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TAXONOMIC NOTES ON CALOGLOSSA MONOSTICHA AND CALOGLOSSA SAIGONENSIS (DELESSERIACEAE, RHODOPHYTA)

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INTRODUCTION

In a monographic treatment of the genus *Caloglossa* (Harvey) G. Martens (Delesseriaceae, Ceramiales, Rhodophyta) King and Puttock (1994) concluded that *C. saigonensis* T. Tanaka & Pham-Hoàng Hô was not separable at the species level from *C. continua* (Okamura) King & Puttock. They did, however, recognize three subspecies of *C. continua* in addition to the nominate subspecies, one being *C. continua* subsp. *saigonensis* (T. Tanaka & Pham-Hoàng Hô) King & Puttock. According to Art. 11.2 of the International Code of Botanical Nomenclature ("Tokyo Code," Greuter et al. 1994), names of taxa have priority only within their own rank. The basionym of *C. continua* is *C. leprieurii* (Montagne) G. Martens var. *continua* Okamura (1903a, 1903b), which means that it does not have priority over *C. saigonensis*, described by Tanaka and Pham-Hoàng Hô (1962) from Ho Chi Minh City [formerly Saigon], Vietnam. Therefore, if these two taxa are conspecific as proposed by King and Puttock (1994), *C. saigonensis* would be the correct name for this taxon.

Caloglossa monosticha Kamiya (in Kamiya et al. 1997), with a reported range of tropical Asia (Singapore) and Australia, was recently described with Derby, Western Australia, as the type locality. This species was reported to be closely related to and compared with *C. continua*. In light of the above demonstration that the name *C. continua* was predated by the name *C. saigonensis*, it became necessary to re-examine all three of these taxa, *C. continua*, *C. monosticha*, and *C. saigonensis*, as well as *C. leprieurii*, to determine their taxonomic relationships.

OBSERVATIONS

The following materials were used in this study:

1) Isotype, *Caloglossa leprieurii* (Montagne) G. Martens var. *continua* Okamura [= *C. continua* (Okamura) King & Puttock]. K. Okamura—Algae Japonicae Exsiccata 67; collected at the river mouth of Ko-yahagi-gawa, Mikawa, Japan; date not given (MICH).

2) *Caloglossa monosticha* Kamiya; Channel Island, Northern Territory, Australia: 22.ii.1994, *leg. J. Luong-Van Thinh NTU-143-A* (MICH). This collection was reported by Wynne and Luong-Van Thinh (1997).

3) Holotype, *Caloglossa saigonensis* T. Tanaka & Pham-Hoàng Hô; collected at Cau Chu Y (Cholon), near Saigon, Vietnam: 24.iv.1961, *leg. Tanaka & Pham-Hoàng Hô* (SAP 052172). The holotype, which was also examined by King and Puttock (1994), was originally deposited in KAG. Tanaka, however, transferred his holotypes from KAG to SAP prior to his death (M. Masuda, pers. comm.).

4) Isotype, *Caloglossa leprieurii* (Montagne) G. Martens; collected from French Guiana; *leg. Leprieur s.n.* (MICH).

Terminology follows that used by King and Puttock (1994) and Kamiya et al. (1995). Abbreviations of herbaria are according to Holmgren et al. (1990).

Okamura (1903a, 1903b) provided the following account to recognize his var. *continua* of *Caloglossa leprieurii*: "fronds decumbent, irregularly dichotomous or often subalternate, continuous (not constricted), slightly bending at apices toward the under surface". Subsequently, Okamura (1908) doubted that his var. *continua* merited recognition and thus merged it into *C. leprieurii*. Post (1936) treated this taxon as a forma, i.e., *C. leprieurii* f. *continua* (Okamura) Post. Tanaka (1992) accepted this treatment in his paper and described all reproductive stages of this entity. Tanaka stressed the alternate branching pattern and the absence of constriction at the node to separate f. *continua* from *C. leprieurii* f. *leprieurii*. In King and Puttock's (1994) monograph of *Caloglossa*, *C. leprieurii*, the type of the genus, and *C. continua* were separated from other species in the genus by their production of endogenous branches at the node and the absence of adventitious branches. *Caloglossa leprieurii* and *C. continua* in turn were distinguished by the fact that in *C. continua* a first lateral adaxial pericentral cell is present, which forms a short series of wing cells, from which rhizoids develop. These rhizoids are discrete (unfused). A comparable first lateral adaxial pericentral cell, however, is not formed in *C. leprieurii* (King & Puttock 1994; Kamiya et al. 1995), and rhizoids are produced from transverse and lateral pericentral cells of the nodal and first axial cells of the exogenous branches. These rhizoids become coalescent.

An examination of the nodal anatomy of *Caloglossa leprieurii* (isotype) confirmed the absence of the first adaxial lateral pericentral cell but its presence in material of *C. continua* (isotype), *C. monosticha* (the Darwin collection), and *C. saigonensis* (holotype) (Fig. 1). This observation has not been previously reported for *C. saigonensis*; the original description by Tanaka and Pham-Hoàng Hô lacks such detailed features. The presence or absence of the first adaxial pericentral is considered a 'stable' character, clearly differentiating *C. leprieurii* from the other three taxa. Thus, we can eliminate *C. leprieurii* from further discussion; however, the relationships among the remaining taxa in the *C. continua* complex still needs to be determined.

Kamiya et al. (1997) found no distinct morphological differences among the nine populations of *Caloglossa continua* and *C. monosticha* that they studied (*C. saigonensis* was not mentioned in their paper.) The only difference was in the number of cell rows from a nodal axial cell, that is, from the side opposite the formation of a primary branch. This character clearly differentiates Japanese *C. continua* and Australian *C. monosticha*. The Singapore specimens included in the study by Kamiya et al. (1997) were morphologically somewhat intermediate but closer to the Australian ones. Hybridization experiments revealed similar results. Japanese *C. continua* was reproductively isolated from the others. The Singapore

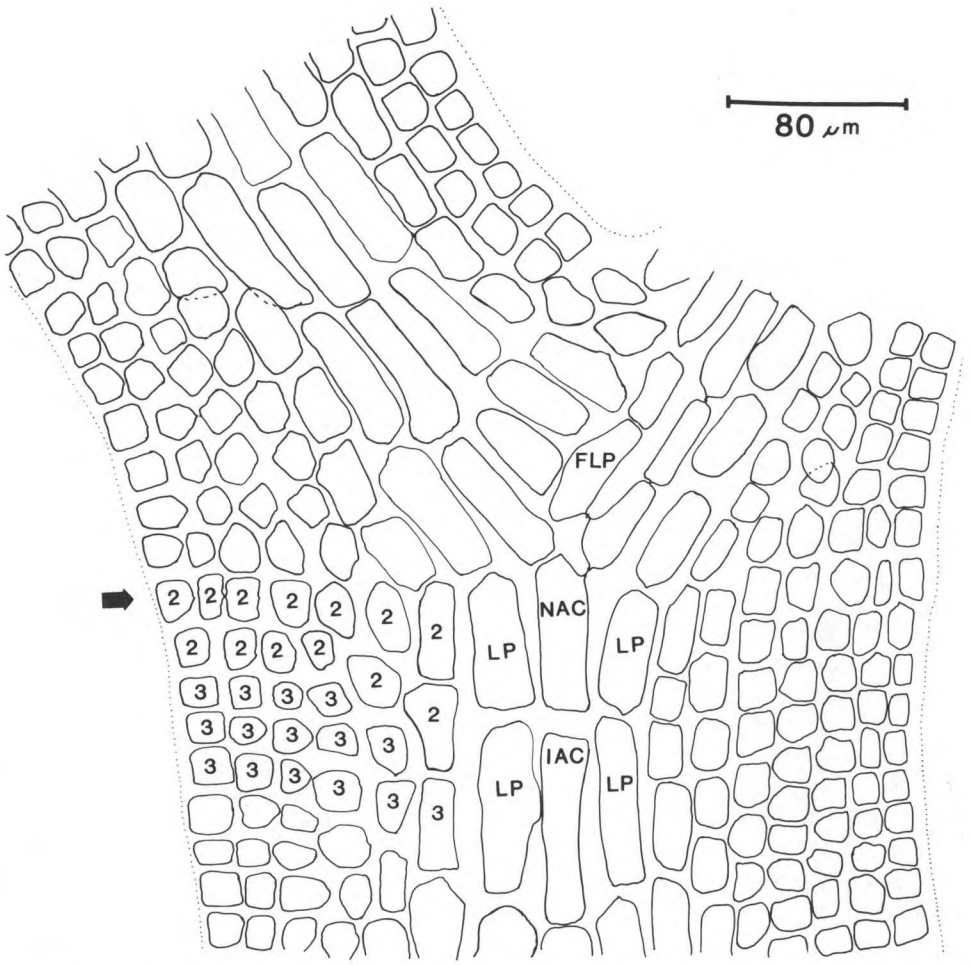

FIG. 1. *Caloglossa saigonensis*. Portion of holotype showing a region of blade with a single second-order cell row (indicated by the arrow) formed from a nodal axial cell opposite the formation of a branch. FLP: first adaxial lateral pericentral cell; IAC: internodal axial cell; LP: lateral pericentral cell; NAC: nodal axial cell; 2: cell of second-order row; 3: cell of third-order row.

specimens were also intermediate. Kamiya et al. (1997) concluded that the Singapore and Australian specimens belong to one species (*C. monosticha*) despite their reproductive isolation (albeit with the formation of pseudocystocarps).

Our examination of holotype material of *Caloglossa saigonensis* reveals that it has the same anatomical detail as *C. monosticha*, namely, the production of a single row of cells from a nodal axial cell on the side opposite the formation of a primary branch (Fig. 1). This is the critical characteristic shared by these two taxa and used to differentiate *C. monosticha* from *C. continua*.

King and Puttock (1994) used blade width to recognize four subspecies of *Caloglossa continua*. The nominate subspecies, subsp. *continua*, had thallus internodes usually 0.8–1.6 mm broad, whereas subsp. *saigonensis* had thallus internodes usually less than 0.5 mm broad. We observed blade widths of isotype material of *C. continua* (based on 10 measurements) to range from 0.7 to 1.0 mm. Blade width in the holotype of *C. saigonensis* (n=10) was 0.3–0.5 mm. Kamiya et al.

(1997) indicated a blade width of 0.5–1.4 mm for *C. monosticha*, while our measurements of the specimen from Darwin, Australia, showed a blade width of 0.6–1.2 mm. Various authors have considered blade width as being too variable a feature to be useful in separating species. Kamiya et al. (1995) noted that blade width demonstrated remarkable variability both in field-observed and cultured plants of *C. leprieurii*. Similarly for *C. monosticha*, Kamiya et al. (1997) observed that blade width can be influenced by environmental conditions and that blade constriction at the node and blade length were both variable under a range of culture conditions. Characters like nodal arrangment and branching are considered more stable.

Likewise, although the ability or lack of ability to form endogenous branches at the node is considered a reliable trait at species-level taxonomy (King & Puttock 1994), the number of so-formed endogenous branches is variable. Our own observations of the holotype of *Caloglossa saigonensis* showed endogenous branches to be formed only occasionally. Their number in *C. monosticha* was stated to range from 1 to 5 per node in field material and 1 to 10 in cultured specimens (Kamiya et al. 1997).

CONCLUSIONS

After examining the type specimen of *Caloglossa saigonensis* and comparing it with other species in the *C. continua* complex, we conclude that *C. monosticha* is conspecific with *C. saigonensis*. The primary reason for their conspecificity is that both taxa have a single axial (second-order) cell row derived from a nodal cell opposite the formation of an exogenous branch. This treatment distinguishes *C. saigonensis* from the morphologically similar *C. continua*, which is characterized by the formation of several second-order cell rows from a single nodal axial cell. *Caloglossa saigonensis* was considered as a subspecies of *C. continua* by King and Puttock (1994). Two other subspecies were recognized in that paper, subsp. *axillaris* and subsp. *postiae*. Regardless of its eventual taxonomic status, the fact that King and Puttock (1994) did not provide a figure for subsp. *postiae* renders that name invalid (Art. 39.1, Greuter et al. 1994). Future research should still clarify the status of the latter two proposed subspecies, but regardless of the eventual taxonomic decisions, neither of them has priority over *C. saigonensis* at the species level.

Disposition of Names

1. *C. leprieurii* (Montagne) G. Martens

2. *C. saigonensis* T. Tanaka & Pham-Hoàng Hô
   synonyms: *C. monosticha* Kamiya; *C. continua* subsp. *saigonensis* (T. Tanaka & Pham-Hoàng Hô) King & Puttock

3. *C. continua* (Okamura) King & Puttock
   synonyms: *C. continua* (Okamura) King & Puttock var. *continua*; *C. leprieurii* var. *continua* Okamura

Unresolved: *C. continua* subsp. *axillaris* King & Puttock

Not validly published: *C. continua* subsp. *postiae* King & Puttock

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