

Short communication

## ***Laurencia caduciramulosa* (Ceramiales, Rhodophyta) from the Canary Islands, Spain: a new record for the eastern Atlantic Ocean**

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### **Abstract**

*Laurencia caduciramulosa* is recorded for the first time for the eastern Atlantic Ocean off Tenerife, Canary Islands, Spain. The specimens were collected in 2006, growing epilithically in the lower intertidal zone on moderately exposed rocky shores. This species is characterized by reduced size, a well-developed stolon-like basal system and erect axes with abundant deciduous branchlets that function as propagules, except on the uppermost portions of the branches, where they form crowns of branchlets. As in all other reports of this species, gametangia and sporangia were not observed. This study expands the geographical distribution of *L. caduciramulosa* to the eastern Atlantic Ocean.

**Keywords:** Atlantic Ocean; Canary Islands; geographical distribution; *Laurencia caduciramulosa*; taxonomy.

*Laurencia caduciramulosa* Masuda et Kawaguchi in Masuda et al. (1997) has been previously reported from Vietnam (type locality) (Masuda et al. 1997), Malaysia (Masuda et al. 2001), the Mediterranean Sea: Italy (Furnari et al. 2001, Gómez Garreta et al. 2001, Serio et al. 2006), France (Klein and Verlaque 2005), Greece (Tsirika and Haritonidis 2005), Indonesia (Liao et al. 2004) and Brazil (Cassano et al. 2006, 2007). Klein and Verlaque (2005) and Cassano et al. (2006) suggested recent intro-

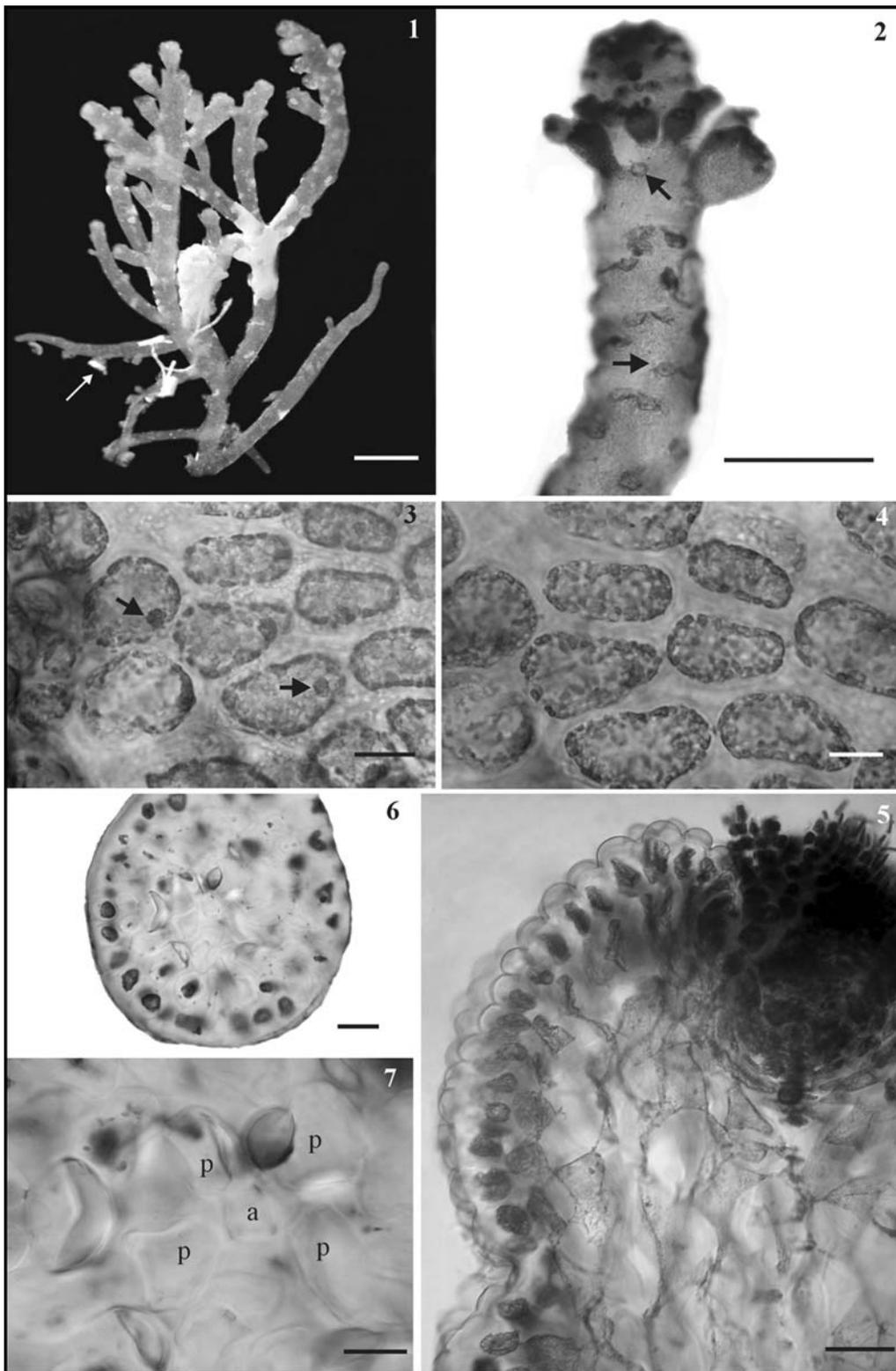
duction into the Mediterranean Sea and Brazil by transoceanic shipping and/or fouling, respectively.

We provide a report for the first time on the presence of *Laurencia caduciramulosa* in the eastern Atlantic Ocean off Tenerife, Canary Islands, Spain.

Transverse 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). The holotype specimen of *Laurencia caduciramulosa* was received on loan from SAP. Voucher specimens are deposited in herbaria TFC, HRJ and SP. Herbarium abbreviations follow the online *Index Herbariorum* (<http://www.nybg.org/bsci/ih/ih.html>).

Examined material was from Spain, Canary Islands, Tenerife, Punta del Hidalgo, on 12 July 2006, leg. M.T. Fujii, A. Senties and M.C. Gil-Rodríguez (TFC Phyc 13205, SP 371.799, HRJ 10983). Additional material examined, *Laurencia caduciramulosa* (holotype SAP 062086), was from Hon Tre Island, Tien Hai Islands, Hatien, Kien Giang Province, Vietnam, on 7 February 1993, leg. M. Masuda and S. Kawaguchi.

The plants were epilithic, soft in texture, forming garnet-brown, cushion-like tufts, up to 5 mm high. Several erect axes arising from a discoid holdfast and from well-developed stolon-like branches attached to substrata by secondary and smaller discoid holdfasts (Figure 1). Erect axes are terete throughout, sparsely branched, mainly in the lower portions of the thalli, with few long first-order branches. Anastomoses between branches are frequent. The main axes measure 384–608  $\mu\text{m}$  in diameter in the mid-portions of the thalli. Branching is irregularly alternate and spirally arranged, usually with 2–3 (–4) orders of branches. The ultimate branchlets are clavate and deciduous, detaching easily from the branches and leaving many scars, except at the uppermost portions of the branches, where they can form crowns of branchlets (Figure 2). These branchlets are basally constricted, 128–520  $\mu\text{m}$  long and 95–384  $\mu\text{m}$  in diameter at the tips. In surface view, epidermal cells are longitudinally elongate in the mid-portions, measuring 37.5–95  $\mu\text{m}$  long and 22.5–40  $\mu\text{m}$  wide, with one *corp en cerise* per cell (Figure 3). Epidermal cells are secondarily pit-connected (Figure 4) and projecting near branch apices (Figure 5). In transverse section, epidermal cells are 17.5–37.5  $\mu\text{m}$  long and 22.5–37.5  $\mu\text{m}$  wide, and medullary cells are 40–105  $\mu\text{m}$  long and 30–75  $\mu\text{m}$  wide, with abundant lenticular thickenings (Figure 6). Pericentral cells number four per vegetative axial segment (Figure 7). Neither gametangia nor sporangia were observed.



**Figures 1–7** *Laurencia caduciramulosa* from the Canary Islands.

(1) Habit of a plant. Note the stolon-like branch with smaller discoid holdfasts (arrow). (2) Upper portion of main branch with small deciduous branchlets forming a crown near the apex and scars of shed branchlets (arrows). (3) Epidermal cells (in preserved material) in surface view, showing single *corp en cerise* per cell (arrows). (4) Epidermal cells in surface view of the middle portion of a branch with longitudinally oriented secondary pit connections. (5) Longitudinal section of a branch showing projected epidermal cells. (6) Transverse section of the middle portion of a branch with lenticular thickenings in the walls of medullary cells. (7) Detail of the upper portion of a branch with an axial cell (a) with four pericentral cells (p). Scale bars: 1 mm in Figure 1; 500  $\mu\text{m}$  in Figure 2; 25  $\mu\text{m}$  in Figures 3–4; 50  $\mu\text{m}$  in Figure 5; 20  $\mu\text{m}$  in Figures 6–7.

The species lives in the lower intertidal zone associated with turfs of articulated Corallinaceae, at moderately exposed sites.

Specimens are in agreement with the holotype (examined) and descriptions given by Masuda et al. (1997, 2001), Furnari et al. (2001), Klein and Verlaque (2005) and Cassano et al. (2006). As in all previous reports of *Laurencia caduciramulosa*, reproductive structures (gametangia and/or sporangia) were not found in the Canarian specimens. According to Cassano et al. (2006), such reproductive structures seem to be efficiently replaced by the vegetative propagules formed by the deciduous branchlets. The occurrence of these propagules is likely important for the dispersal of *L. caduciramulosa*, which has undergone recent geographical expansion.

With increases in transoceanic shipping and, in particular, on shipping routes between the Canary Islands and the Mediterranean Sea (where *Laurencia caduciramulosa* is regarded as an introduced species), it is reasonable to propose transmission by ocean-going vessels from the Mediterranean Sea to the Canaries. However, considering the small size and the very low abundance of *L. caduciramulosa* in the Canaries, it is difficult to determine whether this is a recent introduction, as the species may have been overlooked in the past. Further collecting should be made to determine whether *L. caduciramulosa* is spreading to other sites in the Canary Islands.

The species was originally an element of the tropical Indo-Pacific flora and has since then been reported in the Atlantic Ocean north and south of the equator. Serio et al. (2006) observed an increased proportion of tropical Indo-Pacific elements off Linosa Island in the Mediterranean Sea, among them *Laurencia caduciramulosa*. It is possible that these floristic changes relate to global warming.

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