Synopsis of the genus *Peltigera* (lichenized Ascomycetes) in British Columbia, with a key to the North American species

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Abstract: Based on extensive field studies, herbarium research and thin layer chromatography, the taxonomy, distribution and ecology of 28 species of *Peltigera* occurring in British Columbia are discussed. Distribution maps are presented for selected species, and a key to the North American taxa is provided. *Peltigera cinnamomea* Goward is described as new, and the blue-green phototype of *Peltigera leucoplebeia* (Nyl.) Gyelnik is documented for the first time. *Peltigera scabrosella* Holt.-Hartw. is reported as new for North America based on a collection from the Yukon Territory. *Peltigera hymenia* is new for British Columbia.

Key words: lichens, Ascomycota, *Peltigera*, Peltigeraceae, British Columbia, distribution.

Résumé: Sur base de travaux sur le terrain, d’examen d’échantillons d’herbier et de chromatographies sur couche mince, la taxonomie, la distribution et l’écologie de 28 espèces de *Peltigera* présentes en Colombie-Britannique sont discutées. La distribution de certaines espèces est cartographiée et une clé de détermination des taxons nord-américains est proposée. *Peltigera cinnamomea* Goward est une espèce nouvelle pour la science et le phototype à cyanobactéries de *P. leucoplebeia* (Nyl.) Gyelnik est décrit pour la première fois. *Peltigera scabrosella* Holt.-Hartw. est nouveau pour le continent nord-américain, tandis que *P. hymenia* est nouveau pour la Colombie-Britannique.


Introduction

*Peltigera* Willd. is a diverse assemblage of small to large ter-ricolous foliose lichens characterized by broad lobes, margi-nal apotecia, and a veined, cottony lower surface. Though readily recognized at the genus level, many *Peltigerae* are notoriously difficult to identify to species.

Earlier this century, *Peltigera* received considerable attention from the Hungarian lichenologist V. Gyelnik, who described more than 200 taxa in this genus between 1926 and 1942 (see Sjödin 1954). Most of these taxa have not withstood critical examination. What is more, the status of most of Gyelnik’s names remains uncertain, owing in part to the loss of most of his type specimens during World War II (Wetmore 1960) and in part to a failure on occasion to designate type specimens. Therefore this genus seems likely to remain nomenclaturally unstable into the foreseeable future.

*Peltigera* in North America was first monographed by Thomson (1950), who recognized 41 taxa. Only 12 of these, however, were accorded specific rank; the rest were distributed among 16 varieties and 13 forms. Recent work on this genus (e.g., Vitikainen 1981, 1985; Tønsberg and Holtan-Hartwig 1983) has resulted in the description of several new taxa, as well as the reassignment of a number of Thomson’s varieties to specific rank. The latest North American lichen checklist (Egan 1987, 1991) lists 26 species (and no varieties or forms) of *Peltigera*, though this figure includes *P. erumpens* (Taylor in Hook.) Elenkin, which is actually a synonym of *P. didactyla* (With.) Laundon. More recently, two additional taxa have been recognized as occurring in North America: *Peltigera* sp. 1 sensu Holtan-Hartwig (1993) and *P. didactyla* var. *extenuata* (Nyl. ex Vainio) Goffinet & Hastings (1995).

Compared with other regions of the world, British Columbia contains an unusually rich *Peltigera* flora. With the publication of this paper, all *Peltigera* species hitherto documented for North America are now known or (in the case of *P. scabrosella*) believed to occur in this province. Also present are two taxa previously unknown to science, namely *P. cinnamomea* Goward, and *P. sp. 1* sensu Goward et al., as well as the blue-green phototype of *P. leucoplebeia*.

A summary discussion of British Columbia’s *Peltigera* flora is thus likely to be of general interest to lichenologists.

This paper has five primary objectives: (i) to provide a
floristic inventory of the *Peltigera* of British Columbia;\(^2\) (ii) to summarize the ecology and distribution of the species; (iii) to comment on the taxonomy and identification of critical species; (iv) to provide an identification key to the *Peltigera* of North America; and (v) to point to taxonomic problems in need of further research.

**Methods**

The observations presented below are based on field studies in all portions of British Columbia, as well as on an examination of approximately 1600 specimens of *Peltigera* from ALTA, CANL, H, OSC, UBC, and the personal herbaria of B. Goffinet and T. Goward. These specimens as well as a few specimens of *P. cinnamomea* from the British Columbia Ministry of Forests herbarium in Prince George were studied according to the methods of traditional herbarium taxonomy. In addition, selected specimens were subjected to thin layer chromatography (TLC) following the methods of Culberson (1972), Culberson and Kristinsson (1970), and Walker and James (1980). The lichen substances were extracted in acetone and loaded on precoated Merck Silica gel 60 F254 plates. They were then developed in solvent system G (toluene – ethyl acetate – formic acid = 139:83:8) and (or) system EHF (diethyl ether – hexane – formic acid = 300:100:3).

The chemical data reported here are based primarily on material from British Columbia. However, in species for which local data are lacking, European reports are presented instead. Given the limited amount of data available for many of the taxa, no attempt is made to define chemotypes within species. The symbol ± denotes chemical substances that occur in variable amounts within a given species, i.e., that are lacking in certain chemotypes of such species.

**Results**

**Morphology**

*Peltigera* is a taxonomically difficult group in which accurate identification requires a clear understanding of the idealized morphology of the species. Though it is beyond the scope of this paper to provide a comprehensive glossary of terms, various critical characters are briefly discussed below and are illustrated in Figs. 1–19. Character states for most species are summarized in Tables 1–6. Additional character illustrations and discussions on their variation are provided in Holtan-Hartwig (1993) and Goffinet and Hastings (1994).

**Upper cortex**

In most *Peltigera* the upper cortex is smooth, though in a few species it has a roughened or scabrid appearance, owing to the presence of submicroscopic cortical “warts.” In members of the *P. aphthosa* group and *P. canina* group (Tables 2 and 3), cortical hyphae typically extend beyond the surface of cortex as a minute tomentum of glassy “hairs.” The tomentum may be either appressed or erect. By contrast, the upper cortex is glabrous in members of the *P. polydactylon* group, except when encrusted with tiny whitish calcium oxalate crystals or pruina. The upper cortex can be broadly classified according to topography as dimpled (Fig. 1), corrugate (Fig. 2, proximal portion of lobe), billowed (Fig. 3), or plane (Fig. 2, distal portion of lobe).

*Peltigera venosa* and members of the *P. aphthosa* group are three-way symbioses between a mycobiont and two photobionts. *Coccomyxa*, a green alga, typically serves as the primary photobiont, whereas *Nostoc*, a cyanobacterium, is localized in scattered cephalodia (Fig. 4). The cephalodia may either be peltate, i.e., have free margins (Fig. 4, top), or be appressed (Fig. 4, bottom) and under humid conditions may enlarge into full-sized lobes. The resulting blue-green phototype may grow completely independent of the original green phototype, though more often the two phototypes grow attached.

In a few species, *Nostoc* is discontinuously distributed beneath the upper cortex, as indicated by the presence of pale laminal flecks or maculae. Maculae form a delicate reticulum that is best developed in thalli growing under sheltered, humid conditions. Even then, however, this reticulum is usually conspicuous only when the thallus is moist, though in blue-green phototypes of *P. aphthosa*, *P. britannica*, and *P. leucophlebia*, the upper surface is strongly maculate.

Lobe tips and their inclination provide a critical character for certain members of the *P. canina* group. In some species (Fig. 2), the extreme tips are upturned, whereas in others they are distinctly downturned (Fig. 3). In interpreting for this character, only well-developed, sterile lobes should be examined. Excessively pressed herbarium specimens may be difficult to assess.

Lobe thickness is correlated to a considerable extent with environmental conditions and can also be species specific. Thalli may be classified as either membranous (i.e., less than 200 μm), thin (between 200 and 400 μm), thick (i.e., between 400 and 1000 μm), and very thick (i.e., over 1000 μm). Measurements should be taken on thalli in a moist condition.

**Lower surface**

The lower surface in *Peltigera* is noncorticate and consists of a dense network of medullary hyphae that in turn accrete to form pale or darkish fusing veins. The veins may be characterized according to habit as indistinct (Fig. 5), broad (Fig. 6), or narrow (Fig. 7). In terms of relief, they can be described as low (Fig. 6), raised (Fig. 7), or roopy and overlapping (Fig. 8). In a few species the veins are covered in short erect hyphae termed tomentum. The interstices separating the veins may be described as polygonal (Fig. 7), lenticular (Fig. 8), or oval (Fig. 6). All of these characters are most satisfactorily assessed on the basis of sterile lobes (see Johnst and Frey 1982).

Extending downward from the veins are numerous rhizines, i.e., medullary outgrowths that attach the thallus to the substrate. In outline the rhizines may be classified as simple (Fig. 9), fasciculate (Fig. 11), penicillate (Fig. 12), or floucculent (Fig. 13). There is, however, considerable intergradation between these categories, and many thalli possess more than one kind of rhizine. In certain species within the

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\(^2\) We have refrained from providing an exhaustive list of synonyms as these are given in a taxonomic revision of *Peltigera* in Europe (Vitikainen 1994), which appeared while this paper was in press. Only synonyms not included in the latest checklist of North American lichens (Egan 1987) are presented here.
Figs. 1–16. Morphological characteristics in *Peltigera*. Fig. 1. Dimpled upper surface (*P. horizontalis*. ×3). Fig. 2. Plane and corrugate upper surface with upturned lobe tips (*P. occidentalis*. ×3). Fig. 3. Billowed upper surface, with downturned lobe tips (*P. membranacea*. ×2). Fig. 4 (top). Peltate cephalodia (*P. britannica*. ×15). Fig. 4 (bottom). Appressed cephalodia (*P. aphthosa*. ×15). Fig. 5. Indistinct veins (*P. malacea*. ×2). Fig. 6. Broad, low veins with oval interstices (*P. polydactylon*. ×3). Fig. 7. Narrow, raised veins with polygonal interstices (*P. membranacea*. ×2). Fig. 8. Narrow, wavy veins with lenticular interstices (*P. poncjaris*. ×3). Fig. 9. Simple, nontomentose, discrete rhizines (*P. cinnamomea*. ×5). Fig. 10. Simple, erect-tomentose, discrete rhizines (*P. membranacea*. ×5). Fig. 11. Fasciculate, discrete rhizines (*P. scabrosa*. ×10). Fig. 12. Penicillate, confluent rhizines (*P. canina*. ×5). Fig. 13. Flocculent, confluent rhizines (*P. didactyla*. ×10). Fig. 14. Laminal soredia (*P. didactyla*. ×4). Fig. 15. Marginal soredia (*P. collina*. ×3). Fig. 16. Marginal lobules (*P. praetextata*. ×5). Fig. 17. Marginal lobules (*P. pacifica*. ×5). Fig. 18. Erect, folded apothecia (*P. pacifica*. ×2). Fig. 19. Horizontal, plane apothecia (*P. horizontalis*. ×2). Illustrations by T. Goward.

*P. canina* group, the rhizines are covered in short, erect hyphae and are said to be erect-tomentose (Fig. 10). When considered collectively, rhizines may be discrete (Figs. 9, 10, and 11) or confluent (Figs. 12 and 13). In *P. elisabethae* and *P. horizontalis* the outermost rhizines are arranged in concentric rows, presumably reflecting annual growth increments of the thallus. No such alignment is seen in other species.

**Vegetative propagules**

Asexual reproduction occurs via laminal or marginal soredia (Figs. 14 and 15), laminal isidia, laminal lobules, or margi-
nal lobules (Figs. 16 and 17). Marginal lobules have been observed in a majority of the species discussed here but are diagnostic in only about six species. Marginal lobules are not homologous structures in all species: in *P. pacifica* and *P. polydactylon*, for example, they represent lobe margins in a crisped condition (Fig. 17), whereas in *P. praetextata* they are true thalline outgrowths (Fig. 16) and are sometimes called phyllidia (Holtan-Hartwig 1993). In some species these structures occur both along the lobe margins and along stress cracks of the laminal surface (see Thomson 1948); in the latter case, they must be distinguished from laminal isidia or lobules, which are not associated with stress cracks.

**Apothecia**

Apothecia have been observed in all local species excepting *P. evansiana*, *P. lactucifolia*, and *P. lepidophora*. Spores are eight per ascus, acicular to narrowly elliptical, typically four-celled, hyaline, and of little taxonomic value at the species level. In a majority of species the apothecia themselves are erect and longitudinally folded (Fig. 18), the lower surface is noncorticate, and the disc is brown. Exceptions include the following: *P. elisabethae*, *P. horizontalis*, and *P. venosa*, in which the apothecia are horizontally oriented and more or less plane (Fig. 19); *P. leucophlebia*, in which the lower surface is patchy-corticate versus continuously corticate in *P. aphthosa*, *P. britannica*, and *P. sp. 1*; and *P. collina* and *P. necker*, in which the apothecial discs are black.

### Distribution and ecology

In British Columbia, several major mountain systems, intervening valleys, plains, and plateaux occur in close proximity (Demarchi et al. 1990). The mountains, aligned perpendicularly to the prevailing westerly flow of moist Pacific air, create a strong climatic gradient from west to east. Lowlands along the Pacific coast have a distinctly hypermaritime and temperate climate, whereas in northeastern regions a much more continental and boreal climate prevails (Tulikannen 1984). The mountains themselves introduce additional (oroboreal and oroorctic) elements to the climate, but as these are of a more local nature, they will not be discussed in detail here. For notes on the orographic distributions of various *Peltigera* species, see Goward and Ahti (1992).

Given this climatic heterogeneity, it is hardly surprising that comparatively few *Peltigera* species are ubiquitous in British Columbia. It is possible in fact to recognize five broad categories of distribution: (i) widespread, (ii) inland, (iii) intermontane, (iv) humid, and (v) coastal.

Taxa with a more or less widespread distribution include *P. didactyla* var. *didactyla*, *P. ponoiensis*, *P. rufescens*, and *P. venosa*. Even these species, however, are obviously more abundant in some parts of the province than in others (*P. rufescens*, for example, has yet to be reliably reported from the Queen Charlotte Islands). With the exception of the mesophytic *P. venosa*, these taxa are distinctly xerophytic and depend on the presence of exposed, often somewhat disturbed sites. Other mesophytic species also probably belonging here are *P. leucophlebia* (Fig. 20), and to a lesser extent *P. praetextata*, though the distributions of these are possibly limited by the availability of calcium-rich soils.
Species that are widespread in inland regions but are essentially absent from coastal localities (e.g., Fig. 21) include \textit{P. aphthosa}, \textit{P. canina}, \textit{P. cinnamomea}, \textit{P. didactyla} var. \textit{extenuata}, \textit{P. elisabethae}, \textit{P. evansiana}, \textit{P. lepidophora}, \textit{P. malacea}, \textit{P. neckeri}, \textit{P. polydactylon}, \textit{P. retifovea}, and \textit{P. scabrosa}. Within this group, \textit{P. retifovea}, \textit{P. scabrosa}, and \textit{P. evansiana} are primarily boreal in distribution. A few of the species occur on the southeastern tip of Vancouver Island, which has a distinctly Mediterranean climate.

The intermontane species are restricted primarily to southern inland regions west of the Coast Mountains and east of the Rocky Mountains (e.g., Fig. 22). Included here are the hygrophytic \textit{P. horizontalis} and the more mesophytic \textit{P. kristinssoni}.

Not surprisingly, species restricted to humid coastal or inland localities are invariably hygrophytic in ecology: \textit{P. britannica}, \textit{P. collina}, \textit{P. degeni}, \textit{P. membranacea}, and \textit{P. pacifica}. Based on its distribution in western Europe (Vitikainen 1987), \textit{P. neopolydactyla} s.str. might also be included here, but this species is rather broadly circumscripted in North America and may include more than one taxon.

Only \textit{P. hymenina} is known exclusively from coastal localities, though future segregates of \textit{P. neopolydactyla} will probably also display this pattern.

**Chemistry**

\textit{Peltigera} is a chemically complex and varied genus in which numerous compounds remain to be identified (Holtan-Hartwig 1993). Its species produce the secondary metabolites of two major pathways: the acetate-polymalonate pathway (tenuiorin, methyl gyrophorate, and gyrophoric acid) and the mevalonic acid pathway (several hopane triterpenoids). Representatives of both of these metabolite series are found in all species groups. Chemical diversity and evolution in the Peltigerales was recently reviewed by Galloway (1991).

Though many \textit{Peltigera} display characteristic chemical patterns, these vary in taxonomic importance from species to species and indeed from group to group. For example, most members of the \textit{P. canina} group (exceptions: \textit{P. malacea}, \textit{P. retifovea}, and \textit{P. didactyla} var. \textit{extenuata}) lack any identifiable substances at all. The \textit{P. polydactylon} group, by contrast, is chemically highly diverse. Within this group, some species (e.g., \textit{P. neckeri}) are chemically distinct, whereas others (e.g., \textit{P. elisabethae} and \textit{P. horizontalis}) have overlapping chemical patterns. Some species, including \textit{P. occidentalis}, display various chemical patterns and in the absence of correlating morphological or ecological characters are said to contain two or more chemical races. Some chemical races, especially within \textit{P. neopolydactyla}, might better be treated as distinct taxonomic entities, but such decisions must await thorough chemical, morphological, and ecological investigations on a global scale.

Spot tests are of little or no diagnostic value in \textit{Peltigera}, and the identification of lichen substances must be based exclusively on thin layer chromatography. Even gyrophoric acid, though present in many species of the \textit{P. polydactylon} group, varies considerably in concentration and therefore fails to yield a consistent reaction with C and KC (see Goffinet and Hastings 1995 for further discussion).

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**Key to the North American species of \textit{Peltigera}**

1a. Two photobionts present: primary photobiont green (\textit{Coccomyxa}); secondary photobiont blue-green (\textit{Nostoc}), confined to cephalodia, these scattered over the upper or lower surface .................................................. 2

1b. One photobiont present: blue-green (\textit{Nostoc}); cephalodia absent ........................................ 6

2a (1a). Cephalodia present over lower surface; thallus fan-shaped, attached to the substrate at a single point along the margin, averaging \(<2\) cm in diameter .......................................................... \textit{P. venosa}

2b. Cephalodia present over the upper surface; thallus more or less lobate, broadly attached, averaging \(\geq3\) cm in diameter .............................................................................................................. 3

3a (2b). Lower surface darkening abruptly toward thallus centre; lower surface of apothecia continuously corticate; veins broad to indistinct .......................................................... 4

3b. Lower surface darkening gradually toward thallus centre and (or) the lower surface of the apothecia patchy-corticate, the noncorticate areas appearing whitish; veins broad ............... 5

4a (3a). Mature cephalodia peltate (check sheltered lobes), usually flat or concave, often detaching and leaving white scars; humid localities at lower elevations .................................................. \textit{P. britannica}

4b. Mature cephalodia appressed throughout, usually convex or flat, not detaching; widespread .................. \textit{P. aphthosa}

5a (3b). Lower surfaces of apothecia continuously corticate; lobes few; lobe margins even or weakly crisped; cephalodia in central portions of thallus up to \(2\) mm in diameter; restricted to snowy districts, usually at higher elevations (but also along the coast) ......................................................................................................................... \textit{P. sp. 1}

5b. Lower surfaces of apothecia patchy-corticate to noncorticate; lobes many; lobe margins strongly crisped; cephalodia seldom \(\geq1\) mm in diameter; widespread .......................................................... \textit{P. leucophlebia}

6a (1b). Attached to lobes containing a green alga and (or) upper surface distinctly maculate; restricted to humid localities .. .................................................................................................................. \textit{P. aphthosa}, \textit{P. britannica}, or \textit{P. leucophlebia}\(^3\)

6b. Not attached to lobes containing a green alga; upper surface not maculate; ecology various ....................... 7

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\(^3\) These phototypes overlap morphologically (Table 2) and can only be reliably identified on the basis of the associated \textit{Coccomyxa}-containing thallus.
Soredia present ................................................................. 8
Soredia absent ................................................................. 10

Soredia primarily marginal; apothecial disk black, on short extensions of vegetative lobes ............................... P. collina
Soredia entirely laminal; apothecial disk usually brownish, on rather elongate extensions of the vegetative lobes . . . 9

Rhizines white-flocculent in central portions of thallus, sparse and simple toward margins; mature thallus often deeply concave, consisting of a single lobe (occasionally several-lobed), averaging < 1 cm in diameter; medulla KC -; methyl glyrophorate absent ................................................................. P. didactyla var. didactyla
Rhizines white-flocculent throughout, or sparse or lacking toward thallus centre; mature thallus typically flat to at most weakly concave, multilobate, averaging > 1 cm in diameter; medulla KC + reddish (flash) or KC -; methyl glyrophorate present ................................................................. P. didactyla var. extensa

Laminal isidia and (or) lobules present ................................................... 11
Laminal isidia and lobules absent (note: marginal lobules may, however, be present along laminal stress cracks in some species) ................................................................. 12

Isidia dorsiventral, more or less appressed; mature lobes < 0.8 cm wide; lobe tips upturned; usually over soil ....... P. lepidophora
Isidia cylindrical or rarely dorsiventral, predominantly erect; mature lobes > 1 cm wide; lobe tips often downturned; over moss in sheltered sites ................................................................. P. evanstana

Upper surface bearing scattered greenish lobules, these laminally tomentose, containing a green alga; humid localities (blue-green phototype of) P. aphthosa, P. britannica, or P. leucophlebia3 ................................................................. 13
Greenish lobules absent; ecology various ................................................................. 13

Upper surface tomentose, the hairs either closely appressed or erect and felt-like (note: in P. malacea and P. kristinssonii, the hairs are often confined to the immediate vicinity of the lobe tips and may be difficult to observe) ......................................................... 14
Upper surface scabrid or pruinose in some specimens, but never tomentose ................................................................. 25

Upper surface dark greenish when wet (check sheltered lobes), bearing erect, felt-like tomentum, especially near lobe tips; lower surface lacking veins, or with few and indistinct veins; medulla thick ................................................................. P. malacea
Upper surface bluish or greyish when wet, bearing appressed or erect tomentum near the lobe tips; lower surface distinctly veined; medulla thin or thick ................................................................. 15

Veins low, very dark brown toward thallus centre, strikingly contrastive with the interstices; upper surface in part scabrid, bearing erect tomentum near the lobe tips; lobe tips mostly downturned ................................................................. P. kristinssonii
Veins low or raised, pale throughout or dark toward thallus centre, moderately contrastive to occasionally strikingly contrastive with the interstices; upper surface rarely scabrid, generally covered in appressed tomentum near the lobe tips; lobe tips upturned or downturned ................................................................. 16

Lobes < 1.5 cm wide at maturity; lobe tips mostly upturned .......... 17
Lobes > 1.5 cm wide at maturity; lobe tips mostly downturned ................................................................. 20

Mature apothecia averaging 3 – 5(–6) mm long; most lobes fertile, soralial scars often present on sterile portion of thallus ................................................................. P. didactyla var. didactyla
Mature apothecia > 4 – 8(–12) mm long; thallus often entirely sterile; upper surface lacking scars ................................................................. 18

Rhizines becoming confluent toward thallus centre; veins rather felt-like, uniformly (and often abruptly) darkening toward thallus centre, mostly forming a netlike pattern ................................................................. P. rufescens
Rhizines mostly discrete; veins with a compact appearance, not felt-like, pale throughout or more often irregularly darkening toward thallus centre, often apparently overlapping ................................................................. 19

Lobe margins and (or) margins of stress cracks usually lobulate (check mature lobes); upper surface often somewhat broadly bilowed ................................................................. P. praetextata
Lobe margin and margins of stress cracks lacking lobules; upper surface plane or at least not broadly bilowed ................................................................. P. ponojensis

Veins lacking erect tomentum ................................................................. 21
Veins densely and usually conspicuously covered in minute, erect tomentum ................................................................. 23

Rhizines richly penicillate or flocculent, usually confluent toward thallus centre; upper surface appressed-tomentose more or less throughout ................................................................. P. canina
Rhizines generally simple and discrete (except flaring toward the tips in some specimens); upper surface usually abruptly glabrous toward thallus centre ................................................................. 22

Veins distinctly rusty cinnamon-coloured toward thallus centre; lobe margins more or less even; lobe margins and margins of stress cracks lacking lobules ................................................................. P. cinnamomea
Veins pale to dark brown, but not distinctly cinnamon-coloured; lobe margins more or less crisped; lobe margins and margins of stress cracks usually lobulate (check mature lobes) ................................................................. P. praetextata

Veins broad, strongly raised, apparently overlapping; interstices deeply pitted, mostly oval; rhizines stout; primarily borcal ................................................................. P. retifoveata
Goward et al.

23b. Veins narrow, low to strongly raised, generally fusing; interstices not deeply pitted, polygonal to more often lenticular; rhizines simple; distribution various

24a (23b). Lobe margins and margins of stress cracks usually lobulate (check mature lobes); interstices mostly lenticular; veins raised or more often rather low; rhizines generally lacking erect tomentum........................................................................... P. proteotettata

24b. Lobe margins and margins of stress crack lacking lobulose; interstices lenticular to polygonal; veins strongly raised; rhizines bearing erect tomentum.................................................................................. P. membranacea

25a (13b). Upper surface conspicuously scabrid (at least toward lobe tip), never pruinose

25b. Upper surface smooth and occasionally pruinose near lobe tip

26a (25a). Veins dark toward thallus centre, strikingly contrastive with the interstices; upper surface apparently glabrous but actually bearing minute erect tomentum near lobe tips (check sheltered lobes)................................................................... P. kristinssonii

26b. Veins dark or pale, not strikingly contrastive with the interstices; upper surface glabrous throughout

27a (26b). Rhizines simple, elongate; upper cortex indistinctly scabrid or scabrid in patches; widespread in humid coastal localities

27b. Rhizines fasciculate, proportionally short; upper surface distinctly and uniformly scabrid; inland ................................................................................. (scabrid form of) P. neopolydactyla

28a (27b). Lower surface dark toward thallus centre; rhizines dark throughout ........................................................................... P. scabrosa

28b. Lower surface pale toward thallus centre; rhizines pale when young (check toward lobe tips) .................................................................... P. scabrosella (see under P. scabrosa)

29a (25b). Apothecial disk distinctly black

29b. Apothecial disk brownish, or apothecia absent

30a (29a). Upper surface shiny; veins usually broad, indistinct; outermost rhizines most often dark; typically over (mossy) ground; inland ........................................................................... P. neekeri

30b. Upper surface usually dull; veins narrow, distinct (check fertile lobes); outermost rhizines most often pale; typically over (mossy) trees; widespread in humid localities. ........................................... P. collina

31a (29b). Lobe margins and (or) margins of stress cracks lobulate

31b. Lobe margins and margins of stress cracks crisped in some specimens but never distinctly lobulate

32a (31a). Veins low, abruptly darkening toward thallus centre in most specimens, interstices absent or sparse, oval

32b. Veins raised, darkening only gradually (if at all) toward thallus centre; interstices mostly numerous, lenticular

33a (32a). Outermost rhizines generally aligned in one or more concentric rows; inland ............................................................................. P. elisabethae

33b. Outermost rhizines unaligned; coastal ............................................................................. P. hymenina

34a (32b). Marginal lobules well developed; rhizines darkening abruptly toward thallus centre; margin upturned; chemical substances present (TLC)

34b. Marginal lobules poorly developed, hardly recognizable as such; rhizines darkening only gradually toward thallus centre; margin downturned; chemical substances absent (TLC) ............................................................................... P. pacifica

35a (31b). Outermost rhizines fasciculate, generally aligned in one or more concentric rows; mature apothecia horizontally oriented, the disc more or less plane

35b. Outermost rhizines simple, penicillate or flocculent, not aligned in concentric rows; mature apothecia vertically oriented, the disc vertically folded

36a (35a). Upper surface typically with numerous stress cracks; veins dark brown to almost black, indistinct or apparently absent; interstices sparse ............................................................................... P. elisabethae

36b. Upper surface typically lacking stress cracks; veins medium brown, broad to occasionally indistinct; interstices more or less numerous ............................................................................... P. horizontalis

37a (35b). Veins narrow, more or less distinctly raised, (apparently overlapping in P. ponojensis); veins and rhizines erect-tomentose or not

37b. Veins broad, low, apparently never overlapping; veins and rhizines never erect-tomentose

38a (37a). Veins and rhizines at least in part distinctly erect-tomentose .......................................................... (glabrous form of) P. membranacea

38b. Veins and rhizines not erect-tomentose

39a (38b). Upper surface dull; lobe tips upturned; veins in part apparently overlapping; frequent in xeric and mesic sites in inland localities (infrequent in coastal localities) .......................................................... (glabrous form of) P. ponojensis

39b. Upper surface distinctly shiny; lobe tips downturned; veins not apparently overlapping; rare in hygric sites in coastal and in inland localities ........................................................................... P. degenni

40a (37b). Veins very dark toward thallus centre, strikingly contrastive with the interstices; upper surface apparently glabrous, but actually bearing erect tomentum near lobe tips (check sheltered lobes); inland ........................................................................... P. kristinssonii

40b. Veins pale or dark, not strikingly contrastive with interstices; upper surface glabrous throughout; distribution various

41a (40b). Lobes thick; upper surface pruinose or not

41b. Lobes thin, lacking pruina
The taxa

Peltigera aphthosa (L.) Willd. (green phototype), Flora Berol. Prodr. 347. 1787
Lichen aphthosus L., Sp. Pl. 2: 1148. 1753

Peltigera species having laminal cephalodia and a green primary photobiont belong to the P. aphthosa group. In British Columbia this group consists of four species: P. aphthosa, P. britannica, P. leucophlebia, and P. sp. 1. The following characters are useful for distinguishing among these species: (i) degree of marginal crisping; (ii) degree of cortication on the lower surface of the apothecia; (iii) distinctness of the veins; (iv) abruptness with which the veins darken toward the thallus centre; and (v) the habit of the cephalodia (Fig. 4). These and other points of separation are summarized in Table 1. See also the comments under P. aphthosa (blue-green phototype) below.

Common over soil, moss, duff, logs, and rock in open to somewhat shady inland localities, also rare in coastal localities (Fig. 21); xerophytic to hygrophytic; circumpolar.

Chemistry: Tenuiorin, methyl glyrophorate, ± glyrophoric acid (traces); phlebic acids ± A and B, zeorin and ± unidentified triterpenoids; or two unidentified triterpenoids as in P. leucophlebia. Tønsberg and Holtan-Hartwig (1983) and Holtan-Hartwig (1983) further report dolichorhizin (their chemotype II).

Selected specimens examined (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Mt. Revelstoke National Park, Clachnacuddin Creek, Fairbarns MF3 017 (ALTA); Fraser River Basin, Willow River, Goward 91-1679; Taku River Basin, Sinwa Eddy, Goward 82-811; Stuart River Basin, Fort St. James, MacKinnon 8206610.

Peltigera aphthosa (L.) Willd. (blue-green phototype)

Blue-green phototypes of P. aphthosa, P. britannica, and P. leucophlebia are all bluish grey and in this regard closely resemble certain forms of P. malacea, P. collina, P. hymenina, and P. neckeri. However, the blue-green phototypes are distinctly maculate above and typically bear at least a few scattered green Coccomyxa-containing lobes and lobules.

Distinguishing among these blue-green phototypes is much more difficult and usually involves identifying the associated green thalli. Whereas the blue-green phototypes of P. aphthosa and P. leucophlebia are virtually identical, the blue-green phototype of P. britannica is somewhat distinctive owing to its association with Coccomyxa-containing lobes typically larger than itself, as well as its partly lobulate lobe margins. See also Table 2.

Rare over moss and mossy logs in open, humid inland forests at lower elevations; hygrophytic; western North America and western Eurasia.

Chemistry: Tenuiorin, methyl glyrophorate, ± glyrophoric acid (traces); phlebic acids ± A and B, zeorin, unidentified triterpenoids. Unlike Tønsberg and Holtan-Hartwig (1983) we failed to detect dolichorhizin in our material.

Selected specimens examined (all UBC): CANADA: BRITISH COLUMBIA: Moyie River Basin, Moyie Falls, Goward 81-1677, Kispiox River Basin, Date Creek, Goward 92-319, Fraser River Basin, Legrand Creek, Goward 92-1289.


P. variolosa f. britannica Gyelnik, Ann. Mycol. 30: 453. 1932

P. avenosa Gyelnik, Bryologist, 34: 18, 1931; Ann. Crypt. Exot. 4: 168. 1931

Tønsberg and Holtan-Hartwig (1983) recently synonymized the name P. avenosa Gyelnik against the blue-green phototype of P. aphthosa. They argued that the chemistry of the holotype of P. avenosa agrees with their chemotype II of P. aphthosa. In our opinion, P. avenosa is much more likely to belong to P. britannica. Our chemical studies now reveal that P. avenosa conforms not only with P. aphthosa but also with one of the local chemotypes of P. britannica. Moreover, P. britannica is expected to be much more common than P. aphthosa in the type locality of P. avenosa, which is actually Vancouver Island and not “southeastern Alaska” as previously reported by Tønsberg and Holtan-Hartwig (1983).

If synonymy with P. britannica is accepted, then P. avenosa would take priority. We refrain, however, from advancing this innovation, which would not be in the best interests of nomenclatural stability. Recent changes to the Nomenclatural Code now make it possible to conserve species names (Nicholson and Greuter 1994, example 3); a proposal to conserve P. britannica over P. avenosa is in preparation by one of us (O.V.).

Until recently, P. britannica was treated variously within...
<table>
<thead>
<tr>
<th>Lobes</th>
<th>$P$. $a$phthosa</th>
<th>$P$. $b$ritannica</th>
<th>$P$. $l$eucopelebia</th>
<th>$P$. $s$p. 1</th>
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<tbody>
<tr>
<td>Width (cm)</td>
<td>2–4 (Thin) very thick</td>
<td>2–3 (Thin) very thick</td>
<td>2–3.5 Thin to thick</td>
<td>3–4(–5.5) Thin</td>
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<td>Appressed</td>
<td>Peltate</td>
<td>Appressed Crisp</td>
<td></td>
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<tr>
<td>Cephalodia</td>
<td>Even</td>
<td>Even to crissped</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lobe margins</td>
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<td>Even to crissped</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Abrupt</td>
<td>Abrupt</td>
<td></td>
<td></td>
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<td>Frequent</td>
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<td>Hygic</td>
<td>Xeric to hygic</td>
<td>Hygic (to mesic)</td>
</tr>
<tr>
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<td>Widespread in humid regions</td>
<td>Widespread</td>
<td>Widespread in snowy regions</td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td></td>
<td></td>
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</table>

NOTE: Main diagnostic characters are in boldface.

<table>
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<tr>
<th>Lobes</th>
<th>$P$. $a$phthosa (blue-green phenotype)</th>
<th>$P$. $b$ritannica (blue-green phenotype)</th>
<th>$P$. $l$eucopelebia (blue-green phenotype)</th>
<th>$P$. $k$ristinssonii</th>
<th>$P$. $m$alacea</th>
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<td>Absent or present near tip</td>
<td>Present near lobe tip</td>
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<td></td>
</tr>
<tr>
<td>Tomentum</td>
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<td></td>
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<td>Moderate</td>
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<td>Typically dominant</td>
<td>Typically subordinate</td>
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<td>Green lobes</td>
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<td>Present</td>
<td>Present</td>
<td></td>
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</tr>
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<td>Hygic</td>
<td>Hygic</td>
<td></td>
<td>Mesic</td>
</tr>
<tr>
<td>Habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>XERIC to mesic</td>
</tr>
</tbody>
</table>

NOTE: Main diagnostic characters are in boldface.

$P$. $a$phthosa and $P$. $l$eucopelebia (including $P$. $v$ariolosa Gyelnik). It may be distinguished from both those species on the basis of its peltate cephalodia (Fig. 4, top), the margins of which are somewhat raised or free from the upper cortex, especially on sheltered lobes. Peltate cephalodia are unknown in either of the other species. See also Table 1.

According to Holtan-Hartwig (1993), apothecia are unknown in $P$. $b$ritannica in Norway. Brodo and Richardson (1978) also noted the absence of fruiting bodies in material from British Columbia. Our own observations reveal that $P$. $b$ritannica does produce apothecia but that these are rare and confined to specimens collected at or near the limits of the range.

Frequent over moss and mossy logs and rocks in sheltered to shaded coastal localities at lower elevations; also infrequent in similar habitats in humid inland forests (Fig. 23); hygrophytic; probably incompletely circumpolar.

CHEMISTRY: Tenuiorin, methyl gyrophorrate, ± gyrophoric
Fig. 23. The distribution of *Peltigera britannica* in British Columbia.

![Distribution map of Peltigera britannica in British Columbia.](image)

acid; phlebic acid **B**, dolichorrhizin, zeorin or phlebic acid **B**, and an unidentified triterpenoid. The European material seems to differ in the presence of trace amounts of phlebic acid **A** and the absence of dolichorrhizin and zeorin (Holtan-Hartwig 1993).

**SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated):** CANADA: BRITISH COLUMBIA: Chilliwack River Basin, Sleese Creek, Goward 78-1277; Kootenay River Basin, Kokanee Creek Park, Goward 81-1605b; Kitlopet River Basin, Tasytis River, Goward 91-1290; Vancouver Island, East Sooke Park, Horton 20595 (ALTA).

*Peltigera britannica* (Gyelnik) Holtan-Hartwig & Tønsb. (blue-green phototype)

For points of separation with blue-green *P. aphthosa* and related species, see Table 2 and also the discussion under the blue-green phototype of *P. aphthosa*.

Apparently in keeping with the detachable cephalodia and distinctly hygic ecology of *P. britannica*, this phototype is much more common than the blue-green phototypes of *P. aphthosa* and *P. leucophlebia*. Joined specimens of green and blue-green lobes are typical in this species. In many such specimens, it is possible to trace the development of the blue-green lobes from the laminal cephalodia of the green phototype.

Infrequent over moss and mossy logs in humid coast forests at lower elevations, also rare in humid inland forests; hygrophytic; western North America and western Eurasia.

**CHEMISTRY:** Tenuiorin, methyl gyrophorinate, ± gyrophoric acid; phlebic acid **B**, dolichorrhizin, zeorin or phlebic acid **B**, and an unidentified triterpenoid.

**SELECTED SPECIMENS EXAMINED (all UBC):** CANADA: BRITISH COLUMBIA: Vancouver Island, Ucluelet, Goward 83-355; Kispiox River Basin, Date Creek, Goward 91-999; Skeena River Basin, Mudflat Creek, Goward 81-1908.

*Peltigera canina* (L.) Willd., Flora Berol. Prodr.: 347. 1787

_Lichen caninus_ L., Sp. Pl. 2: 1149. 1753

The combination of broad lobes (1.5–3.0 cm wide), downturned lobe tips, broadcast laminal tomentum (disappearing only gradually toward the thallus centre), and strongly penicillate and confluent rhizines (Fig. 12) distinguish typical specimens of *P. canina* from all other *Peltigera*. Small specimens may approach (i) *P. ponjoensis*, which has upturned lobe tips, discrete, mostly simple rhizines, and compact, often distinctly raised veins, and (ii) *P. rufescens*, in which the lobe tips are upturned and the rhizines (and veins) darken abruptly inward of the lobe tips. Larger specimens of *P. canina* may sometimes be confused with *P. cinnamomea*, in which the central portions of the lower surface are distinctly cinnamon-coloured, and the rhizines are essentially simple, or at least not confluent. For points of separation with other similar species, see Table 3.

Common over soil, moss, dust and logs in open to somewhat sheltered inland localities; weakly xerophytic to mesophytic; circumpolar.

**CHEMISTRY:** No lichen substances detected.

**SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated):** CANADA: BRITISH COLUMBIA: Kootenay National Park, McKay Creek, Dupuis SD2 012 (ALTA); Thompson River Basin, Lac du Bois, Goward 83-508; Fort Nelson River Basin, Fort Nelson, Goward 82-1048; Moyie River Basin, Lumberton, Goward 81-1676a.

*Peltigera cinnamomea* Gowd. sp.nov.

Thallus foliosus, *Peltigerae praetextatae* similis sed pagina inferna cinnamomea et marginibus lobulis carentis differt. Apothecia revoluta disco longa ca. 6–10 mm; sporia bacillarii-aciculares, (38–)40–49(-55) × 3–5 μm, triseptatae. Terricola. Holotypus Goward 82-2b in UBC.

**TYPE:** CANADA: BRITISH COLUMBIA: Clearwater River Basin, 0.5 km S Philip Creek, elev. 675 m, 51°52'N, 120°01'W, over mossy boulder in boulder bed, in open, mixed forest, 13 April 1985, Goward 85-2b (Holotype UBC; Isotypes ALTA, CANL, H).

Thallus foliaceous, loosely appressed, large, 10–30 cm across; lobes somewhat leathery, stiff, averaging to (1–)1.5–3 cm wide, elongate, loosely overlapping, irregularly branching; lobe tips rounded, plane to downturned; lobe margins essentially even; upper surface pale blush grey to pale brownish grey or infussed in part with cinnamon brownish, dull, often somewhat broadly bellowed, tomentose, the tomentum appressed, usually disappearing abruptly toward thallus centre; soredia absent; isidia and marginal lobules absent; lower surface veined; veins pale tan, grading inward to rusty brown, distinct, narrow, in part raised, glabrous; interstices whitish, lenticular, moderately deep; rhizines connecicolous with veins, abundant, simple to becoming penicillate, discrete.

Cortex 50–80 μm thick; photobiont layer 20–80 μm thick, containing Nostoc; medulla white, 70–180 μm thick.

Apothecia common, marginal, located on narrow, elongate lobes; disc medium brown, longitudinally folded, averaging to 6–10 mm long, erect; spores hyaline, 8 per ascus, (38–)40–49(-55) × 3–5 μm, 3-septate. Conidiospores unknown.

The name _cinnamomea_ refers to the typically cinnamon-coloured veins.

Photographs of _P. cinnamomea_ are given in Goffinet and Hastings (1994, Figs. 24 and 25).

*Peltigera cinnamomea* is easily recognized in the field but has until now escaped taxonomic notice. Most of the specimens examined by us had previously been filed under...
<table>
<thead>
<tr>
<th></th>
<th>P. canina</th>
<th>P. cinnamomea</th>
<th>P. didactyla</th>
<th>P. membranacea</th>
<th>P. ponijensis</th>
<th>P. praetextata</th>
<th>P. retioveata</th>
<th>P. rufescens</th>
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<tbody>
<tr>
<td>Lobes</td>
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<td></td>
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<td>0.7–1</td>
<td>1.5–3</td>
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<td>0.5–1</td>
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<td>Thin</td>
<td>Membranous</td>
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<td>Thin to thick</td>
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<td>± Broadcast</td>
<td>Near lobe tip</td>
<td>Broadcast</td>
<td>Near lobe tip</td>
<td>Broadcast</td>
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<td>Plane to upturned</td>
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<td>Pale to dark brown</td>
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<td>Absent</td>
</tr>
<tr>
<td>Habitat</td>
<td>Xeric to mesic</td>
<td>Mesic to hygric</td>
<td>Xeric to mesic</td>
<td>Mesic to hygric</td>
<td>Xeric (to mesic)</td>
<td>Mesic</td>
<td>Mesic</td>
<td>Xeric</td>
</tr>
</tbody>
</table>

**Note:** Main diagnostic characters are in boldface.
**Peltigera praetextata.** That species, however, has brownish or occasionally tan-coloured veins that are also often at least partially erect-tomentose. Additionally, **P. praetextata** tends to have somewhat crisped lobe margins that are lined, at least in older parts of the thallus, with lobules. Though both species are rather widely distributed in inland British Columbia, **P. cinnamomea** is most common in localities subject to prolonged snow cover (e.g., where snow cover persists until May or June), whereas **P. praetextata** is absent from such localities. For points of separation with other species of the **P. canina** group, see Table 3.

**Peltigera cinnamomea** is also very close in appearance to the isidiate species **P. evansiana**. These species may represent the primary and secondary species, respectively, of a species pair (Poelt 1972).

Frequent over moss and mossy rocks and logs in open to somewhat sheltered inland forests at all forested elevations; mesophytic to hygrophytic; western North America (Fig. 24). Together with **P. sp. 1, P. cinnamomea** is among the most tolerant of the local **Peltigera** to prolonged snow cover.

**CHEMISTRY:** No lichen substances detected, except trace amounts of unidentified chemical substances.

**SELECTED ADDITIONAL SPECIMENS EXAMINED (UBC unless otherwise indicated):** CANADA: ALBERTA: Swan Hills, Ostafichuk 330-1 (ALTA). BRITISH COLUMBIA: Clearwater River Basin, Trophy Mountains, Goward 84-850; Skeena River Basin, Cleanza Creek Provincial Park, Goward 91-1060; Skagit River Basin, Lighting Lake, Goward 85-78; Fraser River Basin, Mount Robson Station, Otto 6289; Nechako River Basin, Ootsa Lake, Goward 81-1767. UNITED STATES OF AMERICA: MONTANA: Lake County, Soup Creek, McCune 7440 and 8664 (OSU); WASHINGTON: Pend Oreille County, Newport, Schroeder L438 (ALTA).

**Peltigera collina** (Ach.) Schrader, J. Bot. 1: 78. 1801

**Lichen collinus** Ach., Lich. Suec. Prodr.: 162. 1799

Specimens **P. collina** with characteristic marginal soralia (Fig. 15) cannot be confused with any other species of **Peltigera**. Nonsorediate specimens, however, are occasionally encountered and have been referred to **P. nylanderii** Gyelnik (Gyelnik 1927). Such specimens are similar to **P. neckeri** and **P. elisabethae** but differ in having a pale lower surface and distinct veins. Additionally, **P. collina** is particularly common over trees in humid localities, whereas **P. neckeri** and **P. elisabethae** are essentially terricolous, muscicolous or rarely epixyloous. See Table 4 for additional points of separation.

In two specimens from northwest British Columbia (Goward 92-1084 and 92-1110, UBC), the upper surface is distinctly greenish when wet, and the soralia are primarily laminar. This material may represent a distinct taxon.

Infrequent over mossy rocks and conifers in sheltered forests at lower elevations in humid regions throughout; hygrophytic; incompletely circumpolar.

**CHEMISTRY:** Tenuiorin, methyl glyphorurate; ± dolichorhizin, zeorin, and ± one unidentified triterpenoid. Holtan-Hartwig (1993) reports zeorin as the only triterpenoid.

**SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated):** CANADA: BRITISH COLUMBIA: Selwyn Range, Kinbasket Lake, Ptarmigan Creek, Goftinet 1273 (herb. Goftinet); Chilliwack River Basin, Chilliwack Lake, Goward 91-2074; Kitsumkalum River Basin, Kitsumkalum Lake, Goward 91-1132; Vancouver Island, Victoria, Goward 82-155.


Typical material of **P. degenii** may be distinguished from all other species of **Peltigera** by its glossy, glabrous upper surface, membranous lobes, narrow veins and rather broad interstices. Rare glabrous specimens of **P. membranacea** are similar, but in that species the veins and rhizines are erect-tomentose. In glabrous (or essentially glabrous) forms of **P. ponojensis** the lobes are distinctly thick, the upper surface is never glossy, the veins are thick and rropy, and the ecology is xerophytic. For further points of separation see Table 5.

Though lacking tomentum, **P. degenii** apparently belongs to the **P. canina** group rather than the **P. polypodactylon** group, an observation suggested both by its narrow veins and by its lack of chemical substances (see also Holtan-Hartwig 1993).

Rare over moss and mossy logs in humid coastal localities at lower elevations, also rare in sheltered, humid inland forests; hygrophytic; probably incompletely circumpolar.

**CHEMISTRY:** No lichen substances detected.

**SELECTED SPECIMENS EXAMINED (all UBC):** CANADA: BRITISH COLUMBIA: Chilliwack River Basin, Sleese Creek,
### Table 4. Comparison of *Peltigera* species containing *Nostoc* as primary photobiont and having a scabrid upper surface.

<table>
<thead>
<tr>
<th></th>
<th><em>P. collina</em></th>
<th><em>P. kristinssonii</em></th>
<th><em>P. neopolydactyla</em></th>
<th><em>P. scabrosa</em></th>
<th><em>P. scabrosella</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lobes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (cm)</td>
<td>0.7–1.5(-2)</td>
<td>1–1.5(-2)</td>
<td>2–3(-4)</td>
<td>2–3(-4)</td>
<td>1.5–2.5</td>
</tr>
<tr>
<td>Margins</td>
<td>Even</td>
<td>Even</td>
<td>Even</td>
<td>Even</td>
<td></td>
</tr>
<tr>
<td><strong>Upper surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detail</td>
<td>Plane</td>
<td>±Billowed</td>
<td>Plane to billowed</td>
<td>±Billowed</td>
<td>±Plane</td>
</tr>
<tr>
<td>Tomentum</td>
<td>Absent</td>
<td>Near lobe tip, erect</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Pruina</td>
<td>Near lobe tip or absent</td>
<td></td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td><strong>Veins</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>± Broad</td>
<td>Broad</td>
<td>Broad (to narrow)</td>
<td>Broad to indistinct</td>
<td>Indistinct</td>
</tr>
<tr>
<td>Relief</td>
<td>Low</td>
<td>Low to raised</td>
<td>Low to raised</td>
<td>Low to raised</td>
<td>Low</td>
</tr>
<tr>
<td>Contrast</td>
<td>Moderate</td>
<td>Striking</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Weak</td>
</tr>
<tr>
<td>Surface</td>
<td>Smooth</td>
<td>Erect-tomentose</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
</tr>
<tr>
<td><strong>Rhizines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habit</td>
<td>Simple to flocculent</td>
<td>±Fasciculate</td>
<td>±Simple</td>
<td>Fasciculate</td>
<td>±Simple</td>
</tr>
<tr>
<td>Colour</td>
<td>Pale to brown</td>
<td>Brown</td>
<td>Pale to brown</td>
<td>Brown</td>
<td>Pale to brown</td>
</tr>
<tr>
<td><strong>Apothecia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Very frequent</td>
<td>Infrequent</td>
<td>Frequent</td>
<td>Frequent</td>
<td>Frequent</td>
</tr>
<tr>
<td>Colour</td>
<td>Black</td>
<td>Brown</td>
<td>Brown</td>
<td>Brown</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>Present</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Main diagnostic characters are in boldface.

### Table 5. Comparison of glabrous *Peltigera* species containing *Nostoc* as primary photobiont and having distinct, narrow veins.

<table>
<thead>
<tr>
<th></th>
<th><em>P. degenii</em></th>
<th><em>P. membranacea</em> (glabrous morph)</th>
<th><em>P. neopolydactyla</em> (see text)</th>
<th><em>P. pacifica</em></th>
<th><em>P. ponopojensis</em> (glabrous morph)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lobes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (cm)</td>
<td>0.7–1.5(-2)</td>
<td>0.7–1(-1.5)</td>
<td>0.7–1(-1.5)</td>
<td>1.5–2(-3)</td>
<td>0.7–1(-2)</td>
</tr>
<tr>
<td>Thickness</td>
<td>Thin</td>
<td>Membranous</td>
<td>Thin (to thick)</td>
<td>Thin to thick</td>
<td>Thin (to thick)</td>
</tr>
<tr>
<td><strong>Upper surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gloss</td>
<td>Shiny</td>
<td>Downturned</td>
<td>Shiny to dull</td>
<td>Shiny</td>
<td>Dull</td>
</tr>
<tr>
<td>Lobe tips</td>
<td>Downturned</td>
<td>Even</td>
<td>Upturned</td>
<td>Upturned</td>
<td>Upturned</td>
</tr>
<tr>
<td>Lobe margins</td>
<td>Even</td>
<td></td>
<td>Even</td>
<td>Crisp to lobulate</td>
<td>Even</td>
</tr>
<tr>
<td><strong>Veins</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relief</td>
<td>Raised</td>
<td>Raised</td>
<td>Low to raised</td>
<td>Raised</td>
<td>Raised to ropy</td>
</tr>
<tr>
<td>Surface</td>
<td>Smooth</td>
<td>Erect-tomentose</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
</tr>
<tr>
<td>Interstices</td>
<td>Lenticular to ±polygonal</td>
<td>Lenticular to oval</td>
<td>Lenticular to oval</td>
<td>Lenticular</td>
<td>Lenticular</td>
</tr>
<tr>
<td><strong>Rhizines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habit</td>
<td>Simple</td>
<td>±Simple</td>
<td>Simple</td>
<td>±Simple</td>
<td>Simple to flocculent</td>
</tr>
<tr>
<td>Growth</td>
<td>Discrete</td>
<td>Discrete</td>
<td>Discrete</td>
<td>Discrete</td>
<td>Discrete</td>
</tr>
<tr>
<td>Surface</td>
<td>Smooth</td>
<td>Erect-tomentose</td>
<td>Smooth</td>
<td>Smooth</td>
<td>Smooth</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Absent</td>
<td>Absent</td>
<td>Present</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Habitat</td>
<td>Hygric</td>
<td>Mesic to hygric</td>
<td>Mesic to hygric</td>
<td>Hygric</td>
<td>Xeric to mesic</td>
</tr>
</tbody>
</table>

**Note:** Main diagnostic characters are in boldface.

**Goward et al.,** 78-1274; Vancouver Island, Port Hardy, Deer Island, Lee 91; Vancouver Island, Duncan, Mount Prevost, Noble 3116.

*Peltigera didactyla* (With.) Laundon var. didactyla, Lichenologist, 16: 217. 1984

*Peltigera* *didactyla* (With.) Laundon var. *didactyla*, Lichenologist, 16: 217. 1984

*Peltigera didactyla* (With.) Laundon var. didactyla, Lichenologist, 16: 217. 1984


*Peltigera didactyla* is the only only local *Peltigera* to produce exclusively laminal soredia (Fig. 14). Two varieties are recognized by Goffinet and Hastings (1994). Variety *didactyla* has small, mostly unilobate and strongly concave thalli with rather discrete rhizines restricted to the central portions of the thallus. By contrast, var. *extenuata* is more appressed,
Table 6. Comparison of glabrous, smooth *Peltigera* species containing *Nostoc* as primary photobiont, having broad to indistinct veins, and lacking soredia.

<table>
<thead>
<tr>
<th></th>
<th><em>P. elisabethae</em></th>
<th><em>P. horizontalis</em></th>
<th><em>P. hymenina</em></th>
<th><em>P. neckeri</em></th>
<th><em>P. neopolydactyla</em></th>
<th><em>P. occidentalis</em></th>
<th><em>P. pacifica</em></th>
<th><em>P. polydactylon</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lobes</strong></td>
<td>Width (cm)</td>
<td>1–2(−3)</td>
<td>1–2(−3)</td>
<td>0.4–0.8(−2)</td>
<td>1–1.5(−2)</td>
<td>2–3(−4)</td>
<td>1–1.5(−2)</td>
<td>0.7–1(−1.5)</td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>Thick</td>
<td>Thin</td>
<td>Thin</td>
<td>Thin (to thick)</td>
<td>Thin (to thick)</td>
<td>Thin to thick</td>
<td>Thin to thick</td>
</tr>
<tr>
<td></td>
<td>Upper surface</td>
<td>Dimpled</td>
<td>Dimpled</td>
<td>Plane</td>
<td>Plane</td>
<td>Plane to bollowed</td>
<td>Plane to finely corrugate</td>
<td>Plane</td>
</tr>
<tr>
<td></td>
<td>Detail</td>
<td>Dimpled</td>
<td>Dimpled</td>
<td>Plane</td>
<td>Plane</td>
<td>Plane to bollowed</td>
<td>Plane to finely corrugate</td>
<td>Plane</td>
</tr>
<tr>
<td></td>
<td>Pruina</td>
<td>Near lobe tip</td>
<td>Absent</td>
<td>Absent</td>
<td>Near lobe tip</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td>Stress cracks</td>
<td>±Numerous</td>
<td>Sparse</td>
<td>Sparse</td>
<td>±Numerous</td>
<td>Sparse</td>
<td>Sparse</td>
<td>Sparse</td>
</tr>
<tr>
<td></td>
<td>Lobe margins</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
<td>Crisp to lobulate</td>
</tr>
<tr>
<td><strong>Veins</strong></td>
<td>Width</td>
<td>Indistinct</td>
<td>Broad (to distinct)</td>
<td>Indistinct</td>
<td>Indistinct</td>
<td>Broad (to narrow)</td>
<td>±Indistinct</td>
<td>Broad to ±narrow</td>
</tr>
<tr>
<td></td>
<td>Relief</td>
<td>Low</td>
<td>Low</td>
<td>Gradual</td>
<td>Low</td>
<td>Gradual</td>
<td>Low</td>
<td>Raised</td>
</tr>
<tr>
<td></td>
<td>Inward darkening</td>
<td>Abrupt</td>
<td>Abrupt</td>
<td>Gradual</td>
<td>Abrupt</td>
<td>Gradual</td>
<td>Abrupt</td>
<td>Gradual</td>
</tr>
<tr>
<td></td>
<td>Inward colouring</td>
<td>Blackish</td>
<td>Dark brown</td>
<td>Brown (blackish)</td>
<td>Blackish</td>
<td>Brown</td>
<td>Blackish</td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td>Interstices</td>
<td>Oval</td>
<td>Oval</td>
<td>Oval to lenticular</td>
<td>Oval to lenticular</td>
<td>Oval</td>
<td>Oval</td>
<td>Oval</td>
</tr>
<tr>
<td><strong>Rhizines</strong></td>
<td>Length (mm)</td>
<td>1–3(−5)</td>
<td>2–4(−5)</td>
<td>1–2(−3)</td>
<td>2–3(−5)</td>
<td>4–7(−10)</td>
<td>2–3(−5)</td>
<td>2–4</td>
</tr>
<tr>
<td></td>
<td>Habit</td>
<td>Fasciculate</td>
<td>Fasciculate</td>
<td>(Simple to flocculent)</td>
<td>Simple to fasciculate or flocculent</td>
<td>±Simple</td>
<td>Simple</td>
<td>Simple</td>
</tr>
<tr>
<td></td>
<td>Alignment</td>
<td>Concentric (outer)</td>
<td>Concentric (outer)</td>
<td>Unaligned</td>
<td>Unaligned</td>
<td>Unaligned</td>
<td>Unaligned</td>
<td>Unaligned</td>
</tr>
<tr>
<td><strong>Apothecia</strong></td>
<td>Aspect</td>
<td>Horizontal</td>
<td>Horizontal</td>
<td>Erect</td>
<td>Erect</td>
<td>Erect</td>
<td>Erect</td>
<td>Erect</td>
</tr>
<tr>
<td></td>
<td>Habit</td>
<td>Plane</td>
<td>Plane</td>
<td>Folded</td>
<td>Folded</td>
<td>Folded</td>
<td>Folded</td>
<td>Folded</td>
</tr>
<tr>
<td></td>
<td>Distribution</td>
<td>Inland</td>
<td>Inland</td>
<td>Coast</td>
<td>Inland</td>
<td>Coast</td>
<td>Inland</td>
<td>Coast (inland in humid regions)</td>
</tr>
</tbody>
</table>

**NOTE:** Main diagnostic characters are in boldface.
multilobate, and has flocculent rhizines more or less throughout (Fig. 13). Chemically, the two varieties can be distinguished by the absence of depsides in var. didactyla versus the presence of methyl glyrophorate and often glyrophoric acid (KC+ red) in var. extenuata. Variety didactyla is also rather xerophytic and is often found in open habitats, whereas var. extenuata is mesophytic with an apparent optimum in moist forested sites. Whereas var. didactyla occurs throughout British Columbia, var. extenuata seems to be absent from coastal localities.

At maturity, var. didactyla is frequently fertile, whereas var. extenuata only rarely produces apothecia. Fertile specimens usually lack soredia and may then be difficult to distinguish from P. rufescens. In some specimens of var. didactyla, however, whitish soralial scars are present at the base of the fertile lobes. A small but consistent difference in the size of the apothecia may also be noted: 3–5 (–6) mm long in var. didactyla versus 4–8 mm long in P. rufescens. In var. didactyla, moreover, the rhizines tend to be less flocculent and confluent, and the lower surface less abruptly darkened than in P. rufescens (check sterile lobes). For further points of distinction see Tables 3 and 4.

Frequent over soil and moss in open sites throughout, except rare in coastal regions; xerophytic; circumpolar.

CHEMISTRY: No lichen substances detected or a few unidentified substances occasionally present in trace amounts.

SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA: Clearwater River Basin, Murtle Lake, Goward 79-1068; Slocan River Basin, Winlaw, Schofield 82184.

Peltigera didactyla (With.) Laundon var. extenuata (Nyl. ex Vainio) Goffinet & Hastings, Lichenologist, 1994

P. canina var. extenuata Nyl. ex Vain., Medd. Soc. Fauna Flora Fern. 2: 49. 1878

The presence of strictly laminal soredia in P. didactyla var. extenuata distinguishes this taxon from all other Peltigera except var. didactyla; see the discussion under that heading.

Frequent over moss or soil in open inland localities; mesophytic; incompletely circumpolar.

CHEMISTRY: Methyl glyrophorate and ± glyrophoric acid (often in trace amounts; Goffinet and Hastings 1995).

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Selwyn Range, Kinbasket Lake, Ptarmigan Creek, Goffinet 1309 (herb. Goffinet); Clearwater River Basin, Clearwater Lake, Goward 83-903; Thompson River Basin, Kamloops, Goward 88-66; Spatsizi River Basin, Spatsizi Park, Pajar 1205.

Peltigera elisabethae Gyelnik, Bot. KozI. 24: 135. 1927

The combination of plane, horizontally orientated apothecia, and stout, concentrically aligned (outermost) rhizines, together with a shiny, glabrous upper surface distinguishes P. elisabethae from all other Peltigerae except P. horizontalis. That species lacks the marginal lobules and numerous stress cracks of P. elisabethae, has a thinner medulla, and bears rather distinct veins that are separated by numerous interstices. In P. elisabethae the veins are hardly developed at all, and the interstices are usually sparse. See also Table 6 for additional points of separation.

Frequent over soil and mossy (calcium-rich) rock in open inland forests, especially at lower elevations; weakly xerophytic to mesophytic; circumpolar.

CHEMISTRY: Tenuiorin, methyl glyrophorate, ± glyrophoric acid; zeorin and several unidentified triterpenoids (Holman-Hartwig 1993).

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Clearwater River Basin, Murtle Lake, Ahti 13559; Fort Nelson River Basin, Fort Nelson, Goward 82-1065; Liard River Basin, Muncho Lake, Gowad 82-1230; Spahas Creek Provincial Park, Spahas Creek, Marsh 1758 (ALTA).

Peltigera evansiana Gyelnik Bryologist, 34: 16. 1931

The presence of cylindrical isidia in this species is diagnostic. Most British Columbia specimens of P. evansiana contain copious lobulate isidia in addition to the cylindrical isidia typical of the species. This observation led Goward and Ahti (1992) to suggest that the western material may not actually represent P. evansiana s.s. Subsequent studies, however, revealed that this variation occurs throughout the range of the species and is therefore unworthy of taxonomic recognition.

Rare over mosses in sheltered inland forests, especially in boreal regions; mesophytic; North America, especially in eastern temperate regions.

CHEMISTRY: No lichen substances detected.


Peltigera horizontalis (Huds.) Bauern., Flora Lips. 562. 1790

Lichen horizontalis Hudson, Flora Angl. 453. 1762

Peltigera horizontalis is similar in general distribution to P. elisabethae but is less xerophytic. For points of separation with similar species, see the discussion under P. elisabethae and Table 6.

Frequent over soil and moss in sheltered inland forests, usually at lower elevations (Fig. 22); mesophytic to weakly hygrophytic; incompletely circumpolar.

CHEMISTRY: Tenuiorin, methyl glyrophorate, ± glyrophoric acid; zeorin and several unidentified triterpenoids (Holman-Hartwig 1993).

SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA: Clearwater River Basin, Helmcken Falls, Ahti 13851; Kootenay River Basin, Boswell, Goward 81-1663; Fraser River Basin, Prince George, Mount Baldy Hughes, Goward 81-1555.

Peltigera hymenina (Ach.) Del. in Dudy Bot. Gallica 2: 397. 1830

Pelitidea hymenina Ach., Meth. Lich.: 284. 1803

Peltigera lactucifolia (With.) Laundon, Lichenologist, 16: 221. 1984


The nomenclature adopted here (using P. hymenina instead of P. lactucifolia) follows Santesson (1993). The
material does not match typical \textit{P. hymenina} and may represent a separate taxon. It is morphologically and chemically very similar to some forms of \textit{P. occidentalis} (see below) and could perhaps be included in that species. For the purposes of the present discussion, the name \textit{P. hymenina} will be assigned to coastal material, whereas inland specimens are referred to \textit{P. occidentalis}. However, this taxonomy is very preliminary. Well-developed specimens of \textit{P. hymenina} are rare in British Columbia and may be characterized as having medium-sized lobes (to 2 cm wide) with a shiny, glabrous upper surface, inconspicuous veins and short, sparse, simple to flocculent rhizines. The lower surface varies from pale throughout to medium brown (rarely blackish) toward the thallus centre. The putative coastal distribution of \textit{P. hymenina} is also distinctive. Some forms of \textit{P. neopolydactyla} are close, but in that species the thallus is membranous and the rhizines numerous, long, and more or less simple.

In exposed sites, e.g., mossy seaside headlands, \textit{P. hymenina} is much smaller, its lobes then averaging only to 0.4–0.8 (−1) cm wide. Such specimens are unique among the members of the \textit{P. polydactylon} group in producing marginal lobules similar to those of \textit{P. praetextata}. In some specimens, however, these lobules are sparse or absent. See Table 6 for points of separation with similar species.

Infrequent over exposed mossy outcrops in hypermaritime localities at lower elevations; hygrophytic; global distribution unknown. \textit{Peltigera hymenina} is newly reported for British Columbia.

**CHEMISTRY:** Tenuiorin, methyl gyrophorate, ± gyrophoric acid; peltidactylin, dolichorrhizin, zeorin, and traces of unidentified triterpenoids. The material from British Columbia is chemically identical to the European material as regards its major compounds (Holtan-Hartwig 1993).

**SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA:** Vancouver Island, Ucluelet, Goward 83-208; Vancouver Island, Bamfield, Goward 91-621.


In this distinctive species the upper surface is both scabrid and erect-tomentose (check lobe tips), and the lower surface bears broad, low to weakly raised, blackish veins that are strikingly contrastive with the interstices. See Tables 2 and 6 for points of separation with similar species.

Infrequent over soil and moss in sheltered inland forests, usually at lower elevations; mesophytic; incompletely circumpolar (Vitikainen 1985).

**CHEMISTRY:** No constant lichen substances reported (Vitikainen 1985).

**SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA:** Homathko River Basin, Twist Lake, Goward 81-1429; Thompson River Basin, Lac du Bois, Goward 83-506; Elk River Basin, Crownnest Pass, Goward 81-1718.


**P. canina var. lepidophora** Nyl. in Vainio, Medd. Soc. Fauna Flora Fenn. 2: 49. 1878

The presence of copious appressed dorsiventral isidia (= lobules) over the upper surface is diagnostic. Local material of \textit{P. evansi}.

Peltigera leucophlebia (Nyl.) Geylnik (green phototype), Mag. Bot. Lapok, 24: 79. 1926

\textit{P. aphthosa} var. \textit{leucophlebia} Nyl., Syn. Lich. 1: 323. 1860

For points of distinction with similar species, see Table 1 and notes under \textit{P. aphthosa}.

Frequent over (calcium-rich) soil, moss, and mossy rocks and logs in open forests throughout (Fig. 20), weakly xerophytic to mesophytic. \textit{Peltigera leucophlebia} is similar in ecology to \textit{P. aphthosa} but favours less acidic substrates and is also considerably more common in coastal localities.

**CHEMISTRY:** Tenuiorin, methyl gyrophorate, ± gyrophoric acid; two to four unidentified triterpenoids. The chemistry of our material agrees with that documented from European specimens (Holtan-Hartwig 1993).

**SELECTED SPECIMENS EXAMINED (all UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA:** Vanderhoof, Fraser Lake, Goffinet 380 (herb. Goffinet); Skeena River Basin, Hazelton, Goward 91-1616; Taku River Basin, Tulsequah River, Goward 82-642; Chilcotin River Basin, Tatla Lake, Goward 81-1435.

**Peltigera leucophlebia** (Nyl.) Geylnik (blue-green phototype)

This phototype has not previously been reported. The single specimen on which our present record is based (Goward 92-319, UBC) was collected over moss at the base of a conifer in a shady old-growth forest north of Hazelton, at 55°25′N, 127°48′W.

In most regards the specimen is similar in morphology to the blue-green phototypes of \textit{P. aphthosa} and \textit{P. britannica}, though the rhizines appear to be somewhat less branched and more discrete than in those taxa. The upper surface is distinctly macroscopically covered in erect tomentum, especially near the lobe margins. The lobe margins themselves essentially lack lobules and in this regard are similar to blue-green phototype of \textit{P. aphthosa}.

Chemically, the blue-green phototype of \textit{P. leucophlebia} is similar to its green counterpart, for example in containing two of the major "leucophlebia unknowns." These substances are found also, albeit rarely, in \textit{P. aphthosa}.

**CHEMISTRY:** Tenuiorin, methyl gyrophorate, ± gyrophoric acid; two unknown triterpenoids (in common with the green phototype).

**SPECIMEN EXAMINED:** See text.
Peltigera malacea (Ach.) Funck, Cryptogam. Gewachse, 33: 5. 1817

Peltidea malacea Ach., Syn. Meth. Lich.: 240. 1814

Peltigera malacea differs from other cyanobacteria-containing Peltigerae by its very thick lobes (to 1500 μm), indistinct veins (Fig. 5), and greenish upper surface bearing erect tomentum (check lobe tips). The blue-green phototypes of P. aphthosa and related species are similar but have bluish lobes and conspicuous laminal maculae. See Table 2 for other points of distinction with these and other species.

Frequent over (acid) soil and moss in open, usually dryish inland forests and alpine ridges; xerophytic to weakly mesophytic; probably circumpolar.

CHEMISTRY: Tenuiorin, methyl glyrophorate, + glyrophoric acid; two to three unidentified triterpenoids. Holtan-Hartwig (1993) also reports dolichorrhizin and zeorin.

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Fort Nelson River Basin, Fort Nelson, Annas 27-3; Clearwater River Basin, Spahats Falls, Goward 79-859; Terrace, Williams Creek, Ohlsson 2617 (ALTA).

Peltigera membranacea (Ach.) Nyl., Bull. Soc. Linn. Normandie, ser. 4, 1: 74. 1887

Peltidea canina var. membranacea Ach., Lich. Univ.: 518. 1810

Typical material of P. membranacea may be distinguished from all other laminal tomentose species of Peltigera by the lower surface, in which the interstices are polygonal, the veins narrow, the rhizines simple, and the veins and rhizines erect-tomentose more or less throughout (Figs. 3, 7, and 10). Poorly developed material may be difficult to separate from P. praetextata. In that species, however, the interstices are lenticular, the rhizines typically lack tomentum, and marginal lobules are usually present. See Table 3 for additional points of separation with similar species.

In hypermaritime localities, some specimens of P. membranacea lack laminal tomentum. Such specimens may be confused with P. degeni or various members of the P. polydactylon group, though in those species the veins and rhizines are never erect-tomentose (see also Table 6).

Frequent over soil, moss, and mossy rocks and logs in humid forested localities throughout, except essentially absent from semi-arid and boreal regions; weakly mesophytic to hygrophytic; probably incompletely circumpolar.

CHEMISTRY: No lichen substances detected.

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Queen Charlotte Islands, Maude Island, Brodo and Shchipanek 11287 (ALTA); Vancouver Island, Port Alberni, Mount Arrowsmith, Goward 91-1890; Kispiox River Basin, Kispiox, Date Creek, Goward 91-997; Kitsumkalum River Basin, Glacier Creek, Goward 91-1171.


Peltigera neckeri is highly variable, but typical material may be distinguished by the glossy, bluish upper surface, erect black apothecia, marginal pruinose (not always present), unaligned rhizines, and abruptly darkening lower surface. Nontomentose forms of blue-green P. aphthosa are similar but are usually distinctly maculate and bear at least some green lobes.

Poorly developed specimens of P. neckeri can also be confused with several members of the P. polydactylon group. For additional points of distinction, see Table 6.

Infrequent over soil, mossy rocks and decaying logs in inland localities at lower elevations, especially in humid forest sites, but also rare in steppe communities; mesophytic; probably incompletely circumpolar.

CHEMISTRY: Tenuiorin, methyl glyrophorate, + glyrophoric acid; dolichorrhizin, zeorin and three or more unidentified triterpenoids.


Peltigera neopolydactyla (Gyelnik) Gyelnik Rev. Bryol. Lichenol. 5: 171. 1932

P. polydactyla var. neopolydactyla Gyelnik, Mag. Bot. Lapok, 31: 46. 1932

Syn. Peltigera polydactylon (Necker) Hoffm. var. dolichorrhiza Nyl. sensu Thomson (1950)

Typical P. neopolydactyla may be distinguished from other glabrous Peltigera by its long, simple rhizines, broad, nonlobulate lobes, billowed upper surface, and weakly raised veins. Less robust forms are similar to P. polydactylon, but that species has shorter rhizines, crisped lobe margins, more rounded interstices, and (typically) flatter, broader veins. Peltigera pacifica has lobulate margins, while P. degeni and glabrous forms of P. membranacea have both distinctly raised, narrow veins. For points of separation with other similar species, see Table 6.

Even with the segregation of P. hymenina and P. occidentalis, P. neopolydactyla remains heterogeneous. Athi and Vitikainen (1977) have already called attention to the existence of “bluish-grey” and “greenish” colour forms of this species in Newfoundland. In British Columbia, at least three colour forms may be recognized: olive green, milky blue, and dark slate blue. Where such forms correlate with chemistry or venation, taxonomic recognition may be indicated. Our present delimitation may thus include at least two additional taxa, i.e., an olivaceous taxon having a more or less yellowish medulla and pale, raised veins, and a milky blue taxon with low, broad veins that darken toward the thallus centre. Alternatively, this variation could be attributed to a single mycobiont associating with different species of Nostoc (Hawksworth 1988). Similar specimens have been seen from China, Japan, and New Zealand.

Many specimens from coastal localities are variously scabrid and may be confused with P. scabrosa. That species, however, appears to have a strictly inland distribution in British Columbia. As circumscribed here, P. scabrosa may be recognized by its more evenly scabrid upper surface and its short, fasciculate rhizines that are dark even at the thallus margins; in P. neopolydactyla, the outermost rhizines are typically simple and pale. See Table 4 for a comparison with other scabrid taxa.
CHEMISTRY: Tenuiorin, methyl gyrophorate, ± gyrophoric acid; ± peltidactylin, ± dolichorrhizin, ± zeorin, and various unidentified triterpenoids. The variation observed is similar to that reported from Norwegian material (Holtan-Hartwig 1993). One specimen (Goward 81-2086, UBC) lacked major triterpenoids but showed unusually high amounts of gyrophoric acid.

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Vancouver Island, Sayward, Schoen Lake, Goward 91-752; Kispiox River Basin, Kispiox, Date Creek, Goward 91-998a; Clearwater River Basin, Spahats Falls, Goward 79-1408; Queen Charlotte Islands, Graham Island, Horton 1755 (ALTA).


Peltigera canina var. occidentalis Dahl, Medd. Gronl. 150: 68. 1950

Among the glabrous Peltigerae, P. occidentalis is the only species combining a distinctly thickened thallus, minutely corrugate upper surface (Fig. 2), indistinct veins, and short, unaligned rhizines. It is usually included in P. neopolydactyla but may be distinguished by the thicker lobes, much shorter (usually fasciculate or tapered) rhizines and less hygrophytic ecology. It is also a much more difficult species to collect intact and usually consists of broken fragments in the herbarium packet. For points of distinction with P. nekeri, see Table 6; see also the discussion under P. hymenina.

Infrequent over moss in bogs and at the margins of alpine tarns; mesophytic; global distribution unknown.

CHEMISTRY: Tenuiorin, methyl gyrophorate, ± gyrophoric acid; ± peltidactylin, dolichorrhizin, zeorin, and one or two unidentified triterpenoids. The chemistry is similar to that reported for the type specimen (Vitikainen 1985).

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Monashee Mountains, Malton Range, Kinbasket Lake, Goffinet 1521 (ALTA); Fort Nelson River Basin, Fort Nelson, Parker Lake, Goward 82-970; Fraser River Basin, Yale, Goward 83-401; Liard River Basin, Toad River, Goward 82-1117; Clearwater River Basin, Trophy Mountains, Goward 79-1145.


Among the local species, the only other glabrous Peltigera combining a shiny upper surface with typically crisped or lobulate lobe margins (Fig. 17) are P. elisabethae and P. polydactyly. In those species, however, the veins are low and darken abruptly toward the thallus centre, whereas in P. pacifica the veins are distinctly raised and darken gradually. See also Tables 5 and 6.

Infrequent over soil, moss, and mossy logs in sheltered to shady forests in coastal localities at lower elevations, also rare in humid old-growth inland forests; hygrophytic; western North America (Vitikainen 1985).

CHEMISTRY: Tenuiorin, methyl gyrophorate, gyrophoric acid; peltidactylin, dolichorrhizin, and zeorin (Vitikainen 1985).

SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA: Skeena River Basin, Lakelse Lake, Goward 91-1173; Burrrad Inlet, Lighthouse Park, Goward 86-1; Kispiox River Basin, Kispiox, Date Creek, Goward 91-972.


Lichen polydactylon Necker, Meth. Muscor.: 85. 1771

Peltigera polydactylon is a glabrous species in which the lobes are small, the lobe margins crisped, the veins low and broad, the interstices oval (Fig. 6), and the rhizines unaligned. Though often confused with P. neopolydactyla, that species has broader noncrisped lobes, broadly raised veins, and typically lenticular interstices. For points of separation with other similar species, see Table 6.

Infrequent over soil, moss, and mossy rocks and logs in open but humid inland forests; mesophytic to weakly hygrophytic; circumpolar.

CHEMISTRY: Tenuiorin, methyl gyrophorate, ± gyrophoric acid; peltidactylin, dolichorrhizin, and zeorin.

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Maltin Range, Kinbasket Lake, Goffinet 1537 (herb. Goffinet); Clearwater River Basin, Murtle Lake, Goward 83-824; Columbia River Basin, Revelstoke, Goward 81-1353; Similkameen River Basin, Manning Park, Mount Frosty, Goward 83-979.

Peltigera ponojensis Gyelnik Medd. Soc. Flora Flora
Fenn. 7: 143. 1931

Peltigera plittii Gyelnik is an older name for P. ponojensis and should therefore technically have priority over it. We prefer, however, to refrain from reinstating P. plittii until P. ponojensis has been submitted for possible conservation (O. Vitikainen, unpublished proposal).

Peltigera ponojensis is a small, xerophytic species in which the lobe tips are upturned and the upper surface is usually densely tomentose (but see below). It has traditionally been included within P. rufescens (Thomson 1950) but differs from that species in having simple, typically discrete rhizines, and thicker, more rove veins (Fig. 8) that darken only gradually, if at all, toward the thallus centre. In P. rufescens, the rhizines are usually confluent and mat-forming, and the veins darken abruptly. Peltigera praetextata is also similar but has lobulate lobe margins (check central portions of thallus), low to raised veins, and a more mesophytic ecology. For points of distinction with similar species, see Tables 3 and 4.

The upper surface in P. ponojensis varies in British Columbia from densely tomentose to entirely glabrous, with many specimens intermediate between these two extremes. The glabrous form has been treated by Goffinet and Hastings (1994) as a distinct species, P. sp. 1. Such glabrous specimens might be confused with P. degenii or P. pacifica, but in those species the lobes are membranous, the upper surface is distinctly shiny, and the ecology is hygrophytic. See also Table 6.
Peltigera praetextata (Flörke ex Sommerf.) Zopf Ann. Chem. 364: 299. 1909
Peltidea ulorrhiza var. praetextata Flörke ex Sommerf., Suppl. Fl. Lappon. 123. 1826

Peltigera praetextata has been poorly understood in North America and is often confused with other members of the P. canina group. No other species, however, combines upturned lobe tips with simple rhizines and marginal lobules (Fig. 16). The marginal lobules are typically sparse in the British Columbia material and are confined to the older, central portions of the thallus. Occasional specimens having erect tomentum over the rhizines or veins might be mistaken for P. membranacea, but this species has broader lobes, downturned lobe tips and more or less polygonal interstices. For further points of distinction, see Table 3.

Infrequent over soil, moss, and mossy rocks and logs in open or sheltered forests in humid regions at lower elevations throughout; mesophytic; circumpolar.

Chemistry: No lichen substances detected.

Selected specimens examined (all UBC): CANADA: BRITISH COLUMBIA: Thompson River Basin, Lac Le Jeune, Mount Chuwheis, Goward 81-1289b; Skagit River Basin, Manning Park, Rhododendron Flats, Goward 82-272; Kootenay River Basin, Kokanee Creek, Goward 81-1641.


The appressed-tomentose upper surface and broad, spongy, erect-tomentose veins are diagnostic. Peltigera membranacea also has erect-tomentose veins (and rhizines), but in that species the veins are distinctly narrow. See Table 3 for points of separation with other species.

Though P. reitioveata occurs south to northern Washington State (Goffinet 1992), this is essentially a boreal species; in the southern portion of its range it appears to be restricted to cool spruce forests at montane elevations.

Infrequent over thick moss in somewhat sheltered inland forests, especially in boreal regions at lower elevations; mesophytic; incompletely circumpolar (Vitikainen 1985; Goffinet 1992).

Chemistry: Tenuiorin, methyl gyrophorlate, ÷ gyrophoric acid; peltidactylin, dolichorrhizin, zeorin, and one unidentified triterpenoid (trace amounts).

Selected specimens examined (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Fraser River Basin, Quesnel, Nazko Road, Goward 81-1533; Similkameen River Basin, Allison Lake, Goward 83-514; Nicola River Basin, Logan Lake, Goward 84-93; Fort St. John, Horton 90 (ALTA).

Flora Goett. 79. 1770

Among Peltigera having a tomentose upper surface, only P. rufescens has upturned lobe tips, confluent rhizines, and veins that darken abruptly toward the thallus centre. Peltigera pononensis is similar but has discrete rhizines and ropy veins that darken only gradually, if at all, toward the thallus centre.

Included in our present circumscription of P. rufescens are several specimens having widely spaced veins and simple, more or less discrete rhizines. Such material may warrant separate taxonomic recognition. Further studies are in progress.

Frequent over soil (especially calcium-rich soil), moss or mossy rock in open, often somewhat exposed sites throughout; xerophytic; circumpolar.

Chemistry: No lichen substances detected.

Selected specimens examined (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Kootenay National Park, Fairbarns 2137 (ALTA); Clearwater River Basin, Clearwater Lake, Goward 78-210; Peace River Basin, Hudson Hope, Otto 6253; Kettle River Basin, McRae Creek, Paulson, Otto 6373.

Peltigera scabrosa Th. Fr., Lich. Arct. 45. 1860

Peltigera scabrosa can be characterized as a thick, glabrous, strongly scabrid species with an indistinctly veined lower surface, and short, fasciculate rhizines (Fig. 11) that are invariably dark. Scabrid forms of P. neopolydactyla are readily distinguished by the more defined veins and the simple rhizines. An earlier report of P. scabrosa from coastal British Columbia and Alaska (Ohlsson 1973) should be referred to P. neopolydactyla. For points of distinction with other scabrid species see Table 4.

In the course of our study, we identified a specimen of P. scabrosella Holt.-Hartw. from the Yukon (Trout Lake, south shore, north facing, alt. 500 ft, 68°30’N, 138°40’W, June 29, 1964, Lambert, UBC). This species has not previously been reported for North America. It resembles P. scabrosa in most details but has a pale lower surface and pale outermost rhizines (Holtan-Hartwig 1988). Peltigera scabrosella is expected to occur also in northern British Columbia. The chemistry of the North American specimen is identical to that reported from Europe, i.e., tenuiorin, methyl gyrophorlate, gyrophoric acid, dolichorrhizin, zeorin, and two unidentified triterpenoids (Holtan-Hartwig 1993).

Infrequent over moss, mossy logs, and mossy rock in somewhat open inland localities at lower elevations; mesophytic; circumpolar.

Chemistry: Tenuiorin, methyl gyrophorlate, ÷ gyrophoric acid, peltidactylin, and two unidentified triterpenoids. The material from British Columbia differs from both known European chemotypes in lacking dolichorrhizin and zeorin (Holtan-Hartwig 1993).

Selected specimens examined (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Clearwater River...
Lichen venosus L., Sp. Pl.: 1148. 1753

Peltigera venosa is a small, green, peltate lichen with highly contrastive veins. It is highly distinctive and is unlikely to be confused with any other species.

In P. venosa, cephalodia are located on the veins of the lower surface; under humid conditions they may become detached and develop into tiny, dark, almost black, homomorphic lobules (Ott 1988). Such lobules are frequently found growing at the base of this species in the British Columbia material; their close resemblance to Leptogium is interesting in light of the fact that the blue-green phototypes of other Peltigera species are distinctly Peltigeroïd. This degree of intrageneric dimorphism in blue-green phototypes has previously been reported only in Sticta (see James and Henssen 1976).

Frequent over calcium-rich soil, especially cut banks, in open or somewhat sheltered sites throughout; mesophytic to hygrohypoth; circumpolar.

CHEMISTRY: Green phototype: tenuinor, methyl glycerophosphate, ± glyceric acid, phellic acid B, and three to five unidentified triterpenoids. Blue-green phototype: no lichen substances detected (Tønsberg and Holtan-Hartwig 1983; Goffinet and Hastings 1994).

SELECTED SPECIMENS EXAMINED (UBC unless otherwise indicated): CANADA: BRITISH COLUMBIA: Thompson River Basin, Clearwater, Brodo 27261; Clearwater River Basin, Trophy Mountains, Goward 79-1134; Top of the World Provincial Park, Home Base Campground, Vitt 31168 (ALTA).

Peltigera sp. 1.

Syn. Peltigera aphthosa s.l.

The British Columbia material conforms in many regards with P. sp. 1 of Holtan-Hartwig (1993) but differs in having continuously corticate apothecial lower surfaces and in lacking hairs over the inner portions of the upper surface. Given that three specimens of P. sp. 1 sensu Holtan-Hartwig have been reported from Alaska (Holtan-Hartwig 1993), we prefer to leave open for the moment whether the British Columbia material may, notwithstanding the above differences, be conspecific with it.

Peltigera sp. 1 is a member of the P. aphthosa group. It can be distinguished from similar species on the combined basis of the lower surface of the apothecia, which is continuously corticate, and its veins, which darken gradually toward the thallus centre (see Fig. 18, in Goffinet and Hastings 1994). In general aspect, P. sp. 1 is closest to P. aphthosa s.s., but in that species the lower surface darkens abruptly toward the thallus centre.

This species is tolerant of prolonged snow cover. In inland regions it is in fact essentially restricted to localities in which snow persists for more than half the year, though along the coast it may also occur in districts that receive very little snow. This is the only member of the P. aphthosa group for which a blue-green phototype has not yet been reported.

Frequent over moss and mossy rocks and logs in sheltered forests, usually at higher elevations, but also rarely in seaside forests; hygrophytic; possibly western North America, eastern North America, western Eurasia.

CHEMISTRY: Tenuinor, methyl glycerophosphate, phellic acid B, and unidentified triterpenoids.

SELECTED SPECIMENS EXAMINED (all UBC): CANADA: BRITISH COLUMBIA: Clearwater River Basin, Upper Azure River, Goward 84-1026; Cheakamus River Basin, Garibaldi Lake, Olsson 557; Columbia River Basin, Mount Revelstoke, Otto 3253.

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References


