

# New Record of Freshwater Red Algae (Rhodophyta) in Thailand: *Batrachospermum cayennense* Montague Ex Kützing

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The first records of freshwater algae for Thailand were published in "Flora of Koh Chang" by Johannes Schmidt (1900-1916), which included 98 genera, 418 species, 119 varieties, and 9 forms of Cyanophyta, Chlorophyta, Chromophyta and also Rhodophyta.<sup>1</sup> The majority of the Rhodophyta are marine, but a few genera have representatives in freshwater. Many of these are found in alpine or subalpine streams.<sup>2</sup> The first species of Rhodophyta in Thailand, recorded in 1901, was *Batrachospermum monifliforme* Roth var. *confusum* (Hass), from Koh Chang, Trat Province.<sup>1</sup>

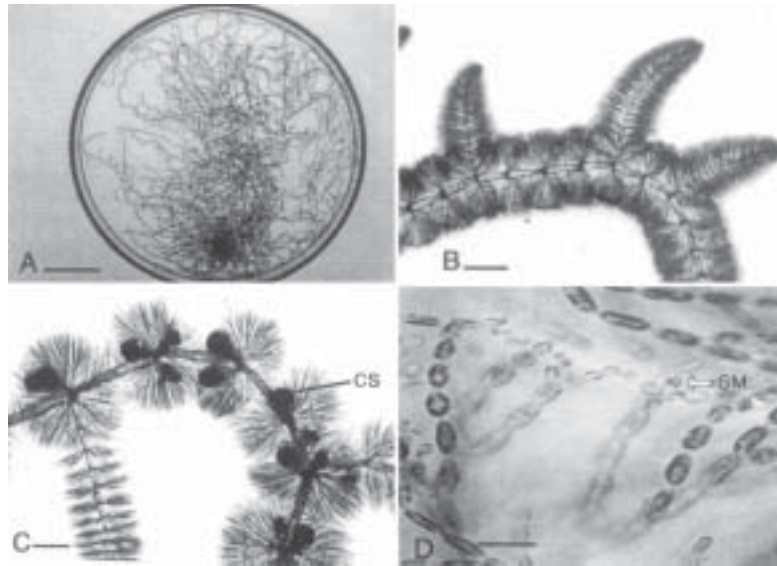
*Batrachospermum* species are freshwater red algae generally attached to rocks in slow-flowing streams and fountains in tropical, sub-tropical and temperate regions.<sup>3</sup> In Thailand, 3 species have been reported, viz *Batrachospermum monifliforme* Roth var. *confusum* (Hass)<sup>1</sup>, *B. macrosporum* Montague, and *B. vugum* Agardh.<sup>4</sup> In Malaysia, 7 species have been recorded, viz *B. bakarensis*, *B. crispatum*, *B. cylindro-cellulare*, *B. gibberosum*, *B. gombakense*, *B. hirosei* and *Batrachospermum* sp.<sup>5</sup>

The thallus of *Batrachospermum* is macroscopically moniliform with an evident central axis. Its texture is gelatinous and its color is usually dark gray-green or blue-green. Older portions of a thallus consist of a single axial row of large cells, densely clothed with simple or forked vertical branches, and bearing globose clusters of lateral branches. In this genus, sexual reproduction involves female (carpogonial) cells and male (anteridial) units. The latter are small, non-motile cells produced in clusters at the tips of lateral branches. The carpogonium is a flask-like cell with an elongate tip, the trichogyne, which receives the spermatia. The shape and location of the carpogonium and the form of the trichogyne are specific characters which are of taxonomic value.<sup>6,7</sup> The spermatia travel with the water current and lodge on the trichogyne to bring about fertilization, which results in the gonimoblast. Terminal

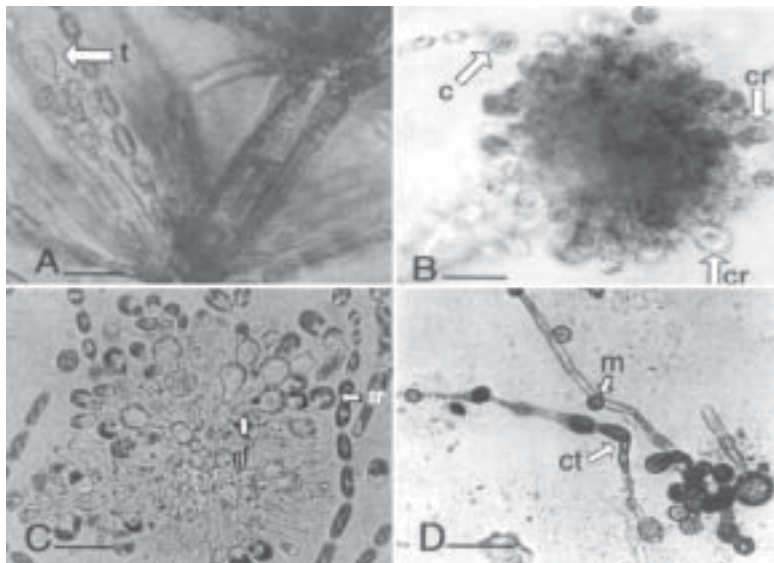
cells of the gonimoblast filaments cut off carposporangia, each producing a single carpospore. Each naked carpospore liberates, attaches to the substratum and germinates to form a Chantransia. At the Chantransia stage, reproduction is asexual by monospore. New filaments of *Batrachospermum* are formed as lateral outgrowths from the Chantransia stage.<sup>3</sup>

*Batrachospermum cayennense* Montague Ex Kützing was found in shallow streams in coniferous forest and hill evergreen forest at about 1,300 m above mean sea level at Phu Kradueng National Park, Loei Province. It is a new record in Thailand. It is present in water with low light intensity and low temperature (16-28 °C), with alkalinity of 4.0-7.0 mg/l as CaCO<sub>3</sub> and pH 5.0-6.0.

The thallus of *B. cayennense* Montague Ex Kützing in the specimens collected was highly to moderately mucilaginous, 7-13 cm long and 1,325-2,025 mm wide, irregularly branched; whorls dense, pear-shaped, compressed, contiguous (Fig 1A, 1B, 1C). Fascicles 2-3, branchlets straight, 12-15 cell-stories, proximal cells cylindrical or ellipsoidal, 6.25-11.25 mm wide, 22.5-35.0 mm long, distal cells ellipsoidal, semispherical, 4.5-12.0 mm wide, 6.25-13.75 mm long, terminal hairs numerous. Spermatangia spherical or ovoidal, 2.50-6.25 mm in diameter, terminal or sub-terminal on fascicles (Fig 1D); carpogonium branches numerous; carpogonia 5.00-8.75 mm wide at the apex, 7.50-11.25 mm long, trichogyne club-shaped and ellipsoidal sessile (Fig 2A); carposporophytes pedunculate, single or in couples, spherical, 87.5-132.5 mm in diameter, in middle or outer third of whorl (Fig 1C, 2B); carposporangia obovoidal or club-shaped, 8.0-12.5 mm wide, 8.0-15.0 mm long with carpospore (Fig 2B, 2C); chantransia stage (2n) produced monospore (n); monospore spherical or ovoidal 2.5-7.5 mm wide, 7.50-8.75 mm long (Fig 2D). Meiotic division form erect macrothallus stage (Fig 1B).



**Fig 1.** *Batrachospermum cayennens* Muntang ex Kützing.  
 A. Gross appearance. Scale bar = 2 cm  
 B. Gametophyte plant. Scale bar = 200  $\mu$ m  
 C. Carposporophyte (cs). Scale bar = 200  $\mu$ m  
 D. Fascicle with spermatangia (sm) at the branch tips.  
 Scale bar = 200  $\mu$ m



**Fig 2.** A. Mature carpegonium with inflated trichogyne (t).  
 B. Mature gonimoblast with carposporangia (cr) and carpospore (c).  
 C. Squash of the mature gonimoblast: gonimoblast filaments (gf) and carposporangia (cr).  
 D. Chantransia stage, showing monospore (m). Scale bar = 20  $\mu$ m

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## REFERENCES

1. Lewmanomont K, Wongrat L and Supanwanid S (1995) *Algae in Thailand*. Office of Environmental Policy and Planning, Ministry of Science, Technology and Environment, Bangkok, Thailand.
2. Prescott GW (1975) *Algae of the Western Great Lake Area*. WM C Brown Company Publisher. Idaho.
3. Singh SP, and Kashyap AK (1978) *Algae: An Introduction*. Kalayani Publishers, India.
4. Kunpradid T (2000) *Biodiversity of Phytoplankton and Macroalgae in Mae Sa Stream, Doi Suthep-Pui National Park, Chiang Mai Province*. M.Sc.Thesis, Chiang Mai University, Thailand.
5. Rokakuho U (1998) *Photomicrographs of the Freshwater Algae*. [http://hosting.interpia98.net/~cmlee/phytoplankton/fresh/c\\_p\\_fw.htm](http://hosting.interpia98.net/~cmlee/phytoplankton/fresh/c_p_fw.htm)
6. Smith GM (1950) *The Freshwater Algae of the United State*. 2<sup>nd</sup>ed., McGraw-Hill Book Co., New York.
7. Whitford LA and Schumacher GJ (1968) *A Manual of the Freshwater Algae in North Carolina*. The North Carolina Agricultural Experiment Station, USA.
8. Traichaiyaporn S (2000) *Water Quality Analysis* 2<sup>nd</sup> edition. Biology Department Faculty of Science Chiang Mai University Thailand.