

Studies on the freshwater Rhodophyta of Papua New Guinea I.\*  
*Batrachospermum nova-guineense* sp. nov.  
from the Papuan Lowlands

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A new species, *Batrachospermum nova-guineense* (Rhodophyta, Nemalionales), from the Papuan lowlands is described. This species belongs to the section *Moniliformia* and differs from others in this group in having a slightly curved carpogonium-bearing brach with well-developed bracts issued unilaterally.

*Key Index Words:* *Batrachospermum nova-guineense* sp. nov.; freshwater Rhodophyta; Papua New Guinea; taxonomy.

In recent years the terrestrial flora of Papua New Guinea has received considerable attention (GRESSITT 1982, PAIJMANS 1976); however, the freshwater algal flora remains relatively unknown. In the three and a half decades since the end of the Second World War, fewer than a dozen publications on the freshwater algae of New Guinea have appeared (JOHNSTONE *et al.* 1980). Despite the wide distribution and diversity of the freshwater red-algal flora of South-East Asia (KUMANO 1980), only one record for this algal group had been reported for New Guinea. This record was for an unnamed species of *Batrachospermum* from the Papuan lowlands (JOHNSTONE *et al.* 1980). *Batrachospermum* is well known from other South-East Asian areas (KUMANO 1980, RATNASABAPATHY and KUMANO 1982a, 1982b, KUMANO and RATNASABAPATHY 1982) and northern Australia (BAILY 1895), and the discovery of *Batrachospermum* in New Guinea was therefore not surprising. Subsequent study has shown

this *Batrachospermum* to be an undescribed species. In the present paper this new species is described in more detail, a holotype for the species is determined and a specific epithet and Latin description are given.

#### Location and Habitat

Specimens were collected in the Papuan coastal lowlands from Ove Ove Creek, a permanent tributary of the Veimauri River (PNG CMB sheet 8379, edition 1). The plant communities of this area of Papua New Guinea have been previously described in detail (MABBUTT *et al.* 1965). Ove Ove Creek originates in the virgin tropical rain forest of the Mount Cemaron Range and flows through natural forest for its entire length except for a 1 km reach where it passes through a rubber plantation. Specimens were collected at the downstream edge of the rubber plantation, where Ove Ove Creek crosses the main Port Moresby-Bereina Highway, on 9 August 1979 in the middle of the dry season. The water depth at the collecting

\* Dedicates to Prof. Munenao KUROGI on the occasion of his academic retirement.

site ranged from 20 to 40 cm, there was a steady current (ca. 10 m/min.), water pH was 8.2 and water temperature was 26°C at 11:00 a.m. (JOHNSTONE *et al.* 1980). *Batrachospermum* plants were growing in both shaded and unshaded regions of the stream, although more plants occurred in the shaded regions. Plants attached to sunken logs and the leaves of *Aponogeton loriae* MARTELLI, an aquatic macrophyte endemic to the Central District of Papua New Guinea. Limited seasonal collections suggest that *B. nova-guineense* is a dry-season, from April to November, annual (JOHNSTONE *et al.* 1980).

### Diagnosis

*Batrachospermum nova-guineense* KUMANO et JOHNSTONE, sp. nov. (Figs. 1-11, 12-20)

Frons dioica, 2-5 cm alta, 300-550  $\mu\text{m}$  crassa, plus minisve irregulariter ramosa, valde mucosa, fusca vel galuca. Cellulae axiales cylindricae, 20-70  $\mu\text{m}$  crassae, 300-650  $\mu\text{m}$  longae. Verticilli ellipsoidei et distantes vel plus minusve compressi. Ramuli primarii abundanter ramificantes, ex 8-18 cellulis constantes; cellulae fasciculorum lanceolato-ellipticae, fusiformis vel ovoideae; pili nuli. Fila corticalia bene evoluta. Ramuli secundarii rari. Antheridia globosa, 6-7  $\mu\text{m}$  diametro. Ramuli carpogoniferi e cellulis basi ramulorum primariorum orientes, 20-100  $\mu\text{m}$  longi, ex cellulis 2-7  $\mu\text{m}$  doliiformibus constantes, leviter curve; carpogonium basi 3-5  $\mu\text{m}$  crassum, apice 4-8  $\mu\text{m}$  crassum, 16-24  $\mu\text{m}$  longum; trichogyne ellipsoidea, distincte pedicellata. Bractee numerosae, elongatae, unilateriter evolutae. Gonimoblasti singuli vel raro duo, globosi, 80-150  $\mu\text{m}$  diametro. intra verticillos inserti. Carposporangia ellipsoidea vel ovoidea, 9-12  $\mu\text{m}$  crassa, 12-17  $\mu\text{m}$  longa; carposporae globosae, 10-12  $\mu\text{m}$  diametro.

Frond dioecious, 2-5 cm high, 300-550  $\mu\text{m}$  wide, more or less irregularly branched, very mucilaginous, dull-green passing into greyish blue or grey changing into brown. Axial cells cylindrical, 20-70  $\mu\text{m}$  wide, 300-650  $\mu\text{m}$  long. Whorls ellipsoidal and distant from each other, sometimes more or less com-

pressed. Primary branchlets abundantly branched, consisting of 8-18 cells; cells of fascicles lanceolate-ellipsoidal, fusiform or ovoidal; hairs lacking. Cortical filaments well-developed. Secondary branchlets rare. Antheridia globose, 6-7  $\mu\text{m}$  in diameter. Carpogoniumbearing branch, arising from the basal cell of the primary branchlets and from the intercalary cells of the branch, 20-100  $\mu\text{m}$  long, consisting of 2-7 barrel-shaped cells, slightly curved; carpogonium 3-5  $\mu\text{m}$  wide at the base, 4-8  $\mu\text{m}$  wide at the apex, 16-24  $\mu\text{m}$  long; trichogyne ellipsoidal, distinctly stalked. Bracts numerous, elongated, unilaterally issued. Gonimoblasts single or rarely couple, globular, 80-150  $\mu\text{m}$  in diameter, inserted within a whorl. Carposporangia ellipsoidal or ovoid, 9-12  $\mu\text{m}$  wide, 12-17  $\mu\text{m}$  long; carpospores globose, 10-12  $\mu\text{m}$  in diameter.

Type locality: Ove Ove Creek (a Veimauri River tributary), Central District, Papua New Guinea (147°03'E, 9°02'S).

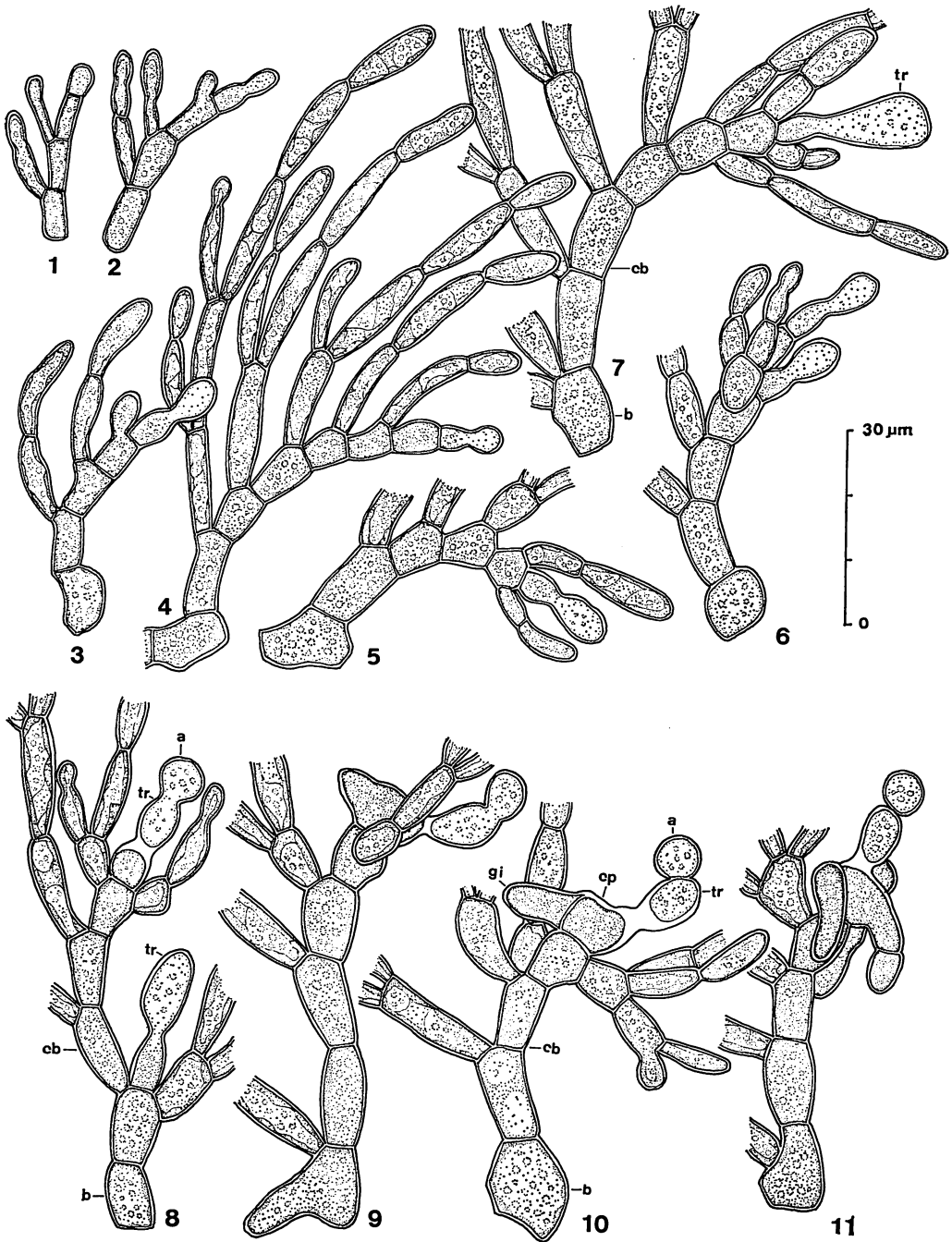
Holotype: JOHNSTONE PNG 413a, 9/VIII 1979, Herbarium of the University of Papua New Guinea (UPNG). Isotype: JOHNSTONE PNG 413b, 9/VIII 1979, Herbarium of Faculty of Science, Kobe University, Japan.

Habitat: This species grows on the submerged logs and leaves of aquatic macrophytes in a small, permanent, tropical lowland stream.

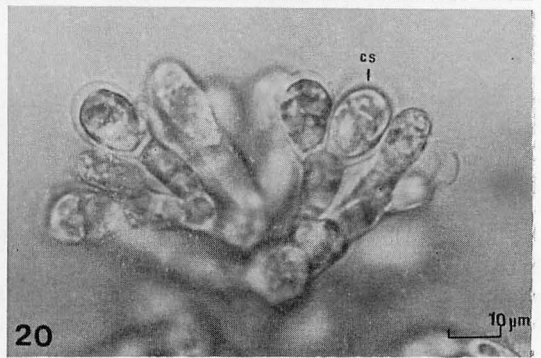
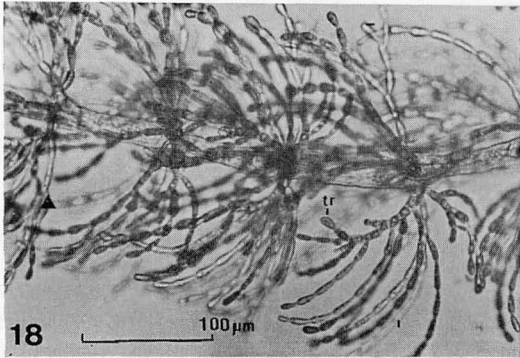
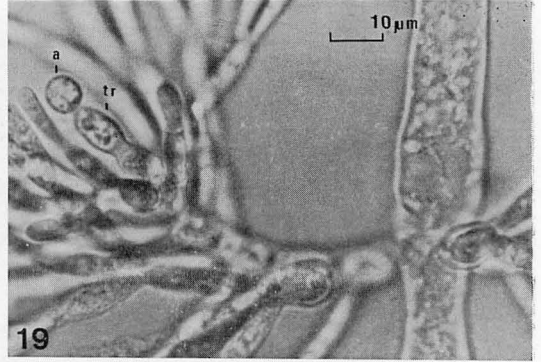
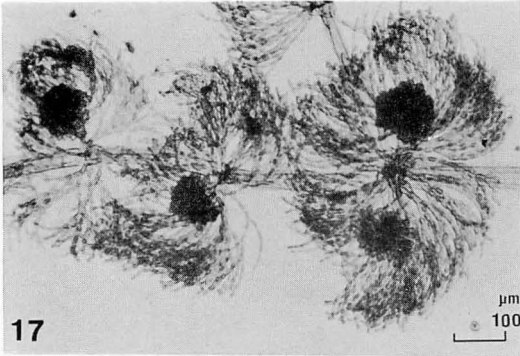
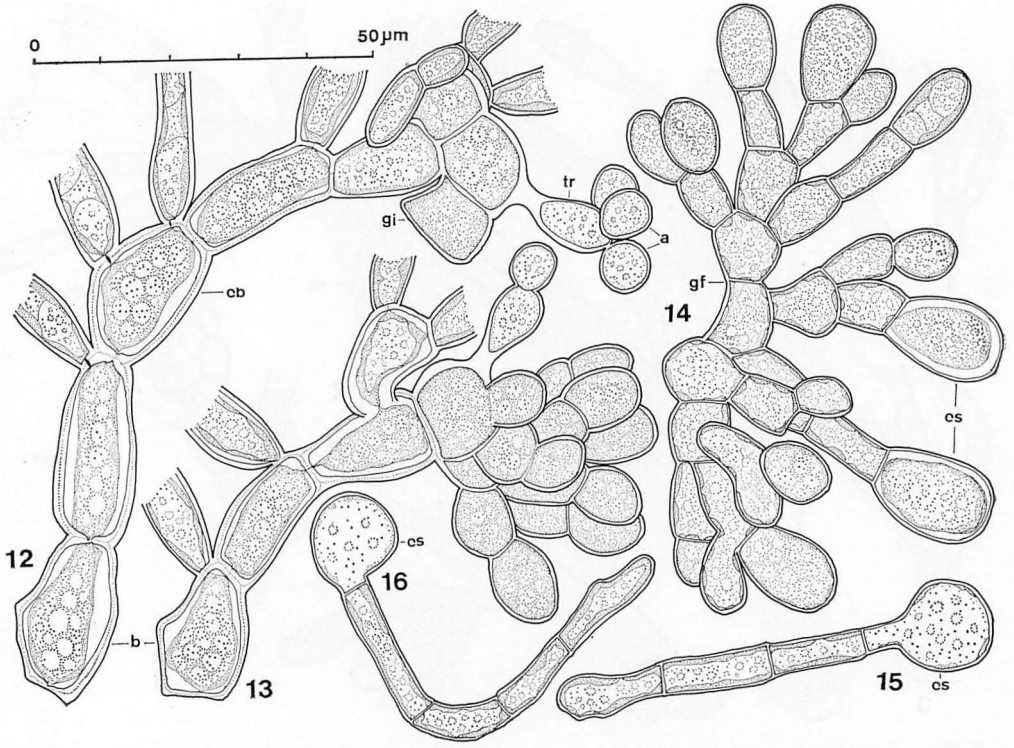
Distribution: Known from type locality only.

### Observations and Discussion

The carpogonium-bearing branch of this species is composed of 2-7 barrel-shaped cells; it arises from the basal cell of the whorl; sometimes the bracts also bear carpogonia (Figs. 6, 8). In the early stage of development, the terminal portion of the young carpogonium protrudes and becomes the rounded initial of the trichogyne (Figs. 1-4), it then develops into the ellipsoidal or urn-shaped trichogyne with a distinct stalk (Figs. 5-8). As the number of cells comprising a carpogonium-bearing branch in-



Figs. 1-11. *Batrachospermum nova-guineense* KUMANO et JOHNSSTONE, sp. nov. 1. A carpegonium initial and a carpegonium-bearing branch at a very early stage; 2-4. Early stages in development of slightly curved carpegonium-bearing branches with many elongated bracts issued unilaterally; 5-7. Mature carpegonium-bearing branches with the ellipsoidal or urn-shaped trichogynes; 8. A branch with mature and fertilized carpegonia; 9-11. The successive stages in development of the gonimoblast initials. (a: antheridium, b: basal cell of the whorls, cb: carpegonium-bearing branch, cp: carpegonium, gi: gonimoblast initial, tr: trichogyne)



creases, the branch becomes slightly curved and bears many bracts unilaterally (Figs. 3-7, 18, 19). After fertilization, the connection between the trichogyne and the carpogonium is closed (Figs. 8, 19). The carpogonium then enlarges, extends a lateral outgrowth (Fig. 9) and the gonimoblast initial is produced (Figs. 12-14, 20) and forms a gonimoblast inserted within a whorl (Fig. 17). The mode of the germination of the carpospore of this species is of the mediated filamentous type (Figs. 15-16), similar to that found in other *Batrachospermum* species.

JOHNSTONE *et al.* (1980) assigned *B. nova-guineense* to the section *Hybrida*, primarily on the basis of gonimoblast frequency per whorl. However, the carpogonium of *Batrachospermum virgato-decaisneanum*, a species representative of the section *Hybrida*, is borne somewhat laterally on the terminal portion of the carpogonium-bearing branch (SIRODOT 1884, KUMANO 1982) and it becomes asymmetrical and oriented sideways on the terminal cells of the carpogonium-bearing branch (KUMANO 1982). This type of carpogonium-bearing branch development is characteristic of the *Hybrida* and *Contorta* sections of the genus *Batrachospermum*. Because of carpogonium of *B. nova-guineense* is neither borne laterally nor is asymmetrical, this species cannot be assigned to the section *Hybrida*.

Members of the section *Contorta* have carpogonium-bearing branches that are spirally twisted or bent like a hook (SKUJA 1938). Some taxa whose carpogonium-bearing branches are curved, such as *Batrachospermum tortuosum* and *B. tortuosum* var. *majus*, also have been assigned to this section by KUMANO (1978, 1982). Although the carpogonium-bearing branch of *B. nov-guineense* is slightly curved, we believe it most resembles that

characteristic of the section *Moniliformia*. For example, the carpogonium-bearing branch produces many well-developed bracts whose cells are more or less barrel-shaped compared with the ovoid to cylindrical cells of the other primary branchlets; the carpogonium bearing branch is only slightly curved and the trichogyne is symmetrical and in the plane of the curve of the branch upon which it is borne. Therefore, *B. nova-guineense* is best assigned to the section *Moniliformia*. The characteristics of *B. nova-guineense*, however, suggest that there are close phylogenetic links between the sections *Contorta*, *Hybrida* and *Moniliformia*.

As mentioned previously, *B. nova-guineense* differs from other taxa of the *Moniliformia* in having a slightly curved carpogonium-bearing branch with bracts issued unilaterally. It should be noted that this species cannot be keyed to the *Moniliformia* with the standard key of BOURRELLY (1970) due to its limitation having normally only one gonimoblast per whorl.

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Figs. 12-20. *Batrachospermum nova-guineense* KUMANO et JOHNSTONE, sp. nov. 12-13. Early stages in development of the gonimoblast filaments; 14. Carposporangia terminal on gonimoblast filaments; 15-16. Young germlings of mediate filamentous type; 17. Structure of whorls showing cystocarps inserted within the whorls; 18-19. Slightly curved carpogonium-bearing branches with many elongated bracts issued unilaterally; 20. Carposporangia terminal on radially branched gonimoblast filaments. (a: antheridium, b: basal cell of the whorls, cb: carpogonium-bearing branch, cs: carposporangium or carpospore, gf: gonimoblast filaments, gi: gonimoblast initial, tr: trichogyne)

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熊野 茂\*\*・I. M. ジョンストン\*\*\*: パプア・ニュー・ギニアの淡水産紅藻 I.  
低地産 *Batrachospermum nova-guineense*, sp. nov. について

パプア・ニュー・ギニア低地のベイマウリ河の支流オベ・オベ・クリーク (ポート・モレスビーの西北約 50 km) から、カワモツク属の 1 新種 *Batrachospermum nova-guineense* (紅藻・ウミゾウメン目) が記載された。本種は *Moniliformia* 節に属し、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、*Moniliformia* 節と *Hybrida* 節と *Contorta* 節との類縁関係が推察できる。(\*\* 657 神戸市灘区六甲台 神戸大学理学部生物学教室, \*\*\* ニュー・ジーランド ハミルトン 私書函 445 ニュー・ジーランド電力局)