

Naetrocymbe herrei (Pleosporales; Ascomycetes), a new lichenized saxicolous species from the coast of central California, U.S.A.

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ABSTRACT. – *Naetrocymbe herrei* is described as new to sciences based on several collections from California in western North America.

KEYWORDS. – *Arthopyrenia*, global warming, maritime lichens, rising sea levels.

INTRODUCTION

During a recent survey of the lichens and lichenicolous fungi of San Simeon State Park, San Luis Obispo Co., California, the first author collected abundant material of what appeared to be a saxicolous species of *Arthopyrenia* A. Massal. growing on rocks below a coastal bluff. After further study failed to reveal a name for the taxon, we contacted Richard Harris who has worked extensively with this and other closely related genera (Harris 1973, 1985, 1995; Tucker & Harris 1980). Harris examined a specimen of the taxon and recognized it as *Arthopyrenia* “*herrei*” a species named in his thesis but for which a validating description has never been published due to a lack of modern material. As our recent collections are more than ample to serve as a type, Dr. Harris has given us permission to formally describe this distinctive species that is so far known only from central California.

In the time that has elapsed since this taxon was originally recognized by Harris (1975), the circumscription of *Arthopyrenia* has changed significantly (Harris 1995). In its historical sense *Arthopyrenia* was circumscribed to include lichenized and non-lichenized fungi with perithecia and bitunicate asci (Ravera 2006). Harris (1995) attempted to make *Arthopyrenia* monophyletic by transferring several groups of species to other genera (and families). Among the groups excluded from *Arthopyrenia* was the *A. punctiformis*/*A. saxicola*-group which is characterized by a usually non-lichenized habit, coarse, short-celled pseudoparaphyses, obpyriform asci with a distinct apical region lacking a nasse, postmature ascospores usually ornamented, brownish, short rod-shaped microconidia, and a primarily temperate-boreal distribution (Harris 1995). The *A. punctiformis*/*A. saxicola*-group was placed by Harris (1995) in the genus *Naetrocymbe* Körber in the family Naetrocymbaceae Höhnelt ex R.C. Harris, a placement which has been followed by most authors (e.g. Lumbsch & Huhndorf 2007, Cannon & Kirk 2007), but not all (e.g. Aptroot 1998, Coppins 2002).

As *Arthopyrenia* “*herrei*” possesses all of the characters recognized by Harris (1995) for placement in *Naetrocymbe*, except for the lichenized nature of the thallus and ornamented ascospores, we place this species in that genus. Nonetheless we recognize that in the future *Naetrocymbe herrei* may need to be transferred to a new genus as a robust molecular phylogeny of this lineage of fungi is developed and new systematic and taxonomic progress is made. We have deposited adequate fresh material of this taxon in several American (NY, UCR) and European herbaria (BR, PRM) to allow for future molecular studies.

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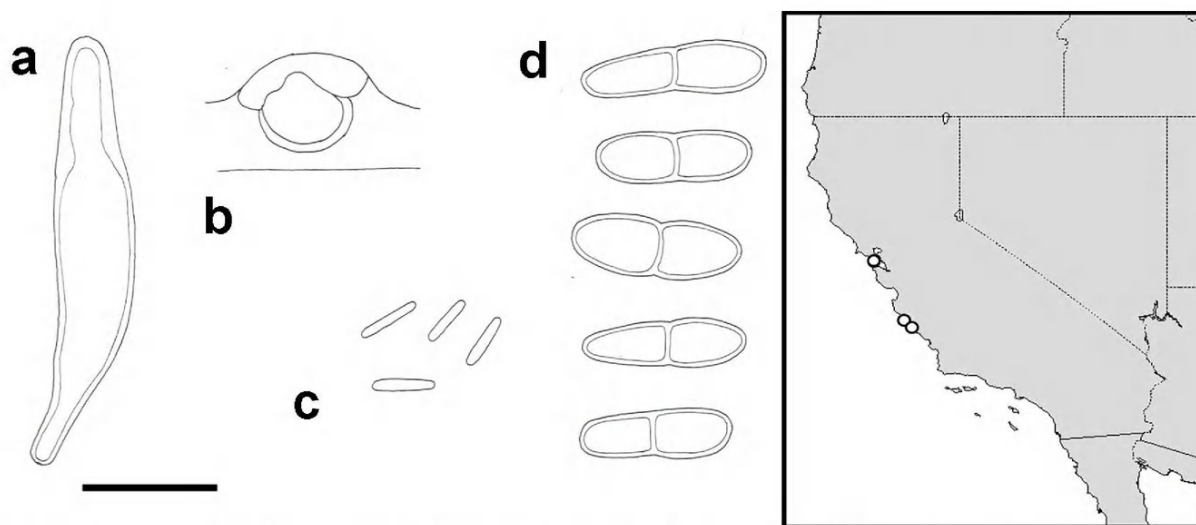


Plate 1. Line drawings of *Naetrocymbe herrei* (left–a, ascus [scale = 25µm]; b, section of perithecium [scale = 250µm]; c–d, conidia and ascospores [scale = 10µm], drawn from *Herre 889*). Geographic distribution of *N. herrei* as presently known (right).

The anomalous nature of this taxon in the broader context of the genus *Naetrocymbe* is significant because it may represent a transitional state between the loss of, or gain of, lichenization. The relevance of this taxon to the phylogeny of this lineage of fungi should not be underestimated. And this, coupled with the apparent fact that it is rare and endemic to the Pacific Plate in central California, clearly necessitates the formal nomenclatural recognition of this taxon to facilitate its potential management by government agencies.

MATERIALS AND METHODS

Thalli and perithecia were measured dry with a Bausch & Lomb StereoZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 microscope with an Olympus DP20 digital camera using Microsuite Special Edition. Photographs were taken with the same compound microscope, camera, and software outlined above and prepared in Adobe Photoshop. Sections of the perithecia were prepared by hand cutting with a razor blade and mounted in water. Measurements of anatomical characters, ascospores, and conidia are based on water mounts prior to the application of reagents (10% KOH, or I). Ascospore measurements are given as the average ($\bar{X}$) $\pm$ one standard deviation (SD). Brilliant cresyl blue (Bcr) was used to stain structures. Specimens were studied with thin layer chromatography (TLC) using solvents C following the standardized methods of Culberson & Kristinsson (1970).

THE NEW SPECIES

Naetrocymbe herrei K. Knudsen & Lendemer sp. nov.

MYCOBANK #512898.

Naetrocymbe thallo epilithico fusco *Trentepohliam* continenti, ascis gracilibus, 65–85 x 12–15–(20) µm et sporis parvis bicellularibus, (15.9)–18.8–(21.8) x (4.7)–5.8–(6.2) µm.

TYPE: **U.S.A. CALIFORNIA.** SAN LUIS OBISPO CO.: San Simeon State Park, north the elephant seal vista, steep rocky slope above cove, 35°39'49"N, 121°15'57"W, 7 m, on volcanic rock, 15.viii.2008, K. Knudsen 10138 (NY, holotype; BR, PRM, UCR, isotypes.)

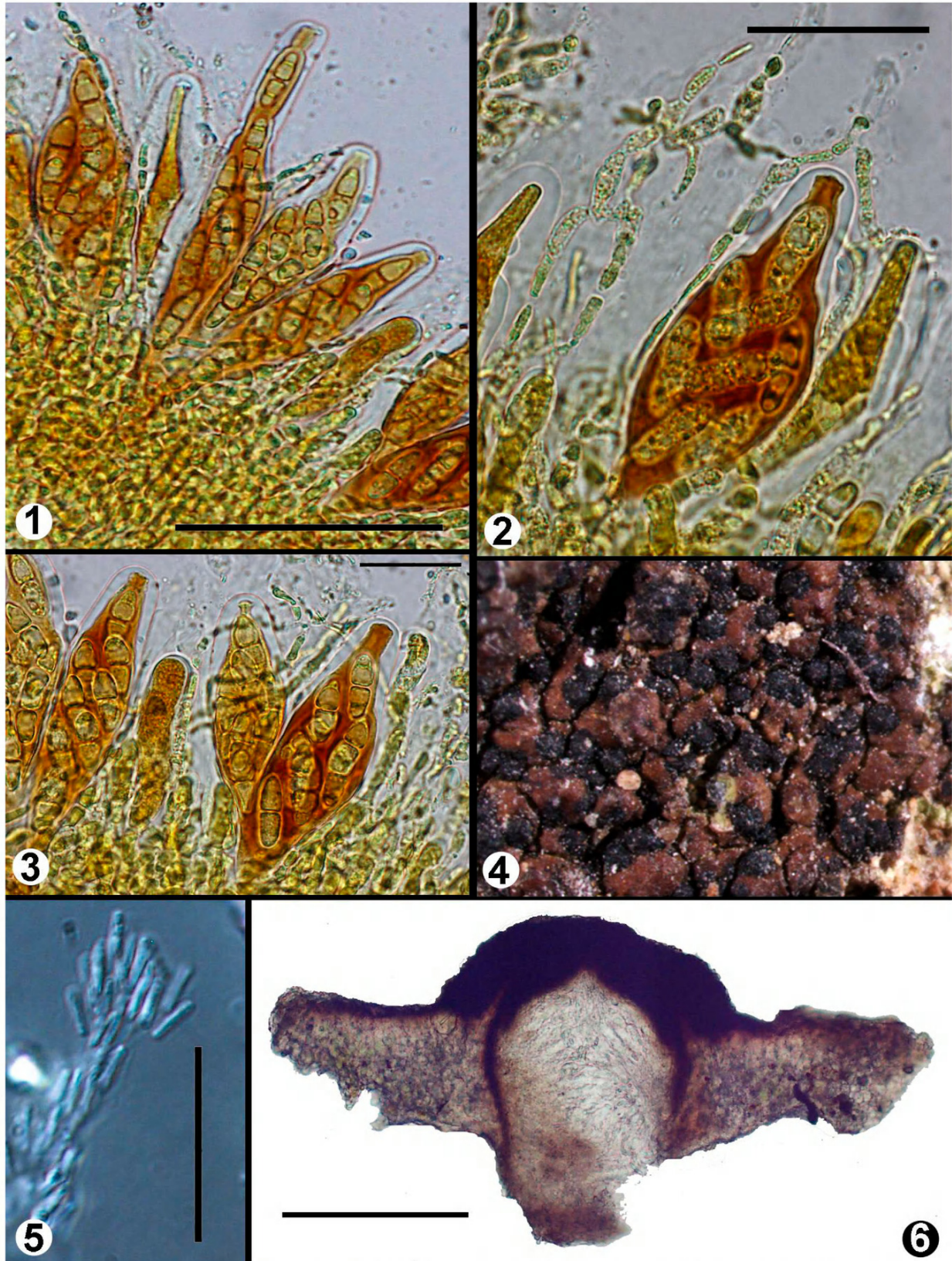


Plate 2. *Naetrocymbe herrei*, thallus, perithecia, and conidia (all from holotype, NY). Figure 1, squash preparation of hymenium (mounted in I, scale bar = 50µm). Figures 2–3, detail of ascus and pseudoparaphyses (mounted in I, scale bar = 20µm). Figure 4, thallus (20x). Figure 5, conidia (differential interference contrast, scale bar = 20µm). Figure 6, section of perithecium (scale bar = 200µm).

DESCRIPTION. – *Thallus* well developed, epilithic, brown to dark brown, matt, epruinose, thin (150–300 µm thick), areolate, well-developed areoles sometimes imbricate, gelatinous when wet, covering areas of up to 10 cm; *Areoles* with indistinct upper cortex formed by pigmented hyphae, and medulla formed of un-oriented gelatinized hyphae, interspersed with crystals, poorly stratified; *Photobiont Trentepohlia*, cells up to 15 µm long, filaments rudimentary, shortened and broken by lichenization; *Ascomata* perithecia, numerous, semi-immersed in areoles, subglobose, 0.2–0.3 mm diam., ostiole visible as depression; *Exciple* globose, 15–20 µm thick, apically slightly thicker, thinning at base, dark brown, usually hyaline at base; *Involucrellum* contiguous with upper half to two-thirds of exciple, spreading outward, 70–90 µm thick, darkly pigmented, obscuring hyphae; *Periphyses* branched, 5–20 x 1–1.5 µm; *Hamathecium* with pseudoparaphyses present, distinct, non-gelatinized, irregular and branching, septate, 1.5–3 µm wide, cells 3–5 µm long, containing abundant small oil drops; *Asci* obpyriform, wall strongly thickened at apex, 65–85 x 12–15–(20) µm; ascospores hyaline, 1-septate, cells equal or upper cell slightly wider, (15.9)–18.8–(21.8) x (4.7)–5.8–(6.2) µm, perispore narrow and indistinct, not usually constricted, lacking ornamentation; *Conidiomata* pycnidial, globose, to 100 µm diam, abundant; *Conidiophores* mostly 10 x 1.5 µm; *Conidia* rod-like, 4–5 x 1 µm; *Secondary metabolites*: none detected.

CHEMISTRY. – No substances detected. Spot tests: K–, C–, KC–, P–, UV–.

ETYMOLOGY. – The specific epithet honors A.C.T.W. Herre (1868–1962), collector of the material that originally led Richard Harris to recognize this taxon as distinct.

ECOLOGY AND DISTRIBUTION. – *Naetrocymbe herrei* is presently only known from the type locality, where it is common in a small area of a rock slope above the cove, and at San Carpofo Creek, a site approximately five miles farther north in San Simeon State Park in San Luis Obispo County, on the central coast of California. This species was originally collected by A.C.T.W. Herre in 1907 on Point Lobos in San Francisco, an area currently included in the Golden Gate National Recreation Area, which is administered by the National Park Service. It is not known if the species still occurs at this historic site. Also it is not known whether *N. herrei* is naturally rare or has just been undercollected. It occurs on volcanic rock, at elevations of 3–10 m or a little higher, above maximum high tide levels but exposed to salt spray. The species grows with *Caloplaca coralloides* (Tuck.) Hulting and *Verrucaria subdivisia* Breuss at the type locality. At San Carpofo Creek it is growing in a well-developed maritime saxicolous community including *Caloplaca luteominia* (Tuck.) Zahlbr. var. *luteominia*, *Caloplaca stantonii* W.A. Weber ex Arup, *Dirina catalinariae* Hasse, *Lecania fructigena* Zahlbr., *Opegrapha brattiae* Egea & Torrente and *V. subdivisia*. In competition with other maritime species it was not dominant, but rather rare and occurring as small thalli that are easily overlooked. *Caloplaca coralloides* did not occur at the San Carpofo Creek site which may indicate that this microhabitat is not best suited for *N. herrei*.

DISCUSSION. – It is important to ascertain the current distribution of *Naetrocymbe herrei* and to determine if it is naturally rare. The effect of global warming on the maritime lichen biota of California (which has many rare and endemic species) is still unknown. *Naetrocymbe herrei* can tolerate salt spray, but so far has been collected above maximum high tide levels. Relatively rapid rising sea levels could have a drastic effect on intertidal lichens, which may not have time to transition to new intertidal positions. Upper littoral zone lichens like *N. herrei* (which may have been limited already by the relatively slow rise of sea levels at the end of the last ice age and are now probably naturally rare) may not be able to transition to new higher sites quickly enough to survive if sea levels rise too rapidly in the next century. It is still unclear what future sea levels will be and how fast they will rise.

In practical terms the dull thin brown thallus can be easily overlooked in the field, despite its prominent perithecia. However, at the two sites where *Naetrocymbe herrei* was collected it could not be confused with any other species.

ADDITIONAL SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA.** SAN FRANCISCO CO.: San Francisco, Point Lobos, 19.vii. 1906, A.C.T.W. Herre 889 (FH, MICH, NY [2 specimens], US, and probably also F). SAN LUIS OBISPO CO.: San Simeon State Park, San Carpofo Creek, south side of creek, north-facing slope between lagoon and beach, 35°43'49"N, 121°19'25"W, 3 m., rare on volcanic rock in mixed saxicolous community, 10.ix.2008, K. Knudsen 10238 (UCR).

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