

THE GENUS *LEPIDIUM* IN CANADA¹

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A world monograph of the genus *Lepidium* was published by Thellung (1906) and a further study of the genus by Hitchcock (1936). According to Hitchcock, Thellung did not have enough North American material at his disposal for an accurate interpretation of our plants. This prompted Hitchcock's comprehensive treatment of the genus *Lepidium* in the United States. However, Hitchcock did not see any material from Canadian herbaria and relatively few Canadian specimens were represented in his material from United States herbaria. Consequently it was not surprising to find on studying Canadian specimens that some of the taxa present in Canada are not included in even the most recent floras or lists. Apparently as the result of not having many Canadian specimens for study, Hitchcock included *L. bourgeauanum*, a common plant in the Canadian prairies, under *L. ramosissimum*. He erroneously applied Thellung's name, *L. bourgeauanum*, to another plant, *L. densiflorum* var. *bourgeauanum*. Specimens of *L. heterophyllum*, a species introduced from Europe, and previously unreported for North America, were found in the material studied.

This paper includes keys to all the *Lepidium* present in Canada and a description and discussion of each taxon. The life durations given are mostly based on information obtained by growing plants in nursery plots at Ottawa. The chromosome numbers given for Canadian material were determined from somatic root tip cells. The root tips studied were processed as in Mulligan (1959). Distribution maps (figs. 12 and 13) were prepared by mapping all the herbarium specimens seen, except where localities were closely duplicated.

A total of 935 herbarium specimens, exclusive of duplicates, was examined from the following Canadian herbaria: Department of Agriculture, Ottawa (DAO); National Museum of Canada, Ottawa (CAN); British Columbia Provincial Museum, Victoria (V); University of British Columbia, Vancouver (UBC). Type specimens were obtained from the Gray Herbarium, Harvard University, Cambridge (GH), the New York Botanic Garden, New York (NY); also seen were McCabe's British Columbia collections from the University of California, Berkeley (UC). I wish to express my appreciation to the curators of these herbaria for the loan of material. I am also indebted to workers at the Plant Research Institute, Canada Department of Agriculture, Ottawa, for their encouragement and assistance in this study.

LEPIDIUM L., Sp. Pl., 643. 1753; Gen. Pl. 291. 1754.

Annual to perennial herbs, glabrous to hirsute with simple hairs.

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Flowers small, white to sulfur yellow in dense terminal racemes. Sepals usually somewhat pubescent along back. Petals lacking, or to twice length of sepals. Stamens 2, 4 or 6. Ovary with 2 ovules, style short, stigma capitate, sometimes 2 lobed. Fruit a dehiscent silicle, strongly keeled or winged (silicle indehiscent, not keeled or winged in closely related *Cardaria*). Usually one seed attached to the apex of each cell.

KEY TO THE SPECIES OF LEPIDIUM IN CANADA

- a. Middle and upper leaves suborbicular, deeply cordate clasping with a closed sinus and slightly overlapping lobes, thus appearing as if perfoliate . 1. *L. perfoliatum*
- aa. Middle and upper leaves narrower, linear to broadly lanceolate, if clasping, not appearing as if perfoliate.
- b. Silicles 5 to 6 mm. long.
- c. Middle and upper leaves clasping the stem, silicles on spreading pedicels.
 - d. Annual or biennial with usually a single erect stem; anthers yellow; silicles covered with small white vesicles, style included to slightly exerted from shallow apical notch. 2. *L. campestre*
 - dd. Perennial with numerous ascending stems; anthers violet; silicles with few or no vesicles, style mostly exerted from shallow apical notch.
 - 3. *L. heterophyllum*
- cc. Middle and upper leaves not clasping, silicles on strongly ascending to appressed pedicels 4. *L. sativum*
- bb. Silicles 2 to 3.5 mm. long.
- e. Glaucous perennial 50 to 130 cm. high, with rhizomes; leaves thickish and rugose, lanceolate to broadly lanceolate 5. *L. latifolium*
- ee. Annual or biennial, 5 to 40 cm. high, leaves not thickish and rugose, linear to lanceolate.
- f. Silicle bidentate at apex, the sinus well developed and broad, its projecting shoulders abruptly contracted into widely divergent teeth, pedicels sigmoid. 7. *L. oxycarpum*
- ff. Silicles merely retuse or acuminate at apex with a shallow sinus, narrowed to abruptly curved into apical teeth; pedicels straight to arching.
- g. Silicles puberulent, at least on margin.
- h. Silicles 2.5 to 3 by 1.5 to 2 mm., nearly elliptic, narrowed into acute apical teeth; inflorescence congested into numerous axillary racemes as well as terminal ones. 11. *L. ramosissimum*
- hh. Silicles 3 to 3.5 by 2.5 to 3 mm., round-obcordate to short oblong-obovate, rounded to abruptly curved into obtuse apical teeth; inflorescence a single raceme or of sparsely branched racemes
 - 9. *L. densiflorum*
- gg. Silicles glabrous.
- i. Silicles oval, orbicular to rotund; petals conspicuous, as long or slightly longer than sepals 8. *L. virginicum*
- ii. Silicles ovate, obovate to round obcordate, petals shorter than sepals or lacking.
- j. Silicles ovate to obovate, narrowed into acutish apical teeth.
- k. Middle and upper cauline leaves blunt tipped, lower cauline and rosette leaves bipinnatifid, petals absent 6. *L. ruderales*
- kk. Middle and upper cauline leaves acute tipped, lower cauline and rosette leaves incised, petals present, usually about half length of sepals 10. *L. bourgeauanum*
- jj. Silicles round obcordate to short-obovate, rounded to abruptly curved into obtuse apical teeth 9. *L. densiflorum*

1. *LEPIDIUM PERFOLIATUM* L., Sp. Pl., 643. 1753.

Annual or winter annual with single erect stem 1–5 dm. high, sparsely hairy, usually branched above; lower leaves bipinnate, the middle and upper leaves suborbicular, deeply cordate clasping; petals pale yellow, a little longer than the sepals; stamens usually 6; silicles usually glabrous, rhombic-ovate, on spreading-ascending pedicels, nearly as broad as long, 3–4 mm. long and 3–4 mm. broad; pedicels terete; style usually projecting beyond the shallow apical notch. $2n = 16$ (voucher: grown at Ottawa from seed collected at Lethbridge, Alberta, *Mulligan 1527*, DAO, fig. 1).

Rare along roadsides and in waste places in Ontario, Saskatchewan and Alberta. Occasional along roadsides in the Okanagan Valley of British Columbia and rare elsewhere in the Province (fig. 12). This plant, introduced from Eurasia, was first collected in Canada at Cranbrook, British Columbia, in 1931.

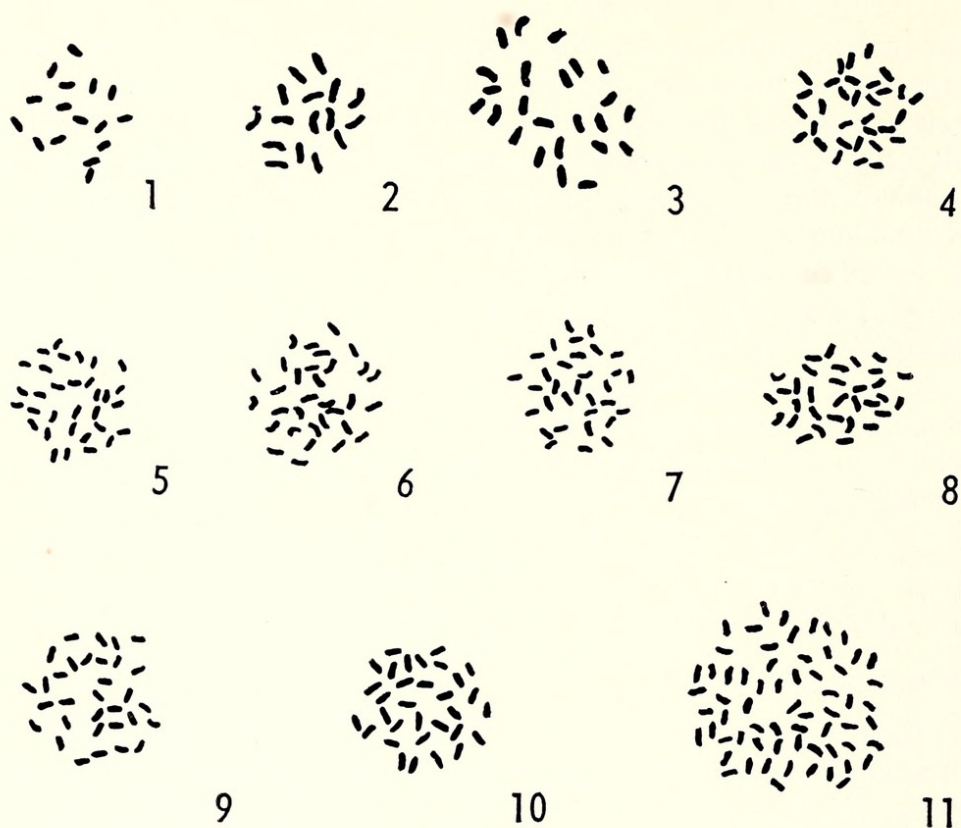
Representative material seen. ONTARIO: York County, at county line of Ontario County, *Shumovich 976* (DAO). SASKATCHEWAN: Swift Current, *Budd* in 1937 (DAO). ALBERTA: Lethbridge, *Bibbey 12* (DAO). BRITISH COLUMBIA: Cranbrook, *Groh* in 1931 (CAN); Kelowna, *McCalla 11598* (UBC, V); Osoyoos, *Lindsay & Woodbury 1128* (DAO).

2. *LEPIDIUM CAMPESTRE* (L.) R. Br., Ait. Hort. Kew, ed. 2, 4:88. 1812.

Annual to biennial with dense short spreading hairs throughout, stem usually solitary, erect, 2–6 dm. high, branched above the middle, the branches ascending; lower leaves entire or lyrate, narrowed into a short petiole, the middle and upper leaves narrowly triangular, sessile, clasping the stem with long narrow pointed basal lobes; petals white, a little longer than sepals; stamens 6 with yellow anthers; pedicels spreading, slightly flattened; silicles densely covered with small white vesicles that become scale-like when dry, silicles oblong-ovate, 5–6 mm. long and 4 mm. broad; style included to slightly exserted from the shallow apical notch. $2n = 16$ (voucher: grown at Ottawa from seed collected in southwestern Ontario, *Mulligan 1499*, DAO, fig. 2).

Common in fields, roadsides and waste places in southern Ontario, Quebec and British Columbia. Sporadic along roadsides and in waste places in Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick and Alberta (fig. 12). Introduced from Eurasia.

Representative material seen. NEWFOUNDLAND: Gander, *Bassett 383* (DAO). PRINCE EDWARD ISLAND: Souris, Kings County, *Erskine and Smith 2046* (DAO); Charlottetown, *Dore & Gorham 45.314* (DAO). NOVA SCOTIA: South Sydney, Cape Breton, *Macoun* in 1886 (CAN); Kentville, *Lewis* in 1944 (DAO); Mabou, *Smith et al 8669* (DAO). QUEBEC: Grosse-Ile, Comté de Montmagny, *Marie-Victorin et al 40129* (CAN); Mont-Rolland, *Marie-Anselm 14* (DAO); Bristol, *Bassett and Mulligan 1140* (DAO); Montreal, *Bernard* in 1952 (CAN, UBC). ONTARIO: Milton West, *Mulligan and Lindsay 818* (DAO); Snelgrove, *White* in 1897 (CAN); St. Thomas, *James 2478* (DAO); Kemptville, *Lindsay and Bassett 213* (DAO); Port Arthur, *Garton 2339* (DAO). ALBERTA: between Macleod and Pincher, *McCalla 11070* (DAO). BRITISH COLUMBIA: Chilliwack, *Faris 32* (DAO); Koksilah, V.I., *Tice* in 1937 (UBC, V); Sandspit, Moresby Island, Queen Charlotte Islands, *Calder 21111* (DAO).



FIGS. 1-11. Somatic chromosomes of *Lepidium*, camera lucida drawings, $\times 2150$. 1, *L. perfoliatum*, $2n=16$; 2, *L. campestre*, $2n=16$; 3, *L. latifolium*, $2n=24$; 4, *L. virginicum* (eastern material), $2n=32$; 5, *L. virginicum* (western material), $2n=32$; 6, *L. densiflorum* var. *densiflorum*, $2n=32$; 7, *L. densiflorum* var. *macrocarpum*, $2n=32$; 8, *L. densiflorum* var. *elongatum*, $2n=32$; 9, *L. densiflorum* var. *pubicarpum*, $2n=32$; 10, *L. bourgeauanum*, $2n=32$; 11, *L. ramosissimum*, $2n=64$.

3. *LEPIDIUM HETEROPHYLLUM* (DC.) Benth., Cat. Pl. Pyr. 95. 1826. *L. smithii* Hook., Brit. Fl., ed. 3, 300. 1835.

Perennial herb with short spreading hairs on leaves and stem; stems many, ascending, 1.5-4.5 dm. high, often branched below as well as above the middle, the branches ascending; lower leaves oblanceolate or elliptical, narrowed into a short petiole, the middle and upper leaves narrowly triangular, sessile, clasping the stem with long narrow basal lobes; petals white, a little longer than sepals; stamens 6, anthers violet; pedicels spreading, slightly flattened; silicles with vesicles lacking or few, oblong-ovate, 5-6 mm. long and 4 mm. broad; style mostly exserted from the shallow apical notch. $2n=16$, European material (Fl. Brit. Isles, 175. 1952).

Occasional along roadsides, in fields and waste places on Vancouver Island, British Columbia (fig. 12). This plant was first collected near Victoria in 1908. *Lepidium heterophyllum*, introduced from Europe, was first recognized as occurring in North America by Dr. C. Frankton in

1956 when he identified a specimen, collected near Courtenay, British Columbia, as *L. smithii*.

Material seen. BRITISH COLUMBIA. VANCOUVER ISLAND: vicinity of Victoria, *Macoun*, May 20, 1908 (CAN), June 19, 1908 (CAN); Telegraph Bay, *Copley* 6657 (V); Mt. Finlayson, *Copley* 6658 (V); Alberni, *Carter* 2196 (V); Millstream Road, *Hardy* 7558 (V); S. Saanich, *Newcombe* 8917 (V); Sooke, *Hardy* 22768 (V); Courtenay, *Molyneux* 73 (DAO, UBC, V); 2 miles east southeast Langford, *Calder et al* 20795 (DAO).

4. LEPIDIUM SATIVUM L., Sp. Pl., 644. 1753.

Annual with a solitary erect stem 2–8 dm. high, glabrous; lower leaves long-stalked, lyrate with toothed obovate lobes, the middle and upper leaves pinnatipartite or bipinnatipartite, occasionally entire and linear; petals white or reddish, up to twice as long as the sepals; stamens 6; silicles glabrous, broadly elliptical or nearly orbicular, 5–6 mm. long and 3–4 mm. broad; pedicels appressed, flattened; style not projecting beyond the deep apical notch. $2n=16$, European material (*Jaretsky* 1932).

Rare along roadsides and in waste places in Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, British Columbia and Yukon Territory (fig. 12). Introduced from Eurasia as early as 1882 but still only a casual escape from cultivation.

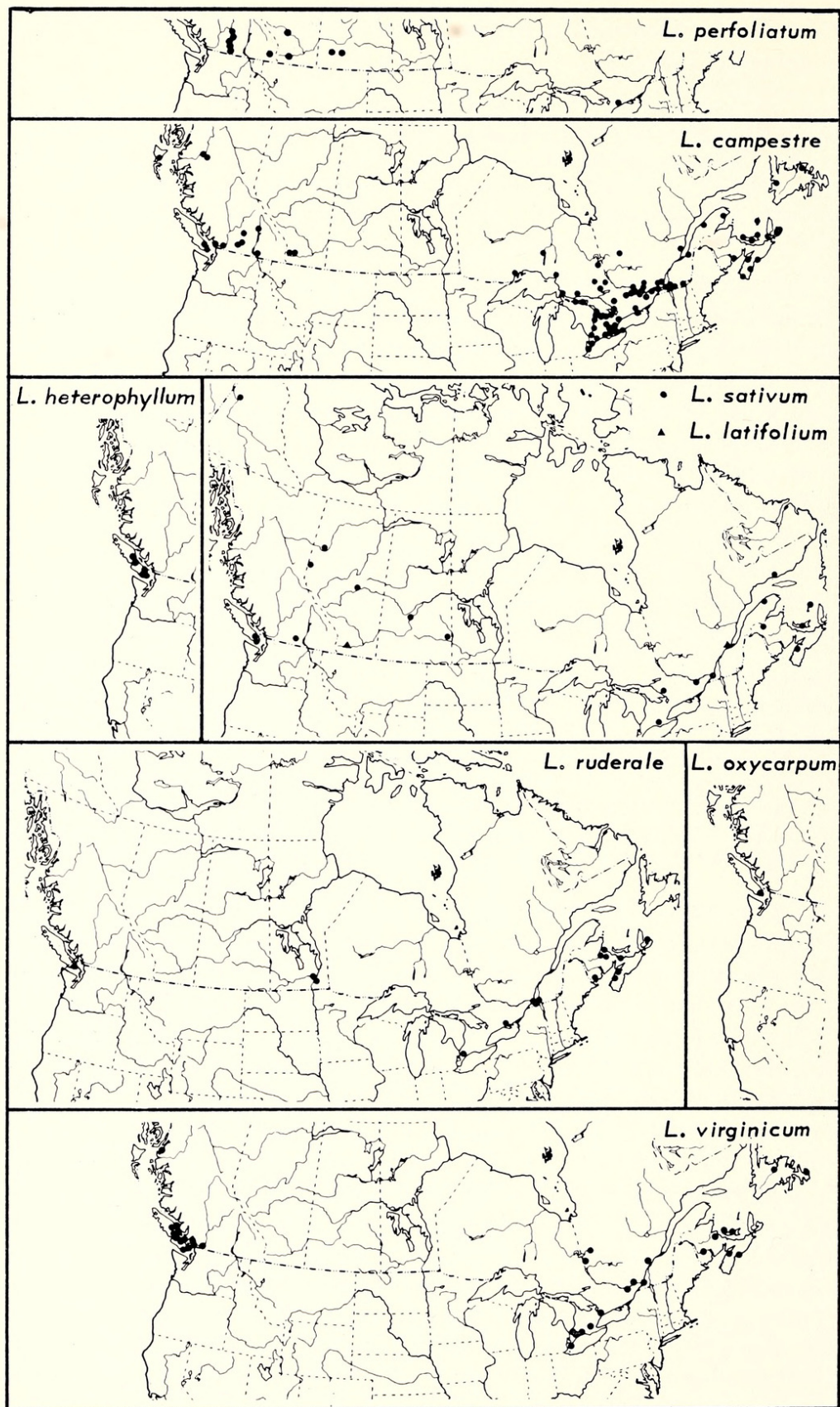
Representative material seen. PRINCE EDWARD ISLAND: 4 miles northwest Charlottetown, *Campbell* 150 (DAO). NOVA SCOTIA: Harbourville, Kings County, *Lewis* in 1944 (DAO). NEW BRUNSWICK: St. Quentin, *Groh* in 1937 (DAO). QUEBEC: Ste. Annes des Monts, Gaspé, *Macoun* in 1882 (CAN). ONTARIO: Ottawa, *Scott* in 1890 (DAO, CAN). SASKATCHEWAN: Yorktown, *Macoun* and *Herriot* in 1906 (CAN). ALBERTA: Beaverlodge, *Brooks* in 1930 (DAO). BRITISH COLUMBIA: Victoria, *Newcombe* 9259 (V); Nelson, *Eastham* 3065 (UBC). YUKON TERRITORY: Dawson, *Macoun* in 1902 (CAN).

5. LEPIDIUM LATIFOLIUM L. Sp. Pl., 644. 1753.

Perennial herb with subterranean rhizomes, each branch of the rhizome giving rise to a single erect stem 5–13 dm. high, glabrous, much branched above; lower leaves long-petioled, simple and ovate with a toothed margin or pinnately lobed with a large terminal and 2 or more smaller lateral lobes, the lobes all rounded, the middle and upper leaves sessile, ovate or ovate-lanceolate, acute, entire or with distant teeth, the uppermost leaves often bract like and white margined near the apex; petals white, up to twice as long as sepals; stamens 6; silicles glabrous to pubescent, elliptical to orbicular, 2 mm. long and 2 mm. broad; pedicels ascending, terete; style very short with large rounded stigma, apical notch very slight or lacking. $2n=24$ (voucher: grown at Ottawa from seed collected at Lethbridge, Alberta, *Mulligan* 2147, DAO, fig. 3).

This plant, introduced from Eurasia, was first collected in 1934 but has remained localized around Quebec City and Lethbridge, Alberta (fig. 12).

Representative material. QUEBEC: Quebec, *Marie-Anselm* in 1934 (DAO). ALBERTA: Lethbridge, *Moss* in 1940 (CAN).

FIG. 12. Distribution maps of *Lepidium*.

6. *LEPIDIUM RUDERALE* L., Sp. Pl., 643. 1753.

Annual to biennial with single erect or ascending stem 1–3 dm. high, plant almost glabrous, with occasionally a few short spreading hairs; stem branched above, the branches ascending; lower leaves long-petioled, deeply bipinnately divided into narrow entire segments, the middle and upper leaves sessile, narrowly oblong, entire, rounded at apex; petals usually absent; stamens usually 2; silicles glabrous, ovate or broadly elliptical, 2–2.5 mm. long and 1.5–2 mm. broad; pedicels spreading to ascending, slightly flattened; style at base of the shallow apical notch. $2n = 32$, European material (Jaretsky 1932).

Rare along roadsides and in waste places in Nova Scotia, New Brunswick, Quebec, Ontario and Manitoba (fig. 12). Introduced from Eurasia as early as 1868.

Representative material seen. NOVA SCOTIA: North Sydney, *Macoun* in 1883 (CAN). NEW BRUNSWICK: Bass River, Kent County, *Fowler* in 1868 (CAN). QUEBEC: Montreal, *Rolland-Germain* 46008 (DAO, CAN). ONTARIO: Wellington, *Montgomery* and *Shumovich* 997 (DAO). MANITOBA: Winnipeg, *Frankton* and *Bibbey* 60 (DAO).

7. *LEPIDIUM OXYCARPUM* T. & G., Fl. N. Am. 1:116, 688. 1838.

Slender, nearly glabrous annual, 0.5–2 dm. high, with many semi-erect stems branched above the middle; lower leaves linear, often with 2–4 pairs of linear lobes, middle and upper leaves usually linear and entire; petals white, rudimentary; stamens 4; silicles on slender somewhat sigmoid and flattened pedicels; silicles ovate, glabrous, and finely reticulate, 2.5–3.5 mm. long and 2–2.5 mm. broad, abruptly contracted at apex into a pair of widely divergent teeth; style at base of large apical notch.

The only Canadian specimen of *L. oxycarpum* seen (fig. 12) was collected at Cadboro on Vancouver Island (*Macoun* in 1893, CAN).

8. *LEPIDIUM VIRGINICUM* L. sensu lat., Sp. Pl., 645. 1753.

Annual, freely branched, erect to spreading, 1.5–6 dm. high, glabrous to strongly pubescent; lower and middle leaves irregularly toothed or incised to pinnatifid, the divisions often again dissected, the upper leaves much reduced, usually entire or remotely toothed; petals white, equalling to much longer than the sepals; stamens usually 2; silicles glabrous, oval, orbicular to rotund, 2.5–4 mm. long and 2.5–4 mm. broad; pedicels spreading to ascending, slightly flattened to terete; stigma included in the shallow apical notch. $2n = 32$ (vouchers: grown at Ottawa from seed collected at St. Thomas, Ontario and Saanichton Spit, British Columbia, *Mulligan* 2420 and 2421, DAO, figs. 4 and 5).

In Canada, *L. virginicum* sensu lat. is represented by eastern and western elements (fig. 12). The positions of the cotyledons in the seeds of Canadian material, as in the United States material (*Hitchcock* 1936), are accumbent in eastern plants and oblique to incumbent in western plants. Eastern plants occur sporadically in Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec and Ontario. These

plants are *L. virginicum* var. *virginicum* and are introduced from further south in the eastern United States. Western plants of *L. virginicum* sensu lat. are found only on Vancouver Island, and the adjacent islands and mainland. They are undoubtedly native to this area. Most of these western plants have morphological characters tending towards the varieties *pubescens* and *medium* as treated by Hitchcock (1936). However, it appears that two and possibly three varieties of *L. virginicum* sensu lat. come together in the southwestern corner of British Columbia and at this northern limit of their range, there is extreme morphological variability in the population. An understanding of the British Columbia plants would require an extensive study of all the western North American material of *L. virginicum* sensu lat. Such a study is outside the limits of this treatment.

Representative material seen. NEWFOUNDLAND: St. John's, *Green* 1517 (DAO). PRINCE EDWARD ISLAND: Charlottetown, *Erskine* 2332 (DAO). NOVA SCOTIA: Wolfville, *Groh* in 1932 (DAO). NEW BRUNSWICK: Fredericton, *Dore* and *Gorham* 45165 (DAO). QUEBEC: Shawinigan Falls, *Groh* in 1927 (DAO, CAN). ONTARIO: near St. Thomas, *Macoun* in 1907 (CAN). BRITISH COLUMBIA: Saanich Spit, *Eastham* in 1939 (DAO, UBC); Parksville, Vancouver Island, *Carter* 2195 (V); Jessie Island, Departure Bay, *Macoun* in 1908 (CAN); Mitlenatch Island, *Sweeney* 15567 (V).

9. *LEPIDIUM DENSIFLORUM* Schrad. sensu lat., Ind. Sem. h. Götting. 4. 1832.

Annual to biennial, puberulent to pubescent; stem erect, 1–5 dm. high, usually branched above the middle, sometimes simple; lower leaves mostly oblanceolate, coarsely toothed to pinnatipartite, the divisions also toothed, the middle and upper cauline leaves reduced, slightly toothed or entire; petals white, rudimentary to sometimes equalling the sepals in western varieties; stamens 2; silicles glabrous to puberulent in some of western varieties, round-obcordate to short oblong-obovate, rounded to abruptly curved into obtuse apical teeth, 2–3.5 mm. long and 1.5 to 3 mm. broad; pedicels slightly ascending to nearly appressed, slightly to conspicuously flattened; stigma included in the narrow apical notch.

KEY TO VARIETIES OF *L. DENSIFLORUM*

- a. Silicles averaging 2.5 mm. long, glabrous; pedicels slightly flattened, crowded, more than 9 pedicels per cm. 9a. var. *densiflorum*
- aa. Silicles averaging 3–3.5 mm. long, puberulent except in var. *macrocarpum*; pedicels conspicuously flattened, less crowded, usually less than 9 pedicels per cm.
 - b. Silicles glabrous 9b. var. *macrocarpum*
 - bb. Silicles puberulent.
 - c. Silicles puberulent only on margins 9c. var. *elongatum*
 - cc. Silicles uniformly puberulent 9d. var. *pubicarpum*

9a. *L. DENSIFLORUM* Schrad. var. *DENSIFLORUM*. *L. densiflorum* var. *typicum* Thell., Bull Herb. Boiss., ser. 2, 4:706. 1904.

Plant erect, 1–5 dm. high, annual or winter annual with glabrous silicles, averaging 2.5 mm. long and 2 mm. broad, smaller than all western

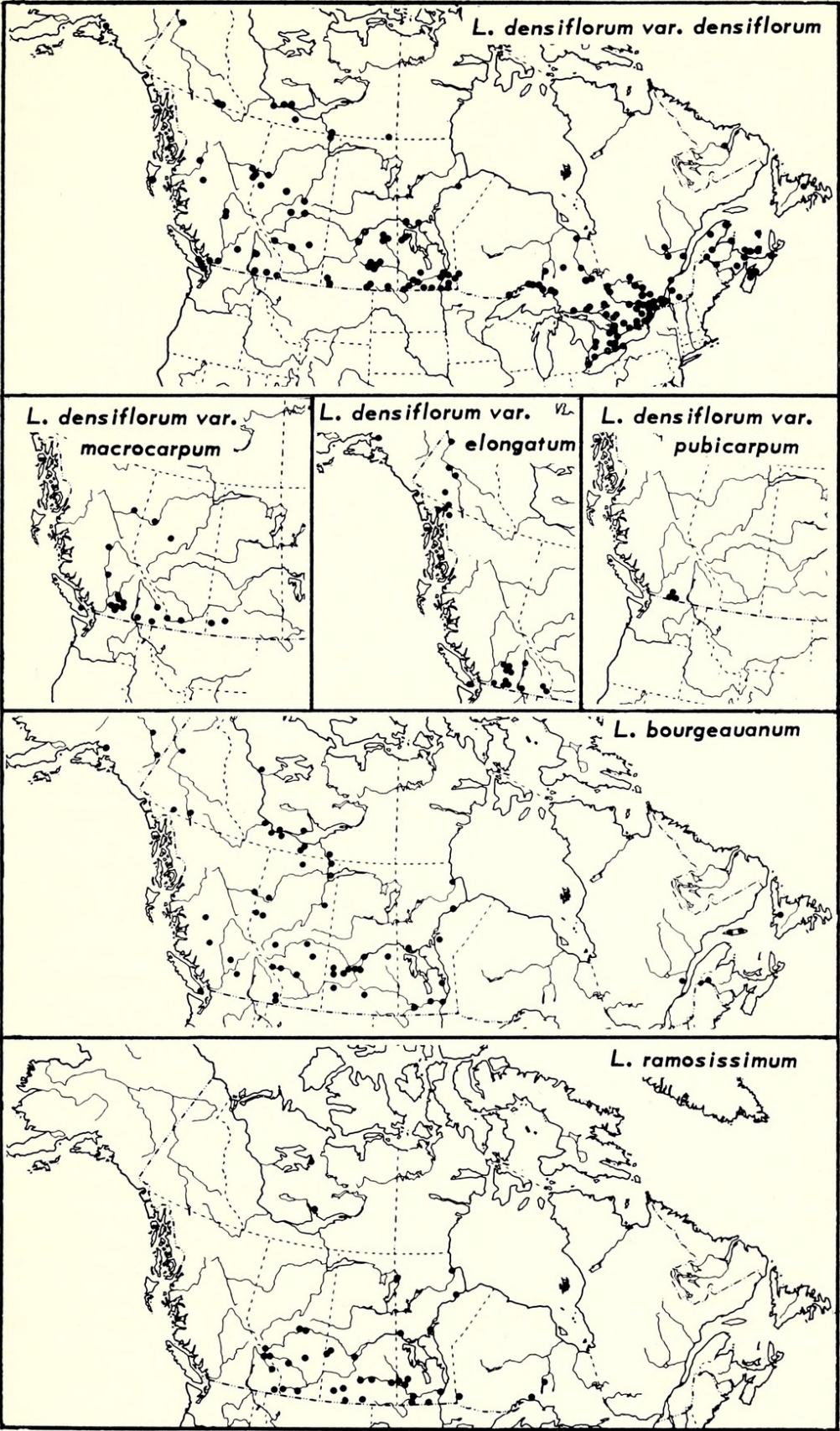


FIG. 13. Distribution maps of *Lepidium*.

varieties. $2n = 32$ (voucher: grown at Ottawa from seed collected at Ottawa, *Mulligan 1528*, DAO, fig. 6).

Widely distributed in all types of disturbed habitats: Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Labrador, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory and Mackenzie District, Northwest Territories (fig. 13). Native to the Prairie Provinces, interior of British Columbia and probably some localities in eastern Canada. Weedy throughout its range.

Representative material seen. NEWFOUNDLAND: Gander, *Bassett 462* (DAO). PRINCE EDWARD ISLAND: Bideford, Prince County, *Smith 319* (DAO); French River, *Fernald et al 7508* (CAN). NOVA SCOTIA: Boylston, *Hamilton* in 1890 (CAN); Wolfville, *Groh* in 1928 (DAO). NEW BRUNSWICK: Point du Chene, *Bassett and Mulligan 2964* (DAO); Woodstock, *Macoun* in 1899 (CAN); Edmundston, *Malte 332* (CAN). LABRADOR: Goose Bay, *Gillett and Findley 5883* (DAO, UBC). QUEBEC: Nominique, *Lucien* in 1924 (CAN); Magog, *Bassett and Hamel 2322* (DAO); Shawville, *Mulligan and Lindsay 382* (DAO); Ville Marie, *Baldwin 5940* (CAN). ONTARIO: Leamington, *Macoun* in 1901 (CAN); Moosonee, *Baldwin 1453* (CAN); Goderich, *Senn et al 4759* (DAO); Point Pelee, *Bassett 1112* (DAO). MANITOBA: Douglas, *Lindsay 490* (DAO); Duck Mountain, *Scoggan and Baldwin 7793* (CAN); Fort Ellice, *Macoun* in 1879 (CAN); The Pas, *Krivda 1223* (DAO). SASKATCHEWAN: Dundurn, *Campbell 54* (DAO); Prince Albert, *Macoun* in 1876 (CAN); Cypress Hills, *Breitung 5001* (DAO); Bjorkdale, *Van Blaricom* in 1941 (DAO). ALBERTA, 7 miles north Fort Fitzgerald, *Cody and Loan 3863* (DAO); 20 miles west Selba, *McCalla 12313* (UBC); Fort Saskatchewan, *Turner 4873* (CAN). BRITISH COLUMBIA: 141 Mile House, *Cottle* in 1949 (UBC); Grand Forks, *Tice* in 1933 (V); Yahk, *Bassett and Cumming 3970* (DAO). NORTHWEST TERRITORIES: Fort Simpson, *Cody and Matte 8109* (DAO); Alexander Falls, Hay River, *Lewis 558* (DAO). YUKON TERRITORY: Watson Lake, *Gillett 2585* (DAO).

9b. *L. DENSIFLORUM* Schrad. var. **macrocarpum** var. nov. *L. densiflorum* var. *bourgeauanum* sensu Hitchcock, Madroño, 3:279, 1936, nec *L. bourgeauanum* Thellung.

Herba biennis erecta, saepius 1–3 dm., siliculis glabris, 3.0–3.5 mm. long., 2.5–3.0 mm. lat., $2n = 32$ ex canadensibus.

Plant erect, 1–3 dm. high, biennial with glabrous silicles 3.0–3.5 mm. long and 2.5–3.0 mm. broad. $2n = 32$ (voucher: grown from seed collected at Cache Creek, *Mulligan 2416*, DAO, fig. 7).

Native on dry open soil in western Saskatchewan, Alberta and British Columbia, as far north as Prince George, British Columbia (fig. 13).

Type. Lethbridge, Alberta, Platières de la rivière Sainte-Marie près de son embouchure, 23 juin 1958, *Boivin, Perron and Harper 12197* (DAO), fig. 14.

Material seen. SASKATCHEWAN: Webb, 7 miles au nord, *Boivin et al 12005* (DAO); Saskatchewan Landing, *Russell S58099* (DAO); 7 miles au sud de la Station Expérimentale de Manyberries, *Boivin and Alex 9651* (DAO). ALBERTA: 1 mile east of Canmore, south of Peace River, *Macoun* in 1903 (CAN); Canyon Creek, *Boivin and Perron 12744* (DAO); Lethbridge, *Boivin and Perron 12166* (DAO). BRITISH COLUMBIA: Tranquille, *Groh 246* (DAO); Lillooet, *Luyat* in 1928 (V), *Anderson 2197* (V), *Macoun* in 1916 (CAN); Kamloops, *Davidson* in 1912 (UBC), *Tisdale 40–410* (DAO), *Wattie* in 1915 (UBC); Kamloops, Thompson

River Flats, *Brink* in 1935 (UBC), a mixture of 1 plant var. *macrocarpum* and 2 plants var. *elongatum*; Spences Bridge, *Macoun* in 1899 (CAN); Hamilton Commonage, Nicola Valley, *Tisdale* in 1935 (DAO), 40-409 (DAO); Cache Creek, *Mulligan* and *Woodbury* 1617 (DAO); Hat Creek Valley, *Thompson* and *Thompson* 221 (DAO); Yahk, *Bassett* and *Cumming* 3988 (DAO); Cecil Lake, *Merten* in 1958 (DAO); Riley's Ranch, Big Bear Creek, *Copley* 6430 (V); Fairmont, *Anderson* 225 (V); Merritt, *Copley* 7312 (V); Nelson, *Eastham* 3057 (UBC); Macalister, *Taylor* and *Lewis* 286 (UBC); Prince George, *Eastham* 14735 (UBC); Nanaimo, *Eastham* 3058 (UBC); Lytton, *Dawson* in 1876 (CAN); Crow Nest Pass, *Macoun* in 1897 (CAN); 2½ miles south Merritt, *McCabe* 4523 (UC); 21½ miles south Williams Lake, *McCabe* 1312 (UC).

9c. *L. DENSIFLORUM* Schrad. var. *ELONGATUM* (Rydb.) Thell., Bull. Herb. Boiss., Ser. 2, 4:706. 1904; Monog. Lepid. 235. 1906. *L. elongatum* Rydb., Bull. Torr. Bot. Club, 29:234. 1902. *L. simile* Heller, Bull. Torr. Bot. Club, 26:312. 1899.

Plant erect, 1-3 dm. high (rarely taller), biennial with silicles puberulent only on margins, 3-3.5 mm. long and 2.5-3 mm. broad. $2n = 32$ (voucher: grown at Ottawa from seed collected at Ashnola River, Flat-iron Mountain, British Columbia, *Mulligan* 2422, DAO, fig. 8).

Native on dry open soil in interior of British Columbia and as far north as Kamloops. Apparently also native along the Mackenzie River in Yukon Territory and in the northwestern corner of British Columbia (fig. 13).

Representative material seen. BRITISH COLUMBIA: 1 mile east Fort Steele, *Calder* and *Savile* 9149A (DAO); Fernie, *Bassett* and *Cumming* 3986 (DAO); Goodfellow Creek, *Hardy* 18.875 (V); Revelstoke, *Macoun* in 1890 (CAN); Windy Arm, Yukon Boundary, *Gervaise* in 1914 (UBC); 2 miles north Skookumchuck, *McCabe* 5031 (UC). YUKON TERRITORY: Carcross, *Gillett* 3384 (DAO); Whitehorse, *Gillett* 3508 (DAO); island in Klondike River, *Macoun* in 1902 (CAN).

9d. *L. DENSIFLORUM* Schrad. var. *PUBICARPUM* (Nelson) Thell., Bull. Herb., Boiss., Ser. 2, 4:706. 1904; Monog. Lepid., 235. 1906. *L. pubicarpum* Nelson, Bot. Gaz. 30:189. 1900.

Plant erect, 1-3 dm. high (rarely taller), annual or winter annual with puberulence scattered over all of silicle, 3-3.5 mm. long and 2.5-3 mm. broad. $2n = 32$ (voucher: grown at Ottawa from seed collected at Osoyoos, British Columbia, *Mulligan* 2412, DAO, fig. 9).

Known to occur in Canada only around Osoyoos and Penticton, British Columbia (fig. 13).

Material seen. BRITISH COLUMBIA: 19 miles east Osoyoos, *Mulligan* and *Woodbury* 2010 (DAO); Osoyoos, *Lindsay* and *Woodbury* 630 (DAO); Penticton, *Eastham* 3056 (UBC), 7067 (UBC); Okanagan Valley at U.S. Boundary, *McCabe* 5848 (UC).

10. *LEPIDIUM BOURGEAUANUM* Thell., Monog. Lepid., 237, 1906. *L. fletcheri* Rydb., Bull. Torr. Bot. Club, 34:428. 1907.

Biennial, 1.5-6 dm. high, sparsely to densely puberulent throughout; stem erect, with many ascending to nearly appressed branches bearing usually less than 5, rarely up to 10 racemes; lower leaves incised, middle



Fig. 14. *Lepidium densiflorum* var. *macrocarpum*, holotype, Perron and Harper 12197 (DAO), left; *Lepidium bourgeauanum*, a representative specimen, Calder and Billard 4627 (DAO), right.

leaves incised or sometimes slightly toothed; upper leaves linear, entire, rarely slightly toothed; petals white, up to $\frac{3}{4}$ length of the sepals; stamens 2; silicles glabrous, ovate to obovate, 2.5–3 mm. long, and 1.5–2 mm. broad; pedicels spreading to ascending, slightly flattened; style included in the apical notch. $2n = 32$ (vouchers: grown at Ottawa from seed collected at St. Simeon, Province Quebec, Alexander Falls and Norman Wells, Mackenzie District, *Mulligan* 2423, 2418 and 2419, DAO, fig. 10).

Fairly common on open soil in Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory and Northwest Territories, and probably native in all these areas. It also occurs at a few locations in Newfoundland, New Brunswick, Ontario and Quebec, where it has probably been introduced (fig. 13).

Lepidium bourgeauanum, described by Thellung (1906), was based on a collection of Bourgeau [Saskatchewan, 1857–8, Bourgeau (Pallisers Brit. N. Am. Exped.)—Herb. Petersburg]. Hitchcock (1936) applied this name to his *L. densiflorum* var. *bourgeauanum*, a plant that is relatively rare on the Canadian prairie. However, Thellung's description obviously refers to the plant here being treated (see fig. 14), not Hitchcock's *L. densiflorum* var. *bourgeauanum*. A Bourgeau specimen [labelled Lake Winnipeg Valley, 1857 (Pallisers Brit. N. Am. Exped.)] in the Gray Herbarium, Harvard University, is *L. bourgeauanum*. This specimen is possibly an isotype of *L. bourgeauanum* with more complete label data than the holotype in the Petersburg Herbarium. *L. bourgeauanum* has been included under *L. ramosissimum* by most botanists, but in addition to the differences in morphology and geographic distribution, the former plant has 32 somatic chromosomes while the latter plant has 64.

Representative material seen. NEWFOUNDLAND: Deer Lake, *Rouleau* 1160 (DAO). NEW BRUNSWICK: 2 miles north northeast Edmunston, Madawaska County, along railroad tracks, *Mulligan* and *Spicer* 2538 (DAO), not mapped on fig. 13. ONTARIO: Prescott, Grenville County, single plant near grain elevator, *Dore* 18299 (DAO), not mapped on fig. 13. QUEBEC: 2 miles west St. Simeon, *Bassett* and *Hamel* 2190 (DAO); Ellis Bay, Anticosti Island, *Johansen* in 1923 (CAN). MANITOBA: Lake Winnipeg Valley, *Bourgeau* in 1857 (GH, possibly isotype of *L. bourgeauanum*); Brandon, *Macoun* in 1896 (CAN); Churchill, *Beckett* 3852 (DAO); Winnipeg, *Fletcher* in 1905 (DAO, isotype of *L. fletcheri*). SASKATCHEWAN: Cherryfield, *Macoun* and *Herriot* 69881 (CAN, paratype of *L. fletcheri*); Dana, *Senn et al* 2745 (DAO); 16 miles west Saskatoon, *Macoun* and *Herriot* in 1906 (CAN); Lee's Lake Reservoir, *Bird* 1560 (DAO). ALBERTA: Fort McMurray, *Cody* and *Gutteridge* in 1953 (DAO); Beaverlodge, *Jenkins* 123 (DAO); Calgary, *Macoun* in 1897 (CAN). BRITISH COLUMBIA: Sinkut Lake, *Eastham* 16959 (UBC, V); 54 miles south Williams Lake, *Mulligan* and *Woodbury* 1776 (DAO). NORTHWEST TERRITORIES. MACKENZIE DISTRICT: Wrigley Harbour, Brabant Island, *Lewis* 998 (DAO); 2 miles east Trout River, *Cody* and *Matte* 8637 (DAO); Indian Village on north shore of Mackenzie River, *Cody* and *Matte* 8622 (DAO). YUKON TERRITORY: West Dawson, *Calder* and *Billard* 4627 (DAO).

11. *LEPIDIUM RAMOSISSIMUM* Nelson, Bull. Torr. Bot. Club, 26:124, 1899. *L. ramosissimum* var. *robustum* Thell., Monog. Lepid., 236. 1906.

Biennial, 1–4 dm. high, sparsely to densely puberulent; stem erect, usually profusely branched throughout, with many spreading to ascending branches bearing usually more than 10, occasionally as few as 5 racemes; lower and middle leaves sessile, pinnately or bipinnately parted; upper cauline leaves usually with at least one pair of linear lobes towards the apex, rarely entire; petals white, up to $\frac{3}{4}$ length of the sepals; stamens 2; silicles puberulent, at least along margins, ovate to obovate, 2.5–3 mm. long and 1.5–2 mm. broad; pedicels spreading to ascending, slightly flattened; style included in the apical notch. $2n = 64$ (vouchers: grown at Ottawa from seed collected at Stirling and Edmonton, Alberta and Yellowknife, Mackenzie District, *Mulligan* 2129, 2424 and 2417, DAO, fig. 11).

Fairly common on open soil in Manitoba, Saskatchewan and Alberta; rare in western Ontario, British Columbia and Mackenzie District, Northwest Territory. Native in the Prairie Provinces, but possibly introduced elsewhere (fig. 13). The first Canadian collection seen was collected by Bourgeau, at Fort Ellice, Manitoba, in 1857.

Representative material seen. ONTARIO: Schreiber, *Hosie et al* 689 (CAN). MANITOBA: Snowflake, *Bassett and Kemp* 3504 (DAO); Norway House, off north end of Lake Winnipeg, *Scoggan* 4233 (CAN); Churchill, *Beckett* 3 (DAO); Buttes de Sables au Fort Ellice, *Bourgeau* in 1857 (GH). SASKATCHEWAN: Scott, *Groh* in 1933 (DAO); Twelve-Mile Lake, Wood Mountain, *Macoun* in 1895 (CAN); Saskatchewan, *Bourgeau* in 1858 (GH, isotype of *L. ramosissimum* var. *robustum*); Scott, *Groh* in 1933 (DAO). ALBERTA: Edmonton, *Frankton* 895 (DAO); Fort Saskatchewan, *Turner* 4948 (DAO, UBC); Craigmyle District, *Brinkman* in 1921 (CAN); Frank, *Bassett and Cumming* 3975 (DAO). BRITISH COLUMBIA: Windermere Slough, Columbia Valley, *Eastham* 16288 (V, UBC); Windermere, *McCabe* 6365 (UC); Fernie, *Bassett and Cumming* 3971 (DAO). NORTHWEST TERRITORIES. MACKENZIE DISTRICT: Yellowknife, *Cody and McCause* 3045 (DAO).

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