

SUBLITTORAL SEAWEED FLORA OF THE ST. MARTIN'S ISLAND, BANGLADESH

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Abstract

Investigation on the sublittoral seaweed flora collected from 0.5 to 10 m depth during late March and April, 2013 from six localities around the St. Martin's Island, Bangladesh has revealed the presence of 39 seaweed taxa, 12 under Rhodophyceae, 11 under Chlorophyceae and 16 under Phaeophyceae. Of these *Avrainvillea amadelpa* (Montagne) Gepp *et* Gepp (green), *Pocockiella variegata* (Lamx.) Papenfuss, *Spatoglossum asperum* J. Ag., *Spatoglossum variabile* Figari *et* De Notaris and *Sargassum pallidum* (Turner) C. Agardh (browns) are new records for Bangladesh.

Introduction

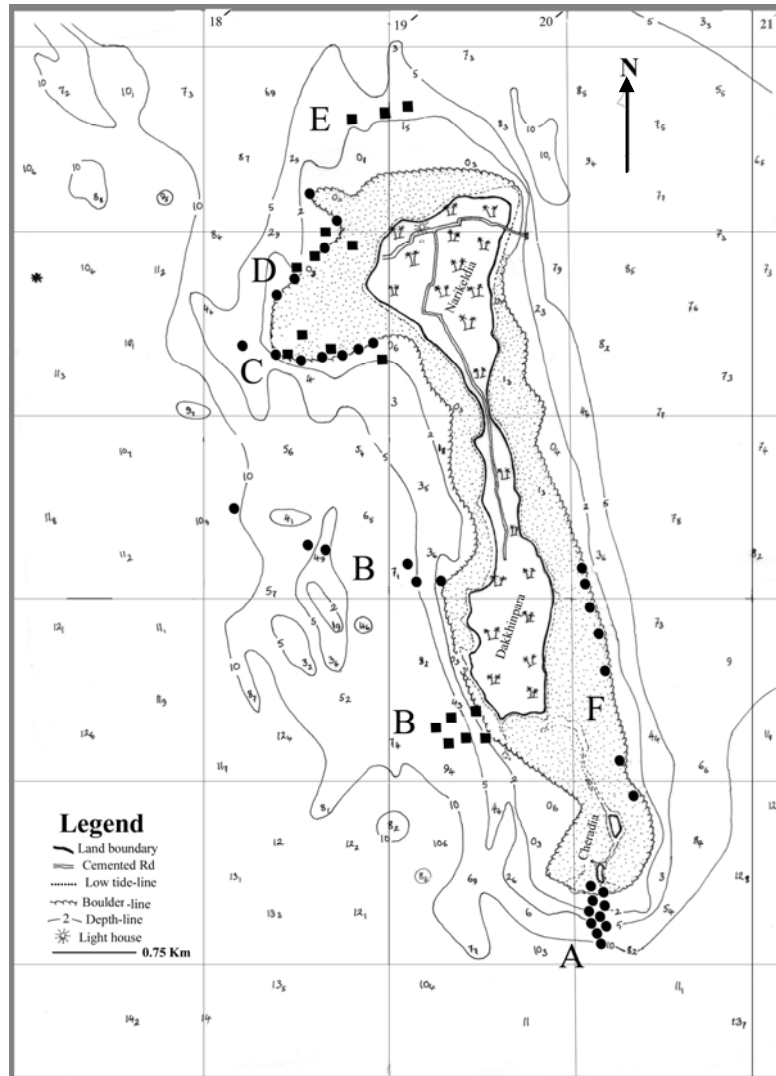
Bangladesh coast is 710 km long, facing the Bay of Bengal in the south. It has rocks and boulders in only about half a km stretch along the Inani Beach and huge in number around the St. Martin's Island (SMI). The intertidal and drifted seaweed flora of these areas, specially the St. Martin's Island is rich. So far, 197 species of seaweeds (of them 95 are red, 46 greens and 56 brown) have been recorded (Ahmed *et al.* 2008, 2009, Aziz and Islam 2009, Islam *et al.* 2010, Aziz and Rahman 2010, 2011). But the study of sublittoral seaweeds is meager, mainly due to lack of facilities like SCUBA divers, and underwater communication systems with video. Recently, attempt was undertaken to enlist exclusively the submerged seaweed species present, their diversity, distribution and standing biomass in the SMI taking all types of support from the Bangladesh Navy. The present paper includes only the floristic account of the submerged seaweeds, while the species diversity, distribution and standing biomass of submerged seaweeds of the island are included elsewhere.

Materials and Methods

Seaweeds were collected from 0.5 to 10 m depth during late March and April, 2013 from six localities of the SMI, taking the help of SCUBA diving team of the Bangladesh Navy. The samples were then preserved in sea water with 5% formalin, and individual seaweed as herbaria, deposited in the Department of Botany, University of Dhaka. A total of five locations in March (A-D, F) and five in April (A-E) were considered around the island (Map 1).

Results and Discussion

In the present investigation a total of 39 seaweed taxa, 12 under Rhodophyceae, 11 under Chlorophyceae and 16 under Phaeophyceae have been worked out, illustrated and discussed.



Map 1. St. Martin's Island, showing six locations A to F of sublittoral seaweed collections made on March (●) and April (■) 2013. Boulder-line (wavy) and depth profile (in meter) around the island and further, during low tide are also shown. A survey was done at 15 m depth in the upper left by video communication system (*).

Rhodophyceae

Sub-class: Floridiophyceae; Order: Nematinales; Family: Chaetangiaceae

Genus: *Galaxura* Lamax.

1. *Galaxura fastigiata* Decaisne

(Islam 1976, Pl. 62, Fig. 368)

Locality: Location E, at a depth of 0.9, 1.7 meters.

Order: Cryptonemiales; Family: Coralliniaceae

Genus: *Jania* Lamax.

2. *Jania ungulata* (Yendo) Yendo

(Syn. *Corallina ungulata* Yendo 1902)

(Islam 1976, Pl. 65, Figs 383-386)

Locality: Location A, at a depth of 0.3 meter; Location C, at a depth of 1.7, 4.0, 6.0 meters; Location F, at a depth of 1.5 meter; Location C, at a depth of 0.2, 0.3, 1.6, 3.0 meters; Location E, at a depth of 1.7 meter.

Order: Gigartinales; Family: Hypneaceae

Genus: *Hypnea* Lamax.

3. *Hypnea musciformis* (Wulf.) Lamx

(Syn. *Fucus musciformis* Wulfen in Jacquin 1789, *Hypnea rissoana* J. Ag. 1842, *Hypnophycus musciformis* (Wulfen) Kütz. 1843, *Hypnea arborescens* P.L. Crouan & H.M. Crouan 1865) (Bórgesen 1915-20, 384; 1937, 47; 1938, 221; 1939, 112; Islam 1976, Pl. 55, Fig. 245).

Locality: North west of Dakshinpara (Location B), at a depth of 5.0 meter; west of Light house (Location D), at a depth of 0.2, 1.5, 1.9 meters; west of Coral view guest house (Location C), at a depth of 1.5, 2.0 meters; east of Dakshinpara (Location F), at a depth of 1.6 meter; north of Light house (Location E), at a depth of 1.7 meter.

Order: Bonnemaisoniales; Family: Bonnemaisoniaceae

Genus: *Asparagopsis* Montagne

4. *Asparagopsis taxiformis* (Del.) Coll. et Harvey

(Syn. *Fucus taxiformis* Delile, *Lictoria taxiformis* (Delile) J. Ag. 1841, *Asparagopsis sandfordiana* Harvey 1855)

(Islam 1976, 57-58, Fig. 370; Pham-Hong 1969, 216, Fig. 2.149)

Locality: South of Cheradia (Location A), at a depth of 0.2, 1.2 meters; east of Modhapara (Location E), at a depth of 0.2, 5.7 meters.

Order: Ceramiales; Family: Dasyaceae

Genus: *Dasya* C. Ag.

5. *Dasya corymbifera* J. Ag.

(Syn. *Callithamnion corymbiferum* (Kützling) Trevisan 1845, *C. corymbiferum* (Kützling) Zanardini 1847, *Dasya venusta* Harvey 1849)

(Islam S *et al.* 2010, 89, Fig. 2A-E)

Locality: West of Coast Guard (Location C), at a depth of 0.3, 3.0 meters; at 3.0 meter the alga was associated with at the base of the *Avrainvillea amadelpha*.

6. *Dasya pedicellata* (C. Ag.) C. Ag.

(Syn. *Sphaerococcus pedicellatus* C. Agardh)

(Islam 1976, Pl. 55, Figs. 333-334; Pham-Hoang, 1969, 245, Fig. 2.176)

Locality: West of Coast Guard Office (Location C), at a depth of 0.2, 3.0 meters; at 3.0 meter the alga was associated with at the base of the *Avrainvillea amadelpha*.

Family: Rhodomelaceae**Genus: Gracilaria Grev.****7. Gracilaria spinuligera** Bórg.(Aziz *et al.* 2002, 114-115, Figs 7-8)*Locality:* West of Coast Guard Office (Location C), at a depth of 2.5 meter.**Genus: Neurymenia J. Ag.****8. Neurymenia fraxinifolia** (Mertens ex Turner.) J. Ag.**(Fig. 1)**(Syn. *Fucus fraxinifolius* Mertens ex Turner 1809; *Neurymenia fraxinifolia* var. *australis* J. Ag. 1863; *N. fraxinifolia* var. *madagascarensis* J. Ag. 1863)

(Chowdhury and Ahmed 2007, 81-82, Figs 1-4).

Locality: Location C, at a depth of 1.7 meter.**Family: Delesseriaceae****Genus: Vanvoorstia J. Ag.****9. Vanvoorstia coccinea** Harvey ex J. Agardh.

(Islam 1976, Pl. 71, Figs a-e)

Locality: East of Dkshinpara (Location F), at a depth of 2.5 meter.**Order: Cryptonemiales; Family: Grateloupiaceae****Genus: Halymenia C. Ag.****10. Halymenia floresia** (Clemeente) C. Ag.(Syn. *Fucus floresii* Clemente 1807).

(Islam and Aziz 1987, 213-214, Fig. 20, Taylor 1960, 418, Pl. 45, Fig. 12; Pl. 51, Fig. 3)

Locality: West of Coral view guest house (Location C), at a depth of 0.9 meter; east of Modhapara (Location E), at a depth of 1.5 meter.**11. Halymenia (?) floridana** J. Ag.(Syn. *H. bermudensis* Coll. *et* Howe 1916; *H. gelinaria* Coll. *et* Howe 1916)

(Aziz and Rahman 2010, 164-165, Figs 3A-C; Taylor 1960, Pl. 53, Fig. 2).

Locality: South west of Dakshinpara (Location B), at a depth of 0.3, 7.1 meters.**Family: Squamariaceae****Genus: Peyssonnelia Decasine****12. Peyssonnelia polymorpha** (Zanard.) Schmitz.(Syn. *Lithymenia polymorpha* Zanard.)

(Aziz 1997, 81-82, Figs 1-4)

Locality: Location A, at a depth of 0.2, 0.3, 2.5, 4.0 meters; Location C, at a depth of 0.3, 2.5 meters, Location D, at a depth of 0.2, 0.3, 2.5, 4.0, 15 meters, on older parts of a live coral, near to *Pocockiella* and growing *Halimeda*.

Chlorophyceae

Order: Cladophorales; Family: Cladophoraceae

Genus: *Cladophora* Kütz.

13. *Cladophora prolifera* (Roth) Kütz.

(Syn. *Conferva prolifera* Roth 1797, *Cladophora multifida* Brand, *C. scoparia* Kütz. 1845, *Conferva scoparia* (Kütz.) Zanardini 1847, *Cladophora prolifera* var. *confertissima* Kütz. 1849, *C. prolifera* var. *firma* Kütz. 1849, *C. prolifera* var. *flaccida* Kütz. 1849, *C. prolifera* var. *scoparia* (Kütz.) Schiffner 1931)

(Aziz *et al.* 2010, 195-196, Fig. 1 A-D)

Locality: West of Bangladesh Coast Guard (Location C), at a depth of 0.2, 0.3, 0.5, 0.9, 1.5 meters.

Order: Codiales; Family: Codiaceae

Genus: *Codium* Stackhouse

14. *Codium geppei* Schmidt

(Syn. *C. divaricatum* Gepp & Gepp 1911)

(Børgesen 1946, 49-52, Figs 19-22; Islam and Khair 1978, Pl. 1; Fig 1; Pl. 2, Fig. 18)

Locality: East of Dakshinpara (Location F), at a depth of 1.5 meter.

Order: Siphonales; Family: Codiaceae

Genus: *Avrainvillea* Decsane

15. *Avrainvillea amadelpha* (Montagne) Gepp *et* Gepp (Fig. 2)

(Syn. *Udotea amadelpha* Montagne 1857; *Avrainvillea lacerata* var. *robustior* Gepp *et* Gepp 1911)

(Børgesen 1948, 33-34, Fig. 14)

Plants with a large hapteron, short stipe with fan-shaped expanded cushion-like irregular structure; holdfast firmly fixed to the substratum, from which a great number of erect fan shaped shoots arise. The erect shoots are densely placed, about 3 - 5 cm high. They have a short up to about 1 cm long, vigorous stripe. This is often ramified, giving out a single or some few erect shoots. The fan shaped flabellum is about 3 - 4 cm broad with a semicircular or more irregularly upper outline. The flabellum is of a soft and rather loose consistency, especially near the upper margin with concentric rings. Holdfast about 1.5 cm diameter forms a moderately hard structure. Calcium carbonate layer forms on the surface of the holdfast. *Jania* filaments (about 0.5 mm diameter) developed from the lower side of the holdfast. On the surface of the older blade several semi circular concentric calcified thalli developed. On the margin several branched red algae (*Dasya corymbifera* and *D. pedicellata*) grew.

Locality: West of Coast Guard Campus (Location C), at a depth of 3.0 meter.

Order: Caulerpales; Family: Caulerpaeae

Genus: *Caulerpa* Lamour.

16. *Caulerpa cactoides* (Turner) C. Ag.

(Syn. *Ahmfeldtia cactoides* (Turner) Trevisan, *Fucus cactoides* Turner 1809, *Caulerpa cactoides* var. *gracilis* G.Murray 1891)

(Islam 1976, Pl. 12, Figs 94-95; Pl. 14 Fig. 103)

Locality: South of Cheradia (Location A), at a depth of 4.0-10.0 meters and East of Dakshinpara (Location C), at a depth of 0.2, 0.3, 1.5 meters.

17. *Caulerpa chemnitzschi* (Esper) Weber- van Bosse (Fig. 3)

(Syn. *C. peltata* Lamx., *C. racemosa* (Forssk.) C. Ag. var. *peltata* (Lamx.) Eubank 1946)

(Islam 1976, Figs. 50-52; Pl. 12, Fig. 93 Nizamuddin 1964, 205, Pl. III; Børgesen, 1932, 62, Fig 5a; Guiry and Guiry 2014).

Locality: South of Cheradia (Location A), at a depth of 1.5, 4.0, 6.0, 7.0 meters and west of Bangladesh Coast Guard Office (Location C), at a depth of 3.0 meter.

18. *Caulerpa chemnitzschi* var. *occidentalis* (J. Ag.) Børgesen. (Fig. 4)

(Syn. *C. racemosa* var. *occidentalis* J. Ag. 1873, in Taylor 1960, 153, Pl. 17, Fig. 6) (Guiry and Guiry 2014)

Locality: West of Bangladesh Coast Guard (Location C), at a depth of 0.2, 1.5, 4.0 meters; east of Dakshinpara (Location F), at a depth of 1.5 meter.

19. *Caulerpa racemosa* var. *clavifera* (Turner) Weber- van Bosse

(Islam 1976, 19-20, Figs 40 - 41; Taylor 1950, 62; 1960, 152 Pl. 17, Fig. 7)

Locality: West of Coast Guard (Location C), at a depth of 0.2, 0.3, 1.5, 4.0 meters; East of Dakshinpara (Location F), at a depth of 1.5 meter.

20. *Caulerpa sertularioides* fa *brevipes* (J. Ag.) Svedelius (Fig. 5)

(Syn. *C. plumaris* var. *brevipes* J. Ag.)

(Taylor 1960, 144, Pl. 13, Figs 2 - 3)

Locality: North-west of Dakshinpara (Location B), at a depth of 5.0 meter and west of Light house (Location D), at a depth of 0.2, 0.4, 0.9 1.5 meters.

21. *Caulerpa taxifolia* (M. Vahl) C. Ag. (Fig. 6)

(Syn. *Fucus taxifolius* Vahl 1802, *Caulerpa pennata* J.V. Lamx 1809, *C. falcata* Kütz 1857)

(Islam 1976, 22 - 23, Figs 49, 68 - 69, 88)

Locality: South of Cheradia (Location A), at a depth of 0.2, 1.6, 10 meters; west of Light house (Location D), at a depth of 1.5, 1.9, 3.1, 3.5, 10, 15 meters; west of Coral view guest house (Location C), at a depth of 1.5, 1.7 meters. It is one of the commonest *Caulerpa* sp. abundantly growing in shallow water in rather exposed areas, in large thick turfs on rocks or stones and mixed up with *Halimeda* sp.

Family: Udotiaceae

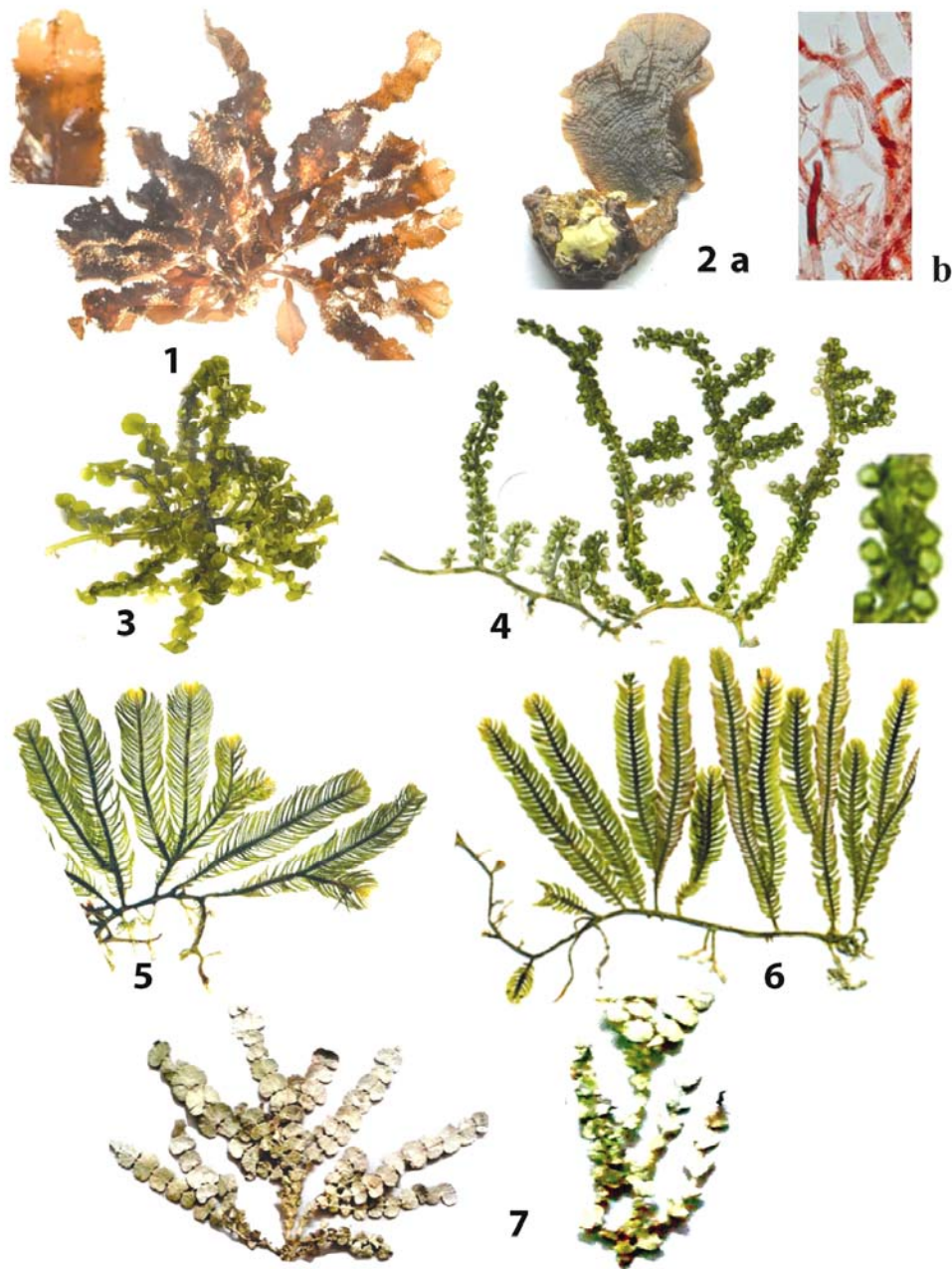
Genus: *Halimeda*

22. *Halimeda discoidea* Decaisne

(Syn. *H. discoidea* Kütz. 1857)

(Islam 1976, Pl. 4, Fig. 39; Pl. 13, Fig. 97 - 98; Børgesen, 1913, 106, Fig. 86)

Locality: West of Coast Guard Office (Location C), at a depth of 1.5 - 3.0 meters; North-west of Dakshinpara (Location B), at a depth of 5.0 meter; west of Light house (Location D), at a depth of 1.5 meter; west of Coral view guest house (Location C in April), at a depth of 1.5 meter; west of Light house (Location D in April), at a depth of 0.9 - 15.0 meters; north of Light house (Location E), at a depth of 1.7 meter; east of Dakshinpara (Location F), at a depth of 1.5 meter.



Figs 1 - 7: 1. *Neurymenia fraxinifolia*, $\times 0.40$. 2 (a-b). (a) *Avrainvillea amadelpha*, a whole plant with stump-like holdfast, $\times 1$; (b) Photomicrograph of a coenocytic filaments. 3. *Caulerpa chemnitzschi* $\times 0.5$, a part of a live plant. 4. *C. chemnitzschi* var. *occidentalis*, $\times 0.60$, herbarium. 5. *C. sertularioides* fa. *brevipes*, $\times 0.30$, herbarium. 6. *Caulerpa taxifolia* $\times 1$, herbarium. 7. *Halimeda opuntia*, two ecotypes $\times 0.3$, herbarium.

23. Halimeda opuntia (L.) Lamx. **(Fig.7)**

(Syn. *Corallina opuntia* Linn. 1758)

(Islam 1976, Pl. 13 Fig. 96; Taylor 1960, 176-177, Pl. 23, Fig. 3; Pl. 24, Fig. 1)

Plants whitish green, well calcified, of moderate height, 4-8 cm (20 cm) high; 5 to 10 cm wide, spreading laterally to form large colonies attaching at various points but with no persisting primary base; densely branching in all planes, successive branches and successive segments often at right angles with each other; segments with a truncate lower margin or becoming slightly pedicellate, transversely oval to reniform or a little trilobed, 3 radiating ribs being distinctly visible on the surface; segments about 2.5 to 10.0 mm (20 mm) wide, 0.3 to 0.7 mm (12.00 mm) long; surface utricles 20 - 50 μ diam. in surface view, in section rarely 70 μ long, the side walls in contact for about 0.078 of their length; medullary filaments incompletely fused, generally in pairs, at the nodes, an opening developing at the point of contact, but each member of the pair continuing upward and dividing dichotomously independently of the other. *H. incrassata* (Ellis) Lamox. (Taylor 1960, Pl 23, Figs. 1, 4) has been created based on having triangular lobes in about lower half of the axis. In *H. opuntia* (L) Lamox. the lower most 2 - 3 segments were invariably triangular, thus *H. incrassata* has been considered as ecotype of *H. opuntia*.

Locality: Location A, at a depth of 0.2, 0.3, 2.5, 2.9, 8.0 meters in association with *Caulerpa peltata*; Location C, at a depth of 1.5, 4.0 meters; Location B, at a depth of 5.0 meter; Location D, at a depth of 1.5 meter; Location C (in April), at a depth of 1.5 meter; Location F, at a depth of 1.5 meter; Location E, at a depth of 2.0 meter.

Phaeophyceae**Order: Dictyotales; Family: Dictyotaceae****Genus: Dictyota Lamx.****24. Dictyota atomaria** Hauck

(Syn. *D. hauckiana* Nizamuddin 1975)

(Islam *et al.* 2004, 1 - 2, Figs 1 - 3)

Locality: East of Dakshinpara (Location F), at a depth of 0.2, 1.5 meters; west of Light house (Location D), at a depth of 15 meter.

Genus: Dictyopteris Lamx.**25. Dictyopteris australis** Sonders in Askenasy.

(Syn. *Haliseris australis* Sonder 1853, *H. pardalis* Harvey 1855, *Neurocarpus pardalis* (Harvey) Kuntze 1898)

(Islam 1976, 38, Pl. 39, 240)

Locality: Location B, at a depth of 0.3, 7.0 meters; Location C, at a depth of 2.0, 4.0, 6.0 meters; Location D, at a depth of 1.0, 1.7 meters; Location C (in April), at a depth of 1.5 meter; Location D (in April), at a depth of 1.5, 1.7 meters.

Genus: Padina Adanson**26. Padina tenuis** Bory.

(Syn. *Vaughaniella rupicola* Børgesen 1950, *Padina commersonii* Bory de Saint-Vincent 1828)

(Islam 1976, Pl. 43. Figs 252-254, Pl. 44, Figs 256-257;)

Locality: East of Dakshinpara (Location F), at a depth of 0.2, 1.5, meters.

27. *Padina pavonica* (L.) Thivy

(Islam 1976, Pl. 45, Fig. 260)

Locality: West of Coast Guard Office (Location C), at a depth of 0.2, 1.5 meters.

28. *Padina gymnospora* (Kütz.) Sonder

(Syn. *P. vikersiae* Hoyt in Howe 1920, *Zonaria gymnospora* Kütz 1859)

(Islam 1976, Pl. 43, Fig. 255)

Locality: North-west of Dakshinpara (Location B), at a depth of 0.2, 4.5, 6.0 meters.

Genus: *Pocockiella* Papenfuss

29. *Pocockiella variegata* (Lamx.) Papenfuss

(Fig. 8)

(Syn. *Spatoglossum nigrescens* (Sonder) Kütz. 1849, *Orthosorus nigrescens* (Sonder) Trevisan 1849, *Pocockiella nigrescens* (Sonder) Papenfuss 1943)

(Taylor 1960, Pl. 33, Fig. 4)

Plants with holdfast, short stipe and wide blades, 3 - 8 cm high, width similar to height or wider, attached by rhizoids from the bases of the blades; dark-brown, not much changed in colour by drying; decumbent to erect; thallus little cleft, becoming broadly deltoid to suborbicular or kidney-shaped, the lobes 3 - 7 cm broad; a few concentric rings present, margin involucre with many sori present; distinct radial cells visible with naked eyes; the marginal row of apical cells developing a single layers of large medullary cells covered by 1 - 2 subcortical layers and by a cortical layer of smaller cells; the number of subcortical layers usually equal on both sides of the blade, which is 100 - 300 µm thick; cortical cells overlying the medullary cells about 8 on one face and only 4 on the other. A number of fronds 3 to 10 may grow together.

Locality: South of Cheradia (Location A), at a depth of 2.5 meter; west of Coral view guest house (Location C), at a depth of 1.5 meter.

Genus: *Spatoglossum* Kützing

30. *Spatoglossum variabile* Figari et De Notaris

(Fig. 9)

(Guiry and Guiry 2014)

Thallus about 42 cm long, basal part rhizomatous compact disc, upper part irregularly to sub-dichotomously divided; branch segments 1 - 3 cm broad, attenuated at the bases and apices; margins provided with small teeth and frequent proliferations of various sizes. Thallus composed of palisade-like superficial layer of cells, 47 - 74 µm broad with abundant chromatophores enclosing about 3 - 4 layers of inner cells; medulla cells 47 - 60 µm broad; angular, thick walled, isodiametric to horizontal with few chromatophores, 107 - 134 µm long, 53.6 - 67.0 µm broad; reproductive structures scattered over the surfaces; tetrasporangia globular, usually occurring singly.

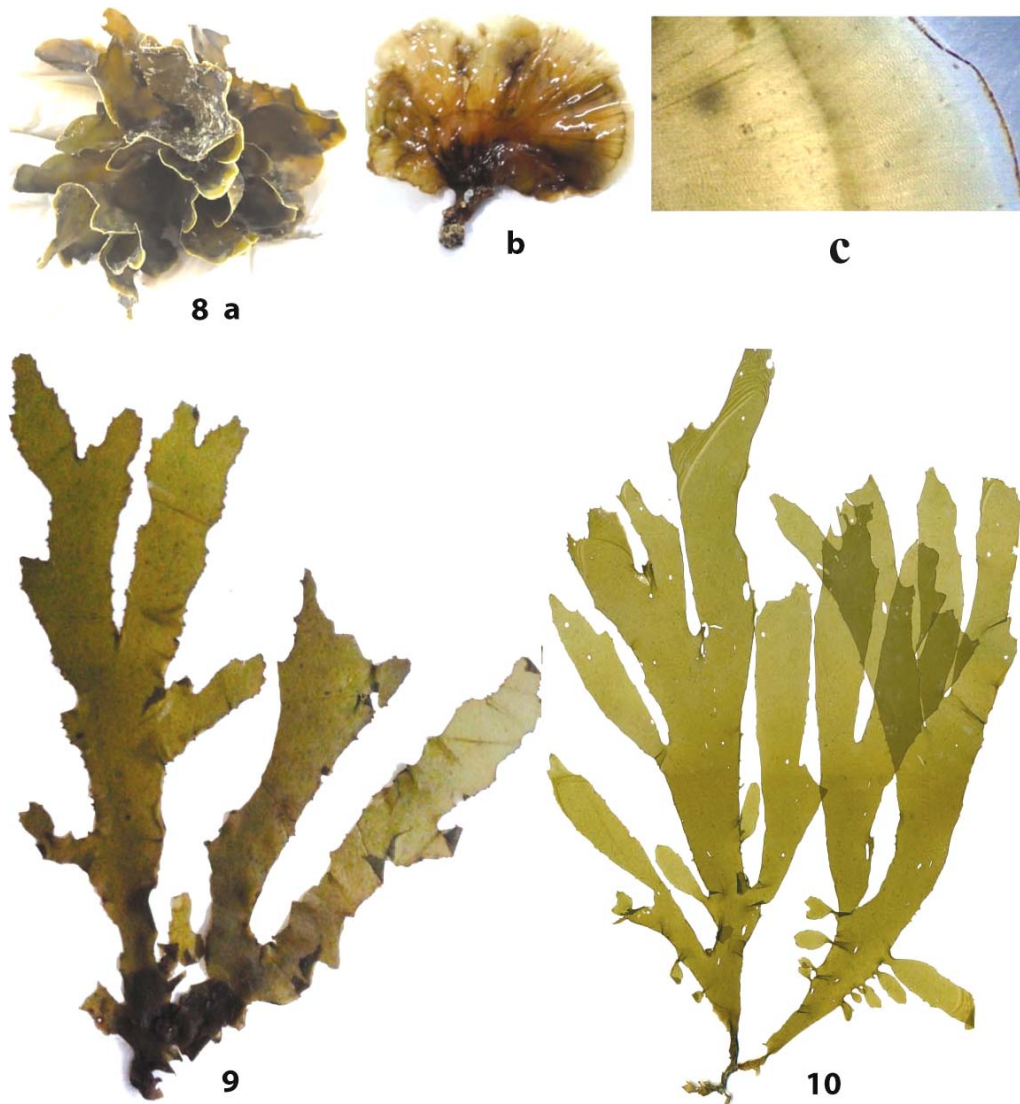
Locality: West of Coast Guard (Location C), at a depth of 0.4, 0.9, 1.5, 1.6, 1.7, 4.0 meters; Location B, at a depth of 0.3, 1.4, 1.7, 6.0 meters; Location D, at a depth of 1.0, 1.7, 7.0 meters.

31. *Spatoglossum asperum* J. Ag.

(Fig.10)

(Guiry and Guiry 2014)

Plants up to 45 cm high, stipe branched dichotomously (sometimes trichotomously), branches strap-shaped, up to 6 cm wide, gives golden coloured tint when a herbarium is made with freshly collected material. The base of each strap is narrow, gradually widens and then slightly narrowed in to nearly pointed to broadly rounded tips; margins develops 1 - 1.5 mm long teeth mostly in the



Figs 8-10: 8(a-c). *Pocockiella variegata*, $\times 0.60$, (a) Aggregate of eight live thalli top view, (b) Herbarium of a thallus, (c). Photomicrograph of a part of the frond showing radiating and concentric nature of the thallus with sori in the margin. 9. *Spatoglossum variabile*, $\times 0.30$, herbarium. 10. *S. asperum*, $\times 0.24$, herbarium of a whole plant.

lower part of the frond. Adventitious branches may develop from lower most $1/5$ to $2/5$ of thallus length; straps contain circular to elliptical and cylindrical rod shaped wholes distributed all along irregularly. Around sporangial initials (2 - 4) at a circumference of about 1 mm, about 10 cells arranged almost radially, which are gradually raised and relative browner towards the sporangial initial; and on the surface of each of these cells there appears to be produced 15 to 20 short rod to spherical structures almost in a circular pattern. Transverse section of the thallus revealed 9 to 10 cell layers where the medulary layer is very large followed by gradually smaller (compressed) cortical cells.

Spatoglossum asperum J. Ag. was recorded by Islam *et al.* 2004, the anatomical description of which fits with *S. schroederi* (Martens) Kg. (July 1965, Pl. 10, Figs 143 - 144).

Locality: Location C, at a depth of 0.4 meter; Location D, at a depth of 0.5, 1.5 meters.

Order: Dictyosiphonales; Family: Chnoosporaceae

Genus: Chnoospora J. Agardh.

32. Chnoospora implexa Hering ex J. Ag.

(Syn. *Dictyota obtusangula* Kützing 1859, *Chnoospora obtusangula* (Harvey) Sonder 1871)

(Islam 1976, Pl, 41, Figs 245 - 246)

Locality: West of Coast Guard (Location C), at a depth of 1.5 meter; east of Dakshinpara (Location F), at a depth of 1.6 meter; north of Light house (Location E), at a depth of 1.6 meter. The seaweed is abundant on the east coast of SMI.

Order: Fucales; Family: Sargassaceae

Genus: Sargassum CA Ag.

33. Sargassum coriifolium J. Ag.

(Syn. *S. lanceolatum* Greville 1848)

(Aziz *et al.* 2001, 135, Figs 3 - 4, 13; Womersley and Bailey 1970, 295, Fig. 6, Pl 24, Fig. 14)

Locality: East of Dakshinpara (Location F), at a depth of 0.2, 1.5 meters.

34. Sargassum olygocystum Mont

(Syn. *S. binderi* Sonder. in Agardh. 1848)

(Aziz *et al.* 2001, 140, Figs 8 - 9, 16)

Locality: South of Cheradia (Location A), at a depth of 3.0 meter.

35. Sargassum swartzii (Turner) C. Ag.

(Aziz *et al.* 2001, 140, Figs 10 - 11, 17A-C)

Locality: East of Dakshinpara (Location E), at a depth of 0.9, 2.5 meters; west of Coast Guard Office (Location D), at a depth of 2.5 meter.

36. Sargassum tenerrimum J. Ag.

(Fig. 11)

(Islam 1976, Fig. 264)

Locality: South of Cheradia (Location A), at a depth of 10.0 meter.

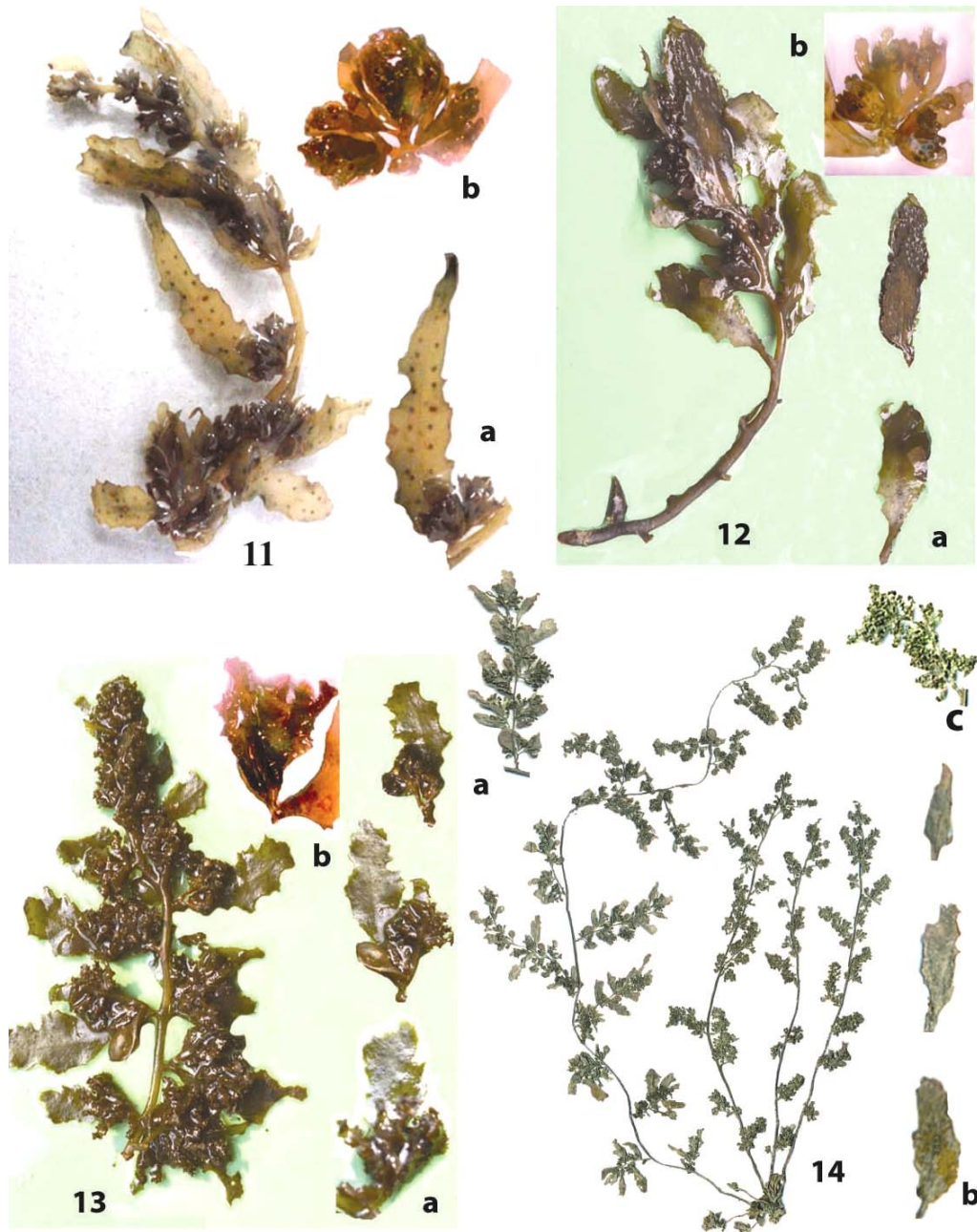
37. Sargassum pallidum (Turner) C. Agardh

(Fig. 12)

(Yoshida 1983, 134 - 136, Fig. 17)

Plants 50 cm high; primary branch produce secondary branches at a regular interval; the secondary branch branches again which are modified in to fronds (leaves), air bladders and receptacles; leaves oblong to ovate, tips obtuse to pointed, 2.5 to 5.5 cm long, 1.0 to 1.5 cm broad with wavy to light dentations on the margin, midrib slightly distinct, cryptostomata not visible; air bladders ovoid, 4 - 8 mm long and 3 - 5 mm broad without leafy outgrowth; receptacles brownish, swollen, partly cylindrical, in to four relatively smooth branches.

Locality: South of Cheradia (Location A), at a depth of 6.0 meter.



Figs 11-14: 11. *Sargassum tenerrimum*, a portion of the plant, $\times 0.28$; (a) enlarged tertiary branch showing receptacles, air bladder and the frond, (b) an enlarged branched receptacles. 12. *Sargassum pallidum*, $\times 0.16$, a portion of the preserved plant; (a) fronds and (b) a branched receptacle enlarged. 13. *Sargassum* sp. (1), $\times 0.10$, a portion of the plant, (a) tertiary branches and (b) a branched receptacle enlarged. 14. *Sargassum* sp. (2), $\times 0.27$, herbarium, (a) a portion of the secondary branch, (b) fronds and (c) a branched receptacle enlarged.

38. Sargassum sp. (1)

(Fig. 13)

Plants 70 cm high; primary branch produce secondary branches at a regular interval; the secondary branch branches again which are modified in to fronds (leaves), air bladders and receptacles; leaves thick, oblong, tips blunt, 2.5 to 5.5 cm long, 1.0 to 1.9 cm broad with deeply notched margins, little dentations, midrib region swollen, distinct, cryptostoma absent; air bladders robust ovoid, 1.0 - 1.3 cm long up to 7.0 mm broad with leafy spiny margins; receptacles robust, profusely branched, cylindrical with spiny projections from around.

Locality: South of Cheradia (Location A), at a depth of 0.9 meter.

39. Sargassum sp. (2)

(Fig. 14)

Plants usually up to 40 cm tall; holdfast strong producing a very short type that gives rise to four robust primary branches; primary branches produce secondary branches alternately at 2.7 - 3.2 cm interval; secondary branches relatively short which tertiary branches again at regular interval and modified in to fronds (leaves), air bladders and receptacles; leaves nearly lanceolate with obtuse to pointed tip, 2.5 - 3.6 cm long, 0.7 - 1.2 cm broad with lightly undulated spiny margins, midrib indistinct, cryptostomata lacking; air bladders ovoid to ellipsoidal, 6 - 8 mm long; secondary branches are transformed into tertiary branches or repeatedly branched cylindrical receptacles, with spines around.

Locality: West of Light House (Location D), at a depth of 5.0 meter.

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