

Alpine Plant Range Extensions for Northern British Columbia, Including Two Species New to the Province

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Between 2002 and 2011, we collected vascular plants from alpine areas of northern British Columbia (B.C.). We have found one species that has not previously been collected in the province: *Phippsia algida*. Collections of an additional three species represent significant range extensions of species already known to occur in the province: *Aphragmus eschscholtzianus*, *Papaver alboroseum*, and *Montia bostockii*. Our collections of *Delphinium brachycentrum* initially appeared to be the first records for the province; however, examination of herbarium specimens at the Royal British Columbia Museum herbarium indicated that this species had been collected prior to our field work but had been misidentified. We indicate the distribution of this species in B.C. for the first time, and we present a corrected distribution map for *Tephroseris yukonensis* that includes our own collections.

Key Words: alpine vascular plants, new records, range extensions, *Tephroseris yukonensis*, *Phippsia algida*, *Delphinium brachycentrum*, *Aphragmus eschscholtzianus*, *Papaver alboroseum*, *Montia bostockii*, British Columbia.

Collections of the alpine flora of northern British Columbia have been limited because of poor access and rugged terrain. To improve our understanding of the distribution of alpine species, we carried out systematic sampling of vascular plants on 65 mountains or high plateaus between the years 2002 and 2011 (Figure 1). At each site, we spent one to three days collecting all vascular plants within each distinct habitat type, from the upper krummholz zone to the high alpine nival zone. We acquired more than 10 000 specimens representing approximately 440 species. These are deposited in the herbarium of the Royal British Columbia Museum (V) (herbarium acronyms follow Thiers 2011*).

In this paper, we report two new species for the province, significant range extensions for three species, a corrected distribution map for a sixth species, and brief comments about smaller range extensions for four species. We present the North American distribution of these species based on specimens from the following herbaria: University of Alaska Museum of the North in Fairbanks (ALA), the University of Alberta (ALTA), the B. A. Bennett Herbarium, Yukon Government (BABY), the National Herbarium of Canada at the Canadian Museum of Nature (CAN), the National Collection of Vascular Plants at Agriculture and Agri-Food Canada (DAO), the Prince Rupert Forest Region of the B.C. Ministry of Forests in Smithers (SMI), the University of British Columbia (UBC), the University of Calgary (UAC), the University of Victoria (UVIC), the

Royal British Columbia Museum (V), and the Burke Museum of Natural History and Culture at the University of Washington (WTU). These distribution maps include recent collections in addition to our own that have not been presented on previously published floras of Alaska (Hultén 1968), Yukon (Cody 2000), or B.C. (Douglas et al. 2002b). With the exception of *Phippsia algida*, whose range extends outside western North America, these maps present the entire known distribution of these species in North America. The data, including nomenclature of associated species, for each specimen that is cited below is repeated as it appears on the label itself.

Asteraceae

Tephroseris yukonensis (A. E. Porsild) Holub (Yukon Groundsel) — BRITISH COLUMBIA: Teslin Plateau, Llangorse Mountain W side of summit area, occasional in hygric-mesic alpine turf meadow on block field talus, organic soil, W-facing 0–10 degree upper slope, with *Salix polaris*, *Carex microchaeta*, *Luzula* sp., 59°23'57"N, 132°48'35"W, 1820 m, 8 August 2008, K. Marr, R. Hebda, W. MacKenzie 08-1373 (V 203992); Cassiar Mountains, Dease Plateau, N end Horseranch Range, W side, uncommon in mesic alpine gravel and silt scree among blocks shattered by frost, 59°28'35"N, 128°54'20"W, 1920 m, 6 August 2004, K. Marr, R. Hebda, W. MacKenzie, A. Banner 04-1104 (V 193214); Stikine Ranges, slopes E of "Little Blue Sheep" Lake, nearly level alpine meadows near summit, granitic

bedrock, with thick lichens, *Carex microchaeta*, *Hierochloa alpina*, *Salix stolonifera*, *Antennaria monocephala*, 58°43'17"N, 128°13'48"W, 1992 m, 12 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1676 (V 202011).

According to Douglas et al. (2002a) and Cody (2000), *Tephrosieris yukonensis* (syn. *Senecio yukonensis* A. E. Porsild) is endemic to B.C., Yukon, the western Northwest Territories, and Alaska; however, the occurrences in the Northwest Territories and B.C. were evidently overlooked by Barkley and Murray (2006). Based on the key and descriptions in Barkley and Murray (2006), five species of *Tephrosieris* that bear four or fewer heads occur in northwestern North America, and we used this treatment to identify *T. yukonensis*. Involucral hairs are yellow in *T. yukonensis*, whereas they are white or white with purple cross-walls in *Tephrosieris frigida* (Richardson) Holub, *Tephrosieris tundricola* (Tolmatchew) Holub, and *Tephrosieris lindstroemii* (Ostenfeld) Å. Löve and D. Löve. Involucral hairs of *Tephrosieris kjellmanii* (A. E. Porsild) Holub are distinctly brown as compared to the above species. All of the specimens at V that we have identified as *T. yukonensis* appear to lack ray flowers; however, these flowers are actually present, but the strap is very short, nearly as short as the adjacent phyllaries.

Our work to document the range of this species (Figure 2a) corrects the distribution maps of Douglas et al. (2002a and 2002b). *Tephrosieris yukonensis* does not occur as far south as these maps indicate because the southernmost record is an error based upon the wrong coordinates for one if not two specimens (a difference of approximately 300 km). According to the label of K. I. Beamish and J. Pojar 730435 (UBC V145162, DAO 208382), the plant was collected from "Table Mt., Cassiar area" with the coordinates as 56°N and 126°W. This location is far south of the town site of Cassiar at 59°17'N, 129°50'W, and J. Pojar (personal communication) has confirmed that the "Table Mt." referred to on the label is near Cassiar.

The label of a second specimen at V (17874) lacks geographical coordinates, but states the following: "Cambrey Mt., A. G. Slocombe, 8 July 1945". No such location exists in either printed or online gazetteers, although there is a "Cambria Peak" at 56°03'N, 129°43'W. However, other specimens collected by A. G. Slocombe on that date come from the Alaska Highway in the vicinity of 59°59'N, 131°32'W. Therefore, it is most likely that the "Cambrey Mt." referred to on the label is along the Alaska Highway.

After correcting for the above two records, our collections extend the range of *Tephrosieris yukonensis* approximately 100 km south of previous collections and document the presence of this species in the Cassiar Mountains of north-central B.C. There are also previous collections from the Liard Plateau and northwestern B.C.

Brassicaceae

Aphragmus eschscholtzianus Andr. ex DC. (Aleutian Cress) — BRITISH COLUMBIA: Cassiar Mountains, Stikine Ranges, Mount Shea, in valley approximately 2 km S of summit, alpine hydric seep meadow, organic soil > 10 cm, W-facing 0–10 degree slope, 58°18'41"N, 128°56'28"W, 1818 m, 9 August 2007, K. Marr, R. Hebda 07-1316 (V 201317); Stikine Ranges, gentle slopes 4 km NE of "Little Blue Sheep" Lake, mossy alpine rivulet on cobbles, SE-facing 0–5 degree upper slope, with *Poa alpina*, *Saxifraga nelsoniana*, and *Eriophorum*, 58°44'37"N, 128°12'49"W, 1836 m, 13 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1782 (V 202067); Stikine Ranges, Cassiar Mountains, eastern part of Spatsizi Plateau between 2 small, 1 km long lakes, 13 km S of Pitman River, uncommon in alpine hydric-mesic alpine meadow, lower slope, NW-facing 0–10 degree mossy runnel with *Salix reticulata*, *Claytonia sarmentosa*, *Carex podocarpa*, *Corydalis pauciflora*, *Polygonum viviparum*, 57°51'44"N, 127°55'46"W, 1623 m, 22 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0242 (V 204869).

Aphragmus eschscholtzianus is an amphiberian species occurring in B.C., Yukon, Alaska, and eastern Russia. It is considered to be rare in B.C. (Douglas et al. 2002a). Plants somewhat resemble *Cardamine bellidifolia* L., with their low stature (less than 5 cm tall) and petiolate basal leaves, as well as habitat preference. They differ in that the fruit of *A. eschscholtzianus* is shorter and more elliptical and the inflorescence is immediately subtended by a few leaves, whereas in *C. bellidifolia* the fruit is linear and the flowering stalk is naked.

We have added three new locations for north-central B.C. (Figure 2b) approximately 420 km southeast of the previous single collection from the "Haines Triangle" (Tatshenshini-Alsek Park in the northwestern corner of B.C.). The single collection from the Brooks Range, Alaska, far from other collections, has been verified by Jordan Metzgar (personal communication). Al-Shehbaz (2010) did not record the species for B.C.

Papaveraceae

Papaver alboroseum Hult. (Pale Poppy) — BRITISH COLUMBIA: Nass River, Mount Beirnes, along SW ridge 1 km S of peak, rare on alpine scree, SW-facing 10–35 degree upper slope, soil of sand and gravel from shale, less than 10 cm, wind exposed, with *Polemonium* and *Trisetum*, 56°57'42"N, 128°33'30"W, 1977 m, 29 July 2005, K. Marr, R. Hebda, W. MacKenzie 05-0360 (V 194657); Nass River, Mount Beirnes, along SW ridge 1 km S of peak, rare, E-facing sparsely vegetated alpine scree, 10–35 degree slope, mesic-hygic silty soil on sedimentary rocks, with *Potentilla diversifolia*, *Poa alpina*, *Artemisia norvegica*, *Oxyria*, *Myosotis*, 56°57'09"N, 128°32'46"W, 1771 m, 29 July 2005, K. Marr, R. Hebda, W. MacKenzie 05-0253 (V 194605); Skeena Mountains, Spatsizi Plateau, NW of

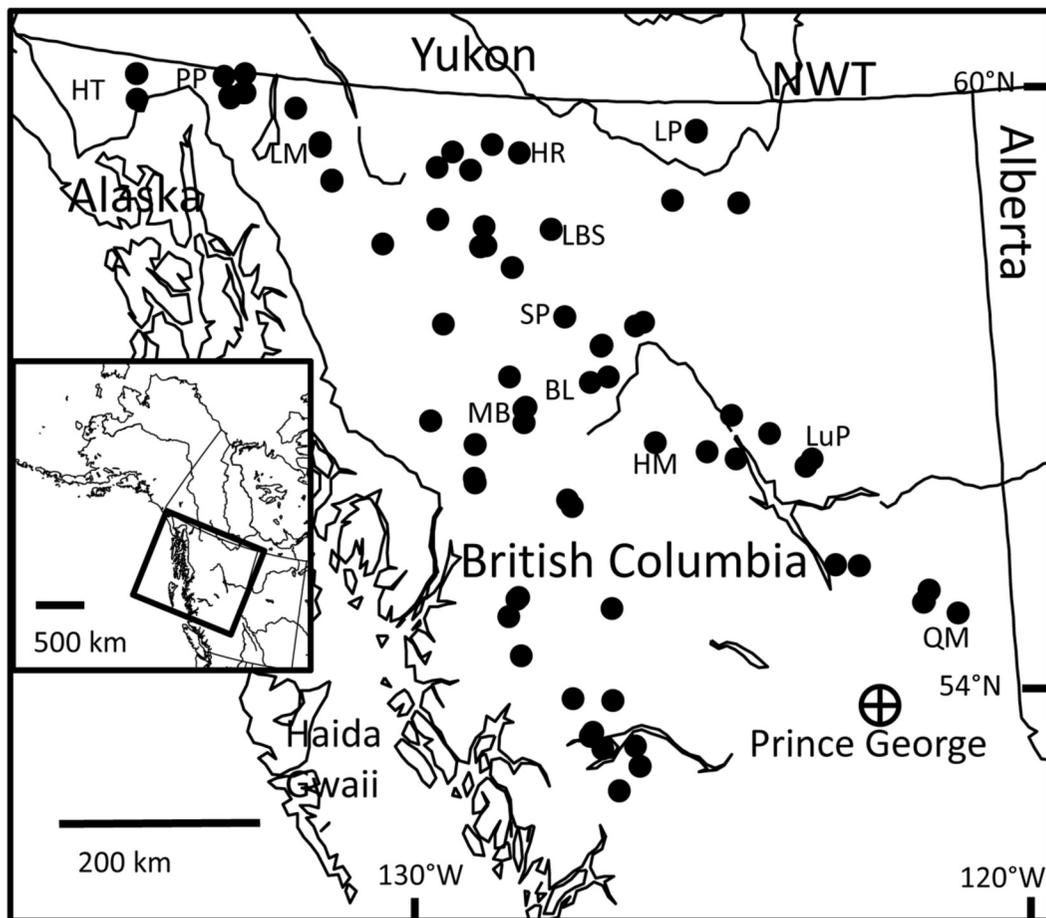


FIGURE 1. Alpine plant collection localities in northern British Columbia, 2002–2011. Selected locations noted in text abbreviated as follows: BL, Brothers Lake; HM, Hogem Mountains; HR, Horseranch Range; HT, Haines Triangle; LBS, Little Blue Sheep Lake; LM, Llangorse Mountain; LP, Liard Plateau; LuP, Ludington Peak; MB, Mount Beirnes; PP, Paddy Pass; QM, Quintette Mine; SP, Spatsizi Plateau.

Brothers Lake, mesic-xeric sparsely vegetated alpine fine scree, late snow, silty soil with gravel and boulders, N-facing 10–35 degree mid-slope, sliding, with *Myosotis asiatica*, *Silene acaulis*, *Artemisia norvegica*, *Luzula spicata*, *Oxyria digyna*, 57°13'23"N, 127°25'50"W, 1950 m, 26 July 2009, K. Marr, Hebda, Richard, W. MacKenzie 09-0770 (V 205481); Omineca Mtns., Hogem Ranges, massif W of Two-Mile Cr., 10–20 degree NE-facing upper slope, sparsely vegetated alpine sedimentary fine scree 0–15 cm deep over bedrock with *Oxyria*, *Ranunculus eschscholtzii*, *Carex pyrenaica*, *Epilobium anagallidifolium*, *Saxifraga nelsoniana*, 56°41'06.0"N, 127°00'05.7"W, 1847 m, August 19, 2011, K. Marr; R. Hebda, N. Hebda 11-715 (207187).

Papaver alboroseum occurs in B.C., Yukon, Alaska, and far eastern Russia, including Kamchatka (Kiger and Murray 1997). It is easily recognized by its white petals—unique among B.C. *Papaver*—that yellow to-

wards the base and the decumbent habit (Figure 3a). This species is rare and was previously known from only three locations within B.C. (Douglas 2002a) (Figure 2c). We have added three additional locations. In addition to the Brothers Lake population noted above, we also noted a population on the southeastern side of the lake (57°08'46.4"N, 127°21'06.2"W, 1928 m, on 27 July 2009), but did not collect a specimen.

Despite our widespread and comprehensive collecting, this species occurs in only a cluster of locations in north-central B.C. to date. This cluster is approximately 420 km from the nearest locality to the northwest and may represent a genuine disjunct distribution. The area near these southern collections is poorly surveyed, and additional populations may be expected. The habitat for this species appears to be quite specific and is restricted to high-elevation, unstable, fine-textured sedimentary scree. The persistence of *Papaver alboroseum* in these sites may be dependent upon the instability of

the substrate. This instability prevents other species from becoming established and overtopping *P. alboroseum*, a nearly prostrate plant whose flowers typically are decumbent, resting upon the ground.

Poaceae

Phippsia algida (Soland.) R.Br. (Icegrass) — BRITISH COLUMBIA: Level Mountain Range, Meszah Peak, rounded plateau surface on mountain 2 km S of summit, uncommon, on sparsely vegetated, mesic NW-facing alpine scree/gravel 10-degree mid-slope, soil less than 10 cm deep, 58°27'49"N, 131°26'03"W, 1933 m, 2 August 2004, R. Hebda, K. Marr, W. MacKenzie 04-0593 (V 192155); Level Mountain Range, Meszah Peak, small valley 2 km S of summit, occasional in an alpine, level fen in valley bottom, with *Petasites*, *Ranunculus*, organic, silty, hygric soil less than 10 cm deep, 58°28'24"N, 131°26'52"W, 1881 m, 2 August 2004, R. Hebda, K. Marr, W. MacKenzie 04-0621 (V 192157); Nimbus Mountain, SW of summit, low cover and rare in level, mesic-hygric, gravelly edge of alpine fen meadow, organic soil > 10 cm on gravel, with *Carex*, *Aconitum delphinifolium*, *Polemonium*, mosses, 59°02'16"N, 132°31'18"W, 1637 m, 6 August 2008, K. Marr, R. Hebda, W. MacKenzie 08-1180 (V 203806); Nimbus Mountain, N of summit, occasional in hygric, alpine rivulet below melting snow, 0–10 degree N-facing mid-slope, fine soil, with *Poa alpina*, mosses, 59°02'29"N, 132°30'23"W, 1853 m, 6 August 2008, K. Marr, R. Hebda, W. MacKenzie 08-1199 (V 203816); Mount Brown, 2 km W of summit, SW of "Lanning Lake", moss covered alpine seep, N-facing 0–5 degree lower slope, with *Oxyria digyna*, *Poa paucispicula*, *Ranunculus pygmaeus*, 59°48'07"N, 134°27'32"W, 1536 m, 4 August 2008, K. Marr, R. Hebda, W. MacKenzie 08-0959 (V 203670); Teslin Plateau, Llangorse Mountain, S of summit, occasional in hygric-mesic alpine runnel meadow below melting snow, granitic soil amidst stone stripes, 20 degree, W-facing, mid-slope, with mosses, lichens, *Poa*, 59°22'53"N, 132°48'30"W, 1572 m, 8 August 2008, K. Marr, R. Hebda 08-1414b (V 204033); Teslin Plateau, Llangorse Mountain, NW of summit, low cover but frequent in hygric-hydric alpine late snow meadow on wet granite cobbles/gravel, level at base of slope, with *Saxifraga ferruginea* and mosses, subject to freeze-thaw, 59°24'11"N, 132°49'09"W, 1717 m, 8 August 2008, K. Marr, R. Hebda 08-1378 (V 203997); Cassiar Mountains, Stikine Ranges, Mount Shea, in valley approximately 2 km S of summit, uncommon in alpine hydric seep meadow, organic soil greater than 10 cm, W-facing 0–10 degree slope, 58°18'41"N, 128°56'28"W, 1818 m, 9 August 2007, K. Marr, R. Hebda 07-1314 (V 201315); Stikine Ranges, gentle slopes 4 km NE of "Little Blue Sheep" Lake, mossy alpine rivulet on cobbles with flowing water, SE-facing 0–5 degree upper slope, with *Poa alpina*, *Saxifraga nelsoniana*, and *Eriophorum* (single head), 58°44'33"N,

128°12'49"W, 1886 m, 31 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1781 (V 202066); Stikine Ranges, slopes of peak north of "Little Blue Sheep" Lake, uncommon in level mesic-xeric alpine summit on shattered rock surface subject to cryoturbation, limestone gravel less than 10 cm, 58°45'07"N, 128°13'12"W, 2105 m, 11 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1607 (V 201952); Stikine Ranges, gentle slopes NE of "Little Blue Sheep" Lake, hygric alpine rivulet at base of E-facing late snow melt hollow, on limestone, possibly metamorphosed, with *Saxifraga lyallii*, *Poa alpina*, mosses, 58°43'46"N, 128°14'19"W, 1703 m, 13 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1770 (V 202060); Stikine Ranges, slopes north of "Little Blue Sheep" Lake, low cover but frequent on limestone gravel of alpine late snow slope, 10–20 degree NE-facing upper slope, 0–2 cm organic soil, with *Saxifraga lyallii*, 58°44'27"N, 128°14'47"W, 1871 m, 11 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1519 (V 201811); French Range, W of Dease Lake, Mount Rath, S of summit, low cover in alpine gravel bar subject to flooding, N-facing, 1–2 degree slope, 58°43'40"N, 130°24'38"W, 1662 m, 10 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1440 (V 201562); Cassiar Mountains, Stikine Ranges, Mount Shea, approximately 1 km S of summit, alpine hygric-hydric, gentle N-facing seep meadow subject to flooding, with *Ranunculus*, *Caltha leptosepala*, *Petasites frigidus*, 58°18'55"N, 128°56'34"W, 1816 m, 9 August 2007, K. Marr, R. Hebda, 07-1241 (V 201243); Cassiar Mountains, Stikine Ranges, Mount Shea, approximately 1 km S of summit, uncommon in runnels of alpine, level, mesic-hygric turf meadow over angular gravel/boulders, with lichens, mosses, *Festuca altaica* tussocks with scattered *Cassiope tetragona*, 58°19'06"N, 128°56'42"W, 1860 m, 9 August 2007, K. Marr, R. Hebda, 07-1231 (V 201236); Stikine Ranges, Cassiar Mountains, Spatsizi Plateau, eastern part of plateau, between 2 small 1 km long lakes 13 km S of Pitman R., low cover and rare, level alpine hygric-hydric meadow at edge of lake, organic soil with gravel, subject to flooding, with *Salix reticulata*, 57°51'15"N, 127°55'43"W, 1606 m, 22 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0176 (V 204839); Stikine Ranges, Cassiar Mountains, Spatsizi Plateau, eastern part of plateau, above 1 km long lake 13 km S of Pitman R., low cover and rare in alpine snow-melt seep in standing or gently flowing water, level bench on ridge top, with mosses, *Claytonia sarmentosa*, *Salix polaris*, 57°51'06"N, 127°52'54"W, 1946 m, 22 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0264 (V 204883); Skeena Mountains, Spatsizi Plateau, Brothers Lake, NW of lake, low cover and rare in hygric, alpine meadow subject to flooding at edge of pond, S-facing, mid-slope, muddy, ephemeral, with *Koenigia islandica*, *Phippsia algida*, *Eriophorum*, *Ranunculus eschscholtzii*, 57°13'16"N, 127°26'34"W, 1935 m, 26 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0838 (V 205551);

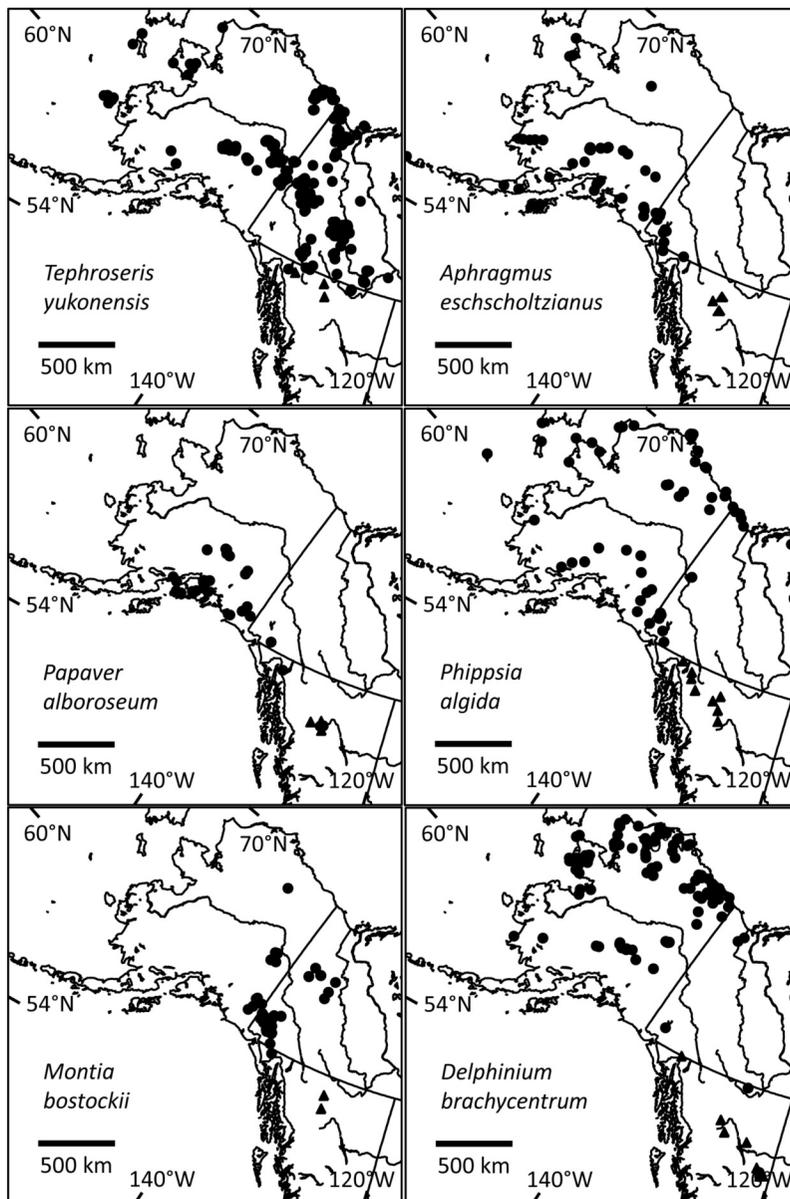


FIGURE 2. Species discussed in the text collected between 2002 and 2011 and deposited at the Royal British Columbia Museum herbarium. Triangles represent collections made by Marr, Hebda, and MacKenzie (MHM); circles represent collections made by other collectors.

Skeena Mountains, Spatsizi Plateau, Brothers Lake, NW of lake, alpine fine scree, S-facing, 10–35 degrees, upper slope and ridge apex, 57°13'30"N, 127°28'W, 2000 m, 26 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0856 (V 205570).

Phippsia algida occurs throughout the circumpolar Arctic (Consaul and Aiken 2007; Hultén 1968). It is a diminutive plant, often less than 2 cm tall, with

relatively narrow leaves, and it is easy to overlook. One species of similar habitats is *Poa paucispicula* Scribn. and Merr., from which *Phippsia algida* differs in having a more compact panicle with more rigid branches and a single floret per spikelet rather than two or more. Both *Phippsia* and *Poa* have prow-like leaf tips that are easily discerned by running a leaf between thumb and finger and noting whether the tip splits in two.

Phippsia algida is not listed in the comprehensive Illustrated Flora of B.C., where it is given as an "excluded species" (Douglas et al. 2001). Citing Taylor and MacBryde (1977), Douglas et al. (1981) reported it as "rare in British Columbia." However, we have not found any specimens that were collected prior to our 2004 collection from northwestern B.C. in the Level Mountain Range. We have since collected it from nine locations (Figure 2d) in B.C. west of the Rocky Mountain Trench to as far south as Brothers Lake (57°13'16"N), a southward range extension, with localities in between, of approximately 630 km from the nearest previous collections, in southwestern Yukon. This species is one of several arctic-alpine plants with a disjunct distribution that includes northern B.C., the Beartooth Plateau (on the Montana-Wyoming border just east of Yellowstone), and northern Colorado (Marr et al., *in press*)

Portulacaceae

Montia bostockii (Porsild) Welsh (Bostock's Minerslettuce) — BRITISH COLUMBIA: Stikine Ranges, gentle slopes 4 km NE of "Little Blue Sheep" Lake, mesic alpine S-facing thick turf meadow, 10–35 degree mid-slope, metamorphosed limestone gravel and cobbles, with *Salix reticulata*, cryptogams, *Dryas integrifolia*, *Carex*, *Polygonum viviparum*, *Potentilla biflora*, 58°44'37"N, 128°12'49"W, 1836 m, 13 August 2007, K. Marr, R. Hebda, W. MacKenzie 07-1784 (V 202068); Stikine Ranges, Cassiar Mountains, eastern part of Spatsizi Plateau, NE of small lake 10 km S of Pitman R., uncommon, S-facing, lower slope 0–10 degrees, meadow patches and gravel runnels among *Betula nana*–*Pentaphylloides*, with *Sphagnum*, *Artemisia norvegica*, *Festuca altaica*, *Salix reticulata*, *Senecio triangularis*, *Sanguisorba canadensis*, *Polygonum viviparum*, 57°53'10"N, 127°57'40"W, 1394 m, 21 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-0085 (V 204773).

Montia bostockii is endemic to northern B.C., Yukon, and eastern Alaska (Miller 2003). It is considered to be rare in B.C. (Douglas 2002a). Other Portulacaceae species also occur in alpine habitats; however, these all belong to *Claytonia*, a genus with opposite stem leaves, whereas those of *Montia* are alternate. Our two collections extend the range to the south and east by approximately 600 km from the previous single B.C. location, in the Haines Triangle (Figure 2e).

Ranunculaceae

Delphinium brachycentrum Ledebour (syn. *Delphinium chamissonis* Pritzl ex Walpers) (Northern Larkspur) — BRITISH COLUMBIA: Rocky Mountain Foothills, Roman Mountain, 5 km WNW of Quintette Mountain, S of Babcock Creek, occasional in alpine meadow heath with *Empetrum nigrum*, *Cassiope* sp. and cryptogams, weakly terraced NE-facing mid-slope, less than 10 degrees, soil 1–10 cm deep

cryptogamic humus on gravel and conglomerate outcrops, 54°53'13"N, 120°56'56"W, 1692 m, 11 August 2003, R. Hebda, K. Marr, R. Forsyth, KM5492 (V 191306); Rocky Mountain Foothills, saddle 2 km WSW of Mt. Spieker summit, in a SE-facing upper sub-alpine mesic meadow with rivulets, beside road, disturbed by digging, mid-slope, 10–35 degrees, *Abies lasiocarpa*, *Picea engelmannii* forest with *Artemisia norvegica*, *Poa* sp., *Trisetum spicatum*, *Epilobium angustifolium*, 55°07'21"N, 121°25'30"W, 1700 m, 12 August 2003, R. Hebda, K. Marr, R. Forsyth KM5675 (V 191032); Rocky Mountains, Mount Ludington, next major ridge to the W, rare on S-facing 10 degree slope near top of ridge, mesic to xeric rocky alpine meadow with *Dryas*, soil gravelly, less than 1 cm deep, 56°28'14"N, 123°23'24"W, 1915 m, 6 August 2003, R. Hebda, K. Marr, W. MacKenzie, R. Forsyth KM4681 (V 191285); Paddy Pass, E of Bennett Lake, peak on plateau 7–8 km N of pass, uncommon in xeric, alpine S-facing, 10–35 degree rocky slope, with *Saxifraga bronchialis*, *Carex*, *Poa*, *Potentilla*, organic soil 0–5 cm, 59°56'03"N, 134°51'46"W, 1789 m, 1 August 2008, K. Marr, R. Hebda, W. MacKenzie 08-0433 (V 203428); Omineca Mountains, Samuel Black Range, Sable Mine area, 6–8 km N of Black Lake, mesic alpine *Festuca altaica* meadow, greater than 10 cm organic soil on limestone bedrock, 0–10 degree SW-facing mid-slope, with *Salix stolonifera*, *Erigeron peregrinus*, *Artemisia norvegica*, *Myosotis asiatica*, 57°17'10"N, 127°06'50"W, 1756 m, 29 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-1174 (V 205901); Omineca Mountains, Swannell Ranges, N of Johanson Lake, valley and slopes at SE end of Wrede Range, mesic alpine *Festuca altaica*–*Salix arctica* meadow, less than 10 cm organic soil on gravel boulder till, W-facing mid-slope; with *Artemisia norvegica*, *Pedicularis bracteosa*, *Juniperus communis*, 56°38'13"N, 126°12'35"W, 1750 m, 30 July 2009, K. Marr, R. Hebda, W. MacKenzie 09-1218 (V 205952).

Delphinium brachycentrum is an amphiberian species (Cody 2000) that has not previously been reported to occur in B.C.; however, at least three specimens at V (V078288, V094471, V089553) that were initially identified as *D. glaucum* S. Wats. have now been identified as *D. brachycentrum*. Our collections, together with those previously determined as *D. glaucum*, constitute a major range extension southward into the Rocky Mountains (Figure 2f). The southernmost collection is approximately 1200 km south of the nearest previously known locality, in the Yukon, where it is considered to be rare (Cody 2000).

In B.C., the distribution of two other species of *Delphinium*—*Delphinium glaucum* (throughout B.C. east of the coastal ranges) and *Delphinium glareosum* Greene (southwestern B.C. only)—includes alpine habitats (Douglas and Meidinger 1999). *Delphinium glareosum* is glabrous, whereas *D. brachycentrum* is pubescent (Warnock 1997). Compared to *D. glaucum*, *D. brachycentrum* is a smaller plant 20–50(–80) cm tall,

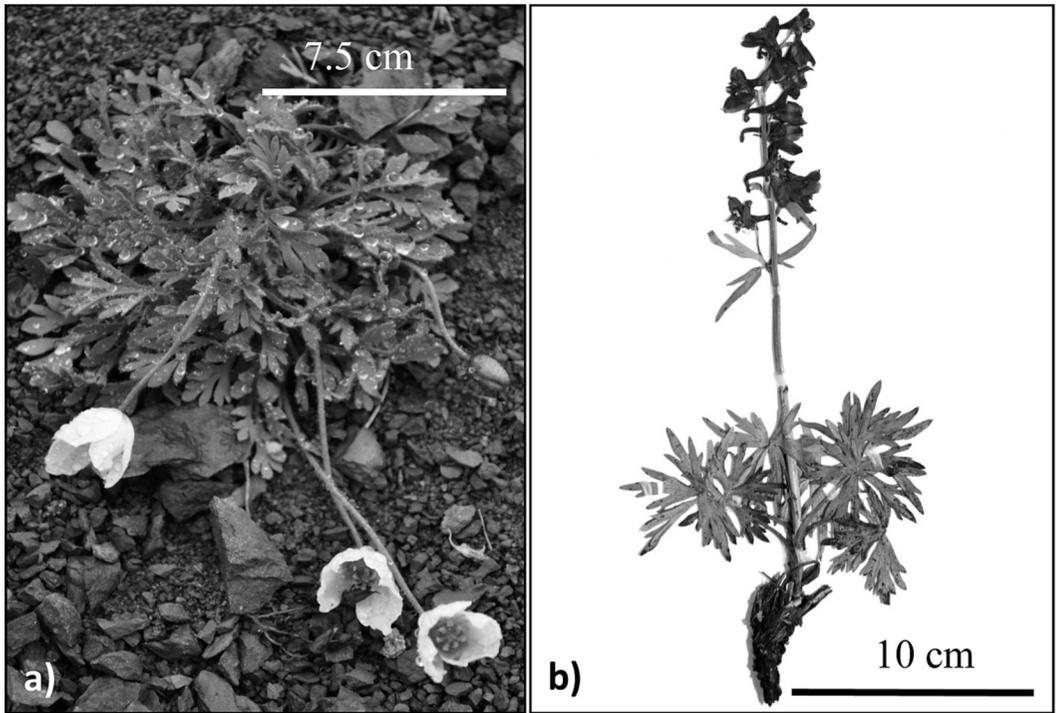


FIGURE 3. a) *Papaver alboroseum* (photo of K. Marr, R. Hebda, N. Hebda 11-715 — Omineca Mountains, Hogen Ranges, massif west of Two Mile Creek); b) *Delphinium brachycentrum* (R. Hebda, K. Marr, W. MacKenzie, R. Forsyth KM4681 — Rocky Mountains, Mount Ludington, next major ridge to the west). See entries for each species for more complete collection location information. Photos: a) Kendrick Marr; b) Carlo Mocellin, Royal British Columbia Museum.

often pubescent, with fewer flowers (5–18), leaves on the lower fifth of the stem and with the ultimate lobes 1-7(-15) mm wide, and pubescent follicles. In *D. glaucum*, plants are (60-)100-200(-300) cm tall, glabrous to puberulent, have more flowers ((13-)40-90(-140)), leaves the full length of the stem, the ultimate lobes 5-24 (-35) mm wide, and with glabrous to puberulent fruit (Warnock 1997).

Following the key and descriptions of Warnock (1997), specimens that we have identified as *D. brachycentrum* are less than 50 cm tall, bear 13 or fewer flowers, have densely pubescent follicles, glabrous to pubescent stems, and the leaves mostly on the lower fifth of the stem (Figure 3b). Hybrids between *D. brachycentrum* and *D. glaucum* evidently occur and have been named *D. × nutans* A. Nelson (Warnock 1997). Some of our six collections may be a result of hybridization or even introgression between these two species, as they are intermediate in some characters between *D. brachycentrum* and *D. glaucum*, with some specimens bearing leaves above the lower fifth of the stem, but in all other characters they much more closely resemble *D. brachycentrum*.

A thorough morphometric/genetic analysis of alpine *Delphinium* species in B.C. would be helpful to more

clearly delineate the characters by which *D. brachycentrum* can be distinguished, to evaluate the possibility of hybridization/introgression with *D. glaucum*, and thus to more fully understand the distribution of *D. brachycentrum*. Existing collections of *D. glaucum* from mountains of B.C., Yukon, and Alberta should be checked to see if some of these are *D. brachycentrum*.

Discussion

In general, most of our collections extend the range of the species reported southward and eastward into areas with limited or no collections. We expect that further collecting in the high elevations of the northern interior of B.C. will add more localities for some of these species. With the exception of *D. brachycentrum*, the focus of collecting should be on relatively restricted habitats of limited distribution, e.g., flowing water and shallow lakes, wind-blown ridges, scree, and gravelly seepage sites, especially near melting snow beds.

Our work also resulted in interesting but much shorter range extensions for four other species. *Hippuris montana* Ledebour is more widespread east of the Coast Mountains and further north in British Columbia than previously documented; the range of *Potentilla*

elegans Cham. & Schlecht., an amphiberian species rare in B.C. (Douglas et al. 2002a), is extended southward by approximately 70 km; *Gentiana platypetala* Griseb., endemic to Pacific coastal North America (Hultén 1968), is more widespread in the eastern slopes of the Coast Mountains than was previously known; and we found three new locations of *Arctophila fulva* (Trin.) Andersson, rare in British Columbia (Douglas et al. 2002a).

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