Avrainvillea Decaisne, 1842

BRYOPSIDALES, DICHOTOMOSIPHONACEAE

Plants erect, composed of flat roundish or fan-shaped blades with long or short stipes. Holdfasts buried in soft substrates or attached to hard substrates. The thallus consists of interlacing un-septate filaments with "Y"-shaped dichotomies, no lateral branchlets, uncalcified and not developing a cortex. The blade green or brownish. At times, the filaments partially free or entirely free and brush-like.

Some species grow in muddy sandy substrates, others on hard substrates.

Four species reported from Sri Lanka:

A. erecta (Berkeley) A. Gepp & E. Gepp, 1911
A. lacerata (Harvey) ex J. Ag., 1887
A. ridleyi A. Gepp & E. Gepp, 1911

- Silva et al, 1996

A. amadelpha (Montagne) A. Gepp & E. Gepp, 1989

- Coppejans et al, 2009
- Mallikarachchi, 2004 & 2013

Description of species

Avrainvillea erecta (Berkeley) A. Gepp & E. Gepp, 1911

Syn. *Avrainvillea papuana* (Zanardini) G. Murray & Boodle, 1889

Morphology Plants erect, consisting of a short cylindrical stipe with an expanded, flat, spongy or firm, fan-shaped or reniform blade showing faint zonation or a mass of free filaments or a combination of the two. Blade margin regular, sometimes irregular, and sometimes with a fringe of free filaments. Blades 38-78 mm wide, 28-55 mm high. Free filaments 10-60 mm long. Holdfasts buried: cylindrical and long or short and bulbous, 20-100 mm long and 10-20 mm thick at their widest.

Anatomy The thallus consists of interlacing, non-septate, cylindrical filaments, with 'Y'-shaped dichotomies. Filaments thicker before dividing, branch origins constricted, the apices blunt. The filaments interlace to form the blade, being compacted to varying degrees from very dense and thin, to spongy and thick, to uncompacted with free filaments producing a brush-like head. Filaments green. The holdfast filaments are golden-yellow, contorted and intertwining with entrapped sand grains, silt and shell debris forming a rigid cylindrical structure.

Filament thickness is variable: in general, free filaments are about twice as thick (62.5-75-90 mμ) as those forming a blade (30-50-65 mμ at the base and 30-35-(45) mμ at the growing margin). Filaments are cylindrical. Individual filaments may vary in thickness in different parts with occasional constrictions.

The apices are usually blunt but sometimes show a blunt point at the very tip (due to rapid growth?). Never tapering or clavate. Holdfast filaments are a mixture of thick and thin, but generally thinner than the exposed portions (37.5-50-67.5 mμ and (12.5)-15-27.5 mμ). They are generally cylindrical but very irregular in thickness, with many irregularly placed constrictions and swellings. Sometimes, short segments are moniliform (beaded).

Dichotomies vary in form between those of free and compacted filaments. When free the dividing filaments expand, often after a slight constriction, into an ovoid shape before the fork, the constricted origins of the branches being closely placed. The apices of the dividing filaments are concave or truncated (flat), sometimes convex. When compacted and in holdfasts, dividing filaments dilate into triangular shapes before forking, the constricted branch origins being far apart, and the dividing filament apices are truncated. These differences hold true whether the free filaments are part of a mixed thallus or of a thallus with only free filaments. (See drawings executed from HMF 417).

Ecology Colombo, Wellawatte, 3 m. On the shoreward side of the first reef, sheltered from the open sea but exposed to turbulence caused by waves breaking over the reef, in fine muddy sand on their own or associated with sea grasses (*Halophila ovalis, Cymodocea*). Exposed parts of plants dark green, aligned parallel to the reef, holdfasts buried to varying depths. Kalpitiya, Bar Reef, 3 m, on sandy bottom with no associated flora. Sallimundal, in sand, inner reef pool (Mallikarachchi, 2013).

Discussion Coppejans & Prud'homme van Reine (1989) considered *Avrainvillea obscura* and *A. erecta* as a complex that might be reducible to a single species. *A. obscura* is described with cuneate blades and clavate filament apices; *A. erecta* with reniform blades and cylindrical filament apices. Teo Lee Wei and Wee Yeow Chin (1983) publish a good colour photograph of a plant with a fan-shaped blade under the name *A. erecta* as well as a photograph of a plant with brush-like filaments under the name *A. obscura* with the synonym *A. capituliformis*.

My plants vary in blade shape from cuneate to reniform. None of the plants examined had clavate filament apices. My plants resemble CA 290 from Bentota in NHP in the cover labelled *Avrainvillea papuana*, that contains specimens with filaments aggregated into fan-shaped blades as well as with free filaments. All my plants are referred to *A. erecta*.

Material examined MBIOD 030, 7.4.96, Wellawatte, Kinross (filaments aggregated into a reniform blade); MBIOD 037, 1.9.96, Wellawatte, Ramakrishna rd. (filaments all aggregated into a blade or partly free); MBIOD 038, 1.9.96, Wellawatte, Ramakrishna rd. (filaments free, brush-like); HMF 179, 23.10.88, Wellawatte, Kinross (filaments aggregated into a blade); HMF 180, 21.10.90, Wellawatte, opposite railway stn. (filaments free, brush-like); HMF 181, 13.10.91, Wellawatte, opposite railway stn. (filaments aggregated into a blade or free and brush-like); HMF 417, 31.8.03, Wellawatte, Kinross, 3 m (two thalli, one with blade and collar of free filaments, one with free filaments only). CA 290 & CA 313 (NHP, in the cover *A. papuana*), Bentota.

References

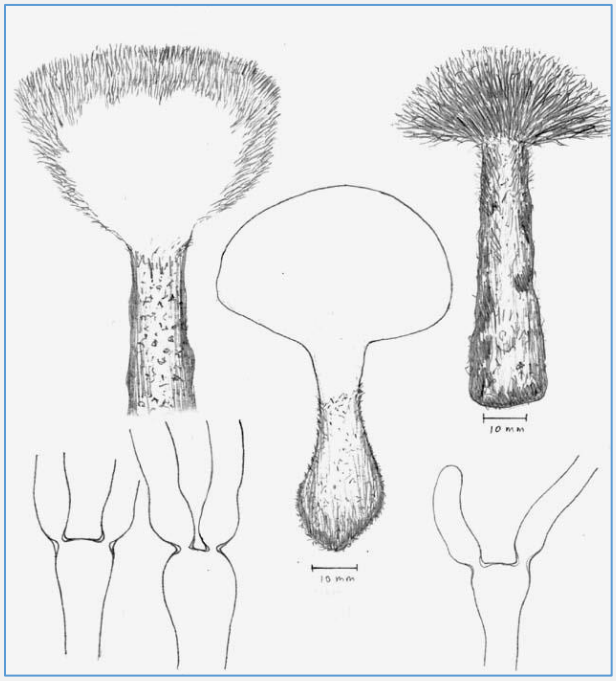
Børgesen (1936): 70
Coppejans & Prud'homme van Reine (1989): 120-125.
Coppejans et al, 2009: 124.
Fritsch (1971): 404 et seq.
Lewmanomont and Ogawa (1995): 23, 25, 43.
Mallikarachchi (2013): 22.
Silva, Basson, and Moe (1996): 875 – 887.
Srinivasan. (1969) 44, Plate XLIV.
Teo Lee Wei and Wee Yeow Chin (1983): 54.

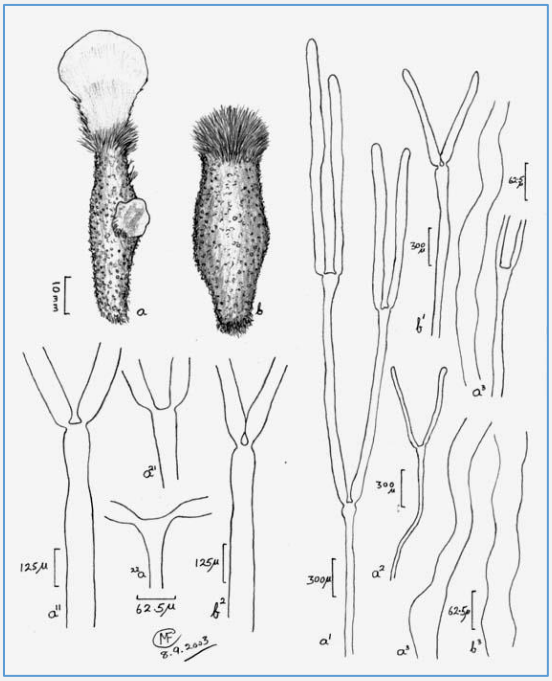
Avrainvillea erecta (Berkeley) A. Gepp & E. Gepp, 1911

Upper: Underwater photograph of two thalli, Kalpitiya Bar Reef, 4 m, buried in silty sand, calm water. 29.2.2004.

Below: Ex-situ photographs: Two thalli collected from Wellawatte, north of the railway station, inshore of the first reef, 3 m. The blade (photosynthetic portion) either compacted into a felted sheet (left) or with filaments free like a shaving brush (right). The holdfast (anchoring portion) buried in muddy sand amidst sea grasses (*Halophila*). Turbulent conditions. 3.9.2003.

Avrainvillea erecta (Berkeley) A. Gepp & E. Gepp, 1911





Left: three thalli showing blades of varying shapes with (buried) holdfasts that are long and cylindrical or short and bulbous. Filaments forming a thick, spongy, flat blade with a fringe of free filaments at the margin, filaments compacted into a thin, flat, blade, or filaments entirely free forming a hemispherical brush-like 'head'.
Portions of filaments showing the dichotomies with constrictions and the apex in one. Filament width 30-50 mμ. HMF 37 & HMF 38.

Right: Two thalli (a) & (b) with representative filaments showing dichotomies and apices. HMF 417.

Avrainvillea amadelpha (Montagne) A. Gepp & E. Gepp, 1908

Morphology A cluster of elongated or fan-shaped blades with ragged edges arising from a compact, branching, spongy stipe 7 mm x 20 mm. Blades up to 60 mm long, 20 to 50 mm wide, irregular in shape but generally widening upwards from a narrow base. The margin irregular, in some deeply cleft; small lobules arising from the edges and the flat surfaces. Fronds thin, a spongy network of fine filaments seen at the edges through a hand lens. Some specimens with sub-cylindrical masses of uncompacted filaments. Blades dark green, stipe brownish.

Anatomy Thallus consists of interlacing, non-septate filaments with distant "Y" -shaped dichotomies. Filaments 20-37.5 mμ thick, regularly constricted to give a beaded appearance (moniliform) or cylindrical, the apices blunt. Angle of dichotomies about 60°, distance apart about 375 mμ. The chloroplasts are spindle-shaped and arranged around the filament walls.

Ecology East coast, Trincomalee and Batticaloa, in shallow, sheltered water, 2 - 10 m, epilithic.

Discussion *A. lacerata* and *A. amadelpha* are somewhat similar in appearance but differ anatomically. The predominance of moniliform filaments in the blades with rounded apices in this specimen suggests that this plant is *A. amadelpha*. The apices of *A. lacerata* are "pointed" or "torn away" (Coppejans &

Prud'homme van Reine). If confirmed by the examination of more specimens this would be a new record for Sri Lanka.

Mallikarachchi (2013) has collected from Sallimundal, Pasikudah and Okanda on the east coast.

Material examined 1.8.2000: HMF 252, Trincomalee, Nilaveli, Pigeon Islands, epilithic, 10 m. (Dark green, fan-shaped to linear felted blades with ragged edges arising from an erect brownish, cylindrical, branching base attached to rock. Filaments moniliform: 20-22 mμ at widest part, 12.5-15 mμ at narrowest, 27.5 mμ before forking.) First determined as *A. lacerata* Harvey ex J. Ag., 1887 and subsequently revised. (Ref. Coppejans & Prud'Homme van Reine, 1989).
24.9.2003: HMF 419, Trincomalee, Erakkandy, Coral Island, 2 m, epilithic on rock. Dirty green with creamy edged blades. Stipe brown, much branched, producing a cluster of blades. 60 mm. high. Blades irregular in shape, discoid to flabellate. Filaments mainly moniliform with blunt apices - 22.5-25-27.5 mμ in maximal thickness.)
24.9.2003: HMF 423, Trincomalee, Nilaveli, Pigeon Islands, 1 m, epilithic on dead coral. (Dark green. Blades on simple or branching erect stipes arising from a confluent, spreading base. The whole mass spongy. Base & blades 40-80 mm. high. Basal expansion 10-20 mm thick, 200-300 mm across. Blades cuneate, flabellate, or irregularly linear. Filaments mainly moniliform with blunt apices.
21.6.2005: HMF 471, Batticaloa, Kattankudy, 2 m, epilithic, in rock crevice. (From shallow ledge, near shore, c. 500 m south of HMF 472. Dirty green. Much surge, water turbid, only a portion of a blade collected from a clump c. 10 cm high. Moniliform filaments with rounded apices in free (growing) margin, mixed moniliform and cylindrical filaments that vary in thickness, generally thicker, in deeper portions.)
21.6.2005: HMF 472, Batticaloa, Kattankudy (7° 41.460' N, 81° 44.388' E), 3 m, epilithic, in rock crevice. (Dirty green. Numerous blades of various shapes arising from a much-branched stipe attached in a crevice on the side of a ridge. Tuft c. 10 cm high, stipe 2-3 cm high, blades thin, felted, superimposed, sublinear, cuneiform and pedicellate-flabellate in shape. Moniliform filaments with rounded apices in free (growing) margin; mixed moniliform and cylindrical filaments that vary in thickness, generally thicker, in deeper portions and stipe.)

References
Coppejans & Prud'homme van Reine (1989):120-125.
Coppejans et al (2009): 122.
Lewmanomont & Ogawa (1995): 24 (photo of *A. lacerata*).
Mallikarachchi (2004): 145; (2013) pp. 13, 22.

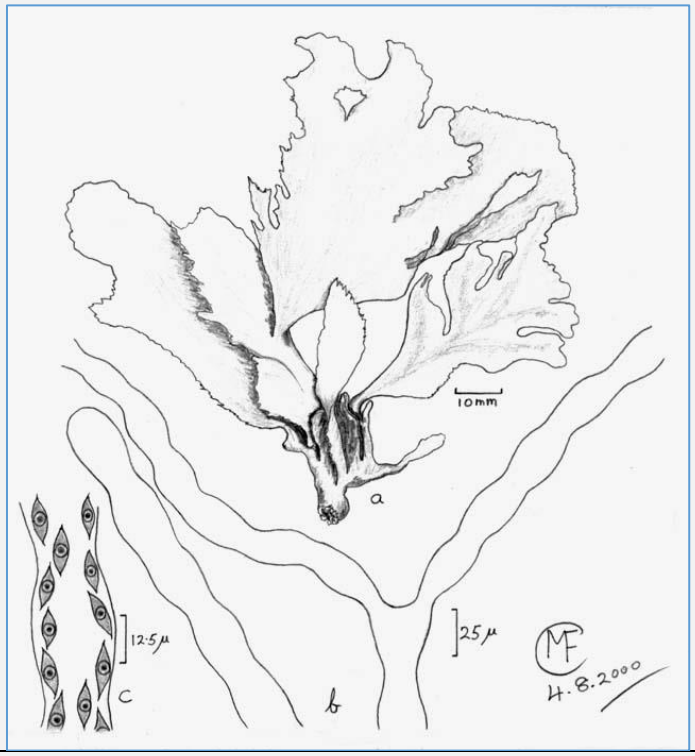
Avrainvillea amadelpha (Montagne) A. Gepp & E. Gepp, 1908

Underwater photograph of *Avrainvillea amadelpha*, 2 m, Trincomalee, Nilaveli, Pigeon Islands, September 2003. [Photo: Malik Fernando]

Left: HMF 252, Nilaveli, Pigeon Islands, ex-situ photo of fresh thallus portion, basal attachment absent.

Right: HMF 472, Batticaloa, Kattankudy, ex-situ photo of fresh thallus portion, basal attachment absent.

Scale bar = 30 mm. 21.6.2005.



HMF 252. (a) Thallus portion collected showing fronds of various shapes, the edges mostly ragged, arising from a thickened basal portion. (b) Moniliform filaments. (c) Spindle shaped chloroplasts lying below the surface of the filament.

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