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Cresia opalescens gen. et sp. nov. (Rhodymeniaceae, Rhodophyta) from Puerto Rico, Caribbean Sea

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Abstract – A new red algal genus and species, *Cresia opalescens* D.L. Ballant., C. Lozada-Troche *et* H. Ruiz is described from coral reef habitats in Puerto Rico at 3 to 20 m depths. The new genus, whose reproductive and morphological characters all fall within those of *Chrysymenia*, possesses patterned and brilliant iridescence. *Cresia opalescens* produces small, simple vesiculate globose or peltate thalli, consisting of a single layer of medullary cells and two cortical cell layers. Gametophytes are dioecious. Cystocarps protrude slightly and measure 270-320 µm in diameter. Spermatangial mother cells are produced in periclinal series, and divide to produce spermatangia. Ovate tetrasporangia are scattered in the cortex. are cruciately divided and intercalary, measuring to 20 × 25 µm. Molecular evidence indicates that this alga is positioned within the *Erythrocolon* group of the Rhodymeniaceae.

***Cresia opalescens* gen. et sp. nov. / Caribbean Sea / coral reef algae / *Erythrocolon* group / Puerto Rico / Rhodophyta / Rhodymeniaceae / taxonomy**

Résumé – ***Cresia opalescens* gen. et sp. nov. (Rhodymeniaceae, Rhodophyta) de Porto Rico, Mer des Caraïbes.** Une nouvelle algue rouge, *Cresia opalescens* D.L. Ballant., C. Lozada-Troche *et* H. Ruíz est décrite des récifs coralliens de Porto Rico à des profondeurs entre 3 et 20 m. Le nouveau genre, dont les caractères reproductifs et morphologiques rappellent ceux de *Chrysymenia*, possède une iridescence brillante qui forme des motifs réguliers. *Cresia opalescens* produit des thalles de petite taille, simples vésiculaires globuleux ou peltés, composés d'une seule couche de cellules médullaires et de deux couches de cellules corticales. Les gamétophytes sont dioïques. Les cystocarpes légèrement protubérants mesurent 270-320 µm de diamètre. Les cellules-mère des spermatanges sont produites en séries périclinales, et elles se divisent pour produire les spermatanges. Les tétrasporanges ovales sont dispersés dans le cortex. Ils sont intercalaires, divisés de façon croisée, et mesurent 20 × 25 µm. Les données moléculaires indiquent que cette algue est positionnée dans le groupe *Erythrocolon* de la famille Rhodymeniaceae.

Algues des récifs coralliens / *Cresia opalescens* gen. et sp. nov. / Groupe *Erythrocolon* / Mer des Caraïbes / Porto Rico / Rhodophyta / Rhodymeniaceae / Taxinomie

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INTRODUCTION

The red algal family Rhodymeniaceae is the largest of the six families currently included in the order Rhodymeniales (Womersley, 1996; Le Gall *et al.*, 2008) and has been the subject of a number of studies in recent years. As a result of application of molecular characters, many classically held concepts of generic relationships in the family have proven to be false. Nevertheless, the phylogenetic position of some genera currently classified within the family remains unresolved or questionable (Saunders *et al.*, 1999; Afonso-Carrillo *et al.*, 2006). For example, the simple morphological criteria as applied to separation of *Chrysymenia* J. Agardh from *Botryocladia* (J. Agardh) Kylin is currently being questioned with the recognition that the genera are not monophyletic and represent heterogenous assemblages (Saunders *et al.*, 1999; Wilkes *et al.*, 2006). In fact, systematic difficulties within the Rhodymeniaceae (Rhodymeniales) as a whole have been well documented (Huisman, 1995, 1996; Saunders and Kraft, 1994, 1996; Saunders *et al.*, 1999; Saunders, 2004).

The *Erythrocolon* group as described by Kylin (1956) originally included *Erythrocolon* J. Agardh, *Coelarthrum* Børgesen and *Fryeella* Kylin, characterized by hollow septate (with internal diaphragms that segregate hollow portions) thalli with gland cells. *Fryeella*, however, has recently been transferred to the Fryeellaceae by Le Gall *et al.* (2008), differing from the two other genera by development of tetrasporangial nemathecia. Despite the fact that it is only septate at branch origins, Ballantine *et al.* (2010) placed *Chamaebotrys* Huisman within the *Erythrocolon* group as well on the basis of 18s and *rbcL* sequence similarity with *Coelarthrum cliftonii* (Harv.) Kylin. *Coelarthrum cliftonii* and *Chamaebotrys prolifera* D.L. Ballant., H. Ruíz *et* C. Lozada are the only Caribbean representatives of the *Erythrocolon* group (Wynne, 2005), including Puerto Rico (Ballantine & Aponte, 2002; Ballantine *et al.*, 2010).

Recent collections from coral reef habitats at 6-23 m depths offshore from La Parguera, Puerto Rico, have yielded specimens of a diminutive species which, based on classical vegetative morphological features was originally considered to be *Chrysymenia*. The new genus is cryptic in habit, growing largely hidden within crevices and difficult to access reef interstices. In this paper we describe a new genus that is supported by molecular evidence.

MATERIALS AND METHODS

Specimens were collected by SCUBA diving and were preserved in 10% Formalin/seawater or desiccated in silica gel for molecular analyses. Transections (30 μm thick) were made using an American Optical Cryo-Cut freezing microtome. Microscopic preparations were stained in acidified 1% aniline blue and mounted in 60% Karo® corn syrup on microscope slides. Photomicrographs were taken with a SPOT RE digital camera through an Olympus BMAX light microscope. The plates were assembled from digital photographs utilizing Adobe Photoshop CS2. The holotypes are deposited in US and paratypes in US, MICH, and MSM. Herbarium abbreviations follow Holmgren *et al.* (1990) and authority designations are according to Brummitt & Powell (1992).

Total DNA extraction, 18S gene amplification, and sequencing were performed as described in Ballantine & Lozada-Troche (2008). For the phylogenetic analysis, a dataset was assembled, including the 10 newly generated sequences, along with 23 representatives of Rhodymeniaceae (Table 1). Alignment of the 18S genes was performed with 36 sequences as implemented by CLUSTALX (Thompson *et al.*, 1997). The phylogenetic reconstruction for the new genus was performed using the maximum parsimony (MP), maximum likelihood (ML), and neighbor-joining (NJ) algorithms as implemented in PAUP* (v 4.1b10) (Swofford, 2002). Bayesian inference was performed with MrBayes (v.3.1.2) from 18S sequences (Huelsenbeck and Ronquist, 2001). The optimal model determined by Modeltest (Posada and Crandall, 1998) used as input for NJ and ML analysis

Table 1. Species used in the phylogenetic analysis.

Species	*Source*	*Accession Number*	*Reference*
Botryocladia ebriosa	GenBank	AF085255	3
Botryocladia iridescens (CLT-147)	La Parguera, PR	EF690265	This study
Botryocladia iridescens (CLT-166)	La Parguera, PR	EF690266	This study
Botryocladia *leptopoda*	GenBank	DQ343160	4
Botryocladia occidentalis (CLT-172)	Isabela, PR	EU086462	This study
Botryocladia *sonderi*	GenBank	AF085256	3
Botryocladia spinulifera (CLT-144)	La Parguera, PR	EU690268	This study
Botryocladia spinulifera (CLT-178)	La Parguera, PR	EU670591	This study
Botryocladia wynnei (CLT-176)	Lab culture	EF690267	This study
Botryocladia wynnei (CLT-218)	La Parguera, PR	EU670589	This study
Chamaebotrys prolifera (DLB-7527)	La Parguera, PR	EU715131	6
Chamaebotrys prolifera (DLB-7527)	La Parguera, PR	EU715132	6
Coelarthrum cliftonii (CLT-197)	La Parguera, PR	EU086465	6
Coelarthrum cliftonii (CLT-235)	La Parguera, PR	EU670594	6
Coelarthrum cliftonii (CLT-236)	La Parguera, PR	EU670595	6
Coelarthrum opuntia	GenBank	AF085258	3
Coelarthrum agardhii (DLB-6000)	La Parguera, PR	EF690262	6
Coelarthrum nodulosa (CLT-181)	La Parguera, PR	EF690291	6
Coelarthrum ornata	GenBank	AF085257	3
Cresia opalescens (DLB-6334)	La Parguera, PR	EF690263	This study
Cresia opalescens (DLB-6296)	La Parguera, PR	EF690263	This study
Erythrocolon podagricum	GenBank	U23953	1
Faucheopsis coronata	GenBank	AF085268	3
Fryeella gardneri	GenBank	EF690264	3
Gloiocladia furcata	GenBank	DQ790749	5
Gloiocladia lacinata	GenBank	AF085266	3
Gloiocladia repens	GenBank	DQ790750	5
Gloiocladia repens	Genbank	AF085267	3
Gloioderma atlantica (CLT-163)	La Parguera, PR	WU086461	This study
Gloioderma fruticulosum	GenBank	U33131	2
Gloiosaccion brownii	GenBank	AF085259	3
Halymenia plana	GenBank	U33133	2
Hymenocladiopsis crustigena	GenBank	AF085254	3
Irvinea ardreana	GenBank	AF085274	3
Sebdenia flabellata	GenBank	U33128	2
Webervanbossea splachnoides	GenBank	AF085269	3

1) Millar *et al.*, 1996; 2) Saunders *et al.*, 1996; 3) Saunders *et al.*, 1999; 4) Saunders *et al.*, 2007; 5) Rodriguez-Prieto *et al.*, 2007 ; 6) Ballantine *et al.*, 2010).

calculated by the Akaike information criterion (AIC) (Akaike, 1974) for 18S alignment was a HKY + I + G evolutionary model (Hasegawa, Kishino and Kano+ Invariable sites + Gamma distribution) (Hasegawa *et al.*, 1985). The assumed nucleotide frequencies were: A = 0.24, C = 0.21, G = 0.29, T = 0.26. Proportion of sites assumed to be invariable = 0.70. The rates for variable sites assumed to follow gamma distribution with shape parameter = 0.69. The robustness of the data was determined by bootstrapping the data set (Felsenstein, 1985) 100 times for ML and 2,000 times for MP and NJ. Bayesian analysis for 18S sequences was conducted using also using the HKY + I + G evolutionary model running 1,200,000 generations. Trees were sampled every 100 generations with log-likelihood scores stabilized at approximately 5,000 generations. The first 5,500 of a possible 12,000 trees were discarded as burn-in.

RESULTS

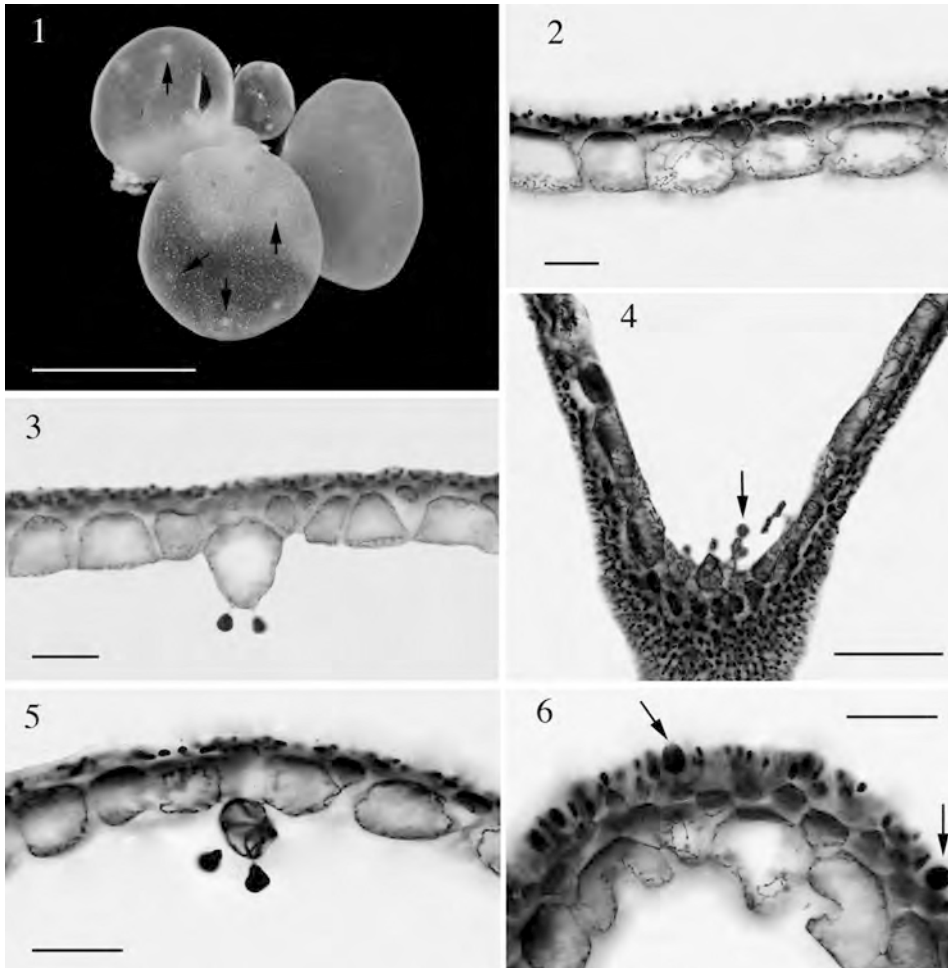
Cresia C. Lozada-Troche *et* D.L. Ballant. gen. nov.
Algae thallos inflatos et non-septatos producentes proxime super stipitem brevem cavumque. Paries thalli strato singulari medullosoque atque uno aut pluribus stratis corticalibus. Filamenta rudimentalia basi vesiculi praesenstia. Cystocarpia projecta. Tetrasporangia a cellulis interioribus corticalibusque in positione intercalari abscissa.

Algae producing inflated non-septate saccate thalli immediately above a short hollow stipe; thallus wall with a single medullary layer and one or more cortical layers; rudimentary filaments are present at base of vesicle; cystocarps projecting; tetrasporangia are cut off from inner cortical cells in an intercalary position.

Generitype: *Cresia opalescens* D.L. Ballant., C. Lozada-Troche *et* H. Ruíz, sp. nov.

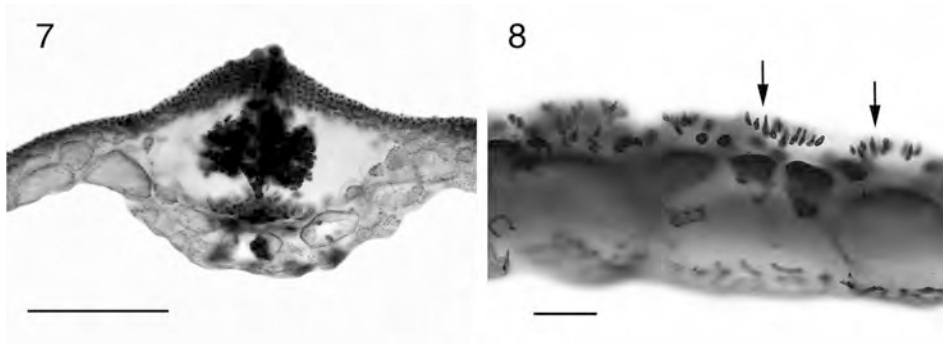
Etymology: The name is based on the acronym CRES which refers to Coral Reef Ecosystem Study, a NOAA supported program which allowed for a fine scale study of algae associated with Puerto Rican reefs.

Cresia opalescens D.L. Ballant., C. Lozada-Troche *et* H. Ruíz **(Figs 1-8)**
Thalli maturi usque ad 7.0 mm alti; rami vesiculares normaliter singulares. Typice unus (raro duo) ramus parvus vesiculatusque super stipite brevem et 1-2 mm longum cavumque celeriter expansus; igitur planta peltata videtur; rami inflati usque ad 7 mm lati; paries thalli e stratis 2 constans; stratum unicum medullosum e cellulis maioribus et rectangularibus constans, usque ad 100 µm longis ×50-60 (85) µm altis, atque inter has cellulas maiores, cellulas minores et triangulares usque ad 30 µm ut maximum interdum confertae; cortex e stratis 2 constans: cellulae interiores corticales rotundae ad elongatas, 15-20 µm diametro atque cellulae corticales exteriores plerumque sphaericae, 3-4 µm diametro; glandicellulae 1-3 per cellulas medullosas sustinentesque productae, abscissae a cellulis interioribus medullosisque in cavitatem projectis, glandicellulae plerumque pyriformes, usque ad 23 µm longae et usque ad 18 µm latae; plantae dioeciae; cystocarpia leniter protrudentia, 270-320 µm diametro, cellulae exteriores corticales usque ad 5 cellulas matricales spermatangiorum, usque ad 8 µm longa, in ordine periclinato abscindentes; spermatangia 2-5 µm diametro, intercalariter abscissa; tetrasporangia paene sphaerica ad leniter ovata, usque ad 25 µm longa, 20 µm lata, a cellulis corticalibus maioribus et interioribus abscissa.



Figs 1-6. *Cresia opalescens* gen. et sp. nov. **1.** Habit of the holotype (arrows denote cystocarps) (*D.L.B. 6334*). Scale bar = 5 mm. **2.** Transection through vesicle wall showing medullary and cortical layers (*D.L.B.6903*). Scale bar = 50 µm. **3.** Transection through vesicle wall showing two gland cells produced from a medullary cell (*D.L.B. 5707*). Scale bar = 50 µm. **4.** Transection through vesicle wall and holdfast region (arrows denote rudimentary medullary filaments (*D.L.B. 6813*). Scale bar = 100 µm. **5.** Transection through vesicle wall showing two gland cells produced from a small secondary medullary cell (*D.L.B. 6903*). Scale bar = 50 µm. **6.** Transection through vesicle wall showing dark-stained tetrasporangia within the cortical layer (arrows) (*D.L.B. 6903*). Scale bar = 25 µm.

Mature thalli to 7.0 mm high; normally single, rarely two, small vesiculate branches expand rapidly above a short, 1-2 mm long hollow stipe, resulting in a plant with a peltate appearance; the inflated branches to 7 mm across; thallus wall consisting of 2 layers; the single medullary layer composed of larger rectangular cells, to 100 µm in length by 50-60 (85) µm in height, with smaller triangular-shaped cells, to 30 µm in largest dimension, occasionally wedged between; the cortex consists of 2 layers, inner cortical cells rounded to tangentially elongate, 15-20 µm in diameter, outer



Figs 7-8. *Cresia opalescens* gen. et sp. nov. **7.** Transection through vesicle wall and cystocarp (*D.L.B. 6343*). Scale bar = 250 µm. **8.** Transection through vesicle wall showing elongate spermatangial mother cells (arrows) (*D.L.B. 6343*). Scale bar = 25 µm.

cortical cells mostly spherical, 3-4 µm in diameter; gland cells produced 1-3 per supporting medullary cell, cut off from inner medullary cells or medullary cells which project into the cavity, gland cells mostly pyriform, to 23 µm in length and to 18 µm wide; plants monoecious; cystocarps slightly protruding, 270-320 µm in diameter, outer cortical cells cut off up to 5 spermatangial mother cells, to 8 µm in length, in a periclinal file, spermatangia, 2-5 µm in diameter, cut off terminally; cruciately divided tetrasporangia, nearly spherical to slightly ovate and measuring to 25µm in length and to 20 µm in width and are intercalary in the cortex.

Holotype: Turrumote Reef, La Parguera (17˚56.097N, 67˚01.130W): *David L. Ballantine* 6334, 11 m, (Coll. Hector Ruíz.) 5.x.2004 (Alg. Coll. # US-209107).
Paratypes: Edge of insular shelf, offshore La Parguera: *D.L.B. 6343*, 14 m, (Coll. H.R.) 15.x.2004. Media Luna Reef, La Parguera: *D.L.B. 5754*, 14 m, (Coll. H.R.) 4.xi.2002; *D.L.B. 6296, ibid.,* 12m, 27.viii.2004; *D.L.B. 6649*, *ibid.*, 11 m, 22.viii.2005. Turrumote Reef, La Parguera: *D.L.B. 5740*, 17 m, (Coll. H.R.) 21.x.2002; *D.L.B. 6263, ibid.*, 9 m, 6.vii.2004; *D.L.B. 6813*, *ibid.*, 3 m, 11.ix.2005; *D.L.B. 6903*, *ibid.*, 12 m, 21.xii.2005. Guanica: Edge of insular shelf (17˚55.401N, 66˚53.852W): *D.L.B. 5707*, 20 m, (Coll. H.R.) 8.viii.2002.
Etymology: the specific epithet refers to the gem-like iridescent aspect of the plant vesicle.

Cresia opalescens thalli measure to 7.0 mm high. Plants arise from a basal holdfast above which the brief, 1-2 mm long hollow stipe normally gives rise to a single small vesiculate branch which expands rapidly giving a peltate appearance (Fig. 1). Rarely two vesicles are produced from the same stipe. The inflated branches measure to 7 mm across. The thallus wall consists of 3 layers (Figs 2, 3, 5), the medullary composed of a single layer of larger rectangular cells, to 100 µm in length by 50-60 (-85) µm in height, with smaller triangular-shaped cells (to 30 µm in largest dimension) occasionally wedged between. Additional medullary cells are sometimes associated with fertile portions. The cortex consists of two layers, the innermost composed of rounded to tangentially elongate cells 15-20 µm in diameter, the outer layer continuous across the surface and mostly composed of spherical cells 3 - 4 µm in diameter. In surface view, the cortical cells incompletely cover the medulla. Secretory cells are mostly obpyriform (to 23 µm in length by 18 µm wide and are borne (1-) 2-3 on medullary cells of normal position and size (Fig. 3) or from adventitious slightly smaller cells (Fig. 5) that project into

the vesicle cavity. Rudimentary medullary filaments are present at the very base of the plant and absent elsewhere (Fig. 4). Figure 4 falsely conveys the impression that the stipe is solid.

Plants are monoecious. Cystocarps protrude slightly (Fig. 7) and measure 270-320 μm in diameter. Within the ostiolate cystocarp, there is a layer of darkly staining sterile cells from which a conspicuous fusion cell, to 100 μm long, arises. The fusion cell produces several gonimolobes and the entire carposporophyte measures to 300 μm in diameter. The lacrimose carposporangia measure to 25 μm in length. Tela arachnoidea are absent. Spermatangial mother cells are cut off from outer cortical cells in an anticlinal file of up to five spermatangial mother cells (Fig. 8), are elongate radially and are to 8 μm in length. Spermatangia are 2-5 μm in diameter and result from divisions of the spermatangial mother cells. In surface view, spermatangial patches form inconspicuous irregular patches, measuring to 50 μm in diameter. Cruciate tetrasporangia are cut off from larger inner cortical cells (Fig. 6) in an intercalary position. Tetrasporangia are nearly spherical to slightly ovate, measuring to 25 μm in length and to 20 μm in width.

A bayesian tree (Fig. 9) inferred from 18S gene sequences revealed that *Cresia opalescens* clades with members of the *Erythrocolon* group and is separated by a divergence of 1.1 and 1.2% from its closest neighbors, *Erythrocolon podagricum* (J. Agardh) J. Agardh and *Coelarthrum opuntia* (Endl.) Børgesen, respectively. Sequence divergence between *Cresia* and other members of the *Erythrocolon* group varied from 1.1-1.4%. Divergence of 18S sequences between *Cresia* and *Botryocladia* was 2.1% and between *Chrysymenia* was 2.3%. The Bayesian phylogram inferred from 18S sequences also indicated the polyphyletic nature of *Botryocladia* revealing two moderately supported clades. One of these contained *B. spinulifera* W.R. Taylor *et* I.A. Abbott and *B. iridescens* D.L. Ballant. *et* H. Ruíz and the other was comprised of *B. ebriosa* A. Millar, *B. leptopoda* (J.Agardh) Kylin, *B. sonderi* P.C. Silva, *B. occidentalis* (Børgesen) Kylin and *B. wynnei* D.L. Ballant. The phylogram also revealed placement of *Gloiosaccion brownii* Harvey clearly within a clade otherwise comprised of *Chrysymenia* species.

DISCUSSION

The Rhodymeniales is now known to possess six families: Rhodymeniaceae, Champiaceae, Lomentariaceae, Faucheaceae, Hymenocladiaceae and Fryeellaceae (Le Gall *et al.*, 2008). Algae of the Rhodymeniaceae were defined by Bliding (1928) as having a hollow or solid medulla lacking longitudinal filaments lining the cavity, possessing cruciately divided tetrasporangia and having carposporophytes in which most gonimoblast cells differentiate into carposporangia. As indicated by (Huisman, 1995), the family lacks a single defining feature.

On initial collection, based on general appearance and subsequently, morphological data, we assumed that the new entity represented an undescribed species of *Chrysymenia*, sharing generic characteristics such as a non-septate, saccate thalli with cruciately divided tetrasporangia borne in an intercalary position. Aside from its reduced size and lack of thallus branching, there are no apparent morphological criteria to separate *Cresia* from *Chrysymenia* and the genera at present are only distinguishable on molecular bases. Thus, *Cresia*, like *Irvinea* (Brodie & Guiry, 1988; Saunders, *et al.*, 1999; Afonso-Carillo *et al.*, 2006;

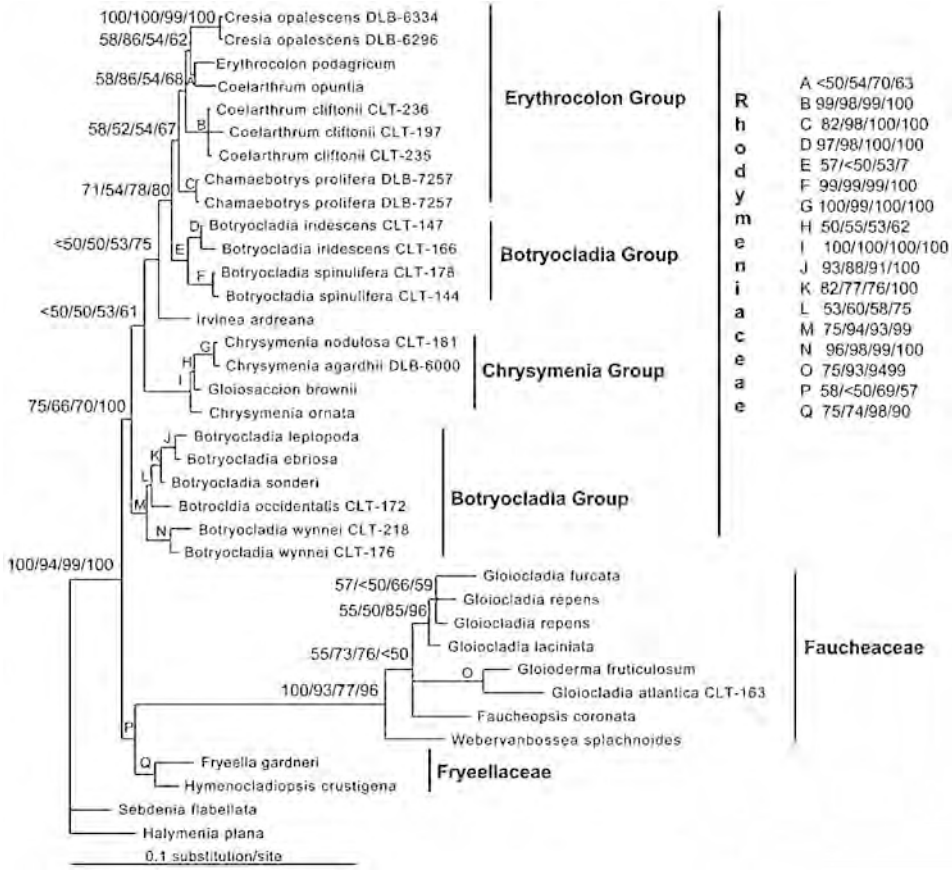


Fig. 9. Bayesian tree of the Rhodymeniaceae inferred from 18S gene sequences, showing the phylogenetic position of *Cresia* gen. nov. Bootstrap proportions are shown on top of the branches. Left to Right: Maximum Likelihood, 100 replicates; Maximum Parsimony, 2000 replicates; Neighbor Joining, 2000 replicates; Bayesian posterior probabilities,1,200,000 generations.

Schneider & Lane, 2008) becomes another rhodymeniacean genus without its own set of morphologically defining criteria. *Cresia* may be differentiated from all other *Erythrocolon* group genera by a combination of characters, principally including habit, lack of septation and presence of rudimentary filaments at the vesicle base (Table 2). Developmental processes may possibly explain the lack of septation in *Cresia* due to its very small size. The new genus further differs from *Chamaebotrys* species on the basis of producing spermatangial mother cells (SMCs) in periclinal series. The character, of anticlinal vs. periclinal orientation of SMCs; however, is known to vary within the genus *Chrysymenia* (Norris & Ballantine, 1995). When observed in the field, *Cresia opalescens* is virtually indistinguishable from *Botryocladia iridescens*. Both are small statured, restricted to cryptic reef habits, and both possess patterned iridescence. They may be differentiated on the basis of the latter possessing a solid stipe.

As previously indicated, *Cresia* is the only genus within the *Erythrocolon* group in which there is a lack of septation. Nevertheless, Gavio & Fredericq

Table 2. Comparison between Cresia and members of the *Erythrocolon* group and *Chrysymenia procumbens*.

Characters	*Cresia*	*Coelarthrum*	*Erythrocolon*	*Chamaebotrys*	*Chrysymenia procumbens*
Habit	Single small vesiculate branch	Dichotomous or polichotomously branched; vesicle-like branches	Irregular to subdichotomously branched; vesicle-like branches	Spherical to ovoid segments, dichotomous to trichotomous or irregularly branched	Decumbent to prostrate, blade-like fronds with or without stipes
Stipe	7.0 mm	5-30 cm			
Size (height)	Absent	Regular	3 cm	2-20 cm	1-2 cm
Septa	2 layers	2-3 layers	Regular	Regular	Absent
Cortex	1 layer	3 to several layers	2 layers	1 layer	1 layer
Medulla			1 layer	1-2 layers	2-3 layers
Medullary filaments	Present only at base	Absent in most species	Absent	Absent	Absent
Spermatangial mother cell orientation	Periclinal series			Randomly from cortical cells	Unknown
Cystocarp	Slightly protuberant	Protuberant or partially inmersed	Protuberant or partially inmersed	Protuberant	Unknown
Cystocarp diameter	270-320 µm	700-1400 µm	700-800 µm	500 µm	Unknown
Tetrasporangial division and position	Cruciate, intercalary in cortex	Cruciate, intercalary in cortex	Cruciate, intercalary in cortex	Cruciate, terminal in nemathecia	Unknown
Gametophytes	Monoecious	Dioecious	Dioecious	Dioecious	Unknown
References	This study	Norris (1986); Huisman (1995)	Abbott (1999)	Huisman (1996); Schils *et al.* (2003)	Weber-van Bosse, (1928); Abbott (1999)

(2005, Fig. 53, p. 77) in their *rbcL*-based tree indicated that *Chrysymenia procumbens* Weber Bosse also claded with *Coelarthrum cliftoni* and that species was well separated from their clade that contained *Chrysymenia.* (i.e. *C. halymenioides* Harv.). Gavio & Fredericq (2005) did not provide further discussion regarding the relationship between *Chrysymenia procumbens* and *Coelarthrum*. *Chrysymenia procumbens* thus represents another non-septate genus of the *Erythrocolon* group or even represents another species *of Cresia*. Unfortunately, we were unable to obtain *rbc*L sequence data for molecular comparison. *Chrysymenia procumbens* is a poorly known species, and it differs

from *Cresia opalescens* by producing blade-like thalli rather than an inflated vesicle. We are reluctant to propose either a new genus or combination for *C. procumbens* without having reproductive material in hand or *rbc*L sequence data. Segmentation otherwise considered important in defining groups as the Champiaceae has been shown to not necessarily be consistent even at the family level. For example, the assignment of *Coelothrix* to the Champiaceae (Le Gall *et al.*, 2008; Lozada & Ballantine, 2009) was made despite lack of segmentation.

Overlapping morphological and reproductive features among genetically distinct groups of Rhodymeniaceae genera have made generic recognition difficult (Huisman, 1996). In fact Saunders *et al.* (1999) have discounted the importance of morphological features in delimiting even familial boundaries within the order. A highly conserved morphological evolution in addition to the fact that evolutionary reversions may occur as well (Saunders *et al.*, 1999), further confound attempts at a comprehensive understanding of relationships between Rhodymeniaceae genera. The erection of still another genus of Rhodymeniaceae with morphological and reproductive characters shared with other genera, underscores the fact that features classically utilized to separate genera and species among Rhodymeniales are frequently highly evolutionary conserved.

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