

**Studies on freshwater red algae of Malaysia IV.
Batrachospermum bakarens, sp. nov. from Sungai
Bakar, Kelantan, West Malaysia**

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The present paper deals with a part of collections of freshwater red algae from Sungai Bakar, Kelantan, West Malaysia. A new species, *Batrachospermum bakarens* (Rhodophyta, Nemalionales) is described here. This species may belong to the section *Viridia* and differs from others in this group, in having a slightly curved carpogonium-bearing branch with short bracts issuing unilaterally.

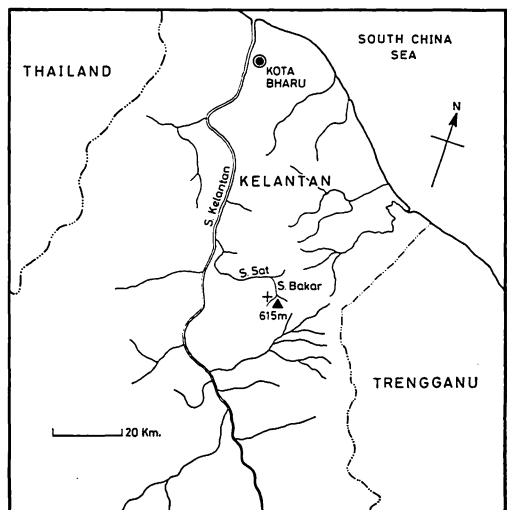
Key Index Words: *Batrachospermum bakarens* sp. nov.; freshwater Rhodophyta; Malaysia; taxonomy.

The wide distribution and diversity of the freshwater red algal flora of South-East Asia has been shown (KUMANO 1980), and the genus *Batrachospermum* is well known from Malaysia (RATNASABAPATHY 1974, 1981, 1982, KUMANO 1978, RATNASABAPATHY and KUMANO 1982a, 1982b, KUMANO and RATNASABAPATHY 1982), northern Australia (BAILY 1895) and Papua New Guinea (KUMANO and JOHNSTONE 1983, KUMANO 1983, KUMANO and WATANABE 1983). The present authors report here on a new species of *Batrachospermum* collected from Sungai Bakar, Kelantan, West Malaysia.

Location and Habitat

Sungai Bakar, lying between latitude 5°41' and 5°45'N, longitude 102°14' and 102°17'E in the state of Kelantan flows generally in a northwesterly direction through mostly primary forest-covered hills of the Hutan Simpan Ulu Sat before discharging into the Sungai Kelantan via Sungai Sat (Map 1).

Bukit Bakar, the highest hill in the area, is about 615 m above mean sea level. Recent disturbances of the forest and the stream by human activities are noticeable. The stream is subject to seasonal fluctuations in water



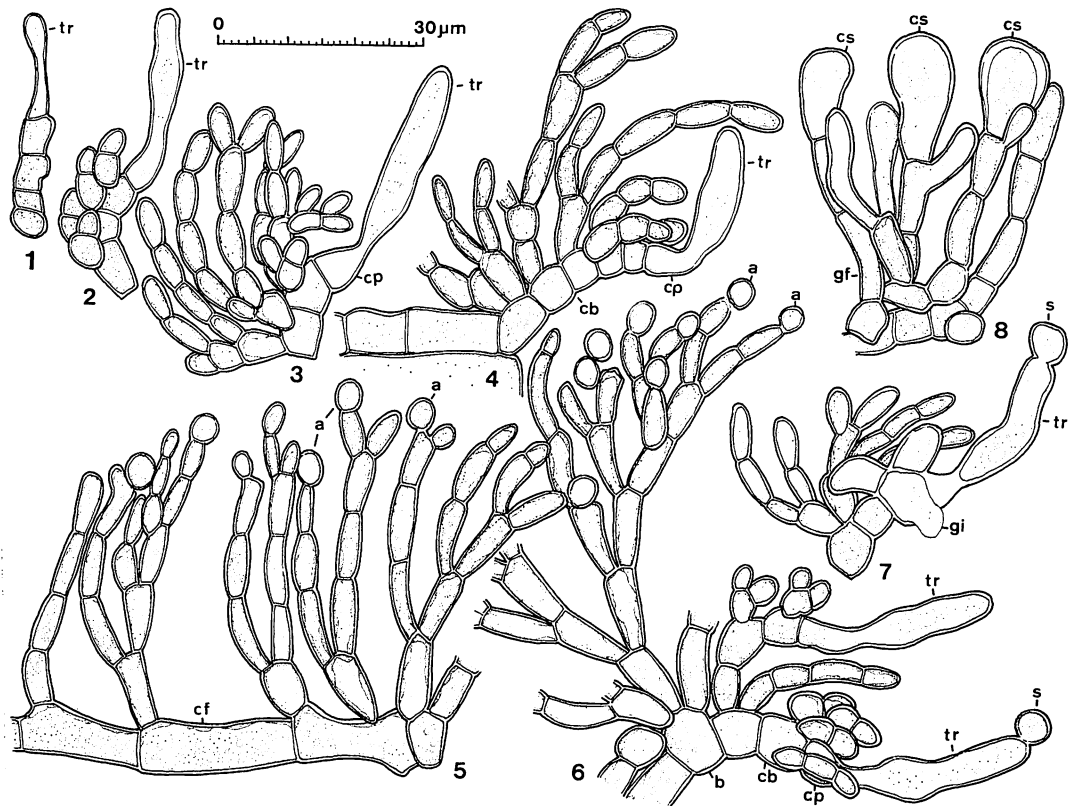
Map 1. The collecting site of *Batrachospermum bakarens*.

level and an inspection of the stream banks showed that during rainy monsoonal months the level may rise to a metre or more in the vicinity of the Forest Department Nursery located about 0.8 km below the site of collection of the alga. The stream bed varies in structure, consisting of granitic rocks, stones or sand, of riffles and some rock pools and cascades. At the time of collecting of the alga in the afternoon, the water was 5-35 cm deep, very clear, its temperature 26-27°C and pH 6.5.

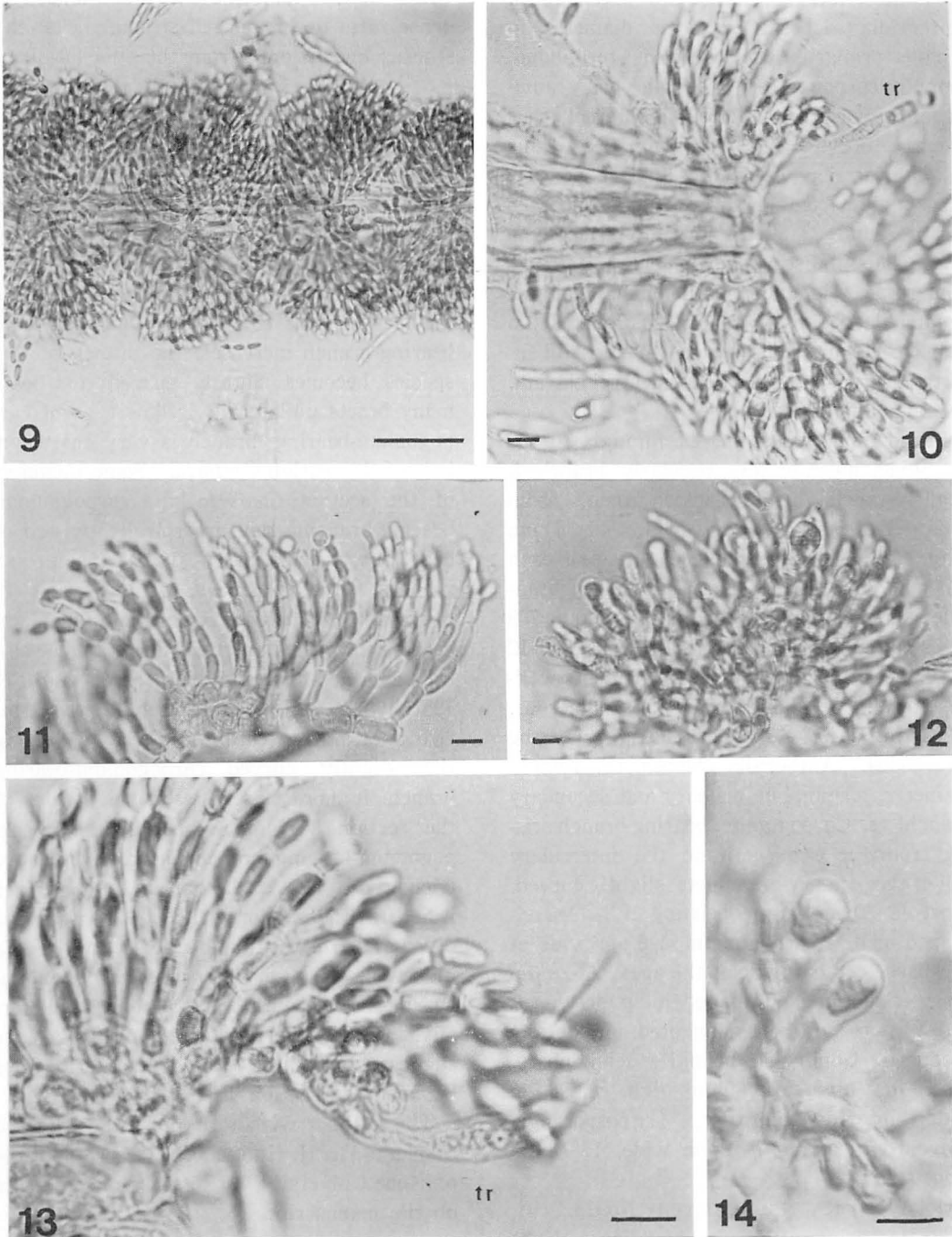
Discription of the Species

Batrachospermum bakarensense KUMANO et RANTASABAPATHY, sp. nov. (Figs. 1-8, 9-14)

Frons monoica, ca. 1.5 cm alta, 70-300 μm crassa, plus minisve regulariter ramosa, parum mucosa, atrovirens. Cellulae axiales cylindricae, 15-40 μm crassae, 40-130 μm longae. Verticilli doliiformes, in parte vetustiore frondis contigui. Ramuli primarii abundanter ramificentes, ex 7-9 cellulis constantes; cellulae fasciculorum fusiformes, 10-12 μm longae; pili nuli. Fila corticalia bene evoluta. Ramuli secundarii numerosi, ex 5-7 cellis



Figs. 1-8. *Batrachospermum bakarensense* KUMANO et RATNASABAPATHY, sp. nov. 1. A carpogonium-bearing branch with a young carpogonium; 2. An early stage in the development of the carpogonium-bearing branch; 3-4. A slightly curved carpogonium-bearing branch, showing bracts unilaterally issued and club-shaped trichogynes indistinctly stalked; 5. Antheridia terminal on the primary and secondary branchlets; 6. A part of thallus showing antheridia terminal on the primary branchlets and two carpogonium-bearing branches, one of which has developed as a lateral of the other; 7. An early stage in the development of gonimoblast filaments; 8. Carposporangia terminal on gonimoblast filaments. (a: antheridium, b: basal cell of primary branchlets, cb: carpogonium-bearing branch, cf: cortical filament, cp: carpogonium, cs: carposporangium, gi: gonimoblast initial, gf: gonimoblast filament, s: spermatium, tr: trichogyne).



Figs. 9-14. *Batrachospermum bakarense* KUMANO et RATNASABAPATHY, sp. nov. 9. Structure of whorls; 10, 13. A part of thallus showing an axial cell, primary branchlets and a carpoogonium-bearing branch with a fertilized carpoogonium; 11. Antheridia terminal on secondary branchlets; 12, 14. Carposporangia terminal on gonimoblast filaments. (Scale: 100 μm for Fig. 9, 10 μm for figs. 10-14) (tr: trichogyne).

constantes, totum internodium obtengentes. Antheridia globosa, ca. $4\ \mu\text{m}$ diametro, in ramulis primariis et secundariis terminalia. Ramulis carpogoniferi e cellulis basi ramulorum primariorum vel e cellulis intercalaribus orientes, breves, 12–30 μm longi, ex cellulis 2–5 doliiformibus constantes, parum curvati; carpogonium basi 4–6 μm crassum, apice 4–6 μm crassum, 23–36 μm longum; trichogyne claviformis, indistincte pedicellata. Bracteae numerosae, elongatae, unilateriter evolutae. Gonimoblasti singuli, semiglobosi, ca. 60 μm alti, ca. 90 μm crassi, in centro verticilli inserti. Carposporangia obovoidea vel clavata, 7–10 μm longa.

Frond monoecious, ca. 1.5 cm high, 70–300 μm wide, more or less regularly branched, slightly mucilaginous, blackish green. Axial cells cylindrical, 15–40 μm wide, 40–130 μm long. Whorls barrel-shaped, touching each other in older part of frond. Primary branchlets abundantly branched, consisting of 7–9 cell stories; cells of fascicles fusiform, 10–12 μm long; hairs none. Cortical filaments well-developed. Secondary branchlets numerous, consisting of 5–7 cell-stories, covering all the internodes. Antheridia globosa, ca. $4\ \mu\text{m}$ in diameter, terminal on primary and secondary branchlets. Carpogonium-bearing branch arising from the basal cell and the intercalary cell of the primary branchlets, slightly curved, short, 12–30 μm long, consisting of 2–5 barrel-shaped cells; carpogonium 4–6 μm wide at the base, 4–6 μm wide at the apex, 23–36 μm long; trichogyne clubshaped, indistinctly stalked. Bracts numerous, elongated, unilaterally produced. Gonimoblast single, semiglobose, ca. 60 μm high, ca. 60 μm high, ca. 90 μm wide, inserted centrally. Carposporangia obovoid or clavate, 7–10 μm wide, 13–18 μm long.

Holotype: RATNASABAPATHY No. 13, 3/VI, 1982, Herbarium of Faculty of Science, Kobe University. Isotype: RATNASABAPATHY No. 3, 3/VI, 1982, Herbarium of Department of Botany, University of Malaya.

Type Locality: Sungai Bakar, Kelantan, West Malaysia.

Distribution: This species is gregarious,

localized, and epilithic; grows attached as dense tufts to submerged stream rocks and stones; known only from the type locality.

Discussion

Batrachospermom bakarensense may be assigned to the section *Viridia*, primarily on the basis of the short carpogonium-bearing branch composed of 2–5 barrel-shaped cells and of the club-shaped trichogyne. As the number of cells comprising a carpogonium-bearing branch increases, the branch of this species becomes slightly curved and bears many bracts unilaterally. This type of carpogonium-bearing branch is very characteristic of the section *Contorta*. Some members of the section *Contorta* have carpogonium-bearing branches that are spirally twisted or bent like a hook (SKUJA 1938). Some taxa such as *Batrachospermum tortuosum* and *B. tortuosum* var. *majus* whose carpogonium-bearing branches are only curved have also been assigned to this section (KUMANO 1978, 1982, 1983). *B. bakarensense* resembles the latter two taxa of the section *Contorta* in having the slightly curved carpogonium-bearing branch, it more closely resembles species of the section *Viridia* in having a short carpogonium-bearing branch and a club-shaped trichogyne. Hence, the present authors place it here in the section *Viridia*. *B. bakarensense* differs from other taxa of the section *Viridia* in having a slightly curved carpogonium-bearing branch with bracts produced unilaterally. The characteristics of *B. bakarensense* suggest that there are close relationships between the section *Viridia* and *Contorta*.

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熊野 茂*・M. ラトナサバパティ**： マレーシア産淡水産紅藻 IV. 西マレーシア，ケランタン州
バカール川の *Batrachospermum bakareense* sp. nov.

タイ国との国境近くのケランタン河の小支流バカール川から、カワモヅク属グリディア節の1新種 *Batrachospermum bakareense* が記載された。本種の造果器をつける枝は片側のみに側枝をもち僅かに彎曲する。本節の他の種から本種を特徴づけるこの形質から、本種はグリディア節とコントルタ節との密接な類縁関係を示す中間型と推察される。(*657 神戸市灘区六甲台 神戸大学理学部生物学教室, **マレーシア クアラ・ルンブール マラヤ大学植物学教室)