

Sporochnus dotyi sp. nov. (Sporochnales, Phaeophyta), a Brown Alga from Hawaii¹

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ABSTRACT: *Sporochnus dotyi* sp. nov. is described based on two collections made in Hawaii. It differs from other *Sporochnus* species in having nonbranched fertile filaments and in the comparatively large size and conspicuous nature of the bases of the apical tufts. A key to the world's species of *Sporochnus* is presented to elucidate the unique features of this new species.

MEMBERS OF THE BROWN algal genus *Sporochnus* C. Agardh occur in temperate and tropical oceans. However, in the tropical Pacific, *Sporochnus* is reported only for the Galapagos Islands. Recently, two collections of *Sporochnus* were made in Hawaii. This paper describes the specimens and contrasts them with previously reported species.

MATERIALS AND METHODS

Collections from French Frigate Shoals (lat. 23° N, long. 167° W) and Oahu (lat. 21°28' N, long. 157°47' W) were made by Douglas Davis and William Cooke, respectively. The former collection consisted of one thallus fouled on a fish trap from a depth of 7–25 m in August 1978, while the latter consisted of three thalli fouled on an anchor hauled from a depth of about 40 m near the entrance to Kaneohe Bay in January 1981. Slides of receptacular areas were made from dried material and mounted in 25 percent corn syrup (Karo, a registered trademark) solution. Some material was stained with 1 percent aqueous aniline blue.

Additionally, slides were prepared and studied from the following dried material: (1) Australia, *Sporochnus apodus* Harvey, Cribb #130.3, Pittwater, Tasmania; *S. radiceiformis* (Brown ex Turner) C. Agardh, Womersley #A20.793, Kangaroo Is., South Australia; (2) New Zealand, *S. moorei* Harvey, Lindauer #234, Pihama, Taranaki; *S. pedunculatus*

(Hudson) C. Agardh, Lindauer #162, Pihama, Taranaki; *S. stylosus* Harvey, Lindauer #206, Stewart Is.; (3) United States, *S. pedunculatus*, Brostoff #24, Santa Catalina Is., California; (4) Bermuda, *S. bolleanus* Montagne, Bernatowicz #49–1513, Nonsuch Is.; *S. bolleanus*, Bernatowicz #53–191, Challenger Bank; *S. bolleanus*, Bernatowicz #53–233, Higgs Is. All specimens except the Brostoff collection were from the M. S. Doty Herbarium of the Herbarium Pacificum, Bernice P. Bishop Museum, Honolulu, Hawaii.

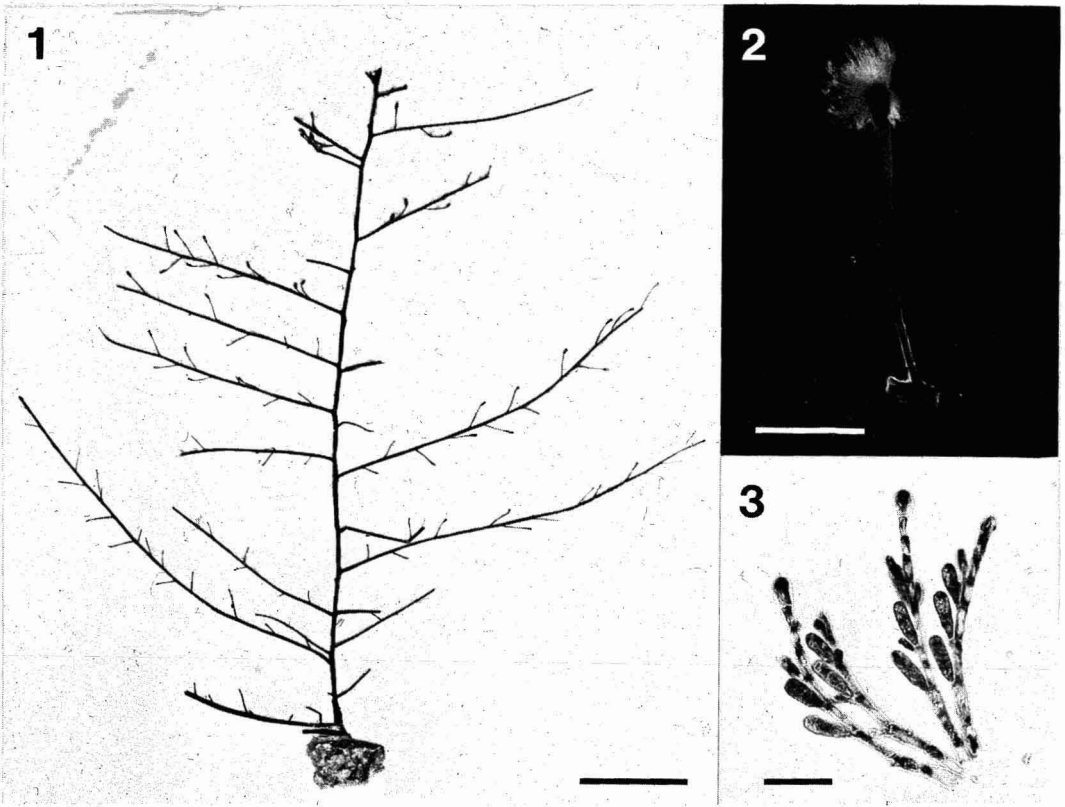
RESULTS AND DISCUSSION

The specimens (Figure 1) are characteristic of the genus *Sporochnus* in gross morphology, having alternately branched, terete axes, with an inner layer of colorless cells; the outer layer being pigmented. The receptacles (Figure 2) are oval to cylindrical, 1–2 mm long, and borne on 6–8 mm long pedicels which arise on all orders of branches. A tuft of assimilatory filaments, about 5 mm long, arises from the apex of each receptacle. Tightly packed fertile filaments (Figure 3), with enlarged terminal cells 12–30 μ m long and 10–15 μ m wide, are borne laterally and form the bulk of the swollen portion of each receptacle. They bear about 4–6 unilocular sporangia unilaterally, each measuring 6–25 μ m long and 5–8 μ m wide. The conical holdfast is composed of loosely aggregated, sparingly branched filaments.

The material differs from the previously known *Sporochnus* species in the following ways: (1) The area of the receptacle from which the apical tuft of hairs arises is enlarged

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FIGURES 1–3. *Sporochnus dotyi* sp. nov. holotype material (Brostoff #1207). (1) Habit of plant. Scale bar = 2.5 cm. (2) Mature receptacle including pedicel and apical tuft. Scale bar = 2.5 mm. (3) Four fertile filaments, the basal cells of which are contiguous. Scale bar = 25 μ m.

and is conspicuous even to the unaided eye. This area is at least equal to, and frequently twice, the pedicel diameter. In other species, the diameter of this structure is less than that of the pedicel and inconspicuous when mature. (2) Pedicel length, receptacle shape and size, as well as apical tuft length, characters which have been used singly and in combination for delineating the species, are compatible with other species individually, but taken together, they do not agree with any species. (3) The Hawaiian plants have non-branched fertile filaments. The genus is described (Agardh 1848) and is usually considered as having branched fertile filaments; a review of the literature and an examination of preserved specimens (cited above) showed all previously described *Sporochnus* species as having irregularly or dichotomously branched fertile filaments.

The alga most closely resembles *S. bolleanus* in habit. Of nine *S. bolleanus* specimens examined, one (Bernatowicz #49–1513), annotated as immature by the collector, has enlarged apical tuft bases. However, the receptacles are barely swollen, there is no sheath of fertile filaments around them (probably both indications that the specimen is immature), and the area from which the apical tuft arises is not conspicuous.

To show the relation of the present collection to data from previously reported *Sporochnus* species, a key to the world's species is presented in Table 1. It has been compiled in part from the literature and keys in local floras by Harvey (1858, 1859, 1862), Taylor (1945), Earle (1969), Lindauer, Chapman, and Aiken (1961), and Womersley (1967) as well as Mower and Widdowson (1969).

TABLE 1
KEY TO THE SPECIES OF *Sporochnus*

1. Distal portion of receptacle terminating in a style or stalk bearing an apical tuft of hairs.	2
1. Distal portion of receptacle nonstylar, receptacle bearing an apical tuft of hairs.	4
2. Branches bearing two distinct types of receptacles, one coarse one fine, apical tuft length 1 mm.	<i>S. elsiae</i> Lindauer (reported for New Zealand, Lindauer [1960])
2. Branches bearing a single type of receptacle, apical tuft length 3 mm or longer.	3
3. Pedicel length 0.3–0.8 mm, apical tuft length 3–5 mm.	<i>S. rostratus</i> Taylor (reported for Galapagos Is., Taylor [1945])
3. Pedicel length 1.5–7.0 mm, apical tuft length 6 mm.	<i>S. stylosus</i> Harvey (reported for New Zealand, Galapagos; Harvey [1855], Taylor [1945], Lindauer et al. [1961])
4. Receptacles sessile or subsessile; twice the pedicel length or longer.	5
4. Receptacles pedicellate; less than twice the pedicel length.	6
5. Receptacles subsessile, about 2 times pedicel length.	<i>S. comosus</i> C. Agardh (reported for Australia; C. Agardh [1824], Womersley [1967])
5. Receptacles sessile.	<i>S. apodus</i> Harvey (reported for Australia; Harvey [1859], Womersley [1967])
6. Immature receptacles globose; mature receptacles globose, cylindrical, obovate, oval, or ellipsoid.	7
6. Immature and mature receptacles cylindrical, obovate, oval, or ellipsoid.	8
7. Older receptacles remaining globose, stem glabrous.	<i>S. radiceformis</i> (Brown ex Turner) C. Agardh (reported for Australia, China, Japan; Agardh [1817], Womersley [1967], Tseng [1983])
7. Older receptacles becoming obovoid to conical, lower portion of stem with very short pubescent hairs.	<i>S. scoparius</i> Harvey (reported for Australia; Harvey [1862], Womersley [1967])
8. Pedicels less than 3 times the length of the receptacle.	9
8. Pedicels 4–8 times the length of the receptacle.	10
9. Pedicels 3.6 mm long, receptacle 1.5–10 mm long, apical tuft 10–15 mm long.	<i>S. bolleanus</i> Montagne (reported for Galapagos Is., Gulf of Mexico, Brazil; Taylor [1945, 1960], Earle [1967])
9. Pedicels 0.75–2.5 mm long, receptacle 1–2 mm long, apical tuft 3.5 mm long.	<i>S. pedunculatus</i> (Hudson) C. Agardh (cosmopolitan in temperate oceans, Agardh [1817])
10. Fertile filaments on receptacle branched, pedicel to 30 mm long.	<i>S. moorei</i> Harvey (reported in Australia and New Zealand; Harvey [1858], Womersley [1967], Lindauer et al. [1961])
10. Fertile filaments on receptacle nonbranched, pedicel 6–8 mm long.	<i>S. dotyi</i> sp. nov. (Brostoff) (distributed in Hawaiian Islands, Brostoff [herein])

Most phycologists reporting more than one species of *Sporochnus* in a given flora (Earle 1969, Lindauer, Chapman, and Aiken 1961, Womersley 1967) express or imply reservations about using pedicel length, receptacle shape and size, and apical tuft length to de-

lineate the species. Harvey (1859) writes that “. . . the form of the receptacle and its proportion to the pedicel are variable. In deep-water specimens, the length of the receptacle is double the average; in some older specimens the ratio and form often vary on the same

fronds." Lindauer, Chapman, and Aiken (1961) believe the citing of exact measurements of fertile branchlets may be very misleading and recommend use of the relative proportions of the organs; they do, however, report the size of the organs in metric units. In the Gulf of Mexico, Earle (1969) has reported populations of thalli on which the young portions resemble *S. pedunculatus* while the older portions resemble *S. bolleanus* with regard to receptacle form and pedicel length. Womersley (1967) has questioned the distinctness of yet other species pairs: *S. scoparius* and *S. radiformis*, and *S. moorei* and *S. radiformis*. Regarding the former pair, *S. scoparius* has more robust thalli and shorter receptacles than *S. radiformis*. Womersley believes, however, they may be only ecological forms of one species as they are frequently difficult to separate. Regarding the latter pair, although *S. moorei* has larger, more linear receptacles than *S. radiformis*, they intergrade. Consequently, Womersley suggests *S. moorei* is a calm-water form of the latter.

The hypothesis implicit in proposing this new taxonomic epithet is that any additional material collected must possess nonbranched fertile filaments even if the other characters are found to be the result of phenotypic plasticity. Two possibilities could negate this hypothesis. First is the possibility that unbranched fertile filaments represent a juvenile or developmental stage and that the specimens collected thus represent juveniles. Second would be the presence of this character on other species, either as juveniles or adults. The former alternative is unlikely since the plants at hand were fertile at the time of collection and lie within the size ranges of other species. The latter is dependent on further study, but the possibility is judged to be minimal because of the preponderance of evidence in the literature. Thus, description of the material as a new species and its addition to this taxonomically unsettled genus is justified.

Sporochnus dotyi sp. nov.

Figures 1–3

Thallus plus minusve alternatim ramosus, usque ad 300 mm altus, 0.3 mm diametro.

Receptacula ovalia ad cylindrica, 1–2 mm longa, suffulta pedicellis 6–8 mm longis, 0.2 mm latis, ferentia caespitem terminalem pilorum 5 mm longorum, basi cujus conspicua et maiore diametro pedicello. Fila fertilia non ramosa. constituentia magnitudinem areae tumidae receptaculi 50–150 μ m longa, cellulis terminalibus auctis et 12–30 μ m longis et 10–15 μ m latis; sporangia unilocularia 6–25 μ m longa et 5–8 μ m lata. Hapteron conicum et compositum filis laxe aggregatis parce ramosis.

Thallus more or less alternately branched, to 300 mm tall, 0.3 mm in diameter. Receptacles oval to cylindrical, 1–2 mm long, supported on pedicels 6–8 mm long, 0.2 mm wide, and bear terminal tufts of hairs 5 mm long, the base of which is conspicuous and greater in diameter than the pedicel. Nonbranched fertile filaments 50–150 μ m long constitute the bulk of the area of the receptacle, the terminal cells of which are enlarged, 12–30 μ m long and 10–15 μ m wide, unilocular sporangia are 6–25 μ m long and 5–8 μ m wide. The hapteron is conical and composed of sparingly branched filaments.

This alga is named for Maxwell S. Doty for his pioneering work in Hawaiian phycology.

TYPE SPECIMEN: The holotype, bearing the author's collection number 1207, is deposited in the Herbarium Pacificum, Bernice P. Bishop Museum, Honolulu, Hawaii. Additional specimens are deposited in the U.S. National Museum, Smithsonian Institution (Brostoff #1205, 1206), and the Bernice P. Bishop Museum (D. Davis #244).

The following are offered as tentative critical diagnostic features of *Sporochnus dotyi* in the expectation that further collections will consistently reveal the following characteristics. (1) The base of the cluster of the filaments arising from the apex of the mature receptacle is at least twice the diameter of the pedicel of the receptacle. (2) The base of the cluster of filaments arising from the apex of the mature receptacle is conspicuous in dried specimens. (3) The fertile filaments emanating from the receptacle are nonbranched.

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