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Author(s): Frederick Seavey and Jean Seavey

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Caloplaca lecanorae (Teloschistaceae), a new lichenicolous lichen and several additions to the North American lichenized mycota from Everglades National Park

Frederick Seavey¹ and Jean Seavey

South Florida Natural Resources Center, Everglades National Park, 40001 State Road 9336, Homestead, FL 33034 U.S.A

ABSTRACT. We report the results of recently investigated collections from Everglades National Park and Biscayne National Park that have yielded several new additions to the North American lichen checklist, and *Caloplaca lecanorae*, a new lichenicolous lichen found on the thallus of *Lecanora leprosa*. Those species new to North America include *Arthonia compensatula*, *A. ochrospila*, *Bacidina pallidocarnea*, *Byssoloma absconditum*, *Coenogonium isidiigerum*, *C. isidiosum*, *Enterographa pallidella*, *Lecanora hypocrocina*, *L. tropica*, *Monoblastia palmicola* and *Parmotrema wrightii*. Both *Lecanora* species have been reported from Mexico, which is excluded from the aforementioned checklist.

KEYWORDS. *Arthonia*, *Bacidina*, Biscayne National Park, *Byssoloma*, *Coenogonium*, *Enterographa*, Florida lichens, *Lecanora*, *Monoblastia*, *Parmotrema*.



Everglades National Park lies at the southern tip of Florida and encompasses approximately 1.6 million acres (640,000 hectares) (Seavey & Seavey 2011b). The original Native Americans, occupying the region for perhaps as much as 10,000 years, were extirpated by the mid-18th century. Later, except for a scattering of runaway slaves and renegade Seminole Indians, the region laid essentially unexplored until the early part of the twentieth century (Tebeau 1968). By the 1930's the floristic uniqueness of the land was recognized and a national park was proposed (Beard 1938). This came to fruition in 1947 with the dedication of Everglades National Park. However,

even today the land remains a rugged and inhospitable one to explore. In many areas of the natural sciences exploration has yet to be undertaken. From the viewpoint of lichenology the entire region of southern Florida has been ignored until very recently. Lücking et al. (2011) demonstrated this by describing 18 species new to science and 89 new to the North American lichen checklist in a four day foray of Fakahatchee Strand Preserve State Park by the Tuckerman Workshop at the extreme southwest corner of the state. Seavey and Seavey (2011a) provided a detailed description of the area and the difficulties encountered in its exploration as well as the paucity of lichenological exploration within Everglades National Park. The first serious in depth inventory of lichens in the Park was begun in 2009, and the lichen checklist now stands at 506 species

¹ Corresponding author's email:
natureguides@mindspring.com
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including five new to science and twelve new to North America, excluding this paper. (Seavey 2009, 2010; Seavey & Seavey 2011a, b)

MATERIALS AND METHODS

All collections were examined using standard stereoscopic and light microscope techniques. A Leica DFC295 compound microscope and a Leica S8APO inspection microscope were used to view hand sections and thalline superficial structures respectively. All macroscopic and microscopic images were captured via computer using Leica Application Suite V3.6.0 28 software. Measurements of internal structures were from water mounts rounded to the nearest 0.5 μm . The software's automatic setting was employed and may have enhanced some of the images. No additional enhancement was used unless noted. Thin layer chromatography (TLC) was carried out in accordance with Orange et al. (2001), using system C in a ratio of 170:30 toluene to acetic acid. Collections were made by the authors primarily within the last four years and are curated at the South Florida Natural Resources Center (FNPS). They are corticolous unless otherwise noted.

TAXONOMY

Caloplaca lecanorae F. Seavey & J. Seavey, *sp. nov.*

Fig. 1

Mycobank #: MB800289

Fungus lichenicola in thallo Lecanorae leprosa
crecens. Apothecia .25–.45 mm diam., solitaria, sessilia, aurantiaca ad testacea, granulata, K+ cerasina. Hymenium hyalinum, 80–95 μm altum. Hypothecium ochraceum pallidum, 45–55 μm altum. Excipulum hyalinum, prosenchymaticum, destitutum basaliter. Asci cylindricae, octospori. Ascosporae hyalinae, ellipsoideae, polariloculares, 11.5–14.5 \times 6.5–7.5 μm . Apothecia cum anthraquinono ignoto.

TYPE: UNITED STATES OF AMERICA, FLORIDA, Miami-Dade County, Dall Hammock within Everglades National Park. 25° 23'N, 80° 44'W; upland broad-leaf tree island dominated by species of West Indian derivation, on bark of *Salix caroliniana*, on *Lecanora leprosa*, 12 January

2012, F. Seavey & J. Seavey 5627E (holotype: FNPS; isotype: FLAS).

Description. Lichenicolous on thallus of *Lecanora leprosa*. Thallus usually absent, visible macroscopically when present, white, 4 mm or less in diameter, height indeterminate. Apothecia round, sessile, .25–.45 mm diameter, thalline margin white, containing algae, ecorticate, soon excluded. Proper margin not detected. Disc orange-brown to red-brown, matte, granulose. Hymenium hyaline, 80–95 μm tall. Hypothecium pale yellow-brown, 45–55 μm tall. Epithymenium 5–10 μm thick, encrusted with orange-brown crystals, K+ purplish red. Proper exciple hyaline, thin, laterally prosoplectenchymatous, excluded basally. Asci cylindrical, 8 spored, 47–57 \times 11–15 μm . Ascospores hyaline, ellipsoid, 11.5–14.5 \times 6.5–7.5 μm , polarilocular, isthmus 4.8–5.8 μm . Pycnidia unknown. Photobiont *Trebouxioid*.

Chemistry. Apothecia containing unknown anthraquinones.

Etymology. Named after genus of the host lichen.

Distribution and habitat. *Caloplaca lecanorae* is uncommon but widespread throughout Everglades National Park and at least the upper Florida Keys. We estimate about 2–4% of the host lichen thalli are parasitized by this species. It is most common in light exposed habitats and often in full sun.

Discussion. In rare instances *C. lecanorae* is able to establish a very small rudimentary thallus of its own but in only one case was it distinctly delimited from its host by a thin pale brown marginal line. In section the dividing line between the two thalli could not be detected. The association of *C. lecanorae* with its host is apparently parasitic as frequently the host thallus can be seen thinning and eventually disappearing around the *Caloplaca* apothecia (Fig. 1B). Lawrey & Diederich (2011) list three lichenicolous *Caloplaca* species known to occur on *Lecanora*. *Caloplaca infestans* H. Magn., a saxicolous species from northern China, differs by having orange apothecia with concolorous margin, an orange thallus and ascospores with a slightly narrower isthmus (Magnusson 1944). *Caloplaca epithallina* Lynge, another saxicolous species of Europe and North America, has dark red-brown

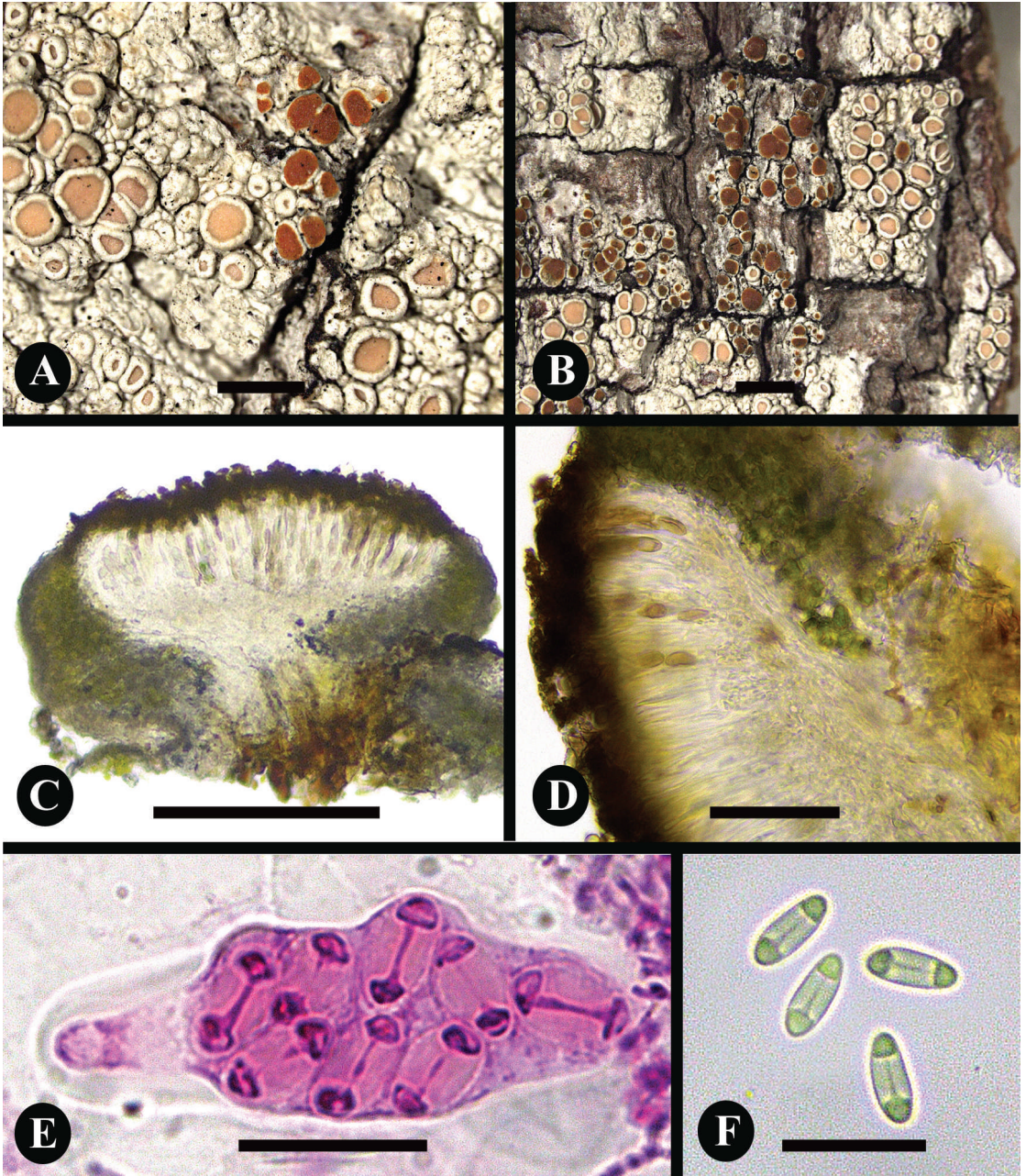


Figure 1. *Caloplaca lecanorae*. A. Apothecia on thallus of *Lecanora leprosa*. B. Parasitic nature of the *Lecanora/Caloplaca* relationship. The *Lecanora* thallus is thinning and dying away around the *Caloplaca* apothecia. C. Thin section of holotype. D. Closer view of apothecia margin with thin prosoplectenchymatous excipular cells disappearing under the hypothecium. E. Phloxine stained ascospores in ascus. F. Ascospores of *Caloplaca lecanorae*. Notice the broad isthmus. Scales: A = 1 mm; B = 2 mm; C = .2 mm; D = 50 μ m; E = 20 μ m; F = 20 μ m.

apothecia, a proper margin concolorous to the disc, ascospores with a shorter isthmus, and lacks a thalline margin (Wetmore 2007). *Caloplaca invadens* Lyngé, an Arctic species extending into the north

central United States, differs by having a yellow tinted thallus, dark yellowish red discs and larger ascospores with a narrower isthmus (Thompson 1997). We were also able to locate a fourth species,

Caloplaca intrudens H. Magn., a saxicolous taxon known from northern China. It differs from *C. lecanorae* by having darker red-brown apothecia without a white thalline margin and ascospores with a narrower isthmus (Magnusson 1940).

Additional specimens examined. U.S.A.:

FLORIDA. Miami-Dade Co.: Bequaert Hammock, Everglades National Park, on *Ilex cassine*, 5801E. Convoy Point, Biscayne National Park, on *Roystonea elata*, 5855B. Madeira Ditches, Everglades National Park, on *Metopium toxiferum*, 6251E. Pine block A, Everglades National Park, on *Salix caroliniana*, 5060E. South shore of Coot Bay, Everglades National Park, on *Rhizophora mangle*, 6177E. Monroe Co.: Bradley Key, Everglades National Park, on *Laguncularia racemosa*, 5302E. Clive Key, Everglades National Park, on lignum *Avicennia germinans* 5911E. Gibby Point, Everglades National Park, on *Conocarpus erectus*, 6279E. Johnson Key, Everglades National Park, on *Cocos nucifera*, 6102E. Mile marker 101, Key Largo, FL, on *Sideroxylon foeditissimum*, 581K. Rock Harbor, Key Largo, FL, on *Sideroxylon foeditissimum*, 582K.

NEW RECORDS FOR NORTH AMERICA

Arthonia compensatula Nyl. Flora 69: 104 (1886).

Type: Cuba.

Discussion. In South Florida, four other *Arthonia* species are superficially similar. *Arthonia pyrroliza* Nyl. has thinner, longer, more highly branched lirellae and smaller ascospores. *A. vernans* Willey has much larger 10–15 celled ascospores with middle cells largest. *A. rubella* (Fée) Nyl. has much larger amphicephalic ascospores (both end cells larger than middle cells). *A. speciosa* (Müll. Arg.) Grube has smaller ascospores and contains a K+ purple pigment.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: On State Route 41 between Krome Ave. and Shark Valley, on *Citrus aurantium*, 976I. Along gated section of Old Ingraham Highway, Everglades National Park, on *Metopium toxiferum*, 2438I. West Lake, Everglades National Park, on *Conocarpus erectus*, 2772I. Mahogany Hammock parking lot, Everglades National Park, on *Swietenia mahagoni*, 3177I. Monroe Co: Everglades Rod and Gun Club, Everglades City, on *Sabal palmetto*, 3057I. Middle

Cape Sable, Everglades National Park, on *Rhizophora mangle*, 3768I. Murray Key, Everglades National Park, on *Sabal palmetto*, 3829I. Elliott Key, Biscayne National Park, on *Avicennia germinans*, 3954NG. Rankin Key, Everglades National Park, on *Pithecellobium keyense*, 4869.

Arthonia ochrospila Nyl. Flora 69: 104 (1886).

Type: Cuba.

Discussion. This species is relatively common at Elliott Key within Biscayne National Park consistently found on red mangrove in a high light environment. *Arthonia subrubella* Nyl. is very similar to *A. ochrospila* but although its ascospores are similar in size, on average they have fewer locules and possess a different ontogeny. This produces ascospores of more or less subequal locules or at least those which lack the distinctly larger middle cells of *A. ochrospila*.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Elliott Key, Biscayne National Park, on *Rhizophora mangle*, 3966NG, 4020NG, 4021NG, 4503NG. Elliott Key, Biscayne National Park, on *Conocarpus erectus*, 3989NG. Pinelands near Osteen Hammock, Everglades National Park, on *Lysiloma latisiliquum*, 4796I.

Bacidina pallidocarneae (Müll. Arg.) Vězda, Folia Geobot. Phytotax. 25: 432. (1990).

Type: Brazil.

Discussion. To date, this species is represented by only one healthy collection from the fronds of cabbage palm (*Sabal palmetto*) in Everglades National Park. Santesson (1952) mentions that 6 to 8 celled ascospores have been found in *Bacidina apiahica* (Müll. Arg.) Vězda and wondered about the credibility of recognizing them as two autonomous species. Lücking (2008) recognizes them as two separate entities based not only on ascospore size but also on pycnidial structures. In our comparative collections the apothecia of *B. pallidocarneae* are larger and more orange than those of *B. apiahica*.

Specimen examined. U.S.A.: FLORIDA. Miami-Dade Co: Mahogany Hammock, Everglades National Park, on fronds of *Sabal palmetto*, 717I.

Byssoloma absconditum Farkas & Vězda, Folia Geobot. Phytotax. 28: 323. (1993).

Type: Tanzania.

Discussion. *Byssoloma absconditum* is currently known from only one location within Everglades National Park but is locally common. The similar, and in our area more common, *B. leucoblepharum* (Nyl.) Vainio occurs on both corticolous and foliicolous surfaces. It is readily separated from *B. absconditum* by its 4 celled ascospores.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Wright Hammock, Everglades National Park, corticolous on *Sideroxylon salicifolia*, 4477, 4478 & 4479.

Coenogonium isidiigerum (Vězda & Osorio)

Lücking, Aptroot & Sipman, Fungal Diversity 23: 297 (2006).

Type: Uruguay.

Discussion. In South Florida specimens, thalli are occasionally almost completely dissolved into isidia with only a few apothecia (often only one or two). *Coenogonium isidiosum* (Breuss) Rivas Plata, Lücking, Umaña & Chavez is a similar species also having cylindrical isidia (see below).

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Along Bear Lake Canal, Everglades National Park, on dead tree, 3715I, 3716I. Wright Hammock, Everglades National Park, on *Ocotea coriacea*, 4704I. Monroe Co: Clive Key, Everglades National Park, on *Sideroxylon salicifolia*, 3812I, 3813I.

Coenogonium isidiosum (Breuss) Rivas Plata,

Lücking, Umaña & Chavez, Fungal Diversity 23: 297 (2006).

Type: Nicaragua.

Discussion. *Coenogonium isidiosum* primarily differs from *C. isidiigerum* by having considerably shorter ascospores and browner apothecia discs as opposed to orange in the latter. There is also a minor difference in isidia size and shape. Collections of both this species and *C. isidiigerum* have come from broad leaf hammock forests in low light habitats. *Fellhanera floridana* (Tuck.) S. Ekman with its granulose thallus can be confused with *C. isidiigerum* or *C. isidiosum* superficially but its apothecia are orange-brown to orange-red and ascospores are 4 celled as opposed to 2 celled in *Coenogonium*.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Atoll Hammock, Everglades National Park, on *Lysiloma latisiliquum*, 1290I. North of Ficus Pond trail, Everglades National Park, on *Annona glabra*, 4733I, 4734I, 4735I.

Enterographa pallidella (Nyl.) Redinger, Feddes

Repert. 43: 61 (1938).

Type: India.

Discussion. In our collections the apothecia are considerably paler than given by Sparrius (2004). In many collections thalline spot tests with sodium hypochlorite (C) are unreliable in the detection of glyphoric acid. Even pretreatment with potassium hydroxide sometimes gives a false negative. In all cases TLC documented its presence. *Enterographa pallidella* is quite prolific growing in full sun on all of the keys visited in both Florida and Biscayne Bays but has only once been discovered on the mainland. It is quite similar to *E. anguinella* (Nyl.) Redinger, which frequently inhabits the same branches and trunks as *E. pallidella* but has larger ascospores, brown to dark brown ascomata and contains psoromic acid.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Elliott Key, Biscayne National Park, on *Krugiodendron ferreum*, 3966B. Research Road, Everglades National Park, on *Lysiloma latisiliquum*, 5362I. Monroe Co: Clive Key, Everglades National Park, on *Avicennia germinans*, 3516I, 3517I, 3792I, 3906I. Murray Key, Everglades National Park, on *Cocos nucifera*, 3943I. Johnson Key, Everglades National Park, on *Rhizophora mangle*, 4686I. Rankin Key, Everglades National Park, on *Avicennia germinans*, 4862I, 5404I. Palm Key, Everglades National Park, on *Rhizophora mangle*, 4927I, 4928I, 4931I. End Key, Everglades National Park, on *Rhizophora mangle*, 5358I. Dump Key, Everglades National Park, on *Laguncularia racemosa*, 5360I, 5370I, 5375I.

Lecanora hypocrocina Nyl., Flora 59: 509 (1876).

Type: Cuba.

Discussion. All collections of this species have been associated with the shores or islands of either Florida Bay or the Gulf of Mexico in the extreme southern portion of Everglades National Park. *Lecanora hypocrocina* was reported by Ryan et al.

(2004) from Baja California Sur and Sinaloa, but the lichens of Mexico are not included on the North American lichen checklist (Esslinger 2011).

Specimens examined. U.S.A.: FLORIDA. Monroe Co: Bear Lake, Everglades National Park, on *Erythrina herbacea*, 2829I, 2830I. Hammock north of Bear Lake canoe dock, Everglades National Park, on *Erythrina herbacea*, 3409I, 3439I. Mangrove mixed forest Gulf Coast, Everglades National Park, on *Eugenia foetida*, 4841I. Sandfly Key, Everglades National Park, on *Pithecellobium keyense*, 4991I.

Lecanora tropica Zahlbr., Cat. Lich. Univ. 5: 589 (1928).

Type: Columbia.

Discussion. According to Guderley (1999) the chodatol chemosyndrome may be present or absent, and in collection 4626I it is lacking. However, as all other characters are essentially identical to collection 4659I, we believe it belongs in this taxon. The presence of this species in North America was first reported from Mexico by Ryan et al. (2004).

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Along firebreak near Osteen Hammock, Everglades National Park, on *Lysiloma latisiliquum*, 4626I. Monroe Co: Coot Bay Hammock, Everglades National Park, on *Conocarpus erectus* lignum, 4659I.

Monoblastia palmicola Riddle, Mycologia 15: 2: 71 (1923).

Type: Cuba.

Discussion. Aptroot et al. (2008) report that species within the genus are rare and mostly found on tropical coasts and our collections are no exception. However, although the perithecia are fairly large, the thallus is often eroded and somewhat cryptic which may cause this species to be overlooked.

Specimens examined. U.S.A.: FLORIDA. Miami-Dade Co: Elliott Key, Biscayne National Park, on *Krugi dendron ferreum*, 4005NG, 4008NG. Monroe Co: Along Bear Lake Trail, Everglades National Park, on *Krugi dendron ferreum*, 2840I. Hammock north side of Homestead Canal, Everglades National Park, on *Rhizophora mangle*, 3362I.

Parmotrema wrightii L. I. Ferraro & Elix, Mycotaxon 49: 405–406 (1993).

Type: Brazil.

Discussion. The chemistry of *P. wrightii* containing atranorin, norstictic acid and echinocarpic acid may be unique within the genus. In our database of slightly over 300 species of *Parmotrema* none have a similar assemblage of metabolites.

Specimen examined. U.S.A.: FLORIDA. Miami-Dade Co: Lott Hammock, Everglades National Park, on *Sideroxylon salicifolia*, 4664I.

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