

## Studies on the freshwater Rhodophyta of Brazil I. Three taxa of *Batrachospermum* ROTH from the northeastern State of Sergipe

Orlando NECCHI Júnior\* and Shigeru KUMANO\*\*

\* Instituto de Botânica, Seção de Ficologia, Caixa Postal  
4005, 01000-São Paulo, SP, Brasil

\*\* Department of Biology, Faculty of Science, Kobe University,  
Rokko-dai, Nada-ku, Kobe, 657 Japan

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Three taxa of *Batrachospermum* ROTH (Rhodophyta) from the northeastern Brazilian State of Sergipe are studied. *Batrachospermum capense* STARMACH ex NECCHI et KUMANO (Section *Contorta*) is lectotypified, and *B. capense* STARMACH ex NECCHI et KUMANO var. *breviarticulatum* NECCHI et KUMANO, var. nov., is described based on the number of cells of primary branchlets and on the size of gonimoblasts. *B. orthostichum* SKUJA (Section *Setacea*) is recorded for the second time in the literature, and *B. cayennense* MONTAGNE (Section *Aristatae*) for the first time for Brazil.

**Key Index Words:** *Batrachospermum capense* var. *breviarticulatum*, var. nov.; *Batrachospermum cayennense*; *Batrachospermum orthostichum*; Brazil; freshwater Rhodophyta; taxonomy.

Brazilian freshwater Rhodophyta, especially those of genus *Batrachospermum* ROTH, have received up today a little attention of specialists. Only 13 taxa of the genus were already reported for Brazil. However, most of them are included in general lists of taxa of other groups of algae, and some contain only brief descriptions and usually no illustrations. Among the papers exclusively dealing with Brazilian freshwater Rhodophyta, it should be mentioned that of SKUJA (1931), in which two new species of *Batrachospermum*, *B. orthostichum* and *B. procarpum*, from Santa Teresa, State of Espírito Santo, are described. *Batrachospermum vagum* (ROTH) C. AGARDH var. *periplocum* is described by SKUJA (1969) based on the material from Rio Negro, in the northern State of Amazonas.

The present authors are starting a series of papers aiming to contribute towards the knowledge of Brazilian freshwater Rhodo-

phyta. The present paper deals with three taxa of *Batrachospermum* from the north-

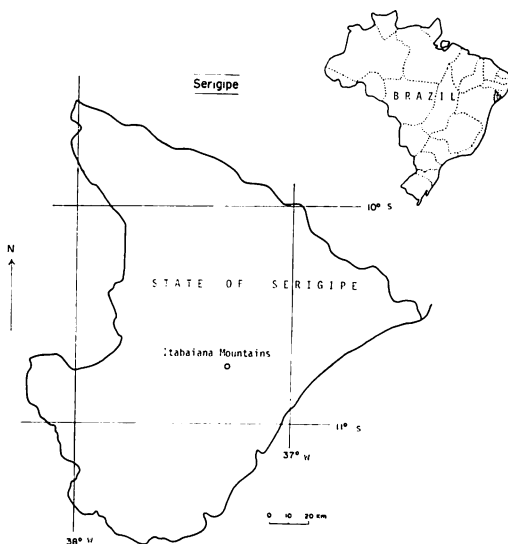


Fig. 1. Map of the State of Sergipe showing the locality from which specimens were collected.

eastern State of Serigipe. All materials studied were collected from two rivulets at Itabaiana Mountains, located at Município of Areia Branca, situated at 10°46' lat. S. 37° 18' long. W. as shown in Fig. 1. All specimens studied are deposited at the Herbarium of Institute of Botany, São Paulo, Brazil (SP).

### Lectotypification of *Batrachospermum capense*<sup>1)</sup> STARMACH

*Batrachospermum capense* was described by STARMACH (1975) but no holotype was designated. This species is not validly published according to Art. 37.1 of the International Code of Botanical Nomenclature. Thus, based on the Guide for determination of types (item 3 and 4), the present authors designate the lectotype as follows:

Lectotypus: leg. J. RZOSKA, det. K. STARMACH, KRA, SP 187186, rivulo Du Cap, insula Mahé, insulis Seychelles.

### Descriptions of Taxa and Discussions

1. *Batrachospermum capense*? STARMACH ex NECCHI et KUMANO var. *breviarticulatum* NECCHI et KUMANO, var. nov. (Figs. 2-11).

Frons monoica, 7 cm alta, 350-550  $\mu\text{m}$  crassa, abundanter irregulariteque ramosa, modice mucosa. Cellulae axiales cylindricae, 50-150  $\mu\text{m}$  crassae, 330-530  $\mu\text{m}$  longae. Verticilli cylindrici, contigui et plus minusve compressi. Fasciculi duo vel tres e cellulis basi ramulorum primariorum orientes. Ramuli primarii di- vel trichotome ramificantes, ex 4-7 cellulis constantes; cellulae fasciculorum lanceolato-ellipticae; pili numerosi, in quoque cellula unus vel duo, longitudine variantes. Ramuli secundarii numerosi, totum internodium obtegentes. Spermatangia globosa, 6-7  $\mu\text{m}$  diametro, in ramulis primariis et secundariis terminalia vel lateralia. Ramuli carpogoniferi e cellulis basi ramulorum orientes, ex cellulis 5-8 disci- vel doliiformibus

constantes, tortuosi, carpogonium 40-72  $\mu\text{m}$  longum; trichogyne cylindrica, indistincte pedicellata. Bractee numerosae, breves. Gonimoblasti singuli, globosi vel semiglobosi, 400-550  $\mu\text{m}$  crassi, 190-270  $\mu\text{m}$  alti, verticilli crassior, in centro verticilli inserti; fila gonimoblastorum laxae agglomeratae. Carposporangia obovoidea, 7-10  $\mu\text{m}$  crassa, 12-16  $\mu\text{m}$  longa.

Fronde monoecious, 7 cm high, 350-550  $\mu\text{m}$  wide, abundantly and irregularly branched, moderately mucilaginous. Axial cells cylindrical, 50-150  $\mu\text{m}$  wide, 330-530  $\mu\text{m}$  long. Whorls cylindrical, more or less compressed, touching each other. 2-3 fascicles arising from the ovoidal basal cell of primary branchlet. Primary branchlets di- or trichotomously branched, consisting of 4-7 cell-stories; cells of fascicles lanceolato-elliptical; hairs numerous, 1-2 in each terminal cell, varying in length with an inflated base. Secondary branchlets numerous, well-developed, straight or slightly curved, covering all the internodes. Spermatangia globular, 6-7  $\mu\text{m}$  in diameter, terminal or lateral on primary and secondary branchlets. Carpogonium-bearing branch arising from the basal cell of primary branchlet, consisting of 5-8 disc- or barrel-shaped cells, twisted; carpogonium 40-72  $\mu\text{m}$  long; trichogyne cylindrical, indistinctly stalked. Bracts numerous, short, forming a glomerule with the carpogonium-bearing branch. Gonimoblasts single, globular or semiglobular, 400-550  $\mu\text{m}$  wide, 190-270  $\mu\text{m}$  high, higher than the whorls; gonimoblast filaments loosely aggregated. Carposporangia obovoidal, 7-10  $\mu\text{m}$  wide, 12-16  $\mu\text{m}$  long.

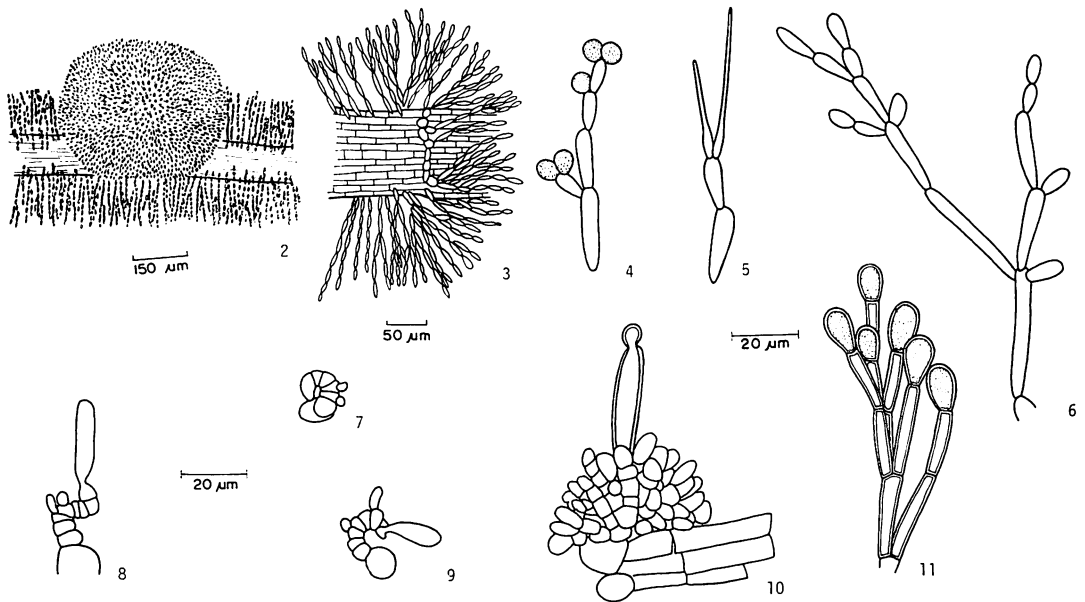
Holotype: E. C. Oliveira FILHO, SP-187102, 05/XII, 1974, Herbarium of Institute of Botany, São Paulo, Brazil (SP).

Type Locality: Município of Areia Branca, Itabaiana Mountains, Serigipe State, Brazil.

Habitat: This variety grows epilithic in a mountain rivulet associated with *Batrachospermum cayennense* MONTAGNE.

This variety differs from *Batrachospermum capense* STARMACH ex NECCHI et KU-

1) The ending of the epithet was changed to agree with the neuter gender of the generic name.



Figs. 2-11. *Batrachospermum capense* STARMACH ex NECCHI et KUMANO var. *breviarticulatum* NECCHI et KUMANO, var. nov. 2. Part of a thallus showing a mature gonimoblast; 3. Structure of a whorl; 4. Spermatangia terminal and lateral on a primary branchlet; 5. An apex of a primary branchlet; 6. Detail of a primary branchlet; 7-9; Early stages in the development of the carpegonium with twisted carpegonium-bearing branches; 10. Early stage in the development of gonimoblast filaments; 11. Carposporangia terminal on gonimoblast filaments.

MANO in the number of cells of primary branchlets and in the size of gonimoblasts. In the type variety, the primary branchlets consists of 7-13 cell-stories and the whorls are 400-580  $\mu\text{m}$  wide (STARMACH 1975) or 400-620  $\mu\text{m}$  wide (STARMACH 1977). While, in the present new variety, they consist of 4-7 cell-stories and the whorls are slightly narrower (350-550  $\mu\text{m}$  wide). The gonimoblasts in the type variety are 600-850  $\mu\text{m}$  wide (STARMACH 1975 1977), while they are 400-550  $\mu\text{m}$  wide in the present new variety.

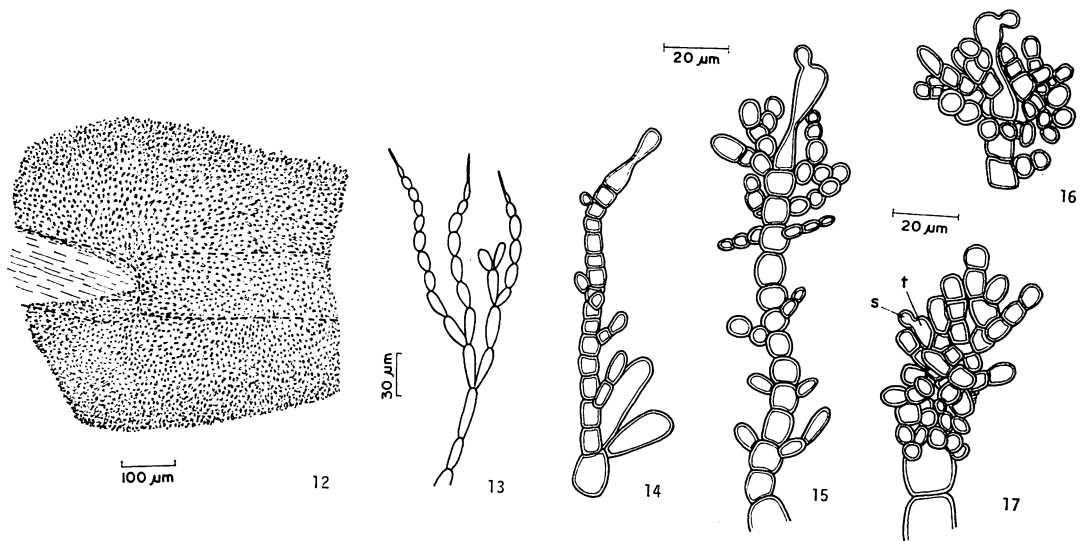
STARMACH (1975) at the time of its original description considered *B. capense* belonging to section *Viridia*. However, the carpegonium-bearing branch in this species is spirally twisted, thus permitting the species inclusion in the section *Contorta* as it was already made by KUMANO (1982).

*Batrachospermum capense* is only known from its type locality, Seychelles, Mahé Island. The present study is, therefore, the second record for the species. This fact

suggests that it most probably has a more extense geographical distribution. Also, the morphological discrepancies between the Brazilian and the original specimens are obviously due to the virtual absence of knowledge of the species today.

## 2. *Batrachospermum cayennense* MONTAGNE (Figs. 12-17)

Frond dioecious, 2 cm high, 400-650  $\mu\text{m}$  wide, irregularly branched, moderately mucilaginous. Axial cells cylindrical, 95-160  $\mu\text{m}$  wide, 400-950  $\mu\text{m}$  long. Whorls pear-shaped or sphaerical, touching each other. 2-3 fascicles arising from the ovoidal basal cell of primary branchlet. Primary branchlets with 3-6 branches, di- or trichotomously branched, consisting of 7-12 cell-stories; proximal cells of fascicles ellipsoidal, distal cells obovoidal or spherical; hairs numerous, short, with an inflated base. Secondary branchlets numerous, straight, oblique, covering all the internodes. Male plants not yet observed. Carpegonium-bearing branch



Figs. 12-17. *Batrachospermum cayennense* MONTAGNE 12. Structure of a whorl; 13. Detail of a primary branchlet; 14. Young carpogonium-bearing branch with a carpogonium initial; 15. Fertilized carpogonium; 16-17. Early stages in the development of gonimoblast filaments. (s. spermatium, t. trichogyne).

arising from the basal cell and from the first cell of primary branchlet, very long, consisting of 12-30 barrel-shaped cells; carpogonium 27-37  $\mu\text{m}$  long; trichogyne club-shaped, indistinctly stalked. Bracts sparse, short, composed of 1-3 cells. Gonimoblasts single or double, inserted at periphery of whorl, immature. Carposporangia obovoidal, immature.

Specimen examined: E.C. Oliveira FILHO, SP-187100, 05/XII, 1974, Município of Areia Branca, Itabaiana Mountains, Serigipe State, Brazil.

Habitat: In a mountain rivulet associated with *B. capense* STARMACH ex NECCHI et KUMANO var. *breviarticulatum* NECCHI et KUMANO.

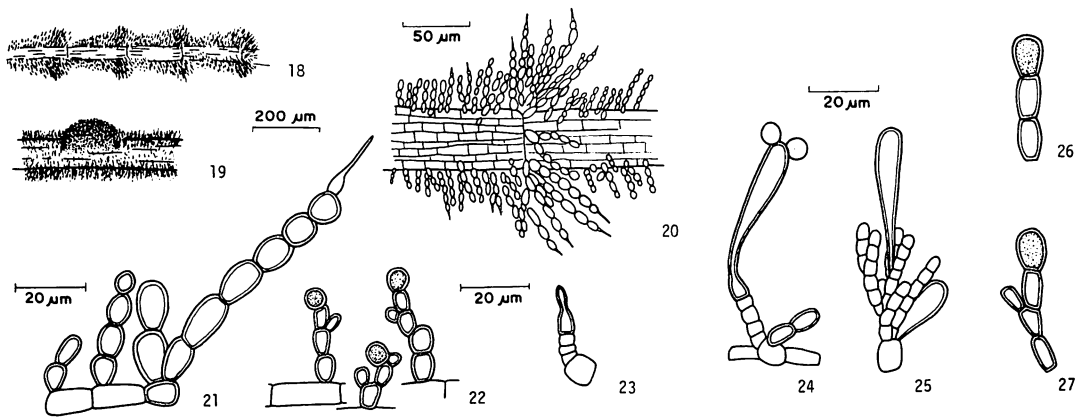
Distribution: French Guiana, Madagascar, Malaysia and Brazil.

*Batrachospermum cayennense* MONTAGNE belongs to the section *Aristatae* SKUJA, and it was originally described based on the material from Cayenne, French Guiana. Later on, BOURRELLY (1964) reported this species from Madagascar, and KUMANO and RATNASABAPATHY (1982) studied the development of carposporophyte based on

materials collected from Malaysia. The section *Aristatae* is characteristic by possessing very long carpogonium-bearing branches. In the species we examined, the carpogonium-bearing branch is composed of 12-30 barrel-shaped cells, and longer than those reported by previous authors.

### 3. *Batrachospermum orthostichum* SKUJA (Figs. 18-27)

Frond monoecious, 7 cm high, 150-250  $\mu\text{m}$  wide, abundantly and irregularly branched, poorly mucilaginous. Axial cells cylindrical, 30-65  $\mu\text{m}$  wide, 200-350  $\mu\text{m}$  long. Whorls pear-shaped at the apex, cylindrical, compressed, touching each other at the middle and basal portions. 2-3 fascicles arising from the globose basal cell of primary branchlets. Primary branchlets dichotomously branched, consisting of 3-7 cell-stories; proximal cells of fascicles obovoid or barrel-shaped, distal cells spherical; hairs abundant, 1-2 in each terminal cell, short, with an inflated base. Secondary branchlets numerous, slightly curved, covering all the internodes. Spermatangia globular, 6-8  $\mu\text{m}$  in diameter, terminal or lateral on secondary



Figs. 18-27. *Batrachospermum orthostichum* SKUJA 18. Structure of whorls; 19. Part of a thallus showing a mature gonimoblast; 20. Structure of a whorl showing primary and secondary branchlets; 21. Detail of primary and secondary branchlets; 22. Spermatangia terminal on secondary branchlets; 23. Carpegonium-bearing branch with a young carpegonium; 24. Mature carpegonium with club-shaped trichogyne; 25. Fertilized carpegonium with spermatia; 26-27. Carposporangia terminal on gonimoblast filaments.

branchlets, rarely on primary branchlets. Carpegonium-bearing branch arising from the basal cell of primary branchlet, consisting of 3-5 barrel-shaped cells; carpegonium 36-47  $\mu\text{m}$  long; trichogyne club-shaped, indistinctly stalked. Bracts more or less numerous, short, composed of 1-5 barrel-shaped cells. Gonimoblast single, semiglobular, 60-110  $\mu\text{m}$  high, 140-220  $\mu\text{m}$  wide, higher than the whorl. Carposporangia obovoid, 8-11  $\mu\text{m}$  wide, 11-14  $\mu\text{m}$  long.

Specimen examined: E.C. Oliveira FILHO. SP-187101, 05/XII, 1974, Município of Areia Branca, Itabaiana Mountains, Serigipe State, Brazil.

Habitat: Epilithic in a mountain rivulet.

Distribution: Brazil.

SKUJA (1931) described and propose *B. orthostichum* as a new species based on the material collected from Santa Teresa in the State of Espírito Santo, and classified it as a member of the section *Setacea*. Since that time, this species was never reported again in the literature. The present information is, therefore, the second record for the species. *Batrachospermum orthostichum* is only known from Brazil, and it has been collected in several other localities, this fact suggests a more extense geographical distribution in Brazil than it was thought

formerly, and this species probably occur in other countries in the world. The specimen examined is very similar to that described and illustrated by SKUJA (1931).

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#### Resmo

Três táxons de *Batrachospermum* ROTH (Rhodophyta) do Município de Areia Branca, Estado de Serigipe, são estudados. *Bartrachospermum capense* STARMACH ex NECCHI

et KUMANO (Seção *Contorta*) é lectotipificado e *B. capense* STARMACH et NECCHI et KUMANO var. *braviarticulatum* NECCHI et KUMANO, var. nov., descrito com base no número de células do ramo verticilar e no tamanho do gonimoblasto. *B. orthostichum* SKUJA (Seção *Setacea*) é registrado pela segunda vez na literatura e *B. cayennense* MONTAGNE (Seção *Aristatae*) pela primeira vez no Brasil.

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## ネッシー O. Jr.\*・熊野 茂\*\*：ブラジルの淡水産紅藻 I. ブラジル北東部、セリジペ州のカワモヅク属 2 種 1 新変種について

STARMACH (1975) が *Batrachospermum capense* を記載する際、基準として用いた複数の標本のうちの 1 つが選定基準標本として選定された。

ブラジル北東部のセリジペ州、アレイア・ブランカ郡のイタバイアナ山地中の小流中から、カワモヅク属コントクタ節の 1 新変種 *B. capense* var. *braviarticulatum* が記載された。本新変種は基本変種に比較して、1 次輪生枝を構成する細胞数が少く、嚢果が小型であることで区別できる。現在までブラジル以外から報告のないセタケア節の *B. orthostichum* が上記の同じ小流中から発見され、これは本種の第 2 の報告である。また、アリストタエ節の *B. cayennense* がブラジル新産種として報告された。(\*01000 ブラジル サンパウロ 私書箱4005 植物研究所藻類部門, \*\*657 神戸市灘区六甲台町 神戸大学理学部生物学教室)