

Research Article

FURTHER RECORDS TO THE OPISTHOBANCH FAUNA OF INDIA

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ABSTRACT

Opisthofauna (Phylum: Mollusca, Class: Gastropoda) of Gujarat has been recorded by various scientists over the years. During the study, three species *Philinopsis speciosa* (Pease, 1860), *Haminoea alfredensis* (Bartsch, 1915) and *Doris grannulosa* (Pease, 1860) belonging to three genera and three families were recorded from the reef area of Bhaidar in the south western Gulf of Kachchh (GoK). Earlier *Philinopsis speciosa* (Pease, 1860) was recorded only from Andaman and Nicobar Islands and Gulf of Mannar while *Haminoea alfredensis* (Bartsch, 1915) and *Doris grannulosa* (Pease, 1860) has not been recorded from any of the Indian waters.

Keywords: *Opisthobranchia*, *Philinopsis speciosa* (Pease, 1860), *Haminoea alfredensis* (Bartsch, 1915), *Doris grannulosa* (Pease, 1860), Gulf of Kachchh

INTRODUCTION

Opisthobranchs (Phylum: Mollusca, Class: Gastropoda, infraclass: Opisthobranchia) are brightly coloured marine molluscs, with high species diversity, wide distribution range and occurring in almost all the near shore habitats including coral reefs, seagrass beds, mangroves, sandy, muddy and rocky habitats.

The most elemental work in the opisthobranch taxonomy was carried out by Alder and Hancock (1864)¹. Other remarkable works on Indian Opisthobranchs are by Gardiner (1903), Eliot (1905, 1906a,b,c, 1909a,b, 1910a,b, 1916), Farran (1905), Hornell (1909a,b, 1949, 1951), O’Donoghue (1932), Rao (1936, 1952, 1961), Satyamurthi (1952), Rao *et al.*, (1960), Burn (1970), Rao *et al.*, (1974), Valdés *et al.*, (1999) and Fontana *et al.*, (2001).

In recent times Apte (2009), Apte *et al.*, (2010), Bhave *et al.*, (2011), Raghunathan *et al.*, (2010), Ramakrishna *et al.*, (2010), Sreeraj *et al.*, (2010) and Apte *et al.* (2011) studied opisthobranch fauna of India. However after the works of Narayana (1968, 1970, 1971a,b) and the comprehensive checklist was published by Apte *et al.*, (2010) no such comprehensive studies were conducted for the Gulf of Kachchh. Most recently Patel *et al.*, (2013) done work on Opisthobranch fauna on Saurashtra coast. During the study, three species *Philinopsis speciosa* (Pease, 1860), *Haminoea alfredensis* (Bartsch, 1915) and *Doris grannulosa* (Pease, 1860) belonging to three genera and three families were recorded from the reef area of Bhaidar island in the western Gulf of Kachchh (GoK).

MATERIALS AND METHODS

The present study included opportunistic data collection during biodiversity assessment surveys and other studies of the coral reefs in the Gulf of Kachchh, by the authors from 2010 to 2012. Specimens were observed on the reef of Bhaidar Island (Figure 1) in the Gulf of Kachchh. The reef is protected as Marine National Park. This reef is dominated by the sandy patches intercepted with massive corals. Total area of the reef is approximately 42 km² while the Island has an area of 7 km². Observed specimens, which were found during the reef walk, were photographed using an Intova (7 megapixel camera with its underwater housing) and Canon 10D. GPS readings were taken using e-trex Garmin hand-held GPS navigator. Identification was based on descriptions given by Rudman (1971, 1972). Systematic classification is based on the classification of MacDonald (2006) and internet sources (<http://www.nudipixel.net>, <http://www.seaslugforum.net>, <http://www.worms.net>). The Govt. of India for the collection of any specimen.

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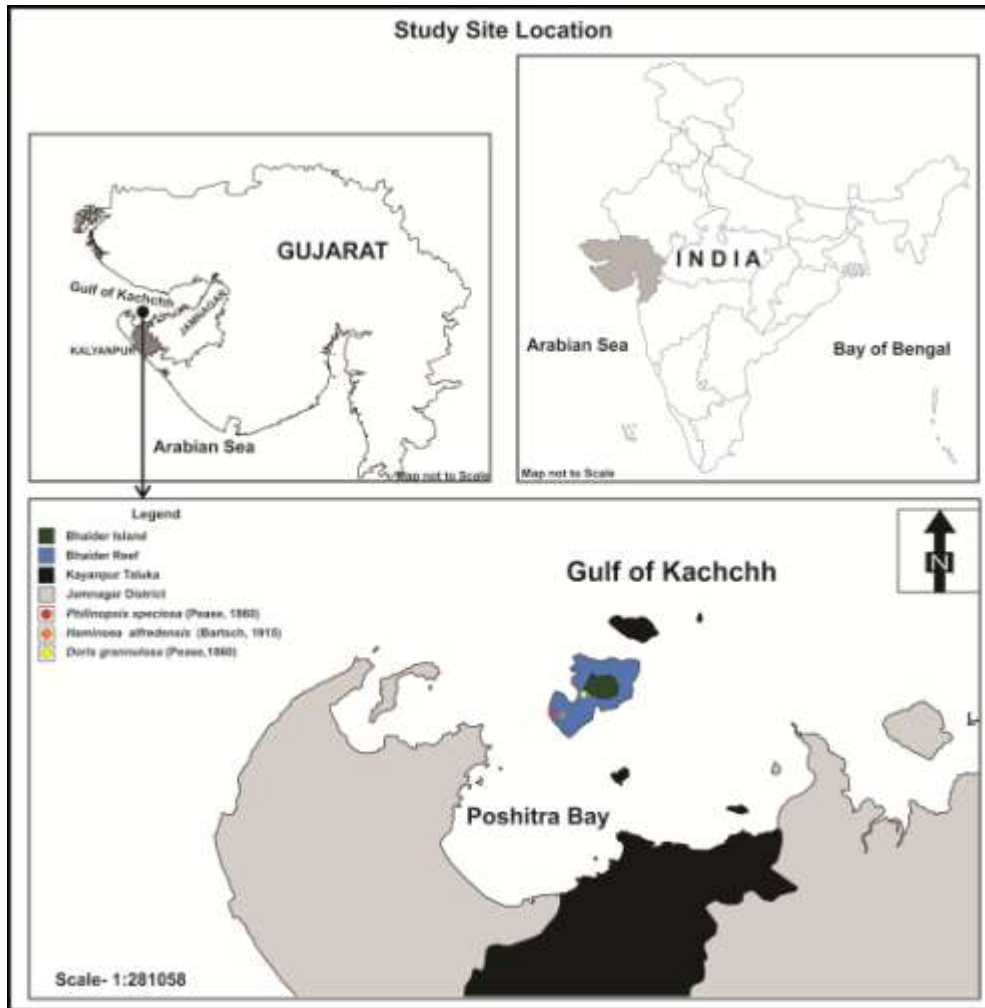


Figure 1: Study Area in the Gulf of Kachchh – West coast of India

RESULTS AND DISCUSSION

Three species viz. *Philinopsis speciosa* (Pease, 1860) (Figure 2), *Haminoea alfredensis* (Bartsch, 1915) (Figure 3) and *Doris granulosa* (Pease, 1860) (Figure 4) were recorded from the reef area of Bhaidar Island during the field visit of February 2012. Only one specimen of *Philinopsis speciosa* (Pease, 1860) (Length: 21 mm) was recorded foraging on sandy patch (22° 26' 17.37" N 69°15' 44.08" E), one specimen of *Haminoea alfredensis* (Bartsch, 1915) (Length: 16 mm) was recorded foraging on sandy-muddy patch (22° 26' 03.25" N 69°16' 23.31" E) and one specimen of *Doris granulosa* (Pease, 1860) (Length: 15mm) was recorded from muddy-rocky patch (22°27'16.88"N 69°17'46.65"E)

***Philinopsis speciosa* (Pease, 1860)**

Systematic

Aglajidae (Family)

Philinopsis (Genus)

Philinopsis speciosa (Pease, 1860)

Synonyms

Aglaja cyanea (Martens, 1879)

Doridium cyanea Martens, 1879

Philinopsis cyanea (Martens, 1879)

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Figure 2: *Philinopsis speciosa*

Observed specimen (Figure: 2) was having translucent brown to an opaque dark brown body colour; pair of yellow parallel lines on the head-shield on either side of the midline; small white spots which may indicate juvenile stage; blue-black coloured margin of the parapodia with yellow markings (Rudman, 1972).

Body length of the observed specimen was 21 mm while Rudman (1972) observed 45 mm in his specimen. Rudman (1972) observed body colour from dark brown to blackish yellow while observed specimen has translucent brown to an opaque dark brown body colour. Present specimen has pair of yellow parallel lines present on the head side while Rudman (1972) described them as orange-brown coloured. The presence of white spots is same in present specimen and in Rudman (1972). In present specimen size of these white spots were small while Rudman (1972) observed them with range from quite small to very large. The margin of the parapodia in present specimen was blue-black with yellow marking while Rudman (1972) observed the colour of parapodia as blue-black with orange-yellow markings. According to Rudman (1972) this species appears to be endemic to the Hawaiian Islands. On the east coast of India (Table:1), four species belonging to genus *Philinopsis* has been recorded from Andaman and Nicobar reefs (Ramakrishna *et al.*, 2010, Sreeraj *et al.*, 2010) and one species from Gulf of Mannar reefs (Yogeshkumar *et al.*, 2011). However there is no record of the genus from the West coast of India, hence this is the first record of the Genus *Philinopsis* from the west coast of India.

Table 1: Other records of the Genus *Philinopsis* from rest of Indian Coast.

S. No.	Species	Location	Reference
1	<i>Philinopsis speciosa</i> (Pease, 1860) as <i>Philinopsis cyanea</i> (Martens, 1879)	Andaman Nicobar	and Ramakrishna <i>et al.</i> , (2010)
2	<i>Philinopsis pilsbryi</i> (Eliot, 1900)	Andaman Nicobar	and Ramakrishna <i>et al.</i> , (2010)
3	<i>Philinopsis speciosa</i> (Pease, 1860)	Gulf of Mannar	Yogeshkumar <i>et al.</i> , (2011)
4	<i>Philinopsis gardineri</i> (Eliot, 1903)	Andaman Nicobar	and Ramakrishna <i>et al.</i> , (2010)

***Haminoea alfredensis* (Bartsch, 1915)**

Systematic

Haminoeidae (Family)

Haminoea (Genus)

Research Article

Haminoea alfredensis (Bartsch, 1915)

Synonyms



Figure 3: *Haminoea alfredensis*

Observed Specimen (Figure: 3) was having translucent body with dull yellow coloured with greenish yellow background shade; dark brown and yellow spots on dorsal side; short foot with brown spots.

Total three species of the genus *Haminoea* (Table:2) have been recorded from Indian waters (Narayana 1969, Fontana 2001, Apte 2009, Ramakrishna *et al.*, 2010, Apte *et al.*, 2010) till date. Three species of the genus viz. *H. cymbalum*, *H. vitrea* and *H. ovalis* has been recorded from the west coast of India and two species of the genus viz. *H. cymbalum* and *ovalis* has been recorded from the east coast. There is no record of the species *H. alfredensis* from any of the Indian marine waters. This is the first record of the species from India.

Table 2: Other records of the Genus *Haminoea* from Indian Coast.

S. No.	Species	Location	Reference
1	<i>Haminoea cymbalum</i> (Quoy and Gaimard, 1832)	Lakshadweep Gulf of Mannar	Apte (2009) Fontana (2001)
2	<i>Haminoe avitrea</i> (Adams, 1850)	Mumbai	Kasinathan <i>et al.</i> , (1975)
3	<i>Haminoeaovalis</i> (Pease, 1868)	Andaman and Nicobar islands, Gulf of Kachchh	Ramakrishna <i>et al.</i> , (2010) Narayana (1969), Apte <i>et al.</i> , (2010)

***Doris grannulosa* (Pease, 1860)**

Systematic

Dorididae (Family)

Doris (Genus)

Doris grannulosa (Pease, 1860)

Synonyms

Doriopsis scabra (Pease, 1871)

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Doris aurantiaca (Eliot, 1913)

Guyonia flava (Risbec, 1928)



Figure 4: *Doris grannulosa* (Pease, 1860)

Observed Specimen (Figure: 4) was having translucent body with uniformly yellow colour. The specimen was found under the loose rock boulder and was feeding on sponge. The body was oblong, convex from above and covered with numerous minute irregularly placed granules. The main feature is the arrangement of gills. Observed specimen had rudely pinnate gills which were directed posteriorly (Pease 1860, Gosliner, 2008). The length of the observed specimen was 15 mm while Gosliner (2008) collected specimen had length of 20 mm.

Doris grannulosa (Pease, 1860) was first described from Sandwich Islands (Pease, 1860) and then after from Madagascar, Seychells (Gosliner, 2008). Though there has been substantial work done by Narayan (1967,1968,1972), Ramakrishna *et al.*,(2010), Apte *et al* (2010) in Gujarat and Sreeraj *et al.*, (2010), Bhawe *et al.*, (2011) from rest of India, *Doris grannulosa* (Pease,1860) has not been recorded so far. However most closely species, *Doriopsisilla sp.*, mention by Apte *et al.*, (2009) from Lakshadweep. Hence this could be the first record of *Doris grannulosa* (Pease, 1860) from Indian water.

Conclusion

Most of the opisthobranch studies are either in early sixties and seventies or in recent years *i.e.* after 2008. There is no continuity of data with reference to opisthobranchs. However there is lack of information on the distribution of such species at global level also. Hence the records of *Philineopsis speciosa*, *Haminoea alfredensis* and *Doris grannulosa* are very crucial and noteworthy for the marine biodiversity and its conservation status in the Marine Protected Areas of India. The inventorisation of the fauna also helps in further drafting of the management plans of the Protected Area also.

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REFERENCES

1. Alder J and Hancock A (1864). Notice on the collection of Nudibranchiate mollusca made in India by Walter Eliot Esq. with descriptions of several new genera and species. *Transactions of the Zoological Society of London* 5 117-147.

Research Article

2. Apte DA (2009). Opisthobranch fauna of Lakshadweep Islands, India with 52 new records to Lakshadweep and 40 new records to India. Part 1. *Journal of Bombay Natural History Society* **106**(2) 162-175.

28. Kasinathan R, Govindan K And Desai BN (1975). On the Opisthobranch *Haminoea vitrea* (A. Adams, 1850) From Madh Island (Bombay). *Journal of the Marine Biological Association of India* **17**(3) 696-701.

Apte DA and Salahuddin VK (2010). Record of *Exabranchnus sanguineus* (Rüppell and Leuckart 1828) from Lakshadweep Archipelago, India. *Journal of Bombay Natural History Society* **107**(3) 261-262.

Apte DA, Bhave VJ and Parasharya D (2010). An Annotated and illustrated Checklist of the Opisthobranch fauna of Gulf of Kutch, Gujarat, India, with 20 new records for Gujarat and 14 new records for India, Part 1. *Journal of Bombay Natural History Society* **107**(1) 14-23.

Bhave VJ and Apte D (2011). Illustrated checklist of opisthobranch fauna of ratnagiri, maharashtra, india, with eight new records to India. *Journal of Bombay Natural History Society* **108**(3) 172-182.

Burn R (1970). *Phyllidia (Phyllidiella) zeylanica* Kelaart a rare nudibranch from the Indian subcontinent. *Memoirs of the National Museum of Victoria* **31** 37-40.

Eliot C (1903). Nudibranchiata, with some remarks on the families and genera and description of a new genus *Doriclomorpha*. *Fauna and Geography of the Maldive and Laccadive Archipelagoes* **2**(1) 540-573.

Eliot CNE (1906a). On the nudibranchs of southern India and Ceylon, with special reference to the drawings by Kelaart and the collections belonging to Alder and Hancock preserved in the Hancock Museum at Newcastle-on-Tyne. *Proceedings of the Zoological Society, London* 636-714.

Eliot CNE (1906b.) On the nudibranchs of southern India and Ceylon, with special reference to the drawings by Kelaart and the collections belonging to Alder and Hancock preserved in the Hancock Museum at Newcastle-on-Tyne. No. 2. *Proceedings of the Zoological Society London* 999-1008.

Eliot CNE (1906c). Nudibranchiata, with some remarks on the families and genera and description of a new genus, *Doridomorpha*. In: *The fauna and geography of the Maldive and Laccadive Archipelagoes, being the account of the work carried on and of the collections made by an expedition during the years 1899 and 1900* edited by Stanley Gardiner J (Cambridge: University Press) **2** 540-573.

Eliot CNE (1909a). Report on the nudibranchs collected by Mr. James Hornell at Okhamandal in Kattiawar in 1905-6. In: Report to the government of Baroda on the marine zoology of Okhamandal, 1 137- 145.

Eliot CNE (1909b). Notes on a collection of nudibranchs from Ceylon. *Spolia Zeylanica, Colombo* **6**(23) 79-95.

Eliot CNE (1910a). Notes on Nudibranchs from the Indian Museum. *Records from the Indian Museum* **5**: 247-252.

Eliot CNE (1910b). Nudibranchs collected by Mr. Stanley Gardiner from the Indian Ocean in H.M.S. "Sealark". *Transactions of the Linnean Society, London* **13**: 411-438.

Eliot CNE (1916). Mollusca Nudibranchiata. *Memoirs of the Indian Museum* **5** 375-380

Farran GP (1905). Report on the Opisthobranchiate Mollusca collected by Prof. Herdman. In: W.A. Herdman's report on the pearl oyster fisheries of the Gulf of Mannar. Part 3 Suppl. Report 21:329-364. *The Ray Society, London*.

Fontana A, Ciavatta ML, D'souza L, Mollo E, Naik CG, Parameswaran PS, Wahidulla S and Cimino G (2001). Selected chemo-ecological studies of marine opisthobranchs from Indian coasts. *Journal of the Indian Institute of Science* **81**(4) 403-415.

Gardiner JS (1903). *The fauna and geography of the Maldives and Laccadive Archipelagoes.* (Cambridge University Press) **2** 1080.

Gosliner TM, Behrens DW and Valdes A (2008). *Indo-Pacific Nudibranchs and Sea Slugs: A field guide to the World's most diverse fauna* (Co-Published by Sea Challengers Natural History Books and California Academy of Science, California)

Hornell J (1909a). A note on the presence of symbiotic algae in the integuments of nudibranchs of the genus *Melibe*. In: Report to the government of Baroda on the marine zoology of Okhamandal 1 145-148.

Research Article

Hornell J (1909b). Report to the Government of Baroda on the marine zoology of Okhamandal in Kattiawar, part 1 (Williams and Norgate, London).

Hornell J (1949). The study of Indian molluscs (part II). *Journal of Bombay Natural History Society* **48**(3) 543-569 [*Opisthobranchia* 547-553].

Hornell J (1951). Indian molluscs. *Journal of Bombay Natural History Society* 1-96, 1 pl. *Nudibranchia* 41-42.

McDonald GR (2006). Nudibranch systematic index. Long Marine Laboratory, Institute of Marine Sciences, UC, Santa Cruz, 418.

Narayanan KR (1968). On the opisthobranchiate fauna of the Gulf of Kutch. *Proceedings of the Symposium on Mollusca, Marine Biological Association of India* **3**(1) 188-213.

Narayanan KR (1970). On a species of the genus *Berthellina* (Opisthobranchia: Notaspidea) of the Gulf of Kutch. *Journal of the Marine Biological Association of India* **12** 210-213.

Narayanan KR (1971a). On two doridacean nudibranchs (Mollusca:Gastropoda), from the Gulf of Kutch, new to the Indian coast. *Journal of Bombay Natural History Society* **68**(1) 280-281.

Narayanan KR (1971b). On a species of the genus *Berthellina* (Opisthobranchia: Notaspidea) of the Gulf of Kutch. *Journal of Marine Biological Association of India* **12**(1-2) 210-212.

Narayanan KR. (1969). On the opisthobranchiate fauna of the Gulf of Kutch. *Proceedings of the Symposium on Mollusca held at Cochin from January 12 to 16, 1968, Symposium Series 3*, pt. 1, 189-213; (Marine Biological Association of India, Mandapam Camp, India).

O' Donoghue CH (1932). Notes on Nudibranchata from southern India. *Proceedings of the Malacological Society of London* **20** Pp. 141-166.

Patel BK, Shukla ML and Apte DA (2013). First Record of *Dendrodoris nigra* (Stimpson, 1855) from Saurashtra coast of Gujarat, India with Observation on effect of Sediment Composition on Distribution. *Research Journal of Marine Science* **1**(3) 10-14.

Pease W (1860). Descriptions of new species of Mollusca from the Sandwich Islands. *Proceedings of the Zoological Society of London* **28** 18-36.

Raghunathan C, Sivaperuman C and Ramakrishna (2010). An account of newly recorded five species of nudibranchs (Opisthobranchia, Gastropoda) in Andaman and Nicobar Islands, pp 283–288. In: *Recent Trends in Biodiversity of Andaman and Nicobar Islands, Zoological Survey of India, Kolkata*, edited by Ramakrishna, Raghunathan C and Sivaperuman C. **24** 542.

Ramakrishna, Seeraj CR, Raghunathan C, Sivaperuman C, Yogesh Kumar JS, Raghuraman R, Immanuel T and Rajan PT (2010). Guide to opisthobranchs of Andaman and Nicobar Islands. *Zoological Survey of India, Kolkata* 196.

Rao KV and Alagarwami K (1960). An account and the structure of early development of a new species of nudibranchiate gastropod, *Eolidina (Eolidina) mannarensis*. *Journal of Marine Biological Association of India* **2**(1) 6-16.

Rao KV (1936). Morphology of the *Kalinga ornata* (Alder and Henslow). *Records from the Indian Museum* **38** (1) 41-79.

Rao KV (1952). *Cuthona adayarensis*, A new Nudibranch (Mollusca:Gastropoda) from Madras. *Journal of Zoological Society of India* **3** 229-238.

Rao KV (1961). On the two opisthobranchiate molluscs, *Placobranchus ocellatus* Hasselt and *Discodoris boholiensis* Bergh from Indian waters not hitherto been recorded. *Journal of Marine Biological Association of India* **3**(1and2) 253-259.

Rao LV, Sivados P and Krishna Kumary L (1974). On three rare dorid form nudibranch molluscs from Kavaratti Lagoon, Laccadive Islands. *Journal of Marine Biological Association of India* **16**(1): 113-125.

Rudman W (1971). On the opisthobranch genus *Haminoea* Turton and Kingston. *Pacific Science* **25**(4) 545-559.

Rudman W (1972). A comparative study of genus *Philineopsis* Pease, 1860 (Aglagidae, Opisthobranchia). *Pacific Science* **26**(4) 381-399.

Research Article

Satyamurthi ST (1952). The mollusca of Krusadai Island. 1. Amphineura and Gastropoda. *Bulletin Madras Govt. Museum: New series Natural History section* 1(2): 216-251.

Sreeraj CR, Ranjan PT, Raghukumaran R, Raghunathan C, RajkumarRajan R, Immanuel T and Ramakrishna (2010). On some new records of sea slugs (Class Gastropoda, Sub Class Opisthobranchia) from Andaman and Nicobar Islands. In: *Recent Trends in Biodiversity of Andaman and Nicobar Islands, Zoological Survey of India, Kolkata*, edited by Ramakrishna, Raghunathan C and Sivaperuman C. **24** 542-289-298.

Valdés A (2002). Review of the genus *Actino cyclus* Ehrenberg, 1831 (Opisthobranchia: Doridoidea). *The Veliger* **45** 193-202.

Yogeshkumar JS, Sreeraj CR and Sornaraj R (2011). Opisthobranchs of the Gulf of Mannar Biosphere Reserve, Tamil Nadu, India. *Indian Journal of Fisheries* **58**(4) 105-114.