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Ball Carleton R

(Two sheets)

Carbon copy of unpublished mss.
No. 155 of Ball Archives, U.S. Nat. Arb.

~~R. K. Beattie~~

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~~Why in larvae of all species~~

found
The (ribbon) copy has
corrections not entered
on this carbon copy

W.A.A. Sept 1961

See also work sheets at back

PENTANDRAE: Dumortier

403. *S. lasiandra* Benth. var. *lanceifolia* (Andersson) Bebb. pp. 503-4, fig. 403.

LONGIFOLIAE: Andersson.

404. *S. interior* Rawles, pp. 504-5, fig. 404. because variable,
He mentions "var. *pedicellata* Andersson" but does not recognize it, or give
the correct citation: var. *pedicellata* (Andersson) Ball., under *S. interior*,
but merely "var. *pedicellata* Anders."

RETICULATAE Fries.

- 405 *S. reticulata* L. pp. 505-7, fig. 405.
He refers to subsp. *orbicularis* (Anders.) Fled. and var. *orbicularis* Anders.
but does not list them as entities.
The same for var. *gigantifolia* Ball.

ALIENAE Flenherus.

- 406 *Sax. setchelliana* Ball. pp. 507-8, fig. 406.

HERBACEAE Berrer.

- 407 *S. retundifolia* Trautvetter. pp. 508-9, fig. 407.

MYRTOSALIX Kerner.

408. *S. Chamissonis* Andersson. pp. 509-10, fig. 408. Cham., an Eurasian sp.

409. *S. pelaris* Wahlenberg, supsp. *pseudopelaris* (Fled.) comb. nov. pp. 510-11, f. 409.

He says *S. venusta* And. is a young form of this plant, non Hest.

He does not mention var. *selwynensis* Raup, of 1934, the list Mt. Selwyn.

410. *S. phlebophylla* Andersson. pp. 511-12, fig. 410.

Cites *S. Dedgum* Rydberg as a synonym.

- S. phlebophylla* X *retundifolia*. pp. 512-13.

ARCTICAE Rydberg.

411. *S. arctophila* Cockerell. p. 513. fig. 411.

(based on Jones 9042, from Nome, det. by GRB as *S. anglerum*)

412. *S. arctica* Pallas, pp. 513-15, fig. 412

occupying

He states that there are three different major types, ~~which~~ distinct areas.

First: *S. crassijulis* Trautvetter, the larger-leaved, larger-amented
plant usually regarded as *S. arctica* Pallas ~~in Alaska~~.

Second: *S. arctica* of both Pallas and R. Brown: equals *S. anglerum* Cham.

Third: The third form he refers to *S. terulea* Trautvetter.

413. *S. crassijulis* Trautvetter (1832), pp. 515-17, fig. 413a. (hybr. 413 b-f)

S. crassijulis X *evalifolia*, 517

S. crassijulis X *Richardsonii* 518

S. crassijulis X *phlebophylla* 518

S. crassijulis X *retundifolia* 518

S. crassijulis X *pulchra* 518

S. crassijulis X *stemonifera* 519

414. *S. terulea* Trautvetter (1832), pp. 519-20. fig. 414.

S. arctophila Ckll. is *S. greenlandica*

Lundstrom, not Heer; & *S. chlereoelades* Fled
fide Hulten.

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November 12, 1951

Dear Friend:

The marked paragraph on the enclosed sheet will immediately indicate to you that we are having just one financial campaign this year for Cooperative Protestantism. We are exceedingly eager that our efforts in this first year of our merger be successful.

You will be called upon during the next few days to make your pledge or give your contribution to our cooperative Protestant work for the year 1952.

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With appreciation,

Clarence T. Nelson

Mrs. Clarence T. Nelson, chairman
General Department of Church Women

F. E. Reissig
Frederick E. Reissig
Executive Secretary

OVALIFOLIAE Rydberg.

415 *S. hebecarpa* Fernald, pp. 520-21., fig. 415.

based on Walpole 1836, Heller (as *S. ovalifolia* var. *pubescens*)

416. *S. ovalifolia* Trautvetter (1832), pp. 521-22, fig. 416.

does not mention vars. *canadensis*, *cyclophylla*, ~~*canadensis*~~ *pubescens*,

417. *S. flagellaris* Hulten (1940) pp. 322-23, fig. 417.

See treatment by CRB.

418. *S. stelenifera* Ceville, p. 523, fig. 418.

419. *S. glacialis* Anderssen, pp. 523-24, fig. 419.

(cites *S. ovalifolia* var. *canadensis* as a synonym)

also compares it with a *S. eblengifolia*

S. glacialis X *ovalifolia*, p. 524

420. *S. aretoliteralis* Hulten (1940), pp. 524-25, fig. 420

(see treatment by CRB.)

GLAUCAE Fries.

421. *S. glauca* L. pp. 525-27, fig. 421 a.

Hulten regards the American varieties as only the Linnean species

subsp. *deserterum* (Richardson) Anders. (1858), pp. 527, fig. 421 b.

var. *sericea* var. *nov.*, p. 527, fig.

(Type is Dall R., 55 miles above mouth, June 23, 1901 (US))

(cited Eastwood 375, Dawson; Setchell 404, Circle City)

S. glauca X *Ferrae* Walpolei, p. 528;

S. glauca X *pseudomenticola*, pp. 528-29, fig. 421 c.

422. *S. brachycarpa* Nuttall, var. *Mexiae* Ball, pp. 529-30, fig. 422.

423. *S. nipheclada* Rydberg (1899), pp. 520-21, fig. 423.

(type locality, Lower Mackenzie River)

424. *S. Muriel* nov. spec., pp. 531-32, fig. 424.

See treatment by CRB.)

425. *S. fullertonensis* Schneider (1918), pp. 532, fig. 425.

(based on Jones 9045, Nome)

CORDATAE Barratt.

426. *S. Ferrae* Ball, subsp. *Walpolei* Cev. & Ball (Bot. Gaz. 71:435, 1921 (Walpolei))

pp. 522-33, fig. 426. Is this the publ. of subspecific status??

If so intended, it certainly does not do so.

HASTATAE Fries.

427. *S. Barclayi* Anderssen, pp. 533-35, fig. 427 a.

He refers to "var. *retundifolia* Ands. as "the main form of the species".

S. Barclayi X *crassijulis* pp. 534-35, fig. 427 b.

S. Barclayi X *glauca*, p. 535 (probably non)

HASTATAE, cont'd.

428S. pseudementicela Ball, pp. 335-36, fig. 428.

429. S. commutata Bebb, pp. 536-37, fig. 429

(Hulten regards var. denudata Bebb as "of very little systematic value, p. 536
He mentions var. puberula Bebb

430. S. myrtillofolia Andersson, pp. 537-38, fig. 430 a.

var. pseudomyrsinites (And.) Ball in sched., p. 538, fig. 430 b.
check specimens for var. brachypoda Fern.

CHRYSANTHEAE Koch.

431. S. Richardsonii Hecker (1840), pp. 538-39, fig. 431.

432. S. alaxensis ((Andersson) Ceville, pp. 539-40, fig. 432 a.

var. longistylis Rydberg) Schneider, pp. 541, fig. 432 b.

S. alaxensis X glauca ? p. 542.

433. S. Barrattiana Hecker (1840), pp. 542-43, fig. 433.

"narrow-leaved and might be referred to var. angustifolia Ands."

also refers to "var. Tweedyi Bebb", in Wye-Ment.

434. S. amplifolia Ceville, p. 543, fig. 434.

LIVIBAE Nyf

435. S. Bebbiana Sargent, pp. 544-45, fig. X 435.

He does not recognize var. perrestrata (Rydb.) Schn. but says that a few
with practically glabrous leaves may be referred to it. He considers a
only pubescence and ignores small size and non-rugose venation.

ROSEAE Andersson

436. S. arbutifolia Pallas, (1788), pp. 545-46, fig. 436.

Hulten says that this is S. fuscescens Anders. (1867); S. rhamnifolia Heek.
S. myrsinites Ledebour. (1846-51). & Arnett, 1841;

He considers my var. reducta a mixture of forms & does not recognize it

S. arbutifolia X arctelitalis, p. 546.

S. arbutifolia X evalifolia, p. p. 546. He says that Cev. & Kearney
2087 a, "Typus" of my var. reducta, is this hybrid.

PHYLLOFOLLIAE Dumertier

437. S. pulchra Chamisso, pp. 547-48, fig. 437 a.

var. yukonensis Schneider, pp. 548-49, fig. 437 b.

438. S. arbusculoides Andersson, (1867), pp. 449-50, fig. 438.

Hulten says that the form with glabrous leaves is var. glabra Andersson,
(S. saskatchewana v. Seem.) "but seems to have no taxonomic value".

DISCOLORES Barratt

439. S. Scouleriana Barratt (in Heek, 1939)? pp. 550-51, fig. 439.

"south of the pleistocene glaciation chiefly in var. crassijulis (Ands.) Scha.

SITCHENSIS Bebb

440. S. sitchensis Sanson (1833), pp. 551-52, fig. 440.

Hulten refuses to recognize var. denudata

He refers to S. Coulteri Andersson, as "Var. Coulteri (Ands.) Jepsen,
"a very closely related subspecies".

There follows a large series of "Not identified quotations of Salix species
from Alaska and Yukon", which should be studied

HULTEN'S TREATMENT OF ALASKA YUKON WILLOWS (SALIX).

By Carleton R. Ball

A. INTRODUCTION.

In preparing a paper covering the willows of Arctic America, it became necessary to study and evaluate the treatment published in 1943 by Dr. Eric Hulten of Sweden, in his Flora of Alaska and Yukon (). The task has required weeks of tedious labor in the critical study of hundreds of herbarium specimens, with their organs in all stages of development. This study has disclosed some amazingly peculiar reasoning and decisions by Hulten, and consequent erroneous and misleading naming and placement of species. The need for more accurate information by students of the arctic flora requires the publication of the writer's conclusions, and of the proofs underlying them. Briefly, this treatment by Hulten contains the most extensive series of erroneous statements encountered by the writer in 60 years of study.

Specific categories of erroneous and misleading conclusions and statements are listed below. The more important are fully discussed in three successive chapters of this paper. These cover his treatment of the three large and difficult arctic Sections, Arcticae, Ovalifoliae, and Glaucae, as listed in the parenthèse following the numbered categories. Others are illustrated at appropriate points in the discussions. A few can be little more than mentioned within the limits of this paper.

1. Ignoring the long-recognized effects of Arctic ~~environment~~ environment and collecting conditions on the development and appearance of plant organs, as seen on herbarium specimens (see chapter B, below).

2. Assertion of the identity of S. arctica Pallas and S. anglerum Chamisso (S. arctica R. Brown), and of the occurrence of Siberian species (S. crassifolia and S. torulosa) in Alaska (see chapter C, below).

3. Inclusion of species not occurring in Alaska (S. arctophila Geck., S. hebecarpa Fern., S. fullertonensis Schneider), based on erroneous identification of specimens (see chapters C, D, and E, below).

4. Presentation of three allegedly "new" species (S. flagellaris Hult., S. arcteliteralis Hult., S. Muriei Hult.) all really synonyms, based on erroneous conclusions and statements (See chapters D and E, below).

5. A persistent obsession that many or most *Salix* specimens represent hybrids (see notes in chapters C, D, and E, below).
6. Including, as species, some entities (as *S. glacialis* Andersson) long recognized as the extremely juvenile (baby) expressions of older accepted species (see chapter D, below).
7. Continued refusal or inability to recognize juvenile (baby) specimens of different species for what they really represent (see notes in chapters C, D, and E).
8. Contradictory attitudes toward the taxonomic value of juvenile (baby) specimens in *Salix* (see his paper, and chapters C, D, and E, below).
9. Failure to recognize the accepted, and often obvious, relationships of species, shown by his placement of them in *Salix* sections (*S. retundifolia* and *S. phlebophylla* in different sections; *S. Chamissonis* in section with *S. phlebophylla*; *S. Setchelliana* in a new section).
10. Refusal to recognize most of the accepted varieties of Alaskan species of *Salix* (3 varieties listed; 5 others mentioned; at least 13 ignored; 2 unneeded new ones made).
11. Shifting of established species and/or varieties to new combinations as subspecies, without explanation (see under 405 *S. reticulata*, 409 *S. polaris*, 421 *S. glauca*, 426 *S. Farrae*, and 440 *S. sitchensis*, in Hulten, Flora).
12. Obvious errors and contradictions in the keys, with no descriptions given to enable accurate determinations (no mention of petiolar glands on *S. lasiandra*; young twigs not always glabrous in *S. pseudomenticola*; leaves sometimes and petioles often pubescent in *S. lasiandra* var. *lancifolia*; styles of *S. commutata* not 0.5 mm. long (pp. 500, 501), but 1-1.5 mm. long, as in *S. Barclayi*; leaves not evenly crenulated or serrulated in *S. Setchelliana*; *S. retundifolia* and *S. phlebophylla*, two most closely related species, widely separated in keys (and assigned to separate sections).
12. Errors and omissions in citing correct and complete authorship for various combinations (see *S. alaxensis* Cov., p. 539, correctly (Anderss.) Cov.; "subsp. *Walpolei* Cov. & Ball in Bot. Gaz. 71 (1921) p. 435" (see p. 532), but Coville and Ball published this as a variety of *S. Farrae*, not a subspecies).
14. Persistent citation of persons as authors of combinations which actually had been made by others, and which the persons so cited were merely listing and/or discussing (scores of these incorrect citations occur throughout the literature references in his Flora).
15. Contradictory statements regarding the taxonomic value of the hairiness of various vegetative and floral organs in *Salix* (see his Flora).

This is from first draft - 3 - app 2. revision is a blank on the thin paper

This paper will deal primarily with No. 3, "new" species, and No. 12, obsession regarding hybrids, with occasional illustration of some of the other categories as required by the discussion of these two topics. Any adequate exposition of the great mass of errors must await a second paper. In order to be most helpful to the students of the Arctic flora, the discussion is presented in three sections, namely: A. Conditions affecting arctic plant collections; B. Hulten's three "new" willow species, and C. Fact and fancy about willow hybrids.

Collected
B. Conditions Affecting Arctic ~~Willow~~ Plant Collections. *Specimens*

The great mainland of Alaska lies mostly between latitudes 60° and 70° North and longitudes 141° and 166° West, with portions of the western mainland extending some two degrees farther south and north, respectively. But the "Panhandle" extends far to the southeast, and the Alaska Peninsula and Aleutian Islands far to the south and west, of this mainland. Alaska is bounded on three sides by the Pacific Ocean, the Bering Sea and Strait, and the Arctic Ocean. The warm but fluctuating Japan Current affects the southern portion, especially the southeast.

Alaska and the Adjacent Yukon comprise successive alternating of paralleling areas areas of seashores, tundras, river valleys, and mountain ranges. Many of the latter are relatively high, and large areas are above timber-line by reason of altitude or latitude. The growing season is very short in much of the area, spring coming late and winter coming early. The distances are great, the area sparsely settled, and transportation to parts off a few main routes is difficult.

Collectors: Most of the many plant collectors have not been residents, but visitors. Many of them were limited as to time, or wished to cover large areas, and so could visit any given locality but once. At each stop, they had to collect their specimens in whatever stage of development they ^{so} then had reached. Many such visitors arrived relatively early in the ~~summer~~ short summer and so obtained chiefly the juvenile stages of the species found. Many collections have been made by such professional and game men as geologists, meteorologists, foresters, fishery/experts, military men, etc., who remained longer but had arduous regular duties other than plant collecting. For all these reasons, earlier Alaskan collectors seldom got successive stages of development from the same plant, or even from the same locality, although there were notable exceptions, such as Eastwood, Satchell, and others.

of these reasons, earlier Alaskan collectors seldom got successive stages of ~~new~~ development from the same plant, or even from the same locality, although there were noteworthy exceptions, such as Eastwood, Satchell, etc. More recently, the veteran Alaska botanist, Dr. J. P. Anderson, has done ~~exception~~ especially valuable work, and the ladies of the Juneau Botanical Club, particularly Mrs. V. F. Williams and Miss Christine Heller, have helped greatly. Since the Naval Research Station was established at Point Barrow, the little known northern portion of Alaska has been covered by botanists who lived in the field during the collecting season, with truly remarkable results. Of these, Lloyd A. Spetzmann and the late Dr. Louis Jordal deserve great credit for their extensive and pains-taking work. But there still remains a much larger percentage of juvenile material from Alaska than is true of more temperate areas. The student still must deal, therefore, with large numbers of babies and children (in organ development), when his real task is to recognize and describe adults.

Drying and Discoloration. Difficulties of distance and transportation; lack of settlements, equipment, and assistance; and the natural desire to collect as many specimens as possible, all influence the care which can be given to the material collected. Proper drying of specimens is highly desirable but very difficult under the conditions noted. Too much pressure, without frequent changing of the driers, excludes air and causes darkening of the specimens. Too high temperatures and too rapid drying provided by electric driers also may darken the specimens so that twigs and buds, leaves and stipules, flower scales, ovaries and capsules, and filaments and anthers may be browned or blackened, instead of their normal colors. Too intense heat may have two bad effects. It may discolor or destroy the waxy substance which produces the pruinose or glaucous color and condition on twigs and buds, and especially on the lower surface of leaves, and sometimes on capsules. It also may dry the specimens so rapidly that they become brittle and there is continuous breaking off and loss of leaves and aments. For these reasons, herbarium material from the Arctic is likely to contain a larger percentage of discolored specimens than does such material from more temperate areas.

Frost Effects. Frost action often is severe after spring growth has begun. This may produce various peculiar effects on the flowering aments. If stamens are frozen, they may be blackened and also the pistillate plants may not be pollinated and sterile ovaries may result. Young ovaries, with styles and stigmas, may be frozen and remain as blackened juvenile organs. Sometimes young capsules are permanently discolored and their pedicels remain shorter, thicker, and blacker than these uninjured. Styles just developing often are injured by cold. If killed, they remain relatively short, stout, and discolored. If only the apical portion is frozen, it will remain permanently thickened, while the basal portion will continue to elongate and become normally slender. If accurate conclusions are to be drawn, it must be recognized that these are ecological effects and not taxonomic characters. Hulten sometimes failed in such recognition.

Degrees of Hairiness. Hairiness of various vegetal and floral organs (twigs, bud scales, leaves, flower bracts, ovaries, capsules, and filaments) is characteristic of many arctic willows, and perhaps more so than in temperate areas. Many prostrate and/or creeping species have the emerging leaves more or less densely villous beneath but becoming glabrous or merely sparsely ciliate on the margins as they expand to full size. Others which remain pubescent, sericeous, or villous on various organs when these are full grown, are much less so at maturity than in their juvenile stages. This may be due to one or both of two causes. The surface area of any organ is ^{enlarged} ~~increased~~ as the organ increases in size, which naturally results in fewer hairs per unit of area. The density of hairs at any stage of development also may be further reduced by actual dropping of some hairs, especially from vegetal organs, by reason of much handling or excessive heat in drying, or both.

On twigs and buds which normally are purplish, or become purplish-black during imperfect drying, small patches of appressed, whitish hair-remnants have been erroneously reported as "gruinese" color of these organs because of the bluish-white color and light-reflection of the combined substances.

Crushing, Browsing, and Trampling. Heavy snow or ice cover, and browsing animals, may affect the form of shrubby plants and the development of their organs. Many arctic willows are prostrate, as noted, and many others are low, but ascending or erect, shrubs. The stems of the latter may be so completely bent over and flattened down by successive loads of snow and resulting ice that they cannot regain their former habit and hence remain almost or quite prostrate during the succeeding summers. Some collectors report them as prostrate, without explanation of causes, which may lead to serious error in determinations and descriptions by the unwary.

Other willow plants are browsed severely throughout much or all of the year by caribous, deers, elks, mooses, musk-oxen, and reindeers. Such browsing may change both their appearance and their growth and flowering habits, and consequently their appearance as herbarium specimens. Trampling by browsers may crush some of these plants down to earth and so help to produce resultant "prostrate" specimens of normally ascending or erect plants. Occasionally an individual stem of a much taller clumpy willow may become prostrate in this way, although the clump remains erect.

Confusing Behavior and Appearance of Certain Organs. Prostrate willows may present main stems, trailing or running (non-rooting) branches, rooting (creeping) branches, and stelons. These are not sharply differentiated in Salix, where any part of a stem or root will develop roots under favorable conditions, and where ~~when~~ trampled erect stems or normally prostrate stems may become rooting, or rooting stem may be ~~then~~ buried and become stelons. As noted above, erect stems may be trampled down and these will root if trampled into or thinly covered by soil. Ordinarily trailing stems such as those of S. arctica and S. ovalifolia, will root freely when pressed into the soil or covered by dirt or sand through wind or water action. If these are buried, they do not produce leaf and flower buds unless they are later uncovered, and so become stelons.

On a few willow species, the ovaries normally are linear and are extremely attenuate at the time the styles are elongating. In such cases, the slender tip of the ovary may be mistaken for the base of the style, and the style therefore may be recorded as much longer than it actually is.

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Winter Retention of Organs. Compensating somewhat for these harmful conditions, taxonomist the Arctic presents the collector and the ~~agronomist~~ with one very helpful effect on willow specimens. Because of the short summers, and early coming of winter, willows often are buried under snow before their leaves and pistillate aments have matured. When this occurs, many leaves and aments remain attached throughout the winter and some are still attached when collections are made in the following spring. Juvenile leaves and aments, often difficult of determination, then can be compared with mature, although often curled and discolored, organs on the same twig. Incidentally, these attached leaves and aments are of real feed value to the browsers digging their daily rations from under the snow in winter. This holding of leaves and aments, however, is in no way a taxonomic character but purely the result of environmental influences. The over-winter retention of stipules in a few species, such as S. Richardsonii and S. pulchra, is so common as to have ~~any~~ taxonomic use.

real

Importance of Vegetal Organs. Willows, like other flowering plants, have both vegetal and fleral organs, and the two sexes are on different plants (dioecious). Of the vegetal organs, the stems and twigs are perennial and the buds, leaves, and stipules are present throughout much or most of the year. The fleral organs, on the other hand, are of relatively short existence. The staminate ^{aments} ~~aments~~ usually are deciduous within a month. The pistillate aments usually drop within two months or so, except the few which may remain attached until the following spring, as noted above. Yet, from time immemorial, the greater emphasis and fuller description has been awarded to the relatively fugacious fleral organs. These are seen but briefly and by comparatively few persons, except in the case of the pussy willow and flerists willows. The vegetal organs, present through all or much of the year, are commonly seen by many more individuals. It is by them, with few exceptions, that willow plants become recognized by the average person. Obviously, they should be duly emphasized, described, and keyed. Both vegetative and fleral keys should be included. It may be remarked, in passing, that when one ~~describes~~ ^{seeks} a lost child or adult human, or a missing cat, cow, dog, horse, or pig, the sex is named but only the non-sexual organs are described in order to ~~enable~~ ^{enable} recognition of the lost animal.

It would seem scarcely necessary to present these varying conditions and plant expressions, were it not for the obvious fact that some taxonomists habitually ~~do~~ ^c either do not recognize some or all of them or else choose to ignore them. Nature produces infinite variety of development and expression within a species, or on a single individual in different years, or in successive seasons of a single year. Man, on the contrary, earnestly desires taxonomic uniformity and is tempted to regard these environmental variations as distinct and nameable entities. Presumably it is the business of botanists, however, to understand the factors influencing plants and not to create unutterable confusion and so prevent proper understanding by other students.

- 5 -

G. HULTEN'S TREATMENT OF SECTION ARCTICAE.

In Section Arcticae, ~~HELIX~~ (pp. 513-520), Hulten places four "species". First is 411. S. arctophila Cockereil, an eastern species which never yet has been found in the Alaska-Yukon region. Second is S. ^{arctica} ~~arctica~~ Pallas, which he here claims to be the plant long recognized as S. anglerum Chamisso. Third is S. crassijulia Trautvetter, a Siberian species which he now asserts to be the species universally known as S. arctica Pallas. Fourth is S. terulosa Trautvetter, an Asian species never before presented as occurring in America.

He thus recognizes four species where but two have been recorded previously. These two, S. arctica Pallas and S. anglerum Chamisso, usually are placed in Section Ovalifoliae. In separating Sections Arcticae and Ovalifoliae, he follows Rydberg and earlier authors. This, of course, is a matter of personal opinion, which will not be discussed here. Now for the proof and discussion of the statements made above, by the writer.

"411. S. arctophila Cock." (p. 513).

As noted, Hulten places first this species, never before reported from the Alaska-Yukon area. It occurs commonly in eastern Canada from Gaspé Peninsula in Quebec (and Mt. Katsadin, Me.) to the Arctic Ocean, and west to the western side of Hudson Bay, with rare occurrence in Mackenzie. It is closely related to S. arctica and S. anglerum, and therefore properly placed in Section Arcticae, if that is recognized. The reasons for placing it first are not clear.

Cockereil () created the name to replace S. ~~greenlandica~~ ^{greenlandica} Lundström, 1877 (), because he held that name to be antedated by S. ~~greenlandica~~ ^{greenlandica} Heer, 1868, applied to a fossil species. Schneider, in 1919 (), questioned whether a name applied to a fossil species actually invalidates the same name applied later to a living species, but he accepted and used the name S. arctophila. Flederus, in 1923 () named an S. ~~chloreclades~~ ^{chloreclades} as a new species from Greenland, but later he acknowledged it to be merely another synonym for S. arctophila.

Hulten inserts S. arctophila as an assertedly Alaskan species (p. 513) and mentions the two synonyms, S. ~~greenlandica~~ ^{greenlandica} Lundström and S. ~~chloreclades~~ ^{chloreclades} Fled.. But 40 pages later, at the end of his treatment of Salix, he discussed "Not Identified Quotations of Salix Species from Alaska and Yukon". There (p. 553), in discussing the reported occurrence of a variety of S. ~~greenlandica~~ ^{greenlandica} Lundström at Port Clarence (on Seward Penin-

sula), Alaska, Hulten states: "The westernmost point from where S. greenlandica is known is Bathurst Inlet on the Arctic Coast. Unknown to me." Thus, after inserting S. arctophila as an Alaskan species, from Nome (also Seward Peninsula), and mentioning S. greenlandica as a synonym of it, he claims that S. greenlandica is not known from west of Bathurst Inlet (northeastern Mackenzie). There is a strange and misleading contradiction in these two statements.

Hulten bases his claim for arctic occurrence of S. arctophila on a single collection, George Neville Jones 9042, from Nome in 1936 "H, sub S. anglerum det. Bell". The writer has not seen the specimen in the Hulten Herbarium "(H)" but has studied Jones 9042 in Herb. Bell. It consists of four pieces with obovate leaves mostly 2-2.5 cm., or rarely 3 cm., long. Two pieces are without aments, one has young aments 2 cm. long, with ovaries densely white-pubescent, and the fourth has two fruiting aments 3 cm. long. It is a typical arctic expression of S. anglerum Chamisso, with one exception. The leaves, instead of being normally glaucous beneath, as are those of S. arctophila also, are mostly green and subshining but a few of the smaller ones show some glaucescence. The lack of glaucescence probably was caused by overheating in drying, as discussed in chapter B.

Of S. arctophila, Hulten says: "This species is recognized by . . . leaves with entire or somewhat glandular-denticulate margin, large catkins, . . .". Actually, the two characters which separate S. arctophila from S. anglerum and S. arctica are (1) leaves not entire but always sparsely and shallowly glandular-undulate-serrulate, and (2) the ovaries and longer capsules with shorter and thinner pubescence. The completely entire leaves on Jones 9042 immediately remove it from S. arctophila. The margins of some of the older leaves, however, are somewhat insect-eaten and thus appear to be coarsely and irregularly serrate. It seems incredible, however, that Hulten could have been misled by this abnormal condition.

The catkins of Jones 9042 certainly are not "large" as in S. arctophila, but really are short, even for S. anglerum. The fruiting capsules are short (about 5 mm.) and somewhat blackened, and apparently have been frost injured. The basal portion of many is but thinly pubescent, which often results from frost injury or heat in drying, or both (see chapter B). The recurved, and thus protected, capsule tips are more densely pubescent, as often happens. Why Hulten based his claim for Alaskan occurrence of S. arctophila on this particular collection alone, remains a mystery. That this eastern species is not yet known from the Alaska-Yukon area, remains a fact.

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412. Salix arctica Pallas (of Hulten) Hulten cites no synonyms directly but, in a rambling 2-page discussion of relationships (two-thirds of it in a single paragraph), he states that he regards S. arctica Pallas as being identical with S. arctica R. Brown, long-ago renamed as S. anglorum Chamisso. Much of this discussion, broken by the writer into six convenient paragraphs, is quoted below. In considering it, the reader should remember that Hulten absolutely refuses to recognize any of the numerous accepted varieties of some species assigned by him to Sections Arcticae and Ovalifoliae.

a. "An astonishing confusion of taxonomy and nomenclature exists in the S. arctica group in Alaska as well as in Eastern Asia. It is hardly possible to quote synonyms, as every group mentioned under one name necessarily includes several sometimes rather different types. The fairly large material ~~now in my hands~~ from all parts of Alaska now in my hands has, however, made it possible to distinguish three different main types, each of which occupies a distinct geographical area of a type well known from many better differentiated species." (pp. 513-514).

b. "The type most frequently met with in the herbaria is that of the Aleutian Islands and the southern coast of Alaska. This plant has large, often long-petiolated, round or more or less obovate, blunt leaves, long, thick catkins on large-leafy peduncles, thick shiny branches with dark-brown large buds. This type, which was described from specimens from Unalaska and Kamchatka as S. crassijulis by Trautvetter, has often been taken to be the typical S. arctica of Pallas, which is very natural, as it is by far the most commonly represented species in most herbaria. This fact probably caused different authors to assert that S. arctica Pallas is different ~~from the~~ from the plant to which R. Brown, without knowing of Pallas' plant, gave the same name. Brown's S. arctica was founded on plants from Baffin Bay and Melville I., while Pallas' S. arctica was based on specimens from lower Lena R., not on specimens from the southern Bering Sea region." (p. 514).

c. "It seems to me that S. arctica Pall. from arctic Siberia and S. arctica R. Br. from arctic America agree fairly well, if numerous specimens from the two districts are compared, and, as far as is possible, when dealing with willows, should be regarded as synonyms. The older name, S. arctica Pall., is then the valid name. Chamisso, who very well knew the common Salices of the arctic group in Kamtschatka and Unalaska, realized from the description of Brown's S. arctica that his plant must be different from the Alaskan one, which he thought to be Pallas' S. arctica, and which is here called S. crassijulis. He accordingly gave Brown's S. arctica a new name and called it S. anglorum." (p. 514).

d. "Andersson has already pointed out that Chamisso's specimens marked S. anglorum are S. phlebophylla, and he consequently reduces S. anglorum Cham. to a synonym of S. phlebophylla. Rydberg (Bull. N. Y. Bot. Gard. 1, 1899, p. 266) denies this and says "As Chamisso does not describe any species and does not cite any specimens, but only gives the name and S. arctica R. Br. as a synonym, S. anglorum must be regarded as a synonym of that species." (quotes omitted by Hulten). "Several modern authors such as Schneider and Bail have accepted this opinion of Rydberg's and call S. arctica R. Br. S. anglorum Cham. Rydberg's statement is, however, not correct. Chamisso (Linnaea 6, 1831, p. 541) mentions specimens of his ~~his~~ S. anglorum from "Insula et sinus Sti. Laurentii." (quotes omitted by Hulten). These specimens are preserved in Berlin and are S. phlebophylla. Under these circumstances I cannot find it possible to use the name S. anglorum Cham. for S. arctica R. Br., especially not for Americans, who lay so much stress on the type specimens. If S. arctica R. Br. is not, as here, considered to be a synonym of S. arctica Pall., it has to be renamed."

e. "S. arctica Pall. differs from S. crassijulis in its smaller growth, thin branches, small, more elliptic, short-petiolated leaves, lacking stipules, shorter catkins, shorter styles, and smaller, practically sessile capsules. This does not, it is true, entail very material differences, but doubtless the plant of the Arctic Coast and that of the Aleutian Islands and southern Alaska are different, although closely related types. In the Bering strait (sic) area, where both these types as well as the third inland type meet, the specimens are in some cases, it ~~must~~ should be admitted, somewhat arbitrarily divided into the respective types, although, on the other hand, good and typical specimens of all three types are clearly found there." (pp. 514-515).

f. "A serious difficulty, apart from the difference in sex, is to judge properly the very different stages of development of the specimens that have to be compared with ~~xxx~~ each other. The juvenile stages have, on the whole, more hairy leaves and capsules and shorter styles and petioles than the outgrown or old stages. Therefore juvenile stages of S. crassijulis resemble S. arctica much more closely than the outgrown ones. Specimens of S. arctica with mature seeds are rarely seen, and it is therefore difficult to compare it with S. crassijulis, of which an abundance of ripe specimens are available. This fact might point to the difference between S. arctica and S. crassijulis being less marked than one would be inclined to believe at first sight." (p. 515).

Hulten's discussion of his concept of S. arctica Pallas and S. crassijulis Trautvetter is quoted above in the writer's paragraphs a to f, inclusive. It is a series of expressions of his confusion, doubt, difficulty, and uncertainty. In spite of these deterrents, however, he makes arbitrary decisions, but gives no supporting evidence.

As a result, he changes the names applied to the two long-recognized species of Section Arcticeae in the Alaska-Yukon area, and introduces a third, S. torulosa Trautvetter, never before recognized. If "An astonishing confusion of taxonomy and nomenclature exists" (a) in the S. arctica group, Hulten certainly has greatly increased it.

He insists that "The fairly large material from all parts of Alaska now in my hands makes it possible to distinguish three different main types." (a). These three were S. arctica Pall. (northern), S. crassijulis Tr. (southern), and S. torulosa Tr. (central), all meeting in the Bering Strait area where, he says, they must be "somewhat arbitrarily divided" (a).

Hulten states that "It seems to me that S. arctica Pallas from northern Siberia and S. arctica R. Br. from arctic America agree fairly well, if numerous specimens from the two districts are compared and, so far as is possible, when dealing with willows, should be regarded as synonyms. The older name, S. arctica Pall., is then the valid name." ~~xxx~~ (c). Note that he speaks of "numerous specimens from the two districts", but he does not cite, or even mention, a single specimen from Siberia. He does not describe the Siberian type specimen of S. arctica Pallas, or indicate that he ever has seen it. Yet he insists, without indication of study, that a plant from

North-central Siberia must be the ^{same} species as one from northeastern Canada. Is this the accepted method in taxonomy? He cites nine specimens from Alaska, but only two are from northern arctic Alaska, comparable to the Siberian and American type localities of the two species discussed. And thus, on the basis of speculation without proof, S. anglerum Chamisso becomes S. arctica Pallas, and what has long been regarded as the latter species becomes S. crassijulis Trautvetter. Changes, even if valid, cause confusion. Even if his conclusions are correct, there is definite obligation to obtain and present full proof before making such changes. Hulten furnishes no proof, but many references to doubt and uncertainty.

Hulten does not describe either S. arctica or S. crassijulis, but merely lists some differences (e). Not a single dimension is given for any organ, nor are the ranges in leaf shape mentioned. Then he says: "This does not, it is true, entail very material differences, but doubtless the plant of the Arctic Coast and that of the Aleutian Islands are different, although closely related types"(d). Why "doubtless", when no Siberian specimens are cited and no proof given? Instead, expressions of doubt, uncertainty, and inability to differentiate follow, one after another, including his statement that the three, in the Bering Strait area, must be "somewhat arbitrarily divided". Lastly, he comments (f) on the "serious difficulty" of judging properly the very different stages of development which have to be compared, and how this leads to further confusion and uncertainty. Critical study of the specimens cited under this and other species discussed shows that he was unable to overcome this "serious difficulty". When in such constant doubt and uncertainty, why make important and confusing changes?

Finally, Hulten maintains that Chamisso's S. anglerum really is a synonym of S. phlebophylla Andersson (d). Rydberg set forth the facts disproving this belief (d), but Hulten says that Rydberg's statement is "not correct" and quotes part of Chamisso's presentation to prove it. However, Rydberg was correct. Here is what Chamisso published, omitting XI only his citations of places of publication of S. arctica R. Br. "Salix anglerum N.-- S. arctica R. Br. (Non Pallas). Insula et sinus Sti. Laurentii. Ex insula Chamissonis, capsulis maturis vetustatae calvescentibus."

This shows conclusively, as stated by Rydberg, that Chamisso merely renamed Brown's S. arctica, antedated by S. arctica Pallas. In so doing, he could not possibly change the type specimen of S. anglorum, which could be nothing but the type of Brown's S. arctica. Although the specimens Chamisso mentioned are S. phlebo-phylla, citing wrongly identified specimens under the name of a species described

by another person in no way invalidates the species if it has a previously cited type on which the description is based. This was completely true of S. arctica R. Brown, renamed S. anglorum by Chamisso. Hulten's statement that if S. anglorum Chamisso is not the equivalent of S. arctica Pallas it must be renamed (d), is without foundation in fact. If the names of species were invalidated by authors who cite wrongly identified specimens under them, then nearly all Alaska-Yukon species have been invalidated by Hulten in his Flora.

Of the nine collections cited by Hulten (p. 513), only one, Walpole 1437 (2 sheets), is cited from the USNH and neither sheet is annotated by him. Two others (Mason 6083 and Ivikteek Lagoon) are in USNH but not cited from it and not annotated. Two others, Anderson 3667 and 4601 (as also Mason 6083), are in Herb. Boll. These five collections (7 sheets) have been studied by the writer. Of the four others not seen, three are from St. Lawrence Id., Bering Sea, and one from the northwest coast.

Of the five collections studied, four are distinctly juvenile. Three of them (two Mason and Anderson 3667), all from St. Lawrence Id., have the juvenile leaves only 1.5-3 cm. long, still subrugose beneath from lack of expansion, but already oval-obovate and rounded to retuse at apex, thus showing unmistakably that they would become the "S. crassijulis" type of Hulten, and not the "S. arctica" type (S. anglorum) in which Hulten places them. They represent var. obcordata (Andersson) Rydberg, of the long-recognized S. arctica Pallas ("S. crassijulis" of Hulten). On the fourth collection, Walpole 1437 (2 sheets), the plants form dense mats with the juvenile leaves elliptical to narrowly obovate and acute. These probably represent S. anglorum Chamisso ("S. arctica" of Hulten). Walpole 1401 (USNH, 2 sheets, not cited), however, is certainly another juvenile "S. crassijulis", like the three discussed above.

The fifth collection studied ~~ANDERSON~~ (Anderson 4601 in GRB) is from Point Hope, on the Northwest Coast (not "Bering Sea Distr." as stated by Hulten). The leaves are obovate-oval to oval, yellowish-green (not dark green), 2-3 cm. long, and strongly raised-reticulate on both sides. The aments are short, with smaller, narrower scales. These facts show conclusively that S. ovalifolia (not S. arctica) is the basic species involved. The stoutish branches, the densely white-hairy ovaries, undeveloped (on Aug. 9), and the stout styles and stigmas, some quite long, indicate a hybrid with S. anglerum Chamisso ("S. arctica Pallas" of Hulten).

We find, therefore, that these five collections, out of the nine cited by Hulten under his "S. arctica Pallas", actually represent three different species. Two of these are in Section Arcticae, and one, represented only in hybrid form, is from Section Ovalifoliae. One collection (Walpole 1437) is S. anglerum Chamisso ("S. arctica Pallas" of Hulten). Three (Mason 6083 and Ivigtek Lagoon, and Anderson 3667), all from St. Lawrence Id., are very juvenile S. arctica Pallas ("S. crassifolia Tr." of Hulten). The fifth (Anderson 4601) is S. ovalifolia Treutv., X S. anglerum Chamisso. Such treatment seems to increase the "existing ~~existing~~ confusion" of which Hulten complains. This finding of three different species represented by the specimens cited by Hulten under a single species occurs again in the case of S. terulosa.

"413. *S. crassijulis* Trautvetter" (of Hulten).

In his Alaska-Yukon Flora (p. 516), Hulten cites 45 collections which he assigns to this species, long regarded as *S. arctica* Pallas, and still so regarded by the writer. Of these collections, 11 are cited as being in the U.S. Natl. Herb. (US), 24 are cited as being in other herbariums, including 9 from Herb. Hulten (H), while for 10 no herbarium is named. Numerous other collections from the Aleutian Islands were cited in in his earlier volume () but these citations are not repeated in this work.

Actually, besides the 11 cited from (US), 9 other cited collections, including two having had no herbarium listed, are found in USN. Of these 20 available in USN, some have two and three sheets each. In addition, several cited collections are in GRB also, including two not in USN, and thus making a total of 22 available to the writer. Of the 11 cited as in the USN, only three bear Hulten's annotation label, as does a fourth which had no herbarium stated. Four out of 20 seems a low percentage, considering the customary practice of annotating all material borrowed for taxonomic study.

It seems unnecessary to discuss individually the 45 collections cited by Hulten under this specific name. All of the 22 studied, though of varying degrees of development, fairly represent the accepted *S. arctica* Pallas ("*S. crassijulis*" of Hulten), or its common variety, *obcordata*, which Hulten declines to recognize. It is marked by blunt leaves truncate to retuse at apex. It should be remembered, as discussed earlier, that at least three of the five specimens cited under *S. anglerum* Chamisso ("*S. arctica* Pallas" of Hulten) actually proved to be very juvenile expressions of the species and/or variety now under discussion.

In his discussion of what he regards as "S. arctica Pallas", Hulten inserts the following paragraph (p. 515): "The third type of the S. arctica group is a plant with much narrower, light-green leaves, light-brown twigs, and capsules fairly strongly pubescent when young but glabrescent in age. It occupies the mountains of the interior, where no specimens resembling S. arctica or S. crassifolia occur. It strongly recalls S. cuneata Turcz., a species which has, however, also the young capsules completely glabrous. It seems to be S. terulea, described on specimens from Altai."

To this supposed "S. terulea" (p. 520), Hulten assigns 24 collections distributed from the upper and central Yukon River districts of Yukon westward in the mountains of southern and central Alaska to Seward Peninsula, and to St. Matthew Id., far out in Bering Sea. He mentions some other specimens also, in his discussion. Of the 24 cited specimens, 7 are cited from the U.S. Natl. Herb. (US), 9 from other herbariums, including 3 from Herb. Hulten (H), and 8 without herbarium indicated.

Of the 7 cited as in (US), only two ~~Kellogg~~ (Kellogg, Nome, as "doubtful"), and Murie 525, McKinley Park) are annotated by Hulten. Five others (Campbell, St. Lawrence Id.; Thornton 819; Setchell 535; Eastwood 374 from 24-Mile House, and Osgood from Coal Creek, both Yukon) bear no ~~Kellogg~~ annotation labels. This seems surprising, in view of the accepted obligation to annotate material borrowed for study. For reasons not clear, Eastwood 374 is cited again from White Pass, Alaska (Arn. Arb.). In addition to the 7 noted, two of these with herbariums not listed also are in (US), one annotated (Pete 128, Copper River) and one not (Walpole 1967, Teller). ~~Three~~ ^{Two} other/cited collections are in Herb. GRB. (Went 344 from Paxson, and Anderson 3769b and Jones 9031 from Nome). Thus, the writer has been able to study 12, or exactly one-half, of the cited collections.

Hulten describes and compares this plant as follows: "The above specimens differ from S. crassijulis in the long and narrow oblanceolate, light-green leaves, glabrous on both sides except in the margin and sometimes along the median nerve below. The capsules are light-brown, narrow and acute, more or less pubescent from white hairs when young but strongly glabrescent in age, and crowned with a thin long style (1.0-1.5 mm.). The catkin-scales are light-brown, pubescent, rounded or often more or less pointed. This plant . . . is doubtless fairly distinct from S. crassijulis. . . . As far as I can judge, our plant must be identical with S. tarulea Trautvetter, illustrated in Fl. S.S.S. R. V tab. III fig. 7 and in Ledeb. Icon. Fl. Ross. V (1834) tab. 160. I have, however, not seen any authentic material of that plant. Alaska specimens agree so well with the description and figures of S. tarulea that I must refer them to that species." (p. 520).

Here we have another species added to the Alaska-Yukon flora by merely comparing Alaskan specimens with the description and figures of an Asiatic species and asserting that they are the same species. Hulten states that he has seen no authentic material of the Asiatic plant. Surely this is a new method in taxonomy, especially when preparing a flora of well-explored foreign country, where there would seem to be an extra desire and obligation for accuracy.

Hulten separates his "S. tarulea" ~~from the other species of Section Arcticae~~ from the other species of Section Arcticae by the asserted characters of three different organs, leaves, capsules, and scales. It seems desirable, therefore, to discuss the 12 cited collections for their expression of each of these three organs separately, and this is done below.

The leaves are described by Hulten as long, narrow, oblanceolate, and light-green. On many not fully developed specimens of S. arctica Pallas ("S. crassijulis" of Hulten) the leaves are only oblanceolate to narrowly obovate and more or less cuneate at base, but becoming large and long. Oftentimes, some leaves on the same specimen will be broader, with broadening bases. These will have also the fully pubescent ovaries and capsules and the obovate, mostly blunt, blackish scales which prove that they belong to S. arctica Pallas and not to the postulated S. tarulea. Eight of the 12 cited

collections studied by the writer unquestionably belong to this category, except that the leaves are not light green. The identity of the other four is discussed below. ^{collections} A series from Point Hope, Goodman 21, 22, 26, 27, 28, in 1934 (GRB) also illustrate these conditions well.

More mature specimens of S. arctica Pallas which are carrying a heavy load of fruiting aments often have these oblanceolate, cuneate-based, long leaves. In such cases, a ~~more~~ sufficient food supply for proper development of both leaves and fruit is lacking and the leaves never complete the broadening of the base. Sometimes the aments and capsules also are affected. This is especially likely to be true if the plants have been injured or browsed ~~in previous years~~ during the previous year. Many specimens showing these abnormalities, but not referred to S. tarulosa by Hulten, are to be seen in Herbarium USN, as also in GRB. This condition occurs also in S. arctica var. subcordata (Andersson) Schneider, as discussed later in this chapter.

Hulten described the leaves as "light green", which suggests comparison with S. felix ovalis and S. stolonifera. In general, however, they are no lighter than the leaves of other specimens of S. arctica and S. anglicum. One of the cited collections (Muir 525, from McKinley Park) has very narrow, yellowish-green leaves to 6-7 cm. long, but the color and venation are those of S. glauca, as are the narrow yellow scales and the yellowish densely pubescent capsules. This plant, with long styles, glabrate leaves, and apparently sterile, unquestionably is a hybrid of S. glauca with either S. arctica or S. anglicum. With his obsession regarding the abundance of hybrid willows, it is strange indeed that Hulten did not recognize this obvious hybrid, so different from the other cited collections.

Another collection cited by Hulten, and annotated as "doubtful", is Kellogg, Nemo, Aug. 29, 1909 (US). He could have been more "doubtful", because it ^{is} S. stolonifera Cov. It has the slender yellowish twigs, the smaller, light green, strongly reticulate leaves, the narrower pointed scales, and the very long and slender capsules, with slender styles more than 1 mm. long, characteristic of the species. Some remaining ovaries are hairy and the past-fruiting capsules show some remnant pubescence on their recurved tips. Why it should be suspected of being "S. tarulosa" is not understandable.

These place it in forma subpileosa Schneider.

Oblanceolate leaves also are the distinguishing characteristic of S. anglerum Chamisso, var. antiplasta Schneider. Leaves of the obovate-leaved species itself may pass through an oblanceolate phase while their bases are broadening. On both the species and the variety, however, the mature leaves are definitely much smaller than those of S. arctica Pallas ("S. crassifolia") and those on collections assigned to "S. terulea".

Setchell 535 (US), from Eagle Summit in NE. Alaska, is cited by Hulten as "S. terulea". This number, in both USN and GRB, is typical S. anglerum ("S. arctica Pallas" of Hulten). The leaves are short and broad, 2-3.5 cm. long by 0.8-2 cm. wide. In shape, they are elliptic-oblanceolate to obovate-oval, according to the degree of development, short-acute to apiculate ~~at~~ apex, and cuneate, where not yet expanded, to broad and almost rounded at base where largest and most completely expanded. They are glaucous beneath and finely veined. It seems incredible that this specimen could have been referred to the supposed "S. terulea". By the way, it is very similar to Jones 9042 (GRB), from Nome, on which Hulten based his asserted occurrence of S. arctophila Cock. in Alaska, but citing only the specimen in (H).

Jones 9031, from Nome, cited by Hulten as S. terulea, without herbarium location, is in GRB. There it consists of four small pieces with leaves oblanceolate to obovate, with narrow bases, to 3.5 cm. long, dark green and rather strongly reticulate above. Basically, this is S. anglerum ("S. arctica" of Hulten) but the stronger reticulation of the leaves and the yellowish-green and short-pubescent capsules suggest a possible hybrid with S. ovalifolia.

Hulten (p. 520) claims also that: "Specimens from Alberta, Mountain Park, collected by Malte and Watson and determined by Ball as being S. anglerum hardly differ materially from this type. I must therefore consider S. terulea to be distributed in the mountains from Altai over Bering Straits Southwards at least to Alberta". He does not identify the specimens by collection numbers, or dates, or herbarium accession numbers. In GRB, however, are three such specimens, all collected "near Mountain Park", Alta., in 1925, by Malte and Watson, and determined as stated. The collection numbers and accession numbers of the Canadian National Herbarium are: No. 2075 (116898), No. 2267

(116941), and No. 2272 (116945), all collected in mid-August. The first is from Mt. Harris at 7000 ft. alt., and the other two from "Wart" Mountain at 7200 and 7400 feet, respectively.

All three are representative of S. anglerum Cham., as originally determined, except one of the three pieces on No. 2075, which has the larger oval-obovate leaves of what Hulten considers to be S. crassifolia. No. 2075 bears short fruiting aments with densely pubescent capsules on the two pieces of S. anglerum, while 2267 has short aments with densely white-pubescent ovaries. Both have large obovate or oval black scales. Thus we see that not one of the three has any of the characters said to separate a Salix terulea, except the oblanceolate-obovate leaves, which are of the standard shape for S. anglerum, which Hulten claims to be synonymous with S. arctica Pallas. Because of ~~the~~ that leaf shape, plus densely pubescent capsules and obovate black scales, all of these would be his "S. arctica" and not "S. terulea".

The second character said to distinguish "S. terulea" is a peculiar capsule hairiness. Here, Hulten's two descriptions vary somewhat. On page 515, we read: "capsules fairly strongly pubescent when young but glabrescent in age." On page 520, he states:

"The capsules are light brown, narrow and acute, more or less pubescent from white hairs when young but strongly glabrescent in age." A critical study of the capsules on the 12 cited collections available shows that the 9 representing S. arctica Pallas and S. anglerum Chamisso have the normally densely pubescent capsules of these species, as does the one representing an S. glauca hybrid. One (Jones 9031) has short-pubescent capsules, and is S. ~~arctica~~ anglerum probably X S. ovalifolia. Only one has the capsules "strongly glabrescent in age" and that (Kellogg, from Nome) is S. stelenifera Ceville, f. subpilea Schneider, to which such capsules are normal.

On six of the arctica-anglerum collections (Andersen 3769, Campbell from St. Lawrence Id., Osgeed from Yukon, Pete 128, Walpole 1967, and Went 344), the aments have been frozen and blackened, many of the capsules have lost a part of their hairs, and some have had much of it rubbed off the upper surface. This gives a glabrescent appearance, but it is an abnormal rather than a natural condition. When capsules are blackened by freezing, the hairs also are darkened and hence do not reflect the light

as usual. Some of the frozen hairs fall off naturally in drying and handling. Such conditions greatly affect the appearance of the organs. From all these facts, it is clear that there is no "S. teruleosa" distinguished by "apostyles strongly glabrescent in age".

Hulten's statement of the third character separating "S. ~~teruleosa~~ teruleosa" reads: "The catkin-scales are light-brown, pubescent, rounded or often more or less pointed." (p. 520). The scales on the Alaskan species of Section Arcticae, S. arctica and S. anglerum, are almost black, broadly ~~oval-obovate~~ oval-obovate, and vary from retuse to truncate, to rounded, and sometimes acute at apex. These apical variation often may be seen on the same specimen, dependent on the position, age, and degree of development of the scale. The nine cited specimens of "S. teruleosa", here determined by the writer as S. arctica Pallas and S. anglerum Cham., all have scales of this character. These on Kellogg from Nene, S. stolonifera, are of the smaller size and brown color normal for that species. These on Jones 9031, S. anglerum probably X S. ovalifolia, are smaller but broad, black, and rounded at apex. These of Murie 525, S. glauca hybrid, naturally are narrow and yellow. Here again Hulten seems to have been more influenced by the characters of the one species of Ovalifoliae and the two hybrids than by the nine specimens representing Section Arcticae, to which he assigned his "S. teruleosa".

This study of the 12 cited collections of "S. teruleosa" thus reveals some startling results. At least three species are included. Eight collections are S. arctica Pallas, one is S. anglerum Chamisso, one is S. stolonifera Coville, and two are hybrids. Thus both the alleged "Salix teruleosa Trautvetter", of Hulten, vanish from the Alaska-Yukon flora.

D. HULTEN'S TREATMENT OF SECTION OVALIFOLIAE.

As Hulten places two of his three "new" species in Section Ovalifoliae, a full discussion of his treatment of that Section becomes important. To this Section, in Arctica America, there usually are assigned five species, namely, S. arctica Pallas, S. anglicum Chamisso, S. arctophila Geckereell (not occurring in Alaska-Yukon), S. ovalifolia Trautvetter (S. glacialis Andersson), and S. stelenifera Coville. Three of these have accepted varieties, which Hulten refuses to recognize. In his Flora of Alaska and Yukon, (), he includes 10 "species" for that smaller area, but divides them into two Sections, Arcticae and Ovalifoliae, as noted previously. In Section Arcticae (discussed fully in chapter G), he placed the first three species listed above (but the first two under other names), and then adds a fourth (S. ^{tarulea} ~~arctica~~ from Asia).

To Section Ovalifoliae (pp. 520-525), he assigns six "species". First is S. hebecarpa Fernald, really a hybrid of one known and one undeterminable species. Second is the well-known S. ovalifolia Trautvetter, of which the third, S. flagellaris Hulten (1940), is but a juvenile or poorly developed expression. Fourth is S. stelenifera Coville. Fifth is the 94-year-old S. glacialis Andersson, actually only a very juvenile (baby) stage of S. ovalifolia var. pubescens Andersson. Sixth is S. arctelitalis Hulten (1940), which is only S. ovalifolia var. camdensis Schneider under a new name.

At least 20 new species, or new specific names, have been created by different authors for the material represented by the five species here regarded as comprising the American portion of Sections Arcticae and Ovalifoliae. Three-fourths of them already have been reduced to synonymy. It is surprising, therefore, that Hulten, after discarding S. anglicum Chamisso, one of the older, long recognized, and widely distributed species, felt it necessary to create two more allegedly new species. These statements by the writer require the full discussion and proof given below. It is hoped that the reader already has studied the discussion of Arctic conditions and their effects on plant material, as presented in chapter B, above.

415. *Salix hebecarpa* Fernald.

Hulten (p. 520) claims *S. hebecarpa* to be a member of the Alaskan flora, in the following statement: "A specimen in Nat. Herb., collected Aug. 18, 1901 by Walpole at Teller (No. 1826, sub *S. ovalifolia* var. *pubescens*) agrees completely, as far as I can see, with the type-number (Fernald & Collins 207) of *Salix hebecarpa* Fern."

In his Flora of Alaska and Yukon (), Hulten inserted three species, each claimed to occur in Alaska, on the basis of his identification of a single specimen in each case. The first was *S. arctophila* Cock. (p. 513), based on Jones 9042, which is typical *S. anglorum*, as discussed at the beginning of chapter C, above. The second is this *S. hebecarpa*, based on Walpole 1826, which actually is *S. ovalifolia* var. *pubescens*. The third is *S. fullertonensis* Schneider (p. 532), based on Jones 9045, which really is a depauperate *S. glauca*, and which had been cited by Hulten, four pages earlier (p. 523), as *S. glauca* X *Ferrae Walpolei*, as will be discussed fully in chapter E, later. These 3 specimens, all from Seward Penin., had been ^{correctly} determined previously, by the writer.

As for *S. hebecarpa*, it can be stated definitely that it is not a species at all, but a hybrid. Fernald published it as var. *hebecarpa* of *S. fuscescens* Anderson, in 1907, raised it to specific rank in 1924, and discussed it again in 1930, when publishing his *S. similans* (which also is a hybrid). Fernald compared his *hebecarpa* with other species, but he never published a description. In his third discussion, he admits that the name *hebecarpa* is a misnomer because "most specimens have the capsules glabrous or only sparsely pubescent." This is the glabrous portion which he originally thought to be *S. fuscescens*, a species not occurring in eastern Canada.

The writer made a critical study of all of the collections of the various forms of this hybrid plant, and published a full discussion of it in 1950 (). It was shown conclusively that the different aspects of so-called *S. hebecarpa* were hybrids of *S. pedicellaris* var. *hypoglauca* Fern. (Section Roseae), with a prostrate species, probably either *S. anglorum* or *S. arctophila* (Section Arctiense or Ovalifoliae). It seems incredible that Hulten, who lists scores of specimens as *hybrids*, was not able to recognize Fernald's specimens as of undoubted hybrid origin.

417. *S. flagellaris* Hulten

Salix flagellaris spec. nov., Hulten in Svensk. Bot. Tidskrift. 34:376, fig. 2. 1940; Hulten, Flora of Alaska and Yukon, pp. 522-523, fig. 417. 1943.

S. flagellaris is the third species discussed by Hulten in Section Ovalifoliae. 417. *S. ovalifolia* Trautvetter, the second species, is long-established and well known, and will be fully discussed in connection with the study of *S. flagellaris* and the three others which follow. Three of the four are synonyms of *S. ovalifolia* or its varieties. For his allegedly "new" species, *S. flagellaris*, Hulten cites five collections, distributed from southeastern, to extreme western, to extreme northern Alaska. With locations, these are: Muir Glacier, Trelease 3452 (Arn. Arb.), Katmai Region, Hagelberger 247 (US), Stepovak Bay, Palache, July 8-19, 1899 (---), Seward Peninsula, Krusenstern R., Walpole 1672 (US, type of the species), and Colville River Delta, Schrader, Aug. 14, 1901 (US). In 1940, Hulten cited the last four, including Palache, as in "Nat. Herb. Wash." The writer has not seen the Trelease specimen. The other four, including the type, have been studied in USN, as also specimens of the Walpole (iso type) and Schrader collections in Herb. CRB.

The plant is described as prostrate, and the branches as very slender, long, fulvous, subterraneous, often rooting. Many species of arctic willows are prostrate, including all members of Section Ovalifoliae, and all arctic members of Herbaceae (Retusae), Rosaceae, and Reticulatae, with a few others. Hulten's chief emphasis, of course, in describing this "new" species, is on the presence of subterranean, stolon-like branchlets, as indicated by the specific name, *flagellaris*. The variability of arctic species in this respect was not discussed in chapter B, with other arctic effects, so must be given attention here.

Prostrate willows vary greatly in habit, within the same species or variety, especially as seen in herbarium specimens, which seldom are complete plants. Some form small and compact mats while others spread for several inches, or more diffusely for as many as 2, 3, or 4 feet (*S. arctica* and varieties). Part of these differences are inherent but a large part are environmental, caused by factors such as length of growing season, relative snow-ice cover, character and fertility of the substratum, and the vigor of the plant, dependent on these and other factors.

Willows are able to produce roots from any part of prostrate or buried stems, branches, or roots. When a prostrate branch is pressed against the soil, or covered even thinly, it soon produces roots if growing conditions are favorable. If the soil is fertile and not too hard, the shoot-buds on such buried branches often start growing and produce subterranean branchlets without leaves or aments, and hence called stolons. If the tips of branches are not buried, or the tips of stolons emerge, they will produce leaves and aments in normal manner.

The covering of prostrate stems or branches may be caused by accumulating leaf-mold, or by wind-blown or water-borne soil or sand, or by mixtures of these. This is equally true of stems of erect willows when crushed down to earth by landslides, water, snow, ice, or animals. It is quite evident, therefore, that prostrate branches ~~which~~ which are rooting, or are subterranean, or, being subterranean, themselves produce stolons, are not fixed taxonomic effects but are the results of ecological factors in the habitat. Under favorable conditions, these are the common means of propagation of both prostrate and erect willows and the cause of steadily expanding clumps. It seems incredible that all botanists and taxonomists do not recognize these facts.

Subterranean branches occur occasionally on practically all of the prostrate arctic willows, especially on those producing the longest branches, as in Section Ovalifoliae. They are found, from time to time, on such abundant and widely distributed and alpine prostrate arctic species as S. reticulata and S. nivalis (Reticulatae); S. phlebo-phylla, S. polaris, and S. rotundifolia (Herbaceae); and S. anglorum, S. arctica, S. ovalifolia, and S. stolonifera (Arcticae and/or Ovalifoliae), as well as others. In proposing his S. stolonifera, Coville states that he never had detected the production of slender, leafless, subterranean branches or stolons in S. ovalifolia, while they were characteristic of his species. Few collectors dig out and make herbarium specimens of the subterranean parts of perennial plants in the Arctic, or elsewhere. It must be remembered, also, that S. stolonifera is most common in the warmer parts of southern Alaska, where growth is more vigorous, glaciers are receding, and water activity increasing, conditions all favorable to the production of subterranean branches. Luckily, Coville had other characters, such as leaf shape and size, and especially longer styles, to validate his species.

The Hagelbarger and Palache specimens, cited by Hulten and discussed above, are both somewhat depauperate with very short branches and no sign whatever of either elongated or subterranean growth. On the Schrader specimen, the elongated young twigs, as well as the buds, petioles, and youngest leaves, are more or less pubescent. This fact is not stated by Hulten in the original description, much as he stresses the importance of any hairiness whatever on ovaries or capsules. At the end of his discussion, however, in both 1940 and 1943, he did state that the Schrader specimen had "shorter petioles and more hairy leaves than the rest".

For vegetal organs, other than branches, the description reads: buds small, narrow, pale fulvous, about 2 mm. long; leaves elliptical, obtuse or obsoletely acute, about 1.5-1.9 cm. long, 0.6-0.9 cm. wide, entire or with 3-4 glands toward the base, glabrous or in the juvenile state sparsely pilose on the lower margins; petioles slender, about 2-5 cm. long. In general, there are the characters of juvenile-stage specimens of S. ovalifolia, under which name three of the four had been ^{dis}tributed and all four had been annotated by the writer. All four are in juvenile or retarded stages of development, mostly at flowering or just after, with correspondingly undeveloped organs. The leaves certainly would have become at least 50 per cent longer and wider and the buds and petioles probably would have doubled in length, based on the measurements of similar mature specimens. If new species are to be based on the size, shape, and color of juvenile organs, the number of published Salix "species" could be doubled over night.

On one point, the description of the leaves is misleading, even for juvenile specimens. The only shape mentioned is "elliptical". On the type (holotype) specimen (USN), and isotype (CRB), some leaves are elliptical, more are elliptic-oblongate and obtuse with somewhat narrowed bases, and a few apical ones, mostly 1-1.5 or rarely 1.7 cm. long, are distinctly obovate with narrowed bases. On the Hagelbarger and Palache specimens, the leaves are elliptical, or elliptic-oval, to obovate. All of these are the normal for juvenile S. ovalifolia, where the leaves have not yet reached final size, shape, thickness or reticulation. On the heavily-branched Schrader specimen, the abundant leaves are elliptical or narrowly oval, about equally broadened at both ends, and rather strongly reticulate on both sides. This more mature specimen (Aug. 14)

has the capsules small but nearly mature. The leaves apparently have been dwarfed by the heavy growth and resulting insufficient food supply for all parts, together with some frost injury.

The bracts are described as about 1 mm. long, rotund, fuscous, pilose, the margins armed with glands 0.2-0.6 mm. long (K) ("margin glandulis 0.2-0.6 mm. longis minutis"). Actually, the bracts are broadly obovate to rotund while juvenile, become mostly elliptical as they mature, and are 1-1.5 mm. long in the pistillate aments, and vary from light to dark brown in color. With one exception, these are the characters of the bracts in S. ovalifolia and its varieties. Although there are two staminate pieces on the type specimen (USN) and three on the isotype (GRB), each piece with one ament, the only mention made by Hulten is "filaments ⁴⁶glabrous". The bracts of these staminate aments are shorter than those of the pistillate, which may account for the description as "about 1 mm. long".

The statement that the bracts are armed with rather long glands on the margins is simply astounding. Such glands on the bracts are completely unknown on American willows and, so far as the writer knows, have never been observed anywhere in the world. To demonstrate the presence of such glands on bracts would be a monumental discovery, and presumably the lucky finder would have proclaimed it with enthusiasm and adequate discussion. But Hulten does not even mention it further, or use it as a character in separating S. flagellaris from related species, either in keys or in text.

A critical study of the bracts on the type and isotype, and on the Palache and Schrader specimens, under both low and high-powered lenses, fails to discover a single such gland on their margins. There seems to be one possible explanation of this alleged discovery. The ^{near} axillary capillary ventral gland of a willow flower stands erect between the pedicel, or filaments, and the ament-rachis. In pressing specimens, both bract and gland might be moved out of the perpendicular. If the bract moved toward one side and the gland toward the other, a gland might protrude from under one side of a bract. One or two such instances were noted in the pistillate aments of the type specimen. But how such a single separate gland, so located, could be described as above is still a mystery.

* These specimens were examined independently by three taxonomists of international standing and have stated without qualification that no such glands are discernible on any of the bracts. (they all)

The capsules are described as 6-7 mm. long, glabrous, glaucous, on short pedicels 0.2-0.5 mm. long. The type specimen bears two pistillate aments, 1.5 and 3 cm. long, respectively, and the single ament on the isotype (CHB) is 2 cm. long. All aments contain both ovaries and young capsules. The ovaries are about 2 mm. long and glabrous. The capsules vary in length, not from 6-7 mm. long, but from 5-8.5 mm., although none is fully grown. All are glabrous and pale green but none is discernibly glaucous as described. They would have reached 8-10 mm. at maturity, thus showing that neither of Hulten's two described species is separable from S. ovalifolia on capsule characters. The styles are ^{described} ~~stipulated~~ as 0.2-0.5 mm. long, entire or divided to the middle, all within the normal limits of S. ovalifolia.

From S. ovalifolia, Hulten says that S. flagellaris differs by branches long, slender, and subterranean, and leaves narrow, thin, light green, not ciliated. The branches were fully discussed above and the small, not all narrow, but thin and light-green leaves of the Palache, Hagelbarger, and Walpole (type) specimens are shown to be characters of the juvenile stage of these collections. From S. stolonifera it is said to differ in its glaucous capsules, short styles, and narrow leaves. As shown above, the capsules are not glaucous, the short styles are exactly those of S. ovalifolia, and the leaves, not all narrow, are either juvenile or depauperate, or both.

In 1943, S. flagellaris is keyed as "Capsules glaucous, leaves oblong", and S. arctolitoralis as "Capsules not glaucous, leaves elliptical". It is shown above that the capsules of S. flagellaris are not glaucous. Leaves "oblong" and leaves "elliptical", even if true, are too nearly alike to create a specific, or even varietal, difference. As a matter of fact, Hulten in 1940 described the leaves of S. flagellaris as elliptical, not "oblong", and those of S. arctolitoralis as ovate or obovate-lanceolate, not "elliptical". How then, in view of these original descriptions, shall the keying of 1943 be explained?

Finally, another peculiar fact is that not one of these four cited specimens in the U.S. Natl. Herb., not even the cited type, is annotated by Hulten as S. flagellaris. Instead, each of the four sheets bears an annotation label reading: "Gelix tenuis-amentosa Hult. Eric Hulten. 1939". On the Walpole sheet, the word "Typus" has been inserted. No mention of this inexplicable annotation is made in either 1940 or 1943.

420. *Salix arctolitoralis* Hulten

Salix arctolitoralis HULTEN spec. nov. Hulten, Eric. Two New Species of *Salix* from Alaska, in Bot. Tidskr. 34: 374, 376, fig. 1 (on p. 374), 1940; Hulten, Flora of Alaska and Yukon, pp. 524-525, fig. 420. 1943.

This species, in 1940, was based on seven collections from western arctic Alaska, where *S. ovalifolia* Trautvetter and its varieties occur abundantly. One, from Umalakleet, Norton Sound, was the smaller of the two specimens on Johnston and Palmer 79 (US, NY), distributed as *S. fuscescens* Andersson. Three were from Seward Peninsula (Jones 9038, from Nome, Anderson 4806 from Deering, and Anderson 4705, type of the species, from Kotzebue, all in Herb. Hulten (H)). Three others were from Point Iay on the western Arctic Coast at nearly lat. 70° N. (Anderson 4417 (H), Goodman 32 (C, US), and Mason 6425 (H)). The two indicated above as in (US) were then cited as (Nat. Herb. Wash.). In 1943, he added another specimen from Seward Peninsula (Anderson 4626 from Kivalina (H)).

The writer has not seen the specimens in the Hulten Herbarium but has studied specimens of all of these eight collections, two in the U.S. National Herbarium (US) and seven in Herb. Ball, including an isotype. All of them are definitely referable to *S. ovalifolia* var. *camdensis* Schneider, but one and that one is variety *pubescens* Andersson. The isotype in Herb. Ball evidently is rather depauperate, with relatively short twigs and buds, and crowded leaves with short petioles. It also is frost-injured, as shown by the tiny blackened ovaries remaining in the basal portions of the fruiting aments, the thickened styles (especially the upper portion), and the varying size and color of the flower bracts. These are common expressions on arctic collections and are seen on others of the specimens cited.

All of these specimens except one were distributed as *S. ovalifolia* (two) or its variety *camdensis* (five) and all had been annotated by the writer as var. *camdensis* Schneider. Johnston & Palmer 79, as noted above, was distributed as *S. fuscescens* Andersson but the sheet bore two quite different specimens. The smaller, with oblanceolate leaves, was included by Hulten in his species and the larger, with obovate leaves somewhat serrulate basally, he annotated as *S. ovalifolia* X *S. arctolitoralis*, but it probably represents *S. ovalifolia* X *S. fuscescens*, as annotated by Ball in 1934. These two portions of Johnston & Palmer 79 now have been remounted on separate sheets in The U. S. National Herbarium.

The plant is described as prostrate, ~~and~~ the branches as long, and the juvenile as fulvous in color, characters common to nearly all species in *Ovalifoliae*. The ~~iso~~ ^{iso} type, however, as noted above, is depauperately abnormal and differs from the rest. No mention is made of pubescence on branches or buds, yet the three Point Iay collections all have some of the younger branches densely to thinly pubescent, and the two bud-bearing have buds pubescent also. This is a common expression in species of *Ovalifoliae*. But, as Hulten insists that collections with any hairiness of ovaries or capsules must represent a species, subspecies, or variety distinct from an otherwise identical entity with these organs glabrous, it is surprising that he does not even mention this vegetal pubescence, let alone making it the basis of a "new" entity.

The buds are described as green and slender, which is true only for young developing buds in *S. ovalifolia* and related species. They range from 2-5 mm. long on the specimens cited. On the depauperate ~~iso~~ ^{iso} type, (Anderson 4705) the buds are only 2-3.5 mm. long but those best developed are quite broad and blunt. On *S. ovalifolia* and varieties, the mature buds are 4-6 mm. long, stout, and often brownish to dark brown. On early-collected specimens, the bud scales of the previous year ~~are~~ often are still adhering and show the true proportions. On late autumnal collections, the seasonal buds will have reached full size. Hulten does not mention stipules, and these organs are rare or early deciduous in *S. ovalifolia* and its varieties. On Goodman 32 in Herb. Bell there is a single lanceolate stipule 5 mm. long.

The leaves were described as ovate or obovate-lanceolate, 2-3 cm. long, many-nerved, glabrous or minutely ciliate, yellowish-green above, pallid below. They actually reach a length of 3.7 cm. on Johnston-Palmer 79, seen by Hulten, 3.5 cm. on other specimens cited, and 4 cm. or more on other collections of var. *camdensis*. *S. ovalifolia* has leaves narrowly to broadly oval, var. *cyclophylla* more orbicular and usually smaller, and var. *camdensis* elliptical-ob lanceolate to narrowly obovate. All are many-nerved (reticulate on both sides) and all are strongly glaucous (not "pallid") beneath, unless discolored. In the species and the varieties, there is a tendency for the final apical leaves, developing in late summer, to be ovate in shape, although in var. *camdensis* they more commonly are oval, as on several of the collections cited.

If the word "ovate" in the description referred to this character, the order of leaf-shape presentation should have been reversed and the "ovate" specifically restricted to late apical leaves. Young leaves of the species and its varieties often are pubescent on petiole and basal upper surface, and densely to thinly long-villous beneath. No mention of such hairiness is made for S. aretolitoralis but it occurs on the pubescent-twigged Point Lay specimens, especially Mason 6425 in Herb. Ball. See discussion below of pubescent capsules on this specimen.

No axent length is given by Hulten but they are about 2 cm. long on the depauperate ^{iso}~~type~~ and reach 2-3 cm. on Anderson 4626 and 4806, and Johnston-Palmer 79.

The flower scales are described as minute, grayish-blue to purplish, gibbous, ciliate on the margins, and shorter than or equalling the pedicels. To call them "minute" seems misleading, as the best developed are 1-2 mm. long on the ^{iso}~~type~~ (margins inrolled). The term gibbous also seems to be misleading, as they are not hump-backed/in nature. The colors and curvature shown on the ^{iso}~~type~~, but not on the others, almost certainly

are the effects of frost injury and subsequent drying, causing the scale to curl around the pedicel in some cases. This is not a taxonomic character.

The capsules are described as pedicelled, 8-10 mm. long, purplish to (denique green, not glaucous, glabrous. The length given, "8-10 mm.", is misleading, as that size is found only on the type (^{iso}~~type~~) specimen, collected on Aug. 12, with capsule valves just recurving. The capsules range from only 6-8 mm. long on Anderson 4417 and Mason 6425, to 7-9 mm. on Anderson 4626, and 8-9 mm. on Anderson 4806, Jones 9038, and Johnston-Palmer 79. These sizes are the normal range in S. ovalifolia and its varieties, including var. candensis, which these specimens represent.

The colors of capsules, as of twigs, are the results of nature, sun, frost, and drying in press. The natural color should be stated, if known, the artificial omitted or explained. Ovaries and young capsules are greenish, the older may become ~~more~~ somewhat brownish, and in a few species glaucescent. Purpling or blackening are the results of frost or drying, or both. Glaucousness or glaucescence is one of the most variable characters known, because it is in the nature of a waxy exudate from the ~~from the~~ underlying tissues and may be removed from ~~from~~ twigs, buds, and capsules by rain, dirt, drying, or handling. After such removal in nature, it may be renewed, or it may not.

depending on environing conditions. The glaucousness of lower leaf-surfaces is much more permanent in nature, but is easily injured or destroyed by too much heat in drying. To state that the capsules of S. ovalifolia ^{and so-called S. flagellaris} are glaucous and that those of S. stolonifera and so-called S. arctolitoralis are not glaucous is untrue and misleading.

Pubescence of ~~ovaries~~ ^b ovaries and capsules, like that of vegetal organs, is a variable expression. Many varieties have been founded on pubescence or glabrousness of vegetal organs or capsules, if the character observed was the reverse of that in the previously-known and otherwise identical species. This is entirely legitimate. Occasionally the same is true for glaucousness of the lower surfaces of leaves. Sometimes the less widely distributed variant is found first and so becomes the species, while a more widely distributed form found later must remain the variety. Hulten seems ~~seems~~ to be strongly impressed by the taxonomic importance of hairs on the ovaries and capsules but not at all by their occurrence on vegetal organs. This will be discussed further in connection with his comparison of his species with others.

As to glabrousness of capsules, some of the species of Section Ovalifoliae, as well as of other Sections, occasionally have young ovaries more or less pubescent but the older ovaries, young capsules, and mature capsules entirely glabrous. Anderson established a var. pubescens under S. ovalifolia and specimens retaining some pubescence on the capsules usually are placed therein. There seems, however, to be some diversity of leaf form among the plants having pubescent capsules.

The styles were described by Hulten as 0,5 mm. long or longer, thickened toward the apex, entire or divided to the middle; stigmas 4. These are the characters of B. lifo ovalis and varieties. The apical thickening, however, as noted in ~~Section~~ chapter A, is one of the common effects of frost injury and not a taxonomic character.

Of the male plant, Hulten merely says: "Stamens unknown". Why did not Hulten describe the staminate specimens of var. camdensis as his new species, just as he did in the case of the ~~several~~ pistillate specimens?

Hulten states that his S. arctolitoralis differs from S. glacialis Andersson by "glabrous capsules, long styles, and large, light-green leaves". S. glacialis, known only from the type specimen collected by Capt. Pullen on the Arctic Coast between Point Barrow and the Mackenzie River, is extremely juvenile, comparable to a baby in humans. The leaves are tiny and still long-villous beneath, the anthers are just emerging from the buds, the tiny ovaries (still covered by the scales) are densely hairy, and the stigmas are sessile because the styles have not yet elongated. Just what its characters would have been at maturity may be determined by intensive study of all material collected in that area. Such study shows that S. ovalifolia and its ~~var.~~ ^{all are found in that area,} camdensis and cyclophylla, as well as var. pubescens with pubescent ovaries and some remnant pubescence on the capsules. We know that the leaves would have enlarged and become less hairy at maturity. We know that the styles would have elongated at least to the length normal to S. ovalifolia, because no plants with ^{mature capsules having} sessile stigmas ever have been found there or elsewhere, and the long-styled S. stolonifera never occurs in northern Alaska. As we know positively that S. glacialis is of Section Ovalifolia, it must go to var. pubescens because of the pubescent ovaries. This disposes of its relationship to S. arctolitoralis.

Hulten says (1943): "In my opinion S. arctolitoralis is most closely related to S. stolonifera Cov., from which it differs in its shorter styles, thicker toward the apex, in its larger capsules, and larger and narrower leaves." S. ovalifolia and all of its varieties have styles definitely shorter than those of S. stolonifera. The thickening of the styles toward the apex, or throughout, is the result of frost action, and can be observed on ~~many~~ arctic specimens of many species. As to longer capsules, it was shown above that Hulten's [†]statement of capsules 8-10 mm. long in S. arctolitoralis was ~~very~~ incorrect and misleading. As to leaf-length, Hulten says 2-3 cm. and Coville says 1.5-3 cm., or no difference. As pointed out above, there were longer leaves on the material Hulten cited but much larger leaves now are known for S. stolonifera. But the leaves of var. camdensis (S. arctolitoralis) are narrower than those of S. stolonifera.

Finally, after discussing everything else, Hulten comes around to its real relationship. He says: "It is doubtless also closely related to *S. ovalifolia* and several of the specimens enumerated above were labelled by Ball *S. ovalifolia camdensis* Schneider. Type specimen~~s~~ (sic) of that plant show, however, that this name is a synonym for *S. glacialis*." (p. 525. 1843). This is a complete misstatement of fact. Schneider (Bot. Gaz. 66:139-140, 1918) cited six specimens collected at ~~333~~ Collinson Point, Camden Bay, Northeast Alaska, by Fritz Johansen, in June and July, 1914, and a seventh from Martin Point, nearby. He says that they differ from typical *S. ovalifolia* ~~only~~ only by narrower leaves and shorter anthers. The writer has examined five of the Camden Bay specimens in Herb. Ball, of which two are juvenile pistillate specimens. There are no hairs on the ovaries, which is the only character certainly separating *S. glacialis* from var. *camdensis*, or *S. ovalifolia*. The type, Johansen 116, farther advanced and with mature fruit, has been examined in the Canadian National Herbarium (Acc. 93482) by Dr. A. E.

Borsild and he informs me that the capsules are completely glabrous. What then is the basis for Hulten's statement of the identity of the glabrous-capsuled var.

camdensis with the pubescent-ovaryed *S. glacialis*?

Another puzzling question remains unanswered. Hulten cited Anderson 4417, Point Lay, under his *S. arctolitoralis*. On that specimen, in Herb. Ball, not only are some twigs and buds pubescent but the mature capsules also have some remnant pubescence, ~~especially~~ especially on the recurved tips of the valves where where protected from loss through wind action or rubbing in handling. Yet Hulten was describing a glabrous-capsuled species. Is it possible that the specimen in the Hulten Herbarium did not possess this capsule pubescence? Or did Hulten overlook it, just as he failed to record the pubescent twigs and buds on all three of the Point Lay collections he cited? In any case, this character appears to place that specimen in *S. ovalifolia* var. *pubescens* Andersson (*S. glacialis* Andersson).

In 1943, S. arctolitoralis and S. flagellaris, as well as S. ovalifolia, are keyed (p. 499) under "Styles short, about 0.5 mm." S. arctolitoralis then is keyed as "Capsules not glaucous, leaves elliptical", and S. flagellaris as "Capsules glaucous, leaves oblong". As the stamens of the capsules on the type and other cited specimens of S. flagellaris showed, above, that they are not glaucous, that difference does not exist. Leaves "elliptical" and leaves "oblong", even if true, are too nearly alike to create a specific, or even a varietal, difference. But were these the stated differences? Actually, Hulten, in 1940, described the leaves of S. arctolitoralis as "ovate or obovate-lanceolate" (not "elliptical") and those of S. flagellaris as "elliptical" (not "oblong"). Now, then, in view of these original descriptions, can the keying of 1943 be explained?

419. Salix glacialis Andersson.

Hulten, in 1943, lists S. glacialis as an accepted species (pp. 523-524), and cites a considerable literature and 16 different collections which he refers to it. Of it, he says: "S. glacialis is characterized by its small, distinctly, often densely, grey-hairy capsules, short and thick styles, small obovate ciliated leaves and long slender reddish- or yellowish-brown branches. The leaves are not so thick as those of S. oblongifolia (sic) and have a texture and venation more or less resembling that of S. arctica. For a long time it was known only from the type specimen collected on the Arctic Coast by Pullen. "

In any interpretation of the above statements, it must be remembered that the "S. arctica" of Hulten is the species known as S. anglorum Chamisso and that the hitherto unheard-of "S. oblongifolia" mentioned above probably is a mis-writing of the well known arctic S. ovalifolia. He cites S. ovalifolia var. camdensis Schneider (Bot. Gaz. 66:139. 1918) as a synonym of S. glacialis (p. 524). But the type specimen of S. glacialis has densely pubescent ovaries and the ovaries and capsules on all of the original collections of S. ovalifolia var. camdensis are glabrous, including the type ~~specimen~~ specimen, Johansen 116. Hulten's statement, in his final discussion of the relationships of his S. arctolitoralis, that the type specimens of var. camdensis shows that name to be a synonym of S. glacialis is fully discussed above and shown to be completely untrue.

By Carleton R. Ball

not published
w. a. Archer

I have just examined Part III of this work, which contains *Salix* (Lunds Universitets Arsskrift, N.F., Avd. 2, Bd. 39, Nr. 1., 1943.). It is very revealing, especially the treatment of *Salix*. Its tragedy of errors shows up the lazy, careless, and selfish taxonomist at his worst. Note the following points.

1. Can a work honestly be called a Flora (or Manual) unless it presents descriptions of the plants included? In this work, only allegedly new entities are described. If he had written descriptions of all of the plants he talks so glibly about, he would know ten times as much about them, and would have been able to publish only about one-tenth as much. And his readers would have a chance to learn something. And other would not have to do all of the real work.

2. When no descriptions are given, there is added obligation to make the keys full and accurate. This certainly has not been done for the genus *Salix*. How can any one make accurate keys for a large genus of plastic (variable) ~~plants~~ species without first having carefully described them? This he had not done. "Let George do it".

3. Hulten obviously is "hipped" on the subject of hybrids in *Salix*, as shown by his discussion on pp. 498-99, and publication of numerous hybrids later on, with recurring suggestions that other forms probably are hybrids. This is an unfailing resource of Old World botanists who have run out of new things to name at home and so tackle American plants, especially willows. Floderus, of Sweden, got the willows from the Natl Herbarium of Canada and renamed practically all of them as hybrids, not only of two supposed parents, but as hybrids of three, four, and even five species. That was sheer foolishness. Every geneticist knows that it is absolutely impossible to determine such degrees of hybridity from living plants, artificially crossed, let alone from dried fragments of allegedly hybrid wild plants, the actual parents of which were not there or collected. But calling many of them hybrids relieves such workers from hard study to find out what such plants really are, and gives them the desired new combinations to publish. Also, they ignore the well-known fact that most hybrids are sterile and do not reproduce themselves at all.

4. Hulten also has adopted the subterfuge of pretending that most variations are subspecies rather than varieties, which gives them opportunity to make many new subspecies or new combinations of previous varietal names. Such authors do not explain the criterions by which one determines whether a variation is a subspecies, a variety, or a form. Some authors now are giving Latin names to 8 categories: species, subspecies, variety, subvariety, form, subform, sub-subform, and sub-sub-subform. I collected five of their sub-forms from one tree. In this one paper, Hulten has 15 of his own subspecies (9 new), and two by others, and only 3 of his own varieties (2 new) in 9 by others. Most of the well-marked and long-established varieties of Alaska *Salix* he ignores.

5. The treatment of *Salix* is a tragedy of errors. The inaccurate keys have been mentioned. Two species so closely related that separation of extremes of poorly developed specimens is very difficult, are put in two different Sections: *S. rotundifolia* in *Herbaceae* and *S. phlebophylla* in *Myrtosaxilix*, along with *S. polaris* and *S. Chamissonis*. This last clearly belongs with *S. Barclayi*, *S. comutata*, etc., having all their characters but an abnormal creeping habit. There is an old gag: "If you found kittens in an oven, would that make them biscuits?". *S. Setchelliam*, whose nearest relative is *S. retusa* of Europe, is put in a new Section *Alienae Floderus*. Which reminds me that Floderus, receiving specimens of the male and female paratypes of my *S. Setchelliam* in Sweden, immediately sat down, described it as *Salix aliena* Floderus, rushed the paper thru into print ahead of accumulated papers and tried to beat me out of my species (nearly succeeded, because my paper took its turn).

6. An example of care in statements. Under *Salix Farrae* (p. 532), he says that Coville and Ball published *Salix Walpolei* in 1921, but our combination is clearly printed "n. var.". He also credits Schneider with publishing *Salix Walpolei* and gives 3 citations. Schneider did not publish such a combination. (ad infinitum)

S. Muriei Hultow

First spec cited is "Copper Center Herb 221 prostrate
221 West ~~"prostrate"~~, Copper Center (S. cub. S. niphoclada
somewhat doubtful),

My list of 27 willows coll by West in vicinity
of Paxson in 1934 includes

220 + 221, "low shrub, near Paxson"
but not named. Just up in S. niphoclada
and desertorum

The other three cited
Eastward 161, Dawson Slide, ^(US) Yukon, not Alaska)

Muris, —, Salcha Slough, June 18, 1923 ^(US)
collected

O. A. Paper 270 Coldfoot (S. of Wiseman, 1904 (US)
are all in US H. N.

Specimens which Hultow thinks might be
hybrids of S. Muriei & S. brachycarpa Mexicana

Anderson 2012 Chitina (no herb cited) ^{nonant}
^(used by C. for herb + det as S. desertorum) ^{given}

Scamman 899 middle fork Koyukuk R. (S.H.) no name
given

Scamman 900 Wiseman (S.H.)

These not in Alaska lists of (P.B.)
In her pub (See her, Alaska list) she lists 899 as S.
glauca acutifolia, from Wiseman, but does not mention
900 there or under S. niphoclada but 904 Wiseman
thereunder.

Am and type S. Muriei; US not types

S. Muriei Hulten is based on four cited specimens:

Murie, Salcha Slough, June 18, 1922 (Arnold Arb, sub *S. pulchra*, type; also in US)

Piper (C. A.), ~~XXXX~~ 270, Coldfeet (U.S. sub *S. pulchra*);

Eastwood 161, Dawson Slide (US, sub *S. arbusculeoides*), in mixture now separated) ^{and *S. myrtilloides* X *glauca* det Ball}
CRB.

Went 221, Copper Center (L. sub *S. nipheclada*, somewhat doubtful)! ^{pro parte} OK

Scamman 899 is cited as doubtful hybrid (X *brachycarpa Mexiae*) under *S. Muriei* and also under *S. glauca* X *S. pseudementicela* forma ~~submerita~~ ^{subpseudementicela} Hulten.

LOOK UP-

"A peculiar specimen resembling *S. Muriei* but with very narrow leaves, having long (3-5 mm.) petioles and being less glaucous below, was collected at Chitina (2012). It might represent a hybrid with *S. brachycarpa* var. *Mexiae*," ^{by Andersen}

LOOK UP

as might also the following specimens, which differ from the last-mentioned plant in having glabrous leaves, more distinctly glaucous below:

Scamman 900, Wiseman (G.H.); Scamman 899, middle fork of Keyukuk River (G.H.).
Check for these in USNH under *S. glauca* ^{*glaberrima*}

Legumes. Farm practices and production costs in alfalfa growing, as influenced by soil formation, were investigated by the Departments of Agronomy and Farm Management of the New Jersey Station in cooperation with the State Department of Agriculture, and the results published by the Station (-408 NJ B) in 1925. ^

In 1929, the Division of Farm Management and Costs, in cooperation with the Division of Forage Crops and Diseases of the Bureau of Plant Industry, began a cooperative investigation of the place of sweet clover in corn-belt farming. The results were published (-1653 FB) in 1931 under joint authorship of the two Federal units, with extensive informal cooperation acknowledged from the Extension Services and Experiment Stations of the various State Agricultural Colleges in the Corn Belt. In 1931, a similar cooperative study was begun in the Great Plains Area. During the years 1929 to 1931, inclusive, the two Federal Divisions named cooperated in an extensive study of the use of winter legumes in farming in the southeastern United States. The results were published in both popular and technical form (-1663 FB; -367 TB) in 1931 and 1933, respectively, under joint authorship, with acknowledgment of much assistance received from experiment stations and extension services in Alabama, Georgia, and South Carolina. In 1934, the Iowa Station published on soybeans in Iowa farming (-309 Iowa Bul), acknowledging the cooperation of the Federal Division of Forage Crops and Diseases with the Sections of Agricultural Economics and Soils and Crops, of the Iowa Station.

Hulten Paper

Citations to write, arrange alphabetically
and number, and enter two or
three listed

Page

1, 23, 24 Hulten Fl. Alaska Yukon

8 Cockerell *Sarcophila*
Lundström *S. groenlandica* (See Cook.)
Schneider 1914
Thodorus *S. chlorocladus* 1923

16 Hulten (earlier vol.)

24 Ball Two Ryd. W (5 *Hebecarpa* -) 1900

Specimens to look up again

p. 15
Anderson 4601, Point Hope in page
S. ovalifolia x *S. angustifolia* (see p. 11 in)

p. 19, 21, 22
Muir 525 McKinley Park in US
S. glauca x (*arctica* or *angustifolia*)
Genl

p. 24
Fern & Collins 207, type of *S. hebecarpa* from
Comp with Walpole 826 Jeller (US)
sub. *S. ovalifolia* v. *pubescens*

ANNOTATION OF CITED SPECIMENS BY HULTEN AND BY BALL
Locality and Specimen IN U.S.N.Herb. IN Herb. Ball
cited by Hulten By Hulten: By Ball

Salix arctolitoralis

- Norton Sound, Unalakleet:
Johnston-Palmer 79 ~~pro parte~~ (US, NY)
Seward Peninsula
Anderson 4705, Kotzebue (H, type) of the species).
Anderson 4806, Deering (H)
Jones 9038, Nome (H).
Anderson 4626, Kivilina (1943) (H).
Point Lay.
Anderson 4417 (H).
Goodman 32 (G, US) (det. as *S. oval.* CRB. *S. arctolitoralis*; *S. o. cam-*
densis.
Mason 6425 (H).

Salix flagellaris

- Muir Glacier
Trelease & 3452 (Arn Arb)
Katmai Region:
Hagelbarger 247 (US) sub *S. fuscescens.* *S. tenuisamentosa*;
S. ovalifolia, juvenile?
Stepovak Bay.
Palace Jul 8-19, 1899 (---).
Seward Penin., Kruzgamapa R.
Walpole 1672 (type) (US, type of the species). Isttype
Colville R. Delta.
Schrader, Aug. 14, 1901 (US). CRB

Salix M^uriei

- Copper Center
Went 221 (L, sub *S. niphoclada*, swt doubtful)
Salcha Slough
Murie, Jun 18, 1922 (A.A, type, sub *S. pulchra*; US)
Coldfoot:
Piper (C.A) 1270 (US, sub *S. pulchra*)
Dawson Slide, Yukon
Eastwood 161 (US, sub *S. arbusc.*, in mixture)

Cited under Muriei as possible hybrids with *S. brachycarpa* Mexiae.

- Chitina,
Anderson 2012 (---) "a peculiar specimen with very narrow leaves, long (3-5 mm.) petioles
and less glaucous below"
Wiseman, Middle Fork Koyukuk R.
Scamman 899 (G, H)
Scamman 900 (G, H)

(Scamman 899 also cited under

Examples of carelessness by Hallen

Citing but not annotating unnumbered specimens
Under *S. crassipolia*, Hallen cites "Mitrofanova Bay,
July 13, 1899. Griggs. (US)" but there are three sheets in
the US cover of *S. arctica* bearing this identical label
none annotated by Hallen. Why did he not give the
Acc. No. or state number of sheets?

Same use of *Saxifraga* several sheets
See *S. crassipolia*

3 sheets of Griggs July 25, 1913 Mitrofanova Bay (US)
which is cited under *S. crassipolia* but not annotated.

Wetmore, Alex. 128 Unalakleet, July 7, 1911 (US) is annotated
as *S. arctica* Ballou by Ball. 1934 and as "*S. arctica* Ball. f."
Fladness, 1935. Hallen does not cite it.

~~178~~ ¹⁷⁸ ~~178~~ Cor. 1/5 1786 1 sheet Unalakleet (hangs off above)
as ? *S. Bonplandii* x *crassipolia*

Does not cite herbarium

Addition erroneous species combinations

S. rotundifolia Andr. p 505 = *S. r. Franch.*

S. leiocarpa Coville p 505 -
= *S. leiocarpa* (Cham) Coville
= *S. rotundifolia* Franch.

S. phlebophylla Seemann Phod. 42: 320
1940. (p. 508)

S. Chamissonis Coville p 509. = *S. Cham.* Anders.

S. buxifolia Rehb (1885) (p 511) = *S. buxifolia* ?

S. Chamissonis Lundström f. 51 (1883) = *S. Cham.*

S. retusa Hook (1840) p 51 = *S. retusa* L. ?

S. lasiantha v. *lanceifolia* Schumacher (503) *S. l. v. lanceifolia* (And) Bebb

S. longifolia, v. *pedicellata* S. " (504) *S. l. pedicellata* (And) Ball

S. angustum Kjellm. (508) *S. angustum* Cham.

S. myrsinites Cham. (509) = *S. myrsinites* ?

S. polaris Seemann (510) *S. polaris* (Watsl.)

S. Pallasii Nees (516) *S. Pallasii* ?

S. ovalifolia Durand (517) *S. oval* Fr. ?

7
29
29

4265 *Fernae* Ball, sub sp *Walpolei* Coville p 522, *Halt. v. munit*

In citing literature,
Hulten: Flora of Alaska and Yukon.

Hulten has the inaccurate and wholly misleading habit of indicating that various authors have published certain species of *Salix*, when actually they never had made such combinations but were merely discussing well-known species published by other authors and so credited in the discussions. See his references to :-

- | | |
|---|--------------------------------|
| S. interior Ball, p. 504 | (really S. interior Rowlee) |
| S. reticulata Heek., 505. | (S. reticulata L.) |
| S. retundifolia Scamman, p. 511. | (S. retundifolia Trautvetter) |
| S. arctica Lundstrom, p. 513. | (S. arctica Pallas) |
| S. myrtilloides Cham., p. 515. | |
| S. arctica Cham., p. 515. | (S. arctica Pallas) |
| S. myrtilloides Cham., p. 521. | (S. myrtilloides L.) |
| S. ovalifolia Ceeley, p. 523. | (S. ovalifolia Trautvetter) |
| S. glauca Ceville, p. 525. | (S. glauca L.) |
| S. nipheclada Scamman, p. 529. | (S. nipheclada Rydberg). |
| S. nipheclada Ceville, p. 530. | (S. " "). |
| S. Walpolei Schn., p. 532. | (S. Walpolei Ceville and Ball) |
| S. Richardsenii Seemann, p. 538. | (S. Richardsenii Heeker) |
| S. Barrattiana Kurtz, p. 542) | (S. Barrattiana Heeker) |
| S. restrata Macoun, p. 544. | (S. restrata |
| S. Bebbiana Cev., p. 544. | (S. Bebbiana Sargent) |
| S. myrsinites Ledeb., p. 545. | (S. myrsinites |
| S. arbusculeoides Cev., p. 549. | (S. arbusculeoides Andersson) |
| S. flavescens Kurtz, p. 550. | (S. flavescens |
| S. Scouleriana Macoun, p. 550. | (S. Scouleriana Barratt) |
| S. Nuttallii Cev., p. 550. | (S. Nuttallii |

20
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In these discussions of treatments by various authors, he names the actual author of the combination correctly in the following:

- S. lancifolia And., p. 505. 3
- S. pseudopolaris Fied., p. 510.
- S. anglerum Cham., p. 511.
- S. speciosa Heek., p. 539.
- S. longistylis Rydb., p. 541.
- S. rhombifolia Heek. & Arn., p. 545.
- S. E. pulchra Cham., p. 547.
- S. longifolia Muhl., p. 504

In the actual listing of the included species and varieties, he makes two errors in authorship.

- 432 S. alaxensis Cev., pp. 539, 541. Correctly S. alaxensis (Andersson) Ceville.
~~S. alaxensis var. longistylis Schn., p. 541. (actually var. longistylis (Rydberg) Schneider (S. longistylis Rydberg)).~~

426. S. Farrae Ball, sumsp. Walpolei Cev. & Ball (p. 532). This was published as a variety and Hulten here apparently is making a new subspecific combination but does not so indicate in any way.

Under *S. arctica* Pallas of Hulten, ^{US} Look up determine, and describe
See if annotated
Bering Sea District, St. Lawrence Id.

Geist at Kangas in 1933 (H)

Geist at Savoonga, in 1933.(H) •

None in US

Kjellman (S)

Arctic Coast, King Pt.

Lindstrom (NY)

Check in the 2 *Saxifraga* covers annotated by Flod.
None in there 24-4
USN

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Look up Chamisso in Linnaea 6:541, 1831, and see if I have accurately quoted him (p. 7 f

Herbariums and Annotations of *Salix arctoliteralis* Hulten.

Norton Sound, Umanakleet:

Johnston & Palmer 79 pro parte (US, NY).

USN. Orig.:

Ball:

Hulten:

Seward Peninsula:

Andersen 4705, Kotzebue (H, type of the species:

USN. Orig.:

CRB. Orig.:

Ball:

Final:

Hulten:

Andersen 4806, Deering (H):

USN., Orig.:

CRB., Orig.

Ball:

Final:

Hulten:

Jones 9038, Nome (H):

USN., Orig.:

CRB., Orig.:

Ball:

Final:

Hulten:

Andersen 4626, Kivillina (1943) (H).

USN., Orig.:

CRB. Orig.:

CRB.

Hulten:

Final:

Point Lay, NW. Coast:

Andersen 4417 (H):

USN. Orig.:

CRB., Orig.: *S. ovalifolia*,
var. *camdensis* Schn.

Ball

Final: *S. ovalifolia*,
var. *pubescent* Anderson

Hulten:

Goodman 32 (G, US):

USN., Orig.:

CTB., Orig.:

Ball:

Final:

Hulten:

Mason 6425 (H):

USN., Orig.:

CRB., Orig.

Ball:

Final:

Hulten:

S. aristatilis

3

(check on ovate)

Leaves are described as ovate or (vel) obovate-lanceolate, 2-3 cm. long, many-nerved, glabrous or minutely ciliate, yellow-green above, pallid below. ("sat length of pedicel")

Leaves on Andersen 4705 (type) ^{Katzenberg} are elliptic, ellip-oblong. or ellip-obovate;

Leaves on Johnston-Palmer 79 (part) are oblong, to 3.7 cm. mostly cuneate base;

On Jones 9038, Neme, ellip-oblong. to obovate, the apical oval;

On Andersen 4626, Kivilina, about same as on type;

On Andersen 4806, Deering, ellip-oblong to 3.5 cm;

On Andersen 4417, Point Lay, ^{much as type} the young apical approaching ovate-oval;

on Goodman 32, Point Lay (in CRB) apical appr. ovate-oval, to 3.5 cm.;

on Mason 6425, Pt. Lay, leaves small, elliptical, some young apical densely to thinly white-villous; some apical becoming broad and nearly oval;

"Differs from *S. glacialis* Anders. in . . . large, light-green leaves." but that species based on juvenile condition, small leaves poorly dried.

" . . . most closely related to *S. stelenifera*, from which it differs in . . . larger and narrower leaves. (Get figures on size and shape of leaves of *stelenifera*)

The petioles on the type are shorter than on most of the others

AMENTS are long-pedunculate, the peduncles with 3-4 leaves (length of aments not given; but mostly 1.5-2 cm. (2 cm. on type)

on Johnston-Palmer 79, aments (two) are 3 cm. long;

on Andersen 4626, Kivilina, (one) 3 cm. long;

on Ander 4806, Deering, aments are 2-3 cm. long;

April 26, 1951

To prevent this violence is our job. It can only be done by continuing painstaking investigation and relentless exposure. Violence is accelerating. Our work likewise must be speeded up. We need your immediate support so that we can again have a full-time man in the field, so that we can go ahead with our planned Florida peonage hearings, so that we can defend each individual as the cases come up.

Sincerely yours,

Donald Harrington

DH:d
oelu-153
Enc.

Donald Harrington
National Chairman
Workers Defense League

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B.D. As this was being written, the urgency of the new Groveland investigations became apparent. Our special investigators are working there now. But our funds are very low, and only if you rush your contribution can we keep them on the job. Won't you send it to us today?

D. H.

S. arctolitoralis Hulten

Goodman 32, Point Lay, (US).

Look for it in USN.

Cited by Hulten in 1940 and 1943 under *S. arctolitoralis*.

Annotated by Hulten in 1943 as *S. arctolitoralis* in US.

Has elliptic-oval leaves, 1-2.5 cm. long, the apical becoming larger and obovate, to 2 cm.

Det. as *S. ovalifolia* by Ball in 1934, acc. to spec. in CRB. but has mostly ellip. or narrowly obovate leaves, and may be filed in US. under var. *camdensis*

Det. by Ball in 1952 as *S. ovalifolia* var. *camdensis* Schneider
(or possibly an undetermined species)

Leaves ellip-oblongate to oval, to 2.5 cm. long, and bases broadening, one leaf broadly obovate, 2.5 by 1.8 cm., but base still cuneate.

DEVER, COLORADO

Raina Watt

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YOUR



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from your radio, keep it in perfect
tune and condition with a service
that we can render at extremely low
cost.

Our Service Department is thorough-
ly acquainted with all makes and types -
the parts we use are the finest money
can buy - and remember, our work is
guaranteed!

Cited under "S. crassijulis" by Hulten

45
(~~54~~ collections) + *Alaska*

S.E. Panhandle:

- Prince of Wales Id., Smith, June 18, 1914 (---)
— Windham Bay, Culbertson 4944, (---), U.S.N. 2 sheets not annotated ✓ *US n*
— Juneau, Hulten 8177 (---)
US n Haines, Scheuber, July 1909 (US, sub. S. anglerum var. araioclada) not annotated ✓
Skagway, Emmer, Sept. 10, 1913 (S)
" Andersen 740 (H)
White Pass, Williams, Aug. 27, 1899 (NY)
" " Eastwood 863a, 919, 934 (Arn. Arb). *all* 934 in US, not cited or annotated ✓ *US n*
US n Yakutat, Disenchantment Bay, Funston 114 (US).
Funston 117 is in US, sub. v. obcord *but not annotated*
Ceville lists 117 only

SOUTHERN:

- Orca, Nerberg, Aug. 25, 1938 (H)
— Virgin Bay Kincaid, June 26, 1899 (---)
— Seward Hulten 7848a (---)
US n Kodiak Cole, July 1, 1899 (US, Arn. Arb) *not annotated* ✓
" Trelease 3421 (Arn. Arb)
US a " Brewer & Cee 232 (US), annot. by Hulten ✓ (sub v. obs)
US n " Piper 4593 (Arn. Arb), in US, not annot by H. ✓ *CRB, US n*
US nn " Walpole 1166, 1168 (US), not annot. by H. ✓
US a Cape Alitek, Griggs, June 22, 1913 (US), annot. by H. ✓ (sub v. obs)
Three Saints Bay, Eyerdam 445 (H)
Semiá Ids., Dall (G) June 11, 1873,
US n Kukak Bay, Ceville & Kearney 1670 (U.S. pro parte) 3 sheets, not annot. by H. ✓ *CRB*
US n Mitrofan Bay, Griggs, July 25, 1913 (US), *3 sheets which are old* not annot. by H.
US a Stepovak Bay, Palache, July 1899 (US) annot by H. ✓ (sub v. obs)
Popof I. Hulten 7714 (H)
Unga Id. Harrington, July 2, 1872 (G)
US n " " Gelder, Sept. 18, 1899 (US) No. 27, v. obs. not annotated ✓
— Squaw Harbor, Jones 8848 (???)
— King Cove Eyerdam (---) (US, *Eg. 1435, Alaska Pom. 1932, US?*)
2 covers under S. crassijulis

ALEUTIAN IDS. (See Fiederus in Hulten, Fl. Aleut. Ids)

Rat Id. Murie 2335 (H)

BERING SEA and STRAIT

Nushagak, McKay

(---)

^

US, annot. by H. (presumably change made by S. Bondar) US 8

St. Paul Id. Macoun, Aug. 14, 1892 (G), US, v. etc. not annot

US 8

" " " Macoun, July 3, 1897 (NY),

" " " Macoun, Aug. 9, 1914 (G), CRB, v. obcord.

(73821) CRB

" " " Hulten 7454, 7455 (H)

Hall Id. Macoun, Aug. 11, 1891 (G)

St. Lawrence Id., Pavobek,

Boxer Bay,

Saveonga, Geist (H)

(Saveonga, U.S., sp. & v. etc. not annot US 8

Nome, Seward Penin. Jones 9012, 9041 (---)

9041 in CRB

" " "

Anderson (Mt. Distin) (---)

" " " obcord

"413. *S. crassifolia* Trautvetter" (of Hulten). In his Flora of Alaska and Yukon, Hulten cites 45 collections assigned to this species, long regarded as *S. arctica* Pallas, and here still so regarded. Of these, 11 are cited as being in the U.S. Natl. Herbarium (US), 24 are from other herbariums, including 9 from Herb. Hulten (H), while 10 for no herbarium is named. Numerous other collections from the Aleutian Islands were cited in his earlier flora of these islands, and are not repeated in this work.

Examination shows that, besides the 11 cited from (US), seven others are found there, two of them not having been cited from any herbarium, thus making a total of 19 collections in the USN, some having two and three sheets each. In addition, several collections are in Herb. CRB., making 22 different collections available for study by the writer.

including two not Hulten, thus

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One of the specimens cited by Hulten in 1943 was Eyerdam, King Cove, under "Western Pacific Coast Distr."

IN USN. (Acc. No. 1631424) is a specimen with a printed label reading: "Plants of Alaska" and having at the bottom the words: "Leg. Eric Hulten. September, 1932", in print. Written on this label are "Salix crassifolia Trautv., King Cove, Alaska Peninsula, July 17, 1932. W. J. Eyerdam 1435". Apparently a gift from Hulten to USN. from White Pass

Eastwood 1934 (US) but cited from (Arn. Arb.) is every juvenile specimens with small, oblanc. or narr. obovate leaf and would pass for *S. teruleosa*.

Check *S. anglorum*

McKay, June 20, 1881, Nushagak (US), is annotated by Hulten as "*S. crassifolia* Trautv." (possibly slightly influenced by *S. Barclayi*) 1939".

Cited but no herb indicated.

Flederus, in 1935, annotated Jepson 33, *S. arctica* Pallas, Unalaska (US) as "*S. Barclayi* And ". This was correctly named before, and is not cited by Hulten.

Check Original Descriptions (See if in "New Species", USN.

S. flagellaris petioles ~~to~~ 2-5 mm. long (or 2-3 mm.)

S. arctolitorlais leaves "ovate",

Look up in USN. and CRB.

Branchlet length and pubescence on type.

Bud length, shape, and hairiness on

Hagelbarger 247, Katmai Region.

Palache Stepovak Bay, July 8-19, 1899.

Walpole 1672 (in type collection and CRB) Kruzgamapa R., Seward Penin.

Petiole length and hairiness:

Hagelbarger 247

Palache

Schrader, Colville Delta. Aug. 14, 1901.

Walpole 1672.

Leaves: Check

Palache as *S. oval.* var. *cyclophylla*

Walpole as var. *camdensis*

Capsules: Check all for any sign of glaucousness

Check Hagelbarger for var. *pubescens*

CHECK CHARACTERS in *S. evalifolia* and varieties.
also in *S. anglerum* and *S. arctica*, and perhaps *S. fuscescens*.

BRANCHES long, reeeting, pubescent

BRANCHES subterranean, forming reets

BUDS: length, celer, pubescence

STIPULES: length, shapes, margins

Leaves: shape of young and old, especially apical vs. lower

Pubescence above and villousness beneath

Petioles: Length, pubescence

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AMENTS. Length and width of male and female

Length and leafiness of peduncles

BRACTS: Length, shape, celer, hairiness

CAPSULE: Length, celer, hairiness

OVARY: Length, celer, hairiness

Styles: length of young and mature; division

Stigmas: Length and division

CHRISTIAN CHILDREN'S FUND INC

Cited as *S. torulosa* by Hulten

S.E. PANHANDLE:

White Pass, Eastwood 374 (Arm Arb), Try Yukon cover; same No. cited fr 24-Mile House

S.E. MAINLAND:

Thompson Pass, Anderson 1888 (---)

Broad Pass Persild 25 B (---)

Copper River Pote 128 (---) *annot in US by H.*

Parson "ext 344 (L)

"

Scamman (---)

US 2

CRB

BERING SEA:

St. Lawrence Id., Gambell, Campbell (US) not annot by H.

SEWARD PENIN.:

Nome Kellogg, Aug. 19, 1909 (USN)

" Mt. Distin, Anderson 3769b (H)

" Jones 9031 (---)

Cape Nome, Thornton 819 (US) not annot. by H.

Teller Walpole 1967 (---) in US., not annot. by H.

S. stolonifera f. subpilosa
[annot by H. as "doubtful".]

CRB

CRB

(on 1 sheet)
6/11, 6/16, 6/29 annot by H.
as *S. massiculata* but not
cited by Hulten

US 11

CENTRAL EAST:

Rapids, Anderson 2220 (H)

McKinley Park, Mexia 2014, 2227, 2266 (Arm Arb.)

" " , Savage R.
Eagle Summit, Steese H.

S. glauca x *S. angustatum* or *S. arctica*
(Marie 525 (US), annot by H. See also Scamman (---))

Satchell 535 (US), not annot by H.

" " Anderson 2466 (H)

" " Scamman (H)

YUKON TERR.

Upper Yukon R., Dalton Trail, Tyrrell in 1893 (---)

24-Mile House, Eastwood 374 (US, Arm Arb), not annot, *cited also at Pinn*

Head of Coal Creek, Osgood, Aug. 8, 1904 (US), not annot by H.

x = deso typed

v = spec seen

total 24

Collections Cited by Hulten (1943) as *S. torulosa* Trautv.

but seen only in Herb. Ball

S. arctica Pallas.

Cited by Hulten (1943) as *S. torulosa* (CRB)
Anderson 3769, Mt. Distin, near Nome (CRB) as 3769b (H).

Four small pieces, 1 stm., 3 pist. All with leaves already becoming oval-obovate, largest to 4.5 by 2.5 cm. (as *S. crassijulis*)
even the peduncle leaves broadening; Aments all frosted, capsules are blackened and distorted, very black and some rubbed smooth and shining, those not distorted still densely pubescent; scales black, rounded to truncate to retuse, obovate.

S. anglorum or possibly X *S. ovalifolia*

Johns 9031, Nome (CRB), cited by Hulten as *S. torulosa* without Herb. (CRB)
4 small pieces. Leaves oblance to obovate, bases narrow, to 3.5 cm. dark green above and rather reticulate, especially above; Heavily fruited. Pist aments somewhat frosted, and some capsules darkened but mostly yellowish-green and short pubescent, some and young seeds; styles variable from 0.5 mm to longer.

S. arctica Pallas, or possibly *S. anglorum* Cham.

Went 344, Paxson, upper Copper River, (CRB), cited by Hulten (1943) as *S. torulosa* Trautv. (L).

3 small pieces; on two, leaves oblanceolate but enlarging beyond *S. anglorum*; on one leaf obovate and some bases broadening.
All aments frost injured but deformed/capsules mostly still densely pubescent. and blackened

Scales broadly obovate, rounded, truncate, or subretuse.
Too fragmentary for satisfactory det.

ALASKA.

Eight

collections cited as *S. terulea*

arctica

Copper River, Pete 128 (---), in US. annotated by H. *S. arctica* Pallas.

3 fragments, mostly peduncles with normal small leaves but some broadened at base; 3 aments 6-7 cm. long, on typical leafy peduncles 4-5.5 cm. long; two aments and base of third frosted and blackened; capsules not fully developed, blackened, recurved, mostly pubescent, some with hair frosted or rubbed off in part; the unfrosted portion nearly normal with long pubescent capsules; styles few but long; scales apparently black, large?

US

US

McKinley Park, Savage R., O.J. Murie 525, Aug. 4, 1923 (US) annot. by H.

Leaves large to 6-7 cm. long, bases mostly cuneate but some blades 2.5 cm. wide, the light color and venation is more that like those of *S. glauca*; scales of the long aments are small and yellow; yellow capsules densely pubescent; few styles but long, as in *S. arctica*; almost certainly a hybrid with *S. arctica* glauca. The capsules have produced coma but no seeds, as occurs in hybrids

Stems hairy

hybr
S. glauca
S. arctica &
S. anglica

Seward Peninsula, Nome, Kellogg, Aug. 29, 1909 (US), annot. by H as "(doubtful)"

Check against *S. stolonifera*. (young capsules thinly pubescent?, old capsules long, slender, glabrous? or remnant pub. at tips recurved?; scales small narrow.

Cape Nome. Thornton 819 (US). Not annot. by H.

Fragment; leaves oval, to 4-5 cm., some broad & rounded at base, others still narrow; 3 frtgs aments; caps. densely pubesc. ant of prev year, caps glab

(rous.

arctica

Walpole 1967, Teller, (US), not annot. by H. leaves small, oblance-ov. and cuneate to broad to oval-obov & base brdng; heavy fruit; aments 4-5 cm., caps. mature (Sept. 2) but blackened, densely pubesc (except a few); scales obovate, blk, broad, but some acute.

US

St. Lawrence Id., Gambell. Campbell (US), not annot. by H.

Two short-stemmed branching pieces. One has leaves narrowly obovate, glabrous, to 3 cm. long from cuneate base, on slender petioles abt 1 cm. long; twigs & buds glabrous; 2 fruiting aments 2-3 cm. long, on 3-cm. peduncles; scales obovate, black; capsules densely pubescent, or some exposed ones partly rubbed off; styles normal, long.

The other juvenile, twigs glabrous; leaves mostly elliptic, to broader, to 2.5 cm., m/l pubescent on both sides, becoming glabrate; numerous aments just coming to flower, or one apical plder.; scales obovate, black; ovaries very densely white pubescent; styles elongating but many apparently frost-injured. These are *S. arctica*, or the latter a hybrid.

YUKON:

US

Head of Coal Creek, Osgood, Aug. 8, 1904 (US), not annot. by H.

arctica

2 pieces. One with large broadly-oval-obovate leaves already to 5 cm. long and strongly veined, darkened, on petioles to 2 cm. or more; one ament, long, 7 cm. on 5-cm. peduncle; young capsules badly frost injured and blackened, normally pubescent except a few shed or rubbed off somewhat

The other has leaves narrowly obovate still, and cuneate at base, and apiculate at apex, glabrous or remnant long-villous beneath at apex, glaucescent; one 5-cm. ament more frost injured than the other but blackened recurved young capsules pubescent. This is *S. arctica*.

US

24-Mile House, Eastwood 374 (US, Arn Arb), not annot. by H. Same No. cited from Wht Pass Short stout stems; the larger leaves to 4 cm. and broadening at base; several pist. aments 4-5 cm. long (stam in 3 cm.); scales very large broadly obovate, black; young capsules to 5 mm., densely pubescent; styles mostly elongated, sparsely pubescent at base, (Undoubtedly *S. arctica* Pallas.)

arctica

Hulten Flora of Alaska + Yukon
 Study the following listed by Schulte
 of Cath. Univ. of America 11/24/48

S. arbutifolia (p. 436) probably *S. fuscescens*
 No. 1

x *S. arctolateralis* Hulten (p. 420)

S. arctophila C. Kell (p. 411)

S. brachycarpa (p. 422)

S. crassius (p. 413)

x *S. flagellaria* Hulten (p. 412)

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S. glauca v. *S. serotina* (Rydb.) C. Kell 421

S. hebecarpa Fern (415)

x *S. murei* nov. spec. (424)

S. ovalifolia v. *subarctica* Schum (416)

S. polaris Wahl. sep. var. (409)

S. pulchra var. *eroclasta* Schum (437)

S. reticulata subsp. *forma* (405)

S. rotundifolia var. *retusa* ? Schum (407)

x *S. tenuosa* Schum. (414)

S. torulosa Trantv.

S. cuneata Turcz.

S. arshan Pallas

S. rhamnifolia Pallas

(*not S. rhamnifolia* Hort + Arnott)
= *S. fuscescens*

S. asbutifolia Pallas

(*S. rhamnifolia* Hort + Arnott)

S. myrsinites L. var. *ledeb.* F. R. Juss. ?

Russ. 3:6 2D. 1846 - J. H. Allen

See if L. or Ledeb.

For. arbutifolia Pallas
check specimens under

5 *myrsinites*
5 *stammifolia* } names cited
by Hulten.

S. arctica Pall. 459.2, p. 17 f
Fl. Rossica 1(2): 86, 1788

S. arbutifolia ibid. p. 79

Hulten refers to p. 505

S. reticulata Fr.

subsp. *orbicularis* (Cand.) Fl. lat.

Sv. Vet.-Akad. Ark. f. Bot.

also to var. *subrotunda* Fr. *Fl. lat.*, p. 5

S. crassifolia Trautv.

Mem. Soc. Nat. Moscou 2: 308, 1832

Subsp		Vase		Jars	
Hutton	Others	Hutton	Others	Hutton	Others
1 1 1 1	1	1 1	1 1 1 1		
1 1 1 1					
1					

In 114 species, of which 38 are
Salix, Hultine presents 15 subspecies
of which 13 are his and only 2 by others.
He has 13 subsp. Harems new here and 2
were published a few years ago.

2 polaris
1 1

A. Walp.

Sahib

Of varietal, Hall's list only 12, of
which 3 are his and 9 are by others
of no (3), 2 are new herein. Six of the 12
species are in Salix.

Species
111

Check scales on 23
 Fats 128 "apple black, large.

- Mure 525, small, yellow S. glauca x
- Kellogg, some small narrow S. stolonifera

Thurston 819

Jones 9031 (not clear)

Scales broadly obovate mostly rounded or retuse

Walpole 1967 obovate, broad, blk, but some acute

Campbell St L. 2. 2. broad black

Osmond - not described

Eastwood 374, very lg, body ob. black

Anderson 3769, ob. blk, red to brown to yellow

Went 344 " " " " " " " " " "

Theme: For Spring Term
 17 Teacher's Meeting
 13 Easter Sunday
 11 Good Friday Service
 10 Maundy Thursday Communion
 6 Palm Sunday and 4 p.m. Easter Carol Service?
 2 Guild
 Our Christian Faith

APRIL

Selchell 525 (not clear)

Chronica Botanica,
Waltham, Massachusetts.

3814 Jocelyn St., N.W.,
Washington 15, D.C.

21 April, 1952.

Dear Dr. Verdoorn:

I appreciate the receipt of your catalog for 1952-53, as it keeps me informed of present and projected publications. From time to time I dip into it for such information. Have just been interested to note "Plants of the Bible", by Harold and Alma Moldenke.

Unfortunately for me, my retiree annuity and the rising costs of living do not permit me to buy many books any more, tho I tell my working colleagues about them when we meet.

Just now I am writing to ask if Chronica Botanica would be interested in a manuscript which will soon be completed. In monographing the willows of the American Arctic, I have made a critical and detailed study of the treatment given to *Salix* by Dr. Eric Hulten, of Sweden, in his *Flora of Alaska and Yukon*.

I am completely amazed at the inaccuracy and apparent irresponsibility of his statements. He presents three new or recently published species of his own, but not one of them is valid, as they represent juvenile and/or frost-injured specimens of previous species. He also inserts in the Alaskan flora, three species of eastern Canada, which do not occur there, basing his claims in each case on a single specimen which is his misidentification of some other species.

He has changed the names of long-accepted species with the bald statement that this must be the same as that because it grows in similar areas, without indicating that he has examined types and without citing any specimens to allow others to make further studies. A study of the collections cited by him under some species shows that they represent as many as three different species in each case.

The same collection is cited from different locations, and in some cases is cited under different entities. There are obvious errors in the keys, in the descriptions, and in the citations.

For these reasons, I am seeking to protect the students of the Arctic flora from such misleading presentation, by giving a detailed account of just what is represented by the alleged species presented, and just what is represented by scores of the specimens cited. The paper will amount to some 40 or 45 typed pages, and proof is given for every conclusion reached.

I expect to complete the manuscript in about two weeks. I will be glad to know if Chronica Botanica would be at all interested in considering its publication. There will be no illustrations, and but few literature citations.

Cordially yours,

Carleton R. Ball

from the editor

Chronica Botanica

P. O. Box 151,
WALTHAM, 54,
MASSACHUSETTS, U.S.A.

May 2, 1952

Dr. Carleton R. Ball,
3814 Jocelyn St., N.W.,
Washington 15, D.C.

Dear Dr. Ball,

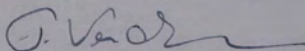
Thank you for your good letter of April 21st. I read with interest about the memoir on the Arctic flora on which you are working and can well see that it will fill a definite need!

I regret, however, that I cannot help by publishing this memoir, we only publish books and our journal *Chronica Botanica* in which we bring chiefly short papers dealing with the history of botany and related subjects!

Dr. Nicholas Polunin, who is at present working at the Gray Herbarium, seems very familiar with publication possibilities relating to the Arctic flora. He has many contacts in Canada and Europe and I wonder whether you would not find it useful to ask him for help. He may well be able to suggest a journal which would be glad to have your memoir.

Believe me,

Yours sincerely,



Frans Verdoorn.

FV/hv50

3814 Jocelyn St., N.W.? Washington 15, D.C.

10 May, 1952.

Dear Dr. Verdoorn:

Many thanks for your kind letter of May 2, and for the information and suggestions therein.

Cordially yours,

Carleton R. Ball

Address all correspondence on editorial matters to Dr. Frans Verdoorn, all business correspondence, orders, remittances, etc. to the Chronica Botanica Co.



Ball, Carleton R. - Hultén's treatment of Alaska-Yukon willows. 63 mss.
pages, 1955. ² (Correspondence relating to).

(The manuscript was sent to Hunt Library previously)