

Systematics of North American *Petasites* (Asteraceae: Senecioneae). III. A taxonomic revision

Donna M. Cherniawsky and Randall J. Bayer

Abstract: *Petasites* Mill. (Asteraceae: Senecioneae) is a taxonomically difficult genus of polygamodioecious, perennial herbs with a widespread distribution across North America. As many as 10 species and as few as two species (*Petasites sagittatus* (Banks ex Pursh) A. Gray and *Petasites frigidus* (L.) Fries with three varieties), with one hybrid taxon, have been recognized previously. Considerable taxonomic controversy has surrounded the genus as a result of a conservative floral morphology and a high degree of polymorphism in leaf morphology. Additionally, a number of intergrading leaf forms among those with rather consistent taxonomic characteristics across various treatments have contributed to the taxonomic ambivalence surrounding *Petasites*. Our taxonomic revision of North American *Petasites* is based on results obtained from recent multivariate morphometric and isozyme analyses. These data have indicated that taxa of *Petasites* are not sufficiently differentiated, morphologically or isozymically, from one another to warrant the recognition of separate species. Therefore, *Petasites* is circumscribed as a single species containing three varietal taxa and one hybrid taxon between two of the varieties. Although our circumscription of *P. sagittatus* is in accordance with most previous circumscriptions, we have removed it from the rank of species to varietal status under *P. frigidus*. The new combination *Petasites frigidus* var. *sagittatus* (Banks ex Pursh) Cherniawsky is proposed. Subsequent to the new status of one of its parental taxa (*P. frigidus* var. *sagittatus*), the new combination for *Petasites xvitifolius* (Greene) Bogle is proposed: *Petasites frigidus* var. *xvitifolius* (Greene) Cherniawsky. The three entities of the *frigidus* complex are united under one polymorphic taxon, *P. frigidus* var. *frigidus* and the circumscription and name of *Petasites frigidus* var. *palmatus* (Ait.) Cronq. is in accordance with previous authors. A complete list of synonymy and a key to the taxa of *Petasites* is presented together with distribution maps.

Key words: *Petasites*, Asteraceae, Senecioneae, North America, taxonomic revision.

Résumé : *Petasites* Mill. (Asteraceae : Senecioneae) est un genre taxonomiquement difficile parmi les herbacées polygamodioïques pérennes, avec une large distribution en Amérique du Nord. On a déjà reconnu jusqu'à 10 espèces et aussi peu que deux espèces (*Petasites sagittatus* (Banks ex Pursh) A. Gray et *Petasites frigidus* (L.) Fries, avec trois variétés) ainsi qu'un taxon hybride. Ce genre a connu une controverse taxonomique considérable due à une morphologie florale conservatrice et un haut degré de polymorphisme foliaire. De plus, un nombre de formes foliaires intermédiaires parmi celles ayant des caractéristiques plutôt constantes dans l'ensemble des divers traitements, a contribué à l'ambivalence taxonomique entourant les *Petasites*. La révision taxonomique des *Petasites* nord-américains effectuée par les auteurs est basée sur des résultats obtenus à partir d'analyses morphométriques multivariées et d'analyses isozymiques. Ces données indiquent que les taxons de *Petasites* ne sont pas suffisamment différenciés, morphologiquement ou isozymiquement, les uns des autres pour supporter la reconnaissance d'espèces distinctes. Conséquemment, le genre *Petasites* est regroupé sous une seule espèce contenant trois taxons variétaux et un taxon hybride entre deux de ces variétés. Bien que la circonscription du *P. sagittatus* déterminée par les auteurs concorde avec la plupart des circonscriptions préalables, ils l'ont cependant relégué au statut de variété du *P. frigidus*, lui enlevant son statut d'espèce. Les auteurs proposent la nouvelle combinaison *Petasites frigidus* var. *sagittatus* (Banks ex Pursh) Cherniawsky. Subéquemment au nouveau statut d'un de ses taxons parents (*P. frigidus* var. *sagittatus*), il proposent une nouvelle combinaison pour le *Petasites xvitifolius* (Greene) Bogle : *Petasites frigidus* var. *xvitifolius* (Greene) Cherniawsky. Les trois entités du complexe *frigidus* sont réunies sous un taxon polymorphe, *P. frigidus* var. *frigidus* et la circonscription et le nom de *Petasites frigidus* var. *palmatus* (Ait.) Cronq. concordent avec les auteurs précédents. Les auteurs présentent une liste complète de synonymie et une clé pour les taxons de *Petasites* ainsi que des cartes de distribution.

Mots clés : *Petasites*, Asteraceae, Senecioneae, Amérique du Nord, révision taxonomique.

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D.M. Cherniawsky.¹ Department of Biological Sciences, University of Alberta, Edmonton, AB T6G 2E9, Canada.

R.J. Bayer. CSIRO – Plant Industry, Molecular Systematics Laboratory, Australian National Herbarium, G.P.O. Box 1600, Canberra, ACT 2601, Australia.

¹Author to whom all correspondence should be addressed. e-mail: dmc5@gpu.srv.ualberta.ca

Introduction

Petasites Mill. is a taxonomically problematic genus of perennial, clonal herbs widely distributed in North America across Canada, Alaska, and the northern contiguous United States. The taxonomic difficulties in *Petasites* are partially attributed to its breeding system and flowering time. *Petasites* is polygamodioecious with flowering inflorescences emerging before the foliage. The conservative floral structure across all taxa has created problems in taxonomic determination as identification is usually impossible without foliage. Difficulties in taxonomy are further compounded by the high degree of polymorphism in the leaves. Between several leaf forms with rather consistent taxonomic characteristics across various treatments (Rydberg 1927; Hultén 1950; Bogle 1968; Cronquist 1978a) are numerous intergrading ones, which have been reported to be interfertile (Bogle 1961; Hultén 1950, 1968). The inability of authors to agree on the relationships and subsequent taxonomic boundaries in *Petasites* has resulted in inconsistent species circumscriptions and often confusing taxonomic treatments and keys. Therefore, even in the presence of foliage, taxonomic determinations are often difficult.

The taxonomic history of *Petasites* in North America began with Linnaeus' (1753) description of seven species of *Tussilago* in *Species Plantarum*, although only *T. frigida* occurred in North America. This taxon was later transferred to *Nardosmia* by Hooker (1833) and then *Petasites* by Fries (1845). A number of taxa later described from North America were similarly named, first as species of *Tussilago*, then *Nardosmia*, and finally *Petasites*. Numerous taxonomic treatments of *Petasites* have been generated since 1753 (Hooker 1833; Nuttall 1840; Herder 1865; Gray 1876; Rydberg 1927; Hultén 1950; Cronquist 1946, 1953, 1978a; Bogle 1968; Toman 1972).

North American species circumscriptions of *Petasites* have varied from 10 (Rydberg 1927) to two species (*Petasites sagittatus* (Banks ex Pursh) A. Gray and *Petasites frigidus* (L.) Fries with infraspecific taxa) (Cronquist 1978a; Bogle 1968), and Bogle (1968) recognized an additional hybrid taxon, *Petasites xvitifolius* (Greene) Bogle. Through a series of crossing studies, he showed that *Petasites warrenii* St. John, *Petasites trigonophyllus* Greene, and *Petasites vitifolius* Greene were a diverse group of plants originating from hybridization between *P. sagittatus* and *P. frigidus* var. *palmatus* (Bogle 1961).

The species circumscription of *P. sagittatus* has essentially remained unchanged throughout history; however, its tendency to intergrade with other taxa has prompted questions regarding its status as a separate species. Bogle (1968) concurred with Hooker (1833) that all taxa in the group might be conspecific with *P. frigidus*, since they were separable by small differences only; however, both authors retained this taxon at the specific rank.

The *frigidus* complex (Cherniawsky and Bayer 1998a) is a group of taxa largely responsible for the taxonomic discordance among the various treatments. This complex consists of *P. frigidus* var. *frigidus* sensu Bogle (1968) (= *P. frigidus* of Hultén 1950), var. *nivalis* sensu Bogle (1968) (= *P. hyperboreus* of Hultén 1950), and the forms intermediate in morphology between these taxa. Bogle (1961) and Hultén (1937,

1950) regard these intermediates as hybrids between vars. *frigidus* and *nivalis* and *P. frigidus* and *P. hyperboreus*, respectively.

To resolve the taxonomic confusion in this genus, the phenetic and genetic relationships among the various taxa of *Petasites* in North America have been investigated by Cherniawsky and Bayer (1998a, 1998b). In this paper, we will summarize these relationships and present our taxonomic treatment of *Petasites* in addition to an identification key.

Relationships

The relationships among the various taxa of *Petasites* in North America have been interpreted from morphological (Cherniawsky and Bayer 1998a), isozymic (Cherniawsky and Bayer 1998b), and chromosomal data (Cherniawsky 1994; Morton 1981; Löve 1975; Packer and MacPherson 1974; Johnson and Packer 1968; Ornduff et al. 1963), in addition to direct observations of herbarium and field specimens. Recent phenetic analyses of *Petasites* (Cherniawsky and Bayer 1998a) have indicated that all taxa are closely related and that the genus is loosely comprised of four subgroups. Although many leaf characters overlap between the various subgroups, the number of primary lobes, depth of sinuses, and number of teeth are useful in their delineation. The most discriminating reproductive characters include number of heads, style branch lengths of disc florets, number and length of ray florets, pappus length of ray florets, and disc corolla lobe lengths. However, reproductive characters are essentially continuous between the subgroups, and only a few extreme ranges of some characters provide reliable discrimination. Therefore, leaf characters, in conjunction with these few reliable reproductive characters provide the optimal tools to delimit the taxa of *Petasites*. It should be noted that latitude played a minor role in distinguishing pistillate *frigidus* plants from the other taxa.

Results from the isozyme study indicate divergence at isozyme loci is not associated with morphological divergence of the different leaf forms (Cherniawsky and Bayer 1998b). Although the differences at isozyme loci are not taxonomically discriminating, they are suggestive of a very close relationship among the taxa of *Petasites* and a relatively rapid and recent morphological divergence.

The similarities in isozymes, chromosome number ($2n = 58, 60$, except for six populations from Barrow, Alaska, where $3n = 90$ (Packer and MacPherson 1974)), and reproductive morphology suggest that the four subgroups of *Petasites* in North America have not yet reached a level of differentiation characteristic of distinct species; therefore, this complex should be considered still to be in the process of divergence leading to speciation. Based on these data and Cronquist's (1978b) species concept, we conclude that North American *Petasites* should be treated as one polymorphic species with infraspecific taxa and one hybrid taxon.

Although our circumscription of *P. sagittatus* is in agreement with most other authors, we propose the new combination, *P. frigidus* var. *sagittatus*. *Petasites sagittatus* exhibits marked differentiation in leaf morphology because of an absence of lobes; however, we do not consider reproductive morphology and isozymes to be sufficiently differentiated to warrant recognition at the specific rank. The tendency for

P. sagittatus to hybridize with other taxa further supports the recognition of this taxon as a variety of *P. frigidus*.

Our circumscription of var. *palmaris* is maintained in accordance with Bogle (1968) and Cronquist (1978a). *Petasites xvitifolius* is circumscribed according to Bogle (1968); however, since the status of *P. sagittatus* has been modified, so must the name for the hybrid between this taxon and var. *palmaris*. Therefore, the new combination *P. frigidus* var. *xvitifolius* is proposed. It is further proposed that the entities comprising the *frigidus* complex should be united under one taxon as they are not separable, morphologically or isozymically, from one another. The possession of both var. *frigidus*, var. *nivalis*, and intermediate leaf forms on the same plants (Cherniawsky and Bayer 1998a) provides additional support for the interpretation of these entities belonging to one highly polymorphic group. This taxon is not recognized as a distinct species because of the phenetic and genetic similarities to the other taxa. Therefore, the formerly recognized var. *nivalis* (Greene) Cronq., in addition to intermediates considered to be hybrids by Hultén (1950), are united as the morphologically diverse typical variety of *P. frigidus*. It is noted that hybridization occurs between all taxa, further enhancing the morphological diversity in *Petasites* and obscuring taxonomic boundaries.

Taxonomic treatment

Description

Perennial herbs with thick creeping rhizomes; basal leaves with long petioles, blades sagittate, deltoid, cordate, reniform, or orbicular with entire to dentate and shallowly to deeply dissected margins, lobe shape obtuse to acute, adaxial surfaces glabrous to extremely woolly, becoming glabrate with age; flowering stalks arising from rhizome in early

spring, usually prior to basal leaves, 1–10 dm high; cauline leaves on flowering stalks, alternate, reduced to parallel-veined, sessile, or ensheathing bracts with inflated lamina at tip with shape characteristic of vegetative foliage; heads several to numerous, polygamodioecious, racemose or corymbose; involucre a series of bracts, generally in one series, often with a few shorter outer bracts, often purplish; receptacle flat, naked; pappus of numerous white capillary bristles; staminate heads consisting of numerous perfect disc florets, functionally staminate, corolla whitish, five cleft, style branches lanceolate with long sweeping hairs, apical appendage of anthers rounded to triangular, disc florets surrounded by a row of sterile, pistillate ray florets, whitish, style undivided to clavate, surface papillose; pistillate heads comprised of numerous fertile pistillate ray florets, whitish or tinged red, ray florets exhibit a reduction in length of the ray from the periphery to the center where corolla becomes filiform, style undivided to clavate, surface papillose, a few perfect, sterile disc florets in center of head with five-cleft corolla, style branches lanceolate with long sweeping hairs, apical appendage of anthers rounded to triangular; cypselas linear, 5–10 nerved, glabrous, rarely villous, beakless, elongating in fruit; chromosome number $x = 29$.

Habitat and distribution

Petasites is commonly found in disturbed habitats and moist woods as well as alpine and subalpine slopes, fens, bogs, meadows, lake shores, stream banks, in addition to dry sites, such as gravelly slopes and roadsides. The distribution of this genus is circumpolar, whereby its range extends from North Africa and western Europe eastward to northern and central North America. Within North America, *Petasites* is distributed across Canada, Alaska, and the northern contiguous United States extending as far south as California.

Key to North American taxa of *Petasites* Mill.

- 1A. Leaves sagittate, deltoid, or cordate, not reniform or orbicular, margins entire to wavy to dentate with as many as 60 teeth,² not lobed,³ adaxial surface glabrous to tomentose, abaxial surface villous to extremely woolly; staminate heads 8–35, style branch length of disc florets 0.5–2.3 mm, style texture of disc florets hairy, ray florets 4–19; ray length 1.1–7.7 mm; pistillate heads 6–34, style texture of disc florets hairy, ray florets 31–139, ray length 0.6–5.4 mm, pappus length of ray florets as long as 17.3 mm, disc corolla lobe length 0.4–1.8 mm *Petasites frigidus* var. *sagittatus*
- 1B. Leaves sagittate, deltoid, cordate, reniform, or orbicular, margins distinctly lobed or dentate only with not more than 22 teeth, if dentate only, adaxial surface mostly glabrous or sparsely tomentose, abaxial surface floccose, if lobed, adaxial and abaxial surfaces glabrous to woolly; staminate heads 2–32, style branch length of disc florets 0.01–2.00 mm, style texture of disc florets papillose to hairy, ray florets 1–70, rays absent or present, if present as long as 12 mm; pistillate heads 5–42, style texture of disc florets papillose to hairy, ray florets 30–125, rays absent or present, if present as long as 6.3 mm, pappus length of ray florets as long as 15 mm, disc corolla lobe length 0.4–4.4 mm 2

² Teeth are protuberances of the leaf margin that are less than one third the length of the primary lobes. If there are no lobes, any protuberances are regarded as teeth.

³ There are two types of lobes: primary, which is the leaf region separated by two sinuses (a sinus must extend at least one quarter of the distance between the leaf margin and midrib), and secondary, which is a protuberance on the primary lobe that is at least one third the length of the primary lobe.

- 2A. Leaves orbicular, deeply cordate to reniform, palmately lobed with 5–11 primary lobes, lobes may be cleft almost to center, 0–13 secondary lobes, margins entire to dentate with as many as 52 teeth; staminate heads 4–32, style branch length of disc florets 0–1.7 mm, ray florets 5–70, rays absent or present, if present as long as 6.3 mm; pistillate heads 8–42, ray florets 51–125, rays absent or present, if present as long as 6.3 mm, pappus length of ray florets as long as 11.8 mm, disc corolla lobe length 0.5–2.9 mm *Petasites frigidus* var. *palmaris*
- 2B. Leaves sagittate, deltoid, reniform, or cordate, margins distinctly lobed or dentate only, if lobed, as many as 14 primary lobes and 0–25 secondary lobes, if dentate only, as many as 22 teeth, if lobed as many as 44 teeth; staminate heads 2–32, style branch length of disc florets 0.05–2.00 mm, ray florets 1–27, ray length 1.6–12.0 mm; pistillate heads 5–34, ray florets 30–109, ray length 0.8–4.8 mm, pappus length of ray florets as long as 15 mm, disc corolla lobe length 0.4–4.4 mm 3
- 3A. Leaves deltoid or mostly cordate, edges at base frequently convex-curved, 4–14 shallow triangular primary lobes, 0–11 secondary lobes, lobes entire to dentate with as many as 44 teeth; staminate heads 3–32, style branch length of disc florets 0.4–1.4 mm, ray florets 2–27, ray length 2.1–7.8 mm; pistillate heads 9–34, ray florets 48–89, ray length 0.8–2.5 mm, disc corolla lobe length 0.8–2.0 mm *Petasites frigidus* var. *xvitifolius*
- 3B. Leaves sagittate, deltoid, or reniform to cordate, margin lobed or dentate only, if dentate only, as many as 22 teeth present, if lobed as many as 14 primary lobes, entire or dentate, 0–25 secondary entire or irregularly toothed lobes, shallowly lobed or deeply parted, in extreme forms lobes with at least 2 lateral triangular teeth, lobes often overlapping, sinuses oblong and closed; staminate heads 2–20, style branch length 0.05–2.00 mm, ray florets 1–13, ray length 1.6–12.0 mm; pistillate heads 5–19, ray florets 30–109, ray length 0.8–4.8 mm, disc corolla lobe length 0.4–4.4 mm *Petasites frigidus* var. *frigidus*

Enumeration of taxa

Petasites frigidus (L.) Fries var. *frigidus*

Tussilago frigida L., Sp. Plant 865. 1753. *Nardosmia frigida* (L.) Hook. Flora Bor. Am. 1: 307. 1833. *Petasites frigidus* (L.) Fries, Summa Veg. Scand. I: 182. 1845. *Nardosmia angulosa* Cass., Dict. Sci. Nat. 188. 1825; *nom. illegit.* *Nardosmia frigida* var. *genuina* Herder, Bull. Soc. Nat. Mosc.: 372. 1865. *Petasites frigidus* var. *genuinus* Cronq., Rhodora 48: 123. 1946. *Petasites frigidus* ssp. *frigidus*, Folia Geobot. Phytotaxon. Praha 7: 389. 1972.

TYPE: "A Lapponia edduxi" (on back of sheet), *C.L. [innaeus]*., 303.

LECTOTYPE: 995.17 LINN (photograph!).

Tussilago corymbosa R. Br., Chloris Melv. 21–22. 1823. *Nardosmia corymbosa* (R. Br.) Hook., Flora Bor. Am. 1: 307. 1833. *Nardosmia frigida* var. *corymbosa* (R. Br.) Herder, Bull. Soc. Nat. Mosc. 38: 372. 1865. *Petasites corymbosus* (R. Br.) Rydb., Bull. Torr. Bot. Club 37: 460. 1910. *Petasites frigidus* var. *corymbosus* auct. non R. Br.: Cronq., Rhodora 48: 123. 1946.

TYPE: "Parry's First Voyage 1819. 'Melville Island' the probable locality, but Baffin Land [was] (Hopper Land and E. coast) visited" (*fide* label), *Capt. Sabine* 407.

LECTOTYPE (designated here): BM-000203!

SYNTYPES (several plants on one herbarium sheet): BM-000203! (*Capt. Sabine s.n.*); BM-00024! (*Capt. Sabine s.n.*); BM-00024! (*Capt. Parry s.n.*); BM-00024! (*Capt. Ross s.n.*).

Petasites nivalis Greene, Pittonia II: 18–19. 1889. *Petasites frigidus* var. *nivalis* (Greene) Cronq., Leaflet West. Bot. VII: 30. 1953. *Petasites nivalis* ssp. *nivalis*, Folia Geobot. Phytotaxon. Praha 7: 390. 1972. *Petasites frigidus* ssp. *nivalis* (Greene) Cody, Can. Field-Nat. 108: 94. 1994.

TYPE: "Washington, Mt. Rainier" (*fide* label), Aug. 21, 1889, *Edw. L. Greene s.n.* Type description reads "Aug. 20" not "Aug. 21."

LECTOTYPE (designated here): NDG-062357!

ISOLECTOTYPE: NDG-062358!

Petasites gracilis Britton, Bull. NY Bot. Gard. 2: 186. 1901.

TYPE: "Walker Gulch" (*fide* label), July 16, 1899, *R.S. Williams s.n.*

HOLOTYPE: NY!

Petasites alaskanus Rydb., N. Am. Flora 34: 314. 1927.

TYPE: "St. Paul's Island, Alaska" (*fide* label), 1879, *Dr. Robert White s.n.*

HOLOTYPE: NY!

Petasites hyperboreus Rydb., N. Am. Fl. 34: 312–313. 1927.

Petasites nivalis ssp. *hyperboreus* (Rydb.) Toman, Folia Geobot. Phytotaxon. Praha 7: 390. 1972.

TYPE: "Second summit W. of Skagit River, B.C." (*fide* label), July 22, 1905, *J.M. Macoun Can. Geol. Survey No. 76977*. Type description reads "76944" not "76977".

HOLOTYPE: NY!

ISOTYPE: CAN-108732!

Petasites frigidus var. *hyperboreoides* Hultén, Flora Aleutian Isl. 328. 1937.

LECTOTYPE: Kanaga Island, July 10, 1932, *Hultén* 6507.

TYPE MATERIAL AND NOTES ABOUT SYNONYMY: *Petasites frigidus* var. *frigidus* was originally described by Linnaeus (1753) as *T. frigida* in *Species Plantarum*, where the diagnosis for *T. frigida*, along with four synonyms, originated from his earlier work, *Flora Lapponica* (Linnaeus 1737). Since it

was not possible to obtain the actual Linnaean type specimens, photographs of the type material were examined for this study. Specimens 995.17 LINN, a duplicate in the Library of the Institut de France, Paris, 995.14 LINN, a specimen at UPS, and at least two illustrations are original elements for Linnaeus' name (C.E. Jarvis (BM), personal communication).

Inspection of photographs of the original specimens provides an insight into Linnaeus' concept of this taxon. The specimen from UPS is merely toothed, whereas 995.17 LINN is gently lobed, and 995.14 LINN is irregularly and coarsely lobed and toothed. This latter specimen, included in *T. frigida* by Linnaeus, resembles the form that Hultén (1950) regarded as a hybrid between *P. frigidus* and *P. hyperboreus* sensu stricto.

Cassini (1825) included *T. frigida* in the segregate genus *Nardosmia* as *N. angulosa*; however, this is a superfluous name and is therefore illegitimate as the Linnaean epithet *frigida* had precedence over *angulosa*. Hooker (1833) made the correct combination *N. frigida* and although he chose to maintain this taxon at the specific rank, he noted its similarity with the other North American species of the genus. He acknowledged the possibility that these taxa might constitute only one species. Fries (1845) later transferred *Nardosmia* to *Petasites*. However, Herder (1865) continued to recognize this taxon as *Nardosmia*. In 1865, Herder accomplished what Hooker (1833) had only alluded to, although he preferred to maintain two species instead of one. Herder (1865) reduced four species of *Nardosmia* to varietal status under *N. frigida*. According to Herder (1865), the variety *genuina* represented the genuine form of *N. frigida*. Even though Cronquist (1946) agreed with Herder's circumscription, he preferred to recognize the genus as *Petasites* as Fries (1845) had done. Cronquist (1946) made the transfer forming *P. frigidus* var. *genuinus*.

In compliance with the International Code of Botanical Nomenclature (ICBN) (Greuter 1994) rules for the automatic establishment of autonyms in the naming of infraspecific taxa, Cronquist (1953) changed *P. frigidus* var. *genuinus* to var. *frigidus*. Toman's (1972) interpretation of *P. frigidus* included only two infraspecific taxa, one circumpolar and one European. He chose to recognize them at the subspecific level, whereby *P. frigidus* ssp. *frigidus* represented the circumpolar entity (Toman 1972). Cody (1994) followed Toman (1972) with the recognition of this infraspecific taxon at the subspecific rank.

Tussilago corymbosa, a taxon based on a plant collected from Parry's first voyage on Melville Island, was described by Brown in 1823. According to Brown, it differed from *T. frigida* in having numerous flower clusters and leaves that were "*minus alt sinuatis*" (less highly wavy). Cronquist (1955) indicates that the type is a specimen collected by Sabine on Melville Island; however, Hultén (1950) suggests that the type consists of a single leaf collected by James Ross. Three specimens of *T. corymbosa* from Captain Parry's voyage have been examined and the one specimen, collected by Sabine, which most closely resembles Brown's description is the one in which the leaf lobes are unequally toothed.

Cronquist (1946) followed Herder's (1865) treatment of *N. corymbosa* and similarly reduced *P. corymbosa* to varietal

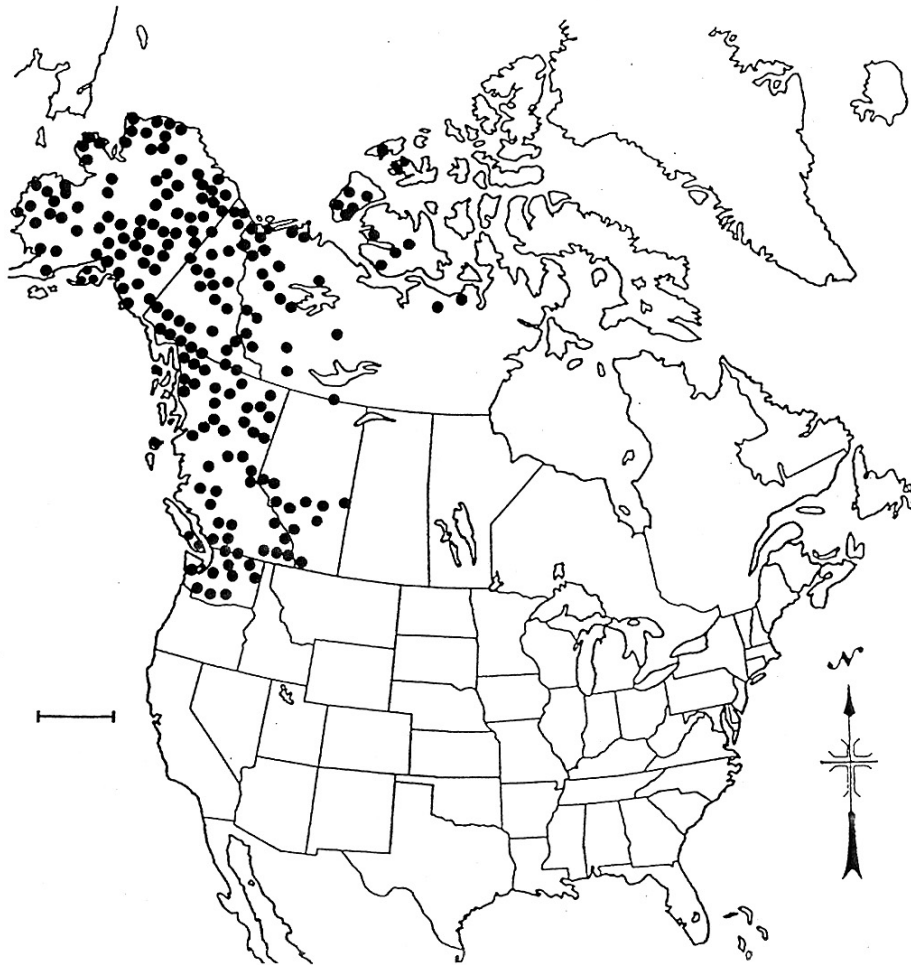
status under *P. frigidus*. Cronquist's (1946) interpretation of this taxon was based on a specimen that was questioned by Fernald, in personal correspondence (Cronquist 1946), and Hultén (1950). Apparently, Cronquist had not examined original material used by Brown and according to Hultén (1950), Cronquist's var. *corymbosa* was more representative of *P. hyperboreus* than *P. corymbosus*. After examining actual material of *T. corymbosa*, Cronquist (1953) agreed with Hultén (1950) and Fernald that he had made an error. *P. frigidus* var. *corymbosus* as Cronquist understood it, was auct. non Brown. Noting the similarity between Brown's type and *P. frigidus*, Cronquist (1953) placed *T. corymbosa* in synonymy under *P. frigidus* var. *frigidus*. He also noted the similarity between the entity in question and *P. nivalis* (= *P. hyperboreus*) and renamed the entity he had earlier referred to as *P. frigidus* var. *corymbosa* as *Petasites frigidus* (L.) Fries var. *nivalis* (Greene) Cronq. Cody (1994) continues to recognize this taxon, but as *P. frigidus* ssp. *nivalis*.

Hultén (1937) proposed a new variety of *Petasites* called *P. frigidus* var. *hyperboreoides* with a leaf form approaching that of *P. hyperboreus* but being less dissected. He postulates that forms with similar intermediate morphologies are the result of hybridization between *P. frigidus* and *P. hyperboreus* and later maintains that *P. alaskanus*, *Petasites arcticus* Porsild, and *P. frigidus* var. *nivalis*, in part, represent additional polymorphic variants of these hybrid intermediates (Hultén 1950). Hultén (1937) did not designate a type specimen for *P. frigidus* var. *hyperboreoides*, as it was not yet required by the ICBN. Cronquist (1978a) indicates that the lectotype is a specimen collected by Hultén from Kanaga Island. The location of this type specimen is not known.

Careful inspection of all of the type specimens, in combination with personal field observations of populations of *P. frigidus* var. *frigidus*, suggests that all of these specimens are of the same polymorphic entity.

DESCRIPTION: Perennial, from a creeping rhizome; basal leaves 2–25 cm long and 2.2–27.0 cm wide (Bogle 1961), blade sagittate, deltoid, reniform to cordate, margin only dentate or lobed, if only dentate, up to 22 teeth present, if lobed up to 14 primary lobes, entire or dentate, and 0–25 secondary entire or irregularly toothed lobes present, shallowly lobed or deeply parted, in extreme forms lobes with at least two lateral triangular teeth, lobes often overlapping, sinuses oblong and closed, sinuses up to 5.2 cm deep and up to 6.0 cm wide, adaxial surface tomentose, abaxial surface glabrous to woolly; staminate heads 2–20, phyllaries 3.6–10.7 mm long and 1.0–4.4 mm wide, phyllary margin entire to serrate, pappus length of ray florets as long as 7.5 mm, peripheral ray florets 1–13, rays 1.6–12.0 mm long and 0.1–3.8 mm wide, style 2.8–10.7 mm long, style branches 0.1–1.5 mm long, style texture papillose to hairy, pappus length of disc florets as long as 6.9 mm long, disc florets 16–78, corolla 2.4–6.1 mm long, corolla lobes 0.8–2.6 mm long and 0.3–4.0 mm wide, corolla lobes triangular, style 3.0–15.8 mm long, style branches 0.05–2.00 mm long, style texture papillose to hairy, anthers 0.5–2.9 mm long, anther apical appendage round to triangular; pistillate heads 5–19, phyllaries 1.7–8.8 mm long and 1.1–3.3 mm wide, phyllary margin serrate, pappus length of ray florets as long as 15 mm, ray florets 30–109, rays 0.8–4.8 mm long and 0.1 to

Fig. 1. Distribution of *Petasites frigidus* (L.) Fries var. *frigidus* in North America. Scale bar = 500 km.



1.2 mm wide, style 4.6–10.0 mm long, style branches 0.08–0.60 mm long, style texture papillose to hairy, pappus length of disc florets as long as 8.3 mm, central disc florets 1–12, corolla 0.3–6.8 mm long, corolla lobes 0.36–4.40 mm long, 0.2–0.8 mm wide, corolla lobes rounded or triangular, style 2.6–8.3 mm long, style branches 0–1.2 mm long, style texture papillose to hairy, anthers 0.4–1.5 mm long, anther apical appendage mostly triangular; cypselas up to 2.7 mm long; chromosome numbers $2n = 60$ and $3n = 90$.

HABITAT AND DISTRIBUTION: *Petasites frigidus* var. *frigidus* occurs on arctic tundra, along moist alpine and subalpine slopes, streams, in marshes, and at edges of moist *Populus*, *Picea*, and *Salix* forests, in addition to gravelly or sandy roadsides. Although commonly found at high altitudes, it also occurs at lower altitudes of approximately 1050 m (Bogle 1961).

In North America, var. *frigidus* is dominant in the western Arctic Archipelago (Banks Island, Victoria Island, Prince Patrick Island, Melville Island), St. Lawrence Island, St. Matthew Island, Aleutian Islands, St. Paul's Island, Nunivak Island, Kodiak Island, continental Alaska, Yukon, and the District of Mackenzie in the Northwest Territories. The distribution of var. *frigidus* continues southward in mountain-

ous regions in British Columbia, Alberta, and Washington (Fig. 1).

REPRESENTATIVE SPECIMENS EXAMINED: CANADA: Alberta: Banff National Park, vicinity of Sunshine Lodge south of Healy Creek, Twin Cabin Mt., A.E. Porsild and J. Lid 19684 (CAN); Banff, vicinity of Lake Louise, in boggy places along west end of Lake Agnes, A.E. Porsild and J. Lid 12864 (CAN). British Columbia: Vancouver Island, Burman Mountain, stream bed with *Mimulus*, *Epilobium*, B.W. Davies and R.A. Keller 1810 (CAN); Robb Lake, slopes on north side of lake, G.W. Argus and E. Haber 10321 (CAN); north side of lake known locally as Glacial Lake, at foot of Glacial Mountain, Cry Lake map sheet, Cassiar District, L. Donovan and C. Sienes 951 (UBC); Birch Mountain, Teresa Island, Atlin Lake, northwest slope, S. Buttrick 507 (UBC); Lake Takakia about 10 miles (1 mile = 1.609 km) south of Moresby Logging Camp (head of Cumshewa Inlet), Moresby Island (Queen Charlotte Islands), J.A. Calder and R.L. Taylor 36268 (UBC); mount northwest of Eve River, easternmost extension of Tsitika River Drainage, northeastern Vancouver Island, H. Roemer 200 (UBC); tundra at Mosquito Flats, Mile 68, Haines Highway, Haines Cut-off, L. Hamet-Ahti 567 (WIS). Northwest Territories: Queen

- Elizabeth Islands, western Melville Island, Stevens Head, S.A. Edlund 447 (CAN); St. Patrick Island, Mould Bay, moist slope of south-exposed hill, S.D. MacDonald 168 (CAN); Great Bear Lake: Scented Grass Hills Peninsula, south shore of Etacho Point, A.E. Porsild 1432 (CAN); Camp Franklin, at origin of Great Bear River, A.A. Lindsay 392 (CAN); peat bog area of Mackenzie Delta near Inuvik, s.n. (UBC - V171428). Yukon Territory: Porcupine River, 35 miles NE of Old Crow, L. Hettinger 232 (ALTA); 90 miles N.W. of Dawson City, in valley 1 mile SE of Mt. Klotz, approx. 0.5 mile below the terminal moraine, C. Greene 405 (ALTA); Ogilvie Mts., along Dempster Road, Mile 44–46, R.T. Porsild 1432 (CAN); Keno Hill, south-facing rich herb mat slopes, in wet places, R.T. Porsild 767 (CAN); Mt. Nansen, 40 miles west of Carmacks, in wet alpine tundra, R.T. Porsild 1384 (CAN); Canol Road: Granite Mountain range west of Upper Rose River, opposite Mile 95, alpine slopes and ravine from timberline (5000 ft; 1 ft = 0.305 m) to summit (6700 ft), A.E. Porsild and A.J. Breitung 10229 (CAN); Blow River, river flats behind wet delta area, S.G. Aiken and K.I. McLachlan 87–244 (CAN); Sleepy Mountain, north-facing slope, Site 3, S.G. Aiken and K.I. McLachlan 87–180 (CAN); near Bear Creek Summit (Mile 1028), ca. 3000 ft., W.B. Schofield and H.A. Crum 7894 (UBC); Lapie Lakes, in willows, K. Beamish, D. Krause, and J. Luitjens 681353 (WIS); mountain slopes east of the mouth of Slim's River, Kluane Lake, wet turf in alpine snow flush, H.M. and L.G. Raup 12567 (WS). U.S.A.: Alaska: Near Wiseman, woodlands, R. Brockman 25 (ALA); Livengood Quad: Wickersham Dome burn, on fireline (Line VI), in wet peat, on bank at edge of fireline, A. Batten 76–134 (ALA); Mt. Michelson Quad.: Kavik River headwaters, S. Keller 1162 (ALA); Fairbanks Quad.: Killarney Lake, in white spruce grove near lake, G.W. Argus 741 (ALA); Nushagak Bay Quad.: Walrus Islands, Round Island, J. Sherburne s.n. (ALA); Juneau, J.P. Anderson 6423 (ALA); Chugach National Forest, Upper Paradise Lake 1.5 miles N.W. of upper end of lake, E. Helmstetter 80–200 (ALA); Endicott Mts. of Brooks Range: Arrigetch Creek Valley, wet basin of cirque, D.J. Cooper 1080 (ALA); Ketchikan Quad.: Upper Wilson Arm – Smeaton Bay Area, meadow, D.E. Bramlet 165 (ALA); edge of *Sphagnum* bog, on bench below Telavirak Hills, ca. 150–200 ft, ca. 2 miles south of Ogotoruk Creek, J.G. Packer 2038 (ALTA); Barrow, U.S.G.S. T23N:R17W, Site 2 area, 25 yards (1 yard = 0.914 m) south of power pole line, 5.4 poles in from road, G. McPherson and M. Galeski 72–246 (ALTA); Swampy place, Mt. McKinley Park, Dutilly, Lepage, and O'Neill 20160 (CAN); McCarthy Quad: vicinity of the Guerin Glacier Terminus, upper White River valley, D.F. Murray 2138 (CAN); St. Matthew Island, Bering Sea District, well drained mesic meadow on gentle southeast-facing slope, "Camp Lake" valley, V.L. Harms 5362 (CAN); St. Lawrence Island, Bering Sea, arctic tundra, vicinity of Boxer Bay, E.G. Franz Sauer s.n. (WIS); Arctic Research Laboratory, Point Barrow, M. Shields s.n. (WIS); Kodiak Island, from top of ridge on west side of Three Saints Bay near mount, B.H. Nybakken 1046 (WIS); Thompson Pass, Chugach Mts., Mile 25.2 Richardson Highway, in montane tundra, L. Hamet-Ahti 567 (WIS); Falls Creek Mine near Kenai Lake, Kenai Peninsula, J.A. Calder 6087 (WS);
- Port San Juan, Evans Island, wet alpine, W.J. Eyerdam 7050 (WS); Eshamy, 24 miles SE of Whittier, Prince William Sound, common in patches along small streams on Sadde Peak, north exposure, J.D. Solf 66 (WS). Washington: Cascade Mts., J.M. Grant s.n. (WIS); Chehalis Co.: Baldy Park, F.H. Lamb 1356 (WS); Whatcom Co.: grassy stream bank, 4200 ft, Twin Lakes, H. St. John 8887 (WS); James Lake, Mt. Rainier, 4370 ft, W.T. Shaw s.n. (WS-62941).
- Petasites frigidus* (L.) Fries var. *palmatus* (Ait.) Cronq., *Rhodora* 48: 124. 1946.
- Tussilago palmata* W.T. Aiton. Hort. Kew 3: 188. 1789. *Nardosmia palmata* (Ait.) Hook., *Flora Bor. Am.* 1: 308. 1833. *Nardosmia hookeriana* Nutt., *Trans. Am. Philos. Soc.* II. 7: 288. 1840; *nom. illegit. Nardosmia frigida* var. *palmata* (Ait.) Herder, *Bull. Soc. Nat. Mosc.* 38: 372. 1865. *Petasites palmatus* (Ait.) A. Gray, *Bot. Geol. Surv. Calif.* 1: 407. 1876. *Petasites hookerianus* (Nutt.) Rydb., *N. Am. Flora* 34: 214. 1927; *nom. illegit. Petasites palmatus* ssp. *palmatus*, *Folia Geobot. Phytotax. Praha* 7: 390. 1972. *Petasites frigidus* ssp. *palmatus* (Ait.) Cody, *Can. Field-Nat.* 108: 94. 1994.
- TYPE: "Croque, Nfld." (*vide* label), 1766, Banks s.n.
- HOLOTYPE: BM-000201!
- Nardosmia speciosa* Nutt., *Trans. Am. Phil. Soc.* II. 7: 288. 1840. *Petasites speciosus* (Nutt.) Piper, *Mazama* 2: 97. 1901. *Petasites palmatus* ssp. *speciosus* (Nutt.) Toman, *Folia Geobot. Phytotaxon. Praha* 7: 391. 1972.
- TYPE: "forests of Columbia and Wahlemet" (*vide* label), s.n.
- LECTOTYPE (designated here): BM-000200!
- Petasites arcticus* A.E. Porsild, *Sargentia* 4: 74. 1943. *Petasites frigidus* subsp. *arcticus* (A.E. Porsild) Cody, *Can. Field-Nat.* 108: 94. 1994.
- TYPE: "Mackenzie River Delta: East Branch, lat. 68°40'N in wet clay of shady ravines. June 26, 1932. A. E. Porsild 6515."
- HOLOTYPE: CAN-10866!
- PARATYPES: CAN-108867! (Coll. No. 7349); CAN-108868! (Coll. No. 6952); CAN-108869! (Coll. No. 3058); CAN-108870! (Coll. No. 7208).
- TYPE MATERIAL AND NOTES ABOUT SYNONYMY: This taxon is sufficiently characterized by the presence of 5–11 palmately divided lobes. Nevertheless, numerous segregates based on slight differences in leaf morphology have been proposed. *Petasites frigidus* var. *palmatus* was first described as *T. palmata* based on a specimen collected at Croque, Nfld., by Banks.
- Nuttall (1840) described two segregates of *N. palmata*. *Nardosmia speciosa* was based on a specimen from Oregon that partly reflected *N. palmata* but was "a larger plant, with the leaves more numerously lobed, and not so deeply cleft" (Nuttall 1840). The morphological variability expressed by

this segregate is within the confines of *Petasites frigidus* var. *palmatus*. However, Nuttall's (1840) segregate, *N. hookeriana*, is illegitimate. Nuttall (1840) considered it to be synonymous with the legitimate *N. palmata*; therefore, *N. hookeriana* is a superfluous name. Since the name *Petasites hookerianus* (Nutt.) Rydberg is based on *N. hookeriana*, it too is illegitimate.

Porsild (1943) described *P. arcticus* for the supposed endemic species of *Petasites* in the Mackenzie Delta region and Richardson and Mackenzie mountains. Distinguishing features of this taxon included glabrous leaves, highly dissected lobes, and deep sinuses. Such characters are hardly constant, as was noted by Hooker (1833), when he stated that the leaves become "perfectly glabrous" with age. Cody (1994), however, continues to recognize this taxon as a subspecies of *P. frigidus*.

Cronquist (1946) followed Herder's (1865) circumscription and made the new combination *Petasites frigidus* var. *palmatus* (Ait.) Cronq. Cronquist (1946) placed the above mentioned segregates, excluding *P. arcticus*, in synonymy under this variety and later added *P. arcticus* to his list (Cronquist 1978a).

After comparing all the type specimens and from personal observations of morphological leaf variation in natural populations we interpreted the slight diversity of leaf form to be within the natural variation of the group.

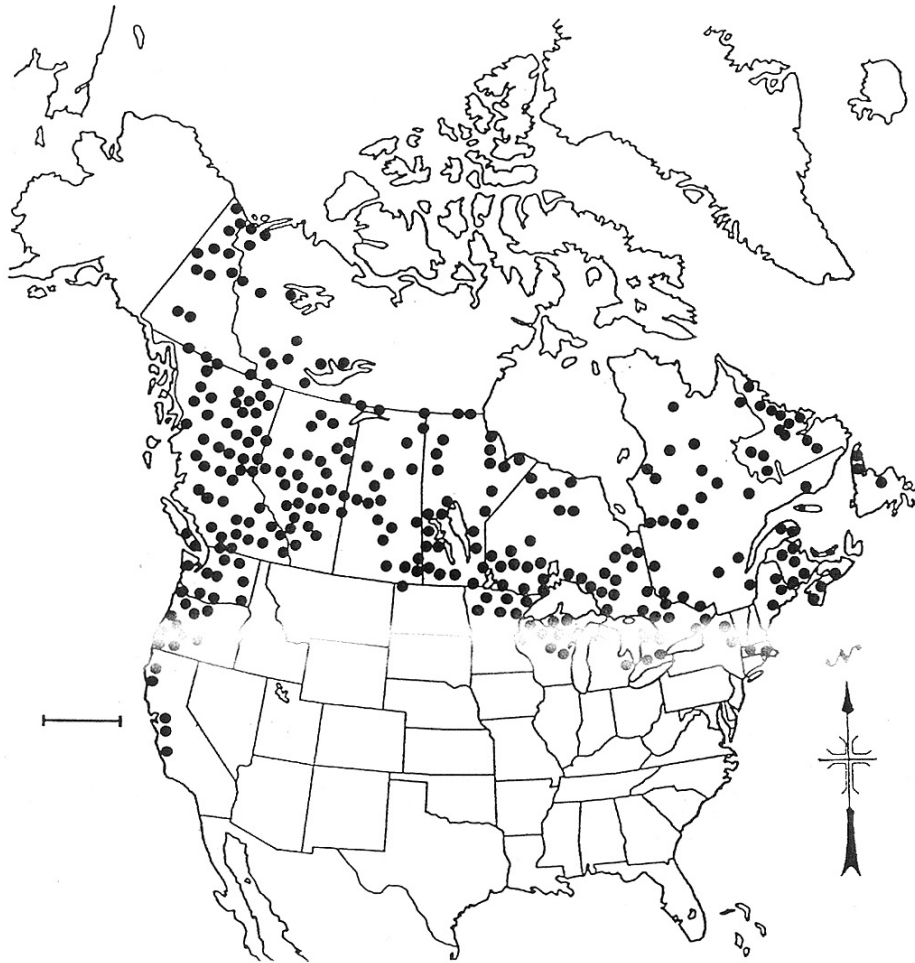
DESCRIPTION: Perennial, from a creeping rhizome; basal leaves 2–40 cm long and 3.9–50.0 cm wide, blade orbicular, deeply cordate to reniform, margins palmately lobed with 5–11 primary lobes, lobes may be cleft almost to center (western specimens are usually larger and are divided only about half way to the base), up to 13 secondary lobes present in larger specimens, lobes entire to dentate with up to 52 teeth, sinuses up 8.9 cm deep, up to 2.1 cm wide, adaxial surface glabrous to pillose, abaxial surface glabrous to tomentose; staminate heads 4–32, phyllaries 5.7–12.8 mm long and 1.5–3.7 mm wide, phyllary margin entire to serrate, pappus length of ray florets as long as 6.3 mm, peripheral ray florets 5–70, rays 0–6.3 mm long and up to 5.0 mm wide, style 1.5–10.3 mm long, style branches 0.1–0.6 mm long, style texture papillose, pappus length of disc florets as long as 8.3 mm, disc florets 11–60, corolla 2.6–4.8 mm long, corolla lobes 0.7–3.8 mm long and 0.3–1.0 mm wide, corolla lobes rounded or triangular, style 5.7–23.0 mm long, style branches 0.01–1.67 mm long, style texture papillose to hairy, anthers 0.04–4.16 mm long, anther apical appendage round to triangular; pistillate heads 8–42, phyllaries 1.0–9.5 mm long and 0.7–2.7 mm wide, phyllary margin completely entire or serrate, pappus length of ray florets as long as 11.8 mm, ray florets 51–125, rays 0–6.3 mm long and up to 0.8 mm wide, style 1.8–9.6 mm long, style branches 0.06–0.80 mm long, style texture papillose, pappus of disc florets up to 6.9 mm long, central disc florets 1–5, corolla 2.0–3.8 mm long, corolla lobes 0.5–2.9 mm long, 0.2–0.6 mm wide, corolla lobes rounded or triangular, style 1.9–8.3 mm long, style branches 0–0.8 mm long, style texture papillose to hairy, anthers 0.7–1.5 mm long, anther apical appendage rounded or triangular; cypselas up to 3.5 mm long; chromosome number $2n = 60$.

HABITAT AND DISTRIBUTION: *Petasites frigidus* var. *palmatus* inhabits moist clay, shale, or sandy soils of disturbed sites, such as road cuts, embankments, stream banks, and roadsides. It also is found commonly in moist woods, fens, and swamps, and has been found growing in relatively dry, gravel roadsides in the Yukon and Northwest Territories.

Petasites frigidus var. *palmatus* is the most widely distributed taxon of *Petasites* across Canada and the northern United States, and it occurs at the most southern latitudes and lowest altitudes of all taxa. It is absent from Alaska and arctic Canada but ranges from the northwestern Yukon Territory to the western District of Mackenzie south to British Columbia and across all provinces of Canada. In the United States, its range extends southward to Maine, Massachusetts, and New York in the east and continues westward to Michigan, Wisconsin, Minnesota, Washington, Oregon, and as far south as Monterey County, California (Fig. 2).

REPRESENTATIVE SPECIMENS EXAMINED: CANADA: Alberta: Thickets along road near McMurray, *H.M. Raup and J.H. Soper 9055* (ALA); Wet place in woods with a northern exposure, bank of Fish Creek, opposite Burnside picnic grounds, about 10 miles S of Calgary, *W.C. McCalla 10464* (ALTA); Goodwin Lake: northwestern tip of lake, ca. 65 miles N of mouth of Owl River on N side of Lac la Biche, Twp. 74, R11–12 - W4thM, *M.G. Dumais and G.G. Rankin 1403* (ALTA); Cold Lake: French Bay E of peninsula along the Alberta–Saskatchewan border Twp. 63, R1 - W4thM, *M.G. Dumais and G.G. Rankin 1220* (ALTA); aspen woods, Pine Lake, *H.M. Raup 3404* (CAN); Slave Lake District, Prairie Creek, low damp spots in forest, *A.H. Brinkman 4130* (US). British Columbia: Vicinity of Baden River, *H.M. Raup and D.S. Correl 10031* (ALA); Mile 612, Alaska Hwy., E of Lower Post, alt. 2000 ft, *J.A. Calder and J.M. Gillett 24474* (ALA); ca. 1 mile N. of Indian Head Mt. Viewpoint, km 572 of the Alaska Hwy., roadside clearcut and ditch, *L. Marvin 2233* (ALA); in leaf mold beneath alder thickets, valley of Kicking Horse River, near Mt. Stephen, Yoho National Park, *W.C. McCalla 9273* (ALTA); Upper Peak Lake, just west of Peak Lake, NW side of lake in wet spruce forest, *J.M. Gillett and M. Boudreau 17712* (CAN); Robb Lake, slopes on north side of lake, *G.W. Argus and E. Haber 10186* (CAN); Priestly, low places in sandy aspen woods, *T.M.C. Taylor and W.H. Lewis 379* (UBC); Spanish Banks, Vancouver, *J.W. Eastham s.n.* (UBC - 6501); Salmon River, 15 miles N of Prince George *J.W. Eastham s.n.* (UBC - 11706). Manitoba: Nueltin Lake, below falls of Thlewiaza River out of Nahili Lake, wet black spruce woods, *W.K.W. Baldwin 2281* (CAN); Assiniboine Rapids, in swamps and bogs, *J. Macoun 14673* (CAN); Head River Lake, *M. and J. Bryant s.n.* (UBC - 86964); Cochrane River, willow–alder thicket, *W.K.W. Baldwin 2112* (WU). New Brunswick: Westmorland County: Salisbury, swamp area, *E.C. Smith, W.J. Curry, R.E. Clattenburg, and A.C. MacDonald 18757* (CAN); Moncton, damp woods, *H.J. Scoggan 12155* (CAN). Newfoundland: Makkovik, *Dutilly, O'Neil, and Duman 3-8-39* (CAN); Labrador: Twin Falls, *I. Hustich 80* (CAN); Labrador: Nain, wet spruce woods, *H. Bishop 597* (CAN); Labrador: Goose Bay, Alexander Lake area, sandy-gravel roadside, *J.M. Gillett and W.I. Findlay 5086*

Fig. 2. Distribution of *Petasites frigidus* (L.) Fries var. *palmatus* (Ait.) Cronq. in North America. Scale bar = 500 km.



(UBC). Northwest Territories: Mackenzie River Delta: Reindeer Station, rare in shade of *Alnus* and *Salix* on middle slope of Caribou Hills, W.J. Cody and D.H. Ferguson 10017 (TOPOTYPE) (ALA); Mackenzie Lowlands: Liard River Valley, Fort Liard, W.W. Jeffrey 181 (CAN); Mackenzie Delta: Kittigazuit, J. Robertson 102 (CAN); Yellowknife, road to airport, moist sand of broad roadside ditch, W.J. Cody and J.B. McCause 3264 (CAN); East side of Canoe Lake, J. Lambert and D. Morrison 65070303 (UBC). Nova Scotia: Shelburne County: swampy woods, east side of Clyde River, A.R. Prince and C.E. Atwood 1278 (WIS). Ontario: Thunder Bay District: S side of Expressway, 1 mile E of Hodder Ave., McGregor Twp., moist low springy area along small stream, C.E. Garton 11388 (CAN); Cochrane District: Hearst, 8 miles northwest of Hanlan Township, clearing in spruce–poplar woods, W.K.W. Baldwin 5634 (CAN); Kenora District: Windigo Lake, east side of lake along Hwy. 599, west side of road, A. Vogg 1496 (CAN); Ojibway Provincial Park: near Sioux Lookout, mesic spruce–fir upland, R. Anderson s.n. (WIS); 18 miles S of Red Lake on Hwy. 105, old growth *Picea* forest, M.J. Lechowicz and W.M. Post III, s.n. (WIS). Prince Edward Island: Prince County: Alberton, wet woods,

M.L. Fernald and H. St. John 8238 (CAN); Brackley Point, swamps and bogs, J. Macoun 16,661 (CAN). Quebec: Opinaca Lake Quad.: Eastman River, 42 miles E of East Main, Forestry Sv. Locality No. 145, *Picea mariana* (Mill.) BSP, feather-moss forest on a marine clay terrace above the river, stand No. 149-P, G.W. Argus 9273 (CAN); Morhiban Lake, Mecatina, I. Hustich 1162 (CAN); Morin Heights, Frère Marie-Victorin and R. Germain 70065 (WS). Saskatchewan: Wallwort, moist ground, A.J. Breitung 401 (CAN). Yukon Territory: cut-over, lodgepole pine (*Pinus contorta* Dougl. ex Loud) woods, at Mile 740.5 Alaska Hwy., S.L. Welsh and G. Moore 7573 (ALA); Watson Lake, J.P. Anderson and R.G. Brown 9939 (CAN); Dempster Highway at Eagle Plains, exposed area around motel, V.E. McNeilus 87–693 (US); Watson Lake, 2 miles E of the town centre, Alaska Hwy. Mile 632, by public campground, L. Hamet-Ahti 1355 (WIS); Rancheria, Alaska Hwy. 710, J.P. Anderson 10413 (WS). U.S.A.: California: Santa Clara County: Alma, C.F. Baker 371 (UBC); Monterey County: Santa Lucia Mountains, R.A. Plaskett 31 (US); Mendocino County: Round Valley, alt. 440 m, V.K. Chestnut 222 (US); Santa Cruz County: About 0.5 mile S of Glenwood along Bean Creek, alt. about 880 ft, moist shaded area along creek

in redwood (*Sequoia sempervirens* (D. Don) Endl.) – Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) region, *J.W. Thomas 1441* (US). Minnesota: Cook County: toward east end, south shore of Mountain Lake, Twp. R2E, *F.K. Butters, G.W. Burns, and M.J. Hendrickson 60* (US); St. Louis County: Highland, *E.P. Sheldou s.n.* (WS - 29025); Itasca Park, *R.W. Dawson s.n.* (WS - 257905). New York: Canton, *O.P. Phelps 1017* (CAN). Oregon: Coos County: in moist, shaded ravine, above Hwy. 42, SW of Remote, *A.N. Steward 6023* (UBC); Columbia County: railway embankment, 5 miles E of St. Helens, *J.W. Thompson 4003* (US); Lincoln County: Cape Perpetua, near Hwy. 101, wet roadcut, *A.N. Steward 6646* (WS). Washington: Mt. Baker, Glacier Creek Rd., rocky roadside, *F. Vrugtman 1669* (UBC); Kittitas County: along banks of Swauk Creek near Liberty, Wenatchee Mts., *J. W. Thompson 14503* (UBC); Kittitas County: Liberty, Swauk Creek District, in wet clay soil, *J. Eyerdam 1502* (WIS); Clallam County: head of trail to Cape Flattery, roadside, pacific rainforest, *G. Hart 285* (WS); King County: along high water bank of Big Creek, *A.R. Kruckeburg 2929* (WS). Wisconsin: Ashland County: Apostle Islands, Michigan Island, *G. Cottam and R.J. Vogl 518* (WIS); Bayfield County: Lake Superior region near Drummond, *L.S. Cherry 4237* (WIS); Oconto County: (T.29N; R.18E; Sect. 27) N.W. of S.W., Town of Maple Valley, *E.J. Judziewicz 1803* (WIS).

***Petasites frigidus* (L.) Fries var. *sagittatus* (Banks ex Pursh) Cherniawsky, comb. et stat.nov.**

Tussilago sagittata Banks ex Pursh, *Flora Am.* Sept. 531. 1814. *Nardosmia sagittata* (Banks ex Pursh) Hook., *Flora Bor. Am.* 1: 307. 1833. *Petasites sagittatus* (Banks ex Pursh) A. Gray, *Bot. Geol. Surv. Calif.* 1: 406–407. 1876.

TYPE: "Hudson's Bay near Fort Albany" (*vide* label), 1781, *Hutchinson s.n.*

HOLOTYPE: BM-000202!

Petasites dentatus Blankinship, *Mont. Agr. Coll. Stud.* I: 102. 1905.

TYPE: "Columbia Falls" (*vide* label), June 5, 1893, *R.S. Williams 344*.

LECTOTYPE (designated here): MONT!

ISOLECTOTYPES: NY!, US-287952!

TYPE MATERIAL AND NOTES ABOUT SYNONYMY: *Tussilago sagittata*, the manuscript name of Banks, was validly published by Pursh (1814) and is based on the specimen collected by Hutchinson at Hudson's Bay. Pursh (1814) described the leaves as being "interrimis" (absolutely entire) which coincides with the type specimen; however, it is in discordance with Hooker's (1833) description for his new combination *Nardosmia sagittata* (1833) which he described as a plant having dentate leaf margins.

Gray (1876) later transferred the genus *Nardosmia* to *Petasites* and his circumscription of this taxon included *T. sagittata* and *N. sagittata*.

Blankinship (1905) proposed the segregate *P. dentata* to include those forms with dentate leaf margins. This name was later synonymized with *P. sagittatus* by Rydberg (1927).

From our personal observations of individual plants which possess leaves with both entire and dentate leaf margins, we believe that *P. sagittatus* and *P. dentata* are convarietal. A new combination and status is proposed to include this taxon as an infraspecific variant of *P. frigidus*: *P. frigidus* var. *sagittatus*.

DESCRIPTION: Perennial, from a creeping rhizome; basal leaves 1.9–34.0 cm long and 1.5–30.0 cm wide, blade sagittate, spade-shaped, deltoid to cordate, apices acute to obtuse, margins entire to wavy to dentate with up to 60 teeth, not lobed, adaxial surface glabrous to tomentose, abaxial surface villous to extremely woolly; staminate heads 8–35, phyllaries 6.2–9.8 mm long and 1.3–3.3 mm wide, phyllary margin entire to serrate, pappus length of ray florets as long as 6.3 mm, peripheral ray florets 4–19, rays 1.1–7.7 mm long and 0.9–4.4 mm wide, style 4.3–8.7 mm long, style branches 0.01–0.48 mm long, style texture papillose to hairy, pappus length of disc florets as long as 6 mm, disc florets 22–56, corolla 0.4–4.6 mm long, corolla lobes 1.2–2.2 mm long and 0.3–3.0 mm wide, corolla lobes triangular, style 5.6–14.0 mm long, style branches 0.5–2.3 mm long, style texture hairy, anthers 1.4–3.8 mm long, anther apical appendage triangular; pistillate heads 6–34, phyllaries 3.8–8.5 mm long and 1.0–3.1 mm wide, phyllary margin serrate. pappus length of ray florets as long as 17.3 mm, ray florets 31–139, rays 0.6–5.4 mm long and 0.1–0.8 mm wide, style 3.9–9.8 mm long, style branches 0.1–0.4 mm long, style texture papillose, pappus length of disc florets as long as 11.3 mm, central disc florets 1–5, corolla 1.6–3.8 mm long, corolla lobes 0.4–1.8 mm long and 0.2–0.6 mm wide, corolla lobes triangular or intermediate between rounded and triangular, style 1.2–9.2 mm long, style branches 0.3–1.3 mm long, style texture hairy, anthers 0.7–1.3 mm long, anther apical appendage round or triangular; cypselas up to 2.8 mm long; chromosome number $2n = 60$.

HABITAT AND DISTRIBUTION: *Petasites frigidus* var. *sagittatus* thrives under wet conditions. Many plants grow in shallow standing water and in bogs, fens, marshes, marshy tundra, alluvial flats, and along moist roadsides and disturbed sites, such as clearcuts. *Petasites frigidus* var. *sagittatus* also grows in association with var. *palmatus* and *P. frigidus* var. *vitifolius* in moist woods and forest edges. It has been observed growing at elevations as high as 3000 m (Bogle 1961). The geographical range of *P. frigidus* var. *sagittatus* parallels that of var. *palmatus*, although it extends into Alaska but not into California. Its distribution includes Alaska, the Yukon, the District of Mackenzie to Hudson's Bay, Quebec, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia and continues southward to northeastern Washington, northern Idaho, Montana, Wyoming, Colorado, North Dakota, South Dakota, northern Minnesota, northern Wisconsin, and northern Michigan (Fig. 3).

REPRESENTATIVE SPECIMENS EXAMINED: CANADA: Alberta: Border of tamarack bog, south of Hondo, *E.H. Moss 9006* (ALTA); shore of small lake in muskeg, Caribou Mt., S

Fig. 3. Distribution of *Petasites frigidus* (L.) Fries var. *sagittatus* (Banks ex Pursh) Cherniawsky in North America. Scale bar = 500 km.



slope, *E.H. Moss* 9372; Mercoal, *E.J. Woollven*, s.n. (ALTA - 18468); Walk from Nicholl's Creek to Elkwater Lake, Cypress Hills Prov. Park, *R.G.H. Cormack* 84 (ALTA); ditch 0.5 mile E of Fort Saskatchewan, *G.H. Turner* M.D. 1644 (UBC). British Columbia: Vicinity of Baden River, *H.M. Raup and D.S. Correl* 10029 (ALA); Fort St. John, roadside ditch, *J.M. Gillett and D.A. Mitchell* 3022 (UBC); wet meadow along 192 Rd. (road to Pink Mt. Summit) ca. 0.5 km from Jct. with Alaska Hwy. at village of Pink Mt., *G.B. Straley and K.W. Nicholls* 6208 (UBC); Marsh, Stikine River basin, north end of Eddontenajon Lake, *W. Gorman* 514 (UBC); 20 miles by road NW of Houston along road to Smithers, *J.A. Calder, D.B.O. Savile and J.M. Ferguson* 15276 (US); Manson Creek Village, N of Fort St. James, alt. 3300', *J.A. Calder, D.B. Savile, and J. Ferguson* 13677 (WS). Manitoba: Woods Polish Grid, WNRE Control Area, *T. Campbell* C96 (ALTA); York Factory: clearings by Hudson's Bay post in Silurian formation, *H.J. Scoggan* 5935 (CAN); Fort Churchill, wet, calcareous soil in open white spruce (*Picea glauca* (Moench) Voss) forest, *J.C. Ritchie* 1650 (CAN); 1 mile S. of Minnedosa, wet margin of pot-hole, *W.H. Kiel Sr.* 86 (WIS); Cape Merry, 0.25 mile S of

the mouth of the Churchill River, N of Churchill, *B. Alverson* 896 (WIS); Churchill District, Gillam, *W.B. Schofield* 902 (WS). Northwest Territories: base of Caribou Hills, East Channel of Mackenzie River about 15 miles NW of Reindeer Station, *W.J. Cody and D.H. Ferguson* 9723 (ALA); District of Mackenzie, Mile 84 of Mackenzie Hwy., *S.S. Talbot* 2186 (ALTA); Mackenzie Bison Sanctuary, *D.L. Smith* 87-47 (ALTA); west side of Bathurst Inlet: in willow thicket near shore of second lake, *J.P. Kelsall and E.H. McEwan* 267 (CAN); Aklavik, elev. 25 ft, *V.J. Krajina* s.n. (UBC - 196443); Wood Buffalo Park, Mackenzie Basin, base of eastern slope of Caribou Mts., grassy slough, *H.M. Raup* 3420 (US); Fort Smith region, in transition areas between the sedge depressions and drier, elevated ridges, *G.B. Kolenosky* 200 (WIS). Ontario: vicinity of the mouth of the Niskibi River, wet turfy margin of small tundra pool about 0.25 mi inland, *D.R. Moir* 2319 (CAN). Quebec: Fort Chimo area, sandy area at camp, in moist depression, *B. Boivin* 2267 (US). Saskatchewan: Candle Lake, *J.W. Eastham* s.n. (UBC - 108420); Cypress Hills, below beaver dam on Boiler Trail, *A.C. Budd and K.F. Best* 2619 (WIS). Yukon Territory: Dezadeash Quad.: Haines Cutoff

Hwy., 148 miles from Haines, in pond, *Juneau Botanical Club 130* (ALA); Mile 667 of Alaska Hwy., willow – black spruce muskeg, *S.L. Welsh and G. Moore 7480* (ALA); vicinity of Halfway Lake: north of Mayo, elev. 2300 ft, lakeshores and swampy flats, *R.T. Porsild 494B* (CAN). U.S.A.: Alaska: Fairbanks Quad.: College, College Ave. and Farmer's Loop Rd., open boggy area, *P. Rutledge 105* (ALA); Small Lake, east side of lake shore, *S. Shelter 854* (ALA); Big Delta Quad.: Salcha River, 12 km up the river from the bridge at Mile 323.1, Richardson Hwy., *J.R. Grant 88-114* (ALA); Big Delta Quad.: Shaw Creek Flats, lake at NE corner, in sedge peat in wet sedge meadow at lake outlet, *A.R. Batten, G.P. Juday, and A.D. McGuire 85-9* (ALA); Gakona, *J.P. Anderson 8619* (CAN). Colorado: banks of Clear Creek, *H.N. Patterson 27835* (WIS). Michigan: Schoolcraft Co.: growing in grass-sedge swale with alder and bog birch, ca. 9.5 miles E of Shingleton, *D. Henson 1814* (WIS). Montana: Bozeman, *J.W. Blankinship s.n.* (US - 668712). North Dakota: Bottineau Co.: in wet depression, at edge of woods, near Lake Metigoshe, Turtle Mts., *V.E. Rudd 677* (US). Washington: Pend Oreille Co.: wet meadows, near Pee Wee Falls, NW 1/4 Sec. 22, T40N, R43EWM, 2500 ft, *E.F. Laysler 606* (WS); Okanogan Co.: wet meadow near Wauconda Summit, alt. 3500 ft, *J.W. Thompson 8641* (WS); Spokane Co.: Latah Creek, *W.N. Suksdorf 12876* (WS); Ferry Co.: Kelete Range, Colville Nat. Forest, Thirteen Mile Area, marshy ponds at headwaters of Thirteen Mile Creek, 35N R33E Sen 1/4 Sec. 25, elev. 4150 ft, *P.M. Anderson and C.R. Annable 4338* (WS). Wyoming: NW corner of Sheep Mt. along Wyo. Hwy. 11, 1.9 miles SW of Wyo. Hwy. 130, R77W, T15N, SE 1/4 Sec. 8, locally abundant in partial shade in a marsh with *Carex, Salix, Betula, Alnus,* and *Populus tremuloides* Michx., elev. 7900 ft, *B.E. Nelson and L. Nelson 1207* (CAN); Albany Co.: in a swamp, Pole Mt. region, elev. 8300 ft, *C.L. Porter 4186* (US); Pole Creek, *A. Nelson 81* (WS).

***Petasites frigidus* (L.) Fries var. *xvitifolius* (Greene) Cherniawsky, comb. et stat.nov.**

Petasites palmatus (Aiton) A. Gray var. *frigidus* Macoun, Cat. Can. Plants III. 553. 1886.

TYPE: Kicking Horse Lake, B.C., *J. Macoun*.

LECTOTYPE: NY!

ISOLECTOTYPES: US-1401796!; CAN-108728!

SYNTYPE: CAN-108664!

Petasites trigonophyllus Greene, Leafl. Bot. Observ. Crit. 1: 180. 1906.

TYPE: Minnesota, "wet meadows, very local. N.P. Junction, Carlton Co." (*fide* label), June 11, 1891, *J.H. Sandberg 155a*.

LECTOTYPE (designated here): US-45058!

Petasites vitifolius Greene, Leafl. Bot. Observ. Crit. 1: 180. 1906. *Petasites xvitifolius* (Greene) Bogle, Rhodora 70:

548. 1968. *Petasites nivalis* subsp. *vitifolius* (Greene) Toman, Folia Geobot. Phytotaxon. Praha 7: 390. 1972.

TYPE: "Emerson, Man." (*fide* label), June 10, 1880, *John Macoun s.n.*

HOLOTYPE: US-219559!

ISOTYPE: CAN-108757!

Petasites warrenii St. John, Res. Stud. State Coll. Wash. 1: 109. 1929.

TYPE: "wet soil along Swauk Creek near Liberty, Kittitas County" (*fide* label), June 11, 1927, *F.A. Warren 542*.

LECTOTYPE: WS-46229!

ISOLECTOTYPES: WS-46254!; US-1651369!

PARATYPES: WS-46291!; WS-46227!

TYPE MATERIAL AND NOTES ABOUT SYNONYMY: Plants designated by this name previously have been recognized as different species and infraspecific taxa of *Petasites*. Macoun (1886) was the first person to recognize this plant as an intermediate between *P. frigidus* var. *palmatus* and *P. frigidus* var. *sagittatus*, and considered it to be a variety of *P. palmatus*, subsequently naming it *P. palmatus* var. *frigidus*.

Later, Greene (1906) named two new taxa, *P. vitifolius* and *P. trigonophyllus*, in the same publication; however, the type specimens of these plants exhibit a high degree of similarity. The latter type specimen was designated as a lectotype instead of the holotype because the specimen lacks flowering heads, which are mentioned in the original description. It appears that Greene (1906) based his concept of this taxon on more than one specimen; however, it is certain that the specimen chosen as the lectotype was of the original material used by him.

Petasites warrenii was the name published for those plants with a limited distribution in Swauk Creek, Washington. The type of this taxon closely resembles types of *P. vitifolius* and *P. trigonophyllus*.

Despite the striking similarity of these plants, they were not recognized as one taxon. Cronquist (1953) placed *P. palmatus* var. *frigidus*, *P. vitifolius*, and *P. trigonophyllus* in synonymy with *P. frigidus* var. *nivalis* and included *P. warrenii* with *P. frigidus* var. *frigidus*. Bogle (1968) finally united all of these similar forms under one name.

Through artificial crosses, Bogle (1961) provided evidence that these plants are the products of hybridization between *P. frigidus* var. *palmatus* and var. *sagittatus* (*P. sagittatus* sensu Bogle). He discovered that not only interbreeding occurs between these two taxa but backcrossing to the parental taxa occurs as well. Furthermore, all of these hybrid entities were shown to produce viable pollen (Bogle 1968). Bogle (1968) concluded that these plants represent phases of a large polymorphic group originating in hybridization between *P. frigidus* var. *palmatus* and var. *sagittatus*. He proposed the binomial *Petasites xvitifolius* Greene (pro sp.) to include the forms of this group. The epithet "vitifolius" had priority over "trigonophyllus" because the

Fig. 4. Distribution of *Petasites frigidus* (L.) Fries var. *xvitifolius* (Greene) Cherniawsky in North America. Scale bar = 500 km.



first time these two taxa of equal priority were united as one by Rydberg (1927), he chose *P. vitifolius* as the correct name. This is in accordance with the rules of the ICBN (Greuter 1994). Although Toman (1972) acknowledged Bogle's (1968) work, he recognized this hybrid taxon as a subspecies of *P. nivalis* and named this subspecies *Petasites nivalis* Greene ssp. *vitifolius* (Greene) Toman.

To accommodate the new status and new name of one of the parental species (*P. frigidus* var. *sagittatus*) of this hybrid, the new combination *P. frigidus* var. *xvitifolius* is proposed.

DESCRIPTION: Perennial, from a creeping rhizome; basal leaves 1.9–43.0 cm long and 3.5–47.0 cm wide, blade reniform to deltoid or mostly broadly cordate, widest at base with edges convex-curved, 4–14 shallow triangular primary lobes, 0–11 secondary lobes, lobes entire to dentate with up to 44 teeth; sinuses up to 6.9 cm deep, up to 7.0 cm wide, adaxial surface glabrous to tomentose, abaxial surface glabrous to woolly; staminate heads 3–32, phyllaries 6.1–10.3 mm long and 1.8–9.6 mm wide, phyllary margin entire to serrate, pappus length of ray florets as long as 5.2 mm, peripheral ray florets 2–27, rays 2.1–7.8 mm long, 0.8–

3.5 mm wide, style 4.2–8.3 mm long, style branches 0.14–0.40 mm long, style texture papillose to hairy, pappus length of disc florets as long as 6.3 mm, disc florets 16–40, corolla 2.8–9.8 mm long, corolla lobes 1.2–2.3 mm long and 0.4–1.0 mm wide, corolla lobes triangular, style 5.7–11.8 mm long, style branches 0.4–1.4 mm long, style texture papillose to hairy, anthers 1.2–2.6 mm long, anther apical appendage triangular; pistillate heads 9–34, phyllaries 3.9–6.8 mm long and 1.08–2.70 mm wide, phyllary margin entire to serrate, pappus length of ray florets as long as 7 mm, ray florets 48–89, rays 0.8–2.5 mm long and 0.2–0.7 mm wide, style 5.1–7.5 mm long, style branches 0.1–0.3 mm long, style texture papillose, pappus length of disc florets as long as 15 mm, central disc florets 1–4, corolla 2.2–3.0 mm long, corolla lobes 0.8–2.0 mm long and 0.2–0.7 mm wide, corolla lobes triangular, style 2.0–6.9 mm long, style branches 0.3–1.2 mm long, style texture papillose to hairy, anthers 0.8–1.3 mm long, anther apical appendage rounded to triangular; cypselas up to 1.7 mm long; chromosome number $2n = 60$.

Bogle (1961) indicates that many juvenile forms of *P. frigidus* var. *xvitifolius* closely resemble the forms of *P. frigidus* var. *frigidus* which exhibit the least divided foliage.

As the blade enlarges in these plants, the teeth expand to form lobes.

HABITAT AND DISTRIBUTION: *Petasites frigidus* var. *xvitifolius* frequently grows in association with its parental species, *P. frigidus* var. *palmatus* and var. *sagittatus*, in wooded habitats of var. *palmatus* or wet, marshy conditions preferred by var. *sagittatus*.

The geographical range of this hybrid is somewhat more extensive than the zone of sympatry of its parental taxa, var. *palmatus* and var. *sagittatus*, but is less extensive than either parent. Its distribution extends from the southeastern Yukon, the southwestern District of Mackenzie, British Columbia, the prairie provinces of Canada, Ontario, central Quebec, Labrador, and south to northern Michigan, northern Wisconsin, northern Minnesota, and Washington (Fig. 4).

REPRESENTATIVE SPECIMENS EXAMINED: CANADA: Alberta: Banff, among willows of flats of Spray River, *W.C. McCalla* 9192 (ALTA); wet place in woods with a northern exposure, bank of Fish Creek, opposite Burnside picnic grounds, about 10 miles S of Calgary, *W.C. McCalla* 10463 (ALTA); edge of stream in woods above Elkwater Lake, Cypress Hills, *W.C. McCalla* 3704 (ALTA); edge of bog 5 miles E and 4 miles N of Fort Saskatchewan, *G.H. Turner M.D.* 4364 (ALTA); Edmonton, border of small slough, river valley, *E.H. Moss* 4219 (ALTA); balsam poplar (*Populus balsamea* (L.) Mill.) woods near Clive and Ponoka, *E.H. Moss* 2006 (ALTA); Crimson Lake, just W of Provincial Park, NW of Rocky Mountain House, *M.G. Dumais and K. Anderson* 2104 (ALTA); 5 miles E of Jasper Park Boundary along the David Thompson Highway, wet ditch by edge of woods, *M.G. Dumais and K. Anderson* 2225 (ALTA); Pembina River: at campsite on Nordegg–Hinton forestry roads, damp conifer woods by the river, *M.G. Dumais and K. Anderson* 2321 (ALTA); Jasper National Park: vicinity of Jasper town, moist, shaded woods along Athabasca River, *A.E. Porsild and A.J. Breitung* 14455 (CAN); muskeg of Mosser Lake Ranger Sta., *H.M. Raup* 3409 (CAN); Banff National Park: Bow River Valley, Buffalo prairie between Cascade and Rundle Mts., moist, shaded places in aspen forest, elev. 4500 ft, *A.E. Porsild and A.J. Breitung* 12363 (CAN); swampy ground, just inside Alberta boundary from Kootenay Valley, B.C., *W.C. McCalla* 9560 (UBC); poplar woods, 4 miles E of Fort Saskatchewan, *G.H. Turner M.D.* 4514 (UBC); Slave Lake District, near Martin Cabin, low-lying spot near creek, *A.H. Brinkman* 4524 (US); White Mud Creek, near Edmonton, low place in poplar woods, *E.H. Moss* 4264 (WIS). British Columbia: Fort St. John, spruce woods, *E.H. Moss* 2355 (ALTA); W side of Klappan River, 1 km N of BCR access road, Stikine River area, 793–854 m, *W. Gorman* 1019 (UBC); low woods, SE of camp near Mt. Stephen, Yoho National Park, *W.C. McCalla* 9336 (UBC); Maxhamish Lake, alt. 1345 ft, *R.M. Annas, V.J. Krajina, and R.G. McMinn* s.n. (UBC - 160161). Manitoba: Emerson, *J. Macoun* s.n. (HOLOTYPE) (US - 219559); Wasagaming, Proven Lake, Rolling River, woods beside river, alluvium, edge of aspen poplar, *W.K.W. Baldwin* 10891 (CAN); Riding Mountain National Park: aspen – white spruce woods by Moon Lake, *H.J. Scoggan and W.K.W. Baldwin* 7399 (CAN); Norway House, off north end of Lake Winnipeg: woods near Hud-

son's Bay Co. post, *H.J. Scoggan* 4278 (CAN); Brandon, swamp near the Equipment Farm, *J. Macoun* 12467 (CAN); Gilbert Plains, Tp. 25–22 W.L., wooded bog, *J.L. Parker* 2319 (CAN). Newfoundland: Labrador: Seaplane Cove, Kangalaksiorvik Fjord, *J. Schwedland* s.n. (CAN - 500269). Northwest Territories: Wood Buffalo Park, Mackenzie Basin, base of eastern slope of Caribou Mountains, timbered muskeg, *H.M. Raup* 3410 (CAN). Ontario: Winisk, Hudson Bay Lowlands, in willow thicket, *W.K.W. Baldwin* 7442 (CAN). Quebec: Gaspé Co.: Table Top Mt., alpine meadows, alt. 900–1100 m, *M.L. Fernald and J.F. Collins* 259 (US); Chimo, in deep grass sod, and in sand, *J.M. Gillett* 5054 (US). Saskatchewan: Tisdale, *A.J. Breitung* 1794 (ALTA); 4.5 miles W of McKague, moist aspen woods, *A.J. Breitung* 556 (CAN). U.S.A.: Michigan: Schoolcraft Co.: growing in grass–sedge swale, E1/2 Sec 35 T46N-R16W ca. 9.5 miles E of Shingleton, *D. Henson* 1815 (WIS). Minnesota: Clearwater Co.: Itasca Park, tamarack forest, road to Bear Point, *J.B. Moyle* 948 (WIS). Washington: Kittitas Co.: wet soil along Swauk Creek near Liberty, *F.A. Warren* 542 (LECTOTYPE) (WS); Kittitas Co.: edge of marsh on Ellensburg–Liberty highway, 15 miles S of Liberty, *C.L. Hitchcock and V.L. Marsh* 3283 (WS).

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