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CENTROCEROCOLAX UBATUBENSIS (CERAMIACEAE, CERAMIALES), AN ADELPHOPARASITIC RED ALGA NEW TO THE CARIBBEAN SEA

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ABSTRACT: The monotypic red algal adelphoparasite *Centrocerocolax ubatubensis* Joly (Ceramiaceae, Ceramiales), has been reported only from the coasts of southern Brazil. We report it for the first time from eastern Venezuela as a new addition to the Caribbean Sea. By its host specificity to *Centroceras clavulatum* (C. Agardh) Montagne, thallus organization and reproduction, the Venezuelan plants showed a close similarity to the Brazilian plants. The present report constitutes the 9th species of a parasitic red alga from the Wider Caribbean Sea.

RESUMEN: El alga roja monotípica adelfoparasítica *Centrocerocolax ubatubensis* Joly (Ceramiaceae, Ceramiales), ha sido registrada solamente para la costa sur de Brasil. Se reporta esta especie por primera vez para el oriente de Venezuela como un nuevo registro para el Mar Caribe. Por su especificidad al hospedero *Centroceras clavulatum* (C. Agardh) Montagne, su anatomía y reproducción, las plantas venezolanas muestran una estrecha semejanza con las plantas brasileñas. El presente registro constituye la novena especie de alga roja parasítica en la amplia región del mar Caribe.

INTRODUCTION

Although the marine red algal flora of the Caribbean Sea is known to be rich (TAYLOR, 1960; WYNNE, 1986), the generally dimunitive red algal parasites growing on larger forms receive considerably less attention. As shown in Table 1, only 8 taxa are reported so far from this area. In this paper, we report our observations on a new addition, *Centrocerocolax ubatubensis* Joly (Ceramiales, Ceramiaceae), growing on the nearly cosmopolitan *Centroceras clavulatum* (see also GANESAN, 1990).

MATERIALS AND METHODS

Microscopic examination of the host plants of *Centroceras clavulatum* collected from the intertidal zone of Bahia de Manzanillo, Isla de Margarita, eastern Venezuela on 1.x. 1983 showed the presence of several pustules on the surface of the host. Both the host plants and the parasite were preserved in 4 % seawater formalin. Whole mounts of *Centroceras clavulatum* containing the postules were made after staining them in 1% aqueous Aniline Blue, acidified with dilute HCL and mounted in 50 % aqueous Karo syrup. Voucher specimens (herbarium material and slides) are deposited in the Herbariun of the Institute of Oceanography, Universidad de Oriente, Cumaná, Venezuela.

OBSERVATIONS

In contrast to the darkly pigmented filaments of *Centroceras clavulatum,* pustules of *Centrocerocolax ubatubensis* stand out as colorless or bright white warts on the host surface. Fully grown pustules ranged between 290-780 μm broad and up to 1 mm high. Pustules were generally spherical (Figs. 3,6) or oval and irregularly lobed (Fig. 1) or assumed a stellate appearance in senescent plants. Young pustules (Fig. 5) showed 1-3 prominent, long and unicellular basal rhizoidal cells for anchorage to the host cells. However, the establishment of secondary pit-connections showing an organic connection between the host and parasite tissue was not evident in the preparations examined by us. Growing margins showed several uniseriate filaments (Fig. 2), while the pustule body itself consisted of a mass of coalesced filaments without any special organization. Many of the cells from the central part of the pustules had small processes in the form of stellate cells.

Tetrasporic, female and male pustules were commonly observed on the host surface. Frequently, tetrasporic pustules were slightly larger in size and irregulary lobed compared to the female and male pustules. In the tetrasporic and female plants, a clear membrane at the growing margin of the pustules enclosing the vegetative and reproductive bodies was more evident and clearly observable than it was in the male plants (Figs. 2,7) Such a diffe-

rence was also reported earlier by JOLY (1965) for the Brazilian plants. Tetrasporangia were borne in several small verticillate stichidia towards the periphery of the pustules giving the plant an irregularly lobed appearance. Mature tetrasporangia were spherical, pyriform or oval and tetrahedrally or irregularly cruciately divided (Fig. 4), varying from 25 to 33 µm in maximum diameter. Sexual plants were dioecious. In the females, 4 celled carpogonial branches, as well as several densely grouped carposporangia embedded inside the pustules were observed. Male pustules showed abundant formation of numerous small, spherical and refringent spermatangia along the margins (Fig. 7). Each spermatangial mother cell produced 1-3 spermatangia.

DISCUSSION

As show in Table 1, only 8 species of parasitic red algae are known so far from the wider Caribbean Sea. Of these, *Gelidiocolax desikacharyi* and *Pterocladiophila hemisphaerica* are alloparasites, while the rest are adelphoparasites. *Cetrocerocolax ubatubensis*, an adelphoparasite, is reported here for the first time as a ninth addition to the Caribbean Sea, based on material collected from eastern Venezuela.

The monotypic *C. ubatubensis* was described and illustrated for the first time in detail by JOLY (1965) based on material collected from Ubatuba, São Paulo, Brazil. Subsequently, other Brazilian phycologists (OLIVEIRA–FILHO 1969; OLIVERIA and UGADIM, 1976; UGADIM, 1976; CORDEIRO–MARINO, 1978) also reported this species from other parts of southern Brazil. Hence, the present report from the Caribbean Sea considerably enlarges its distribution range to as far north as 11º 09'30" N. Lat. In general, our observations on the Venezuelan plants agreed very closely with the descriptions and figures given for the Brazilian populations. It is well known (TAYLOR, 1955, 1960; JOLY, 1964; DIAZ–PIFERRER, 1969) that many of the Caribbean species extend southwards to Brazil and *vice versa*. Mention should also be made of the fact that the place where *C. ubatubensis* was collected in Venezuela is known to be subjected to an intense seasonal upwelling of deeper waters (PARR, 1937; RICHARDS, 1960; FUKUOKA, 1965, 1966; OKUDA *et al.* 1974), which brings about some notable changes in the marine algal compostion (DIAZ–PIFERRER, 1967). However, to associate this species with the upwelling conditions could be misleading, for, the host plant, *C. clavulatum*. a species nearly world-wide in distribution, is also frequently reported from other non-upwelling areas of Venezuela (GANESAN, 1990). Hence, careful examination of *C. clavulatum* occuring in other geographical latitudes, and from non-upwelling areas in Venezuela for the presence of *C. ubatubensis* and also laboratory culture studies on the infection of carpopores and tetraspores of the parasite on the host (to estabilish whether viable gametophytes and tetrasporophytes of the parasite are produced) would be necessary to settle this point. The recent laboratory culture study of WEST and CALUMPONG (1988) on the parasitic red alga *Dawsoniocolax bostrychiae* (Choreocolacaceae, Gigartinales), a species known to be present only in Brazil, but now reported from Australia, to establish its range of host specificity on some *Bostrychia* species isolated from Australia, Puerto Rico and Brazil is a pointer in this regard, which has given a new insight to the host/parasite association and distribution.

TABLE 1. SYNOPSIS OF THE PARASITIC RED ALGAE REPORTED CHRONOLOGICALLY FROM THE WIDER CARIBBEAN SEA.

No.	Name of the taxon	Source
1	*Hypneocolax stellaris* BØRGESEN	BØRGESEN (1915-20)
2	*Gelidiocolax desikacharyi* GANESAN	GANESAN (1970)
3	*Meridiocolax narcissus* MORRILL	MORRILL (1976)
4	*Grateloupiocolax colombiana* SCHNETTER *et al.*	SCHNETTER *et al.* (1983)
5	*Gracilariophila gardneri* SETCHELL	LEMUS (1984)
6	*Champiocolax sarae* BULA-MEYER	BULA-MEYER (1985)
7	*Pterocladiophila hemisphaerica* FAN & PAPENFUSS	STEGENGA & VROMAN (1986)
8	*Gracilariophila oryzoides* SETCHELL & WILSON	RIOS (1987)
9	*Centrocerocolax ubatubensis* JOLY	This paper

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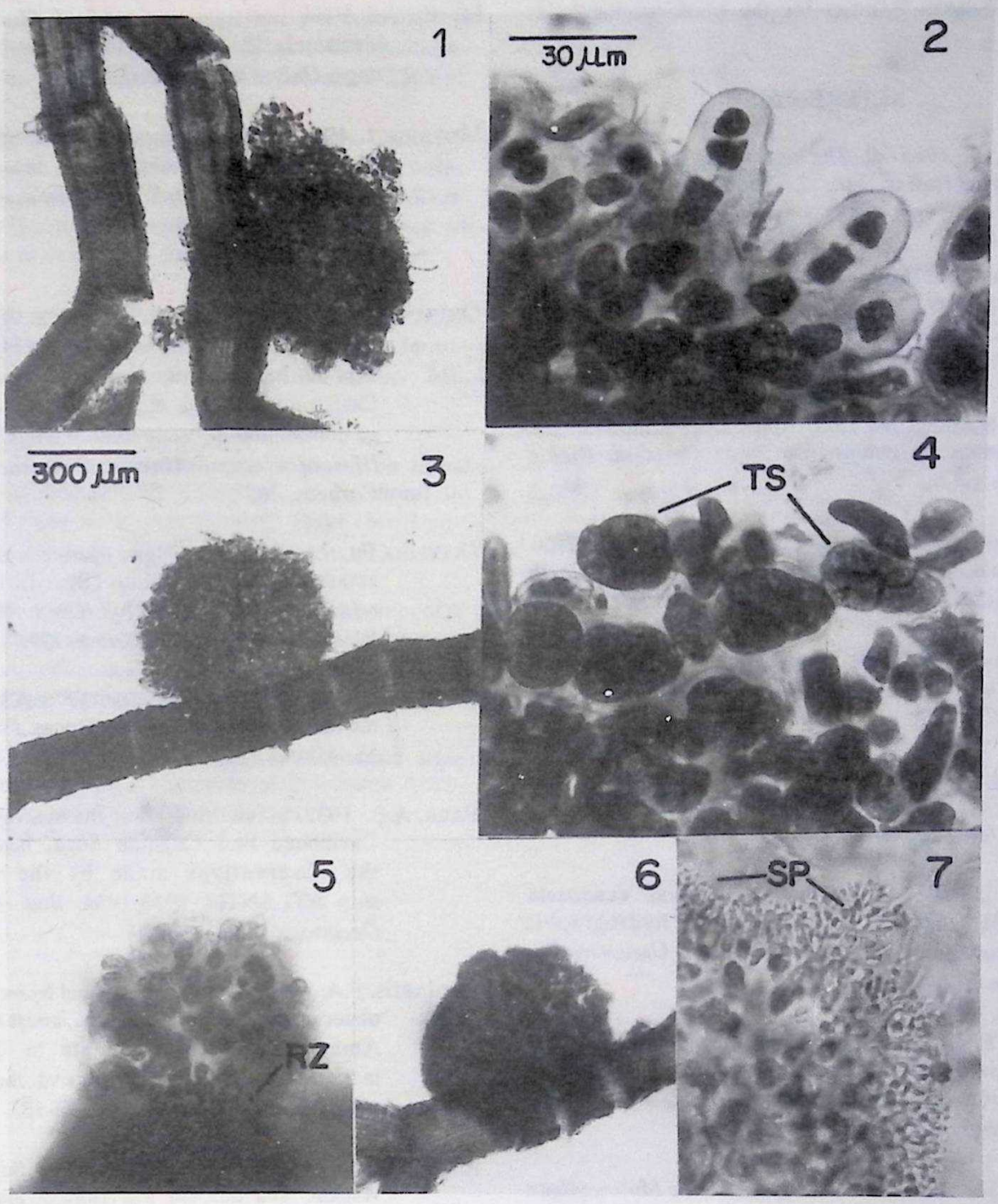


Fig. 1. Tetrasporophytic pustule attached to the host plant. Fig. 2. Marginal part of a pustule showing the uncompacted uniseriate nature of the vegetative filaments.Fig. 3. A female pustule. Fig. 4. Young and mature tetrasporangia in a squashed preparation. Fig. 5. A young pustule showing 3 basal rhizoids on the host surface. Fig. 6. A male pustule. Fig. 7. Marginal portion of a male pustule enlarged to show formation of spermatangia. Abbreviations for figures 4, 5 and 7: RZ = rhizoids: SP = spermatangia: TS = tetrasporangia. Scale in Fig. 1 is also applicable to Figs. 3 & 6. Scale in Fig. 2 is also applicable to Figs. 4, 5 & 7.

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