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BOTANY.—*The Alaskan species of Puccinellia*.¹ JASON R. SWALLEN, Bureau of Plant Industry, Soils, and Agricultural Engineering.

Several years ago, Dr. Eric Hultén, Botaniska Museet, Lund University, Sweden, sent a large number of specimens of *Puccinellia* from Alaska for study and identification. Most of them were collected by Dr. Hultén on rather extensive trips in Alaska and Yukon. The report on this collection was to have formed the basis for the treatment of *Puccinellia* in Dr. Hultén's *Flora of Alaska*, but it was not received until after the second part containing the grasses had gone to press. Since

the author's treatment differs considerably from that in Dr. Hultén's flora this account was prepared for publication.

This study is based on the specimens sent by Dr. Hultén, those in the U.S. National Herbarium, and those in the herbarium of the U.S. National Arboretum. Dr. J. P. Anderson, who has made extensive botanical collections in Alaska over a period of years, also sent all his specimens of *Puccinellia* to the author for examination. The assistance given the author by Dr. Hultén and Dr. Anderson is gratefully acknowledged.

¹ Received October 12, 1943.

Puccinellia is one of the circumpolar genera of grasses well represented in North America, especially in Alaska. The species furnish a considerable amount of forage, being leafy, densely tufted grasses. The genus is taxonomically a difficult one, the species being variable and closely allied. Many species have been proposed, but the genus as a whole has not been intensively studied, and the nomenclature is much involved. Some species are common to America and Eurasia, and in the preparation of this paper those of the circumpolar regions have been studied so far as possible.

Puccinellia Parl. Fl. Ital. 1: 366. 1848.

Atropis Rupr. in Griseb. in Ledeb. Fl. Ross. 4: 388. 1853.

Spikelets several-flowered, usually terete or slightly flattened; glumes rather firm, often scarious at the tip, 1- to 3-nerved; lemmas usually firm, rounded on the back, usually scarious and often erose at the tip, 5-nerved, the nerves parallel, usually indistinct. Low smooth cespitose annuals or perennials with narrow to open panicles.

Puccinellia differs from *Poa* chiefly in the rounded lemmas with usually indistinct parallel nerves. The species are mostly found on seashores, in brackish marshes or meadows near the coast, or in alkaline soils in the interior. They range from the Arctic regions of both hemispheres to the middle Western States in America, with a few species in southern South America; to the British Isles and the north coast of the Mediterranean, and to central China and Japan in the Old World. One species is found in Africa and a few in Australia and New Zealand.

KEY TO ALASKAN SPECIES

Anthers 1.8 to 2 mm long; plants low, frequently with widely spreading stolons. 1. *P. phryganodes*

Anthers not more than 1.5 mm long; plants not stoloniferous.

Panicle branches distinctly scabrous.

Anthers 0.3 to 0.5 mm long; lemmas mostly 1.6 to 1.8 mm long; panicle branches very slender, distinctly reflexed at maturity. 2. *P. hauptiana*

Anthers 0.7 mm long or more; lemmas 2 to 4 mm long; panicle branches, if reflexed, relatively stout.

Lemmas 3 to 4 mm long; anthers 1.3 to 1.5 mm long; panicle branches usually nar-

rowly ascending, stout, 10 to 20 cm long. 3. *P. grandis*
Lemmas 2 to 2.5 mm, rarely 3 mm, long; anthers not more than 1 mm long; panicle branches ascending to reflexed, slender, rarely more than 5 cm long, not stiff. 4. *P. borealis*
Panicle branches glabrous or (in *P. nutkaensis*) only very sparsely scabrous.

Lemmas 3.5 to 4 mm long; anthers mostly 1.3 to 1.5 mm long.

Panicle branches ascending, elongate.

Culms 25 to 40 cm tall; spikelets 5- to 7-flowered, 8 to 10 mm long, the florets spreading. 5. *P. glabra*

Panicle branches stiffly spreading or reflexed.

Spikelets 2- to 3-flowered, 5 to 7 mm long; lemmas 3.5 to 4 mm long, obtuse; culms densely tufted, erect, 45 to 60 cm tall. 6. *P. triflora*

Spikelets 5- to 7-flowered, 6 to 8 mm long; lemmas not more than 3.5 mm long, acute or subobtuse, sometimes irregularly toothed; culms 15 to 30 cm tall, erect from a rather long decumbent base. 7. *P. andersoni*

Lemmas not more than 3 mm long, or if so, the panicle branches appressed; anthers mostly less than 1 mm long.

Lemmas thin (see also *P. kamschatica*), strongly nerved; anthers 0.3 to 0.6 mm long.

Lemmas 3 to 3.3 mm long; anthers of lowest floret 0.3 to 0.4 mm long; culms as much as 30 cm tall. 8. *P. alaskana*
Lemmas 2 to 2.5 mm long; anthers of lowest floret 0.5 to 0.6 mm long; culms usually less than 10 cm tall. 9. *P. paupercula*

Lemmas firm (thin in *P. kamschatica* but the nerves not prominent), the nerves obscure (except the lateral nerves at the base in *P. pumila*); anthers mostly 0.8 to 1 mm long.

Palea longer than the lemma; plants soft with slender culms 15 to 25 cm tall; panicle branches ascending or, at maturity, spreading or reflexed. Lemmas thin, shining, obtuse. 13. *P. kamschatica*

Palea equaling the lemma or shorter; plants relatively hard, the culms densely tufted or coarse; panicle branches appressed or stiffly spreading, usually stout.

Panicle branches stout, stiffly spreading or reflexed, naked in lower half.

Culms stout, erect from a decumbent base; blades erect, flat, 2 to 2.5 mm wide; lower panicle branches in whorls, long and short ones intermixed, glabrous or obscurely scabrous. 10. *P. hulleni*

. 10. *P. hulleni*

Culms relatively slender, densely tufted, erect or ascending, but the base not decumbent; blades spreading, usually convolute; panicle branches solitary or in pairs with no short ones intermixed, glabrous, with a characteristic pearly lustre. Pedicels swollen below the spikelets. . . .

.....11. *P. pumila*
Panicle branches slender, usually closely appressed, sparsely hispid-scabrous.12. *P. nutkaensis*

1. *Puccinellia phryganodes* (Trin.) Scribn. & Merr. Contr. U. S. Nat. Herb. 13: 78. 1910

Poa phryganodes Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. 1: 389. 1830.

Perennial; culms 5 to 15 cm tall, erect or ascending from slender rhizomes, frequently with widely spreading stolons; culm sheaths overlapping, those on the stolons usually much shorter than the internodes; ligule 0.5 to 1 mm long, truncate, decurrent; blades soft, lax, mostly involute, 2 to 8 cm, usually less than 5 cm, long; panicles 2 to 2.5 cm long, few-flowered, the short glabrous branches appressed, naked below; spikelets 3- to 5-flowered, 5 to 7 mm long; glumes firm, obtuse, the first elliptic, 1.8 to 2 mm long, 1 nerved, the second elliptic to obovate, 2.5 to 3 mm long; lemmas firm, obtuse, elliptic, glabrous, the lowest 3.5 to 3.8 mm long; palea as long as the lemma, subacute, the keels glabrous; anthers 1.8 to 2 mm long.

Type locality: Kotzebue Sound, Alaska.

Seashores, mud flats, and brackish marshes, Pribilof Islands, Alaska, and Greenland.

SEWARD PENINSULA: Port Clarence, *Walpole* 1633, 1718. NORTON SOUND: St. Michael, *Hitchcock* 4714. PRIBILOF ISLANDS: St. Paul, *Johnston*, June 8 and July 4, 1923 (H), *Hultén* 7330; *J. M. Macoun Geol. Surv. Can.* 16233. ALASKA PENINSULA: Port Moller, *Murie* 2150. SOUTHEASTERN ALASKA: Glacier Bay, *Cooper* 130.

2. *Puccinellia hauptiana* (Krecz.) Kitagawa, Rep. Inst. Sci. Res. Manchukuo 1: 255. 1937

Atropis hauptiana Krecz. in Kom. Fl. U.R.S.S. 2: 485, 763, pl. 36, f. 21. 1934. *Poa hauptiana* Trin. ex Kom. Fl. U.R.S.S. 2: 485, 763. 1934, as synonym.

Perennial; culms slender, erect to prostrate, sometimes forming mats, 10 to 40 cm long; sheaths mostly longer than the internodes; ligule 1.5 to 2.5 mm long, obtuse, decurrent; blades 3 to 8 cm long, not more than 1.5 mm wide, flat or loosely involute, especially those on the innovations, the margins more or less scabrous; panicles 3.5 to 15 cm long, the slender scabrous, somewhat flexuous, spreading to reflexed branches mostly in rather distant pairs, naked in the lower third or half, the lowest as much as 7 cm long; spikelets 3- to 5-flowered, 3 to 4 mm long, appressed; glumes acute or sub-obtuse, the first 1 to 1.5 mm long, 1-nerved, the second 1.2 to 2 mm long, 3-nerved; lemma of lowest floret 1.6 to 2 mm long, obtuse, tinged with bronze or purple, glabrous or very sparsely pubescent on the callus; anthers 0.3 to 0.5 mm long.

Type locality: Siberia.

Wet ground and river banks, Siberia; Alaska, Yukon, and Alberta.

ALASKA: Rampart, *Hitchcock* 4460; Circle City, *Hitchcock* 4437, *J. P. Anderson* 2543; Tanana, *Hitchcock* 4641; Fairbanks, *Hitchcock* 4576, 4617; Copper Center, *Heideman* 2, *Went* 207(H); Gulkana, *J. P. Anderson* 2734; Chitina, *J. P. Anderson* 2028. YUKON: Dawson, *Hitchcock* 4323, 4352. ALBERTA: Banff, *McCalla* 2324.

3. *Puccinellia grandis* Swallen, sp. nov.

Perennis; culmi 50-90 cm alti, dense caespitosi, erecti vel geniculati; vaginae glabrae, inferiores internodiis longiores, superiores internodiis breviores; ligula 2-3 mm longa, obtusa, membranacea; laminae firmae, elongatae, 2-3.5 mm latae, eae innovationum molles, angustiores; paniculae 10-20 cm longae, ramis appressis vel denique patentibus, ad apicem scabris, basi nudis; spiculae 8-15 mm longae, 5-12-florae, appressae; gluma prima 2-3 mm longa, obtusa vel subacuta; gluma secunda 3-3.5 mm longa, obtusa, minute dentata; lemmata 3-4 mm longa, obtusa vel subacuta, obscure nervosa, basi sparse pilosa; palea lemma aequans, carinis obscure ciliatis; antherae 1.3-1.5 mm longae.

Perennial; culms 50 to 90 cm tall, densely tufted, erect or geniculate at the lower nodes; sheaths glabrous, the lower longer, the upper shorter than the internodes; ligule membrana-

ceous, obtuse, 2 to 3 mm long; blades firm, flat or drying involute, elongate, mostly 2 to 3.5 mm wide, those of the innovations often soft and fine; panicles 10 to 20 cm long, pyramidal, the scabrous branches at first appressed but often finally stiffly spreading, usually naked at the base; spikelets 8 to 15 mm long, 5- to 12-flowered, appressed, rather prominently tinged with purple; first glume 2 to 3 mm long, 1-nerved, obtuse or sometimes subacute; second glume 3 to 3.5 mm long, 3-nerved, broader than the first, obtuse, often minutely toothed; lemmas 3 to 4 mm long, rather abruptly narrowed to an obtuse or subacute apex, sparsely pilose at the base, the nerves rather obscure; palea as long as the lemma, obscurely ciliate on the keels; anthers mostly 1.3 to 1.5 mm, rarely as much as 2 mm long.

Type in the U. S. National Herbarium, no. 948937, collected on high sea beaches at Seattle, Wash., June 1890, by C. V. Piper (no. 1451).

Salt marshes and sandy or rocky seashores, Alaska to central California.

Specimens of this species have previously been referred to *Puccinellia nutkaensis*, which is much smaller, the culms mostly 15 to 30 cm tall, with closely appressed, obscurely scabrous branches, the lemmas not more than 3 mm long the anthers mostly only 0.8 to 1 mm long.

ALASKA: Skagway, *Hitchcock* 4186, 4197, 4203; Juneau, *Hitchcock* 4068, 4077; Aurora, *Piper* 4699; Glacier Bay, *Cooper* 106. YUKON: Whitehorse, *Hitchcock* 4289. BRITISH COLUMBIA: Cadbow Bay, *Macoun* 66; Crescent, *Henry* 7; Vancouver Island, *Hitchcock* 4887, *Macoun* 245, *Geol. Surv. Can.* 81003, 91951. WASHINGTON: Seattle, *Piper* 1451; Olympic, *Hitchcock* 23448. OREGON: Gearhart to Tillamook Head, *Chase* 4923; near Gearhart, *Shear & Scribner* 1718. CALIFORNIA: Eureka, *Hitchcock* 13085, *Tracy* 3742, 4820; Samoa, *Tracy* 3147; Point Reyes Peninsula, *Burt-Davy* 6749.

4. *Puccinellia borealis* Swallen, sp. nov.

Perennis; culmi densi caespitiosi, 25–35 cm alti, erecti, basi decumbentes; vaginae internodiis paulo longiores, glabrae, inferiores molles rufo-fuscae; ligula 2 mm longa, obtusa vel truncata, hyalina; laminae 4–8 cm longae, 1–2 mm latae, planae, infra glabrae, supra scabrae, marginibus scabris; paniculae 10–14 cm longae,

ramis gracilibus scabris adscendentibus vel reflexis, inferioribus 4–5 cm longis in dimidio inferiore nudis; spiculae 4–6-florae, 4–5 mm longae, appressae, breviter pedicellatae; gluma prima 1–1.5 mm longa, acuta; gluma secunda 1.5–2 mm longa, obovata, obtusa; lemmata 2–2.3 mm longa, obtusa vel subtruncata, minute eroso-ciliata; palea lemmate paulo brevior et multo angustior, carinis hispidociliatis; antherae 0.6–0.7 mm longae.

Perennial; culms densely tufted, 25 to 35 cm tall, erect from a usually decumbent base; sheaths mostly a little longer than the internodes, glabrous, the lowermost soft, reddish brown, loose, papery, becoming more or less fibrous; ligule about 2 mm long, obtuse or truncate, hyaline; blades 4 to 8 cm long, 1 to 2 mm wide, flat, glabrous below, scabrous above and on the margins; panicles 10–14 cm long, the slender scabrous branches ascending to reflexed, in rather distant fascicles of 2 to 4, the lower mostly 4–5 cm long, naked for nearly half their length; spikelets 4- to 6-flowered, 4 to 5 mm long, tinged with purple, short-pedicelled, appressed to the branches; first glume 1 to 1.5 mm long, acute; second glume 1.5 to 2 mm long, obovate, obtuse; lemmas 2 to 2.3 mm long, obtuse or subtruncate, minutely erose-ciliate; palea a little shorter than the lemma, bifid at the apex, about 0.5 mm wide between the hispid-ciliate keels, much narrower than the broad lemma; anthers 0.6 to 0.7 mm long.

Type in the U. S. National Herbarium, no. 379136, collected on tundra bank, Teller Reindeer Station, near Port Clarence, Alaska, September 7, 1901, by F. A. Walpole (no. 2015).

Seacoast and moist ground, mostly along rivers, Alaska and Yukon.

SEWARD PENINSULA: Deering, *J. P. Anderson* 4788; Kotzebue, *J. P. Anderson* 4670; Port Clarence, *Walpole* 2015; Nome, *Hitchcock* 4815, *J. P. Anderson* 4991. NORTON SOUND: St. Michael, *Hitchcock* 4700. YUKON VALLEY: Fort Yukon, *Bates* in 1889; Tanana, *Henderson* 14988. TANANA VALLEY: Fairbanks, *Hitchcock* 4594, *J. P. Anderson* 1444. YUKON: Dawson, *Hitchcock* 4358.

These specimens have been referred to *P. distans* (L.) Parl., but they are very different in appearance from typical European material. The Alaskan plants are perennial, while the typical European species appears to be annual;

the panicle branches are more slender and not so densely flowered, and the lemmas not so conspicuously broad at the summit. J. P. Anderson, who has studied the plants of Alaska for many years, states that the Alaskan species that has been referred to *P. distans* is apparently native, not introduced into America as is *P. distans*.

Puccinellia borealis is closely related to *P. sibirica* Holmb., differing chiefly in the smaller florets. None of the Siberian material examined agrees with the Alaskan specimens cited above; hence, without a specimen of Holmberg's species for comparison, it seems better to propose a new species than to refer these doubtfully to *P. sibirica*.

5. *Puccinellia glabra* Swallen, sp. nov.

Perennis; culmi 25–40 cm alti, erecti vel basi decumbentes, glabri; vaginae glabrae internodiis longiores; ligula obtusa, decurrens, 3–5 mm longa; laminae 5–14 cm longae, 1.5–3 mm latae, planae vel ad apicem involutae, glabrae; paniculae 10–20 cm longae, ramis adscendentibus, glabris, 4–10 cm longis, basi nudis; spiculae 5–7-florae, 8–10 mm longae, appressae; gluma prima 2–3 mm longa, 1-nervia, acuta vel subobtusa; gluma secunda 3–4 mm longa, 3-nervia, obtusa, minute ciliolata; lemmata 3.5–4 mm longa, obtusa, glabra vel basi sparse pilosa, lucida, obscure nervata; paleae in carinis glabrae; antherae 1.3–1.5 mm longae.

Rather densely tufted perennial; culms 25 to 40 cm tall, erect or decumbent at the base, glabrous; sheaths glabrous, longer than the internodes; ligule thin, obtuse, decurrent, 3 to 5 mm long; blades 5 to 14 cm long, 1.5 to 3 mm wide, flat or becoming involute toward the tip, glabrous; panicles mostly 10 to 20 cm long, the glabrous branches ascending, 4 to 10 cm long, naked at the base; spikelets 5- to 7-flowered, 8 to 10 mm long, appressed, the florets somewhat spreading, pale or tinged with purple; first glume 2 to 3 mm long, 1-nerved, acute or subobtuse; second glume 3 to 4 mm long, 3-nerved, obtuse, minutely ciliolate; lemmas 3.5 to 4 mm long, obtuse, glabrous, or with a few hairs at base, rather thin and shining, the nerves obscure; palea a little shorter than the lemma, the keels not ciliate; anthers 1.3 to 1.5 mm long.

Type in the U. S. National Herbarium, no. 749542, collected on flats frequently overflowed by tides, Kasilof ("Kussiloff"), Kenai

Peninsula, Alaska, in 1898 by Walter H. Evans (no. 609).

The relationship of *Puccinellia glabra* to the other Alaskan species is obscure. The relatively long ascending panicle branches, the spreading florets, and long lemmas are characteristic.

Tidal flats, Alaska and Kenai Peninsulas and Kodiak Island.

ALASKA PENINSULA: Women's Peninsula, Church in 1916. KENAI PENINSULA, Kasilof, Evans 609. KODIAK ISLAND, Piper 4696.

6. *Puccinellia triflora* Swallen, sp. nov.

Perennis; culmi erecti, dense caespitosi, 45–60 cm alti; vaginae glabrae internodiis paulo longiores; ligula 4–5 mm longa, tenuis, obtusa, decurrens; laminae 4–6 cm longae vel eae innovationum longiores, 1–1.5 mm latae, molles, glabrae, planae vel involutae; paniculae 15–20 cm longae, ramis fasciculatis abrupte patentibus vel reflexis basi nudis; spiculae 5–7 mm longae, 2–3-florae, appressae, purpurascens; glumae acutae vel subobtusae, prima 1.5–3 mm longa, 1-nervia, secunda 2.5–4 mm longa, 3-nervia; lemmata 3.5–4 mm longa, lata, obtusa, basi sparse pilosa; palea lemma aequans, carinis prominentibus glabris; antherae 1.3–1.5 mm longae.

Erect, densely tufted perennial; culms 45 to 60 cm tall, glabrous; sheaths glabrous, overlapping or a little shorter than the internodes; ligule thin, obtuse, decurrent, 4 to 5 mm long; blades 4 to 6 cm long or those of the innovations longer, 1 to 1.5 mm wide, soft, glabrous, flat or becoming loosely involute; panicles 15 to 20 cm long, the branches glabrous, in rather distant fascicles of 2 to 4, naked at base, stiffly and abruptly spreading or reflexed, the branchlets appressed; spikelets 5 to 7 mm long, 2 or 3-flowered, appressed, deeply tinged with purple; glumes acute or sometimes subobtuse, the first 1.5 to 3 mm long, 1-nerved, the second 2.5 to 4 mm long, 3-nerved; lemmas 3.5 to 4 mm long, broad, obtuse, the nerves evident, sparsely pilose at the base or nearly glabrous; palea as long as the lemma, the keels prominent, glabrous; anthers 1.3 to 1.5 mm long.

Type in the U. S. National Herbarium, no. 948675, collected on flat near creek, at Tyoonok ("Tyoonock"), Cook Inlet, Alaska, by Walter H. Evans in 1897 (no. 480).

Puccinellia triflora is related to *P. glabra*, differing in the taller culms and stiffly spread-

ing or reflexed panicle branches, and in the spikelets only 2- or 3-flowered.

This species was also collected on flats that are overflowed by spring tides at Kasilof ("Kussiloff"), Kenai Peninsula, *Evans* 684.

7. *Puccinellia andersoni* Swallen, sp. nov.

Perennis; culmi densi caespitosi, erecti, basi decumbentes, 15–30 cm alti; vaginae glabrae, internodiis longiores, inferiores tenues, rufuscae; ligula 2 mm longa, decurrens; laminae planae, 5–11 cm longae, 1–2.5 mm latae, glabrae; paniculae 4–8 cm longae, ramis rigidis, glabris, adscendentibus vel patentibus, 2–4 cm longis, 1–5-spiculatis; spiculae 5–7-florae, 6–8 mm longae; gluma prima 2 mm longa, acuta; gluma secunda 2.5–3 mm longa, latior, acuta vel subobtusata; lemmata 3–3.5 mm longa, acuta, dentata, basi sparse pilosa; palea lemma aequans, carinis prope apicem sparse scabris; antherae 0.8–1 mm longae.

Perennial; culms densely tufted, erect from a decumbent base, 15 to 30 cm tall, with short ones, 5 to 8 cm tall, apparently from the outside of the clump; sheaths glabrous, longer than the internodes, the lower loose, thin, reddish brown, becoming fibrous; ligule thin, decurrent, 2 mm long; blades flat, 5 to 11 cm long, 1 to 2.5 mm wide, glabrous; panicles 4 to 8 cm long, the branches relatively stout, glabrous, stiffly ascending to spreading, 2 to 4 cm long, bearing 1 to 3 or sometimes 5 appressed spikelets; spikelets 5- to 7-flowered, 6 to 8 mm long; first glume 2 mm long, acute, the second 2.5 to 3 mm long, much broader, acute or subobtusate; lemma 3 to 3.5 mm long, usually acute, sometimes irregularly toothed, sparsely pilose at the base and on the lower part of the prominent nerves; palea as long as the lemma, the keels sparsely scabrous near the summit; anthers 0.8 to 1 mm long.

Type in the herbarium of the U. S. National Arboretum, collected in very wet soil, Point Lay, Arctic Alaska, August 5, 1938, by J. P. Anderson (no. 4399a).

This is a rather distinct species and its relationship is not evident. The long decumbent base, short, stiffly spreading panicle branches, and acute, more or less toothed, lemmas are characteristic. Only known from the type collection. Mr. Anderson's no. 4399 consisted of specimens of this species and of *Puccinellia paupercola*. Those of *P. andersoni* have been

labeled 4399a, while those of *P. paupercola* have been labeled 4399b.

8. *Puccinellia alaskana* Scribn. & Merr. Contr. U. S. Nat. Herb. 13: 78. 1910

Puccinellia paupercola var. *alaskana* Fern. & Weath. *Rhodora* 18: 18. 1916.

Perennial; culms in small dense tufts, erect or ascending, 6 to 30 cm tall; sheaths soft, much longer than the internodes; ligule 2 to 3.5 mm long, hyaline, decurrent; blades flat or loosely folded, 2 to 9 cm long, 1 to 2 mm wide; panicles 3 to 9 cm long, the short slender glabrous branches appressed or ascending; spikelets 3- or 4-flowered, 4 to 5 mm long; glumes contorted, strongly nerved, the first 1 to 1.5 mm long, subacute to obtuse, entire, the second 2 to 2.5 mm long, 3-nerved, oblong to obovate, entire or erose; lemma prominently 5-nerved, abruptly narrowed to an irregular subacute tip, densely pubescent at the base, the lowest 3 to 3.3 mm long; palea as long as the lemma, ciliate on the keels; anthers of lowest floret 0.4 to 0.5 mm long.

Differs from *P. paupercola* in its usually larger size, flat broader blades, and its longer more distant lemmas, densely pubescent below (nearly glabrous in *P. paupercola*).

Type locality: St. Paul, Pribilof Islands.

Islands of Bering Sea and Western Alaska.

SEWARD PENINSULA: Port Clarence, *Walpole* 1889. NUNIVAK ISLAND: Nash Harbor, *J. P. Anderson* 3864. ST. MATTHEW ISLAND: *Cole* in 1899. PRIBILOF ISLANDS: St. Paul, *Haley* in 1925, *Hultén* 7489, 7498(H), *Johnston*, June 30, 1923(H), *Kincaid*, Aug. 24, 1897, *Macoun*, Aug. 11, 1892, and in *Geol. Surv. Can.* 94198, *Merriam*, Aug. 4, 1891, *Trelease & Saunders* 2960; St. George, *W. H. Palmer* "Aug. 11," *Johnston*, Aug. 5, 1920. ALEUTIAN ISLANDS: Agattu, *Hultén* 6319; Semisopochnoi, *Steenis* 4619(H); Atka, *Eyerdam* 994, *Hultén* 6996, 7017; Amlia, *Eyerdam* 1272, 1273; Carlisle, *Eyerdam* 1387; Umnak, *Hultén* 7086(H); "Ogliuga," *Murie* 2108. SHUMAGIN ISLANDS: Popof, *Kincaid*, July 14, 1899.

9. *Puccinellia paupercola* (Holm) Fern. & Weath. *Rhodora* 18: 18. 1916

Glyceria paupercola Holm, *Repert. Sp. Nov. Fedde* 3: 337. 1907.

Perennial; culms very slender in small dense tufts, 5 to 15 cm tall, scarcely exceeding the blades; sheaths crowded, the lowest rather papery becoming shredded in age; ligule 0.5 to 0.8 mm long, usually not decurrent; blades 2 to 4 cm long, 0.5 to 1 mm wide, flat or usually loosely involute, straight or falcate; panicles 1 to 7 cm long, few-flowered, the slender glabrous relatively distant branches appressed or sometimes spreading, naked below; spikelets 3- to 5-flowered, 4 to 8 mm long, the florets not crowded; first glume 1 to 1.5 mm long, 1-nerved, acute to subobtusate; second glume 1.5 to 2 mm long, 3-nerved, subacute to obtuse; lower lemma rather strongly 5-nerved, 2 to 2.5 mm long (rarely to 2.8 mm), elliptic to obovate, erose, glabrous or very sparsely pilose at the base; palea a little shorter than the lemma, the keels glabrous; anthers 0.5 to 0.6 mm long.

Type locality: Mansfield Island, Hudson Bay.

Rocky and sandy shores, Arctic America.

ARCTIC ALASKA: Point Lay, *J. P. Anderson* 4399b; Point Hope, *J. P. Anderson* 4603; Point Martin, *Johansen* 145 (Geol. Surv. Can. 97948). BERING STRAIT: St. Lawrence Island, *Geist*, July-Aug. 1931; "Arakamtchetchene" Island, *Wright* in 1853-56. ALEUTIAN ISLANDS: Agattu, *Hultén* 6320; Unalga, *Steenis* 4658(H).

10. *Puccinellia hulteni* Swallen, sp. nov.

Perennis; culmi rigidi, erecti, basi decumbentes, 35-40 cm alti; vaginae internodiis longiores, glabrae; ligula 2.5-3 mm longa, tenuis, decurrens; laminae 5-11 cm longae, 2-2.5 mm latae, erectae, nervosae, glabrae; paniculae 8-14 cm longae, ramis rigide adscendentibus vel patentibus, glabris vel obscure scabris, inferioribus 5-8 cm longis, in parte superiore floriferis; spiculae 3-4-florae, 5-6 mm longae; gluma prima 1.5-2 mm longa, 1-nervia, acuta vel subacuta; gluma secunda 2-2.5 mm longa, 3-nervia, obtusa vel subacuta; lemmata 2.5-2.8 mm longa, subobtusata, basi obscure pubescentia; palea lemmate brevior, minute dentata, carinis scabris; antherae 0.8 mm longae.

Perennial; culms stiffly erect from a decumbent base 35 to 40 cm tall; sheaths much longer than the internodes, glabrous; ligule hyaline, decurrent, 2.5 to 3 mm long; blades 5 to 11 cm long, 2 to 2.5 mm wide, narrower on the innovations, stiff, erect, strongly nerved, glabrous; panicles 8 to 14 cm long, the glabrous or ob-

scurely scabrous branches stiffly ascending or spreading, the lower 5 to 8 cm long with shorter ones intermixed, loosely few-flowered above the middle; spikelets 3- or 4-flowered, 5 to 6 mm long; first glume 1.5 to 2 mm long, 1-nerved, acute or subacute, the second 2 to 2.5 mm long, broader than the first, 3-nerved, subacute or obtuse; lemma 2.5 to 2.8 mm long, acutish, obscurely pubescent on the strong lateral nerves at the base; palea a little shorter than the lemma, minutely toothed, rather strongly scabrous on the keels, especially toward the summit; anthers 0.8 mm long.

Type in the U. S. National Herbarium, no. 1819613, collected at Port Hobron, Sitkalidak Island, Kodiak, Alaska, August 20, 1931, by W. J. Eyerdam (no. 131).

The stiffly erect culms with erect flat blades and open panicles with stiffly ascending branches of irregular length are characteristic. Probably most closely related to *P. pumila* which is much smaller, with short densely flowered branches and much more obtuse lemmas.

Seashores, Kodiak and neighboring islands, Kenai Peninsula, and southeastern Alaska.

KODIAK: Old Harbor, *Eyerdam* 651; Sitkalidak Island, *Eyerdam* 131. KENAI PENINSULA: Tutka Bay, *Hultén* 7782. SOUTHEASTERN ALASKA: Sitka, *Hultén* 8582.

11. *Puccinellia pumila* (Vasey) Hitchc. Amer. Journ. Bot. 21: 129. 1934

Glyceria pumila Vasey, Torrey Bot. Club Bull. 15: 48. 1888.

Atropis kurilensis Takeda, Journ. Linn. Soc. Bot. 42: 497. 1914.

Puccinellia kurilensis Honda, Journ. Fac. Sci. Univ. Tokyo Sec. III, Bot. 3: 59. 1930.

Perennial; culms in loose or rather dense tufts, erect or decumbent at the base and geniculate-ascending, 10 to 30 cm tall; sheaths usually much longer than the internodes; ligule 1.5 to 2.3 mm long, hyaline, truncate, decurrent; blades flat, as much as 20 cm long, usually much shorter, 1 to 2.5 mm wide, scaberulous; panicles 2.5 to 15 cm long, the glabrous branches stiffly ascending to reflexed, naked in the lower half, sometimes in depauperate specimens bearing only a single spikelet; spikelets 4- to 6-flowered, 5 to 7 mm long, appressed;

first glume 1.5 to 2.5 mm long, 1-nerved, subacute; second glume 2.5 to 3 mm long, 3-nerved, subacute; lower lemma about 3 mm long, rather abruptly narrowed toward the subacute apex, the nerves usually conspicuous, sparsely pubescent on the callus; palea as long as the lemma, the keels glabrous; anthers of lower floret 0.8 to 1.2 mm long.

The eastern material which has been referred to this species requires further study, at least some of it may represent another species.

Type locality: Vancouver Island.

Brackish marshes and seashores, Alaska to Vancouver Island.

KODIAK: *Griggs*, Aug. 15, 1915, *Piper* 4701. COOK INLET: Halibut Cove, *Coville & Kearney* 2456. PRINCE WILLIAM SOUND: Orca, *Coville & Kearney* 1336. SOUTHEASTERN ALASKA: Sitka, *Hitchcock* 4139½; Skwashianski Bay, *Piper* 4698.

12. *Puccinellia nutkaensis* (Presl) Fern. & Weath. *Rhodora* 18: 22. f. 49-53. 1916

Poa nutkaensis Presl, *Rel. Haenk.* 1: 272. 1830.

Perennial; culms relatively slender in dense tufts, mostly 15 to 30 cm tall, rarely as much as 45 cm, erect or sometimes ascending at the base; sheaths overlapping or the upper occasionally shorter than the internodes; ligule 1 to 2 mm long, obtuse or truncate, decurrent; blades 3 to 13 cm long, 1 to 2 mm wide, soft, flat or folded, glabrous or very sparsely scabrous on the upper surface; panicles 5 to 12 cm long, the few slender glabrous branches appressed, naked toward the base, the lower rarely more than 5 cm long; spikelets 4- to 6-flowered, 7 to 8 mm long; first glume 1.5 to 2 mm long, 1-nerved, subobtuse; second glume 2 to 2.5 mm long, 3-nerved, ovate or broadly elliptic, obscurely ciliolate; lemma of lowest floret 3 mm long, elliptic, glabrous except for a few hairs on the callus and sometimes on the lateral nerves near the base; palea as long as the lemma, sparsely scabrous; anthers 0.8 to 1.2 mm long.

Type locality: "Nootka Sound?"

Beaches and sandy or rocky soil near the coast, Alaska.

This is on the whole a characteristic and uniform species, apparently the commonest of those found in Alaska.

ALEUTIAN ISLANDS: Atka, *Hultén* 6989(H), 7012, *Turner* 1208. SHUMAGIN ISLANDS: Popof, *Hultén* 7742, *Saunders*, July 7-18, 1899, *Trelease & Saunders* 2946. KODIAK ISLAND: *Eyerdam* 497, *Coville & Kearney* 2240, *Trelease & Saunders* 2942, 2945, 2973, *Cole*, July 19, 1899, *Kincaid*, July 20, 1899. ALASKA PENINSULA: Kukak Bay, *Coville & Kearney* 1588; Fox Bay, *Griggs*, July 28, 1913. KENAI PENINSULA, Tutka Bay, *Hultén* 7785 (H). PRINCE WILLIAM SOUND: Hinchinbrook Island, *Norberg*, June 4, 22(H), and 28, July 14, 1936, July 14 and 20, 1937; Knight Island, *Eyerdam* 10; Cordova, *Hitchcock* 4145. YAKUTAT BAY: *Funston* 31, *Trelease & Saunders* 2939. SOUTHEASTERN ALASKA: Skagway, *J. P. Anderson* 1717(H), 1719, *Eastwood* 730, 730A, *Walker* 808; Yes Bay, *Howell* 1718, Lynn Canal, *Krause* 276, 276a(H); Juneau, *J. P. Anderson* 197; Howkan, *Evans* 144; Davidson Glacier, *Cooper* 76; Sitka, *Coville & Kearney* 843, *Evans* 257, *Hitchcock* 4053, *Piper* 4697, *W. G. Wright* 1585, 1593; Chichagof Island, *Norberg* 183, 188, 203; Ketchikan, *J. P. Anderson* 481.

13. *Puccinellia kamtschatica* Holmb. var. *sublaevis* Holmb. *Bot. Not.* 1927: 209. 1927

Perennial; culms rather densely tufted, erect or somewhat decumbent at the base, 12 to 25 cm high; sheaths smooth, all longer than the internodes; ligule membranaceous, about 2 mm long; blades smooth, rather soft, flat or drying involute, not more than 2 mm wide; panicles 4 to 10 cm long, the branches rather narrowly ascending, or eventually spreading, sparsely scabrous, mostly spikelet-bearing in the upper half; spikelets 3- or 4-flowered, 3 to 4 mm long; first glume acute, about half as long as the first lemma; second glume much broader, obtuse, the tip hyaline; lemmas 2 mm long, obtuse, glabrous; anthers 0.6 to 0.8 mm long.

Type locality: Schtschapina, Kamchatka.

Cold wet soil, Kamschatka and Alaska.

SHUMAGIN ISLANDS: Popof, *Hultén* 7747. SOUTHEASTERN ALASKA: Glacier Bay, *Cooper* 165; Holkham Bay, *Cooper* 369.