

Cryptothecia evergladensis sp. nov. (Arthoniaceae), a new lichen species from Everglades National Park, Florida

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ABSTRACT. – A new lichenized species of *Cryptothecia* (Arthoniaceae, Arthoniales) is described from Everglades National Park in subtropical Florida. Its description, typification and known distribution are given and its taxonomic position is discussed.

INTRODUCTION

Cryptothecia evergladensis is a common lichen in Everglades National Park. Because of this, I have delayed some years in describing it as new, believing it probably had a name buried somewhere within *Arthothelium* A. Massal. or *Cryptothecia* Stirton of Cuba. I recently had an opportunity of examining new information obtained from various sources and now believe it to be an undescribed species.

MATERIALS AND METHODS

All collections were made by the author and are from Everglades National Park or the adjacent Miccosukee Indian Reservation. Spore and oxalate crystal measurements were made from water mounts under oil immersion lens and rounded to the nearest 0.5 μm . Asci, thalline and ascomatal measurements were made at 400x magnification after the sections were cleared by introducing a 10% solution of potassium hydroxide (KOH) in water. Lugol's solution (0.50%) was used in staining ascomatal and thalline tissue and the results are given as I+ or I-. When pretreated with KOH, the results are given as KI+ or KI-. Photos were taken at various magnifications indicated in the captions. Spore measurements were obtained by selecting 10 collections and removing four sections from the center of two ascogenous areas per collection. Only obviously mature spores were measured. Ascospore and ascus dimensions were consistent among all collections examined and both length and width ranges were narrow. For this reason I am reporting the minimum and maximum ranges of both length and width as being 2 standard deviations below and above the arithmetic mean for all spores measured, rounded to the nearest 0.5 μm , indicating 95% of all ascospores and asci measured fall within those ranges. The smallest and largest measurements are given in parenthesis before and after the range, respectively. Thin layer chromatography was done in accordance with Orange et al (2001) using solvent system C.

RESULTS AND DISCUSSION

The generic delimitations of lichenized mycota within the Arthoniaceae have been less concise and less clearly defined than with many other families. This is particularly true in regards to the generic complexes of *Arthonia*/*Arthothelium* and *Stirtonia*/*Cryptothecia*. Commonly used distinctions between the four genera are outlined in the following key:

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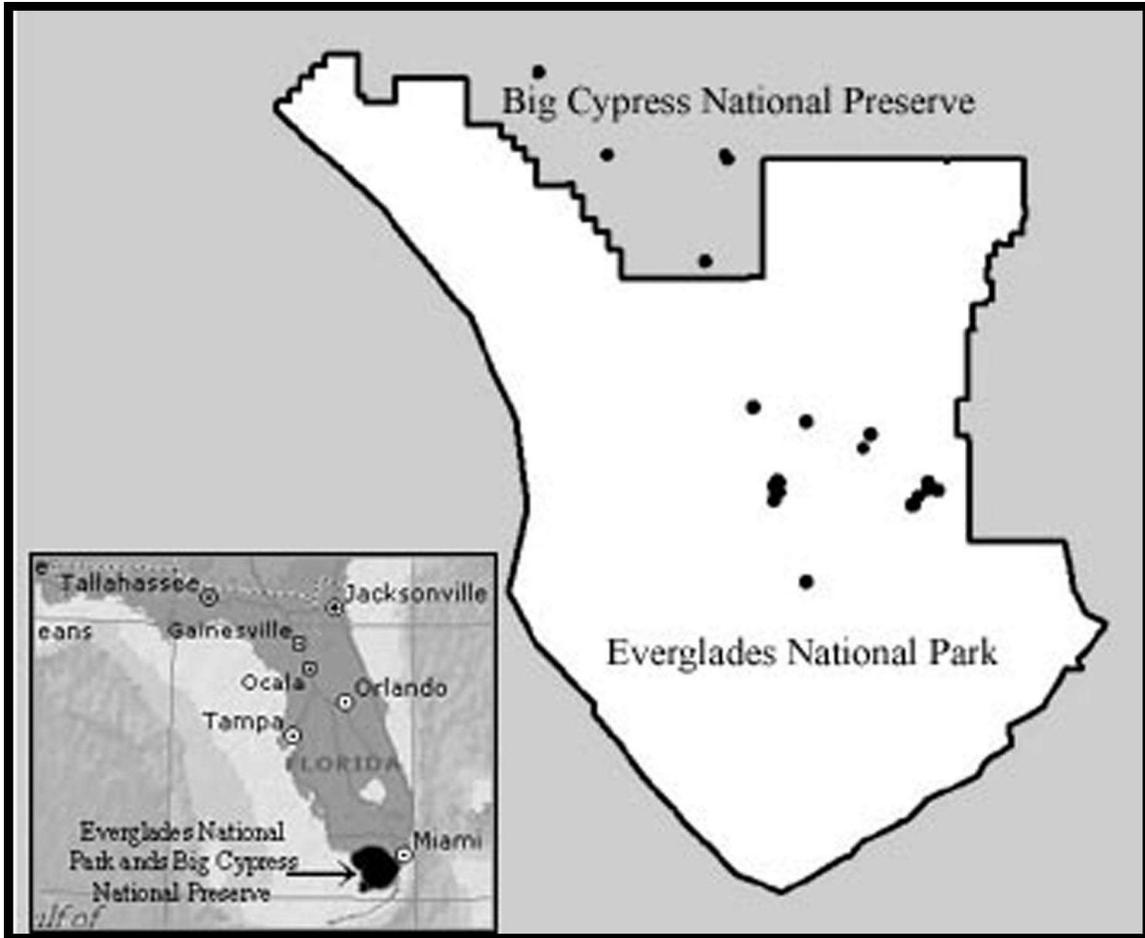


Plate 1. Geographic distribution of *Cryptothecia evergladensis* as presently known.

- 1. Ascospores transversally septate.....2
 - 2. Hymenium coherent with jelly.....*Arthonia*
 - 2. Hymenium loose or lacking jelly.....*Stirtonia*
- 1. Ascospores muriform.....3
 - 3. Hymenium coherent with jelly.....*Arthothelium*
 - 3. Hymenium loose or lacking jelly.....*Cryptothecia*

Although appealingly simple, it is clear that using the above delimitations these genera are unnatural as presently circumscribed, and are in need of thorough revision.

Stirton (1876: 164), in describing *Cryptothecia*, separated it from *Arthonia* Ach. by its having asci “pretty equally distributed throughout the thallus and not congregated in groups so as to constitute true apothecia,” Santesson (1952: 64) and others before him expanded the concept of the genus but Santesson admitted to confusion as to the generic limits between *Arthothelium* and *Cryptothecia* by asking “May one ascogonium form only one single ascus in the extreme *Cryptothecia* species, but on the other hand, a whole ascocarp in *Arthothelium*?”. Thor (1990) essentially paraphrased Stirton’s concept of *Cryptothecia* but went beyond this by stating the distinction between *Arthothelium* and *Cryptothecia* can be difficult especially where asci are aggregated in some areas of the thallus but still not in clearly defined ascomata.

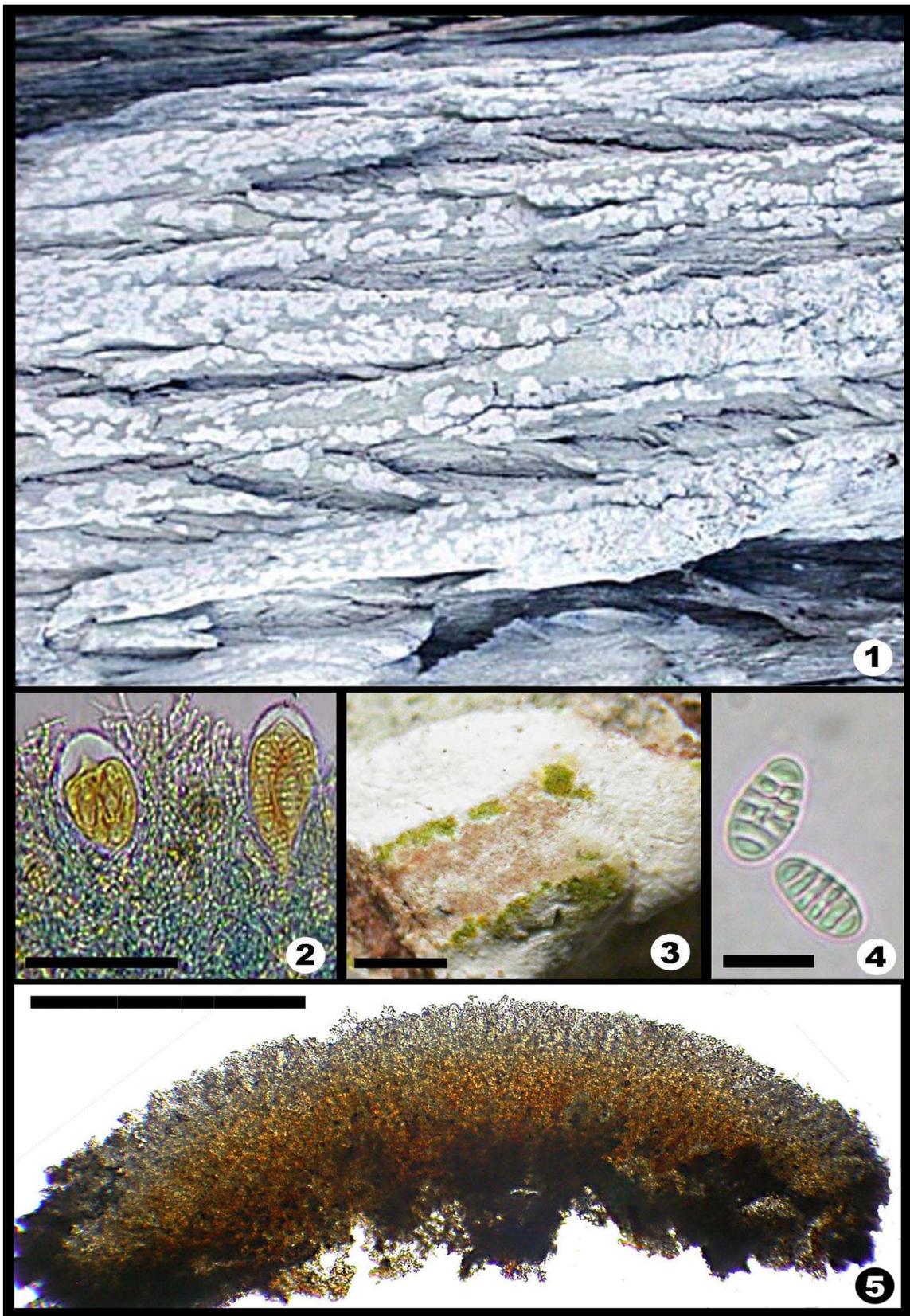


Plate 2. *Cryptothecia evergladensis*. Figure 1, thallus in situ on *Taxodium ascendens* (x 1.5). Figure 2, pyriform to broadly pyriform asci (scale = 25 μ m). Figure 3, ascigerous zone with white pruina removed (scale = 3 mm). Figure 4, submuriform ascospores (scale = 10 μ m). Figure 5, section of of the light brown ascigerous area shown in Figure 1C above after treatment by 10% KOH. Asci are represented by the numerous lighter areas among the gray paraphysoids. The red-brown hypothecioid zone is paraplechtenchymatic (scale = 1 mm).

Over the past quarter century other authors have added to or sharpened the concept of *Cryptothecia* (Makhija & Patwardhan 1985, 1987; Thor 1990, 1997; Grube 1998; Sparrius 2005; Lücking pers. comm. 2009). Although *Cryptothecia* has been the subject of many other works, a compilation of characters taken from the above authors gives a more or less complete description of the genus as it is currently understood. A paraphrased compilation follows: 1. thallus commonly ecorticate with developed strata absent or rudimentary, I+ blue at least in part; 2. asci randomly dispersed within the thallus or concentrated into \pm distinct ascigerous zones (if the latter, then the individual zones separated by hydrophobic plectenchyma but well defined hymenium, hypothecium and exciple tissue normally lacking); 3. asci pyriform to more commonly globose, usually thickened at the apex with a KI+ blue layer (occasionally lacking, e.g. *C. striata* G. Thor); 4. ascigerous areas non-carbonized and lacking hamathecial jelly; 5. ascospores muriform to submuriform. In addition, the position of *Cryptothecia* within the Arthoniales has been characterized in dichotomous key form by Grube (1998). The new taxon described herein closely adheres to the above concept of *Cryptothecia*, keys to that genus in the Grube key and is, therefore, placed in that genus.

Although well organized and sharply delimited ascomata are known within *Cryptothecia* (e.g. *C. candida* (Kremp.) R. Sant. and *C. filicina* (Ellis & Everh.) Lücking & G. Thor), the somewhat differentiated hypothecium of *C. evergladensis* might suggest placement in *Arthonia* or *Arthothelium*. However, the lack of hamathecial jelly, the presence of hydrophobic plectenchyma, and a chemistry atypical of *Arthonia* support inclusion in *Cryptothecia*. Additionally, absence of pycnidia, absence of an epithelial layer or dark paraphysoid caps and submuriform ascospore septation (admittedly weak characters when taken separately) when taken together suggest that *Arthonia*, as currently described, would be a poor fit. The same characters, plus paraphysoids which at best are only loosely arranged around the asci (figures 1 & 2), make *Arthothelium* an even more unlikely fit.

THE NEW SPECIES

Cryptothecia evergladensis Seavey sp. nov.

MYCOBANK #515450.

Thallus crustaceus, continuus, ecorticatus, laevis vel verruculosus, byssaceus, 80-180 μ m crassus. Asci aggregati in ascomatis distinctis pallide bruneolis cum pruina albida. Ascospores 8, decolores, submuriformes, ovoideae, 14-18 x 7-10 μ m. Acidum psoromicum, acidum 2-O-methylperlatolicum continens cum vel sine lichexanthono.

TYPE: U.S.A. FLORIDA. MIAMI-DADE CO.: Everglades National Park, ca 2.3 km SW of Pa-Hay-Okee Overlook, inundated cypress strand, 5.v.2004, *F. Seavey 2894E* (FNPS, holotype).

DESCRIPTION. – Thallus corticolous, crustose, pale bluish-gray to pale tan, epiphloeic, ecorticate, continuous, effuse, 80-180 μ m thick; surface glaucous and often with a thin white pruina, smooth to verruculose; byssoid without soredia or isidia; often forming large irregularly shaped patches to 20 cm long and wide, consisting of loosely interwoven hyphae and algal cells with little or no differentiation between the surface and a medullary layer, reacting I+ and KI+ faint blue. Thallus evenly interspersed with abundant yellowish (polarized light) oxalate crystals, 2-12 μ m, roundish to irregular and insoluble in K, soluble in 25% H₂SO₄; white to brown prothallus occasionally present. Asci loosely entwined by paraphysoids and concentrated in pale brown ascigerous areas which are irregular in shape, immersed and indicated by a normally thick white pruinose cover, the whole slightly or significantly elevated above the thallus surface. Ascigerous layer 50-100 μ m high, composed of hyaline, strongly anastomosing paraphysoids, I-, KI+ blue except the extreme upper part KI-; subtended by a brown hypothecioid zone of paraplectenchymatous cells 95-145 μ m thick, I+ blue, KI+ blue. Asci pyriform to broadly pyriform, 8 spored, \pm randomly dispersed throughout ascigerous zone, (36)38-50(55) x (14)16-22(24) μ m, thickened at the apex, KI-. Ascospores hyaline, ovoid, submuriform with 5 evenly spaced transverse septa, the mid 2-4 cells once vertically septate, (13)14-17.5(19) x (6.5)7.5-9.5(10) μ m, remaining essentially hyaline in post maturity. Neither

pycnidia nor acervuli were detected. Photobiont: *Trentepohlia*, cells mostly single, occasionally in clusters, rarely in short chains, broadly oblong, 8-12 x 7-9.5 µm.

CHEMISTRY. – Of 10 collections analyzed all had psoromic acid (P+ yellow) but occasionally only in trace amounts. 2-O-methylperlatolic acid was major in all but two collections. Lichexanthone was present but frequently only as a trace. Thallus UV+ yellow when lichexanthone present in sufficient amounts. Pruina covering ascigerous areas, UV+ bright white.

DISTRIBUTION AND HABITAT. – At present most collections have been found in the cypress zone of Everglades National Park and the south central portion of Big Cypress National Preserve. I have not encountered it north of U.S. Highway 41 (Tamiami Trail) nor west of the band of cypress that extends in a north/south direction through Big Cypress and Everglades National Park. On the east side of that zone it has been collected from nearby hammocks (islands of broad leaf trees). *Taxodium* bark is by far the most common substrate but collections also have been made from *Metopium toxiferum* (1), *Sideroxylon salicifolia* (2), *Ateramnus lucida* (2), *Lysiloma latisiliquum* (1), and several from the lignum of *Conocarpus erectus*.

DISCUSSION. – *Cryptothecia evergladensis* is recognized by its glaucous bluish-gray to greenish-gray thallus reacting P+ yellow and usually UV+ yellow, distinct light brown ascigerous zones covered by white pruina (UV+ white) and its small hyaline, submuriform ascospores. Currently, two other *Cryptothecia*, *C. striata* and *C. rubrocincta* (Ehrh.:Fr) G. Thor, are recognized from south Florida. The latter has recently been transferred to the genus *Herpothallon* Tobler by Aptroot et al. (2009) as *H. rubrocinctum* (Ehrenb.:Fr) Aptroot et al., but is easily separated from other North American *Cryptothecia* by being always sterile, having a bright red prothallus and bright red patches dispersed over the thallus (chiodectonic acid, K+ purple). It also contains confluent acid. *C. striata* is superficially somewhat similar to *C. evergladensis* but its ascospores are much larger (55-70 x 23-29 µm) and muriform and its asci are usually scattered in radiating or irregular lines and do not form distinct white patches. In addition, it lacks the chemistry of *C. evergladensis* and contains only gyrophoric acid (C+ red).

SPECIMENS EXAMINED. – U.S.A. FLORIDA. MIAMI-DADE CO.: near Coe cypress dome, 25°20'N, 80°39'W, 9.i.2005, *F. Seavey 493E* (FNPS); cypress dome east of gated section of Ingraham Highway, 25°21'N, 80°37'W, 31.i.2008, *F. Seavey 1891E* (FNPS); north of Sissal Hammock, 25°24'N, 80°47'W, 2.ii.2005, *F. Seavey 516E* (FNPS); Jones Hammock, 25°25'N, 80°43'W, 29.xii.2008, *F. Seavey 2541E* (FNPS); 1 km. south of Ficus Pond, 25°21'N, 80°50'W, 28.iii.2005, *F. Seavey 576E* (FNPS); 2 km. south of Nine Mile Pond, 25°14'N, 80°48'W, 11.iv.2005, *F. Seavey 617E* (FNPS); Robertson Hammock, 25°26'N, 80°43'W, 7.xii.2008, *F. Seavey 2853E* (FNPS); 1.6 km. west of main park road, 25°21'N, 80°50'W, 3.ii.2006, *F. Seavey 737E* (FNPS); Deer Hammock, 25°24'N, 80°43'W, 15.i.2009, *F. Seavey 2557E* (FNPS); MONROE CO.: Miccosukee Indian Reservation, 25°45'N, 80°54'W, 16.iv.2008, *F. Seavey 2170M* (FNPS).

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