Illustrative checklist of opisthobranchs from selected beaches of Mumbai

Sagar Gavas*, Bhupendra Shirke, Prathamesh Kulkarni, and Sagar Rajpurkar
D.G.Ruparel College, Senapati Bapat Marg, Mahim, Mumbai- 400 016, India
[Email ID: sagarsgavas@gmail.com]

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Opisthobranchs are marine slugs belonging to phylum Mollusca. Till date, Mumbai is least studied for opisthobranch biodiversity with very few official reports on opisthobranch fauna. The present study documents a list of opisthobranchs from Mumbai. The opisthobranchs were collected from selected beaches along the Mumbai coast and identified using standard guidelines. Eight species of opisthobranchs belonging to three families were identified. All of these are new records to Mumbai with five species being new records to India. This study is a preliminary data for further investigations, monitoring and conservation of opisthobranch fauna.

[Key words: Checklist, Opisthobranch, Mumbai, mollusks]

Introduction
The work done on opisthobranchs in India is sparse and patchy. On the western coast of India, most of the work on Opisthobranch is restricted to the Gulf of Kutch and Lakshadweep. It includes work by Hornell1, 2; Patil3; Gideon et al.4; Narayanan5-6; Menon et al.9; Rudman20; Balani and Patel11; Valdés et al.12; Fontana et al.13; Jagtap et al.14; Apte 15; Apte et al.16; Apte and Salahuddin17. The Opisthobranch fauna study of Maharashtra is limited to a few publications by Hornell 1, 2; Winckworth18, 19; Kasinathan et al.20; Balani and Patel11 and Apte and Bhve21. The present study was designed and carried out to provide an insight to the biodiversity and current status of the opisthobranchs along selected beaches of Mumbai.

Study area
In spite of the anthropogenic disturbances, Mumbai shows fair diversity of intertidal organisms. The intertidal areas of rocky beaches have a good representation of sponges, some hydroid and very few algae. These serve as good habitat for opisthobranchs. For the current study, intertidal areas of rocky shore along Mumbai coast were selected. Mumbai is located on the west coast of India (between Lat. 18°54’ to 19°09’ N and Long. 72°47’ to 72°56’ E). Sampling was carried out on rocky patches of Mumbai.

Materials and Methods
The survey was carried out during low tide on rocky shores of Mumbai from October 2012-February 2014. The digital images were taken on site during survey to record their native colouration and pattern. Live specimens brought to the laboratory were subjected to detailed observation to reveal their morphological and biometric characters. The specimen were preserved, labeled and deposited in the museum. Identification was carried out based on the morphological characters and available literatures 22-26 (http://www.seaslugforum.net, http://www.nudipixel.net). Identification of some species is validated by eminent Malacologist Mr. Garry Cobb.

Results and discussions
During this study of eighteen months a total of eight species were found. They belong to three families Discordorididae, Facelinidiae, Haminoeidae. All of these are new record to Mumbai and six of the eight species new record to Maharashtra whereas five are new records to India (Table-1)

Family Discordorididae
1. Carminodoris cf. grandiflora (Pease, 1860) (Fig.2A)
Size: 30-40 mm
Description: The body is oval, flat and the notum is covered with large, rounded tubercles that decrease in size towards the mantle edge. Tubercles are
somewhat brownish with white basal band. The species has a close resemblance with *Carminodoris grandiflora*. The rhinophores are closely-set and stout, with a knob-shaped lamellar region (10–15 lamellae) that terminates in a point.

2. *Ategema asseosa* (Kelaart 1859) (Fig.IIB)
Size: 5 mm
*A. asseosa* has bristly mantle. The rough surface bears papillae which are white in color. The papillae contain projecting spicules. This species has the same colour and texture as the sponge on which it lives and feeds and its colouration simulates the surroundings. There are also a series of darker markings (patches without spicules) which match the oscula or waterholes in the sponge.

3. *Atagema* sp. (Fig. IIC)
Size: 15 mm
It is small discodorid usually seen in shallow pools and under rocks. Mantle is broad, white and tuberculated and a median ridge. It has oval, stout foot. A definite mid-dorsal crest is present extending from rhinophore to branchial pouch. Body and mantle is a translucent white with scattered brown papillae. The gills are protected by pockets. The raised rhinophore packets are characteristic of *Atagema* sp.

Family: Facelinidae

4. *Cratena* sp. (Fig. IID)
Size: 14 mm
The body is translucent white and the long oral tentacles and rhinophores have varying amounts of opaque white speckling. The specimen illustrated has orange spots on the rhinophore. The ceratal tip is white, and the ceratal digestive gland ranges in colour from red to dark brown. It feeds on hydroids.

5. *Cratena* sp. (Fig.IIE)
Size: 17 mm
It has quite long rhinophores and a dark spot in the ceratal digestive gland just below the tip. It was found in association with *Eudendrium* sp.in rock pool. It has tentacular foot corners. Bright orange spot can be seen on head. It resembles *Cratena peregrina*.

6. *Phidiana militaris* (Alder and Hancock, 1864) (Fig IIF)
Size: 17 mm
It is characterized by the bright orange median line on the head. The oral tentacles, rhinophores, tentacular foot corners and cerata are all tipped with yellow and there is a broad orange band on the rhinophores. Cerata are transparent and digestive gland is bright violet and orange.

### Table I. Opisthobranch fauna of Mumbai

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Family</th>
<th>Species</th>
<th>New record to Mumbai</th>
<th>New record to Maharashtra</th>
<th>New record to India</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Discodorididae</td>
<td><em>Carminodoris cf. grandiflora</em> (Pease, 1860)</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Discodorididae</td>
<td><em>Ategema asseosa</em> (Kelaart 1859)</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td>Discodorididae</td>
<td><em>Atagema</em> sp.</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>4</td>
<td>Facelinidae</td>
<td><em>Cratena</em> sp.</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>5</td>
<td>Facelinidae</td>
<td><em>Cratena</em> sp.</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Facelinidae</td>
<td><em>Phidiana militaris</em> (Alder &amp; Hancock, 1864)</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Haminoeidae</td>
<td><em>Haminoea</em> sp.</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>8</td>
<td>Haminoeidae</td>
<td><em>Haminoea</em> sp.</td>
<td>√</td>
<td>√</td>
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</tr>
</tbody>
</table>
**Conclusion**

Present study throws light on the biodiversity of the opisthobranch fauna along selected Mumbai beaches. The concern is that we may lose many species without being aware of their existence in Mumbai beaches. Present work which deals with eight species of opisthobranchs, belonging to three families which adds information on the marine intertidal fauna of the Indian waters and gives an exclusive account of the extent to which various different groups of opisthobranch are distributed along the Mumbai coast. Regular monitoring and assessment of these are planned to be studied.

**Acknowledgements**

Authors are grateful to Mr. Gary Cobb who helped us in identification.
**A. Carminodoris cf. grandiflora**  
**B. Ategema asseosa**  
**C. Atagema sp.**

**D. Cratena sp.**  
**E. Cratena sp.**  
**F. Phidiana militaris**

**G. Haminoea sp.**  
**H. Haminoea sp.**

Fig II. Opisthobranch fauna of Mumbai beaches

### References


5. Narayanan, K.R. On three opisthobranchs from the south-west coast of India. Journal of the Marine Biological Association of India 10(2) (1968) 377-380; Fig. 1-2.


24. Marcus E.B. and Marcus E. Some gastropods from Madagascar and West Mexico, Malacologia 10(1); (1858) 199-206.


