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# *Hypogymnia apinnata* sp. nov., a New Lichen (Ascomycotina) from the Pacific Northwest of North America

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Abstract. *The epiphytic lichen* Hypogymnia apinnata *sp. nov. is described from the Pacific coast of North America. Although superficially similar to* H. enteromorpha, H. apinnata *is distinguished from that species both morphologically (in producing few or no marginal lobules) and chemically (in lacking medullary lichen substances). Range maps are provided for these common Pacific Northwest endemics.*

*Hypogymnia* is a homogeneous assemblage of roughly 50 species worldwide. Although the taxonomy of the European species has now stabilized, many North American species have remained poorly understood until very recently. Several of these were formerly united within *H. enteromorpha* (Ach.) Nyl. Since Krog (1968), for example, seven previously unrecognized species have been segregated from that species alone, namely *H. heterophylla* Pike, *H. imshaugii* Krog, *H. inactiva* (Krog) Ohlsson, *H. krogiae* Ohlsson, *H. occidentalis* Pike, *H. oceanica* Goward, and *H. rugosa* (Merr.) Pike *ex* Hale. The purpose of this paper is to separate an eighth distinct element from *H. enteromorpha.*

The latest taxonomic concept of *H. enteromorpha* (e.g., Hale & Cole 1988) includes two distinct chemical strains. These may be referred to as the PD+ chemotype, in which the medullary substances are protocetraric, physodalic, physodic, and diffractaic acids, and the PD− chemotype, in which no medullary substances occur at all. An examination of many *H.* "*enteromorpha*" (from ALA, CANL, ID, OSC, SBM, SRP, UBC, UC, US, and the personal herbaria of the authors) from various parts of the Pacific Northwest revealed that the PD− chemotype differs in morphology from the PD+ chemotype. Though the points of distinction are often subtle, it is usually possible to correctly predict the chemistry of mixed collections of PD+ and PD− material even before performing spot tests on them. From this, as well as from differences in distribution (see below), we conclude that the PD+ and PD− chemotypes previously united within *H. enteromorpha* actually represent two distinct taxa. Given that Pike and Hale (1982) recently lectotypified *H. enteromorpha* on the basis of a PD+ red specimen in the Smith Herbarium (BM), we now describe the PD− chemotype as *H. apinnata.*

**HYPOGYMNIA APINNATA** Goward & McCune sp. nov. (FIG. 1–2, 7)

*Hypogymniae enteromorphae* similis sed thallo apinnato et non nisi atranorinum continenti differt. Apothecia numerosa; sporae 6.5–7.0 × 5.0–5.5 μm. Corticola.

Thallus foliose, rather closely appressed to loosely pendulous, orbicular to irregular, to 15 cm diam.; lobes hollow, averaging 3–4 mm broad, short to more often elongate, frequently somewhat nodulose, often apically perforate, marginal "lobules" absent or at most sparse, branching isotomic- to more often anisotomic-dichotomous; upper surface pale mineral gray to nearly white, shiny, convex, smooth to becoming in part weakly rugose, as seen from above usually (but not always!) bordered by the expanded shiny, black, wrinkled lower surface; soredia absent; medulla thin, cottony, at first white but soon darkening around central cavity. Apothecia common, short stipitate, to 10 mm diam., disc medium to dark brown, usually concave; spores 8 per ascus, colorless, subglobose to broadly ellipsoidal, at maturity ca. 6.5–7.0 × 5.0–5.5 μm.

*Chemistry.*—Cortex K+ yellow; medulla K−, KC−, C−, PD−, I−. Contains atranorin (demonstrated by TLC) and probably chloroatranorin, although no attempt was made to separate it from atranorin.

TYPE. U.S.A. MONTANA. LINCOLN CO.: Cabinet Range, Granite Creek, elev. 1,070 m, branch of *Thuja plicata,*

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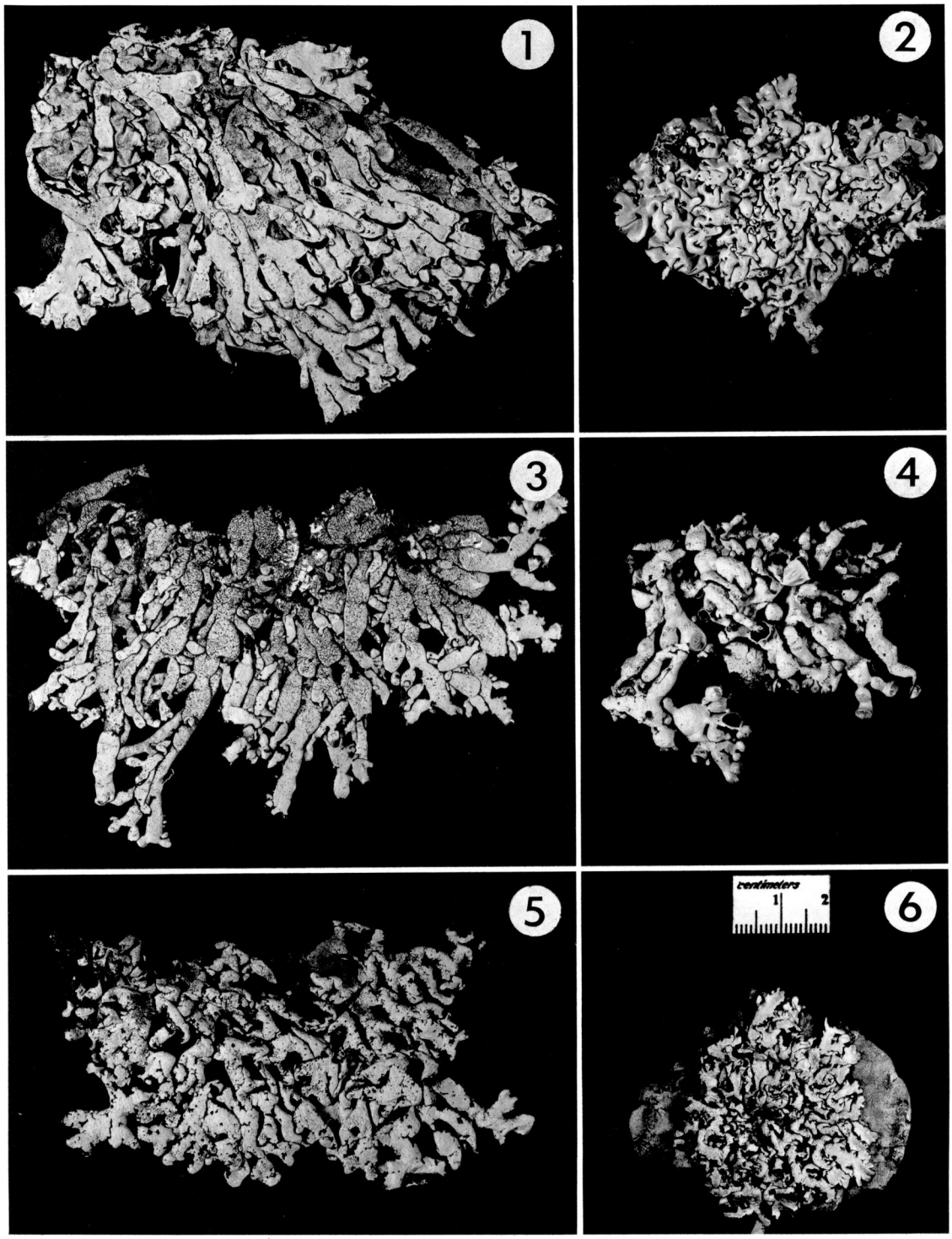
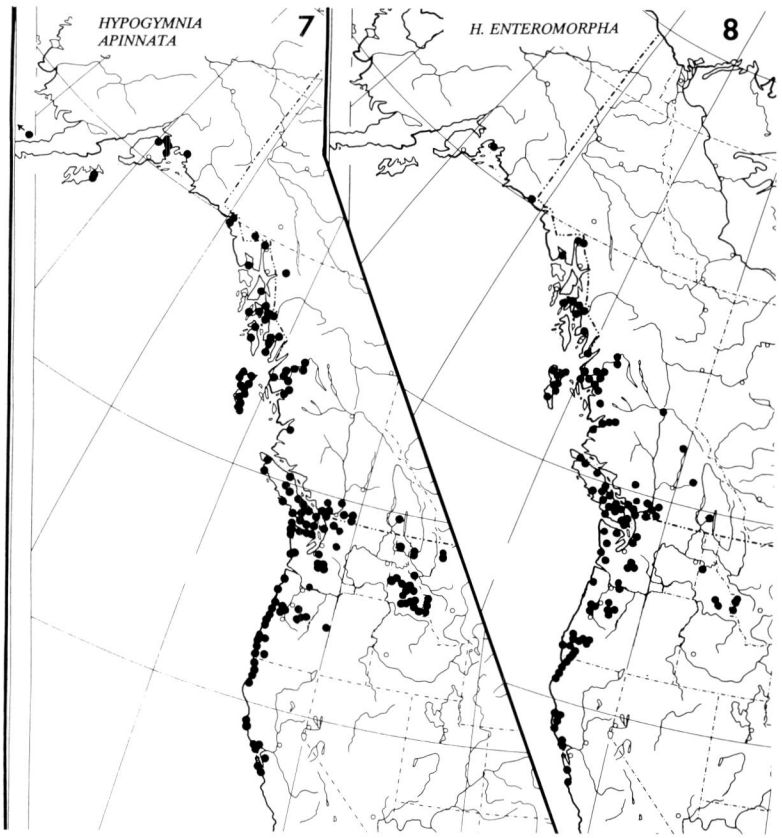



FIGURES 1–6. *Hypogymnia.* — 1. *H. apinnata,* holotype. — 2. *H. apinnata,* short-lobed form from the immediate coast, *Anderegg 473.* — 3. *H. enteromorpha,* Idaho, Benewah Co., *Schroeder L819* (ID). — 4. *H. enteromorpha,* short-lobed form, Alaska, *McCune 18275*). — 5. *H. rugosa,* Oregon, Linn Co., *McCune 19462.* — 6. *H. occidentalis,* Montana, Missoula Co., *McCune 16958.* All photos are at the same scale (lower right).




FIGURES 7–8. World distributions. — 7. *Hypogymnia apinnata.* — 8. *Hypogymnia enteromorpha.*

48°18′N, 115°40′W, 17 August 1982, *McCune 12506* (holotype, OSC; isotypes, BM, CANL, H, UBC).

*Selected specimens examined.*—CANADA. BRITISH COLUMBIA. New Hazelton area, *Goward 81-1877* (UBC).

U.S.A. ALASKA. Attu Island, *K. A. Miller s.n.* (UC). Kodiak Island, *Silverwood 15* (US). Skagway area, *Goward 82-406* (UBC). OREGON. BENTON CO.: *Goward 90-334* (UBC). LANE CO.: *Anderegg 473* (ID). WHEELER CO.: *Anderegg 670* (ID). WASHINGTON. SKAGIT CO.: *Goward 82-125* (UBC).

A PD− chemotype of *H. enteromorpha* was earlier described from Japan as *H. enteromorpha* fo. *inactiva* (Asahina 1952). Though the type of this taxon is currently unavailable for study (Kashiwadani, pers. comm.), we have examined several Japanese specimens attributed to that taxon, and conclude that the material is not conspecific with the North American material. Nor does the Japanese PD+ material we have seen match the type of *H. enteromorpha.* Both chemotypes, in fact, are possibly more closely related to *H. krogiae* Ohlsson (physodic, physodalic, and protocetraric acids) than to *H. enteromorpha* s.s. Specimens of the Japanese *H. "enteromorpha* fo. *inactiva"* were subjected to TLC, and found to contain physodic, conphysodic (= 3-hydroxyphysodic), and an unknown long-wave UV+ substance, while the Japanese *H. "enteromorpha"* contained physodic, conphysodic, physodalic, and protocetraric acids.

The name *apinnata* is chosen in recognition of the relative absence of marginal lobules in this species. In the closely related *H. enteromorpha* (Fig. 3–4, 8), marginal lobules (i.e., small adventitious lobes) are often well developed, and tend to be aligned perpendicular to the primary lobes, thus giving the thallus a somewhat "pinnate" appearance, at least in part (see also fig. 134 in Hale 1979). Branching in *H. apinnata,* by contrast, is usually anisotomic to isotomic dichotomous, and not at all pinnate (Fig. 1; see also fig. 26a in Hale & Cole 1988).

Although marginal lobules are typically absent in *H. apinnata,* sparse (rarely abundant!) lobules do occur in a small percentage of the PD− specimens we examined. Such specimens may perhaps be interpreted as representing PD− chemotypes of *H. enteromorpha,* although these specimens may actually represent various degrees of introgression between that species and *H. apinnata.* Hybridization has occasionally been proposed to explain taxonomically "intermediate" lichens in other genera (see for example, the discussion in Brodo 1978), and recently Schuster et al. (1985) demonstrated this

phenomenon in *Physcia*. Pending more detailed studies, however, we prefer to assign all PD+ specimens to *H. enteromorpha* and all PD− specimens to *H. apinnata*.

Appressed, short-lobed forms of *H. apinnata* may be difficult to distinguish morphologically from *H. occidentalis* Pike (Fig. 6)—another PD− species. In general, however, *H. occidentalis* is a smaller lichen, the lobes averaging 1.5–3 mm across vs. 3–4 mm across in *H. apinnata*. Moreover, *H. occidentalis* contains medullary physodic acid (KC+ pink–orange), and may thus be distinguished from the acid-deficient *H. apinnata* on chemical grounds as well.

A further possible point of separation between *H. occidentalis* on the one hand, and *H. apinnata* and *H. enteromorpha* on the other hand is spore size. According to Pike and Hale (1982) the spores of *H. occidentalis* are ellipsoid, and 7–9 × 5 μm, whereas in *H. enteromorpha* s.l. the spores are nearly spherical, and 5 × 6 μm. However, our own studies failed to confirm these differences (*enteromorpha*: 6–7.5 × 4.5–6 μm; *occidentalis*: 7–7.5 × 5.5–6 μm).

The primary lobes of both *H. apinnata* and *H. enteromorpha* are unique among western Hypogymniae in frequently developing regular nodular swellings (see Fig. 1, 3–4). These swellings—which possibly represent annual growth increments—provide an additional character by which to distinguish these lichens in the field, especially when growing adjacent to one another. In general, the lobes of *H. apinnata* are more strongly nodulose than those of *H. enteromorpha,* though considerable variation occurs in both taxa, sometimes even within a single thallus. The nodulations, moreover, are usually restricted to the longer, more trailing lobes, and may be absent altogether in short-lobed morphs of both species.

Short-lobed, nonnodulate forms of *H. apinnata* are common, and must be carefully distinguished from *H. rugosa* (Fig. 5), a species of the Pacific Northwest having broad, nonnodulose lobes, isotomic dichotomous branching, and a strongly rugose upper cortex. In most cases the latter two characters are sufficient to differentiate this species, though difficult specimens may require testing with TLC or PD: *H. rugosa* gives a diagnostic PD+ slowly yellow (finally pale orange) medullary reaction. Note that the "PD−" reaction of *H. apinnata* and other PD− Hypogymniae may sometimes be read as PD+ slowly pale yellow if the reagent is allowed to come in contact with the upper cortex. In this case, however, the yellow coloration is restricted to the upper portion of the medulla (i.e., the portion lying adjacent to the cortex), while the lower portion remains unchanged. By contrast, the PD+ yellow reaction of *H. rugosa* involves the entire medulla.

*Ecology and distribution.*—Like *H. enteromorpha,* with which it often grows, *H. apinnata* is most common over conifers in coastal localities, especially at low to moderate elevations. In most of their range (Fig. 7–8), these species occur in both exposed and rather sheltered habitats. They thrive, however, only in the latter sites: specimens from exposed sites are frequently rather small and short-lobed, and are often difficult to determine on morphological grounds alone. Below the canopy of shady coast forests, on the other hand, both species are usually absent altogether.

Although broadly sympatric, *H. apinnata* appears to be somewhat more widespread than *H. enteromorpha*. In particular, *H. apinnata* seems to extend farther north and west along the Pacific coast of Alaska (to Attu Island), and is usually the more common of the two species in inland localities. Here it is especially common in the glacial refugia of the Clearwater Drainage in Idaho, where it occurs in oldgrowth forests at low to middle elevations.

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