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Ball, Carleton R.

Canadian willows of Section Cordatae.

(Partial mss. 40 pp., unpublished)

The species numbers are in sequence from those published in Canadian willows of sections Pentandrae, Nigrae and Albae. Canad. Field-Natur. 40: 145-152. 1926.

CANADIAN WILLOWS OF SECTION CORDATAE
(The Ball Archive copy contains portions of Sect.
Commutatae & Lanatae)

(Indexed by W.A. Archer, Sept. 1961)
(compiled from Ball list & keys)

Sect. Cordatae 2

balsemifera (*)

cordata 8

- angustata 12

farrae 13

- exiguiifolia 21

- microserrulata 22

- walpolei (*)

- n. var. 20

irrorata (*)

lasiiolepis (*)

- bakeri (*)

- bigelovii (*)

lutea 23

- famelica 26

- ligulifolia (*)

- platyphylla (*)

mackenziana 27

- macrogramma (*)

monochroma (*)

myrtillofolia 30

- pseudomyrsinites 31

pennata (*)

pseudocordata 36

pyrifolia 37

wolfii (*)

- idahoensis (*)

(*) - no text found.

} also copy in Ball Arch. 168)

CANADIAN WILLOWS OF SECTION CORDATAE

by
CARLETON R. BALL

*unpublished
ms
v. a. a.*

This is the third paper in the series on Canadian Willows. The first^{1/} covered the sections Pentandrae, Nigrae, and Albae, the latter section containing only introduced species. The second paper^{2/} discussed the species of the section Longifoliae, the long-leaf willows.

^{1/}
Ball, Carleton R. Canadian Willows of Sections Pentandrae, Nigrae, and Albae. Can. Field-Nat. 40 (7): 145-152, Oct., 1926.

^{2/}
Ball, Carleton R. Canadian Willows of Section Longifoliae. Ibid 40 (8): 171-175, Nov., 1926.

Canadian willowsCordatae

(Copy of Ball list)

balsamifera*
cordata
- angustata
farrae
- walpolii*
irrorata*
lasiolepis*
- bakeri*
- bigelovii*
lutea
- famelica
- ligulifolia
- platyphylla
mackenziana
missouriensis*
monochroma*
myrtillifolia
psendomyrsinites
wolfii
- idahoensis*

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* no data in original mss. of Ball Archives
W A A May 12 1964

3

The writer wishes to express here his grateful appreciation ^{to} of the courtesies extended by Dr. M. O. Malte, Dominion Botanist at the Victoria Memorial Museum, Ottawa, who has donated ^{material} collections and made available the rich collections of the Canadian National Herbarium for this study, and also ^{has} aided greatly in reading proof and in other ways; to Mr. N. B. Samson, [^] Curator of the Rocky Mountains Park Museum at Banff, who has presented the writer with a splendid series of specimens from the Park; to Prof. E. H. Moss, Assistant Botanist of the University of Alberta, who has loaned and given material and field data; to Prof. G. A. Hardy, of the Provincial Museum at Vancouver, who has made available some critical material from the mountains of British Columbia. It is especially pleasant to pay tribute to the labors and personal friendship of the two veteran students of the Dominion Flora, Prof. John Macoun, and his son, Prof. James M. Macoun, whose contributions of material and notes made possible the early knowledge of Canadian willows which is the foundation for the present study. Nor should the name of Dr. M. L. Fernald, of the Gray Herbarium of Harvard University, be omitted, for his critical ecological and taxonomic studies of the willows of Newfoundland^{3/} and the Gaspé Peninsula of Quebec and his generous contribution of material and data have helped greatly to an understanding of the numerous species of this area.

3/

The writer is aware that Newfoundland is not a part of the Dominion of Canada, but for the purposes of this study it is included as if it were a province, instead of an independent unit.

The present paper includes species and varieties of the Section Cordatae, the cordate-leaved or heart-leaved willows known to occur in Canada. The fourth paper which will follow this one immediately will discuss the Section Commutata, or Adenophyllae. The two sections are closely related differing chiefly in the length of the style, which is 0.3-0.6 mm. long in the Cordatae and 1-2 mm. long in the Commutatae. The latter also usually are stouter in branchlet and ament, and have longer capsules.

Both sections have erect stems, growing in clumps; relatively large leaves, usually 5-10 cm. long; often broad or cordate at the base, and nearly always crenate-serrate or serrate (entire or nearly so in farrae and commutata, and sometimes in lutea); crisp-villose, acute, brownish or fuscous scales, and lanceolate glabrous capsules (pubescent only in varieties of barclayi and commutata). Species of one section frequently are mistaken for species in the other.

(Typed copy of original mss. notes of C. R. Ball - Aug. 17, 1961. W. A. Archer)

For most of the specimens cited, the herbaria containing the particular sheet examined are indicated by abbreviations in parentheses. For most of the specimens of the Canadian Government collectors, the serial herbarium number is the only collector's number, and then usually is given directly after the name of the collector. Where there is a separate collection number, the serial number is given afterwards in parentheses with the initial "C" prefixed. The abbreviations used in the current paper and the herbaria for which they stand are as follows:

- A - herbarium Arnold Arboretum, Jamaica Plain, Mass.
- Al.- " University of Alberta, Edmonton
- Ay.- New York State Museum, Albany, N. Y.
- B. - Carleton R. Ball, Washington, D. C.
- F. - Field Museum (including the Bebb Salix Herbarium), Chicago, Ill.
- O. - National Herbarium of Canada. Victoria Memorial Museum, Ottawa, Ont., Canada.
- I. - Iowa State College, Ames, Iowa.
- M. - Univ. Minnesota, Minneapolis, Minn.
- Mo.- Missouri Botanical Gardens, St. Louis, Mo.
U.S.
- N. -/National Herbarium, Smithsonian Institution, Washington, D. C.
- ND.- No. Dakota Agricultural College,
- FM.- Rocky Mountains Museum, Banff, Alberta, Canada.
- SD.- University So. Dakota, Vermillion, S. Dakota.
- W. - University of Wyoming, Laramie, Wyo.

(Type from ribbon copy in Ball Archives - May 13, 1964 -
W. A. Archer)

6 - 7

Handwritten, rough draft of keys in Ball Archives copy.

12. Salix cordata Muhlenberg. Heart-leaved willow.

Salix cordata Muhl. Neue Schrift. Gesellsch. Naturfor. Freund.
Berlin 4: 236, pl. 6, fig. 3, 1803.

Salix cordata L. C. Rich. in Michx. Fl. 2:225, 1803.

Salix acutidens Rydberg in Britton Manual Fl. No. States ^{and} Can.
315, 1901.

This well marked species was described from material collected at Lancaster, in southeastern Pennsylvania. The type has the very broadly lanceolate leaves characteristic of material from the Atlantic Coast area. Westward from this coastal area the leaves gradually diminish in width. In 1814, Pursh published his Salix angustata which he describes as having "^Foliis lanceolatis acutis longissimis basi sensim attenuatis serrulatis glaberrimis subconcoloribus, stipulis semicordatis." Pursh gave the distribution of his plant as "On the banks of rivers: New York and Pennsylvania." Just where the line of demarcation between cordata and variety angustata should be placed is difficult to determine. Pursh apparently did not have the very narrow-leaved form in hand. A liberal interpretation of his species and of Andersson's variety would make it include nearly all the material of the United States and Canada. The writer prefers the more restricted interpretation, which limits the varietal name to specimens with distinctly narrow leaves on even the seasonal vegetative shoots, as well as on fruiting branches.

9

Salix cordata is a plant of brook and stream banks and lake margins but not of swamps or bogs. It does not occur on sand bars or new alluvium, as S. interior does, but usually well above normal waterlevel. It ordinarily grows in somewhat circular clumps of from 5 to 20 stems, with a butt diameter up to 2 inches and a height of 6 - 20 feet. It is found abundantly in the central and eastern part of its range. With S. sericea Marsh., it ^{often} forms a continuous ribbon of green which marks the course of creeks and small rivers in Pennsylvania, New York, Ontario, and New England.

The aments and leaves unfold at the same time (coetaneous). Flowering occurs from about April 15 or 20 in the southern part of its range to the latter part of May in the northern part, and the fruit ripens some 2 to 3 weeks later.

It occurs abundantly in the northeastern one-sixth of the United States and in adjacent Canada. On the south it ranges from the District of Columbia and Maryland west to eastern Kansas and northward to eastern South Dakota and southern Minnesota, and thence northeastward to southern Ontario and down the St. Lawrence Valley to Labrador and Newfoundland. Its zonal distribution is the humid portion of the Upper Austral, Transition, and lower Canadian zones. The locality in eastern Newfoundland probably is in the Hudsonian zone.

Salix cordata is distinguished from lutea by having brownish and often pubescent branchlets; larger, darker, more lanceolate and more strongly serrulate leaves, less glaucous beneath; and usually larger aments.

In the western part of its range and westward it has been confused with several related species, especially S. lutea Nutt. Where the ranges of the two species meet and slightly overlap, at about the meeting-line of prairie and plains, it is more difficult to distinguish cordata from lutea than elsewhere because the twigs of cordata tend to become more yellowish under those climatic conditions. The leaves of cordata also are smaller and more distinctly glaucous beneath in the West, which increases the resemblance to S. lutea. Most of the manual statements, giving the range of cordata far to the west of the limits recognized above, are caused by this failure to distinguish it from lutea and related species.

John Macoun (Cat. Can. Pl. 1(3): 446-7, 1886) says (p. 446) "This is one of our most widely spread willows and one that takes innumerable forms between the Atlantic and the Pacific." He then cites its reported occurrence from New Brunswick to Ontario and continues "Very common in central Ontario, around Lakes Superior, Nipissing, and Nipigon, and westward through the Rocky Mountains to the Fraser River, B. C." (p. 446). He then cites other collections and records from Northern Ontario and from Saskatchewan and the Northwest Territories. Although he recognized lutea and machenzi^eana, (p. 447), much of the western range given above was based on specimens of these two species and others such as farrae, barclayi, commutata, and pseudomonticola.

Rydberg (Britton, Man. Fl. No. 2/ States and Can. 314, 1901) gives the range of cordata as "N.B. to Br. Col., south to Va., Mo., Colo., and Cal." In 1917, Rydberg gives the same range (Fl. Rocky Mtns. and Adj. Plains, p. 193). Robinson and Fernald (Gray's New Man. Bot. 323, 1908) do not give the range. Schneider (Journ. Arnold Arb. 2:190, 1921) says "S. cordata is so far as I know not represented in the west." Ball (in Deam, Shrubs of Indiana, p. 49, 1924) says "west to Manitoba." The Manitoba material, however, proves to belong to S. lutea.

4

11

The Canadian specimens referred to S. cordata are listed below.

NEWFOUNDLAND. Grand Falls, Valley of Exploits River, Fernald and Wiegand 5273, July 6, 1911 (O, pistils all unfertilized).

NOVA SCOTIA. Baddeck, Cape Breton Id., Macoun O, 20351, July 26, 1898 (O). Sunny Brae, Valley of the East River, Pictou Co., St. John 1416, July 28, 1913 (N, O). Truro, Chester Co., J. Macoun O, 24351, June 12, 1883 (O).

NEW BRUNSWICK. Bass R., Kent Co., Bebb. Herb. Sal. No. 10 (B, N, 150286, 935093); J. Fowler 2626, July 29, 1872 (N). Chapman, J. Fowler, Aug. 1883 (N). Fredericton, York Co., J. Fowler, July 30, 1892 (N). St. Stephen, Charlotte Co., J. Vroom O, 24350, May, 1884, and O, 24354, Sept. 2, 1884 (O).

QUEBEC. Labrador Peninsula, Saguenay Co., River St. Augustin, H. St. John, O, 90369, Aug. 6, 1915 (O). Gaspé Co., River Ste. Anne des Monts, Fernald and Collins 484, July 14-17, 1906 (O). Montmorency Falls, Macoun O, 68781, June 23, 1905 (O). Isle-aux-Noix, Richelieu River, M-Victoria 8225, Aug. 13, 1918 (N). Chelsea, J. Macoun O, 85739, June 21, 1911, and O, 85740, July 27, 1911 (O). Beyond "Bedars," Aylmer, Macoun and Malte O, 187760, May 21, 1913 (O). Fraser's Mills near Aylmer, M. O. Malte O, 111831, May 25, 1922.

ONTARIO. Ottawa, Bank of Pt. River, Rockcliff Pt., Harrington 2015, July 1, 1905 (O); In a little bay by Rockcliffe, Macoun O, 60766, May 26, 1903 (O); Along Rideau River, below Billings Bridge, Macoun O, 60767, May 13, 1903 (O); Rockcliffe, M. O. Malte O, 111830, Aug. 23, 1922 (B, O); McKay's Lake, M. O. Malte O, 111739, 111740, June 7 and July 5, 1923 (B, O). Niagara, Macoun O, 26887 and O, 26888, May 9 and May 13, 1901. Toronto, May 3 and May 14, 1902 (N, 981014-15, 962093). London, Burgess, O, 24348 and 24355, May 23 and 21, 1884 (O). Walpole Island, C. K. Dodge 139, Apr. 30 and July 13, 1896 (B). North Bay, Lake Nipissing, Macoun O, 24356, May 24, 1884.

Toronto J. Fowler, May 20, 1903 (O)

5
12
12-a. Salix cordata angustata (Pursh) Andersson

S. angustata Pursh, Fl. Am. Sept. 2:613, 1814.

S. cordata subsp. angustata (Pursh) Anderss. (Monog. Sal)

Svensk Vetensk. Akad. Handl. 6: 159, 1857.

S. cordata var. angustata (Pursh) Anderss. in D.C. Prod. 16²:252, 1868.

This variety is the narrow-leaved expression of S. cordata. As noted under the species, only the most eastern material is typical broad-leaved cordata. The variety, as recognized here, covers on the very narrow-leaved material. It occurs in the same situations as the species and has the same habits. The following Canadian specimens are referred here.

NOVA SCOTIA. Sunny Brae, Valley of the East River, Pictou Co.,
H. St. John 1417, July 28, 1913 (O).

QUEBEC. W. end of McGregor Lake (near Ottawa), M. O. Malte O, 111738,
June 15, 1923 (B, O).

ONTARIO. Snelgrove, J. White 8, May 4, 22, and 29, 1903 (O, 73113).
Below Galt, J. Macoun O, 84818, May 31, 1907 (pedicels and styles very short.)
London, Burgess O, 24352, May 16, 1884 (O).

Salix farrae Ball

Salix farrae Ball, in P. C. Standley, Flora of Glacier National Park, Montana. Contr. U. S. Nat. Herb. 22:321, 1921.

The first collections of this trim little species apparently were made by Miss Edith M. Farr at Field, B. C., on June 8, 1904, and June 7 and July 15, 1905. John Macoun was a close second with his specimens from Laggan, Alberta, on June 26, 1904, and again at Emerald Lake, B. C., on Aug. 27, 1904. Of these specimens, only Miss Farr's second collection was complete enough to permit a description of the species and it accordingly became the type. It was a real pleasure to dedicate the species to this able and observant collector. Her paper ^{1/} on the

^{1/}

Farr, Edith M. Contributions to a Catalogue of the Flora of the Canadian Rocky Mountains and the Selkirk Range. Contr. Bot. Lab. Univ. Penn. 3:1-88, 1 map. 1907.

flora of the Rocky and Selkirk Mtns. of Canada was published long before this species was recognized and it is there mentioned under S. cordata and S. glaucops (p. 30). Only with the abundant collections of N. B. Sanson from Banff and vicinity, made available in 1919 and thereafter, was it possible to determine the range of expression in this species and prepare a description.

The treatment given in the Flora of Glacier National Park necessarily was brief and a projected monograph of the section Cordatae was prevented by other duties. It seems desirable, therefore, to present the following more complete description.

complete but pretty long hand

Caespitose shrub 3 dm. to 1.5 m. high; branches ascending; branchlets ascending or somewhat divergent, glabrous, reddish brown and shining, or drying a dull reddish brown, more or less striated; those of the season pale yellow or reddish-yellow, glabrous or occasionally somewhat puberulent; bud-scales colored as the seasonal twigs, glabrous or puberulent, 2-4 or 6 mm. long, mostly obtuse.

Leaves small to mid-sized, glabrous throughout; stipules wanting or occasionally 0.5-1.5 or rarely 3 (Sanson 2028) mm. long and semicordate; petioles glabrous or slightly puberulent, yellow or yellowish-brown, twisted; blades elliptical-oblongate to elliptic-oval, or broadly lanceolate (the young lower ones often obovate and obtuse), usually widest just above the middle, acute to usually rounded or sometimes truncate at the base, acute or those on sterile twigs often abruptly short acuminate and sometimes plicate at the apex, entire or rarely the upper minutely glandular-serrulate, 1-1.8 cm. wide, 3-5.5 cm. long, or the largest 2.5-6 cm. on sterile twigs, common sizes being 1.4 x 3; 1.3 x 3.5; 1.4-1.7 x 4; 1.7-2.0 x 5, and 1.8 x 6 cm., or the sterile 2.4 x 6 cm., green and rather dull above, subglaucous to usually strongly glaucous beneath, the veins above subimpressed when the leaves are young but somewhat elevated in age, those on the lower surface slender and raised to form a fine but not close reticulation.

15

Aments costaneous, short-pedunculate; pistillate peduncles 5-10 or rarely 15 mm. long, yellow during anthesis, becoming brown, glabrous or very thinly pilose pubescent, bearing 2-3 or rarely 4 small leaves usually 1-1.5 or 2 cm. long; pistillate aments 1-2 cm. long in anthesis, becoming 2-4 cm. long and about 1 cm. wide in fruit; the rachis glabrate to thinly pilose; scales oblong or oblanceolate, 0.7-1 mm. long, obtuse, the lower portion yellowish, the apical portion dark brown, sometimes completely fuscous in drying, thinly pilose beneath or becoming glabrous throughout; capsule lanceolate, often acute at base, 4-6 mm. long, glabrous, yellowish, sometimes becoming brown in age; pedicel yellow, glabrous, 1-1.5 mm. long, or on basal capsules sometimes 1.5-2 mm.; gland short, filiform-capitate; style 0.4-0.8 mm. long; stigmas usually very short, entire or sometimes one or both somewhat bifid.

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The staminate aments are scarcely known. Although many of the collections bearing only leaves probably are from staminate plants, they were made too late to obtain aments. Cusick's No. 3386^a from the Imnaha Mts. of Northeastern Oregon, collected on August 18, bears one staminate ament with full grown leaves. This doubtless represents a second or autumnal flowering and may not be fully representative of vernal flowers. However, the following description is given. It is to be hoped that collectors will be enabled to obtain staminate flowers and later to get mature foliage from the same plants.

Staminate ament (a single autumnal example) short-pedunculate, 1.5 cm. long, yellow; peduncle 5 mm. long, bearing 2 small leaves 4 x 10 mm. long; stamens 2; filaments glabrous, free; anthers oval or subspherical, yellow.

One striking feature of most of the pistillate specimens examined is the frosted condition of the aments^x. In many cases, the ovaries have not been fertilized, although this ^{condition} could result from absence of male plants. In a large percentage of the cases, however, the ament is distorted and all or part of the capsules are blackened. Often the rachis and pedicels show injury. This prevalent condition seems to indicate a lack of adaptation to the present environment. Reproduction by seeds must be greatly reduced and this may be a factor in the apparently limited range of the species.

Salix farrae is a plant of wet places, chiefly swamps and marshes. It has been found from the Yellowstone National Park of northwestern Wyoming, the ^{Wallowa mts} Imnaha Mountains of northeastern Oregon, and the Glacier National Park of northwestern Montana, northward along the Rocky Mountain ranges as far as Lake Louise in the Rocky Mountains Park of Alberta, and Wapta and Emerald Lakes in the Yoho Park of British Columbia. This carries it north nearly to latitude 51°30'. Very probably its known range will be extended as more collecting is done in the northern mountains. It occurs at relatively high altitudes varying from 7000 or 8000 feet in the southern portion of its range to 5000 or 6000 feet in Glacier Park and 4000 to 5000 in the Canadian Mountains. Its zonal distribution is upper Transition and Canadian. The following specimens have been studied.

WYOMING. Yellowstone National Park, Obsidian Creek: ^{In small} ~~clumps~~ ^{on a boggy slope, 3-4 feet high} 2-3 ft. high, A. and E. Nelson 6094 (B); 6104 (N), July 24, 1899.

MONTANA. Stillwater Cr., West Rosebud Canon, alt. 8,000 ft.,
P. H. Hawkins 329, Aug., 1923 (B). (Apparently only 3 dm. high, with very
small leaves and unfertilized capsules only 3-4 mm. long.)

Glacier National Park: Along Apeku Creek, 2-3 ft. high, in open mossy bog; P. C. Standley 16930, Aug. 2, 1919 (B,N); Vicinity of Cracker Lake, alt. 1740
common, on rock slides above lake,
to 1920 m., 2-3 feet high, Standley 15755 (N), 15813 (B,N), July 15, 1919;
Vicinity of Grinnell Glacier, alt. 1650-1950 m., 2-4 feet high, common
on rocks
near brook, common, Standley 16753 (B,N), July 31, 1919; Vicinity of Grinnell
Lake, alt. 1500-1650 m., in marsh, 3 feet high, Standley 16109, 16110, July
21, 1919 (B,N); Along Swift Current Creek, below Lake McDermott, alt. about
1350 m., 1-2 feet high, abundant in open marsh. Standley 16058, 1919 (B,N).
July 20

OREGON. ^{Wallowa} ~~Imnaha~~ Co., shrub 3-5 feet high, on the Imnaha R., alt.

7,000 ft., W. C. Cusick, 3386, 3388a, Aug. 18, 1909 (B, as *S. monticola* Bebb);

~~Cor, but higher~~

Wallowa Mts., near
the lake, a low shrub,
W.C. Cusick 2302,
(as *S. commutata*

denudata) Aug. 2,
1899 (N, four small ^{immature} twigs, 3 pistillate and 1
staminate, probably all belonging to *farrae*,
and, if so, one pistillate twig representing
forma *microserrulata* B.S.P.)

, N, on sheet 622467
with Cusick 3383,
S. melanopsis.

as a mixture

moist place at foot
of cliff, 3 feet high,

And E. Nelson,

WYOMING. Yellowstone National Park, Obsidian Creek: In small clumps 2-3 ft. high, A. and E. Nelson 6094 (B); on a boggy slope, 3-4 feet high, A. and E. Nelson, 6104 (N), both July 24, 1899.

MONTANA. Glacier National Park: Along Apeakun Creek, 2-3 ft. high, in open mossy bog, P. C. Standley 16930, Aug. 2, 1919 (B,N); Vicinity of Cracker Lake, alt. 1740 to 1920 m., common, on rock slides above lake, Standley 15755(N), moist place at foot of cliff, 3 feet high, 15813(B,N), July 15, 1919; Vicinity of Grinnell Glacier, alt. 1650-1950 m., 2-4 feet high, common on rocks near brook, Standley 16753(B,N), July 31, 1919; Vicinity of Grinnell Lake, alt. 1500-1650 m., in marsh, 3 feet high, Standley 16109, 16110, July 21, 1919(B,N); Along Swiftcurrent Creek, below Lake McDermott, alt. about 1350 m., 1-2 feet high, abundant in open marsh. Standley 16058, July 20, 1919(B,N).

GREGG CO. Wallows Co., shrub 3-5 feet high, on the Innaha R., alt. 7,000 ft., W. C. Cusick, 3386, 3386a, Aug. 18, 1909(B as S. monticola Bebb; N, on sheet 622467 as a mixture with Cusick 3383, S. melanopsis); Wet higher Wallows Mts., near the lake, a low shrub, W. C. Cusick 2302 (as S. commutata denudata) Aug. 2, 1899 (N, four small immature twigs, 3 pistillate and 1 staminate, probably all belonging to farrae, and, if so, one pistillate twig representing forma microserrulata Ball).

ALBERTA. Margins of streams, Oldman River, W. Dawson O, 24334
 (as S. cordata), Aug. 7; 1883 (O). [#]Rocky Mountains Park. [#]Elbow River,
 J. Macoun 41, June 23, 1897 (B,O,94441, as S. lutea); [#]Banff and vicinity:
 Lake back of Mt. Assiniboine ²⁰(~~15~~ mi. S.W. of Banff), N.B. Sanson 811, 813,
 816, Aug. 26, 1921 (B,RM); Swampy ground to Calumet Camp, Banff, N. B.
 Sanson 603, July 29, 1924 (B,RM); Museum Grounds, back of cages, N. B.
 Sanson 95, 132, 134, 180, June 9, 10, 19, 21, 1911 (BRM); By the Spray Riv-
 er, N. B. Sanson 108, June 9, 1911 (B,RM, pedicels up to 2 mm. long); Damp
 places, Cave Avenue, Macoun O, 24337, June 26, 1891 (O, as S. cordata var.);
 River Avenue, N. B. Sanson 336, Aug. 2, 1911, and 2032, Aug. 12, 1911 (B,RM);
 Cascade Mtn. (about 5 miles north of Banff), ^{and} 2207 (Cascade Camp), Aug.
 26, 1916 (B,RM); ^{and} 2027 (amphitheatre), Sept. 2, 1916 (B,RM); Side of 40-mile
 Creek, Sanson 2048, June 13, 1900 (B, O, 25358 as S. cordata, RM); Without
 specific locality, N. B. Sanson 228, June 29, 1911 (B,RM), 241, 315, 317,
 318, ^{and} 322, ^{all} July, 1911 (B,RM), 338, 359, 386 (smaller, obovate leaves), 390,
 415, 440, 2034, ^{all} August, 1911 (B,RM); Castlemount Ranger Station, In swamp
 about 3 miles east, alt. 4300 ft., Malte and Watson ^{508, 511}O, 116774, 116777 (ovate-
 obovate leaves), ⁵⁷⁹116779, June 21, Sept. 4, 1925 (B,O); Lake Louise, alt.
 5700 ft.; Upper end of Lake, Malte and Watson ¹⁰⁸¹O, 116813 along the shore.
^{July 9, 1925 (B,v)} Malte and Watson O, 116812, 116823 (with young branchlets, bud scales, and
 near chateau at Lake Louise, J.B. Jack 2927, as
 petioles pubescent, large ovate leaves, and long aments of var. waipouia
S. baselaysii, Sept. 18, 1922 (A) 2x
 from Alaska but also the long styles of the species.

Encloser 898

ALBERTA. Margins of streams, Oldman River, W. Dawson C, 24334
(as S. cordata), Aug. 7, 1883 (C). Rocky Mountains Park.-- Elbow River,
J. Macoun 41, June 23, 1897 (B, C, 94441, as S. lutea);-- Banff and vicinity:
Lake back of Mt. Assiniboine (20 mi. S.W. of Banff), N.B. Sanson 811, 813,
816, Aug. 26, 1921 (B, RM); Swampy ground to Calumet Camp, Banff, N. B.
Sanson 603, July 24, 1924 (B, RM); Museum Grounds, back of cages,
N.B. Sanson 95, 132, 134, 180, June 9, 10, 19, 21, 1911 (B, RM); By the Spray
River, N. B. Sanson 108, June 9, 1911 (B, RM, pedicels up to 2 mm. long);
Damp places, Cave Avenue, Macoun C, 24337, June 26, 1891 (C, as S. cordata
var.); River Avenue, N. B. Sanson 336, Aug. 2, 1911, and 2032, Aug. 12,
1911 (B, RM); Cascade Mtn. (about 5 miles north of Banff), 2028, and 2207
(Cascade Camp), Aug. 26, 1916 (B, RM), and 2027 (amphitheatre), Sept. 2,
1916 (B, RM); Side of 40-mile Creek, Sanson 2048, June 13, 1900 (B, C, 25358
as S. cordata, RM); Without specific locality, N. B. Sanson 228, June 29,
1911 (B, RM), 241, 315, 317, 318, and 322, all July, 1911 (B, RM), 338, 359,
386 (smaller, obovate leaves), 390, 415, 440, 2034, all August, 1911 (B,
RM); Castlemount Ranger Station, In swamp about 3 miles east, alt. 4300
ft., Malte and Watson 508, 511 (ovate-obovate leaves), 513, June 21, Sept.
4, 1925 (B, C, 116774, 116777, 116779); ~~Lake~~ Louise, alt. 5700 ft., Upper
end of Lake, Malte and Watson 1081, July 9, 1925 (B, C, 116813); 2-4 ft.
high, Near chateau at Lake Louise, J. G. Jack 2927, as S. barclayi, Sept.
18, 1922 (A).

BRITISH COLUMBIA (All in Yoho Park). Emerald Lake, J. Macoun 0,68901, as S. cordata var. (B,O), Aug. 21, 1904. Field, along the Kicking Horse River, on the flats which are often overflowed in July, when snows melt, Edith M. Farr 558 (B, type), June 7, July 15, 1905; Edith M. Farr. June 8, 1904 (B, as a mixture with S. glauca glabrescens). North side of Wapta Lake, J. Macoun 0,68900 (B,O, as S. cordata var.), Aug. 2, 1904. Burgess Pass trail, alt. 6,500 ft., shrub, 3 ft. high, Titus Ulke, July 28, 1922 (U).

S. farrae variety

New var.

Differs from typical farrae in having the vigorous seasonal branchlets and their bud scales often thinly to densely pubescent; larger and broader leafblades, the upper broadly ovate or sometimes obovate, 2-3.5 cm. wide and 4-7 cm. long; longer pistillate aments, 4-7 cm. long, borne on peduncles 1-2 cm. long; and the longer pedicels, 1.5-2.5 ^{mm} cm. long, subtended by large scales 1-2 ^{mm} cm. long. The scales are nearly black and the styles 0.5-0.8 mm. long, as in the species.

This variety bears a superficial resemblance to S. farrae walpolei Coville and Ball from Alaska. Variety walpolei differs, however, in having its large leaves more obovate than ovate, with shallowly crenulate-serrulate margins; in the pale brown scales; in the laxer aments, and in the very short styles, only 0.2-0.3 mm. long. It is known yet only from Lake Louise, in the Rocky Mountains of southwestern Alberta.

ALBERTA. Rocky Mountains Park: Along the shore of Lake Louise (Rocky Mtns.), alt. 5700 ft., M. O. Walte and W. R. Watson 1097, 1091(type), July 9, 1925 (B.O. 116819, 116823).

Salix farrae forma exiguifolia new form.

Leaf blades narrowly oblanceolate to narrowly elliptical, acute at the base, acute or abruptly short-acuminate at the apex; occasionally narrowly lanceolate and somewhat rounded at the base. Common sizes are 7-8 mm. by 3 cm.; 8-10 mm. by 4 cm., and 10-12 mm. by 5 cm.

In its extreme expression, this form is so distinct from the normal form with lanceolate to broadly lanceolate leaves that it seems to deserve recognition. It may prove to be a good variety but more and better material will be necessary to a decision. Of the 3 specimens cited, the first is immature, the second and third sterile, and the fourth bearing two small aments with apparently unfertilized ovaries. This form apparently has the same range as the species.

WYOMING. Yellowstone National Park, 2-3 feet high, in a draw, Mammoth Hot Springs, A. and E. Nelson 5626, July 1, 1899 (B,H).

MONTANA. Stillwater Co., West Rosebud Canon, alt. 8,000 ft., F. H. Hawkins 320, Aug., 1923 (B).

ALBERTA. Rocky Mountains Park. Banff or vicinity, N. B. Sanson 358 (B, type; RM), Aug. 9, 1911; 2100 (B, RM), Aug. 12, 1911.

OV31 → S. fauræ forma microserrulata Balf.

On many shoots of typical fauræ the apical leaf or leaves may be somewhat serrulate. This is true also of the leaves of some other species with normally entire margins, as S. planifolia Pursh. x Occasionally, however, a specimen has all or nearly all of its leaves with the margins finely and regularly serrulate. ~~Such specimens~~ ^{They} do not seem to differ in other respects from typical fauræ, though this is not wholly certain. x But most such specimens are without fruit or have only infertility of capsules.

It seems desirable to designate these as a variety until more and better material enables a sure diagnosis. The following specimens are placed here.

Alberta x Rocky Mountains Park x

Banff and Vicinity: Springy thickets, Sundance Canyon, near Banff, alt. 4500 ft., M.O. Matte and W.R. Watson 11680 898, July 4, 1925 (B, type; Di); Swampy Canyon Road, NB Sanson 1x, Aug 21, 1911 (B, R.M.); Without specific locality, NB Sanson 327, July 27, 1911, B.R. 395, Aug 16, 1911, and 2040, Aug 10, 1911 (all B, R.M.) x

328 (capsules to 7 mm. long), July 28, 1911 5
340, Aug. 3, 1911,

This form
differs from the species in having
the margins of the leaves shallowly
but not always regularly serrulate, or
sometimes crenulate - serrulate x the
blades themselves tend to be a little narrower
than in the species.

S. farrae forma microserrulata new form

This form differs from the species in having the margins of the leaves shallowly but not always regularly serrulate, or sometimes crenulate-serrulate. The blades themselves tend to be a little narrower than in the species.

On many shoots of typical farrae the apical leaf or leaves may be somewhat serrulate. This is true also of the ^{apical} leaves of some other species with normally entire margins, as S. planifolia Pursh. Occasionally, however, a specimen has all or nearly all of its leaves with the margins finely and regularly serrulate. Such specimens do not seem to differ in other respects from typical farrae, though this is not wholly certain. Most such specimens are without fruit or have only unfertilized capsules. It seems desirable to designate these as a form of the species rather than a variety until more and better material enables a surer diagnosis. The following specimens are placed here.

ALBERTA. Rocky Mountains Park:-- Banff and Vicinity: Springy thickets, Sundance Canyon, near Banff, alt. 4500 ft., M. O. Malte and W. R. Watson 898, July 4, 1925 (B, type; O, 116806); Swamp, Canyon Road, N. B. Sanson lx, Aug. 21, 1911 (B, RM); Without specific locality, - N. B. Sanson 327, July 27, 1911, 328 (capsules to 7 mm. long), July 28, 1911, 340, Aug. 3, 1911, 395, Aug. 16, 1911, and 2040, Aug. 10, 1911 (all B, RM).

Canadian
227 Cord 23

13. Salix lutea Nuttall

S. lutea Nutt. N. A. Sylva 1:63, pl. 19, 1843.

S. cordata lutea (Nutt.) Bebb, Gard. & For. 8: 473. 1895.

S. cordata watsoni Bebb. Willows Calif. (repr. S. Wats. Bot. Calif. 2: 86.) 1879.

S. flava Rydb. Bull. Torrey Club 28: 273. 1901, not Schoepf, 1796.

S. watsoni (Bebb) Rydb. Bull. Torrey Club 33: 137. 1906.

S. crinsbyensis von Seemen, Bull. Torr. Bot. Club 30: 635, 1903.

The Yellow willow is one of the most widely distributed and abundant plants of the western half of North America. Like its nearest relative, S. cordata, it grows in clumps of 5 to 20 stems, varying in height from 8 to 20 feet, and reaching a butt diameter of 4 inches or more. Like cordata, too, it frequents the water courses but usually above the high water mark. The lower parts of the clumps often are browsed by cattle.

In lutea, and to a lesser extent in the related cordata, missouriensis, and mackenziana, the death of successive basal branchlets as the clump develops causes scars which eventually may become deep diamond-shaped depressions by the continued enlargement of the adjacent normal tissues. When these depressions are well developed and regularly arranged in the usual phyllotaxis of the leaves, it gives the name "diamond" willow to this species. Good examples, when seasoned and polished, make unique walking sticks.

Salix lutea is distinguished from cordata, mackenziana, farrae, and its own variety ligulifolia by having bright yellow branchlets, only occasionally reddened on the sunny side. From cordata it is distinguished also by having glabrous branchlets and petioles, smaller, broader, less serrulate and more glaucous leaves, and usually shorter aments and longer pedicels. From mackenziana it is separated further by having shorter pedicels and less oblanceolate leaves. From farrae it is distinguished, also by much larger stature, mostly serrulate leaves, nearly sessile aments and shorter styles.

Salix lutea is widely and abundantly distributed in the foothills, valleys, canyons and plateaus of the western mountains. It occurs from southern California, northern Arizona, and Colorado northward east of the Cascade Range to Jasper Park, Alberta; Lake Manito, Edmonton, and Prince Albert, in Saskatchewan, and Lake Winnipeg in Manitoba. The general northern boundary is between 53° and 54° N. latitude, so far as present collections show. Immature specimens apparently of this species have been collected still further north at Athabaska Lake near the mouth of the Athabaska River. Its local distribution is Transition and Canadian.

The altitudinal distribution of lutea is from about 4,000 to a maximum of 7,000 feet in the southern and central portions of its territory to only 1400 feet in central Saskatchewan and 700 or 800 feet in Manitoba.

Besides the var. famelica discussed later, there are two varieties not yet found in Canada. These are ligulifolia Ball of the southern Rocky Mountains and platyphylla Ball of the Great Basin area west of the Rockies. The latter may yet be found in southeastern British Columbia. It has more ovate leaves and longer pedicels.

5. lutea 3

27

lutea

MANITOBA. River Park, Winnipeg, Macoun O, 13668, June 3, 1896. West of Portage la Prairie, along line of G. T. P. Ry., Macoun and Herriot, O, 70278 and 70280, June 5, 1906 (O). MacGregor, Macoun and Herriot O, 70279, June 11, 1906 (B, O). (All four specimens distributed as S. cordata.)

SASKATCHEWAN. No. locality, E. Bourgeau, 1859 (N, 287063-64). Moose Jaw, J. M. Macoun O, 100596, May 28, 1884. Old Wives Creek, Macoun A1008, May 23, 1895 (O). Maple Creek ("N.W. Territory."), J. M. Macoun O, 24241 (cited by Macoun in Cat. Can. Pl. 1(3): 451 under S. nigra), May 29, 1884; W. Dawson O, 24240 (as S. nigra), June 6, 1883. Bluffs of So. Saskatchewan River at Saskatchewan Landing, northwest of Swift Current, C. R. Ball 2318, Aug. 19, 1925 (B, I, N, O). Saskatoon: Bluff on east bank of South Saskatchewan R., north of concrete bridge to University, C. R. Ball 2322, 2326, Aug. 21, 1925 (B); Along Saskatchewan River, Macoun and Herriot O, 70269, July 27, 1906 (B, O). Eye Hill Creek, along line of the G. T. P. Ry.: Manitou Lake, Macoun O, 70261; South of Lake Manitou, Macoun O, 70270, both Aug. 8, 1906 (B, O). Rosthern P. E. Dist., High bluff of So. Saskatchewan R. near Batoche, C. R. Ball 2328, Aug. 22, 1925 (B). Paddockwood, 27 mi. N.E. of Prince Albert, C. R. Ball 2332, Aug. 22, 1925 (B, N, O).

ALBERTA. Castellated Rocks, Milk River, Macoun O, 13690a, July 15, 1895. Medicine Hat, J. Macoun O, 5942a, May 31, 1894 (B, as S. cordata). Lethbridge, Belly River Valley, Macoun O, 5941, June 5, 1894. Calgary: J. Macoun O, 94330, June 5, 1897 (B, O); Alluvial flat along Elbow R., Calgary, alt. 3400 ft., Malte and Watson O, 116718, June 3 and 28, 1925 (B, O, leaves nearly entire); East Calgary, H. B. Sanson 602, May 26, 1925 (B). Jasper Park, Athabaska River, J. M. Macoun O, 95802, July 25, 1918 (B, O). Athabaska Lake: Athabaska (River) Delta, Main Branch, 8 miles from mouth, common, in thickets along river, H. M. Laing 34 and 36, June 3, 1920 (B, N); Mouth of Athabaska River, E. A. Preble, 184, June 2, 1903 (N).

Midnapore, N. B. Sanson, O, 94209, June 7, 1917 (O, with narrow leaves approaching var. famelica Ball).

26
13-a Salix lutea famelica Ball

~~13-a SALIX LUTEA FAMELICA BALL~~

Salix lutea famelica Ball, Bot. Gaz. 71 (6): 426, June, 1921.

This variety is characterized by small and narrow leaves with prominent veins. The aments and the pedicels of the capsules both are somewhat shorter than in the species. The name famelica means starved or hungry, suggested by the narrow outline and evident "ribs."

The type specimen came from Forsyth, on the Yellowstone River in southeastern Montana. Specimens have been collected also in the adjacent western parts of South Dakota and North Dakota, and near Glendive, Montana, on the Yellowstone. The only Canadian specimen known to the writer is from Saskatchewan, where it was collected in the sandhills of the McFarlane River, near Lake Athabaska, by Francis Harper, No. 111, on Aug. 10, 1920 (B). A specimen, No. 0,94209, collected by H. B. Sanson at Midnapore, Alta., on June 7, 1917, and cited in the present paper as S. lutea, has narrow leaves but is too immature to determine with entire certainty.

*Distribution and citation of
specimens in Ball Archive copy*

Salix myrtillifolia Andersson. Typical form. Rechecked August, 1949 (30).

Newfoundland. Cold mossy brooksides and pond margins one mile back of Savage Cove, Straits of Belle Isle, NW. Mfld., Fernald and Long 28004, July 14, 1925 (CRB, Gray).

LABRADOR. Forteau, A.C. Waghorne, Aug. 2, 1894 (Feb 3576, fragment CRB).

JAMES BAY. Charlton Id., A. Dutilly 10049, July 10, 1942 (CRB).

ONTARIO. Lomaski River, James Bay, ^{R.H. Smith} 44 (CRB), 110 (CRB, USN), July 20, 1944.

MANITOBA. Swamps and stream margins, north of Lake of the Woods, R. Bell 31, July, 1883. (CNM 18868; Feb 7707; CRB, photograph of Feb 7707, and fragment).

Churchill, Hudson Bay, Lat. 58° 50' N., J.M. Macoun, Aug. 2, 1910 (CNM 79160; CRB, fragment). Hayes River, 25 miles above York Factory, Hudson Bay, Preble & Preble 58, Aug. 30, 1900 (USN, as *S. pseudomyrsinites*).

SASKATCHEWAN. McKague and Vicinity: A. J. Breitung 1, May 17 & June 7, 1936 (CRB); no No., May 13, 31, 1937 (CRB); 2 b, Aug. 10, 1938 (CRB); 6 a, 6 b, May 18, 1938 (CRB); 6 c, June 11, 1938 (CRB); 6 d, Aug. 10, 1938 (CRB); 36, May 12, 1939 (USN); 141, June 11, 1939 (USN).

Waskesiu Lake, Fraser & Ledringham 18 a, 18 b, June 9, 1937 (CRB).

Prince Albert Natl. Park, G. F. Ledringham 11, July 2, 1937 (CRB);

Clearwater River, bogs (NW Sask, Lat. 57° N), J.M. Macoun, July 1, 1888 (CNM, 18854; Feb 7709; CRB, fragment).

Lake Athabaska, Charlot Pt., (Lat. 59° 36' N; Long. 109° 13' W), Hugh M. Raup 6176, 6177, 6198, 6199, June 18, 1935 (CRB); 6298, July 24, 1935 (CRB).

ALBERTA. Southern: Morley. A. H. Brinkman 3346, July 3, 1928 (CRB); Elbow River, John Macoun 84 (CNM, 94437), July 15, 1907 (CRB, CNM).
Banff and Vicinity: H. B. Sanson 9, July 11, 1911 (CRB); Sanson 82, June 9, 1911 (CRB); Sanson 192 (as *S. pseudomyrsinites*), June 21, 1911 (CRB); Sanson 211, June 21, 1911 (CRB); Sanson 226, June 29, 1911 (CRB); Sanson 452, Sept. 1, 1911 (CRB); Sanson 2049, 2051, June 25, 1913 (CRB); 2099, June, 1915 (CRB).

Central: Jasper Park: near Yellowhead Pass (Mt. Cavell S station), close bushy growth 18 in. high, J.G. Jack 2736, Sept. 5, 1922 (CRB); Cavell Creek, by spring, elev. 4500 ft., J.M. Macoun 95392 (as *S. monticola*), 95394 (as *S. pseudomyrsinites*), Aug 14, 1917 (CRB); Border of Cabin Lake, low ground subject to overflow, J.M. Macoun 95765 (as *S. pseudomyrsinites*), June 21, 1918 (CRB); Athabaska River, west end of bridge, mixed alluvial soil and gravel, J.M. Macoun 95767, 95768, 95771, 95772 (all as *S. pseudomyrsinites*), June 15, 1918 (CRB); above Punch Bowl Falls, shrubs a few inches high "creeping" over moss, in woods, W.C. McCalla 7079, July 4, 1942 (CRB); Maligne Canyon, McCalla 7116, July 6, 1942 (CRB); Jasper, bog, R.H. Moss 2639, Aug 5, 1933 (CRB, lg lvs): virgin spruce forest, Moss 4600, June 10, 1939 (CRB); near Jasper, boggy sources of Cottonwood Creek, Moss 4656, June 12, 1939 (CRB).
Fort Saskatchewan, wet edge of slough, G.H. Turner 1753, June 7, 1940 (CRB);
Lesser Slave Lake district, near Atauwau Cabin, in dryish sphagnum muskeg, A. H. Brinkman 4269, June 21, 1929 (CRB).

Northern. Wood Buffalo Park, Pine Lake distr., (about 59° 34' N, 112° 15' W), bushes up to 3 ft. high in muskeg along Salt R., H.M. Raup 2157, June 20, 1928 (USN).

MACKENZIE. Southern: Slave River, Ft. Smith, A. Dutilly 8071 B, June 20, 21, 1940 (CRB).

Great Slave Lake: Caribou Id., Seton & Preble 63 (CNM, 78306), July 21, 1907 (CRB);

Ft. Providence, Preble & Cary 43, (as *S. pseudomyrsinites*), July 5, 1903 (USN).

Central. Great Bear Lake, Cameron Bay (66° N, 117° W), Dutilly 28250, 7/28/40 (CRB).

Mackenzie River: Wrigley, A. Dutilly 8766, 8769, July 9, 1940 (CRB); Ft. Norman,

Dutilly 8860, July 8, 1940 (CRB); Ft. Good Hope, E.A. Preble 331, June 23, 1904 (USN)

Southwest. Nahanni Mtns. Preble & Cary 63, July 15, 1903 (USN); Nahanni R., on summit of mtn. near timberline, about 2000 ft. elev., E.A. Preble 311, June 4, 1904 (USN).

mytilloides Var. typica

Canadian willows (30)
sect. cord

SPECIMENS EXAMINED

MANITOBA. Hayes R., 25 mi. above York Factory, Hudson Bay,
Battle
Preble and Cary 58, Aug. 30, 1900 (N.).

SASKATCHEWAN. In the muskeg north of Prince Albert, Macoun
(O 13672 in part), July 1, 1896 (O).

ALBERTA. Elbow River, John Macoun 34 (O 94437), July 15
1897 (B, O). Banff: 2 ft. high, low ground along Cave Ave-
nue, W. C. McCalla 2243, May 31, June 27, 1899 (N); The Loop,
N. B. Sanson 9, July 11, 1911 (B); Sanson 82, June 9, 1911 (B),
Sanson 2183, July 7, 1911 (B). Jasper Park: by a spring, Ca-
vell Creek, alt. 4,500 ft., J. M. Macoun (O 95394), Aug. 14,
1917 (B, O); along Athabaska River, near Jasper, J. M. Macoun
(O 95385), Aug. 24, 1918 (O); West end of bridge, Athabaska
River, J. M. Macoun (O 95767), June 15, 1918 (B, O); ^{18 in. high,} Mt. Cavell
Sta., near Yellowhead Pass, J. G. Jack 2736, Sept. 5, 1922 (B);
Athabaska Plains (Railway Survey), John Macoun 11 (O 24633),
Sept. 17, 1872 (O, as S. nova-angliae).

YUKON. White Horse, John Macoun (O 91478), Aug. 30, 1902
(O). Dawson, Cemetery Hill, Alice Eastwood 438, June 29, 1914
(O 97535, in part).

R1 rough dfr with carbon

myrtillifolia var. pseudomyrsinites And.

p 3 missing
Canadian Bot. Cord

A depressed or low shrub 2-8 dm. high, the much branched stems spreading or ascending, the seasonal shoots usually yellowish and pubescent, the 1-year and 2-year branchlets reddish brown to fuscous, sometimes shining, puberulent to more or less densely pubescent; the obtuse budscales colored and clothed as the branchlets, sometimes pruinose. Stipules minute and sub-orbicular to 1-2 mm. long, and ovate or ovate-lanceolate; petioles 4-8 mm. long, yellowish to brown, glabrous ~~or~~ or puberulent; blades broadly or narrowly obovate or oblanceolate, usually narrowed but sometimes somewhat rounded at base, usually $1/3$ to $2/5$ or rarely $1/2$ as wide as long, 1-2 cm. wide, 2.5-5 cm. long, common sizes being 1 x 2.5, 1-1.4 x 3-3.5, 1.2-1.4 x 4, 1.6-2 x 4, 1.5-2 x 4.5, and 1.6-2 x 5, apex rounded to abruptly acute, sometimes plicate, margins finely crenulate-serrulate, both surfaces green and glabrous, or rarely subglaucescent beneath, often browning in drying, the rather slender primary and secondary veins usually rather prominently raised at maturity, especially beneath.

Aments small, 1-2.5 cm. long in flower, the pistillate becoming 1.5-3.5 or rarely 4.5 cm. long in fruit. Staminate aments 1-2 cm. long ascending sessile or on pubescent peduncles 3- mm. long and bearing 2-3 small leaf-like bracts; stamens 2, filaments glabrous, free; the scales oblanceolate-oblong, acute, mostly glabrous outside, thinly pilose within. Pistillate aments subdensely flowered, spreading or ascending, 1.5-3.5 or rarely 4.5 cm. long and ^{about} at least 1.5 cm. wide in fruit, on pubescent peduncles 0.5 to 1, or rarely 1.5 cm. long and bearing 2-4 small leaves or leaflike bracts.

✓ extra copy

Capsules lanceolate to broadly lanceolate, 5-6.5 or 7 mm. long (when fertilized), yellowish or brownish, glabrous; pedicels 0.7-1.5 or the lowermost 2 mm. long, slender, glabrous (at least at maturity); styles 0.5-0.8 mm. long, entire stigmas very short, entire or notched. Scales lanceolate-oblong, becoming acutish, light brown at base with fuscous tips or dark throughout, thinly pilose to glabrous outside, pilose with crisp twisted hairs within.

Differs from variety typica in usually less pubescent branchlets and the leafblades obovate-ob lanceolate, mostly narrowed at base, the width usually about one-third the length.

SPECIMENS EXAMINED

NEWFOUNDLAND. Cold mossy brooksides and pond margins one mile back of Savage Cove, Straits of Belle Isle, N. W. Nfld., Fernald and Long 29004, July 14, 1925 (B. G.).

LABRADOR. Forteau, A. C. Wagherne, Aug. 2, 1894 (Fbb 3576).

QUEBEC. Calcareous alpine meadows, alt. 1000-1125 m., Table-topped Mtn., Gaspé Co., Fernald and Collins 525, Aug. 7 and 12, 1906 (O, 80378 as pseudomyrsinites And.).

ONTARIO. Pic River, J. Macoun 89, July 30, 1869 (Fbb 7708); Swamps and stream margins, north of Lake of the Woods, R. Bell 31, July, 1883 (O 18868; Fbb 7707; B. photograph of Fbb 7707)

MANITOBA. Hayes R., about 25 miles above York Factory, Hudson Bay, Preble and Preble 59, Aug. 30, 1900. (N) Churchill, Hudson Bay, Lat. 58°50', J. M. Macoun, Aug. 2, 1910 (O, 79160).

SASKATCHEWAN. In the muskeg, north of Prince Albert, Macoun, July 1, 1876 (O 13672, in part); July 3, 1876 (O 81897). Bogs, Clearwater R., (N. W. T.), J. M. Macoun, July 1, 1888 (O, 18854, Fbb 7709). Common on the portage of the Grand Rapid (of the Saskatchewan) near Lake Winnipeg, Douglas (Fbb 7618 in part, a drawing made by Bebb from the specimen in Gray Herbarium). Palliser's Brit. N. A. Explor. Exped. (locality unknown), E. Bourgeau, 1859 (N. as cordata subhestate).

SPECIMENS EXAMINED

1 *myrs* NEWFOUNDLAND. Cold mossy brooksides and pond margins
 one mile back of Savage Cove, Straits of Belle Isle, N. W.
 Mid., Fernald and Long 29004, July 14, 1925 (B. Gray).

2 *myrs* LABRADOR. Forteau, A. C. Wagner, Aug. 2, 1894
 (Fb 3576). fragment (B)

3 *myrs* QUEBEC. Calcareous alpine meadows, alt. 1000-1125 m.,
 v. heavily ~~table-topped Mtn., Gaspé Co., Fernald and Collins 525~~ (US) as *S. Barclayi* 204 Aug 76
 Aug. 7 and 12, 1906 (O. 80378 as pseudomyrsinites And.).

ONTARIO. Pic River, J. Macoun 89, July 30, 1869

4 *myrs* (Fb 7708); Swamps and stream margins, north of Lake of the
 Woods, R. Bell 31, July, 1882 (O. 18862; Fb 7707; B. photo
 sketch of Fb 7707) + fragment

MANITOBA. Hayes R., about 25 miles above York Factory,

5 *myrs* Hudson Bay, Preble and Preble 59, Aug. 30, 1900. (N) Churchill;

6 *myrs* Hudson Bay, Lat. 62°50', E. M. Macoun, Aug. 2, 1910 (O. 79160).

7 *myrs* SASKATCHEWAN. In the muskeg, north of Prince Albert,

Macoun, July 1, 1876 (O. 13672, in part); July 3, 1876 (O. 81897).

8 *myrs* Bogs, Clearwater R., (N. W. T.), E. M. Macoun, July 1, 1882

(O. 18456, Fb 7709). Common on the portage of the Grand

Rapid (of the Saskatchewan) near Lake Winnipeg, Douglas

(Fb 7618 in part, a drawing made by Rebb from the specimen in

Gray Herbarium). Palliser's Brit. N. A. Explor. Exped. (1857)

salinity unknown; E. Bourgeau, 1859 (N. as *cordata subaequalis*).

9 Where is character P. Not in atlas = NWS Sask, w to Athab R.
 alt 570 ft

ALBERTA. Jumping Pound Creek (Near Elbow R.) John Macoun
O 94434, June 11, 1897 (B, O); O 94435, June 13, 1897, (B);
O 94436, June 11, 1897 (B, O). Banff: Damp places near Spray
bridge, Macoun 37, July 1, 1891 (O 18867); Beside aspen drive,
Edith M. Farr 535, 535a, May 31, Aug. 31, 1905 (B); without spe-
cific collection locality except as named, N. B. Sanson 89, 191,
192, 208, ~~212~~ (River Ave.), ~~226~~ (all June, 1911), 261, 14, 14x
(The Loop) (all July, 1911), 370, 429, ~~450~~ (all Aug.-Sept., 1911),
~~5249 (Swamp, off Alder Ave.), 2051 (both June, 1915), 2099 (June,
1915) (all B, 1915). Jasper Park: By springs, Cavell Creek, alt.~~
~~4500 ft., J. M. Macoun O 95392, Aug. 14, 1917 (B, O); Border of~~
~~Cabin Lake, J. M. Macoun O 95764, 95765, June 21, 1918 (B, O);~~
~~West end of bridge, Athabasca River, J. M. Macoun O 95767, 95768,~~
~~95771, 95772, June 15, 1918 (B, O); West of Edmonton, W. Spread-~~
~~borough O 20355, June 11, 1898 (O, as S. cordata mackenziana)~~
East of McLeod R., Spreadborough O 20354, June 17, 1898 (O, as
S. cordata mackenziana, leaves thin, obovate-oval, glaucescent be-
neath). White Mud Creek, McLeod R., Spreadborough O 20356, June
21, 1898 (O, as S. cordata mackenziana). Athabasca R., Lat. 53°
30', Spreadborough O 20357, June 25, 1898 (O, as S. cordata mack-
enziana). ~~Prairie Creek, N. Hollister 66, July 3, 1911 (N).~~

Highwood River district, river flat west of
Forest Exp. Sta., A.H. Bristman 3160, 3162
June 9, 1928 (B, N); river flat at edge of forest, oppos-
ite Forest Station June 10 (B, N).

① Morley (south of), Side of swamp, A.H. Bristman,
2346, July 3, 1928 (B).

(Those crossed out are S. myrtillofolia)

ALBERTA. Jumping Pound Creek (Near Elbow R.), John Macoun
O 94434, June 11, 1897 (B, O); O 94435, June 13, 1897, (B);
O 94436, June 11, 1897 (B, O). Banff: Damp places near Spray
bridge, Macoun 37, July 1, 1891 (O 18867); Beside aspen drive,
Edith M. Farr 535, 535a, May 31, Aug. 31, 1905 (B); without spe-
cific collection locality except as named, N. B. Sanson 89, 191,
192, 208, 211 (River Ave.), 226 (all June, 1911), 261, 14, 14x
(The Loop) (all July, 1911), 370, 429, 452 (all Aug.-Sept., 1911),
2049 (swamp, off Alder Ave.), 2051 (both June, 1913), 2099 (June,
1915) (all B, RM). Jasper Park: By springs, Cavell Creek, alt.
4500 ft., J. M. Macoun O 95392, Aug. 14, 1917 (B, O); Border of
Cabin Lake, J. M. Macoun O 95764, 95765, June 21, 1918 (B, O);
West end of bridge, Athabaska River, J. M. Macoun O 95767, 95768,
95771, 95772, June 15, 1918 (B, O); West of Edmonton, W. Spread-
borough O 20355, June 11, 1898 (O, as S. cordata mackenziana)
East of McLeod R., Spreadborough O 20354, June 17, 1898 (O, as
S. cordata mackenziana, leaves thin, obovate-oval, glaucescent be-
neath). White Mud Creek, McLeod R., Spreadborough O 20356, June
21, 1898 (O, as S. cordata mackenziana). Athabaska R., Lat. 53°
30', Spreadborough O 20357, June 25, 1898 (O, as S. cordata mac-
enziana). Prairie Creek, N. Hollister 66, July 3, 1911 (N).

1-2 ft. high, Lake Beauport, J.B. Jack. 2538, Aug.
26; 6 in. high, trail to Whistler's Mtn., 4500
ft. alt., J.B. Jack 2781 (A.C.S.), Sept. 7, 1922.

~~MACKENZIE (N. W. T.) Fort Resolution (mouth of Slave R.,
Great Slave Lake), E. A. Preble 199, 200, June 21, 1903 (N). Fort
Providence (west end Great Slave L.) Preble and Cary 43, 45, July 5,
1903 (N). Caribou Island, Great Slave Lake, Seton and Preble 63,
July 21, 1907 (B). Nahanni Mts. (S. W. Mackenzie, near Yukon)
Preble and Cary 63, July 15, 1903 (N); "at mouth of Nahanni R.", on
summit of mountain, near timberline, about 2000 ft. elev., E. A.
Preble 311, June 4, 1904 (N). Fort Good Hope (on Mackenzie R., just
south of Arctic Circle), E. A. Preble 331, June 23, 1904 (N).~~

~~BRITISH COLUMBIA. Telegraph Trail, lat. 54° N., John Macoun
21, 22, June 8, 1895 (N). Trail west of Dease Lake, Dawson 29,
June 3, 1887 (O 24360); Lake Atlin (near Yukon boundary), Alice East-
wood 643, July 14, 1914 (O 97534).~~

YUKON. White Horse, John Macoun, O 91478, Aug. 30, 1902 (O)
leaves oval; Alice Eastwood 608, July 12, 1914 (O 97540); White Pass,
Eastwood 413, June 27, 1914 (O 97533); Bonanza Creek (low shrub,
roadsides) (O 100614, as a mixture in *S. glauca acutifolia*, O 54383).
Hunker Creek, Klondike R., Macoun O 54406, 54406a, July 22, 1902,
O 54404, July 25, 1902 (O). Ft. Selkirk, moist ground and old river
bottoms, much eaten by moose, M. W. Gorman 979, May 23, 1899 (O 59133).
Dawson (mountains back of), Macoun O 54405, July 12, 1902 (O, as
pseudomyrsinites, form) Dawson; Alice Eastwood 77, 78, May 18, 1914
(O 97545, 97547); Eastwood 104a, May 23, 1914 (O 97544); 103, May 26
(O 97541); 104, May 27 (O 97542); 186, 186a, June 11 (O 97546, 97543);
438 (in part), 439 (both Cemetery Hill), June 29, 1914 (O 97535, 97532).

~~ALASKA. Probably between Rampart and Eulato, A. J. Collins 163,
1902 (N, N) = *myrtillofolia*~~

MACKENZIE (N. W. T.) Fort Resolution (mouth of Slave R., Great Slave Lake), E. A. Preble 199, 200, June 21, 1903 (N). Fort Providence (west end Great Slave L.) Preble and Cary 43, 45, July 5 1903 (N). Caribou Island, Great Slave Lake, Seton and Preble 63, July 21, 1907 (B). Nahanni Mts. (S. W. Mackenzie, near Yukon) Preble and Cary 63, July 15, 1903 (N); "at mouth of Nahanni R.", on summit of mountain, near timberline, about 2000 ft. elev., E. A. Preble 311, June 4, 1904 (N). Fort Good Hope (on Mackenzie R., just south of Arctic Circle), E. A. Preble 331, June 23, 1904 (N).

BRITISH COLUMBIA. Telegraph Trail, lat. 54° N., John Macoun 21, 22, June 8, 1875 (N). Trail west of Dease Lake, Dawson 29, June 3, 1887 (O 24360); Lake Atlin (near Yukon boundary), Alice Eastwood 643, July 14, 1914 (O 97534).

YUKON. White Horse, John Macoun, O 91478, Aug. 30, 1902 (O) leaves oval; Alice Eastwood 608, July 12, 1914 (O 97540); White Pass, Eastwood 413, June 27, 1914 (O 97533); Bonanza Creek (low shrub, roadsides) (O 100614, as a mixture in *S. glauca acutifolia*, O 54383). Hunker Creek, Klondike R., Macoun O 54406, 54406a, July 22, 1902, O 54404, July 25, 1902 (O). Ft. Selkirk, moist ground and old river bottoms, much eaten by moose, M. W. Gorman 979, May 23, 1899 (O 59133). Dawson (mountains back of), Macoun O 54405, July 12, 1902 (O, as *pseudomyrsinites*, form) Dawson, Alice Eastwood 77, 78, May 18, 1914 (O 97545, 97547); Eastwood 104a, May 23, 1914 (O 97544); 103, May 26 (O 97541); 104, May 27 (O 97542); 186, 186a, June 11 (O 97546, 97543); 438 (in part), 439 (both Cemetery Hill), June 29, 1914 (O 97535, 97532).

ALASKA. Probably between Rampart and Nulato, A. J. Collins 163, 1902 (N, N)

S. pseudocordata Shrub 1 - 2 m. high. Branchlets (2-yr., 1-yr., and seasonal shoots) and bud scales glabrous, yellow to red and shining, or drying dark brown.

(Copy of penciled note in Ball Archive copy)

W. A. Archer, May 1964

Salix pyrifolia Andersson

S. balsamifera Barratt, in Hooker, Fl. Bor.--Am. 2:149, 1839

(as a synonym).

S. balsamifera Barr. in Bebb, Bot. Gaz. 4:190, 1879.

S. columbine Nelson and MacBride, Bot. Gaz. 56: 473, 1913 (as new name for S. pyrifolia And.)

S. cordata balsamifera (Barr.) Hooker Fl. Bot.-Am. 2:149, 1839

(S. balsamifera Barr. as synonym).

S. pyrifolia Anderss. in Svensk. Vetensk. Akad. Handl. 6: 162, t.8, fig. 93, 1867. (Monog. Sal.)

It seems doubly unfortunate that Barratt's earliest and singularly appropriate name, balsamifera, cannot be maintained for this unique species.

It has a characteristic balsamic odor. Though Hooker preferred to publish it as a mere variety of cordata, he states that Barratt, who was a profound student of the willows, regarded it as a distinct species. It is too bad

that Hooker could not have accepted Barratt's more experienced judgment.

The name pyrifolia also had an earlier use, by Schleicher (Cat. Pl. Helv. ed. 3, p. 26, 1815), but this, like Hooker's publication of Barratt's name, was only a nomen ^m ~~adum.~~ _^

Salix pyrifolia is so well marked and unique a species that Schneider (illus. Handb. ^{W&A}Landvolk. 1:57, 1904) proposed a new section, Balsamiferae, for it. He repeats this treatment 16 years later (Journ. Arnold Arb. 1:167-168, 1920) and 18 years later (ibid 3:74, 1922). Without raising here the question of the validity of a new and separate section, it may be said that this species differs from the remainder of the Cordatae in the rich red shining bark of the branchlets; the ovate or ovate lanceolate leafblades, net-veined and almost rugose beneath; the long-peduncled aments; the light colored scales; the very short styles, and the short, thick gland. The plant is glabrous throughout, the stipules are quickly deciduous or wanting, and the pistillate aments are lax and open by reason of the elongated pedicels. Good illustrations are given by Sargent (Silva 16:63, pl. 728, 1902, and Gard. and For. 6:28, fig. 5, 1893).

Salix pyrifolia is a plant of wet ground but seems to be somewhat intermediate in its ecologic adaptations between S. cordata and S. lutea, on the one hand, and S. farrae on the other. The two species first named are found on brook and river banks, but usually well above the water. S. farrae is found in boggy or swampy ground. S. pyrifolia is recorded by its collectors from riverbanks, damp thickets, wet spruce woods, low or swampy ground, and peat bogs.

NEWFOUNDLAND. Glenwood, Valley of Gander River, Fernald and Wiegand 5276, July 12 and 13, 1911 (O, 99856). Virginia Water near St. John's, Robinson and Schrenk 140, August 5, 1894 (N, 2 sheets; O, 13696). Headwaters of Rocky River, Whitbourne, Avalon Peninsula, Fernald and Wiegand 5280, Aug. 8, 1911 (N, as var. lanceolata).

PRINCE EDWARD ISLAND. Brackley Point, Macoun O, 24257, June 30, 1888.

NOVA SCOTIA. Louisburg, Cape Breton Island, Macoun O, 20363, Aug. 17, 1898. Boylston, C. A. Hamilton O, 24764, May, 1890. Truro, Macoun O, 24256, June 12, 1883. Hants Co., Uniacke Lake, Fernald, Bartram and Long 23740, July 26, 1921 (O). Yarmouth Co., Yarmouth, Bissell, Pease, Long and Linder 20957, July 4, 1920 (O).

NEW BRUNSWICK. Northumberland Co., Miramichi, J. Fowler, June 28, 1892 (N). Kent Co., Bass River: J. Fowler O, 24255, June 12, 1872 (O); Bebb. Herbarium Salicum No. 1, representing plants grown in Illinois from cuttings sent by Fowler from Kent Co., N. B. (B, N, 2 sheets); J. Fowler, June 11 and Oct. 7, 1872 (N, 780077); June 2, 1873, June 4, 1874 (N, 261305). Charlotte Co.: St. Andrews, J. Fowler, June 18, 1900 (N); Campobello Island, ~~Charlotte Co.~~ John D. Smith, July - Aug., 1888 (N, as S. cordata).

QUEBEC. Labrador Peninsula: Turner's Head, Hamilton Inlet, A. C. Waghorne 74, Aug. 7, 1892 (N); Snack Cove, A. C. Waghorne, July 17, 1892 (N); Chateau, J. A. Allen, Aug. 8, 1882 (N, O, 24251) x Saguenay Co., Edge of slough in sand dunes, Natashquan, H. St. John O, 90370, July 4, 1915. ⁴ Temiscouata Co., By the St. Lawrence, Cacouna, Collins and Fernald 58, July 5, 1905 (N, 2 sheets, O). Temiskaming Co., Spirit Lake, Bro-M-Victorin, July 9, 1918 (N). Abittibi Lake district, Makamik, H. B. Humphrey 1, Sept. 3, 1926 (B).

ONTARIO. Ottawa and vicinity: Blackburn, east of Ottawa, Macoun O, 60772, May 27, 1903; Mer Bleue, W. H. Harrington 2010, June 18, 1905 (O), also J. M. Macoun O, 84853, May 30, 1913; Mer Bleue, near Carlsbad Springs, J. Macoun, O, 85738, June 6, 1911 (very broad and short, ovate leaves), also M. O. Malte O, 111854-855, May 30, 1913 (B, O); Rifle Ranges, M. O. Malte O, 111846, May 3, 1913 (B, O). Algonquin Park: No locality, J. Macoun O, 22011, July 17, 1900; Petawawa Falls, J. Macoun O, 84835, July 24, 1900. Muskoka Dist., Portage between Peninsular Lake and Lake of Bays, F. V. Coville 1156, Aug. 19, 1901 (N, as S. discolor). Livingston Point, Lake Nipigon, Macoun O, 24253, July 10, 1884.

MANITOBA. Berens River, J. M. Macoun O, 24252, June 9, 1886 (very broad, short leaves).

SASKATCHEWAN. Sand Hills, Qu'Appelle Valley, J. Macoun 6, July 12, 1879 (N, as S. monticola). North shore of Lake Athabaska, near mouth of Palayer River, Francis Harper 87, Aug. 4, 1920 (B).

MACKENZIE (N.W. Territories). Between Lake Athabaska and Chesterfield Inlet, J. W. Tyrrell O, 1715, July 19, 1893 (O).

ALBERTA. Edmonton District, on "low moor" border of a peat bog (muskeg), E. H. Moss 505, June 25, 1926 (A, B). Pembina Elec. District, in swamp 5 miles south of Legal, C. R. Ball 2367, 2368, 2369, 2370, 2371, Aug. 29, 1925 (B, N, O). Athabaska River, W. Spreadborough. O, 20350, June 30, 1898 (O, as S. cordata mackenziana).

BRITISH COLUMBIA. In swamps, Nacho (Nechako ?) River, J. Macoun O, 24254, June 18, 1875 (Form with very small leaves; aments small, scales large, glabrate; style divided). Upper Liard R., Lat. 62°, Dawson 27, June 22, 1887 (F B b 6943, without name).

Canadian willows
Add to S. lutea

Edmonton, Bank of Saskatchewan River, Ed.
Moss 4, May 31, 1928 (Al.).

Add to S. balsamifera

Edmonton, Calcareous lake in deciduous
muskeg, Miss E. S. Dowding 29 B (in part),
Sept. 1, 1926 (Al.); about 10 miles southeast
Ed. Moss 299, May 22, 1926 (Al.);

Add to pseudomonticola

Edmonton: Saskatchewan R. Valley, Ed. Moss
514, June 25, 1926 (Al.).

Lutea

Gray

52

Sack 70269

Sack

"Palmer's Brit N. Am. Expl. Expedition"
- E. Bourgeau 1859. a *S. cordata*
var *vitellina* (Andes.)

Digitized by Hunt Institute for Botanical Documentation
S. farinosa all as *S. monticola* Bell
Banff vic, alt 4600, Stewardson
Brown 8, June 8-17, 1906

Headwaters of the Sack + Achol Rivers

Upper Maligne Valley S. Brown 1129
July 6, 1908
Maligne Lake S. Brown 1189, 1190, 1201
July 9, 1908.

S. barclayi
as above 1199 July 19, 1908
as *S. monticola*

cordata (ovate leaves)

Gray, Herb

Cover 58/5

1830 or 1840s from Provincetown 1919
(shoot densely white woolly)

Wm Booth, waste way, Middlesex
Canal, May 11, 1854. Shoot glabrate
Cover 58 1/2

J. Barrett "S. prinoides" Middlesex
Comm.

Spsandomonticola

70278a Macoun Herriett Round Valley
Lake, E of L. Manitou, Aug 7, 1906 Sast

S. farae Ball

Oreg. Steens Gulch, opp. Steine Ranch
alt 1900 m. wet slopes J B Seberg
2505, July 5, 1896 (*S. cordata*).

S. pseudomonticola

Sask. Round Valley Lake, E of L. Manton
Macdonald & Sternott, 70278^a, as *S. cordata*
Aug 7, 1906 (Also one sheet same date but
no No, probably same spec.)

Alb. Banff Canby 270 Aug 9, 1897

Digitized by Hunt Institute for Botanical Documentation

Rocky Mts, "Gallies & Brit. N. Am. Expl.
Expedition" E Bourgeau 1858 (*S. cordata*)
podifolia Aylmer

Sask. ^{at Chaguan} ditto E B 1859 as

S. cordata Muhl. (Ands) at least the
♀ twigs (lvs just expanding, styles)

S. lutea

70278 as *S. cord* west of Port. La Prairie Man
Macdonald June 5, 1906

S. Mackenziana Gray Herb.

5

Brit. Col.

J. M. Macoun 68126, ^{ascende,} Brit. Kettle & Columbian
June 26, 1902

Dan Park Col. R., J. M. 27, June 10, 1890
Lytton, J. M. Apr. 17, 1889 (No 11, ^{on} sheet
6946 of Beth Herb). Scordata var.

Victoria, Vancouver Id., J. M. 489, May 31, 1893
(pedicels pub. below)

Wet meadows, Donald, Columbia Valley,
J. M. June 4, 1885. (leaves only)

Digitized by ^{Herbarium} Institute for Botanical Documentation
61,267, June 13 1902 (pedicels glob.)

MacK. R., June, 1876 (cotype)

Summit of Selkirk Mts, B.C. J. M. 15
Aug 16, 1890. Dark stems, small plane-
ellipt. lvs)

Calif Yosemite Nat Park, Yos. valley near
Sentinel Hotel, Abrams 4492, June 1911
4000-4100 ft.