Stenocybe procrastinata (Mycocaliciaceae), a new calicioid fungus on Cercocarpus in western North America

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ABSTRACT. – Stenocybe procrastinata (Mycocaliciaceae, Mycocaliciales) is described as new to science. The species occurs with remarkable reliability on Cercocarpus ledifolius in western North America.

KEYWORDS. – Biodiversity, Caliciales, endemism, Mycocaliciales, Phaeocalicium, substrate specificity, taxonomy.

INTRODUCTION

Western North America hosts a diverse assemblage of calicioid lichens and fungi (Hardman et al. 2017, Peterson & Rikkinen 1999, Tibell 1975). Diversity is greatest in humid forests near the coast, while rather few calicioid taxa have been found in the arid intermountain west, as evidenced by the scarcity of calicioid species occurrences reported between the Sierra Nevada / Cascade Ranges and the Rocky Mountains (GBIF.org 2021). Yet, during fieldwork for vegetation ecology in the cool semi-deserts of Nevada, a new Stenocybe was found with remarkable reliability on Cercocarpus ledifolius Nutt., an evergreen hardwood plant with a growth form that is intermediate between a shrub and a tree (Martin 1950). Since being initially recognized in 2000, the species has been found more broadly, including locations in California and, reportedly, Idaho.

Over a decade ago, one specimen of the species was referenced by Titov (2006) under the name “Phaeocalicium cercocarpicola” E. B. Peterson & Titov”. That publication of the name was accompanied by text that resembled a formal description. However, the publication lacked the Latin diagnosis or description that was required at that time for valid publication (Art. 39.1; Turland et al. 2018). The present publication rectifies this by formally describing the new species with a validly published name. As is discussed below, although Titov (2006) placed the taxon in Phaeocalicium A.F.W. Schmidt, a placement in Stenocybe (Nyl.) Körb. is considered more appropriate based on the available data.

MATERIALS AND METHODS

Morphology of ascomata and microhabitat was examined with a Wild dissecting microscope ranging from 10–45x magnification. Standard photography of ascomata was carried out in low relative humidity (<50%) with a DSLR camera equipped with a macro-lens and bellows, resulting in magnification of approximately 8x at the sensor. Ascomatal anatomy was examined primarily as squash-mounds in distilled water with a Nikon compound microscope at magnifications from 100–1000x (with oil immersion at 1000x). Longitudinal sections of ascomata were cut for examination of anatomy by placing ascomata in a solution of polyethylene glycol, allowing it to dry to a wax, sectioning by hand under the dissecting microscope, then placing sections into a wet mount with distilled water. Anatomical photographs were captured with a mirrorless micro-four-thirds digital camera. Asci were difficult to separate in water mounts without breakage, so measurements were taken after treatment with KOH and included five asci from each of two ascomata, measured by ocular micrometer, and given in the format (minimum) - mean - (maximum). Ascospores were digitally measured with ten ascospores from each of three ascomata photographed at 1000x, and are given in the format (minimum) - mean minus one standard deviation - mean - mean plus one standard deviation -

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Figure 1. Ascomata of *Stenocybe procrastinata* (from the holotype) photographed at ca. 8× magnification and presented as a composite focal-stack of approximately 20 source images. Scale bar = 1 mm.

(maximum). Chemical tests of ascomata followed Selva and Tibell (1999), with chemicals added to squash-mounts at the edge of the cover slip and observing reactions at 100×.

**The New Species**

*Stenocybe procrastinata* E. B. Peterson, sp. nov.
MYCOBANK #838570.


**Figures 1–3.**

**Diagnosis.** Saprophytic fungus on bark of *Cercocarpus ledifolius* with ascomata typically forming in cracks beneath the outer surface of the bark. Ascomata stalked, 0.3 to 1.0 mm tall at maturity, dark greenish brown to black. Excipulum formed as an extension of stalk tissues with multiple layers of cells; excipular rim slightly constricted at the margin. Ascospores (19.6–)21.5–23.3–25.2–(28.2) μm long, (7.0)–8.0–9.2–(10.4)–(12.0) μm wide, mostly 3-septate. Ascospore pigmentation brown at maturity, often lighter at the apical cells; ornamentation minutely rugose. Septa and ascospore pigmentation typically forming prior to release from asci.

**Type: U.S.A. California:** Trinity Co.; Scott Mountains, Mount Eddy, 41.3246°N, 122.5064°W, in sparse forest of *Abies magnifica*, *Pinus albicaulis*, and *Cercocarpus ledifolius* interspersed with shrublands, 19.viii.2020, epiphytic on bark of *Cercocarpus ledifolius*, E.B. Peterson 5195 (CAS!, holotype; ASU!, F!, NY!, OSC!, UPS!, isotypes).

**Description.** Saprophytic fungus on bark of *Cercocarpus ledifolius* with ascomata typically forming in cracks beneath the outer surface of the bark. Ascomata stalked, 0.3 to 1.0 mm tall at maturity. Stalk greenish brown to black under dissecting microscope, brown under compound microscope with pigme-
Figure 2. Anatomy of ascomata and asci in *Stenocybe procrastinata* (all from the type collection). **A**, longitudinal section of ascoma in wet mount at 100×, note slight reddish pigments in the excipulum. **B**, ascus tips showing a flat interior wall (left), angular interior wall (right) and the most frequently observed indented interior wall (center). Scale bars = 100 µm in A, 10 µm in B.
-nts strongest in the interior of the stalk; faint reddish pigments occasionally observed, particularly toward the top of the stalk; hyphae irregularly arranged with a slight tendency toward periclinal arrangement. Capitula broadly obconical to obovate, black under dissecting scope. Excipulum formed as an extension of stalk tissues with multiple layers of cells, occasionally with reddish pigments, hyphae becoming periclinal and with a fine irregular cracking of the outer surface of the excipulum. Excipular rim slightly constricted at the margin. Epithecium covered with dark granular material. Asci cylindrical, containing obliquely arranged ascospores with occasional changes in direction, (137)–163–(178) µm long, (10)–12–(14) µm wide. Ascus tip without a canal; interior wall flat to angular (most commonly with a small indentation). Ascospores (19.6)–21.5–23.3–25.2–(28.2) µm long, (7.0)–8.0–9.2–10.4–(12.0) µm wide, mostly 3-septate. Ascospore pigmentation brown at maturity, often lighter at the apical cells. Septa typically forming first, followed by pigmentation, prior to release from asci. Ascospore ornamentation minutely rugose, often with a faintly longitudinal pattern, forming cracks with age that are primarily longitudinal, but irregular over the apical cells.

CHEMISTRY. – Ascomata HNO₃ negative; KOH negative except for a slight intensification of reddish pigments (if present) in the excipulum or stalk, and strongly sclerotized hyphae sometimes turning dark gray.

ETYMOLOGY. – The epithet ‘procrastinata’ was chosen to acknowledge the long delays between the discovery of the taxon (in December, 2000), the first printed mention (Titov 2006), and this publication as a new species.

DISTRIBUTION AND ECOLOGY. – Stenocybe procrastinata is known with certainty from California and Nevada, U.S.A. in western North America (Figure 5). A likely occurrence of the species has also been found in Idaho (N.R. Johannson pers. comm.; M. Haldeman 1819), but the supporting voucher is on loan to H and has not been confirmed by the author. That specimen is also from flaking bark of *C. ledifolius*, although the available information suggests that the bark was on an outward branch and the ascomata are visible around the margins of the bark flakes, thus with ascomata more exposed than in the specimens examined.

Stenocybe procrastinata is remarkably faithful to old *Cercocarpus ledifolius* (Figure 4), where it grows on flaking bark of old trunks and large branches. Few *C. ledifolius* of sufficient age to produce flaking bark 0.5 meters above the ground have been observed by the author without finding *S. procrastinata*, even when growing as isolated individual trees at the western margin of the range of *C. ledifolius*. Thus, it is reasonable to hypothesize that the range of *S. procrastinata* may be nearly identical to the range of *C. ledifolius*. Confirmation of this hypothesis will require more sampling, but it is possible that the new species is narrowly endemic to western North America and it is restricted to mature individuals of the host species. Such host specificity is widely recognized to occur in other members of the Mycocaliciaceae, including *Chaenothecopsis* Vain. and *Phaeocalicium* (Selva & Tibell 1999, Tibell 1984, 1996).

The range of *Cercocarpus betuloides* Nutt. overlaps that of *C. ledifolius* (Martin 1950), and *C. betuloides* also forms flaky bark when sufficiently mature. Several large *C. betuloides* in California have been examined by the author, but *S. procrastinata* has yet to be found on it.

DISCUSSION. – Anatomically, *S. procrastinata* resembles *Phaeocalicium minutissimum* (G. Merr.) Selva and *P. tremulicola* (Norrl. ex Nyl.) Tibell. However, *S. procrastinata* differs from both in having larger ascospores with ornamentation that is visible under a light microscope. *Stenocybe procrastinata* further
Typical habitat of *Stenocybe procrastinata* which grows on very large, old, *Cercocarpus ledifolius*. The type was collected from the tree pictured on the left, which is currently a national co-champion for size.

differs from *P. tremulicola* by the regular, early development of ascospore septa (versus ascospores often remaining 0–1 septate; Tibell 1996) and from *P. minutissimum* in having a thicker excipulum (versus a single layer of cells; Selva & Tibell 1999). It is also similar to *S. fragmenta* E. B. Peterson & Rikkinen, which can also grow on *Cercocarpus* in arid western North America (Peterson & Rikkinen 1998). However, *S. procrastinata* differs in having 3-septate ascospores with walls that may crack with age, but do not fully fragment (versus 5-7 septate ascospores that begin to swell within minutes of placement into a squash mount, splitting into multiple segments within an hour).

The distinction between *Phaeocalicium* and *Stenocybe* deserves attention. Tibell (1984) acknowledged similarities between the two genera, but distinguished them in keys based on *Stenocybe* having multispetate ascospores. Tibell (1996) observed that some taxa of *Phaeocalicium* can produce multiple septa within ascospores, and transferred a 3-septate *Stenocybe*, now recognized as *P. tremulicola*. Selva and Tibell (1999) transferred another 3-septate species to *Phaeocalicium*, resulting in *P. minutissimum*. Thus, septation of ascospores no longer distinguishes the two genera. Ascospore size could partially distinguish the genera with *Stenocybe* having ascospores greater than 20 µm in length, except for *S. pullatula* (Ach.) Stein with 11-16 µm ascospores (Tibell 1999). In his descriptions of the genera, Tibell (1984) noted that *Phaeocalicium* has ellipsoidal ascospores with rounded ends, while *Stenocybe* has fusiform ascospores and that the apical cells of *Stenocybe* ascospores tend to be pale. The ascospores of *S. major* (Nyl.) Körb. (the type species of *Stenocybe*), are 3-septate and with pale apical cells (Schmidt 1970), although in the author’s experience with North American material, the ascospores tend to have rounded ends.

The present taxon is similar to the aforementioned taxa that were transferred to *Phaeocalicium*, but is here placed into *Stenocybe* for several reasons. First, ambiguity among these genera remains and the name *Stenocybe* has precedence. Second, *S. procrastinata* likely has a close phylogenetic relationship to *S. fragmenta*, based on substrate, ascospore size, and the tendency for the ascospore wall to crack with age. Third, the ascospores are similar to *S. major* in that they often have pale apical cells. Lastly, the ascospore size falls within the range of the majority of *Stenocybe* as discussed above.

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LITERATURE CITED


