

THE NORTH AMERICAN SPECIES OF STIPA.

By A. S. HITCHCOCK.

INTRODUCTION.

The genus *Stipa* was established by Linnaeus in the *Species Plantarum*, being based upon three species, two from Europe, *S. pennata* and *S. juncea*, and one from Virginia, *S. avenacea*. A fourth species, *S. membranacea*, was added in the addenda. The genus is well marked and the generic concept has not been changed materially, the three original species being still retained in the genus. In the original description of the genus ¹ Linnaeus distinguished the group by the articulation of the awn with the summit of the lemma, the awn being sometimes bent and sometimes straight.

The name *Stipa* was coined by Linnaeus. He makes no statement as to the origin of the word, but it is assumed to come from the Greek, *στύπη*, meaning tow, probably referring to the feathery appearance of the awns of *S. pennata*. Ascherson ² writes the word *Stupa* and Doell ³ writes it *Stypa*.

The species of *Stipa* form an appreciable or even important part of the forage in our Western States. Their forage value is greatest during the early part of the season, and decreases rapidly toward maturity as the leaves and stems become woody and fibrous. The species that produce robust sharp-pointed fruits, such as *S. comata*, *S. leucotricha*, and *S. spartea*, may become injurious to stock at maturity.

One species, *S. vaseyi*, called sleepy grass, has the reputation of being toxic and is said to produce narcotic effects upon grazing animals, especially horses.

Stipa tenacissima L., of Spain and Algeria, furnishes a part of the esparto or alfa of commerce, used in the manufacture of paper and cordage.

The American species of *Stipa* are commonly known as spèargrasses, to distinguish them from the needlegrasses belonging to the allied genus *Aristida*. Some of our species, especially those with robust awns are called porcupine-grasses, and one, *S. comata*, because of the long slender flexuous awns, is known in the West as needle-and-thread grass.

The illustrations, by the author, show the mature floret at natural size and the body of the lemma enlarged 5 diameters.

¹ Gen. Pl. ed. 5. 34. 1754.

² Rhein. Fl. 106. 1843.

³ Fl. Brand. 1: 812. 1864.

DESCRIPTION OF THE GENUS AND SPECIES.

STIPA L.

Stipa L. Sp. Pl. 78. 1753. Linneaus describes three species, *S. pennata* and *S. juncea*, from Europe, and *S. avenacea*, from Virginia. *Stipa pennata*, being the commoner of the European species, is selected as the type. The plumose awn may have suggested the generic name.

Trichosathera Ehrh. Beitr. Naturk. 4: 149. 1789. A name given in Ehrhart's Phytophylacium to *Stipa capillata* L. The name was misspelled *Trichosantha* by Steudel.⁴

Jarava Ruiz & Pav. Fl. Peruv. Chil. 1: 5. pl. 6. f. b. 1798. Based on *Jarava ichu* Ruiz & Pav. The data of publication of *Jarava* is discussed on page 259. Steudel⁵ spells the name *Jarapha* and lists *J. arundinacea* Willd., *J. ichu* R. P., and *J. usitata* Pers.

Achnatherum Beauv. Ess. Agrost. 19. pl. 6. f. 7. 1812. The figured species is *Stipa calamagrostis* (L.) Wahl.

Podopogon Raf. Neogen. 4. 1825. The genus is briefly described and two species mentioned, *Stipa avenacea* and *S. barbata* (same as *S. avenacea*). The genus is again described as if new in 1830,⁶ and the same two species mentioned.

Lasiagrostis Link, Hort. Berol. 1: 99. 1827. Includes one species, *L. calamagrostis*, based on *Stipa calamagrostis* Wahl.

Macrochloa Kunth, Rév. Gram. 1: 58. 1829. Includes two species, *M. tenacissima*, based on *Stipa tenacissima* L., and *M. arenaria*, based on *S. arenaria* Brot. The first may be regarded as the type.

Aristella Bertol. Fl. Ital. 1: 690. 1833. Includes one species, *A. bromoides*, which is the same as *Stipa aristella* L. This was first used as a section of *Stipa* by Trinius.⁷

Orthoraphium Nees, Proc. Linn. Soc. 1: 94. Feb. 1841; Nees, Ann. Mag. Nat. Hist. 7: 221. May, 1841. Includes only one species, *O. roylei* Nees. (*Stipa roylei* Mez). In this the body of the lemma exceeds the very unequal glumes, the callus is blunt, the lemma not convolute below, the palea visible at the base; the articulation with the awn is very obscure and marked by a few stiff reflexed hairs; the awn is flexuous, with a few loose twists.

Ptilagrostis Griseb. in Ledeb. Fl. Ross. 4: 447. 1853. Includes only one species, *P. mongholica*, based on *Stipa mongholica* Turcz.

Trinius⁸ divides *Stipa* into four sections: section 1, *Oreostipa*, with naked awns; section 2, *Jarava*, with plumose awns; section 3, *Neostipa*, with unequal glumes, from Australia; section 4, *Schizachne*, with subulate glumes, from South Africa; section 5, *Eustipa*, with long awns, from the North Temperate regions. He holds distinct *Aristella*, *Orthoraphium* and *Lasiagrostis*.

DESCRIPTION.

Spikelets 1-flowered, disarticulating above the glumes, the articulation oblique, leaving a barbed sharp-pointed callus attached to the base of the floret; glumes membranaceous, often papery or hyaline, acute, acuminate, or even aristate, usually long and narrow, equal or slightly unequal; lemma narrow, terete, oblong to linear or fusiform, indurate at maturity, strongly convolute, terminating in a persistent or more or less deciduous, usually twisted and twice geniculate awn, a distinct line of demarcation between awn and body of lemma; palea inclosed in the lemma.

⁴ Nom. Bot. ed. 2. 2: 702. 1841.

⁶ Bull. Bot. Seringe 1: 221. 1830.

⁵ Nom. Bot. ed. 2. 1: 797. 1840.

⁷ Fund. Agrost. 110. 1820.

⁸ Mém. Acad. St. Pétersb. VI. Sci. Nat. 5¹: 26-82. 1843.

Cespitose perennial grasses, with usually convolute blades and narrow or sometimes open panicles. Species about 250 in the temperate regions of the world, especially on plains and steppes.

In America the genus extends from Canada south through the Mexican plateau, but is nearly absent from Central America. It reappears in the Andes of Colombia, and is represented by numerous species in the southern part of South America.

In the type species, *S. pennata*, the terminal segment of the elongate twice-geniculate awn is beautifully plumose. To the group including this species belongs our *S. neomexicana*.

Stipa speciosa, with a once-geniculate awn strongly plumose below the bend, has several allies in southern South America.

In Australia⁹ there is a group in which the apex of the lemma is 2-lobed with the awn from between the lobes. One of our species, *S. stillmanii*, possesses a strongly lobed lemma, but does not seem to be allied closely to the Australian group. In a few other species (for example, *S. scribneri* and *S. pinetorum*) the lemma may develop minute lobes. In *S. porteri* the lobes are rather broad, firm, and acutish, but not long-acuminate as in the others.

The awn in most of the species is persistent, but in a few species is readily or tardily deciduous, thus approaching *Oryzopsis*, which has a shorter and more turgid lemma and scarcely twisted deciduous awn.

Stipa, *Oryzopsis*, *Nassella*, and *Piptochaetium* form a well-marked group, which together with *Aristida*, *Ortachne* and *Streptachne* compose the subtribe *Stipeae* of the tribe *Agrostideae*. *Aristida* is distinguished by its trifid, usually unarticulated awn (the lateral awns obsolete in a few species). *Oryzopsis*, *Nassella*, and *Piptochaetium* have broad lemmas and deciduous awns; *Stipa*, *Ortachne*, and *Streptachne* have persistent awns and narrow lemmas. *Stipa* is distinguished from the other two by the more indurate lemma, the awn usually tightly twisted below, and usually by a needle-like callus.

Our species are all perennials, but in the Old World there are a few annual species, such as *S. tortilis* Desf., *S. compressa* R. Br., and *S. lachnoclea* Hughes, and in South America there is one annual, *S. annua* Mez.

The awns are usually hygroscopic, twisting and untwisting with varying amounts of moisture. In *S. spartea* the robust awns, straight until maturity as is usual in all the species, become strongly twisted and twice bent when dry, but straighten and untwist when moistened. The alternate twisting and untwisting, together with the strongly barbed callus, undoubtedly aid in burying the fruits.

Cleistogenes have been found in the base of the lower sheaths in *S. leucotricha*, *S. brachychaeta*, *S. mucronata*, and *S. neesiana*, and in other South American species.

KEY TO THE SPECIES.

Terminal segment of awn conspicuously plumose, flexuous, 7 to 12 cm. long.
1. *S. neomexicana*.

Terminal segment of awn not plumose.

First segment of the once-geniculate awn strongly plumose, the ascending hairs 5 to 8 mm. long..... 2. *S. speciosa*.

First segment of awn sometimes plumose but the hairs not over 2 mm. long.
Mature lemma not over 3 mm. long.

Summit of lemma bearing ascending or spreading hairs 3 to 4 mm. long.
40. *S. ichu*.

Summit of lemma slightly hispidulous, but lacking long hairs.
39. *S. tenuissima*.

⁹Hughes, D. K. A revision of the Australian species of *Stipa*. Kew Bull. Misc. Inf. 1921:1-30. 1921.

- Mature lemma more than 3 mm. long, mostly more than 5 mm.
- Lemma densely appressed-villous with white hairs 3 to 4 mm. long, rising above the summit in a pappus-like corona.....6. *S. coronata*.
- Lemma often villous but the hairs not over 1 mm. long, or sometimes those at the summit as much as 2 mm. long.
- Summit of mature lemma smooth, cylindric, whitish, forming a ciliate crown 0.5 to 1 mm. long. (Compare *S. mexicana* with crown 0.2 mm. long.)
- Lemma 5 to 6 mm. long; callus about 2 mm. long; awn 3 to 5 cm. long.....3. *S. mucronata*.
- Lemma 1 cm. long; callus 4 mm. long; awn 6 to 10 cm. long.
4. *S. leucotricha*.
- Summit of mature lemma not forming a crown.
- Lemma 2-lobed at summit, the lobes extending into awns 2 to 3 mm. long on each side of the central awn. California.
5. *S. stillmanii*.
- Lemma not lobed at summit or only slightly so.
- Awn plumose below, the hairs ascending or spreading, sometimes plumose throughout. (Compare *S. pulchra* with more or less appressed-hispid but not plumose awn, and *S. mexicana* with awn slightly plumose just above the lemma.)
- Awn plumose throughout, once-geniculate. Lemmas with two short broad lobes.....19. *S. porteri*.
- Awn plumose only below the second bend.
- Lemma glabrous above the callus, brown, terete. Mexico.
14. *S. leiantha*.
- Lemma pubescent all over. Western States.
- Sheaths pubescent.....21. *S. elmeri*.
- Sheaths glabrous.
- Ligule 3 to 6 mm. long.....20. *S. thurberiana*.
- Ligule very short.
- Hairs on upper part of the lemma much longer than those below.....26. *S. californica*.
- Hairs short all over the lemma...22. *S. occidentalis*.
- Awn scabrous or nearly glabrous, rarely appressed-hispid, but not plumose.
- Lemma more than 7 mm. (often 1 to 2 cm.) long, glabrous or sparsely pubescent above the callus, mostly cylindric (somewhat fusiform in *S. pulchra*).
- Mature lemma pale, sparsely pubescent to summit, mostly over 1 cm. long.....12. *S. comata*.
- Mature lemma dark.
- Lemma 8 to 10 mm. long.
- Glumes 3-nerved. Summit of lemma hispidulous-ciliate, the hairs erect, nearly 1 mm. long; lemma somewhat fusiform, pubescent in lines above the callus.
13. *S. pulchra*.
- Glumes 5 to 9-nerved.
- Lemma glabrous above the base, minutely roughened at apex; callus sharp and slender-tipped.
10. *S. avenacea*.
- Lemma sparsely pubescent to apex; callus rather blunt.....15. *S. pringlei*.

Lemma 12 to 2.5 mm. long, cylindric.

Mature lemma glabrous above the callus. Florida.

8. *S. avenacioides*.

Mature lemma more or less pubescent above the callus.

Panicle open, the branches flexuous, glabrous below the spikelet. Mexico.....11. *S. saxicola*.

Panicle narrow, the branches appressed, straight, scabrous-pubescent below the spikelet. 9. *S. spartea*.

Lemma less than 7 mm. long, or if as long as 7 to 8 mm. then distinctly pubescent on the upper part.

Culms several-noded (nodes more than 3).

Ligule less than 1 mm. long; neck of lemma short, obscure.

23. *S. multinodis*.

Ligule 3 to 5 mm. long; neck of lemma distinct, 1 mm. long.

24. *S. constricta*.

Culms 1 to 3-noded.

Panicle more or less open, the branches spreading or ascending, naked at base.

Panicle diffuse, the branches divergent, drooping; lemma about 5 mm. long; awn about 2 cm. long.

Northwestern States.....7. *S. richardsoni*.

Panicle somewhat open but not diffuse. Southwestern States and Mexico.

Ligule 3 to 4 mm. long. Awn about 5 cm. long, the terminal segment flexuous.

16. *S. eminens*.

Ligule 1 mm. long or less.

Hairs at summit of lemma about 1 mm. long.

Awn 1 to 1.5 cm. long. 17. *S. clandestina*.

Hairs at summit of lemma very short. Awn 2.5 to 3.5 cm. long.....18. *S. lepida*.

Panicle narrow, the branches appressed.

Hairs on lemma copious, at least at summit, 2 mm. long.

Lemma about 8 mm. long, villous at summit, pubescent below.....25. *S. scribneri*.

Lemma about 5 mm. long, villous all over but more so above.....36. *S. pinetorum*.

Hairs not copious, not over 1 mm. long at summit.

Summit of lemma forming a slightly enlarged firm smooth ring or narrow crown.

29. *S. mexicana*.

Summit without crown; lemma villous throughout.

Mature lemma villous with brown hairs.

Lemma 4 mm. long; culms rarely over 30 cm. tall.....27. *S. angustifolia*.

Lemma 5 to 6 mm. long; culms mostly over 75 cm. tall.....28. *S. virescens*.

Mature lemma villous with white hairs, usually fusiform; panicles usually many-flowered.

Glumes broad, abruptly acuminate, rather firm, the first 5-nerved. Pacific coast.

30. *S. lemmoni*.

Glumes narrow, gradually acuminate, usually hyaline, the first usually 3-nerved.

Ligule 3 to 6 mm. long. Awn very slender, flexuous, obscurely geniculate, 3 to 4 cm. long. Mexico... 38. *S. editorum*.

Ligule very short.

Awn 4 to 6 cm. long, obscurely geniculate, the untwisted terminal segment flexuous. , Arizona, Utah... 37. *S. arida*.

Awn mostly less than 5 cm. long, if as much as 4 cm. long, then twice-geniculate and the terminal segment straight or nearly so. Western States.

Sheaths, at least the lowermost, pubescent..... 31. *S. williamsii*.

Sheaths glabrous.

Sheaths villous at the throat; callus broad and short; lower nodes of panicle villous.

Glumes thin and papery; plants rather slender, mostly less than 1 meter tall; panicle rather slender and open.

32. *S. viridula*.

Glumes firm, the nerves inconspicuous; plants robust, mostly more than 1 meter tall; panicle larger and more compact. Southwestern States.

33. *S. vaseyi*.

Sheaths not villous at the throat or only slightly so; callus comparatively narrow; nodes of panicle glabrous or nearly so.

Awn mostly more than 2 cm. long; hairs at summit of lemma about as long as the others.

34. *S. columbiana*.

Awn mostly less than 2 cm. long; hairs at summit of lemma longer than those on the body, 1 to 1.5 mm. long.

35. *S. lettermani*.

1. *Stipa neomexicana* (Thurb.) Scribn.

Stipa pennata var. *neo-mexicana* Thurb. in Coulter, Man. Rocky Mount. 408. 1885. "Extending into S. W. Colorado from New Mexico and Texas." I have not been able to locate the type of this. In the herbarium of the New York Botanical Garden there is a sheet from the Torrey Herbarium labeled "Ex Coll. Geo. Thurber. Rio Mimbres, New Mexico, April, 1851. No. 269." On the sheet is written, possibly in Dr. Gray's hand, "*S. pennata* var. *Neo Mexicana* Thurber." This specimen may be the type.

Stipa neo-mexicana Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 17: 132. f. 428. 1899. Based on *Stipa pennata neo-mexicana* Thurb.

DESCRIPTION.

Culms densely cespitose, erect, glabrous, about 2-noded, mostly 40 to 80 cm. tall, sometimes taller; sheaths glabrous or the lower minutely pubescent; the prophyllum puberulent; ligule very short, ciliate; blades slender, firm, convolute, glabrous beneath, scaberulous on the upper surface, the basal 10 to 30 cm. long, scarcely 1 mm. wide when unrolled; the panicle narrow, emerging from the uppermost inflated sheath, the axis mostly 3 to 8 cm. long, glabrous, bearing a few ascending branches, the lowermost 1 to 3 cm. long, mostly with 2 spikelets, the upper shorter, sometimes only 2 mm. long, mostly with a single spikelet, the pedicels more or less pubescent; spikelets pale, more or less shining; glumes papery, mostly 5-nerved (sometimes with 1 or 2 extra nerves), narrowed into a long, slender, scarcely awned point about as long as the body, the total length 3 to 5 cm., the first a little longer; fertile lemma about 15 mm. long, including the sharp, densely pilose callus (4 to 5 mm. long), about 1.5 mm. wide, at maturity brown, 5-nerved, sparsely villous, minutely tuberculate at the short, slightly constricted neck; awn readily deciduous, 12 to 18 cm. long, the lower $\frac{1}{4}$ to $\frac{1}{2}$ straight, strongly twisted, appressed-villous, the middle segment 1 to 2 cm. long, flexuous or more or less twice-geniculate and slightly twisted, the terminal segment untwisted, flexuous, plumose, the hairs pale or tawny, about 3 mm. long. (Pl. 50, figs. 1, 2. Chase 5982.)

This species is allied to *Stipa pennata* L., of the steppes of Europe and Asia. The latter has a once-geniculate awn, the terminal segment of which is 30 cm. long and more strongly plumose than in the American species.

DISTRIBUTION.

Mesas, canyons, and rocky slopes, western Texas and Colorado to Utah and Arizona.

TEXAS: Guadalupe Mountains, Chase 5945, 5982. Upper Concho River, *Reverchon* 163, 1365. El Paso, *Vasey* in 1881.

COLORADO: La Porte, *Pammel* in 1896. Colorado Springs, *Jones* 1547. Paradox, *Walker* 79a. Rum Canyon, *Eastwood* 16 in 1892.

UTAH: Marysvale, *Jones* 5377, 5397.

NEW MEXICO: Guadalupe Mountains, *Hitchcock* 13578. Las Vegas Hot Springs, *Grant* 5761. Roswell, *Griffiths* 4272. Alamogordo, *Hitchcock* 2541. Santa Fe, *Heller* 3666.

ARIZONA: Santa Rita Mountains, *Pringle* in 1884. Clarks Valley, *Rusby* 9078. Adamana, *Chase* 5855; *Hitchcock* 10427. Jacks Canyon, *Coville* 1005. Ash Fork, *Williams* 3051; *Griffiths* 4755. Canyon Padre, *Hitchcock* 13230. Tucson, *Toumey* 732, 733. Fort Apache, *Palmer* 576. Hackberry, *Jones* 4762.

2. *Stipa speciosa* Trin. & Rupr.

Stipa speciosa Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5¹: 45. 1842. "Chile (Cumingl)." The type has been examined in the Trinius Herbarium.

Stipa frigida Phil. Fl. Atacam. 54. 1860. "In monte Alto de Puquios" at 12,500 feet altitude, but in January mostly out of flower. It is described as having florets only half as large as those of *S. speciosa*. The type has not been examined and the species is referred provisionally to *S. speciosa*.

Stipa vaginata Phil. Linnaea 33: 281. 1864-65. "Prope 'S. Felipe de Aconcaqua' crescit, unde attulit orn. Landbeck." The type has been examined. The awns are shorter than usual, each segment being about 12 mm. long. Buchtien's no. 1184 and Asplund's no. 6552 from alpine regions of Bolivia are the same.

Stipa californica Vasey, Proc. Calif. Acad. 24: 80. 1889. Nomen nudum, based on *Palmer* 505 in 1887 from Los Angeles Bay, Lower California.

Stipa speciosa var. *minor* Vasey, Contr. U. S. Nat. Herb. 3: 52. 1892. No specimen is cited and no sheet in the National Herbarium has this name written upon it by Dr. Vasey. On a sheet of *S. speciosa* collected by Jones at Empire

City, Nevada, in 1882, Dr. Vasey has written the name, "var. *humilis* Vasey, dwarf, or *S. chrysophylla*." This is probably the type, the name in publication being changed to *minor*.

Stipa humilis jonesiana Kuntze, Rev. Gen. Pl. 3²: 371. 1898. The only specimen mentioned is Jones 4111 from Empire City, Nevada, a sheet of which is in the National Herbarium.

Stipa hieronymusii Pilger, Bot. Jahrb. Engler 56: Beibl. 123: 24. 1920. "Argentinien: Cordillera de la Rioja, Cuesta del Peñon, südl. der Laguna brava (Hieronymus et Niederlein n. 314)." The type has been examined in the Berlin Herbarium.

DESCRIPTION.

Culms densely cespitose, rather stout, glabrous, erect, mostly 30 to 60 cm. tall, 3-noded in the larger plants; sheaths firm, striate, the upper glabrous, the lowermost pubescent, shining chestnut-brown, the uppermost often inflated at the base of the panicle; ligule very short, densely ciliate, a dense tuft of hairs about 0.5 mm. long on each side at the throat of the sheath, the uppermost longer, as much as 1 mm., and less pubescent; blades slender, coriaceous, closely involute, glabrous or scaberulous on the under or outer surface, densely scaberulous-pubescent on the upper surface, 0.5 to 1 mm. thick when rolled, 20 to 40 cm. long, the apex subulate and very sharp, the uppermost blade reduced; panicle narrow, compact, mostly 10 to 15 cm. long and 1 to 2 cm. wide, pale or tawny; the branches short and appressed, these and the axis scaberulous, spikelet-bearing to base or nearly so; glumes about equal, glabrous, pale, papery, about 15 mm. long, gradually narrowed to a fine soft point, the first 3-nerved, the second 5-nerved; lemma cylindrical, coriaceous, 8 to 9 mm. long including the callus (1.5 mm. long), this densely appressed-pubescent except at the curved tip (base); the body densely soft-pubescent, slightly narrowed and sometimes glabrate upward; awn with one bend, the first segment about 2 cm. long, tightly twisted, strongly plumose on the lower two-thirds with ascending hairs about 8 mm. long, the terminal segment bent 60 to 80° from the vertical, untwisted, scabrous, 15 to 25 mm. long. (Pl. 50, figs. 3, 4. Chase 5747.)

DISTRIBUTION.

Deserts, canyons, and rocky hills, Colorado to southern California; also in Chile, the type locality, and Argentina.

COLORADO: Mesa Verde National Park, Bethel in 1918. McElmo Canyon, Eastwood in 1892.

UTAH: La Sal Mountains, Rydberg & Garrett 8585. Fish Creek Garrett 2598a. St. George, Jones 5110. Santa Clara, Jones 5115. La Verken, Jones 5183

NEVADA: Lovelock, Griffiths & Hunter 544. Reno, Jones in 1897. Candelaria, Shockley 104. Palisade, Jones 4110. Goldfield, Tidestrom 9734. Empire City, Jones 4111.

ARIZONA: Yucca, Jones 3919. Grand Canyon, Chase 5810, 5823; Grant 5558; MacDougal 223; Hitchcock 10451. Peach Springs, Tracy 135. Carrizo Mountains, Standley 7515. Without locality, Lemmon in 1882.

CALIFORNIA: Mohave Desert, Pringle in 1882; Parish Brothers 879. Lone Pine, Jones in 1897. Erskine Creek, Purpus 5077. Mountain Spring, Schoenfeldt 3075; Vasey 659; Mearns 3127. Mono Lake, Bolander 6117. Edge of Colorado Desert, Mearns 2963. Jacumba Hot Springs, Schoenfeldt 3231. Acton, Elmer 3709. Glenavon, Wilder 1092. Big Pine, Heller 8260. Barstow, Chase 5773. Randsberg, Chase 5758. Newberry, Chase 5786. San Bernardino, Chase 5534. Mentone, Leiberg 3298. Bishop Creek, Hall & Chandler 7261. Stanislaus, Elmer 4349. Campo, Abrams 3607. Kramer Chase 5747. Santa Rosa Mountains, Hall 2129; Jepson 1455. San Luis Obispo, Lemmon 5470. Bonanza King Mine, Munz 4134.

LOWER CALIFORNIA: Los Angeles Bay, *Palmer* 505 in 1887. Japa, *Orcutt* 1140.
 CHILE: Quebrada Ramón, *Claude Joseph* 1781, 1788. Santiago, *Claude Joseph* 807. Atacama Desert, *Reiche* in 1901. Aconcagua, *Philippi*. San Ramón, *Claude Joseph* 2345. Maipo, *Claude Joseph* 2966.
 ARGENTINA: General Roca, *Fischer* 46. Colonia San Martín, *Gerling* 70. Mazaredo, *Dusén* 5274. Cipolletti, *Parodi* 956. Choele-Choel, *Parodi* 2551. Cacheuta, *Spegazzini* 2390, 2392.
 BOLIVIA: Pasña, *Buchtien* 1184. Uyuni, *Asplund* 6552.

3. *Stipa mucronata* H. B. K.

Stipa mucronata H. B. K. Nov. Gen. & Sp. 1: 125. 1816. "Crescit in montanis regni Mexicani, prope Actopan et vicum Magdalena, altit. 1040 hexap." The type, in the Paris Herbarium, is labeled "Actopan regni Mexicani. Alt. 1040 hex." A photograph of the type and a fragment of the inflorescence from the type are in the U. S. National Herbarium. The type itself is only the upper part of a culm with a small panicle. The fruit is like that of the type of *S. setigera*, but the awns are wanting. The description states that the ligule is "elongata, ovata, membranacea, glabra." This elongate ligule is not true of the specimens here included nor of any other Mexican species with smooth cylindric summit. In the "H. B. K." herbarium at Paris is another specimen labeled *Stipa mucronata*, but without other data, which belongs to *S. mexicana*, having a fruit only 4 mm. long. The Actopan specimen is selected as the type, since it corresponds better to the original description.

Stipa setigera Presl, Rel. Haenk. 1: 226. 1830. "Hab. . ." The type, in the National Museum at Prague, bears no data except the name, and the source of the specimen is unknown. The sheet has two specimens upon it, both fragmentary, consisting of a panicle and the upper part of the culm. Only one corresponds to the description. Hackel has examined the same sheet and left a note attached to the type which says, "nur dieses Exempel stimmt mit Presl's Beschreibung, das andere durchaus nicht." In the type the fruit shows the characteristic smooth cylindric hispidulous crown.

Stipa trochlearis Nees & Mey. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1. 151. 1843. "Ad Arequipam urbem Peruviae in campis siccis pedum 12,000 altitud., et ad lacum Titicacam." In the Berlin Herbarium is a specimen, probably the type, labeled in Nees' hand, "Ad Arequipu Peruviae. Alt. 12,000, ad Laguna nom de Titicaca. Apr. 1831. Meyen." In the Trinius Herbarium is a specimen from the Meyen Herbarium in 1836, probably a part of one of the preceding specimens, labeled "Peru, Laguna de Titicaca." The species was described by Trinius and Ruprecht¹⁰ in 1842 and credited to "Nees et Meyen! Meyen It. 1. (1834) p. 484. N. ab Esenb. Act. Leopold. 19. p. 151." The first citation is a nomen nudum. The second is supposed to have been published in 1843 but is cited by Trinius and Ruprecht (loc. cit.) in 1842, possibly from proof sheets; or the Leopold work may have actually appeared earlier than 1843. Trinius and Ruprecht say concerning the specimens, "Ad Arequipa, urbem Peruviae, in campis siccis altit. 12,000 ped. et ad lacum Titicaca. Aprili. (Meyen!) Mexico (Berlandier! n. 604)."

Stipa amethystina Steud. Syn. Pl. Glum. 1: 124. 1854. "Hrbr. Lechler nr. 279. Arique, Chile." The type has been examined.

Stipa pratensis Phil. Linnaea 33: 284. 1864. "In Provincia Valdivia, S. Juan, Corral, etc., crescit." The type has been examined.

Stipa chapulcensis Fourn. Mex. Pl. 2: 74. 1886, "Chapulco (Liebm. n. 652)." The type specimen in the Copenhagen Herbarium has been examined.

¹⁰ Mém. Acad. St. Pétersb. VI. Sci. Nat. 3¹: 30. 1842.

DESCRIPTION.

Culms erect or geniculate at the lower nodes, somewhat bulbous at base, glabrous, the nodes pubescent, 60 to 100 cm. tall; sheaths glabrous, pilose at the throat and on the margin; ligule less than 1 mm. long; blades flat, becoming involute, those of the innovations involute, rather sparsely short-pilose on both surfaces, 10 to 20 cm. long, 1 to 3 mm. wide; panicle narrow, nodding, mostly purple, rather dense, 10 to 30 cm. long, the branches ascending or appressed, mostly 1 or 2 at the distant nodes, naked for 1 to 3 cm. at base, branching and bearing several or many appressed spikelets above, often a secondary panicle at the uppermost sheath; glumes about equal, rather broad, usually purple except the hyaline tip, acuminate, 8 to 10 mm. long, the first 3-nerved, scabrous on the keel, the second 5-nerved; lemma 5 to 6 mm. long, turgid, about 1 mm. wide, the callus about 2 mm. long, densely barbed with tawny hairs, the body oblong, dark brown, villous on the lower half, glabrate and strongly but minutely papillate-roughened on the upper half, abruptly contracted at summit into a smooth cylindric whitish neck or crown about 0.5 mm. long, the crown ciliate with erect stiff hairs about as long as the neck; awn slender, 3.5 to 5 cm. long, twice-geniculate, the bends sometimes obscure, twisted and appressed-hispidulous to the second bend, the first segment about 1 cm. long, the second a little shorter, the third straight or nearly so. (Pl. 50, figs. 5, 6. Type.)

DISTRIBUTION.

Dry hills and mesas, Mexico to Argentina.

NUEVO LEÓN: Monterrey, *Hitchcock* 5545.

ZACATECAS: Zacatecas, *Hitchcock* 7503, 7522; *Purpus* in 1904.

GUANAJUATO: Jaral, *Schumann* 1726.

HIDALGO: Pachuca, *Hitchcock* 6744, 6762, 6763.

MEXICO: Toluca, *Hitchcock* 6892.

FEDERAL DISTRICT: *Pringle* 1172, 6583; *Hitchcock* 5931; *Bourgeau* 672.

PUEBLA: Esperanza, *Hitchcock* 6463; *Arsène* 2177. Puebla, *Arsène* 220, 1183.

TLAXCALA: *Arsène* 30.

COLOMBIA: Bogotá, *Apollinaire & Arthur* 17.

VENEZUELA: Mucurubá, *Jahn* 774.

ECUADOR: In Andes, *Spruce* 5406. Riobamba, *Mille* 57. Quito, *Harteman* 58; *Rose* 24029; *Mille* 257. La Magdalena, *Harteman* 22. Malchinguí to Pomasquí, *Hitchcock* 20901. Huigra, *Hitchcock* 20610, 20743, 20757, 20771. Tulcán, *Hitchcock* 20975, 20994, 21037, 21092. Baños, *Hitchcock* 21900, 21920. Alausí, *Hitchcock* 20721.

PERU: Urubamba Valley, *Holway* 763. Chinche, *Macbride & Featherstone* 1283. Matucana, *Macbride & Featherstone* 378. Cuzco, *Hitchcock* 22483, 22505. Oroya, *Hitchcock* 22181. Goyllarisquisca, *Hitchcock* 22299, 22307. Atocsaico, Junín, *Hitchcock* 22211. Ollantaytambo, *Hitchcock* 22556.

BOLIVIA: La Paz, *Holway* 423; *Asplund* 6560; *Buchtien* 866, 3962. Sorata, *Holway* 511. Cochabamba, *Hitchcock* 22799. Palca, *Hitchcock* 22577, 22580.

ARGENTINA: North Patagonia, San Carlos Bariloche, *Buchtien* 165. Cholila, Chubut, *Illin* 135. Río Corcovado, *Illin* 268.

CHILE: Valdivia, *Philippi*; *Buchtien* in 1903. Valparaíso, *Buchtien* in 1895. Southern Chile, *Elliot* 216. Recinto, *Holway* 287. Budi, *Claude Joseph* 2037. Panquipulli, *Claude Joseph* 2445. San Rosendo, *Claude Joseph* 2344. San Antonio, *Claude Joseph* 2343.

4. *Stipa leucotricha* Trin. & Rupr.

Stipa leucotricha Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5¹: 54. 1842. "Texas. (Hooker!)." The type, in the Trinius Herbarium, is labeled "Texas. I. 5.," the handwriting and label similar to those on specimens sent by Hooker. The blades are involute, glabrous beneath, the glumes about 1.5 cm. long.

Stipa ciliata Scheele, Linnaea 22: 342. 1849. "Prope Neubraunfels leg. Römer." The type has not been examined, but the description identifies the species.

DESCRIPTION.

Culms in rather small tufts, glabrous, the nodes pubescent, erect or somewhat geniculate at base, rather slender, 30 to 60 cm. tall, sometimes as much as 1 meter tall; sheaths glabrous or the lower hispidulous, more or less villous at the throat; ligule less than 1 mm. long; blades flat, often becoming involute, hispidulous beneath, scabrous and sometimes hispidulous on the upper surface, 15 to 30 cm. long, 2 to 4 mm. wide; panicle narrow, often inclosed at base in the uppermost somewhat inflated sheath, mostly not over 10 cm. long, the branches slender, distant, scabrous, mostly in pairs, ascending, bearing 1 or 2 spikelets; glumes pale or purple, rather narrow, nearly equal, tapering to a slender soft awnlike point, mostly 12 to 18 mm. long, the first 3-nerved, the second 5-nerved, with additional intermediate nerves sometimes present; lemma about 1 cm. long, the slender callus very sharp, densely barbed with pale yellow hairs, about 4 mm. long, the body oblong, brown or brownish, appressed-pubescent on the lower part, densely papillate-roughened at least toward the summit, abruptly narrowed into a cylindric smooth neck about 1 mm. long, the crown a little wider, ciliate with short stiff erect hairs; awn 6 to 10 cm. long, rather stout, twice-geniculate, the first segment hispidulous, twisted, 2 to 3.5 cm. long, the second 1.5 to 2 cm. long, the third straight, slender. (Pl. 50, figs. 7, 8. Hitchcock 5138.)

DISTRIBUTION.

Dry open grassland, Texas to central Mexico.

TEXAS: Dallas, *Reverchon* 1056, in *Curtiss N. Amer. Pl.* 3419,* *Bebb* 1346. Big Spring, *Tracy* 8109; *Hitchcock* 13382. Grand Saline, *Reverchon* 4127. Waller, *Hitchcock* 1227½. Kerrville, *Hitchcock* 5259. Fort Worth, *Ruth* 167. Bexar County, *Jermy* 208. San Antonio, *Hitchcock* 5138; *Ball* 912. Robstown, *Hitchcock* 5392. New Braunfels, *Hitchcock* 5194. Corpus Christi, *Hitchcock* 5369; *Heller* 1558. Fort Clark, *Mearns* 1470 (awn about 3 cm. long). Austin, *Hall* 766. Without locality, *Lindheimer* 561.

OKLAHOMA: Fort Towson, *Houghton* 3961.

COAHUILA: Diaz, *Pringle* 8292.

ZACATECAS: Zacatecas, *Hitchcock* 7495.

SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5714.

FEDERAL DISTRICT: *Hitchcock* 5918; *Rose & Painter* 8636.

5. *Stipa stillmanii* Boland.

Stipa stillmanii Boland. Proc. Calif. Acad. 4: 169. 1872. "Blue Canon, Sierra Nevada, July, 1870." Bolander says, "Dr. J. D. B. Stillman was a pioneer botanist of California, who * * * performed a journey through the northern part of the State for the purpose of making a collection of California plants, which he forwarded to Doctor Torrey." There are 5 sheets of the type collection in the National Herbarium, one of them, from the California Academy of Sciences, bearing the published data, "Blue Canon, Sierra Nevada Mts., July, 1870."

DESCRIPTION.

Culms rather stout at base, erect, glabrous, 4 or 5-noded, 70 to 100 cm. tall; sheaths glabrous, puberulent on the collar; ligule a very short ciliate ridge; blades firm, flat, glabrous beneath, scabrous on the upper surface, 15 to 30 cm. long, 3 to 6 mm. wide, the uppermost short and involute; panicle pale, narrow, compact, spikelike, interrupted below, 10 to 20 cm. long, the branches short and appressed, villous at base, the axis and branches scaberulous or scabrous; glumes equal, 15 to 18 mm. long, rather thin, narrowed into a scabrous awn 2 to 3 mm. long, scaberulous, the first 1-nerved, the second obscurely 3 to 5-nerved; lemma pale, about 8 mm. long, the callus rather blunt, 1 mm. long, densely barbed with tawny hairs, the body gradually narrowed from above the base, appressed-villous all over, 2-lobed, the lobes awn-tipped, 2 to 3 mm. long; awn 2.5 to 3 cm. long, somewhat bent at the middle and with another obscure bend below, scabrous, twisted below the bend. (Pl. 50, figs. 9, 10. *Bolander*.)

DISTRIBUTION.

Known only from the type collection.

CALIFORNIA: Blue Canyon, Sierra Nevada, *Bolander* in 1870.

6. *Stipa coronata* Thurb.

Stipa coronata Thurb. in S. Wats. Bot. Calif. 2: 287. 1880. "Hills near Julian City, San Diego County (*Bolander*); near San Bernardino, *Parry & Lemmon* n. 422 (1876)." In the U. S. National Herbarium is a specimen, "Distributed by George Thurber," which was collected "in a canyon around springs on hill-sides near Julian City, San Diego Co., Apr. 1872." This is probably a duplicate type.

DESCRIPTION.

Culms stout, erect, glabrous, usually 1 to 2 meters tall, as much as 6 mm. thick at base, 3 or 4-noded; sheaths glabrous, pubescent at the throat and along the margins above; ligule a very short membrane less than 1 mm. long, ciliate with hairs of variable length, sometimes as long as the ligule; blades flat, more or less involute toward the long slender tip, firm, glabrous beneath, scaberulous on the upper surface, scabrous on the margin, 30 to 60 cm. long, as much as 1 cm. wide; panicle pale or purplish, narrow, densely flowered, somewhat nodding, the branches appressed, several from each node, the longer ones naked below, as much as 15 cm. long, bearing several branchlets, the axis and branches glabrous, the branchlets and pedicels usually scabrous; glumes unequal, the first longer, 15 to 20 mm. long, narrowed to a fine point, both 5-nerved, glabrous or minutely scaberulous; lemma about 9 mm. long, pale, densely appressed-villous with white hairs 3 to 4 mm. long, the callus 1.5 mm. long, densely barbed; awn 3.5 to 5 cm. long, scabrous, twice-geniculate, twisted to the second bend, the first segment about 1 cm. long, the second a little shorter, hispidulous, the third straight, scabrous. (Pl. 50, figs. 11, 12. *Orcutt* 1068.)

DISTRIBUTION.

Gravelly plains and rocky slopes, California.

CALIFORNIA: Bernardo, *Abrams* 3360. Colton, *Pringle* in 1882. San Diego, *Orcutt*, 1068. Tassajara Hot Springs, *Elmer* 3302. Roscoe, *Eastwood* 230. San Bernardino Mountains, *Parish Brothers* 872. San Bernardino, *Chase* 5532, 5537; *Parish* 1656, 3665; *Jepson* 5528. Mount Wilson, *Chase* 5580. Echo Mountain, *Chase* 5558. Riverside, *Griffiths* 7850. San Gabriel Forest Reserve, *Leiberg* 3336. Santa Monica Mountains, *Abrams* 1305. San Jacinto Mountains, *Hall* 2078. Julian, *Hitchcock* 13156. Claremont, *Baker* 5282. Corn Peak, *Davy* 7716. Pico Blanco, *Davy* 7345. Ojai Valley, *Hubby* 27.

6a. *Stipa coronata parishii* (Vasey) Hitchc.

Stipa parishii Vasey, Bot. Gaz. 7: 33. 1882. "Collected in the San Bernardino Mts., by Mr. S. B. Parish, for whom it is named." The type, in the U. S. National Herbarium, is *Parish Brothers* 1079.

Stipa parishii var. *depauperata* Jones, Contr. West. Bot. 14: 11. 1912. "Detroit, Utah, May 25, 1891." The type is in Mr. Jones's herbarium. A fragment in the U. S. National Herbarium shows the panicle to be much reduced. The glumes are about 1 cm. long, and the once-geniculate awns about 12 to 15 mm. long.

DESCRIPTION.

The normal form of the subspecies differs in being only 30 to 50 cm. tall, with a rather few-flowered panicle 10 to 15 cm. long, blades 10 to 20 cm. long, and often smaller spikelets, the lemma being 6 to 7 mm. long, and the awn about 2.5 cm. long, once-geniculate, the first segment twisted and scabrous-pubescent, about 1 cm. long, the second segment bent about horizontally, straight, scabrous.

This description applies to the type of the subspecies and a few specimens from San Bernardino and San Jacinto Mountains. Several other specimens are intermediate. Schoenfeldt's no. 3220 from Jacumba Hot Springs is a fairly robust plant with a dense panicle 20 cm. long, having the aspect of the species but with a short once-geniculate awn. Mearns's no. 3312 from the same locality and Schoenfeldt's no. 3441 from Lower California have a less dense panicle with twice geniculate awns 3 to 4 cm. long. Hitchcock's no. 13062 from Grand Canyon resembles in appearance the last-mentioned specimen, being about 1 meter tall, but the awns are about 2.5 cm. long and obscurely twice-geniculate, neither bend being pronounced. In all these specimens the lemma is shorter than in the species. Because of the slight differences and the intermediate specimens it seems better to place *S. parishii* under *S. coronata* as a subspecies. (Pl. 50, fig. 13. *Parish Brothers* 1079.)

DISTRIBUTION.

Dry or rocky slopes, southern California.

UTAH: Detroit, *Jones* in 1891.

NEVADA: Charleston Mountains, *Heller* 11052. Candelaria, *Shockley* 283.

ARIZONA: Grand Canyon, *Hitchcock* 13062.

CALIFORNIA: San Bernardino Mountains, *Parish Brothers* 1079; *Parish* 3287, 10230; *Wilder* 1127; *Hall* 7580. Tanquitz, San Jacinto Mountains, *Hall* 2309. San Antonio Mountains, *Johnston* 1515. Jacumba, *Abrams* 3637. Jacumba Hot Springs, *Schoenfeldt* 3220; *Mearns* 3312. Los Angeles, *Davidson*. Baldy Mountain, *Abrams & McGregor* 623. Southeastern California, *Purpus* 5452. Funeral Mountains, *Coville & Funston* 328. Mill Creek Falls, *Parish* 2487. Without locality, *Lemmon* 5431. Bonanza King Mine, *Munz* 4133, 4249.

LOWER CALIFORNIA: Nachoguero Valley, *Schoenfeldt* 3441. Sierra Cantillas, *Orcutt* 1151.

7. *Stipa richardsoni* Link.

Stipa richardsoni Link, Hort. Berol. 2: 245. 1833. "Hab. in America boreali occidentali. Dr. Richardson semina misit." The type has been examined at the Berlin Herbarium. The third segment of the awn is about 1.5 cm. long.

Stipa richardsoni var. *major* Macoun, Cat. Can. Pl. 4: 191. 1888. No description is given. "This form exactly matches Scribner's No. 341 from Montana."

DESCRIPTION.

Culms erect, glabrous, 50 to 100 cm. tall; sheaths glabrous, sometimes a little villous at the throat, the lower sometimes puberulent; ligule less than 1 mm. long; blades involute, scabrous, mostly less than 2 mm. wide when flat, 10 to 15 cm. long, sometimes longer; panicle open, 10 to 20 cm. long, the branches slender, mostly in pairs, distant, spreading or drooping, naked below, 8 to 15 cm. long, scabrous, bearing near the end a few spikelets on short branches; glumes 8 to 9 mm. long, about equal or the first a little longer, rather firm and broad, scaberulous, acute but not long-acuminate, often purplish, 3-nerved but the nerves rather obscure; lemma about 5 mm. long, the callus about 1 mm. long, densely barbed with white hairs, the body fusiform, brown, villous, sparingly villous or glabrate toward the minutely papillate, narrowed summit; awn 2.5 to 3 cm. long, twice-geniculate but the first bend often obscure, appressed-hispidulous and twisted to the second bend, the first and second segments together 7 to 9 mm. long, the third segment straight, scabrous. (Pl. 50, figs. 14, 15. *Hitchcock* 11468.)

DISTRIBUTION.

Bottom lands and wooded slopes, Saskatchewan to Colorado and British Columbia.

SASKATCHEWAN: Without locality, *Macoun* 103.

ALBERTA: Jasper, *Macoun* 98207. Banff, *Hitchcock* 5035, 11468. Waterton Lake, *Macoun* 13346. Old Bow Fort, *Macoun* 131. Silver City, *Macoun* in 1885.

BRITISH COLUMBIA: Shusmap Lake, *Macoun* 15.

SOUTH DAKOTA: Custer, *Griffiths* 703; *Rydberg* 1113.

MONTANA: Columbia Falls, *Hitchcock* 4940; *Williams* 601. North Fork Smith River, *Scribner* 341. Anaconda, *Jones* in 1905. Jack Creek Canyon, *Rydberg & Bessey* 3549. Garrison, *Rydberg* 2125. Silver Bow, *Rydberg* 2109. Castle, *Rydberg* 3233; *Shear* 357. Monarch, *Spragg* 691. Medicine Springs, *Chase* 5229. Lolo Hot Springs, *Chase* 5135.

WYOMING: Big Horn Mountains, *Williams* 2732. South Fork Clear Creek, *Williams & Griffiths* 97a. Sour Dough Creek, *Williams & Griffiths* 97. Crazy Woman Creek, *Williams & Griffiths* 23. Teton Forest Reserve, *Tweedy* 68; *Merrill & Wilcox* 372, 395. Welcome, *Williams* 2676½. Inyan Kara Mountain, *Griffiths* 649, 666. Yellowstone National Park, *Tweedy* 611; *Hitchcock* 1963; *Nelson* 5900, 5940; *Knowlton* in 1888.

COLORADO: North Park, *Crandall* in 1890. Laramie County, *Osterhout* in 1897.

8. *Stipa avenacioides* Nash.

Stipa avenacioides Nash, Bull. Torrey Club 22: 423. 1895. "Collected by writer in 1895 in the pine lands near Cassia, Lake Co., Florida, no. 2051." The type collection is widely distributed. Cassia is in the vicinity of Eustis.

DESCRIPTION.

Culms in small tufts, erect, glabrous or minutely scaberulous, 2 or 3-noded, about 1 meter tall; sheaths glabrous or minutely scaberulous; ligule 2 to 3 mm. long, decurrent; blades slender, involute, glabrous beneath, less than 1 mm. thick when rolled, 15 to 30 cm. long, the uppermost reduced; panicle open, 10 to 20 cm. long, the branches mostly in two's, slender, spreading, few-flowered, naked below, the pairs distant; glumes equal, about 2 cm. long, broad, often purple, tapering into a point, papery, faintly several-nerved, glabrous; lemma brown, linear, 1.5 to 2 cm. long including the callus, this about 7 mm. long, tapering into a fine point, densely barbed with brown hairs, the body glabrous, minutely papillate

at the slightly contracted neck, slightly hispidulous on the crown; awn, 8 to 11 cm. long, scabrous, twice-geniculate, the second bend at about the middle, the first segment twisted, about 3 to 4 cm. long, the second slightly twisted, the third straight. (Pl. 50, figs. 16, 17. *Curtiss* 5834.)

DISTRIBUTION.

Dry pine woods, peninsular Florida.

FLORIDA: Okeechobee region, *Fredholm* 5725. Clarcona, *Meislahn* 191. Palma Sola, *Tracy* 7031. Manatee, *Combs* 1335. Grasmere, *Combs & Baker* 1075 1155. Merrimack, *Baker* 115. Eustis, *Nash* 2051. Eau Gallie, *Curtiss* 5834. Duval County, *Fredholm* 5092. Tavares, *Hitchcock* 812. Braidentown, *Hitchcock* 967.

9. *Stipa spartea* Trin.

Stipa spartea Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. 1: 82. 1830. "V. spp. Amer. bor." [Specimen seen from North America.] The type, in the Trinius Herbarium, is labeled "Rocky Mountains near the Missouri, no. 253 of Hook. Cat." The mature lemma is 16 mm. long, first segment of awn 7.5 cm., second segment, 1.5 cm., third segment 5 cm. long. The original spelling of the specific name is *sparta*, but Trinius corrects this later to *spartea*.¹¹

DESCRIPTION.

Culms in small tufts, erect, glabrous, about 1 meter tall, mostly 2-noded; sheaths glabrous; ligule rather firm, 4 to 5 mm. long, decurrent, shorter on the innovations; blades flat, more or less involute in drying, glabrous beneath, very scabrous and sometimes pubescent on the upper surface, 20 to 30 cm. long, 3 to 5 mm. wide, tapering to a capillary point, those of the innovations more slender, often involute, and sometimes 50 or 60 cm. long; panicle narrow, nodding, 15 to 20 cm. long, the branches few, distant, solitary or clustered, slender, ascending, scabrous, bearing 1 or 2 spikelets, the lowermost as much as 10 cm. long, all finally drooping with the weight of the fruit; glumes nearly equal, narrow, pale, papery, glabrous, with 5 strong nerves and additional intermediate nerves, 3 to 4 cm. long, tapering to a fine soft awnlike point; lemma subcylindric, brown, 1.6 to 2.5 cm. long, the callus about 7 mm. long, gradually tapering to a fine sharp point, densely barbed with brown hairs, the body slightly tapering above the callus, decreasingly pubescent upward, the upper half minutely roughened, glabrous except for a line of pubescence on one side, the crown ciliate with short erect hairs; awn stout, 12 to 20 cm. long, twice-geniculate, the first segment scabrous, twisted, 5 to 8 cm. long, the second more loosely twisted, flexuous, mostly 2 to 3 cm. long, the third straight, slender. (Pl. 50, figs. 18, 19. *Hitchcock* 11020.)

Standley's no. 6223 from New Mexico is like *S. spartea* in size, but the floral parts are smaller than usual for that species. It is intermediate between this and *S. spartea curtiseta*.

DISTRIBUTION.

Prairies, Ontario to British Columbia, and south to Kansas.

ONTARIO: Sarina, *Morris* 194. Squirrel Island, *Dodge* 61.

MANITOBA: Birtle, *Herriot* 77178.

ALBERTA: Edmonton, *Hitchcock* 11368.

BRITISH COLUMBIA: Kamloops, *Macoun* 17. Lower Arrow Lake, *Macoun* 105.

¹¹ Mém. Acad. St. Pétersb. VI. Sci. Nat. 1: 68. 1842.

- INDIANA: Morocco, *Deam* 31659. Lake Maxinkuckee, *Clark* 1856. Pretty Lake, *Deam* 15939. Dune Park, *Chase* 2042, 6146. Miller, *Chase* 1794. Porter County, *Deam* 36679.
- ILLINOIS: Galva, *V. H. Chase* 1750. Joliet, *Skeels* 248. Hanover, *Gleason & Gates* 2602. St. Clair County, *Eggert* 280. Wady Petra, *V. H. Chase* 1206. Naperville, *Kneucker Gram. Exs.* 846.
- MICHIGAN: Akron, *Dodge* in 1910. Woodward Lake, *Wheeler* in 1880. Lansing, *Beal* in 1881.
- WISCONSIN: Polk County, *Burglehaus* in 1892. Milwaukee, *Lapham*. Lauderdale, *Bebb* 2061.
- MINNESOTA: Fort Snelling, *Mearns* 737. Heron Lake, *Skinner* 54. Spring Grove, *Rosendahl* 314. Minneapolis, *Sandberg* 299.
- NORTH DAKOTA: Grand Forks, *Brannon* 12. Leeds, *Lunell* in 1901. Fargo, *Minns*.
- SOUTH DAKOTA: Aberdeen, *Griffiths* 820. Custer, *Rydberg* 1110; *Hitchcock* 11113.
- IOWA: Missouri Valley, *Pammel* 672. Marshall County, *Ball* 18. Little Rock, *Ball* 406. Iowa City, *Somes* 3216. Ames, *Hitchcock* 11020; *Ball* 177.
- NEBRASKA: Halsey, *Hitchcock* 11062. Thedford, *Rydberg* 1402.
- MISSOURI: Lees Summit, *Bush* 302, 3937.
- KANSAS: Manhattan, *Hitchcock* 2520, 10418. Riley County, *Norton* 592.
- WYOMING: Bear Lodge Mountains, *Griffiths* 990; *Williams* 2640. Manhattan, *Williams* 2683.
- NEW MEXICO: Sierra Grande, *Standley* 6223.

9a. *Stipa spartea curtiseta* Hitchc., subsp. nov.

DESCRIPTION.

Differing from the typical form of the species in the shorter awn, shorter glumes, and shorter fruiting lemma. Culms rather slender, mostly 30 to 60 cm. tall; blades mostly slender and involute; glumes mostly 2 to 3 cm. long; fertile lemma mostly 12 to 15 mm. long; first segment of awn 2 to 4 cm. long, the third segment 1 to 4 cm. long.

Type in the U. S. National Herbarium, no. 745,744, collected in Hound Creek Valley, Montana, August 1, 1883, by F. Lamson-Scribner (no. 339).

This form may represent a distinct species, but the differences by which it is distinguished from *S. spartea* are those of degree rather than of kind. The nearly distinct range would indicate a transition to a distinct species.

Some of the specimens have been referred previously to *S. comata intermedia*, from which this form can be distinguished by the differences between the mature lemmas and the ligules (the same characters which distinguish *S. comata* and *S. spartea*). In *S. comata* the lemma is pale and more or less villous to the summit and the ligule is long and papery; in *S. spartea* the lemma is brown and glabrous on the upper part, except for a line of pubescence along one side, and the ligule is short and firm.

DISTRIBUTION.

Dry open ground, Manitoba to Alberta and Wyoming.

MANITOBA: Birtle, *Herriot* 77177.

SASKATCHEWAN: Bredenbug, *Herriot* 77179. Prince Albert, *Macoun* 13344.

ALBERTA: Waterton Lake, *Macoun* 13343.

MONTANA: Hound Creek Valley, *Scribner* 339. Central Montana, *Spragg* 408.

Columbia Falls, *Williams* 960. Flathead Region, *Ayres* in 1883.

WYOMING: Sundance, *Griffiths* 478.

10. *Stipa avenacea* L.

Stipa avenacea L. Sp. Pl. 78. 1753. "Habitat in Virginia." The type, in the Linnaean Herbarium,¹² is from Gronovius.

Stipa barbata Michx. Fl. Bor. Amer. 1: 53. 1803. Not *S. barbata* Desf. 1798. "Hab. in sylvis Virginia et Carolinae superioris." The specimen, in the Michaux Herbarium at Paris, is labeled "In sylvis Virginiae Carolinae."

Stipa virginica Pers. Syn. Pl. 1: 99. 1805. Persoon renames *S. barbata* Michx. and cites the same habitat.

Stipa diffusa Willd. "hbr."; Steud. Nom. Bot. ed. 2. 2: 642. 1841, as synonym of *S. avenacea* L.

DESCRIPTION.

Culms few in a tuft, erect, glabrous, 60 to 100 cm. tall; sheaths glabrous; ligule rather firm, about 3 mm. long on the culm leaves, about 2 mm. long on the innovations; blades flat (about 1 mm. wide) or involute, very slender, glabrous, sometimes scabrous especially toward the tip, 20 to 30 cm. long, the uppermost culm blade reduced; panicle open, 10 to 15 cm. long, the branches in two's or three's, distant, slender, scabrous, ascending, finally drooping, mostly 2 to 4 cm. long, bearing 1 or 2 spikelets; glumes equal, about 1.5 cm. long, papery, rather broad, somewhat abruptly contracted into an acuminate point, 5-nerved, the first sometimes obscurely so; lemma dark brown, 9 to 10 mm. long, the sharp acute callus about 2 mm. long, densely barbed, the upper hairs 2 to 3 mm. long, the body glabrous, papillate-roughened toward the summit, not narrowed into a neck, the crown slightly hispidulous; awn scabrous, 4.5 to 6 cm. long, twice-geniculate, the first segment twisted, about 2 cm. long, the second slightly twisted, 1 cm. long, the third straight. (Pl. 50, figs. 20, 21. *Kneucker Gram. Exs.* 564.)

DISTRIBUTION.

Dry or rocky open woods, Massachusetts to Florida and Texas.

MASSACHUSETTS: Malden, *Boott* in 1861. Marthas Vineyard, *Seymour* 1060.

CONNECTICUT: North Stonington, *Weatherby* 4122.

NEW YORK: Eastport, *Chase*, 7401.

NEW JERSEY: Egg Harbor, *Chase* 7312.

PENNSYLVANIA: Philadelphia, *Scribner* in 1881.

INDIANA: Mongo, *Deam* 20709; 36302.

MICHIGAN: Portage, *Burgess* 227.

DELAWARE: Wilmington, *Commons* in 1875.

MARYLAND: Great Falls, *Chase* 2321; *Kneucker, Gram. Exs.* 564; *Ball* 707.

High Island, *Pollard* 322.

VIRGINIA: Great Falls, *Chase* 3705. Hampton, *Miller* in 1903. Northwest, *Kearney* 1102.

NORTH CAROLINA: Wilmington, *Chase* 7220. Biltmore, *Biltmore Herbarium* 960b, 960. Chimney Rock Mountain, *Biltmore Herbarium* 960a.

SOUTH CAROLINA: Spartanburg, *McCarthy* in 1888. Clemson College, *Hitchcock* in 1901.

GEORGIA: Stone Mountain, *Eggert* 36; *Hitchcock* 1346. Lookout Mountain, *Ruth*, 93.

FLORIDA: Old Town, *Combs* 876. Lake City, *Rolfs* 43. Gainesville, *Garber* in 1876.

TENNESSEE: Knoxville, *Ruth* in 1895. Lenoir, *Matthews* in 1897.

ALABAMA: Montgomery, *Mohr* in 1868. Tuskegee, *Carver* 44. Auburn, *Hitchcock* 1318, 1341.

MISSISSIPPI: Biloxi, *Tracy* 4544.

LOUISIANA: Natchitoches, *Ball* 158. Calhoun, *Hitchcock* 1271.

TEXAS: Houston, *Hall* 765. Palestine, *Plank* 53. Angelina County, *Reverchon* 4128.

¹² Types of American Grasses Contr. U. S. Nat. Herb. 12: 122. 1908.

11. *Stipa saxicola* Hitchc., sp. nov.

DESCRIPTION.

Culms glabrous, slender, 60 cm. tall; sheaths glabrous; ligule of culm leaves firm, 2 to 3 mm. long, of the innovations less than 1 mm. long; blades slender (0.5 to 1 mm. thick), involute, glabrous, 10 to 20 cm. long; panicle open, 10 cm. long, the branches slender, flexuous, distant, in pairs, bearing one or two spikelets, sparingly scabrous, the bracts at the base of the branches 2 to 3 mm. long; glumes nearly equal, 2.5 to 3 cm. long, long-acuminate, 5-nerved, glabrous; lemma brown, 1.5 cm. long, the callus slender, very sharp, densely barbed with tawny hairs, the body sparsely villous, the summit with a few erect short stiff hairs; awn 7 to 8.5 cm. long, twice-geniculate, the first segment 2 to 3 cm. long, twisted, pubescent with short appressed hairs, the second segment like the first, 1.5 to 2 cm. long, the third straight, scabrous. (Pl. 51, figs. 1, 2. Hitchcock 6488.)

Type in U. S. National Herbarium, no. 993,394, collected on a rocky hill, Esperanza, State of Puebla, Mexico, August 28, 1910, by A. S. Hitchcock (no. 6488). This is the only specimen seen.

This resembles *Stipa spartea curtiseta* in general appearance, but differs in the more open panicle, with slender flexuous branches, and the sparsely villous body of the lemma.

In an earlier work on Mexican Grasses¹³ this specimen was referred to *S. melanosperma* Presl. The latter has pilose panicle branches and pedicels, the body of the fruiting lemma is glabrous, and the nerves of the glumes are connected by a few flexuous anastomosing lines. The type locality of *S. melanosperma* is unknown. The type, which was examined at the National Museum at Prague, consists of a panicle only, and the label bears nothing but the name.

Hassler's no. 9469 from Paraguay, named by Hackel¹⁴ *Stipa melanosperma* var. *erythrina*, answers to the description in every detail except that Presl says the nerves of the glumes are hispid ("nervis pilis brevissimis rigidulis hispidae"). However, the glumes of the type of *S. melanosperma* are glabrous. Haenke, who collected the latter species, visited Chile, but the species is not known from that country. Hassler's no. 12090 from Paraguay and Dusen's no. 10874 from Paraná are also *S. melanosperma*. All three specimens agree in having the nerves of the glumes connected by anastomosing lines as in the type. Spegazzini¹⁵ includes *S. melanosperma* in his account of the Stipeae Platenses, recording it from Paraguay and from Santa Fé.

12. *Stipa comata* Trin. & Rupr.

Stipa comata Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5¹: 75. 1842. "Carlton House Fort ad fl. Saskatchewan (Drummond); ad ripas et in planitie fl. Columbia prope 'Missouri Portage' (Douglas)." The type, in the Trinius Herbarium, is the first of the specimens cited, and is labeled "*Stipa capillata* T 12 Hooker mis." Trinius and Ruprecht cite with the original description two synonym, *S. juncea* Nutt. not L., with doubt, and "*Stipa capillata* Hooker! Fl. Bor. Amer. 2. (1840) p. 237." In the type the glumes are 2 cm. long, the lemma 12 mm. long, the awn about 15.5 cm. long, the first segment 3 cm., the second, 1.5 cm. and the third, sinuous. Hooker misapplied the name *S. capillata* L.

¹³ Contr. U. S. Nat. Herb. 17: 282. 1913.

¹⁴ Repert. Nov. Sp. Fedde 6: 345. 1909.

¹⁵ Anal. Mus. Nac. Montevideo 4: 67. 1901.

DESCRIPTION.

Culms cespitose, glabrous or sometimes puberulent around the nodes, 30 to 60 cm. tall, rarely as much as 1 meter; sheaths glabrous or scabrous, naked at the throat, the uppermost usually inflated; ligule thin, 3 to 4 mm. long, decurrent, 1 to 2 mm. long on the innovations; blades flat or involute, smooth or scaberulous beneath, scaberulous on the upper surface, 10 to 30 cm. long, the uppermost shorter, 1 to 2 mm. wide; panicle narrow, 10 to 20 cm. long, usually partly inclosed in the uppermost sheath, the branches slender, scabrous, ascending or appressed, naked below, mostly two at a node, bearing one to few spikelets, the lowermost as much as 10 cm. long; glumes 1.5 to 2 cm. (rarely 3) cm. long, about equal, papery, gradually narrowed to a soft awnlike point, 5-nerved; lemma 8 to 12 mm. long, mostly about 1 cm., pale or finally brownish, the callus about 3 mm. long, slender, very acute, densely barbed with tawny hairs, the body slightly tapering from just above the callus, villous with short appressed hairs or glabrate toward the summit, the joint with the awn distinct, glabrous or slightly hispidulous; awn indistinctly twice-geniculate, scabrous, somewhat deciduous, the first segment straight, twisted, 1.5 to 4 cm. long, the second loosely twisted, flexuous, mostly 1 to 2 cm. long, the third capillary, very sinuous or merely curved, mostly 10 to 12 cm. long. (Pl. 51, figs. 3, 4. *Hitchcock* 1700.)

DISTRIBUTION.

Prairies, plains, and dry hills, Minnesota to Yukon Territory, south to Texas and California.

MANITOBA: Brandon, *Macoun* 13342.

SASKATCHEWAN: Moose Jaw, *Macoun* 13341.

ALBERTA: Rosedale, *Moodie* 952. Lethbridge, *Hitchcock* 4964. Calgary, *Hitchcock* 11452. Edmonton, *Hitchcock* 11376.

BRITISH COLUMBIA: Kamloops, *Macoun* 19. Spences Bridge, *Macoun* 20. Lake Osoyoos, *Macoun* 77228. Lillooet, *Macoun* 91570.

YUKON: Five Finger Rapids, *Tarleton* 85.

INDIANA: Noble County, *Deam* 40826.

WISCONSIN: Brown County, *Schuette* in 1883.

MINNESOTA: St. Anthony Park, *Oswald* in 1911.

NORTH DAKOTA: Devils Lake, *Brannon* 54. Leeds, *Lunell* in 1901 and 1911. Dickinson, *Ball* 2100.

SOUTH DAKOTA: Aberdeen, *Griffiths* 86. Custer, *Hitchcock* 11110; *Rydberg* 1111. Edgemont, *Hitchcock* 11093.

IOWA: Little Rock, *Ball* 406.

NEBRASKA: North Platt, *Rydberg* 2024; *Shear* 278. Halsey, *Hitchcock* 11044. Thedford, *Rydberg* 1344.

KANSAS: Garden City, *Hitchcock* in 1903. Morton County, *Hitchcock* 593.

TEXAS: Paloduro Canyon, *Reverchon* 2821. Big Spring, *Tracy* 7910. Channing, *Williams* 3060.

MONTANA: Billings, *Hitchcock* 11202. Smith River, *Scribner* 338. Spanish Basin, *Rydberg* 3152. Manhattan, *Shear* 433, 2195; *Rydberg* 2196. Melrose, *Shear* 350. Hamilton, *Chase* 5205. Wilsall, *Suksdorf* 238. Bozeman, *Tweedy* 1015.

WYOMING: Sundance, *Griffiths* 509, 944. Gillette, *Hitchcock* 11190. Guernsey, *Nelson* 8313. Jacksons Hole, *Merrill & Wilcox* 277. Orin Junction, *Williams* 2569. Cassa, *Nelson* 8360. Red Desert, *Nelson* 7135. Yellowstone National Park, *Hitchcock* 1917.

- IDAHO: Shoshone Falls, *Chase* 4706. Caldwell, *Chase* 4764. American Falls, *Chase* 4668. Jerome, *Chase* 4691. Pocatello, *Chase* 4634, 4647; *Hitchcock* 1835. Nez Perce County, *Sandberg, Heller & MacDougal* 293. Big Butte Station, *Palmer* 213 in 1893. Payette Project, *Macbride* 871.
- WASHINGTON: Douglas County, *Sandberg & Leiberg* 240. Washtucna, *Elmer* 1033. Spokane, *Piper* 2600. Wenatchee, *Whited* 1130, 1229. Sunnyside, *Griffiths & Cotton* 19.
- OREGON: Dalles, *Howell* in 1881. Bulton Springs, *Leiberg* 388. Snake River, *Sheldon* 8204. Catlow Valley, *Griffiths & Hunter* 322.
- COLORADO: Arboles, *Baker* 220. Trinidad, *Standley* 6015. Salida, *Eggleston* 6671. Delta, *Tidestrom* 2174. Manitou, *Chase* 5301; *Hitchcock* 1700. Platte River, *Jones* 201.
- UTAH: Indianola, *Tidestrom* 2243. Marysvale, *Rydberg & Carlton* 7052; *Jones* 5388. La Sal Mountains, *Rydberg & Garrett* 8592. La Verken, *Jones* 5182. Springdale, *Jones* 5252. Silver Reef, *Jones* 5163. Milford, *Jones* 1786. Glenwood, *Ward* 73.
- NEVADA: Austin, *Hitchcock* 10605. Karshaw, *Gooding* 966. Reese Valley, *Watson* 1293. Ely, *Hitchcock* 10848. Lone Mountain, *Hitchcock* 10728. Kings Canyon, *Baker* 1116. Truckee Mountains, *Watson* 1294.
- NEW MEXICO: Santa Fe, *Heller* 3576. Raton, *Standley* 6260. Tunitcha Mountains, *Standley* 7676, 7819. Raton Mountains, *Griffiths* 5106. Ute Park, *Standley* 14300.
- ARIZONA: Flagstaff, *Hitchcock* 13236; *Chase* 5835, 5842; *Leiberg* 5556. Adamana, *Chase* 5857; *Hitchcock* 10425. Hell Canyon, *Rusby* 46. Little De Motte Park, *Jones* 6056. Grand Canyon, *Hitchcock* 10445.
- CALIFORNIA: Benton, *Tidestrom* 9993. Orland, *Heller* 11434. Mount Tallac, *Hitchcock* 3125. Mono Lake, *Bolander* 26. Bishop Creek, *Davidson* 2536.

12a. *Stipa comata intermedia* Scribn.

Stipa comata intermedia Scribn. Bot. Gaz. 11: 171. 1886. Not *S. intermedia* Trin. 1842. "Junction Butte, alt. 6,000 ft." The article is on a collection of grasses made in Yellowstone Park by Frank Tweedy. The specimen described, no. 610, is in the U. S. National Herbarium.

Stipa tweedyi Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11: 47. 1898. A new name for *Stipa comata intermedia* Scribn.

Stipa spartea var. *tweedyi* Jones, Contr. West. Bot. 14: 11. 1912. Based on *S. tweedyi* Scribn.

DESCRIPTION.

Differing from *Stipa comata* in the shorter straight third segment of the awn; glumes and lemma averaging a little longer; panicle usually exerted from the uppermost sheath. The ligule is long, as in *S. comata*. (Pl. 51, fig. 5. *Tweedy* 610.)

DISTRIBUTION.

Habitat and range as in *S. comata*, but not extending so far east.

SASKATCHEWAN: Lipton, *Clokey* 1618.

ALBERTA: Craigmyle District, *Brinkman* in 1922.

MONTANA: Jefferson City, *Scribner* 338. Pony, *Rydberg & Bessey* 3550. Spanish Basin, *Rydberg* 3156.

WYOMING: Evanston, *Williams* 2421, 2438. Yellowstone Park, *Tweedy* 610; *Mearns* 1307, 2610, 2714; *Hitchcock* 2019. Jacksons Hole, *Merrill & Wilcox* 316. Antelope Basin, *Nelson* 7497. Laramie Hills, *Nelson* 417. Specimen Ridge, *Nelson & Nelson* 5886.

- IDAHO: Victor, *Merrill & Wilcox* 210, 212. Picabo, *Macbride & Payson* 2960; St. Anthony, *Merrill & Wilcox* 127. Bear Lake, *Williams* 2559.
- WASHINGTON: Spokane County, *Suksdorf* 8990, 8990b.
- COLORADO: Gunnison, *Shear* 944. Black Canyon, *Baker* 118. Twin Lakes, *Wolfe* 1103. Mancos, *Baker, Earle & Tracy* 383. Veta Pass, *Clements* 122; *Shear* 821.
- UTAH: Charleston Mountains, *Heller* 11020. Ely, *Hitchcock* 10838. Austin, *Hitchcock* 10639. Silver Reef, *Jones* 5149. Ephraim, *Tidestrom* 1260.
- NEW MEXICO: Glorieta, *Vasey* in 1881. Without locality, *Fendler* 980.
- ARIZONA: Grand Canyon, *Hitchcock* 10450; *MacDougal* 171; *Chase* 5805, 5817. Hell Canyon, *Rusby* 877.
- CALIFORNIA: Redding, *Heller* 12334. Fallen Leaf Lake, *Eastwood* 1058. White Mountains, *Jepson* 7294.

12b. *Stipa comata intonsa* Piper.

Stipa comata intonsa Piper, Contr. U. S. Nat. Herb. 11: 109. 1906. "Near Rockland, Klickitat County, *Suksdorf* 1026, type." The type collection is widely distributed.

DESCRIPTION.

Differing from *S. comata* in having pubescent foliage. Scarcely more than a form of that species.

DISTRIBUTION.

Dry sandy prairies, eastern Washington.

WASHINGTON: Rockland, *Suksdorf* 1026, 4447.

13. *Stipa pulchra* Hitchc.

Stipa pulchra Hitchc. Amer. Journ. Bot. 2: 301. 1915. "Type specimen in the U. S. National Herbarium, no. 416,590, collected in a railroad cut three miles south of Healdsburg, Sonoma county, California, April 9, 1902, by A. A. Heller (no. 5252)."

This has usually been referred to *S. setigera* Presl¹⁶ in works on California botany.

DESCRIPTION.

Culms glabrous, often pubescent below the nodes, sometimes scabrous below the panicle, erect or spreading at base, 60 to 100 cm. tall; sheaths glabrous or scaberulous, pubescent on the margin, a little pilose at the throat and on the collar; ligule about 1 mm. long; blades flat or involute, 1 to 2 mm. wide, glabrous beneath, scaberulous or pubescent on the upper surface, 10 to 20 cm. long; panicle open, 10 to 20 cm. long, the branches distant, slender, spreading, flexuous, scabrous or appressed-hispid, bearing 2 to several spikelets, often somewhat pilose at the axil; glumes about 1.5 cm. long, subequal, or the first a little longer, acuminate, 3-nerved, usually purplish, roughish on the nerves; lemma at maturity pale or rather dark, 8 to 10 mm. long, the callus sharp, about 2 mm. long, densely barbed with tawny hairs, the body minutely papillate-roughened, sparsely pubescent, especially along the back, sometimes glabrate toward the summit, constricted into a short neck scarcely 1 mm. long, the summit bearing a row of stiff erect hairs about 1 mm. long; awn 5.5 to 9 mm. long, twice-geniculate, rather easily deciduous, the first segment 1.5 to 2 cm. long, twisted, appressed-hispid, the second like the first, about 1 cm. long, the third straight and slender, scabrous; anthers tipped with a minute tuft of hairs. (Pl. 51, figs, 6, 7. *Chase* 5598.)

¹⁶ Presl. Rel. Haenk. 1: 226. 1830.

DISTRIBUTION.

Dry hills and deserts, central California to Lower California.

CALIFORNIA: San Diego, *Brandege* 833; *Parish Brothers* 1550, 1554; *Pringle* in 1882. Capay Valley, *Lemmon* 5455. Healdsburg, *Heller* 5252. San Luis Obispo, *Jones* 3233; *Lemmon* 5472. Arroyo del Puerto, *Brewer* 1262. Santa Barbara, *Elmer* 3874, 3935; *Chase* 5598, 5622, 5636. Pacific Grove, *Elmer* 3507; *Chase* 5659; *Hitchcock* 2621. San Clemente Island, *Trask* 361. San Nicolas Island, *Trask* 16. Santa Catalina Island, *Knopf* 201. North Fork, *Griffiths* 4601. Marysville Buttes, *Heller* 11804. Ballona Harbor, *Abrams* 1185. Winchester, *Hall* 2921. Riverside, *Hall* 2977. Borax Lake, *Torrey* 579. Stony Creek, *Hansen* 1668. Sacramento Valley, *Hartweg* 2028. Playa del Rey, *Chase* 5549. Ventura, *Chase* 5589. San Bernardino, *Chase* 5527. Berkeley, *Chase* 5664. Mount Tamalpais, *Chase* 5670. Without locality, *Kellogg & Harford* 1096, *Bolander* 4802.

LOWER CALIFORNIA: Guadalupe Ranch, *Orcutt* in 1886.

14. *Stipa leiantha* Hitchc., sp. nov.

DESCRIPTION.

Culms erect, rather slender, glabrous, about 60 cm. tall; sheaths glabrous; ligule rather firm, 1 to 2 mm. long; blades involute, filiform, scabrous, 10 to 15 cm. long on the innovations, shorter on the culm; panicle narrow, few-flowered, 15 to 20 cm. long, the branches few, distant, appressed, the lower in pairs or threes, the shorter with one or two spikelets, the longer naked at base, with about 3 spikelets, the axis and branches smooth, the pedicels sometimes sparsely scabrous; glumes about equal, 7 to 8 mm. long, rather firm, glabrous, broad, abruptly acute or short-acuminate, purple below, tawny above, obscurely 3 to 5 nerved; lemma about 6 mm. long, the callus 1 mm. long, sharp, densely barbed with brown hairs as much as 2 mm. long, the body oblong, terete, glabrous, light brown (lighter than the callus), very minutely granulose or scaberulous near the slightly contracted summit; awn 1.5 to 2 cm. long, twice-geniculate, densely short-pilose to the second bend, the first segment about 7 mm. long. (Pl. 51, figs. 8, 9. *Hitchcock* 6489.)

Type in the U. S. National Herbarium, no. 993,443, collected on a rocky hill at Esperanza, State of Puebla, Mexico, altitude 2,600 meters, August 28, 1910, by A. S. Hitchcock (no. 6489).

Known only from the type specimen.

15. *Stipa pringlei* (Beal) Scribn.

Oryzopsis pringlei Beal, Bot. Gaz. 15: 112. 1890. "No. 1410, C. G. Pringle, collected in Chihuahua, Mexico, 1887, and distributed as *Stipa Pringlei* Scribn." The type collection is widely distributed.

Stipa pringlei Scribn. in Vasey, Contr. U. S. Nat. Herb. 3: 54. 1892. Based on *Oryzopsis pringlei* Beal.

DESCRIPTION.

Culms cespitose, erect, glabrous, sometimes puberulous about the nodes, mostly about 1 meter tall; sheaths glabrous; ligule about 2 mm. long, decurrent; blades flat or those of the innovations involute, firm, erect, scabrous, 10 to 30 cm. long, 1 to 3 mm. wide; panicle nodding, 10 to 15 cm. long, the branches ascending, few-flowered, naked below, the axis glabrous, the branchlets and pedicels slightly scabrous; glumes equal, about 1 cm. long, membranaceous, broad, rather abruptly narrowed into a short point, glabrous, the first about 9-nerved, the second about 7-nerved; lemma 7 to 8 mm. long, oblong-elliptic,

brown, villous with appressed brownish hairs, the surface also minutely papillate, the callus 1 mm. long, densely barbed, the abruptly narrowed summit with a dense ring of short brown hairs; awn about 2 cm. long, obscurely twice-geniculate, scabrous, twisted to the second bend. (Pl. 51, figs. 10, 11. *Hitchcock* 7681.)

DISTRIBUTION.

Rocky woods and slopes, New Mexico and Arizona to Chihuahua.

NEW MEXICO: Turkey Creek, *Metcalf* 557. Queen, *Hitchcock* 13553.

ARIZONA: Huachuca Mountains, *Griffiths* 4836; *Mearns* 2573; *Pringle* in 1884.

Rincon Mountains, *Nealley* 66. White Mountains, *Griffiths* 5298. Flagstaff, *Griffiths* 4976; *Tracy* 130. McKays Peak, *Wooton* in 1913. Chiricahua Mountains, *Lemmon* 4678; *Blumer* 1405. Santa Rita Mountains, *Griffiths & Thornber* 107; *Williams, Hitchcock* in 1903.

CHIHUAHUA: Sierra Madre, *Pringle* 1410. Sánchez, *Hitchcock* 7677, 7681.

16. *Stipa eminens* Cav.

Stipa eminens Cav. Icon. Pl. 5: 42. pl. 467. f. 1. 1799. "Habitat prope oppidium mexicanum Chalma." The type, at the Madrid Botanical Garden, is labeled, "Chalma en Nueva-Espana. Née dedit." The lemma is 6 mm. long, the first segment of the awn is 5 mm., the second 5 mm., and the third 2 cm. The description states that the awn is an inch and one-half long, bent about the middle. The awn is twice-geniculate, but the first bend is rather obscure.

Stipa erecta Fourn. Mex. Pl. 2: 75. 1886. Not *S. erecta* "Ht. Madr.;" Trin. 1824. The only specimen cited is "Tehuacán, (*Liebm.* n. 654)." The type specimen, bearing the name in Fournier's hand, is in the Copenhagen Herbarium. The lemmas are only 4.5 mm. long; the awn is a little over 2 cm. long.

Stipa flexuosa Vasey, Bull. Torrey Club 15: 49. 1888. "G. C. Nealley, Western Texas." In the type, in the U. S. National Herbarium, the lemma is 5 mm. long, the awn 4.5 cm. long, the third segment 3.5 cm. long, the first bend obscure.

DESCRIPTION.

Culms slender, rather wiry, glabrous, 80 to 120 cm. tall; sheaths glabrous, short-villous at the throat; ligule 3 to 4 mm. long or even 6 mm. long on the culm leaves, about 1 mm. long on the innovations; blades flat or involute, glabrous or scaberulous, as much as 35 cm. long, 1 to 4 mm. wide; panicle open, 10 to 20 cm. long, usually densely pilose on the lower node, sometimes at the others, the branches slender, scabrous, spreading, often flexuous, usually 3 or 4, or even more, at a node, the lowermost 5 to 8 cm. long; glumes about 1.5 cm. long, the first a little longer, pale, 3-nerved, long-acuminate, glabrous; lemma pale, 5 to 7 mm. long, the callus 1 to 2 mm. long, densely barbed with white hairs, the body broadest about one-third from the callus, villous all over, narrowed above into an obscure neck; awn 3 to 6 cm. long, obscurely twice-geniculate, the first segment scabrous-hispid, twisted, about as long as the lemma, the second similar, a little shorter, the third flexuous, scabrous, not twisted. (Pl. 51, figs. 12, 13. *Palmer* 523.)

DISTRIBUTION.

Rocky hills, Texas to Arizona and south to central Mexico.

TEXAS: Presidio County, *Nealley* 155.

NEW MEXICO: Kingston, *Metcalf* 1330. Organ Mountains, *Wooton* 1070; *Hitchcock* 3768; *Standley* in 1906. Without locality, *Wright* 1998; *Emersley* 31.

ARIZONA: Camp Grant, *Rothrock* in 1874.

SONORA: Fronteras, *Hartman* 20.

CHIHUAHUA: Santa Eulalia Mountains, *Pringle* 384; *Wilkinson* in 1885.

DURANGO: Durango, *Palmer* 523 in 1896; *Hitchcock* 7624.

ZACATECAS: Zacatecas, *Hitchcock* 7524; *Pringle* 2043. Hacienda de Cedros, *Lloyd* 187, 212.

SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5671; *Parry & Palmer* 929.

QUERÉTARO: San Juan del Río, *Rose, Painter & Rose* 9581.

HIDALGO: Sierra de la Mesa, *Rose, Painter & Rose* 9099. Pachuca, *Hitchcock* 6700. Tula, *Rose, Painter & Rose* 8362.

MEXICO: Río Hondo, *Pringle* 6228.

FEDERAL DISTRICT: *Bourgeau* 669; *Hitchcock* 7837; *Pringle* 9564.

PUEBLA: Tehuacán, *Pringle* 6766; *Hitchcock* 6079. Chalchicomula, *Hitchcock* 6274. Esperanza, *Hitchcock* 6486; *Pittier* 443.

17. *Stipa clandestina* Hack.

Stipa clandestina Hack. Repert. Nov. Sp. Fedde 8: 516. 1910. "Mexico. Prope Michoacan leg. Fr. Arsène (no. 3441). Prope Saltillo in circ. Coahuila leg. E. Palmer, no. 3 (Apr. 1898)." These specimens have been examined in the Hackel Herbarium. The first cited may be taken as the type. In the U. S. National Herbarium is a specimen of this species collected by Brother Arsène (no. 3441), but it is from Saltillo. The Palmer collection also is in the U. S. National Herbarium.

DESCRIPTION.

Culms erect, glabrous, 50 to 80 cm. tall, the whole plant pale green; sheaths glabrous, hispid at the throat, the lower often concealing cleistogamous panicles; ligule a membrane about 1 mm. long or less, ciliate with stiff hairs 1 to 2 mm. long; blades folded or involute or the older lower ones flat, rather firm, glabrous, subulate-pointed, 10 to 20 cm. long, 1 to 2 mm. or even as much as 4 mm. wide; panicle narrow, pale, rarely purplish, 10 to 20 cm. long, often more or less inclosed in the uppermost sheath, the branches in distant fascicles, ascending or appressed, naked below, bearing several spikelets above, the axis glabrous, densely pilose at the lowermost node, more or less pilose at the other nodes; glumes equal, about 8 mm. long, papery, broad, abruptly acuminate, 3-nerved, scaberulous on the nerves and somewhat so between the nerves; lemma fusiform, pale, about 6 mm. long, the callus about 1 mm. long, densely barbed with white hairs, the body densely white-villous below, glabrate in streaks above, narrowed toward summit, this ciliate with stiff erect hairs 1 mm. long; awn 11 to 18 cm. long, twice-geniculate, almost smooth, scaberulous on the angles only, slightly twisted to the second bend, the first and second segments each 3 to 5 mm. long. (Pl. 51, figs. 14, 15. *Arsène* 3441.)

The Colombian specimens differ slightly in having a nearly glabrous ligule, in being scarcely pilose on the lower nodes of the panicle axis, and in being less pilose at the summit of the fruit. The plants appear to be more lax. They may belong to a distinct species.

DISTRIBUTION.

Dry open ground, northern Mexico; also in Colombia.

COAHUILA: Saltillo, *Nil* in 1909; *Arsène* 3441, 3467; *Nicolas* in 1909; *Palmer* 3 in 1898; *Hitchcock* 5579.

COLOMBIA: Tierra Adentro, State of Cauca, *Pittier* 1334, 1438.

18. *Stipa lepida* Hitchc.

Stipa lepida Hitchc. Amer. Journ. Bot. 2: 302. 1915. "Type specimen in the U. S. National Herbarium, no. 733,683, collected on an open hillside in the Santa Ynez Forest Reserve, Santa Barbara County, California, April 19, 1910, by Agnes Chase (no. 5611)."

This species has been referred in California floras to *S. eminens* Cav.

DESCRIPTION.

Culms cespitose, often in large bunches, erect or spreading at base, glabrous or scaberulous, or the lower internodes pubescent, the upper ones sometimes puberulent below the nodes; sheaths glabrous, sometimes a little roughened, slightly villous at the throat; ligule very short, less than 1 mm. long; blades flat or soon involute, rather lax, glabrous or scaberulous beneath, pubescent on upper surface, 10 to 30 cm. long, 1 to 2 or even as much as 4 mm. wide; panicle open, nodding, 10 to 20 cm. long, the branches single, in pairs, or in clusters, ascending or more or less spreading, slender, scabrous, naked below (or with some short branches in the cluster), 5 to 8 cm. long, or sometimes longer, branching about the middle, bearing several or many pale or sometimes purplish spikelets, the branchlets appressed; glumes 6 to 8 mm. long, equal or the first a little longer, narrow, acuminate, glabrous, 3-nerved, lemma 4.5 to 5.5 mm. long, the callus less than 1 mm. long, barbed with white hairs, the body tapering from below the middle to the summit, brown at maturity, sparsely villous all over with white hairs or glabrate toward summit, the neck short and obscure, the summit with several short stiff appressed hairs; awn obscurely twice-geniculate, scaberulous, very slender, loosely twisted to the second bend, mostly 2.5 to 3.5 cm. long; anthers tipped with a minute tuft of hairs. (Pl. 51, figs. 16, 17. *Chase* 5609.)

DISTRIBUTION.

Dry hills, open woods, and rocky slopes, central California to Lower California.

CALIFORNIA: Santa Ynez Forest, *Chase* 5608, 5609, 5611, 5634, 5637. Oakland Hill, *Kellogg & Harford* 1095. Chico Meadows, *Heller* 11501. Los Angeles, *Grant* 2971; *Piper* 6291, 6300, 6310; *Chase* 5559. Santa Clara County, *Heller* 8548; *Hitchcock* 2674. Pasadena, *Jones* 3544. Chollas Valley, *Orcutt* 1065. San Bernardino, *Parish Brothers* 870; *Chase* 5535. Santa Catalina Island, *Trask* in 1901. Southern California, *Perry & Lemmon* 20.

LOWER CALIFORNIA: Cedros Island, *Palmer* 661 in 1889.

18a. *Stipa lepida andersoni* (Vasey) Hitchc.

Stipa eminens var. *andersoni* Vasey, *Contr. U. S. Nat. Herb.* 3: 54. 1892. "Lower California (Dr. Anderson, Dr. Hasse, Allen, and others)." The type, in the U. S. National Herbarium, was collected at Santa Cruz by C. L. Anderson in 1888 (no. 58). The locality, "Lower" California as given by Vasey is an error. The specimens collected by Hasse, Allen, and others, examined by Vasey, are all from southern California and not from Lower California.

Stipa hassei Vasey, *Contr. U. S. Nat. Herb.* 1: 267. 1893. "Dry ridges near Santa Monica, California. Type specimen collected in 1891 by Dr. H. E. Hasse, for whom it is named. It is nearly related to *Stipa eminens* [*S. lepida*] variety *andersoni* Vasey, which is found in the same region." The type is in the U. S. National Herbarium. The spikelets are distorted by a smut.

Stipa lepida andersoni Hitchc. *Amer. Journ. Bot.* 2: 303. 1915. Based on *S. eminens andersoni* Vasey.

DESCRIPTION.

Differing only in the more slender culms, the slender involute blades, and the narrow or reduced panicle. Scarcely a distinct variety.

DISTRIBUTION.

Dry or rocky hills, central and southern California.

CALIFORNIA: Ventura, *Chase* 5590. Santa Monica, *Hasse* in 1892. Santa Cruz Island, *Brandege* in 1888. Santa Cruz Mountains, *Lemmon* 5452. Berkeley, *Davy* 4235; *Chase* 5667. Santa Catalina Island, *Nuttall* 115, 336. Walker Valley, *Davy & Blasdale* 5040. Dunlap to Millwood, *Griffiths* 4653.

19. *Stipa porteri* Rydb.

Stipa porteri Rydb. Bull. Torrey Club 32: 599. 1905. Based on *Stipa mongolica* as described by Porter and Coulter,¹⁷ not *S. mongolica* Turcz. The only specimen mentioned by Porter and Coulter is Hall & Harbour 648. *Stipa mongolica* is mentioned earlier¹⁸ in Gray's enumeration of plants collected by Hall and Harbour. The number of the specimen is given as 646, that cited by Porter and Coulter being an error, as shown by the number found on the Hall and Harbour collection. Hall & Harbour 646 is therefore the type collection of *Stipa porteri*.

Beal,¹⁹ in transferring *Stipa mongolica* to *Oryzopsis*, probably had the Hall and Harbour plant in mind.

DESCRIPTION.

Culms erect, glabrous, mostly 20 to 35 cm. tall, exposing one node above the basal leaves; sheaths glabrous; ligule rather firm, 2 to 3 mm. long, that of the basal leaves a little shorter, oblong, somewhat 2-lobed, glabrous or minutely puberulent, the uppermost clasping the culm; blades involute, sulcate, scaberulous, slender, less than 1 mm. wide when rolled, 2 to 12 cm. long, the uppermost 2 to 4 cm. long; panicle open, mostly 5 to 8 cm. long, the branches mostly in pairs, slender, flexuous, 1 to 3 cm. long, unbranched or branched about the middle, sometimes again branched, the lowermost pair 2 to 2.5 cm. distant, the others a little closer, the main axis and the branches glabrous, the pedicels sparsely pilose below the spikelets; glumes equal, elliptic, broad and thin, obtuse, somewhat notched, about 5 mm. long, more or less purple-tinged, glabrous below, scaberulous at the tip and finely ciliate-fringed or pubescent at the apex, faintly 5-nerved; lemma about 5 mm. long including the rather blunt, densely pilose callus about 0.5 mm. long, softly pilose with appressed hairs on the lower half, scaberulous only above, faintly nerved, lobed at summit, the tips of the lobes and of the palea finely pubescent like the glumes, the palea about as long as the lemma; awn 12 to 15 mm. long, with a single bend one-third from the base, the first segment weakly twisted, plumose with hairs 1 to 2 mm. long, the second segment untwisted, 8 to 10 mm. long, pubescent with appressed hairs. (Pl. 51, figs. 18, 19. Wolfe 1109.)

This species is closely allied to *Stipa mongolica* Turcz. of central Asia. It differs in the pilose pedicels, the shorter spikelets and awns, and the less villous lemma.

DISTRIBUTION.

High mountains of Colorado.

COLORADO: Twin Lakes, Wolfe 1109. Without locality, Hall & Harbour 646; Vasey, Powell's Expedition, in 1868.

20. *Stipa thurberiana* Piper.

Stipa thurberiana Piper, U. S. Dept. Agr. Div. Agrost. Circ. 27: 10. 1900. "*S. occidentalis* Thurb. in Wilkes, U. S. Explor. Exped. 17: 483. 1874, not U. S. Geol. Explor. 40th Par. 5: 380. 1871." This species had been confused with *S. occidentalis*. The species described by Thurber in the first work cited, being different from the one he described under the same name in the second work, was distinguished by Piper as *S. thurberiana*. The locality cited is "North branch of the Columbia and Okanagan." The type specimen was collected by Pickering and Brackenridge. A duplicate type is in the U. S. National Herbarium.

¹⁷ Syn. Fl. Colo. 145. 1874.

¹⁸ Proc. Acad. Phila. 1863: 79. 1863.

¹⁹ Bot. Gaz. 15: 111. 1890.

DESCRIPTION.

Culms densely cespitose, slender, erect, scabrous, sometimes hispidulous or puberulous below the nodes, mostly 30 to 60 cm. tall, about 2-noded; sheaths scaberulous or the upper glabrous; ligule thin and hyaline, 2 to 5 mm. long, decurrent; blades slender, involute, scabrous beneath, scaberulous-pubescent on the upper surface, flexuous, about 0.3 mm. thick when rolled, 10 to 25 cm. long, the uppermost 3 to 5 cm. long; panicle narrow, mostly 8 to 15 cm. long, somewhat nodding, the axis and branches scaberulous, the branches ascending, mostly in pairs, one short, the other 5 to 8 mm. long, bearing a single spikelet or the lowermost sometimes with more, the pedicel thickened below the spikelet; glumes 11 to 13 mm. long, nearly equal, the second a little shorter, thin, often purple, the upper part hyaline, gradually narrowed to a soft point, glabrous or minutely scaberulous, or the first minutely pubescent along the margins, 3-nerved; lemma 8 to 9 mm. long, gradually narrowed from below the middle, pale, appressed-pubescent, the sharp callus about 1 mm. long, the pubescence about the same as on the body; awn 4 to 5 cm. long, twice-geniculate, the second bend rather obscure, the first and second segments about 1 cm. long, twisted, plumose with ascending white hairs 1 to 2 mm. long, the second segment less densely plumose than the first, the third slightly twisted, scabrous. (Pl. 51, figs. 20, 21. Chase 4689.)

DISTRIBUTION.

Mesas and rocky slopes, Idaho and Washington to central California.

IDAHO: Picabo, *Macbride & Payson* 2962, 2972. Jerome, *Chase* 4689. Mountain Home, *Chase* 4719. Shoshone, *Saunders* 2930.

WASHINGTON: Coulee City, *Piper* 3919. Bickleton, *Suksdorf* 94. North Yakima, *Henderson* 2255. Spokane, *Piper* 2613. Ellensburg, *Piper* 2611. Douglas County, *Sandberg & Leiberg* 269. Yakima, *Griffiths & Cotton* 48, 50. Wenatchee, *Griffiths & Cotton* 144; *Whited* 1230. Ephrata, *Griffiths & Cotton* 477. Prosser, *Griffiths & Cotton* 13.

OREGON: Baker, *Eggleston* 12611. Laidlaw, *Whited* 56, 3200. Poison Creek, *Eggleston* 7143. Powder River, *Cusick* 1154. Snake River, *Cusick* 1320. Cathro Valley, *Griffiths & Hunter* 308. Malheur County, *Leiberg* 2086, 2289. Long Creek, *Griffiths & Hunter* 134. Bedes Buttes, *Griffiths & Hunter* 354. Crook County, *Leiberg* 215.

NEVADA: Reno, *Hitchcock* 10558, 10561; *Tracy* 243. Austin, *Hitchcock* 10620, 10632. Palisade, *Jones* 4110. Without locality, *Wheeler* in 1872.

CALIFORNIA: Modoc Forest Reserve, *Hatton* in 1911. Yreka, *Butler* 1271.

21. *Stipa elmeri* Piper & Brodie.

Stipa viridula pubescens Vasey, *Contr. U. S. Nat. Herb.* 3: 50. 1892. Not *S. pubescens* R. Br., 1810. "Nevada, Oregon, and Washington." No specimen or definite locality is cited. A sheet in the U. S. National Herbarium, upon which Vasey has written the name, is accepted as the type. This was collected in Washington by *Suksdorf* on dry ground along the Columbia River in 1883. The culms are 75 cm. tall, rather robust.

Stipa elmeri Piper & Brodie, *Scribn. U. S. Dept. Agr. Div. Agrost. Bull.* 11: 46. 1898. Based on *Stipa viridula pubescens* Vasey.

DESCRIPTION.

Culms erect, puberulent, 50 to 100 cm. tall, 2 or 3-noded; sheaths pubescent; ligule a membrane less than 1 mm. long; blades of the culm mostly flat, becoming involute, 15 to 30 cm. long, 2 to 4 mm. wide, pubescent on both surfaces, the uppermost shorter, those of the innovations slender, involute; panicle narrow,

dense or somewhat interrupted, 10 to 20 cm. long, the branches short and appressed, the pedicels sometimes pubescent; glumes nearly equal, about 12 mm. long, pale, thin, tapering to a fine soft point, minutely scaberulous, 3-nerved; lemma about 6 to 7 mm. long, dark brown, rather sparsely appressed-pubescent, widest about the middle, the callus a little over 1 mm. long, densely bearded with yellowish hairs; awn 3.5 to 5 cm. long, twice-geniculate, the first segment 1 cm. long, twisted, plumose with ascending hairs about 1 mm. long, the second like the first, slightly shorter, less plumose toward the tip, the third straight, scabrous. (Pl. 51, figs. 22, 23. *Hitchcock* 3336.)

DISTRIBUTION.

Dry hills, sandy plains, and open woods, Washington to California and Nevada.

IDAHO: Coeur d'Alene, *Rust* 347.

WASHINGTON: Spokane, *Turesson* 21; *Piper* 2276, 2601; *Chase* 4985. Ellensburg, *Piper* 2583. Chelan, *Elmer* 487. Spokane County, *Suksdorf* 8989. Steamboat Rock, *Griffiths & Cotton* 441.

OREGON: Laidlaw, *Whited* 3071. Without locality, *Cusick* 1156.

NEVADA: Empire City, *Jones* 4109. Glenbrook, *Hitchcock* 3190. Kings Canyon, *Baker* 1285.

CALIFORNIA: San Jacinto Mountains, *Hall* 2537. Goose Valley, *Eastwood* 922. Fallen Leaf Lake, *Eastwood* 1063. Dunlap, *Griffiths* 4680. Yosemite National Park, *Hitchcock* 3247, 3336. Yosemite Valley, *Jepson* 4280. Mount Tallac, *Hitchcock* 3124. San Bernardino County, *Parish* 2491. Stanislaus Forest, *Eggleston* 9504.

22. *Stipa occidentalis* Thurb.

Stipa occidentalis Thurb.; S. Wats. in King, Geol. Expl. 40th Par. 5: 380. 1871. "Yosemite Trail, California (5038 Bolander). Pah-Ute Range, Nevada; 5,000 feet altitude; June (1,296 [Watson])." Duplicates of both cited specimens are in the U. S. National Herbarium. The first, *Bolander* 5038, may be considered the type. In both specimens the third segment of the awn is appressed-pilose.

Stipa stricta Vasey, Bull. Torrey Club 10: 42. 1883. Not *S. stricta* Lam. 1791. "Oregon, W. N. Suksdorf, and through the Sierra Nevada Mountains." Dr. Vasey is differentiating this from what was later described as *S. thurberiana* and which he assumed was the true *S. occidentalis*. The type, in the U. S. National Herbarium, collected in 1882 in "Washington Terry," bears the name in Vasey's hand. The published locality, Oregon, is an error.

Stipa stricta sparsiflora Vasey, Contr. U. S. Nat. Herb. 3: 51. 1892. "California (Bolander, No. 5038 and 5020), Oregon (*Cusick*) and Washington (*Suksdorf*)." Dr. Vasey has written the name upon two sheets in the U. S. National Herbarium, *Bolander* 5038 and *Bolander* 5020. The two specimens are alike, but the first may be selected as the type.

Stipa oregonensis Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 17: 130. f. 426. 1899. "*S. stricta* Vasey, not Lam." A new name for *S. stricta*, which is a homonym.

Stipa occidentalis montana Merr. & Davy, Univ. Calif. Publ. Bot. 1: 62. 1902. "*Stipa occidentalis* Thurber, U. S. Geol. Expl. 40th Par. V. 380 (1871), in part." "Yosemite Trail, on loose, disintegrated granite, Aug. 20, 1866 (Dr. H. N. Bolander, No. 5038; type)." From Merrill's discussion it appears that he considers the type of *S. occidentalis* to be the second specimen cited, Watson 1296 from Pah-Ute Mountains, because Watson's description of the awn "densely pilose below, scabrous above" applies best to this. In both the specimens cited

the third segment of the awn is appressed-pilose, but in the second specimen, because of being glued to the sheet, the hairs are obscured.

The confusion in regard to *S. occidentalis* arose because Thurber described two species under this name. The first (in 1871), as cited above, having a short ligule, retains the name. The second, having a long ligule, was described later.²⁰ Vasey recognized this difference between the two species but renamed the one published first, calling it *S. stricta*, retaining *S. occidentalis* for the other. Piper set things straight by naming the second one *S. thurberiana*.

DESCRIPTION.

Culms cespitose, erect, glabrous, about 2-noded, mostly 25 to 40 cm. tall; sheaths glabrous; ligule a membrane about 0.5 mm. long; blades erect, flat or usually involute, glabrous beneath, scabrous-puberulent on the upper surface, 10 to 20 cm. long, 1 to 2 mm. wide when flat; panicle narrow, 10 to 20 cm. long, the branches appressed, 1 to 2 cm. long, mostly in unequal pairs, the pedicels glabrous; glumes about 12 mm. long, nearly equal, pale, hyaline, tapering to a fine soft point, faintly 3-nerved; lemma pale brown, about 7 mm. long, rather sparsely appressed-pubescent, widest about the middle, the callus a little over 1 mm. long, rather sparsely barbed, the sharp point naked; awn 3 to 4 cm. long, twice-geniculate, the first and second segments 7 to 10 mm. long, twisted, plumose with ascending hairs about 1 mm. long, the hairs of the second segment a little shorter, the third segment slender, untwisted, appressed-pilose below, naked toward summit or scabrous throughout. (Pl. 51, figs. 24, 25. *Hitchcock* 11740.)

Hitchcock's no. 10475 from Truckee, California, is puberulous on culms, sheaths, and blades, and is taller than usual for the species (about 70 cm.), thus resembling *S. elmeri*, but the measurements for the awns are like those of *S. occidentalis*.

DISTRIBUTION.

Plains, rocky hills, and open woods, Wyoming to Washington and California.

WYOMING: Yellowstone National Park, *Hitchcock* 1870, 2109; *Merrill* 138; *Letterman* 99; *Nelson* 6592. Albany County, *Nelson* 457. Teton Forest Reserve, *Merrill & Wilcox* 420. Jacksons Hole, *Merrill & Wilcox* 357, 358.

IDAHO: Divide between Salmon and Payette rivers, *Henderson* 3081. St. Anthony, *Merrill & Wilcox* 147.

WASHINGTON: Chiwankum Lake, *Eggleston* 13591. Sunnyside, *Cotton* 487. Yakima County, *Henderson* 2257; *Cotton* 1457. Klikitat County, *Cotton* 1559. Kittitas County, *Cotton* 1675, 1755. Stehekin, *Griffiths & Cotton* 21a. Falcon Valley, *Suksdorf* 6240.

OREGON: Silvies River, *Griffiths & Hunter* 192. Mount Hood, *Hitchcock* 11740. *Henderson* 1282. Crook County, *Coville & Applegate* 601; *Leiberg* 560. Goose Creek, *Cusick* 2241. Izee, *Griffiths & Hunter* 203. Swan Lake Valley, *Applegate* 3133. Bald Knob, *Sampson & Pearson* 99. Crater Lake, *Hitchcock*, 3036. Brokentop Mountain, *Coville & Applegate* 565. Steins Mountains, *Griffiths & Morris* 604. Fort Klamath, *Hitchcock* 3009. Wallowa Mountains, *Cusick* 3196.

NEVADA: Franktown, *Heller* 10528. Mount Rose, *Kennedy* 983. Steins Mountains, *Griffiths & Morris* 554. Virginia City, *Bloomer* 2261. Gold Creek, *Hitchcock* 10772. Park Station, north of Elko, *Hitchcock* 10730. Austin, *Hitchcock* 10663. Pah-Ute Mountains, *Watson* 1296.

²⁰ In Wilkes, U. S. Expl. Exped. 17: 483. 1874.

CALIFORNIA: Siskiyou County, *Heller* 11427. Mount Goddard, *Hall & Chandler* 708. Mariposa trail, *Bolander* 5020. Truckee, *Hitchcock* 10475, 10476. Mount Whitney, *Jepson* 5056. Upper Kern River, *Hall & Babcock* 5311. Summit Valley, *Pringle* in 1882. Tulare County, *Palmer* 232 in 1888. Mount Shasta, *Pringle* in 1881; *Baker* 3896; *Hitchcock* 2938. San Jacinto Mountains, *Hall* 2325; *Reed* 2395. Bear Valley, *Abrams* 2101. Kaweah Peak, *Purpus* 1558. Black Mountain, *Hall & Chandler* 585. Ventura, *Elmer* 3815. San Bernardino Mountains, *Parish* 3288. Yosemite Trail, *Bolander* 5038. Yosemite National Park, *Hitchcock* 3245, 3272, 3335. Lake Valley, *Abrams* 4775. Lake Merced, *Jepson* 3189. Mount Wilson, *Abrams* 2598. Tahoe, *Hitchcock* 3114. Kings River, *Lemmon* in 1902. Sequoia National Forest, *Hitchcock* 3415, 3433, 3462. Mount Tallac, *Hitchcock* 3141.

23. *Stipa multinodis* Scribn.

Stipa multinodis Scribn.; Beal, Grasses N. Amer. 2: 222. 1896. "Mexico, *Pringle* 385 in 1885." The type, in the herbarium of the Michigan Agricultural College, bears the name, with Scribner as author, in Beal's script. The duplicate types are widely distributed. In the U. S. National Herbarium is a specimen of the type collection from the Scribner Herbarium which is labeled in Scribner's hand, *Stipa multinodis* Scribn., n. sp.

DESCRIPTION.

Culms erect, firm and wiry, glabrous, several-noded, 60 to 100 cm. tall, usually bearing a few appressed branches at the middle nodes; sheaths glabrous, overlapping; ligule less than 1 mm. long; blades flat, stiff and firm, becoming involute especially toward the end, scabrous, 10 to 30 cm. long, 1 to 3 mm. wide; panicle narrow, pale, 10 to 20 cm. long, the branches distant, several at a node, appressed or ascending, slender, rather stiff, short and long intermixed, the longer as much as 6 cm. long, naked at base; glumes about 9 mm. long, nearly equal, pale and hyaline, acuminate, glabrous, scarcely nerved on the sides; lemma pale, narrow, about 5 mm. long, the callus about 0.5 mm. long, barbed with tawny hairs, the body densely pubescent with tawny or white appressed hairs, narrowed into a short obscure neck, the upper hairs extending upward past the summit for about 0.5 mm.; awn 2.5 to 3 cm. long, twice-geniculate, the first two segments twisted, scabrous-pubescent, about 6 mm. long, the third scabrous, straight. (Pl. 51, figs. 26, 27. *Pringle* 385.)

DISTRIBUTION.

Rocky hills, northern Mexico.

CHIHUAHUA: Santa Eulalia Mountains, *Pringle* 385. Santa Eulalia Plains, *Wilkinson* 349.

COAHUILA: Saltillo, *Hitchcock* 5617.

24. *Stipa constricta* Hitchc., sp. nov.

DESCRIPTION.

Culms somewhat decumbent at base, glabrous, several-noded, about 80 cm. tall, bearing appressed branches below the middle; sheaths glabrous; ligule rather prominent, 3 to 5 mm. long; blades loosely involute, glabrous, or scaberulous toward the tip, 5 to 15 cm. long, 1 to 2 mm. wide; panicle narrow, purplish, 10 to 20 cm. long, the branches ascending, slender, naked at the base, several-flowered, the pedicels scabrous-pubescent; glumes about 8 mm. long, equal, narrow, acuminate to a fine point, 3-nerved; lemma narrow, 6 mm. long, the callus nearly 1 mm. long, densely barbed with white hairs, the body narrowly

fusiform, narrowed above into a neck about 1 mm. long, dull brown, appressed-villous all over with white hairs, more sparsely above, the summit ciliate with a few erect hairs 1.2 to 1.4 mm. long; awn scabrous, twice-geniculate, mostly 2 to 2.5 cm. long, the first two segments less than half the entire length. (Pl. 51, figs. 28, 29. *Hitchcock* 6742.)

Type in the U. S. National Herbarium, no. 993345, collected on a rocky hill at 2,400 meters altitude, Pachuca, Hidalgo, Mexico, September 7, 1910, by A. S. Hitchcock (no. 6742).

No other specimens have been seen. The species resembles *S. multinodis* in having several nodes and in the branching habit, but differs in the prominent ligule and in the longer lemma with more constricted summit.

25. *Stipa scribneri* Vasey.

Stipa scribneri Vasey, Bull. Torrey Club 11: 125. 1884. "Collected on dry hillsides at Santa Fe, New Mexico." The type, in the U. S. National Herbarium, is a pale plant, about 60 cm. tall, with flat blades 3 mm. wide and panicles 20 cm. long.

DESCRIPTION.

Culms erect, glabrous, sometimes puberulent below the nodes, 30 to 70 cm. tall; sheaths glabrous, villous at the throat; ligule less than 1 mm. long; blades flat, involute toward the tip or sometimes involute to base, glabrous, scaberulous on the upper surface, 15 to 25 cm. long, 2 to 4 mm. wide; panicle narrow, rather compactly flowered, 10 to 25 cm. long, pubescent at the nodes, the branches fasciated, appressed, some short and some as much as 5 cm. long, the shorter ones bearing 1 or 2 spikelets, the longer ones naked at base and bearing several spikelets; glumes 10 to 15 mm. long, about equal or the first longer, pale, long-acuminate, scaberulous, 3-nerved; lemma about 8 mm. long, pale, the callus 1 mm. long, barbed with tawny hairs, the body narrow-fusiform, villous, the hairs white, on the lower part short and appressed, on the upper part ascending, as much as 2 mm. long, more dense at the summit; awn 14 to 20 cm. long, twice-geniculate, scabrous, twisted to the second bend, the first and second segments 3 to 5 mm. each, the third straight. (Pl. 51, figs. 30, 31. *Vasey*.)

Hitchcock's no. 10733, from Lone Mountain, Nev., is densely caespitose with slender wiry culms, 20 cm. tall, and slender closely involute blades.

DISTRIBUTION.

Mesas and rocky slopes, Colorado to Nevada and Texas.

TEXAS: Without locality, *Nealley*.

COLORADO: Georgetown, *Jones* 488. Boulder, *Letterman* in 1885. Royal Canyon, *Clements* 275. Golden, *Rydberg* 2507. Mount Blanco, *Shear* 88f. Manitou, *Hitchcock* 1788. Salida, *Tracy* 474. Trinidad, *Shear* 16. Canyon City, *Shear* 970. Twin Lakes, *Clements* 319. Georgetown, *Shear* 641. Raton Mountains, *Griffiths* 5451. Empire, *Patterson* 273. Trail Glen, *Clements* 76.

NEVADA: Lone Mountain, 25 miles north of Elko, *Hitchcock* 10733. Karshaw, *Goodding* 976.

NEW MEXICO: Queen, *Hitchcock* 13502. Santa Fe, *Vasey* in 1884. Ute Park, *Standley* 14595. Organ Mountains, *Hitchcock* 3773. Cloudercroft, *Hitchcock* 13277, 13296. Ruidoso Creek, *Wootton* in 1905. Gallinas Canyon, *Wootton* in 1910. Cimarron Canyon, *Griffiths* 5565.

ARIZONA: Grand Canyon, *Hitchcock* 10448.

26. *Stipa californica* Merr. & Davy.

Stipa californica Merr. & Davy, Univ. Calif. Publ. Bot. 1: 61. 1902. "Type specimen collected by H. M. Hall, no. 2556, north side Fullers Ridge, San Jacinto Mountains, Southern California, July, 1901, 2,100 meters (7,000 ft.) alt." The type, in the U. S. National Herbarium, bears the additional datum, "West fork of Snow Creek."

DESCRIPTION.

Culms erect, glabrous or slightly roughened or puberulent below, 2 or 3-noded, 75 to 125 cm. tall, sometimes taller; sheaths glabrous or the lower puberulent, ciliate on one margin, slightly villous at the throat; ligule rather firm, puberulent, 1 to 2 mm. long, decurrent; blades flat, becoming involute, rather firm, glabrous beneath, scabrous on upper surface, 10 to 20 cm. long, 1 to 4 mm. wide, those of the innovations slender and involute; panicle narrow, rather slender, pale, 15 to 30 cm. long, the branches appressed, the axis glabrous; glumes about 1 cm. long, equal, pale, hyaline, gradually acuminate, 3-nerved, glabrous; lemma 6 to 7 mm. long, rather sparsely villous with ascending white hairs 1.5 mm. long, the callus about 1 mm. long, barbed; awn 2.5 to 3.5 cm. long, twice-geniculate, the first segment 7 mm. long, twisted, villous with ascending hairs about 0.5 mm. long, the second slightly shorter and a little less villous than the first, the third straight, slender, naked. (Pl. 51, figs. 32, 33. Hall 2556.)

DISTRIBUTION.

Dry open ground, Washington to California.

WASHINGTON: Spokane County, *Suksdorf* 9011. Hood, *Suksdorf* 10661.

OREGON: Hood River, *Hitchcock* 2744. Crater Lake, *Heller* 12586.

NEVADA: Hunter Creek Canyon, Reno, *Hitchcock* 10582.

CALIFORNIA: Weed, *Hitchcock* 3062. El Dorado County, *Heller* 12535. Mount Shasta, *Congdon* in 1900; *Hitchcock* 2934, 2936, 2948. Castle Crag, *Hitchcock* 3064. McCloud, *Eastwood* 1131. Harden Lake, *Eastwood* 224, 257. Siskiyou County, *Heller* 7936. Mount Tallac, *Hitchcock* 3121, 3159. Yosemite National Park, *Bolander* 6099, 6109; *Hall & Babcock* 3336; *Abrams* 4469. Wawona, *Congdon* in 1897. Soda Springs, *Kennedy & Doten* 247. San Jacinto Mountains, *Hall*, 2556. Donner Lake, *Torrey* 578. Truckee, *Hitchcock* 10515. Lake Tahoe, *Hitchcock* 3101.

27. *Stipa angustifolia* Hitchc., sp. nov.

Culms slender, glabrous, 10 to 30 cm. tall; sheaths glabrous, naked at the throat, the old basal ones flat; ligule of the culm leaves 1 to 2 mm. long, of the innovations shorter; blades involute, slender, rather lax and flexuous, glabrous, 10 to 20 cm. long, scarcely 0.5 mm. thick; panicle narrow, pale, rather loose or lax, the branches ascending or appressed, the lowermost as much as 5 cm. long, usually with one or two shorter branches at the base, the lower node of the main axis sometimes a little villous or hispidulous; glumes about 6 mm. long; nearly equal, green in the center and hyaline on the edges, broad, abruptly acuminate, 5-nerved; lemma medium brown, about 5 mm. long, the callus broad, a little less than 1 mm. long, densely barbed with brown hairs, the body oblong, 1 mm. wide, abruptly and asymmetrically contracted at summit, villous all over with ascending brown hairs about 1 mm. long, these sometimes less dense toward the summit, the summit densely ciliate with hairs nearly 1 mm. long; awn 10 to 15 mm. long, twice-geniculate, very minutely scaberulous, twisted to second bend; palea as long as the lemma; anthers without hairs at the tip. (Pl. 52, figs. 1, 2. *Palmer* 726.)

Type in U. S. National Herbarium, no. 570,290, collected among rocks on summit of Sierra de la Puebla, near Saltillo, Coahuila, Mexico, July 25, 1905, by Edward Palmer (no. 726).

The specimens of the type collection are the only ones known.

28. *Stipa virescens* H. B. K.

Stipa virescens H. B. K. Nov. Gen. & Sp. 1: 126. 1816. "Crescit in subfrigidis regni Mexicani, prope St. Rosa et Cuesta de Belgrado; item in radicibus montis porphyritici La Buffa, juxta Guanajuato, inter 1069 et 1240 hexap." At the Paris Herbarium is the second specimen cited, labeled "In subfrigidis Regni Mexicani, Guanaxuato, alt. 1069-1240 hex." The first specimen could not be found.

Stipa caerulea Presl, Rel. Haenk. 1: 227. 1830. "Hab. in Mexico." The type, in the German University at Prague, bears no data as to origin.

Stipa avenacea Willd. "hrb."; Steud. Nom. Bot. ed. 2. 2: 644. 1841, as synonym of *S. virescens* H. B. K.

Stipa arsenii Hack. Repert. Nov. Sp. Fedde 8: 515. 1910. "Mexico, Michoacan, prope Morelia, 2,200 m. s. m., leg. Fr. Arsene, no. 3211." The specimen has been examined in the Hackel Herbarium.

DESCRIPTION.

Culms erect, glabrous, mostly 75 to 120 cm. tall; sheaths glabrous; ligule firm, 1 to 2 mm. long; blades slender and involute, rather lax, those of the innovations numerous, glabrous or scabrous, 10 to 40 cm. long, about 1 mm. wide when flat; panicle narrow, 10 to 25 cm. long, the branches slender, appressed, 1 to several at a node, bearing 1 to few spikelets, the shorter pedicels shorter than the spikelets; glumes 7 to 8 mm. long, equal, rather broad, pale or purple, abruptly acuminate, obscurely 3-nerved; lemma dark brown at maturity, 5 to 6 mm. long, the callus about 1 mm. long, densely barbed with brown hairs, the body over 1 mm. broad, densely villous with brown hairs, contracted above to a very short undifferentiated neck, the summit bearing a close row of stiff erect brown hairs 0.5 mm. long; awn 1 to 2 cm. long, twice-geniculate, twisted and scabrous-pubescent to the second bend, straight and scabrous beyond, the first segment 3 to 5 mm. long, the first bend often at right angles, the second segment about as long as the first. (Pl. 52, figs. 3, 4. Hitchcock 5973.)

DISTRIBUTION.

Open woods, central Mexico.

ZACATECAS: Plateado, *Rose* 2750.

JALISCO: Mount Nevada, *Hitchcock* 7151. Volcano of Colima, *Jones* 479. Zapotlán, *Hitchcock* 7169.

HIDALGO: Real del Monte, *Clokey* 1900; *Rose, Painter & Rose* 8700.

MICHOACÁN: Morelia, *Arsène* 2699, 3211, 5305, 5375, 6749, 6998, 7338.

MEXICO: Popo Park, *Hitchcock* 5965, 5973, 6019.

FEDERAL DISTRICT: *Orcutt* 3731; *Pringle* 6588, 9574; *Hitchcock* 5947.

PUEBLA: Chinantla, *Liebmann* 649. Mount Orizaba, *Rose & Hay* 5671; *Hitchcock* 6266.

VERACRUZ: Cabrestros, *Liebmann* 650.

MORELOS: Sierra de Ajusco, *Pringle* 6236.

OAXACA: Cerro San Felipe, *Nelson* 1107; *Smith* 926; *Pringle* 4759. Cumbre de Estepec, *Liebmann* 648. Oaxaca, *Nelson* 1373.

29. *Stipa mexicana* Hitchc., sp. nov.

Culms cespitose, glabrous, erect, or usually geniculate or prostrate-spreading, mostly 20 to 30 cm. long, sometimes as much as 60 cm. long; sheaths glabrous, naked at the throat; ligule a very short firm membrane; blades firm, involute, sharp-pointed, glabrous beneath, scabrous on upper surface, mostly less than 10 cm. long and less than 0.3 mm. thick when rolled, sometimes as much as 20 cm.

long; panicle narrow, usually purplish, 5 to 10 cm. long, the branches appressed or ascending, short and few-flowered; glumes equal, about 1 cm. long, broad, 3-nerved, rather firm, glabrous, abruptly narrowed to an acute point; lemma 4 mm. long, finally dull brown, the callus rather short and comparatively blunt, densely barbed with white hairs, the body oblong, appressed-villous all over with short white hairs, somewhat narrowed at summit into a short firm whitish neck about 0.2 mm. long, ciliate with hairs about 0.5 mm. long; awn about 1 cm. long, weakly twice-geniculate, scabrous-pubescent to second bend. (Pl. 52, figs. 5, 6. *Pringle* 4299.)

Type in the U. S. National Herbarium, no. 993,386, collected in mountain meadows, Sierra de las Cruces, State of Mexico, Mexico, October 1, 1892, by C. G. Pringle (no. 4299).

This species approaches *S. mucronata*, but the panicle is narrower and more compact, the awns are shorter, and the neck of the fruit is shorter and less conspicuous. A specimen of this species is in the Paris Herbarium (H. B. K. Herbarium) under the name *S. mucronata*. (See discussion under *S. mucronata*.)

DISTRIBUTION.

Open woods and grassy slopes at high altitudes, southern Mexico to Peru.

MEXICO (State): Mount Popocatepetl, alt. 3,700 meters, *Hitchcock* 5989; alt. 3,500 meters, *Rose & Hay* 6035. Popo Park, alt. 2,300 meters, *Hitchcock* 6014. Sierra de las Cruces, alt. 3,000 meters, *Pringle* 4299, 11756. Nevada de Toluca, alt. 3,300 to 4,000 meters, *Rose & Painter* 6434.

HIDALGO: Real del Monte, *Clokey* 1901.

COLOMBIA: Bogotá, *Karsten*.

VENEZUELA: Páramo de Timotes, *Jahn* 772.

PERU: Mito, *Macbride & Featherstone* 1876.

30. *Stipa lemmoni* (Vasey) Scribn.

Stipa pringlei lemmoni Vasey, Contr. U. S. Nat. Herb. 3: 55. 1892. "Mountains of Plumas county, Cal. (J. G. Lemmon)." The type, in the U. S. National Herbarium, is labeled, "Mohawk Valley, Plumas County, May 1889, J. G. Lemmon 5456." The glumes are 10 to 11 mm. long, the lemma 7.5 mm. long, and the culms puberulent below the nodes.

Stipa lemmoni Scribn. U. S. Dept. Agr. Div. Agrost. Circ. 30: 3. 1901. Based on *S. pringlei lemmoni* Vasey.

Stipa lemmoni jonesii Scribn. U. S. Dept. Agr. Div. Agrost. Circ. 30: 4. 1901. "This variety is represented in the National Herbarium by Nos. 3563, L. Schoenfeldt, collected at Laguna, Cal., June 4, 1894; 49, J. W. Blankinship, collected at Mount San Hedrim, Mendocino County, Cal.; 3298, Marcus E. Jones, collected at Emigrant Gap, Cal., June 28, 1882 (type). There is also a specimen from Mariposa County, Cal., collected by J. W. Congdon, June 4, 1897." The type specimen has a more slender, fewer-flowered panicle than that of *S. lemmoni*, the culms are glabrous below the nodes, the glumes are 8 to 9 mm. long, and the lemma about 6 mm. long. There are all gradations between them.

DESCRIPTION.

Culms erect, scaberulous, puberulent below the nodes, 30 to 80 cm. tall; sheaths glabrous; ligule membranaceous, decurrent, 1 to 3 mm. long; blades flat or involute, glabrous beneath, scabrous on the margins, scabrous-pubescent on the upper surface, 10 to 20 cm. long, 1 to 2 mm. wide, or those on the innovations very narrow; panicles narrow, rather compact, mostly pale, sometimes purplish, mostly 5 to 12 cm. long, the branches appressed, bearing 1 to few spikelets,

usually more or less villous at the base; glumes 8 to 10 mm. long, about equal, rather broad and firm, somewhat abruptly acuminate, glabrous, the first 5-nerved, the second 3-nerved with an outer obscure pair; lemma mostly 6 to 7 mm. long, pale or light brown, the callus rather blunt, 0.5 mm. long, barbed with white hairs, the body fusiform, 1.2 mm. wide, villous with appressed hairs, those at the summit and around the crown rather stiff, about 0.5 mm. long; awn 20 to 35 mm. long, twice-geniculate, twisted and appressed-pubescent to the second bend, the first segment 3 to 6 mm. long, the second 5 to 7 mm., the third 10 to 20 mm. long. (Pl. 52, figs. 7, 8. *Butler* 830.)

DISTRIBUTION.

Dry open ground and open woods, British Columbia to California.

BRITISH COLUMBIA: Vancouver Island, *Macoun* 109, 257; *Rosendahl* 1933.

IDAHO: Moscow Mountains, *Henderson* 4615.

WASHINGTON: Wenatchee Mountains, *Cotton* 1263, 1630, 1637. Hood River, *Howell* in 1882. Falcon Valley, *Suksdorf* 6273. Bingen, *Suksdorf* 5135, 8661, 10054. Perkins Creek, *Cotton* 1613. Spokane, *Chase* 4984; *Henderson* 2258. Rockland, *Suksdorf* 4056. Stehekin, *Griffiths & Cotton* 213.

OREGON: Eight Dollar Mountain, *Piper* 6478. West Fork, *Cusick* 4721. Roseburg, *Cusick* 3904, 3928. Siskiyou, *Hitchcock* 2893, 2922. Ashland Creek, *Cusick* 2857. Ukiah, *Eggleston* 12723. Klamath Falls, *Hitchcock* 2973. Waldo, *Howell* in 1884. Lower Applegate Creek, *Leiberg* 4089. Ashland, *Applegate* 2158.

CALIFORNIA: Eel River, *Bolander* 4692. Moffit Creek, *Butler* 830. Red Mountain, *Bolander* 6469. Long Valley, *Davy & Blasdale* 5287. Yosemite Valley, *Chase* 5713; Tehachapi, *Chase* 5731. Weaverville, *Yates* 269. Emigrant Gap, *Jones* 3298. Clarks, Yosemite National Park, *Bolander* 4865. Humboldt County, *Tracy* 2707, 4047. Goose Valley, *Eastwood* 911. Laguna, *Schoenfeldt* 3563. Plumas County, *Heller & Kennedy* 8712. Siskiyou County, *Heller* 7934. North Fork, *Griffiths* 4542. Castella, *Piper* 6333, 6334. Delta, *Heller* 11694.

31. *Stipa williamsii* Scribn.

Stipa williamsii Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11: 45. 1898. "Dry soil on west side of Big Horn Mountain, near Monument Spring, Wyo., altitude 2,200 to 2,400 meters (no. 2804, Thomas A. Williams, August 3, 1897)." Other specimens mentioned are: Little Laramie River, *Williams* 2234; Jefferson City, *Scribner* 340. The type, in the U. S. National Herbarium, is about 90 cm. tall, the culms and sheaths are velvety-puberulent, the blades of the culm sparsely pubescent or glabrate.

DESCRIPTION.

Culms erect, rather robust, velvety-puberulent, glabrate above, 60 to 100 cm. tall, the nodes glabrous or glabrate; sheaths velvety-pubescent, the upper often glabrate; ligule about 0.5 mm. long; blades flat, those of the innovations more or less involute, more or less pubescent on one or both surfaces, 10 to 30 cm. long, 1 to 4 mm. wide; panicles narrow, moderately compact, sometimes rather loose, 10 to 20 cm. long, the branches appressed, two or more at each node, some short and floriferous from base, one usually longer and, naked at base, the nodes glabrous or sparsely pilose; glumes about 1 cm. long, equal, hyaline, narrow, acuminate and short-awned, scaberulous, 3-nerved; lemma about 7 mm. long, pale or brownish at maturity, the callus sharp and rather slender, about 1 mm. long, barbed above the point with white hairs, the body narrowly

fusiform, villous all over with appressed whitish hairs, those of the crown scarcely different, about 1 mm. long; awn 3 to 5 cm. long, twisted and scabrous-pubescent to the second bend; anthers glabrous at tip or with 1 or 2 hairs.

This species is closely related to *S. columbiana*, especially to the variety *nelsoni*. The type is distinctly pubescent on culm, sheaths, and blades, as are many of the specimens cited below. On other specimens the pubescence is more scant, and may be absent except on the lowermost sheaths. The ligule is usually shorter, and the awns are usually longer than in *S. columbiana*. (Pl. 52, figs. 9, 10. *Williams* 2804.)

DISTRIBUTION.

Dry hills and plains, Montana and Washington to Colorado.

MONTANA: Butte, *Hitchcock* 2157. Indian Creek, *Rydberg & Bessey* 3552. Big Creek, *Griffiths & Lange* 167. Big Horn Mountains, *Williams* 2804. Jefferson City, *Scribner* 340.

WYOMING: Teton Pass, *Merrill & Wilcox* 235a. Jackson, *Merrill & Wilcox* 297, 303. Yellowstone National Park, *Hitchcock* 1916, 1928, 1964; *Tweedy* 613. Big Horn County, *Goodding* 301.

IDAHO: Latah County, *Henderson* 4614. Fremont County, *Merrill & Wilcox* 175. Bitter Root Mountains, *Chase* 5140.

WASHINGTON: Loomis, *Griffiths & Cotton* 328, 335. Wenatchee Mountains, *Cotton* 1304. Colville Reservation, *Griffiths & Cotton* 390.

OREGON: Wallowa Lake, *Shear* 1788. Umatilla, *Shear* 1687. Fort Klamath, *Hitchcock* 2997, 2998. Goose Creek, *Cusick* 2243. Wallowa River, *Cusick* 2321.

COLORADO: Routt County, *Shear & Bessey* 1380.

UTAH: Mount Logan, *Ball* 1284. Ephraim Canyon, *Tidestrom* 1757.

NEVADA: Summit Lake region, *Griffiths & Morris* 300. Kingston Ranger Station, *Hitchcock* 10655, 10658. Lone Mountain, *Hitchcock* 10715. Gold Creek, *Hitchcock* 10783.

32. *Stipa viridula* Trin.

Stipa viridula Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2¹: 39. 1836. Trinius states concerning the origin of the specimen he describes, "V. spp. Am. bor.?" The type, in the Trinius Herbarium, is labeled "Saskatchewan. Hooker 57. mis. 1835."

Stipa nuttalliana Steud. Nom. Bot. ed. 2. 2: 643. 1841. Based on *Stipa parviflora* Nutt.²¹ not Desf. Nuttall describes a plant from the plains of the upper Missouri River and refers it to *S. parviflora* Desf., of which he thinks it is a variety.

DESCRIPTION.

Culms erect or sometimes geniculate at base, glabrous or scaberulous, mostly 60 to 100 cm. tall; sheaths glabrous, villous at the throat, often rather sparingly so, more or less hispidulous in a line across the collar, villous on the margin; ligule membranaceous, about 1 mm. long; blades flat or, especially on the innovations, involute, mostly scabrous, sometimes glabrous beneath, 10 to 30 cm. long, 1 to 3 or even 5 mm. wide; panicle narrow, greenish or tawny at maturity, 10 to 20 cm. long, the branches appressed or ascending, somewhat distant but usually overlapping, 2 or 3 at a node or branching near base and appearing fascicled, some short, one longer and naked below, 3 to 7 or even 10 cm. long, the lower nodes hispidulous; glumes 7 to 10 mm. long, about equal, narrowed

²¹ Gen. Pl. 1:59. 1818.

above and extending into a slender tip as much as 3 mm. long, hyaline with green nerves, 3-nerved, scaberulous on the keel and sometimes on the lateral nerves; lemma 5 to 6 mm. long, fusiform, at maturity plump, over 1 mm. wide, the callus rather blunt, about 0.5 mm. long, barbed with short whitish hairs, the body at maturity usually brown or brownish, rather sparingly villous all over with whitish appressed hairs, the surface roughened with minute papillae, the summit hispidulous with erect hairs 0.5 to 1 mm. long; awn 2 to 3 cm. long, twice-geniculate, slender, scabrous, twisted to the second bend, the first segment 3 to 4 mm. long, the second usually a little longer, the third somewhat flexuous; anthers bearing at apex a few hairs. (Pl. 52, figs. 11, 12. *Griffiths* 201.)

DISTRIBUTION.

Plains and dry slopes, Minnesota to Alberta and south to New Mexico.

SASKATCHEWAN: Red Deer Lakes, *Macoun* 74. Touchwood Hills, *Herriot* 77181. Breakmore, *Herriot* 77180.

ALBERTA: Calgary, *Hitchcock* 4972, 11457. Edmonton, *Hitchcock* 11362. Lethbridge, *Hitchcock* 4954.

MINNESOTA: St. Anthony Park, *Oswald* in 1911. Heron Lake, *Skinner* 41.

NORTH DAKOTA: Benson County, *Lunell* 1334. Minot, *Waldron* 1809; *Brannon* 113.

SOUTH DAKOTA: Redfield, *Griffiths* 201. Aberdeen, *Griffiths* 130, 828. Brookings, *Wilcox* 11. Hot Springs, *Rydberg* 1112; *Hitchcock* 11154. Custer, *Hitchcock* 11112. Edgemont, *Hitchcock* 11103.

IOWA: Ames, *Hitchcock* 11012 (introduced).

NEBRASKA: Halsey, *Hitchcock* 11048. Mullen, *Rydberg* 1598. Wiegand, *Clements* 2680.

MONTANA: Manhattan, *Shear* 413. Missoula, *Williams & Griffiths* 271, 272, 273. Gallatin, *Rydberg* 2180, 2285; *Shear* 528. Bozeman, *Rydberg* 3011. Jefferson City, *Scribner* 340. Shelby, *Hitchcock* 11330. Billings, *Hitchcock* 11212.

WYOMING: Gillette, *Hitchcock* 11188. Beulah, *Griffiths* 969. Hulett, *Griffiths* 933. Cassa, *Nelson* 8359. Badger, *Nelson* 8341. Welcome, *Williams* 2700a. Pine Bluff, *Nelson* 3613. Sibylee Creek, *Nelson* 473. Yellowstone National Park, *Hitchcock* 1930.

COLORADO: Estes Park, *Johnston* 702. Gato, *Baker* 222. Fort Collins, *Pammel* in 1896. Columbine, *Tweedy* 4367. Without locality, *Hall & Harbour* 626.

NEW MEXICO: Las Vegas, *Rose & Fitch* 17573.

33. *Stipa vaseyi* Scribn.

Stipa viridula var. *robusta* Vasey, *Contr. U. S. Nat. Herb.* 1: 56. 1890. "Chenete Mountains (Presidio county). Ranges from Colorado to Mexico." This was included in an article by John M. Coulter on "A collection of plants made by Mr. G. C. Nealley, in the region of the Rio Grande, in Texas, from Brazos, Santiago to El Paso County." The type, in the U. S. National Herbarium, is numbered 714, and was collected in 1887. It is below the usual height for the species, being about 80 cm. tall. The lemma is 6.5 mm. long, the awn 18 mm. long.

Stipa robusta Scribn. *U. S. Dept. Agr. Div. Agrost. Bull.* 5: 23. 1897. Based on "*S. viridula robusta* Vasey."

Stipa vaseyi Scribn. *U. S. Dept. Agr. Div. Agrost. Bull.* 11: 46. 1898. Based on "*Stipa viridula robusta* Vasey, not *S. robusta* Nutt." *Stipa robusta* Nutt. was given by Trinius²² as a synonym of *S. spartea*. It appears never to have been used as a valid name for a species, and might not have interfered with the use of *robusta*. It does not seem advisable to make this change now.

²² *Mém. Acad. St. Pétersb. VI. Sci. Nat.* 5¹:69. 1842.

DESCRIPTION.

Culms erect, robust, glabrous, mostly 1 to 1.5 meters tall; sheaths glabrous, villous at the throat and on the margin, a strong hispidulous line across the collar; ligule membranaceous, sometimes ciliate, 2 to 4 mm. long, shorter on the innovations; blades flat or on the innovations slender and involute, mostly glabrous, scaberulous on the margins and toward the tip, as much as 60 cm. long and 8 mm. wide; panicles narrow, compact, pale or greenish, often more or less interrupted below, as much as 30 cm. long and 2 cm. wide, the branches appressed, several at each node, some short, some as much as 8 cm. long and naked at base, bearing several spikelets, strongly villous or hispid at the lower nodes; glumes about 1 cm. long, equal, acuminate to a fine soft point but scarcely awned, rather firm, 3-nerved or the first 5-nerved, the nerves inconspicuous, lemma 6 to 8 mm. long, at maturity medium dark brown, the callus rather blunt, about 0.5 mm. long, densely barbed with whitish hairs, the body narrow-fusiform, narrowed above into an obscure neck, villous all over with appressed white hairs, those of the summit 1.5 to 2 mm. long; awn mostly 2 to 3 cm. long, scabrous, rather obscurely twice-geniculate, twisted to the second bend; anthers tipped with a minute tuft of hairs. (Pl. 52, figs. 13, 14. *Hitchcock* 13280.)

Stipa vaseyi, called sleepy grass, is reported on creditable authority to act as a narcotic on animals that graze upon it, especially affecting horses. Chemical analyses have failed to show the presence of poisonous properties and the grass appears to lose its narcotic effect when cut for hay. As yet there has been no exact experimentation upon the effect of sleepy grass, and the nature of its action must await detailed study. Although the species extends from Colorado to Arizona, the poisonous effect has been reported only from the vicinity of the Sacramento Mountains in New Mexico. (See Sampson, *Native American Forage Plants*, 229. 1924).

This species differs from *S. viridula* in the more robust habit, larger and more compact panicles, firmer, less hyaline glumes (the nerves thus less conspicuous), the acuminate, less attenuate-tipped glumes, and the longer, less turgid fruit, with longer hairs on the crown.

DISTRIBUTION.

Dry plains and hills and dry open woods, Colorado to northern Mexico.

TEXAS: San Diego, *Nealley* in 1891. Chenate Mountains, Presidio County, *Nealley* 714.

COLORADO: Idaho Springs, *Rydberg* 2493, *Shear* 725. Pagosa Springs, *Baker* 221. Colorado Springs, *Williams* 2130, 2156. Manitou, *Shear* 713, 715, 1109, *Hitchcock* 1695, 1709, 1775, 1783; *Chase* 5295; *Clements* 17. Sedalia, *Hitchcock* 16235. Starkville, *Chase* 5344. Twin Lakes, *Wolfe* 1104. Piedra, *Wooton* 2939. Salida, *Clements* 248. Georgetown, *Shear* 639. Ouray, *Hitchcock* 2239. Raton Mountains, *Griffiths* 5489.

NEW MEXICO: Clouderoft, *Hitchcock* 13280, 13305. Santa Fe Canyon, *Rose* 17711. Santa Fe, *Standley*, 6472. Pecos, *Standley* 4901. Windsor Creek, *Standley* 4216. Glorietta Mountains, *Griffiths* 5040. Cimarron Canyon, *Griffiths* 5546. El Rito, *Wooton* 2991. Las Vegas, *Chase* 5861. Raton, *Standley* 6253; *Rose* 17559. Dulce, *Standley* 8113. White Mountains, *Wooton* 370.

ARIZONA: San Francisco Mountains, *Leiberg* 5908; *Lemmon* 3181. Volunteer Valley, *Lemmon* 4679.

COAHUILA: Lerios, *Palmer* 1249 in 1880. Saltillo, *Palmer* 317 in 1902.

34. *Stipa columbiana* Macoun.

Stipa columbiana Macoun, Cat. Can. Pl. 4: 191. 1888. "Yale, B. C.; Cedar Hill, four miles from Victoria, Vancouver Island. (Macoun.)" The two specimens cited are in the herbarium of the Geological Survey at Ottawa, Canada. The Yale specimen (no. 28,940, collected on rocks, May 17, 1875) in the Ottawa Herbarium, may be considered the type. It is about 35 cm. tall, with a panicle 10 cm. long, the culm blades mostly flat, the glumes 1 cm. long, the lemma 6 mm. long, with a callus, 0.5 mm. long, the awn 2.5 cm. long, scabrous-pubescent below. The Cedar Hill specimen (no. 28,941, collected on dry slopes, May 7, 1875) is similar. In both specimens the panicles are not fully developed, being partially inclosed at the base in the uppermost sheath.

Stipa viridula var. *minor* Vasey, Contr. U. S. Nat. Herb. 3: 50. 1892. "Smaller [than *S. viridula*] throughout, occurs at higher altitudes, the awns usually shorter." No specimen is cited and no locality is given. The type, in the U. S. National Herbarium, was collected on Kelso Mountain, near Torrey's Peak, Colo., by G. W. Letterman (no. 95), at 13,000 feet altitude, August 13, 1885. The name is in Doctor Vasey's hand. This specimen is closely similar to the two specimens mentioned under *S. columbiana*, but is rather less developed. The lemmas are about 5 mm. long, but are immature. Four other specimens have the name in Doctor Vasey's hand, two being now referred to *Stipa lemmoni* and two being similar to the Letterman specimen. The last is the only specimen cited by Scribner (see next paragraph), when he raised the variety to specific rank, and thus will stand as the type.

Stipa minor Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11: 46. 1898. Based on *S. viridula minor* Vasey. The species is described and several specimens are cited.

DESCRIPTION.

Culms erect, glabrous, mostly 30 to 60 cm. tall, sometimes as much as 1 meter; sheaths glabrous, naked at the throat; ligule rather firm, 1 to 2 mm. long; blades mostly involute, especially on the innovations, those of the culm sometimes flat, glabrous or nearly so, 10 to 20 cm. long or sometimes longer, on the innovations mostly about 0.5 mm. thick, sometimes wider on the culms; panicles narrow, compact or rather loose, often purplish, 5 to 15 cm. long, the branches short and appressed; glumes about 1 cm. long, nearly equal, acuminate or awn-pointed, glabrous or slightly scaberulous, 3-nerved, the nerves rather obscure because of the firm texture; lemma 6 to 7 mm. long, the callus short, barbed, the body densely appressed-villous, scarcely narrowed at summit, the hairs at the summit about the same as the others; awn mostly 2 to 2.5 cm. long, more or less twice-geniculate, scabrous or somewhat scabrous-pubescent to the second bend. (Pl. 52, figs. 15, 16. Hitchcock 4911.)

A few specimens from New Mexico (*Standley* 4555, 14727; *Wootton* in 1907; *Vasey* in 1881) have narrower stiffer fewer-flowered panicles and firmer glumes than found in the typical form.

DISTRIBUTION.

Dry plains and open woods, Wyoming to Yukon and south to New Mexico and California.

ALBERTA: Mount Paget, *Macoun* 64852. Banff, *Hitchcock* 11506. Laggan, *Macoun* 64851. Pipestone Creek, *Macoun* 64850. Jasper Park, *Macoun* 98206. Waterton Lake, *Macoun* 13336.

BRITISH COLUMBIA: Yale, *Macoun* 18. Cedar Hill, *Macoun* 75. Columbia Valley, *Macoun* 61. Kamloops, *Macoun* 16.

YUKON: Whitehorse, *Hitchcock* 4303.

SOUTH DAKOTA: Custer, *Hitchcock* 11123.

MONTANA: Lima, *Rydberg* 2302. Glacier National Park, *Hitchcock* 11282, 11311. Prickly Pear Creek, *Scribner* in 1883. Black Hawk, *Rydberg* 3281. Columbia Falls, *Hitchcock* 4911, 4937. Bitter Root Mountains, *Chase* 5239.

WYOMING: Clear Creek, *Williams & Griffiths* 98. Yellowstone National Park, *Nelson & Nelson* 6677; *Chase* 5254; *Rydberg & Bessey* 3551b. Battle Lake, *Nelson* 4026. Sundance, *Williams* 2601. Ferris Mountains, *Nelson* 4961. Antelope Basin, *Nelson* 7478. Bridger Peak, *Goodding* 1940. Chimney Park, *Nelson* 450. Laramie Hills, *Nelson* 408.

IDAHO: Victor, *Merrill & Wilcox* 221.

WASHINGTON: Pullman, *Piper* 1762. Brewster, *Griffiths & Cotton* 258.

OREGON: Wallowa Lake, *Shear* 1759, 1780, 1785; *Cusick* 2321. Wallowa National Forest, *Jardine* 336. Grizzly Range, *Leiberg* 4125. Albee, *Chase* 4802. Wallowa Mountains, *Cusick* 2242, 3195. Crook County, *Leiberg* 495. Steins Mountains, *Griffiths & Morris* 552.

COLORADO: Veta Pass, *Shear* 843. Hebron, *Shear & Bessey* 1467. Tolland, *Ramaley* 8824. Robinson, *Shear* 1046½. Red Mountain, *Shear* 1190. Buena Vista, *Shear* 1006, 1025. Marshall Pass, *Clements* 202; *Baker* 478. Villa Grove, *Shear* 890. Leadville, *Hitchcock* 2325. Anita Peak, *Goodding* 1762. Rogers, *Baker* 801. Cumbres, *Baker* 218. Boulder, *Hitchcock* 16239.

UTAH: Wasatch Mountains, *Tidestrom* 602, 1807, 1875, 1892; *Coville & Tidestrom* 17. Manti National Forest, *Hitchcock* 10947, 10953. Marysvale, *Jones* 5940. Tushar Mountains, *Eggleston* 10496. Abajo Mountains, *Rydberg & Garrett* 9857.

NEVADA: Pine Forest Mountains, *Griffiths & Morris* 212. East Humboldt Mountains, *Watson* 1295. Lone Mountain, *Hitchcock* 10717. Glenbrook, *Hitchcock* 3191. Ely, *Hitchcock* 10806, 10836.

NEW MEXICO: Brazos Canyon, *Standley & Bollman* 10911. Chama, *Wooton* 2980; *Baker* 219. Silver City, *Metcalf* 745. Pecos National Forest, *Standley* 4542, 4555. Las Vegas, *Vasey* in 1881. White Mountains, *Wooton* in 1907. Ute Park, *Standley* 14727.

CALIFORNIA: Yosemite National Park, *Hitchcock* 3271½, 3324. Summit Valley, *Pringle* in 1882. Mount Lyall, *Hitchcock* 3304. Sierra National Forest, *Hitchcock* 3393.

34a. *Stipa columbiana nelsoni* (Scribn.) Hitchc.

Stipa nelsoni Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 11: 46. 1898. "Woods Landing, Albany County, Wyo., altitude 2,600 meters (No. 3963, A. Nelson, August 9, 1897); rich soil, Sheep Mountain, * * * (No. 2269, Thomas A. Williams, July 2, 1897.) Named for Prof. Aven Nelson." The type (*Nelson* 3963), in the U. S. National Herbarium, closely resembles the type of *S. williamsi*; but the culms and leaves are glabrous, except for the lowermost internode of the main culm, which is puberulent. The sheaths are somewhat pilose at the throat, and some of the first glumes are 3-nerved and some 5-nerved.

DESCRIPTION.

Differing in its usually large size, being as much as 1 meter tall, the broader culm blades, and the larger and denser panicle. The lemma is 6 to 7 mm. long, the awn as much as 3.5 cm. long or even longer. In some specimens (for example, *Griffiths & Cotton* 433, from eastern Washington) the awns are as much as 5.5 cm. long. (Pl. 52, fig. 17. *Nelson* 3963.)

DISTRIBUTION.

Dry plains and open woods, Alberta and Washington to Colorado and Lower California.

ALBERTA: Banff, *McCalla* 2327. Craigmyle District, *Brinkman* 790.

BRITISH COLUMBIA: Yale, *Macoun* 18 in 1889.

MONTANA: Columbia Falls, *Williams* 1039; *Hitchcock* 4912, 4939. Spanish Basin, *Rydberg* 3153. Bonner, *Sandberg, Heller & MacDougal* 986. Barker, *Rydberg* 3374. Sheep Creek, *Rydberg* 3307. Anaconda, *Blankinship* 755. Jefferson City, *Scribner* 340.²³ Little Belt Mountains, *Rydberg* 3422.

WYOMING: Battle Lake, *Nelson* 4060. Wilson, *Merrill & Wilcox* 273. Yellowstone National Park, *Rydberg & Bessey* 3551; *Mearns* 3781; *Hitchcock* 1938, 1990, 2022; *Tweedy* 609. Jackson, *Merrill & Wilcox* 290. Seminole Mountains, *Nelson* 4922. Jacksons Hole, *Merrill & Wilcox* 311. Sheep Mountain, *Williams* 2269. Evanston, *Williams* 2423. Antelope Basin, *Nelson* 7478. Medicine Bow Mountains, *Nelson* 7829.

IDAHO: Victor, *Merrill & Wilcox* 216, 223. Lake Waha, *Henderson* 2856. Montpelier, *Williams* 2535, 2540. St. Anthony, *Merrill & Wilcox* 150. Saw Tooth National Forest, *Woods & Tidestrom* 2557. Beaver Canyon, *Rydberg* 2345. St. Marys River, *Leiberg* 1173. Soldier Mountain, *Henderson* 3287.

WASHINGTON: Spangle, *Suksdorf* 8726. Spokane, *Suksdorf* 8844. Oaksdale, *Suksdorf* 8865. Steptoe, *Vasey* 3040.

OREGON: Blue Mountains, *Griffiths & Hunter* 116. Klamath Marsh, *Leiberg* 741. Dry Creek, *Coville & Applegate* 601. Wallowa Mountains, *Cusick* 3296c, 3308a, 3367.

COLORADO: Idaho Springs, *Rydberg* 2489. Marshall Pass, *Shear* 902. Sheep-horn Divide, *Shear & Bessey* 1546. Cerro Summit, *Baker* 420. Tolland, *Ramaley* 6918. Veta Pass, *Shear* 47. Ouray, *Hitchcock* 2226. Silverton, *Shear* 1212.

UTAH: Abajo Mountains, *Rydberg & Garrett* 9856. Wasatch Mountains, *Coville & Tidestrom* 4, 16; *Tidestrom* 1748, 1844. Manti National Forest, *Hitchcock* 10892, 10908.

NEVADA: Austin, *Hitchcock* 10612, 10654, 10687. Gold Creek, *Hitchcock* 10754. Lone Mountain, *Hitchcock* 10722. Reno, *Tracy* 418.

CALIFORNIA: Mount Dana, *Bolander* 5078. Yosemite National Park, *Lemmon* in 1897. Truckee, *Hitchcock* 10501. San Nicholas Island, *Trask* 11.

LOWER CALIFORNIA: Guadalupe Ranch, *Orcutt* in 1886. San Telmo, *Orcutt* in 1886. Todos Santos Island, *Anthony* 202.

35. *Stipa lettermani* Vasey.

Stipa lettermani Vasey, Bull. Torrey Club 13: 53. 1886. "Collected in Idaho by Prof. G. W. Letterman." The type, in the U. S. National Herbarium, collected on Snake River in August, 1885, is numbered 102. The culms are 30 to 50 cm. tall, the lemma about 5 mm. long including the callus (this 0.5 mm. long), the hairs at summit as much as 1 mm. long, the awn about 1.5 mm. long.

Stipa viridula var. *lettermani* Vasey, Contr. U. S. Nat. Herb. 3: 50. 1892. Presumably based on *S. lettermani* Vasey, but no synonymy is given and no specimens are cited.

DESCRIPTION.

Culms cespitose, often in large tufts, glabrous or minutely scaberulous, erect, mostly 30 to 60 cm. tall; sheaths glabrous, not pilose at throat; ligule a rather firm membrane less than 0.5 mm. long; blades slender, involute, the innovations

²³ There are several Scribner collections numbered 340.

numerous, glabrous or minutely scaberulous, 10 to 20 cm. long, mostly less than 0.5 mm. thick; panicles slender, narrow, rather loosely flowered, pale or greenish, 10 to 15 cm. long, the branches short and appressed, few-flowered; glumes about 6 mm. long, equal, acuminate, or awn-pointed, pale, rather firm, rather obscurely 3-nerved, minutely scaberulous; lemma 4 to 5 mm. long, pale, the callus 0.5 mm. long, rather sparsely barbed, the body narrow, somewhat narrowed at the summit, appressed-villous, the hairs longer above, those of the summit 1 to 1.5 mm. long; awn slender, obscurely twice-geniculate, scabrous, 1.5 to 2 cm. long. (Pl. 52, figs. 18, 19. *Letterman* 102.)

DISTRIBUTION.

Open ground or open woods at upper altitudes, Wyoming to New Mexico and California.

MONTANA: Lima, *Shear* 595.

WYOMING: Jacksons Hole, *Merrill & Wilcox* 267, 314, 360. Teton Mountains, *Nelson & Nelson* 6534. Leckie, *Merrill & Wilcox* 58. Yellowstone National Park, Electric Peak, *Hitchcock* 2005. Sheep Mountain, *Williams* 2309. Bighorn County, *Tweedy* 72. Jackson Lake, *Merrill* 102. Evanston, *Williams* 2433. Teton Forest Reserve, *Merrill & Wilcox* 393. Jackson, *Merrill & Wilcox* 287.

IDAHO: Ketchum, *Nelson & Macbride* 1224. Wood River, *Henderson* 3286. Snake River, *Letterman* 102.

OREGON: Mount Thielsen, *Coville & Applegate* 431. Crater Lake, *Hitchcock* 3049; *Heller* 13448.

COLORADO: Routt County, *Eastwood* in 1891. Fall Creek, *Rose* 138.

UTAH: Manti National Forest, *Hitchcock* 10901. Burrville, *Jones* 5642. Cottonwood Canyon, *Garrett* 1650. Alta, *Jones* 1146. Tushar Mountains, *Eggleston* 10412. Ephraim Canyon, *Tidestrom* 1755. Twelve Mile Canyon, *Eggleston* 1776. Summit County, *Garrett* 2621. Gunnison Valley, *Coville & Tidestrom* 14. Mount Ellen, *Jones* 5684. Ogden, *Tracy* 355.

NEVADA: Ely, *Hitchcock* 10812.

NEW MEXICO: Santa Fe, *Standley* 6459. Chama, *Standley* 6570; *Wooton* 2980. Pecos, *Standley* 5188. Brazos Canyon, *Standley & Bollman* 10866.

CALIFORNIA: Lincoln Valley, *Kennedy & Doten* 215. Soda Springs, *Jones* 2553. Summit Valley, *Pringle* in 1882. Truckee, *Hitchcock* in 1901. Bear Valley, *Parish Brothers* 1552.

36. *Stipa pinetorum* Jones.

Stipa pinetorum Jones, Proc. Calif. Acad. II. 5: 724. 1895. "No. 6023 p. September 8, 1894, Panguitch Lake, Utah, 8,400 alt., growing in open places among the pine forests." Collected by Marcus E. Jones. A specimen of this collection is in the U. S. National Herbarium.

DESCRIPTION.

Culms cespitose, often in large tufts, the inner part dying out leaving a zone of living plants; culms erect, puberulent below the nodes, otherwise glabrous, slender, 30 to 50 cm. tall; sheaths glabrous; ligule a very short membrane; blades involute-capillary, more or less flexuous, slightly scabrous, mostly clustered near the base, two on the culm, the basal 5 to 12 cm. long, scarcely 0.5 mm. thick; panicle narrow, 8 to 10 cm. long, the branches short and appressed or ascending, few-flowered; glumes about 9 mm. long, equal, acuminate, obscurely nerved, lemma 5 mm. long, 0.5 mm. wide, narrowly fusiform, pale or finally brownish, clothed especially on the upper half with hairs 2 mm. long, forming a conspicu-

ous tuft, exceeding the body of the lemma, the summit bearing two very thin slender teeth at base of awn; awn about 2 cm. long, twice-geniculate, scaberulous or nearly glabrous, the first segment 6 mm., the second 4 mm. long; palea a little more than half as long as the lemma, villous at top with hairs 0.2 mm. long. (Pl. 52, figs. 20, 21. Jones 6023.)

This species resembles *S. lettermanni* in habit, but differs in the conspicuously villous lemmas.

DISTRIBUTION.

Open pine woods at high altitudes, Colorado and Utah.

COLORADO: Leadville, in open pine woods, Hitchcock 2281.

UTAH: Panguitch Lake, Jones 6023p.

37. *Stipa arida* Jones.

Stipa arida Jones, Proc. Calif. Acad. II. 5: 725. 1895. "No. 5377, Marysvale, Utah, on very dry talus slopes in shingle, 6,000 alt., June 4, 1894." The description is in an article by M. E. Jones (Contributions to Western Botany), on plants collected by himself. A duplicate type is in the U. S. National Herbarium. The panicles for the most part are inclosed at base in the uppermost sheath.

Stipa mormonum Mez, Repert. Nov. Sp. Fedde 17: 209. 1921. "Vereinigte Staaten von Nordamerika: Utah (Jones)." The type has been examined at the Berlin Herbarium by Mrs. Chase. It is numbered 2106.

DESCRIPTION.

Culms densely cespitose, erect, scaberulous below the nodes, 40 to 80 cm. tall; sheaths glabrous or somewhat scaberulous; ligule a ciliate membrane about 0.5 mm. long; blades flat or involute, scabrous, 10 to 20 cm. long, 1 to 2 mm. wide when flat; panicle narrow, compact, somewhat nodding, pale or silvery, 10 to 15 cm. long, the branches short, appressed; glumes 8 to 12 mm. long, equal or the first a little longer, hyaline, scaberulous, acuminate, the first 3-nerved, the second 5-nerved; lemma about 5 mm. long, pale or light brown, the callus very sharp, about 0.5 mm. long, barbed with whitish hairs, the body narrow, villous with appressed white hairs except the narrowed slightly roughened summit, more or less glabrate on the sides, the summit naked or sparsely ciliate; awn 4 to 6 cm. long, capillary, scaberulous, loosely twisted for 1 to 2 cm., untwisted and flexuous beyond, sometimes obscurely once or twice geniculate; palea half as long as lemma. (Pl. 52, figs. 22, 23. Jones 5377.)

DISTRIBUTION.

Rocky slopes, Utah and Arizona.

UTAH: Richfield, Ward 251. Marysvale, Jones 5377. Milford, Jones in 1880.

ARIZONA: Bright Angel Trail, Grand Canyon, Grant 5718; Chase 5809, 5814; Hitchcock 10446, 13063.

38. *Stipa editorum* Fourn.

Stipa editorum Fourn. Mex. Pl. 2: 75. 1886. "In valle edita inter *La Noria del Viejo* et *La Miquiguana*, agosto (Karw. n. 1009c)." The type collected by Karwinsky has been examined at the St. Petersburg Botanical Garden.

DESCRIPTION.

Culms erect, glabrous, closely cespitose, 80 to 100 cm. tall, the scales at the somewhat bulbous base felty-pubescent; sheaths glabrous, more or less pilose at the throat; ligule 3 to 6 mm. long, thin; blades flat or usually loosely involute,

tapering to a fine involute point, glabrous beneath, more or less scabrous toward the point, 20 to 40 cm. long, 2 to 3 mm. wide on the culm, very slender on the innovations; panicle narrow, rather soft, 10 to 20 cm. long, or even longer, the branches appressed, several at each node, many-flowered, the shorter ones floriferous from base, the longer ones naked at base, as much as 10 cm. long, the pedicels slender; glumes about 9 mm. long, subequal, narrow, hyaline, acuminate to a fine point, 1-nerved, the second with a faint lateral pair of nerves, the first scaberulous on the keel; lemma narrowly fusiform, pale, 5 to 6 mm. long, the callus acute, rather slender, nearly 1 mm. long, densely barbed with white hairs, the body appressed-villous all over, the hairs at the summit few, about 1 mm. long; awn very slender, 3 to 4 cm. long, scaberulous, flexuous, usually rather obscurely twice-geniculate; anthers with a minute tuft of hairs at summit. (Pl. 52, figs. 24, 25. *Hitchcock* 6469.)

DISTRIBUTION.

Dry open ground and rocky hills, central Mexico.

HIDALGO: Pachuca, *Hitchcock* 6716.

PUEBLA: Esperanza, *Hitchcock* 6469, 6494, 6500. Oriental, *Orcutt* 3947. San Marcos, *Hitchcock* 6520.

39. *Stipa tenuissima* Trin.

Stipa tenuissima Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2¹: 36. 1836. "V. spp. Chil." The type specimen, in the Trinius Herbarium, is from Mendoza, collected by Gillies and sent to Trinius by Hooker. Trinius gives the origin of the type as Chile, but Mendoza is in western Argentina. The fruit of the type and of the other specimens cited from Argentina is only 2 mm. long.

Stipa mendocina Phil. Anal. Univ. Chile 27: 339. 1865. "Ad radicem Andium Mendocinarum l. d. la Guardia," collected by Max. Landbeck. Referred to *S. tenuissima* from the description.

Stipa geniculata Phil. Anal. Univ. Chile 36: 204. 1870. Collected in the vicinity of Mendoza, Argentina. The type has not been examined, but the description is sufficient to identify the species.

Stipa cirrosa Fourn. Mex. Pl. 2: 75. 1886. "Absque loco (*Karw.* n. 1009)." The type, collected by Karwinsky, has been examined at the herbarium of the St. Petersburg Botanical Garden. The fruit is 2 mm. long.

Stipa subulata Fourn. Mex. Pl. 2: 75. 1886. "Tanque Colorado (*Karw.* n. 1009b)." The type has been examined at the herbarium of the St. Petersburg Botanical Garden. The fruit is 2 mm. long.

Stipa oreophila Speg. Contr. Fl. Ventana 65. 1896. No exact locality is given. The article is on the flora of Sierra de la Ventana, a mountain range in the southern part of the Province of Buenos Aires. The type has not been examined. The fruit is described as being 3 mm. long.

Stipa tenuissima oreophila Speg. Anal. Mus. Nac. Montevideo 22: 155. 1901. Based on *Stipa oreophila* Speg.

Stipa tenuissima planicola Speg. Anal. Mus. Nac. Montevideo 22: 155. 1901. No specimen is mentioned.

Stipa sanluisensis Speg. Anal. Mus. Nac. Montevideo 4: 156. 1901. Type, from San Luis, Argentina, has not been examined. The specimen examined, *Parodi* 335, differs from *S. tenuissima* chiefly in the much shorter awn.

Stipa debilis Mez, Repert. Nov. Sp. Fedde 17: 209. 1921. "Argentina, bei Cosquin (Hieronymus)." The type has been examined at the Berlin Herbarium. It is the short-awned form.

DESCRIPTION.

Culms densely cespitose in large tufts, slender, wiry, erect, glabrous, 30 to 70 cm. tall; sheaths glabrous or minutely scaberulous; ligule acute, 2 mm. long; blades slender and wiry, closely involute, tapering to a fine point, more or less scabrous, 15 to 30 cm. long or even longer, scarcely 0.5 mm. wide when rolled; panicle narrow, soft, nodding, 10 to 30 cm. long, the branches appressed, slender, rather loosely flowered; glumes about 1 cm. long, the first a little the longer, pale or purplish, soft and hyaline, glabrous, minutely scaberulous on the keel, faintly 3-nerved, tapering to a fine soft awn or awnlike point; lemma 2 to 3 mm. long, oblong-elliptic, plump, brown, glabrous, roughened with minute papillae, the callus 0.5 mm. long, densely barbed, the hairs extending a short distance up on the keel of the lemma, the neck abruptly narrowed, slightly hispidulous; awn capillary, flexuous, obscurely geniculate about the middle, scaberulous, about 5 cm. long. (Pl. 52, figs. 26, 27. *Hitchcock* 13498.)

DISTRIBUTION.

Dry open ground, rocky slopes, and open dry woods, Texas to central Mexico; also in Argentina.

TEXAS: Guadalupe Mountains, *Bailey* 694. Limpia Canyon, *Nealley* 131; *Hansen* 763. Chisos Mountains, *Havard* 12.

NEW MEXICO: Socorro, *Plank* 35. Queen, *Hitchcock* 13498. Without locality, *Wright* 1999.

COAHUILA: Saltillo, *Arsène* 3469; *Palmer* 455 in 1904; *Nil* in 1909. Carneros Pass, *Pringle* 3274. Chojo Grande, *Palmer* 341½ in 1904.

PUEBLA: San Marcos, *Hitchcock* 6518, 6519, 6540. Chalchicomula, *Smith* 556. Esperanza, *Arsène* in 1907; *Hitchcock* 6464, 6499.

ARGENTINA: Estancia San Teodoro, *Stuckert* 13649; *Kneucker*, *Gram. Exs.* 198. Capilla del Monte, *Stuckert* 19008. Sierra de la Ventura, *Dusén* in 1904. Córdoba, *Parodi* 335. Cacheuta, *Spegazzini* 2394. Aguas Buenas, *Parodi* 4814. Boven, *Parodi* 4822.

40. *Stipa ichu* (Ruiz & Pav.) Kunth.

Jarava ichu Ruiz & Pav. Fl. Peruv. Chil. 1: 5. pl. 6. f. b. 1798. "Habitat in alpibus (vernaculi *Punas de los Andes*) *Cautae*, *Huarochiri*, *Xauxae*, *Huancavelicae*, *Tarmae Huanuci*, *Huamalies*, et aliarum Provinciarum Regni Peruviani." Concerning the common names it is stated, "Vernacule *Ichu* et *Ocssa* nuncupatur." The type has not been examined, but the figure is characteristic.

The original place of publication is usually given as the earlier work, the *Prodromus*, by the same authors.²⁴ This work describes genera only and no species is mentioned in connection with *Jarava*. According to the Type-basis Code the genus is not effectively published at this place, and the species *J. ichu* is certainly not published here. The descriptions are given in parallel columns, Spanish and Latin. In some cases the common name of the genus is given after the generic name in the Spanish column. This is given *Jarava (ichu)*. This appears to be the ground for giving this work as the place of publication of *Jarava ichu*. It is evident that the authors are not proposing a new species here, but are giving the common name.

Jarava usitata Pers. Syn. Fl. 1: 6. 1805. Based on *Jarava ichu* Ruiz & Pav.

Stipa jarava Beauv. Ess. Agrost. 18, 179. pl. 6. f. 3. 1812. Under *Stipa* Beauvois includes *Jarava* Ruiz & Pav. as a synonym. In the index the name occurs as "*Stipa Jarava?* nob." The description of the plate is headed *Stipa*

²⁴ Ruiz & Pav. Fl. Peruv. Chil. Prodr. 2. pl. 1. 1794.

jarava. Since Ruiz and Pavon included only one species in their genus *Jarava* we may assume *Stipa jarava* Beauv. to be based on *Jarava ichu* Ruiz & Pav.

Stipa eriostachya H. B. K. Nov. Gen. & Sp. 1: 127. pl. 41. 1816. "Crescit locis planis regni Quitensis juxta Riobamba, inter Ticsan et Guamote et prope Mulalo in radicibus montis Cotopaxi; item in temperatis regni Mexicani prope Moran." The type, in the "H. B. K." Herbarium in the Paris Herbarium, bears the name in Kunth's script and the number 3060, but no data.

Stipa ichu Kunth, Rév. Gram. 1: 60. 1829. Based on *Jarava ichu* Ruiz & Pav.

Jarapha ichu Ruiz. & Pav.; Steud. Nom. Bot. ed. 2. 1: 787. 1840, as synonym of *Stipa ichu*.

Jarapha arundinacea Willd.; Steud. Nom. Bot. ed. 2. 1: 797. 1840, as synonym of *Stipa eriostachya*.

Jarapha usitata Pers.; Steud. Nom. Bot. ed. 2. 1: 797. 1840, as synonym of *Stipa ichu*.

Stipa pungens Nees & Mey. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 151. 1843. "In campis arenosis ad Arequipam urbem et ad lacum Titicacam Peruviae." The name was mentioned earlier²⁵ as a nomen nudum. The type has been examined in the Berlin Herbarium.

Stipa gynerioides Phil. Anal. Univ. Chile 36: 203. 1870. "Mendoza." The type has not been examined. Grisebach²⁶ refers this to *Stipa ichu* with certainty.

Stipa liebmanni Fourn. Mex. Pl. 2: 76. 1886. "Cerro Leon pr. Perote, [Veracruz] (Liebm. n. 667)." In the U. S. National Herbarium is a duplicate type, labeled in Fournier's hand. It is a depauperate specimen about 15 cm. tall, with a much reduced panicle.

Stipa ichu var. *gynerioides* Hack. Anal. Mus. Nac. Buenos Aires 11: 98. 1904. Based on *Stipa gynerioides* Phil.

Stipa ichu var. *gynerioides* forma *interrupta* Hack. Anal. Mus. Nac. Buenos Aires 21: 76. 1911. "Differt panicula inferne interrupta. St. [Stuckert] no. 18,989 (12. I. 1907) Capilla del Monte, C (M. E.) [Mario Estrada]." In the U. S. National Herbarium is a specimen with all the data of the cited specimen except the number, which is 19010. It corresponds with the description of this form.

DESCRIPTION.

Culms closely cespitose, often in large bunches, erect, slender, wiry, glabrous, mostly 80 to 100 cm. tall, sometimes depauperate; sheaths glabrous or scaberulous minutely hispidulous at the throat; ligule rather firm, about 2 mm. long, on the innovations much shorter; blades of the culm flat or involute, as much as 4 mm. wide, those of the numerous innovations slender, involute, wiry, mostly scabrous, 30 to 60 cm. long; panicle narrow, nodding, shining, pale or purplish, densely flowered, often inclosed at base in the uppermost more or less inflated sheath, 15 to 40 cm. long, the numerous branches appressed, many-flowered, the axis scaberulous, the pedicels very scabrous; glumes about 1 cm. long, less than 0.5 mm. wide, equal, hyaline, papery, gradually narrowed to a fine soft point, faintly 3-nerved, glabrous, lemma fusiform, about 2.5 mm. long, rather sparsely short-pubescent, narrowed into a short neck bearing a conspicuous tuft of ascending or spreading hairs 3 to 4 mm. long; awn slender, 1 to 2 cm. long, flexuous or obscurely twice-geniculate, scaberulous, the lower part more or less twisted. (Pl. 52, figs. 28, 29. Hitchcock 6521.)

This species is distinguished by the small fruits, with a crown of long hairs. In the Andes the grass is commonly known as "ichu."

²⁵ Meyen, Reis. Erd. 1: 484. 1834.

²⁶ Abh. Ges. Wiss. Göttingen 19: 258. 1874.

DISTRIBUTION.

- Dry hills and plains, Mexico, southward through the Andes to Argentina.
- SAN LUIS POTOSÍ:** San Luis Potosí, *Parry & Palmer* 967; *Schaffner* 174.
- MEXICO:** Sierra de las Cruces, *Pringle* 4281. Ixtaccihuatl, *Purpus* 323, 1610. Popocatepetl, *Purpus* 1609. Montezuma, *Bourgeau* 1156. Cima, *Orcutt* 3788. Mixcoac, *Arsène* 8804.
- PUEBLA:** Manzanilla, *Arsène* 1695. Acatzinco, *Arsène* 1572, 1575. Chalchicomula, *Pringle* 9566; *Hitchcock* 6275. Mount Orizaba, alt. 3,300 meters, *Smith* 603; *Seaton* 194. San Marcos, *Hitchcock* 6521. Esperanza, *Hitchcock* 6467, 6498, 6502; *Pittier* 423.
- HIDALGO:** Real del Monte, *Clokey* 1896.
- OAXACA:** Sierra de Clavellinas, *Pringle* 4998. Chinantla, *Liebmann* 669.
- GUATEMALA:** Volcano Agua, *Hitchcock* 9123.
- COLOMBIA:** Calaguuala, *Pennell* 7125. Bogotá, *Ariste Joseph* in 1905.
- ECUADOR:** Quito, *Spruce* 5923. Ambato, *Pachano* 93. Cotacallao, *Mille* 255. Alausí, *Hitchcock* 20701. Punin, *Anthony & Tate* 442.
- PERU:** Occa Pampa, *Shepard* 63. Ollantaytambo, *Hitchcock* 22527; *Cook & Gilbert* 676. Oroya, *Rose* 18694; *Macbride & Featherstone* 952. Río Blanco, *Macbride & Featherstone* 644, 645. Matucana, *Macbride & Featherstone* 254, 335. Goyllarisquisca, *Hitchcock* 22293. Cuzco, *Hitchcock* 22460. Chuquibambilla, *Hitchcock* 22427. Junín, *Hitchcock* 22174.
- BOLIVIA:** La Paz, *Pflanz* 2544; *Buchtien* 2492, 2545; *Holway* 451, 597. Pasña, *Buchtien* 1185. Cochabamba, *Holway* 330, 342, 345, 362, 387, 389, 399; *Hitchcock* 22785, 22812. Sorata, *Holway* 529; *Mandon* 1273. Palca, *Hitchcock* 22558, 22581. Atocha, *Hitchcock* 22872.
- ARGENTINA:** La Falda, *Holway* 2026. Córdoba Province, *Stuckert* 11775, 17818, 19010; *Parodi* 3321, 4668; *Kneucker Gram. Exs.* 200, 200a. Catamarca Province, *Jørgensen* 1362. Esquina Grande, *Jørgensen* 1447. Jujuy, *Fries* 372. Santiago del Estero, *Parodi* 389. Colonia Alvear, *Parodi* 4837. Boven, *Parodi* 4824. Without locality, *Lorentz* 77.

UNIDENTIFIED SPECIES.

STIPA GRISEBACHII Fourn. Mex. Pl. 2: 74. 1886.

Fournier's description is as follows: "Culmo bipedali stramineo glabro; foliis rigidis convolutis laete viridibus, radicalibus et caulinis mediocribus lanceolato-linearibus, intus secus mesonevrum et margines ciliato-echinatis, ligula brevi pilosa; panicula laxa 4-5-pollicari, radiis binis a basi floriferis; glumis violaceis acutis; palea a basi fere usque ad apicem barbata; coronula ciliata; arista torta valida longissime pubescente.—In valle Mexicensi (*Schaffn.* n. 17 a pl. ed. Hohen.); in collibus pr. Santa Fe in valle Mexicensi, julio (*Bourg.* n. 677)."

No specimens of either cited collection have been seen. The description applies fairly well to *S. leucotricha* Trin. & Rupr.

STIPA VIRLETHII Fourn. Mex. Pl. 2: 75. 1886.

Fournier's description is as follows: "Foliis planis lanceolato-linearibus semipedalibus basi intus pilosis; ligula inconspicua; panicula 3-4-pollicari, radiis geminis; rhachi pubescente; glumis inaequalibus glabris acutis decoloratis, superiore latiore et longiore, flosculo piloso cum mesonevro prominente; coronula ciliata; arista pilosa torta longissima.—San Luis de Potosi (*Virl.* n. 1376)."

STIPA KOLEOTRICHIA Steud. Syn. Pl. Glum. 1: 125. 1854.

Steudel's description is as follows: "Culmo erecto valido elato glabro; vaginis dense sericeo-pilosis, foliis lanceolato-linearibus elongatis (1-2 pedibus) striatis sparsim pilosis vel glabratis; paniculae amplae dense verticillatae ramis

erectis coarctatis; flosculis pedicellatis; paleis nervosis acutis; arista geniculata vix torta nuda flosculis duplo longiore.—Cordillera Vera Cruz (*Galeotti* 1840)."

This is probably not a species of *Stipa*.

STIPA SPICATA Walt. Fl. Carol. 78. 1888.

Walter's description is as follows: "Spicata? 4. Aristis nudis, receptaculo elongato in spicam dentibus bifloris plumosis, floribus alternis muticis, alternis aristatis; calycibus alternis concavis, alternis convexis."

This may be a species of *Andropogon*, possibly *A. scoparius* Michx.

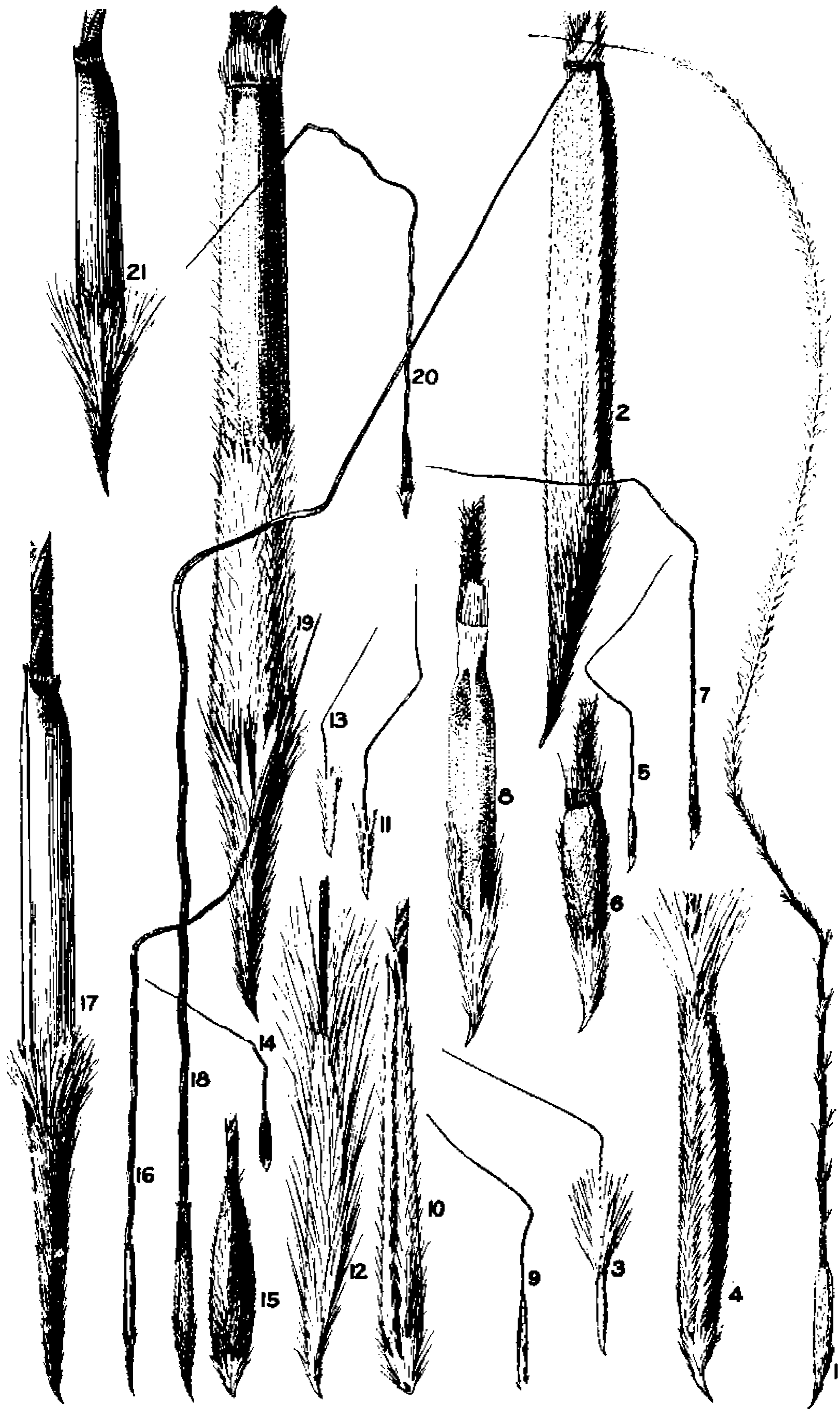
EXCLUDED SPECIES.

The following names, at some time included in *Stipa*, comprise only those based on species found in North America:

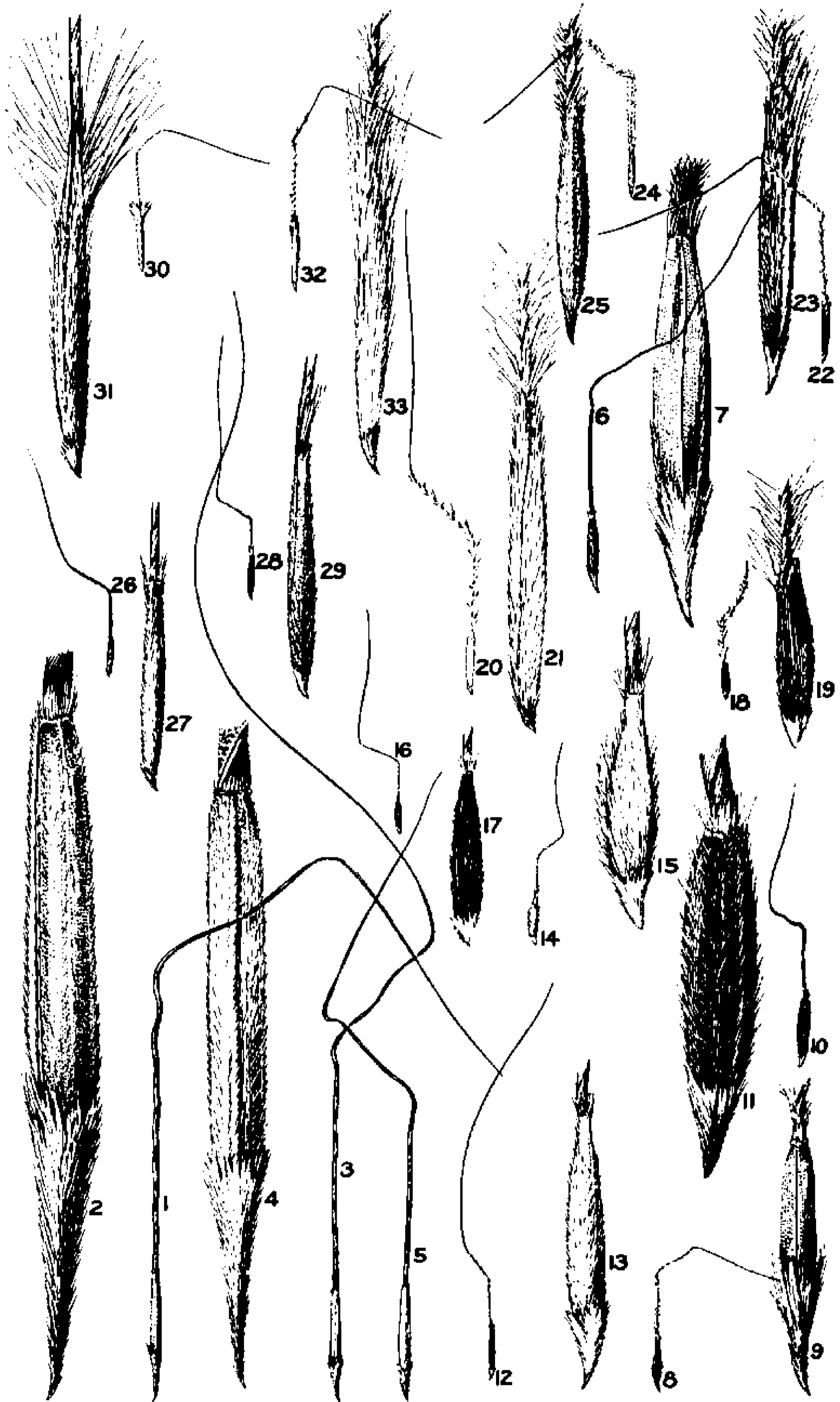
- Stipa bloomeri* Boland. = *Oryzopsis bloomeri* (Boland.) Ricker
Stipa brevicalyx Fourn. = *Piptochaetium brevicalyx* (Fourn.) Ricker
Stipa caduca Scribn. = *Oryzopsis bloomeri* (Boland.) Ricker
Stipa canadensis Poir. = *Oryzopsis canadensis* (Poir.) Torr.
Stipa capillaris Lam. = *Muhlenbergia capillaris* (Lam.) Trin.
Stipa demissa Steud. = *Limnodea arkansana* (Nutt.) L. H. Dewey
Stipa diffusa Walt. = *Muhlenbergia capillaris* (Lam.) Trin.
Stipa expansa Poir. = *Muhlenbergia expansa* (DC.) Trin.
Stipa fimbriata H. B. K. = *Oryzopsis fimbriata* (H. B. K.) Hemsl.
Stipa hymenoides Roem. & Schult. = *Oryzopsis hymenoides* (Roem. & Schult.)
 Ricker
Stipa juncea Michx. = *Oryzopsis canadensis* (Poir.) Torr.
Stipa kingii Boland. = *Oryzopsis kingii* (Boland.) Beal
Stipa latifolia Rasp. = *Olyra latifolia* L.
Stipa linearifolia Fourn. = *Oryzopsis* sp.
Stipa macounii Scribn. = *Oryzopsis canadensis* (Poir.) Torr.
Stipa melanocarpa Muhl. = *Heteropogon melanocarpus* (Ell.) Benth.
Stipa membranacea Pursh. = *Oryzopsis hymenoides* (Roem. & Schult.) Ricker
Stipa patens Willd. = *Triniochloa stipoides* (H. B. K.) Hitchc.
Stipa pauciflora Rasp. = *Lithachne pauciflora* (Swartz) Beauv.
Stipa rostrata Willd. = *Triniochloa stipoides* (H. B. K.) Hitchc.
Stipa sericea Michx. = *Muhlenbergia capillaris* (Lam.) Trin.
Stipa stricta Lam. = *Sorghastrum nutans* (L.) Nash?
Stipa villosa Walt. = *Sorghastrum nutans* (L.) Nash

LIST OF NEW SPECIES AND SUBSPECIES AND NEW NAMES.

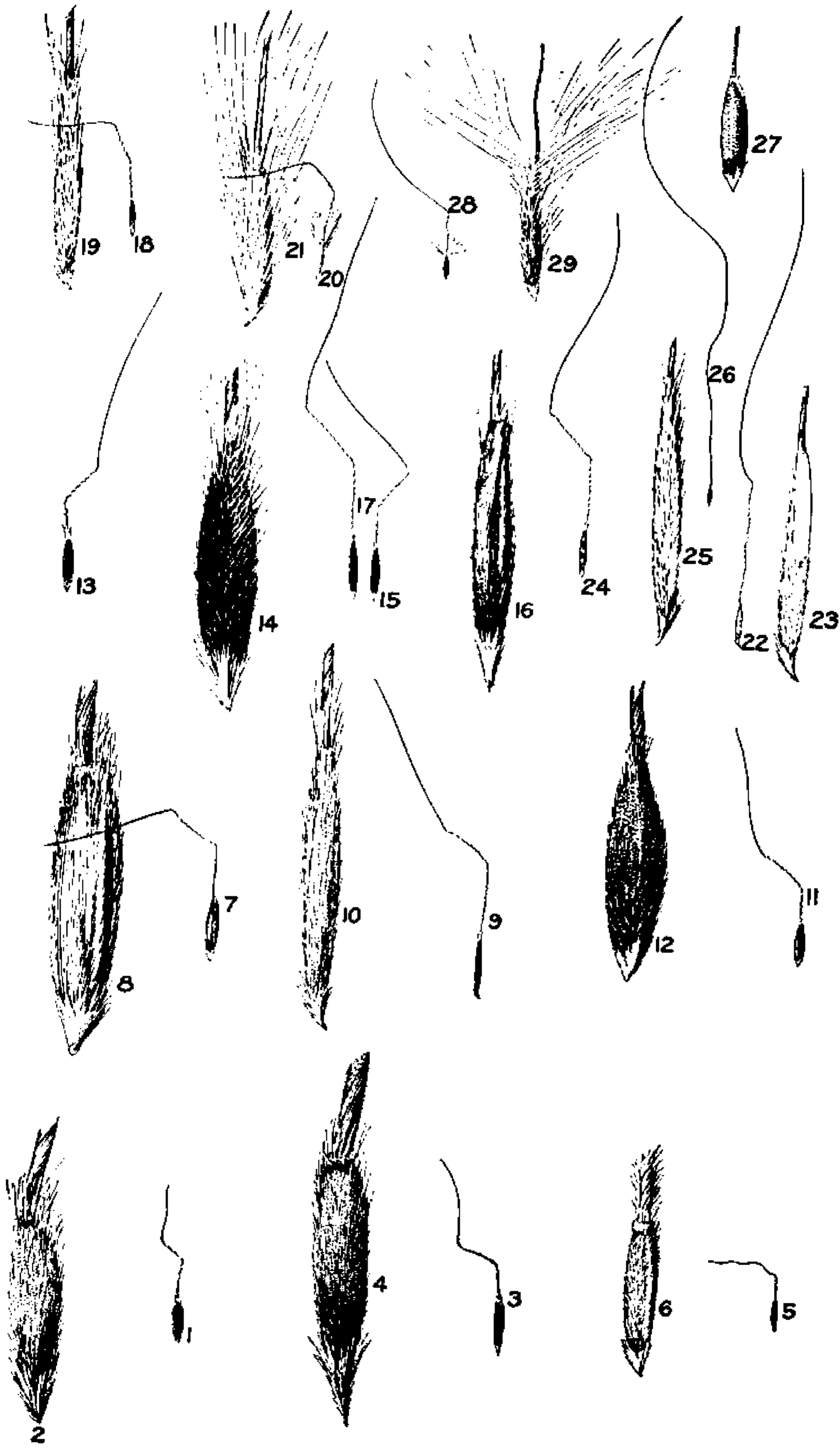
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<i>Stipa angustifolia</i> Hitchc., sp. nov.	246
<i>Stipa columbiana nelsoni</i> (Scribn.) Hitchc.	254
<i>Stipa nelsoni</i> Scribn.	
<i>Stipa constricta</i> Hitchc., sp. nov.	244
<i>Stipa coronata parishii</i> (Vasey) Hitchc.	227
<i>Stipa parishii</i> Vasey.	
<i>Stipa lelantha</i> Hitchc., sp. nov.	236
<i>Stipa mexicana</i> Hitchc., sp. nov.	247
<i>Stipa saxicola</i> Hitchc., sp. nov.	232
<i>Stipa spartea curtiseta</i> Hitchc., subsp. nov.	230



FRUITS OF STIPA



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