Martensia K. Hering, 1841

CERAMIALES, DELESSERIACEAE

Thallus with thin membranous blades when young, developing a reticulum distally that can extend to the margins or terminate submarginally. Growth by means of a marginal row of obliquely dividing apical cells; new blades occasionally proliferating from the terminal margin, resulting in membranous regions alternating with mesh-like regions. Membranous portion with 1–5 cell layers; veins lacking; margins smooth or denticulate. Spermatangia in small sori on the network or the membranous blades. Cystocarps borne on the network or marginal membranous portion. Tetrasporangia in small sori on membranous and network partitions, tetrahedrally divided.

- M.D. Guiry in Guiry, M.D. & Guiry, G.M. 2021. *AlgaeBase*. World-wide electronic publication, National University of Ireland, Galway. http://www.algaebase.org; searched on 06 April 2021.

Species reported from Sri Lanka

Martensia fragilis Harvey, 1854 [Harvey, 1854:145; Harvey, 1857a: no. 5; G. Murray, 1887: 30. - Silva et al, 1996

Martensia fragilis Harvey, 1854 - Coppejans et al, 2009: 210.

Martensia flabelliformis Harvey ex J. Agardh, 1863 - Fernando, unpublished

Martensia pavonia – Fernando, unpublished.

Martensia cf. *indica* – Fernando, unpublished.

Description of species

Martensia fragilis Harvey, 1854

Type locality: Belligam (Weligama), Sri Lanka

Morphology Thalli gregarious, forming low cushions up to 80 mm diameter on hard substrates. Solitary small thalli may be encountered where water movement is strong. Fronds stipitate, crowded, lightly attached to each other. The blades supple, semi-circular to sub-orbicular, ruffled, some more expanded and divided. Reticular bands set in the middle in well-developed thalli, marginally in young thalli. Cream or pink-white with dark spots underwater, vermilion coloured in air.

Anatomy The solid areas are single-cell thick, possibly two basally, the free margin toothed. The reticulum consists of radial elements one-cell wide (and two cells deep?) connected by cross-links two-cells wide, the enclosed spaces radially rectangular. With growth the enclosed spaces become larger and more square than rectangular. Tetrasporangia are formed in the reticulum, being placed between two rows of cells (see drawing below).

Ecology All collections have been subtidal, from the Mount Lavinia to Wellawatte area, epilithic, between 3 and 12 m depths. Coppejans et al, 2009 report very small specimens from low intertidal pools at a depth of ½ m, on dead coral, and also from depths down to 20 m.

Discussion This species is distinguishable in the field by the characteristic low cushions consisting of ruffled, pinkish fronds adhering to one another. When spread out, the wide central reticular band is nearly as deep as the basal and marginal solid areas.

A question arises as to how correct this determination is. The images in Fig. 178 of Coppejans et al, 2009 show large reticular areas with narrow solid bands basally and marginally, like specimens described as *Martensia indica* in this work. In the same work is a remark that Millar (1990:418-420) synonymized *M. denticulata* Harvey with *M. fragilis*, but Littler & Littler (2003:136) distinguish both taxa based on the presence of marginal teeth in *M. denticulata*. Coppejans et al state "…outer blade margin entire." Are the thalli described here really *M. fragilis*? Or *M. denticulata*? Both species are illustrated by Kützing, 1856 with Latin descriptions, one without and one with marginal denticulations, otherwise similar.

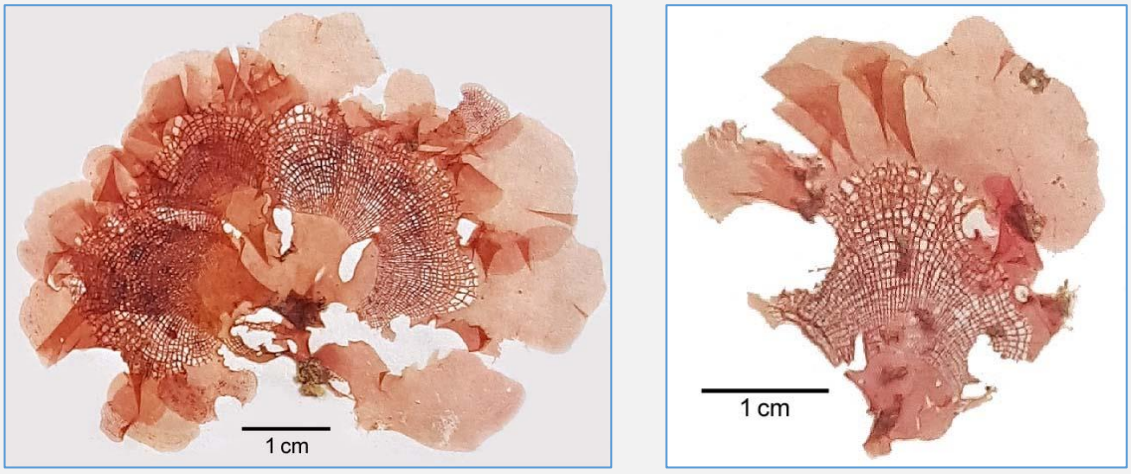
Material examined HMF 536, 11.12.1994, Colombo, Wellawatte, Kinross, 7 m, epilithic, frilled circular cushion, pink-white, spotted, and netted (underwater), vermilion, un-spotted in air. HMF 537, 8.1.1995, Colombo, Wellawatte, Medigala, 12 m, epilithic, cushion of short, ruffled fronds, approx. 80 mm dia., on the upper surface of a rock, pale cream with purplish blotches and darker spots (underwater), pink in air. HMF 538, 17.12.1989, Mount Lavinia, in-shore slope of Bellangala rocky islet, 3 m, epilithic, in heavy surge, small, pink thalli exposed to heavy surge, vermilion coloured in air.

Observed and photographed growing on dead coral at Weligama, Kapparatota, 2-3 m depth.

References

Coppejans et al, 2009: 210 Fig. 178.
Kützing, 1856: 22, Pl. 59, #4325 & #4326.
Silva et al, 1996.

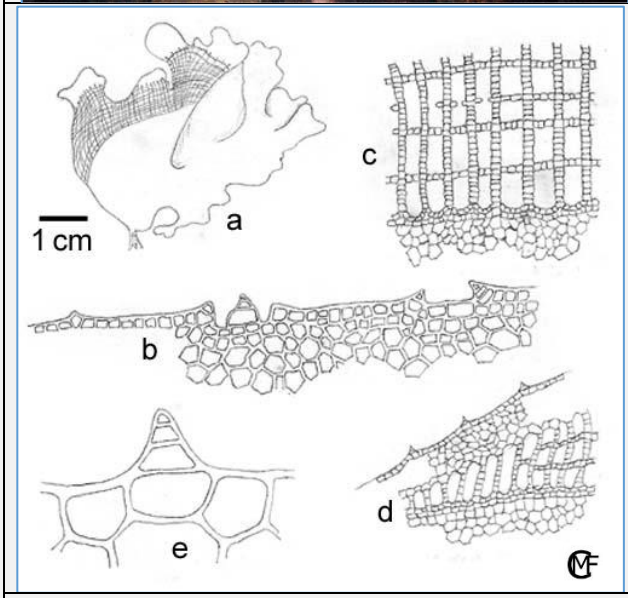
Martensia fragilis Harvey, 1854



Herbarium scans of HMF 536, 11.12.1994: Wellawatte, 7 m, off the Kinross Club.

Martensia fragilis growing on dead coral, 2-3 m.

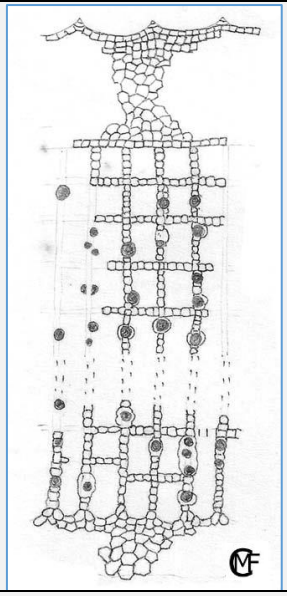
21.11.2004, Kapparatota, Weligama.



Drawings

HMF 537 (at right)

Tetrasporangia within the radial cords of the reticulum. The cords are two cell-rows deep, the tetrasporangia sandwiched in between.



HMF 536 (above) a) Habit showing stipe and expanded, lobed, ruffled blade with a reticular band set within a wide solid base and a narrower marginal area. (b) Thallus margin in surface view showing irregular disposition of spines. (c) Cells of the reticulum arising from the basal, solid part of the thallus. (d) Detail of a growing edge showing a narrow band of reticulum and the toothed free margin. (e) Highly magnified view of a marginal tooth.

Martensia flabelliformis Harvey ex J. Agardh, 1863

Type locality: Tonga

Morphology Thalli with cordate blades attached by a short solid stipe that may be forked supporting two blades. Blade up to 35 mm across, slightly ruffled. Solitary or in small groups adherent to one another. Reticulum a narrow circumferential band with a narrow solid margin and a deep solid base.

Anatomy Basal stipe 0.5 mm thick, up to 8 mm long (generally much shorter), stiff and cartilaginous, arising from a divided holdfast attached to the substrate by rhizoids 30 µm thick. Stipe often branched bearing two blades. Young thalli (up to a blade diameter of 7 mm) discoid, becoming cordate with growth. Reticulum develops at blade diameters 12-14 mm.

The solid membrane appears one-cell thick, the cells square, rectangular or polygonal, 25 µm square to 45-50 µm long. In some views it appears to be 2-cells thick in the unstained specimen. The margin of older thalli bear irregularly placed teeth consisting of 3 cells, sometimes placed at the summits of a scalloped margin, at other times randomly placed on a regular margin. Young thalli may have random teeth on a regular margin.

The reticulum, consisting of radial elements connected by cross-walls, develops as a circumferential band with a rim of solid membrane. The radial elements are sheets one-cell wide and up to 6 or more rows high. The cross-walls are two cells wide. The enclosed spaces are circa 80 x 30-50 µm. Sometimes 150 µm long meshes are seen with cross-walls being formed in the middle. The cells of the reticulum are circa 30 µm wide and 25-50 µm high.

Tetrasporangia 75 µm in diameter form buried in radial elements that consist of more than 6 cell-rows in depth. Adventitious rhizoids—unseptate, 25 µm thick, 300-500 µm long—were seen in one 22 mm thallus growing as extensions from square marginal cells of a blade.

Ecology Moratuwa, Itipandama reef, 12.5 m, epilithic. Only a single collection.

Discussion This determination needs confirmation. It is based on the drawing by Kützing, 1856 and the accompanying Latin description. Images on the Internet of *M. flabelliformis* show thalli with a small basal membrane and a large reticulate area extending to the margin. AlgaeBase, in its distribution records, does not list locations in the northern Indian ocean, but includes South Africa and countries in the Indo-Pacific, such as Indonesia, Philippines and Vietnam. Silva et al, 1996 gives the Indian Ocean distribution as "Indonesia (Flores)". As the species has been described from South Africa, in the western Indian ocean, as well as from the east, it should not be surprising that it also occurs in Sri Lanka.

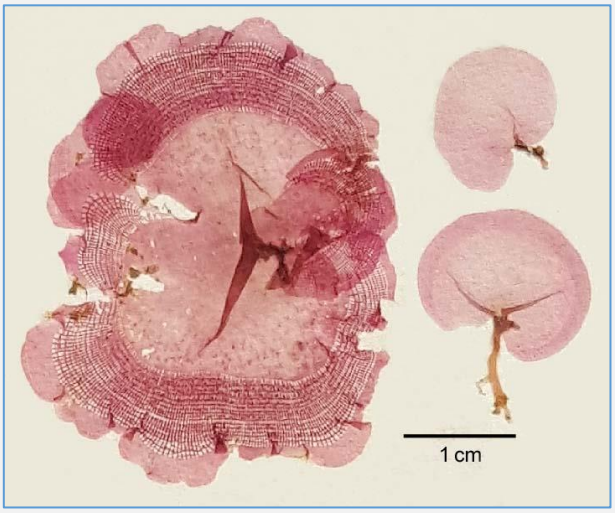
[A translation of the Latin description by Kützing reads thus: "... with stem solid terete, simple or bifid; 'phyllomate' significantly flabellate (fan shaped) apical margin reticulate, minutely toothed (denticulate). The original in Latin being: "… *stipitate, stipites solido terete, simplici vel bifido; phyllomate insigniter flabellato, margine extremo reticuli minutissime denticulato*."]

Material examined HMF 298, 19.1.2001, Moratuwa, Itipandama, 12.5 m, epilithic, on horizontal rocky substratum, translucent, iridescent pale blue/violet and cream, the blue corresponding to the reticulum, pink with a purplish blush at the surface.

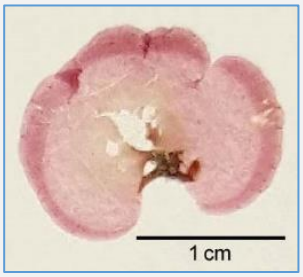
References

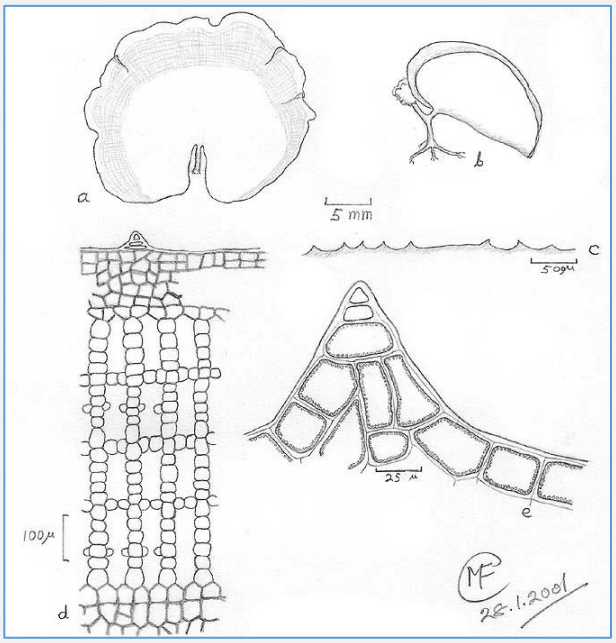
G.M. Guiry in Guiry, M.D. & Guiry, G.M. 2021. *AlgaeBase*. World-wide electronic publication, National University of Ireland, Galway. http://www.algaebase.org; searched on 08 April 2021.
Silva et al, 1996: 460
Kützing, 1871:22 Pl. 60, #4327

Martensia flabelliformis Harvey ex J. Agardh, 1863



Herbarium scans HMF 298, 19.1.2001, Moratuwa, Itipandama reef



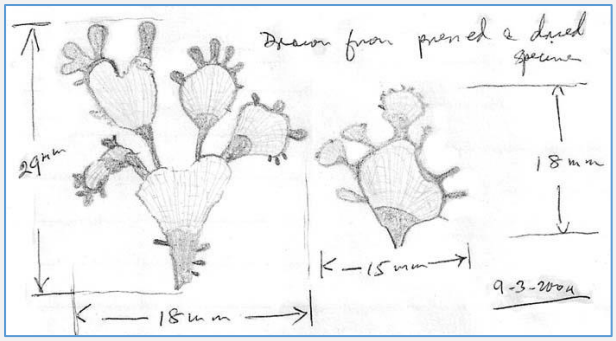


Drawing HMF 298, 19.1.2001, Moratuwa, Itipandama reef

a) Mature thallus, spread out.
b) Young thallus with reticulum just forming, from the side, folded to show branching stipe, holdfast and rhizoids.
c) Margin of a mature, 22 mm thallus, showing marginal teeth.
d) Cell details of reticulum and adjacent solid tissue from a 10 mm thallus.
e) Cells of the margin, including a tooth, from a 22 mm thallus.

Martensia pavonia Harvey ex J. Agardh, 1863

Morphology Delicate, supple, clumps 3-4 cm high and 5 cm across, attached to coral rubble—small pieces on the sand bottom or larger pieces forming the dead reef. Numerous upward-pointing ligulate processes give the thalli a ragged appearance in the field. Blades when spread out are characterised by a large oval or lobed reticular area with a narrow solid marginal fringe and a small basal solid membrane that is attenuate downwards. Daughter blades from the upper margin begin as solid ligulate processes.



Anatomy The basal solid membrane is one-cell thick, in surface view the cells being irregular polygons, with long and short diameters of 37.5-50 x 25-30 µm. The reticulum consists of radial elements one cell (37.5-50 µm) thick joined by cross-walls placed far apart from each other consisting of 3-4 cells 50 µm square. The enclosed spaces vary from 400-500 µm long in younger parts to 1000-1500 µm in older parts. The width of the spaces is 125-137.5 µm.

The radial elements of the reticulum are sheets of cells one-cell wide viewed end on and many cells deep—6-8 or more in old thalli, each 37.5-50 µm square. Spores are borne on older parts of the reticulum. Tetraspores 57.5 µm across are buried in the radial sheet in ones or a few between each pair of cross-walls. The cross walls appear to be one-cell deep, making them less deep than the multi-cell deep radial elements, and are not always placed at the same level throughout (see Fig. 2a).

Ecology Kalpitiya Bar reef, in sheltered water, attached to coral rubble.

Discussion This determination is based on the drawing by Kützing, 1856 and the accompanying Latin description. The name is listed as a synonym of *Martensia fragilis* Harvey, 1854 in Silva et al p. 460. [Millar (1909) included *M. pavonia* in the synonymy of *M. fragilis* Harvey, but Littler & Littler (2000) and Dawes & Mathieson (2008: 260) retain *M. pavonia*. - Wendy Guiry (3 Feb 2008)].

It is distinguished from *M. fragilis* by its delicate habit, elongated basal segments attenuate downwards, small ligulate erect daughter segments and the tufted growth form on coral rubble.

It has been reported from India by Rao & Gupta, 2015.

[The original Latin description has not been translated: *"… parvula, delicatula, phyllomate stipitato, varie diviso et lobata, lobis angustis flabellatis; reticulo heteromorpho, hine grosse fenestrato, illine minutissime cancellato.*]
]

Material examined HMF 437, 29.2.2004, Kalpitiya, Bar reef (N 8° 22.138' E 79° 46.466'), 4-5 m, (and 1-2 m), epilithic on coral rubble on sand. Clumps 5 cm diam. composed of delicate, densely clustered, adherent fronds 3-4 cm high. Basal parts pink to red, apical parts sand coloured with a fringe of erect lobules. Observed on the reef at: N 8° 22.664' E 79° 43.749'.

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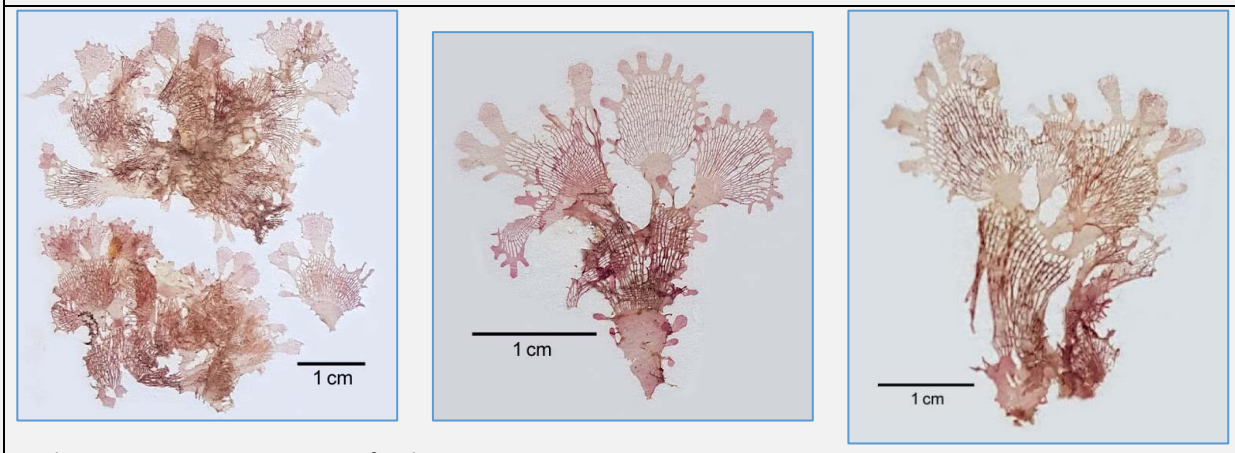
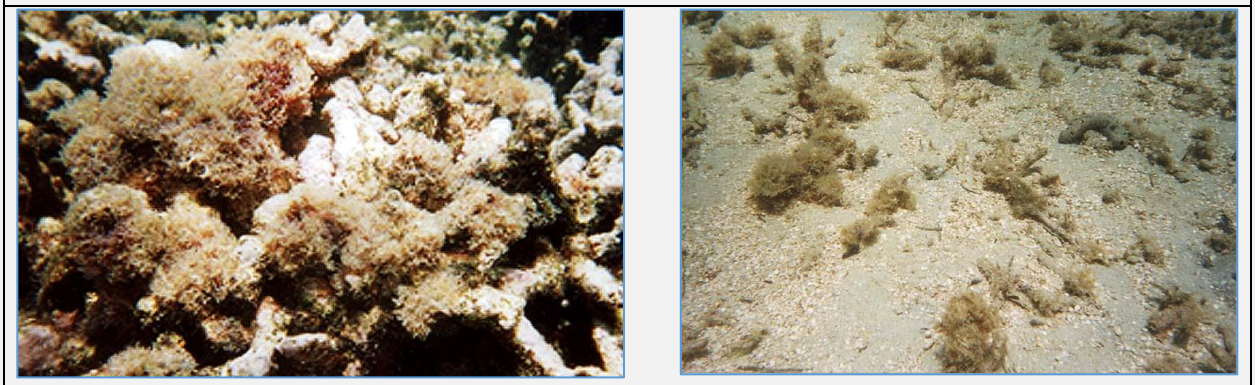
Guiry, M.D. in Guiry, M.D. & Guiry, G.M. 2021. *AlgaeBase*.
Kützing, 1856: 22, Pl. 60, #4328.
Rao & Gupta, 2015.

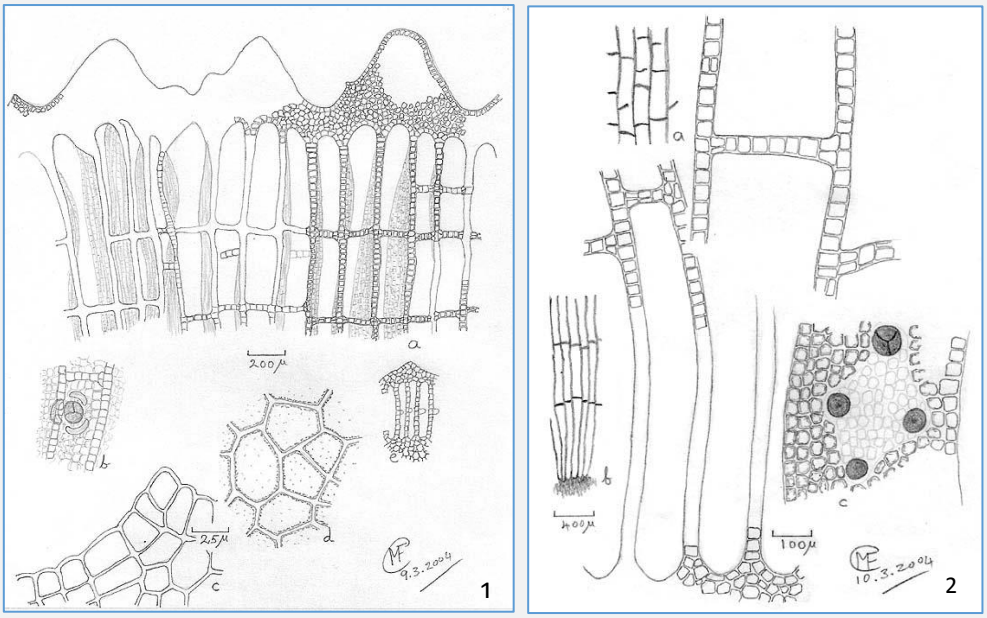
Martensia pavonia Harvey ex J. Agardh, 1863



Herbarium scans, HMF 437, Bar Reef, Kalpitiya



Bar Reef, Kalpitiya, 1.4.2004: *Martensia pavonia* growing on regenerating coral reef (left), and coral rubble (right), 3 m.



Drawings: HMF 437

Figure 1:
a) Growing edge of thallus showing solid membrane with lobes fringing the reticulum. The radial cords are sheets many cells deep, some shown folded.
b) A tetrasporangium on an older reticular part. [similar Fig. 2 (c)]
c) Cells of growing margin at higher magnification.
d) Cells of solid basal membrane from an older part.
e) Growing edge of very young thallus.

Figure 2: a) Portion of marginal reticulum seen end-on and its cells magnified at right. Some cross walls appear incomplete under a microscope as they pass out of focus, being attached lower down on one side.
b) Portion of the basal solid membrane and reticulum and its cells seen end-on magnified at right.
c) Portion of a radial sheet (cord) turned on its side, free margin to the left, showing tetrasporangia buried within.

Martensia cf. indica V. B. Krishnamurthy & P. C. Thomas, 1977

Type locality: Tamil Nadu, India (Silva & al. 1996: 461)

Morphology Subtidal 14 - 20 m deep, epilithic, associated with low corals or other algae. Thalli erect with large blades or matted forming low cushions c. 20-30 cm across. Blades circular, oval or reniform, base attenuate, short. Solid membrane confined to a small area at the base and a very thin peripheral margin, the reticulum predominating. Meshes elongate at the base becoming square above. In older thalli the square meshes subdivided both horizontally and vertically into irregular spaces - but the ultimate row of peripheral interspaces square, large and prominent.

Anatomy The basal solid membrane one cell thick. Cells polygonal with rounded corners, generally squarish, rectangular or oval of varying sizes and proportions: 50-90 µm long, 37.5-62.5 µm wide. Chromatoplasts parietally disposed.

The reticulum consists of radial sheets one or two cells wide and many cell rows deep with cross-walls one or many cells long. The earliest formed radial elements are one cell wide, composed of square or rectangular cells 37 µm across. Cross walls consist of cells 37-45 µm wide in single or double series. The enclosed meshes are long, narrow rectangles at first, becoming progressively squarish by the formation of cross walls that are randomly placed. The mesh dimensions are 50 x 125 µm initially, 62.5 x 175 - 50 x 112.5 - 42.5 x 50 µm in the middle, and 175 x 225 - 112 x 200 - 87.5 x 175 µm at the margin. In general, the mesh dimensions increase from the older parts to the recent by the formation of cross walls. The upper meshes are subdivided by growths formed as buds from cross walls that join other cross walls, resulting in irregular shaped meshes (see drawing Fig. 2).

Ecology Found in water 14 to 22 m deep, epilithic. In the deeper locality associated with Fungid corals (Diaseris, Cycloseris) and *Stylophora pistillata*, as well as other algae (including *Halimeda tuna* and *Bryopsis*) .

West coast: off Kandakuliya, Kalpitiya peninsula. East coast: Uppuveli, off Lively rocks.

Discussion The later collection from Uppuveli was found to be the same species as that collected from Kandakuliya by a comparison of the anatomy. The general appearance is also the same: blades oval, a large reticulum, small basal solid membrane, narrow marginal solid membrane, many daughter blades from the margin, reticular meshes generally large. The collection has been referred to *M. indica* based on a single herbarium specimen illustrated on the Krishnamurthy Institute website with no distribution. The publication has not been seen. The type location is Pamban Island, on the other side of the Gulf of Mannar from north-west Sri Lanka.

Material examined HMF 323, 5.3.2001, Kandakuliya, Diaseris bed, 21 m, epilithic on stones, sand bottom, iridescent, fairly stiff green/purple erect discs, associated with many other epilithic algae and free living Fungid corals. HMF 438, 2.3.2004, (DRW221) Kandakuliya, 'Bhoondi' shoal, associated with the coral *Stylophora pistillata.* HMF 439, 2.3.2004, Kandakuliya, 'Seylan Bank' shoal. Note: The shoal names are those given by local divers, based on the appearance of the dominant corals present. HMF 481, 14.9.2005, Trincomalee, Uppuveli, off Lively Rocks, 14 m, epilithic, red, iridescent thalli, adherent to one another forming loose cushions c. 20 - 30 cm, loosely attached to the substrate.

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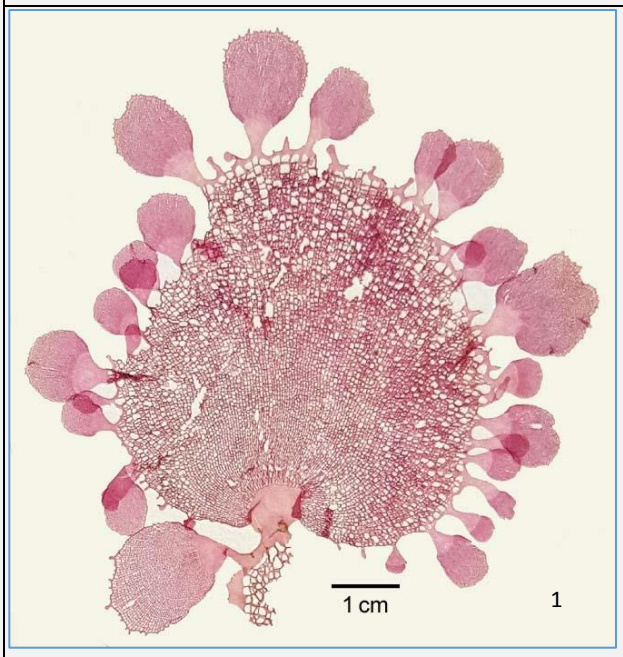
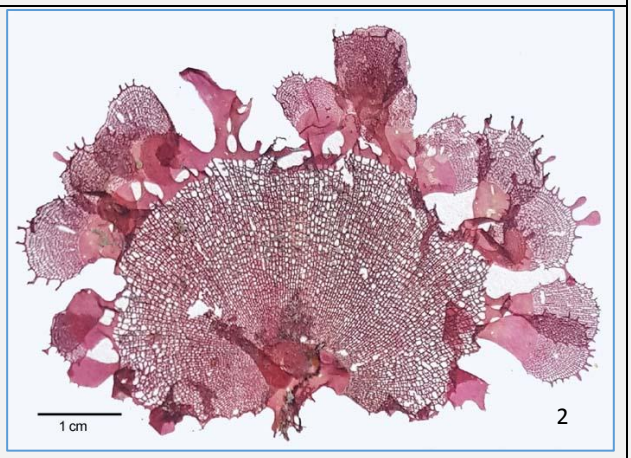
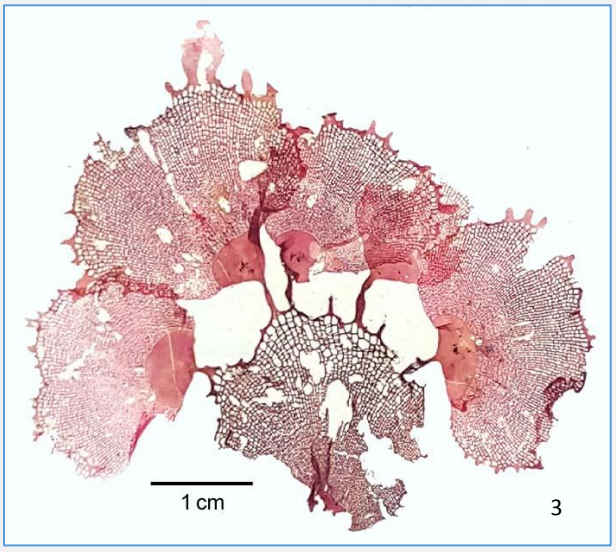
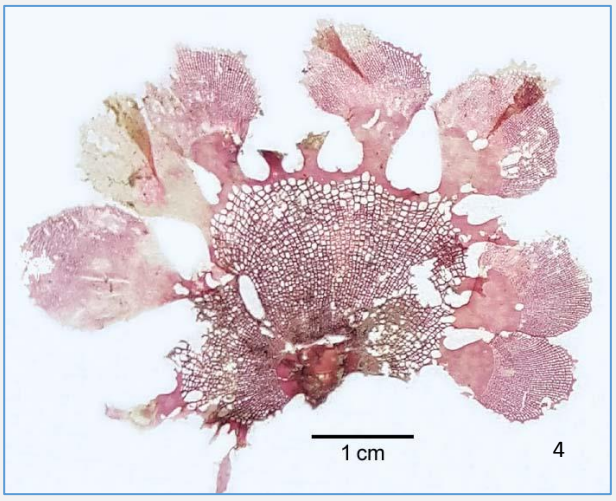
Krishnamurthy Institute of Algology, Chennai - images of herbarium specimens.
Krishnamurthy & Thomas, 1977.

Martensia* cf. *indica V. B. Krishnamurthy & P. C. Thomas, 1977



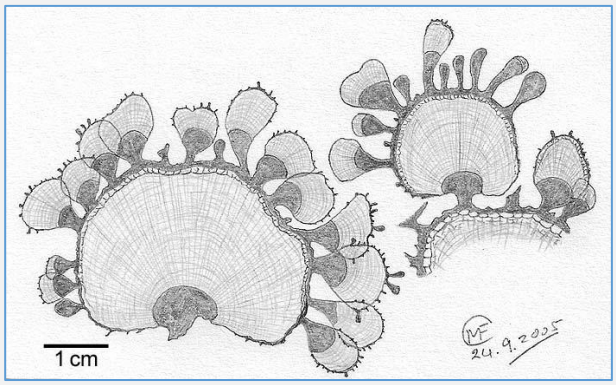


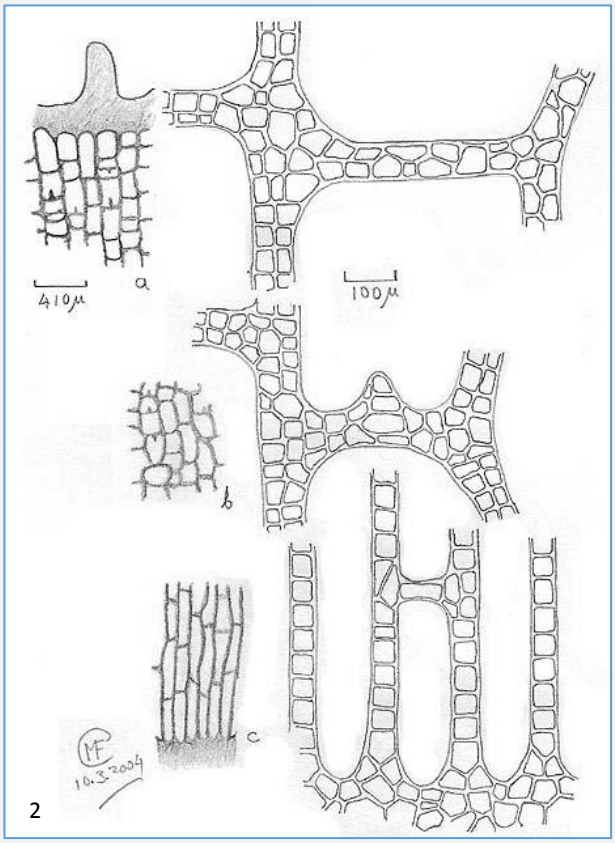




Herbarium scans

1) HMF 323 - 5.3.2001, Kandakuliya, Diaseris bed, 20-22 m.
2) HMF 481 - 14.9.2005, Uppuveli, 14 m.
3) HMF 438 - 2.3.2004, Kandakuliya, 'Bhoondi' shoal
4) HMF 439 - 2.3.2004, Kandakuliya, 'Seylan Bank' shoal.

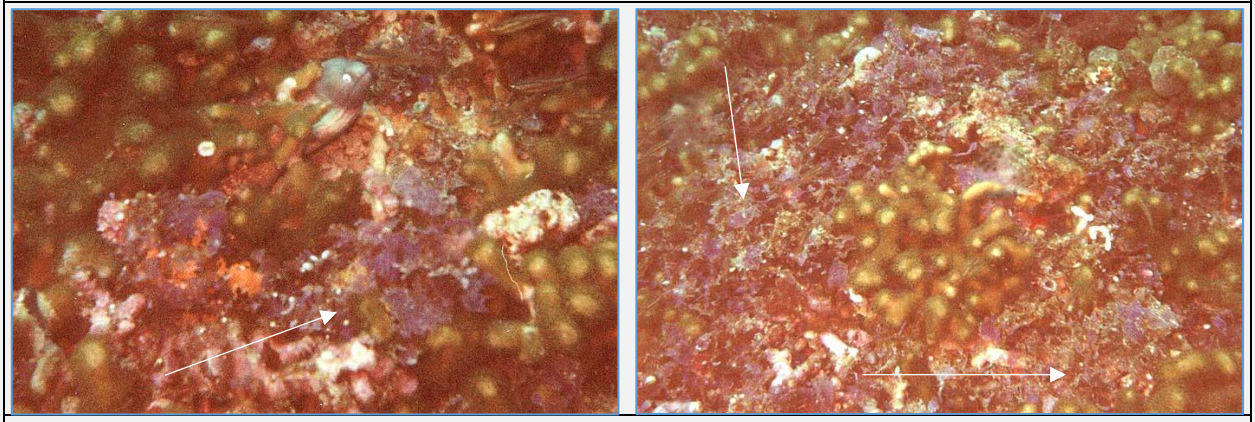




Drawings

Fig. 1: HMF 481 from Uppuveli. Small solid membrane areas with large reticular areas. Blades spread out, fan-shaped.

Fig. 2: HMF 438 from Kandakuliya, cell details under magnification.
a) Blade margin showing ligulate new blade rudiment and reticulum. At right - cells magnified in region of a cross-wall.
b) Reticulum in the middle region showing irregular enclosed spaces. At right - cells magnified with a developing bud from a cross-wall.
c) Basal solid membrane and reticulum. At right - cells magnified. Cross-walls are present at many levels, only a few come into focus at a time under the microscope.



Martensia cf. *indica* HMF 439 amongst live coral (*Stylophora pistillata*) at Kandakuliya. 2.3.2004.

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MF 16.6.2021.