

Avrainvillea amadelpha (Codiales, Chlorophyta) from Oahu, Hawaii¹

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ABSTRACT: The siphonous green alga *Avrainvillea* is reported for the first time in Hawaii. The Hawaiian specimens are described and compared to *A. amadelpha* (Mont.) Gepp and Gepp and other *Avrainvillea* species elsewhere in the world. Although Hawaiian *Avrainvillea* differ in siphon diameter from *A. amadelpha* from other locations, on the basis of other characteristics *A. amadelpha* is the proper identification. *Avrainvillea* may be an alien species in Hawaii; if so, its mode of introduction is unknown.

THE GENUS *Avrainvillea* is a siphonous green alga found throughout the tropics (Stojkovich 1985) but not previously reported from Hawaii. Its habit and some of its anatomical characteristics show great plasticity (Stojkovich 1985), but when they are used in conjunction with other characteristics, distinct species can be recognized. Species determination in *Avrainvillea* is most reliably based on holdfast type, siphon diameter, and siphon shape (Stojkovich 1985).

Several collections of a siphonous alga appearing to be *Avrainvillea* were brought to me in 1981 and 1984.

MATERIALS AND METHODS

Two collections of *Avrainvillea* were made by Donn Fukuda during environmental monitoring by Hawaiian Electric Company in 1981 at Kahe Point, island of Oahu, Hawaii (lat. 21°22' N, long. 158°08' W). Depth was about 13 m, and the substrate was sand-covered dead coral. There was a single patch of about 3 m². These specimens, bearing my collection numbers 1224 and 1225, are deposited in the Herbarium Pacificum of the Bernice P. Bishop Museum, Honolulu, Hawaii.

Another collection consisting of 14 thalli was made by Marilyn Cannon and Jane Lewis of the Botany Department, University of

Hawaii, in 1985. It was collected at a depth of 10 m from Maunalua Bay, island of Oahu, Hawaii (lat. 21°18' N, long. 157°43' W), from sand and rock substrata. The thalli were growing in tight clumps.

In 1987 and 1988, several more collections of this alga were made by various individuals (Karla McDermid, William Magruder, and Julie Brock) from the Hawaii Kai (lat. 21°18' N, long. 157°44' W) intertidal area of Oahu.

The habit and internal anatomy of both fresh and dried specimens, listed above, as well as preserved specimens in the M. S. Doty collection of the Herbarium Pacificum, Bernice P. Bishop Museum, Honolulu, were studied. Relevant herbarium specimens are cited by their collection number.

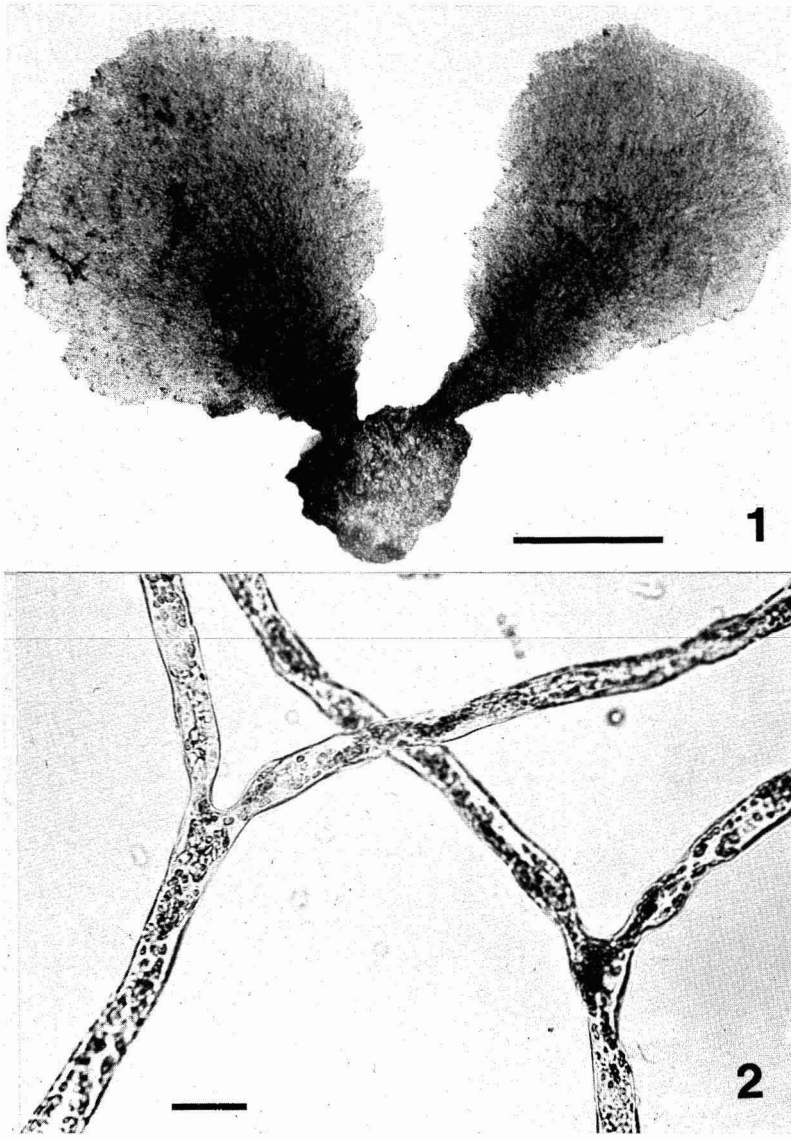
RESULTS

The thalli are green to green-gray and up to 5 cm tall (Figure 1). The thallus consists of from one to four cuneate to slightly reniform blades, each supported on a nonbranched stipe that arises from a compact holdfast. Blades are thin, slightly diaphanous, and non-zonate. They range from 1 to 4 cm wide, and from 1 to 3 cm tall, exclusive of the stipe, which ranges from 0.4 to 1.5 cm long. The stipe is flattened in cross section. Two thalli showed new blades proliferating from old blade margins. The blade margin is smooth to slightly lacerate.

The siphons are 10–12 μ m in diameter

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FIGURES 1-2. *Avrainvillea amadelpha* from Hawaii. Figure 1: Habit. The faint radial and longitudinal zonation is highlighted by being photographed with transmitted and reflected red light. Scale bar = 1 cm. Figure 2: Siphons showing dichotomal constrictions and cylindrical to torulose nature. Scale bar = 20 μ m.

throughout the thallus and are cylindrical to somewhat torulose (Figure 2). They are nontapering to very slightly tapering and appear to be haphazardly oriented at the blade margin. They range in color from transparent to green, with rare brown, pluglike inclusions. The dichotomies appear to be deeply and

longly constricted, using Stojkovich's (1985) criteria. The constriction width is less than half the siphon diameter and its length is about equal to the siphon diameter. The apices are rounded to very slightly clavate, and are nontortuous. Neither tentacula nor laterals are present.

DISCUSSION

On the basis of siphon structure, the collection is *Avrainvillea amadelpha* (Mont.) Gepp and Gepp, as interpreted by Stojkovich (1985). The siphon structure, the most reliable means of identifying species, is similar to that reported for *A. amadelpha* from Mauritius by Børgesen (1948) as well as to that found in preserved specimens in the Herbarium Pacificum from Mauritius (G. Faure # MAU A. 58), the Tuamotus (Doty # 11882), and Bulusan, Philippines (C. & G. Kraft # 172). The siphon diameter, however, is less than the 20 μm found in the preserved specimens and is at the extreme low end of the range reported for *A. amadelpha*. The habit is similar to that of *A. amadelpha* collections from Mauritius and the Philippines (above) and thus corresponds to *A. amadelpha* forma *submersa*, the deep-water form of Gepp and Gepp (1911).

The Hawaiian plants resemble in some respects *Avrainvillea hollenbergii* Trono, *A. lacerata* J. Agardh, and *A. riukiensis* Yamada. They are similar in habit and siphon diameter to *A. hollenbergii* (Trono 1971, Stojkovich 1985), but in the Hawaiian plants the siphons are weakly if at all constricted and are tapered at the apices. The siphon diameter of the Hawaiian material is also within the range reported for *A. riukiensis* (Yamada 1932, Børgesen 1940, Stojkovich 1985). However, the habit of the latter taxon differs drastically in having very narrow blades and the siphon structure differing as well. *A. lacerata* is somewhat similar in both habit (of some specimens) and siphon structure (e.g., Newhouse # 4117(3)-1) but differs in others in being repeatedly branched, having a lacerate margin, and having somewhat deeper and longer siphon constrictions.

Although the material from Oahu differs from previously reported *Avrainvillea* species on the basis of a combination of anatomical characteristics, if siphon morphology is non-plastic then the identification as *A. amadelpha* is justified.

Avrainvillea has not been collected or reported from Hawaii previous to the present collection, so it may represent a recent intro-

duction. The initial collection at Kahe Point, Oahu, was in an area under careful study for several years previous, so that its presence would have been noted. The apparent spread of *Avrainvillea* from a small patch on the leeward shore to large areas on the south shores of Oahu may further substantiate the claim that it is a recent arrival. Other algae have been transported to Oahu on ship bottoms (e.g., *Acanthophora*) (Doty 1961), and the first collection site of this alga is only a few kilometers from harbors frequented by ships arriving from foreign ports. Ship introduction is unlikely, however, as the normal habit of the alga is on sand or sand and rubble.

An alternative hypothesis is that *Avrainvillea* is an ephemeral in Hawaii and has been previously overlooked. The sites from which it has been collected, with the exception of Kahe Point, are only infrequently visited by phycologists.

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