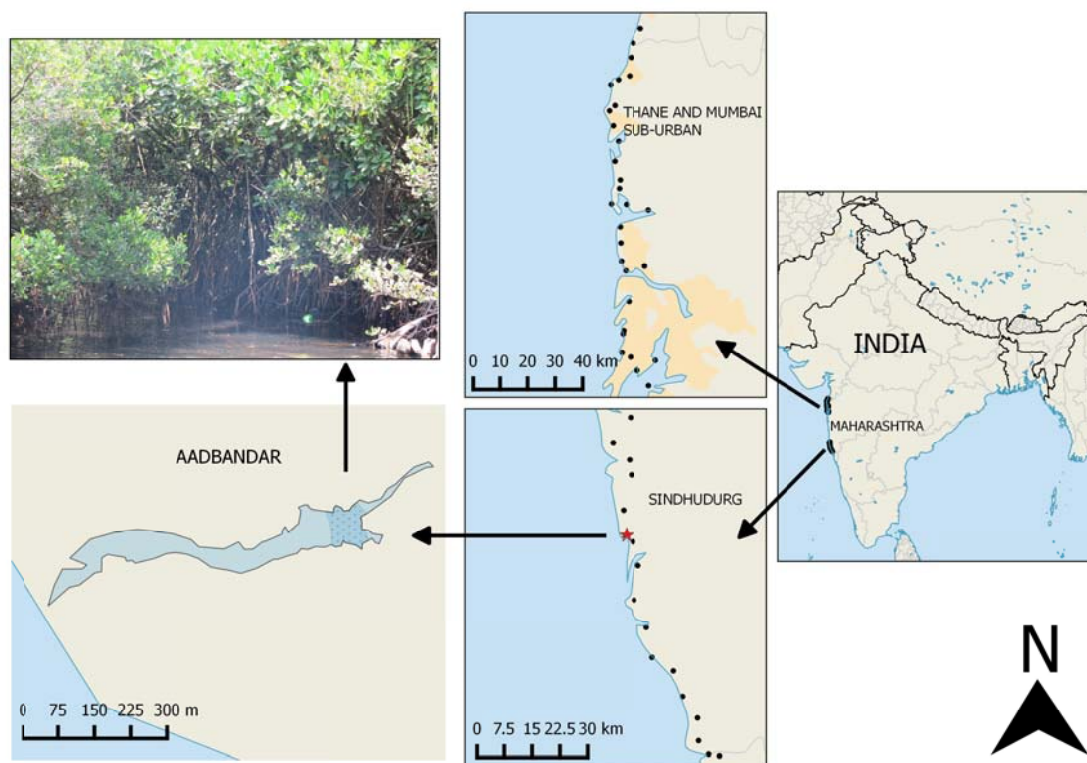


Fig. 1 — Map showing the 46 mangrove patches surveyed in Maharashtra and the only site Aadbandar where *F. ater* was observed with a dense aggregation.



Fig. 2 — *F. ater* (Linnaeus, 1758); A, Close up view of the shell; B, Dense aggregation on sandy substratum; C, Aggregation on gunny bags.

occurrence site using a refractometer (Extech RF20, USA).

Results

Systematic accounts

Phylum: Mollusca Linnaeus, 1758

Class: Gastropoda Cuvier, 1795

Order: Caenogastropoda [Unassigned] Cox, 1960

Family: Pachychilidae Fischer & Crosse, 1892

Genus: *Faunus* Montfort, 1810

Species: *F. ater* (Linnaeus, 1758) (Fig. 2A)

Diagnostic Characters: The specimens examined were black and brown in colour (Fig. 2) with an average shell length: 27 mm (range: 14 – 46 mm), average shell width: 13 mm (range: 5 – 19 mm), average aperture length: 11 mm (range: 5 – 17 mm), and average aperture width: 9 mm (range: 4 – 13 mm). Shells were elongated and the apical whorls were decapitated in all the specimens, out of which 60% were in the 21-30 mm size range (Fig. 3). An average of 6 whorls was observed; flat in nature, few with extremely weak curved whorls, inflated towards the aperture side. Longitudinal subsutural lines

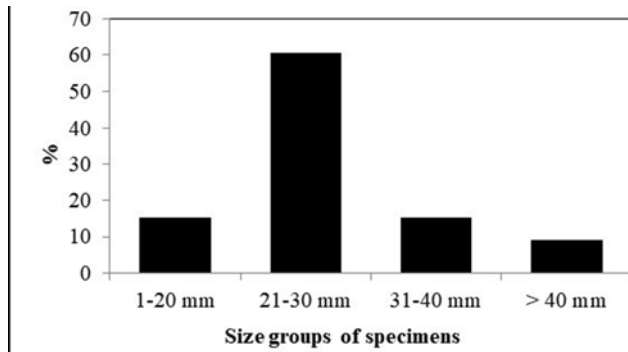


Fig. 3 — Different size groups (%) of shells examined (n = 33)

present with colabral lines. Slightly extended parietal wall with a smooth outer lip. Most specimens had damaged or broken outer lips; aperture ovate and white in colour; few had a white aperture with a brown interior edge. Two sinuses, the unique characteristic of the species, present. Deep anal sinus prominent in some specimens with variable depth and its outer lip joins the suture. Anterior sinus quite discernible. Operculum thick, ovoid, black to dark brown, paucispiral with the nucleus unconventional in location.

Large aggregations of devil snail were observed in Aadbandar out of 46 mangrove patches surveyed during this study. The density of *F. ater* in the patch was found to be 100 to 640 individuals/m² (Fig.4). *Neritina violacea* (Gmelin, 1791) was the only mollusc observed along with *F. ater*, sharing the same habitat, but with lesser density. Out of 17 mangrove species observed in the 46 contiguous mangrove patches, *Avicennia marina* was the most common however only 4 species, viz. *Aegiceras corniculatum*, *Lumnitzera racemosa*, *Rhizophora* sp. and *Excoecaria agallocha* were recorded in Aadbandar along with mangrove associates like *Cerebra odollum*, *Acrostichum aureum* and other terrestrial flora. The devil snail aggregation were found over household discards, wooden logs, roots of mangrove associates and on the substratum of the estuary (Fig. 2B and 2C). Salinity in the site was 9 ppt.

Discussion

Taxonomically the decapitated apex is a common character of *F. ater*¹⁷ as observed in the present study. The variation of whorl geographically is from being bulged out to flat⁴ with the species growing up to a maximum size of 90 mm with 20 or more whorls¹⁸. However, the maximum length in the study area was limited to 46 mm. Malacofaunal diversity in the area was limited to *Neritina violacea*, while similar

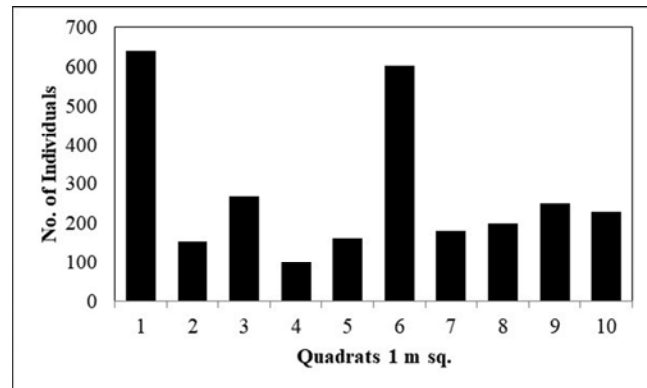


Fig. 4 — Abundance of individuals among the quadrats studied.

mangrove patches in the vicinity i.e. Acharabander and Morve consisted of *Pirenella cingulata*, *Marcia opima* and *Anadara granosa*. Some species of brackish water snails are known to serve as an intermediate host of trematode parasites, which are of medical and veterinary importance¹⁹. Similarly, devil snails have been reported to be an intermediate host of pathogenic trematode larval stages like *Furcocercous*, *Monostome* and *Xiphidiocercaria*, which can reach to an infection rate of above 90%^{11,12}. The fact is alarming because it is harvested in Southeast Asian countries like the Philippines, where they are consumed as a native delicacy⁵.

The distribution of *F. ater* is limited to the tropical Indo-west Pacific region^{3,4} with some notable studies from Asian countries, providing information on its adaptation to various habitats and salinity (Table.1). In Asia, it has been reported from countries like Sri Lanka, Myanmar, Thailand, Malaysia, Singapore, Philippines, Indonesia, New Guinea and China^{1,4-6,20-22}. Its distribution and abundance in a brackish water, specifically from a mangrove habitat is reported here which can be regarded as a baseline information from the Indian subcontinent. Furthermore, the density reported in this study is higher than or comparable to that of other reports from India, Sri Lanka and Thailand, however the highest being observed in Singapore (6700/m²)⁴ (Table 1). A similar observation with a dense aggregation of devil snail from an estuarine habitat of Kerala (South-west coast of India) further strengthens our findings that the species is abundant only in localized habitats, raising a possibility that *F. ater* may possibly act as an indicator species (Ravinesh R, pers. comm.).

Mangrove leaves are known to serve as a food source for certain gastropod species²³. The dwelling of *F. ater* on fallen mangrove leaves in the study site

Table 1 — Some notable studies conducted/involving *F. ater* in Asia indicating its diverse habitat

Country	Location	Habitat	No. of ind/m ²	Salinity (ppt)	Depth (m)	Reference
Indonesia	Java and Sumatra	Tidal mudflats/Shallow rivers and estuaries	-	-	-	Van Benthem Jutting, 1956 ²⁰
India	Pune, (Maharashtra)	Freshwater streams and Brooks (Muddy substrate)	-	-	-	Tonapi and Mulherkar, 1963 ³²
India	Nizampatnam & Nagarjunasagar Dam, (Andhra Pradesh)	Lotic Habitat	-	-	-	Janakiram and Radhakrishna, 1984 ⁹
Sri Lanka	Balapitiya, Hikkaduwa & Negombo Estuary	Mangrove/Estuarine habitat	-	-	-	De Silva and De Silva, 1986-87 ²¹
India	Goa, Nicobar Islands	Brackish water	-	-	-	Subba Rao, 1989 ³³
Thailand	Gulf of Thailand	Shallow river and ditch with brackish water	10-100	-	-	Swennen, <i>et al.</i> 2001 ³⁴
India	Maharashtra	Freshwater/Terrestrial	-	-	-	Patil and Talmale, 2005 ¹⁰
Thailand	Samui Island	Mangrove habitat	0.05*	-	-	Sri-aroon, <i>et al.</i> 2005 ²²
Sri Lanka	Negombo Estuary	Estuary/Seagrass habitat	<100	26	0.97	Dahanaka and Aratne, 2006 ⁷
	Negombo Estuary	Interior part of Estuary	<100	10	1.25	
	Negombo Estuary	Estuary/Seagrass habitat	100-1000	28	1.10	
Thailand	SoiTaksin, SoiSuphan, Similana resort.	Mangrove/Estuary/Wells	12-588*	-	-	Sri-Aroon, <i>et al.</i> 2006 ³¹
Philippines	Abatan River	Estuarine channel	-	4	1	Lozouet and Plaziat, 2008 ¹
India	Southern Rajasthan	Freshwater	-	-	-	Choubisa, 2008 ¹¹
India	Ramsagar Reservoir (Uttar Pradesh)	Freshwater	12-20	-	-	Garg, <i>et al.</i> 2009 ²⁹
India	Almatti Reservoir, Bijapur (Karnataka)	Freshwater	10-33**	-	-	Karekal, <i>et al.</i> 2010 ³⁰
Malaysia	Pantai Sri Tujoh (Kelantan); Pantai Bisikan Bayu (Kelantan); village Kg. Telaga Nenas (Perak) and Kesang Laut (Johor)	Aquaculture area/Beach/Fishing	20**	-	-	Yap, <i>et al.</i> 2010 ⁶
Singapore	West Coast Park	Drain/Pond	5800-6700	Low-Full Salinity/ Low-Mid Salinity	0.5 - 0.1	Lok, <i>et al.</i> 2011 ⁴
India	Wardha River, Chandrapur (Maharashtra)	Freshwater	-	-	-	Dahegaonkar, <i>et al.</i> 2012 ²⁶
India	Wainganga River, Khobragadhi River (Maharashtra)	Lotic system	-	-	-	Bhandarkar and Bhandarkar, 2013 ²⁴
India	Gorewada Reservoir, Nagpur (Maharashtra)	Freshwater lake	-	-	-	Dorilkar, <i>et al.</i> 2014 ¹³
Philippines	Alabel (Sarangani province)	Intertidal	4*	-	-	Manzo, <i>et al.</i> 2014 ⁸
India	Ambazari Lake, Nagpur (Maharashtra)	Freshwater lake	-	-	-	Lonkar, <i>et al.</i> 2015 ¹⁴
Philippines	Guihing River, (Municipality of Hagonoy)	River mouth	-	-	-	Deanne, <i>et al.</i> 2016 ⁵
India	Kerala	Estuary	-	-	-	Ravinesh R, (Unpublished data)
India	Aadbandar, (Maharashtra)	Mangrove/Brackish water	100-640	9	0.3 - 1.0	Present Study

*Density estimated per unit area; ** Actual numbers reported; Area not provided

however could not be correlated to foraging of the snails on the leaves. Henceforth the discards that were accumulating in the area was a good aggregating site as the devil snail is suspected to be attracted towards garbage disposal¹ and known to be present in areas with anthropogenic impacts²⁴.

Conclusion

Large accumulation of devil snail calls for a detailed investigation of the habitat characteristics that affects the area and the species distribution. Being an intermediate host of trematode parasite larvae, understanding its host-pathogen and host-vector relationships may yield insight on its effects on the coastal populations. Further, *F. ater* is now an addition to the rich molluscan fauna found along the mangrove habitats of India and this information will act as a baseline for further studies relating to this species in the region.

Acknowledgement

The study was undertaken as a part of the national research study, "Delineation and mapping of ecologically sensitive coastal areas (ESA) and critically vulnerable coastal areas (CVCA) along the coast of India" of the Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt. of India. The authors are grateful to Dr. Pierre Lozouet (Muséum National d'Histoire Naturelle, France) for providing valuable information regarding the ecology of *F. ater*, to Dr. Mrunalini N. Desai (Department of Botany, Shivaji University) for providing relevant information on the study area. The authors also acknowledge the field assistance provided by Mr. G. Kantharajan (Central Institute of Fisheries Education, Mumbai) during the survey of the Mumbai Sub-Urban district mangrove areas.

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