

## ***Choreonema thuretii* and *Pneophyllum confervicola* (Corallinales, Rhodophyta), new records of coralline algae for the Azores**

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**Abstract** – *Choreonema thuretii* and *Pneophyllum confervicola*, two cosmopolitan species, are here recorded for the first time for the Azores. They were found during an investigation of intertidal communities in Pico Island (Azores) in the summer of 2007. Both species were found hosted in *Jania rubens* specimens, *C. thuretii* as a semi-endophytic parasite, *P. confervicola* as an epiphyte. They are present on other archipelagos from Macaronesia (Madeira and Canary Islands). It is likely that they have been overlooked in the Azores due to their small size and parasitic/epiphytic habit. A morphological and anatomical account is provided for both species, and it is hoped that this additional observations provided herein will alert field surveyors for their presence.

***Choreonema thuretii* / *Jania rubens* / Macaronesia / new record / *Pneophyllum confervicola***

**Résumé** – *Choreonema thuretii* et *Pneophyllum confervicola* (Corallinales, Rhodophyta), nouveaux reports d'algues corallines aux Açores. *Choreonema thuretii* et *Pneophyllum confervicola*, deux espèces cosmopolites, ont été observées pour la première fois aux Açores. Elles ont été trouvées lors d'une recherche scientifique sur les communautés intertidales de l'île de Pico (Açores) pendant l'été 2007. Ces deux espèces étaient hébergées sur *Jania rubens*, *C. thuretii* comme un parasite semi-endophyte et sur *P.confervicola* comme un épiphyte. Elles sont présentes dans les autres archipels de la Macaronésie (Madère et les îles Canaries). Il est probable qu'elles n'aient pas encore été observées dans les Açores en raison de leur petite taille et de leur port parasitaire/épiphyte. Une description morphologique et anatomique de ces deux espèces est donnée, et il faut espérer que ces nouvelles observations alerteront les futurs collecteurs sur leur présence.

***Choreonema thuretii* / *Jania rubens* / Macaronésie / nouveau report / *Pneophyllum confervicola***

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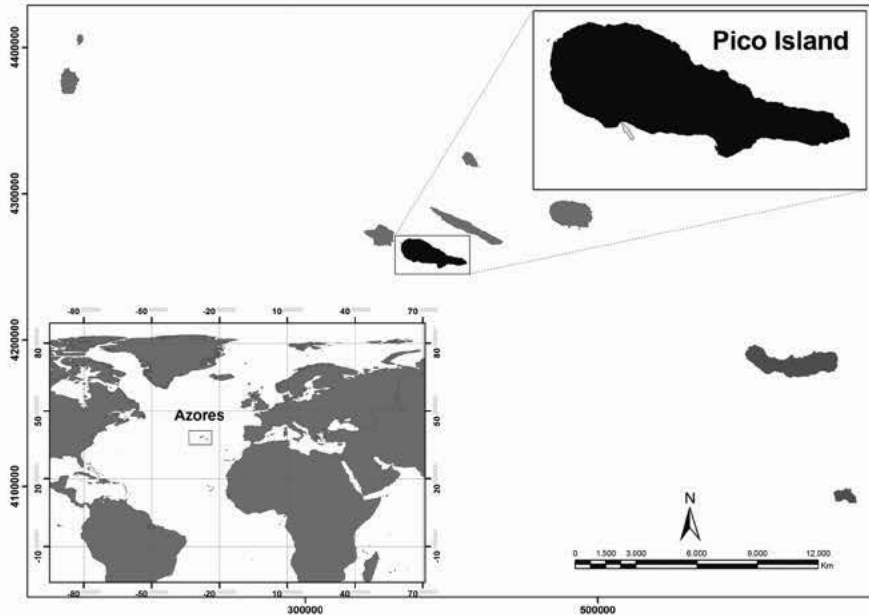


Fig. 1. Azores archipelago, with Pico Island in black and location of the studied site (arrow).

## INTRODUCTION

The coralline algal flora (Corallinales, Rhodophyta) of the Azores is poorly documented. Only twelve genera have been listed from the area, including four geniculate and eight non-geniculate genera (Neto, 1994; Rosas-Alquicira *et al.*, 2009). In particular, little attention has been given to the study of diminutive coralline red algae.

The present note provides morphological and anatomical descriptions for *Choreonema thuretii* (Bornet) F. Schmitz (Hapalidiaceae) and *Pneophyllum confervicola* (Kützing) Y.M. Chamberlain (Corallinaceae), which are newly recorded for the archipelago. Both species are distributed worldwide and have been reported further south in Macaronesia (Madeira: Neto *et al.*, 2001; Canary Islands: Haroun *et al.*, 2002; Sangil *et al.*, 2003).

## MATERIALS AND METHODS

During a survey that investigated the occurrence and abundance of marine algae on São Caetano, Pico Island (Fig. 1) in summer 2007, specimens of *Jania rubens* (Linnaeus) J.V. Lamouroux were found with unrecognised coralline epiphytes at 23 m depth. Samples were fixed in 4 % formalin in seawater. In the

laboratory, *Jania* material was subjected to detailed observations which revealed the occurrence of crustose epiphytes and semi-endophytic parasites. Fracture segments were prepared for scanning electron microscopy (SEM) following the method of Woelkerling (1988). Images were collected and analysed using software for image acquisition (*SemAfore*, JEOL) and analysis (*AxioVision*, Zeiss). Species identification was based on Irvine & Chamberlain (1994) and Bressan & Babbini (2003). Conceptacle height and diameter, and pore diameter were measured in randomly selected reproductive portions of thallus. Dimensions are expressed as minimum and maximum values. Specimens were registered and lodged at the Herbarium Ruy Telles Palhinha (AZB), Universidade dos Açores, Portugal (herbarium code AZB, PIX-07-1314).

The morphology and anatomy of the specimens from the Azores were compared with those from different geographical regions based on literature data (Woelkerling, 1987; Irvine & Chamberlain, 1994; Mendoza-González & Mateo-Cid, 1996; Bressan & Babbini, 2003; Mateo-Cid & Mendoza-González, 2009).

## RESULTS AND OBSERVATIONS

The species on *Jania rubens* were identified as *Choreonema thuretii* and *Pneophyllum confervicola*. The former occurred as a semi-endophytic parasite; the latter species was a surface epiphyte. Morphological and anatomical details of the observed specimens are given below.

### *Choreonema thuretii* (Bornet) F. Schmitz

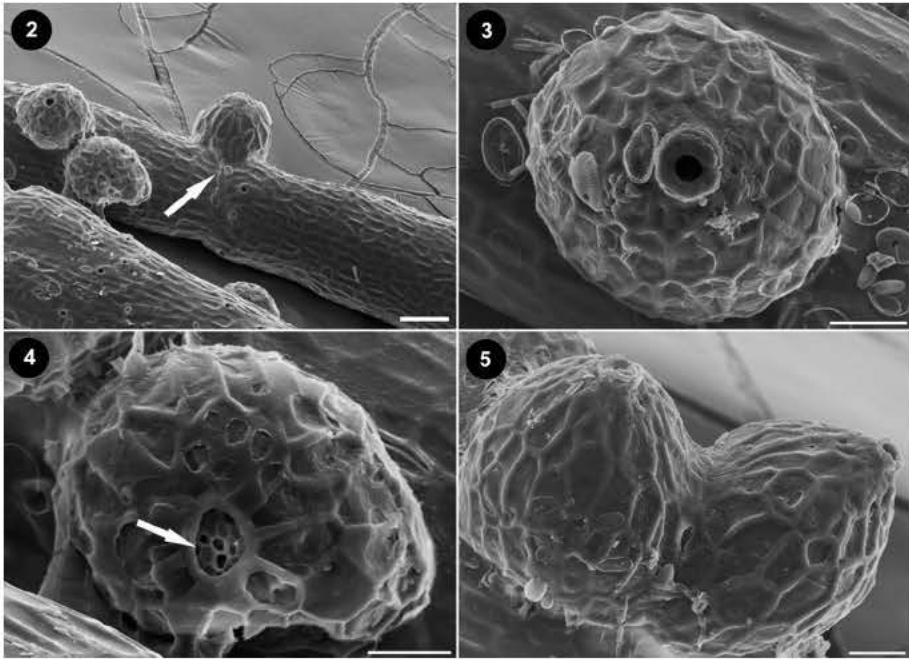
**Figs 2-5**

Specimens were visible as light pink calcareous conceptacles on the surface of host thalli, mostly on the intergenicula, but also at the genicula (Fig. 2). This surface comprised of a reticulum of ridges enclosing flat plates. Gametangial conceptacles were globular to conical shaped, uniporate (Fig. 3), 78-90 µm in diameter and 64-105 µm high, with a pore 4.5-10.6 µm in diameter. Tetra/bisporangial conceptacles were also globular in shape, 83-93 µm in diameter and 63-75 µm in height. Conceptacles were uniporate with a multiporate plate (Fig. 4) inside the pore canal; the canal measured 7.7-16.5 µm in diameter. Germinating conceptacles were found (Fig. 5).

### *Pneophyllum confervicola* (Kützinger) Y.M. Chamberlain

**Figs 6-8**

Specimens comprised a more or less circular or lobed dorsiventral and dimerous pink thallus that measured up to 229 µm in diameter and 11 µm thick. It was composed of a single layer of radiating, repeatedly pseudodichotomously branched basal filaments. Each cell cut off an uncalcified, small lenticular epithallial cell from its dorsal surface (Fig. 6), showing a "*Pneophyllum* type" surface (Chamberlain, 1990). Intercalary trichocytes were common (Fig. 6). A germination disc with a 8-celled centre was visible. Basal filaments comprised a single layer of squarish basal cells 5.7-15.3 µm long and 6.4-12.7 µm wide. Conceptacles are uniporate (Fig. 7), dome shaped (Fig. 8) 51-88 µm diameter and 48-62 µm high.

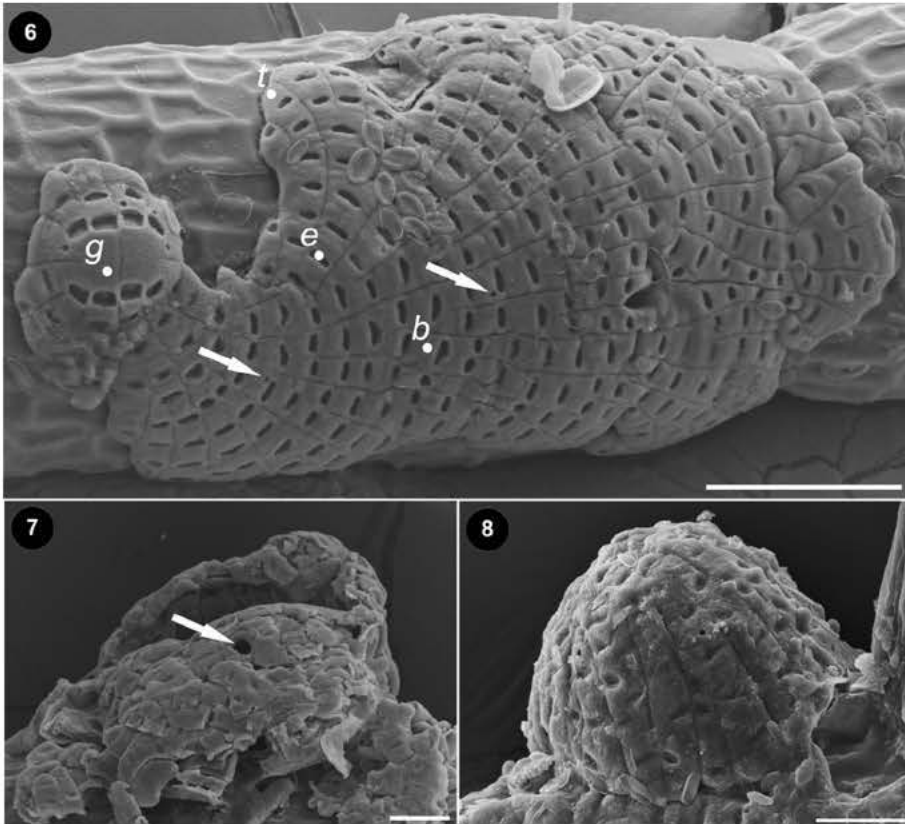


Figs 2-5. *Choreonema thuretii*. 2. Conceptacle at the genicula (arrow). Scale bar = 50  $\mu\text{m}$ . 3. Uniporate gametangial conceptacles. Scale bar = 20  $\mu\text{m}$ . 4. Tetra/bisporangial multiporate plate (arrow). Scale bar = 20  $\mu\text{m}$ . 5. Geminated conceptacles. Scale bar = 20  $\mu\text{m}$ .

## DISCUSSION AND CONCLUSIONS

The addition of *Choreonema thuretii* and *Pneophyllum confervicola* to the Azorean seaweed flora increases the number of Corallinales to 30 species (Neto, 1994; Rosas-Alquicira *et al.*, 2009). *Choreonema thuretii* is the only species in the subfamily Choreonematoideae present in the archipelago. *Pneophyllum confervicola* is the first species of the genus recorded in the Azores. Both species are distributed worldwide (see Guiry & Guiry, 2010) and have been recorded in the Macaronesian archipelagos of Madeira (Levring, 1974; Neto *et al.*, 2001) and the Canary Islands (Afonso-Carrillo, 1980; Haroun *et al.*, 2002; Sangil *et al.*, 2003). It is likely that these species have been overlooked in the Azores due to their small size and parasitic/epiphytic habit.

The studied plants of *C. thuretii* fall within the morphological limits as described by Woelkerling (1987), which includes the type material. Our plants were also similar to the ones described by Irvine & Chamberlain (1994), Mendoza-González & Mateo-Cid (1996) and Bressan & Babbini (2003) from Australia, France, British Islands, Mexico and Mediterranean respectively. The range values for reproductive characters of Azorean specimens overlap those recorded for plants from the British Islands and the Mediterranean but are slightly smaller than the ones recorded for other locations (Table 1).



Figs 6-8. *Pneophyllum confervicola*. 6. Dimerous thallus; *g* – germinating spore; *b* – basal filament cell; *e* – epithelial cell; *t* – terminal initial cell; arrows – intercalary trichocytes. Scale bar = 50  $\mu$ m. 7. Uniporate conceptacle (arrow). Scale bar = 20  $\mu$ m. 8. Dome shaped conceptacle. Scale bar = 20  $\mu$ m.

Azorean specimens of *P. confervicola* are morphologically similar to those described by Irvine & Chamberlain (1994, British Islands), Bressan & Babbini (2003, Mediterranean) and Mateo-Cid & Mendoza-González (2009, Mexico). With the exception of the thallus thickness and cells size, which are larger in Mexican material, the range values of anatomical and reproductive characters of Azorean material overlap with those from other locations (Table 2).

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Table 1. Data on morphological and anatomical features for *Choreonema thuretii* (present study and published data). All measurements are in  $\mu\text{m}$ . n.a.: data not available.

	Conceptacles		Tetra/bisporangial conceptacles		Gametangial conceptacles		Reference
	Diameter	Height	Diameter	Height	Diameter	Height	
Azores	n.a.	n.a.	83-93	63-75	78-90	64-105	This Study
British Islands	n.a.	n.a.	70	74	56	58	Irvine & Chamberlain (1994)
Mediterranean Sea	n.a.	n.a.	90	50-70	100	100	Bressan & Babbini (2003)
Southern Australia	130	160	n.a.	n.a.	n.a.	n.a.	Woelkerling (1987)
France (lectotype)	125	150	n.a.	n.a.	n.a.	n.a.	Woelkerling (1987)
Mexico	n.a.	n.a.	111-120	90-10	105-129	99-138	Mendoza-González & Mateo-Cid (1996)

Table 2. Data on morphological and anatomical features for *Pneophyllum confervicola* (present study and published data). All measurements are in  $\mu\text{m}$ .

	Thallus thickness	Cell length $\times$ width	Conceptacles diameter $\times$ height	Reference
Azores	11	5.7-15.3 $\times$ 6.4-12.7	51-88 $\times$ 48-62	This Study
British Isles	10	5-14 $\times$ 4-16	30-107 $\times$ 23-74	Irvine & Chamberlain (1994)
Mediterranean Sea	10	5-14 $\times$ 4-16	59-91 $\times$ 30-74	Bressan & Babbini (2003)
Mexico	15-30	15-23 $\times$ 7.5-9	40-110 $\times$ 20-50	Mateo-Cid & Mendoza-González (2009)

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