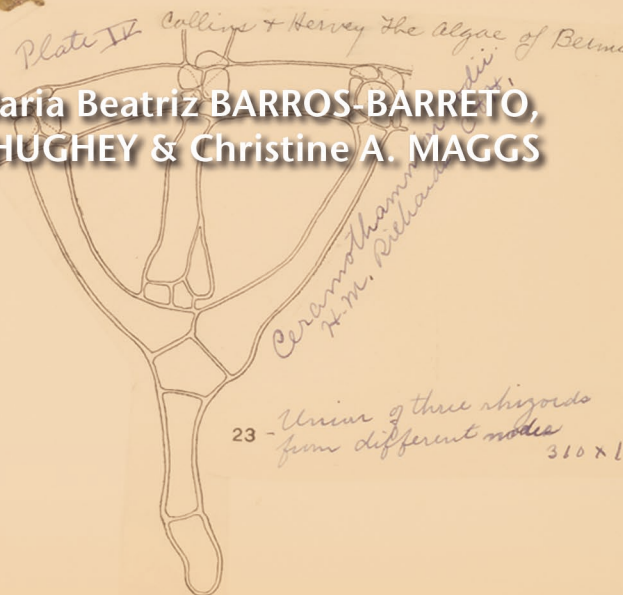


Genome sequencing of *Phycotheca*
Boreali-Americana material of
Ceramothamnion codii H. Richards confirms
synonymy of *Stirkia* Barros-Barreto &
Maggs with *Ceramothamnion* H. Richards

Maria Beatriz BARROS-BARRETO,
Jeffery R. HUGHEY & Christine A. MAGGS



2193. *Ceramium tenuissimum* var. *pygmaeum*
(Kuetz.) Hauck.

Hauck, Meeresalgen von Puerto Rico, p. 460, 1887.
De Toni, Syll. Alg., Vol. IV, p. 1452, 1903.

Hornoceras pygmaeum Kuetzing, Tab. Phyc., Vol. XII, p.
23, Pl. LXXV, 1862.

On *Codium decorticatum*, Cooper's Island, Aug. 2, 1913,
with *Ceramothamnion Codii*.

F. S. COLLINS.

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Maria Beatriz BARROS-BARRETO

Department of Botany, Federal University of Rio de Janeiro, Rua Professor Rodolpho P. Rocco
211, CCS-Bloco A, sala 66, 21941-902, Rio de Janeiro, RJ (Brazil)
beatrizdebb@gmail.com (corresponding author)

Jeffery R. HUGHEY

Division of Mathematics, Science, and Engineering Hartnell College,
CA 93901, Salinas, California (United States)

Christine A. MAGGS

School of Biological Sciences, Queen's University,
Belfast BT9 5AJ (North Ireland)

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ABSTRACT

The systematic status of the newly proposed genus *Stirkia* Barros-Barreto & Maggs and its relationship to the currently accepted name *Ceramothamnion* H.Richards remain uncertain because no authentic specimens of the generitype *C. codii* H.Richards from the type locality in Bermuda have been sequenced. To clarify the taxonomy of *C. codii*, we performed high-throughput sequencing on a topotype, a 1912 *Phycotheca Boreali-Americana* (P.B.-A.) specimen collected by F.S. Collins. The *rbcL*, COI-5P and LSU genetic markers from the P.B.-A. specimen were assembled and used to infer gene and multi-gene phylogenies to determine its phylogenetic history. In all analyses, the topotype of *C. codii* was closely allied with *C. fujianum* Barros-Barreto & Maggs, the generitype of *Stirkia*, as well as with other species of *Ceramothamnion* from the southwestern Atlantic and Pacific Oceans. These data support the relegation of the genus *Stirkia* to *Ceramothamnion* and indicate that the only previously published DNA sequences of *C. codii*, from Hawai'i, represent a different, presumably undescribed species of *Ceramothamnion*. They also highlight the power of whole genome sequencing and the need to analyse type, topotype, or historically authentic herbarium specimens to ensure the accurate application of algal binomials.

KEY WORDS

Ceramieae,
COI-5P,
LSU,
molecular systematics,
rbcL gene.

RÉSUMÉ

Le séquençage du génome du matériel Phycotheca Boreali-Americana de Ceramothamnion codii H.Richards confirme la synonymie de Stirkia Barros-Barreto & Maggs avec Ceramothamnion H.Richards.

Le statut systématique du genre *Stirkia* Barros-Barreto & Maggs nouvellement proposé et sa relation avec le nom actuellement accepté *Ceramothamnion* H.Richards restent incertains car aucun spécimen authentique du généritype *C. codii* H.Richards de la localité type des Bermudes n'a été séquençé. Pour clarifier la taxonomie de *C. codii*, nous avons effectué un séquençage à haut débit sur le spécimen d'un topotype, un spécimen de *Phycotheca Boreali-Americana* (P.B.-A.) de 1912 collecté par F.S. Collins. Les marqueurs génétiques *rbcL*, COI-5P et LSU du P.B.-A. des spécimens ont été assemblés et utilisés pour déduire des phylogénies génétiques et multigéniques afin de déterminer leur histoire

MOTS CLÉS

Ceramieae,
COI-5P,
LSU,
systématique
moléculaire,
rbcL gène.

phylogénétique. Dans toutes les analyses, le topotype de *C. codii* était étroitement lié à *C. fujianum* Barros-Barreto & Maggs, le généritype de *Stirikia*, ainsi qu'à d'autres espèces de *Ceramothamnion* du sud-ouest des océans Atlantique et Pacifique. Ces données soutiennent la relégation du genre *Stirikia* à *Ceramothamnion* et indiquent que les seules séquences d'ADN précédemment publiées de *C. codii*, d'Hawaï, représentent une espèce différente et non décrite de *Ceramothamnion*. Ils mettent également en évidence la puissance du séquençage du génome entier et la nécessité d'analyser des spécimens d'herbier de type, de topotype ou historiquement authentiques pour garantir l'application précise des binômes végétaux.

INTRODUCTION

Recently, an extensive morphological and molecular reclassification of the tribe *Ceramieae* Roth was proposed (Barros-Barreto *et al.* 2023a). The new genus *Stirikia* Barros-Barreto & Maggs was described for a morphologically diverse clade identified by its well-supported molecular monophyly, typified by *Stirikia fujianana* Barros-Barreto & Maggs. Based on a partial LSU rDNA sequence of “*Ceramium codii*” from Kure Atoll, Hawai'i (HQ421967; “*C. codii*” was included in *Stirikia* and the new combination *S. codii* (H. Richards) Barros-Barreto & Maggs was proposed (Barros-Barreto *et al.* 2023b). Wynne & Schneider (2023) promptly noted that the basionym of *Ceramium codii* was *Ceramothamnion codii* H. Richards, a species originally described from specimens forming minute red turfs that grew epiphytically on *Codium tomentosum* Stackhouse from Bermuda (Richards 1901). As *Ceramothamnion* H. Richards is a valid genus with nomenclatural priority, Wynne & Schneider (2023) transferred all the species assigned to *Stirikia* by Barros-Barreto & Maggs to *Ceramothamnion*. They noted however that if additional phylogenetic evidence demonstrates that *C. codii* is phylogenetically distinct from *S. fujianana*, *Stirikia* would remain available for use.

To determine the correct application of a name, analysing DNA from the type material is preferable (Hughey *et al.* 2001). As documented by Wynne & Schneider (2023), the type material of *Ceramothamnion codii* Richards (1901: 265) is no. 845 in Phycotheca Boreali-Americana (P.B.-A.) Fasc. XVII (Collins *et al.* 1901, coll. H.M. Richards, Harris Bay, Bermuda, Feb. 1889, on *Codium tomentosum* [actually *C. decorticatum* (Woodward) M. Howe, see Schneider 2003]). However, it is not possible to analyse the BM (herbarium acronyms follow Thiers 2024, continuously updated) isotype of *C. codii* as the specimen distributed as no. 845 (BM000619304) is mounted on mica and has developed a fungal growth that has destroyed the algal material and rendered it demonstrably ambiguous (Fig. 1A). We do not have access to the NY specimens and thus performed high-throughput sequencing on another P.B.-A. specimen of *C. codii* in BM (Fig. 1B, BM000936098), a specimen collected by F.S. Collins from Cooper's Island, Bermuda, distributed in the exsiccata P.B.-A. as no. 1899, by Collins *et al.* (1912) and considered topotype material by Cho & Fredericq (2006) and Huisman (2018). The lectotype of *C. codii* has never been formally designated, despite the assumption that it should be the NY example

(Huisman 2018). The assembled genetic markers that we obtained were then used to perform single and multi-marker phylogenetic analyses to determine the systematic relationship of *C. codii* to *S. fujianana* and the other species recently transferred to *Ceramothamnion*.

MATERIAL AND METHODS

DNA EXTRACTION AND GENOMIC ANALYSIS

Epiphytic fragments of the tiny filamentous red alga distributed as *Ceramothamnion codii* P.B.-A. no. 1899 were sampled from the left and right specimens of *Codium* sp. (BM000936098; Fig. 1) and combined for the DNA extraction. The sample was processed in the personal residence of JRH. Genomic DNA was isolated using the DNeasy Blood and Tissue Kit (Qiagen) following previous protocols and two modifications: the binding step was centrifuged at 4000 g for 3 mins and the DNA was eluted after incubation for 7 mins in 40 µL TAE (Hughey & Gabrielson 2012, Lindstrom *et al.* 2011, Hughey *et al.* 2019).

The 150 bp PE library was constructed with the KAPA HyperPrep Kit (Roche, Basel, Switzerland) and sequenced by Quick Biology Inc. (Pasadena, California, United States). The resulting reads were filtered using the default BBDuk settings in Geneious Prime 2019.1.3 (Biomatters Limited). The filtering yielded 49 408 547 trimmed reads that were assembled *de novo* with MEGAHIT 1.2.9 using the default settings with the kmers 29, 39, 59, 79, 99, 119, 141 (Li *et al.* 2015). Since the *de novo* did not yield long algal contigs, the standard red algal genetic markers (COI, *rbcL*, LSU) were instead assembled by iterative mapping reads 5X onto the following *Campylaeophora sungminbooi* (J.R. Hughey & G.H. Boo) Barros-Barreto & Maggs reference sequences using the Medium Sensitivity/Fast setting in Geneious Prime 2019.2.3: *rbcL*-GenBank accession number KR025491; COI- GenBank accession number KU145004; and LSU-GenBank accession number EF033604. The assembly sequences were then confirmed for accuracy by iterative remapping of the reads onto the consensus sequences using the same settings in Geneious Prime. *Codium rbcL* and *tufA* DNA sequences were also targeted using the same assembly parameters above using the *Codium* reference sequences: *rbcL*-GenBank accession number ON113499, *tufA*-GenBank accession number

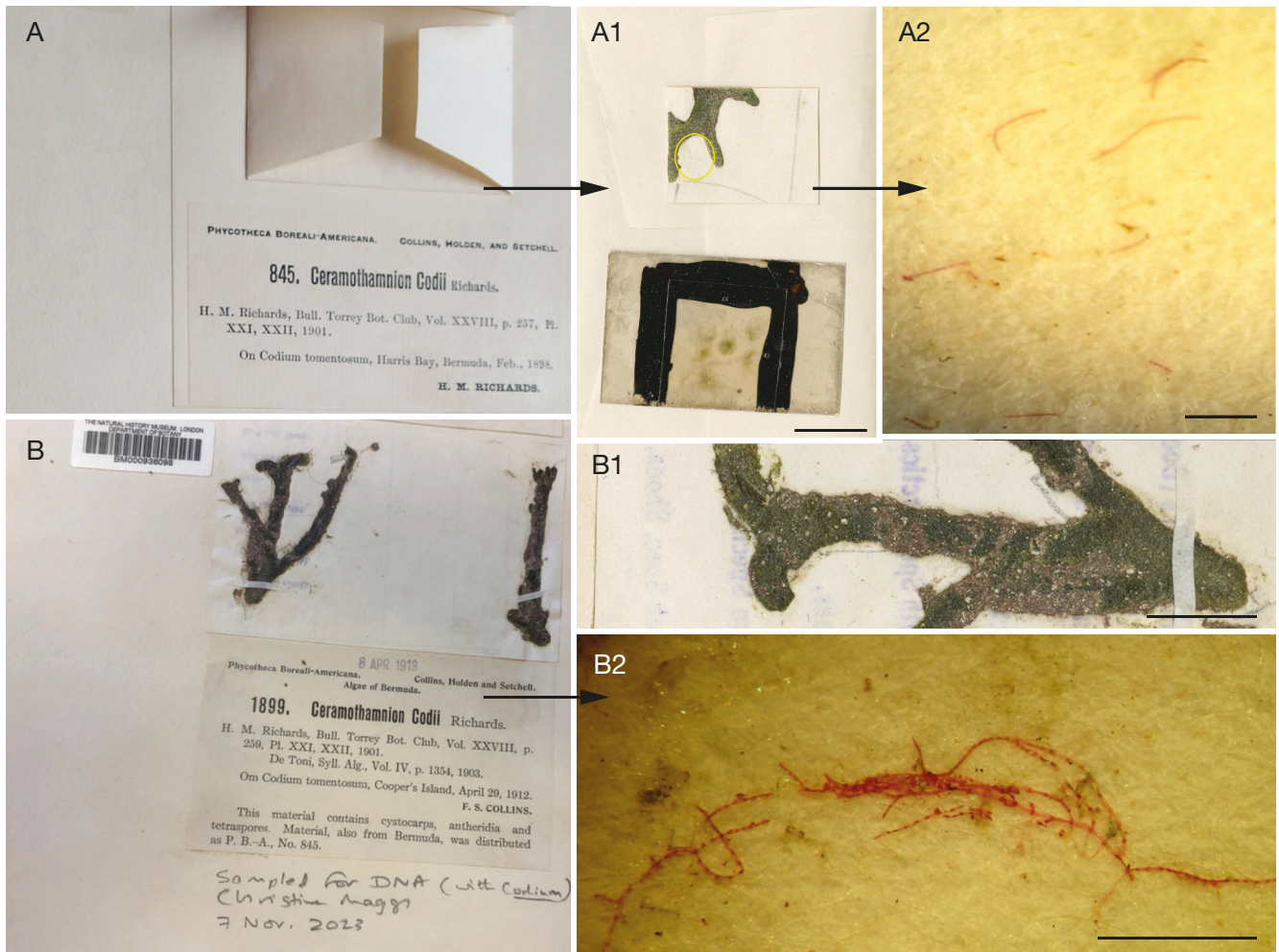


FIG. 1. — *Ceramothamnion codii* H. Richards type and authentic material: **A**, *C. codii*, from Cooper's Island, Bermuda in the exsiccata Phycotheca Boreali-Americana (P.B.-A.) no. 845 (BM000619304) on *Codium tomentosum* Stackhouse (actually *C. decorticatum* (Woodward) M. Howe); **B**, *C. codii*, from Cooper's Island, Bermuda in the exsiccata Phycotheca Boreali-Americana (P.B.-A.) no. 1899 (BM000936098). Scale bars: A1, B1, 1 cm; A2, B2, 1 mm.

KX855797, and rpl16-rps3-GenBank accession number EU045560 to confirm the identity of the host.

PHYLOGENETIC ANALYSES

The *Ceramothamnion codii* marker sequences determined here and others downloaded from GenBank (Appendix 1) were aligned using Seaview 4.2.10 (Gouy *et al.* 2010). There were totals of 182 accessions (including the outgroup) for the *rbcL* locus; 84 accessions for COI-5P; 87 for LSU rDNA; and 72 for the concatenated alignment of the three markers (Appendix 2). Due to missing marker data for some taxa, the *rbcL* alignment was trimmed to 1239 bp and the COI-5P alignment to 624 bp. For LSU, ambiguous sites were cut according to GBlocks (Castresana 2000) to 573 bp following the alignment with MAFFT v7 (Katoh *et al.* 2019); the concatenated alignment was 2487 bp (*rbcL* = 1239 bp; LSU = 682 bp; COI-5P = 566 bp).

Sequence data were analysed with the maximum likelihood (ML) optimality criterion using IQ-TREE (Trifunopoulos *et al.* 2016; Nguyen *et al.* 2015). Genes and codons were partitioned, and evolutionary models were selected

by ModelFinder (Kalyaanamoorthy *et al.* 2017) using the Bayesian Information Criterion (BIC); partitioned models were used when appropriate (Chernomor *et al.* 2016); merge option was also included to increase model fit in IQ-TREE (Appendix 2). Tree branches were tested by SH-like aLRT (Guindon *et al.* 2010), Ultrafast (Hoang *et al.* 2018) and standard bootstrapping with 1000 replicates.

Bayesian inference (BI) analyses were implemented using MrBayes 3.1.2 (Huelsenbeck & Ronquist 2001; Ronquist & Huelsenbeck 2003) or executed on the CIPRES Science Gateway (Miller *et al.* 2010). BI analyses consisted of two parallel runs, each of four Markov chains, and 30^6 generations were run (three times for each dataset) with sampling every 1000 generations. The *rbcL* and COI-5P markers were partitioned (codon positions), the concatenated alignment was partitioned by gene and codon, and the model implemented independently for each gene/codon partition; all the parameters were unlinked. Burn-in fraction was set to 0.30%, and the generation numbers stopped when the Average Standard Deviation of split frequencies reached 0.015 (Appendix 2). The full taxon *rbcL* and COI-5P trees were

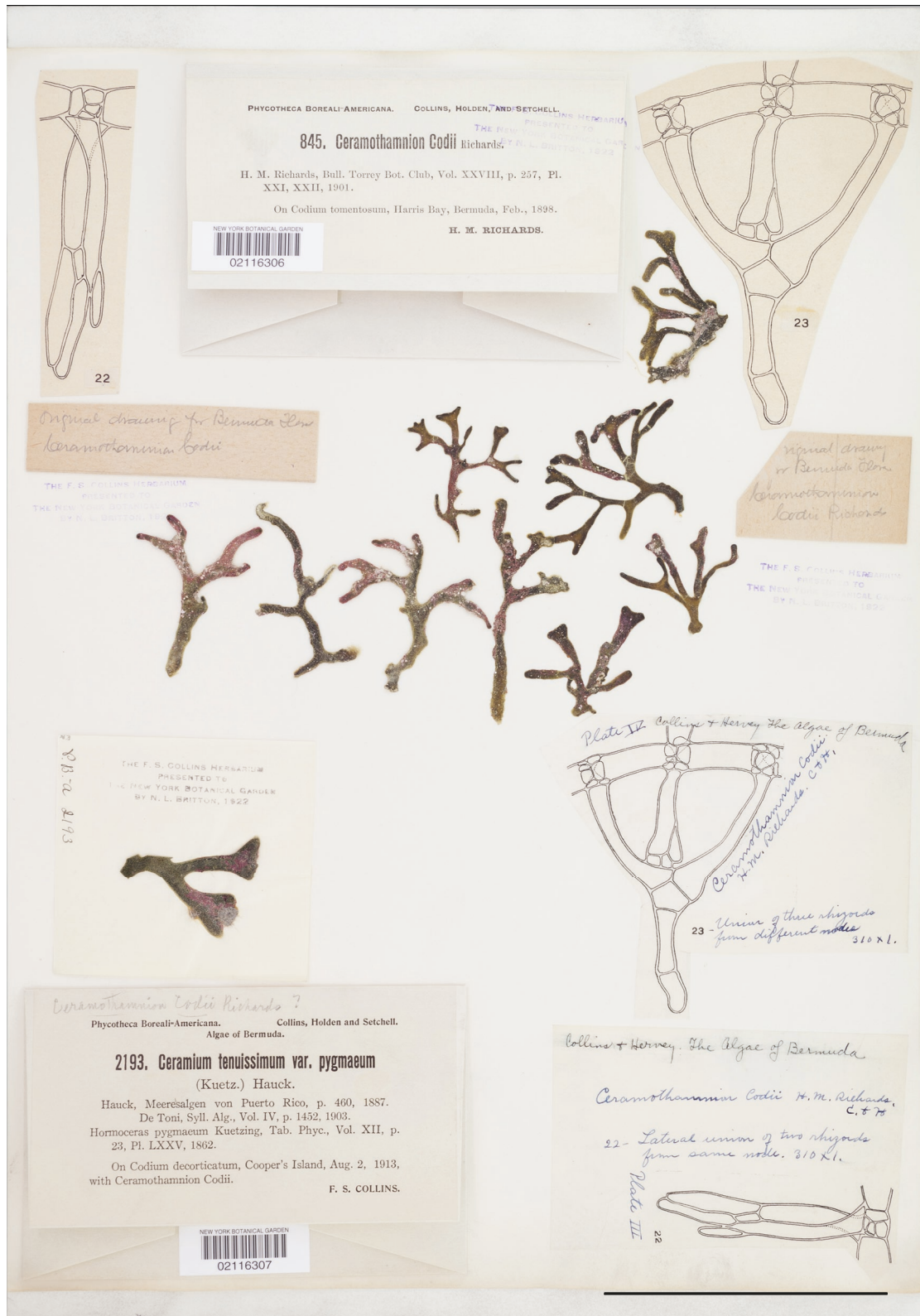


FIG. 2. — *Ceramothamnion codii* H. Richards growing on *Codium tomentosum* Stackhouse and *Codium decorticatum* (Woodward) M.A. Howe thalli, and original drawings from the Algae of Bermuda (Collins & Hervey 1917), lectotype NY02116306. Scale bar: 10 cm.

rooted designating five species from Callithamniaceae and Wrangeliaceae, as the outgroups. For the LSU analyses, two species of Ceramiaceae were used as outgroups. *Antithamnion*

nipponicum Yamada & Inagaki (Ceramiaceae, Antithamnieae) was selected as the outgroup for the concatenated alignment (Appendix 2).

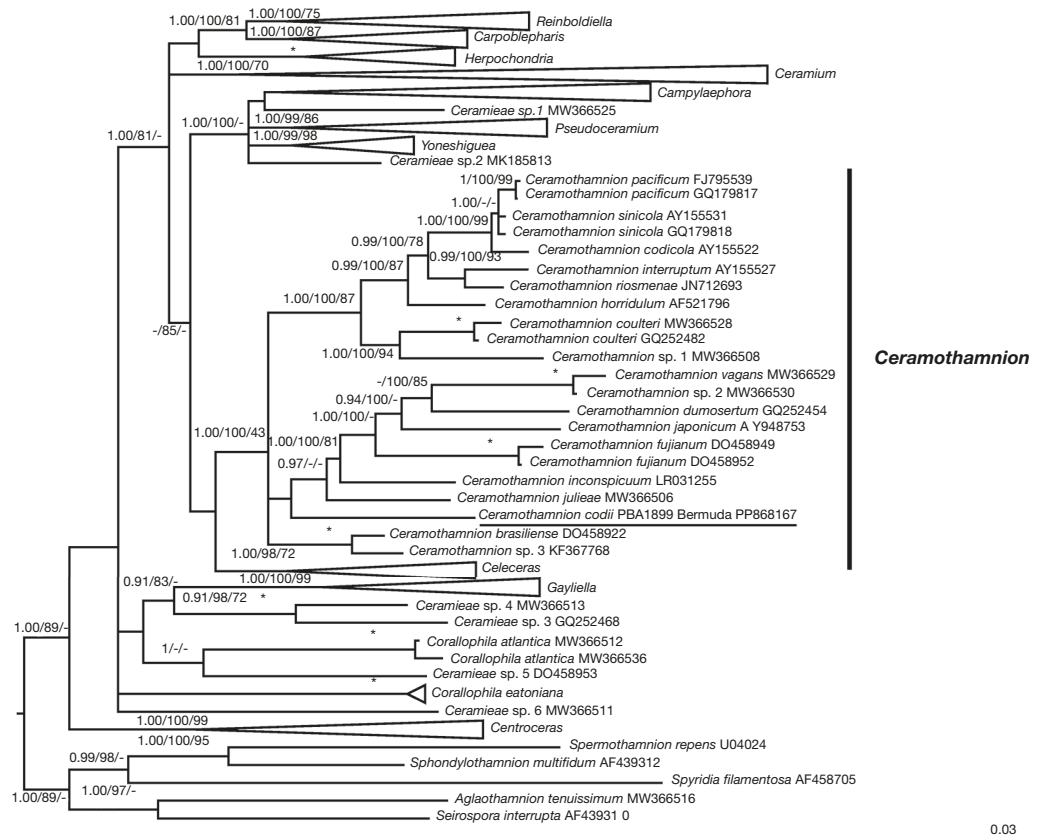


FIG. 3. — Phylogenetic reconstruction of the red algal tribe Ceramieae C. Agardh ex Greville inferred from *rbcl* gene sequences. The tree is the majority rule consensus tree resulting from Bayesian analysis. Values at the nodes represent posterior probability and bootstrap values for ML, support lower than 0.90 (PP), 80 (Ultrafast Bootstrap) and 40 (standard BP) are not shown. *, full support. Sequence generated in this study is in bold and the topotype sequence is underlined.

RESULTS

We herein designate *Ceramothamnion codii* no. 845 P.B.-A. (NY02116306) collected by H. M. Richards from Harris Bay, Bermuda, February, 1898 as the lectotype (Fig. 2), on the basis that Collins' herbarium is in NY (Setchell 1925). *Ceramothamnion codii* no. 1899 P.B.-A. (BM000936098) collected by F.S. Collins from Cooper's Bay, Bermuda, April 29, 1912 is considered to be a topotype (Fig. 1). High-throughput sequencing of the BM's P.B.-A. no. 1899 *Ceramothamnion codii* specimen yielded 53 767 172 reads (BioSample SAMN41642873, BioProject ID PRJNA1119217, SRA SRR29258986). *De novo* assembly of the trimmed reads resulted in 1 338 contigs with an N50 of 418 bp and maximum *C. codii* contig length of 1 920 bp, which was inadequate for organellar genome assembly. Mapping of the reads to the reference sequences however resulted in the assembly of the complete *C. codii rbcl* (GenBank accession number PP868167, 1467 bp) and COI (GenBank accession number PP868169, 1584 bp) genes, and a partial nuclear encoded LSU sequence (GenBank accession number PP863326, 1585 bp) with 144X, 31X, and 13X coverages.

Phylogenetic analysis of the complete *rbcl* gene sequence of *Ceramothamnion codii* positioned it in a clade containing species recently reclassified as *Ceramothamnion* from the south-

western Atlantic, and western (including *C. fujianum*) and eastern Pacific Oceans (Fig. 3). The clade containing *C. codii* and various *Ceramothamnion* spp. was well-supported based on Bayesian and ultrafast bootstrap numbers, however, it displayed low support based on standard bootstrapping (Fig. 3), the genetic distance among this clade is 7–10% (Appendix 3, Table 1). The LSU analysis placed *C. codii* close to *C. fujianum*, however the inferred tree indicated a paraphyletic relationship with respect to *C. codii* and the many species currently assigned to *Ceramothamnion* (Fig. 4), the genetic divergence from *C. codii* from *Ceramothamnion* spp. is 3–7%, except from *C. brasiliense* (16%) (Appendix 3, Table 2). Analysis of the COI-5P data resulted in a phylogenetic tree with numerous polytomies. *Ceramothamnion codii* was grouped in an unsupported clade with six *Ceramothamnion* spp. (Fig. 5; Appendix 3, Table 3). The combined analysis fully resolved *C. codii* in a clade with *C. fujianum* and eleven other *Ceramothamnion* spp. (Fig. 6).

Further analysis of the genome sequencing data found that the LSU sequence identified in GenBank as “*Ceramium codii*” from Kure Atoll, Hawai'i differed from the *Ceramothamnion codii* topotype from Bermuda by 3.7%.

In addition, mapping of the genome data to *rbcl* and *tufA* sequences of *Codium tomentosum* failed to yield matching sequences. Instead, the two *Codium* specimens on sheet

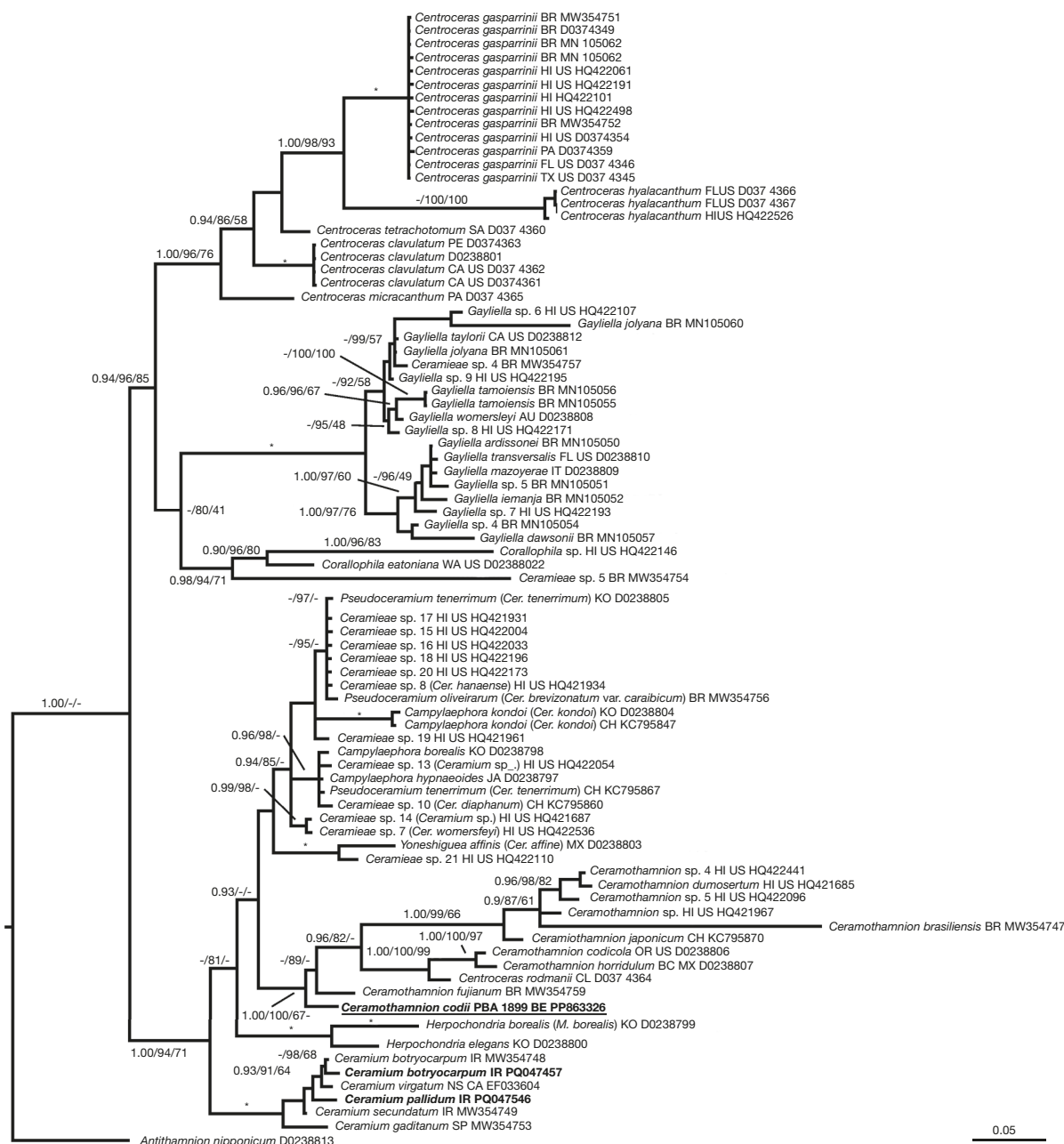


FIG. 4. — Phylogenetic reconstruction of the red algal tribe Ceramieae C.Agardh ex Greville inferred from LSU rDNA sequences. The tree is the majority rule consensus tree resulting from Bayesian analysis. Values at the nodes represent posterior probability and bootstrap values for ML, support lower than 0.90 (PP), 80 (Ultrafast Bootstrap) and 40 (standard BP) are not shown. *, full support. Sequence generated in this study is in bold and the topotype sequence is underlined. Abbreviations: AU, Australia; BE, Bermuda; BC MX, Baja California, Mexico; CA US, California; United States; CH, China; CL, Chile; FL US, Florida, United States; HI US, Hawai'i, United States; IR, Ireland; IT, Italy; JA, Japan; KO, South Korea; MX, Mexico; NS CA, Nova Scotia, Canada; OR US, Oregon, United States; PA, Panama; PE, Peru; SA, South Africa; SP, Spain; TX US, Texas, United States.

no. 1899 P.B.-A. yielded *rbcL* and *tufA* sequences that were identical to sequences deposited in GenBank under the names *Codium decorticatum* (Woodward) M.A.Howe and *Codium fragile*. The *rpl16-rps3* sequence of *Codium fragile* was a partial sequence and did not span the entire locus, but did contain nucleotide markers G at site 50, C at 104, and C at 134. These markers are identical to *Codium fragile* subsp. *tomentosoides* and the *Codium fragile* haplotype from China.

DISCUSSION

CERAMOTHAMNION CODII GENETIC ANALYSIS

The *rbcL* gene is the most commonly used marker within the Ceramiales (Cassano *et al.* 2019; Díaz-Tapia & Verbruggen 2024), therefore obtaining an *rbcL* sequence from authentic material of *Ceramothamnion codii* made it possible to phylogenetically confirm the circumscription of *Ceramothamnion*. High-throughput sequencing of red algal type and other

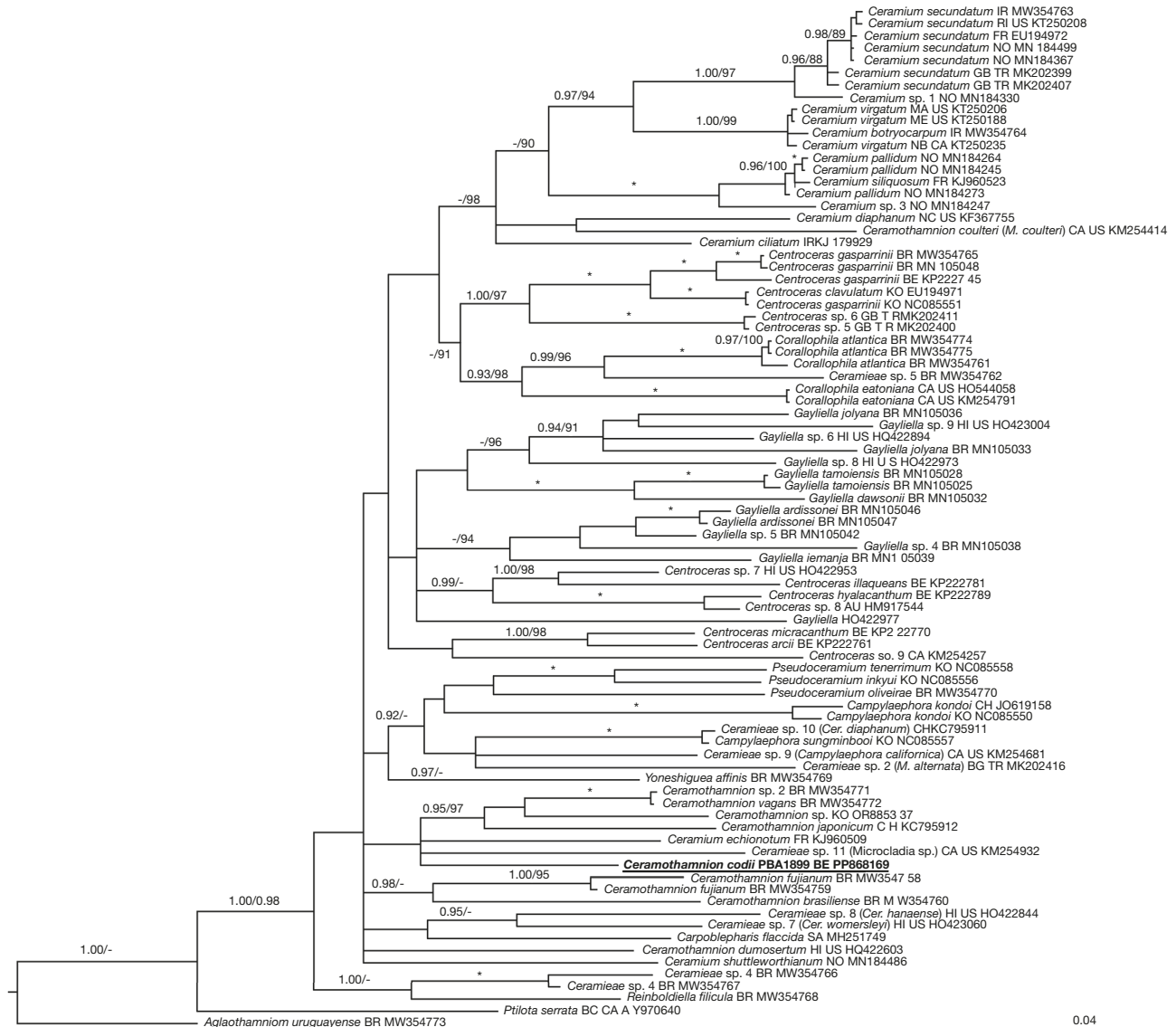


Fig. 5. — Bayesian tree inferred from COI-5P sequences. The trees are the majority rule consensus tree resulting from Bayesian analysis. Values at the nodes represent posterior probability and bootstrap values for ML, support lower than 0.90 (PP), 80 (Ultrafast Bootstrap) and 50 (BP) are not shown. *, full support. Sequences generated in this study are in bold and the topotype sequence is underlined. Abbreviations: AU, Australia; BE, Bermuda; BR, Brazil; CA US, California, United States; CH, China; FR, France; GB TR, British Overseas Territory of Tristan da Cunha; IR, Ireland; KO, South Korea; HI US, Hawai'i, United States; MA US, Massachusetts, United States; ME US, Maine, United States; NB CA, New Brunswick Canada; NC US, North Carolina, United States; NO, Norway; RI US, Rhode Island, United States; SA, South Africa.

historically valuable herbarium specimens has been shown to be useful for resolving many systematic questions in the red algae (Hughey *et al.* 2014, Boo *et al.* 2016, Gabrielson *et al.* 2018, Hughey & Miller 2021, Hughey *et al.* 2022). Although whole genome sequencing here was unable to decipher the complete organellar genomes as reported by the studies above, this analysis successfully generated a sufficient number of reads to assemble the standard phylogenetic genetic markers required to conclusively characterize the generic affinity of the 112 year-old topotype *C. codii* specimen from Bermuda. Although low standard bootstrap supports were observed for the *rbcL*, LSU and combined datasets, all three analyses positioned *Ceramothamnion* species together in a single clade. In

addition, these analyses show that *C. codii* is placed in the same clade as the generotype of *Stirkia*, *S. fujitana*, and therefore support the transfer of all *Stirkia* spp. to *Ceramothamnion* as proposed by Wynne & Schneider (2023). Seo *et al.* (2023) resolved a fully supported *Ceramothamnion* clade in their maximum likelihood phylogeny of the Ceramiales based on nucleotide sequences of 23 protein-coding genes. In addition, our results indicate that the two publicly available sequences in GenBank from Hawai'i deposited under the name *Ceramium codii* (collection number ARS03339, LSU and 23S plastid gene sequences) do not represent the same species as the type material from Bermuda. The genetic distances exhibited between the Hawai'i and Bermuda specimens are higher than

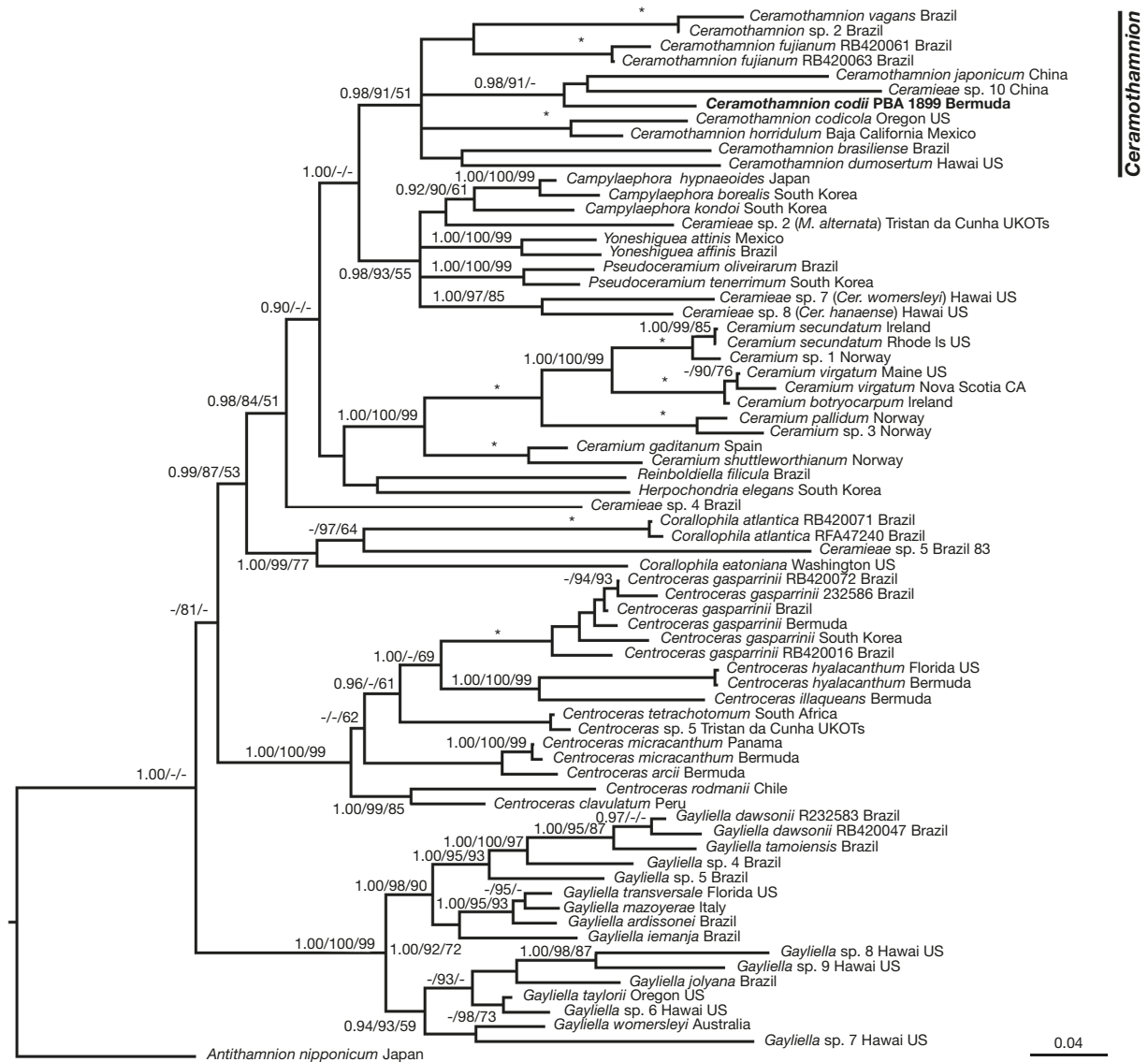


FIG. 6. — Reconstructed phylogeny of the red algal tribe Ceramieae C.Agardh ex Greville based on concatenated *rbcl*L, LSU and COI-5P gene sequences. Majority rule consensus tree resulting from Bayesian analysis. Values at the nodes represent posterior probability and bootstrap values for ML, support lower than 0.90 (PP), 80 (Ultrafast Bootstrap) and 50 (BP) are not shown. *, full support. Sequences generated in this study are in bold and the topotype sequence is underlined. Abbreviation: **UKOTs**, United Kingdom Overseas Territories, United States.

typically observed in intraspecific pairwise comparisons. The Hawaiian specimen thus appears to represent an undescribed species of *Ceramothamnion*.

Three isotype specimens of *Ceramothamnion codii* P.B.-A. no. 845 are housed in the New York Botanical Garden Herbarium under numbers NY2348656, NY02116304, and NY02116306. Specimen NY2348656 contains a slide with filaments on it and an approximately 2.0 cm excised fragment of *Codium* with a scant amount of visible dark red *Ceramothamnion* filaments. This small *Codium* fragment is mounted on its own paper and has been removed with a razor blade and placed in an envelope on the herbarium sheet. The second specimen, NY02116304, also contains a slide with tufts on it (labeled 845a) and three small 0.5-1.0 cm sized *Codium* fragments with some visible *Ceramothamnion* filaments.

This specimen too has been removed with a razor blade and placed in an envelope. The third specimen NY02116306, was selected as the lectotype of *Ceramothamnion codii* because it includes nine full-sized *Codium* thalli, all with numerous and conspicuous pinkish red *C. codii* filaments covering the fronds. In addition, the original drawings from the *Algae of Bermuda* (Collins & Hervey 1917) are mounted adjacent to the envelope containing the nine specimens. *Ceramothamnion codii* no. 1899 is topotype material distributed in the P.B.-A., molecularly characterized here in this paper.

CODIUM GENETIC ANALYSIS

It was surprising to find *Codium fragile* (Suringar) Hariot chloroplast DNA sequences amongst the *Codium decorticans* genome reads from the two host plants on NHM sheet

no. 1899. We are uncertain which thalli represent which species because the two fragments were combined into a single tube for the DNA extraction to maximize the number of *Ceramothamnion codii* sequences obtained from the WGS. What is further perplexing is that no sequences of *Codium fragile* from Bermuda are publicly available in GenBank, nor has the name been reported from Bermuda (Schneider 2003; Guiry & Guiry 2024). It is possible that the *Codium fragile* from the topotype sheet of *Ceramothamnion codii* represents the invasive strain of the species, *Codium fragile* subsp. *tomentosoides* (van Goor) P.C.Silva, because the partial rpl16-rps3 sequence we obtained excludes *atlanticum* subsp. (Cotton) P.C.Silva and the following haplotypes: Northeast Pacific, South Africa, New Zealand, Tasmania and Mexico as defined by Provan *et al.* (2008). The two haplotypes/subspecies that cannot be excluded based on the mutations recovered from the genomic data are subsp. *tomentosoides* and the China haplotype.

In summary, HTS of archival 1912 topotype material of *C. codii* generated an adequate number of endogenous reads to assemble standard genetic markers and thereby corroborate the taxonomic placement of *C. codii* in the genus *Stirkia*. The data was also able to confirm two host plant species, *Codium fragile* and *Codium decorticatum*.

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APPENDICES

APPENDIX 1. — Samples information and GenBank accession number.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Campylaeophora borealis</i> (Y. Nakamura) K.S. Seo, T.O. Cho & S.M. Boo	—	—	South Korea: Sinnam, Kangwon	25.II.1998	T.O.Cho & H.S. Yoon	AY945767	DQ238798	—
<i>Campylaeophora boydenii</i> (E.S. Gepp) Barros-Barreto & Maggs	<i>Ceramium boydenii</i> E.S. Gepp	CAM 412	Japan: Uranohama. NCU-A-0004403	11.VII.1994	MHH	MW366520	—	—
<i>Campylaeophora californica</i> (Farlow) T.O.Cho in T.O. Cho, Hommersand, B.Y.Won & Fredericq	—	CAM 409	USA: Pigeon Point, San Mateo Co, California. NCU-A-0003395	21.XII.1992	MHH	MW366519	—	—
<i>Campylaeophora californica</i> (Farlow) T.O.Cho in T.O. Cho, Hommersand, B.Y.Won & Fredericq	—	TC395	USA: California, Pigeon Point, San Mateo Co	21.XII.1992	MHH	EF613500	—	—
<i>Campylaeophora californica</i> (Farlow) T.O.Cho in T.O. Cho, Hommersand, B.Y.Won & Fredericq	—	AC274	USA: California, Monterey	07.IX.2006	A. L. Carlile	GQ252449	—	—
<i>Campylaeophora crassa</i> (Okamura) Nakamura	—	—	South Korea: Sinnam, Kangwon	25.II.1998	T.O.Cho & H.S. Yoon	AY945769	—	—
<i>Campylaeophora gardneri</i> (Kylin) Barros-Barreto & Maggs	<i>Ceramium gardneri</i> Kylin	AC247	USA: San Juan Is., Washington	02.VIII.2006	—	GQ252455	—	—
<i>Campylaeophora gardneri</i>	<i>Ceramium gardneri</i>	AC307	USA: San Juan Is., Washington	02.VIII.2007	—	GQ252456	—	—
<i>Campylaeophora gardneri</i>	<i>Ceramium gardneri</i>	AC311	USA: San Juan Is., Washington	05.VIII.2007	—	GQ252457	—	—
<i>Campylaeophora hypnaeoides</i> J.Agardh	—	—	South Korea: Daesado, Wando	13.VI.1999	T.O. Cho, & W.J. Lee	EF613506	—	—
<i>Campylaeophora hypnaeoides</i>	—	—	Japan: Akkeshi, Hokkaido	07.V.1999	S.M.Boo & H.S. Yoon	EF613505	—	—
<i>Campylaeophora hypnaeoides</i>	—	—	Japan: Sonohora, Tsuyazaki, Fukuoka	18.III.1999	T.O. Cho & S. P.W. Kawaguchi	—	DQ238797	—
<i>Campylaeophora kondoi</i> (Yendo) Barros-Barreto & Maggs	<i>Ceramium kondoi</i> Yendo	C163	Japan: Hokkaido, Akkeshi	—	—	AY770641	—	—
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	C554	South Korea: Taean, Bangpo	—	—	AY770638	—	—
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	AC230	South Korea: Yeosu, Anpori	16.V.2006	—	GQ252460	—	—
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	—	South Korea: Taean, Hakampo	—	E.C., Yang, S.M.Boo	AY295176	—	—
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	—	South Korea: Namhae, Kyengnam	30.III.1998	T.O. Cho	—	DQ238804	—
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	mbccc09	China, Qingdao	III.2011	—	—	—	JQ619158
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	C1318	Japan: Aomori, Senjougiki	—	—	DQ350384	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Campylaeophora kondoi</i>	<i>Ceramium kondoi</i>	LQD- Hqw20111124- R21	China	11.XI.2011	Wu F.-F.	—	KC795847	—
<i>Campylaeophora sungminbooi</i> (J.R.Hughey & G.H.Boo) Barros-Barreto & Maggs	<i>Ceramium sungminbooi</i>	—	Norway: Frognerkilen, Oslofjord	5.IX.1996	Jan Rueness	KX037019	—	—
<i>Campylaeophora sungminbooi</i>	<i>Ceramium sungminbooi</i>	—	Hoedong, Jindo. NU<KOR>:034423	28.II.2002	—	KU160485	—	—
<i>Campylaeophora sungminbooi</i>	<i>Ceramium</i> sp.	AC239	South Korea: Taeon, Magumpo	26.V.2006	—	GQ252466	—	—
<i>Campylaeophora</i> sp. 1	<i>Campylaeophora</i> sp.	OSsj0609-7	South Korea	9.VI.2017	—	MH200825	—	—
<i>Campylaeophora</i> sp. 2	—	LM 1554	Japan: East Segami Bay BM(NH)	12.VII.2003	C. Trowbridg	MW366526	—	—
<i>Campylaeophora</i> sp. 3	<i>Ceramium cimbricum</i> H.E.Petersen in	AC177	USA: Sitka, Alaska	22.V.2005	—	GQ252452	—	—
<i>Campylaeophora</i> sp. 3	Rosenvinge <i>Ceramium cimbricum</i>	AC185	USA: Sitka, Alaska	24.VI.2005	—	GQ252453	—	—
<i>Campylaeophora</i> sp. 4	<i>Ceramium californicum</i> J.Agardh	TC006	USA: Oregon, Yaquina Bay	13.VII.1998	T.O. Cho & G.-I. Hansen	AY591931	—	—
<i>Campylaeophora</i> sp. 4	<i>Ceramium californicum</i>	AC279	USA: Cape Arago, Oregon	14.VI.2007	—	GQ179819	—	—
<i>Carpoblepharis flaccida</i> (J.V.Lamouroux) Kützing	—	ODC 855	South Africa: Kommetjie, Western Cape Province	9.XI.1999	ODC	AY945764	—	—
<i>Carpoblepharis flaccida</i>	—	—	South Africa	—	—	DQ787567	—	—
<i>Carpoblepharis flaccida</i>	—	CUK14732	South Africa: Hout Bay Harbour Cape Town Western Cape	—	—	—	—	MH251749
<i>Carpoblepharis minima</i> E. S. Barton	—	Lynn1561	South Africa	—	LM	MW366505	—	—
<i>Carpoblepharis minima</i>	—	TC408	Namibia: Grossbuchte, Luderitz	09.VII.1993	MHH	EF613508	—	—
<i>Carpoblepharis obsoleta</i> (C.Agardh) Barros-Barreto & Maggs	<i>Ceramium obsoletum</i> C.Agardh	—	South Africa: Houk Bay, Cape Town	24.XI.1999	O. DeClerck	FR871402	—	—
<i>Carpoblepharis</i> sp.	<i>Ceramium pacificum</i> (Collins) Kylin	CAM 1056	US	—	—	MW366514	—	—
<i>Celeceras monile</i> (Hooker & Harvey) Kützing	<i>Ceramium puberulum</i> Sonder	—	Port MacDonnell, Discovery Bay, South Australia NCU-A-0004649	28.VIII.1995	MHH	MW366517	—	—
<i>Celeceras novae-zelandiae</i> (J.Agardh) Barros-Barreto & Maggs	<i>Microcladia novae-zelandiae</i> J.Agardh	CAM 411	New Zealand: Aromoana. BM000701861	29.III.1994	W. Nelson via MHH	MW366518	—	—
<i>Celeceras pusilla</i> (Harvey) Barros-Barreto & Maggs	<i>Ceramium pusillum</i> Harvey	CAM 1542	New Zealand: Christchurch.	01.X.2003	M.P. Johnson,	FR871403	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Centroceras arcii</i> C.W. Schneid., Popolizio & C.E. Lane	—	CWS/CEL09-13-6	Bermuda: Horseshoe Bay	16.III.2009	C.W.Schneider et C.E Lane	KP222800	—	—
<i>Centroceras arcii</i> C.W. Schneid., Popolizio & C.E. Lane	—	BDA 0870	Bermuda: Devonshire Bay	16.II.2012	T.R. Popolizio	—	—	KP222761
<i>Centroceras clavulatum</i> (C.Agardh) Montagne	—	—	Peru: Punta La Cruz, Ancon, Lima	30.VIII.2003	N. Arakaki	—	DQ374363	—
<i>Centroceras clavulatum</i>	—	C76	South Korea: Pohang, Guryongpo	07.VII.1999	E.C., Yang, Boo, S.M	—	—	EU194971
<i>Centroceras clavulatum</i>	—	bB9	—	—	—	—	DQ238801	—
<i>Centroceras clavulatum</i>	—	TC825	USA: California, Pescadero, San Mateo Co	03.VII.2003	—	—	DQ374362	—
<i>Centroceras clavulatum</i>	—	TC293	USA: California, Lover's Point, Pacific Grove, Monterey Co	10.XII.1999	—	—	DQ374361	—
<i>Centroceras gasparrinii</i> (Meneghini) Kützinger	<i>Centroceras clavulatum</i>	MBBB 48	Brazil: Mangue, Itapemirim, Espírito Santo RB420016	4.III.2004	MBBB	DQ458919	MW354752	—
<i>Centroceras gasparrinii</i>	—	MBBB 143	Brazil: Praia da Joana, Rio das Ostras, Rio de Janeiro. RB420072	26.VIII.2005	MBBB	—	MW354751	MW354765
<i>Centroceras gasparrinii</i>	—	MBBB 526	Brazil: Praia de Manguinhos, Armação de Búzios, Rio de Janeiro. R232586	21.VIII.2013	MBBB	MW366535	MN105062	MN105048
<i>Centroceras gasparrinii</i>	—	B6	Brazil: Praia Rasa, Buzios, RJ	22.XI.2003	C.F.D. Gurgel	DQ374311	DQ374349	—
<i>Centroceras gasparrinii</i>	—	LM 1559	Morocco: Devil's Point, culture. BM000701866	II.2002	CAM	AF439294	—	—
<i>Centroceras gasparrinii</i>	—	—	South Korea: Gampo, Pohang	27.IX.1998	T.O.Cho & H.S. Yoon	AY945766	—	—
<i>Centroceras gasparrinii</i>	<i>Centroceras minutum</i> Yamada	—	Australia: Horn Island, Queensland	21.VI.2002	—	DQ374321	—	—
<i>Centroceras gasparrinii</i> (Meneghini) Kützinger	—	—	South Africa: Reunion Rocks, KwaZulu-Nata	17.VIII.2005	T.O. Cho & S. Fredericq	DQ374320	—	—
<i>Centroceras gasparrinii</i>	—	BDA 0356	Bermuda: St. George's Harbour	23.VIII.2010	C.W. Schneider et C.E Lane	KP222805	—	KP222745
<i>Centroceras gasparrinii</i>	—	TC6721	South Korea: Jindo, Baekdongri, Imhoemyeon	16.IV.2001/ 20.VIII.2009	T. O. Cho, S. Y. Jeong & J. K. Lee	HM240515	—	—
<i>Centroceras gasparrinii</i>	<i>Centroceras clavulatum</i>	ARS02604	US: Hawaii	—	—	—	HQ422498	—
<i>Centroceras gasparrinii</i>	<i>Centroceras clavulatum</i>	ARS03547	US: Hawaii	—	—	—	HQ422061	—
<i>Centroceras gasparrinii</i>	<i>Centroceras clavulatum</i>	ARS03696	US: Hawaii	—	—	—	HQ422191	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Centroceras gasparrinii</i>	<i>Centroceras clavulatum</i>	ARS03255	US: Hawaii	—	—	—	HQ422016	—
<i>Centroceras gasparrinii</i>	<i>Centroceras clavulatum</i>	ARS03573	US: Hawaii	—	—	—	HQ422101	—
<i>Centroceras gasparrinii</i>	—	TC826	USA: Texas, Port Aransas, Aransas Co	08.VII.2003	T.O. Cho & B.Y. Won	—	DQ374345	—
<i>Centroceras gasparrinii</i>	—	TC367	USA: Florida, Sand Key State Park, St. Petersburg, Pinellas Co., W. Florida	19.IX.2002	T.O. Cho	—	DQ374346	—
<i>Centroceras gasparrinii</i>	—	TC833	USA: Hawaii, Ka’ala’wai, O’ahu	08.VIII.2003	P. Vroom	—	DQ374354	—
<i>Centroceras gasparrinii</i>	—	W00265	Panama: Isla Culebra, Pacific Panama	16.IV.1999	B. Wysor	—	DQ374359	—
<i>Centroceras gasparrinii</i> (Meneghini) Kützing subsp. <i>minor</i> M.A. Wolf, A. Buosi, A.S. Juhmani & A. Sfriso	<i>Centroceras gasparrinii</i>	A000838	Italy: Venice	—	—	LR536401	—	—
<i>Centroceras hommersandii</i> Won, T.O.Cho & Fredericq	—	B105	South Africa: Trafalgar, KwaZulu-Nata	20.II.1999	E. Coppejans <i>et al.</i>	DQ374322	—	—
<i>Centroceras hyalacanthum</i> Kützing	—	TC524	USA: Florida, Nerritt Island, Brevard Co., E. Florida	05.III.2003	T.O. Cho & B.Y. Won	DQ374341	DQ374366	—
<i>Centroceras hyalacanthum</i>	—	BDA 0590	Bermuda: Cove east of Spanish Pt.	18.I.2012	C.W. Schneider et C.E Lane	KP222803	—	KP222789
<i>Centroceras hyalacanthum</i>	—	ARS02737	USA: Hawaii, Oahu	—	—	—	HQ422526	—
<i>Centroceras illaqueans</i> C.W. Schneider, Cianciola & Popolizio	—	BDA 09-2-9	Bermuda: Capt. William’s Bay	15.III.2009	C.W. Schneider et C.E Lane	KP222802	—	KP222781
<i>Centroceras micracanthum</i> Kützing	—	W01063	Panama: Galeta Island, Smithsonian Tropical Research Institute (STRI), Caribbean entrance to the Panama Canal	01.X.1999	B. Wysor	DQ374336	DQ374365	—
<i>Centroceras micracanthum</i> Kützing	—	BDA 0584	Bermuda: Cove east of Spanish Pt.	18.I.2012	C.W. Schneider	KP222804	—	KP222770
<i>Centroceras natalense</i> Won, T.O. Cho, & Fredericq	—	TC2796	South Africa: Leisure Bay	24.VIII.2005	T.O. Cho & S. Fredericq	DQ374343	—	—
<i>Centroceras rodmanii</i> Won, T.O. Cho & Fredericq	—	TC435	Chile: Cocholgue, Bahia Concepcion	01.I.1996	MHH	DQ374333	DQ374364	—
<i>Centroceras tetrachotomum</i> Won, T.O. Cho & Fredericq	—	TC415	South Africa: Lambert Bay, Western Cape	25.I.2001	MHH	DQ374323	DQ374360	—
<i>Centroceras</i> sp. 1	<i>Centroceras clavulatum</i>	-	Jamaica: Falmouth, Trelawny Province	VII.1999	D.T. Thomas	DQ022809	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Centroceras</i> sp. 2	<i>Centroceras</i> sp. 1	HV06148	Australia: VIC, Mallacoota	—	Heroen Verbruggen, Kyatt Dixon	MK125359	—	—
<i>Centroceras</i> sp. 3	<i>Centroceras</i> sp. 3	HV06015	Australia: VIC, Mallacoota	—	Heroen Verbruggen, Kyatt Dixon	MK125362	—	—
<i>Centroceras</i> sp. 4	<i>Centroceras</i> <i>clavulatum</i>	AC272	USA: CA, Monterey	07.IX.2006	-	GQ252451	—	—
<i>Centroceras</i> sp. 5	<i>Centroceras</i> sp. 1	1Tris	UK: Tristan da Cunha, Saint Helena: Nightingale. Nightingale 2010 024	21.III.2010	Sue Scott	MK185797	—	MK202400
<i>Centroceras</i> sp. 6	<i>Centroceras</i> sp. 1	1Tris	UK: Tristan da Cunha, Saint Helena: West of Harbour, pools 2010 069	31.III.2010	Sue Scott	—	—	MK202411
<i>Centroceras</i> sp. 7	—	ARS03786	USA:Hawaii, Oahu	19.IV.2008	A. Kurihara	—	—	HQ422953
<i>Centroceras</i> sp. 8	<i>Centroceras</i> <i>clavulatum</i>	GWS015026	Australia	19.I.2010	G.W. Saunders & K. Dixon B.	—	—	HM917544
<i>Centroceras</i> sp. 9	<i>Centroceras</i> <i>clavulatum</i>	GWS021277	USA: California, Pigeon Point Lighthouse	15.V.2010	Clarkston & K. Hind CAM	—	—	KM254257
<i>Ceramium barbatum</i> Kützinger	—	CAM 1528	Italy: Lerici, Liguria. BM000701867	11.VII.2001	CAM	FR871396	—	—
<i>Ceramium</i> <i>botryocarpum</i> A.W.Griffiths ex Harvey	—	CAM 275	N. Ireland: Annalong, Co. Down	XI.1993	CAM	AF439288	—	—
<i>Ceramium</i> <i>botryocarpum</i> Roth	—	CAM 1081	Annalong, Co. Down, N. Ireland	25.I.2003	CAM	—	MW354748	MW354764
<i>Ceramium</i> <i>botryocarpum</i> Roth	—	CAM 1086	Annalong, Co. Down, N. Ireland	25.I.2003	Ellen Cocquyt	—	PQ047457	—
<i>Ceramium ciliatum</i> (Ellis) Ducluzeau	—	GALW	Ireland: Finavarra, Co. Clare	2003	L.M. GALW	FR871397	—	—
<i>Ceramium ciliatum</i> (Ellis) Ducluzeau	—	strain 25996	Spain: Tragove, Pontevedra	04.III.2011	Javier Cremades	—	—	KJ179929
<i>Ceramium cimbricum</i> H.E.Petersen in Rosenvinge	—	CAM 211	Ireland: Tamney, Mulroy Bay, Donegal. BM000701865 (Maggs & Hommersand, 1993, Fig 15b)	15.II.1993	CAM	MW366531	—	—
<i>Ceramium cimbricum</i> H.E.Petersen in Rosenvinge	—	CAM 212	Ireland: Tamney, Mulroy Bay, Donegal. BM000701863	15.II.1993	CAM	MW366532	—	—
<i>Ceramium cimbricum</i> H.E.Petersen in Rosenvinge	—	C 8843/C-A- 37605	Denmark: Egerslev Ron, Limfjorden	27.VII.1920	H. Petersen	KU925350	—	—
<i>Ceramium circinatum</i> (Kützinger) J.Agardh	—	CAM 181	England: Kimmeridge, Dorset	13.X.1992	CAM	FR871398	—	—
<i>Ceramium connivens</i> Zanardini	—	-	Italy: Ca' Roman, Pellestrina	—	-	LR031254	—	—
<i>Ceramium derbesii</i> Solier ex Kützinger	—	#4 (HA 3150-1)	Venice Lagoon, Lido di Veneza, Italy	00.VI.2010	Wolf & Sciuto	FR775778	—	—
<i>Ceramium</i> <i>deslongchampsii</i> Chauvin ex Duby	—	CAM 45	N. Ireland: Helen's Bay, Co. Down	30.III.1992	CAM	AF439293	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Ceramium diaphanum</i> (Lightfoot) Roth	—	NCweed1220	USA: North Carolina, Onslow Bay, Atlantic Ocean, Wynne Plaza Park	18.III.2013	D.W. Freshwater	—	—	KF367755
<i>Ceramium diaphanum</i> sensu Harvey	—	CAM 199	England: Cornwall,	10.III.1993	CAM	FR871401	—	—
<i>Ceramium</i> aff. <i>diaphanum</i>	—	CAM 249	Canada: Pomquet Harbour, Antigonish Co., Nova Scotia	26.IX.1993	C. Bird	FR871400	—	—
<i>Ceramium</i> aff. <i>diaphanum</i>	—	CAM 136	Ireland: St John's Point, West Donegal	29.VIII.1992	CAM	FR871399	—	—
<i>Ceramium</i> <i>echionotum</i> J.Agardh	—	LM 1027	Canary Islands: Corallejo, Fuerteventura	25.III.1999	CAM	AF439313	—	—
<i>Ceramium</i> <i>echionotum</i> J.Agardh	—	RMAR2945	France: Brittany, Le Loup	30.VIII.2011	Couceiro L., Robuchon M.	—	—	KJ960509
<i>Ceramium gaditanum</i> (Clemente) Cremades	—	CAM 1052	UK: Broad Haven, Pembrokeshire, Wales. BM013821504	18.III.2000	CAM	MW366534	—	—
<i>Ceramium gaditanum</i>	—	MBBB 64	Spain: Cudillero, Asturias.	20.I.2005	CAM	—	MW354753	—
<i>Ceramium</i> <i>glandulosum</i> (Solander ex Turner) Barros-Barreto & Maggs	<i>Microcladia</i> <i>glandulosa</i> (Solander ex Turner) Greville	CAM 322	England: Helston, Cornwall BM(NH)	30.VII.1994	CAM	MW366533	—	—
<i>Ceramium nodosum</i> (Kützing) A.W. Griffiths & Harvey	—	—	Italy: Ca' Roman, Pellestrina	—	—	LR031256	—	—
<i>Ceramium</i> <i>nudiusculum</i> (Kützing) Rabenhorst	—	#2 (HA 3150-4)	Venice Lagoon, Lido di Veneza, Italy	00.VI.2010	Wolf & Sciuto	FR775780	—	—
<i>Ceramium pallidum</i> (Kützing) Maggs & Hommersand	—	CAM 223	Ireland: Flannery's Bridge, Kilkieran Bay, Co. Galway	12.VI.1993	CAM	AF439292	—	—
<i>Ceramium pallidum</i>	—	CAM 1071	UK: Northern Ireland, Strangford Lough, The Dorn.	24.X.2002	Ellen Cocquyt	—	PQ047456	—
<i>Ceramium pallidum</i>	—	GWS039884	Norway: Ormhilleren (site 1)	05.VI.2016	G.W. Saunders & T. Bringloe	MN184533	—	MN184264
<i>Ceramium pallidum</i>	—	GWS039872	Norway: Hellesoy	05.VI.2016	G.W. Saunders & T. Bringloe	—	—	MN184245
<i>Ceramium pallidum</i>	—	2016_ BIO309A_47	Norway: Hordaland, Sore egdholmen	18.IV.2016	C.M. Berntsen, N. E. Frogg, C.C. Martin	—	—	MN184273
<i>Ceramium rothianum</i> M.A.Wolf, K.Sciuto, I. Moro, Maggs & Sfriso	—	—	Italy: Ca' Roman, Pellestrina	—	—	LR031258	—	—
<i>Ceramium</i> <i>secundatum</i> Lyngbye	—	CAM 41	Ireland: St John's Pt, Co. Donegal	20.II.1992	CAM	AF439287	—	—
<i>Ceramium</i> <i>secundatum</i>	—	CAM 355	Dale Fort, Pembs, Wales	10.X.1995	CAM	AF439286	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Ceramium secundatum</i>	—	—	France: Bretagne, Roscoff	05.IV.2000	Yang, E.C. Boo, S.M.	—	—	EU194972
<i>Ceramium secundatum</i>	—	IN07.R036	UK: Tristan da Cunha, Saint Helena, Inaccessible, Off Tom's Beach	29.XI.2007	Susan Scott	MK185826	—	—
<i>Ceramium secundatum</i>	—	Tristan 2010 073	Saint Helena: Tristan, West of Harbour, pools	31.III.2010	Susan Scott	—	—	MK202399
<i>Ceramium secundatum</i>	—	Nightingale 2010 056	Saint Helena: Nightingale, East Landing	23.III.2010	Susan Scott	—	—	MK202407
<i>Ceramium secundatum</i>	—	GWS018041	US: Fort Witherill, Jamestown, Rhode Island	16.IV.2016	B. Clarkston, D. McDevit, M. Bruce, A. Savoie, C. Longtin	KT250273	—	KT250208
<i>Ceramium secundatum</i>	—	2016_ BIO309A_30	Norway: Hordaland, Espeland	17.IV.2016	C.S. Armitage	—	—	MN184367
<i>Ceramium secundatum</i>	—	GWS038089	Norway: Station Dorm Beach, Espeland	03.VI.2016	G.W. Saunders & T. Bringloe	—	—	MN184499
<i>Ceramium shuttleworthianum</i> (Kützing) Rabenhorst	—	CAM 1049	UK: Broad Haven Beach, Wales	17.III.2003	CAM	FR871404	—	—
<i>Ceramium shuttleworthianum</i>	—	GWS039860	Norway: Hellesoy	05.VI.2016	G.W. Saunders & T. Bringloe	MN184563	—	MN184486
<i>Ceramium siliquosum</i> (Kützing) Maggs & Hommersand	—	CAM 172	Ireland: Fanore, Co. Clare	28.IX.1992	CAM	FR871405	—	—
<i>Ceramium siliquosum</i>	—	RMAR1120	France: Brittany, Les Rospects	14.III.2011	Le Gall, L., Turpin, Y.	—	—	KJ960523
<i>Ceramium strictum</i> Roth	—	CAM 140	Ireland: Skerries, Co. Dublin	30.VIII.1992	CAM	FR871408	—	—
<i>Ceramium tenuicorne</i> (Kützing) Waern	—	Rueness 9817	Culture	04.X.1994	B. Eklund	FR871409	—	—
<i>Ceramium virgatum</i> Roth	—	CAM 496	Germany: South Harbour, Helgoland, North Sea	07.I.1999	A. Wagner	AF439290	—	—
<i>Ceramium virgatum</i>	—	GWS003615	USA: Maine, Cape Neddick, southern ME	24.IV.2006	L. Le Gall	—	—	KT250188
<i>Ceramium virgatum</i>	—	GWS014784	USA: Massachusetts, Folly Cove, Gloucester, right side	13.IV.2010	B. Clarkston, A. Savoie	KT250272	—	KT250206
<i>Ceramium virgatum</i>	—	GWS002366 or GWS2366	Canada: Nova Scotia, Cape St. Marys	5.IX.2004	G.W. Saunders	—	EF033604	KT250235
<i>Ceramium</i> sp. 1	<i>Ceramium</i> sp.	2016_ BIO309A_66	Norway: Hordaland, Stora Kalsoy	19.IV.2016	T. Ulvatn, H. Dybevik	MN184543	—	MN184330
<i>Ceramium</i> sp. 2	<i>Ceramium secundatum</i>	LM 1565	New Zealand: Christchurch, Cultured	I.2003	M.P. Johnson	MW366509	MW354749	MW354763
<i>Ceramium</i> sp. 3	<i>Ceramium</i> sp1	GWS040811	Norway: Hakonsund	10.VI.2016	G.W. Saunders & T. Bringloe	MN184529	—	MN184247
<i>Ceramium</i> sp. 4	—	LM 1562	Tenerife, Spain	2003	LM	MW366507	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Ceramium</i> sp. 5	—	CAM 1130	Italy: Ischia. Culture	7.XII.2002	CAM	FR871407	—	—
<i>Ceramoathamnion brasiliensis</i> (A. B. Joly) M.J.Wynne & C.W.Schneider	<i>Ceramium brasiliense</i> A.B. Joly	MBBB 41	Brazil: Boa Viagem, Recife, Pernambuco. RB420020	15.XII.2001	J. Torres & L. Gestinari	DQ458922	MW354747	MW354760
<i>Ceramoathamnion codii</i> H.Richards	—	—	Bermuda: Cooper's Island P.B.-A. 1899 from BM000936098	29.IV.1912	F.S. Collins	PP868167	PP863326	PP868169
<i>Ceramoathamnion codicola</i> (J.Agardh) M.J.Wynne & C.W.Schneider	<i>Ceramium codicola</i> J.Agardh	—	USA: Boiler Bay, Oregon	08.VII.1998	T.O. Cho & G.I. Hansen	AY155522	DQ238806	—
<i>Ceramoathamnion coulteri</i> (Harvey) M.J.Wynne & C.W.Schneider	<i>Microcladia coulteri</i> Harvey	CAM 402	USA: Asilomar Beach, California. BM013821501	00.VII.1996	CAM	MW366528	—	—
<i>Ceramoathamnion coulteri</i>	<i>Microcladia coulteri</i> Harvey	AC263	USA: WA, San Juan Is.	18.VIII.2006	Carlile, A. L.	GQ252482	—	—
<i>Ceramoathamnion coulteri</i>	<i>Microcladia coulteri</i> Harvey	GWS022133	USA: California, Stillwater Cove, Pebble Beach	20.V.2010	B. Clarkston, K. Hind & S. Toews	—	—	KM254414
<i>Ceramoathamnion dumosertum</i> (R.E. Norris & I.A. Abbott) M.J.Wynne & C.W.Schneider	<i>Ceramium dumosertum</i> R.E. Norris & I.A. Abbott	AC191	USA: Hawaii, Kihei, Maui	05.IV.2006	Carlile, A. L.	GQ252454	—	—
<i>Ceramoathamnion dumosertum</i>	<i>Cer. dumosertum</i> R.E. Norris & I.A. Abbott	ARS00847	USA: Hawaii, Maui, Lipoa St	05.IV.2006	Carlile, A. L.	—	HQ421685	HQ422603
<i>Ceramoathamnion fujianum</i> (Barros- Barreto & Maggs) M.J.Wynne & C.W.Schneider	<i>Ceramium fujianum</i> Barros- Barreto & Maggs	MBBB 22	Brazil: Itacuruça, Cananéia, Sao Paulo. RB420061	16.VI.2003	M.T. Fujii	DQ458949	MW354750	MW354758
<i>Ceramoathamnion fujianum</i>	<i>Ceramium fujianum</i>	MBBB 82	Brazil: Praia Baleia, Manguinhos, Espírito Santo. RB420063	26.III.2005	M.T. Fujii	—	—	MW354759
<i>Ceramoathamnion fujianum</i>	<i>Ceramium fujianum</i>	MBBB 84	Brazil: Portal de Santa Cruz, Espírito Santo. RB420064	25.III.2005	M.T. Fujii	DQ458952	—	—
<i>Ceramoathamnion horridulum</i> (P.C.Silva) M.J.Wynne & C.W.Schneider	<i>Ceramium horridum</i> Setchell & N.L. Gardner	—	México: San Juan de la Costa, Baja Califórnia	15.VI.2000	T.O. Cho & R.R.- Rodriguez	AF521796	DQ238807	—
<i>Ceramoathamnion inconspicuum</i> (Zanardini) M.J.Wynne & C.W.Schneider	<i>Ceramium inconspicuum</i> Zanardini	—	Alberoni dyke, Lido of Venice	—	—	LR031255	—	—
<i>Ceramoathamnion interruptum</i> (Barros- Barreto & Maggs) M.J.Wynne & C.W.Schneider	<i>Ceramium interruptum</i> Setchell & Gardner	—	USA: Dana Point, California	04.XII.1999	T.O. Cho & S. Murray;	AY155527	—	—
<i>Ceramoathamnion japonicum</i> (Okamura) M.J.Wynne & C.W.Schneider	<i>Ceramium japonicum</i> Okamura	—	South Korea: Namhae, Kyengnam	03.III.1998	T.O. Cho	AY948753	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Ceramothamnion japonicum</i>	<i>Ceramium japonicum</i> Okamura	LQD- Hqw20121115- R5	China: Huiquan Bay, Qingdao	11.XI.2012	Wu F.-F.	—	KC795870	—
<i>Ceramothamnion japonicum</i>	<i>Ceramium japonicum</i> Okamura	CQD- Hqw20121115- R5	China: Huiquan Bay, Qingdao	21.XI.2012	Wu F.-F.	—	—	KC795912
<i>C. juliae</i> (A.Millar & P.G.Richards) M.J.Wynne & C.W.Schneider	<i>Ceramium juliae</i> A.J.K. Millar	—	South Africa	culture	W. Stirks	MW366506	—	—
<i>Ceramothamnion pacificum</i> (Collins) M.J.Wynne & C.W.Schneider	<i>Ceramium pacificum</i> (Collins) Kylin	AC306	USA: Washington, San Juan Island	29.VII.2007	Carlile, A. L.	FJ795539	—	—
<i>Ceramothamnion pacificum</i>	<i>Ceramium pacificum</i> (Collins) Kylin	AC286	USA: WA, Clallam Co., Cape Alava	18.VI.2007	Carlile, A. L.	GQ179817	—	—
<i>Ceramothamnion riosmenae</i> (B.Y.Won & T.O.Cho) M.J.Wynne & C.W.Schneider	<i>Ceramium riosmenae</i> B.Y.Won & T.O.Cho	TC245	Mexico: B.C.S., Bahía Magdalena, López Nateos, Estero Santo Domingo	01.VI.2000	T.O.Cho & R.R.-Rodriguez	JN712693	—	—
<i>Ceramothamnion sinicola</i> (Setchell & N.L.Gardner) M.J.Wynne & C.W.Schneider	<i>Ceramium sinicola</i> Setchell & Gardner	DANA	USA: Dana Point, California	04.XII.1999	T.O. Cho & S. Murray;	AY155531	—	—
<i>Ceramothamnion sinicola</i>	<i>Ceramium sinicola</i>	AC298	USA: CA, Santa Cruz Co., Greyhound Rock	03.VII.2007	—	GQ179818	—	—
<i>Ceramothamnion vagans</i> (P.C.Silva) M.J.Wynne & C.W.Schneider	<i>Ceramium vagans</i> P.C. Silva	MBBB 126	Brazil: Praia da Feiticeira, Ilha Grande, Mangaratiba, Rio de Janeiro. RB420069	29.VII.2005	MBBB	MW366529	—	MW354772
<i>Ceramothamnion</i> sp. 1	—	CAM 1144	Caldera, Chile. BM013821505	undated	Juan Correa	MW366508	—	—
<i>Ceramothamnion</i> sp. 2	—	MBBB 110	Brazil: Prainha, Arraial do Cabo, Rio de Janeiro. RB420052	27.VII.2005	MBBB	MW366530	—	MW354771
<i>Ceramothamnion</i> sp. 3	<i>Ceramium</i> sp. 2	DWF-2013	USA: North Carolina, Onslow Bay, Atlantic Ocean, Wynne Plaza Park NCweed1227	18.II.2013	D.W. Freshwater	KF367768	—	—
<i>Ceramothamnion</i> sp. 4	<i>Ceramium</i> sp.	ARS01431	USA: Hawaii	—	—	—	HQ422441	—
<i>Ceramothamnion</i> sp. 5	<i>Ceramium</i> sp.	ARS03593	USA: Hawaii	—	—	—	HQ422096	—
<i>Ceramothamnion</i> sp. 6	<i>Ceramium codii</i> (H.Richards) Mazoyer	—	USA: Hawaii, Kure Atoll	08.VII.1998	T.O. Cho & G.I. Hansen	—	HQ421967	—
<i>Corallophila atlantica</i> (A.B.Joly & Ugadim) R.E.Norris	—	MBBB 146	Brazil: Prainha, Arraial do Cabo, Rio de Janeiro. RB420071	27.VII.2005	MBBB	MW366512	—	MW354761

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Corallophila atlantica</i>	—	MBBB 457	Brazil: Praia da Tartaruga, Armação de Búzios, Rio de Janeiro	11.IX.2015	MBBB	—	—	MW354774
<i>Corallophila atlantica</i>	—	MBBB 458	Brazil: Praia da Tartaruga, Armação de Búzios, Rio de Janeiro	11.IX.2015	MBBB	MW366536	—	MW354775
<i>Corallophila eatoniana</i> (Farlow) T.O.Cho, H.-G. Choi, G.I.Hansen & S.M.Boo	<i>Ceramium eatonianum</i> (Farlow) De Toni	GWS021384	USA: California, Pigeon Point Lighthouse	15.V.2010	B. Clarkston & K. Hind	—	—	KM254535
<i>Corallophila eatoniana</i>	—	XX1109	California, USA	—	E. Serrão	DQ458957	—	—
<i>Corallophila eatoniana</i>	—	TC047	USA: Friday harbor, Washington,	16.VII.1998	T.O. Cho	AY945765	DQ238802	—
<i>Corallophila eatoniana</i>	—	AC135	Canada: B.C., Vancouver Is.	05.VII.2004	AC	GQ252469	—	—
<i>Corallophila eatoniana</i>	—	—	USA: Oregon, Crystal Core	15.XII.1999	—	DQ787568	—	—
<i>Corallophila eatoniana</i>	<i>Ceramium eatonianum</i>	GWS021391	USA: California, Santa Cruz (Four Mile)	15.V.2010	B. Clarkston, & K. Hind	—	—	HQ544058
<i>Corallophila eatoniana</i>	<i>Ceramium eatonianum</i>	GWS021384	USA: California, Pigeon Point Lighthouse	15.V.2010	B. Clarkston, & K. Hind	—	—	KM254535
<i>Corallophila huysmansii</i> (Weber-van Bosse) R.E.Norris	—	ARS03236	USA: Hawaii, Kure Atoll	30.XI.1999	I.A. Abbott Collection	—	HQ421935	HQ422782
<i>Corallophila</i> sp.	<i>Ceramium</i> sp.	ARS03774	USA: Hawaii	—	—	—	HQ422146	—
<i>Gayliella ardissonaei</i> Barros-Barreto & F.P.Gomes	<i>Ceramium flaccidum</i>	MBBB 26	Brazil: Ponta da Baleia, Aracruz, Espírito Santo. RB420056	07.VII.2002	MBBB	DQ458944	—	—
<i>Gayliella ardissonaei</i>	<i>Ceramium flaccidum</i>	MBBB 50	Brazil: Praia Mole, Vitória, Espírito Santo. RB420057	01.VIII.2003	MBBB	—	—	MN105046
<i>Gayliella ardissonaei</i>	<i>Ceramium flaccidum</i>	MBBB 51	Brazil: Praia Mole, Vitória, Espírito Santo. RB420058	01.VIII.2003	MBBB	DQ458946	MN105050	MN105047
<i>Gayliella dawsonii</i> (A.B.Joly) Barros-Barreto & F.P.Gomes	<i>Ceramium dawsonii</i>	MBBB 53	Brazil: Redonda Sul, Abrolhos, Bahia. RB420047	14.XII.2002	MBBB	DQ458938	—	MN105032
<i>Gayliella dawsonii</i>	—	FPG234	Praia do Gonzaguinha, São Vicente, São Paulo. Brazil. R232583	12.X.2016	F. P. Gomes	—	MN105057	—
<i>Gayliella fimbriata</i> (Setchell & N.L.Gardner) T.O.Cho & S.M.Boo	—	AC202	USA: HI, Maui	08.IV.2006	—	GQ252474	—	—
<i>Gayliella flaccida</i> (Harvey ex Kützinger) T.O.Cho & L.J.Mclvor	—	CAM 113	UK: Beau Port, Jersey, Channel Islands	12.VIII.1992	CAM	AY945778	—	—
<i>Gayliella iemanja</i> Barros-Barreto & F.P.Gomes	<i>Ceramium dawsonii</i>	MBBB 34	Brazil: Serrambi, Pernambuco. RB420045	14.XII.2001	J. Torres & L. Gestinari	DQ458936	MN105052	MN105039

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Gayliella jolyana</i> Barros-Barreto & F.P.Gomes	<i>Ceramium dawsonii</i>	MBBB 49	Brazil: Peracanga, Guarapari, Espirito Santo. RB420046	31.VII.2003	MBBB	DQ458937	MN105061	MN105033
<i>Gayliella jolyana</i>	<i>Ceramium dawsonii</i>	MBBB 69	Brazil: Prainha, Arraial do Cabo, Rio de Janeiro. RB420050	29.VII.2001	MBBB	—	MN105060	MN105036
<i>Gayliella mazoyerae</i> T.O. Cho, Fredericq & Hommersand	—	—	Italy: Sicily	XII.2003	Cormaci	AY945776	DQ238809	—
<i>Gayliella nanaensis</i>	<i>Gayliella</i> sp.	HTa—2020a	China	—	Tan Huaqiang	MN592682	—	—
<i>Gayliella tamoiensis</i> Barros-Barreto & F.P.Gomes	—	MBB 241	Brazil: Praia Rasa, Armacao dos Buzios, RJ R232576	2.VI.2011	MBBB	MN105075	MN105055	MN105028
<i>Gayliella tamoiensis</i>	—	MBB 434	Brazil: Praia Rasa, Armacao dos Buzios, RJ R232578	2.VI.2011	MBBB	—	MN105056	MN105025
<i>Gayliella taylorii</i> (E.Y. Dawson) T.O. Cho & S. M. Boo	—	TC255	USA: Crystal Cove, Orange Co., California	3.VII.1999	T.O. Cho & S.N. Murray	AY945774	—	—
<i>Gayliella taylorii</i> (E.Y. Dawson) T.O. Cho & S. M. Boo	—	—	USA: Laguna Beach, Orange Co., California	3.XII.1999	T.O. Cho & S.N. Murray	—	DQ238812	—
<i>Gayliella transversalis</i> (Collins & Hervey) T.O. Cho & Fredericq	<i>Gayliella keywestensis</i>	TC961	USA: Key West, Florida	30.XI.2003	T.O. Cho	AY945777	DQ238810	—
<i>Gayliella womersleyi</i> T.O. Cho, Maggs & L. McIvor	<i>Gayliella miniatum</i>	C1507	Australia: Williamstown	13.III.2002	M.D. Guiry	AY945780	DQ238808	—
<i>Gayliella</i> sp. 1	<i>Gayliella</i> sp.	AC165	Mexico: Baja CA, Cabo San Quintin	20.III.2005		GQ252475		
<i>Gayliella</i> sp. 2	—	JAW 4461	Williamstown, South Australia, culture	24.VII.2004	J.A.West	MW366510	—	—
<i>Gayliella</i> sp. 3	<i>Gayliella</i> sp. 1 JFC—2019	HV06133	Australia: VIC, Mallacoota	—	Heroen Verbruggen, Kyatt Dixon	MK125376	—	—
<i>Gayliella</i> sp. 4	—	FPG 202	Brazil: Praia do Gonzaguinha, Sao Vicente, SP R232573	12.X.2016	F.P. Gomes	MN105065	MN105054	MN105038
<i>Gayliella</i> sp. 5	—	FPG 125	Brazil: Praia da Pedra Rachada, Paracuru, CE R232568	4.VI.2016	F.P. Gomes	—	MN105051	MN105042
<i>Gayliella</i> sp. 6	—	ARS03583	USA: Hawaii, Molokai, Wavecrest	21.III.2008	K. Conklin	—	HQ422107	HQ422894
<i>Gayliella</i> sp. 7	—	ARS03693	USA: Hawaii, Lanai	28.III.2008	A. Kurihara	—	HQ422193	HQ422977
<i>Gayliella</i> sp. 8	—	ARS03689	USA, Hawaii, Oahu, Nanakuli	12.III.2008	A. Kurihara	—	HQ422171	HQ422973
<i>Gayliella</i> sp. 9	—	ARS03846	USA, Hawaii, Oahu, Makai Pier	08.VI.2008	A. Kurihara	—	HQ422195	HQ423004
<i>Herpochondria borealis</i> (Ruprecht) Barros-Barreto & Maggs	<i>Microcladia borealis</i> Ruprecht	CAM 424	USA: Salt Creek, Crescent Bay, Washington NCU-A-0020296	09.VI.1994	MHH	MW366515	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Herpochondria borealis</i>	<i>Microcladia borealis</i>	TC391	USA: Lone Ranch Beach, Brookings, Josephine Co, Oregon	18.V.1999	MHH	EF613514	—	—
<i>Herpochondria borealis</i>	<i>Microcladia borealis</i>	—	USA: Otter Crest, Oregon	12.VII.1998	T.O. Cho & G.I. Hansen	—	DQ238799	—
<i>Herpochondria corallinae</i> (G. Martens) Falkenberg	—	H6	South Korea: Jeongdori, Wando	10.VII.1998	S.M. Boo, T.O. Cho & H.G. Choi	DQ787569	—	—
<i>Herpochondria elegans</i> (Okamura) Itono	—	TC037	South Korea: Jeongdori, Wando	15.XII.1998	S.M. Boo, T.O. Cho & H.G. Choi	AY945771	DQ238800	—
<i>Pseudoceramium brevizonatum</i> (H.E. Petersen) Barros-Barreto & Maggs	—	CAM 240	Italy: Pietro Ligure, Liguria. BM000701867	19.VII.1993	CAM	MW366524	—	—
<i>Pseudoceramium caraibicum</i> (H. E. Petersen & Borgesen) Barros-Barreto Maggs & M.A.Jaram.	<i>Ceramium brevizonatum</i> H. E. Petersen	—	Mexico: Yucatan	13.II.1993	C.F.D. Gurgel	AF259491	—	—
<i>Pseudoceramium clarionense</i> (Setchell & N.L. Gardner) Barros-Barreto & Maggs	<i>Ceramium clarionense</i> Setchell & N.L. Gardner	MBBB 76	Brazil: Siriba, Abrolhos, Bahia. RB420036	13.XII.2002	MBBB	DQ458933	—	—
<i>Pseudoceramium inkyui</i> (T.O. Cho, Fredericq & S.M. Boo) Barros-Barreto & Maggs	<i>Ceramium inkyui</i> T.O. Cho, Fredericq & S.M. Boo	—	South Korea: Sinnam, Kangwon	7.VII.1999	T.O.Cho	MW366527	—	—
<i>Pseudoceramium paniculatum</i> (Okamura) Barros-Barreto & Maggs	<i>Ceramium paniculatum</i> Okamura	—	South Korea: Gampo, Kyungbuk	8.IX.1999	S.M. Boo & T.C. Cho	AF521802	—	—
<i>Pseudoceramium planum</i> (Kützing) Barros-Barreto & Maggs	<i>Ceramium planum</i> Kützing	CAM 413	South Africa: Kommetjie, Western Cape	9.XI.1999	MHH	MW366527	—	—
<i>Pseudoceramium oliveirarume</i> Barros-Barreto, M.A.Jaram. & Maggs	<i>Ceramium brevizonatum</i> var. <i>caraibicum</i> H.E. Petersen & Borgesen	MBBB 47	Brazil: Costão, Itapemirim, Espírito Santo. RB420029	04.III.2004	MBBB	—	MW354756	—
<i>Pseudoceramium oliveirarume</i>	<i>Ceramium brevizonatum</i> v. <i>caraibicum</i>	MBBB 98	Brazil: Ponta do Pái Vitória, Armação dos Búzios, Rio de Janeiro. RB420031	10.VII.2005	MBBB	—	—	MW354770
<i>Pseudoceramium oliveirarume</i>	<i>Ceramium brevizonatum</i> v. <i>caraibicum</i>	MBBB 80	Brazil: Guaibura, Guarapari, Espírito Santo. RB420030	31.VII.2003	MBBB	DQ458932	—	—
<i>Pseudoceramium tenerrimum</i> (G. Martens) Barros-Barreto & Maggs	<i>Ceramium tenerrimum</i>	—	South Korea: Namhae, Kyungnam	30.V.1999	T.O.Cho & H.S.Yoon	AF521805	—	—
<i>Pseudoceramium tenerrimum</i>	<i>Ceramium tenerrimum</i>	AC209-	South Korea: Jeju City, Yongdam	11.V.2006	—	GQ252467	—	—
<i>Pseudoceramium tenerrimum</i>	<i>Ceramium tenerrimum</i>	—	South Korea: Gampo, Kyengju	08.IX.1999	T.O. Cho	—	DQ238805	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Pseudoceramium tenerrimum</i>	<i>Ceramium tenerrimum</i>	LQD- HQQW20120309- R14	China: Huiquan Bay, Qingdao	12.V.2012	Wu F.-F.	—	KC795867	—
<i>Pseudoceramium sp. 1</i>	—	CAM 1654	Marigot, St Martin, Dutch Antilles. BM013821502	19.I.2005	W. Prud'homme van Reine	MW366523	—	—
<i>Pseudoceramium sp. 2</i>	<i>Ceramium tenerrimum</i>	MBBB 77	Redonda Sul, Abrolhos, BA; Brazil. RB420068	14.XII.2002	MBBB	DQ458954	—	—
<i>Reiboldiella filicula</i> (Harvey ex Womersley) Barros- Barreto & Maggs	<i>Ceramium filicula</i> Harvey ex Womersley	XX1015	Australia: Melbourne, Williamstown	—	J.C. Zuccarello	DQ458956	—	—
<i>Reiboldiella filicula</i>	<i>Ceramium filicula</i>	MBBB 17	Brazil: Praia Vermelha, Urca, Rio de Janeiro. RB420054	13.IX.2004	W. Paradas	DQ458942	—	MW354768
<i>Reiboldiella orientalis</i> S.-M.Lin & Mas. Suzuki	—	RO-CJ3	Taiwan: Keelung, Chaojing	05.V.2016	S.-M. Lin	LC201458	—	—
<i>Reiboldiella orientalis</i>	—	RO-CJ4	Taiwan: Keelung, Chaojing	05.V.2016	S.-M. Lin	LC201459	—	—
<i>Reiboldiella schmitziana</i> (Reinbold) De Toni	—	TC032	South Korea: Guryongpo, Pohang	04.V.1998	T.O.Cho & H.S. Yoon	AY945772	—	—
<i>Reiboldiella schmitziana</i>	—	RS-JP	South Korea: Guryongpo, Pohang	05.VI.2009	S.-M. Lin & M. Suzuki	LC201465	—	—
<i>Reiboldiella taiwanensis</i> S.-M. Lin & Mas. Suzuki	—	RT-CJ1	Taiwan: Chaojing, Keelung	07.IV.2016	S.-M. Lin	LC201467	—	—
<i>Reiboldiella taiwanensis</i>	—	RT-CJ2	Taiwan: Chaojing, Keelung	07.IV.2016	S.-M. Lin	LC201468	—	—
<i>Reiboldiella warburgii</i> (Heydrich) Yoshida & Mikami	—	—	Taiwan: St. Tiago, Taipei Co.	22.V.2005	S.-M. Lin	EF125878	—	—
<i>Reiboldiella warburgii</i>	—	RW-CJ	Taiwan: Chaojing, Keelung	28.IV.2009	M. Suzuki	LC201471	—	—
<i>Yoneshigunea affinis</i> (Setchell & N.L. Gardner) Barros- Barreto & Maggs	<i>Ceramium affine</i> Setchell & N.L. Gardner	—	México: Pichilingue, Baja California,	27.V.2000	T.O. Cho & R.R. Rodriguez	AF521797	DQ238803	—
<i>Yoneshigunea affinis</i> (Setchell & N.L. Gardner) Barros- Barreto & Maggs	<i>Ceramium affine</i>	MBBB 65	Brazil: Lagoinha, Ubatuba, Sao Paulo. RB420018	24.V.2003	M.T. Fujii	DQ458920	MW354755	MW354769
<i>Yoneshigunea compta</i> (Børgesen) Barros- Barreto & Maggs	<i>Ceramium comptum</i> Børgesen	MBBB 118	Brazil: Lagoa Azul, Ilha Grande, Mangaratiba, Rio de Janeiro. RB420041	29.VII.05	MBBB	MW366522	—	—
<i>Yoneshigunea</i> sp.	—	JAW 3507	French Polynesia: Cooks Bay, Moorea, Culture	01.VII.1995	J.A. West	MW366521	—	—
<i>Ceramieae</i> sp. 1	—	CAM 1133	France: Thau Lagoon	VI.2005	M. Verlaque	MW366525	—	—
<i>Ceramieae</i> sp. 2	<i>Microcladia alternata</i>	Nightingale 2010 040	UK: Tristan da Cunha, Saint Helena: Nightingale, Southwest Point	22.III.2010	Susan Scott	MK185813	—	MK202416
<i>Ceramieae</i> sp. 3	<i>Ceramium tenuissimum</i> (Roth) J.Agardh	AC213	South Korea: Jeju Is., Onpyong	12.V.2006	—	GQ252468	—	—

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Ceramieae</i> sp. 4	—	MBBB 156	Brazil: Laje de Santos, São Paulo. RB420038	05.XI.2005	MBBB	MW366513	—	MW354766
<i>Ceramieae</i> sp. 4	—	MBBB 157	Brazil: Laje de Santos, São Paulo. RB420039	05.XI.2005	MBBB	—	MW354757	MW354767
<i>Ceramieae</i> sp. 5	<i>Ceramium nitens</i> (C.Agardh) J.Agardh	MBBB 83	Brazil: Pontal de Maracaípe, Ipojuca, Pernambuco. RB420066	28.I.2005	M.T. Fujii,	DQ458953	MW354754	MW354762
<i>Ceramieae</i> sp. 6	—	JAW 4446	Madagascar: Airport Lagoon. I. St. Marie, 17°05.741'S 49°48.776'. BM000701862	22.V.2004	J.A. West	MW366511	—	—
<i>Ceramieae</i> sp. 7	<i>Ceramium womersleyi</i> R.E.Norris & I.A.Abbott	ARS01943	USA: Hawaii, Maui, Lipoa St	28.I.2007	T. Sauvage	—	HQ422536	HQ423060
<i>Ceramieae</i> sp. 8	<i>Ceramium hanaense</i> R.E.Norris & I.A.Abbott	ARS03261	USA: Hawaii, Kure Atoll	30.XI.1999	Abbott collection	—	HQ421934	HQ422844
<i>Ceramieae</i> sp. 9	<i>Campylaephora californica</i> (Farlow) T.O.Cho	GWS021269	USA: California, Pigeon Point Lighthouse	15.V.2010	B. Clarkston & K. Hind	—	—	KM254681
<i>Ceramieae</i> sp. 10	<i>Ceramium diaphanum</i> (Lightfoot) Roth	CQD-SLR20111028-R8	China	12.X.2011	Wu F.-F	—	—	KC795911
<i>Ceramieae</i> sp. 11	<i>Microcladia</i> sp.	GWS021844	USA: California, Jade Cove	18.V.2010	B. Clarkston, K. Hind	—	—	KM254932
<i>Ceramieae</i> sp. 12	<i>Ceramium diaphanum</i>	LQD-SLR20111028-R8	China	12.X.2011	Wu F.-F	—	KC795860	—
<i>Ceramieae</i> sp. 13	<i>Ceramium</i> sp.	ARS03540	USA: Hawaii	—	—	—	HQ422054	—
<i>Ceramieae</i> sp. 14	<i>Ceramium</i> sp.	ARS00852	USA: Hawaii	—	—	—	HQ421687	—
<i>Ceramieae</i> sp. 15	<i>Ceramium</i> sp.	ARS03153	USA: Hawaii	—	—	—	HQ422004	—
<i>Ceramieae</i> sp. 16	<i>Ceramium</i> sp.	ARS03197	USA: Hawaii	—	—	—	HQ422033	—
<i>Ceramieae</i> sp. 17	<i>Ceramium</i> sp.	ARS03032	USA: Hawaii	—	—	—	HQ421931	—
<i>Ceramieae</i> sp. 18	<i>Ceramium</i> sp.	ARS03848	USA: Hawaii	—	—	—	HQ422196	—
<i>Ceramieae</i> sp. 19	<i>Ceramium</i> sp.	ARS03260	USA: Hawaii	—	—	—	HQ421961	—
<i>Ceramieae</i> sp. 20	<i>Ceramium</i> sp.	ARS03687	USA: Hawaii	—	—	—	HQ422173	—
<i>Ceramieae</i> sp. 21	<i>Ceramium</i> sp.	ARS03571	USA: Hawaii	—	—	—	HQ422110	—
Outgroups								
<i>Aglaothamnion uruguayense</i> (W.R.Taylor) N.E.Aponte, D.L.Ballantine & J.N.Norris	—	MBBB 147	Brazil: Praia Rasa, Búzios, Rio de Janeiro. RB631393	09.VII.2005	MBBB 147	—	—	MW354773
<i>Aglaothamnion tenuissimum</i> (Bonnemaison) Feldmann-Mazoyer	—	CAM 114	Spain: Cudillero Harbor, Asturias; culture. BM000701860	06.III.1999	CAM	MW366516	—	—
<i>Antithamnion nipponicum</i> Yamada & Inagaki	—	1078 Kobe University	Japan: Hachinohe, Aomori	—	M. Kamiya	—	DQ238813	—
<i>Ptilota serrata</i> Kylin	—	GWS002173	Canada: British Columbia	16.VI.2000	-	—	—	AY970640

Appendix 1. — Continuation.

Sample	Herbaria/ GenBank names	Sample number	Location and specimen voucher	Date collected	Collector	GenBank accession number		
						<i>rbcL</i>	Partial LSU	COI-5P
<i>Seirospora interrupta</i> (Smith) F. Schmitz	—	Clone N484	UK: Sarn Badrig, Cardigan Bay, Caernavon, Wales	15.VIII.1998	CAM	AF439310	—	—
<i>Spermothamnion</i> <i>repens</i> (Dillwyn) Magnus	—	CBS IUCC1412, MA, USA	USA: Massachusetts	—	—	U04024	—	—
<i>Sphondylothamnion</i> <i>multifidum</i> (Hudson) Nägeli	—	Clone N471	UK: Sarn Badrig, Cardigan Bay, Caernavon, Wales	20.VIII.1998	CAM	AF439312	—	—
<i>Spyridia filamentosa</i> (Wulfen) Harvey	—	PR2946	Puerto Rico: Cayo Enrique, culture	16.III.1989	—	AF458705	—	—

APPENDIX 2. — Selected evolutionary models for the different partitioned data sets, best scores and tree length. Modelfinder (IQtree) using the BIC criterion. Bayesian inference under mixed models and unlinked rates, available at: <https://doi.org/10.5252/cryptogamie-algologie2025v46a6.s1>

APPENDIX 3. — Genetic distance matrices. Table 1: estimates of evolutionary divergence between *Ceramothamnion* H.Richards sequences for *rbcL* gene. Table 2: estimates of evolutionary divergence between *Ceramothamnion* sequences for partial LSU rRNA. Table 3: estimates of evolutionary divergence between *Ceramothamnion* sequences for COI-5P gene, available at: <https://doi.org/10.5252/cryptogamie-algologie2025v46a6.s2>