

NOTE

LAURENCIA MARILZAE (CERAMIALES, RHODOPHYTA)
FROM THE MEXICAN CARIBBEAN: A NEW RECORD
FOR THE TROPICAL WESTERN ATLANTIC

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ABSTRACT

Laurencia marilzae Gil-Rodríguez, Sentías & MT Fujii is recorded for the first time for the tropical western Atlantic Ocean, occurring in Isla Mujeres, Quintana Roo, Mexican Caribbean. The specimens were collected in November 2008 and June 2009, growing epilithically in the lower intertidal zone on moderately exposed rocky shores. This species is characterized by its distinctive yellow-orange color in the natural environment, four pericentral cells per vegetative axial segment, the presence of secondary pit-connections between adjacent cortical cells, which are markedly projecting at the apices, and by the presence of one “corp en cerise” per cell in all cells of the thallus: cortical, medullary, including pericentral and axial cells, and trichoblasts. Morphological similarities and molecular data support the determination of this material as *L. marilzae*. The present study expands the geographical distribution of *L. marilzae* to the Caribbean Sea in the tropical Western Atlantic Ocean.

The genus *Laurencia* was established by JV Lamouroux (1813) with the original recognition of eight species. *Laurencia obtusa* (Hudson) JV Lamouroux is the type species. *Laurencia* sensu lato comprises ~430 (160) described species (and infraspecific taxa), of which 134 have been considered as taxonomically accepted (Guiry and Guiry 2011), included in five genera: *Laurencia* sensu stricto, *Osmundea* Stackhouse (Nam et al. 1994), *Chondrophyucus* (Tokida & Saito in Saito 1967) Garbary & JT Harper (Garbary and Harper 1998), *Palisada* KW Nam (Nam 2007), and the recent genus *Yuzurua* (KW Nam) Martin-Lescanne (Martin-Lescanne et al. 2010), based on elevation of the subgenus *Yuzurua* KW Nam (Nam 1999).

Laurencia sensu stricto is characterized by the presence of four pericentral cells per vegetative axial segment, presence of pit-connections secondary between cortical adjacent cells, production of the first pericentral cell beneath the basal cell of the trichoblast, tetrasporangia formed from particular pericentral cells, without formation of additional fertile pericentral cells, spermatangial development of trichoblast-type with spermatangial branches produced from one of two laterals on the suprabaasal cells of trichoblasts, and five pericentral cells in procarp-bearing segments of female trichoblasts (Nam 2006). Of the 35 *Laurencia* sensu lato species recorded for the tropical and subtropical western Atlantic phycoflora (Wynne 2005), only 12 have been recognized from the Mexican Caribbean (Sentías and Fujii 2002).

Laurencia marilzae Gil-Rodríguez, Sentías & MT Fujii has an amphi-Atlantic distribution restricted to subtropical regions: Canary Islands, Spain, type locality (Gil-Rodríguez et al. 2009) and São Paulo, southeastern Brazil (Rocha-Jorge et al.

2010). The main morphological feature that characterizes the species is the presence of “corps en cerise” in all cells of the thallus. The species also exhibits cortical cells markedly projecting in apical portions of the thallus, in addition to all the typical characters of the genus. The distinctive yellow-orange color observed in the thalli from the type locality, growing in the intertidal zone, has been proven to be variable in that deep-water Brazilian specimens are pink-red. Here we report the presence of *L. marilzae* for the first time in the western tropical region of the Mexican Caribbean.

Transverse and longitudinal hand-sections were made from specimens fixed in 4% formalin solution with a stainless steel razor blade and stained with 0.5% aqueous aniline blue solution acidified with 1 N HCl (Tsuda and Abbott 1985). Photomicrographs were taken with a Sony W5 digital camera (Tokyo, Japan) coupled to a Nikon Eclipse E200 microscope (Tokyo, Japan). Voucher specimens are deposited in UAMIZ. Herbarium abbreviations follow Thiers (2009). Extraction, amplification, and sequencing of DNA followed the protocols of Díaz-Larrea et al. (2007). Phylogenetic relationships were inferred using PAUP* 4.0b10 (Swofford 2002) and MrBayes v.3.0 beta 4 (Huelsenbeck and Ronquist 2001). Maximum-parsimony trees were constructed using the heuristic search option and tree-bisection-reconnection branch swapping. The GTR+I+G model was used in the Bayesian analysis.

Material Examined.—Examined material was from Mexico, Quintana Roo, Isla Mujeres, collected on 16 November, 2008, leg. A Senties and MT Fujii (UAMIZ 1019), and on 10 June, 2009, leg. A Senties and KM Dreckmann (UAMIZ 1020).

Additional Material Examined.—*L. marilzae* (holotype TFC Phyc 13129), Punta del Hidalgo, northern Tenerife, Canary Islands, Spain, 12 July, 2006, leg. MC Gil-Rodríguez, A Senties, and MT Fujii; Laje de Santos, Marine State Park, Santos, São Paulo, Brazil 18 August, 2008, leg. R Rocha-Jorge (SP399826).

The plants form yellow-orange tufts when alive, up to 4 cm high, with terete axes, cartilaginous in texture, irregularly pyramidal in outline (Fig. 1A). Thalli are attached to the substratum by a discoid holdfast. Erect axes irregularly alternate and spirally arranged, usually with 2–3 orders of branches. The main axes measured 720–1056 μm diam in the mid-portions of the thalli. Trichoblasts are subdichotomously branched to three or four orders at the apex of each branch. A single corps en cerise is present in each cell of the thallus (trichoblasts, cortical and medullary cells, including axial and pericentral cells; Fig. 1B,C,E). In surface view, cortical cells are regularly arranged in longitudinal rows and connected to each other by longitudinally oriented secondary pit connections (Fig. 1D). Cortical cells are isodiametric-polygonal in the upper portions of the thalli and measure 22.5–55 μm long and 27.5–45 μm wide, at median longitudinal section through a branchlet, cortical cell walls near apices are markedly projecting (Fig. 1E,F).

In transverse section, thalli with one layer of pigmented cortical cells and four or five layers of colorless medullary cells (Fig. 1G). Cortical cells measure 30–55 μm long and 27.5–47.5 μm wide at mid-portions of the main branches. Medullary cells are rounded or slightly radially elongated, measuring 75–147.5 μm long and 40–100 μm wide at mid-portions of the main axes. Medullary cell walls are uniformly thickened, but lenticular thickenings are absent. Each vegetative axial segment cuts off four pericentral cells (Fig. 1H); the first pericentral cell is produced underneath the basal cell of the trichoblast (Fig. 1I). Reproductive plants were not observed. The spe-

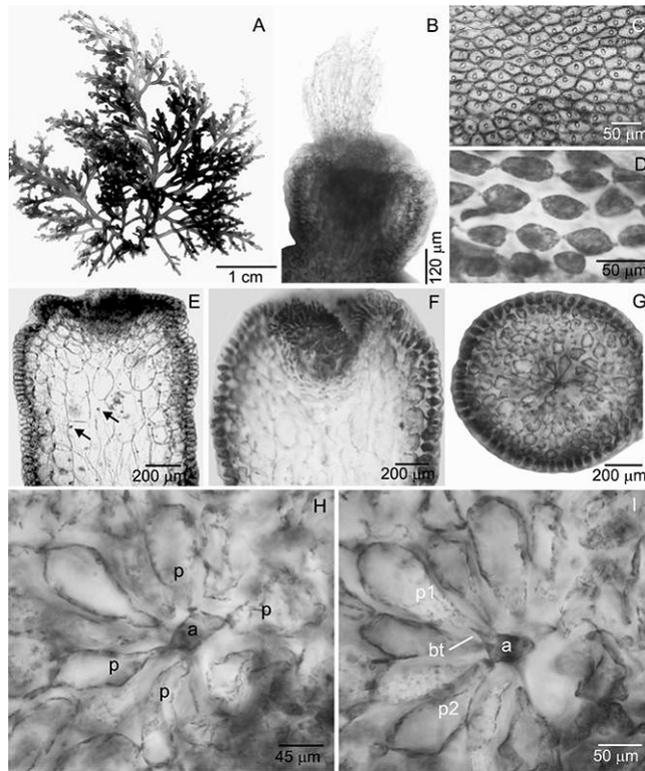


Figure 1. *Laurencia marilzae* from the Mexican Caribbean. (A) Habit of a plant. (B) Detail of a branchlet with trichoblasts. (C) Cortical cells in superficial view showing 1 corps en cerise per cell. (D) Cortical cells in surface view of the mid-portion of a branch with longitudinally oriented secondary pit connections. (E) Longitudinal section of a branch showing corps en cerise in medullary cells (arrows). (F) Longitudinal section of a branch showing projecting cortical cells near the apex. (G) Transverse section of a main axis. (H) Transverse section of the upper portion of a branch showing an axial cell (a) with 4 pericentral cells (p). (I) Transverse section near the apex of branchlet showing a vegetative axial segment with an axial cell (a) and 2 pericentral cells (p1, p2). Note the first pericentral cell (p1) produced underneath the basal cell of the trichoblast (bt).

cies grows in the lower intertidal zone among other turf algae at exposed sites, overhanging rocks subject to moderate wave action.

Specimens of *L. marilzae* from the Mexican Caribbean were compared with those described by Gil-Rodríguez et al. (2009), including the holotype, and Rocha-Jorge et al. (2010). Our specimens displayed high morphological similarity with the type material, sharing all vegetative characters, including the yellow-orange color of the thalli. The presence of the corps en cerise in the cortical cells and trichoblasts is characteristic for the *Laurencia* s.s. species, and the quantity in every cell can vary, although is not decisive to separate species. In this sense, Rocha-Jorge et al. (2010) recorded for the Brazilian *L. marilzae* species two corps en cerise for some cortical cells. It was not possible to compare the reproductive characters because fertile thalli were not found in the Mexican populations. The position of the first pericentral cell underneath the basal cell of the trichoblast is indicated for the first time for *L. marilzae*, a feature considered as diagnostic at the generic level by Nam (2006), being underneath the basal cell of the trichoblast in *Laurencia* and *Palisada* or on the side of the trichoblast basal cell in *Chondrophycus* and *Osmundea*.

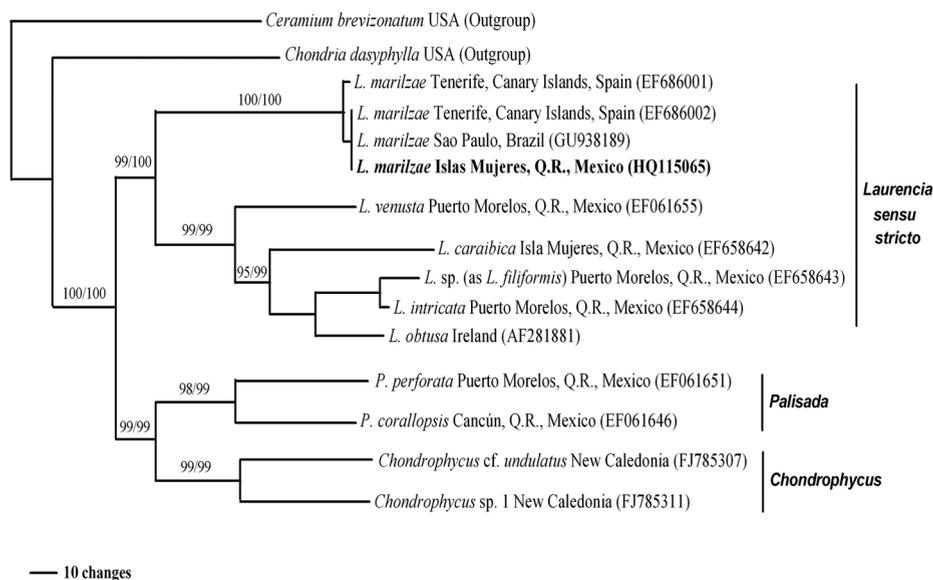


Figure 2. Phylogenetic relationships of the *Laurencia marilzae* specimens based on Bayesian analysis of *rbcL* DNA sequences. A fifty percent majority-rule consensus tree was computed after the “burn-in” point. The GTR+I+G evolutionary model was used in the Bayesian analysis, selected by a maximum-likelihood ratio test. Bootstrap (right) and Bayesian posterior probabilities (left) values are indicated at the nodes.

In the morphological sense, *L. marilzae* showed a similar habit compared with some species from the Mexican Caribbean, such as *Laurencia filiformis* (C Agardh) Montagne, *Laurencia microcladia* Kützing, and *L. obtusa*, and differed mainly in the presence of the corps en cerise and their characteristic yellow-orange color in situ.

The molecular analysis indicates that samples of *L. marilzae* from Mexico, Quintana Roo (HQ115065), Spain, Canary Island, Playa Paraíso (EF686001) and Punta del Hidalgo (EF686002), and Brazil, São Paulo, Santos, Laje de Santos State Marine Park (GU939189) form a well supported clade with low levels of genetic variation among *rbcL* sequences (0%–0.2%, Fig. 2).

This report expands the geographical distribution of *L. marilzae* to the Caribbean Sea and increases the number of Mexican Caribbean *Laurencia* complex species to 13.

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