# AN ANNOTATED AND ILLUSTRATED CHECKLIST OF THE OPISTHOBRANCH FAUNA OF GULF OF KUTCH, GUJARAT, INDIA WITH 21 NEW RECORDS FOR GUJARAT AND 13 NEW RECORDS FOR INDIA: PART 1

DEEPAK APTE<sup>1,2</sup>, VISHAL BHAVE<sup>1,3</sup> AND DISHANT PARASHARYA<sup>1,4</sup>

<sup>1</sup>Bombay Natural History Society, Hornbill House, Dr. Sálim Ali Chowk, S.B. Singh Road, Mumbai 400 001, Maharashtra, India. <sup>2</sup>Email: spiderconch@gmail.com

<sup>3</sup>Email: vishalbhave@gmail.com

<sup>4</sup>Email: dparasharya@gmail.com

The Opisthobranch fauna of Gujarat is among the least studied molluscs. Field surveys were undertaken along the Gulf of Kutch over a period of four months under the All India Co-ordinated Project on Taxonomy (AICOPTAX – Mollusca) funded by the Ministry of Environment and Forests, Government of India, and supported by the Gujarat State Forest Department and Marine National Park authorities. 33 species belonging to 19 families were recorded, of which 21 are new records to Gujarat and 13 are new records to Indian coast.

Key words: Opisthobranch, Gulf of Kutch, AlCOPTAX, Dorididae

#### INTRODUCTION

Opisthobranchs are among the least studied molluscs in India. The work done on opisthobranch fauna is sparse and patchy. The earliest work dates back to the 1880s by Alder and Hancock (1864), Kelaart (1858a,b; 1859a,b,c,d; 1883), and Bergh (1877). Studies on the opisthobranch fauna of Gulf of Kutch are limited to a few publications by Burn (1970), Narayanan (1970), Eliot (1909a,b), Gideon *et al.* (1957), Menon *et al.* (1970), Narayanan (1969, 1970, 1971a,b), Rudman (1980) and Deomurari (2006). The most comprehensive work on the opisthobranchs of the Gulf of Kutch was that by Narayanan (1969, 1970, 1971a,b).

Other notable works on Indian Opisthobranchia are by Eliot (1906a,b,c, 1909a,b, 1910a,b, 1916), Farran (1905), Hornell (1909a,b, 1949, 1951), O'Donoghue (1932), Rao (1936, 1952, 1961), Rao and Alagarswami (1960), Rao and Rao (1980). Rao *et al.* (1974), Satyamurthi (1952), Burn (1970), Valdés *et al.* (1999), and Fontana *et al.* (2001). Indo-Pacific opisthobranchs were studied by Gosliner and Willan (1991), Gosliner (1992, 1994, 1995), Gosliner and Behrens (1998), Gosliner and Johnson (1999), Jensen (1992), Rudman (1980, 1984, 1986, 1990), Yonow (1984a,b, 1986, 1988, 1989, 1990, 1992, 1994, 1996, 2000, 2001, 2008a,b), Yonow and Hayward (1991), Fahey and Gosliner (2003) and Apte (2009). Brunckhorst (1993) reviewed the Phyllidiidae in Indo-Pacific region, and Yonow (1996) reviewed 11 species from the Indian Ocean. More recently Dayrat (2010) reviewed basal Discodorids of the world.

The present study was carried out along the Gulf of Kutch, Gujarat, India. The Gulf of Kutch is a large inlet of the Arabian Sea, *c*. 60 km wide at its broadest and tapering north-eastwards for 170 km. It includes 735,000 ha under the Marine National Park and Marine Sanctuary which are situated along

the southern side of the Gulf from Okha ( $22^{\circ} 30'$  N;  $69^{\circ} 00'$  E) and eastward to the vicinity of Khijadia ( $22^{\circ} 30'$  N;  $70^{\circ} 05'$  E). A vast area of intertidal mudflats, salt marshes and seasonally inundated coastal flats extend north-east along the Wagardhrai creek to about  $23^{\circ} 15'$  N and  $70^{\circ} 40'$  E. The National Park and Marine Sanctuary include 42 islands and a complex of fringing reefs backed by mudflats and sandflats, coastal salt marsh, and mangrove forest. Field collection was carried out from December 2008 to March 2009.

#### METHODOLOGY

Direct search during low tides was used to collect the specimens. Specimens were stored in 100% ethyl alcohol after studying the morphological characters. Digital images of live specimens of each species were taken to record true colours. Notes on egg cases were made wherever possible. Specimens were relaxed before preserving in MgCl<sub>2</sub>.

#### **RESULTS AND DISCUSSION**

During the study a total of 33 species belonging to 19 families were recorded. Of these 33 species, 21 are new records to Gujarat and 13 are new records to the Indian coast. This clearly indicates that the opisthobranch fauna in India, particularly in Gujarat, is not well-studied. A comprehensive assessment is necessary to reveal the true diversity. Table 1 summarizes the findings of this study.

The Gulf of Kutch also hosts a very high density population of *Hypselodoris infucata*, *Peltodoris murrea*, *Atagema* cf. *rugosa*, and *Dendrodoris fumata*. We are presently in the process of determining the population structure of these species.

#### Table 1: Opisthobranch fauna of Gulf of Kutch

Sr. No	Species	Present Study	New record to India	New record to Gujarat
1.	Hydatina zonata	$\checkmark$	-	-
2.	Bulla ampulla	$\checkmark$	-	-
3.	Haminoea ovalis			
4.	Aplysia dactylomela		-	-
5.	Berthellina citrina			-
6.	Berthellina cf. citrina (spotted form)	$\checkmark$	-	-
7.	Berthella stellata			
8.	Elysia tomentosa		-	
9.	Elysia thompsoni			
10.	Elysia obtusa			
11.	Plocamopherus ceylonicus		-	-
12.	Carminodoris cf. grandiflora			
13.	Gymnodoris alba		-	
14.	Gymnodoris sp.			
15.	Chromodoris bombayana		-	
16.	Hypselodoris infucata		-	-
17.	Peltodoris murrea			
18.	Tayuva lilacina		-	
19.	Atagema cf. rugosa			
20.	Atagema spongiosa		-	
21.	Sclerodoris cf. tuberculata		$\checkmark$	
22.	Jorunna funebris		-	-
23.	Dendrodoris fumata		-	
24.	Doriopsilla sp.			
25.	Doriopsilla cf. miniata		-	-
26.	Bornella stellifer		-	-
27.	Dermatobranchus fortunata			
28.	Flabellina bicolor		-	
29.	Phestilla lugubris		-	
30.	Cuthona yamasui	$\checkmark$		
31.	Phidiana militaris		-	-
32.	Pteraeolidia ianthina		$\checkmark$	$\sim$
33.	Sakuraeolis gujaratica	$\checkmark$	-	-
		33	13	21

# Family: Hydatinidae

## Hydatina zonata (Lightfoot, 1786) (Fig. 1a)

**India**: Widely distributed both on the east and west coast of India.

Wider Distribution: Indo-West Pacific region. Size: 10-30 mm.

**Description:** This is a benthic species. Shell very light and semi-transparent. Body whorl in the centre bears one distinct pair of dark brown band. A single band present near the spire and at the base of body whorl.

Status: Uncommon.

#### Family: Bullinidae

# Bulla ampulla Linnaeus, 1758 (Fig. 1b)

India: Widely distributed both on the east and west coast of India.

Wider Distribution: Indo-West Pacific region.

**Description**: Seasonal congregation of this species is common. Mostly occurs on sand flats. Shells are solid with a large body whorl, white with profuse dark to light brown mottling.

Status: Common.

## Family: Haminaeidae

Haminoea ovalis Pease, 1868 (Fig. 1c)

**India**: Gulf of Kutch. This is the first record of this species for India.

Wider Distribution: Australia, Samoa, Japan, Guam. Size: 12 mm.

**Description**: It resembles *H. cymbalum*. Shell is fragile and transparent. Animal is brilliantly coloured. Light green ground colour is profusely spotted with orange spots which are encircled by light green. Surface also bears deep blue spots on mantle and foot. Foot is short, and spotted orange and blue.

Status: Uncommon.

#### Family: Aplysiidae

## Aplysia dactylomela Rang, 1828 (Fig. 1d)

India: Widely distributed in India.

Wider Distribution: Red Sea. Africa, Hawaii, South Pacific, Australia, Japan, Sri Lanka, Caribbean.

Size: 100-180 mm.

**Description**: A large animal usually seen in large congregations in shallow waters from December to February. The shell is considerably reduced in these animals and is present inside the body. They show remarkable colour variations. In Lakshadweep it is dotted dull brown with black and white spots; mantle is bordered pink. Specimens from Gulf of Kutch are usually dull green with black spots. Pink lining of mantle flap is also absent. The animals release a purple dye when disturbed.

Status: Common.

## Family: Pleurobranchidae

*Berthellina citrina* (Rüppell and Leuckart, 1828) (Fig. 1e) India: Gulf of Kutch, Lakshadweep.

Wider Distribution: South Africa to Arabian Sea, Red Sea, Australia, New Zealand, Hawaii, Seychelles, Japan, Norfolk Island (South Pacific), French Polynesia, Maldives.

Size: 20-40 mm.

**Description**: A small sea slug occurring on reef sand. Body colour deep orange with light orange foot; Rhinophores light orange.

Status: Common.

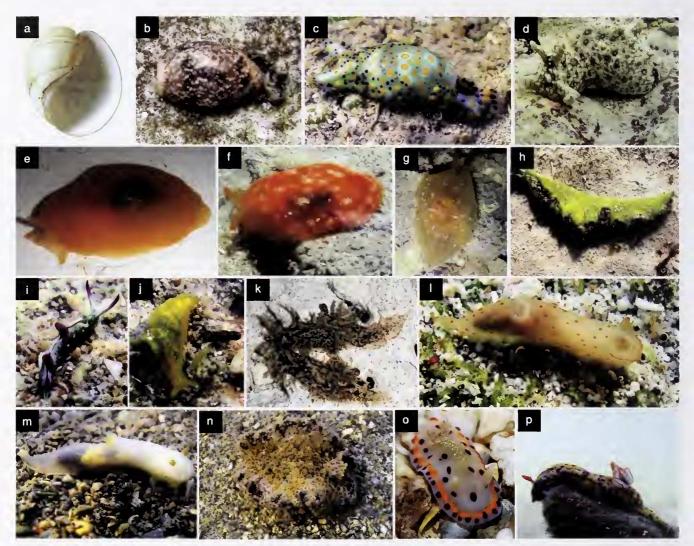


Fig. 1: a. Hydatina zonata, b. Bulla ampulla, c. Haminoea ovalis, d. Aplysia dactylomela, e. Berthellina citrina, f. Berthellina cf. citrina, g. Berthella stellata, h. Elysia tomentosa, i. Elysia thompsoni, j. Elysia obtusa, k. Plocamopherus ceylonicus, I. Gymnodoris alba, m. Gymnodoris sp., n. Carminodoris cf. grandiflora, o. Chromodoris bombayana, p. Hypselodoris infucata

# *Berthellina* cf. *citrina* (Rüppell and Leuckart, 1828) (spotted form) (Fig. 1f)

India: Gulf of Kutch.

Wider distribution: Unknown.

**Description**: A small sea slug occurring on reef sand or below the rocks. Body colour deep orange with light orange foot; Rhinophores light orange. This form is heavily spotted with white.

Status: Common.

# Berthella stellata (Risso, 1826) (Fig. 1g)

# India: Gulf of Kutch.

**Wider Distribution**: Red Sea, Australia, Mexico, South Africa, Indo-west Pacific.

#### Size: 5-15 mm.

Description: A small slug, it prefers sandy substrate.

Colour light yellow-orange; Rhinophores and oral tentacles transparent and light yellow. Some specimens have a starshaped opaque white pattern on the dorsa. **Status**: Rare.

#### Status: Kare.

# Family: Elysiidae

Elysia tomentosa Jensen, 1997 (Fig. 1h)

India: Gulf of Kutch, Lakshadweep.

Wider Distribution: South Africa, Red Sea, Indo-West Pacific.

Size: 18-40 mm.

**Description**: A large *Elysia* seen on coral sand. It is deep green yellow in colour. The parapodia are lined by black and pink bands. Rhinophores are reddish brown. They usually occur among *Caulerpa racemosa*.

Status: Abundant.

## Elysia thompsoni Jensen, 1993 (Fig. 1i)

India: Gulf of Kutch. It is the first record outside Western Australia

Wider Distribution: Western Australia.

Size: 20 mm (Single specimen).

**Description**: These small sea slugs are herbivorous. They feed by sucking sap from green algae *Caulerpa* sp. and *Codium* sp. The animal is usually translucent greyish white with violet parapodial margin. Tips of rhinophores are purple violet. Body and parapodia covered with numerous black spots.

Status: Rare.

# Elysia obtusa Baba, 1938 (Fig. 1j)

India: Gulf of Kutch.

Wider Distribution: Australia, Hong Kong, Japan, Korea, Hawaii.

Size: 5-12 mm.

**Description**: A small, herbivorous sea slug, it is translucent yellow with fine white spots. All specimens were identical, except that in the specimens found in Ratnagiri, broken white line on the parapodia is clearly seen, but in Gujarat specimens, the parapodial white line is not clearly visible.

Status: Uncommon.

#### Family: Polyceridae

# Plocamopherus ceylonicus (Kelaart, 1858) (Fig. 1k)

India: South Gujarat, Alibaug (Maharashtra), Gulf of Mannar (Tamil Nadu).

Wider Distribution: Australia, Singapore, Philippines, Indonesia, Marshall Island.

Size: 20-45 mm.

**Description**: These nocturnal slugs are found under rocks. The gills are surrounded by four papillae having pink rounded knobs that emit light when disturbed (pers. obs.). Foot and mantle bear bright orange yellow spots. Foot is extended to form tapering tail which is used to swim actively when disturbed (pers. obs.).

Status: Rare.

#### Family: Gymnodorididae

Gymnodoris alba (Bergh, 1877) (Fig. 11)

India: Gulf of Kutch, Lakshadweep.

**Wider Distribution**: Japan, China, Indonesia, Australia, Hawaii, Singapore, Philippines, Southern Africa.

Size: 20 mm.

**Description:** A small sea slug mostly found on sandy substrate. The light orange or cream coloured body profusely spotted with bright orange spots. Rhinophores are white or pale orange. Gills are white.

Status: Uncommon.

#### Gymnodoris sp. (Fig. 1m)

India: Gulf of Kutch.

Wider Distribution: Australia, South Pacific.

Size: 28 mm.

**Description**: Uncommon, it is found on sandy substrate. Light cream coloured body is profusely spotted with light orange spots. Mantle bears fine papillae with yellow tips. Rhinophores and gills are pale yellow. Foot has an orange tip.

Status: Uncommon.

## Family: Dorididae

Carminodoris cf. grandiflora (Pease, 1860) (Fig. 1n)

India: Gulf of Kutch.

Wider Distribution: Not known.

Size: 60-75 mm.

**Description**: It mostly remains attached to the lower side of rocks. Its perfectly camouflaged body makes it impossible to locate it. Surface bears rounded tubercles which are smaller and densely packed at the peripheral margins of the mantle. Brown tubercles are surrounded by a white ring at the base. Ground colour is light brown and heavily mottled. Gill leaves are feathery, light brown.

Status: Uncommon.

#### Family: Chromodorididae

*Chromodoris bombayana* (Winkworth, 1946) (Fig. 10) India: Mumbai, Ratnagiri.

Wider Distribution: Known only from India.

Size: 4-16 mm.

**Description:** It is a tiny sea slug from rocky reefs. Base colour of the body is white with highly decorated surface. Margin is deep orange lined by a row of deep purple spots. Dorsal surface is profusely spotted with silver spots. Rhinophores and gills have silver spots. Foot is short and white in colour.

Status: Uncommon.

# *Hypselodoris infucata* (Rüppell and Leuckart, 1828) (Fig. 1p)

India: Gulf of Kutch, Lakshadweep.

Wider Distribution: Indo-West Pacific: India, Red Sea, Indonesia, Vietnam, New Caledonia, Israel, South Africa, Philippines.

#### Size: 2-45 mm.

**Description**: Colour is light purple grey and profusely spotted with black and yellow spots. Rhinophores are red and finely ribbed. Gills are white with red margin. Mating pairs are commonly seen from November to April.

Status: Abundant.

# Family: Discodorididae

## Peltodoris murrea (Abraham, 1877) (Fig. 2a)

## India: Gulf of Kutch.

Wider Distribution: Maldives, Mauritius, Reunion, to New Caledonia and Japan.

Size: 10-45 mm.

**Description**: A small discodorid usually seen in shallow pools and under rocks. It prefers reef substrate with large silt contents. Colour is white with dark orange or black spots. Rhinophores are yellow.

Status: Abundant.

## Tayuva lilacina (Gould, 1852) (Fig. 2b)

**India**: Malvan (Maharashtra), Gulf of Kutch, Gulf of Mannar (Tamil Nadu), Waltair (Andhra Pradesh).

**Wider Distribution**: Indian Ocean, Australia, Philippines, Red Sea, Japan, South Africa, Thailand, Hawaii, New Caledonia.

Size: 30-150 mm.

**Description**: A large sea slug, usually seen in shallow pools and under rocks. It prefers rocky substrate. Brown mottling on the foot, gills highly frilled. This species is usually confused with *Sebadoris fragalis* (earlier *D. fragalis*). The mantle of *T. lilacina* does not break off while that of *D. fragilis* breaks off if disturbed. DNA sequencing will help solve the mystery of these species. We have collected samples from Ratnagiri (Maharashtra) where mantle of the individuals does break off as described while as specimens from Gulf of Kutch does not autotomize the mantle.

Status: Common.

# Atagema cf. rugosa Pruvot-Fol, 1951 (Fig. 2c)

India: Gulf of Kutch.

Wider Distribution: Australia.

Size: 12-25 mm.

**Description**: A small discodorid usually seen in shallow pools and under rocks. It prefers muddy reefs. Mantle is white and tuberculate.

Status: Common.

## Atagema spongiosa (Kelaart, 1858) (Fig. 2d)

India: Gulf of Kutch, Waltair.

**Wider Distribution**: Indo-West Pacific: Australia, South Korea, Philippines, Christmas Island, Singapore, Red Sea.

# Size: 90-130 mm.

**Description**: It has sponge-like external appearance. Mantle is deeply pitted and brown in colour with few green and pale red patches. Foot and underside is dark purplish.

Status: Common.

#### Family: Platydorididae

Sclerodoris cf. tuberculata Eliot, 1904 (Fig. 2e) India: Gulf of Kutch. Size: 15-70 mm.

**Description**: It is a small *Sclerodoris*. Rhinophores are deep red. Gill leaves are feathery and red. It is always found under rocks with red coloured encrusting sponge. Ventral surface orange.

Status: Common.

# Family: Kentrodorididae

# Jorunna funebris (Kelaart, 1858) (Fig. 2f)

**India**: Gulf of Kutch, Andaman and Nicobar, Gulf of Mannar, Lakshadweep.

Wider Distribution: Indo-West Pacific: Red Sea, Oman, Maldives, Australia to Japan, Papua New Guinea, Hong Kong, Singapore.

Size: 90 mm.

**Description**: A common slug in Indian waters. The surface of this sea slug has a rough texture, a character typical of the genus. Black rings present on the white body are rough to touch. Rhinophores are black and lamellate with a white base. Gills are black. Some areas of the Gulf of Kutch have very high density populations of this species. The size is also very large compared to other areas.

Status: Abundant.

## Family: Dendrodorididae

Dendrodoris fumata (Rüppell and Leuckart, 1831) (Fig. 2g) India: Gulf of Kutch, Ratnagiri.

Wider Distribution: Red Sea, Western Australia, Korea, New Caledonia, Seychelles, Reunion, Singapore, Japan. Size: 10-60 mm.

**Description**: It is found mostly in shallow pools and under rocks on muddy reef. This species resembles some forms of *D. nigra* except that it has 5-6 bushy and branching gills which expand to larger than the body width. Rhinophores have white tips. Species shows colour variation from light brown to red.

Status: Common.

**Remarks:** We have *D. nigra* but from Lakshadweep and Andaman Islands. Based on our work, we believe that *D. fumata* and *D. nigra* have distinct site separation; *fumata* prefer muddy reefs while *nigra* prefer high quality reef. Species identified by Narayanan (1968) from Gujarat as *D. nigra* in fact are most likely *D. fumata* as this is the most abundant species in this locality. We have not found a single specimen of *nigra* in the last 10 years from this locality. *D. fumata* is seen all along Maharashtra and Gujarat coast, western coast India, which have muddy reefs. Also for *D. nigra*, juveniles

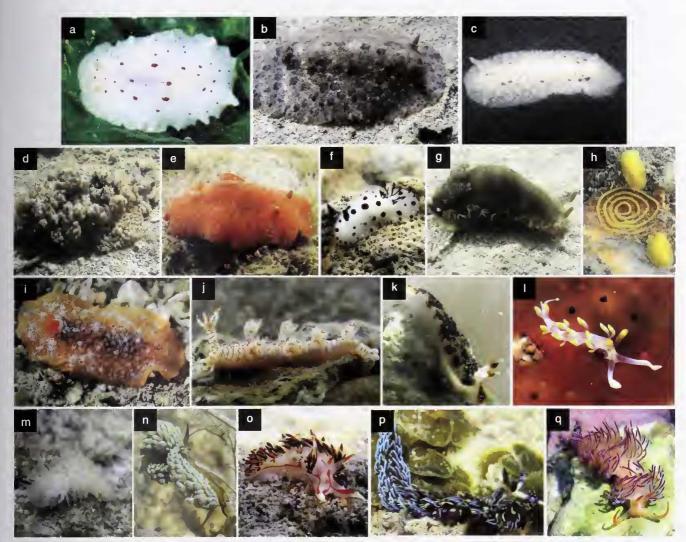


Fig. 2: a. Peltodoris murrea, b. Tayuva lilacina, c. Atagema cf. rugosa, d. Atagema spongiosa, e. Sclerodoris cf. tuberculata, f. Jorunna funebris, g. Dendrodoris fumata, h. Doriopsilla sp., i. Doriopsilla cf. miniata, j. Bornella stellifer,
k. Dermatobranchus fortunata, I. Flabellina bicolor, m. Phestilla lugubris; n. Cuthona yamasui, o. Phidiana militaris, p. Pteraeolidia ianthina, q. Sakuraeolis gujaratica

have red band on foot margin while as *D. fumata* juveniles are light orange and lack red band.

# Doriopsilla sp. (Fig. 2h)

India: Gujarat. Wider Distribution: Unknown. Size: 10-20 mm.

**Description:** It is a small sea slug found on muddy substrate. The entire animal including rhinophores and gills are yellow. Surface bears numerous outgrowths. Egg case is also yellow.

Status: Common.

Doriopsilla cf. miniata (Alder and Hancock, 1864) (Fig. 2i)

India: Gulf of Kutch.

**Wider Distribution**: South Africa and Gulf of Aden. **Size**: 30-40 mm.

**Description**: It is a large *Doriopsilla*. Rhinophores and gills are light yellow orange. In some specimen gills are deep orange red. Body is mottled with network of white lines. Colour of the egg case matches the specimen, i.e., the dark orange form lays dark orange egg case, while the light yellow form lays light yellow egg case. It differs from *miniata* in that the white lines, instead of meandering all over the dorsum, are concentrated on the tubercles.

Status: Rare.

#### Family: Bornellidae

# Bornella stellifer (Adams and Reeve, 1848) (Fig. 2j)

**India**: Gulf of Kutch (Gujarat), Ratnagiri and Revdanda (Maharashtra), Gulf of Mannar.

Wider Distribution: Australia, Singapore, Malaysia, Indonesia, Taiwan, American Samoa, South Africa.

Size: 30 mm (Single specimen).

**Description**: A small sea slug found on rocky reefs. Oral tentacles paired and finger-like. Gills placed at the base of each cerata. Rhinophores present on long stalks and surrounded by long papillae. It feeds on the hydroids. Colour, deep reddish brown with white patches. Tips of cerata and papillae with apical red band.

Status: Uncommon.

# Family: Arminidae

*Dermatobranchus fortunata* (Bergh, 1888) (Fig. 2k) India: Gulf of Kutch.

Wider Distribution: Australia, Philippines.

Size: 10-25 mm.

Description: This small sea slug is found under rocks

on muddy reefs. When disturbed, animal secretes large quantity of slime. Rhinophores are bulbous at the tip and have orange and black apical bands. Oral flap has orange border. Egg mass is yellow, spiral conical ribbon-like.

Status: Seasonally common.

## Family: Flabellinidae

## Flabellina bicolor (Kelaart, 1858) (Fig. 2l)

**India**: Gulf of Kutch, Lakshadweep. This is the first record of this species from Gujarat.

**Wider Distribution**: Widely distributed in Indo-Pacific, Papua New Guinea, Japan, Hong Kong, Maldives, South Africa to Hawaii, Red Sea.

Size: 10-20 mm.

**Description**: A small sea slug usually seen under rocks or among dead coral branches. It has a long and narrow body with numerous cerata which are in pairs, and have a distinct orange coloured band near the tip. However, specimens from Gulf of Kutch are always with yellow coloured bands. Besides cerata, the head also bears orange banded oral and propodial tentacles. Rhinophores are bulbous and brown in colour.

**Status**: Uncommon in the Gulf of Kutch, common in Lakshadweep.

## Family: Tergipedidae

# Phestilla lugubris (Bergh, 1870) (Fig. 2m)

**India**: Gulf of Kutch, Lakshadweep. This is the first record of this species from Gujarat.

Wider Distribution: Tanzania, Red Sea, Indonesia, Australia, Hawaii, Japan, Vietnam, Hong Kong.

Size: 40-45 mm.

**Description**: These sea slugs are closely associated with *Porites* sp. They feed on the polyps of this species (pers. obs.).

Body colour is light brown. Body surface bears numerous cerata. Each cera is bulbous in nature with distinct white bands and ringed nodes.

**Status**: Uncommon in the Gulf of Kutch. Common in Lakshadweep.

## Cuthona yamasui Hamatani, 1993 (Fig. 2n)

India: Gulf of Kutch.

Wider Distribution: Tropical Indo-West Pacific. Size: 30-35 mm.

**Description**: This species seems to show colour variation, particularly of head, rhinophores and oral tentacles appear to range in colour from translucent orange to dark blue-black. Body colour is somewhat translucent light orange-brown. There is a prominent white band between the rhinophores. The tips of the oral tentacles and rhinophores are whitish. Cerata are elongated. The tips of the cerata are black followed by a yellow and turquoise blue band. Rest of the cerata is greyish-white in appearance. It is found feeding on the stinging hydroid *Aglaophenia* sp. (pers. obs.).

Status: Uncommon.

#### Family: Facelinidae

## Phidiana militaris (Alder and Hancock, 1864) (Fig. 20)

India: South Gujarat, Ratnagiri (Maharashtra).

Wider Distribution: Malaysia, Papua New Guinea. Size: 20 mm.

**Description**: A beautiful nocturnal sea slug, it is closely associated with *Goniopora* corals. Cerata are transparent and digestive gland is bright violet and orange. Oral tentacles and rhinophores bear distinct orange lines. They are seasonally common and seen in small groups among *Goniopora* polyps.

Status: Seasonally common.

# Pteraeolidia ianthina (Angas, 1864) (Fig. 2p) India: Gulf of Kutch.

Wider Distribution: Australia, Singapore, China, Vanuatu, Fiji, Japan, Hawaii, Madagascar, Seychelles, Maldives.

Size: 50 mm. Description: It is a large aeolid. Body covered with

numerous cerata. Tentacles have distinct purple coloured bands. It occurs on coral sand. No data available about this species in India.

Status: Very rare.

#### Sakuraeolis gujaratica Rudman, 1978 (Fig. 2q)

India: Endemic to the Gulf of Kutch. This is the second record of this species from its type locality after it was described in 1971.

Size: 20 mm.

**Description**: Body is elongated. The oral tentacles are long and slender. Five sets of cerata are distinct on the body. The body is pale orange. Tips of rhinophores and cerata deep orange. Digestive gland inside cerata is deep violet, oral tentacles are orange.

Status: Rare.

#### **ACKNOWLEDGEMENTS**

This paper is a result of field work conducted during the "All India Co-ordinated Project on Taxonomy – Mollusca" funded by the Ministry of Environment and Forests, Government of India. We are grateful to the Department of Environment and Forests, Government of Gujarat, Mr. Pradeep Khanna, IFS, PCCF (Wildlife), for providing necessary permits to visit the marine National Park and Sanctuary areas. We are thankful to Mr. D.S. Narve, IFS Conservator of Forests, Marine National Park, Mr. P.H. Sata DCF, Mr. Radadia ACF, Mr. B.H. Dave RFO Sikka and Mr. Dipak Pandya RFO, Dwarka for their help in field work. Mr. Vinod Gajjar, Mr. Vishwas Shinde, Mr. Sudhir Sapre, and Ms. Swapna Prabhu also assisted during the field work.

Dr. Bill Rudman, Dr. T. Gosliner and Dr. N. Yonow helped to validate some species.

#### REFERENCES

- ALDER, J. & A. HANCOCK (1864): Notice on the collection of Nudibranchiate mollusca made in India by Walter Eliot Esq. with descriptions of several new genera and species. *Trans. Zool. Soc. Lond, 5*: 117-147.
- APTE, D.A. (2009): Opisthobranch fauna of Lakshadweep Islands, India with 52 new records to Lakshadweep and 40 new records to India. J. Bombay Nat. Hist. Soc. 106(2): 162-175.
- BERGH, L.S.R. (1877): Malacologische Untersuchungen. In: Semper, C.G. (Ed.): Reisen im Archipel der Philippinen, Wissenschaftliche Resultate. Band 2, Heft 12: 495-546, pls. 58-61.
- BRUNCKHORST, D.J. (1993): The systematics and phylogeny of phyllidiid nudibranchs (Doridoidea). *Records of the Australian Museum*, *supplement 16*: 1-107, pls. 1-9.
- BURN, R. (1970): Phyllidia (Phyllidiella) zeylanica Kelaart a rare nudibranch from the Indian subcontinent. Memoirs of the National Museum of Victoria 31: 37-40.
- BURN, R.F. & K.R. NARAYANAN (1970): Taxonomic notes on *Eolis militaris* Alder & Hancock, 1864 (Opisthobranchia, Eolidacea). Journal of the Malacological Society of Australia 2(1): 83-86.
- DAYRAT, B. (2010): A monographic revision of basal Discodorid sea slugs (Mollusca: Gastropoda: Nudibranchia: Doridina). Proc. Calif. Acad. Sci. 61 (supplement 1): 1-403.
- DEOMURARI, A. (2006): *Berthellina citrina* from the Gulf of Kutch, India. [Message in] Sea Slug Forum. Australian Museum, Sydney. Available from http://www.seaslugforum.net/find/17187, July 29, 2006.
- ELIOT, C.N.E. (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. *Proc. Zool. Soc. London*. pp. 636-691, pls. 42-47.
- ELIOT, C.N.E. (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. *Proc. Zool. Soc. London.* Pp. 999-1008.
- ELIOT, C.N.E. (1906c): Nudibranchiata, with some remarks on the families and genera and description of a new genus, Doridomorpha. Pp. 540-573, pl. 32. *In*: Stanley Gardiner, J. (Ed.): 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, vol. 2.
- ELIOT, C.N.E. (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, C.N.E. (1909b): Notes on a collection of nudibranchs from Ceylon. *Spolia Zeylanica, Colombo* 6(23): 79-95.

- ELIOT, C.N.E. (1910a): Nudibranchs collected by Mr. Stanley Gardiner from the Indian Ocean in H.M.S. Sealark. *In*: Reports of the Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner, M.A. *Transactions of the Linnaean Society, Zoology, series 2, 13(2)*: 411-439, pl. 25.
- ELIOT, C.N.E. (1910b): Notes on nudibranchs from the Indian museum. *Records of the Indian Museum 5(4)*: 247- 252, pl. 19.
- ELIOT, C.N.E. (1916): Mollusca Nudibranchiata. In: Fauna of the Chilka Lake. *Memoirs of the Indian Museum* 5: 375-380.
- FARRAN, G.P. (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. *3 Suppl. Report 21*: 329-364. The Ray Society, London.
- FAHEY, S.J. & T. GOSLINER (2003): Mistaken identities: On the Discodorididae genera *Hoplodoris* Bergh, 1880 and *Carminodoris* Bergh, 1889 (Opisthobranchia, Nudibranchia). *Proc. Calif. Acad. Sci.* 54(10): 169-208, 31 fig.
- FONTANA, A., MARIA LETIZIA CIAVATTA, LISETTE D'SOUZA, ERNESTO MOLLO, CHANDRA G. NAIK, P.S. PARAMESWARAN, SOLIMABI WAHIDULLA & GUIDO CIMINO (2001): Selected chemo-ecological studies of marine opisthobranchs from Indian coasts. *Journal of the Indian Institute of Science 81(4)*: 403-415.
- GIDEON, P.W., P.K.B. MENON, S.R.V. RAO & K.V. JOSE (1957): On the marine fauna of the Gulf of Kutch: A preliminary survey. J. Bombay Nat. Hist. Soc. 54(3): 690-706.
- Gosliner, T.M. (1992): Biodiversity of Tropical Opisthobranch Gastropod Faunas. *Proceedings of the Seventh International Coral Reef Symposium, Guam, 1992, Vol.* 2: 702-709.
- Gosliner, T.M. (1994): New species of *Chromodoris* and *Noumea* (Nudibranchia: Chromodorididae) from the western Indian Ocean and southern Africa. *Proc. Calif. Acad. Sci.* 48(12): 239-252, 8 figs.
- GOSLINER, T.M. (1995): The genus *Thuridilla* (Opisthobranchia: Elysiidae) from the tropical Indo-Pacific, with a revision of the phylogeny and systematics of the Elysiidae. *Proc. Calif. Acad. Sci.* 49(1): 1-54.
- GOSLINER, T.M. & D.W. BEHRENS (1998): Five new species of *Chromodoris* (Mollusca: Nudibranchia: Chromodorididae) from the tropical Indo-Pacific Ocean. *Proc. Calif. Acad. Sci.* 50(5): 139-165.
- GOSLINER, T.M. & R.F. JOHNSON (1999): Phylogeny of Hypselodoris (Nudibranchia: Chromodorididae) with a review of the monophyletic clade of Indo-Pacific species, including descriptions of twelve new species. Zool. Jour. of the Linnean Soc 125: 1-114.

- GOSLINER, T. & R. WILLAN (1991): Review of the Flabellinidae (Nudibranchia: Aeolidacea) from the tropical Indo-Pacific, with the descriptions of five new species. *Veliger 34*(2): 97-133.
- HORNELL, J. (1909a): Report to the Government of Baroda on the marine zoology of Okhamandal in Kattiawar, pt 1, Williams and Norgate, London.
- HORNELL, J. (1909b): 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, pp. 145-148.
- HORNELL, J. (1949): The study of Indian molluscs (part 11). J. Bombay Nat. Hist. Soc. 48(3): 543-569 [Opisthobranchia: 547-553].
- HORNELL, J. (1951): Indian molluscs. Bombay Natural History Society, pp. 1-96, 1 pl. (Nudibranchia pp. 41-42).
- JENSEN, K.R. (1992): Anatomy of some Indo-Pacific Elysiidae (Opisthobranchia: Sacoglossa (=Ascoglossa), with a discussion of the generic division and phylogeny. *Journal of Molluscan Studies* 58(3): 257-296.
- KELAART, E.F. (1858a): Descriptions of new and little known species of Ceylon nudibranchiate molluscs and zoophytes. *Journal of the Ceylon Branch of the Royal Asiatic Society* 3(1): 84-139, 2 pls.
- KELAART, E.F. (1858b): Description of a new Ceylonese nudibranch. Ann. Mag. Nat. Hist., series 3, 1(4): 257-258, pl. 10 B.
- KELAART, E.F. (1859a): Descriptions of new and little-known species of Ceylonese nudibranchiate molluscs. Ann. Mag. Nat. Hist. series 3, 3: 291-304.
- KELAART, E.F. (1859b): Descriptions of new and little-known species of Ceylonese nudibranchiate molluscs. Ann. Mag. Nat. Hist. series 3, 3: 488-496.
- KELAART, E.F. (1859c): On some additional species of nudibranchiate molluscs from Ceylon. Ann. Mag. Nat. Hist. series 3, 4: 267-270.
- KELAART, E.F. (1859d): Description of new and little-known species of Ceylonese nudibranchiate molluscs, and zoophytes, 64 pp. "Trincomalie 1st November 1857".
- KELAART, E.F. (1883): New and little known species of Ceylon nudibranchiate molluscs, and zoophytes. *Journal of the Ceylon Branch of the Royal Asiatic Society*, 1856-61 3(9): 76-125.
- MENON, P.K.B., A.K. DATTA GUPTA & D. DAS GUPTA (1970): On the marine fauna of the Gulf of Kutch. J. Bombay Nat. Hist. Soc. 58(2): 475-494, pls. 1-10.
- NARAYANAN, K.R. (1968): On three opisthobranchs from the south-west coast of India. J. Mar. Biol. Ass. India 10(2): 377-380; figs. 1-2.
- NARAYANAN, K.R. (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, pp. 189-213; figs. 1-20. Marine Biological Association of India, Mandapam Camp, India.
- NARAYANAN, K.R. (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, K.R. (1971a): On two doridacean nudibranchs (Mollusca: Gastropoda), from the Gulf of Kutch, new to the Indian coast. J. Bombay Nat. Hist. Soc. 68(1): 280-281.
- NARAYANAN, K.R. (1971b): On a species of the genus *Berthellina* (Opisthobranchia: Notaspidea) of the Gulf of Kutch. J. Mar. Biol. Ass. India 12(1-2): 210-212; tbl. 1.
- O'DONOGHUE, C.H. (1932): Notes on Nudibranchata from southern India. Proceedings of the Malacological Society of London 20: 141-166.
- RAO, K.V. (1936): Morphology of the Kalinga ornata (Alder and Hancock). Rec. Ind. Mus. 38: 41-79.
- RAO, K.V. (1952): Cuthona adayarensis, A new Nudibranch (Mollusca: Gastropoda) from Madras. J. Zool. Soc. India, Calcutta 3: 229-238.

- RAO, K.V. (1961): On the two Opisthobranchiate molluscs, *Placobranchus ocellatus* Hasselt and *Discodoris boholiensis*  Bergh from Indian waters not hitherto been recorded. J. Mar. Biol. Ass. India 3 (1&2): 253-259.
- RAO, K.V. & K. ALAGARSWAMI (1960): An account and the structure of early development of a new species of nudibranchiate gastropod, *Eolidina (Eolidina) mannarensis. J. Mar. Biol. Ass. India* 2(1): 6-16.
- RAO, N.V. & K.V. SURYA RAO (1980): On a rare nudibranch, *Thordisa crosslandi* Eliot (Mollusca: Dorididae) from the west coast of India. *Bulletin Zoological Survey of India* 2(2-3): 219, pl. IV.
- RAO, K. V., P. SIVADAS & L. K. KUMARY (1974): On three rare doridiform nudibranch molluscs from Kavaratti Lagoon, Laccadive Islands. *Journal of the Marine Biological Association of India 16(1)*: 113-125.
- RUDMAN, W.B. (1980): Aeolid opisthobranch molluscs (Glaucidae) from the Indian Ocean and the south-west Pacific. Zoological Journal of the Linnean Society 68: 139-172.
- RUDMAN, W.B. (1984): The Chrormodorididae (Opisthobranchia: Mollusca) of the Indo-West Pacific: a review of the genera. Zoological Journal of the Linnean Society 81: 115-273.
- RUDMAN, W.B. (1986): The Chromodorididae (Opisthobranchia: Mollusca) of the Indo-West Pacific: the genus Glossodoris Ehrenberg (H. & A. Adams). Zoological Journal of the Linnean Society 86: 101-184.
- RUDMAN, W.B. (1990): The Chromodorididae (Opisthobranchia: Mollusca) of the Indo-West Pacific: further species of *Glossodoris*, *Thorunna* and the *Chromodoris aureomarginata* colour group. Zoological Journal of the Linnean Society 100: 263-326.
- SATYAMURTHI, S.T. (1952): The mollusca of Krusadai Island. 1. Amphineura and Gastropoda. Bull. Mad. Govt. Mus. (Nat. Hist.) 1(2): 216-251.
- VALDÉS, A., E. MOLLO & J.A. ORTEA (1999): Two new species of Chromodoris (Mollusca, Nudibranchia, Chromodorodidae) from southern India, with a re-description of Chromodoris trimarginata (Winckworth, 1946). Proceedings of the California Academy of Sciences 51(13): 461-472.
- YONOW, N. (1984a): Doridacean nudibranchs from Sri Lanka, with descriptions of four new species. *The Veliger 26(3)*: 214-222.
- YONOW, N. (1984b): Opisthobranchia. Pp. 304, pls. 34-37. In: Sharabati, D. (Ed.): Red Sea Shells. KPI Ltd., London.
- YONOW, N. (1986): Red Sea Phyllidiidae (Mollusca, Nudibranchia) with descriptions of new species. *Journal of Natural History 20(6)*: 1401-1428.
- Yonow, N. (1988): Red Sea Opisthobranchia. 1. The family Phyllidiidae (Mollusca, Nudibranchia). Fauna of Saudi Arabia 9: 138-151.
- YONOW, N. (1989): Red Sea Opisthobranchia. 2. The family Chromodorididae (Mollusca, Nudibranchia). Fauna of Saudi Arabia 10: 290-309.
- YONOW, N. (1990): Red Sea Opisthobranchia. 3. The orders Sacoglossa, Cephalaspidea, and Nudibranchia: Doridacea (Mollusca, Opisthobranchia). *Fauna of Saudi Arabia 11*: 286-299.
- YONOW, N. (1992): Observations on the diet of *Philinopsis cyanea* (Martens) (Cephalaspidea, Aglajidae). J. Conch., London 34(4): 199-204.
- YONOW, N. (1994): Opisthobranchs from the Maldive Islands, including descriptions of seven new species (Mollusca: Gastropoda). *Revue* française d'aquariologie herpetology 20(4): 97-130.
- YONOW, N. (1996): Systematic revision of the family Phyllidiidae in the Indian Ocean Province: Part 1 (Opisthobranchia: Nudibranchia: Doridoidea). J. Conch., London 35(6): 483-516.
- YONOW, N. (2000): Red Sea Opisthobranchia 4: The Orders Cephalaspidea, Anaspidea, Notaspidea, and Nudibranchia: Dendronotacea and Aeolidacea. *Fauna of Saudi Arabia 18*: 87-131.

- YONOW, N. (2001): Results of the Rumphius Biohistorical Expedition to Ambon (1990). Part 11. Doridacea of the families Chromodorididae and Hexabranchidae (Mollusca, Gastropoda, Opisthobranchia, Nudibranchia), including additional Molukkan material. Zool. Verh. Leiden 75(1-15): 1-50.
- YONOW, N. (2008a): Sea Slugs of the Red Sea. Pensoft Publishers, Sofia, Bulgaria. 304 pp.

YONOW, N. (2008b): Opisthobranchs of the Gulf of Eilat and the Red

Sea: an account of similarities and differences. Pp. 177-196. *In*: Por, F. (Ed.): Aqaba – Eilat, The Improbable Gulf. Environment, Biodiversity and Preservation. The Hebrew University Magnes Press, Jerusalem.

YONOW, N. & P.J. HAYWARD (1991): Opisthobranches de l'Ile Maurice, avec la description de deux éspèces nouvelles (Mollusca: Opisthobranchia). *Revue française d'aquariologie herpetology* 18(1): 1-30.

. . .