Chaetomorpha Kützing, 1845

CLADOPHORALES, CLADOPHORACEAE

Filaments with cells in a single row, unbranched, robust, either erect and attached with an elongate, thick-walled, basal cell or loose lying without basal cells. Cells cylindrical or barrel-shaped, rarely oval, 20 - 5000 µm in diameter, as wide as long or much longer than width. Cells multinucleate. Reproduction asexual by fragmentation of filaments, or sexual.

Cosmopolitan, in marine or brackish waters, rarely in freshwater. In salt marshes or on soft bottoms forms extensive mats of interwoven filaments. Common intertidally as scattered individuals or clumps of individuals. Some species common as unattached filaments entangled with other algae.

- Guiry, *AlgaeBase*, 2021

Eleven species are reported from Sri Lanka, including ten by Silva et al, 1996.

aerea* (Dillwyn) Kützing, 1849. [Durairatnam, 1961: 20, pl. I fig. 10]
antennina* (Bory de Saint-Vincent) Kützing, 1847. [Durairatnam, 1961: 20-21; Coppejans et al, 2009: 84; Mallikarachchi, 2013: 16]
brachygona Harvey, 1858. [Durairatnam, 1961: 20]
clavata Kütz., 1847. [Durairatnam, 1961: 21]
crassa* (C. Agardh) Kützing, 1845. [Durairatnam, 1961: 20; Coppejans et al, 2009: 84]
gracilis Kützing, 1845. [Durairatnam, 1961: 19-20; Mallikarachchi, 2004: 141; Mallikarachchi, 2013: 16]
implicata Kützing, 1847
indica (Kützing) Kützing, 1849. [GM 1887]
linum* (O. F. Muller) Kützing, 1845
obscura Kjellman in Wittrock and Nordstedt, 1880: no. 320 (type locality: Galle, Sri Lanka). [Murray, 1887]
spiralis Okamura, 1903 [Mallikarachchi, 2004: 141; Mallikarachchi, 2013: 17 Coppejans et al, 2009: 86]

Description of species

Chaetomorpha aerea (Dillwyn) Kützing, 1849

Morphology Short, attached, unbranched filaments forming mats.

Anatomy Filaments 5-7 mm high, 120-212.5-375 µm thick, tightly packed into a confluent mat. Attached to the rock substrate by short, branching rhizoids that interlace with those of adjoining filaments, trapping small amounts of silt. The basal cells long, tapering downwards without annulations. Other cells rectangular, constricted at the cross walls, length 1.5 - 2 times the width. Long cells up to 4 times the width are in active division, with segregated cell contents. The cell walls are thick and lamellated.

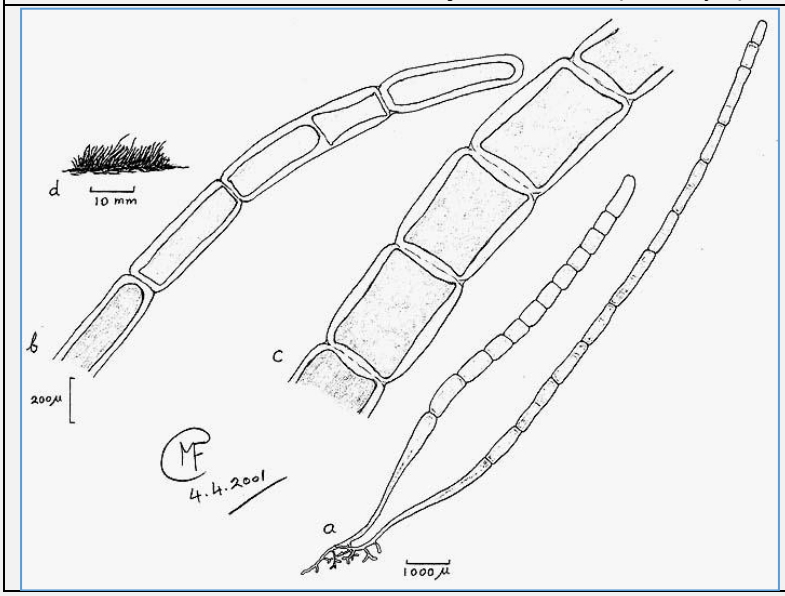
Ecology Light or dark green gregarious filaments forming mats on sides and bottom of intertidal tide pools and gullies. On higher ground exposed at low tide but wetted by swells. Continuously immersed plants are light green, those periodically air exposed are dark green.

Discussion This collection agrees with Durairatnam's description and drawing of plants collected from a rock pool in Galle.

Material examined HMF 312, 1.4.2001, Mount Lavinia, Bellangala, intertidal, epilithic, attached.

References Durairatnam, 1961: 20, Plate I Fig.10.

Chaetomorpha aerea (Dillwyn) Kützing, 1849



a) Habit: two filaments, one thick and one thin. The thin filament has many cells in the process of dividing - they are up to 4 times the width in length with segmented chloroplasts (segregative division). Thick filaments of the size illustrated are uncommon.

b) & (c) Detail of cells showing thick, lamellar cell walls.

d) Habit of a mat, in the natural position, on a hard substrate.

Chaetomorpha antennina (Bory de Saint-Vincent) Kützing, 1847

Synonym *Chaetomorpha media* (C. Agardh) Kützing 1849

Morphology Thallus consists of wiry erect filaments clustered into clumps, attached to intertidal hard substrates by branching rhizoids. Grass green in colour. Reproductive filaments have white tips that break off easily.

Anatomy Filaments up to 50 - 60 mm high, 200 - 500 µm wide, constricted at the nodes. Individual cells cylindrical, lower ones 800 - 1200 µm long, the upper ones 500 - 600 µm. The basal cell 6-7 mm long, tapering down to 200 µm wide, the lower part annulated. Attachment is by branching rhizoids.

Ecology Rocky, surf-exposed coastlines forming tufted growths in the intertidal zone or spray zone. Common on the Mount Lavinia rocky shore. Mallikarachchi has found the species on the south-west coast and on the east coast.

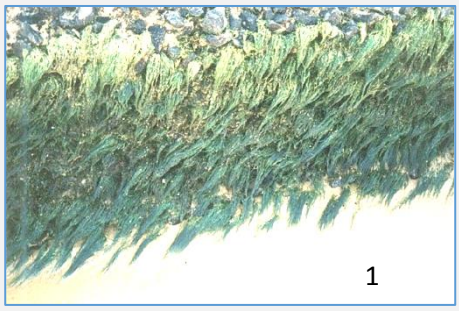
Discussion Coppejans et al, 2009 remark that the characteristic brush-like tufts and basal cells with annulations distinguishes this species from the other attached forms like *C. aerea* and *C. indica*.

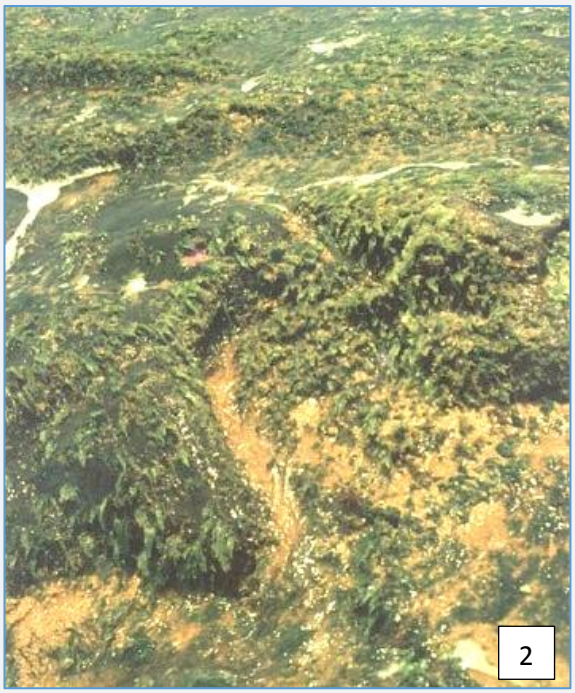
Material examined HMF 002, 13.8.1995. Mount Lavinia - Dig gala shore rock, intertidal and spray zone, pale green discrete erect tufts exposed to wave action. HMF 003, 1.10.1995, Mount Lavinia - Lover's rocks, epilithic, intertidal, long, green, wiry tufts exposed to waves. HMF 214, 7.1.1989, Mount Lavinia - intertidal rocky shore, epilithic. HMF 215, 5.2.1989, Wellawatte, Fernando road - intertidal, beach revetment, tufted clumps up to 55 mm high, wetted by waves. HMF478, 24.7.2005, Wellawatte, Fernando Road - intertidal, near low water mark, epilithic on vertical rock revetment.

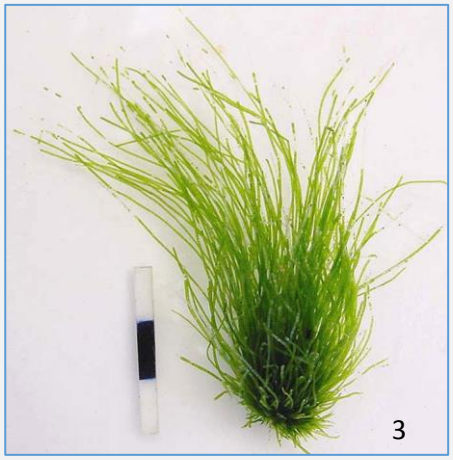
References

Coppejans et al, 2009: 84.
Durairatnam, 1961: 20, Plate I Fig.10.
Guiry, *AlgaeBase* 2021.
Mallikarachchi, 2004: 28 and 2013: 12.

Chaetomorpha antennina (Bory de Saint-Vincent) Kützing, 1847



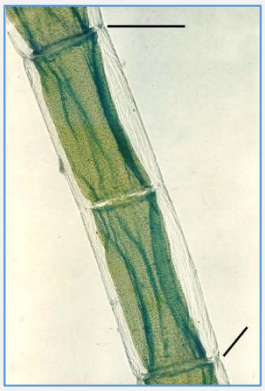


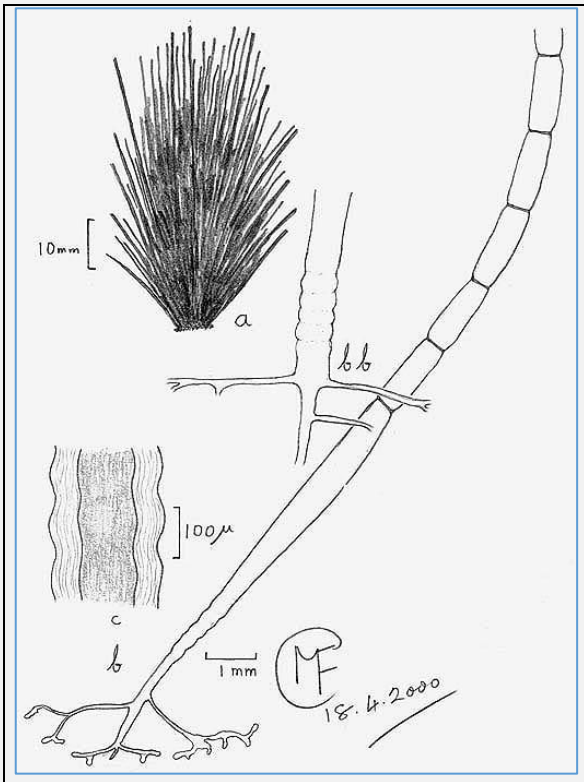


1. In-situ photo of *C. antennina* covering a rock revetment on the beach exposed to waves. 2. Intertidal rocks at Mount Lavinia covered with tufts of *C. antennina, Chaetomorpha vagabunda* and *Ulva fasciata.* 3. Ex-situ photo of a single clump.

Photomicrograph of a cell in the process of division

A single cell (between the marks) showing the chlorophyll-containing cellular contents divided in two. Note the thick, lamellated cell wall.





Drawing

a) Habit, a clump of filaments.

b) Portion of a single filament and (bb) the enlarged lower end of a basal cell showing annulations.

c) Detail of the annulated portion of the basal cell with thick, lamellated cell wall.

***Chaetomorpha* crassa** (C. Agardh) Kützing, 1845

Regarded as a synonym of *Chaetomorpha aerea* (Dillwyn) Kützing and included in *Chaetomorpha linum* by Burrows (1991) and Brodie, Maggs & John (2007), but this synonymy not accepted by Silva, Basson & Moe (1996: 759) and other more recent authors – Wendy Guiry, *AlgaeBase* 2021.

Morphology Interwoven masses of unattached, wiry unbranched filaments tightly coiled or laxly curved, usually entangled with other algae, sometimes breaking off in surf and floating free. Clumps on reef flat 10 - 15 cm long or longer, extending in the direction of water flow.

Anatomy Filaments consist of cylindrical cells joined end to end, the chlorophyll containing cell contents often taking a dumbbell shape with thickened, lamellated cell walls. Cells 350 - 400 - 750 - 850 µm long, 350 - 400 - 420 µm wide. Cells as long as wide or up to twice as long. Longest cells form before dividing.

Ecology Rocky, surf-exposed coastlines forming interwoven clumps in the intertidal zone, particularly in tide pools, tangled with other algae.

Discussion The cell dimensions of my specimens agree with those in Coppejans et al, 2009. Filament thickness 400 - 650 µm in Durairatnam, 1961.

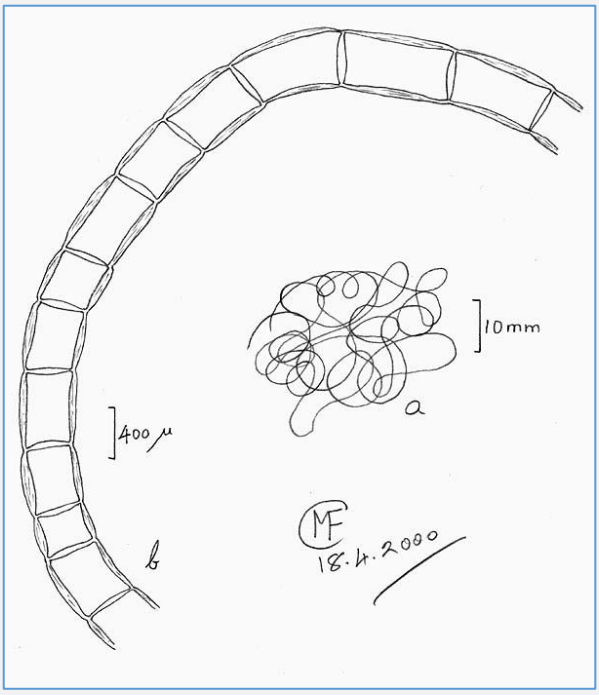
Material examined HMF 211, 3.9.1989, Mount Lavinia, beached drift weed, tangled around *Sargassum*. HMF 212, 1.4.1990, Galle, Unawatuna bay, drift weed. HMF 213, 12.6.1995, Beruwela, Barberyn reef lagoon, drift weed, light green, tangled masses up to 150 mm x 110 mm, wiry unbranched filaments tightly coiled or laxly curved, on its own or tangled with *Valoniopsis pachynema*, *Caulerpa nummularia*, *C. sertularioides* or *C. clavifera*. HMF 234, 13.5.2000, Beruwela, Barberyn reef, intertidal reef flat in tide pool, entangled with *Gelidium acerosa*, bright green, larger masses entangled with *Gracilaria* sp. on reef flat. *Filament 350 µm thick, cells 1-1.3 times as long as width.

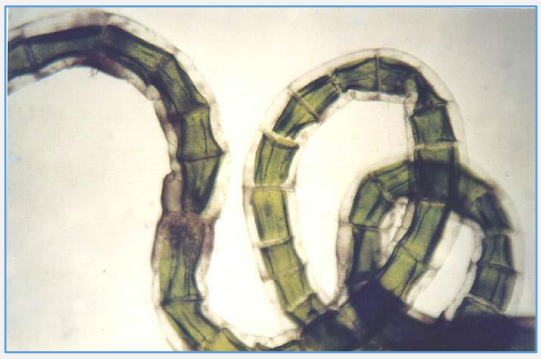
References

Coppejans et al, 2009: 84.
Durairatnam, 1961: 20.
Wendy Guiry, *AlgaeBase* 2021

***Chaetomorpha* crassa** (C. Agardh) Kützing, 1845

28.8.2005: Beruwela, a tangled mass of drift weed.





Drawing of HMF 213

a. Habit, an unattached, coiled filament.

b. Portion of filament, drawn from re-soaked material.

Photomicrograph

Portion of a filament.

Chaetomorpha linum (O. F. Müller) Kützing, 1845

Morphology Tangled masses of fine, unattached, unbranched interwoven filaments, entangled with other algae, seagrass, or solid projections in shallow brackish water lagoons. May form large, spongy, mats.

Anatomy Filaments unbranched, varying in diameter, cells cylindrical, usually unconstricted. Thin filaments 40 - 42.5 - 75 - 85 µm diameter commonest, thick filaments 112.5 - 122.5 - 150 µm diameter uncommon. Cells cylindrical, unconstricted, 1 - 1.6 - 2 - 2.3 times as long as wide (Puttalam). Cells of thicker filaments of 330 - 350 - 380 - 400 µm in diameter 1 - 1.6 - 2.3 - 4.6 times as long as wide, variable over short distances, the longest cells showing segregated cytoplasm as a prelude to cell division. Cells usually cylindrical, occasionally barrel shaped with some constriction at the septa. Cell wall thick, lamellated. (Rekawa).

Ecology Shallow, brackish water lagoons, the unattached filaments interwoven around other algae and seagrasses, or snagged around solid projections on sandy/muddy bottoms. (Said to be a marine/freshwater species in *AlgaeBase.*)

Discussion *Chaetomorpha linum* (Müller) Kützing is an entity that is accepted in *AlgaeBase* 2021. However, some authorities consider that this and *Chaetomorpha aerea* are synonymous, being different growth forms of the one species (e. g. John et al. (2003) cite *Chaetomorpha aerea* (Dillwyn) Kütz. as a synonym of this species - M.D. Guiry *AlgaeBase* 2021.) The Rekawa collection is referred to *Ch. linum* even though filament thickness is similar to *Ch. crassa*, a name now considered a synonym of *Ch. aerea*, itself considered by some authorities a synonym of *Ch. linum*. Coppejans et al, 2009 (citing Leliaert & Boedeker, 2007) remark that DNA sequencing has shown that European *Ch. crassa* is conspecific with *Ch. linum* and that tropical species referred to as *Ch. crassa* constitute a new species.

The Naturalist would find it convenient to use the names *Chaetomorpha aerea, linum* and *crassa* as these three entities are different in habit, habitats, and appearance in Sri Lanka.

Chaetomorpha gracilis is described by Mallikarachchi, 2013:16 as unbranched filaments 15 - 100 cm long, entangled with other algae or objects in the wave washed intertidal zone. The filaments are 45 - 65 µm in diameter with cylindrical cells about 2 - 4 times their diameter. In comparison, the cells of *Chaetomorpha crassa* are 350 - 420 µm in diameter, as long as wide or up to twice as long. Thin filaments of *Chaetomorpha linum* have similar dimensions to those of gracilis.

Chaetomorpha spiralis Okamura, 1903 is described by Coppejans et al, 2009:86 and Mallikarachchi, 2004 & 2013:17. Found in low intertidal sand covered rock pools the thalli are erect unbranched filaments up to 9 cm in height with spiral or sinuous basal parts, the straight apex 1 mm in diameter.

Material examined HMF 307, 3.3.2001, Kalpitiya, NARA station, Puttalam lagoon, in shallow water amongst sea grass, unattached, tangled on sea grass forming yellow-green, spongy mats 5 - 10 cm across, exposed at low tide. HMF 378, 10.2.2002, Rekawa lagoon, submerged 30 - 50 cm, at lagoon edge, unattached, entangled around seagrass bases with masses of *Polysiphonia* sp. (HMF379) ?epiphytic on it. HMF 435, 28.2.2004, Kalpitiya, Puttalam lagoon, unattached, free living snagged on obstructions, submerged 10-20 cm on sand bottom.

The National Herbarium, Peradeniya (PDA) Classical Collection contains a number of specimens in the folder titled "Linum". CA282, 320, 322 & 410 are undetermined, consisting of tangled, filamentous mats that resemble *Chaetomorpha linum* macrospcopically. CA188, collected by "Titus" (who was William Ferguson's servant), was from the Puttalam lagoon, near a freshwater outlet. The handwriting of the label appears to be that of A.H.G. Alston, with a determination Chaetomorpha linum in pencil. Some un-numbered sheets contain specimens from "mouth of lagoon at Palai" (sic) and "Also at Putlam" (sic). CA280, collected by Harvey dated 27.4.1872 gives the location as "Mutwall" (sic) "Stones at mouth of river in bay with D. lepreuri and Grateloupia filicina." Herbarium sheets examined - 4.8.1999.

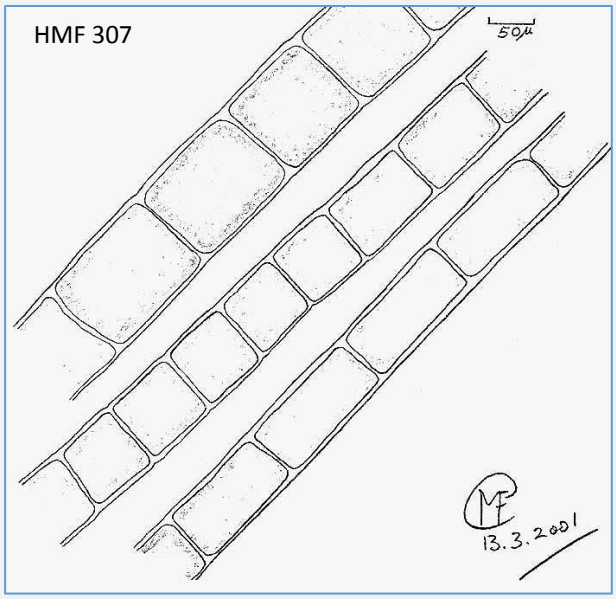
References

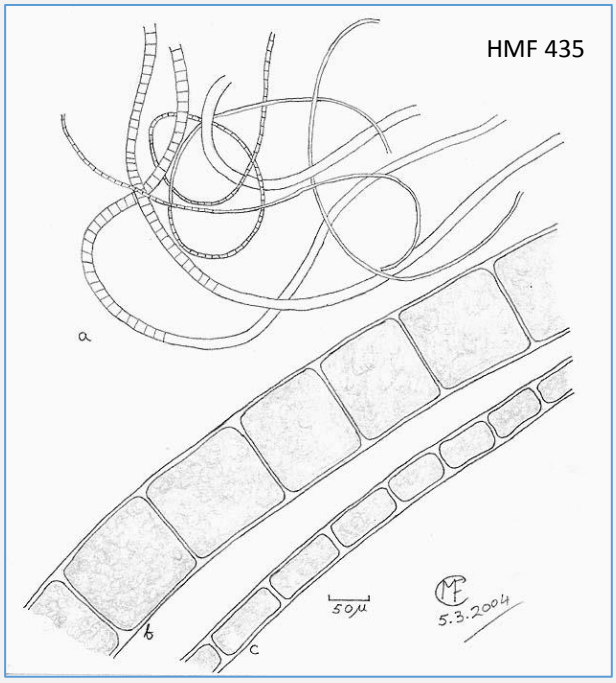
Coppejans et al, 2009: 84.
Guiry, M.D., *AlgaeBase,* 2021.
Mallikarachchi, 2004: 17 and 2013: 16, 17.

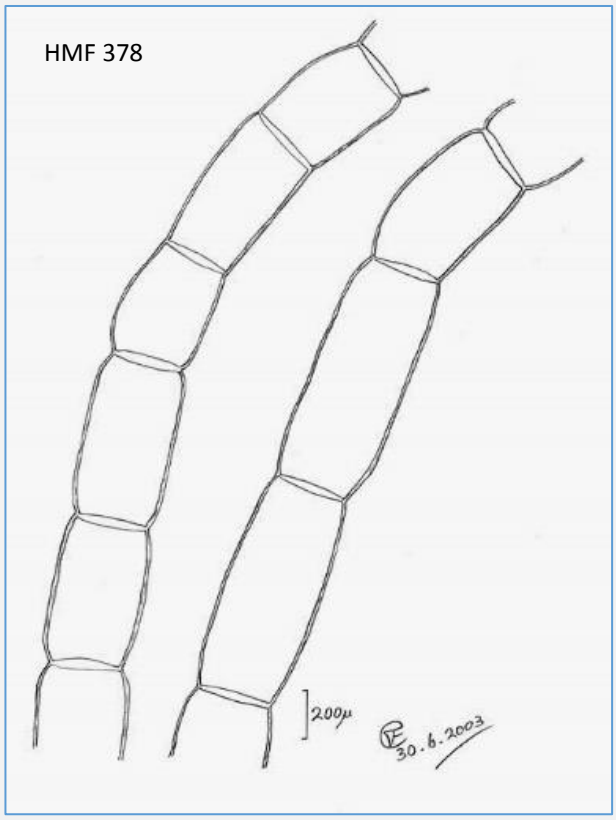
***Chaetomorpha* linum** (O. F. Muller) Kützing, 1845

Left
3.3.2001: Puttalam lagoon. HMF 307 collected from a similar mat of filaments tangled around sea grasses in shallow water.

Below
28.2.2004: Puttalam lagoon. HMF 435 collected from similar skeins of tangled filaments snagged on obstructions in shallow water.







HMF 307 - Puttalam lagoon: Portions of three filaments showing varying thickness and cell length. The thickest (112.5 µm) are uncommon; the thinner filaments (< 100 µm) are usual, the most abundant being those with squarish cells.

HMF 378 - Rekawa lagoon: Portions of two filaments showing variable cell length. Filament thickness 350 µm (at left) and 380 - 400 µm (at right).

HMF 435 - Puttalam lagoon: a) Portion of entangled filaments that include thick and thin ones.
b) Portion of a thick filament, 122.5 - 150 µm wide.
c) Portion of a thin filament, 40 - 42.5 µm wide.

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(Link to page *Ch. crassa* - http://www.algaebase.org/search/species/detail/?species_id=1385)

MF 18.3.2021.