

## **Hubbsia W. Weber**

After Weber, and Tehler, et al.

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**THALLUS** subfruticose to subfoliose with lower part attached to the surface, epilithic, smooth, pruinose, creamy white, to 2 cm thick; prothallus not seen; calcium oxalate absent; heteromerous. **Cortex** predominantly of interwoven in parts somewhat anticlinally arranged, branched hyphae; hyphae verrucose, hyaline in a granular, hyaline gel. **Medulla** white, byssoid to cretaceous; thalline hyphae verrucose (possibly due to attached crystals), hyaline, cell walls 1-2  $\mu$ m, 3-4  $\mu$ m diam.; hypomedullary plectenchyma present in basal parts. **Photobiont** Trentepohlia sp., cells coccal, 10-20 x 10-7  $\mu$ m.

**ASCOMATA** in synascomata but sometimes solitary, sessile or immersed developed mutually with the thallus, lateral, distributed over the inner lobes, lirelliform with branched lirellae, 4-5 x 0.1-0.2 mm; disc hidden, epruinose. **Thalline margin** thin and slightly elevate, with algae and cortex; **proper exciple** parathecial. **Hypothecium** distinct, dark brown (carbonaceous), extending down and gradually disappearing into the medulla, up to 0.4 mm thick. **Hamathecium** paraphysoidal. **Hymenium** 60  $\mu$ m; paraphysoids reticulate and richly branched, conglutinated, not separable, hyaline, 1  $\mu$ m diam. **Epithecium** brown, 20-25  $\mu$ m; hyphae reticulate and richly branched in a brown gel; tips brownish with an olive tinge, cylindrical, 1-2  $\mu$ m diam., smooth; calcium oxalate absent. **Asci** clavate, in the range of 75 x 13  $\mu$ m. **Spores** ellipsoidal to bluntly fusiform, straight, smooth, 3- or 4-septate, hyaline.

**PYCNIDIA** numerous, solitary, lateral, immersed or slightly elevated, pale brown, when elevated 0.6 mm, when immersed 0.2 mm diam.; **conidia** filiform, curved, 12-14 x < 1  $\mu$ m.

**CHEMISTRY:** Cortex and medulla C+ red, K-, I-, KI-; hypothecium K- (olive-black), I-, KI-; hymenium K-, I-, KI-; epithecium K-, I-, KI-; asci I-, KI+ blue. Major substances erythrin and lecanoric acid; minor substances montagnetol and orsellinic acid; three other minor substances are probably hydrolysis or methanolysis products.

**1. Thallus lobes solid; soralia absent.** Central parts of thallus often with  $\pm$  terete, lumbricoid, appressed branches. Hypomedulla with brown or in lowermost parts yellowish plectenchyma. Ascomata numerous; spores 15-18 x 4-5  $\mu$ m. On vertical rocks and cliffs, coastal California and Baja California. .... H. californica (Rasanen) W. A. Weber

**1. Thallus lobes hollow; soralia present.** Central parts of thallus lacking terete, lumbricoid, appressed branches. Hypomedulla with brown plectenchyma in lowermost parts. Soralia maculate to confluent in central parts of thallus. Thallus fruticose; lobes erect or suberect, scantily branching, 10-20 mm or more long, ca. 3 mm thick; surface mealy throughout, smoothish, or becoming transversely tortuous when old or at base, often with heaps of soredia. Cortex K+ yellow, C+ red; medulla K-, C-. Ascocarps absent or sparse,  $\pm$  stellate, immersed then finally sessile; spores fusiform, 8-locular, 16-17 x 4-5  $\mu$ m (20-33 x 4  $\mu$ m acc. to ?). On vertical rocks and cliffs, coastal California and Baja California. .... H. parishii (Hasse) Tehler

**Hubbsia californica (Räsänen) W. Weber** (Synonym: Hubbsia lumbricoides)

Thallus fruticose, pendent, composed of masses of terete to somewhat flattened or contorted, sometimes intestiniform, simple or sparingly dichotomously branched solid stems intertwined and overlapping but generally directed downwards and curving towards the substrate, tapering to rounded tips, very fragile and brittle when dry, spongy when wet, very light in weight, neither sorediate nor isidiate, loosely attached by a brownish-discolored basal portion consisting of the bases of branches loosely fused by compression; branches to 10 cm long, 5-7 mm diam. in older places, 1.5 mm diam at tips, average ca. 3 mm diam.; surface smooth, pruinose, pale gray to chalky white or creamy white, matt. Holdfast only as an attachment. Prothallus absent. Soredia and isidia absent. Cortex 50-70  $\mu\text{m}$  thick, consisting of irregularly interwoven, branched, prosenchymatous hyphae which are haphazardly oriented to in some parts somewhat anticlinally arranged; hyphae verrucose, hyaline, surface gel granular, only incorporated in cortex, hyaline; lumina under 1  $\mu\text{m}$  wide; walls to 2  $\mu\text{m}$  thick, densely incrustated by granules or crystals (presumably of lecanoric acid); medulla white, cretaceous or slightly byssoid; thallus gel granular, hyaline; medullary hyphae similar to cortical ones, verrucose (possibly caused by attached crystals), 3-4  $\mu\text{m}$  diam., thick-walled (walls 1-2  $\mu\text{m}$ ), dense and cottony, forming a solid, spongy central core. Hyphomedullary plectenchyma present in holdfast and lowermost branches. Calcium oxalate absent. Photobiont *Trentepohlia* sp., cells coccal, 10-20 x 10-17  $\mu\text{m}$ , in a definite layer.

Asocarps numerous, multiascal locules, monocarpocentral (hymenial strands absent), developing mutually with the thallus, lateral, produced on the older growth, immersed, lirelliform, in sessile synascomata but sometimes solitary, not constricted at the base, 4-5 x 0.1 mm; branching at first dichotomously, finally pectinately- or stellately, narrowly linear, often becoming reticulate and, on older stems, sometimes compressed at right angles to the long axis and thus undulate-plicate, black in surface view, appearing as narrow slits which widen with age, ascolocular, in cross section with usually one, sometimes two, discrete cups (interthecial tissue units) side by side, each 100-200  $\mu\text{m}$  diam., 110-135  $\mu\text{m}$  deep, in longitudinal (along axis of lirella) view showing large numbers of discrete cups in a row, these separated by their excipuloid walls and a small wedge-shaped remnant of cortical plectenchyma of oblong hyphae and with slightly larger lumina than the normal vegetative cortical tissue. Discs hidden, concave, epruinose. Thalline margin thin and slightly elevated, with algae and cortex. Proper exciple (excipuloid tissue) parathecial, brown-black, consisting of vertically oriented elongate prosoplectenchyma on sides of interthecial cups, grading into distinct, dense, dark brown (carbonaceous) "hypothecium" at base of ascocarp, extending down and gradually disappearing into medulla, up to 0.4 mm thick. Hamathecium paraphysoidal. Hymenium 60  $\mu\text{m}$ ; paraphysoids reticulate and richly branched, conglutinated, not separable, hyaline, 1  $\mu\text{m}$  diam., septate with cells ca. 10  $\mu\text{m}$ . Epithecium brown, 20-25  $\mu\text{m}$ ; gel brown, clear; hyphae reticulate and richly branched, with tips cylindrical, 1-2  $\mu\text{m}$  diam., smooth, brownish with olive tinge; calcium oxalate absent. Asci clavate, bitunicate, (30-)55-75 x (6-)13  $\mu\text{m}$ . Spores 8/ascus, biserial, (2-)4-5(-6)-celled, slightly fusiform to oblong or oblong-ellipsoid, with rounded tips, straight, smooth, 3- or 4-septate, not constricted at septa, hyaline, (11-)15-17(-19) x (3.5-)4-5(-6)  $\mu\text{m}$ . Interthecial tissue IKI+ vinose red.

Pycnidia numerous, solitary, lateral, immersed or slightly elevated, pale brown (black according to Weber), when elevated 0.6 mm, when immersed 0.2 mm diam., at first punctiform, later visible as large areas concolorous with thallus and delimited by circular cracks in the cortex; pycnosporos (microconidia) acicular, curved in a semicircle, 12-14 x < 1  $\mu\text{m}$  (15-18  $\mu\text{m}$  along a line drawn straight from tip to tip and 0.5  $\mu\text{m}$  diam., according to Weber)

Cortex and medulla C+ red, K-, P-, I-, with erythrin, lecanoric acid, and an unidentified blue fluorescent substance; plus schizopeltic acid according to Follmann. Asci I-, K/I+ blue; other apothecial tissues I-, K/I-.

On vertical sides and cave-like underhangs of basaltic cliffs facing the sea. Coast of Baja California and southern California (San Diego area).

I'm not sure where I got the following description--perhaps from Hasse, S. California:

Thallus hard, strong, thick (8 mm), lobed; lobes 4-7 mm wide, dense (medulla white), intestiniform, terete, blunt at tips, esorediate, epruinose, matt, pale ashy, K-, C+ red, I-.

Apothecia elongate, well branched, lirelliform, subinnate, epruinose, black, thin. Hypothecium brown-black, thick. Hymenium hylaine. Paraphyses branched, intricate, thin. Asci cylindrical, curved, ca. 85 x 10 um, thickened at tips. Spores hyaline, 8, oblong, straight, 3-septate, Opegrapha-like, 10-14 x 3-4 um, thin-walled. On maritime rocks, southern California.

**H. parishii (Hasse) Follmann, or Tehler, Lohtander, Myllys & Sundin** (need to determine the exact dates of publication to decide which has priority)

**THALLUS** thick, fruticose (to  $\pm$  crustose towards center in "R. subcrustacea"), loosely attached by an extensive, rough, blackish tomentum interspersed by humus and substrate particles; 50 mm wide; laciniae erect or suberect, scantily branching, closely packed, partly intricate, 10-20(-25) mm long, squat, ca. 3-9 mm thick, compressed, to irregularly terete, tips well rounded, when young solid, full-grown hollow and inflated, , extremely fragile when dry, spongy when wet. Apical laciniae 0.12-0.15 mm thick, the older basal laciniae considerably thicker. **Surface** ashy white, light gray to ash-gray, on younger and terminal laciniae matt, smoothish, sometimes slightly pruinose, in the older or basal ones often transversely tortuous, rugose, or cerebriform, mealy throughout, sometimes developing compact, globular isidia. Cephalodoid heaps of soredia not infrequent. **Soralia** usually present,  $\pm$  capitate, to 2 mm diam., coarsely granular, slightly creamy white, distributed over the inner lobes. **Prothallus** whitish, inconspicuous. **Cortex** hyaline, delicate, 20-35 um thick, of predominantly interwoven, branched , and verrucose hyphae to 3 um diam., but occasionally also by somewhat anticlinally arranged ones, these being somewhat clavate at tips and 4 um thick; **algal layer** 60-75 um thick, with definite upper border 3-4 times thicker than cortex, lower border gradually merging into the medulla; trentepohliaceous photobionts solitary or in short chains, covered by clamp hyphae; **medulla** hyphae to ca. 2 um thick, densely and irregularly interwoven, predominantly periclinally oriented, branched, incrusting; all hyphae indistinctly, if at all, septate; except for the dark basal portion white; outer stratum cretaceous, inner one byssoid; thickness varying with development of central cavity; thallus gel granular, hyaline.

**ASCOCARPS** rare, usually absent (probably belonging to a lichenicolous fungus according to Follmann, 1997),  $\pm$  stellate, at first immersed, later erumpent, finally appressed sessile, appearing to be isolated on gall-like excrescences on older branches surrounded by relatively deep fissures which possibly allow shedding. **Hypothecium** dark brown to black. **Epihymenium** subcontinuous, granulose, pale to dark yellow. **Hymenium** colorless, 140-160 um high, the lower part with dark streaks ascending from the hypothecium. Hymenial gel I-, K-. **Paraphysoids** branching, matted, ca. 2 um thick, containing numerous minute globules. **Asci** elongate-clavate, 160 x 12 um, thick-walled throughout, 8-spored. **Spores** colorless, fusiform, 8-celled, 20-27 x 4 um.

**PYCNIDIA** present in c. 50% of the thalli, lateral, blackish, immersed or slightly elevated, superficially punctiform or roundish, to 200 um diam., corpus pyriform, pycnoconidia "exobasidial", filiform, curved or crescent-shaped, 14-18 x 0.5-1.0 um.

**CHEMISTRY:** Cortex, medulla and soralia C+ rose-red, K-, I-. Erythrin (abundant), lecanoric acid (scanty), orsellinic acid (scanty), schizopletic acid (abundant), and an undetermined phenolic product (scanty) present

**ECOLOGY AND DISTRIBUTION:** On rocks, near the sea but away from the spray zone, coast of Baja California and southern California.

## Literature

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