Phycological Research 1996; **44**: 81–84

Avrainvillea rotumensis sp. nov. (Bryopsidales, Chlorophyta), a peltate species from the South Pacific

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SUMMARY

A new species of *Avrainvillea* was found on the South Pacific island of Rotuma, Fiji. *Avrainvillea rotumensis* sp. nov. occurs 1.5–3.0 m deep in a high energy current area of the Hoféa Passage, one of the few openings in the fringing reef that surrounds the island. The distinctive peltate growth habit of *A. rotumensis* is unique for the genus and facilitates quick and accurate field identification. The peltate blade (7–9 cm in diameter at maturity) is unusually thick (3–4 mm) tapering toward a short (up to 6 cm in length), thick (1.5–2.0 cm in diameter) stipe.

Key words: *Avrainvillea*, Bryopsidales, Chlorophyta, South Pacific, Udoteaceae.

INTRODUCTION

Avrainvillea Decaisne [Udoteaceae, Bryopsidales (see Silva 1982)] is widely distributed on tropical and subtropical reef systems. There are presently 26 species of *Avrainvillea* recognized worldwide with 13 reported from the tropical Pacific (see Kraft and Olsen-Stojkovich 1985; Littler and Littler 1992; Olsen-Stojkovich 1985); however, thorough collections have not been carried out in deeper waters and around many of the smaller Pacific Islands. Consequently, the number of species is expected to increase as additional collections become available from the vast Pacific basin.

The genus *Avrainvillea* is generally characterized by an uncalcified erect thallus composed of a rhizoidal mass as an anchoring system, an upright corticated stalk and a fan-shaped terminal blade. Blades and stipes of *Avrainvillea* are composed of dichotomously branched siphons (filaments) which vary from cylindrical, moniliform or tortuous (contorted). In some cases, siphons taper abruptly near the surface in a pattern of repeated and close-set branching, forming a loosely woven (e.g. *A. levis* Howe) to tightly woven (e.g. *A. asarifolia* Børgesen) cortex. *Cladocephalus,* a very similar genus, has a cortex formed by lateral branches terminating in highly reduced hyaline apices that interweave to form an extremely tight surface layer. The terminal blade is highly variable. Blades are generally flabellate; however, in some species blades can be completely lacking or slightly bulbous (as in *A. digitata* D. S. Littler *et* M. M. Littler), clustered and highly bifurcated (as in *A. fenicalii* D. S. Littler, M. M. Littler *et* M. E. Hay) or knurled, knobbed, thickly spatulate or pseudopeltate (as in *A. rawsonii* [Dickie] Howe [see Littler and Littler 1992 figures 3, 5, and 19, respectively]). Blade siphons are constricted immediately above all major dichotomies. *A. rotumensis* is the only species of the genus that is peltate, leading to easy and certain recognition.

The new species was collected from the island of Rotuma (12°30'S, 177°05'E, Fig. 1). The island is about 465 km northwest of the main islands (Vanua Levu, Viti Levu) of the Fijian group. Rotuma is approximately 12 km long and variable in width from 0.5 km to 5 km wide (Fig. 1). It is a totally independent volcanic edifice of late Pleistocene origin, therefore geologically younger than the main Fijian group (N'Yeurt 1993). The reefs are predominantly fringing with few breaks or passages. The collections were made at the mouth of the Hoféa Passage (Fig. 1) at the northernmost point of the island. Three complete specimens from two different seasons were collected and liquid preserved; however, numerous plants were observed out of reach of collecting due to dangerously strong currents. Even though relatively few specimens were collected, the plants are so distinct and consistent in habit that species designation is justified.

MATERIALS AND METHODS

Specimens were collected in the field and preserved in 5% formalin in seawater. Wet-preserved material was examined microscopically after portions were prepared on glass slides for anatomical study. Fragments were taken from the mid holdfast, mid stipe, mid blade and growing margin of the blade, stained with 1% aniline blue and mounted in a 20% glucose syrup (Karo Syrup, Corn Products, Inc.) solution in distilled water containing a trace of phenol. All anatomical drawings were illustrated using a drawing tube on a Zeiss Universal Microscope to ensure accuracy. Internal measurements were made with a calibrated ocular micrometer.

Communicating editor: H. Kawai.
Received 11 October 1995; accepted 1 February 1996.

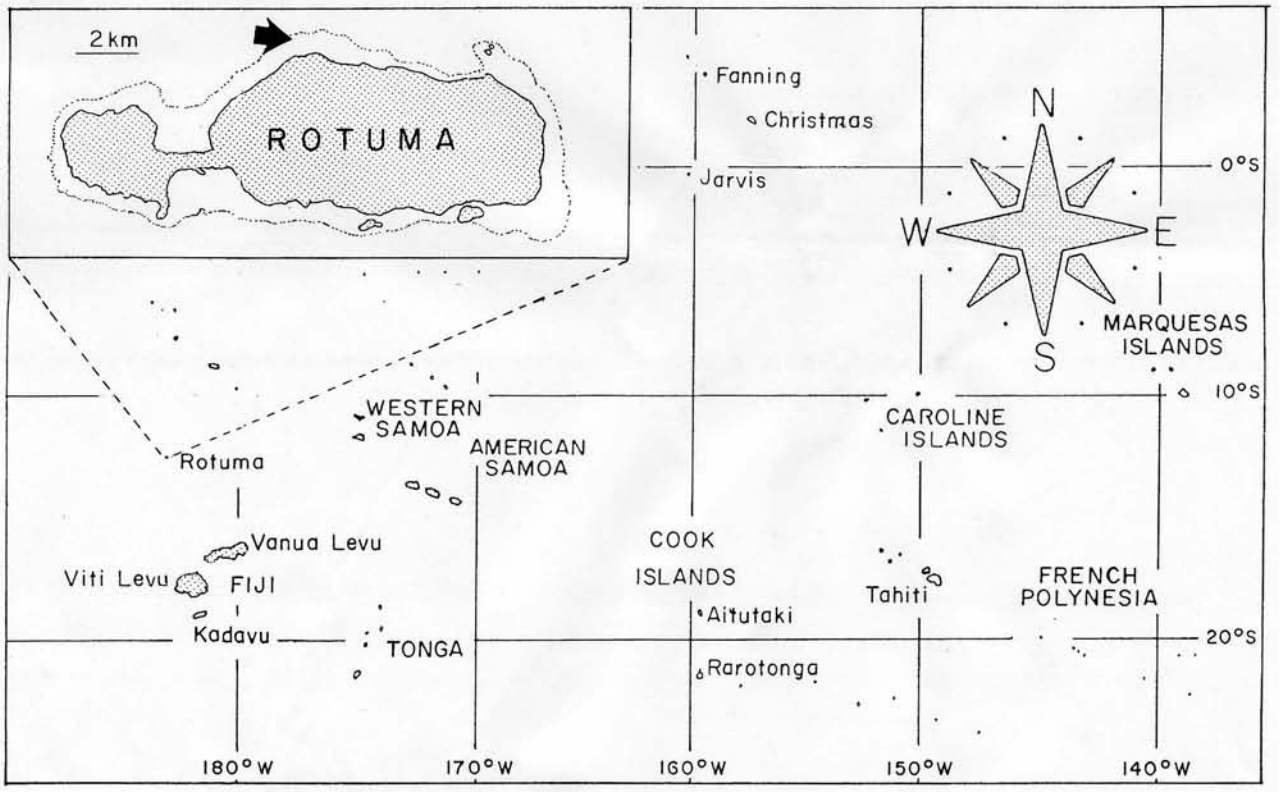

Fig. 1. South Pacific island groups showing collection site (black arrow) at Hoféa Passage, Rotuma, Fiji.

RESULTS

Avrainvillea rotumensis sp. nov.

Diagnosis

Thalli erecti a 10 cm longi solitarii, laminis peltatus diametro 9 cm late 4 mm zonatis margine integris, haptero rhizoidealis fibroso; siphones laminales medullares moniliformes in diametro 20–40 μm corticales moniliformes vel tortuosi in diametro sensim 8 μm; siphones stipitis medullares moniliformes in diametro 50–80 μm corticales moniliformes vel tortuosi saepe hyalini in diametro 15–20 μm.

Holotype

Hoféa, Rotuma, Fiji, on the northern coast, at the mouth of Hoféa Passage, 1.5–3.0 m deep anchored in carbonate sediment, 6.v.1993, coll.: A. D. R. N'Yeurt, Univ. S. Pac. (USP) #615.

Etymology

A. rotumensis is named for the island on which it was collected, Rotuma.

Representative specimens examined

Hoféa, Rotuma, Fiji, on the northern coast, at the mouth of Hoféa Passage, 1.5–3.0 m deep anchored in carbonate sediment, 20.ix.1993, coll.: A. D. R. N'Yeurt, USP #622, US #162710 (juvenile).

Habit

Thalli to 10 cm high, dark olive-green, solitary; mature blades distinctively peltate, 7–9 cm in diameter (Fig. 2A), 3–4 mm thick, smooth, concentric zonation faint, blade margins smoothly rounded, not lobed or ragged, to 2 mm thick; mature stipe to 6 cm long, 1.5–2.0 cm in diameter, cylindrical, seldom branched; anchored by bulbous, fibrous rhizoidal system.

Anatomy

Medullary siphons of blade 20–40 μm in diameter, moniliform (Fig. 2B), weak-walled; surface siphons of blade taper abruptly to 8 μm in diameter, moniliform to tortuous, dichotomies wide-spreading; apices rounded, hooked or tortuous (Fig. 2B), forming loose cortex; siphons of growing margin 30–40 μm in diameter, moniliform (Fig. 2C), tapering to 20 μm; medullary siphons of stipe 50–80 μm in diameter, moniliform (Fig. 2D); cortical siphons of stipe tapering to 8–15 μm in diameter, moniliform to tortuous, often hyaline (Fig. 2D); rhizoids moniliform, tortuous to cylindrical, 20–50 μm in diameter tapering to 10 μm (Fig. 2E).

DISCUSSION

A. rotumensis is easily recognizable by the conspicuous peltate blade, which is unique within the genus (Table 1). However, two other species have pseudopeltate growth forms that superficially approximate the peltate growth form, *A. rawsonii* in the Atlantic and *A. calithina* Kraft *et*

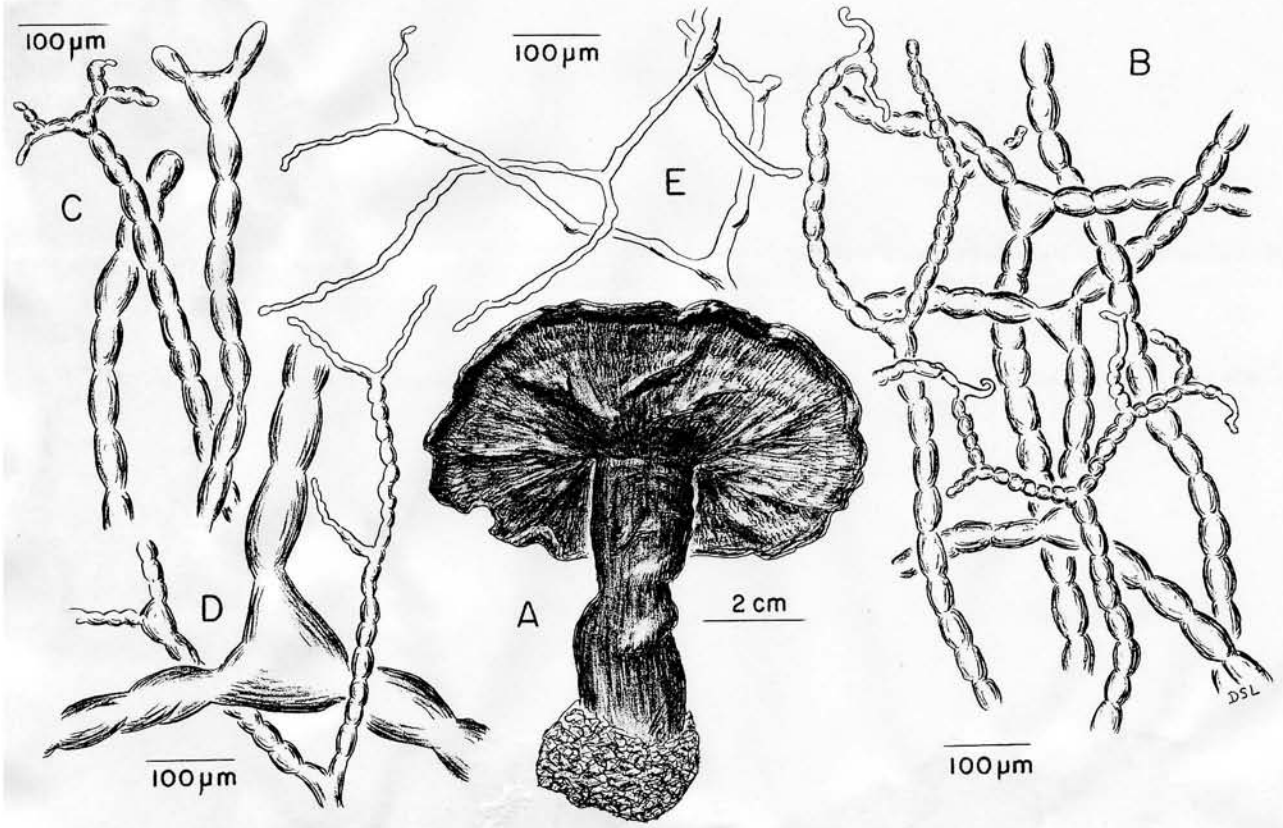

Fig. 2. *Avrainvillea rotumensis* sp. nov., illustration of Holotype (USP#615). A. Habit of plant. B. Blade siphons depicting larger moniliform medullary siphons with abrupt tapering and increasing branching at cortex. C. Growing margin siphons. D. Stipe siphons with large medullary siphons and finer cortical siphons. E. Rhizoids.

Olsen-Stojkovich in the Pacific. Both of these differ from *A. rotumensis* in form and in internal anatomy. In *A. rawsonii,* the pseudopeltate blade is extremely thick and spatulate with the offset upper surface generally angled somewhat obliquely in respect to the light source (Littler and Littler 1992, fig. 19) and the thick tapering stipe is off-center and angled. In *A. calithina,* the blade is oblong to cuneate (Kraft and Olsen-Stojkovich 1985) when young, subpeltate at maturity and strongly concave at the base creating a 'scoop'-shaped habit. In contrast to *A. calithina, A. rotumensis* is peltate with the stipe perpendicular and centered below the horizontal blade (i.e. the blade grows equally in all directions from the central stipe at a right angle) even when plants are young.

Of the Pacific species, *A. rotumensis* is most similar anatomically to *A. pacifica* A. Gepp *et* E. S. Gepp, with both species having extremely thick blades (to 4 mm) and wide (to 2 cm in diameter) short stipes, all formed by moniliform siphons that taper distally. However, the blade siphons of *A. pacifica* range from 28 µm in diameter tapering to 6 µm at surface apices, while those of *A. rotumensis* are considerably larger, 40 µm in diameter tapering to 8 µm at the surface. Also, *A. pacifica* is reported (Gepp and Gepp 1911) to have two or more upright paddle-shaped

Table 1. Comparison of species which are most similar in either anatomical structure or habit to *Avrainvillea rotumensis*

Characters	*A. rotumensis*	*A. rawsonii*	*A. pacifica*	*A. silvana*	*A calithina*
Blade shape	Peltate	Pseudopeltate	Flabellate	Flabellate	Subpeltate
Blade thickness (mm)	3–4	3–4	3–4	1–2	0.2–0.6
Stipe diameter (cm)	1–2	1–2	0.50–1.25	0.4–0.7	0.1–0.4
Medullary siphon shape (blade)	Moniliform	Moniliform	Torulose	Moniliform	Torulose
Medullary siphon diameter (blade, µm)	20–40	50–65	20–25	45–80	12–30
Cortex	Distinct	Not present	Not present	Distinct	Extremely tight (*Cladocephalus*-like)

blades arising from a single thickened base, although Olsen-Stojkovich (1985) noted only solitary uprights. In contrast, *A. rotumensis* has only one peltate blade per each basal structure.

Of the Caribbean species, *A. rotumensis* is most similar anatomically to *A. silvana* D. S. Littler *et* M. M. Littler, since both have moniliform siphons that taper. The appearance of the blades is considerably different, however, with those of *A. silvana* being thin (1–2 mm) and paddle-shaped; as mentioned, the blades of *A. rotumensis* are thick (3–4 mm) and peltate. Blade siphons of *A. silvana* range from 80 μm in diameter tapering to 20 μm at the surface apices, while those of *A. rotumensis* range from 40 μm in diameter tapering to 8 μm at the surface. The stipe siphons are virtually identical in both species ranging from 70–80 μm in diameter and tapering to 15 μm with the siphons moniliform to tortuose and often hyaline.

Little is known about reproduction in most species of *Avrainvillea* and this also is the case with *A. rotumensis*. No specialized reproductive structures have been observed. Vegetative reproduction and persistence of basal portions are presumed important, since this is the pattern for other members of the genus.

ACKNOWLEDGEMENTS

We thank Barrett L. Brooks for valuable field, library and laboratory assistance. Gratitude is extended to H. E. Robinson for help with the Latin diagnosis. Field and laboratory work was supported by grants from the MARPAT Foundation, the Research Opportunities Fund of the National Museum of Natural History and the Smithsonian Marine Station at Link Port, Florida (SMS Contribution #396). Financial support to A. D. R. N'Yeurt from the University of the South Pacific Research Committee (U.R.C. grant #0713-9106) and the International Center for Ocean Development (ICOD) is gratefully acknowledged. We especially thank the people of Rotuma for their kind hospitality during the field work.

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