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Parmelia hygrophila, a new lichen species from the Pacific Northwest of North America

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The lichen *Parmelia* (subg. *Parmelia*) *hygrophila* Goward & Ahti, sp. nova, is reported from Alaska, British Columbia (typus), Idaho and Washington, where it is a widespread epiphyte in humid and subhumid sectors at low and middle elevations. Salazinic acid and atranorin are its major phenolic constituents. A key to the species of the *P. saxatilis* group in the Pacific Northwest is presented.

Key words: lichen, *Parmelia*, epiphyte, phenols, British Columbia

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Recent lichenological studies in the "Interior Wet Belt" of British Columbia, Canada, especially in Wells Gray Provincial Park and its vicinity, have turned up a common lichen which is here described as a new species, *Parmelia hygrophila*. Although usually readily distinguishable from *P. saxatilis* (L.) Ach., *P. hygrophila* has hitherto been either included in that species, or else treated as a variety of it, namely *P. saxatilis* "var. *divaricata* Delise ex Nyl." (see Ahti 1962, Hämet-Ahti 1965, Otto & Ahti 1967). This latter variety, however — actually originally described from Japan as *P. saxatilis* [subsp.] *divaricata* Delise ex Nyl. — is now known to be a synonym of *P. squarrosa* Hale. Delise's epithet *divaricata* was never published by him and likely referred to a specimen from Newfoundland.

Parmelia hygrophila Goward & Ahti, sp. nova (Fig. 1)

Thallus foliosus, *Parmeliae saxatilis* similis sed isidiis soredioideis fragilissimis, pro parte maxima ecorticatis praeditus; lobis marginalibus vix rufescentibus; vulgo corticola.

Typus: Canada. British Columbia. Kokanee Creek Park, 17 km E of Nelson, 49°36'N, 117°07'W, alt. 530 m, in rather dense *Populus trichocarpa — Abies grandis — Thuja plicata — Betula papyrifera* stand on interfluve of Kokanee Creek delta, on trunk of inclining *Betula papyrifera;* northern temperate zone (Interior Western Hemlock Zone), 25.VII.1981 *Trevor Goward* 81-1601, *Roz Scarnell & Sherry Kirkvold* (UBC, holotypus; BM, CANL, H, US, isotypi).

Thallus foliose, appressed, moderately to rather loosely adnate, 4–10 cm in diameter. Lobes 1–5 mm wide, weakly reticulate-ridged to almost plane or concave with age, linear and elongate, somewhat dichotomously branching, more or less divergent. Upper surface pale to dark greenish grey, occasionally bluish grey, slightly or not at all browning at lobe tips; checkered with effigurate pseudocyphellae which typically become fissural toward the thallus centre, somewhat shiny, pruinose or not at lobe tips; isidiate, the isidia not at all hard-corticate, largely ecorticate (never shiny), not or little embrowned at tips, soon becoming soredioid, short-granulose, simple or irregularly branched, extremely fragile, generally disposed in intermittent clusters along laminal or marginal pseudocyphellae, c. 0.08–0.16 mm high and 0.08–0.1 mm in diameter, forming continuous, readily eroding masses at centres of old thalli. Lower surface dark brown at lobe tips, otherwise entirely black, smooth and shiny; moderately to rather sparsely rhizinate, the rhizinae black, up to 1(1.5) mm long, simple or apically furcate, occasionally with a few short lateral branchlets

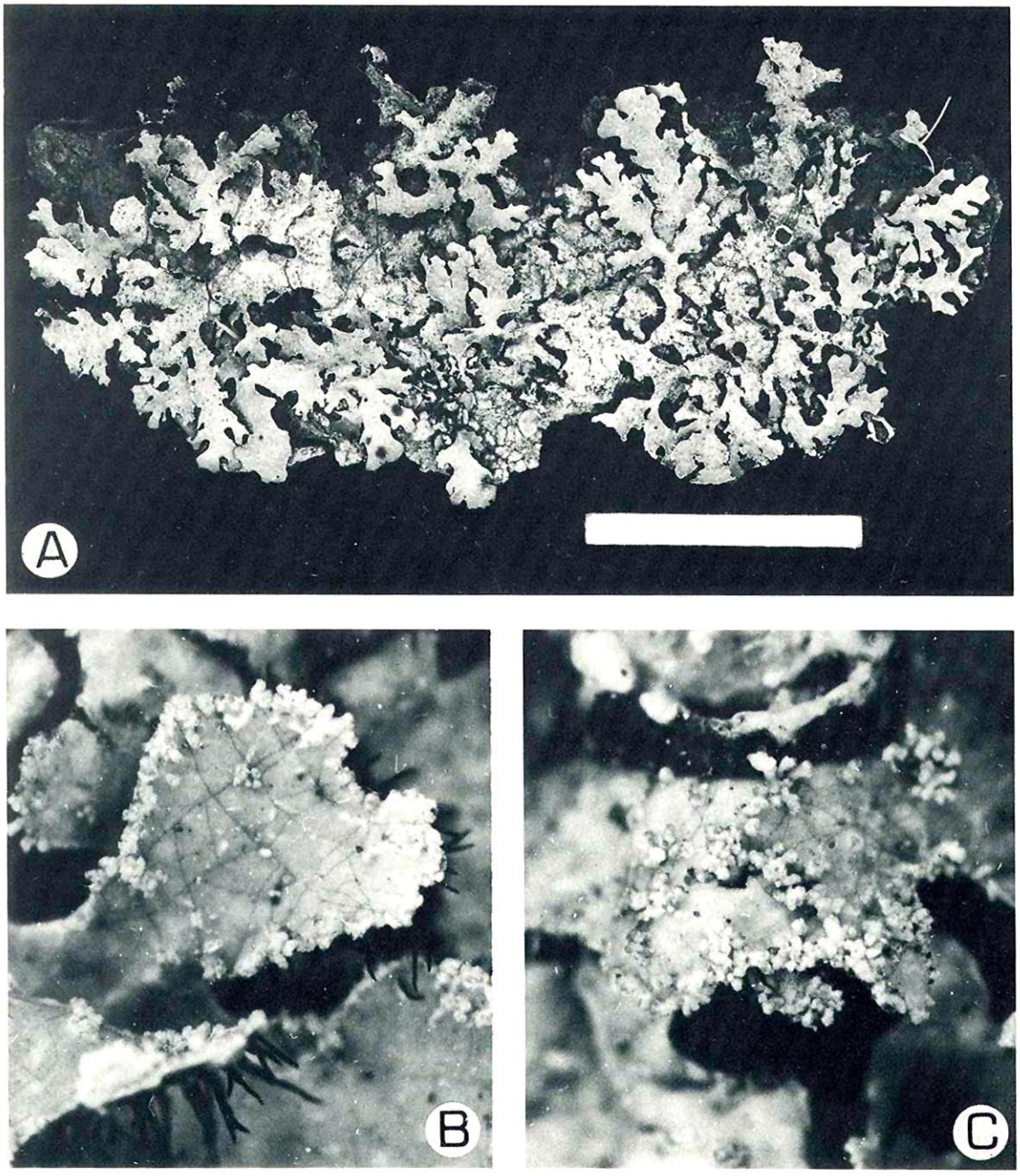

Fig. 1. Parmelia hygrophila Goward & Ahti. Canada. British Columbia: Wells Gray Provincial Park, Murtle Lake, 1980 *Goward 80-35-2 & Summerbell* (H). — A: General habit. White bar = 2 cm. B–C: Lobes showing marginal and laminal soredioid isidia and non-squarrose rhizinae. (×20). — Photo Mauri Korhonen.

(but never truly squarrose), occurring almost or quite to the lobe margins. Lobes 190–250 μm thick, upper cortex 15–30 μm, algal layer 50–75 μm, medulla 75–120 μm, lower cortex 18–25 μm. Apothecia rare, slightly elevated, at least up to 2 mm in diam., margin c. 100 μm thick, largely ecorticate, eroded and even flocculose, hymenium 50–60 μm thick, subhymenium distinct, c. 50 μm, very pale brown; asci c. 70 × 20 μm, with 8 ovoid spores, 14–16 × 9–12 μm, simple. Conidiomata not observed.

Chemistry: Cortex K + yellow, medulla K + yellow becoming red, C–, KC–, PD+ orange. Contains atranorin, salazinic acid and trace amounts of unidentified substances (by thin-layer chromatography).

P. hygrophila is a common epiphyte of numerous coniferous and deciduous tree and shrub species, e.g. *Abies amabilis, A. lasiocarpa, Picea engelmannii, P. glauca, P. sitchensis, Tsuga heterophylla, Pseudotsuga menziesii, Juniperus scopulorum, Betula papyrifera, Alnus rubra, Quercus garryana, Acer glabrum, A. macrophyllum* and *Shepherdia canadensis.* More rarely, it has also been collected over other substrata including rock, saxicolous moss and the (shaded) cedar shakes of an abandoned farmhouse roof.

The ecology of *P. hygrophila* has been particularly observed in the Columbia Mtns and Shuswap Highland region of south-central B.C. Here it often grows in the company of *P. sulcata* Taylor. This latter species, however, is much the more widespread of the two, *P. hygrophila* being confined mostly to rather humid situations, for example, the sheltered side of tree trunks. This hygrophytic tendency, moreover, is especially underlined by *P. hygrophila*'s total absence from the arid and subarid sectors of Interior B.C. (e.g. from the so-called Interior Douglas Fir Zone and the Ponderosa Pine – Bunchgrass Zone; Krajina 1965). Its scarcity in forests of Upper Boreal and Hemiarctic (timberline) elevations may also be explained on hygric (rather than thermic) grounds. At any rate, this species is best represented in humid and subhumid *Thuja plicata, Abies lasiocarpa* and *Tsuga heterophylla* forests at low to middle elevations.

In oceanic and suboceanic regions, the microdistribution of *P. hygrophila* is apparently controlled more by illumination than it is by hygric factors. Thus, whilst this species is often abundant over the trunks of rather exposed trees in city parks (e.g. in Vancouver and Victoria), it is nevertheless generally absent from all but the most open native forest types. In open forests, however, it may be locally common, occurring at least up to Middle Boreal elevations.

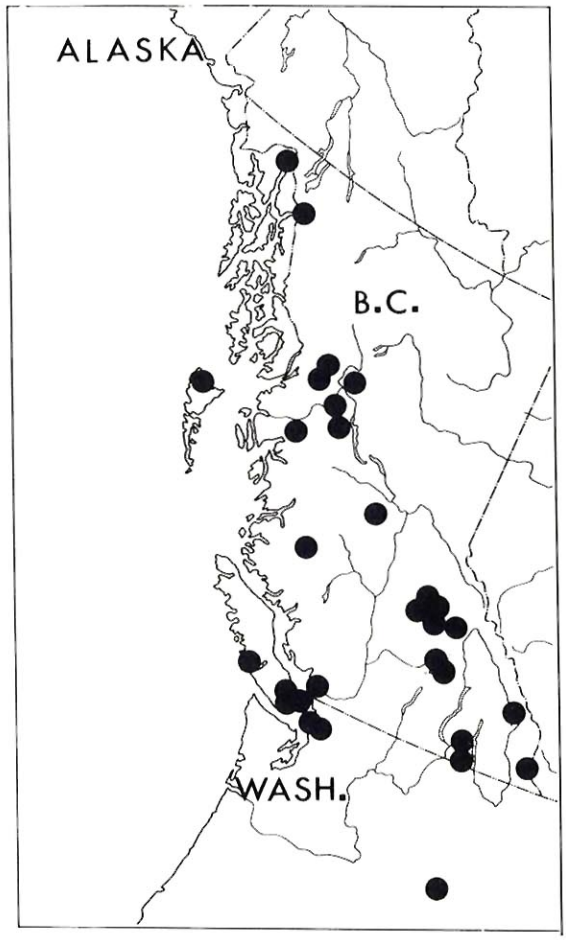

Fig. 2. Distribution of *Parmelia hygrophila* Goward & Ahti.

Distribution

P. hygrophila seems to be an oceanic to subcontinental species of western North America (Fig. 2). Besides British Columbia, it has been recorded from adjacent parts of Alaska, Idaho and Washington. In addition to our personal field notes and collections we have examined the collections of several public herbaria, primarily in Vancouver (UBC), Ottawa (CANL) and Helsinki (H). However, the extent of the range southwards and northwards, in particular, is still poorly defined.

Representive specimens (paratypes) examined:

CANADA.— British Columbia. Queen Charlotte Is., Graham I., Naden Harbour, 1967 *Brodo 10697* (CANL). Rocher Déboulé Mtns., SE of New Hazelton, 1 170 m (Middle Boreal), on *Tsuga heterophylla*, 1981 *Goward 81–1892* (UBC). East of Kitimat, 180 m, 1970 *Ohlsson 2420* (CANL). Mt. Baldy Hughes, 35 km SW of Prince George, 700 m (Lower Boreal), on *Picea glauca*, 1981 *Goward 81–1547* (UBC). Wells Gray Park: NW of Hemp Creek (Lower Boreal), on *Thuja plicata*, 1961 *Ahti & Ahti 14009* (H); Murtle Lake, 1215 m (Middle Boreal), on *Thuja plicata*, 1980 *Goward 80–35–2 & Summerbell* (H, UBC). Shuswap Highland, Trophy Mtn., 1620 m (Upper Boreal), on *Abies lasiocarpa*, 1980 *Goward 80–22–1 & Ahti* (UBC). Kootenay Natl. Park, Olive Lake area, 1 150 m (Lower Boreal), on *Abies lasiocarpa*, 1981 *Goward 81–1750* (UBC). 12 km SSE of Salmo, 1 000 m (North Temperate), on *Pseudotsuga*, 1981 *Goward 81–1577b* (UBC). New Westminster, 1904 *Hill* (UBC). Vancouver, Univ. British Columbia campus (North Temperate), on *Malus*, 1978 *Goward 78–1095* (UBC). Mayne Island, 1914 *Macoun* (UBC). Victoria, by main gate of Univ. of Victoria (North Temperate), on *Quercus garryana*, 1982 *Goward 82–147* (UBC). Trial I., 2 km S of Victoria (North Temperate), saxicolous, 1982 *Goward 82–166 & Schofield* (UBC). Confluence of Taku and Tulsequah Rivers, 150 m (Hemiboreal), on *Acer glabrum*, 1982 *Goward 82–1577 & Parisien* (UBC).

U.S.A. — Washington. Skagit Co.: Burlington (North Temperate), on *Juniperus scopulorum*, 1982 *Goward 82–136, Schofield & McIntosh* (UBC). — Idaho. Idaho Co.: Nez Perse Natl. Forest, Castle Creek Forest Camp, saxicolous, 1959 *Howard 5025* (UBC). — Alaska. Dyea, on Taiya River estuary, 6 km NW of Skagway (Hemiboreal), on *Picea sitchensis*, 1982 *Goward 82–401, Ceska & Ceska* (UBC).

Discussion

Though superficially similar to *P. saxatilis*, *P. hygrophila* may be readily distinguished from that species by its typically ecorticate, soredioid isidia, its typically somewhat greener upper cortex, and by its nearly exclusive occurrence over bark. *P. saxatilis* has definitely non-soredioid, hard-corticate isidia, an often bluish-grey (or embrowned) upper cortex, and a less frequent occurrence over bark. In continental regions *P. saxatilis* is a more or less strict saxicole. However, in oceanic climates, it may occur sparsely, but regularly, over bark — and may then sometimes be difficult to separate from *P. hygrophila*. Rarely, the two species have been found growing intermixed.

P. squarrosa, a common epiphyte in both eastern and western North America (especially in coastal areas), as well as in eastern Asia (e.g. Lamb 1954, Hale 1971, Dey 1978), may be easily separated from *P. hygrophila* on the basis of the former's squarrose rhizinae. The isidia of *P. squarrosa*, moreover, are generally hard corticate in western material, thereby differing from the isidio-soredia of *P. hygrophila*. Interestingly, the isidia of eastern populations of *P. squarrosa* often develop a somewhat more soredioid appearance (rarely observed in the western material also). However, *P. squarrosa* regularly has brown-tipped isidia, whereas the isidia of *P. hygrophila* nearly always tend to be "clean", i.e. pale grey.

From *P. sulcata* our new species may be differentiated by its large, granular "isidia" and simple (vs. squarrose) rhizinae.

Like *P. hygrophila*, *P. pseudosulcata* Gyelnik is a western North American corticole. The isidia of this latter species, however, are always hard-corticate and often elongate-cylindrical, as against *P. hygrophila*'s more soredioid and short-granular isidia. In *P. pseudosulcata*, moreover, the upper cortex seldom bears the obvious checkered-pseudocyphellate pattern typical of *P. hygrophila*. *P. pseudosulcata* is primarily restricted to coastal localities.

Among the North American species of the *P. saxatilis* group, *P. hygrophila* is perhaps most closely related to the saxicolous *P. fraudans*. From this species it differs primarily in its corticolous habitat and lack of usnic acid. Points of similarity include the simple rhizinae, typical absence of apothecia and (perhaps most importantly) soredioid isidia. These last, however, are larger, more copious, more marginally disposed and more apically embrowned in *P. fraudans* than in *P. hygrophila*.

Outside North America a very similar species is *P. contorta* Bory, which is widespread in the Mediterranean region extending northward to southern Germany and Czechoslovakia (Schindler 1975). It tends to be more robust and has contorted lobes, less effigurate pseudocyphellae, and punctiform isidia-bearing soralia.

The diagnostic characters of *P. hygrophila* and its allies — all members of *Parmelia* subg. *Parmelia*, subsect. *Parmelia* (Hale & Kurokawa 1964) — are included in the following key.

Key to species of the Parmelia saxatilis group in the Pacific Northwest

1. Thallus without soredia or isidia (check lobe margins) ..... *P. omphalodes* (L.) Ach.
1. Thallus with distinct (rarely sparse) soredia and/or isidia
   2. Thallus sorediate; soredia farinose and confined to discrete soralia; rhizinae more or less richly squarrose ..... *P. sulcata* Taylor

2. Thallus isidiate, isidia occasionally soredioid and then often branched and associated with pseudocyphellae and marginal or laminal cracks, never farinose; soralia lacking or inconspicuous; rhizinae simple (squarrose in *P. squarrosa*)

3. Isidia distinctly hard-corticate (often shiny), with distinctly embrowned tips, often becoming long-cylindrical
   4. Collected over rock (rarely over bark); rhizinae simple; upper cortex bluish grey or brownish grey (rarely greenish grey); apical portions of lobes often covered in more or less raised white reticulations: medulla K+ reddish; widespread ..... *P. saxatilis* (L.) Ach.
   4. Collected over bark (rarely over rock); rhizinae simple or squarrose; upper cortex whitish, greenish or greenish grey; apical portions of lobes often checkered-pseudocyphellate, but without raised reticulations; medulla K+ reddish or K–; mostly restricted to oceanic localities
      5. Rhizinae at least in part squarrosely branching; medulla K + reddish (salazinic acid) .... *P. squarrosa* Hale
      5. Rhizinae simple to apically dichotomous; medulla K–(protocetraric acid) *P. pseudosulcata* Gyelnik

3. Isidia not at all hard-corticate, often ecorticate and soredioid (never shiny), with or without distinctly embrowned tips, generally short-granular
   6. Collected over rock; rhizinae simple or somewhat apically branching, but never squarrose; isidia (or isidio-soredia) obviously in large part marginal (especially on yonger lobes), densely clustered and typically disposed in extensive rows; upper cortex with a generally distinct yellow-green cast (contains usnic acid) ..... *P. fraudans* Nyl.
   6. Collected over bark (rarely over rock); rhizinae simple or squarrose; isidia (or isidio-soredia) in large part laminal, more or less clustered, but seldom disposed in extensive marginal rows; upper cortex blue-green or greenish grey (without usnic acid)
      7. Isidia (isidio-soredia) with regularly and conspicuously embrowned tips; rhizinae strongly squarrosely branching; restricted to oceanic localities ..... *P. squarrosa* Hale
      7. Isidia (isidio-soredia) mostly with pale tips (or rarely with irregularly embrowned tips); rhizinae simple or somewhat apically branching: widespread .... *P. hygrophila* Goward & Ahti

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