Three new species of *Batrachospermum* Roth (Batrachospermaceae, Rhodophyta) in China*

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**Abstract** Three new species of *Batrachospermum* Roth (Batrachospermales, Rhodophyta) from China are described in this paper. *B. yunnanense* sp. nov. has long-cylindrical trichogynes with long stalks and is diagnostic of section *Virescentia*. Within this section, *B. yunnanense* is similar to *B. helminthosum* Bory emend. Sheath *et al.*, but it is dioecious and has curved carpogonial branches, while the latter is monoecious and has straight carpogonial branches. It is also similar to *B. transtaganum* Reis, but it differs from the latter in long carpogonia, big carposporophytes and carposporangia. It is considered that *B. nothocladoideum* sp. nov. is assigned to section *Contorta*, subsection *Kushiroense*, because its carpogonial branches are twisted and gonimoblast filaments are loosely agglomerated. This new species similar to *B. iriomotense* Kumano, but with short fascicles, long-ovoid or subpyriform cells, numerous terminal hairs, long-ellipsoid trichogynes, big carposporophytes and small carposporangia. The plant is quite tough and cartilaginous and similar to *Nothocladus* in gross morphology, but its carposporophytes are compact instead of diffuse. This shows that it may be a transitional species between section *Contorta* and genus *Nothocladus*. So, *B. transitorium* sp. nov. should belong to section *Contorta*, subsection *Kushiroense*, because of its curved or twisted carpogonial branches and loosely agglomerated gonimoblast filaments, with globose or subglobose cells in fascicles similar to *B. spermatiophorum* Vis et Sheath, but no colourless spermatiophores. In terms of small and numerous carposporophytes, *B. transitorium* sp. nov. is similar to some species of section *Batrachospermum*. However, their other features are unique, indicating its transitional nature between section *Contorta* and *Batrachospermum*.

**Key words:** freshwater red algae, *Batrachospermum*, *B. yunnanense* S. L. Xie et Z. X. Shi, *B. nothocladoideum* S. L. Xie et Z. X. Shi, *B. transitorium* S. L. Xie et Z. X. Shi, new species; China

**1 INTRODUCTION**

The first published records of genus *Batrachospermum* Roth in China are from Jao (1941), when eleven taxa were reported. Since then, Shi, Hu and Kumano (1993), Shi (1994a, 1994b), Hua and Shi (1996), Xie et al. (1999, 2003), Xie and Shi (2003) have described in more detail the species from China. To date, 23 taxa of *Batrachospermum* Roth in China have been reported, of which, *B. yunnanense*, *B. nothocladoideum* and *B. transitorium* are new species of this genus, and are described here.

**2 OBSERVATIONS**

2.1 *Batrachospermum yunnanense* S. L. Xie et Z. X. Shi, sp. nov. Fig. 1: 1–9

**Diagnosis:** Fila dioecious cum verticilli globosi vel obconici, remoti in fronde mascula et contigui in fronde feminea, 300–500 μm lato, 8–10 cellularum fasciculorum compositae. Spermatangia globosa, singulata vel binata, in summis et lateribus fasciculorum affixa, 5–6 μm diametro. Rami carpogonialis brevi, paulo curvi, e cellulis basalius fasciculorum secundarius aliando orientes, 1–4 cellulas longitudine; bracteis brevibus constantibus ex paucis cellulis; carpogonia 8–9 μm lato, 64–80 μm longitudine, trichogyne cylindrico, conspicuo longopedicello. Carposporophyta (gonimoblasti,

Plants dioecious, caespitose, mucilaginous, 2–3 cm high, alternate branched. Whorls globose or obconic, remote in male plants and confluent in female, mature whorls 300–500 μm in diameter. Fascicles 1–4-time dichotomously branched, 8–10 cells long; cells long-cylindrical, 25–40 μm long, 6–8 μm in diameter; terminal hairs absent. Secondary fascicles major, 1–3-time dichotomously branched, cells same as those of the fascicles. Axial cells 360–650 μm long, 60–70 μm in diameter; rhizoidal filaments well-developed, cylindrical. 34–48 μm long, 6–7 μm in diameter.

Spermatangia globose, single or in pairs, terminal or lateral on vegetative fascicles, 5–6 μm in diameter. Carpogonial branches curved, arising from the base of fascicles or sometimes from the base of secondary fascicles, 1–4 cells in length; cells 6–10 μm long, 7–8 μm in diameter, with short involucral filaments; carpogonia 64–80 μm long, 8–9 μm in diameter; trichogyne long-cylindrical, with long

Fig. 1 *Batrachospermum yunnanense* S. L. Xie et Z. X. Shi
1. primary fascicle; 2. apex of a primary fascicle, showing antheridia; 3–5. different stages of carpogonia; 6 and 7. part of a carposporophyte, showing carposporangia; 8. part of a female frond, showing shape of whorls and location of carposporophytes; 9. part of a male frond, showing shape of whorls