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GRASSES OF NORTH AMERICA.

BY

W. J. BEAL, M.A., M.Sc., Ph.D.,

*Professor of Botany and Forestry in Michigan
Agricultural College.*

Contents of Vol. I.—CHAPTERS ON THE PHYSIOLOGY, COMPOSITION, SELECTION, IMPROVING, AND CULTIVATION OF GRASSES; MANAGEMENT OF GRASS LANDS; ALSO CHAPTERS ON CLOVERS, INJURIOUS INSECTS, AND FUNGI. 8vo. \$2.50.

Contents of Vol. II.—THE GRASSES CLASSIFIED, DESCRIBED, AND EACH GENUS ILLUSTRATED, WITH CHAPTERS ON THEIR GEOGRAPHICAL DISTRIBUTION, AND A BIBLIOGRAPHY. 8vo.

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GRASSES
OF
NORTH AMERICA

BY
W. J. BEAL, M.A., M.S., PH.D.
*Professor of Botany and Forestry in
Michigan Agricultural College*

IN TWO VOLUMES

VOL. II

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GENUS ILLUSTRATED, WITH CHAPTERS ON
THEIR GEOGRAPHICAL DISTRIBUTION
AND A BIBLIOGRAPHY

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PREFACE.

To some extent this volume supplements the first, though in most respects it is an independent work. The first volume is intended more particularly for farmers and students, and comprises chapters on the physiology, composition, selection, improving, and cultivation of grasses and clovers. A few of the illustrations in the first apply also to species described in the second.

It is ten years, lacking less than five months, since the first volume was published. During this period many collections have been added to the herbarium and new publications have appeared, making it often necessary to change and add to the text. Owing to the nature of the work, it seemed necessary to have many specimens well in mind at one time; to do this it was necessary to limit the time for study to a few weeks each year. Little opportunity could be found for this work while college classes were to be instructed; besides a considerable portion of the long vacation was claimed for participating in farmers' institutes.

It has required some courage and persistence to adhere to the work so long, realizing fully that it must contain many defects, and that perhaps its chief use would be to serve as the basis for others in the future to enlarge, correct, and otherwise improve.

Originally it was the intention that Prof. F. L. Scribner should furnish all the drawings and share as author of this volume, but to my regret he appeared to be unable to complete his part of the work. As will be seen, he furnished many of the drawings and Mrs. D. M. Richardson the others, with a single exception which was made by B. O. Longyear. Prof. Scribner furnished hints for some of the artificial keys.

In most cases the generic characters closely follow those given by Bentham and Hooker in *Genera Plantarum*. Some valuable extracts from Bentham will be found regarding the writings of prominent authorities on grasses; also notes regarding the tribes and some of the genera.

Besides the fine herbarium of Michigan Agricultural College, I have been permitted to examine all the grasses in the herbaria of the University of Michigan and Harvard University (including the grasses of the late Dr. Geo. Thurber), those of the Department of Agriculture at Washington, and those of Professor Scribner.

Prof. L. H. Bailey rendered some assistance in reporting the geographical distribution of certain species; Professor S. M. Tracy furnished some notes on geographical distribution; L. H. Dewey looked up a number of authorities and furnished notes concerning a few species. A. A. Crozier rendered valuable assistance in reading much of the revised proof.

I have made an enormous number of measurements, usually many from several plants for each species, and have recorded the extremes. With rare exceptions the figures given are the results of my own measurements. To familiarize readers with the decimal scale here adopted, the publishers have placed a sheet in the back part of this volume on which are ruled duplicates that may be cut out and used to measure any part of a grass which is to be compared with the text.

Up to April, 1895, when the text was sent to the publishers, I had described all species that I was able to obtain that were native of the United States and northward; all those collected in Mexico by C. G. Pringle and Dr. E. Palmer, but not the meagre specimens of several of the older collectors in Mexico and Central America.

Heartily thanking every one who has rendered assistance and encouragement, this long-delayed volume is now subject to the inspection of all interested in the subject.

W. J. BEAL.

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NUMBER HERE DESCRIBED.

Native Species	809
Exotic Species	103
Total described in this volume	912

GRASSES OF NORTH AMERICA.

GRAMINEÆ.

Flowers perfect or imperfect in little green or more or less scarious spikes, called *spikelets*, consisting of a small axis, *rachilla*, bearing several scalelike distichous bracts called *glumes*, the 2 or sometimes 1 or rarely 3 or more lower ones and sometimes 1 or more upper ones empty, the other one or more *floral* or *flowering* glumes with 1 sessile flower in the axil of each. No normal perianth, but the flower usually in a 2-nerved glumelike scale called a *palea* (prophyllum), within which are often found 2 or 3 very thin hyaline scales called *lodicules*. Stamens usually 3, sometimes 2 or 1, in a few genera 6-40; filaments distinct, filiform or rarely monadelphous; anthers usually versatile, rarely attached at one end, ovate, oblong or linear, with 2 parallel cavities without any prominent connective. Ovary sessile or on a short stipe, erect, 1-celled. Styles 2, lateral or rarely 3 or 1, distinct or united at the base into a 2- or 3-branched style, the upper stigmatic portion, or *stigmas*, either feathery with simple or branched stigmatic hairs, or more rarely simple and clothed with very short papillæ. Ovule 1, ascending, slightly campylotropous. Fruit a *caryopsis* or grain, usually small, often enclosed in the palea and subtending glume, to the former (and rarely the latter) of which it sometimes adheres, the thin membranous pericarp usually closely adnate to the seed and inseparable from it, in a few genera loosely surrounding the seed and dehiscent. Seed erect with a thin adnate testa; embryo small, on one side of the base of the endosperm (albumen).

Annual or perennial herbs usually tufted or decumbent, rarely

climbing, often creeping and rooting at the base: some of the *Bambusæ* shrubby or almost arborescent. Stems, *culms*, simple or branched, usually hollow between the nodes. Leaves alternate, distichous; the sheaths while growing often split open opposite the base of the blade and often terminate within the blade in a scarious or ciliate appendage, the *ligule*; blade entire, parallel-veined, sometimes with small netted veins, usually long and narrow; a 2-keeled membranous *prophyllum* stands between each branch and the main axis.

There are in the Gramineæ probably about 3500 species, the family ranking fifth in size among flowering plants, and among monocotyledons is only exceeded by the Orchidaceæ. The family is allied most nearly to the Cyperaceæ.

IMPORTANT WORKS ON GRAMINEÆ.*

“A considerable proportion of Gramineæ are almost cosmopolitan in their geographical distribution within or without the tropics, often covering the ground with innumerable individuals. Grasses are easily dried, abound in herbaria in specimens readily exhibiting their most essential characters; and every local botanist considers himself perfectly competent to describe as new species or genera suggested only by comparison with the few forms known to him from the same limited locality. The consequence is that the number of bad species and genera of Gramineæ with which science has been overwhelmed is truly appalling.

“The paramount importance of the order in an economical point of view has called forth innumerable treatises, memoirs, and essays on cereals, on forage and other cultivated grasses, on meadows and pastures, on ornamental grasses, on the physiology and properties of the order.

“In a systematic point of view, the great mistake of Linnæus and the earlier systematists was the attempt to regard the whole spikelet as a single flower, with a calyx and corolla to be compared

*Notes on Gramineæ, by George Bentham, F.R.S., Journ. Linn. Soc., XIX. p. 18 abstract.

with those of the more perfect Monocotyledons. Robert Brown, with his usual sagacity, pointed out this and other errors, and first laid down the true principles upon which the order could best be divided into tribes and genera : but he unfortunately took up the idea that the so-called lower and upper paleæ represented three outer segments of a perianth; and although this theory has long since been proved to be groundless, especially by Hugo Mohl, whose views have been fully confirmed by all subsequent careful observers, yet so great is the authority so deservedly attached to everything that has issued from the pen of Brown, that his explanation of the structure of the spikelet is still allowed to influence the terminology adopted in generic and specific descriptions.

“Shortly after the publication of Brown’s ‘*Prodromus*,’ Gramineæ were taken up by several French botanists who had acquired materials, rich for the time, chiefly from North America and the West Indies. Some of these had already been published by Michaux or by Persoon, with more or less assistance from Louis Claude Richard, to whom the credit of all that is good in Persoon’s ‘*Synopsis*’ as well as in Michaux’s ‘*Flora*’ has been attributed by several subsequent writers. Michaux’s ‘*Flora*’ was published in 1803, the first volume of Persoon’s ‘*Synopsis*’ in 1805, both antecedent to Brown’s.

“Desvaux published his new genera, first by abstract in 1810, and afterwards in full in the second ‘*Journal de Botanique*’ in 1813. Between these two periods Poliset de Beauvois published his ‘*Agrostographie*’ in which he undertook a general arrangement of the whole order.

“A few years later, three eminent botanists undertook the general study of Gramineæ. Kunth at Paris and afterwards at Berlin, Trinius in Germany and afterwards at St. Petersburg, and Nees von Esenbeck at Bonn, afterwards at Breslau, worked more or less contemporaneously, but with little or no communication with each other. Kunth’s ‘*Revisio Graminum*’ [*Revision des Graminées*] published in 1829 and following years, is a work not only splendidly illustrated, but remarkable alike for the accuracy of detail in the descriptions of species, as for several of the views given of their

structure and arrangement. This work is costly, while the more generally known first two volumes of his 'Enumeratio Plantarum,' containing the grasses, were unfortunately a far too hasty compilation. Kunth in all his works fully adopted Brown's theory as to the homology of the parts of the spikelet.

Trinius published his 'Fundamenta Agrostographiæ' in 1820, evidently founded on insufficient materials. From that time, however, he devoted himself with the greatest zeal and increasing success to the study of the order. I heard him say, *à propos* of some rather costly collection of specimens, that he would willingly sell his last coat for a new grass; and all his later works published in the Memoirs of the Petersburg Academy are of the greatest value to agrostologists.

Nees von Esenbeck entered but little into general considerations of the structure and terminology of the Order; but he described with great care the grasses of various tropical and other regions. He had ample materials from the collections of Martius, Drège, Preiss, Hooker, Arnott and Lindley, and he came to be regarded as the great authority for the determination of exotic Gramineæ. His 'Agrostographia Brasiliensis' is perhaps the best of all his works; and his 'Flora Africae australis' is also very good. He showed a tendency to multiply genera as well as species. He worked up the grasses of each country separately, without paying sufficient attention to the cosmopolitan nature of so many species.

The last enumeration of Gramineæ was that of Steudel, who published in 1855 the first volume of his 'Synopsis Plantarum Glumacearum,' the worst production of its kind I have ever met with. He was an excellent mechanical compiler, . . . but beyond that, as he was no botanist, he was thoroughly incompetent for the task he had undertaken. Whenever he met with a grass he could not readily make out, he set it down as new, with new name, and a character so carelessly drawn up as to render its identification hopeless without recourse to the specimens themselves; . . . in one case describing as a caryopsis the larva which had eaten up the ovary and taken its place in the enlarged pericarp. Having, more-

over, no idea of methodical arrangement, his work is a perfect chaos.

“Much has been done, however, for the elucidation of the order in local floras. . . . About the close of the last century, several continental botanists proposed new genera for anomalous European grasses . . . that were overlooked by Beauvois, Persoon, Willdenow, and other general systematists. Several of the same genera have since been re-established, but under other names which have now been so long and so universally adopted that they must be considered as having acquired a right of prescription to overrule the strict laws of priority. It would indeed be mere pedantry, highly inconvenient to botanists, and so far detrimental to science, now to substitute *Blumenbachia* for *Sorghum*, *Fibichia* for *Cynodon*, *Santia* for *Polypogon*, or *Singlingia* for *Triodia*.

“Since the days of Kunth, Trinius, and Nees, the most important local revisions of Gramineæ are: Andersson’s ‘Gramineæ Scandinaviæ,’ Parlatore’s first volume of his ‘Flora Italiana,’ Cosson and Durieu’s Glumaceous volume of the great unfinished ‘Flore d’Algérie,’ Doell’s Gramineæ for the great Brazilian Flora founded by Martius, and Fournier’s Gramineæ for the Mexican Flora he has undertaken; partial revisions by Grisebach in his ‘Spicilegium Floræ Rumeliæ et Bithyniæ,’ in the fourth volume of ‘Flora Rossica,’ and by Emile Desvaux in Claude Gray’s ‘Chilian Flora,’ supplemented by new genera and species published by Philippi in various papers on Chilian plants. Andersson was a most acute observer, but, for want of access to an extensive library, his synonyms are often very inaccurate. Palatore’s monograph of Italian grasses is thoroughly to be relied upon when the result of his own observations, but old errors have sometimes been copied from others. Cosson and Durieu’s ‘Monograph of Algerian Grasses’ is a most valuable treatise. Grisebach has also done much for the elucidation of oriental Gramineæ. In Doell’s work I have been disappointed, as he exhibits a general carelessness in redaction. Advance sheets of Eugène Fournier’s ‘Enumeration of Mexican Gramineæ’ have been published. His genus *Lesourdia* had already been published for a southern species by Philippi

under the name of *Scleropogon*. His work would have been much more useful if he had more frequently given the character of the tribes, genera, or other groups instead of limiting himself to dichotomous keys. These keys when carefully drawn up are of the greatest use as guides or indexes to direct the botanist where to look for his plant, but are wholly insufficient for its identification either generic or specific. For about sixty years I have had great experience both in using and in making them. It was with the aid of the admirable 'Analyses' in De Candolle's 'Flore Française' that I was enabled in 1817 and 1818 to learn botany without any extraneous teaching. Their principle was developed in the 'Essay on Nomenclature and Classification' which I published in 1823. I have introduced them more or less into all my local floras. They frequently require the repetition of the same plant under different branches of the key. The best genera and other groups are usually distinguished by a combination of characters.

"In recent days, however, we had all been led to look up to my much lamented friend, the late General Munro, as the one who was to unravel the intricate web into which the order had become involved. His 'Monograph of Bumbuseæ,' and various detached papers and communications, were instalments of great promise. He was known to have a thorough acquaintance with species, and to have already formed a well-digested framework for genera and tribes; he had amassed an immense number of notes, etc., for use in DeCandolle's Monographs, but much of his knowledge I can only gather from his conversation and correspondence.

[For Dr. Bentham's views on the terminology of various parts of Gramineæ see vol. i. p. 33.]

"In Gramineæ we have a new element on the floral axis below the stamens and pistil or actual flower, in the *palea* and *lodicules*, for which we cannot at once find any parallel in other orders. They have recently been the subject of a very able paper in Engler's *Botanische Jahrbücher* (i. p. 336) by Professor Hæckel of Vienna.

"He comes to the conclusion that the palea and the pair of lodicules (when only two) are each of them single, more or less bifid organs, and that they and the third lodicule, when present, must

be regarded as two or three bractlets inserted alternately fore and aft on the floral axis below the flower. The only representations of homologues to the palea and lodicules in the orders nearly allied to Gramineæ are mentioned in my paper (Journ. Linn. Soc. (Bot.), xv. p. 516), where it is compared with the hypogynous scales of *Hypolytrum pungens* and *Platylophus*, and some species of *Eriocaulon*.

“In all cases the palea . . . acquires a certain fixity of character, and requires mention in all full generic characters. The lodicules, on the other hand, are generally rudimentary representatives of suppressed organs having lost all functional powers [*], . . . and their slight variations in form or consistency are generally not even of specific importance.”

Near the end of this volume will be found a partial list of works on Gramineæ, with comments concerning a few of them.

THE DIVISION INTO TRIBES AND SUBTRIBES.

“The division of the order into tribes and subtribes is a matter of exceptional difficulty. Whatever tribes have been proposed, whatever characters have been assigned to them, there have always been more or less ambiguous forms uniting them and preventing the restricting them within absolutely definite limits. We are obliged in Gramineæ, more perhaps than in any other order, to rely upon combinations of characters, allowing for occasional exceptions in every one of our groups, preferring those which experience has shown to present the fewest aberrations. Following up these views, none of the general divisions of the order hitherto proposed have proved to be more natural or more definite than Brown’s original primary one into two great groups or suborders—*Panicaceæ*, in which the tendency to imperfection is in the lower flowers of the spikelet; and *Poaceæ*, in which the tendency is in the opposite direction. This indication of the principle

* The use of lodicules is to spread the glumes and palea when the plants are in flower. At such times they are turgescient, but soon after wither.

kept in view is too indefinite to serve as a practical character; but combining it with that proposed by Munro of the articulation in the axis of the spikelet being below the spikelet itself (in the pedicel) in Panicaceæ, and above the lowest glume or none in Poaceæ, the exceptional forms are reduced to the lowest possible figure.

“Kunth entirely gave up Brown’s groups and divided the order into thirteen tribes, many of which were natural, fairly defined by a combination of characters, and have been very generally adopted. He attached too much importance to such characters as the separation of the sexes or the increase in the number of stamens; in the general arrangement his removal of the Andropogoneæ to a distance from the Paniceæ is disapproved of; and his describing flowers as actually existing when only theoretically imagined is sometimes misleading. Nees generally adopted Kunth’s tribes, but improved the circumscription of some of them, and added two or three small ones.

“Fries, followed by Andersson, proposed for a primary division of Gramineæ that into *Clisanthææ*, with the flower (i.e., the flowering glume and palea) closed and the elongated styles protruding at the apex, and *Euryanthææ*, with the glume and palea open at the time of flowering and the short styles protruding laterally. This division is practically useless, as the flowers of most species open only for a very short time, and in dried specimens are almost always closed; besides, the styles are usually slender and fugacious. The long styles, moreover, would place the majority of the subtribe Seslerieæ, for instance, among Panicaceæ, when all their other characters are those of Poaceæ.

“Fournier rejects both Brown’s and Fries’s primary divisions, but proposes a new one founded on the position of the lowest glume of the spikelet next to the main axis in Chlorideæ and Hordeaceæ, and averted from it or external in other tribes. But this relative position cannot well be ascertained in loosely paniculate Gramineæ, and in one-flowered spikelets it is often uncertain which is to be regarded as the lower glume. The total number of glumes in the tribe Paniceæ is variable, two, three, or four; the lowest in *Reimaria*, the highest in *Panicum*, and medium in *Paspalum*. All

these genera are included by Fournier, as by all others, in one and the same tribe; and if so, are we to regard as the outer glume the small outer one of *Panicum*, called by some an extra bract, and an imaginary one in *Paspalum* and its allies, or the outer one of *Paspalum*, which is second in *Panicum*? Again, in one and the same genus the relative position of the outer glume and the main axis is not always constant, as, for instance, in *Paspalum*.

“Another character much insisted on of late years for tribal distinction is still more uncertain, the adherence of the ripe grain or caryopsis to the palea, as in *Festuca*, *Bromus*, etc. This is usually very conspicuous in a dry state, and the union is perhaps never truly organic, yet, if not taken too absolutely, the character is sometimes a useful one.

“Considerable importance was attached by the earlier agrostologists to the presence or absence of the awn on the back or apex of the flowering glume; but this has subsequently been found to be subject to great variations.

“The spiral twist, however, in the lower part of the awn in some genera is more constant. The awn, when present, is generally twisted in Andropogoneæ, Tristegineæ, Agrostideæ, and Avenaceæ, and not in Paniceæ, Chlorideæ, Festuceæ, or Hordeæ, but there are occasional exceptions. In all the tribes the awn is occasionally deficient.

“The partial or absolute separation of the sexes or the increase in the number of stamens observed in a few genera have been occasionally introduced amongst tribal characters; but they have proved to be often of no more than generic value, although in the tribe Maydeæ the absolute unisexuality of the spikelet may be constant.

“Differences in the size of the embryo, in the form of the so-called scutellum on the caryopsis, or in the longitudinal groove or cavity, have been sometimes brought forward as absolute generic, if not tribal, characters, but, as yet, we know too little about them to test their value fairly.”

More recently E. Hackel of Austria has demonstrated the great value of the shape of the hilum in defining some of the tribes.

See the "True Grasses," translated by Scribner and Southworth, 1890, and published by Henry Holt & Co., New York.

"Following out the views of General Munro as to the general arrangement of the order, in so far as I have been able to ascertain them, I have divided it into tribes and subtribes, as follows, giving the most prominent characters, and some other remarks on the pages referred to in connection with the names as here enumerated:"

Arrangement according to Munro and Bentham.	Arrangement of tribes according to E. Hackel and followed in this work.
Division PANICACEÆ.	
Tribe i. Paniceæ.	Maydeæ.
Tribe ii. Maydeæ.	Andropogoneæ.
Tribe iii. Oryzeæ.	Zoysieæ.
Tribe iv. Tristegineæ.	Tristegineæ.
Tribe v. Zoysieæ.	Paniceæ.
Subtribe 1. Anthephoreæ.	
Subtribe 2. Euzoysieæ.	
Tribe vi. Andropogoneæ.	Oryzeæ.
Division POACEÆ.	
Tribe vii. Phalarideæ.	Phalarideæ.
Tribe viii. Agrostideæ.	Agrostideæ.
Subtribe 1. Stipeæ.	
Subtribe 2. Phleoideæ.	
Subtribe 3. Sporoboleæ.	
Subtribe 4. Euagrostææ.	
Tribe ix. Aveneæ.	Aveneæ.
Subtribe 1. Aireæ.	
Subtribe 2. Euaveneæ.	
Tribe x. Chlorideæ.	Chlorideæ.
Tribe xi. Festuceæ.	Festuceæ.
Subtribe 1. Pappophoreæ.	
Subtribe 2. Triodieæ.	
Subtribe 3. Arundineæ.	
Subtribe 4. Seslerieæ.	
Subtribe 5. Euagrostææ.	
Subtribe 6. Meliceæ.	

- Subtribe 7. Centotheceæ.
 Subtribe 8. Eufestuceæ.
- Tribe xii. Hordeæ. Hordeæ.
- Subtribe 1. Triticeæ.
 Subtribe 2. Leptureæ.
 Subtribe 3. Elymeæ.
- Tribe xiii. Bambuseæ. Bambuseæ.
- Subtribe 1. Arundinerieæ.
 Subtribe 2. Eubambuseæ.
 Subtribe 3. Dendrocalameæ.
 Subtribe 4. Melocanneæ.

DIVISION I.—**PANICACEÆ.**

Spikelets 1-, rarely 2-flowered; lower flower when present staminate or neuter, at maturity falling from the pedicels entire, in groups, or together with certain joints of the rachis. Rachilla not produced beyond the flowers. (In *Isachne* the lower flower is perfect and the rachilla is articulate above the empty glumes.)

“This division of Gramineæ is very well defined by two characters: the articulation of the pedicel below the spikelet or cluster of spikelets, and the single fertile flower apparently terminal, with or without a single male or sterile one below it. Where either of these two characters fail, the plant should be referred to Poaceæ.

“As the spikelet falls away it usually leaves a slight dilation at the apex of the persistent portion. This kind of articulation has not been observed in any species of Poaceæ except in *Fingerhuthia*, a genus of one species belonging to South Africa. In the *Cenchrus* group of the tribe Paniceæ, in the subtribe Anthephoreæ of Zoysiæ, and in some Andropogoneæ the articulation is not under each spikelet, but under little clusters of spikelets; and in Maydeæ it is the whole rachis of the spike or ear which disarticulates under each female spikelet. The articulation is usually under the fertile spikelets only, and not under the males.” Panicaceæ have never more than four glumes, and sometimes only three, rarely only two. In *Isachne* and *Beckmannia*, and in very rare instances in some species of *Setaria* [*Chamæraphis*] and *Panicum*, the lower flower may be perfect, still it is usually sterile, excepting in the first genus mentioned.

“The tribes of Panicaceæ run much into each other.”

TRIBE I.—MAYDEÆ.

Monœcious. The staminate spikelets paniculate, spicate or solitary at the apex of the culm or its branches, the pistillate below, spicate or solitary, disarticulating (except in *Zea*) with the joints of the rachis. Grain ellipsoidal, spherical, or obcompressed, unfurrowed, with large embryo, and often enclosed in a hard capsule which is composed either of the glumes or a part of the articulate rachis.

Culms usually tall, solid (without cavity); leaf-blades usually broad and flat.

- A. Pistillate spikes fasciculate, distinct, articulate. . . 1. (37)
- B. Pistillate spikes of each leaf-axil grown together, forming a compound spike with a very thick axis. . . 2. (38)
- C. Staminate and pistillate spikelets in the same spike, the axis articulate between each two fertile spikelets. 3. (36)
- D. Pistillate spike usually reduced to a single spikelet, wholly enclosed by the indurated sheath of the subtending bract, the pedicel of the solitary staminate spike issuing from the opening at the top . . . 4. (32)

1. (37). **EUCHLÆNA** Schrad. Ind. Sem. Hort. Gœtt. (1832).
Reana Brign. Ind. Sem. Hort. Moden. (1849).

Spikelets monœcious, the staminate 2-flowered, in pairs, one subsessile, the other pedicellate, in the alternate notches of the spikes of the terminal panicle; the pistillate 1-2-flowered on axillary spikes, each surrounded by leaflike bracts. The staminate spikelets with 2 outer acute membranous glumes, each floral glume also acute membranous, enclosing a hyaline palea. Stamens 3. Pistil rudimentary. The pistillate spikelets solitary, sessile on alternate teeth of the rachis, first empty glume very broad, smooth, coriaceous, enclosing the others and the slender rachis, second glume not so firm, floral glume hyaline, enclosing a palea, other glumes thin, empty. The pistillate spikelet may be said to contain 2 flowers, the lower neuter and the terminal fertile. Stami-

nodia 0. Styles very long, filiform, bifid. Grain enclosed with the internodes of the rachis, not adherent.

Terminal panicle much resembling that of Maize; the fertile spikes racemose, each enclosed in long bracts. The affinity to *Zea* appears to be recognized even by those not botanists, as in its native country it is known as "Wild Maize."

Leaves much like those of Maize. Species 3, or perhaps 1 species and 2 varieties, all belonging to Mexico.

1. **E. luxurians** Dur. et Asch. Bull. Soc. Linn. Par. 1 : 107 (1877). TEOSINTE. GUATEMALA GRASS.

E. Mexicana Fourn. Bull. Soc. Roy. Bot. Belg. 15, 467, not Schrad. *Reana luxurians* Dur. Bull. Soc. d'Acclim. ser. 2, 9, 581.

The plant considerably resembles Indian corn, sometimes attaining the height of 4-5 m., branching freely near the ground. Spikes bearing staminate spikelets numerous, digitate, about 15 cm. long; stipe of the pedicellate spikelet nearly half as long as the spikelet. Spikelets elliptical, acute, scabrous. 8-10 mm. long; first glume pointed, flattened on the back, almost 2-keeled, many-nerved, longer than the others; second glume thinner, broad oval; floral glume and palea similar, 6-7 mm. long. Fertile spikelets 6, thick, about 7 mm. long, in section almost semicircular, apex obtuse. Grain 4 mm. long, ovoid, with a broad truncate base and a short point.

Mexico. Cultivated in Florida and other warm regions for the green fodder. This is the plant in cultivation, and in *Index Kewensis* is included under *E. Mexicana* Schrad.

2. **E. Mexicana** Schrad. Ind. Sem. Hort. Gœtt. (1832).

Spikes bearing staminate spikelets 5-7, nearly digitate, about 15 cm. long. Stipe of the pedicellate spikelet 15 mm. long, the spikelets 10 mm. long. Empty glumes oval or ovate, sub-equal, many-nerved. Fertile spike 3-8 cm. long, 1.5 cm. wide, the lower portion fertile. Fertile spikelets 2-ranked, usually appearing 4-ranked owing to the production of a grain to each floret. Grain ovoid, projecting beyond the glumes, 7 mm. long.

Mexico (Michoacan), *Pringle* 4319.

Found on rocky hills.

2. (38). **ZEA** L. Sp. Pl. 971 (1753). INDIAN CORN. CORN. MAIZE.

Spikelets unisexual, monoœcious, the staminate in pairs on alternate sides of the spikes of a terminal panicle, 2-flowered; the pistillate borne on the large dense axillary spikes ("the cob"), each enclosed by an ample involucre ("the husk"), longitudinal rows

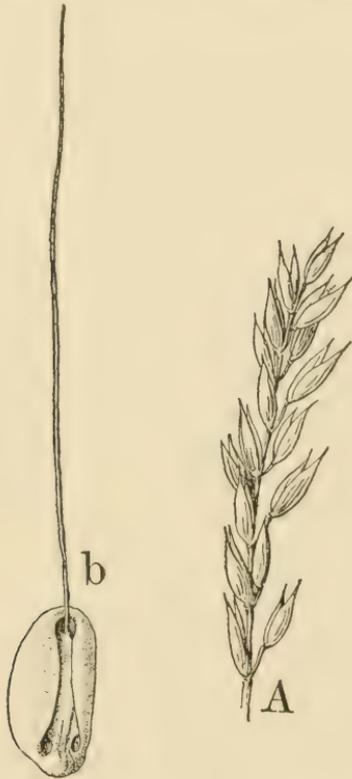


FIG. 1.—*Euchlœna Mexicana*. A, portion of the staminate panicle, $\times 1$; B, pistillate floret, $\times 3$. (Richardson.)

4–40, 1-flowered. *Staminate* spikelets slightly unequal, pedicellate, or one sessile. Glumes 4–5, acute, the 2 outer larger, membranous, empty, the 2 inner, the floral and the palea hyaline. Stamens 3. Pistil rudimentary or 0. *Pistillate* spikelets sessile, densely imbricated in longitudinal rows, the rachis hard or slightly spongy, not articulate. Glumes 4, all membranous, hyaline, or

rarely subherbaceous, short, very broad, obtuse or emarginate, 2-lobed, the 2 outer empty sometimes thicker, the third hyaline, often protecting the short palea, the terminal or floral glume hyaline, often bifid; the palea equally broad, but not divided. Staminodia 0. Style very long, threadlike, briefly parted at the apex, rarely separated to the base, stigmatic hairs very short. Grain, on a short stipe, subglobose or obcompressed, hard, slightly protected by the delicate glumes and palea or enclosed or covered by a variety of acute or subherbaceous glumes.

The terminal staminate panicle with a long showy peduncle, in some varieties in cultivation bearing some pistillate flowers mixed with the staminate. Staminate flowers at the apex of the pistillate spike are not uncommon. The pistillate spikes usually solitary or branching in the axils of the leaves, the styles when mature much exerted, pendulous: at maturity the pistillate spike is long, hard, and entirely covered with the palealike sheaths. It is exceptional in the whole order, by the manner in which its pistillate spikelets are densely packed in several vertical rows around a central spongy or corky axis. How much of this arrangement is due to changes brought about by cultivation and selection can only be a matter of conjecture.

Species 2, possibly 3, all American.

1. **Z. Mays** L. Sp. Pl. 971 (1753). Annual. Most likely a native of tropical America; extensively cultivated in the warmer temperate zones, exceedingly variable, 0.5-6 m. high, not known in a wild state. A very valuable well-known cereal and fodder-plant. See Vol. I.

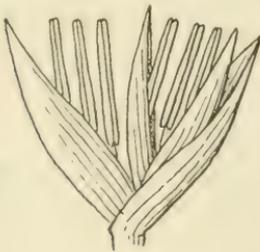


FIG. 2.—*Zea Mays*. Staminate spikelet, $\times 3$. (Richardson.)

2. **Z. canina** S. Wats. Proc. Am. Acad. 26 : 160 (1891).

Culms several from the same root, ascending, branched, 2-4 m. high. Leaves like those of *Zea Mays*. Staminate racemes often elongated and drooping. Spikelets 2-4 (usually 3) at each node, one or more short-pedicelled; empty glume 3-5-nerved, bicarinate. Pistillate

spikes sessile in the axils and terminal, the terminal staminate at the apex; pistillate spike (ears) very variable, 5-10 or more cm. long, about 2 cm. broad, tapering slightly to an acutish apex, 4-12-rowed, dividing more or less readily at the joints. Kernels 6-8 mm. long, ovoid, white, hard, smooth, acutish, constricted at the base.

Specimens obtained from Prof. Dugès at Moro Leon near Wiangato, about four Mexican leagues north of Cape Cuitzo; near the boundary-line between the states of Guanajuato and Michoacan, Mexico.

The natives are said to believe this to be the source of the cultivated varieties of Maize.

In the report of the New York Agricultural Society for 1878, there is a statement by Dr. Surtevant from Dr. Brewer to the effect that Roetzl, the well-known German collector, stated in 1869 that "he found in the State of Guerero a *Zea* which he thinks specifically distinct, and he thinks undescribed; the ears very small, in rows truly distichous; the ear (but not each grain separately) covered with a husk, the grain precisely like some varieties of Maize, only smaller and harder." Possibly this may be the original plant from which our cultivated maize has been derived.

In 1889, at the botanic garden of Harvard University, plants were raised, but the seed failed to mature. For a fuller account of this very interesting plant the reader is referred to the original article above noted.

3. (36). **TRIPSACUM** L. Syst. Ed. 10, 2:1261 (1759).

Spikelets unisexual, monœcious, sessile on alternate joints of the spike, the upper staminate, 2-flowered, the lower pistillate, 1-flowered, the spikes breaking up at maturity, each piece carrying a spikelet. Spikes axillary and terminal; the staminate spikelets in pairs on two sides of a triangular rachis. Glumes 4, the 2 outer slender, coriaceous, stiff or membranous, empty, the 2 inner shorter, more slender, usually hyaline, enclosing the hyaline palea and flower. Stamens 3. Pistils rudimentary or 0. The pistillate spikelets single, sessile, embedded in the cartilaginous rachis. Glumes 4, broad, concave, the outer coriaceous or becoming

woody, the second slender, pointed, the 2 inner hyaline, slender included with the palea, the third empty, the terminal including the pistillate flower. Stammodia 0. Styles joined near the base, much exerted, slender, hispid. Grain enclosed by the hard outer glume and the internode of the hard rachis, but not adherent. Peduncles straight, erect, solitary or in pairs in the upper axils or often bearing 2-3, rarely 4 to many or only one spike, the staminate portion above with an articulate rachis, the pistillate portion below at length breaking up at maturity, each internode carrying one grain.

Species 2 or 3, American, allied to *Euchlæna* and *Zea*.

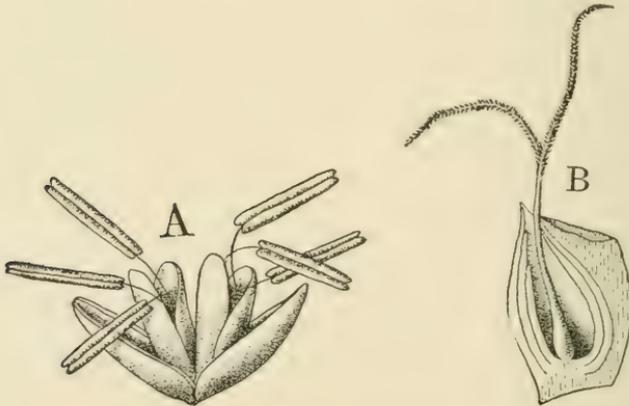


FIG. 3.—*Tripsacum dactyloides*. A, staminate spikelet, x 2; B, pistillate spikelet, x 2. (A, Richardson; B, after A. Gray, "Man.")

1. *T. dactyloides* L. Sp. Pl. Ed. 2, 1378 (1763). GAMA GRASS. SESAME GRASS.

Coix dactyloides L. Sp. Pl. 972 (1753). *T. monostachyum* Willd. Hort. Berol. 1. Tab. 1. (1816). *T. lanceolatum* Rupt., in Benth. Pl. Hartw. 247 (1839-57). *T. compressum* Fourn. in Bull. Soc. Roy. Bot. Belg. 15 : 465.

Culms stout, 1-2 m. high. Sheaths subcylindrical, keeled; blades scabrous above, 30-60 cm. long, often 2 cm. wide. Spikes often digitate, 2-3 together, rarely single, 10-20 cm. long. Stam-

inate spikelets oblong or linear or acute, 8-9 mm. long, first empty glume coriaceous, oblong, margins abruptly involute, keeled, obscurely 9-15-nerved, second thinner, 5-nerved; floral glumes hyaline, oblong, 5-nerved; palea spatulate oblong, a little longer than the glumes. Anthers 5 mm. long.

Fla., *Curtiss* 3626; Texas, *Hall* 844; Ala., *Winchell*; Ind. Terr., *Palmer* 422. Moist soil, Conn., Ill., and south to Brazil. When young sometimes cut for hay.

Var. **Floridanum** (Porter). *T. Floridanum* T. C. Porter, Vasey in Contrib. U. S. Nat. Herb. 3 : 6 (1892).

Culm rather slender. Sheaths compressed-keeled; blades involute, the longest about 60 cm. long, 4-8 mm. wide, with filiform tips. Anthers 4 mm. long.

Fla., *Garber* 77; Texas, *Neally*.

Var. **Lemmoni** (Vasey). *T. Lemmoni* Vasey Contrib. U. S. Nat. Herb. 3 : 6 (1892).

Sheaths sometimes hirsute; blades narrower, often involute. Joints of fertile portion of spikes 3-4 mm. long. First glume of the staminate spikelets membranous, ovate-oblong, about 7 mm. long. Second glume thinner.

Arizona, *Lemmon and wife* 2932.

2. **T. fasciculatum** Trin. Bull. Acad. Brux. 9 : 8 ().

T. dactyloides Schlecht. (not Linn.) in Linn. 6 : 40 (1831).

Culms robust, 5-7 m. high. Blades lanceolate, often 4-5 cm. wide, margins ciliate-scabrous. Spikes racemose with 3-7-20 branches; joint of pistillate portion 5 mm. long, the staminate portion flexuose. Staminate spikelets 4-5-8 mm. long, first glume membranous, linear, 7-nerved.

Mexico, *Palmer* 58, 508, 509.

4. (32). **Coix** L. Sp. Pl. 972 (1753).

Spikelets monœcious, spicate, several above staminate, 1-2 of the lower pistillate; the slender rachis articulate above the pistillate spikelets. The staminate spikelets in twos or threes, one of them pedicellate, 1-2-flowered. Glumes of the staminate spikelets 4, the 2 outer firm or herbaceous, slightly unequal, empty, the 2 inner hyaline. Stamens 3. Pistil rudimentary or 0. The pistillate

spikelets one at the base of the spike, 1-2-flowered, the upper fertile, the lower neuter, both included in a hard shining bract, having a small opening above. Glumes of the staminate spikelets 4, all slender, hyaline, the 2 outer empty, broad, acuminate, the 2 inner including the hyaline palea and the pistillate flower or the third empty. Lodicules very rarely present, 3. Style very long, slender, parted for half its length, covered with very short hairs. Grain globose or oblong, enclosed by a smooth, hard globose or oblong bract.



FIG. 4.—*Coix Lachryma*, $\times 1.5$ Portion of panicle. (Richardson.)

Culms branching, leaf-blades broad. Spikelets often more or less included in the sheaths of the upper leaves, the staminate portion at length deciduous. Species 3 or 4, natives of East India.

1. *C. LACHRYMA* L. l. c. **JOB'S TEARS.**

Annual; 60 cm. high. Leaf-blades 2 cm. wide.

The hard bract covering the lower flowers ovoid, 8 mm. diam., bluish white when ripe; sometimes used for rosaries.

Common in gardens, scarcely naturalized. Native of Southern Europe. M. A. C. Cult. Nos. 1. 2.

TRIBE II.—**ANDROPOGONEÆ.**

Spikelets two (rarely one) at each joint of the rachis, one sessile and one pedicellate (both pedicellate in *Trachypogon*), often apparently three at the terminal joint. Spikelets usually 1-flowered with 3 empty glumes, rarely a floral glume with a staminate flower instead of the third empty glume; first glume always thicker than the floral glume, the latter often hyaline, usually bearing a bent or twisted awn. Palea usually shorter than its glume, sometimes 0.

Stamens 3, rarely 2 or 1. Styles free. Stigmas plumose. Embryo nearly half as large as the unfurrowed obcompressed grain.

- A. Spikelets homogamous, paniculate, rarely spicate, joints of the rachis usually hairy, not much thickened, nor excavated for the reception of the spikelets.
- a. Axis of the racemes continuous, spikelets in pairs, rarely in threes.
 - b. Racemes in a spikelike panicle, spikelets awnless. 5. (73)
 - b. Racemes in broad panicles. Spikelets usually awned. 6. (74)
 - a. Axis of racemes articulate. Spikelets 2-flowered, the spikes or racemes paniculate, main axis elongated.
 - b. Spikelets awnless. 7. (75)
 - b. Spikelets awned 8. (76)
- B. Axis of the spikes articulate, somewhat thickened and excavated for receiving the spikelets; fertile glumes awnless.
- a. First empty glume of the perfect spikelet flattened or convex. 9. (84, 88)
 - a. First empty glume of the perfect spikelet hard and globular, externally pitted 10. (87)
- C. Spikelets heterogamous, the sessile perfect (rarely pistillate), the pedicellate staminate, neuter or rudimentary (in *Trachypogon* one spikelet is pedicellate, the other sessile).
- a. Secondary spikelets 2-flowered, sessile, awned, pedicellate spikelets flower-bearing; racemes 3-16, digitate . 11. (91)
 - a. Sessile or subsessile spikelets 1-flowered, floral glume of the pedicellate spikelets awnless. (n)
 - n. Axis of the racemesim perfectly articulate, not brittle, spikelets all more or less pedicellate 12. (92)
 - n. Axis of racemes distinctly articulate; spikelets both sessile and pedicellate. (o)
 - o. First empty glume with abalsam-bearing line along the nerves; racemes solitary; spikelet awnless. 13. (83)
 - o. First empty glume without a balsam-bearing line along the nerves, racemes in pairs, often subtended by a leaf-sheath or bract. 14. (94)
5. (73). **IMPERATA** Cyrill. Pl. Rar. Ic. 2. 26, t. . 11 (1792).

Spikelets with 1 or rarely 2 flowers, usually in pairs, one sessile, the other pedicellate along the slender continuous rachis of the short branches of a long cylindrical spikelike panicle, densely silky with the long hairs surrounding and seated on the spikelets. Glumes 4, all thin, hyaline, and awnless, 2 outer empty ones usually hairy, the third empty, or rarely enclosing a flower, smaller and without hairs; terminal floral glume still smaller; palea usually truncate and jagged at the top. Stamens 1-2. Styles united below, distinct above. Grain small, enclosed, not adherent.

There are 3 or 4 species widely dispersed in tropical and subtropical regions of Europe, China, Japan and America.

In this genus the branches of the panicle are exceptionally inarticulate, approaching *Tristegineæ*, but the long silky hairs and the very much reduced floral glume and palea retain it in *Andropogoneæ*.

1. ***I. Braziliensis*** Trin. Mem. Acad. St. Petersb. (6) 2 : 331 (1833). *I. caudata* Chapm. Fl. S. States, Ed. 2, 668 (1889).

Culms erect, terete, smooth, 30-100-130 cm. high. Ligule short with long hairs at the base; blades 10-30 cm. long, 4-8 mm. wide induplicate, firm, the upper shorter, often 3-5 cm. long. The dense white woolly panicle 10-15-20 cm. long, 1.5-2 cm. diam. Spikelets in pairs, densely covered with silky hairs reaching 1 cm. from the base, empty glumes sub-equal, about 3 mm. long, the tips obtuse and ciliate, first ovate-lanceolate, and very delicately 5-nerved near the base, second lance-oblong and 3-nerved, third glume oval, 2.5 mm. long, smooth, without nerves, delicately hyaline, with a few short hairs above, fourth glume oval, about 1 mm. long, smooth and nerveless; palea narrower, otherwise like the fourth glume. Stamen 1. Styles united for 1 mm., then distinct, about 4 mm. long.

Mexico, *Pringle* 515. Florida, Mexico, West Indies, Brazil.

2. ***I. Hookeri*** Rupr. ex Anderss. in Cefvers. Vet. Akad. Stockh. 12 : 160 (1855). *I. caudata* Scribn. Bull. Torr. Club, 9 : 86 (1882). *I. brevifolia* Vasey, Bull. Torr. Club, 13, 26 (1886). By some distributions of authors incorrectly called *I. arundinacea* L.

An erect glabrous perennial, 50-120 cm. high. Upper sheaths

lax, very smooth; ligule very short; blades erect, flat, some of the lower 40 cm. long, 1 cm. wide, the upper 1-4 cm. long. Panicle dense, 20-30 cm. long, 2-3 cm. diam., more or less interrupted below, clothed with yellowish-white wool, the anthers and the stigmas protruding. Spikelets in pairs, bearing at the base a tuft of silky hairs 1 cm. long, and scattered hairs on the back of the outer glumes; first glume 4 mm. long, oblong, obtuse, ciliate at the apex, 5-nerved, second a little shorter, otherwise like the first, third empty, smooth, still shorter, fourth and the palea 1.5 mm. long.

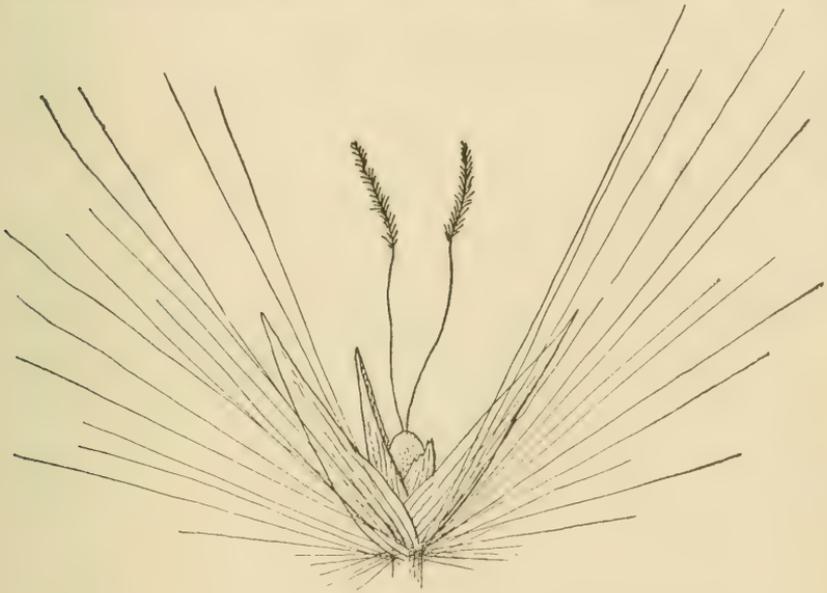


FIG. 5.—*Imperata Hookeri*. Spikelet, $\times 9$. (Richardson.)

Stamen 1. Styles united below, 6 mm. long including the ovary. N. Mex., *Wright* 2001; Texas, *Havard* 24; Southern Calif., *Parish* 1031; Mexico (Jalisco), *Palmer* 444.

Arizona, Nevada, West Texas.

6. (74). **MISCANTHUS** Anderss. (Efv. Vet. Akad. Stockh. 165 (1885). *Eulalia* Trin. Mem. Acad. St. Petersburg. (vi.) 2 : 332 (1833) in part. *Eccoilopus* Steud. Syn. Pl. Gram. 123 (1855).

Spikelets in pairs unequally pedicellate on the inarticulate branches of the spreading panicle. First and second glumes mem-

branous, 3-7-nerved, awnless, third glume smaller, hyaline, awnless; floral glume delicately hyaline, bifid with more or less of an awn in the notch. Stamens 3. Styles distinct. Tall grasses with narrow and usually flat leaf-blades. Panicle terminal, large, usually silky hairy.

It differs from *Imperata* by its broad panicle, three stamens, and bifid floral glume usually with an awn in the notch.

There are 8 species, tall grasses found in Southern and Eastern Asia, 1 of which is found in Southern Africa.

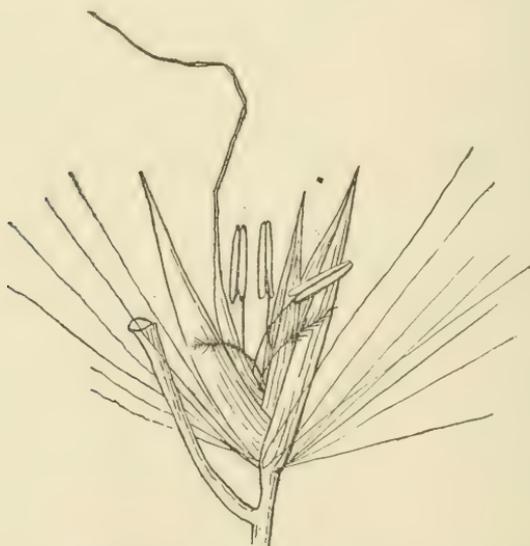


FIG. 6.—*Miscanthus Sinensis*, $\times 9$. Spikelet. (Richardson.)

1. *M. SINENSIS* Anderss. Öfvers. K. Vet. Akad. Stockh. 166 (1855). See Hack. in D. C. Monog. Phan. 6 : 105 (1889). *Eulalia Japonica* Trin. Mem. Acad. St. Petersb. (vi.) 2 : 333 (1833). *Erianthus Japonicus* Beauv. ap. R. & S. Syst. 2 : 324 (1817).

Culms solid, rather stout, 1-2 m. high. Sheaths slightly compressed, smooth, throat ciliate; ligule obtuse, broad, 1-2 mm. long; blade flat, 30-60 cm. long, 8-12 mm. wide. Panicle oval, 20-30 or more cm. long, rays numerous, simple, bearing spikelets for their entire length. Spikelets with numerous silky hairs of their own

length, linear-lanceolate, 4 mm. long, the twisted awn protruding about 4 mm. Cultivated, from Japan.

Var. *VARIEGATA*. Leaf-blades striped. Var. *ZEBRINA*. Leaf-blades contain transverse bands of brown and light color. Cultivated for ornament; not hardy, in the northern U. S.

7. (75). *SACCHARUM* L. Gen. Pl. Ed. 1, No. 49 (1735).

Spikelets awnless in pairs, one sessile, the other pedicellate, on the jointed branches of a panicle, each containing perfect flowers or the pedicellate one containing a pistillate flower. The three empty glumes acute or acuminate, hyaline, or membranous, first and second equal, third smaller, floral glume unawned. Stamens 3. Styles distinct. Grain oblong enclosed, but not adherent.

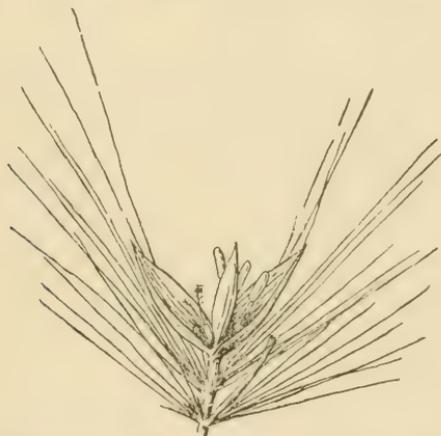


FIG. 7.—*Saccharum officinarum*. Spikelet, $\times 7$. (Richardson.)

Tall perennials with flat or convolute leaf-blades. Panicle terminal, variable, spreading or spikelike. Spikelets more or less villous.

Species about 12 which are tropical or subtropical, 1 of which is extensively cultivated.

1. *S. OFFICINARUM* L. Sp. Pl. Ed. 2, 1 : 79 (1762). SUGAR-CANE.

Culms solid, 2-4 m. high, 2-5 cm. diam. Leaf-blades long, 2-4 cm. or more wide. Panicle pyramidal, 40-80 cm. long. Silky hairs twice as long as the spikelets. Spikelets linear, 2.2-2.5 mm. long.

Seldom flowering in the United States. Propagated by planting the culms in furrows. Introduced from tropical Asia.

8. (76). **ERIANTHUS** Michx. Fl. Bor. Am. 1: 54 (1803). *Rhipidium* Trin. Fund. Agrost. 169 (1820), *Spodiopogon* Fourn.

Spikelets in pairs on each joint of the slender rachis, one sessile, the other pedicellate; otherwise alike. Glumes 4, the 2 outer membranous, often firm, subequal, empty, first 4-6-nerved (9 in *E. striatus*), often 2-toothed, second many-nerved, third shorter, hyaline, empty; fourth or floral glume hyaline, setaceous, or bearing a straight or twisted awn; palea hyaline, smaller. Stamens 3. Styles distinct. Grain oblong, enclosed, but not adherent.

Tall often reedlike grasses with flat or convolute leaf-blades. Panicle terminal, narrow and dense or somewhat spreading, sometimes one-sided, often clothed with numerous hairs. *Erianthus* is intermediate between *Saccharum* and *Pollinia*.

Species 12, widely spread over the warmer regions of Europe, China, Japan and North America.

Spikelets 4-5 mm. long.	1
“ 6 mm. long.	2
“ 7 mm. long.	3
“ 10 mm. long.	4

1. **E. RAVENNÆ** (L.) Beauv. Agrost. 14 (1812). WOOLLY BEARD GRASS. *Andropogon Ravennæ* L. Sp. Pl. Ed. 2, 1481 (1763). *Saccharum Ravennæ* L. Syst. Veg. Ed. 13, 88 (1774).

Culms 2-3 m. high, reedlike, glabrous. Sheaths smooth; ligule short, pilose; the lower blades hairy, very narrow, grooved on the upper side, 1-2 m. long. Panicle 30-60 cm. long, 15-20 cm. wide when in flower. Spikelets 5 mm. long, these as well as their pedicels clothed with hairs about their own length; glumes nearly equal, ovate-lanceolate, 3-nerved, third hyaline, oval, acuminate, 4-5 mm. long, 1-nerved; floral glume broad-oval, hyaline, 3 mm. long, 3-nerved with a straight awn about 5 mm. long; palea ovate, acute, hyaline, nerveless, 2 mm. long. Lodicules 0.6-0.7 mm. long. Stamens 3.

Introduced into cultivation from Europe for its stately appearance in gardens.

2. *E. alopecuroides* (L.) Ell. Bot. S. C. & Ga. 1 : 38 (1816).
Andropogon alopecuroides L. Sp. Pl. 1045 (1753).



FIG. 8.—*Erianthus alopecuroides*. Spikelets, $\times 4$. (Richardson.)

E. saccharoides Michx. Fl. Bor. Am. 1 : 55 (1803). *Anthoxanthum giganteum* Walt. Fl. Car. 65 (1788).

Culms 1-2 m. high, hairy at the nodes. Panicle contracted, 20-60 cm. long. The tawny hairs at the base and sparingly on the outer glumes exceeding the spikelets, spreading when dry and mature; first and second empty glumes equal, ovate-lanceolate, firm membranous, tawny, round, or flat on the back, 6 mm. long, first 2-toothed, 5-6-nerved, second mucronate, 3-nerved; third and fourth red, hyaline, ovate-lanceolate, 1-3-nerved, third 4-5 mm. long, with a terminal straight awn nearly its own length, fourth shorter, 2-toothed with a straight awn 1-2 cm. long; palea hyaline, membranous, about 2 mm. long. Lodicules broad, truncate, ciliate, 0.7 mm. long. Stamens 2. Styles distinct.

New Jersey, *Scribner* 3627 from Parker; Delaware, *Canby*; Fla. *Curtiss* 3627.

Dry or wet soils, New Jersey to Texas.

3. *E. brevibarbis* Michx. Fl. Bor. Am. 1 : 55 (1803). *E. saccharoides* sub-sp. *brevibarbis* Hack., D. C. Monog. Phan. 6 : 131 (1889).

Culms rather slender, tall, sparingly hairy at the nodes. Sheaths often glabrous; ligule 1-2 mm. long; blade 30-80 cm. long, 6-15 mm. wide. Panicle 15 cm. long, hairs seldom as long as the spikelets. Spikelets 7 mm. long, first and second glumes nearly alike, 3-4-nerved above, 2-toothed, third shorter, hyaline, fourth still shorter, 2-cleft bearing a twisted awn 2 cm. long.

The plant resembles *Andropogon (Chrysopogon) nutans*, except that the spikelets are sessile or on short stiff pedicels.

Virginia to Texas.

VAR. *Contortus* (Nutt.) Chapm. Fl. S. States, 582 (1860). *Saccharum contortum* Nutt. Gen. 1: 60 (1818). *E. contortus* Ell. Bot. S. C. and Ga. 1: 40 (1816). *E. saccharoides* Michx. sub-sp. *contortus* Hack., D. C. Monog. Phan. 6 : 131 (1889).

Culm 60-130 cm. high, leaf-blades smoother. Panicle 20-40 cm. long, narrower, thinner. The third glume white with two slender teeth, the awn twisted at the base and twined like a cork-screw above.

North Carolina to Texas.

4. *E. strictus* Baldwin, Ell. Bot. S. C. and Ga. 1:39 (1816).
Saccharum strictum Nutt. Gen. 1:60 (1818).

Culms slender, 130-240 cm. high, terete, smooth, slightly hairy at the nodes. Sheaths terete, slightly keeled above, glabrous, nodes minutely pubescent; ligule 1-2 mm. long, truncate; blades smooth, flat, setaceo-acuminate, 30-60 cm. long, 6-15 mm. wide, with a narrow base. Panicle 20-40 cm. long, 1-2 cm. wide, all parts more or less red or carmine. Sessile spikelets 10 mm. long, linear-lanceolate; first and second glumes about 10 mm. long, firm, scabrid, round on the back, involucre of hairs very short or none; first oblong-lanceolate when spread, 9-nerved, 2-toothed, second ovate-lanceolate, 2-toothed, mucronate, third membranous, linear-lanceolate, 7 mm. long, 2-3-nerved, fourth shorter, hyaline, 3-nerved, 2-toothed with a straight awn about 2 cm. long; palea 2-nerved, hyaline, nerveless. Lodicules truncate, 1 mm. long.

Texas, *Nealley*; Tenn., *Gattinger*; Fla., *Chapman*.

River banks. North Carolina, Tennessee to Florida and Texas.

9. (84, 88). **MANISURIS** L. Mant. 2:164 (1757) not Sw.

Rottballia L. f. Diss. Nov. Gram. 23 (1779). *Hemarthria* R. Br. Prod. 207 (1810). *Phacelurus* Griseb. *Peltophora* Desv.

Spikelets in pairs in the alternate notches of the articulate or almost entire rachis of a simple spike, the first sessile and embedded in a cavity of the rachis, with one perfect flower and sometimes a staminate one below it, the other on a closely appressed or adnate pedicel, but often spreading with a staminate or rarely a perfect flower, or reduced to 1-2 empty glumes. The spike single on each peduncle above a sheathing bract and cylindrical or nearly so. Glumes in the sessile spikelet 4, the outer one coriaceous, flattened on the back, closely covering the cavity of the rachis, second thinner but often firm, concave or keeled, third and fourth and the palea hyaline, all awnless. Stamens 3. Styles distinct. Grain enclosed, but not adherent.

In addition to the above from Bentham, our 4 species are smooth, tall perennials, blades compressed and pointed. The second glume of the sessile spikelets ovate, acute, compressed, keeled, 3-nerved, third and fourth glumes and the palea ovate.

Third glume flat, 2-nerved, the fourth compressed, 3-nerved. Lodicules 2, truncate, many-nerved. Bentham in *Flora Australiensis* remarks that "*Rottbællia* was originally founded by the younger Linnæus on five species which are now separated into as many genera. Brown's proposed plan to restrict the name to *R. exaltata* and allied species since added has now been generally adopted."

These grasses are mostly tall perennials, with flat or compressed leaf-blades. Spikes terminal and lateral. Species about 23, extending over tropical Asia, Africa, and 4 in America.

The characters of this genus have been very differently restricted by different botanists. I have followed E. Hackel, and included *Hemarthria* R. Br. in this genus.

On this subject Bentham says: "*Hemarthria* is separated from *Rottbællia* chiefly on account of the flattened and less distinctly articulated rachis and the curious way in which the stipes of the sterile spikelet is adnate to the rachis."

a. First glumes of the sessile spikelet

Transversely rugose	1
" and vertically rugose	2
Unequally pitted	3

a. First glume of the sessile spikelet

Neither rugose nor pitted	4
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1. *M. rugosa* (Chapm.) Kuntze, Rev. Gen. Pl. 780 (1891).

R. rugosa Chapm. Hack. in D. C. Monog. Phan. 6 : 308 (1889).

R. rugosa Chapm. Fl. S. States, 579 (1860), not Nutt.

Culms robust, compressed, 40-90 cm. high. Lower sheaths compressed, equitant; ligule very short, truncate; lower blades 20-60 cm. long, 2-5 mm. wide; the upper about 4 mm. long. Spikes terminal and lateral, 3-5 cm. long, 2-5 mm. diam., often partly included in the sheaths. Sessile spikelets about as long as the joints of the rachis. In the *sessile* spikelets, first glume 4-5 mm. long, including the spongy base, ovate, flat, 2-keeled, bifid, 6-8-nerved, with two or more regular spongy ridges passing more or less transversely; second glume 3.5-4 mm. long; third 3.5 mm. long, 2-nerved; fourth broad ovate, obtuse, 3 mm. or less in length.

The wavy cell-walls of the palea and the fourth glume are conspicuous under a lens. In the *pedicellate* spikelets, first glume flat, ovate, 9-11-nerved, over 2 mm. long, a winged keel near one margin, second glume as long as the first, compressed, keeled, 5-nerved, third glume as long as the others, hyaline, 2-nerved.

Fla., *Curtiss* 3622; *G. V. Nash* 1074.

2. *M. corrugata* (Baldw.) Kuntze, *Rev. Gen. Pl.* 779 (1891).

R. corrugata Baldwin, *Sill. Am. Journ.* 1:355 (1819).

Culms robust, compressed, 90-120 cm. high. Lower sheaths compressed, equitant; ligule very short; lower blades 50 cm. long, 5-8 mm. wide, the upper shorter. Spikes projecting above the sheaths, 6-10-15 cm. long, 3-4 mm. diam., cylindrical. *Sessile* spikelets about as long as the joints of the rachis, first glume, including the callous base, 5 mm. long, concave, ovate, bifid, nerves indistinct, vertically and transversely rugose, second glume about 4 mm. long, third glume about 3.5 mm. long, 2-nerved, fourth glume as long as the third. *Pedicellate* spikelets nearly 3 mm. long, first glume ovate, 6-nerved, a keel near one edge, second glume compressed, keeled, 3-nerved.

Low pine barrens near the coast. South Carolina to Texas.

3. *M. cylindrica* (Michx.) Kuntze, l. c. *Tripsacum cylindricum* Michx. *Fl. Bor. Am.* 1:60 (1803).

R. cylindrica Torr. *Bot. Whipl. Exped.* 159 (1857).

Culms slender, terete, simple, 60-90 cm. high. Sheaths glabrous, terete or subcompressed; ligule very short, ciliate; blade 15-40 cm. long, 2-3 mm. broad. Spikes single, projecting, terete, 10-18 cm. long, 2.5 mm. wide. Spikelets sessile, 6-7 mm. long, with a callus 1 mm. long; first glume of the sessile spikelets obtuse, 7-nerved, 6-8 mm. long, very firm, bifid, nerves inconspicuous, concave, with slight pits on the outside; second and third glumes 4 mm. long. Anthers 3 mm. long. The pedicellate spikelets rudimentary, consisting of 2 small glumes 1.5-2 mm. long.

Texas, *Hall* 843; Fla., *Chapman*.

Dry sandy soil, Florida to Texas.

4. *M. compressa* (L. f.) Kuntze, l. c.

R. compressa L. f. Suppl. 114 (1781). Var. *fasciculata* (Lam.) Hack., D. C. Monog. Phan. 6: 286 (1889).

R. fasciculata Lam. Ill. Gen. 1: 204 (1791). *Lepturis fasciculatus* Trin. Fund. Agrost. 123 (1820). *Hemarthria Havardii* Vasey.

Culms branching, compressed, 120 cm. or more high. Lower blades few and rather short, keeled, ciliate on the margins, the sheaths of the other leaves half to two-thirds as long as the internodes; ligule short ciliate, blades of the culms 5-7-nerved, more or less scabrous, usually conduplicate, 10-18 cm. long, 4-6 mm. wide. Spikes numerous, terminal and lateral, usually compressed and more or less enclosed, 6-10 cm. long. *Sessile* spikelets about as long as the joints of the rachis. In the sessile spikelets, first glume oblong acute, 6 mm. long, about 10-nerved, second glume linear, as long as the first, third glume linear acute, 5-6 mm. long, fourth ovate-lanceolate, obtuse, 4 mm. long; palea about the length of its glume.



FIG. 9.—*Manisuris compressa*. Portion of a spike, $\times 3$. (Richardson.)

In *pedicellate* spikelets first glume flat, linear-lanceolate, extreme tip obtuse and 2-toothed, 7-nerved, second glume lanceolate, extending to the apex of the first glume, compressed, 3-5-nerved, third glume and palea much alike, about 3 mm. long. Grain 2 mm. long.

S. E. Texas, *Havard*, *Nealley*; Mexico, *Pringle* 3132. Also found in N. Africa and S. W. Europe.

10. (87). **HACKELOCHLOA** Kuntze. Rev. Gen. Pl. 776 (1891). *Manisuris* Sw. Prod. Veg. Ind. Occ. 1: 186 (1797), not Linn.

Spikelets in pairs in the notches of the 1-sided articulate rachis of a simple spike, 1 sessile and half embedded in a cavity on the rachis, with 1 perfect flower, the other on a short appressed pedicel reduced to 2 empty glumes, or with a staminate flower, the spike single on the peduncle above a sheathing bract. Glumes of the

sessile spikelet 4, awnless, warty, hard, empty, the second smaller concave, thin and firm, third and fourth small, thin and hyaline, awnless; palea minute or 0. Stamens 3. Styles distinct. Grain enclosed by the round glume, but not adherent.

Species 11, widely spread over the warmer regions of the New and the Old World.

1. *H. granularis* (L.) Kuntze, Rev. Gén. Pl. 776 (1891). *Cenchrus granularis* L. Mant. 2 : App. 575 (1771). *Manisuris granularis* Sw.

A slender leafy branching annual, 70-90 cm. high. Sheaths loose, compressed, hispid; ligule very short; blades short flat, ciliate cordate, 6-20 cm. long, 8-12 mm. wide, clothed with spreading hairs each springing from a tubercle, the floral leaves generally exceeding the enclosed sheathing bracts and spikes and narrower sheathing bracts, the whole inflorescence forming an irregular leafy panicle. Spikes 1.5-2.5 cm. long. *Sessile* spikelets 1.8-2.5 mm. long, 1.3 mm. diam. on an obconical callus,

0.5-0.8 mm. long, outer glume 11-nerved, second oval, 1-nerved; *pedicellate* spikelets 2 mm. or more long, first glume flat-oval, 5-7-9-nerved, with a keel near each margin, second concave, 7-nerved, the keel winged.

Ga., *Curtiss* 3625; Arizona, *Pringle*, *Lemmon* 315; Mexico, *Palmer*, *Pringle* 366; both for U. S. Dept. Agric.

In *Palmer's* specimen there is a thin glume, nearly as long as the outer glume; it is hyaline, broad oval, 2-nerved. A fourth one is a little shorter, hyaline, nerveless. Stamens 3. In *Pringle's*

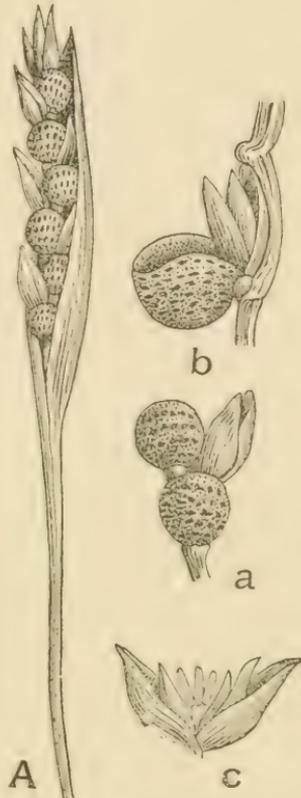


FIG. 10.—*Hackelochloa granularis*. A, spike; a, b, ♀ spikelet, $\times 4$; c, ♂ spikelet, $\times 7$. (Scribner.)

specimens from Arizona, there are three or four empty glumes and no stamens.

Introduced. North Carolina, Florida, Texas, Mexico.

11. (91). **EREMOCHLOA** Buese, Miq. Pl. Jungh. 1 : 357 (1854). *Ischæmum* in part. *Pectinaria* Hack. Engl. and Prantl. Nat. Pl. 2, 2 : 26 (1887). *Vossia* Wall.

Spikelets in pairs in the alternate notches of the articulate flexuose rachis of simple spikes, 1 sessile with 1 perfect terminal flower and a staminate 1 below it, the outer pedicellate and either similar or with only 1 perfect or 1 or 2 staminate flowers or reduced to 2 empty glumes, the spikes either solitary or 2 or more, sessile or nearly so on the end of the common peduncle. The outer glume of the sessile spikelet the largest, awnless, truncate or 2-toothed at the top, second glume keeled and sometimes produced into a straight awn, third glume rather smaller, thin, enclosing a palea and 3 stamens, terminal glume a twisted and bent awn, attenuate or hyaline and bifid at the base as in *Andropogon*; palea small and thin or 0. Styles distinct. Grain enclosed in the glumes, but not adherent.

About 30 species, mostly Asiatic.

The above in reference to *Eremochloa* is mostly taken from Benthams's *Flora Australiensis*. It will scarcely lead one to recognize our single introduced species.

1. **E. LEERSIOIDES** (Munro) Hack., D. C. Monog. Phan. 6 : 264 (1889). *Ischæmum leersioides*, Munro, Proc. Am. Acad. 4 : 363 1864-65). This is not *Eremochlœ* S. Wats.

Culms slender, sparingly branched, 20-40 cm. high, nodes puberulent. Leaf-blades flat or involute, hirsute, setaceous, 6-12 cm. long, 2-3 mm. wide. Spikes curved (looking much like *Bouteloua tenuis* or *B. polystachya*), terminal or lateral, 2-5 cm. long. Pedicellate spikelets reduced to a stipe less than 3 mm. long. Sessile spikelets 3.5 mm. long, first glume flattened, ovate, about 4 mm. long, 6-nerved, subacute with two close teeth, margins supplied with short spiny hairs 2-3 mm. long, second glume elliptical, acute, 4 mm. long, 3-nerved, third glume and palea 3 mm. long, hyaline, terminal glume awnless.

Introduced into California from eastern Asia.

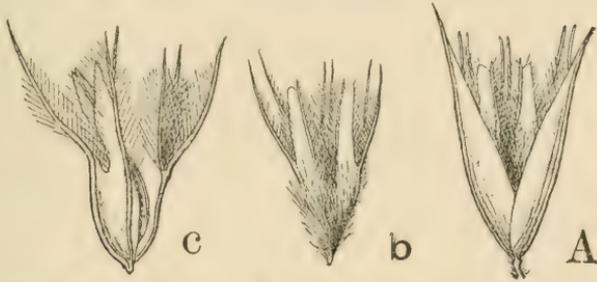


FIG. 11.—*Eremochloa leersioides*. A, spikelet, $\times 10$; b, c, florets. (Scribner.)

12. (92). **TRACHYPOGON** Nees, Agrost. Bras. 341 (1829), in part.

Spikelets 1-flowered, in pairs at the nodes of the rachis of a simple 1-sided spike, a subsessile staminate awnless spikelet and an awned pedicelled, pistillate or perfect spikelet. Empty glumes 3-4, the outer 1 firm, awnless, enclosing the others, second narrower but similar, third empty, very delicately hyaline, narrow, very small; terminal glume in the sessile spikelet delicately hyaline, awnless, in the pedicelled spikelet hyaline below, above bearing a long twisted awn; palea very small or 0. Stamens 3. Styles distinct. Grain oblong, included, not adherent.

Tall tufted perennial grasses, with long narrow, flat or involute leaf-blades. Spikes solitary or 2 or 3 and sessile at the apex of the peduncles. Spikelets slightly imbricated and appressed to the rachis. Nearly related to *Heteropogon*.

Found in tropical America and in Africa and Australia.

Anderss. in Cefvers. Vet. Akad. Stockh. 1857, enumerates 11 species, 1 of which is African and the rest peculiar to tropical and subtropical America, including Brazil and Mexico. Hackel places them all in one species with many subspecies and varieties.

1. **T. polymorphus** Hack., Mart. et Eichl. Fl. Bras., 2, pars. 3 : 263 (1883).

A slender erect perennial grass, 60-90 cm. high, hairy at the nodes. Sheaths terete, longer than the inter nodes, more or less pubescent; ligule firm; blades narrow, flat or convolute, glaucous, rigid, the lower 20 cm. long, the upper 5-8 cm.

long. Spikes 1-5, terminal, protruding above the leaves, 8-17 cm. long. Sessile staminate spikelet 5-8 mm. long, without a callus, oblong obtuse, flat concave, 2-keeled, 9-11-nerved, 7 mm. long, second glume linear, 3-nerved, as long as the first, third oblong, 2-nerved, 5 mm. long, fourth narrower and shorter, 3-nerved. Pedicellate spikelets 2-3 mm. long with a hard oblique point, above which are appressed hairs. Flower perfect, first glume sparsely hairy, flat-concave, obtuse, 7-9-nerved, 8 mm. long, second round on the back, oblong, 3-nerved, bifid, as long as the first, third 3-nerved, the lower portion hyaline, 2 mm. long bearing a twisted bent awn 2.5-12 cm. long.

Mexico, *Palmer* 303.

The species is found in west Texas, Arizona and Mexico.

Var. **Montufari** (H.B.K.) Hack. l. c. *Andropogon Montufari* H.B.K. Nov. Gen. et Sp. 1 : 184 (1815). *T. Montufari* Nees, Mart. Fl. Bras. 2 : 342 (1829). Blades all flat or the radical ones convolute, 2-5 mm. wide; ligule 2-13 mm. long. Spikes 10-17 cm. long; staminate spikelets ovate-oblong, 6-7 mm. long, first glume more or less pilose on the back. Arizona, *Pringle* 175; Mexico, *Palmer* 467.

FIG. 12.—*Trachypogon polymorphus*. Spikelets, $\times 4$. (Richardson.)



13. (83). **ELIONURUS** H. & B. Willd. Sp. Pl. 4 : 941 (1805) (*Elyonurus*). *Callichlœa* Spreng. Steud. Nom. Ed. 2, 1 : 257 (1840).

Spikelets in pairs in the alternate notches of the articulate

rachis of a simple spike, 1 sessile with 1 perfect flower, the other pedicellate and barren, the spike solitary and the rachis densely silky-hairy. Outer glume of the barren spikelet usually spreading. Fertile spikelet appressed; glumes 4, the outer one firm, largest, erect and often 2-lobed, with a balsam-bearing line along the nerves, second shorter, thin but rigid and pointed, third and fourth shorter, hyaline, all without awns; palea none or very minute. Styles distinct. Stamens 3. Grain enclosed in the outer glumes, but not adherent. Culms tufted, usually erect. Sheaths subtumid; ligule very short, truncate; blades flat or more or less folded. Racemes erect.

They all differ a little from *Manisuris* (*Rottballia*), connecting this with *Andropogoneæ*. Boissier has proposed *Lasivurus* as a genus to include the species, having 3 spikelets instead of 2 at each node of the rachis: but this character is by no means constant.

Species about 12, mostly perennials spread over tropical and subtropical America and Africa, sparingly in western Asia, and one in tropical Australia.

Pedicellate spikelet neuter	1
" " staminate	2

1. *E. barbiculmis* Hack., D. C. Monog. Phan. 6 : 339 (1889).
Andropogon candidus Trin. in part.

Culms tufted, slender, 50-70 cm. high, containing 3-4 nodes, one or two of the upper ones bearing solitary branches. Sheaths terete, loose; blades of the lower leaves very narrow, often 30 cm. long, the upper 1-4 cm. long, 0.7-1 mm. wide. Spike 6-8 cm. long, 5 mm. wide, white with dense silky hairs. *Sessile* spikelet lanceolate, much flattened, 7-9 mm. long; first glume lance-elliptical, densely hairy, obscurely 7-nerved, the lateral nerves heavy, second glume 5-6 mm. long, obscurely nerved, third and fourth about equal, 4 mm. long, one 3-nerved, the other 2-nerved. Styles plumose, red. *Pedicellate* spikelets 5 mm. long, borne on pedicels rather shorter, the outer glume lanceolate, flattened on the back, hairy, the second acute, 4 mm. long, the third and fourth 3 mm. long; no flower. E. Hackel considers the Brazilian grass, *Elionurus candidus* (Trin.) Hack., to which our form has been referred,

as a distinct species, and proposes the above name for our species.

West Texas, *Wright* 804; New Mexico, *Wright* 2106; Arizona, *Lemmon* 2926; Mexico, *Pringle* 423; Texas, *Nealley*, *Havard*; Arizona, *Lane*, *Rothrock* 638.

Texas, Arizona, and northern Mexico.

2. *E. tripsacoides* H.B.K. Nov. Gen. et Spec. 1 : 192 (1815). *Andropogon Nuttallii* Chapm. Fl. S. States, 580 (1860). *Elionurus Nuttallii* Vasey, Deser. Cat. Gr. U. S. 25 (1885).

Culms erect, tufted, slender, compressed, sparingly branched from the upper 1-3 nodes, internodes but little longer than the sheaths



FIG. 13.—*Elionurus tripsacoides*. Spikelets. (Richardson.)

70-120 cm. high. Ligule ciliate with long hairs; blades filiform-involute, glabrous or pilose, the lower 15-50 cm. long, 2-4 mm. wide, those of the middle of the culm 30-50 cm. long, the upper 3-5 cm. long. Spikes axillary and terminal, 5-14 cm. long. Sterile spikelets 4-7 mm. long borne on a hairy pedicel 3 mm. long, first glume flattened, smooth, ovate-lanceolate, obtuse, 5-nerved besides the keel at each margin, second

glume as long as the first, elliptical-lanceolate, keeled near the apex, 3-nerved, third glume a little shorter, 2-nerved, fourth still shorter. Stamens 3. Sessile spikelets on an obovate callus, 1-1.5 mm. long, densely barbate, flattened, 5-6 mm. long, smooth or scabrid, the 2 keels clothed with short hairs, first glume flat, narrowly ovate, bifid, 11-nerved, second concave, elliptical-lanceolate, nearly as long as the first, keeled above, third and fourth shorter; flower perfect.

Florida, *Curtiss* 3630, *Drummond* 344.

Florida to Texas.

Var. *Ciliaris* (Trin.) *E. ciliaris* H.B.K. Nov. Gen. et Sp. 1 : 193 t. 63 (1815).

The first glume copiously clothed on the back with short hairs.

Kunth describes this grass in his supplement, and at the close remarks that it is hardly distinct from *H. tripsacoides* H.B.

It is also so considered by Hackel.

Texas and Arizona. *Rothrock* 638.

14. (94). **ANDROPOGON** L. Sp. Pl. 1045 (1753). *Dichanthium* Willem. Ust. Ann. Bot. 18 : 11 (1796). *Sorghum* Pers. Syn. 1 : 101 (1805). *Heteropogon* Pers. Syn. 2 : 533 (1807). *Diectomis* Beauv. Agrost. t. 23. f. 5 (1812). *Cymbopogon* Spreng. Pugill. 2 : 14 (1815). *Chrysopogon* Trin. Fund. Agrost. 187 (1820). *Lepeocercis* Trin. Fund. Agrost. 203 (1820). *Schizachyrium* Nees, Agrost. Bras. 331 (1829). *Hypogynium* Nees, Agrost. Bras. 364 (1829). *Euklastaxon* Steud. Flora. 33 : 1.229 (1850). *Gymnanthelia* and *Hyparrhenia* Anderss. Nov. Act. Upsal. 2 : 231 (1856).

At least twenty other synonyms have been discovered.

Spikelets 1-flowered or empty, in pairs, or by the suppression of 1. single, the axis often terminated by 2 pedicellate spikelets by the side of 1 sessile, either in the alternate notches of the articulate rachis of simple spikes, or else paniculate, 1 sessile, perfect (or rarely staminate) and fertile, the other pedicellate and barren, either staminate or empty. Glumes in the fertile spikelets 4, the outer 1 the largest, awnless, or with a straight awn, several-nerved, but often almost 2-keeled, with 2 nerves near the margin much more prominent than the others; second glume keeled, rarely produced into a short straight awn, third glume much smaller, hyaline and empty, fourth or terminal glume very slender, flexuose and stipe-like at the base, or if dilated hyaline, entire or bifid at the apex, usually with an awn, either terminal or from the notch, rigid and twisted in the lower part, bent back and very fine above the middle; palea small, hyaline, or 0. Lodicules cuneate. Glumes of the barren spikelet 4 or fewer, the outer one the largest and many-nerved, second keeled, third and fourth, when present, small, thin and hyaline, all awnless. Stamens 3. Styles distinct. Grain enclosed, but not adherent. Culms usually destitute of a hollow inside, hard, often flattened, dark red or brown near the nodes. Leaf-blades usually very narrow, never cordate, pedicels and joints of the rachis usually ciliate or villous.

The grasses of this polymorphous genus number about 130 species, are generally branching, often found in poor land, and vary much in habit. They are widely dispersed in the warmer portions of Europe, Asia, Australia and America.

Bentham reduces the species of *Andropogon* proper to 5 sections.

I have followed E. Hackel, who places our species of the genus under subgenera as follows:

Subgenus 1. SCHIZACHYRIUM (Nees as a genus). Spikes slender, single, terminal or axillary, the thickened joints of the rachis with a cup or toothlike appendage at the apex, pedicellate spikelets usually neuter, about as long as the sessile ones, second glume of the sessile spikelets awnless or with a very short awn, floral glume often cleft nearly to the base, bearing an awn between the lobes; culms usually low and slender.

- a. Spikelets and pedicels clothed with soft hairs (b)
- b. Hairs reaching beyond the spikelets 1
- b. Hairs not reaching beyond the spikelets 2
- a. Spikelets and pedicels containing a few short hairs in rows or lines (c)
- c. Annual, culms filiform, bearing spikes at all the nodes, blades 2-6 cm. long 3
- c. Perennial, culms stouter, leaves longer (d)
- d. Lateral spikes all exerted (e)
- e. Lateral spikes very few (f)
- f. Spikelets 5-6 mm. long 4
- f. Spikelets 7 mm. long 5
- e. Lateral spikes numerous 6
- d. Lateral spikes partly embedded (g)
- g. Sessile spikelets about 4 mm. long 7
- g. Sessile spikelets about 6 mm. long 8
- g. Sessile spikelets about 7 mm. long 9

Subgenus 2. DICTOMIS (Beauv. as a genus). Pedicellate spikelets laterally compressed, neuter, broad, twice as long as the sessile ones, second glume of sessile spikelets awned 10

Subgenus 3. ARTHROLOPHIS. Spikes mostly in pairs, rarely digitate or paniced, terminal or axillary, one pedicellate, the other

sessile, the branches and branchlets more or less included by a broad spathe or sheath having little or no blade.

A. Pedicellate spikelets with 1-2 glumes half as long as the sessile ones, culms simple below, much branched above.

- a. Spikes 4-6-jointed. (b)
- b. Spikes 1-2 cm. long, sessile spikelets 4 mm. long 11
- b. Spikes 2-7 cm. long, sessile spikelets 5 mm. long 12
- Spikelets 6 mm. long. (c)
- c. Spikes 3-4 cm. long. 13
- c. Spikes 5-7 cm. long. 14
- a. Spikes 10-20-jointed. (d)
- d. Spikes 2 cm. long, mostly raised above the tips of the long bracts. 15
- d. Spikes mostly with bracts as long as themselves. (e)
- e. Spikes about 2 cm. long, sessile spikelets 3-5 mm. long. (f)
- f. Plant slender, spikes in remote clusters 16
- f. Plant stout, spikes mostly clustered near the top. 17
- e. Spikes 2-3 cm. long, sessile spikelets 3 mm. long. Some plants of 19
- e. Spikes 2-3 cm. long, sessile spikelets 4 mm. long. 18-20

B. Pedicellate spikelets staminate, with 4-5 glumes, as long as the sessile ones, which are 7-11 mm. long, branching little above.

- a. Spikes 2, near or at the apex of the culm or its branches. 21, 22
- a. Spikes 3-8, digitate near the apex of the culm. 23

Subgenus 4. AMPHILOPHIS. Spikes digitate or paniced at the apex of the culm or branches, all pedicellate. Joints of the rachis and the pedicels with a median, longitudinal, translucent line. Floral glume tapering into an awn.

- a. Pedicellate and sessile spikelets equal. 24
- a. Pedicellate spikelets shorter than the sessile, spikes in a terminal panicle often branched. 25

Subgenus 5. *SORGHUM* (Pers. as a genus). Spikelets truly and conspicuously paniculate, rays consisting of a sessile fertile one on a pedicel, the branches pedicellate spikelets. First and second glumes of the fertile spikelets coriaceous.

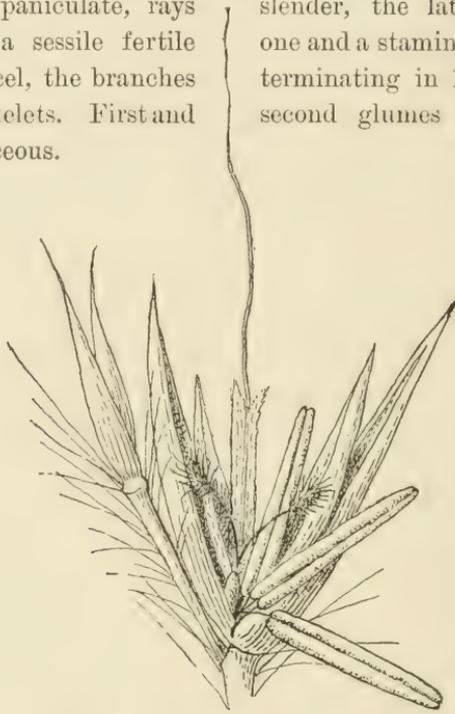


FIG. 14.—Spikelets of *A. Hallii*.

- a. Rays of the panicle verticillate; the pedicellate spikelets staminate with 4 glumes, rarely 1-2 and neuter. 26
- a. Rays of the panicle mostly solitary, but branching near the base. (b)
- b. Pedicellate spikelets none or sometimes reduced to pedicels merely. (c)
- c. Panicle oblong, erect or nodding. 27
- c. Panicle secund, rays variously flexuose. 28

Subgenus 6. *CHRYSOPOGON* (Trin. as a genus). Racemes whorled, pedicellate, spikelets obviously paniculate and laterally compressed. Our single species is a tall annual; the awns 12-15 cm. long. 29

Subgenus 7. *DICHANTHIUM* (Willemet as a genus). Spikes

usually 3 to many, digitate, all pedicellate or all sessile, not subtended by a leaf-sheath. Floral glume usually stalklike . . . 30

Our single species annual; racemes nodding on very slender peduncles.

Subgenus 8. *HETEROPOGON* (Persoon as a genus). Racemes or spikes solitary and terminal or lateral. Spikelets imbricated, 1-15 of the lowest pairs homogamous; awns large with sharp barbed points.

a. Annual 31

a. Perennial 32

Subgenus 9. *CYBOPOGON* (Spreng. as a genus). Racemes in pairs, terminal or lateral, 1 sessile, always with 1-2 basal homogamous pairs (of 2 staminate spikelets), the other short-pedicelled, with or without homogamous pairs, both together subtended by a sheathing leaf, frequently arranged in a false panicle, interrupted by leaves. Floral glume strongly awned 33

1. *A. gracilis* Spreng. Syst. 1: 284 (1824). A very slender, erect, tufted, glabrous perennial, 30-60 cm. high. Sheaths terete; ligule very short; blade convolute-setaceous, 10-20 cm. long. Spikes solitary, 3-4 cm. long, the terminal one exserted, the lateral ones distant, sheathed by narrow bracts 2-4 cm. long, the zigzag rachis and pedicels clothed with soft spreading hairs reaching beyond the spikelets. Pedicel 4 mm. long bearing an awned spikelet 2 mm. long, consisting of a single glume. Sessile spikelets lanceolate, about 5 mm. long, first and second glumes equal, the former 2-toothed with 2 nerves toward each margin, the latter acute, 1-nerved, the bent awn nearly 2 cm. long.

Fla., *Garber*. Found in Florida and the West Indies.

2. *A. hirtiflorus* Kunth. Rev. Gram. 2: 569, *t.* 198 (1829).

Culms slender, 50-120 cm. high mostly with 2 branches above, each as well as the main stem bearing a single erect spike. Lower sheaths often hirsute or barbed at the throat; blades sparingly hairy, 10-20 cm. long, 3-5 mm. wide, the upper ones slender, 0-4 mm. long. Spike single, narrow, zigzag, 4-6 cm. long bearing 5-8 pairs of spikelets, rachis and pedicels hairy throughout. First glume of sessile spikelet 7-9 mm. long, lanceolate, 2-toothed margins invo-

lute, 7-8-nerved, second membranous, ciliate-keeled, 4-5-nerved, 8 mm. long, third hyaline shorter, fourth 6 mm. long bifid over half its length bearing a bent awn 12-17 mm. long. Pedicellate spikelets protruding above the hairs. Pedicels 6 mm. long bearing a lanceolate spikelet a little shorter than itself consisting of 2 empty glumes.

Texas, *Nealley*; Arizona, *Pringle*, *Lemmon* 925. The latter is owned by F. L. Scribner and marked "teste E. Hackel."

Var. **brevipedicellatus**. Leaf-blades less than 2 mm. wide. Pedicels 4 mm. long, first glume of the sessile spikelet 6-7 mm. long.

Mexico, *Pringle* 383. Distributed as *A. hirtiflorus* *Kunth*.

Subvar. **oligostachyus** (Chapm.) Hack. D. C. Monog. Phan. 6 : 372 (1889). *A. oligostachyus* Chapm. Fl. S. States, 581 (1860).

Rachis slender, 5-6 cm. long with 10-15 joints.

Arizona, *Pringle*.

Var. **feensis** (Fourn.) Hack. D. C. Monog. Phan. 6 : 372 (1889). *A. feensis* Fourn. Mex. Pl. Enum. Gram. 62 (1886). Sheaths pilose, ciliate; blades scabrid; racemes 5-7 cm. long, slender, 10-12-jointed, apex of the joint 1 mm. broad, loosely pilose.

Arizona, *Lemmon* 2925. Mexico, *Parry*, *Palmer* 966.

3. **A. brevifolius** Sw. Prodr. Fl. Ind. Occ. 26 (1797). Annual; culms 10-100 cm. long, very slender with filiform flowering branches in twos and threes from nearly all the nodes. Ligule very short; blade contracted at the insertion, green, glabrous, with margins scabrous, spathes reddish green, glabrous, clavate. Racemes 5-10-jointed, the joints clavate, 2-toothed, about the length of the sessile spikelets. Sessile spikelet linear-oblong, pale green; first glume firm, involute, 2-toothed, subconvex on the back, obscurely 2-3-nerved; second glume awnless, very acute, 1-nerved; fourth glume divided almost to the base. Anthers 1-1.5 mm. long. Grain linear. Pedicellate spikelets 1-1.5 mm. long, on pedicels which are as long as the joints of the racemes, first glume bearing a slender awn.

Var. **genuinus** Hack. D. C. Monog. Phan. 6 : 363 (1889). *A. brevifolius* var. *pulla* Franch. et Savat. Enum. Pl. Jap. 2, 610

(1875-79). *A. tenellus* Presl. Reliq. Hænk. 1: 335 (1830). Blades obtuse, 2-5 cm. long, 1.5-5 mm. wide. Racemes very slender, 1-2 cm. long; spathe 1.5-2 cm. long. Sessile spikelets 3-4 mm. long, the awn 8-12 mm. long.

Mexico, *Pringle* 1771.

Mexico to Brazil, Madagascar, India, China, and other countries.

4. **A. tener** Kunth. Rev. Gram. 2, 565 *t.* 197 (1829).

Culms very slender, 20-70 cm. high, branching sparingly, the exerted threadlike tips 2-10 cm. long, each carrying a single narrow spike 4-6 cm. long. Sheaths of culm almost carinate; ligule truncate, glabrous, very short; blades destitute of hairs, the lower ones 2-5 cm. long, 0.9-2 mm. wide, the upper bristlelike, 1-2 cm. long. Short hairs on the rachis below the sessile spikelets. Stipe 3-6 cm. long, sparingly clothed on one edge with short hairs, each spikelet subtended by a short 2-pointed bract. The first glume of the sessile spikelet ovate-lanceolate, 4-5 cm. long, flattened, 2-keeled, obscurely 7-nerved; second glume as long as the first, compressed-keeled, 3-nerved, fourth bearing a twisted awn 8-14 mm. long. Anthers 2 mm. long. Pedicellate spikelets flattened, 3-5 mm. long, of 2-3 glumes only. It resembles considerably *A. cirratus* Hack.

Mexico, *Palmer* 504.

Florida to Texas and Mexico.

Var. **filiformis** (Nees) Hack. D. C. Monog. Phan. 6: 379 (1889). *Schizachyrium filiforme* Nees, Agrost. Bras. 338 (1829). Culms filiform, 40-60 cm. high, branching from the base; leaf-blades convolute, filiform, 0.4-0.5 mm. diam.; spikes, 3-4 cm. long.

Florida, *Curtiss*; Miss., *Tracy*.

A. cirratus Hack. in Flora 68: 119 (1885).

Plant glaucous. Culms sparingly branched, thread-like, exerted, 3-5 cm. long, each bearing a single spike 4-6 cm. long. Sheaths terete; ligule 2 mm. long; blade very sparingly hairy, the lower and middle ones 10-15 cm. long, 3 mm. wide, the upper rarely 2 cm. long. Spikes single, the rachis at each node and

on one edge of the stipe bearing hairs 2 mm. long. Sessile spikelet 7 mm. long; first glume flattened, 9-nerved, ovate-lanceolate with 2 ciliate keels; second glume shorter, thinner, keeled, 3-nerved; third still shorter, hyaline; fourth bifid, bearing a twisted awn 1 cm. or more in length. Pedicellate spikelets 2-4 mm. long, consisting of 1-3 empty glumes.

Mexico, *Wright* 2105, *Pringle* 382, *Greene* 406; Texas, *Nealley* 598.

A neat slender grass found in New Mexico, Arizona, and northern Mexico.

6. *A. scoparius* Michx. Fl. Bor. Am. 1 : 57 (1803). *A. purpurascens* Muhl.; Willd. Sp. Pl. 4 : 913 (1806).

(Culms slender, 60-90 cm. high, with numerous branches. Sheaths sparingly hairy; blades 2-3 mm. wide. Spikes slender, scattered, usually 2-3 from a single sheath, exerted on slender pedicels, the joints of the rachis clothed on the two edges with lax dull-white hairs. The sterile spikelet consists of a single glume about 3 mm. long, or staminate and longer. First and second glumes of the pistillate spikelet lanceolate, 6 mm. long, and awn-pointed; first glume flattened on the back, scabrid, obscurely nerved; second glume thinner, keeled, 3-nerved; fourth bifid for one third its length, bearing in the notch an awn 10-15 mm. long.

From the Atlantic to the Rocky Mountains. Very common on the prairies, affording considerable pasture; sometimes cut for hay. It starts very late in the spring and is damaged by frost.

Subspecies *euscoparius* Hack. D. C. Monog. Phan., l. c. Low tufted; sheaths smooth; blades glaucous, scabrous, 5-7 mm. wide; first and second glumes of sessile spikelet 8 mm. long, with points 2 mm. long. Specimens marked "teste E. Hackel" owned by F. L. Scribner. Sands of Cape May, N. J. Coll. J. Burk, Oct. 2, 1888.

Subspecies *genuinus* Hack., l. c.

Pedicellate spikelets 2-3 mm. long, subulate; first glume 3-nerved, terminating in a bristle; branches filiform, glabrous below the nodes; racemes slender; very variable. Michigan (M. A. C. 3), *Cooley*, *Beal* 5; Illinois, *Beal* 4; Penn., *Scribner* 3635; Vt., *Pringle*; N. J., *U. S. Dept. Agric.* from *Scribner* 200; Texas, *Nealley*.

Subspecies **maritimus** Hack., l. c. Var. *genuinus* Hack. *A. maritimus* Chapm. Fl. S. States, Suppl. 668 (1889).

Leaves and spathes glabrous; blades 10 cm. long. Spikelets sessile, 10 mm. long. Panicles or racemes 2-branched. Spathes acuminate. Racemes 4-5 cm. long, stout, 6-8-jointed; rachis subundulate; pedicels densely clothed on the margins with long hairs; first glume of sessile spikelet 3-5-nerved, long, pointed; third light violet, awns 13 mm. long. Pedicellate spikelets 7-10 mm. long; first glume 7-nerved, very short-awned; fourth also short-awned.

Florida, *Chapman*.

7. **A. condensatus** (Nees) H. B. K. Nov. Gen. et Sp. 1 : 188 (1815). *Schizachyrium condensatus* Nees, Agrost. Bras. 333 (1829).

Culms stout, 30-150 cm. high, paniculately branching. Sheaths compressed, mostly shorter than the internodes; blades flat or conduplicate, those of the sterile shoots 30-40 cm. long, those of the culm shorter, 2-7 mm. wide, smooth or scabrous. Spathes 1-2 cm. long, lanceolate, acute. Racemes short, loose, 2-8-jointed, more or less wavy or zigzag; pedicels of the sterile spikelets as long as the fertile spikelet. Spikelets usually 4 mm. long, linear; first glume chartaceo-membranous, linear-subulate, 2-toothed, or acute; third about the length of the first, lanceolate, nerveless, ciliolate; fourth about the length of the second, linear, 1-nerved, glabrous, awn 12-15 mm. long. Palea 0. Stamens 3.

Var. **paniculatus** (Kunth) Hack. Monog., l. c. *A. paniculatus* Kunth, Enum. Pl. 1 : 494 (1833). Racemes exerted above the spathes, or the base included.

Mexico, State of San Luis Potosi, *Pringle* 3134.

8. **A. semiberbis** (Nees) Kunth, Enum. 1 : 489 (1833). *Schizachyrium semiberbe* Nees, Agrost. Bras. 336 (1829). *A. oligostachyus* Chapm. Fl. S. States, 581 (1869).

Culms erect, leafy below, branching above, 90-150 cm. high. Sheaths often barbate at the throat; blades smooth, glaucous, keeled, the lower 30-40 cm. long, 4-5 mm. wide; spikes solitary, the terminal one barely exerted, the lateral ones often half or more

covered by the sheath-like bracts, the pedicels and rachis bearing a few short spreading hairs. Sessile spikelet linear-lanceolate, about 6 mm. long; first glume firm, scabrous, flattened, obscurely nerved; second a little shorter, incurved, compressed-keeled, 3-nerved; the fourth with a thin pointed projection 2 mm. long each side of the twisted awn, which is about 1.5 cm. long. Pedicels 3.5 mm. long bearing a rudimentary spikelet with an awn nearly twice its length.

Florida, *Chapman*, for F. L. Scribner, teste E. Hackel; also *A. P. Garber* in 1887, *Gardier* in 1892.

Var. **pruinatus** Hack. D. C. Monog. Phan. 370 (1889). Nodes and blades pruinose. Florida, *Simpson*.

9. **A. Schottii** Rupr. Hack. in Mart. Fl. Bras. 2; Pars. 3 : 299 (1871).

Culms slender, 40–80 cm. high, compressed; branches single from the remote nodes. Sheaths very smooth; blades rigid, acute, 10–20 cm. long, 2–4 mm. wide, glabrous, sometimes thinly hairy toward the base. Spathes 4–6 cm. long, narrow, obtuse or acute, as long as the exerted part of the peduncle or longer. Racemes 4–7 cm. long, slender, pilose; joints as long as the sessile spikelets; the apex 1 mm. wide, unequally 2-toothed, glabrous on the back, ciliate on the margins. Sessile spikelets 7 mm. long; first glume firm, linear, acuminate, subbimucronate, glabrous, pale red, obscurely 3-nerved, the callus with a stout tuft of hairs; second glume acute, 1-nerved, the keel scabrous; third glume ciliate, the fourth divided nearly to the base, the awn 15 mm. long. Pedicellate spikelets on slender peduncles as long as the joints, ciliate on the edges; spikelets subulate, 3 mm. long.

Mexico, *Palmer* 7.

10. **A. fastigiatus** Sw. Fl. Ind. Occ. 26 : 207 (1788).

Perennial; culms 60–90 cm. high, terete, branching, flower-bearing branches in threes, fastigiata, smooth. Sheaths loose, keeled, scabrous or smooth; ligule acute, many-nerved, glabrous, wider than the blade, 6–10 mm. long; lower blades sometimes 30 cm. long, 1–4 mm. wide, all narrow at the base, setaceously acuminate, flat or loosely folded, glabrous or sparingly ciliate at the base. Spathes linear-lanceolate, 5–7 cm. long. Racemes 4–7 cm.

long, dense, reddish green; joint cuneate, a third shorter than the spikelets, with white spreading hairs on the edges, the apex 1 mm. wide. Sessile spikelets whitish, 4-5 mm. long; first glume linear-oblong, obtuse, 2-toothed; margins firm, involute, hairy; second glume as long as the first, obovate-truncate, compressed, ciliate, bearing an awn 3-4 times its length between the two very short teeth; third linear, the oblong margins involute, ciliate; fourth elliptical, half as long as the second, ciliate, the awn 3.5-4.5 cm. long; palea one third shorter than its glume. Anthers 1.8 mm. long. Pedicellate spikelets twice as long as the fertile ones, tinged with red; first glume herbaceous, obovate-falcate, flattish, abruptly acute, with 15 or more nerves, ciliate, bearing a slender awn its own length; second glume half as long as the first, ovate-lanceolate, with a slender awn half its length or longer. Stamens 0.

Mexico, *Palmer* 2320, *Pringle*; Cuba, *Wright* 3483.

Found in Mexico, Cuba, Central America to Brazil, tropical Africa, India.

11. **A. brachystachyus** Chapm. Fl. S. States, Suppl. 668 (1889).

Culms 100-150 cm. high, with numerous very slender branches, each bearing two short spikes. Leaf-blades smooth, the lower 30 cm. long, 3 mm. wide, the upper reduced to mere short threads. Spikes mostly in pairs, slender, zigzag, 1-2 cm. long, the hairs of the rachis and pedicels extending beyond the spikelets. First glume of the sessile spikelet lanceolate, 2-keeled, 2-nerved, 4 mm. long; second rarely as long, compressed, 1-nerved; third shorter, hyaline; fourth very narrow, bearing a twisted awn 1 cm. long. Pedicels bearing no spikelet.

Florida, *Curtiss* 3632.

12. **A. arctatus** Chapm. Coult. Bot. Gaz. 3 : 20 (1878).

An erect, smooth perennial, branching above the middle. Culms hard, cylindrical. Sheaths shorter than the internodes; blades 10-15 cm. long, 2-3 mm. wide, often involute. Spikes in pairs, 2-4 cm. long, the terminal pair barely exerted, the lateral with its base enclosed by a sheath, the tip of which seldom reaches the apex of the spikes; rachis and pedicels clothed with soft white hairs extending beyond the spikelets. Sessile spikelet lanceolate, 5 mm.

long; first and second glumes equal, the former with two nerves near each margin, the latter 1-nerved, the bent awn protruding one or more times the length of the spikelet. Pedicel about 3 mm. long, bearing a minute rudiment consisting of a single glume.

Florida, *Garber* in 1877, *Chapman*.

13. **A. argyreus** Schult. Mant. 2 : 450 (1824). *A. argenteus* Ell. Bot. S.C. and Ga. 1 : 148 (1817).

Plant smooth, rather slender, branching above, 60–100 cm. high. Most leaf-blades 30–50 cm. long, 3–5 cm. wide, the upper one a mere bristle. Spikes usually in pairs, mostly exserted, without bracts, 3–4 cm. long, on slender pedicels; white hairs on rachis and pedicel longer than the spikelets. Sessile spikelet about 6 mm. long, 2 outer glumes membranous, lanceolate; first glume 2-keeled, 2-nerved, 2-toothed; second compressed-keeled, 3-nerved; third and fourth hyaline and shorter, the twisted awn on the latter 10–15 mm. long. Stamens 3. Sterile spikelet composed of 1–2 small glumes or wanting.

The plant has much the appearance of *A. Cabanisii*.

Florida, *Simpson*, *Curtiss* 3637; Maryland, *Scribner* 3637 from Brinton.

Delaware to Florida and Texas.

14. **A. Cabanisii** Hack. Flora 68 : 133 (1885).

Culms erect, compressed, sparingly branching toward the top, often 120 cm. high. The middle sheaths half as long as the internodes, which are often 20 cm. long; blades firm, smooth, often involute, 15–25 cm. long, 4 mm. wide. Spikes in pairs, 5–7 cm. long, the terminal pair barely exserted, the lateral ones more or less enclosed by the sheathing bracts, the rachis and pedicels thinly clothed by fine soft white hairs reaching beyond the spikelet. Fertile spikelets linear, acute, 6 mm. long; first glume flat, scabrid, 2-toothed, 8-nerved; second incurved, acute, keeled, 3-nerved; third elliptical when spread, 2-nerved; fourth bearing a bent awn about 10 mm. long. Pedicels 4–5 mm. long, bearing a single awnless glume 3 mm. long. The plant has much the look of *A. argyreus*.

Florida, *Garber*, now in Herb. Scribner, named by Hackel.

15. **A. Elliottii** Chapm. Fl. S. States, 581 (1860).

Culms slender, 60–80 cm. high, branching, internodes long, bearded at the upper joints. Sheaths often hairy above, inflated by several young or rudimentary sheaths and spikes; lower blades 30 cm. long, those farther up 2 cm. long, 4 mm. wide, the upper reduced and threadlike. Spikes 2 or more, about 2 cm. long or threadlike, exerted or enclosed, stems zigzag, hairs on rachis and pedicels exceeding the spikelets. First glume of the sessile spikelet lanceolate, membranous, 4 or more mm. long, 2-nerved, margins involute; second glume membranous, compressed-keeled, 1-nerved, third hyaline, 3–4 mm. long, fourth bifid, with a bent awn about 15 mm. long. Sterile floret represented by a threadlike pedicel 4–6 mm. long. Stamen 1.

Florida, *Chapman, Curtiss* 3636a; Texas, *Nealley*; District of Columbia, *Ward*.

Virginia to Florida and Texas, on wet or dry pine barrens.

Var. **laxiflorus** Scrib. ined.

Sheaths of spikes shorter and narrower. Spikes 4–6 cm. long, their internodes twice as long as those of the species.

Florida, *G. V. Nash* 1597 in 1854.

16. **A. Virginicus** L. Sp. Pl. 1046 (1753). *A. dissitiflorum* Michx. Fl. Bor. Am. 1 : 57 (1803). *A. vaginatus* Ell. Bot. S. C. and Ga. 1 : 148 (1817).

Plant smooth, or sometimes soft hairy, 60–100 cm. high. Culms flattened below, panicle branching much or little. Sheaths inflated, including spikes and sheaths with spikes inside; most blades 15–40 cm. long, 2 mm. wide, the upper short. Spikes nearly sessile, slender, zigzag, 2 sometimes 3 together, nearly sessile, 2 cm. long, shorter than the sheaths the upper of which are 3–5 cm. long, the soft dull white hairs on the rachis and peduncles much longer than the spikelets. Sessile spikelet 3–5 mm. long; first glume ovate-lanceolate, 2-keeled, 2-nerved; second glume compressed-keeled, 1-nerved, 3 mm. long; third and fourth glumes shorter and hyaline, the awn straight or slightly twisted and bent, 1.3–2 cm. long. Pedicel slender, 4 mm. long, bearing a rudimentary spikelet or not. Stamen 1.

A very variable species, with many varieties and forms, apparently running into *A. macrourus* Michx. with all its forms. Florida, *Chapman*; Louisiana, *Langlois*; Pennsylvania, *Garber* 319.

Sandy land, Massachusetts to Florida and Texas.

Var. **glaucus** Hack. D. C. Monog. Phan. 6: 411 (1889). Florida, *Curtiss* 3638b. A slender, glaucous plant.

Var. **tetrastachyus** (Ell.) Hack. Monog. Phan. 6: 411. *A. tetrastachyus* Ell. Bot. S. C. and Ga. 150 (1817). Slender, spikes usually in clusters of 4.

Florida, *A. H. Curtiss* 3633; Alabama, *Mohr*.

17. **A. macrourus** Michx. Fl. Bor. Am. 1: 56 (1803).

Culms usually erect, stout. Branches numerous, in typical plants, mostly near the top of the culm. Pedicels often 5 mm. long. After studying many plants, the above are all the essential differences that I can discover which hold good between this plant and *A. Virginicus* L. U. S. Dept. Agric. 191; Florida, *Curtiss* for Scribner 3639; Texas, *Nealley* for Nat. Mus.

New York to Florida and west to Southern California.

Var. **abbreviatus** Hack. D. C. Monog. Phan. 6: 408 (1889). Rather low, culms narrow; panicle dense, obovate-oblong, 10–15 cm. long; rays short, springing from 3–4 nodes; secondaries solitary. Spathes about equalling the racemes.

New Jersey (*A. Gray*). Plant seen by me now in Herb. Gray.

Var. **corymbosus** Chapm. The branches borne in one or more spreading corymbose panicles. Florida, *Curtiss* 3639c.

Var. **glaucopsis** Ell. Bot. S. C. and Ga. 1: 150 (1816). Plant rather slender, glaucous, the numerous branches paniculate for 30–40 cm. or more at the top. This includes var. *viridis* Chapm.

Florida, *Curtiss* 3639b, d.

Var. **hirsutior** Hack. D. C. Monog. Phan. 6: 409 (1889). Sheaths green, villous with tuberculate hairs; blades smooth, very scabrous. Panicles ample, with many branches 20–50 cm. long. Spathes scabrid.

Florida, *Curtiss* 3639, now in Herb. Gray.

18. **A. Floridanus** Scribn. ined.

Culms subterete, branching much near the top, 90–120 cm. high. Upper sheaths slightly inflated, those of the extreme apex narrow and extending to the base of the spikes. Spikes in pairs, sessile, zigzag, 3–4 cm. long; lateral pedicels a little shorter and stouter than those of *A. Virginicus*. The whole plant is somewhat intermediate between *A. Virginicus* and *A. macrourus*, with which this has been somewhat hastily compared. Low pine land.

Florida, *G. V. Nash*, 1572, 1681, in 1894.

19. **A. Leibmanni** Hack. Flora 132 (1885). *A. macrothrix*, Fourn. Mex. Pl. Enum. Gram. 60 (1886).

Culms branching sparingly above, 15–20 cm. high. Leaf-blades smooth, with a few soft hairs, 2–5 cm. long, 2–3 mm. wide. Spikes exerted or enclosed, 3–4 together, simple or branching, 2–3 cm. long, hairs of the rachis and pedicels exceeding the spikelets. The 2 outer glumes of the sessile spikelet membranous, ovate-acute, 3 mm. long, first 2-keeled, 2-nerved, second 1-keeled, third and fourth hyaline and shorter, the awn of the latter 15 cm. long. Stamen 1. Sterile spikelets 2 mm. long on pedicels 3 mm. long of one to two glumes.

Mexico, *Bourgeau 2376*, *Palmer 227*; Texas, *Nealley*, sent out by him as *A. macrourus* Michx. var. *pumilus* Vasey.

Var. **Mohrii** Hack. D. C. Monog. Phan. 6 : 413 (1889).

Plant (especially the sheaths) clothed with numerous soft hairs. Culm 90–120 cm. high, with many branches above. The lower blades 60 cm. long, 5 mm. wide, the upper becoming mere sheaths partially enclosing 3 or more slender spikes. Pedicels 4 mm. long. Sessile spikelets 4 mm. long, awn 2 cm. long.

Alabama, *Mohr*.

20. **A. longiberbis** Hack. Flora 68 : 131 (1885). *A. tetra-stachyus*, var. *distachyus* Chapm. Fl. S. States, 581 (1860). A tufted perennial, sparingly branched above, 60–80 cm. high. Sheaths silky hairy, those on the middle of the culm half as long as the internodes; blades flat, smooth, or with a few silky hairs below, 2–4 mm. wide. Spikes mostly in pairs, about 3 cm. long, at length protruding from the sheath, which is 3.5–5 cm. long; apex

of peduncle, rachis, and pedicels clothed with soft hairs nearly 1 cm. long. Sessile spikelet linear-lanceolate, 4 mm. long. Spikelet like that of *A. Virginicus* L. Pedicel 4 mm. long, bearing a very short rudimentary spikelet. It has the general appearance of *A. (argenteus* Ell.) *argyreus* Schultz, Curtiss 3637.

The plant seen is owned by F. L. Scribner, Coll. by A. P. Garber in 1877 in Miami, Fla., distributed as *A. argenteus* Ell. Marked "teste E. Hackel."

Florida, *Curtiss* 3639, distributed as *A. macrourus* Michx. var. *viridis* Chapm. ined.

It is well branched, and too near *A. Virginicus* L. Perhaps my specimens are not genuine.

21. **A. Hallii** Hack. Sitzb. Akad. Wien. 89 : 127 (1884).

Plant glaucous, smooth, excepting the margins of the blades. Culms rather stout, 80–120 cm. high, usually branching once or more near the top. Ligule 2–3 mm. long; blades of the culm 15 cm. long, 4 mm. wide, the upper reduced to mere points. Spikes 2, at the apex of the culm and branches, 5–9 cm. long, protruding a little above the leaves; rachis and pedicels pubescent on the edges, the hairs shorter than the spikelets. First glume of sessile spikelet firm, lanceolate, 11 mm. long, a vertical groove on the back, margins involute, 6-nerved; second curved towards the flower, ovate-lanceolate when spread, 10 mm. long, compressed-keeled, a faint nerve on each margin; third shorter, hyaline, fourth hyaline, bifid, bearing a twisted awn over 1 cm. long; palea hyaline, 6 mm. long, 1.5 mm. wide. Lodicules truncate, 1 mm. long. The first glume of the pedicellate spikelets lanceolate, scabrous, margins involute, 10 mm. long, 9-nerved; second a little shorter, 3-nerved; third and fourth hyaline, containing rudiments of stamens and pistils.

Colorado, *Vasey*; Texas, *Nealley*.

Growing from Kansas to Arizona.

Var. **flaveolus** Hack. Joints of the spikes with yellow hairs; spikelets 8 mm. long, first and second glumes pilose on the back or outside; the awn of the fourth 2–5 mm. long, scarcely extending above the hairs of the other glumes. *E. Hall* 651; *Barbour* in 1862; Texas, *Nealley*.

Var. **incanescens** Hack. l. c. Joints of the spikes clotted with white hairs; sessile spikelets 11 mm. long; first glume longer than the second, both sparingly pilose on the keels.

Colorado, *Vasey*.

Var. **muticus** Hack. D. C. Monog. Phan. 444 (1889). Like *incanescens*, excepting that the fourth glume is awnless. Leaves and spikelets sparingly pruinose.

Montana, *Ward*; Colorado, *Vasey*.

22. **A. geminata** Hack. ined. *A. Hallii* Hack. var. *bispicata* Vasey.

Plant glaucous, smooth, excepting the margins of the leaf-blades. Culms simple, rather stout, 60–100 cm. high, from hard creeping rootstocks. Sheaths terete, the lower as long as the internodes, the upper shorter; ligule ciliate, 1.5 mm. long; blades setaceous-acuminate, the lower 30 cm. long, 4–6 mm. wide. Spathes 10–12 cm. long. Spikes 2, at the apex of the culm and one of the two branches, 3–4 cm. long; partially included, rachis and pedicels pubescent on the edges with white or yellowish hairs. Sessile spikelets 8 mm. long, linear-lanceolate, green or tinged with red; first glume firm, minutely 2-toothed, 6-nerved, the back with a vertical groove; second as long as the first, lanceolate, compressed, 1-nerved, the margins hyaline; third 6 mm. long, linear-lanceolate, 3-nerved, the upper third of the margins ciliate; fourth 5 mm. long, 2-toothed. Pedicellate spikelet as long as the sessile, narrowly lanceolate; first glume flat below, keeled toward the apex, 9-nerved; second 6 mm. long, 5-nerved, the margins ciliate along the upper third. *Nealley*, for Nat. Mus.

23. **A. provincialis** Lam. Encycl. 1: 376 (1783). *A. furcatus* Muhl.; Willd. Sp. 4: 919 (1806). BLUE STEM. BLUE JOINT. TURKEY FOOT. FINGER GRASS.

Culms 100–150 cm. high, rigid, branching above. Sheaths terete, glabrous, rarely villous; ligule 1–1.5 mm. long; blades of thrifty plants 60 cm. long, 7 mm. wide, upper narrow, 1–4 mm. long. Spikes 3–8, digitate, 3–10 cm. long. On the sessile spikelet first glume 6-nerved, otherwise like the first one on the sterile spikelet; second compressed-keeled, 3-nerved, 5 mm. long; fourth bifid with a

bent awn 7-15 mm. long. Pedicels shorter than the sterile spikelets, which they bear; first glume flattened, ovate-lanceolate, 6-8 mm. long, 7-nerved, margins involute; second 3-nerved, 5 mm. long; third and fourth as long as the second, and hyaline. Stamens 3.

From Rocky Mountains and east to the Atlantic; found in good soil or in poor and dry soils; also abundant on the prairies, where it is the leading grass for hay and very prominent for grazing.

In Coult. Bot. Gaz. 302 (1888) A. A. Crozier states that in Iowa the plants are largely dioecious. The fertile plants are smaller and darker in color than the others.

Mexico, *Pringle* 4294; D. C., *McCarthy*; Mich., *Beal* 6. Kansas 7.

Var. **pycnanthus** Hack. D. C. Monog. Phan. 6 : 443 (1889). Silky hairs larger and tawny; first glume of pedicellate spikelet 5 mm. long, 5-nerved. Mex., *Brandegee* 47, teste E. Hackel in herb. Scribner.

24. **A. Wrightii** Hack. Flora, 68 : 139 (1885).

Plant smooth, glaucous, 100-120 cm. high, culms usually simple above. Leaf-blades 20-30 cm. long, 5 mm. wide, the upper ones about 10 cm. long, short hairs at the nodes and ligule; the latter 1 mm. long. Spikes 4-6, digitate, 4-6 cm. long; rachis and pedicels well clothed with hairs which are shorter than the spikelets. On sessile spikelets first glume elliptical-lanceolate, 6-7 mm. long, flattened on the back, which contains a round pit one-third the way from the tip, 11-nerved, margins involute; second ovate-acute, membranous, keeled, 3-nerved; third and fourth hyaline, the latter bearing a twisted awn 2-3 mm. long. On the pedicellate spikelet first glume 7 mm. long, ovate-lanceolate, rounded on the back, 13-nerved, margins involute; second same shape and nearly as large, 4-5-nerved; third hyaline.

N. Mex., *Wright* 2104; Mex., *Pringle* 1409.

New Mexico to Arizona and Mexico.

25. **A. saccharoides** Sw., Fl. Ind. Occ. 1 : 26 (1797).

Culms stout or slender, 80-120 cm. high, hairy at the nodes, branching below. Sheaths terete, ribbed, glaucous, glabrous; ligule short, hairy; blades 8-25 cm. long, 4-7 mm. wide. Spike-

lets mostly terminal in pairs or fours, panicle, with few or many branches, 6–12 cm. long, the white hairs longer than the spikelets and partially concealing them. On the sessile spikelets first glume ovate-lanceolate, with a vertical groove on the back, 8-nerved, margins involute, keeled, 4 mm. long; second ovate, acute, membranous, keeled, 3-nerved; the bent awn of the fourth 15–25 mm. long. Stamen 1. Pedicels as long as the spikelets; first glume lance-elliptical, 11-nerved, margins involute, keeled; second smaller.

Texas, *U. S. Dept. Agricul.* 199 from Reverchon and Nealley; Arizona, *Pringle*.

Texas to Arizona.

Var. **barbinodis** (Lag.) Hack. D. C. Monog. Phan. 6 : (1889). *A. barbinodis* Lag. Gen. et Sp. 1:3 (1816). *A. argenteus* D. C. Cat. Hort. Monsp. 77 (1813). *Saccharum argenteum* Brous. El. 50. *Erianthus saccharoides* Willd. Enum. 46 (1809).

Sheaths densely bearded at the nodes; ligule 3–4 mm. long; blade green or subglaucous, smooth or sparingly pilose below, 20–40 cm. long, 4–7 mm. wide; panicle 10–15 cm. long, showy.

Mexico, *Palmer* 1347.

Var. **genuinus** Hack. D. C. Monog. Phan. 6 : (1889).

Glaucous, slender, hairs on the nodes few and short. Pedicellate spikelets 2.5 mm. long, of 2 glumes. Sessile spikelets 3–5 mm. long; first glume flattened, 3 mm. long, 9-nerved; second 3 mm. long, awn slender, 9–18 mm. long.

Mexico, *Pringle* 316.

Var. **submuticus** Hack. l. c., var. *inermis* Vasey ined. Nodes smooth, spikes 1.5–3 cm. long, in about 10 clusters of 4–10 each, all racemose on a rachis about 10 cm. long; first glume of pedicellate spikelet 5-nerved, fertile floret 3 mm. long.

Texas, *Nealley* in herb. Scribner.

Var. **glaucus** (Torr.) Scribn. *A. glaucus* Torr. Ann. Lyc. N. Y. 1:157 (1824). *A. saccharoides*, var. *Torreanus* Hack. D. C. Monog. Phan. 6 : 495 (1889). *A. Torreanus* Steud. Nomencl. Ed. 2, 93 (1841).

East Texas, *Hall* 845, *Curtiss* 3633, *Wright* 2102, *Drummond* 313.

26. **A. HALEPENSIS** (L.) Brot. Fl. lusit. 1:89 (1804). *Holcus halepensis* L. Sp. Pl. 1047 (1753). *Sorghum halepense* Pers. Syn. 1:101 (1805). JOHNSON GRASS.

Culms robust, 0.6–1.5 m. high, erect. Sheaths terete, usually shorter than the internodes; ligule round, firm, 1–3 mm. long; blade narrowed more or less at the base, the longest 20–60 cm. long, 1–7 cm. wide, flat, with undulate margins, the apex drooping. Panicle variable, more or less drooping, exserted, rays mostly in verticels of 4, rarely 2–6. Sessile spikelets variable; first glume firm, more or less shining, margins involute, 5–9–11-nerved; second as long as the first, 3–7-nerved, keeled; third one-fourth shorter, elliptical, oblong or oval, delicately 2-nerved; fourth half as long as the second, broadly oval, obtuse, 2-lobed, bearing a short awn. Anthers 2.5–3 mm. long. Pedicellate spikelets staminate or neuter, much narrower than the sessile ones. Sessile spikelets lanceolate to elliptical, 4–5.5 mm. long, first glume obscurely 5–7-nerved. Perennial with stout creeping root-stocks. Blades 1–2 cm. wide. Panicle 15–30 cm. long, oblong-elliptical, dense or rather loose, lower rays 1–6 cm. long, the awns 10–15 mm. long (see vol. i, Fig. 78, p. 171).

Subspecies **sativus** Hackel, D. C. Monog. Phan. 6:505 (1889).

Out of this subgenus Hackel, in his recent elaborate monograph has made nine series, containing thirty-six varieties and twelve subvarieties. Many of them are in cultivation in tropical regions.

Some of the common names as we know them are: GUINEA CORN, GREAT MILLET, INDIAN MILLET, DURRA OR DOURA, IMPHEE, CHINESE SUGAR-CANE, EGYPTIAN RICE-CORN.

The following is a description of the race known as “Amber Cane.” Culms 1–2 m. high, leaf-blades broad. Panicle erect or included, rather compact, 20–30 cm. long, 6–10 cm. wide. Spikelets when mature round-obovoid, 5 mm. long, the branches and pedicels and base of spikelets short-hairy, awn abortive. The 2 outer glumes smooth, almost black, indistinctly many-nerved, the first 11–13-nerved, the second 11-nerved, reddish, with hairy margins, very variable in size. Lodicules red, hairy at the apex, truncate, very broad above, 0.7 mm. long. Pedicellate spikelets 5

mm. long, ovate-lanceolate, obtuse. Often cultivated in the Northern States for syrup and sugar.

“Egyptian Rice-corn:” Panicle dense, ovoid, 15 cm. long, suspended from the “crook-necked” culm. Spikelets light-colored, awn 1 cm. or less in length, the white grain protruding; branches, pedicels and outer glumes well clothed with soft hairs, nerves tinged with red. First glume (in one case) 25-nerved, second 15-nerved. Otherwise much like “Amber Cane.” Cultivated in Kansas, California and India. The following notes are made concerning a race sent out by the U. S. Dept. Agricul. as “Honduras.”

Tall, panicle erect, 30–40 cm. long, about 10 cm. wide, more or less spotted and tinged with red. Sessile spikelets 6 mm. long, thinly covered with short hairs the awn usually less than 1 cm. long. There are many races in cultivation in tropical countries for grain, sugar, and fodder.

27. *A. nutans avenaceus* (Michx.) Hack. D. C. Monog. Phan. 6: 530 (1889). *Andropogon avenaceus* Michx. Fl. Bor. Am. 1: 58 (1803). *Sorghum nutans* A. Gray, Man. Ed. 1, 617 (1848). *S. avenaceum* Chapm. Fl. S. States, 583 (1860). *Chrysopogon avenaceus* Benth. Journ. Linn. Soc. 19: 73 (1881). INDIAN GRASS. WOOD GRASS.

A graceful perennial 50–150 cm. high, with very hard matted root-stocks. Leaf-blades linear-lanceolate, glaucous, flat, 30–60 cm. long, 1–1.5 cm. wide. Panicle narrowly oblong, nodding, 15–30 cm. long, pedicels hairy, a little shorter than the spikelets. Fertile spikelets shining, yellowish brown, lanceolate, hairy, about 6 mm. long. Empty glumes equal, obtuse with involute margins, first nearly flat on the back, 5–9-nerved, second 5-nerved, third oval, hairy on the margins, 2-nerved, fourth still shorter, 3-nerved, 2-lobed, bearing an awn 0.5–2 cm. long; palea about 1 mm. long. Lodicules fleshy, smooth, truncate, over 0.5 mm. long. The sterile spikelets small, neuter, deciduous or reduced to a pedicel.

Very variable. It is difficult to decide whether the two following varieties should not be included as a part of the species.

Vt., *Pringle*; N. J., *Scribner* for U. S. Dept. Agricul. 207; Ala., *Mohr* for Dr. Clark 2501; Texas, *Reed* for U. S. Dept. Agricul.

Dry soil, New England to the Rocky Mountains, south to the Argentine Republic.

This grass starts late in spring and is late in flowering. In some of the prairie regions it forms an important element in the grazing. With other wild grasses it is often cut for hay, though at the east it is considered of poor quality.

Var. **stipoides** (Kunth) Hack. Monog. Phan. 6 : 530 (1889). *A. stipoides* H. B. K. Nov. Gen. et sp. 1 : 189 (1815).

Spikelets 4-6 mm. long, awn 10-15 mm. long; ligule 2-3 mm. long; blades flat or subconvolute above, scabrous or pubescent. Nodes of the peduncle with short, silvery, silky hairs. Spikelets chestnut-colored, first glume pilose for two-thirds its length, second glabrous.

Var. **Linnæanus** Hack. D. C. Monog. Phan. 6 : 531 (1889). *A. nutans* L. in part. *Sorghum nutans* Chapm. Fl. S. States 583 (1860). Spikelets linear, oblong, 6-7 mm. long, awn 20-30 mm. long; ligule 2 mm. long; blades very scabrous. Panicle 25-30 cm. long. Tenn., *Scribner*.

Florida, Texas, Maine.

Var. **incompletus** (Presl.) Hack. l. c. *A. incompletus* Presl. Reliq. Hænk. 1 : 342 (1830).

Spikelets linear, oblong, 4 mm. long, brownish, the awn 20-22 mm. long. Sheaths glabrous; ligule 1-2 mm. long; blade 4-5 mm. wide, flat, glabrous or scabrous. Panicle 10-15 cm. long, rather dense, rachis smooth. First glume truncate, pilose for two-thirds of its length, second glabrous.

Mexico, *Pringle* 2466, *Palmer* 590.

28. **A. unilateralis** Hack. D. C. Monog. Phan. 6 : 533 (1889). *A. secundus* Ell. Bot. S. C. and Ga. 1 : 38 (1816). *Sorghum secundum*. Chapm. Fl. S. States, 583 (1860).

Perennial; culms 60-100 cm. or more high. Sheaths glabrous, nodes puberulent or smooth; ligule 4-5 mm. long; blades narrowed at the base, flat or subconvolute, 2-5 mm. wide. Panicle 18-25 cm. long, linear, secund, dense or open, rays capillary, often curved. Spikelets linear-lanceolate or linear-oblong, 7 mm. long, brown, first glume firm, truncate, 9-nerved, callus densely barbed; second

longer than the first, linear-oblong, keeled above, 5-nerved; third shorter than the first, broadly oblong, obtuse, 2-nerved; fourth and third equal, lance-oblong, ciliate, 3-nerved.

Florida, *Chapman, Garber, Curtiss* 3644.

Subgenus 6. *CHRYSOPOGON* Hack. D. C. Monog. Phan. 6 : 547 (1889). *Chrysopogon* Trin. Fund. Agrost. 187 (1820).

Fertile spikelets 1-flowered, sessile between two pedicellate, staminate or barren spikelets at the end of the filiform, unequal, simple or divided branches of a true terminal panicle, with sometimes 1-3 pairs of spikelets on the branch below the terminal 3. Sessile spikelets compressed, first glume largest, awnless, membranous and many-nerved, or more rigid with the lateral nerves prominent and often muricate; second narrower, obscurely keeled, pointed or obtuse or produced into a fine straight awn; third much smaller, hyaline; fourth linear, entire or 2-toothed, with a short or long awn. Grain compressed. Pedicellate spikelets obcompressed, awnless or awned, with reduced glumes and usually one staminate flower, sometimes reduced to a small rudiment or wanting.

Perennials, excepting *A. pauciflorus*, with narrow leaf-blades; mostly limited to tropical regions.

29. *A. pauciflorus* (Chapm.) Hack. l. c. *Sorghum pauciflorum* Chapm. Coult. Bot. Gaz. 3 : 20 (1878).

Annual; culms 80-110 cm. high, compressed, smooth, usually branching near the base. Sheaths compressed-keeled, smooth, shorter than the internodes, pilose along the margins above, often tinged with violet; ligule short, ciliate; blade flat or becoming conduplicate, with a broad, subcordate base, attenuate-pointed, 12-18 cm. (the upper ones 2-3 cm.) long, 5-8 mm. wide, smooth, or the mid-nerves setaceous, margins ciliate with hairs from tubercled bases. Panicle exserted, 14-20 cm. long, broadly ovate, very loose, lower rays in twos to fours, very slender, the longest about 7 cm. long. Sessile spikelets 15-17 mm. long, with a callus 6 mm. long, densely barbulate with rufous hairs, linear, oblong, obtuse, first glume firm, truncate, margins involute, shining or punctulate on the back, obscurely 5-nerved; second as long as the first, firm,

linear, truncate, mucronate, 2-keeled, convex on the back, 3-nerved; third shorter, nerveless, fourth a little shorter, linear, entire or with two short lobes, 1-nerved, the awn 12-15 cm. long, flexuose, scabrid, stout, 10-15 cm. long; palea 0. Anthers 1.5 mm. long. Pedicellate spikelets on scabrid pedicels as long as the sessile spikelet, first glume subulate, 3-nerved.

Florida, *Chapman, Garber, Curtiss* 3644*.

Subgenus 7. *DICHANTHIUM* Hack. D. C. Monog. Phan. 6 : 566 (1889). *Dichanthium* Willem, in Usteri Ann. Bot. 18 : 11 (1796).

Racemes digitate or rarely solitary, terminal or lateral, forming a true panicle, the lower fourth of the racemes homogamous. The perfect spikelets obcompressed, awned; first glume keeled above, second keeled, awnless, third hyaline, fourth very narrow, bearing a short awn at the tip or between the teeth. Grain compressed, flat in front, convex on the back; embryo a half to two-thirds the length of the grain; pedicellate spikelets staminate or rarely neuter.

Perennials, excepting *A. piptatherus*, with flat leaf-blades. Culms rarely branching; panicle more or less exserted, the homogamous part persistent, the rest deciduous. Found in tropical regions.

30. *A. piptatherus* Hack. Mart. Fl. Bras. 2 ; part 3, 293 (1883).

Var. *Palmeri* Hack. D. C. Monog. Phan. 6 : 580 (1889).

Annual; culms erect, slender, terete, 30-40 cm. high, most of the bearded nodes bearing 1 or 2 compound branches. Sheaths loose, compressed, thinly pilose; ligule short, obtuse; blades thin, narrow at the base, 8-25 cm. long, 3-10 mm. wide, more or less pubescent with tubercled hairs. Racemes usually corymbose, pedicels very smooth, barbellate in the axils, 2.5-5 cm. long. Fertile spikelets 4 mm. long, linear-oblong, first glume firm, obtuse margins involute, 5-7-nerved, pilose on the lower third or half; second as long as the first, keeled, 3-nerved, glabrous; fourth bearing an awn 2.5-3.5 cm. long. Anthers 0.5-1 mm. long. Pedicellate spikelets neuter, consisting of two glumes.

Mexico, *Palmer* 591, *Pringle* 4612.

Subgenus 8. *HETEROPOGON* Hack. D. C. Monog. Phan. 6 : 583 (1889). *Heteropogon* (genus) Pers. Syn. 2 : 533 (1807).

Racemes solitary, 1-sided at the apex of the culm or its branches. One to fifteen of the lower pairs of spikelets homogamous, the staminate or neuter awnless. The perfect pistillate spikelets sub-cylindrical, awned, first glume hard, involute, second awnless, obscurely keeled, third hyaline, fourth narrow at the base, bearing a protruding awn, the twisted portion of which is clothed with short rufous or white hairs; palea 0 or minute. Grain linear-oblong or oblong, obcompressed; embryo extending beyond the middle. Pedicellate spikelets awnless, staminate or neuter, culms compressed. Leaf-blades usually narrow.

These grasses are widely distributed over warm regions of Europe, Asia, Africa, Australia, and North America.

31. **A. melanocarpus** Ell. Bot. S. C. and Ga. 1 : 146 (1816). *Stipa melanocarpa* Muhl. Gram. 183 (1817). *Cymbopogon melanocarpus* Spreng. Syst. 1 : 289 (1824). *Trachypogon scrobiculatus* Nees, Agrost. Braz. 347 (1829). *Heteropogon acuminatus* Trin. Mem. Acad. St. Petersburg. (VI.) 2 : 254 (1833). *Andropogon scrobiculatus* Kunth, Enum. 1 : 507 (1833).

Annual; culms 0.5-2 m. high, very smooth, much branched above, the spikes nearly covered by the sheaths. Sheaths subcompressed, very smooth, loose, the highest with no blade or a very short one; ligule 1-4 mm. long, smooth at the apex, round; the lower blades flat, 15-40 cm. long, 0.5-1 cm. wide, the base rather narrower, the apex long-pointed, margins scabrous. Racemes within the spathes borne on short pedicels, erect, slightly compressed, 4-6 cm. long, besides the awns. Pistillate or perfect spikelets 7-9 mm. long, on a callus 3 mm. long, clothed with appressed, rusty, brown hairs, first glume obscurely 9-nerved, 6 mm. long, fourth glume bearing a bent awn, 8-12 cm. long, shortly and softly pubescent with brown hairs; palea 0. Ovary oblong, with two points, the staminate or neuter spikelets pedicellate, slightly sigmoid, lanceolate-acuminate, 16-20 mm. long; first glume herbaceous, smooth except the infolded margins, 17-21-nerved, second a third or fourth shorter, lanceolate, 3-nerved, very acute, third 1-nerved, 8 mm. long, fourth very short, hyaline; palea 0. Anthers 4 mm. long, sometimes 0. Widely dispersed. Florida, *Curtiss* 3641, *A. P.*

Garber 300; Alabama, *McCarthy*; Mexico (Rio Blanco), *Palmer* 679, 589, *Pringle* 820.

South Carolina to Florida, Mexico, and South America.

32. **A. contortus** L. Sp. Pl. 1045 (1753).

Perennial; culms ascending or erect, 40–100 cm. high. Sheaths compressed, very smooth; ligule short, truncate, ciliate; blades soon conduplicate, narrow, ciliate with a few hairs, the lower acute, 8–20 cm. long, 3–8 mm. wide, the upper very short, erect. Racemes (besides the awns) 4–7 cm. long, erect or curved. Pistillate spikelets slightly curved, on a callus 3 mm. long, first glume hard, brown, hairy, nerves obsolete, fourth awned, 6.5–12 cm. long; palea 0. Grain linear, white. The staminate spikelets lanceolate, pedicellate, 8–10 mm. long, first glume herbaceous, rather obtuse, keeled, second inequilateral, obscurely 13-nerved, equalling or exceeding the first, membranous, acute, 3–6-nerved; palea very short, ciliate.

Very variable and widely distributed over tropical Asia, Africa, Australia, Texas and Mexico of North America; also South America. No attempt has been made to place these in subvarieties after Hackel.

Mexico, *Palmer* 267, 767, 767a, 1156; S. Calif., *Palmer* 122; Arizona, *Pringle*; Cent. Mex., *Parry* and *Palmer* 955; Cuba, *Wright* 1595.

Subgenus 8. CYMBOPOGON. Hack. D. C. Monog. Phan. 6 : 592 (1889). *Cymbopogon* Spreng. as a genus. Pl. Min. Cogn. Pug. 2 : 14 (1815).

Racemes simple, in pairs, at the apex of the branches, usually included by the sheath, one subsessile, the other pedicellate. Two, rarely 7–9 of the lowest spikelets of the subsessile racemes staminate or neuter, awnless. The flowers of the upper sessile spikelets perfect, flattened on the back or subcylindrical, usually awned.

Tall tropical or subtropical grasses; rare in America.

33. **A. Ruprechtii** Hack. Flora 68 : 126 (1885). *Hyparrhenia Ruprechtii* Fourn. Mex. Pl. Enum. Gram. 67 (1886). *A. anthistiroides* Rupr. Bull. Acad. Brux. 9 : 245 (1842), not Hochst.

Perennial; culms solid, simple below, much branched above, 1.5–2.5 m. high. Sheaths slightly compressed, more or less hirsute;

ligule 3-6 mm. long, decurrent ; blades rigid, rough, 20-40 cm. long, 4-6 mm. wide. Panicle simple, erect, narrow, 20-40 cm. long, rays in pairs ; spathes yellowish green, 4-5 cm. long, setaceously acuminate, usually longer than the racemes. Racemes 2.5 cm. long, erect, bearing 1, rarely 2 fertile spikelets, two staminate spikelets and other neuter spikelets. Fertile spikelets 11 mm. long, linear-oblong on a callus 4 mm. long, first glume firm, 2-pointed, grooved on the back, 6 mm. long, besides the short awn which is 2-3 mm. long ; second as long as the first, deltoid, obtuse, 3-nerved ; third shorter, fourth 4 mm. long, bearing an awn 5-6.5 mm. long. Pedicellate or staminate spikelets 11-15 mm. long, on filiform pedicels, first glume about 13-nerved, second 3-nerved, third and fourth 1 mm. long, narrow and ciliate on the margins. Anthers 3.5 mm. long.

Mexico (Rio Blanco), *Palmer* 313, in 1886 ; also found in tropical Africa.

TRIBE III.—ZOYSIÆ.

Spikelets solitary, or often in groups of 2-6 at each joint of the main axis, each group falling off entire from the continuous rachis. Spikelets usually 1-flowered, the floral glume awnless (awned in *Schaffnera*), membranous ; empty glumes firmer and often awned, the first usually the largest. Palea usually shorter than its glume, sometimes 0. Stamens 3 or fewer. Style free, stigmas plumose. Embryo nearly half as large as the unfurrowed obcompressed grain.

- A. Groups of spikelets usually numerous, in solitary, terminal spikes or racemes.
 - a. Spikelets 3-4 together, each group surrounded by an indurated false involucre consisting of the first glume of each spikelet. (15)
 - a. Spikelets ternate, strictly sessile, the outer ones 2-flowered, staminate, the inner 1-flowered, pistillate or perfect. (16)
 - a. Spikelets 2 to 6 together, the groups distinctly pedicellate. (b)

- b. Clusters of spikelets secund along the main axis, the terminal one in each group fertile, with delicate empty glumes. (17)
- b. Clusters of spikelets not secund, the terminal one in each group sterile; first empty glume minute, the second large and coriaceous with hooklike spines on the back. (18)
- B. Spikelets few, clustered in the axils of the upper leaf-sheaths, 1-flowered; empty glume 1, floral glume awned. . . (19)

15. (63). **ANTHEPHORA** Schreb. Besch. Gräs. 2 : 105, t. 44 (1772-79). *Hypudewurus* Reichb. Nom. 37 (1841). *Antephora* Steud. Syn. Pl. Gram. 111 (1855).

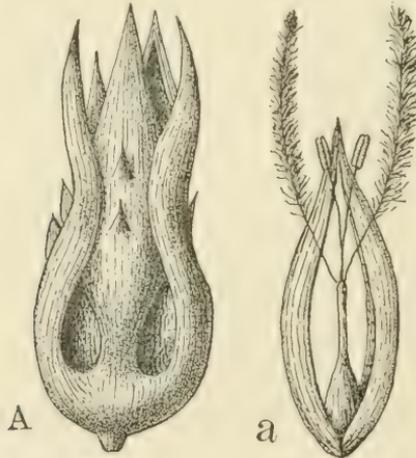


FIG. 15.—*Antephora elegans*. A, spikelets; a, floret. (Scribner.)

Spikelets 1-flowered, 3-4 together, of which 1-2 are perfect, 2-3 sterile; each group surrounded by a hard involucre consisting of the first empty glumes of each spikelet, the groups falling off entire from the flexuose rachis of the single terminal spike.

First glume minute, second largest, third small, floral glume and palea smooth, firmer, and obcompressed. Stamens 3. Styles slightly united at the base. Grain obcompressed, ovate to oblong, enclosed by the glume and palea, but not adherent.

Tufted, branching grasses, with flat leaf-blades.

There are five species known, one of which belongs to tropical America, the others to Africa.

1. *A. elegans* Schreb. l.c.

Plant diffuse, 15–45 cm. high. Leaves pubescent, the sheaths longer than the internodes; ligule 1 mm. long; blades lanceolate, the longest 5–8 cm. long. Spike 3–6 cm. long, about 4 mm. broad. Bracts of the involucre erect, obtuse to acuminate, 3–5 mm. long. First glume 1-nerved, second 5-nerved, 3 mm. long, floret hard and shining, obcompressed, 3–5 mm. long. Grain obcompressed, oval, 1.5 mm. long.

Mexico, *Palmer* 1255, *Pringle* 6030; Lower Calif., *Xanthus* 114; Cuba, *Wright* 3690. Lower California, Mexico, West Indies to Brazil.

16. (60). **HILARIA** H. B. K. Nov. Gen. et Sp. 1: 116, *t.* 37 (1815). *Pleuraphis* Torr. Ann. Lyc. N. Y. 1: 148, *t.* 10 (1824). *Hexarrhena* Presl. Reliq. Hænk. 1: 326 (1830). *Symbasiandra* Willd. Steud. Nom. ed. (2) 1: 767 (1840). Spikelets in threes, collected in a bractless, deciduous fascicle, the central with 1 pistillate or perfect flower, the lateral with 2 staminate flowers, the fascicles simple, almost sessile on the rachis of the spike. Glumes 4, 2 outer empty, firm, delicate, or hardened, forming an involucre, the first larger and variable, usually many-nerved, entire or bifid, toothed or torn at the apex, with an awn on the back between the lobes, or awnless; second narrower, often keeled, entire or 2-toothed, mucronate, short-awned, or awnless; third and fourth membranous, hyaline, entire or toothed at the apex, the outer in the staminate spikelets enclosing the floret and narrow palea; third in the fertile spikelet empty (or sometimes wanting?); the terminal flower of the fertile spikelet sometimes linear-acuminate, from a broad base, sometimes gradually narrowing or inequilateral, including the perfect or pistillate flower and the narrow palea. Stamens 3. Styles briefly joined at the base (or distinct?), with stigmas feathery. Grain ovate or broadly oblong, included by the involucreal glumes, but not adherent.

Grasses with solid culms, decumbent at the base, branching or in tufts, creeping, often sending out stolons; leaf-blades narrow.

flat, or convolute-terete. Spikes solitary, on a terminal peduncle, short or long, the clusters of spikelets on the jointed rachis often surrounded by a ring of hairs. Spikelets of the panicle sessile.

There are 5 or 6 species dispersed over western and south-western North America.

The genus is readily recognized by each cluster consisting of three spikelets, the central one containing a single fertile flower, either pistillate or perfect, the two lateral ones staminate.

- | | |
|---|------|
| A. Covered with short dense wool. | 1 |
| B. Not woolly. | (b) |
| b. Stoloniferous. | 2 |
| b. Not stoloniferous. | 3, 4 |

1. *H. rigida* (Thurb.) Scribner, Bull. Torr. Club. 9 : 33 (1884).
Pleuraphis rigida Thurb. S. Wats. Bot. Calif. 2 : 293 (1880).

Branching, 40-60 cm. high, covered with short, dense, white wool. Ligule very short; lower blades 10 cm. long, upper 2-3 cm. long, stiff, involute, bristly-pointed. Spike 7 cm. long, 7-10 mm. wide, glumes and palea of the lateral spikes nearly equal; glumes of the terminal spikelets bifid, 3-nerved, 5-6 mm. long, central nerve excurrent below the middle, the lateral nerves produced as setæ; floral glume 3-nerved; palea about equal to the glume.

California, *Jones*; Arizona, *Lemmon* for U. S. Dept. Agricul. 412.

2. *H. cenchroides* H. B. K. Nov. Gen. et Sp. 1117 (1815).

Culms 10-30 cm. high, stoloniferous, frequently rooting at the pubescent nodes. Ligule short, laciniate; blades flat or involute, narrow, 1-6 cm. long. Spikes 3-4 cm. long. Spikelets with dark glands on the lower half. Outer empty glumes of the empty spikelets about 5 cm. long, elliptical, 4-nerved, one vein becoming a short awn, one-fourth of the distance from the apex; inner empty glume shorter, with a longer awn; floral glume and palea nearly equal, hyaline, the former emarginate, 1-nerved. Empty glumes of the terminal florets 5-6-nerved, an awn extending half its length above, near the base of which is a ligulate scale; the

apex of another vein becomes a mucronate awn ; floral glume 3-nerved for one-third its length, broadly oval, then abruptly contracted, emarginate ; palea narrow.

Arizona, *Lemmon* for Nat. Mus. 415 ; Mexico (Jalisco), *Palmer* 296.

Var. **longifolia** Vasey. Leaves thin, numerous, erect, 8-12 cm. long.

Arizona, *Wheeler's Survey* 595 ; Lower California, *Palmer* 347.

Var. **ciliatus** Scribn. ined. Spikes about 3 cm. long ; empty

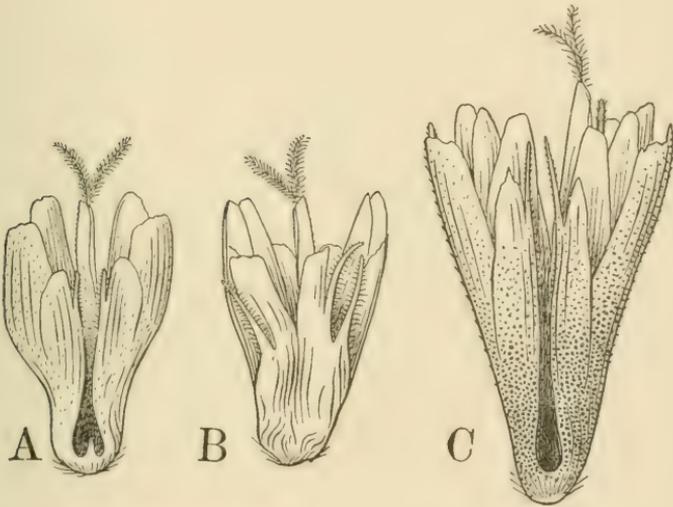


FIG. 16.—*Hilaria cenchroides*. A, B, C, spikelets. (Scribner.)

glumes above strongly ciliate, awns not extending beyond the lobes of the glumes.

Mexico, *Pringle* 3128.

Var. **Texana** Vasey. Leaf-blades mostly 1-3 cm. long ; spikes narrower.

Texas, *Reverchon* 1173, *Jenny* and *Nealley* for Nat. Mus.

3. **H. mutica** (Buck.) Benth. Jour. Linn. Soc. 19 : 62 (1881).

Pleuraphis mutica Buckl. Proc. Acad. Phila. 95 (1862).

Plant smooth, light colored. Culm 40-60 cm. high. Ligule

short; blades 1-5 cm. long, involute, bristling at the throat. Spikes dense, 5 cm. long, 5-12 mm. wide. Empty glumes of the lateral spikelets 4-5 mm. long, cuneate, obovate; the outer slightly longer, with a short hairy awn on one edge below the middle; 6-9 diverging nerves disappearing below the rounded, scarious apex; the inner with 4 diverging nerves, one excurrent, as a short awn; floral glume and palea a little shorter, the outer 3-nerved, with the apex obovate; palea emarginate. Empty glumes of the terminal spikelet narrow, keeled, equal, bearing 5-6 bristles; floral glume and palea of equal length, the former 3-nerved, bifid, mucronate.

Texas, *Reverchon* 1367; Arizona, *Pringle* in 1884.

4. **H. Jamesii** (Torr.) Benth. l. c. *Pleuraphis Jamesii* Torr. Ann. Lyc. N. Y. 1 : 148, t. 10 (1824).

Culms 25-40 cm. high, slender, branching at base, the nodes pubescent. Ligule oval, laciniate; blades 1-15 cm. long, appearing glaucous, owing to the numerous very small, stiff prickles, convolute, scabrous, hairy at the throat. Spikes 5-8 cm. long, often tinged with purple. Lower empty glume of the lateral spikelets 6-7 mm. long, awned above the middle, outer side 2-nerved; upper empty glume emarginate, cuspidate, 3-nerved on the outer side, two-nerved on the inner side; floral glume and palea about equal to the empty glumes. Empty glumes of the perfect spikelet keeled, ciliate, cleft nearly to the middle, lateral nerves obscure, 3-7 bristles on the back; floral glume and palea exceeding the empty glumes, the former 3-nerved, unequally bifid, cuspidate, the palea a little shorter, bifid.

Colorado, *Jones* 792; New Mexico, *Vasey* for U. S. Dept. Agricul.

Indian Territory, Arizona and southward.

17. (61). **ÆGOPOGON** Beauv. Agrost. 122 (1812) in part.

Ægopogon H. & B., Willd. Spec. Pl. 4 : 899 (1815). *Hymenothecium* Lag. Gen. et Sp. Nov. 4 (1816). *Schellingia* Steud. Flora 33 : 231 (1850). GOAT'S-BEARD GRASS.

Spikelets 1-flowered, in clusters of 2-6, the clusters almost sessile on the peduncle or continuous rachis of the simple secondary

spike. rachilla not continued above the perfect flower. Glumes 3 each, more or less 3-toothed at the apex, the lateral teeth short, the middle one extended into a bristle or awn; the 2 outer glumes empty, a little shorter, or the empty ones vary, either 1 only, entire,



FIG. 17.—*Ægopogon cenchroides*. A, spike; a, b, spikelets. (After Doell.)

acute, or all broadly emarginate and awnless at the apex; floral glume often larger than the empty glumes and prominently 3-toothed; palea a little shorter than the glume, narrower, 2-nerved,

2-toothed. Stamens 3. Styles distinct, stigmas plumose. Grain oblong, enclosed by the glumes, the clusters of spikelets at length deciduous by a joint.

Diffuse or tufted, slender grasses with flat, narrow blades. The clusters of spikelets finally drooping, not unfrequently containing spikelets, 1-3 of which are slender, sterile or neuter mixed with the fertile.

The genus has at first sight much the aspect of the Asiatic *Melanocenchris*, or of some of the very short-spiked species of *Bouteloua*, but the real affinity appears to be with *Hilaria*.

Species 3, found in Arizona, Texas, Mexico, and South America.

1. *Æ. cenchroides* H. & B. Willd. Sp. Pl. 4 : 899 (1806).

Culms 20-40 cm. high, more or less reddish throughout. Sheaths slightly rough, not keeled; ligule 3 mm. long, bifid; blades 4-8 cm. long. Spikes 5-8 cm. long, spikelets in threes, terminal, perfect, the 2 lateral neuter. Empty glumes equal, 2-2.5 mm. long, 1-nerved, each with an awn its own length between the shorter teeth; floral glume one-third longer, 3-awned; the lateral awns equalling those of the outer glumes; the terminal awn twice as long; palea with 2 short awns between the lobes. Glumes and palea of the neuter flowers smaller, otherwise much like the fertile.

Mexico, *Parry* and *Palmer* for U. S. Dept. Agricul.

Texas and Mexico.

2. *Æ. geminiflorus* H. & B. Nov. Gen. et Sp. 4:133, t. 43 (1815).

A slender grass, 10-20 cm. high, more or less tinged with red. Culms geniculate. Spikes secund, 3-6 cm. long. Spikelets in threes, the 2 lateral neuter; empty glumes of the perfect flower 1.7 cm. long, 1-nerved, cuneiform, cuspidate between the broad, rounded lobes of the emarginate apex; floral glume nearly twice as long, 3-nerved, lateral awns short, central awn about twice as long as the glume; palea equalling the floral glume, with 2 very short setæ, empty glumes of the neuter spikelets half as long as the fertile; floral glumes oval, 3-nerved, mucronate, or with a very short awn; palea obovate, bicuspidate. Anthers 1.5 mm. long.

Arizona, *Lemmon*; Mexico (State of Jalisco), *Palmer* 479.

Var. **abortivus** Fourn. Mex. Pl. Enum. Gram. 71 (1886). Awn of floral glume very short, scarcely above the obtuse lobes. Mexico, *Pringle* 1408.

Var. **unisetus** (R. & S.) Fourn. l.c. *Æ. unisetus* R. & S. Syst. 2:805 (1817). The central awn of floral glume of the fertile spikelet projecting 6 mm., the lateral awns less than 1 mm. long.

Mexico, *Pringle* 1407.

3. **Æ. gracilis** Vasey, Bull. Torr. Club, 13:230 (1886). Perennial; often tinged with red. Culms tufted, erect, slender, smooth, sparingly branched, 30–40 cm. high. Sheaths two-thirds as long as the internodes; ligule 1–2 mm. long; blades flat, thin, 1–3–5 cm. long, 1 mm. wide. Panicle racemose, 3–6 cm. long, the axis bearing 10–12 secund clusters of spikelets, the clusters consisting of 1 sessile and 2 short, pedicellate spikelets. Spikelets 2–3–4 mm. long, first and second glumes linear, acutely 3-lobed, 1 mm. long, the middle lobe extending into an awn, 1 mm. long; floral glume oblong, 3-nerved, 2 mm. long, 3-awned, lateral awns 2 mm. long, the central twice as long; palea oblong, shortly 2-toothed. Anthers 0.8 mm. long.

Mexico, *Palmer* 28, 247, 505 and *Pringle* 823.

18. (65). **NAZIA** Adans. Fam. Pl. 2:31 (1763). *Tragus* Hall. Hist. Stirp. Helv. 2:203 (1768). *Lappago* Schreb. Gen. 55 (1789). Spikelets 1-flowered, mostly in clusters of 2–5, at length deciduous by a joint, the terminal one often sessile, the others including a perfect flower, the clusters having very short pedicels on the rachis of the spike. Glumes 2–3, the lower minute, often absent, the second empty, stiff, its nerves covered with strong, hooked prickles; the terminal floral 1 shorter, slender; this and the palea hyaline. Stamens 3. Styles short distinct, stigmas plumose with long hairs. Grain oblong, enclosed by the glumes. Internodes often catching sand and small insects by means of a sticky substance.

Two species are very widely distributed in the tropics and warmer temperate countries.

1. **N. racemosa** (L.) Kuntze, Rev. Gen. Pl. 780 (1891). *Cenchrus racemosus* L. Sp. Pl. 1049 (1753). *Lappago racemosa* Willd.

Sp. Pl. 1: 484 (1798). *Tragus racemosus* Hall. Hist. Stirp. Helv. 2: 1413 (1768). A low, branching annual, 10–30 cm. high, culms smooth, 2–6 cm. long. Leaf-blades 2–4 cm. long, flat, thin, the margins clothed with prickles. Spikes 3–8 cm. long, 7–8 mm. broad, with the base included in the swollen sheaths. Spikelets in clusters of three, 3 mm. long, ovate-lanceolate, easily detached and carried away by animals.

Pa. (Phila.), *Scribner* 3620a from Dr. Brinton; Texas, *Jones*; Mississippi, *Tracy* cult. A rare weed introduced from Europe.

2. *N. occidentalis* (Nees). *T. occidentalis* Nees. Agrost. Bras. 286 (1829). Plant erect, 20–30 cm. high. Spikes dense, 5–8 mm. long, 5–6 mm. broad, the base often included. Spikelets in clusters of two, ovoid, 2–2.5 mm. long. The pedicels with a broad calloused base.



FIG. 18. — *Nazia occidentalis*. Spikelet. (Richardson.)

Arizona, *Pringle* in 1884; Mexico, *Pringle* 421; Colorado, *Jones*.

19. (?) **SCHAFFNERA** Benth., Journ. Linn. Soc. 19: 63 (1881).

Spikelets 1–4, 1-flowered, jointed on very short axillary peduncles, flowers perfect or sterile. Glumes 2–3; if 3, then the first is ciliate-fringed, 3-nerved, and about 1 mm. long, second almost hyaline, 2–3 mm. long, 3–5 awned, third as long as the spikelet, several-nerved, with an awn back of the apex; palea hyaline, 2-nerved, 2-toothed or obtuse. Stamens 3. Anthers long and narrow. Styles 2, distinct, long and slender.

The above differs in some respects from the description in *GENERA PLANTARUM*, but corresponds to the specimen as I observed it. Bentham at one time united this with the genus *Zoysia* Willd. At first sight it seems to resemble *Cathestechum*. It approaches some species of *Andropogon* (*Cymbopogon*) and of *Apluda*.

One species is known, and that is found in Mexico.

1. *S. gracilis* Benth. Hook. Ic. Pl. (XIV.) 59, t. 1378 (1882). A low, diffuse, branching annual, 15 cm. high. Sheaths 1 cm. or less in length; blades rough, narrow, 2–3 cm. long. Peduncles unequal, partially included in the sheaths. Part of the spikelets of

any cluster fertile, others sterile, spikelets finely pubescent, with a sheath of very short hairs at the base, linear-lanceolate, 5 mm. long, third glume elliptical-lanceolate, 5-nerved, as long as the spikelet, with a straight awn about half its own length: palea elliptical when spread, 5 mm. long, with 2 nerves near the middle. Grain linear, compressed, 1 mm. long.

Mexico, *Schaffner* 1070.

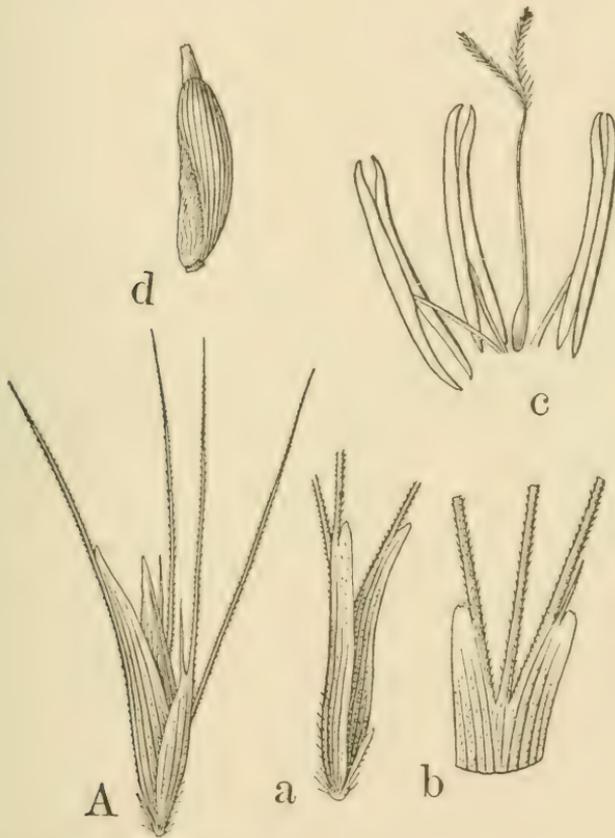


FIG. 19.—*Schaffnera gracilis*. A spikelet dissected. (Scribner.)

TRIBE IV.—TRISTEGINEÆ.

Spikelets all similar, 1-2-flowered, in paniced racemes, falling off singly from the ultimate branches of the continuous axis of the panicle. Empty glumes three, herbaceous or chartaceous, the first

narrowest, the third sometimes standing as the floral glume of a terminal staminate flower; floral glume and palea membranous, the former of the perfect flower terminating in a twisted awn.

Tropical grasses, somewhat nearly related to *Andropogoneæ* and *Panicææ*.

This tribe was first proposed by Nees, and partly adopted and extended by Munro and Bentham.

They differ from *Panicææ* and approach *Andropogoneæ* in the thin texture of the floral glume and palea, and by the frequent presence of a slender, often bent awn on the floral glume. They differ from *Andropogoneæ* in their inflorescence; the spikelets singly scattered, or clustered along the inarticulate branches of the panicle. The tribal name comes from *Tristegis* Nees, a name given to the genus *Melinis* supposing the forms to be new.

20. (51). **ARUNDINELLA** Raddi. *Agrost. Bras.* 37, *t. l. f.* 3 (1823).

Goldbachia Trin. *Spreng. N. Entd.* 2: 81 (1821).

Calamochloë Reichb. *Consp.* 52 (1828).

Thysanachne Presl, *Thysan. Nov. Pl. Gen.* (1829).

Brandtia Kunth, *Rev. Gram.* 2: 511, *t.* 170 (1830).

Riedelia Trin. Kunth, *Enum. Pl.* 1: 515 (1833).

Acratherum Link, *Hort. Berol.* 1: 230 (1834).

Spikelets acute or acuminate, with 1 terminal, perfect flower and often a second staminate one below it, in a loose terminal panicle. Glumes 4, the three outer ones often pointed, but not awned, the second longer than the others, the third with a palea or male flower in its axil; terminal floral glume smaller, thinner, hyaline, with a fine awn twisted in the lower part and bent back at or below the middle; palea smaller. Stamens 3. Styles distinct. Grain oblong, included, but not adherent.

Low or tall grasses with a terminal panicle. A tropical or subtropical genus, containing 25 species, chiefly Asiatic, with a few African and American species.

1. **A. Palmeri** Vasey ined.

Culms smooth, sparingly branching, about 90 cm. high. Ligule ciliate, about 1 mm. long; blades of the culm rigid, erect, involute, scabrous, 15-20 cm. long, 3-5 mm. wide. Panicles rather densely

many-flowered, yellowish, 15–30 cm. long, 3–5 cm. broad, rays bearing spikelets along the upper half. Spikelets on pedicels 1–2 or more mm. long. First glume ovate-lanceolate, extending to the top of the florets, 3-nerved, 3–3.5 mm. long including the stout point, rachilla broad and carrying the second glume 0.3 mm. above the first glume, second glume linear-lanceolate, 5-nerved, 4–5 mm. long, including the stout point, third glume (floral glume of the staminate floret) ovate-lanceolate, 2.5 mm. long, delicately 5-nerved, lateral nerves near each other, its palea 2 mm. long, fourth glume (floral glume of the upper floret) membranous, delicately 3-nerved, 1.7 mm. long, bearing a tuft of very short hairs at its base, and a terminal awn 6–10 mm. long, the lower third of which is brown and twisted.

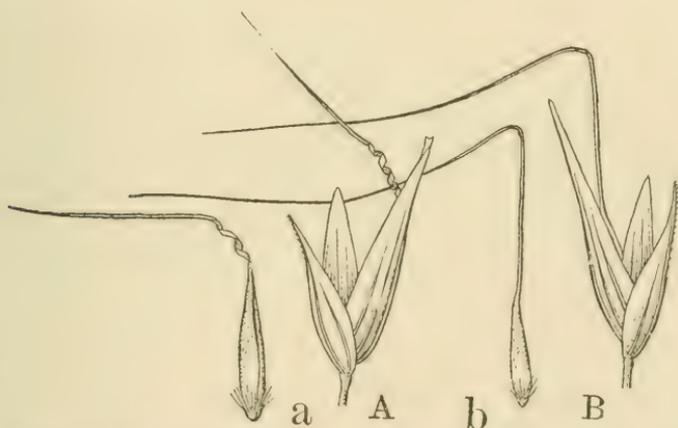


FIG. 20.—*Arundinella Palmeri*. A, a, *Deppeana*; B, b, spikelets and florets respectively. (Scribner.)

Nearly allied to *A. pallida* Nees, of which it is possibly only a variety. Mexico, *Palmer 12*.

2. *A. pallida* Nees, *Agrost. Bras.* 465 (1829).

A rather smooth, stout, erect perennial. Culms hard, 180–200 cm. high. Ligule very short; blades smooth below, scabred or pubescent above, 25–40 cm. long, 6–10 mm. wide. Panicle ovoid or narrower, 30–40 cm. long, rays smooth in threes to fives, sparingly branched. Spikelets on pedicels 1–2 mm. long, scattered the

whole length of the branches. First glume ovate-lanceolate, 3-nerved, about 3 mm. long, second 5-nerved, 4 mm. long, third glume (floral glume of the staminate floret) 7-nerved, 3 mm. long; palea nearly as long as its glume; floral glume of the upper floret round on the back, 3 mm. long, scabrid, very obscurely 5-nerved, bearing a tuft of short hairs at its base and a terminal awn about 6 mm. long; palea shorter, 2-nerved.

Mexico, *Pringle* 1746, *Palmer* 526.

A. Cubensis Griseb. in *Plantæ Wrightianæ Cubensis*, No. 1552, is identical with the above 1746 of Pringle, 526 of Palmer.

Found in Mexico and several countries of South America.

3. **A. Deppeana** Nees, *Bonplandia* 3: 84 (1855).

A rather slender, smooth perennial; culms hard, 90–150 cm. high. Ligule very short and fringed with hairs; blades smooth or slightly scabrid or pubescent, involute, 20–30 cm. long. Panicle elliptical, 20–40 or more cm. long, rays mostly in threes to fives, sparingly branched. Spikelets on pedicels 1–2 mm. long, scattered the whole length of the branches. First glume less than 2 mm. long, besides the very short and narrow apex, 3-nerved, second lanceolate, 5-nerved, 3.5 mm. or less long, third (floral glume of the staminate floret) 2.3 mm. long, floral glume of the upper floret 2 mm. long, with an awn having one bend above the spikelet.

Mexico, *Pringle* 3133.

It differs chiefly from *A. pallida* in its shorter glumes and longer awn, with only one bend; and it is not improbable that a study of more plants may show that one is only a variety of the other.

TRIBE V.—PANICEÆ.

Fertile spikelet with one terminal perfect or pistillate flower, with or without a staminate one below it; arranged in spikes, racemes or panicles, falling off singly from the ultimate branches; the axis usually continuous. Floral glume and palea of the perfect flower always firmer than the empty glumes, unawned (or in *Eriochloa* with a short straight awn); empty glumes rarely with straight awns. Stamens three, rarely fewer. Grain enclosed in

the upper glume and palea, not adherent, obcompressed; unfurrowed; embryo large.

- A. Spikelets not sunken in excavations of the rachis. Some or all of the flowers perfect. (a)
- a. Spikelets not subtended by 1 to many bristles or spines. (b)
- b. Empty glume 1; spikelets acuminate, 2-ranked. 21
- b. Empty glumes 2; perfect flower 1. (c)
- c. First empty glume with a swollen ring at the base, floral glume mucronate or short-awned. 25
- c. First empty glume without a swollen ring at the base. (d)
- d. Spikelets usually plano-convex and obtuse, sessile or nearly so, in 1 to several 1-sided racemes or spikes. 22
- d. Spikelets in panicles. (e)
- e. All spikelets fertile. 23
- e. Spikelets on the terminal panicle sterile, the fertile ones subterranean. 24
- c. Empty glumes 2, with 1 staminate and 1 perfect flower, or 3 with 1 perfect flower. (m)
- m. First and second glumes without a callus and awnless. 26
- m. Rachilla with membranous appendages or pits. 27
- m. Spikelets without callus, first and second glumes awned. 28
- m. Spikelets with a callus, the 3 empty glumes awned. 29
- a. Spikelets single or in twos or threes, subtended by 1 to many bristles or spines. (n)
- n. Spikelets articulating above the persistent bristles. 30
- n. Spikelets articulating below the bristles or adnate spines. (o)
- o. The involucre of spines more or less consolidated. 31
- o. The involucre of few to many bristles. 32

- B. Spikelets 1-4, on very short branches that are sunken in the cavities of the thickened rachis. Some or all of the flowers perfect. 33
- C. Plants monœcious; spikelets in panicles. 34

21. (1). **REIMARIA** Flüggé. Gram. Monogr. 213 (1810), in part.

Spikelets acuminate, sessile, appressed, alternately on two sides of a triangular rachis, with one perfect terminal flower. Empty glumes usually one, sometimes another small one, acute, membranous, 5-9-nerved; floral glume firm, a little shorter; palea still shorter. Stamens 2. Styles distinct. Grain oblong, obcompressed, enclosed by glume and palea, but not adherent. Culms ascending, diffusely branching at the base. Spikes few, simple, finally reflexed.

There are four species, all belonging to tropical America. Our species much resembles *Paspalum disticum* L. var. *virginatum*.

There are several species of *Paspalum* which have only a single lower empty glume, but *Reimaria* has the spikelets more acuminate and more closely appressed to the rachis than in any *Paspalum*; and the stamens are only two.

1. **R. oligostachya** Munro. Benth. Jour. Linn. Soc. 19:34 (1881).

Smooth throughout, 20-40 cm. high. Sheaths slightly inflated; blade narrow, acuminate, 6-10 cm. long, often involute.

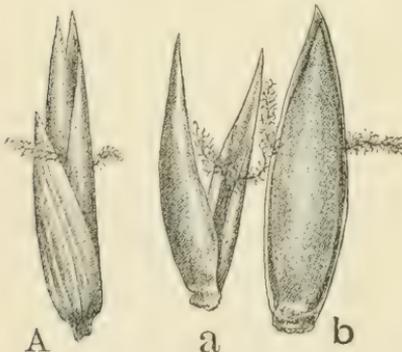


FIG. 21.—*Reimaria oligostachya*. A, spikelet; a, b, florets. (Scribner.)

Spikes 2-4, on short peduncles, exerted or more or less included, 4-7 cm. long. Contiguous spikelets of the same row with a little space between them, elliptical-lanceolate, 4-5 mm. long; first glume minute or slender and half as long as the spikelet, often absent, second elliptical, ovate, acute,

9-nerved, floral glume firmer and palea firmer and shorter, much

alike, the former 7-9-nerved, the latter with 2 obscure nerves near each margin.

Florida, *A. H. Curtiss* 3562.*

22. (2) **PASPALUM** L. Syst. Ed. 10, 2:855 (1759).

Salsab Adans. Fam. 2:31 (1763).

Cleachne Roland. Rottb. Act. Lit. Univ. Hafn. 1:285 (1778).

Ceresia Pers. Syn. 1:85 (1805).

Axonopus Beauv. Agrost. 12 (1812).

Cabrera Lag. Gen. et Sp. Nov. 5 (1816).

Paspalanthium Desv. Opusc. 59 (1831).

Mænchia Wender. Steud. Nom. ed. (2). 2:153 (1841).

Anachyris Nees. Hook. Kew Journ. 2:103 (1850).

Maizilla Schlecht. Bot. Zeit. 8:601 (1850).

Anastrophus Schlecht. Bot. Zeit. 8:681 (1850).

Cymatochloa Schlecht. Bot. Zeit. 12:821 (1854).

Lappagopsis Steud. Syn. Pl. Gram. 112 (1855).

Wirtgenia Nees. Doell. Mart. Fl. Bras. (2) 2:40 (1877).

Spikelets 1 flowered, not awned, usually plano-convex in 1 or 2 single or double rows, on short pedicels. Glumes 3, the two outer ones empty, usually membranous and equal or nearly so, the third or floral of a thinner texture; palea within the floral glume, firm, smaller, nearly flat. Stamens 3. Styles distinct, rather long. Grain enclosed, but not adherent. Some spikelets of some species, as *P. distichum*, have an additional small glume on the flat side, thus serving to unite this genus with *Panicum*.

A large tropical and subtropical genus of about 160 species, especially abundant in America; also found in Africa, Asia, a few in Australia, and two in Europe. The species vary much in habit, though in North America many of them grow on sandy land. Most of them are not hardy in the Northern States.

Considering its great size, the genus is very well defined, and readily distinguished from *Panicum* by the inflorescence, and by the technical character of the absence of the first empty glume. Neither of these characters is absolutely constant. A few *Panica* of the section *Brachiaria* have the inflorescence of *Paspalum*; and the lowest glume is frequently reduced to a small callus, or is

entirely deficient in the section *Digitaria*; consequently several species have been referred by some botanists to one genus and by others to the other. These ambiguous species appear to be best placed in *Panicum*.

All the true *Paspala* have the spikelets sessile or nearly so, in two to four rows along the lower or outer side of the rachis or simple branches of the panicle. Scarcely five species can be regarded as belonging exclusively to the Old World. General Munro had nearly completed a monograph of the genus, leaving descriptions of 138 species. He and Dr. Bentham agreed perfectly in not making species to show all slight variations, corresponding to what many local European botanists describe as critical species.

Trinius subdivided the genus, chiefly according to the size of the spikelets.

Bentham and Hooker adopted three sections, founded on Nees's—*Eupaspalum*, *Cabrera*, and *Anastrophus*, subdividing the first and much the largest into four groups—*Anachyris*, *Opisthion*, *Pseudoceresia*, and *Ceresia*.

Anachyris is a purely artificial one, characterized solely by having only a single empty glume below the flowering one. It was first proposed as a genus by Nees for *Paspalum malacophyllum* Trin. *Opisthion* was proposed by Doell as a section of *Paspalum*, but Bentham and Hooker use it as a name for a group. It includes all the typical *Paspala* with two lower empty glumes, and the rachis of the spikes not dilated. The species are numerous and varied. *Pseudoceresia* is the name of the group of species in which the rachis of the spikes is more or less dilated and concave, but green and herbaceous throughout, and the spikelets are small and glabrous or nearly so. The species are few, including *P. repens* Berg. and its allies. *Ceresia* is the name proposed for a genus by Persoon. Here the dilated rachis of the spike is bordered by a colored or smooth membranous margin and the half-enclosed spikelets are larger than in *Pseudoceresia* and densely ciliate. *Cabrera*, the second section of *Pasalum*, contains a single species, *P. aureum* H.B.K., forming Lagasca's genus *Cabrera*. In this the direction of the spikelets is nearly that of *Anastrophus*; but

instead of being marginal on one side of the rachis, they are deeply embedded in alternate cavities on the outer and lower side of that rachis.

Anastrophus, the third section, was proposed as a genus by Schlechtendahl. In this the spikelets are on alternate margins of the narrow, somewhat flexuose rachis of the spike and the back of the floral glume being turned outwards from the rachis. The spikes are generally several, close together at the end of the peduncle.

Besides the above valuable notes taken from Bentham, considerable aid has been received from a valuable synopsis of the genus by Vasey, in Bull. Torr. Club, 13:162 (1886).

- A. *ANASTROPHUS* Schlecht. *Spikelets almost distichous with (back of the floral glume) first glume turned outward away from the rachis. Leaves obtuse.*
- | | |
|---|---|
| a. Leaves 4 mm. wide or narrower. | 1 |
| a. Leaves 5 mm. wide or wider. | 2 |
- B. *EUPASPALUM* Benth. *Spikelets strictly secund with (back of the floral glumes) first glume turned inward toward the rachis. Leaves sharp-pointed.*
- | | |
|---|-----|
| a. Rachis thin, folding towards the small spikelets and partially enclosing them. | (o) |
| o. Spikes 3-6. | 3 |
| o. Spikes 3-8. | 4 |
| o. Spikes 40-60. | 5 |
| o. Spikes 75-100. | 6 |
| a. Rachis not enclosing the spikelets, usually less than 1 mm. wide. | (b) |
| b. Rachis not winged. | 7 |
| b. Rachis more or less winged. | (c) |
| c. Spikelets more or less hairy or puberulent. | (d) |
| d. Spikelets 2-2.5 mm. long. | 8 |
| d. Spikelets 1.5 mm. long. | 9 |
| c. Spikelets glabrous. | (e) |
| e. Spike single at the apex of the culm or each branch; spikelets 1 mm. long. | 10 |

- e. Spikes more than one to the culm. (f)
- f. Spikes 1-2 cm. long. 11
- f. Spikes 3-4 cm. long, var. of *P. inops*. 11
- f. Spikes longer. (g)
- g. Spikelets 1.7 mm. long, spikes 4-15 cm.
long. 12
- g. Spikelets longer. (h)
- h. Rachis more or less pubescent. 13
- h. Perhaps some plants of number. 17
- h. Rachis glabrous. (i)
- i. Spikes 3-5, spikelets about 2 mm.
long. 14
- i. Spikes 5-8, spikelets 2-2.3 mm.
long. 15
- i. Spikes 3-7, spikelets 3 mm. long. 16
- i. Spikes mostly single, spikelets 2.2
mm. long. 17
- a. Rachis not enclosing the spikelets, usually 1 mm. or
more wide. (j)
- j. Spikelets more or less hairy or puberulent. (k)
- k. Spikelets narrowly elliptical, acute, ciliate on the
margins, 3.3 mm. long. 18
- k. Spikelets oval, acute, 3-4 mm. long. 19
- k. Spikelets oval, obtuse; spikes 3-6. 20
- j. Spikelets glabrous. (m)
- m. Spikes 2 (sometimes 1), 8-16 cm. long; spikelets
oval, 2.5-3 mm. long. 21
- m. Spikes more than 2 to the culm. (n)
- n. Rachis 2 or nearly 2 mm. wide; spikelets
2-2.3 mm. long. 22
- n. Rachis rarely 2 mm. wide in some plants of
number 23
- n. Rachis 2 mm. wide; spikelets 2.5 mm. long. 24
- n. Rachis 2 mm. wide; spikelets 3 mm. long. 25
- n. Rachis narrower. (p)
- p. Spikelets subacute, 2.5-3 mm. long; rachis

- 1 mm. wide ; spikes usually 3 in number,
2-3.5 cm. long. 26
- p. Spikelets acute, 3.5-4 mm. long ; rachis
about 1.5 mm. wide ; spikes 2-4 in num-
ber, 2-5 cm. long. 27
- p. Spikelets obtuse, 3.5 mm. long ; rachis 1
mm. wide ; spikes 2, 7-10 cm. long. . . 28
- p. Spikelets subacute, 3 mm. long ; rachis 1-2
mm. wide ; spikes 2, rarely 3, 3-9 cm. long. 23
- p. Spikelets obtuse, 2.2-3 mm. long ; rachis 1
mm. wide ; spikes 3-6, 4-6 cm. long. . . 29
- p. Spikelets broad, subacute, 3 mm. long ;
rachis 1.3 mm. wide ; spikes 3-4, 6-11 cm.
long. 30
- p. Spikelets subacute, 3.5 mm. long ; rachis 1.7
mm. wide ; spikes 3-4, 10-17 cm. long. . 31
- p. Spikelets obtuse, 3.5-4 mm. long ; rachis
1-1.7 mm. wide ; spikes 3-5, 10-14 cm. long. 32

1. **P. compressum** (Swartz) Nees. Mart. Bras. 2:23 (1829).

Milium compressum Sw. Prod. 24 (1788).

P. platycaulon Poir. Lam. Encycl. 5:34 (1804).

Culms filiform, branching, 12-24 cm. high, usually consisting of two internodes from a creeping root-stock. Sheaths narrow, compressed, with a few soft hairs ; blade narrowly linear, obtuse, smooth, 2-6 cm. long, 2-3 mm. wide. Spikes 2-3, approximate, slender, 2-4 cm. long. Spikelets in two rows, overlapping little or none, narrowly oblong, 2 mm. long ; first and second glumes 2-nerved, with short hairs above.

Florida, *A. H. Curtiss* 3565, *J. H. Simpson* for Nat. Mus.
South Carolina to Florida and Texas.

2. **P. paspalodes** (Michx.) Scribn. Mem. Tor. Bot. Club, 5:25
(1894).

Digitaria paspalodes Michx. Fl. Bor. Am. 1:46 (1803).

P. Michauxianum Kunth, Rev. Gram. 1:25 (1835).

P. Elliottii S. Wats., A. Gray, Man. Ed. 6,629 (1890). *P.*

Digitaria Poir. Lam. Encycl. Suppl. 4:316 (1816).

P. furcatum villosum Vasey.

Culms containing 3-4 internodes above the root-stock, 50-80 cm. high. Sheaths compressed; blades thinly clothed with soft hairs, flat, rough above, obtuse, 10-15 cm. long, 1 cm. wide. Spikes 2-3, narrow, 5-8 cm. long. Spikelets about one third longer than the internodes of the rachis, ovate-lanceolate, less than 5 mm. long; first glume 7-nerved, second 5-nerved, third 2.7 mm. long.

Florida, *A. H. Curtiss* 3565, ticketed *P. Digitalia* Poir., *G. V. Nash* 509.

Swamps, North Carolina to Florida and other Southern States.

3. **P. membranaceum** Walt. Fl. Car. 75 (1788), not Lam. (1791). *P. Walterianum* Schultes, Mant. 2:166 (1824).

Culms decumbent, from creeping rhizomes, much branched, 20-60 cm. long. Sheaths rather loose; blades smooth, acute, 4-6 cm. long, 4 mm. wide. Spikes 3-6, approximate, the lowest ones included by the sheath, about 2 cm. long, rachis thin, 2.5 mm. wide, clasping the spikelets. Spikelets in two rows, in each row overlapping for one half their length, oval, flattened, nearly 2 mm. long, first and second glumes thin, 3-nerved or with two outer obscure nerves.

Maryland, *Scribner* 3564 from Canby; Tennessee, *U. S. Dept. Agricul.* 28 from Gattinger.

New Jersey, Delaware, and Southern States.

4. **P. gracile** Schlecht. Linnæa, 26:134 (1853-55).

Culms diffuse or decumbent, much branched, 15-30 cm. high. Sheaths rather loose, thickly pubescent; blade ovate-lanceolate or linear-lanceolate, flat, thin, sparingly pubescent, 2-5 cm. long. Spikes 3-8, scattered, 1-2 cm. long, the lowest ones included by the sheath, rachis thin, about 2 mm. wide, flat or clasping the spikelets. Spikelets in two rows, one each side the mid-nerve, those of each row about 2 mm. apart, elliptical, 2.2-2.4 mm. long, first and second glumes very thin, 3-nerved.

Mexico, *Pringle* 3343.

In appearance considerably like *P. membranaceum* Walt.

5. **P. mucronatum** Muhl. Cat. 8 (1813). *Ceresia fluitans* Ell.

Bot. S. C. and Ga. 1:109 (1817). *Paspalum fluitans* Kunth, Rev. Gram. 1:24 (1829).

Culms branching, ascending, creeping or floating from a rhizome, 30–90 cm. long, nodes soft hairy. Upper sheath extending nearly to the spikes; blades flat, thin, acuminate, 5–15 cm. long, about 1 cm. wide. Spikes racemose, 40–60, alternate and verticillate, spreading, 3–7 cm. long, the thin rachis 1.5 mm. wide, extending 3 mm. beyond the spikelets. Spikelets in two vertical rows, pubescent, oblong, acute, 1.5 mm. long, first and second glumes very thin, 2-nerved.

Louisiana, *A. B. Langlois*, collected in 1885.

Virginia to southern Illinois and southward.

6. **P. repens** Berg. Act. Helvet. 7, t. 7:129 (1772).

P. pyramidale Nees, Mart. Bras. 2:77 (1829). *P. gracile* Steud. in part.

Culms creeping or floating in water, the ascending portion 20–30 cm. high. Sheaths longer than the internodes, inflated, scabrid, spotted, the throat bearing two peculiar stipular appendages, 5–7 mm. long; ligule lacerate, truncate, brown, 2–3 mm. long; blades flat, scabrous, acute, 10–18 cm. long, 7–15 mm. wide. Spikes 75–100 or more, ascending, crowded into an erect, ovoid, spikelike raceme, about 9 cm. long; the spike 2–3 cm. long, the thin involute rachis 3 mm. wide, the acuminate tip projecting 8–10 mm. above the spikelets. Spikelets in a single vertical row of 5–8 in number, oblong, subacute, 2–2.2 mm. long, first and second glumes equal, very thin, 2-nerved, a little longer than the floret.

Mexico (Jalisco). *Pringle* 3854; also found in South America; growing in water.

7. **P. racemosum** Lam. Illustr. 1:176 (1791).

Culms erect, simple, 60–120 cm. high from a scaly root-stock. Lower sheaths thinly clothed with long hairs; blades linear-lanceolate, glaucous, keeled, 30–40 cm. long, 5–10 mm. wide. Panicle erect, exserted, 15–20 cm. long. Spikes 3–4, lax, slender, 4–16 cm. long, rachis triquetrous-terete, flexuose. Spikelets smooth, in alternate pairs, distant, pedicels 2–5 mm. long, oval, obtuse, about 4 mm long, first glume 5–7-nerved, second 3–5-nerved.

Georgia, *Cooley collection* Mich. Agr. College in 1863; Ala., *Mohr* in 1888.

North Carolina to Florida and Louisiana.

8. *P. virgatum* L. Sp. Pl. 81 (1753). Var. *pubiflorum* Vasey, Bull. Torr. Club, 13:167 (1886).

Culms stout, 90–120 cm. high, dark at the nodes. Leaf-blades smooth, hairy at the throat, 30 cm. long, 7–10 mm. wide. Panicle 15–20 cm. long. Spikes 12–15, flexuose, the lower 6–8 cm. long, those above gradually growing shorter, rachis straight or flexuose, less than 1 mm. wide. Spikelets flattened, soft-hairy, ovate, acute, crowded in four or more rows, 2–2.5 mm. long, some of them on pedicels of their own length; first and second glumes 3-nerved, third shorter, obtuse.

Louisiana, *A. B. Langlois*. “Cuba, Mexico to Uruguay,” *Grisebach*.

Var. *platyoxon* Doëll. Leaf-blades 1.5–2 cm. wide; spikes about 5, the lower 15 cm. long, rachis 3 mm. wide; spikelets oval or subovate, smooth, 3 mm. long.

Texas, *Reverchon* 703, in 1874, identified by Munro, now in herbarium of Harvard University.

9. *P. cæspitosum* Flüggé, Monog. 161 (1810). *P. Blodgettii* Chapm. Fl. S. States, 571 (1860).

Culms slender, of few internodes, 20–40 cm. high. Leaf-blades flat, acute or acuminate, glabrous except at the base, 3–15 cm. long, 7–10 mm. wide. Spikes 2–4, 4–6 mm. long, one terminal, the others distant 5–7 cm. from each other, rachis less than 1 mm. wide. Spikelets minutely pubescent, obovoid or oval, usually in pairs in each row, pedicels as long as the spikelets, which are 1.5 mm. long, first and second glumes thin, 3-nerved.

Florida, *U. S. Dept. Agricul.* from A. H. Curtiss.

Florida, Cuba, Guiana.

10 *P. Pittieri* Hack. MS.

A slender tufted diffuse grass, branching near the base, 15–20 cm. high. Leaf-blades hispid, acuminate, 2–6 cm. long, about 2.5 mm. wide. Spikes single, rarely in pairs, slender, 2–3 cm. long,

axis thin, wavy involute, 0.5–0.7 mm. wide. Spikelets 1.4 mm. long on pedicels 1 mm. long, in two rows (one of each pair abortive), obovate, subacute, puberulous on the margins of the convex side, first and second glumes thin, 3-nerved.

Mexico, *Pringle* 2359.

11. *P. inops* Vasey, ined.

Culms low, spreading, 10–20 cm. high. Sheaths hairy, the upper one reaching nearly to the lowest spike, blades flat, pubescent on both sides, acute, 1–4 cm. long, 4–6 mm. wide. Spikes 2–3, 1–2 cm. long. Spikelets mostly in pairs, smooth, nearly hemispherical, 2.5 mm. long, first and second glumes 5-nerved, third and the palea brown.

Mexico (Jalisco), *Palmer* 617.

Var. *major* Vasey, ined. Leaf-blades sparingly pubescent, often 15 cm. long, 1 cm. wide; spikes 3–4 cm. long.

Mexico, *Pringle* 1875.

12. *P. conjugatum* Berg. Act. Helv. 7, t. 8: 129 (1772).

Culms branching, 4–7 cm. high from a creeping rhizome. Leaf-blades flat, acuminate, nearly smooth, 4–10 cm. long, 5–8 mm. wide. Spikes 2, slender, exserted, culms digitate, sometimes with 1–2 lateral ones, 4–15 cm. long, 1.7 mm. wide. Spikelets secund, in two rows, slightly imbricated, ovate, broadly acute, 1.7 mm. long, first and second glumes thin, 2-nerved, the first ciliate on the margins.

Mexico, *Palmer* 367, *Pringle* 3129; Alabama, *Mohr*.

Florida to Texas and Mexico.

13. *P. tenellum* Willd. Enum. Hort. Berol. 1:89 (1809).
P. elegans Flügge, Monog. 183 (1810).

Culms rather slender, 60–90 cm. high. Sheaths compressed, the lower ciliate at the throat; ligule 1–2 mm. long, blades of sterile shoots conduplicate, 4–10 cm. long, 5–8 mm. wide, acute, puberulent above, those of the culm 1–2 cm. long. Panicle 15–30 cm. long. Spikes 6–13, the lower 5–15 cm. long, those above gradually growing shorter. rachis slightly flexuose, 0.7 mm. wide, pubescent at the base and very sparingly along the sides. Spikelets loosely arranged in about four rows, some of them on pedicels

exceeding their own length, oval, obtuse or subacute, 2.5–2.7 mm. long; first and second glumes equal, 3-nerved, but little longer than the floret.

Mexico (San Luis Potosi), *Pringle* 3755, and farther south. Alkaline meadows.

14. **P. Drummondii** C. Muell. Bot. Zeit. 19:332 (1861). *P. lentiginosum* of Vasey's Catalogue, not Presl.

Culms erect, slender, smooth, often branching below, 60–90 cm. high. Sheaths loose; blades 1–2 cm. long, 10–13 mm. wide, one margin undulate. Spikes 3–5, 2–4 cm. apart, the lowest ones 7–10 cm. long, the upper a little shorter, rachis subflexuose, less than 1 mm. wide. Spikelets in pairs, obovate-oval, minutely pubescent and brown-spotted, a little over 2 mm. long. Usually with a minute sterile glume on the flat side as in *Panicum*.

Texas, *Nealley* in 1888.

15. **P. macrophyllum** H.B.K. Nov. Gen. et Sp. 1:92 (1815). *P. planifolium* Fourn.? Hemsl. Biol. Centr. Am. Bot. 3:48 (1880).

Culms 90–120 cm. high, smooth. Sheaths hispid, ciliate at the throat; ligule very short; blades flat, scabrid or smooth, 18–25 cm. long, 1–2 cm. wide, acuminate, pungent-pointed. Spikes 5–8, sessile, scattered, somewhat distant, the lower 6–12 cm. long, the others gradually shorter, rachis flat, 1 mm. wide. Spikelets purple, more or less in four irregular rows, crowded, elliptical, obtuse, 2–2.3 mm. long, first and second glumes equal, 3-nerved.

Mexico (San Luis Potosi), *Pringle* 3779.

Low fields.

The plants were identified by Professor Scribner; who, on account of meagre descriptions, is uncertain as to the correct name. The type specimens were not at hand for comparison.

16. **P. plicatulum** Michx. Fl. Bor. Am. 1:43 (1803). *P. undulatum* Poir. Lam. Encycl. 5:29 (1804).

Culms 30–60 cm. high, simple, smooth. Leaf-blades smooth, 15–20 cm. long, 5–8 mm. wide. Panicle 10–13 cm. long. Spikes 5–7, recurved, 2–6 cm. long, the upper much the shorter, rachis less than 1 mm. wide, flexuose. Spikelets in pairs, one pair about 3 mm. above or below another pair, oval, obtuse, convex on the

back, 3 mm. long, first and second glumes 5-nerved, the latter when mature with 2-3 transverse plications on each side, third glume and palea brown.

Mexico (Rio Blanco), *Palmer* 468.

Texas to Florida and Mexico.

17. *P. setaceum* Michx. Fl. Bor. Am. 1:43 (1803). *P. ciliatifolium* Michx. Fl. Bor. 1:44 (1803). *P. debile* Michx. Fl. Bor. Am. 1:44 (1803).

Culms ascending, branching, very slender, 50-70 cm. high. Leaves throughout, or the sheaths only, smooth, 5-15 cm. long, 3-5 mm. wide. Spikes mostly single, terminal, and one or more exerted or included in the sheaths of the upper leaves, 5-10 cm. long; rachis flexuose, 1 mm. wide. Spikelets in two or more irregular rows, broad-oval, 2.2 mm. long, first glume 3-nerved, second 2-nerved.

Delaware, *Canby* 3576.

East Massachusetts to Illinois and southward.

Var. *ciliatifolium* (Michx.) Vasey, Contrib. U. S. Nat. Herb. 3:17 (1892). *P. ciliatifolium* Michx. Fl. Bor. Am. 1:44 (1803). *P. dasphyllum* Ell. Bot. S. C. and Ga. 1:105 (1816). Culms stouter; leaf-blades mostly longer, 1 cm. wide; spikelets crowded, often appearing in more than two rows, owing to the branching of the pedicels of the spikelets.

Florida, *U. S. Dept. Agricul.* 3, from *A. H. Curtiss*.

Southern States.

18. *P. Humboldtianum* Flüggé, Monog. 67 (1810).

Culms hard, not flattened in drying, exerted, branching below, 60-80 cm. long. Leaf-blades numerous, smooth or rough, flat, acuminate, 5-12 cm. long, 1-1.5 cm. wide. Spikes 3-4, approximate, 8-10 cm. long, rachis 1.5 mm. wide. Spikelets in pairs, 4-rowed, not crowded, pubescent, oval-lanceolate, 3.3 mm. long, first glume with 2 nerves on the margins very close to each other, over 1 mm. long, second glume smooth, 3-nerved, third shorter, oval, obtuse.

Mexico (Rio Blanco), *Palmer* 286.

Mexico to Quito.

19. *P. dilatatum* Poir. Lam. Encycl. 5:35 (1804). *P. ovatum* Nees, Agrost. Bras. 43 (1829).

Culms 90–130 cm. high, simple, smooth. Leaf-blades smooth, 30–40 cm. long, 7–9 mm. wide. Spikes 3–7, rather remote, 6–10 cm. long, rachis over 1 mm. wide. Spikelets in 4 rows, compressed, ovate, acute, pubescent, 3.5 mm. long, first glume 5-nerved, second 3–5-nerved, third orbicular, 2.5 mm. long.

Louisiana, *A. B. Langlois*.

Var. *decumbens* Vasey, Bull. Torr. Club, 13:166 (1886).

Culms shorter and decumbent. Spikes usually 3–4.

20. *P. pubiflorum* Rupr. Bull. Brux. 9, part 2, 237 (1842). *P. Hallii* Vasey and Scribn., Vasey in Bull. Torr. Club, 13:65 (1886).

Culms geniculate and rooting, branching below, nodes pubescent, 60–90 cm. high. Ligule firm, 2 mm. long; blades smooth, flat, 10–20 cm. long, 6–8 mm. wide. Spikes 3–6, approximate, 2–6 cm. long, rachis 1.7 mm. wide. Spikelets mostly in couples, those in direct lineal line distant about 2 mm., obtuse, finely pubescent, ovate, oval or obovate, obtuse, 2.7 mm. long, first and second glumes 3-nerved.

Mexico (Chihuahua), *Pringle* 374; Texas, *Nealley*; Lower California, *Palmer* 45.

Alabama to Texas.

Var. *glaucum* Scribn., ined.

(Glaucous; culms erect, rigid; sheaths hairy; spikelets more hairy.

Mexico (Coahuila), *Pringle* 427.

21. *P. rectum* Nees, Hook. Kew Journ. 2:104 (1850). *P. monostachyum* Vasey, Chapm. Fl. S. States. Suppl., 665 (1889).

A smooth erect perennial, 60–90 cm. high, from creeping rootstocks. Leaf-blades firm, conduplicate, 20–60 cm. long, 2–3 mm. wide. Spikes erect, much exserted, mostly single, sometimes two, approximate, 12–20 cm. long, rachis round on the back, slightly flexuose, about 1 mm. wide. Spikelets in pairs, those in lineal rank nearly touching each other, smooth, oblong, 2.5–3 mm. long;

first glume shorter than the floret, thin, 3-nerved, second equalling the floret, 5-nerved.

The above name is given on the authority of General Munro, who had seen the plants of D. Garber.

Florida, *Garber* 224, in the year 1877, now in the herbarium of Harvard University.

22. **P. Boscianum** Flügge, Monog. 170 (1810). *P. purpurascens* Ell. Bot. S. C. and Ga. 1:108 (1816).

Culms decumbent or erect, 60–90 cm. high. Leaf-blades flat, smooth or hairy at the base, often purple, 30 cm. long, 6–8 mm. wide. Spikes 5–7, sometimes 10–20, not crowded, 5–8 cm. long, rachis flat, 2 mm. wide. Spikelets smooth, obtuse, crowded in 2–4 rows, oval or obovate, 2.3 mm. long, first and second glumes 5-nerved, third and palea dark brown or black when mature.

North Carolina, *U. S. Dept. Agricul.* from McCarthy.

North Carolina to Florida and Texas. There is considerable doubt as to the correct name of the grass here described.

23. **P. distichium** L. Amœn. Acad. 5:391 (1759).

Culms ascending, 20–60 cm. high, from a long creeping base, extending beyond the upper sheath. Sheaths smooth; blades linear-lanceolate, crowded below, flat, glaucous, glabrous or rough above, 4–12 cm. long, 2–4 mm. wide. Spikes 2, rarely 3, 3–9 cm. long, 1 sessile, the other on a short peduncle, rachis flat on the back, 1–2 mm. wide. Spikelets single in two rows (sometimes crowded in more than two rows), those in the middle of a lineal line overlapping one fourth their length, oval, ovate, 3 mm. long; on the flat side sometimes a slender, 1-nerved glume, first ordinary glume 5-nerved, second 3-nerved.

Delaware, *Canby*; Florida, *Curtiss* 3567; Texas, *Nealley*, *Scribner* 3567 from Tweedy; New Mexico, *Vasey*; Arizona, *Pringle*; Oregon, *Howell*; Mexico, *Palmer* 243, 693.

Virginia, south and west; also East India and Australia.

24. **P. lividum** Trin. MS. Schlecht. in Linn. 26:383 (1853–5).

Culms branching below, 60–80 cm. high. Leaf-blades 12–20 cm. long, 4 mm. wide. Spikes 4–10, 2–4 cm. long, approximate or crowded, the whole 8–10 cm. long, rachis flat, 2 mm. wide.

Spikelets rather flat, oval, abruptly pointed, smooth, pale green, in 4 rows or irregularly arranged, 2.5 mm. long, first and second glumes 3-nerved, third a little shorter, obtuse.

Mexico, *Palmer* 206.

Texas to Mexico.

25. *P. elatum* Rich. Doell, Mart. Fl. Bras. 2, part 2, 78 (1877).

Culms erect, glabrous, rooting at the lower nodes, 50–60 cm. high. Leaf-blades 20–30 cm. long, 1.5–2.5 wide, flat, smooth excepting the margins, which are rough, apex narrowly acuminate. Spikes 5–7, 1–3 cm. from each other, 4–8 cm. long, spreading, rachis flat on the back, 2 mm. wide. Spikelets in pairs, in four crowded rows, obovate, subacute, 3 mm. long, first and second glumes with 1 nerve in the middle and 2 near each margin.

Louisiana, *A. B. Langlois* in 1880.

Found from Florida to Texas.

26. *P. Buckleyanum* Vasey, Bull. Torr. Club, 13: 167 (1886).

Culms simple, smooth, decumbent at the base, 60–90 cm. high. Leaf-blades scabrous, conduplicate, 20–40 cm. long, 3–4 mm. wide. Panicle erect, 12–18 cm. long; spikes 3–6, alternate, 2–3.5 cm. distant, the lower 6–7 cm. long, the upper 3–4 cm. long, rachis straight. Spikelets light-colored, in four rows, the middle ones overlapping for half their length, elliptical, oblong, acute, 2.5–2.7 mm. long, first and second glumes sparingly pubescent, 3–5-nerved.

Nearly related to *P. lividum*, from which it differs in its longer panicle, more numerous, longer and more distant spikes, and the spikelets pubescent.

Texas, *Buckley* and *Nealley*.

27. *P. vaginatum* Sw. Fl. Ind. Occ. 1: 135 (1797).

Culms from a creeping base, internodes short, 10–40 cm. high. Leaf-blades smooth, distichous, involute, pointed, 3–9 cm. long. Spikes 2, rarely 3 or 4, 2–5 cm. long, on exserted pedicels. Spikelets in two rows, overlapping about one fourth of their length, oblong-lanceolate, acute, 4 mm. long, first glume 5-nerved, second 2-nerved.

Florida, *A. H. Curtiss*.

Florida to Texas in saline swamps.

28. *P. notatum* Flügge, Gram. Monog. 106 (1810).

Culms 50–70 cm. high, ascending from a stout root-stock. Leaf-blades narrow, smooth. Spikes 2, exserted, diverging, 7–10 cm. long, approximate, both sessile, rachis flat on the back, 1 mm. wide. Spikelets smooth, single, in two rows, those in the same row in the middle of the spike overlapping one fourth of their length, ovate or oval, obtuse, 3.5 mm. long; first glume thin, with two prominent nerves toward each margin, second firmer, 5-nerved.

From ballast found at Camden, N. J., coll. by Scribner.

Near the Gulf coast, West Indies, Mexico, Brazil.

29. *P. præcox* Walt. Fl. Car. 75 (1788). *P. lentiferum* Lam. Illustr. 1:175 (1791).

Culms simple, smooth, 60–120 cm. high, much exserted. Leaf-blades smooth or hairy below, 15–30 cm. long, 15 mm. wide. Spikes 3–6, 4–6 cm. long, separated about their own length from each other, rachis 1 mm. wide. Spikelets single, in two rows, those in a row overlapping for about half their length, or some of the pedicels branching, then 3–4 rows, compressed, nearly orbicular, or broad oval, 2.2–3 mm. long, first and second glumes 3-nerved, or two outer obscure nerves, making 5 in each.

Florida, *A. H. Curtiss* 3569. Southern States.

30. *P. læve* Michx. Fl. Bor. Am. 1:44 (1803).

Culms upright or decumbent, simple, 60–120 cm. high. Sheaths compressed; blades flat, smooth, 30 cm. long, 7 mm. wide. Spikes 3–5, 5–10 cm. long, approximate, usually widely diverging, rachis about 1 mm. wide, flexuose or straight. Spikelets single, in two rows, little if at all overlapping, broad-oval, 3 mm. long, first and second glumes smooth, 5-nerved. Nearly allied to *P. floridanum* Michx. Pa. (Phila.), *Scribner* 3570.

Moist soil; South New England to Florida and Texas.

31. *P. giganteum* Baldwin, ined.: see Bull. Torr. Club, 13:166 (1886).

Culms simple, 90–150 cm. high, exserted. Leaf-blades flat, smooth, erect, 35–50 cm. long, 2 cm. wide. Spikes 3–4, 4–5–10 cm. apart, spreading, 15–20 cm. long, rachis stout, round on the

back, somewhat flexuose, 1.7 mm. wide. Spikelets in pairs, those in lineal rank with pedicels 5-6 mm. apart, smooth, broad-oval, almost acute, 3.5-4 mm. long, first and second glumes 5-nerved.

Florida, *Curtiss* in 1875.

Not yet heard from in any other state.

32. *P. Floridanum* Michx. Fl. Bor. Am. 1:44 (1803).

P. macrospermus Flüggé, Monog. 172 (1810).

Culms erect, simple, 60-150 cm. high. Sheaths hairy; blades 30-40 cm. long, 5-7 mm. wide, hairy or smooth, the upper very short. Spikes 3-5, erect, rachis 1-1.7 mm. wide, flexuose, 8-12

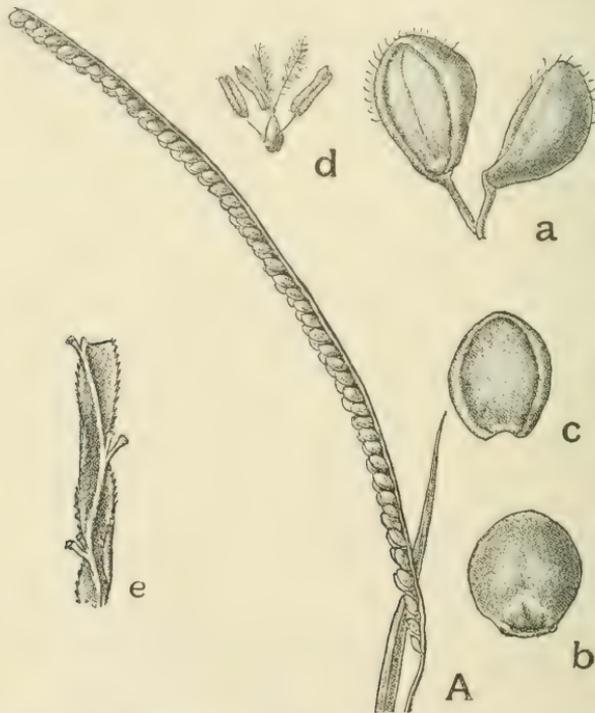


FIG. 22.—*Paspalum Floridanum*. A, spike; a, spikelets; b, c, florets; d, flower; e, rachis. (Scribner.)

cm. long. Spikelets in 3 rows, those in a direct line overlapping for about one third of their length, smooth, oval, obtuse, 3.5-4.5 mm. long, first and second glumes 5-nerved. Nearly allied to *P. leve* Michx.

Virginia to Florida, Arkansas to Texas.

Var. *glabratum* Eugelm.

Leaves smooth; spikes 5-7, rachis 1-1.5 mm. wide; spikelets 4 mm. long.

Louisiana.

23. (3). *ANTHENANTIA* Beauv. Agrost. 48, t. 10, f. 7 (1812).

Anthenantia R. Br. Flind. Voy. 2: App. (III.) 582 (1814).

Aulaxanthus Ell. Bot. S. C. and Ga. 1: 102 (1816). *Aulaxia*

Nutt. Gen. 1: 47 (1818). *Leptocoryphium* Nees, Agrost. Bras. 83 (1824).

Spikelets jointed with the apex of the pedicels, oval, sometimes acute, racemose or slender, erect, branches of a loose contracted panicle containing 1 perfect terminal flower and 1 staminate or neuter. Empty glumes nearly equal, membranous, hairy, as long as the florets or longer; fertile floret membranous when young, becoming firmer with age, the apex soft. Stamens 3. Styles distinct. Grain enclosed, but not adherent.

The genus is closely related to *Panicum*, but lacks the small lowest glume of that genus.

There are 3 species, 2 of which are found in North America, the other in South America.

1. *A. rufa* (Ell.) Schult. Mant. 2: 258 (1824). *Aulaxanthus rufus* Ell. l. c. *Panicum rufum* Kunth, Rev. Gram. 1: 35 (1829).

A slender tufted perennial, 50-150 cm. high, from creeping rootstocks, smooth throughout save the spikelets. Leaf-blades erect, flat or conduplicate, almost obtuse, the lower often 40-60 cm. long, 3-4-6 mm. wide. Panicle exserted, slender, interrupted, 5-12 cm. long. Spikelets 3 mm. long, hairs spreading, outer empty glumes oval, 5-nerved, red near the apex, with 4 vertical rows of hairs, third glume (floral glume of the lower floret) thin, oval, 3 mm. long, with no flower, floral glume of fertile floret delicately 5-nerved, its palea delicately 4-nerved.

Florida, *A. H. Curtiss* 3603; Mississippi, *J. Donnell Smith* in 1885.

Pine-barren swamps. Southern States.

2. **A. villosa** Beauv. Agrost. 48, t. 10, f. 7:748 (1812). *Aulaxanthus ciliatus* Ell. l. c. *Panicum ignoratum* Kunth, l. c. A slender tufted perennial with creeping rootstocks, smooth throughout, save the margins of the leaves and the spikelets, 30–120 cm. high. Leaf-blades flat, acuminate, the lower spreading, those on the



FIG. 23.—*Anthanantia villosa*. Spikelet. (Scribner.)

middle of the culm 5–8 cm. long, 4–6 mm. wide. Panicle exserted, slender, 10–18 cm. long. Spikelets elliptical or oval, 3–4 mm. long, pale green, hairs fewer than on the former species, usually appressed; outer glume 3–5-nerved, with 4 vertical rows of hairs; third glume (floral glume of the lower floret) thin, enclosing a staminate flower; fertile floret much like that of the former species.

Florida, *A. H. Curtiss* 3596, *Garber* 198, 247; North Carolina, *G. McCarthy*; Louisiana, *A. B. Langlois*.

Dry gravelly soil, Southern States.

3. **A. lanata** (H. B. K.) Benth. Journ. Linn. Soc. 19: 39 (1882). *Paspalum lanatum* H. B. K., Nov. Gen. et Sp. 1: 94, t. 29 (1815). *Leptocoryphium lanatum* Nees, Agrost. Bras. 2: 84 (1829).

A slender tufted perennial, smooth throughout, excepting the margins and the throat of the sheaths and the spikelets, 30–50 cm. high. Leaf-blades flat or involute, acuminate, 3–4 mm. wide. Panicle exserted, erect, rather densely many-flowered, 10–18 cm. long. Spikelets pale green or straw-colored, linear-lanceolate, 3.5–4.5 mm. long, outer empty glumes ovate-lanceolate, 7-nerved, with 4 vertical rows of hairs, third glume ovate-lanceolate, thin and slightly hairy at the apex, delicately 5–7-nerved, 4 mm. long; palea much like the third glume, delicately 4-nerved. Apparently a spikelet with 2 empty glumes, 1 floral glume, and 1 palea.

South Mexico, Cuba, also in several parts of South America.

24. (4). **AMPHICARPON** Raf. Am. Month. Mag. 2: 175 (1818). *Amphicarpum* Kunth, Gram. 1: 28 (1829).

Spikelets 1-flowered, oblong or ovoid, articulate with the pedicels. of two kinds, in narrow, erect, exserted interrupted panicles, containing perfect flowers which seldom bear fruit; the other kind

larger, bearing pistillate or perfect flowers at the apex of slender peduncles, which bear sheathing bracts near the base. Glumes 3, the outer empty, nearly equal (sometimes with another very small one outside), the floral glume shorter, delicately membranous, or in the fertile flowers soon becoming hard. Stamens or staminodea 3. Styles distinct. Grain oblong, enclosed, but not adherent.

Grasses with flat or involute blades. Somewhat nearly related to *Milium* and *Panicum*. There are 2 species, both found in the southeastern portion of the United States.

1. **A. amphicarpon** (Pursh) Nash. Mem. Torr. Bot. Club, 5: 352 (1894). *Milium amphicarpon* Pursh, Fl. Am. Sept. 1:62, t. 2 (1814). *Milium ciliatum* Muhl. Gram. 77 (1817). *A. Purshii* Kunth, Rev. Gram. 28 (1829-35).

An erect tufted annual or biennial, 30-120 cm. high. Culms slender, smooth. Blade and sheath hispid with rigid hairs; the former 5-10 cm. long, 3-10 mm. wide, the upper blade rudimentary, the next below very short and narrow. Spikelets on the strict panicle, elliptical, acute, 4 mm. long, first and second glumes 5-nerved; floral glume delicately 5-nerved; palea 2-nerved; subterranean spikelets oval, acute, about 8 mm. long, first and second glumes 15-19-nerved. Grain ovoid, terete, obtuse, 4 mm. long.

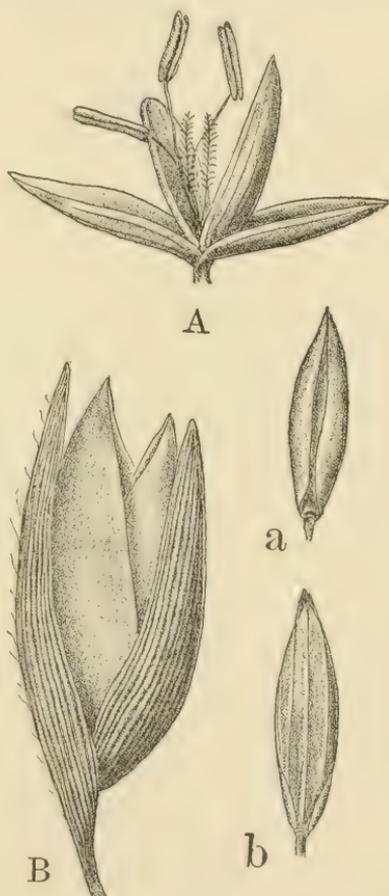


FIG. 24.—*Amphicarpon amphicarpon*. A, spikelet on the top of plant; a, b, florets; B, subterranean spikelet. (Scribner.)

Some of the plants, when only 15 cm. high, with no panicle above, produce subterranean fertile spikelets.

Specimens collected on the pine-barrens, New Jersey, in 1884. New Jersey to Florida.

2. **A. Floridanum** (Chapm.) *Amphicarpum Floridanum* Chapman, Fl. S. States 572 (1860).

An erect pale green perennial, 30–90 cm. high, branching below from creeping rootstocks. Sheaths fringed on the margins; blades linear-lanceolate, rigid, nearly smooth. Panicle thin and narrow, 10–20 cm. long, containing spikelets which are lance-elliptical, 6–7 mm. long. Empty glumes 3, first 1–2 mm. long, second and third nearly equal, 7–8-nerved; floral glume membranous, 5–7-nerved, its palea with 1–2 nerves toward each margin. Subterranean spikelets not seen. Anthers of the radical flowers imperfect; grain compressed, globose, pointed. “Paleæ of the radical flowers crustaceous at maturity.” CHAPMAN’S FLORA. Banks of the Apalachicola River, Florida. Sept. and Oct.

25. (5). **ERIOCHLOA** H. B. K. Nov. Gen. et Sp. 1: 94 (1815).

Monachne Beauv. Agrost, 49, t. 10 (1812).

Helopus Trin. Fund. Agrost. 103 (1820).

Ædipachne Link, Hort. Berol. 1: 51 (1827).

Aglycia Willd. ex Steud. Nom. Ed. 2, 1: 37 (1840).

Alycia Willd. ex Steud. l. c. 66 (1840).

Spikelets with 1 perfect flower, and in some cases with a second staminate or neuter one, without protruding awns, with a callus, annular or almost cuplike base, articulate on a short pedicel, in 1–2 rows, along one side of the simple branches of a simple panicle. Empty glumes usually membranous, equal or subequal; floral glume of the terminal floret shorter, of a firm coriaceous texture, obtuse, but tipped with a tuft of hairs or a point or short awn, not exceeding the outer glumes; its palea of much the same texture. Stamens 3. Styles distinct, rather long. Grain enclosed, but not adherent.

Bentham, in FLORA AUSTRALIENSIS and in GENERA PLANTARUM, defines this genus as 1-flowered. In accordance with a suggestion by Vasey, in BOTANICAL GAZETTE, p. 96, 1884, I have changed the generic character to include *Panicum molle* Michx., which

has a second staminate flower below the perfect one. The genus has the habit rather of the section *Brachiaria* of *Panicum* than of *Paspalum*, but wants the small lower glume of the former genus, and differs from both in the peculiar callus. A few species of *Panicum* have more or less of a callus.

There are about 7 species, 5 found in North America, 1 in Asia, 1 in Africa. Some extend to Australia.

The most natural key for aiding to find the name of a species would start out with *a*, those in which the fertile florets are mucronate; *b*, those in which the fertile parts are awnless, but have a tuft of hairs at the apex. The following more artificial key may be found easier and equally useful:

- A. Spikes 6-7, simple, erect. (a)
 - a. Blades short and 1-1.5 cm. wide. 1
 - a. Blades long and narrow (b)
 - b. Lower spikes 2 cm. or less long. 2
 - b. Lower spikes 4-5 cm. long. 3
- B. Spikes more than 7. (c)
 - c. Spikelets abruptly pointed, 4 mm. long. 4
 - c. Spikelets ovate-lanceolate, 3.5-4 mm. long. 5
 - c. Spikelets ovate-lanceolate, 5 or more mm. long. 6

1. E. Lemmoni Vas. & Scrib. Coult. Bot. Gaz. 9 : 185 (1884).

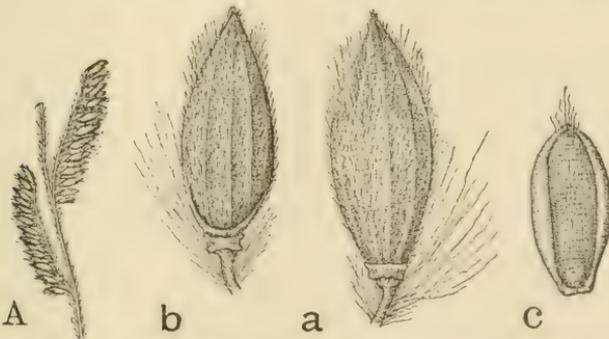


FIG. 25.—*Eriochloa Lemmoni*. A, spikes; a, b, spikelets; c, floret. (Scribner.)

Culms ascending, branching below, 50-90 cm. high, and with the sheaths and blades clothed with fine, soft pubescence. Sheaths

rather loose, mostly shorter than the internodes; ligule a ciliate ring; blades flat, acuminate, 8–15 cm. long, 1–1.5 cm. wide. Panicle simple, 6–10 cm. long, rays 4–8, spikelike, secund, spreading in flower, erect in fruit, 2–3 cm. long, clothed with short hairs. Spikelets in pairs, 1 subsessile, pubescent, lance-elliptical, acute, 5–6 mm. long. Outer glumes soft-hairy excepting the obtuse tip, equal, narrowly ovate, first 5-nerved, second 3-nerved: floral glume 2.5–3.5 mm. long, finely wrinkled, oblong or obovate-oblong, apex subacute, with a tuft of short hairs.

Mexico, *Palmer* 110^a, *Pringle* 2317.

2. *E. sericea* Munro, Vasey's Contrib. U. S. Nat. Herb. 3: 21 (1892).

A slender tufted perennial, about 50 cm. high, clothed from culm to spikelet with very short pubescence. Sheaths reaching above the nodes; blades flat or involute, 12–20 cm. long, 3–5 mm. wide. Panicle exserted or partially enclosed, simple, 7–12 cm. long, bearing 4–6 simple, secund spikes about 2 cm. long and distant their own length from each other. Spikelets narrowly oval, acute, 4–4.5 mm. long, borne on short pedicels, on which some of the hairs often extend to the apex of the spikelet, first and second glumes equal, 5-nerved; fertile floret oval, very briefly mucronate.

Texas, *Reverchon* for U. S. Dept. Agricul. 37.

Texas and New Mexico.

3. *E. longifolia* Vasey, Contrib. U. S. Nat. Herb. 3: 21 (1892).
E. mollis longifolia Vasey, Bull. Torr. Club, 13: 25 (1886).

Culms smooth, slender, branching, 60–120 cm. high. Lower sheaths nearly as long as the internodes; blades smooth, except the soft hairs at the nodes, 30–60 cm. long, 2–3 mm. wide. Panicle exserted, slender, 12–20 cm. long, of 5–8 pedicellate alternate spikes, the lower one 5 cm. long, the others gradually shorter; general rachis and rays finely pubescent. Spikelets 10–12 to the spike, third glume destitute of a flower, fertile floret short-awned.

Florida, *Curtiss*.

4. *E. mollis* Kunth, Rev. Gram. 1: 30 (1829).

Perennial: culms smooth below, 1–2 m. high. Leaf-blades flat, 30–50 cm. long, 1–1.5 cm. wide, throat fringed. The nodes,

branches of the panicle and spikelets, villous. Panicle open, 20-30 cm. long, branches mostly simple, those below 4-6 cm. long, those above 2 cm. long. Spikelets 2-flowered, mostly single, some in pairs or in threes, oval, abruptly pointed, 4 mm. long; first and second glumes membranous, obtuse when spread, 5-nerved; lower palea as long as the second glume, hyaline, 2-nerved, enclosing a staminate flower; fertile floret oval, obtuse or mucronate, 3 mm. long.

Much like *E. punctata*, and in INDEX KEWENSIS placed with that species.

"Sea islands of South Carolina," ELLIOTT. Florida, *Curtiss* 3600.

5. *E. punctata* (L.) W. Hamilt. Prod. Pl. Ind. Occ. 5 (1825). *Milium punctatum* L. Amœn. Acad. 5 : 392 (1759). *Helopus pilosus* Trin. Fund. Agrost. 104 (1820). *Edipachne punctata* Link, Hort. Berol. 1 : 51 (1827). *Helopus punctatus* Nees, Agrost. Bras. 16 (1829).

Perennial; culms branching below, smooth or silky hairy, especially at the nodes and near the panicle, 40-70 cm. high. Sheaths smooth or soft hairy, reaching nearly to the nodes; blades flat, hirsute above, 5-15 cm. long, 3-10 mm. wide. Panicle simple, narrow, exserted or partially included, 7-10 cm. long, rachis and branches short-hairy, branches 5-8, secund, subsimple, 2-3 or even 5 cm. long. Spikelets mostly single, some in pairs, on pedicels 2-4 mm. long, clothed with short hairs, ovate-lanceolate, 3.5-4 mm. long, with an awn 0.5-2 mm. long; the 2 empty glumes 5-nerved, first the larger; fertile floret rough, narrowly oval, 2.5-3 mm. long, very briefly mucronate, or with the awn longer.

New Mexico, U. S. Dept. Agricul. 17; Texas (El Paso), *Jones* 4177; Mexico, *Pringle* 812; Arizona, *Pringle*; Lower California, *Palmer* 44.

Texas, Arizona, New Mexico, Mexico, West Indies, Buenos Ayres.

6. *E. aristata* Vasey, Bull. Torr. Club, 13 : 229 (1886).

Culms rather stout, decumbent and branching below, nodes

glabrous or finely pubescent, 90–120 cm. high. Leaf-blades flat, acuminate, scabrous above, 12–35 cm. long, 1–1.5 mm. wide. Panicle simple, the lower branches 8–10 cm. long, those above shorter, rachis and branches finely pubescent, 15–25 cm. long. Spikelets 1-flowered, pubescent, ovate-lanceolate, 8–10 mm. long, including the gradually tapering awns, first glume wider and longer than the second, both 5-nerved; fertile floret rough, elliptical, shortly mucronate, 3.5 mm. long.

Found in Mexico.

26. (8). **PANICUM** L. Sp. Pl. 55 (1753).

Digitaria Heist. ex Adans. Fam. 2 : 38, 550 (1763).

Echinochloa Beauv. Agrost. 53. t. 11 (1812).

Hymenachne Beauv. Agrost. 48. t. 10, f. 8 (1812).

Trochloa Beauv. Agrost. 52. t. 11, f. 1 (1812).

Trichachne Nees, Agrost. Bras. 85 (1829).

Brachiaria Griseb. Ledeb. Fl. Ross. 4 : 469 (1853).

INDEX KEWENSIS contains the names of 25 other synonyms.

Spikelets with 1 terminal perfect flower and often a staminate or neuter flower below it, rarely awned, variously arranged along the branches of a panicle. Glumes usually 4, the outer one smallest, sometimes minute or rarely obsolete, the second and third very variable in relative proportions, the third often with a palea with or without 3 stamens in its axil, fourth or floral glume smaller, or as long as the third, of a firmer texture, enclosing a palea and perfect flower. Styles distinct or very shortly united at the base. Grain enclosed, but not adherent.

The genus is a very large one, in many respects polymorphous, containing 250–280 species, though nearly 800 supposed species have been published. It is not separated by any universal characters from *Paspalum*. No less than eighteen genera have at different times been separated from it, but are now reunited, some of them as sections.

Their limits are far from being absolutely definite. Plants of this genus are well represented in the warmer regions of the earth. Some of our worst weeds belong here, while *P. miliaceum* (*Indian Millet*), *P. miliare* (*Little Millet*), *P. frumentaceum* (*Sonwa*

Millet), *P. colonum* (*Shama Millet*), form important articles of food for man and domestic animals.

A. DIGITARIA (Heist. as a genus). *Spikelets crowded 2-3 together, mostly in pairs, along the outer or lower side of simple clustered 1-sided spikes on short pedicels of unequal length; outer glume very small or obsolete; root mostly annual.* Some species are very closely allied to *Paspalum*.

- a. Spikes erect, rachis less than 0.5 mm. wide. 1
- a. Spikes spreading, rachis less than 0.5 mm. wide. 2, 3
- a. Spikes spreading, rachis about 1 mm. wide. (b)
 - b. Spikelets oblong, acute, about 3 mm. long. 4
 - b. Spikelets elliptical or ovoid. (c)
 - c. Leaves smooth, 3-4 mm. wide. 5
 - c. Leaves hairy, 5-7 mm. wide. 6

B. TRICHACHNE (Nees as a genus). *Spikelets paniced, silky-hairy, narrow, slender, clustered or rarely in pairs along the rachis of the 2-few long erect branches; fruiting glume not much hardened. Species few.* 7, 8, 9

C. BRACHIARIA (Griseb. as a genus). *Spikelets awnless, single or in twos and threes, 2-4-seriate along simple spikes borne on the axis. Nearly allied to Paspalum, differing from that genus in having a small first or lower glume. Shading off with some of the sparingly-flowered species into Eupanicum, comprising many species.*

- a. Spikelets single and in two rows. (b)
 - b. Spikes 4-6 cm. long. 10, 11
 - b. Spikes 1-3 cm. long. (c)
 - c. Spikes 4-8 approximate. 12
 - c. Spikes 8-12 on about 10 cm. of the axis. 13
 - c. Spikes 10-15 on 20-30 cm. of the axis 14
- a. Spikelets in twos or threes. (b)
 - b. Spikes appressed, the lowest often not overlapping . (c)
 - c. Plant tall, erect. 15
 - c. Plant creeping. 16
 - b. Spikes spreading, imbricate. (c)
 - c. Peduncles about 0.5 mm. diam. 17

- c. Peduncles 1 mm. or more diam. (d)
- ā. Blades lance-ovate, 3 mm. long. 18
- d. Blades much longer. 19, 20
- D. ECHINOCHLOA (Beauv. as a genus). *Spikelets imbricate, spiked, sessile or on short pedicels on two sides of a triangular rachis, usually rough with stiff hairs, the third glume often awl-pointed or awned.* Usually coarse plants; only a slightly distinct section of *Panicum*.
 - Spikelets 5 mm. or more long. 20
 - Spikelets less than 5 mm. long. (a)
 - a. Spikes simple, about 2 cm. long. 21, 22
 - a. Spikes more or less compound. 22, 23
- E. PTYCHOPHYLLUM (Braun as a genus). *Tall with ample leaves. Panicle simple or compound, many-flowered. Spikelets subsessile, subtended by a solitary bristle, which seems to connect these species with *Chamæraphis* (*Setaria*). The setæ of this section, however, are merely the tips of the ultimate spikelet-bearing branches of the panicle, whereas the setæ of *Chamæraphis* are abortive branchlets, forming a kind of involucre below the spikelet.* A small and distinct section. 24, 25
- F. HYMENACHNE (Beauv. as a genus). *Spikelets small or minute in a spike-like panicle.* Species 5 or 6. 26
- G. EUPANICUM. *Spikelets in panicles, awnless, mostly pedicellate.* Containing about 200 species, strictly normal in structure. Several of the cultivated Millets belong in this section. (K. M.)
- K. *Virgaria* Trin. *Spikelets pointed, often in pairs. Branches of the panicle mostly angular.*
 - Stiff hairs on the pedicels. 27
 - No bristles nor stiff hairs on the pedicels. (a)
 - a. Spikelets conspicuously white, pubescent. 28
 - a. Spikelets with appressed, silky hairs as seen by a lens. 29
 - a. Spikelets not white, pubescent nor hairy. (b)
 - b. Spikelets clothed with short hairs from callus-bases. 30
 - b. Spikelets smooth or slightly rough. (c)

- c. Spikelets 3 in number, 5-6 mm. long, very narrow (some plants of 30). 31, 32
- c. Spikelets about 5 mm. long, ovoid or oval, acute. 33
- c. Spikelets 3 in number, 5-6 mm. long, wider . (d)
- d. Panicle narrow, simple, blades smooth. 34
- d. Panicle diffuse, large. (e)
- e. Sheaths pubescent. 35
- e. Sheaths smooth. 36
- c. Spikelets about 8 mm. long, ovate-lanceolate. 37
- c. Spikelets usually 4 mm. long or less. (f)
- f. Panicle very narrow, simple, culm and leaves slender. 38
- f. Panicle spike-like, many-flowered. 39
- f. Panicle diffuse. (g)
- g. Spikelets less than 2 mm. long, plant slender. 40
- g. Spikelets about 2.5 mm. long. (h)
- h. Rootstocks creeping. 41
- h. Rootstocks not creeping. 42, 43, 44
- g. Spikelets acute on very slender pedicels of a large diffuse panicle. (i)
- i. Annual; sheaths usually hirsute, spikelets 2-2.7 mm. long. 45
- i. Annual; sheaths usually hirsute, spikelets 3.2-3.5 mm. long. 46
- i. Sheaths usually smooth, spikelets 3.5-6 mm. long. 34
- i. Sheaths usually smooth, spikelets 4 mm. long. 36
- g. Perennial; smooth, bulbous, spikelets terete, 3-4 mm. long. 47
- g. Perennial; scaly rhizomes, spikelets 4 mm. long. 48
- g. Perennial; tufted, spikelets 3.5-4 mm. long, blades 3-4 mm. wide. 49

- g. Perennial; hirsute, spikelets 4 mm. long,
blades 6-10 mm. wide. 50
- M. *Miliaria* Trin. *Spikelets obovate or ellipsoidal, obtuse or
barely pointed.*
- Spikelets with 2 prominent rows of hairs 51
- Spikelets warty, roughened. 52
- Spikelets finely glandular on the surface. . . 53, 54, 55, 56
- Spikelets more or less pubescent. 57
- Spikelets unlike either of the 4 previous sections. . . (a)
- a. Spikelets about 1 mm. long. 58
- a. Spikelets 1.4 mm. long, blades 20-30 mm. wide. . . 59
- a. Spikelets 2 mm. long, blades 2-4 mm. wide. . . 60, 61
- a. Spikelets 1.5-2 mm. long, blades 5-7 mm. wide. . . 62
- a. Spikelets 1.6-1.9 mm. long, blades 1.5 mm. wide. . . 63
- a. Spikelets usually more than 2 mm. long. (b)
- b. Blades 2.5 mm. wide, strict, panicle small, very
narrow. 64
- b. Blades 4.6 mm. wide, including the bases of the
narrow panicles, spikelets 2.5 mm. long. 65
- b. Blades 1-2 cm. wide, spikelets 2.5-3 mm. long;
part of. 66
- b. Blades usually 7 mm. or more wide. (c)
- c. Panicle very simple and narrow, spikelets 3
mm. long, blades 10-15 mm. wide. 68
- c. Panicle compound, spreading. (d)
- d. Spikelets 2.2-2.3 mm. long, plants 90-120
cm. high, often hairy. 69
- d. Spikelets 2.3-3 mm. long, blades 10-20
mm. wide, plant smooth. 67
- d. Spikelets 3 mm. long, blades 7-13 mm.
wide. 70
- d. Spikelets 3-4 mm. long, blades 15-30 mm.
wide. (e)
- e. Sheaths often hairy. 71, 72
- e. Sheaths smooth. 73
- H. LASIACES. *Spikelets obovate, bearing a tuft of villous down at*

the summit ; palea of fertile floret gibbous above. Stem shrubby, variable.

One species. 74.

1. **P. filiforme** L. Sp. Pl. 57 (1753). *Paspalum filiforme* Fluegge, Gram. Monog. 139 (1810). *Digitaria filiformis* Muhl. Gram. 131 (1817). *Syntherisma villosa* Walt. Fl. Car. 77 (1788), teste Kunth.

Culms very slender, upright, much branched below, 30-70 cm. high. Lower sheaths hairy ; blades smooth, 4-22 cm. long, 3 mm. wide. Spikes 2-8, erect, approximate, 4-14 cm. long, the rachis filiform, triangular, flexuose. Spikelets in pairs or threes; in the former case the pedicel of one is about its own length, of the other more than twice as long: first glume minute or obsolete, second and third thin, clothed with minute hairs with enlarged tips, the former half or two-thirds as long as the spikelet, 3-nerved, the longer 7-nerved, fourth and palea shorter, dark brown.

New Jersey, *Scribner* 3590, *Beal* for M. A. C. ; Georgia, *Cooley* ; Mexico, *Palmer* 454, 502.

Florida, Texas, and Mexico.

2. **P. Simpsoni** (Vasey). *P. sanguinale* L. var. *Simpsoni* Vasey, Contrib. U. S. Nat. Herb. 3: 25 (1892).

Culms branching and rooting at the lower nodes, more or less compressed, 60-120 cm. high. Sheaths about the length of the internodes, softly pubescent with hairs from glandular bases: ligule ciliate, about 1 mm. long ; blades flat, slightly pubescent, 10-15 cm. long, 4-6 mm. wide. Spikes 8-10, digitate or approximate, spreading, 12-15 cm. long, the rachis slightly flexuose, flattened, 0.3-0.4 mm. wide. Spikelets in pairs, one subsessile, the other raised on a pedicel half or two-thirds its length ; empty glumes 2, subequal, a little longer than the floret, smooth, linear, 3.2 mm. long, almost obtuse, when spread, 7-nerved: floral glume obscurely 3-nerved. Anthers linear, 2 mm. long.

Florida (Manatee), *J. H. Simpson* in 1890 for U. S. Dept. Agricul.

3. **P. setigerum** Beauv. Fl. Owar. 1, t. 49 (1804). *Echinochloa setigera* Beauv. Agrost. 53 (1812).

Culms slender, geniculate, branching below, 30-50 cm. high. Leaves more or less pubescent throughout; blades flat, 3-6 cm. long, 4-7 mm. wide. Spikes 3-8, approximate, spreading, 4-8 cm. long, rachis triangular, flexuose. Spikelets in pairs or threes, ovate-lanceolate, 2.2 mm. long, pedicels 0.5-1.5 mm. long, first glume obsolete, second half as long as the floret, third smooth, 5-nerved.

Florida, *G. V. Nash* 996, in 1894.

High pine land along roadsides.

4. *P. SANGUINALE* L. Sp. Pl. 57 (1753). CRAB-GRASS. FINGER-GRASS. *Digitaria sanguinalis* Scop. Fl. Carn. Ed. 2, 1: 52 (1772). *Syntherisma præcox* Walt. Fl. Car. 76 (1788). *Paspalum sanguinale* Lam. Tabl. Encycl. 1: 176 (1791).

Culms erect or decumbent, branching below, rooting at the lower nodes, 30-90 cm. high. Leaves often pubescent, blades flat, very variable in length and width. Spikes 4-15, rarely 2-3, erect or spreading, crowded within 2-3 cm. at the end of a long peduncle, 3-15 cm. long, the rachis usually flattened on the back, flexuose, 1 mm. or less wide. Spikelets in pairs, 1 subsessile, the other reaching half its length above the lower, the pedicellate spikelet containing more pubescence than the other, oblong, acute, 2.5-3.5 mm. long, first glume minute, second lanceolate, about half as long as the spikelet, pubescent or nearly smooth, 3-5-nerved, third glume pubescent or nearly smooth, 5-7-nerved, fourth glume and palea shorter, smooth. Grain flattened, oblong, 2 mm. long, the embryo less than half its length.

New Jersey, *Scribner* 95; Massachusetts, *Beal* for M. A. C. 9; Texas, *Jenney* for Nat. Mus. 10, *Georgeson* 22; New York, *Beal* for M. A. C. 11; Oregon, *Howell*; Mexico, *Palmer* 48, 269.

Introduced from Europe into gardens, fields, and waste places. A very common annual weed, thriving in warm weather. The roots are very strong, making it difficult to remove the plants.

5. *P. LINEARE* Krock. Fl. Sil. 1: 95 (1787). *Digitaria humifusa* Pers. Syn. 1: 85 (1805). *Syntherisma glabra* Schrad. Fl. Germ. 1: 163 (1806). *Paspalum ambiguum* D. C. Fl. Gall. 123 (1806). *Panicum glabrum* Gaud. Agrost. 1: 22 (1811).

Culms spreading, prostrate, or erect where crowded or shaded, branching freely below, 15-30 cm. high. Leaf-blades flat, thin, smooth, 3-6 cm. long, 3-4 mm. wide. Spikes 2-6, diverging, nearly digitate, 4-6 cm. long, rachis flat, thin, 1 mm. wide. Spikelets 3 together, successively overlapping for half their length, ovoid or oblong, 2 mm. long, first glume minute and likely to be overlooked, second and third as long as the spikelet, soft with very short hairs, some having enlarged tips, 5-nerved.

Iowa, *Hitchcock*; Ontario, *Fowler*.

Introduced from Europe. An annual grass, common especially southward.

Var. **Mississippiense** Gattinger.

Plant 30-50 cm. high; spikes 7-10 cm. long, rachis nearly straight; spikelets mostly in pairs or single. Tennessee, *Gattinger*, also Minneapolis, Minn.

6. **P. serotinum** (Walt.) Trin. Gram. Panic. 166 (1833). *Syntherisma serotina* Walt. Fl. Car. 76 (1788). *Digitaria serotina* Michx. Fl. Bor. Am. 1: 46 (1803). *D. villosa* Ell. Bot. S. C. and Ga. 1: 132 (1806). *Paspalum serotinum* Fluegge, Monog. 146 (1810).

Perennial; culms branching below, ascending from a creeping base, 10-30 cm. high. Blades and sheaths rough, hairy, the blades thin, flat, 3-7 cm. long, 5-7 mm. wide. Spikes 3-5, exserted or included, spreading, not over 1.5 mm. apart at base, 4-7 cm. long, rachis thin, flat, 1 mm. wide. Spikelets mostly in threes on pedicels of unequal lengths, oblong, acute, 1.5 mm. long, first glume obsolete, second one-third as long as the spikelet, 3-nerved, clothed with crooked and knotted hairs, third hairy, about as long as the spikelet, 7-nerved.

Florida, *Curtiss* 3606.

North Carolina to Florida and westward.

7. **P. lanatum** Rottb. Act. Lit. Univ. Hafn. 1: 269 (1778). *P. leucophæum* H. B. K. Nov. Gen. et Sp. 1: 97 (1815).

Culms stout, erect, 60-120 cm. high. Leaf-blades flat, broadly linear, scabrous, often 30 cm. long; ligule ciliate. Panicle erect, contracted, 15-30 cm. long, branches numerous, 5-10 cm. long.

Spikelets in pairs on unequal pedicels, linear-lanceolate, 4 mm. long, clothed with numerous soft white or brown hairs, as long as the spikelet. first glume minute, second lanceolate, 3-nerved, nearly as long as the spikelet, third glume ovate-lanceolate, 5-nerved; no palea; fertile floret smooth, brown, ovate-lanceolate, mucronate, 3.5 mm. long.

Florida, *U. S. Dept. Agricul.* No. 80 from Curtiss; Texas, *Nealley*.

8. *P. lachnanthum* A. Gray, *Pacif. Rail. Rep.* 7: 21 (1857).

Culms rather slender, 60–90 cm. high. Leaf-blades numerous below, scabrid, 7–15 cm. long, 2–4 mm. wide. Panicle slender, contracted, 15–20 cm. long, the branches fewer and shorter than in the preceding. Spikelets in pairs, oval-lanceolate, 3 mm. long. In other respects much like *P. lanatum* H. & K.

Mexico, *Pringle* 378; Arizona, *Pringle*; California, *Palmer* 348.

9. *P. tenerrimum* Kunth, *Rev. Gram.* 1: 39 (1829). *Trichachne tenuis* Nees, *Agrost. Bras.* 89 (1829).

A very slender erect perennial, 30–60 cm. high, sparingly branched at the base. Leaves of the culm 8–12, sparingly hairy, on sterile shoots and the culms alike. Sheaths longer than the internodes; ligule a mere ring; blades flat, erect, rather abruptly pointed, 3–4 cm. long, 1.5–2.5 mm. wide, the upper 5–10 cm. long. Spikes 1–3 cm. long, rays 3–6, single, slender, flower-bearing for the whole length. Spikelets narrowly elliptical, 2.3–2.6 mm. long, clothed with appressed hairs, first glume minute, second and third equal, the former 3-nerved, the latter 5-nerved, floret brown, nearly as long as the longest glumes.

Texas (Pecor County and Del Rio), *Nealley* for U. S. Nat. Mus. in 1892, the only localities known in North America. Also found in Brazil.

10. *P. platyphyllum* Munro, Wright, in *Sauv. Fl. Cub.* 197 (1873).

Culms decumbent, branching, 30–60 cm. high. Leaf-blades and sheaths pale green, firm, smooth or nearly so, blades flat, broad at the base, 6–10 cm. long, 5–8 cm. wide. Spikes 3–7,

spreading, 2-6 cm. from each other, some of the lowest enclosed, 3-6 cm. long, rachis flat or involute, about 2 mm. wide. Spikelets single, imbricated little or none, sessile on alternate sides of a ridge of the rachis, smooth, elliptical-ovate, almost acute, about 4 mm. long, first glume broad, thin, obscurely nerved, about 1 mm. long, second 7-nerved, floral glume of the neuter floret much like the latter, 5-nerved, its palea a little shorter, upper floret rugose, oval, 3 mm. long. This much resembles *Paspalum*.

Texas, *U. S. Dept. Agricul.* No. 88, collected by *J. Reverchon, E. Hall, G. C. Nealley*.

11. *P. PLANTAGINEUM* Link, Hort. Berol. 1: 206 (1827).

Annual; culms branching below, 30-60 cm. high, from a creeping or geniculate base. Margins of the sheaths and the ligule ciliate-fringed, sheaths mostly longer than the internodes; blades flat, smooth, 7-15 cm. long, 1-1.5 cm. wide. Spikes about four, 3-5 cm. long, secund, the lowest partly included, the terminal one on a pedicel nearly its own length, the others single, sessile, 2-4 cm. from each other. Spikelets single, alternating in two rows along one side of a narrow rachis, those of the same row imbricate or not, smooth, compressed, obovate-elliptical, about 4 mm. long, first glume very broad, clasping the spikelet. 2 mm. long, 7-nerved, second glume and floral glume of the neuter floret equal, broadly oval when spread, the former 9-nerved, the latter 7-nerved, the palea of the latter but little shorter, fertile floret oval, transversely wrinkled, 3.5 mm. long.

Sparingly introduced and found on ballast-ground at Philadelphia, Penn.

12. *P. prostratum* Lam. Ill. 1: 171 (1791). *P. cæspitosum* Sw. Fl. Ind. Occ. 1: 146 (1797).

Tufted or creeping, much branched below, 30-50 cm. high. Sheaths inflated; blades thin, flat, broad at the base, hairy as well as the sheaths, 7-15 cm. long, 6-10 mm. wide. Spikes 5-9, alternate, ascending on 2-3 centimeters of the top of the exerted culm. 1-2 cm. long. Spikelets alternate in 2 rows on one side of the hairy rachis, overlapping for about one-third of their length, subsessile, smooth, oval, awnless, about 3 mm. long, first glume thin,

acute, 1-2 mm. long, 3-nerved, second 5-nerved, third or floral glume to the neuter floret like the second empty glume; palea as long as its glume, oval, hyaline; fertile floret rugose, oval, mucronate.

Mexico, *Pringle* 375, *Palmer* 254.

Found in Mexico, West Indies, Egypt, and India, and very likely in Texas and New Mexico.

13. **P. Isachne** Roth, Nov. Pl. Sp. 54 (1821). Var. **Mexicana** (Vasey). *P. eruciforme* Sibth. Fl. Græc. 1:44, t. 59 (1806). Var. *Mexicana* Vasey, ined.

Culms branching, creeping below, nodes hairy, 20-40 cm. high. Leaf-blades flat, rough, broad at the base, sometimes hairy, 5-10 cm. long, 3-7 mm. wide. Panicle secund, narrow, 6-12 cm. long, sometimes partially included. Spikes 8-12, alternate, 1-2 cm. long, rachis filiform. Spikelets single, alternate, imbricate for half their length on pedicels less than 1 mm. long, attached to one side of the rachis, pubescent, elliptical, almost acute, 1.7 mm. long, first glume broad, minute, second ovate, obtuse, 5-nerved, as also is the floral glume of the neuter floret, its palea obtuse, shorter; fertile floret smooth, about 1.5 mm. long.

Specimen seen was cultivated from seed obtained in Mexico, by U. S. Dept. Agricul., 1887.

14. **P. paspaloides** Pers. Syn. 1:81 (1805).

An erect stout glabrous perennial, sparingly branched, 60-90 cm. high. Leaf-blades 20-30 cm. long, 6 mm. wide. Spikes 10-20, erect, simple, alternate along 2-3 centimeters of the axis, 2-3 cm. long. Spikelets single, subsessile on two sides of a flexuous, triangular rachis, those in one row overlapping for one-fourth their length, glabrous, doubly convex, oval, acute, awnless, 2.5 mm. long, containing a staminate and a perfect flower; first and second empty glumes membranous, broad, obtuse, the former nerveless, 0.5 mm. long, the latter twice as long, 4-nerved; floral glume of the lower floret 5-nerved; palea as long, hyaline, obtuse, second floret oval.

Mexico, *Palmer* 429, 690, *Pringle* 3336; Texas, *Nealley*.

In water, Florida to Texas and Mexico; also found in Central America, Mauritius, Brazil, Egypt, tropical Africa, and East Indies.

15. *P. Curtisii* Steud. Syn. Pl. Gram. 66 (1855), not Chapm. (1860).

P. Walleri Ell. Bot. S. C. and Ga. 1:115 (1816).

P. carinatum Torr. Bost. Journ. Nat. Hist. 1:137 (1835), not Presl (1830).

P. digitarioides Carpenter, ex M. A. Curt. in Am. Journ. Sc. (II.) 7:410 (1849), not Rasp. ex Steud. Nom.

Culms slender, rigid, often rooting at the lower nodes, 100–130 cm. high. Sheaths sometimes hairy; blades smooth, rigid, 15–20 cm. long, 10–15 mm. wide. Panicle slender, simple, 15–18 cm. long. Spikes appressed, the lower 2–4 cm. long, 5–8 cm. distant, the upper crowded and very short, rachis slender, flexuous, triangular. Spikelets mostly in pairs on pedicels shorter than themselves, each containing a staminate and a perfect flower, ovate-lanceolate, 2–2.5 mm. long; first glume half as long as the spikelet, acute, 3-nerved, second ovate, 5-nerved; floral glume of the sterile floret like the second empty glume; palea oval, as long as its glume 2-nerved; fertile floret ovate-lanceolate, acute, much like the preceding.

Florida, *Curtiss* 3585.

Ponds and swamps, North Carolina to Florida and Texas.

16. *P. obtusum* H. B. K. Nov. Gen. 1:98 (1815).

A glabrous tufted grass, decumbent or creeping, hairy at the nodes and near the ligule, 15–40 cm. high. Leaf-blades firm, slender, 5–12 cm. long, 2–4 mm. wide. Spikes 3–5, mostly simple, erect, usually longer than the internodes, 1–4 cm. long, rachis filiform, triangular, flexuose. Spikelets mostly in pairs, smooth, oval, obtuse, 3 mm. long, first glume one-third shorter than the spikelet, ovate with 5 green nerves, second longer, 7–9-nerved; floral glume of the staminate floret like the first empty glume, first palea ovate, 2-nerved. Stamens 3. Fertile floret elliptical.

Texas, *Jones* 3168; Arizona, *U. S. Dept. Agricul.* 85 from Lemmon.

Texas, Arizona, and Mexico.

17. *P. prostratum* Lam. Ill. 1:171 (1783). *P. caespitosum* Sw. Fl. Ind. Occ. 1:146 (1797), not Spreng.

Culms slender, usually creeping at the base, 30–60 cm. high. Sheaths shorter than the internodes; blades 2–8 cm. long, 5–15 mm. wide, lanceolate, flat, glabrous, except cilia on the margins near the broad base, at the throat and sometimes on the sheath. Panicle exerted, of 3–10 simple, crowded, spikes, 1–4 cm. long. Spikelets single or 2–3 together in alternate rows on two sides of a flexuose, rough, triangular rachis, pedicels unequal, very short, often bearing bristles, smooth, flattened, oval, almost acute, containing a staminate and a perfect flower, first empty glume membranous, very short, broad, second broad-oval, 5–7-nerved; floral glume of the lower floret ovate, 5-nerved; palea as long. Stamens 3. Upper floret oval, finely rugose, mucronate or obtuse, 1.5 mm. long.

Louisiana, *A. B. Langlois*.

Found in the southern U. S., West Indies, Brazil, Egypt, Arabia, East Indies, Australia.

18. *P. GROSSARIUM* L. Amœn. Acad. 5: 392 (1759). *P. cœspitosum* Spreng. ex Steud. Nom. Ed. 2, 2: 253 (1841).

Culms smooth, rather slender, 10–30 cm. high, branching from a decumbent or creeping base, the lower internodes about 3 mm. long. Margins of the sheaths and ligule hairy; blades flat, ovate-lanceolate, acute, 2–5 cm. long, 5–10 mm. wide, the margins near the base pubescent. Panicle much or little exerted above the short sheath or the lower partially included, consisting of about 6 approximate spikes, each 2–3 cm. long. Spikelets mostly in pairs on two sides of a slender, flexuose, triangular rachis, 1 subsessile, 1 borne on a pedicel 1–2 cm. long, elliptical-obovate, mucronate, 3 mm. long, first glume broad, about one-third of the length of the spikelet, 5–7-nerved, second glume ovate, acute, 8–9-nerved; floral glume of the neuter spikelet a little shorter, 5-nerved, its palea shorter and much narrower; fertile floret firm, elliptical, transversely wrinkled, 2.5 mm. long.

P. adpersum Trin. Gram. Panic., as figured, appears to be the same as the above, only the leaves are longer and wider, the spikelets 2–3 in number and longer.

Introduced into Philadelphia, Penn., on ballast-ground.

Found also in the West Indies.

19. **P. fasciculatum** Sw. Fl. Ind. Occ. 1:145 (1797). *P. striatum* Chapm. Fl. S. States, Suppl. 666 (1889), not Lam., not R. Br.

Annual; culms branching, erect, or the base decumbent, 30–90 cm. high. Leaf-blades thin, flat, cordate, rough or smooth, 6–20 cm. long, 5–7 mm. wide. Panicle contracted, exerted or partially included, branches mostly simple, erect, 8–15 cm. long. Spikelets smooth, nerves of the glumes reticulate, pedicellate, mostly in pairs on one side of a slender, flexuose, hairy branch, obovate, almost acute, 3–3.5 mm. long, first glume broad, irregularly nerved, about 1 mm. long, second broad-obovate, 7–9-nerved; floral glume of the sterile floret broad-oval, 7-nerved, its palea of equal length, oval; fertile floret with the sides unequally convex, rugose with transverse lines, broad-oval, 2.5–2.8 mm. long.

Mexico, *Palmer* 159, 208; Lower California, *Palmer* 207; Texas, *U. S. Dept. Agricul.* from Reverchon.

South Carolina to Florida and Texas.

Also found in the West Indies and in South America.

Var. **fuscum** (Sw.) *P. fuscum* Sw. Prod. 23 (1788). Plant smaller; leaves 4–6 cm. long; spikes 1–3 cm. long; second glume and lower floral glume 5-nerved.

Arizona, *Pringle* in 1884, distributed as *P. fuscum* Sw.

Var. **major** (Vasey). *P. fuscum major* Vasey, Contrib. U. S. Nat. Herb. 3:27 (1892). The whole plant stouter; blades 1.5 cm. wide; panicle 12 cm. long.

Lower California, *Palmer* 158.

Var. **reticulatum** (Torr.) *P. reticulatum* Torr. Marcy, Bot. Exp. Red Riv. Louis. 299 (1852). Plant strict, blades narrow, 4–6 cm. long, blades and sheaths hairy; panicle contracted, 4–7 cm. long; second and third glumes 5-nerved.

Mexico, *Pringle* 379, 380.

20. **P. Texanum** Buckl. Orel. Rep. Geol. & Agric. Surv. Tex. (1866), teste, Vasey *Agricul. Grasses U. S.* (1889). TEXAS MILLET. CONGHO GRASS.

A stout decumbent and spreading annual, smooth or clothed

throughout from culm to spikelet with short soft hairs, sparingly branched, 60–120 cm. high. Leaf-blades numerous, margins rough, 15–20 cm. long, 2 cm. wide. Panicle erect, often enclosed at the base, 15–25 cm. long, the rays mostly alternate, simple, rough, the lowest 8 cm. long, the upper shorter. Spikelets mostly in pairs on one side of the rather stout rays (a few on the main axis), the hairy pedicel of one about 2 mm. long, the pedicel of the other shorter, nerves prominent, reticulate toward the apex of the glumes, obovate-oblong, acute, 5–6 mm. long; first glume acute, a little over half the length of the spikelet, 5–7-nerved, second glume and floral glume of the sterile floret equal, the former 7-nerved, the latter 5-nerved, its palea but little shorter; fertile floret oblong, acute, rugose with transverse lines.

Texas, *Reverchon* 1226, *Nealley*.

Texas in dry lands.

It has been cultivated in the Southern States for fodder, and has received many favorable notices. See Vol. I. p. 189, Fig. 84, for a more extended notice.

21. **P. colonum** L. Sp. Pl. 84 (1753). *Oplismenus colonus* H. B. K. Nov. Gen. et Sp. 1:108 (1815).

Annual; erect or geniculate and rooting at the lower nodes, 30–60 cm. high. Leaf-blades linear, acuminate, glabrous or rough, 8–12 cm. long, 4–6 mm. wide. Spikes 7–10, 1–2 cm. distant, borne on the main axis, simple, 1-sided, 1.5–2.5 mm. long. Spikelets crowded on the rachis 2–3 together, subsessile in alternate rows along two sides of a rough, triquetrous rachis, flat on one side, scabrous-pubescent, oblong, acute, 3 mm. long, first glume broad-triangular, half as long as the spikelet, mucronate, 3-nerved, second concave, broad-oval, acute, 5–7-nerved, third shorter, hyaline, fourth 7-nerved; floral glume and palea shorter, smooth, obtuse.

Texas, *U. S. Dept. Agricul.* 55 from Buckley; Mexico, *Palmer* 193; Gulf of California, *Palmer* 51.

Alabama to Florida, Texas, Arizona, Mexico. Also found in the West Indies, Spain, Italy, Egypt, Arabia, Australia.

Var. **ZONALE** (Guss.) L. H. Dewey, *Contrib. U. S. Nat. Herb.*

3:502 (1894). *P. zonale* Guss. Fl. Sic. Prod. 1:82 (1825). "A form with purple zonate leaves," Grisb. Cultivated.

22. **P. Schiedeanum** Trin. ex Steud. Nom. Ed. 2, 2:263 (1841). *P. Pringlei* Vasey, ined.

Apparently perennial; diffusely branching near the base, about 20 cm. high. Sheaths smooth; ligule a ciliate ring; blades flat, scabrous above, lanceolate, 2-3 cm. long. Panicle about 4 cm. long, consisting of 3-5 secund spikes 1-2 cm. long, with a scabrous, triquetrous or flattened wavy axis. Spikelets crowded, single, 4.5 mm. long, ovate-lanceolate, each very short pedicel bearing a bristle 4-6 cm. long; first glume broad-oval, thin, 3-nerved, 1.5 mm. long, second ovate, subacute, 11-nerved, 4 mm. long; floral glume of the lower staminate floret but very little longer, 5-nerved, upper floret pistillate, narrowly ovate, scabrid, mucronate, 2.7 mm. long.

Mexico (Jalisco), *Pringle* 2423.

23. **P. Crus-galli** L. Sp. Pl. 56 (1753). BARNYARD-GRASS. *Oplismenus Crus-galli* Dum. Obs. Gram. Belg. 138 (1823). *Echinochloa Crus-galli* Beauv. Agrost. 53 (1812).

A coarse erect or decumbent annual, branching below, 30-120 cm. high. Leaf-blades lanceolate, 10-20 or more cm. long, 5-15 mm. wide, margins rough, otherwise usually smooth; ligule obsolete. Spikes dense, alternate, simple or compound, 2-8 cm. long, forming dense, secund panicles 10-20 cm. long. Spikelets crowded, 2-3 together, subsessile in alternate rows along two sides of a rough, triquetrous rachis, flat on one side, ovoid, acute, stout, hairy, 3-4 mm. long; first glume broad, triangular, half as long as the spikelet, mucronate, 3-nerved, second concave, broad-oval, acute, 7-nerved, third shorter, 5-nerved, fourth hyaline, 2-nerved; floral glume and palea smooth, acute or obtuse.

Very variable in size; color green or purple. Widely distributed in warm and tropical countries. It makes a very good forage-plant when grown on rich, moist soil.

Michigan, *Farwell* for M. A. C.; Montana, *Anderson*; Mexico, *Palmer* 430, 430a; New Jersey, *Brinton* for U. S. Dept. Agricul. 58; New Mexico, *Jones* 4125; Iowa, *Hitchcock*; Washington, *Lake*.

Var. **hispidum** (Muhl.) Torr. Fl. N. Y. 2:424 (1843). *P.*

hispidum Muhl. Gram. 107 (1817). *P. muricatum* Michx. Fl. Bor. Am. 1: 47 (1803). Tall and coarse, with awns sometimes 1-2 cm. long. Found with the species.

Michigan, Beal for M. A. C. 13.

Var. **sabulicolum** (Nees) Trin. in Herb. *Panicum sabulicolum* Nees, Agrost. Bras. 2: 258 (1829). *Oplismenus sabulicolus* Kunth, Enum. Pl. 1: 145 (1833). Stout, 60-90 cm. high. Spikelets lance-elliptical, 5-6 mm. long.

Mexico, *Pringle* 1404.

Wet places, Mexico to South America.

24. **P. Palmeri** Vasey, Contrib. U. S. Nat. Herb. 1: 281 (1893).

Annual; culms 120-180 cm. high, erect, slender. Ligule short; blades smooth, 30-40 cm. long, 2-4 cm. wide. Panicle pyramidal, 15-20 cm. long, rays single, the longest 5-10 cm. long, flower-bearing to the base, rachis rough, tiquetrous, less than 1 mm. wide, straight or flexuose. Spikelets single, imbricate, alternate on two sides of the rachis, subsessile, each spikelet subtended by a bristle exceeding its own length, ovate-lanceolate, about 4 mm. long; first glume about 1 mm. long, 1-3-nerved, second 11-13-nerved; floral glume of the sterile floret much like the latter, 5-nerved; palea broad-oval, fertile floret nearly smooth, ovate-elliptical, mucronate, 2.5 mm. long.

Mexico, *Palmer* 372; *U. S. Dept. Agricul.*, a specimen cultivated from seed sent from Mexico.

25. **P. Reverchoni** Vasey, Bull. Bot. Divis. U. S. Dept. Agricul. 8: 25 (1889).

A rather slender, sparingly branching perennial, 25-60 cm. high, with short, stout rootstocks. Ligule a ciliate ring; blades firm, flat, or involute, mostly scabrous, 10-15 cm. long, 1-2.5 mm. wide, points slender. Panicle very simple, spikelike, much interrupted, 5-15 cm. long, the longest ray 2-3 cm. long, the short pedicels each bearing a short bristle below the apex. Spikelike, oval, obtuse, 2-3.5 mm. long, first glume deltoid, 3-5-nerved, less than half as long as the spikelet, second and third equal, 5-7-nerved, fertile floret oval, plano-convex, subacute, rugose with fine transverse

lines. Reverchon distributed this as *Setaria uniseta*. Nearly allied to *P. fasciculatum* and joining *Panicum* and *Chamaropsis*.

Mexico, *Pringle* 381, 2377; Texas, *Wright* 1849, *Reverchon* 792, 1096.

26. **P. Myosurus** Rich. Act. Soc. Hist. Nat. Par. 1:106 (1792). *P. Myurus* Lam. Ill. 1:172 (1791). *Hymenachne Myurus* Beauv. Agrost. 49, t. 10: f. 8 (1812).

Culms erect, robust, without cavity. Sheaths smooth, but little shorter than the internodes (at least above); ligule broad, entire, 1.5 mm. long; blades cordate, with clasping base, lanceolate-linear, some near the top, 30–40 cm. long, 3–5 cm. wide. Panicle cylindrical, dense, slightly branching near the base, 20–30 cm. long, 8–12 mm. broad. Spikelets linear, acuminate, 4.5 mm. long, first glume broadly ovate, 3-nerved, about 1.5 mm. long, second and third, 5-nerved; floret acute at both ends, 3 mm. long, floral glume and palea thin, the former delicately 3-nerved.

Martinique, *Hahn* 1259; Mexico, *Palmer* 1259.

Mexico, West Indies to Brazil, East Indies.

27. **P. MOLLE** Sw. Prod. 22 (1788). PARA-GRASS. *P. barbinode* Trin. Mem. Acad. St. Petersburg. (VI.) 3:2, 256 (1835).

A stout ascending or erect perennial, sparingly branched, 60–180 cm. high, nodes villous. Leaf-blades 20–30 cm. long, 1–1.5 cm. wide, flat, glabrous, or with a few soft, short hairs. Panicle loose, 1-sided, 20 cm. long, purplish, lead-colored, the lower branches 8–10 cm. long, simple or branched, the upper 2 cm. long. Spikelets glabrous, sessile in clusters of 2–4 or single on 2 sides of a rough, flexuous, triquetrous rachis, oval or elliptical, acute, 3 mm. or more long, containing a staminate and a perfect flower; first glume deltoid, membranous, 1-nerved, 1 mm. long; second membranous, obtuse when spread, 5-nerved; floral glume of the lower floret like the second empty glume; palea elliptical, hyaline, 2-nerved; floral glume and palea of the perfect flower firm, obtuse.

Alabama, *Mohr* in 1883.

Introduced into Alabama from South America and succeeds well on low lands.

“Also found in Jamaica, Trinidad, Cuba, Brazil, Africa, East Indies.” Griesb.

28. *P. Urvilleanum* Kunth. Rev. Gram. 1: 35 (1829).

A stout branching perennial, 40–70 cm. high, from a rootstock; culms and sheaths clothed with soft, whitish, retrorse hairs. Leaf-blades 30–50 cm. long, 1 cm. wide, rigid, often convolute with setaceous points. Panicle diffuse, 15–30 cm. long, rays often naked for the lower third. Spikelets hairy, ovate, acute, 7–8 mm. long: first and second glumes nearly equal, ovate, acute, the former 7–9-nerved, the latter 15–17-nerved; floral glume of the staminate floret ovate, about 6 mm. long, 11–15-nerved, its palea nearly as long, ovate, pubescent; fertile floret oval, 4.5 mm. long, smooth outside, but floral glume and palea pubescent on the inner or upper side.

California, *Pringle* 887, *S. M. Tracy*, *Lemmon*, *Parish*.

Southern California to Chili.

29. *P. autumnale* Bosc, Spreng. Syst. 1: 320 (1825). *P. fragile* Kunth. Enum. Pl. 1: 36 (1829). *P. divergens* Muhl. Gram. 120 (1817).

Perennial; culms erect, ascending, branching at the base, 2–4 cm. high. Ligule obtuse, blades numerous, flat, smooth or sparingly hairy, 2–5 cm. long, 3–5 mm. wide. Panicle partially included by the upper sheath, effuse, rays capillary, few flowered, bearded in the axils. Spikelets 1–6 cm. long, single at the end of rough, unbranched pedicels, lanceolate-oblong, about 3 mm. long, first glume minute, second glume lance-oblong, minutely hairy along the margins and between the nerves, 3–5-nerved, third glume little longer, 5-nerved, otherwise like the former glume; fertile floret lanceolate-oblong, brown, 2.9 mm. long.

Illinois, *U. S. Dept. Agricul.* 44 from *Patterson*; *Patterson* 3581.

Sand hills, Illinois and southward.

30. *P. brachyanthum* Steud. Syn. Pl. Gram. 67 (1855). *P. sparsiflorum* Vasey, Contrib. U. S. Nat. Herb. 3: 34 (1892). *P. angustifolium* Chapm. Fl. S. States, 574 (1860) not Ell.

Culms weak, slender, diffuse, branching, 50–80 cm. high.

Leaf-blades smooth, 7-12 cm. long, 2-3 mm. wide. Panicles much exerted, simple, 8-15 cm. long, rays few, elongated, bearing 2-4 spikelets near the tips. Spikelets elliptical, acute, papillose-hispid, over 3 mm. long, first glume minute, second and third broad, oval, obscurely 5-7-nerved, palea to the lower floret 0; fertile spikelet smooth, elliptical, nearly 3 mm. long.

Texas, *Scribner*.

South Carolina to Florida and Texas.

31. **P. gymnocarpon** Ell. Bot. S. C. and Ga. 1: 117 (1816).

Perennial; culms rigid, erect, 60-100 cm. high, nodes brown. Sheaths shorter than the internodes; blades 20-30 cm. long, 2-3 cm. wide, lanceolate, flat, broad at the base, smooth except the rough margins. Panicle pyramidal, rigid, the few spreading rays, mostly two or more, from nodes 2-5 cm. distant, 30 cm. long, 18 cm. diam. Spikelets on short pedicels, usually in scattered clusters of 3-6, lanceolate, about 6 mm. long, first glume narrow, awn-pointed, 3-nerved, 4-5 mm. long, second and third longer, 5-nerved, palea for the third (floral) glume about half as long as the floret; fertile floret very smooth, obovoid, obtuse, 2 mm. long; rachilla about 1 mm. long, separating perceptibly the glumes and florets.

Louisiana, *U. S. Dept. Agricul.* 75 from Langlois.

Banks of rivers, South Carolina to Florida and Texas.

32. **P. virgatum** L. Sp. Pl. 59 (1753).

Culms glabrous, firm, 100-160 cm. high, from tufted, perennial rootstocks. Ligule often silky-bearded; blades of culm 30-50 cm. long, flat, firm, with a wide white midrib, the lower ones 1 m. long, 5-10 mm. wide. Panicle exerted, compound, loose and spreading, drooping or erect, 20-50 cm. long. Spikelets scattered, often purplish, mostly in pairs on pedicels 2-5 mm. long, very variable, ovate-acute to ovate-lanceolate, 3.5-6 mm. long, first glume deltoid to ovate-acute, 2-4.5 mm. long, 5-6-7-nerved, second glume ovate, acute or acuminate, 3.5-5.5 mm. long, 5-7-nerved; floral glume of the staminate floret shorter, 5-7-8-nerved, fertile floret ovate, acute or obtuse, 2.3-2.7 mm. long.

The above measurements were carefully made after examining

several spikelets from five different plants taken from different localities. A large number of forms could be selected. Plants from Colorado have been seen in which there were 2-7 flowers and some empty glumes to the spikelet, all staminate.

A tall grass, culms and leaves too tough to make the best of feed.

Florida, *Curtiss* 3609; New Jersey, *Scribner* for U. S. Dept. Agricul. 104; Colorado, *Cassidy*; Mexico, *Palmer* 510; Florida, *Simpson* for Nat. Mus. 580; Arizona, *Toumey* 781; Illinois, *Beal* for M. A. C. 14; Michigan, *Hicks* for M. A. C. 15.

Connecticut, Northern Indiana, Kansas, Missouri.

Mexico to Florida, and west to the Rocky Mountains.

33. ***P. capillarioides*** Vasey, Contrib. U. S. Herb. 1: 54 (1890).

A rather slender perennial, 30-60 cm. high, with much the aspect of *P. capillare*. Sheaths pubescent, about the length of the internodes; ligule a ciliate ring; blades flat, nearly smooth, 10-25 cm. long, 5-10 mm. wide. Panicles at length barely exerted, mostly terminal, pyramidal, 8-15-30 cm. long, 12-20-40 cm. broad, rays often in pairs, mostly single, rather stiff with pubescent glands in the axils, branches diverging, straight or slightly flexuose, flower-bearing mainly above the middle. Spikelets single, or 3 near the ends of the branches, green or purple, linear-lanceolate, 5-6 mm. long, first glume ovate, 2.5 mm. long, 5-nerved, second and third linear, scarcely acute, 11-13-nerved, fourth or palea of the sterile spikelet ovate, 2 mm. long; floret mottled with brown, oval, 1.8 mm. long.

Texas, *Buckley*, *Neally* 30, *Miss Croft*.

34. ***P. amarum*** Ell. Bot. S. C. and Ga. 1: 121 (1817).

A robust glabrous creeping perennial, 30-90 cm. high. Leaf-blades 20-40 cm. long, 7-12 mm. wide, glaucous, firm, often involute, with long, slender points, some of them reaching above the panicle. Panicle 10-30 cm. long, racemose, simple, smooth with the appressed rays sometimes included. Spikelets ovate-lanceolate, about 5 mm. long, first glume ovate, acute, 4 mm. long, 9-nerved, second longer, 7-nerved; floral glume of the sterile floret like the latter, only 5-nerved, its palea as long; fertile floret oval, 3.5 mm. long.

South Carolina to Florida in the sands of the coast. Leaves bitter.

Var. **minor** V. & S. Contrib. U. S. Nat. Herb. 3 : 36 (1892).

A smaller form with larger spikelets, growing from Connecticut to North Carolina.

New Jersey, *U. S. Dept. Agricul.* 41 from Isaac Burk.

35. *P. MILIACEUM* L. Sp. Pl. 58 (1753). MILLET.

Annual; culms stout, erect, branching, often rough, 60–120 cm. high. Sheaths often beset with hairs from warty bases; blades numerous, flat, hairy or smooth, 30–50 cm. long, 2–3 cm. wide. Panicle usually exserted, compound, pyramidal or ovoid, spreading and in most races nodding in fruit, 15–30 cm. long. Spikelets all pedicelled, mainly borne towards the ends of the branches, mostly oblong, elliptical, acute, 4 mm. long, first glume broad, acute, 5-nerved, about 3 mm. long, second glume and the floral glume of the neuter floret much alike, the former 7–9-nerved, the latter 13-nerved, its palea about 2 mm. long; fertile floret smooth, shining, oval, almost acute, 3 mm. long.

Said to be a native of India. Extensively cultivated in tropical and temperate regions.

Turkey for *Cooley* by *Sartwell*; Louisiana, *Langlois*.

36. *P. arenarium* Cham. & Schlecht. Linn. 6 : 35 (1831).
P. Kunthii Fourn. Mex. Pl. Enum. Gram. 29 (1886).

Culms stout, tall (?), lower sheaths loose, smooth, about as long as the internodes; ligule a ciliate ring; blades flat, smooth or pilose at the base, 20–30 cm. long, 5–10 mm. broad. Panicles terminal, spreading, 20–35 cm. long, rays erect, single or in pairs, the longest two-thirds as long as the panicle, bearing 3–8 spikelets above the middle on its rather stiff but slender branches. Spikelets in pairs, linear-lanceolate 4 mm. long, pedicel of one of them 1 mm. long, the other 4–5 mm. long; first glume deltoid, 3-nerved, about 1.5 mm. long, second and third subequal, the former 7-nerved, the latter 9-nerved; floret linear, acute, the floral glume 3 mm. long, 7–9-nerved. Grain elliptical, 1.7–2 mm. long.

Mexico, *Bourgeau* 529.

37. *P. Havardii* Vasey, Bull. Torr. Club, 14 : 95 (1887). *P.*

virgatum. Var. *macrospermum* Vasey, Contrib. U. S. Nat. Herb. 3: 36 (1892).

Perennial; culms stout, 100–180 cm. high. Ligule a thick ring of short hairs; blades thick, rigid, often involute, smooth or hairy near the ligule, 30–60 cm. long, 5–10 mm. wide. Panicle exserted, smooth, diffuse, pyramidal, 30–50 cm. long, rays single or in twos or threes, often naked for the lower third. Spikelets smooth, ovate, acute, 8–9 mm. long, first glume over half as long as the spikelet, ovate, acute, 5–7-nerved, second ovate-acute, 8–9-nerved; floral glume of the staminate spikelets nearly as long as the second glume, 5–7-nerved; palea nearly as long as its glume, membranous, ovate when spread, fertile floret smooth, 5 mm. long.

Mexico, *Pringle* 1124.

It was first cultivated in S. W. Texas in 1881 by Dr. Havard. Texas and Mexico.

38. **P. stenodes** Griseb. Fl. W. Ind. 547 (1864). *P. anceps strictum* Chapm. Fl. S. States, 573 (1860).

A tufted slender glabrous erect annual, sparingly branched above, 50–80 cm. high. Blades erect, involute, setaceous, 12–20 cm. long. Panicle exserted or the lower partly included, narrow, simple, 4–8 cm. long, with 5–6 slender rays. Spikelets ovate-lanceolate, 2.5 mm. long, first glume one-third to two-thirds as long as the spikelet, acute, 1-nerved, second glume and floral glume of the sterile floret thin, ovate, acute, 5-nerved; palea much shorter than its glume; fertile floret firm, half-terete, oval, obtuse, 1.7 mm. long.

Texas, *Nealley*, U. S. Dept. Agricul. 99; Alabama, *Mohr*.

Ponds and wet places, Florida to Texas.

39. **P. gibbum** Ell. Bot. S. C. & Ga. 1: 116 (1816).

Culms slender, branching below, 30–50–90 cm. or even 2 m. high. Blades and sheaths smooth or soft hairy, blade flat, acuminate, 7–12 cm. long, 4–12 mm. wide. Panicle close, spikelike above, interrupted below, 8–16 cm. long, 13 mm. diam. Spikelets caducous, each on a short, slender pedicel, oblong, obtuse, or some of the lowest narrower and acute, 3.5 mm. long; first glume about

1 mm. long, 1-3-nerved, second oval, 11-nerved, tumid at the base; floral glume of the neuter spikelet 5-nerved; its palea membranous, 2-nerved; fertile floret smooth, flat on one side, ovoid, obtuse, 1.5 mm. long.

Florida, *Curtiss* 3591.

An annual, thriving in wet ground.

South Carolina to Florida and Texas.

40. **P. melicarium** Michx. Fl. Bor. Am. 1: 50 (1803). *P. debile* Poir. Lam. Encycl. Suppl. 4: 283 (1816). *P. patentissimum* R. & S. Syst. 2: 448 (1817). *P. hians* Ell. Bot. S. C. and Ga. 1: 118 (1816).

A slender glabrous perennial, with a creeping or decumbent base. Culms slender, 15-50 cm. high. Blades 8-15 cm. long, 2-3 mm. wide, the upper reaching to the panicle. Panicle simple, spreading, rays few, capillary, single or in pairs, naked below, 6-15 cm. long. Spikelets mostly in distant clusters, on pedicels 1-2 mm. long, ovate, subacute, nearly 2 mm. long, first glume broad, 1-3-nerved, 1 mm. long, second oval, 5-nerved; floral glume of neuter floret 3-5-nerved, its palea firm, large and as long as itself, broadly obovate, gaping at the apex, 2-4-nerved; fertile floret smooth, elliptical, 1-6 mm. long and usually causing the outer glumes to open.

Low grounds, North Carolina to Texas.

41. **P. repens** L. Sp. Pl. 87, Ed. 2, 87 (1762-63).

Culms stiff, leafy, 30-60 cm. high, ascending from a creeping rhizome. Ligule ciliate; blades glabrous or softly hairy, involute, 7-15 cm. long, 3-5 mm. wide. Panicle 7-15 cm. long, with a few long, erect or spreading, flexuous branches. Spikelets smooth, irregularly crowded, on short, slender pedicels, oblong pointed, 2.5 mm. long, first glume thin, broad, not half as long as the spikelet, obtuse or acute, nerved or not; second and third floral glumes acute, broad-ovate, 7-9-nerved ("3-5-nerved," Benth.), palea of the staminate floret oval, nearly 2 mm. long; fertile floret oblong, obtuse, 1.5 mm. long, with a thin floral glume and palea. Stamens 3.

Alabama, *Mohr*; Louisiana, *Langlois*.

Introduced along the Gulf coast, near salt water; also found in Mexico, Brazil, Europe, Asia, northern Africa and Australia.

Var. **confertum** Vasey, Contrib. U. S. Nat. Herb. 3:28 (1892).

Culms 7-30 cm. high, blades spreading, 3-6 cm. long, 3-5 mm. wide; panicle simple, 2-7 cm. long; first glume longer and less obtuse.

Louisiana, *Langlois*.

Near salt water on the Gulf coast.

42. **P. anceps** Michx. Fl. Bor. Am. 1:48 (1803).

A rather slender erect perennial, 60-90 cm. high, culms flattened from stout, scaly rootstocks, the internodes of which are 2-3 mm. long. Sheaths often hairy; blades scabrous or not, slender, 30-40 cm. long, 5 mm. wide. Panicles terminal, 20-40 cm. long, rarely one or more lateral ones, rays erect or spreading. Spikelets ovate-oblong, acute, often bending sidewise from the appressed branches at a wide angle, bringing pedicel and first glume into line, apex often curved, 2.2-2.5 mm. long; first glume over 1 mm. long, 3-nerved, second ovate, 5-7-nerved; floral glume of sterile spikelet like the latter, only a little longer, its palea two-thirds as long; fertile floret smooth, hard, elliptical, 1.5 mm. long. Some forms are much like *P. agrostoides* Spreng. District of Columbia, *U. S. Dept. Agricul.* from Gerald McCarthy.

Alabama, *Mohr*.

Massachusetts to Texas.

43. **P. agrostoides** Muhl. Gram. 119 (1817).

An erect branching perennial, with smooth, flattened culms, 80-180 cm. high. Sheaths often compressed, softly hairy; blades flat, smooth or rough, 40-80 cm. long, 7-12 mm. wide. Panicles 20-40 cm. long, usually reddish or purple, terminal and lateral, rays numerous, spreading or erect. Spikelets elliptical or lanceolate, usually in line with the very short pedicels, apex straight, 2-2.5 mm. long; first glume acute, 1.5 mm. long, 3-nerved, second 5-nerved; floral glume of sterile floret like it, only shorter, its palea two-thirds as long; fertile floret smooth, oval, 1-1.5 mm. long. Quite variable.

New Jersey, *U. S. Dept. Agricul.* 39 from Scribner; Alabama, *Mohr*; Michigan, *Cooley*.

A tall leafy grass, growing in wet places. Massachusetts to Texas.

44. ***P. proliferum*** Lam. *Encycl.* 4: 747 (1797). *P. miliaceum* Walt. *Fl. Car.* 72 (1788), not L.

Annual; mostly smooth throughout. Culms branched, ascending, very variable in size at the north, 30–50 or more cm. high. Sheaths flattened; ligule ciliate; blades flat, 10–20 cm. long, 5 mm. or more wide. Panicles terminal and lateral, compound, pyramidal, rays rough, slender, spreading, exerted or partially included, 10–20 cm. long. Spikelets pale green or purple, crowded, appressed on short pedicels, lance-ovate, acute, 2.5–3 mm. long; first glume broad, reniform, 1 mm. or less long, 1–3-nerved, second glume as long as the spikelet, 7-nerved, third 5-nerved; fertile floret oval, smooth, 2 mm. long. Sometimes there is a palea for the neuter floret.

Damp places, New England to Texas; also in Illinois.

Var. ***geniculatum*** (Muhl.) Vasey, *Contrib. U. S. Nat. Herb.* 3: 34 (1892). *P. geniculatum* Muhl. *Gram.* 123 (1817).

“This is sometimes called ‘sprouting Crabgrass.’ The stems are at first erect, then become decumbent and spreading, frequently attaining a length of 6–7 feet, bent and rooting at the lower joints. It has much the same habit as *P. Texanum*, but the stems are smooth and more flattened; the leaves also are smoother and larger. The stems are sometimes nearly an inch thick at the base, and very succulent. The panicles are sometimes 2 feet long.” Vasey, *Desc. Cat. Grasses U. S.* Leaves rough above.

District of Columbia, *U. S. Dept. Agricul.* coll. Vasey.

Southern States; common.

45. ***P. capillare*** L. *Sp. Pl.* 58 (1753). OLD-WITCH GRASS.

Annual; culms erect or spreading, branching below, mostly 30–60 cm. high. Sheaths hirsute with hairs having tuberculous bases; blades thin, flat, usually hirsute, 15–30 cm. long, 1–1.5 cm. wide. Panicle 20–30 cm. long, containing many capillary rays, partially included when young, spreading when old by the action

of the enlarged callous bases. ovoid when mature, then easily broken off and carried by the wind. Spikelets smooth, ovoid, acute, oblong-lanceolate, 2-2.7 mm. long, pedicel 1-10 mm. long, first glume 1-5-nerved, about 1 mm. long, second glume 5-nerved, third longer, 5-7-nerved; floral glume of fertile floret elliptical, 1.5 mm. long.

Very variable in size and appearance, as are most annual grasses which are found in such a wide range of country. Very common.

Philadelphia (Penn.), *Scribner* 48; Michigan, *Clark* 744, *Farwell* for M. A. C., *Beal* 17; Washington, *Lake*; Minnesota, *Holzinger* 9, 10; Utah, *Jones* 1313; Oregon, *Howell*; Montana, *Anderson* 73.

Michigan Agricul. College in 1885.

Var. **vulgare** Scribn. Grasses Tenn. 2: 44 (1894). Var. *agreste* Gattinger, Tenn. Flora, 94 (1887). Stout and very hairy; panicle very large and widely spreading; forming no tufts. Spikelets 1.7 mm. long.

In fields and gardens. Tennessee, *Gattinger*.

Var. **campestre** Gattinger, Tenn. Flora, 94 (1887). Var. *Geniculatum* Scribn.

Culms mostly simple, slender, 20-30 cm. high. Root-leaves forming flat tufts appressed to the soil. Spikelets 1.7 mm. long.

Tennessee, *Gattinger*; Virginia, *Millsbaugh*.

Var. **flexile** Gatt. Tenn. Flora, 49 (1887). *Panicum flexile* Scribn. Grasses Tenn. 2: 44 (1894).

A slender plant, thin, elastic and upright, sparingly hairy, panicle thin, smaller, spikelets rather large, acute, much like *P. autumnale* Bosc. Tennessee, *Dr. Gattinger*, U. S. Dept. Agricul. 49 from Gattinger. Found in the cedar glades.

Var. **minimum** Engel. Gatt. Tenn. Flora. 94 (1887). *P. minimum* Scribn. A slender plant, 10-60 cm. high; panicle simple, with 6-10 single rays; spikelets usually less than 2 mm. long.

Tennessee, *Gattinger* 17; New Mexico, *Lemmon* 3152.

Perhaps only a form grown on poor soil or where much crowded.

46. **P. sonorum**. *P. capillare miliaceum*. Vasey ined.

A stout annual, 30–100 cm. high. Culms sparingly branched, and these, as well as the sheaths, clothed with stiff hairs coming each from a prominent tubercle. Sheaths mostly longer than the internodes, rather loose; ligule a ciliate ring; blades more or less hirsute, flat, cordate, 30–40 cm. long, 2–3.5 cm. wide. Panicle usually included at the base, obovoid, 20–40 cm. long, rays very numerous, rather stiff, mostly single, branching freely and bearing an immense number of spikelets. The pedicels of the spikelets 1–7 mm. long. Spikelets linear-oval, 3.2–3.5 mm. long, first glume ovate, 2.2 mm. long, 5-nerved, second and third equal, 9–11-nerved, fourth or palea of the neutral floret 1 mm. long; fertile floret oval, 2.2–2.5 mm. long, floral glume 7-nerved.

The plant is more robust than that of *P. capillare*; the spikelets are larger, first glume longer and 5-nerved, instead of 1-nerved, second and third glumes 9–11-nerved.

Mexico (Sonora) and Lower California, *Palmer*.

Seeds sown in wet places to raise grain, which is used by the Cocopa Indians.

47. *P. bulbosum* H. B. K. Nov. Gen. et Sp. 1: 99 (1815).

Culms 90–120 cm. high, glabrous, erect, flattened, from a perennial bulbous base. Blades flat, scabrous or pilose, 30–40 cm. long, 2–5 mm. wide. Panicle exserted, compound, spreading, 20–40 cm. long, the main rays single or two or three at a node, scabrous, the ultimate branches short and scattered all along the main branches. Spikelets usually greenish, often in pairs, one of which is borne by a pedicel usually 2 mm. or longer, the other on a longer pedicel, oblong-linear, terete, about 4 mm. long; first glume ovate, acute, 3–5-nerved, over half as long as the spikelet, second 5–7-nerved; floral glume and neuter spikelet reaching beyond the second glume, 5-nerved, its palea shorter, 2-nerved; fertile floret soft, ovate-lanceolate, 3.5 mm. long.

Mexico, *Palmer* 207^a; Texas, *Nealley*.

Texas, New Mexico, Arizona and Mexico.

Var. *minor* Vasey Contrib. U. S. Nat. Herb. 3: 35 (1892).
P. maximum var. *bulbosum* Munro. Culms more slender, panicle narrow, 15 cm. long; spikelets 3.5 mm. long.

Arizona, *Pringle*.

Var. *avenaceum* (H. B. K.). *P. avenaceum* H. B. K. Nov. Gen. et Sp. 1: 99 (1815). Spikelets subsessile, about 3 mm. long, often purple; first glume scarcely half as long as the spikelet, the lower floret often staminate, fertile floret 3 mm. long.

Mexico, *Pringle* 377.

Arizona, Mexico, Quito, Guyana.

48. **P. MAXIMUM** Jacq. Ic. Pl. Rar. Coll. 1: t. 13, 76 (1786). GUINEA GRASS. *P. jumentorum* Pers. Syn. 1: 83 (1805).

A stout perennial, from scaly, creeping rootstocks. Culms smooth, 80–150 cm. high, nodes smooth or silky hairy. Leaf-blades smooth, 20–30 cm. long, 5–10 mm. wide; ciliate at the ligule and on the margins of the smooth sheath. Panicle large, 15–20 cm. or more long, erect, the numerous rays erect or spreading, bearing spikelets above the middle of the main branches. Spikelets on pedicels, usually 1–5 mm. long, smooth, elliptical or oval, acute, 4 mm. long; first glume ovate, rounded, acuminate, 7-nerved, 3–4 mm. long; second glume and floral glume of the staminate floret broad-ovate, 3–7-nerved, the latter a little the shorter; palea ovate, as long as its glume. Stamens 3. Fertile floret smooth, transversely wrinkled, 2.5–3 mm. long.

Cultivated in the warmer States; also found in Mexico, West Indies, Buenos Ayres. Introduced from tropical Africa.

This must not be confounded with *Sorghum halepense*, often called *Johnson Grass*.

49. **P. Hallii** Vasey, Bull. Torr. Club, 11: 61 (1884).

Culms caespitose, slender, erect, smooth, branching below, 30–60 cm. high. Ligule a ciliate ring; sheaths smooth or pubescent; blades flat, nearly smooth, light green, about 4 to each culm, 8–15 cm. long, 3–15 mm. wide. Panicle exserted or the lower partially included, 8–15 cm. long, simple, spreading; rays mostly single, naked below and few-flowered. Spikelets very smooth, pale green or purple, single or in pairs, mostly borne above the middle of the branches, lanceolate-ovate, acute, 3–4 mm. long; first glume acute or obtuse, one-third to one-half as long as the spikelet, 5-nerved; second glume ovate-lanceolate, acute,

9-nerved; floral glume of the neuter floret a little shorter, 7-9-nerved, its palea much shorter; fertile floret half terete, smooth, oval, 2-2.5 mm. long. This was distributed by the U. S. Dept. Agricul. at one time as *P. giganteum* Scheele.

Mexico, *Pringle* 376, *Palmer* 168^a, 206; Arizona, *Pringle*, distributed as *P. capillare* (var.?): West Texas, *Nealley*, *Harvard*.

Found in many parts of Texas and Mexico.

A plant named as above is in the herbarium of the late Dr. G. Thurber, from Kotschy, iter Nubicum. One very closely resembling it is named *P. psilopodium*, Trin. MSS., identified by General Munro and now in Herb. Gray of Harvard University.

In the description above considerable use was made of Vasey's contribution as above referred to.

The specimens resemble No. 497 of Pringle's Mexican plants named *P. diffusum* Swartz.

Found in many parts of Texas and in Mexico.

50. *P. diffusum* Sw. Prod. 23 (1788).

A tufted perennial, hirsute throughout, except the spikelets, sparingly branching below, about 60 cm. high. Leaf-blades flat, erect, 10-20 cm. long, 6-10 mm. wide. Panicles pyramidal, much exerted or the lowest partially included, 10-15 cm. long, simple, open; rays mostly single, stiff, spreading. Spikelets pale green, very smooth, single or in pairs, on short pedicels, lanceolate-ovate, about 4 mm. long; first glume acute, half as long as the spikelets, 5-nerved; second ovate, acute, 13-nerved; floral glume of the lower floret equal to the second and 11-nerved, its palea half as long; fertile floret oval, almost acute, 2.5 cm. long.

Mexico, *Pringle* 497.

Much like *P. Hallii* Vasey; but this plant is hirsute, blades longer and wider, the spikelets larger, second glume 13-nerved instead of 9-nerved, third glume 11-nerved in place of 9-nerved.

Mexico, West Indies.

51. *P. ciliatissimum* Buck. fide Vasey, Contrib. U. S. Nat. Mus. 3:29 (1892).

Culms slender, procumbent or erect, 30-40 cm. high, nodes pubescent. Leaf-blades flat, pubescent, rough with stout hairs on

the margins near the base, 4-6 cm. long, 5 mm. wide. Panicle simple, narrow, 4-6 cm. long. Spikelets ovate or oblong, pubescent or smooth, acute, 4 mm. long; first glume ovate-acute, 3-6-nerved; second glume and the floral glume of the staminate spikelet ovate, acute, with a crest of close hairs a little way from each margin, 11-13-nerved; palea oblong, acute, 5-nerved, as long as its glume. Stamens 3. Fertile floret oval, almost acute, 3 mm. long.

East Texas, *Buckley, Hall 824, Nealley.*

52. *P. velutinsum* Nees, *Agrost. Bras.* 121 (1829).

A branching, somewhat diffuse annual, 30-60 cm. high. Culms hirsute more or less. Sheaths smooth or nearly so; ligule a ciliate ring; blades hirsute, flat, cordate, acuminate, 7-13 cm. long, 4-6 mm. wide. Panicles thin, 10-17 cm. long, linear or spreading; rays hirsute, distant, slightly spreading, the longest 3-5 cm. long, bearing 8-14 spikelets. Spikelets mostly sessile (the pedicel hairy), clothed with short, spreading pubescence, oval, subacute at both ends, about 3.4 mm. long; first glume very hard, 5-nerved, 2 mm. long, second 7-nerved; floral glume of the neuter floret oval, mucronate, 2.5 mm. long, finely rugose with transverse lines.

Arizona, *Pringle, Lemmon 3062*; Mexico, *Palmer 159, 208.*

53. *P. microspermum* Fourn. *Hemsl. Biol. Centr. Am. Bot.* 3: 492 (1880).

Culms branching below and decumbent, 30-70 cm. or more high. Sheaths slightly ciliate on the margins, about two-thirds as long as the internodes; ligule a ciliate ring; blades smooth, flat, linear-lanceolate, contracted, but cordate at the base, 6-15 cm. long, 12-15 mm. wide. Panicle diffuse, broadly ovoid, 16-20 cm. long, the rays mostly single, but some of them in pairs, very soon branching near the base, diverging or reclined, the axils enlarged and glandular; rays stiff, spreading at wide angles, hairlike, straight and flexuose. Spikelets all pedicellate, broadly oval, scarcely pointed, 1.1-1.2 mm. long, yellowish green with a finely glandular surface; empty glumes brittle, first minute, second and third equal, 5-nerved; floret persistent, as long as its glumes.

Cuba, *Wright 753*; Mexico, *Palmer 1257.*

Owing to the meagre descriptions and the few and incomplete specimens seen, there is considerable doubt as to the correct identification of this species. Possibly other plants would unite it to *P. brevifolium* L., after the manner of numerous puzzling forms of *P. dichotomum* L.

54. **P. neuranthum** Griseb. Pl. Cub. 232 (1866).

A smooth slender erect or ascending grass, 30-50 cm. high, considerably branched near the top. Ligule a mere ring; blades rather firm, flat or subinvolute, acuminate, 5-10 cm. long, 2-4 mm. wide. Terminal panicle much exserted, simple, 3-5 cm. long; rays diverging. Spikelets pedicellate, softly pubescent, oval, obtuse, 2.5 mm. long; first glume very thin, delicately 3-nerved, 1.3 mm. long; second and third glumes 7-nerved; fertile floret broad, oval, smooth, obtuse.

Var. **ramosum** Gris. Much branched, blades very narrow, spikelets 2 mm. long.

U. S. Dept. Agricul. 84.

Texas, *Riggs*.

This seems much like a form of *P. dichotomum*, so far as I have studied the few specimens seen.

55. **P. pedicellatum** Vasey, Bull. 8, U. S. Dept. Agricul. 28 (1889).

A slender erect light green perennial, 30-60 cm. high, branching but little. Blades of the culm thin, nearly smooth, erect, acuminate, 4-7 cm. long, 4-6 mm. wide, those of the sterile shoots much shorter, thicker and pubescent. Panicle much exserted, simple, 3-5 cm. long; rays 4-5, spreading, each bearing 2-3 spikelets. Spikelets on pedicels 4-10 mm. long, oblong-obovate, obtuse, sparsely pubescent, 3 mm. long; first glume at some distance from the others, ovate, 1-nerved, 1.6 mm. long; second and third glumes oblong, obtuse, 7-nerved.

Texas, *U. S. Dept. Agricul.* from Reverchon. In herb. Gray is an identical plant from the same source ticketed, by mistake most likely, *P. Reverchoni* Vasey.

56. **P. verrucosum** Muhl. Gram. 113 (1817). *P. debile* Ell. Bot. S. C. and Ga. 1:129 (1817).

A very slender smooth branching perennial. 30-80-120 cm. high. Leaf-blades smooth, shining, flat, tapering at the base, 6-15 cm. long, 5-7 mm. wide. Panicle exserted, pyramidal, 8-20 cm. long; rays few, capillary, mostly single, bearing few spikelets. Spikelets dark green, obovate or oval, subacute, warty-roughened, 1.6 mm. long; first glume very small, second and third equal, the nerves obscure, long enough to barely cover the fertile floret.

Delaware, *Canby*; Florida, *Curtiss* 3608; New Jersey, *U. S. Dept. Agricul.* 103 from Scribner.

Sandy low land near the coast, from New England to Florida and Texas.

57. *P. brevifolium* L. Sp. Pl. 87 (1753).

A slender geniculate branching annual, rooting at the lower nodes, 30-60 cm. high. Sheaths pilose; ligule very short; blades flat, oblong-lanceolate, acuminate, rounded at the base, inequilateral, 2-5 cm. long, more or less hirsute. Panicle diffuse, apex oval, 8-12 cm. long; rays branching for most of their length. Spikelets borne on stiff, capillary pedicels, obovate, obtuse, 1-1.3 mm. long, puberulent; first glume half to two-thirds as long as the spikelet, 3-nerved; second and third equal, 3-5-nerved; floret ellipsoid, subacute, 1 mm. long; palea slightly convex.

Mexico (Jalisco), *Pringle* 3828, *Palmer* 1083; also in the West Indies and Brazil. Shaded places.

58. *P. ramulosum* Michx. Fl. Bor. Am. 1: 50 (1803).

A slender tufted perennial, 10-30 cm. high, culms erect, smooth, exserted. Blades linear-lanceolate, 3-4 to a culm, rather firm, flat or becoming involute, scabrous on the margins, with a few hairs near the base and at the ligule, 2-3 cm. long, about 3 mm. wide. Panicle diffuse, oval or pyramidal, 3-5 cm. long; rays capillary, flexuose, bearing numerous spikelets. Spikelets oval or obovoid, about 1 mm. long; first glume broad, one-third as long as the spikelet; second and floral glume of the neuter floret similar, 7-nerved, or the latter 5-nerved; palea half as long as its glume; fertile floret smooth, broad, oval. By some believed to be a form of *P. dichotomum* L.

Florida, *Curtiss*, *Chapman*, *Canby*

So far as observed this seems to a good species.

Southern Texas.

59. *P. microcarpon* Muhl. Gram. 111 (1817).

An erect stout perennial; culm smooth, sometimes hairy at the nodes, perhaps sparingly branched, 30-90 cm. high. Sheaths as long as the internodes; blades oblong-lanceolate from a narrowed cordate base, smooth except the rough margins and ciliate base, 9-13-nerved, 10-18 cm. long, 2-3 cm. wide, usually a tuft of thick ovate leaves near the ground, the apex much the shape of the leaves of *P. clandestinum*. Panicle much exerted on a slender peduncle, oblong or oval, 8-18 cm. long. Spikelets often purple, smooth or nearly so, very numerous on very slender pedicels, obovoid or oval, 1.4 mm. long; first glume less than one-third as long as the spikelet; second and floral glume of the neuter floret similar, 7-nerved, the palea for the latter very small, hyaline, the fertile floret smooth, the shape of a hemisphere slightly compressed.

Specimens from the U. S. Dept. Agricul., no locality; District of Columbia, *McCarthy*.

Wet ground, Massachusetts to Michigan and Texas.

Var. *sphærocarpon* (Ell.). *P. sphærocarpon* Ell. Bot. S. C. & Ga. 1:125 (1817). Plant shorter, more slender; blades 6 cm. long, 8 mm. wide; sheaths shorter than the internodes, which are often pubescent; panicle 5-7 cm. long; spikelets smooth or shortly pubescent.

District of Columbia, U. S. Dept. Agricul. from *Dr. Vasey*.

Same range as the species.

60. *P. Chapmani* Vasey, Bull. Torr. Club, 11:61 (1884). *P. tenuiculmum* Chapm. Fl. S. States, 572 (1860), not Meyer.

Culms tufted, erect, slender, mostly simple. Sheaths ciliate on the margins; ligule a ciliate ring; blades of sterile shoots firm, mostly involute, usually smooth below, scabrous above, 20-30 cm. long, 2-4 mm. wide, those of the culms shorter or about the length of the internodes. Panicle slender, simple, racemose, 15-30 cm. long, composed of 8-10 appressed, sessile spikes, which are distant below and approximate above, 1-3 cm. long; rachis triquetrous, scabrous, flexuose, terminated by a short bristle. Spikelets oval.

almost acute, 2 mm. long; first glume broad, obtuse, 3-nerved, about 1 mm. long; second and third equal, with cross nerves, 7- and 5-nerved respectively; fertile floret oval or ovate, abruptly acute, finely striate, 2 mm. long.

Florida, *Curtiss* 3607, *Blodgett*, *A. P. Garber*, all in herb. Gray.

61. *P. INDICUM* L. Mant. 2: 184 (1771).

Culms slender, branching, erect or diffuse, 40-60 cm. high. Sheaths smooth; ligule 1 mm. long; blades and panicles often purplish, smooth or scabrid, the former flat, 15-20 cm. long, 2-4 mm. wide. Panicle strict, dense, spikelike, 5-15 cm. long, 3-5 mm. diam.; rays 1-5 mm. long. Spikelets cuneate-ovate, smooth, 2 mm. long; first glume 3-5-nerved, 1.3 mm. long; second and floral glume of lower floret equal, 7-9-nerved; fertile floret smooth, shining, oval, almost acute at both ends, 1.4 mm. long.

Mexico (Jalisco), *Pringle* 2363.

Near shallow pools, probably introduced from the Old World.

62. *P. dichotomum* L. Sp. Pl. 1: 58 (1753).

Perennial; culms smooth or softly hairy, slender, simple or later in the season branching freely along the middle, 20-50 cm. high, rarely 15-90 cm. high. Leaf-blades near the base, tufted, firm, ovate-lanceolate, 0.5-3 cm. long, the others flat, lanceolate, usually 5-7 cm. long, 5-7 mm. wide, holding their width well to the base, some not over 3 cm. long, others 12 cm. long; blades and sheaths usually containing some soft hairs, sometimes smooth, and on short plants sometimes rough. The terminal panicle exerted, spreading, compound, ovoid or pyramidal, 3-9 cm. long, the lateral ones smaller, partially or wholly included. Spikelets few (10) to many (250), on slender pedicels, oblong-ovate, obtuse, downy, less often smooth, 1.5-2 mm. long; first glume broad, 1-nerved, minute to one-third the length of the spikelet; second empty glume and floral glume of the neuter floret equal, usually 7-nerved, occasionally with one or two or more nerves; palea small, hyaline, the fertile floret smooth, oval as long as the second and third glumes.

Most parts of North America.

Plants of various forms and perhaps varieties or even species

from widely separated localities too numerous to mention have received protracted study, so far with results quite unsatisfactory. It is a pity that some of these forms ever received distinct names. For example, plants in which the nodes are clothed with dense, straight hairs have been called *P. barbulatorum* Mx., often without much regard for other peculiarities. In a similar manner, if shaggy-hairy or villous, the plants have been known as *P. pubescens* Mx. or *P. villosum* Ell., or, if the leaves were smooth except straight hairs on the margins, *P. ciliatum* Ell., or, if the culms and sheaths were softly hairy, *P. lanuginosum* Ell. Plants with smooth leaves varying considerably in other respects have received the name of *P. nitidum* Lam. If the leaves be smooth, flat, short, tapering much like a wedge, the plant is *P. ensifolium* Baldw. In a large collection there will be many specimens, each answering to one and often two or more of these names; and there will be others showing various combinations of peculiarities expressed in the names above given.

Var. **laxiflorum** (Lam.). *P. laxiflorum* Lam. Encycl. 4: 748 (1797). Leaves numerous; blades thin, lanceolate, 10-14 cm. long; panicle thin.

Dr. Watson, in Gray's Manual, Ed. 6, describes the forms or varieties as: (a) *commune*, with simple culms erect or ascending, and leaves suberect, usually pale green, (b) *fasciculatum*, with clustered leafy branches and short peduncles, a common autumn state, and (c) *gracile*, the culms lax, very slender and elongated, with rather distant spreading leaves (usually bright green), and mostly long-pedunculate panicles.

63. **P. rhizophorum** Fourn. Hems. Biol. Centr. Am. Bot., 3: 495 (1880).

Culms rather slender, geniculate, rooting at the lower nodes, 30-60 cm. high, slightly branching, more or less puberulent. Sheaths puberulent, margins pilose; ligule a mere ring; blades flat, 6-10 cm. long, 1.5 mm. wide, ovate-lanceolate, acuminate, inequilateral, subcordate. Panicles mostly terminal, simple, 4-7 cm. long; rays pubescent at the axils, spreading, single, the longest 2.5-3 cm. long, the rays bearing clusters of spikelets on the ends.

Spikelets smooth, oval or obovate, obtuse, 1.6–1.9 mm. long; second and third glumes equal, 5-nerved; floret hispidulous, oval, 1.4 mm. long.

Mexico (San Luis Potosi), *Pringle* 3817, *Bourg.* 3035, *Bott.* 150, 151, 427, *Bel.* 390.

Shady rocky slopes.

64. *P. depauperatum* Muhl. Gram. 112 (1817). *P. Wilcoxianum* Vasey, Bull. 8, U. S. Dept. Agric. Bot. Div. 32 (1889).

A tufted perennial; culms slender, simple, erect, branching below, 20–40 cm. high. Sheaths mostly pubescent; blades 3 to a culm, narrowly linear, erect, flat or involute, beset with long soft hairs. Panicle 3–6 cm. long, simple, contracted on long peduncles, above the leaves or some of them much lower. Spikelets mostly acute when young, some of them becoming obtuse when mature, oval-ovate or oval-obovate, 2–3.5 mm. long; first glume 1–2 mm. long, 1–5-nerved, second 7–10-nerved; floral glume of the neuter spikelet 5–9-nerved, its palea small; fertile floret oval, smooth, 1.7–2.7 mm. long.

The plant varies much, especially the spikelets. In the above measurement of spikelets the larger is from a plant collected by Dr. Vasey in D. C., and named by Vasey & Scribner; the smaller is one of the Cooley collection, from Deerfield, Mass.

New York to Texas. Michigan, *Wheeler* for M. A. C. 17, *Beal* 18, 19, *Cooley* for M. A. C. 20, 21; Massachusetts, *Sturtevant*; Texas, *Jenny* for Nat. Mus., *Nealley*.

Var. *laxum* Vasey, Bull. Torr. Club, 16:8 (1889). “Weaker stemmed; panicle with longer and more spreading branches (1.5–2 inches), the lower ones single or verticillate; spikelets smaller.”

Virginia, Florida, Texas, Arkansas, Missouri.

65. *P. Vaseyanum* Scribn. ined.

A geniculate purplish branching annual, 50–80 cm. high, smooth throughout, except the margins of the blades and the hispid branches of the panicle; nodes light-colored. Sheaths loose, ciliate; ligule very short; blades thin, flat, 10–15 cm. long, 4–6 mm. wide. Panicles terminal, or with two or three lateral,

partially included by the leaves, narrow, erect, compact, 4-7 cm. long, 5-7 mm. wide; rays rather stiff, appressed, 1-2 cm. long. Spikelets smooth, oval or ovoid, 2.5 mm. long; first glume thin, deltoid, 1-nerved, about 1 mm. long; second and third glumes equal, delicately 9-11-nerved; fertile floret smooth, subacute, 2.3 mm. long.

Mexico, *Pringle* 1415.

Wet places, pine plains, base of Sierra Madre, Sep. 30, 1887. The above description was made entirely from the single specimen above noticed.

66. **P. commutatum** Schultes, Mant. 2:242 (1824). *P. nervosum* Muhl. Gram. 116 (1817), not Lam.

A rather slender, erect perennial. Culms simple, smooth, 40-60 cm. high; nodes dark purple. Sheaths smooth or softly ciliate, some of the lowest shorter and thicker and rough, covering about half the internodes; blades ovate-lanceolate, or lanceolate with the base cordate, smooth, except the ciliate margins, 11-nerved, 7-10 cm. long, 1-2 cm. wide. Panicle exserted, pyramidal or oval, spreading; branches slender, flexuous, smooth, 6-12 cm. long. Spikelets numerous; capillary pedicels 2-15 mm. long, elliptical, subacute, minutely hairy under a lens, or smooth, 2.5-3 mm. long; first glume broad, thin, 1-nerved; second glume and floral glume of the neuter floret equal, 7-nerved, the palea to the latter half as long as the spikelet; fertile floret smooth, oval, obtuse, 2.3 mm. long.

U. S. Dept. Agricul. no locality, Georgia, *Cooley*; Kentucky, *herb. Michigan Univ.* from Houghton; Texas, *Nealley*.

By some this is included with *P. dichotomum* L.

Michigan, Pennsylvania, to Louisiana.

Var. **consanguineum** (Kunth). *P. consanguineum* Kunth, Rev. Gram. 1:36 (1829). *P. villosum* Ell. Bot. S. C. & Ga. 1:124 (1816). *P. angustifolium* Ell. Bot. S. C. & Ga. 1:129 (1816). Culms branching. Sheaths pubescent; blades villous on the margins near the base, 5-8 mm. wide. Panicle sometimes partially included.

Virginia, U. S. Dept. Agricul. from *Vasey*; Florida, *Curtiss* 3583.

The latter specimens are more slender in every way, not producing panicles, a feeble growth reminding one of the sickly growth of peach-trees having the yellows.

South Carolina to Florida.

67. *P. Joorii* Vasey, Bull. 8, U. S. Dept. Agric. 31 (1889).

Perennial; culms branching, 20-40 cm. high. Sheaths crowded and overlapping toward the top of the culm, ciliate on the margins; ligule a mere ring; blades flat, linear-lanceolate or oval-lanceolate, 6-10 cm. long, 1.3-2 mm. wide, wavy-margined, the cordate base ciliate. Panicle often partly included, when exerted ovoid, about 5 cm. long; rays bearing a few pedicelled spikelets from base to apex. Spikelets linear to oval, acute, 3 mm. long; first glume deltoid, 1.3 mm. long, obscurely 5-nerved; second and third or floral glume of the lower floret oval, subacute, 9-nerved, 2.7 mm. long, its palea narrow and more than half as long; fertile floret oval, 2 mm. long; floral glume and palea membranous, rather soft.

Mississippi, *S. M. Tracy* in 1888.

68. *P. xanthophysum* A. Gray, Ann. Lye. N. Y. 3:233 (1835).

An erect yellowish-green perennial, sometimes sparingly branched near the base, 20-40 cm. high. Sheaths hairy, usually covering all the culm, except above the upper leaf; blades 4-6, smooth except the margins and the ciliate, bearded, clasping base, lanceolate-acuminate, 9-11-nerved, 7-15 cm. long, 1-1.5 cm. wide. Panicle erect, much exerted, very simple; branches appressed, 5-8 cm. long. Spikelets 5-15, broad-ovate, minutely downy, a little over 3 mm. long; first empty glume ovate, acute, 3-5-nerved, reaching near to the middle of the spikelet; second 9-13-nerved; floral glume of sterile floret 9-nerved, its palea nerveless, 2.5 mm. long and when spread of equal width below; fertile floret smooth, 2.5 mm. long.

New York, U. S. Dept. Agricul. 106 from *Dudley*; Vermont, *Pringle*; New Jersey, *Britten*; New York, *Clinton* for Dr. Clark 2499; Michigan, *Wheeler* for M. A. C. 19.

Dry sandy soil, Massachusetts, New York, northern Michigan, to Minnesota and northward, rare.

69. *P. viscidum* Ell. Bot. S. C. & Ga. 1:123, *t.* 7, *f.* 3 (1817).
P. scoparium Michx. Fl. Bor. Am. 1:49 (1803), not Lam.
 (1797).

A robust branching leafy perennial, 90–120 cm. high, softly hairy throughout, except the nodes, branches of the panicle and sometimes the upper surface of the leaves. Leaf-blades flat, lanceolate, narrowed toward the base, 12–24 cm. long, 1–2 cm. wide. Panicle compound; branches glandular, diffuse, the base included by the upper sheath, 12–18 cm. long. Spikelets borne on capillary flexuose pedicels, elliptical, subacute, about 2.5 mm. long; first glume thin, 1-nerved, less than 1 mm. long; second and floral glume of the neuter floret 7–9-nerved; palea much shorter and narrower; fertile floret ovate-oblong, subacute, 2 mm. long.

Alabama, *Mohr*; District of Columbia, *McCarthy*. Wet places near the seacoast.

New England to Florida and Texas.

Var. *scabriusculum*. *P. scabriusculum* Chapm. Fl. S. States 576 (1860), non Ell. *P. Nealleyi* Vasey.

Sheaths and lower side of the blades smooth, rough or more or less pubescent. Spikelets smooth or minutely pubescent under a lens.

Alabama (Mobile), *Mohr*; Texas, *Nealley*; Florida, *Chapman* 31.

North Carolina to Florida and Texas.

70. *P. scoparium* Lam. Encycl. 4:744 (1797). *P. pauciflorum* Ell. Bot. S. C. & Ga. 1:120 (1817).

A tufted upright perennial, branching much or little, 30–60 cm. high. Culm rough or smooth, rather stout, internodes longer than the sheaths. Sheaths hairy; blades flat, firm, lanceolate, mostly hairy beneath, faintly 7–11-nerved, 6–14 cm. long, 7–13 mm. wide. Panicles exserted, simple, ovoid or pyramidal, 4–7 cm. long. Spikelets all pedicelled, obovate-obtuse, pubescent, 3 mm. long, often purple at the base; first glume broad, 1-nerved, over 1 mm. long, second not longer than the fertile floret, 9–11-nerved; floral glume of the neuter floret 9-nerved, its palea thin and much shorter; fertile floret firm, smooth, broad-oval, 2.5 mm. long.

New Jersey, *Scribner* 3601 from Parker, named by Vasey and Scribner; Michigan, *Wheeler*; District of Columbia, *Vasey*; Arizona, *Pringle*.

In all the above there is a remarkable uniformity in size of spikelets.

Massachusetts to Oregon, Georgia and Arizona.

71. *P. clandestinum* L. Spec. Pl. 58 (1753).

Perennial, from tufted rootstocks. Culms stout, erect, very leafy. Sheaths rough with papillæ bearing stiff spreading hairs; blades oblong-lanceolate, 12–15 cm. long, 2–3 cm. wide, from a heart-shaped base; apex long, wedge-shaped, rough or smooth. Panicles terminal and usually exerted or lateral and included, the terminal one spreading and pyramidal, 12 by 10 cm. Spikelets oblong, mostly smooth, 3–3.5 mm. long; first glume acute, 1-nerved, second 9–11-nerved; floral glume of staminate floret 7–11-nerved, its palea present; fertile floret oval, subacute, 3.5 mm. long.

Much like *P. latifolium*. Culm stouter, branching more freely; panicle with more branches and more spikelets, which are oval.

District of Columbia, U. S. Dept. Agricul. 54 from *Chickering*; Philadelphia, Pa., *Scribner* 3583; Massachusetts, *Sturtevant* for M. A. C.; Pennsylvania, *Dr. Clark* 2371; New Jersey, Herb. Univ. of Mich. Also No. 125 presented by S. S. Garrigues to Univ. of Mich. The sheaths of the latter feel smooth to the touch.

Low land, Massachusetts, Michigan, Texas.

72. *P. Oaxacense* Steud. Syn. Pl. Gram. 73 (1855).

Culm smooth, erect, stout, 2–2.5 m. high. Sheaths shorter than the internodes, ciliate on the margins above; ligule 1–2 mm. long; blades smooth or very sparingly pubescent, cordate, acuminate, at least 10–20 cm. long, 1.5–3 cm. wide. Panicle open, pyramidal, about 30 cm. long; rays smooth, rigid, in twos, threes or single, 3–5 cm. distant; branches few, spreading, bearing 2–10 spikelets. Spikelets sessile or on pedicels 1 mm. to 4 cm. long, globose, oval, 4 mm. long; first glume concave, ovate-deltoid when spread, 7-nerved, 3 mm. long; second glume and floral glume of

the neuter floret equal, the former 7-nerved, the latter 9-nerved; fourth glume (palea of the neuter floret) obovate, 3 mm. long, with a long callous base; upper floret shining, smooth, oval, subacute, 3.5 mm. long.

Mexico (Jalisco), *Pringle* 1732.

73. **P. Walteri** Poir. Lam. Encycl. Suppl. 4:282 (1816).

P. latifolium Walt. Fl. Car. 73 (1788), not L., teste Swartz.

Perennial, from tufted rootstocks. Culms smooth, erect, simple or sparingly branching, 30–70 cm. high. Leaf-blades 11–15-nerved, 9–11 cm. long, 2–3.5 cm. wide, ovate-lanceolate or oblong-lanceolate, rather abruptly taper-pointed, the base cordate-clasping, mostly smooth except the throat, margins near the base, and lower end of the sheath near the nodes, which are villous. Panicle simple, usually exserted, often on a long peduncle; rays spreading, 7–12 cm. long. Spikelets often downy, obovate, 3–4 mm. long (mostly 3.5); first glume 1-nerved, 1 mm. or more long, second 9–13-nerved; lower floret staminate, floral glume 7–13-nerved, its palea but little shorter; fertile floret elliptical, subacute, 2.5–3.3 mm. long.

Much like *P. clandestinum*, but blades more tapering below the middle, tapering more abruptly, with concave margins above, mostly shorter and wider.

A plant from Dr. Vasey, collected at Washington, D.C., 1884, marked "typical" has hairy sheaths, blades 10 cm. by 2 cm., panicles small, branches stout. Spikelets 4 mm. long.

Michigan, *Beal* 21, *Austin*; Massachusetts, *Beal* 22; New York, *Beal* 23; Minnesota, *Holzner* 32; District of Columbia, *McCarthy*.

Found from New England to Texas.

Var. **molle** Vasey, Contrib. U. S. Nat. Herb. 3:33 (1892). Smaller, more slender, soft velvety-pubescent throughout. District of Columbia, *Vasey* for U. S. Dept. Agricul.

Virginia to Louisiana.

27. (9) **ICHNANTHUS** Beauv. Agrost. 56, t. 12, f. 1 (1812). *Navicularia* Raddi, Agrost. Bras. 38 (1823).

Spikelets ovate or acuminate, short-pedicellate on the branches of the panicle, with one perfect terminal flower and a lateral staminate flower.

The two lower empty glumes subequal, membranous, the floral glume of the staminate or neuter floret about the length of the two lower glumes; floral glume and palea of the fertile floret usually shorter and harder, and the rachilla below supplied with membranous appendages or pits. Stamens 3. Styles distinct at the base. Grain oblong, enclosed by glume and palea, but not adherent.

Grasses with much the habit of *Eupanicum* in the genus *Panicum*; blade usually broad. Panicle rather dense.

There are about twenty species found in tropical America, and one of them is also found in India.

1. *I. pallens* (Sw.) Munro, Benth. Fl. Hongk. 414 (1861). *Panicum pallens* Sw. Prod. 23 (1788).

A rather slender grass, the leafy branching culms 30–40 cm. high, from creeping bases. Sheaths half as long as the internodes; ligule very short; blades flat, ovate or ovate-lanceolate, more or less hirsute, 5–9 cm. long. Panicles terminal or lateral, linear or slightly spreading, 8–12 cm. long; rays single or in twos, the longest 6–8 cm. long, bearing scattering spikelets on the branches for the whole length. Spikelets oval, 3–3.5 mm. long; first empty glume 3-nerved with a slender beak, second and third 5-nerved; fertile floret oval, obtuse, 2 mm. long.

Mexico (San Luis Potosi), *Pringle* 3827, also found in the West Indies and in Brazil.

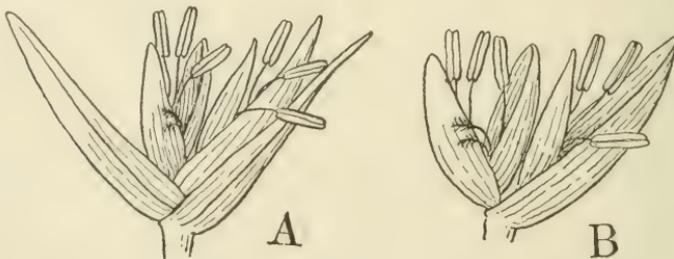


FIG. 26.—*Ichnanthus pallens*. A, B, spikelets. (Richardson.)

28. (10) **OPLISMENUS** Beauv. Fl. Owar. 2:14, t. 58 (1807). *Paniculatum* Ard. Animad. 2:14 (1764). *Orthopogon* R. Br. Prod. 194 (1810). *Ophismenus* Poir. Encycl. Suppl. 4:271 (1816). *Hekaterosachne* Steud. Syn. Pl. Gram. 118 (1855).

Spikelets with 1 terminal perfect flower and a rudimentary 1 below it, awned, clustered along the second distant rays of a simple panicle, articulate with the pedicels. Glumes 4, the 3 outer ones membranous, the lowest empty one not much shorter than the others and with a longer awn, floral glume awnless and hardened with the palea as in *Panicum*, to which it is very nearly allied, in the section *Brachiaria*. Stamens 3. Styles distinct.

A small tropical and subtropical genus of 10 to 16 species, found in both hemispheres. By some botanists they have been separated as though there were thirty species. The genus differs from *Panicum* in the greater development of the lowest empty glume, which is always awned.

1. *O. undulatifolius* Beauv. Agrost. 54 (1812). *O. setarius* R. & S. Syst. 2:481 (1817). *Panicum setarium* Lam. Ill. 1:170 (1791).

Culms weak, sparingly branched, 20-50 cm. high, ascending from a long creeping base. Sheaths ciliate, about as long as the internodes; blades reticulate-veined, ovate-lanceolate or lanceolate, acute, 2-4 cm. long, 5-12 mm. wide, sparingly ciliate. Spikes 5-8, on 3-8 centimeters of the axis, 5-8 mm. long. Spikelets 3-7, glabrescent, oval, 3 mm. long, first glume 1-nerved, 2 mm. long, with a stout, straight, smooth, blunt awn, 1 cm. long, second a little longer, ovate, 5-nerved, bearing an awn its own length, third glume broad-oval, still longer, 7-9-nerved, with a short awn; fertile floret ovate, about 2 mm. long.

Florida, *Curtiss* 3595.

2. *O. Liebmanni* Fourn. Hemsl. Biol. Centr. Am. Bot. 3:502 (1880).

Culms simple excepting at the base, 40-60 cm. high. Sheaths

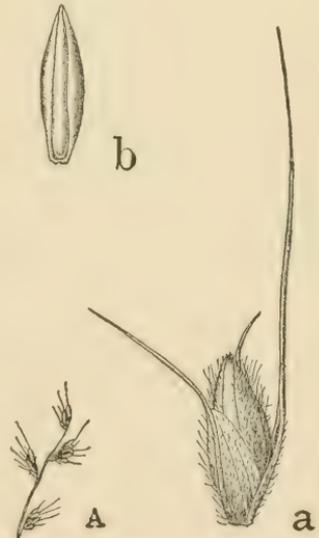


FIG. 27.—*Oplismenus undulatifolius*. A, spike; a, spikelet; b, floret. (Scribner.)

slightly ciliate, mostly shorter than the internodes; blades reticulate-veined, elliptical-lanceolate, acuminate, 4–8 cm. long, 8–14 mm. wide, sparingly ciliate. Spikes 5–8, on 7–10 centimeters of the axis, the longest 3–5 cm. long. Spikelets in clusters of 2–5 on the primary branches, elliptical, 3 mm. long, first glume 3-nerved, 2 mm. long, with an awn 2–5 mm. long, second a little longer, 5-nerved, unawned, third still longer, 7–9-nerved, unawned; fertile floret 2.5 mm. long.

Mexico (Oaxaca), *Pringle* 4944.

Texas, Mexico to Brazil.

Another form or variety is No. 463, *Dr. E. Palmer*, Jalisco, Mexico, in 1886. In the latter the rachis is clothed with hairs extending beyond and covering the spikelets. Spikelets 12–20 in an oblong spike 1 cm. long, oval 2 mm. long, awns very slender and rough, third glume awnless.

29. (11) **CHÆTIUM** Nees, *Agrost. Bras.* 269 (1829).

Berchtoldia Presl, *Reliq. Hænk.* 323, *t.* 43 (1830).

Spikelets narrow in a close panicle, the pedicel articulate near the middle. 1-flowered with 3 empty glumes (the third standing for a second floret), first and second empty glumes terminating in bristle-like awns, second usually larger with a longer awn, third shorter with a shorter awn; fertile floret firm, shorter, acuminate. Stamens 3. Styles distinct. Grain oblong, enclosed, but not adherent.

Rather stout grasses with narrow leaf-blades. Panicle terminal and dense with slender rays.

There are two species known, one belonging to Mexico, the other to Brazil.

Chætium has nearly the spikelets of *Oplismenus*, the outer glumes being well developed and awned; the inflorescence is quite different. Kunth places it with *Oplismenus*, Döel with *Panicum*. Fournier retains *Chætium* for one of two species and places the other in the genus *Berchtoldia*.

1. **C. bromoides** (Lam.) Benth. *Journ. Linn. Soc.* 19: 46 (1881).
Panicum bromoides Lam. *Ill.* 170 (1791).

Culms hard, smooth, compressed, about 60 cm. high, from pe-

rennial rootstocks. Sheaths longer than the internodes: ligule, margins of the sheaths, and the nodes short-hairy; blades nearly smooth, sparingly soft-pubescent, flat or conduplicate, 30 cm. long, 5 mm. wide. Panicle partially included by the upper sheath,



FIG. 28.—*Chætium bromoides*. Spikelet. (Richardson.)

15–18 cm. long, rachis and rays triangular and hispid, pedicels clothed with short, stiff, erect hairs, and separating obliquely near the base. Spikelets rough, compressed, narrowly elliptical, with a

furrow on each side, 7 mm. long, besides the barbed points at the base and the awns above; awns 10–20 mm. long, first and second glumes 7-nerved (3 nerves near the middle and 2 toward each edge); third glume (floral glume of the rudimentary floret) delicately 5-nerved; fertile floret rough, elliptical, 5–6 mm. long, terminating in a short spine, the floral glume 5-nerved.

Mexico, *Palmer* 619, *Pringle* 2331.

30. (12) **CHAMÆRAPHIS** R. Br. Prod. 1:193 (1810). *Setaria* Beauv. Agrost. 113 (1812), not Ach. (1798).

Spikelets with one terminal perfect flower, and a staminate or neuter one below it, crowded into a cylindrical dense or sometimes interrupted spikelike panicle, awnless, articulate with the pedicel, some or all of which bear 1 to several persistent, awnlike, barren branches; first outer glume small, second larger, floral glume of the barren floret equalling the second or longer, all three membranous; floral glume of the fertile floret firm. Stamens 3. Styles distinct. Grain enclosed, but not adherent. Annual grasses with flat leaf-blades. Panicle terminal.

Species very variable, about 35, though Bentham said, in *Genera Plantarum*, “Hardly more than 10 that are well defined.” Extensively distributed over the warmer and temperate regions of the globe. Most of them are considered weeds, though the young plant and the seeds make wholesome food for many domestic animals.

The older authors included *Chameraphis* (*Setaria*) in *Panicum*, and it has been restored as a section by Studel and Döel. It is easily recognized by the dense spikelike panicle, usually bristling with numerous setæ issuing from the pedicels below the spikelets. The setæ are not epidermal, like the hairs of many plants, but are thought to represent abortive branchlets inserted *below* the articulation of the pedicels. A few species have the lower flower perfect as well as the upper, which is quite exceptional in *Panicaceæ*. *Panicum unisetum* Trin. has a single awn on some of the pedicels, and on this account has been by some called *Setaria uniseta*, while Presl called it *Urochloa uniseta*, and Schlecht founded a genus for it called *Ixophorus*.

- A. Leaf-blades plicate. 15
- B. Bristles with fine teeth pointing downwards. 1
- C. Bristles with fine teeth pointing upwards. (a)
- a. Plants 3-6 meters high. 2
- a. Plants 25-60 cm. high. Sheaths compressed. 3, 4, 5, 6
- a. Plants usually 8-20 cm. high (No. 7 often taller). Sheaths compressed little if any. (b)
- b. Exotic, cultivated, 20-40 cm. or more high. 7
- b. Native in Florida and Texas. 8
- a. Plants usually 30-60 cm. high. Sheaths compressed little if any. (c)
- c. Spikes tawny yellow when mature. 9
- c. Spikes green or reddish brown when mature. (d)
- d. Fertile floret strongly wrinkled transversely, as in *C. glauca*. 10, 11
- d. Fertile floret not wrinkled transversely, or only as seen under a lens. (e)
- e. Spikes dense. 12
- e. Spikes interrupted. (i)
- i. Spikelets 3 mm. long. 13
- i. Spikelets 2 mm. long, bristles single. 14

1. **C. verticillata** (L.) Porter, Bull. Torr. Club, 20:196 (1893).

Panicum verticillatum L. Sp. Pl. Ed. 2, 82 (1762). *Pennisetum verticillatum* R. Br. Prod. 1:195 (1810). *Setaria verticillata* Beauv. Agrost. 51 (1812).

Culms erect or ascending, branching and cylindrical below, 30-60 cm. high. Sheaths smooth, loose; ligule ciliate; blades flat, rough, twisted (?), broad at the base, of large specimens, 15 cm. long, 12-15 mm. wide. Spikelike panicle green, often rather loose and interrupted at the base, the spikelets densely clustered, each pedicel bearing 1-2 bristles twice as long as themselves with the asperities directed downwards. Spikelets oval, about 2 mm. long, first glume one-half the length of the spikelet, 1-nerved, second nearly as long as the third, broad, 7-nerved, the latter 5-7-nerved; fertile floret smooth, the minute transverse wrinkles scarcely visible, even under a lens.

New Jersey (ballast), *Scribner* 3613 + for U. S. Dept. Agricul. 117; Iowa, *Hitchcock*; Mexico, *Vasey* for U. S. Dept. Agricul.

The plants have much the habit of *C. viridis*. A weed in cultivated grounds of warm countries.

2. *C. magna* (Griseb.). *Setaria magna* Griseb. Fl. Brit. W. Ind. 554 (1864).

Culm compressed, robust, 3-6 meters high, pubescent below the nodes, having much the habit of *C. Italica*. Ligule oblique, ciliate; blades flat, scabrous. Spikes cylindrical-clavate. 4-5 cm. diam., rays crowded or the lowest somewhat remote, bristles 1-3 to the spikelet, roughened upwards, 10-15 mm. long. Spikelets elliptical, about 2 mm. long, first glume 3-nerved, half the length of the floret, all others nearly equal in length, second 7-nerved, third 5-nerved, with a palea; fertile floret smooth.

Florida, *G. V. Nash* 1279 in 1894; also found in Cuba and Jamaica swamps.

3. *C. latiglumis* (Vasey). *S. latiglumis* Vasey, Bull. Torr. Club, 229 (1886).

Culms erect, simple or sparingly branched, slender, 25-45 cm. high, nodes finely pubescent. Sheaths compressed, narrow, sparsely scabrous-pubescent, shorter than the internodes; ligule a ciliate ring; blade scarcely smooth, 10-15 cm. long, 4-6 cm wide. Spike erect, loosely flowered, 5-10 cm. long, 6-8 mm. diam., rays short, 1-6-flowered, usually with 1 bristle to each spikelet, the bristles 15-20 mm. long. Spikelets broadly ovoid, obtuse, 4 mm. long, glumes thin, first glume subreniform, concave, 7-9-13-nerved, 3 mm. long, second cordate, shaped like the first one, 15-23-28-nerved, third tumid at the base, truncate, 11-13-nerved, with a thin short palea; fertile floret ovate, abruptly acute or mucronate, 3 mm. long.

Nearly allied to *C. pauciseta*, and perhaps one is a mere variety of the other.

Mexico, *Palmer* in 1885.

4. *C. pauciseta* (Vasey) Kuntze, Rev. Gen. Pl. 769 (1891). *Setaria pauciseta* Vasey, Bull. Tor. Club, 13:230 (1886).

A rather slender, erect grass. 30–40 cm. high. Culms branched at the base, compressed. Sheaths compressed-keeled equalling, or the upper longer than the internodes; ligule a ciliate ring; blades erect, acuminate, 10–20 cm. long, 4–8 mm. wide. Panicle erect, loosely flowered, 6–10 cm. long, 6–10 mm. diam., rachis and rays angular, scabrous, bristles about twice as many as the fertile flowers. 1–2 cm. long, rays irregular, 6–12 mm. long, 1–5–10-flowered. Spikelets ovoid, acute, about 3 mm. long, first glume very broad, obtuse, concave, thin, 5–11-nerved, 1.3 mm. long, second obtuse, thin (with cross nerves), subreniform, 13–19-nerved, third ovate, obtuse when spread, 7–9-nerved, with or without a palea; floral glume ovate, mucronate, 2 mm. long. Spikelets appear acute, owing to the involution of the apex of the glumes. In the above description, Dr. Vasey is followed rather closely, though the plant was examined.

Nearly allied to *C. latiglumis*, and perhaps one is a mere variety of the other.

Mexico, *Palmer 78*.

5. *C. Ventenatii* (Kunth).

Setaria Ventenatii Kunth, *Rev. Gram.* 1: 251, *t.* 37 (1829).

Culms erect, glabrous, slightly compressed, pubescent at the nodes, 40–60 cm. high. Sheaths compressed; ligule a fringe of hairs; blades scabrous, flat, narrow below, 15–30 cm. long, 5–7 mm. wide. Spikes much exserted, thin, purplish, 6–8 cm. long. Spikelets 2–4 in a cluster or single, having 2–3 bristles 15 mm. long, each (including those abortive) with asperities pointing upwards, oval, almost pointed, gibbous, 2.5 mm. long; first glume deltoid, half as long as the spikelet, 3-nerved, second longer, 5–7-nerved, third 5-nerved; fertile floret slightly wrinkled transversely. *Index Kewensis* includes this under *Setaria glauca*.

Florida, *G. V. Nash 1382* in 1894.

6. *C. flava* (Kunth) Kuntze. *Rev. Gen. Pl.* 770 (1891). *Setaria flava* Kunth, *Rev. Gram.* 1: 46 (1829). *Panicum flavum* Nees, *Trin. Gram. Panic.* 162 (1833).

Culms erect, compressed, smooth, branching below, 30–60 cm. high. Sheaths compressed; ligule a mere ring, thinly pubescent;

blades flat, nearly smooth, twisted, 10–17 cm. long, 3–4 mm. wide, the tips slender. Spikes light green, rather dense, 5–8 cm. long, 7 mm. diam. Spikelets 2–4 in a cluster, having 2–3 bristles (3–10 mm. long), each with asperities pointing upwards, oval, almost pointed, gibbous, 2.5 mm. long, first glume half the length of the spikelet, 3-nerved, second but little longer than the first and 5-nerved, third 5-nerved, as long as the fertile floret and including a palea of its own length; fertile floret very slightly wrinkled transversely when seen with a lens. Index Kewensis includes this under *Setaria flava*.

Florida, *G. V. Nash* 566 in 1894.

7. *C. ITALICA* (L.) Kuntze, Rev. Gen. Pl. 768 (1891). ITALIAN MILLET. *Panicum Italicum* L. Sp. Pl. 56 (1753). *Setaria Italica* Beauv. Agrost. 51 (1812).

Culms smooth, stout, branched, 90–240 cm. high. Leaf-blades flat, rough, lanceolate, 20–40 or more cm. long, 15–25 mm. wide. Spikes compound, green or purplish, the rays well filled and contiguous, or the lower ones a little distant, nodding, 20–40 cm. long, 15–25 mm. diam., bristles 1–3 for each spikelet, with asperities pointing upward, very variable in length. Spikelets narrowly obovoid when in flower, 3 mm. long, first glume one-third the length of the spikelet, 3-nerved, second three-fourths as long as the spikelet, 5–7-nerved: floral glume of the neuter floret 5-nerved, its palea small or wanting; fertile floret finely rugose transversely under a lens.

A very variable plant, as might be expected when we consider the wide range of soil and climate in which it is cultivated.

Introduced from the East Indies. For a more extended account consult Vol. 1, p. 175.

8. *C. composita* (H. B. K.). Kuntze, Rev. Gen. Pl. 769 (1891).

Setaria composita H. B. K. Nov. Gen. et Sp. 1: 111 (1815). *Panicum compositum* Nees, Agrost. Bras. 244 (1829).

Culms smooth, 60–130 cm. high. Throat and margins of sheath hairy; blades rough, linear-lanceolate, 20–30 cm. long, 15–20 mm. wide. Spikes loose, compound, slightly nodding, 20–30 cm. long, some of the rays often 15–20 mm. long; bristles single or in pairs,

serrate, 1-2 cm. long. Spikelets elliptical, acute or narrowly oval, 3.5 mm. long, glumes reticulate-veined, first glume broad, 1.5 mm. long, 3-5-nerved, second 3 mm. long, 5-nerved; floral glume of the neuter floret like the second and empty glume, only a little longer, its palea slender, 2 mm. long; fertile floret with faint transverse ridges. Resembling Hungarian grass. Index Kewensis in one place includes this under *Setaria macrostachya*.

Pennsylvania, *Scribner* 3618; North Carolina, *McCarthy*; Iowa, *Hitchcock*; Michigan, *M. A. C.* 22, 23, 24, *Cooley*, *Clark* 753.

Florida, *Curtiss* 3617.

Florida to Texas.

9. *C. GLAUCA* (L.) Kuntze, Rev. Gen. Pl. 767 (1891). FOX-TAIL. *Panicum glaucum* L. Sp. Pl. 56 (1753). *Setaria glauca* Beauv. Agrost. 51 (1812).

Culms erect, branching and compressed below, 30-60 cm. high. Sheaths smooth, loose, the lower ones compressed and more or less tinged with red; blades scabrous, flat, twisted once or more around, broad at the base, scabrous and, on large plants, often sparsely ciliate, 20-30 cm. long, 7-10 mm. wide. Spike simple, cylindrical, usually tawny yellow, 3-10 cm. long, awnlike branches 6-13, with the asperities directed upwards, 2-4 times as long as the spikelet. Spikelets solitary, flat on one side, oval, obtuse or almost acute, 2.5-3 mm. long, first glume broad, one-half to two-thirds as long as the spikelet, 3-nerved, second wider and a little longer, 5-nerved; floral glume of neuter floret as long as the spikelet, 5-nerved, its palea nearly as long; fertile floret gibbous on one side, marked with prominent transverse wrinkles.

A common weed found in many parts of the world in which the climate is temperate or tropical. Starts much later and flowers much later in the season than *C. viridis*.

District of Columbia, *Vasey* for U. S. Dept. Agricul. 111; Mexico, *Pringle* 431; Delaware, *Canby* for *Dr. Clark* 1936; Michigan, *Clark* 751, *Beal* 24; Alabama, *Mohr*.

Var. *lævigata* (Muhl). *Panicum lævigatum* Muhl. Gram. 100 (1817).

“Has a more flattened culm, longer, narrower, and smoother leaves, and the perfect flower obscurely wrinkled. In damp soil along the coast, Florida to North Carolina.” (Chapman’s Flora.)

A plant from Dr. Mohr, Mobile, Alabama, has the smooth slender leaf, but is otherwise like *C. glauca*.

Two plants collected in Harrisburg, Texas, by Prof. Mark W. Harrington, answer to Chapman’s description of *C. levigata*, with the addition that the spikelets are considerably narrower than those of *C. glauca*.

Var. **geniculata** (Beauv.). *Setaria geniculata* Beauv. Agrost. 51 (1812). *Panicum geniculatum* Lam. Encycl. 4:727 (1791). *Pennisetum geniculatum* Jacq. Eclog. Gram. t. 27 (1813).

Culms slender, often ascending; sheaths glabrous; blades slender, smooth; spike yellowish green, more slender, 4–5 mm. diam., bristles usually shorter.

Texas, *Reverchon*; Mexico, *Bourgeau* 231, 2031, *Wright* 3472, *Palmer* 293.

Texas to South America.

Var. **perennis** (Curtiss). A slender-leaved perennial plant, coming from scaly rootstocks.

Florida, *Curtiss* 3614*; Texas, *Reverchon*; Cuba, *Wright*.

10. **C. corrugata** (Schultes). Kuntze, Rev. Gen. Pl. 770 (1891). *Setaria corrugata* Schultes, Mant. 2:276 (1824). *Panicum corrugata* Ell. Bot. S. C. & Ga. 1:123 (1816).

Culms slender, branching below, long exserted, about 60 cm. high. Leaf-blades flat, twisted as in *C. glauca*, slightly rough, narrow, tapering towards the base, 20–30 cm. long, 4–7 mm. wide. Spikes compound, green, densely cylindrical, 2–10 cm. long, 7 mm. diam., not counting the bristles, which are often 1 cm. in length. Spikelets 6–10 in a cluster (developed and abortive), having 1–2 bristles each, with asperities pointing upwards. oval, almost pointed, gibbous, 2 mm. long; first glume deltoid, half as long as the spikelet, 3-nerved, second broad, longer, concave, 5-nerved; floral glume of the neuter floret as long as the spikelet, 5-nerved, its palea minute; fertile floret strongly wrinkled transversely.

Florida, *Curtiss* 3616.

Georgia to Florida.

11. *C. imberbis* (Poir) Kuntze, Rev. Gen. Pl. 767 (1891). *Panicum imberbe* Poir, Lam. Encyl. Suppl. 4:272 (1816). *Setaria imberbis*, R. & S. Syst. 2:891 (1817).

Culms erect, slender, branching sparingly, 30–50 cm. high. Sheaths often longer than the internodes; ligule very short; blades flat, smooth or scabrid or soon involute, 6–18 cm. long, 3 mm. wide. Spike simple, cylindrical, green, 4–5 cm. long, 4–5 mm. diam., awnlike branches about 5, with the asperities directed upwards, branches 4–6 mm. long. Spikelets flat on one side, ovoid, pointed, about 2 mm. long, first glume broad, half as long as the spikelet, 5-nerved, second longer and wider, 5–7-nerved; fertile floret gibbous on one side, marked with transverse wrinkles.

Texas, *Nealley*.

Mississippi and Texas.

12. *C. VIRIDIS* (L.) Porter, Bull. Torr. Club, 20:196 (1893). PIGEON-GRASS. BOTTLE-GRASS. GREEN FOXTAIL. *Panicum viride* L. Sp. Pl. Ed. 2:83 (1762). *Setaria viridis* Beauv. Agrost. 51 (1812).

Culms erect, branching below, 30–60 cm. high. Ligule and margins of sheaths ciliate; blades flat, scabrous, not twisted while growing, acuminate, tapering toward the base, on large plants 15 cm. long, 10 mm. wide. Spikelike panicle erect, green, nearly cylindrical, 3–8 cm. long. The lower spikelets in small clusters, the upper fewer or single, the bristles, 1–5 for each spikelet, often 10 mm. long, the asperities directed upwards. Spikelets oval, 2 mm. long, first glume one-half as long, 1-nerved, second and third glumes equal, 5–7-nerved; fertile floret oval, the surface containing minute vertical lines, seen only under a lens.

Very common in fields which are in cultivation, resembling considerably small forms of *C. Italica*. It starts earlier in the spring and flowers much earlier than *C. glauca* in the Northern States.

Michigan, M. A. C. *Beal* 25, 26, *Farwell*, *Clark* 752; Montana, *Anderson* 17.

13. *C. caudata* (Lam.). *Panicum caudatum* Lam. Ill. 1:171 (1791). *Setaria caudata* R. & S. Syst. 2:495 (1817).

Culms slender, erect, flattened and branching below, 60–90 cm. high, from creeping rootstocks; nodes glabrous. Leaf-blades scabrous, twisted, flat, some of the largest 20 cm. long, 4 mm. wide, having a very long slender apex. Panicle cylindrical, pale green, interrupted, 15–20 cm. long, 7 mm. diam., main axis pilose, bristles 1–3 to the spikelet, the asperities pointing upwards, some of them as long as the spikelets, others 10 mm. long, with all grades between. Spikelets oblong, moderately acute, nearly 3 mm. long, first glume broad, nearly half the length of the spikelet, 3-nerved, second glume and floral glume of the neuter spikelet equal, 5–7-nerved; palea small; fertile floret acute, finely transversely wrinkled. A good forage grass.

Arizona, *Pringle*; Lower California and Mexico. *Palmer* 340.

New Mexico, Texas, and Arizona; also West Indies, Brazil, and East Indies.

Var. *pauciflora* Vasey, ined.

Much more slender, 30–40 cm. high, blades thinner, nearly smooth, 10 cm. long, 8–10 mm. wide; panicle more interrupted, some of the lower branches 1 cm. long.

California, *Palmer* 191.

14. *C. uniseta* (Presl) Kuntze, Rev. Gen. Pl. 770 (1891). *Urochloa uniseta* Presl, Reliq. Hænk. 1:319 (1830). *Panicum unisetum* Trin. et Rupr. Mem. Acad. St. Petersburg. (VI.) t. 3:217 (1835). *Setaria uniseta* Fourn. Hemsbl. Biol. Centr. Am. Bot. 3:506 (1880).

Culms slender, smooth or rough, branching below, 40–70 cm. high. Leaf-blades flat, twisted (?), scabrous, 10–14 cm. long, 10–15 mm. wide. Spikes interrupted, the larger branches 3–5 mm. long, bristles single, finely serrulate, 10–15 mm. long. Spikelets oval, hardly acute, 2 mm. long, first glume less than half as long as the spikelet, 3-nerved, second and the floral glume of the neuter spikelet 5-nerved, the former a little the shorter; palea small; fertile floret with very slight transverse ridges as seen with a lens.

Mexico, *Pringle* 381.

15. *C. sulcata* (Raddi). *Setaria sulcata* Raddi, Agrost. Bras. 50.

Culms stout, 90-120 cm. high. Sheaths hispid; ligule a fringe of hairs; blades glabrous, folded, grooved, 30-120 cm. long, 3-4 cm. wide, acuminate at both ends. Panicle dense, lanceolate, the apex nodding, 30-60 cm. long, the longest rays 2.5-3 cm. long, the branches and pedicels bearing scattered slender bristles 1-2 cm. long. Spikelets elliptical, acute, 3 mm. long, first empty glume ovate, 3-nerved, 1.5 mm. long, second ovate, obtuse or subacute, 5-nerved, 2 mm. long, the third ovate-acute, 5-nerved, a little exceeding the acute floret. Floral glume and palea not very firm. Near streams.

Mexico (San Luis Potosi), *Pringle* 3921.

31. (13). **CENCHRUS** L. Sp. Pl. 1049 (1753). Linn. Coroll. Gen. 20 (1737). *Rarem* Adans. Fam. 2: 35 (1763). *Echisachys* Neck. Elem. 3: 228 (1790).

Spikelets with one terminal perfect flower and sometimes a staminate one below it, not awned, single or 2-3 together within an ovoid or globular involucre of numerous bristles, the inner ones usually broad and flattened, connected at the base and hardened around the fruit; the involucres sessile or pedicellate in a simple spike or raceme and falling off with the spikelets. Glumes 4, the outer one much smaller or minute, the second and third nearly equal or the second shorter; a palea and sometimes 3 stamens in the third floral glume of the perfect floret rather firm, but not so hard as in most species of *Panicum*. Styles mostly shortly united at the base. Grain enclosed, but not adherent to the glume and palea.

There are about 12 species of annuals or perennials, widely scattered over the warmer regions of the New and the Old World. Most of them are troublesome weeds on sandy land.

Cenchrus is perhaps most nearly related to *Pennisetum*, also related to *Chamæraphis* and *Panicum*.

- a. Spike cylindrical, burs containing 1 spikelet which is as long as the spines 1
- a. Spike cylindrical, burs containing 2 spikelets, blades conduplicate 2

- a. Spike cylindrical, burs containing 3-5 spikelets, with a row of barbed bristles below the spikes 3
 a. Burs 6-20 or more, 1 cm. long including spines. 4
 a. Burs 2-3, 2-3 cm. diam. including stout spines 5

1. **C. myosuroides** H. & K. Nov. Gen. et Sp. 1: 115, t. 35 (1815). *Pennisetum myosuroides* Spreng. Syst. 1: 303 (1824).

An erect, robust perennial, sparingly branched, 60-180 cm. high; culms smooth and hard. Sheaths smooth, rather loose, about the length of the internodes; ligule a fringe of hairs; blades 30-40 cm. long, about 10 mm. wide, flat or involute, scabrid above and below, the apex long drawn out. Spike dense, usually wholly exserted, cylindrical, 12-20 cm. long. Involucre a wide row of erect spines and bristles placed around the margin of the broad apex of a short pedicel. Spikelets single, as long as the spines, ovate-lanceolate, 5 mm. long, first glume 9-nerved, second 5-nerved, third (palea) present; floral glume of the fertile floret 5-nerved, its palea 2-3-nerved.

Mexico, *Pringle* 429, *Palmer* 765; Lower California, *Palmer* 327.

Wet land, Florida to Mexico.

2. **C. incertus** M. A. Curt. Bost. Journ. Nat. Hist. 1: 135 (1837). *C. strictus* Chapm. Coult. Bot. Gaz. 3: 20 (1878).

A smooth, nearly simple erect grass, 45-90 cm. high. Lower sheaths longer than the internodes; ligule very short; blades conduplicate, 2-3 mm. wide. Spikes cylindrical, 5-8 cm. long, involucre at the base for 2-3 mm., the large spines 6-12 in number, 4-6 mm. long, ciliate. Spikelets in pairs, smooth, the sterile one bearing 3 stamens. Sandy coast.

Mississippi, *Tracy*; Florida, *G. V. Nash* 288.

3. **C. echinatus** L. Sp. Pl. 1050 (1753).

An ascending annual, 30-60 cm. high. Sheaths loose, about the length of the internodes; ligule ciliate; blades flat, rough above, often 25 cm. long, 10 mm. wide. Spike cylindrical, 5-12 cm. long. Involucre about the length of the spikelets, many-lobed, downy, lobes lanceolate-acuminate, spiny above, with a row of rigid

barbed bristles above the base: heads 5-6 mm. long, beside the spines, containing 3-5 spikelets. Spikelets ovate-lanceolate, 5 mm. long, first glume 4 mm. long, 5-nerved, second like it only a little shorter: palea 5 mm. long, 2-nerved, containing 3 stamens: fertile floret ovate-lanceolate, acuminate, 4 mm. long or more.

“Variable in the length of the spike, the size of the spikelets, the length of the lowest glume, the number of glume-nerves, and in the development of the palea in staminate or neutral flower.” Grisebach's Flora of the West Indies.

North Carolina to Florida and Texas, West Indies, Mexico to Brazil, tropical Africa, East Indies.

4. *C. tribuloides* L. Sp. Pl. 1050 (1753). BUR-GRASS. SAND-BUR. HEDGE-HOG-GRASS. *C. Carolinianus* Walt. Fl. Car. 79 (1788).

A branched ascending annual, 30-60 cm. high. Sheaths loose, about as long as the internodes; ligule ciliate; blades linear, flat or conduplicate, about 10 cm. long, 5 mm. wide. Spike usually oblong, with 6-20 spherical heads about 6 mm. long, besides the spreading barbed spines; heads more or less downy. Spikelets 2-3 in each head, ovate, 5-7 mm. long, first and second glumes subequal, 5-nerved and 3-nerved respectively, third glume (palea of the neuter floret) hyaline, 2-nerved; fertile floret ovate, briefly acuminate, about 5 mm. long.

New Jersey, *U. S. Dept. Agricul.* 122, identified by Vasey and Scribner; Michigan, *Cooley*; Illinois, *Beal* 25.

Number 349, of *Dr. E. Palmer*, Sonora, Mexico, is a more slender plant, the heads scarcely more than half the size of



c



b



A

FIG. 29.—*Cenchorus tribuloides*. A. Spiny spike; b, same in section; c, spikelet. (Scribner.)

the preceding, spikelets much smaller, fertile floret 3 mm. long. This corresponds with the remark of Grisebach in his Flora of the West Indies. "All West Indian specimens agree in the small size of the spikelet, while in the northern, original form, the spikelets are usually twice as large; the species, however, is as variable as the preceding (*C. echinatus* L.) and often difficult to be distinguished from it."

A plant from Mobile, Ala., sent by Dr. C. Mohr, is no doubt *C. incertus* Curtiss. The second glume is 5-nerved, third glume or palea of the lower floret contains a staminate flower. Most likely *C. incertus* Curtiss, also *C. pauciflorus* Benth., should be included in the above variable species.

A troublesome weed on sandy lands found from New England to California, West Indies, Mexico, Brazil, Africa, East Indies.

5. *C. Palmeri* Vasey, Proc. Cal. Acad. (II.) 2: 211 (1889).

Annual; culms rather slender, geniculate, branching, about 30 cm. high. Sheaths loose, about as long as the internodes; ligule hairy; blades numerous, rough, flat, 10. cm. long, 5-8 mm. wide. Peduncles exserted, bearing 2-3 twinlike downy burs 2 cm. long, including the stout spines before they are bent and hardened, each bur including 5-7 spikelets. Spikelets ovoid, acute, 6 mm. or more long; first and second glumes alike, ovate-cuneate, obtuse, truncate or irregularly divided with 5 strong green nerves; palea of the staminate flower about the length and shape of the empty glumes, 2-nerved; floral glume of the fertile floret oval, as long as the empty glumes, acuminate with 7 prominent nerves, its palea with 2 strong nerves. When mature the burs are often 3 cm. diam. from the tips of the stout spines. Spines yellow or black.

Lower California, *Palmer* 689; Mexico, *Palmer* 271.

Abundant on sandy bottoms, where it must be a formidable nuisance to man and beast.

32. (14). **PENNISSETUM** Rich. Pers. Syn. 1: 72 (1805). *Penicillaria* Wild. Enum. Hort. Berol. 1036 (1809). *Gymnothrix* Beauv. Agrost. 59, t. 13, f. 6 (1812). *Catatherophora* Steud. Flora, 12: 465 (1829). *Pentastachya* Hochst. Steud. Nom. Ed. 2,

2: 299 (1841). *Sericura* Hassk. Flora, 25 (1842). *Beckeropsis* and *Eriochaeta* Fig. & De Not. Mem. Acc. Torin. (II.) 14: 365, 374 (1854). *Macrochaeta* Steud. Zoll. Syst. Verz. Ind. Archip. 60 (1854). *Amphochaeta* Anderss. Vet. Akad. Handl. Stockh. 1853, 136 (1855).

Spikelets 2-flowered, the lower neuter or staminate, the terminal one perfect or pistillate, solitary or 2-3 together, sessile or nearly so, each one enclosed in an involucre of several usually numerous simple or plumose bristles (probably awnlike branches of the panicle), the involucres crowded in a spike or spikelike simple panicle falling off from the main rachis with the spikelet and short peduncle, the outer glume shorter or minute, short or nearly equal to the floral glume, the palea of the sterile floret smaller, fertile floret sometimes more or less hardened. Stamens 3. Styles distinct or united near the base. Grain enclosed, but not adherent.

Annuals or perennials; blades flat.

There are about 40 species, mostly found in Africa, a few in Asia near the Mediterranean, two in Australia, two or three in tropical America. Some are cultivated as ornamental grasses.

It has been at various times proposed to separate several genera from it. *Gymnothrix* was proposed as a genus for those species in which the bristles are perfectly glabrous, but this is not a constant character.

- a. Bristles not plumose. (b)
- b. Bristles mostly shorter than the spikelets. 1, 2
- b. Bristles mostly as long as the spikelet, plant 120-150 cm. high. 3
- b. Bristles mostly 2-3 times as long as the spikelets. 4
- b. Bristles some shorter some longer than the spikelet. 5, 6
- a. Bristles more or less plumose. (c)
- c. Bristles as long as the spikelet. 7
- c. Bristles very much longer than the spikelets. 8

1. *P. durum*. *P. crinitum* Scribn. ined.

A tufted glaucous perennial, 60-120 cm. high. Sheaths loose; blades smooth, long-pointed, 30-40 cm. long, 7-10 mm. wide.

Spikes exerted, interrupted below, 7–15 cm. long, 8 mm. diam., bristles all simple (not plumose), all shorter than the single spikelet or one of them longer. Spikelet elliptical, acute, about 7 mm. long, first and second glumes ovate, 1-nerved, the former about 2 mm. long, the latter 3 mm. long; floral glume of the neuter floret acute, 4–6 mm. long, 4–5-nerved, its palea about 1 mm. long; fertile floret acute, 5–6 mm. long, the glume 5-nerved. Grain obovate, 2 mm. long.

Mexico, *Pringle* 489, 817. The name given by Scribner had been used by Spreng and is a synonym for *Setaria purpurea*.

Found under cliffs of ledges.

2. *P. multiflorum* Fourn. Hems. Biol. Centr. Am. Bot. 3: 508 (1880).

Culms erect, solid, 30–40 cm. high. Sheaths smooth or scabrous; ligule a fringe of hairs; blades flat, scabrous or hispid, 30–40 cm. long, 5–8 mm. wide. Spikes exerted, 9–15 mm. long, 10–12 mm. diam. Involucre consisting of about 20 pectinate bracts, all a little shorter, or some of them as long or some longer than the 5 spikelets, except one that is larger; many smaller bristles below. Spikelets ovoid-lanceolate, about 6 mm. long, first glume ovate, 1-nerved, 3 mm. long, second ovate acute, 5-nerved, 5–6 mm. long; floral glume of neuter floret 5-nerved, 5.5 mm. long, that of the terminal floret a little longer.

Mexico (Jalisco), *Pringle* 3848.

Wet slopes of Barranca near Guadalajara.

3. *P. LATIFOLIUM* Spreng. Syst. 1: 302 (1824). *Gymnothrix latifolia* Schult. Mant. 3: 601 (1824).

Culms stout and tall, branching above, 120–150 cm. high, the nodes clothed with short hairs. Leaf-blades flat, 30–60 cm. long, 2–3 cm. wide, narrowed into a petiole, midrib prominent, white. Spikes 4–6 cm. long, protruding from the upper sheaths, involucre consisting of about 20 simple bristles as long as the spikelets, and one bristle much longer (15 mm. long). Spikelets linear-lanceolate, not far from 6 mm. long, first glume 1 mm. long, second ovate-acute, 3-nerved, 2–3 mm. long; floral glume of the neuter

floret ovate-lanceolate, 5-nerved, 7 mm. long; floral glume of the terminal floret 5-nerved, 5-6 mm. long.

Sometimes cultivated as an ornamental plant.

South America.

4. **P. cenchroides** Rich. Pers. Syn. 1: 72 (1805). *Gymnothrix cenchroides* R. & S. Syst. 2: 499 (1817).

Culms slender, geniculate, branching below, 30-60 cm. high. Sheaths about half as long as the internodes; ligule ciliate; blades flat, smooth or nearly so, 8-12 cm. long, 3-5 mm. wide. Spike dense, exserted, ovate, 2-4 cm. long, the involucre usually containing 2-3 spikelets, consisting of simple spreading bristles below, and erect plumose bristles united more or less at the base, the latter 2-3 times as long as the spikelets. Spikelets ovate-lanceolate, 4-5 mm. long, first glume thin, ovate, 1-nerved, almost 2 mm. long, second a little longer, 1-3-nerved; floral glume of staminate spikelet broad-ovate, with 5 prominent nerves, its palea ovate, nearly as long; floral glume and palea of terminal floret much like those of the lower floret, only a little longer.

Plant from the U. S. Dept. Agricul. grown from seed from Mexico.

5. **P. Mexicanum** Hemsl. Biol. Centr. Am. Bot. 3: 508 (1880). *Gymnothrix Mexicana* Fourn. Mex. Pl. Enum. Gram. 48 (1886).

Culms smooth, 90-120 cm. high from a branching base. Ligule a mere ring; blades scabrous above, long-pointed, 40-50 cm. long, 10-15 mm. wide. Spikes terminal, partially enclosed at the base, yellowish white or light straw-color, 20 cm. long, 1 cm. diam., bristles of the involucre 17-25, some shorter, some as long as the spikelet, and some longer; one of them 10-15 mm. long. Spikelets solitary, linear-lanceolate, 5 mm. long, first glume cuneate-ovate, obtuse, 1-nerved, 2 mm. long; second and third equal, linear-lanceolate before spreading, 5-nerved; floral glume of fertile floret hyaline, otherwise much like the second and third glumes; palea of the lower neuter floret short, of the fertile floret 3.5 mm. long.

Mexico, *Palmer* 514, *Pringle* 4316.

6. **P. bambusiforme** Hemsl. Biol. Centr. Am. Bot. 3: 507 (1880).

A reedlike grass 1-2 m. or more high, culms hard. Ligule a fringe of hairs; blades flat, long-pointed, some of the upper 20-30 cm. long, 2 cm. wide. Panicle of spikes 60-90 cm. long, consisting of 100 or more spikes which are 3-6 cm. long, 10-15 diam. Bristles of the involucre 5-15 mm. long, 25-40 in number surrounding each spikelet. Spikelet linear-lanceolate, 5 mm. long, first glume minute, second 1.5 mm. long, third as long as the floret, 5-nerved.

Mexico, *Pringle* 6075.

Rocky slopes of Mexico.

7. *P. setosum* (Sw.) Rich. Pers. Syn. 1:72 (1805). *Cenchrus setosus* Sw. Fl. Ind. Occ. 1:26 (1797). *P. purpurascens* H. B. K. Nov. Gen. et Sp. 1:113 (1815).

Perennial; culms branching, 90-120 cm. high. Sheaths smooth; ligule ciliate; blades rough or glabrous, 20-50 cm. long, 10 mm. wide. Spike scarcely exerted, cylindrical, dense, about 8-15 cm. long, 1 cm. diam., bristles often as long as the single spikelet, with one or more 2-3 times as long, plumose below. Spikelet linear-ovate, 4 mm. long, first glume delicate, 2 mm. long, second and floral glume of the neuter floret equal, delicately 5-nerved, the former ovate-cuneate, the latter oval, obtuse, emarginate, or irregularly toothed, palea of the lower floret 3 mm. long, 2-nerved; fertile floret smooth, narrowly ovate, 2.5 mm. long, floral glume delicately 7-nerved, its palea obtuse, truncate, fringed.

Mexico (Jalisco), *Palmer* 677.

Florida, Mexico, West Indies, Brazil, tropical Africa, East Indies.

8. *P. LONGISTYLUM* Hochst. Flora, 24:1 (1841). I. Intell. 19, name only.

Culms branching, erect, 90-120 cm. high, from a branching rootstock. Sheaths smooth, shorter than the internodes; ligule ciliate; blades flat, hispid, 30-40 or more cm. long, 3-5 mm. wide. Spikes dense, exerted, ovate or oblong, 5-12 cm. long, the short stipes covered with stiff hairs 1-2 mm. long, involucre surrounding a single spikelet, 3-4 cm. long, the bristles plumose for one-third their length, the purple styles projecting for 15 mm. Spikelets

lanceolate, 10 mm. or more long, first glume 1 mm. long, second acuminate, 1-nerved, 3-4 mm. long; floral glumes of both florets ovate-lanceolate, about 10 mm. long, 7-9-nerved; palea but little shorter.

Sometimes cultivated as an ornamental grass.

Abyssinia.

33. (21). **STENOTAPHRUM** Trin. Fund. Agrost. 175 (1820).
Diastemanthe Steud. Syn. Pl. Gram. 360 (1855).

Spikelets with one terminal perfect flower and a staminate or neuter one below it, usually 2-4 together in very short spikes embedded in the alternate notches of the broad rachis of a spikelike panicle, the rachis of the partial spike usually extending as a short point beyond the base of the terminal spikelet, the common rachis often breaking into pieces when mature. The first empty glume very small, the second empty, and the largest membranous, but rigid, 3-5-nerved; floral glumes of both florets rather smaller, with the nerves less prominent, and of a somewhat firmer texture; palea similar. Styles distinct. Grain enclosed, but not adherent.

Grasses with a creeping habit. There are two or three species widely spread over tropical and subtropical regions of the Eastern and the Western Hemispheres.

1. **S. secundatum** (Walt.) Kuntze, Rev. Gen. Pl. 794 (1891).
Ischæmum secundatum Walt. Fl. Carol. 249 (1788). *S. Americanum* Schrank, Flor. Monac. t. 98 (1811-18). *Diastemanthe platystachys* Steud. l. c. *Rottbællia compressa* Beauv. Agrost. 109 (1812).

A glabrous ascending perennial grass, about 30 cm. high. Culms slightly flattened. Sheaths compressed, loose; ligule a ciliate ring; blades obtuse, flat or involute, 10-15 cm. long, 5-7 mm. wide. Spikes solitary and terminal, 5-7 cm. long, convex on both sides or elliptical in cross-section, axis slightly flexuose, 4 mm. wide. Spikelets 2 or 3 together on angular branches, sessile, oval-oblong, acute or acuminate, 4 mm. long, the partial rachis reaching nearly to the top of the spikelets.

Florida, *Garber*, *Curtiss* 3621; Louisiana, *Langlois*; Cuba, *Wright* 3490.

Found along the coast in the Southern States, also in the West Indies, Mexico, Buenos Ayres, Sandwich Islands, Australia.



FIG. 30.—*Stenotaphrum secundatum*. A, portion of spike; a, spikelet.

34. (25). **OLYRA** L. Syst. Ed. 10. 1261 (1759). *Mapira* Adans. Fam. 2: 39 (1763). *Lithachne* Beauv. Agrost. 135, t. 24, f. 2 (1812). *Raddia* Bertol. in opusc. Sc. Bologn. 3: 410 (1819). *Strephium* Schrad. Nees, Agrost. Bras. 298 (1829).

Spikelets 1-flowered, monœcious in panicles, those which are staminate, on the lower portion of the panicle or in separate panicles, destitute of empty glumes, floral glume narrow and acuminate, 1-nerved, palea 2-nerved, nearly as long as its glume. Stamens 3. Pistillate spikelets usually in the upper portion of the panicle, ovate; empty glumes herbaceous, pointed or awned, equal, or the first longer; floral glume and palea much shorter, obtuse, cartilaginous. Stamens 0. Styles 2, united at the base. Grain firmly enclosed, but not adherent. Blades of the leaves broad, netted-veined, often borne on short petioles; panicles terminal or axillary.

Species about twenty; one of them belongs to tropical Africa, the others to tropical America. Some authors reduce nearly all of the species to varieties of *O. latifolia*.

1. *O. latifolia* L. l. c. *O. paniculata* Sw. Obs. Bot. 347 (1791).

Culms hard, branched. Leaves more or less puberulent; sheaths shorter than the internodes; ligule a mere ring; blades flat, ovate-oblong to ovate-lanceolate, 7-14 cm. long. Panicles terminal or axillary, simple, oval, 10-17 cm. long, rays scattered or in threes to sevens, rather stout. Fertile spikelets ovoid, acuminate, empty glumes with involute tips; first 11-13-nerved, 7-12 mm. long,

with the beak 5–8 mm. long, second 7-nerved; floret ellipsoidal, 5 mm. long, shining, hard, of a dull ivory color.

Mexico, *Pringle* 3795. Also found in Cuba, Trinidad, Central America to Brazil.

TRIBE VI.—ORYZEÆ.

Spikelets laterally compressed, with one terminal perfect or unisexual flower, enclosed by a floral glume and palea, the latter usually 1-nerved. Empty glumes two or more, very seldom numerous. Stamens frequently six. Stigmas more or less elongated. Grain usually with a small embryo and long, linear hilum.

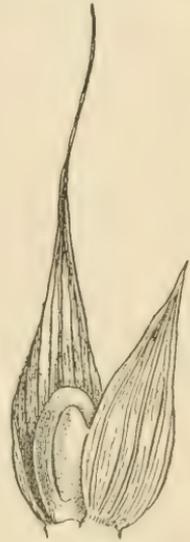


FIG. 31.—*Olyra latifolia*.
Pistillate spikelet.

The close affinity of Oryzeæ and Phalarideæ has often been recognized. The essential character of both resides in having the scale immediately under the single terminal perfect flower keeled or 1-nerved, like the glumes, so as to make it uncertain whether it is a glume or palea,—that is, whether it is attached to the rachis or primary axis of the spikelet, or to a secondary or floral axis reduced to a mere point. Bentham considers the scale in question a floral glume, and considers the palea as deficient. With this view the Oryzeæ have 2–4 or rarely 3 glumes, all above the articulation of the pedicel, and the Phalarideæ 4–6 or rarely 5 glumes, the lowest pair persistent below the articulation of the rachilla.

- A. Plants monœcious; anthers six or more.
 - a. Spikes terminal and axillary, the former pedunculate and staminate, the latter sessile. 35
 - a. Inflorescence paniculate. (b)
 - b. Spikelets in pairs at each node of the branches of the panicle, one sessile and pistillate, the other smaller pedicellate and staminate; floral glume linear-oblong. 36

- b. Spikelets not in pairs; empty glumes none. . . . (c)
- c. Pistillate spikelets all above the staminate in the panicles, linear, subterete, embryo as long as the grain. 38
- c. Pistillate spikelets terminal and the staminate at the base of each branch of the panicle; grain subcompressed, ovate, embryo much shorter. . . . 39
- c. Staminate and pistillate spikelets in separate panicles, rarely in the same, when the staminate are terminal. 37
- B. Spikelets in panicles, all perfect, much compressed. . . (e)
- e. Empty glumes two; floral glumes often awned. . . . 40
- e. Empty glumes none or minute, floral glume awnless. . . 41

35. (39). **HYDROCHLOA** Beauv. Agrost. 135, t. 24, f. 4 (1812).

Spikelets small, unisexual, monoëcious, spicate, the staminate terminal, the pistillate axillary. Glumes 2, slightly unequal, membranous, concave, awnless, the lower one a little the larger; palea 0. Stamens 6. Styles short, distinct, sublateral; stigmas elongated, shortly plumose. Grain included by the glumes, but not adherent. A slender, branching grass, floating or creeping, with flat and narrow leaf-blades. The peduncle terminal, slender, the staminate spikelets few (3-5), towards the apex, subsessile. The pistillate spikelets subsessile in the upper axils, few-flowered, slightly protruding from the sheath of the upper leaf, the stigmas protruding for some distance beyond the glumes. Seed flat, oval, with a thin translucent ridge on one side, loose in the brittle pericarp. Only one species, which is found in the southeastern part of the United States.

It differs from *Zizania* chiefly in the reduction of the 2- to few-flowered spikes, of which the terminal one is staminate and pedunculate, the lower one pistillate and sessile in the axils.

1 **H. Carolinensis** Beauv. l. c.

An aquatic, 20-60 cm. high; leaf-blades 2-3 cm. long; very seldom bearing good flowers.

Infrequent. North Carolina to Florida, July and August.

36. (26). **PHARUS** P. Br. Hist. Jamaic. 344 (1756).

Spikelets 1-flowered, monœcious, in pairs on a spreading panicle; one pedicellate and staminate, the other sessile and pistillate. The two empty glumes membranous, many-nerved, the floral glume in the staminate spikelets membranous, in the pistillate coriaceous. Stamens 6. Stigmas 3. Grain enclosed, but not adherent. Leaf-blades petioled, broad with many straight nerves gradually diverging from a midrib. The pistillate spikelets 2-3 times as long as the staminate.

There are thought to be 5 species, belonging to tropical America, from Florida to Brazil.

1. **P. glaber** H. B. K. Nov. Gen. et Sp. 1:196 (1815). *P. latifolius* Trin. Griseb. Fl. Brit. Ind. 536 (1864).

Culms 40-90 cm. high. Leaf-blades lanceolate-oblong, acuminate, 15-30 cm. long, 3-6 cm. wide, small transverse nerves numerous. Panicle spreading, 25 cm. long. Staminate spikelets on pedicels as long as the pistillate spikelets or shorter, oval, about 3 mm. long, glumes thin and brittle; pistillate spikelets linear, acute at both ends, 13 mm. long, first and second glumes nearly equal, 5-6 mm. long, 3-5-nerved; fertile floret villous, the floral glume involute, enclosing a narrow, 2-nerved palea of its own length.

Southern Florida, West Indies, Venezuela. Brazil.

37. (41). **LUZIOLOA** Juss. Gen. Pl. 33 (1789). *Caryochloa* Trin. Diss. 2: 54 (1826). *Arrozia* Schrad. Kunth, Enum. Pl. 1:11 (1833).

Spikelets ovate, small, unisexual, monœcious, 1-flowered, subses-

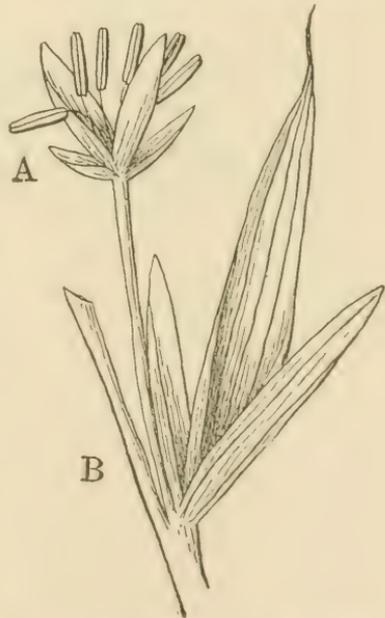


FIG. 32.—*Pharus glabra*. A, staminate spikelet; B, pistillate. (Richardson.)

sile or pedicellate on the jointless branches of the jointed panicle. Staminate spikelets with 2 glumes that are narrow, membranous, awnless, the outer one broader and empty, the inner floral one narrower, but scarcely shorter; palea 0. Stamens 6-18. Pistil rudimentary or 0. Pistillate spikelets smaller than the staminate, the outer glume broader and apparently many-nerved. Staminodia 0. Styles short, distinct, with simple plumose stigmatic hairs. Grain ovoid, loosely enclosed in the membranous glumes. Seed plano-convex, free from the pericarp. Creeping or floating grasses, low or tall, with flat blades. Panicles terminal or axillary, spreading, with filiform rays.

Nearly allied to *Zizania*, but the spikelets are smaller, not awned, the styles short, distinct, and there are usually more than six stamens to the flower.

Species six, all American.

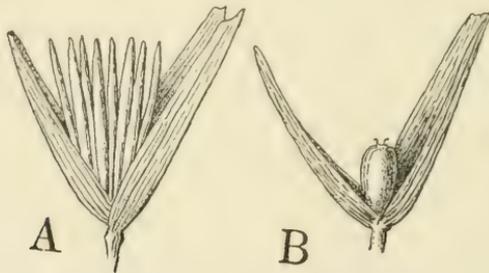


FIG. 33.—*Luziola Alabamensis*. A, staminate spikelet; B, pistillate spikelet. (Richardson.)

1. *L. Alabamensis* Chapm. Fl. S. States, 584 (1860).

Culms 5-15 cm. high, branching near the base, from a creeping rhizoma. Leaf-blades flat, smooth, the upper partially included by the purple sheath of the one below. Base of panicle often included in the sheath. Spikelets ovate-lanceolate, shorter than their pedicels. Glumes of staminate spikelets lanceolate, 7-nerved: those of the pistillate broader, 11-13-nerved, twice the length of the smooth mature grain.

Alabama.

2. *L. Peruviana* J. F. Gmel. Syst. 637 (1778).

Culms 30 cm. high, branching from a creeping rhizoma. Leaf-blades flat, smooth. Base of panicle scarcely above the sheath. Spikelets lanceolate, generally equal in length to the pedicels. Outer glume of staminate spikelet 7-nerved, 6 mm. long; inner glume 9-nerved, emarginate; glumes nearly equal; pistillate spikelets 50-80. Panicles about the size of the former species, glumes much alike, 7-nerved, and half as long as those of the staminate spikelets.

Florida, Mexico, to Brazil.

38. (40). **ZIZANIA** L. Sp. Pl. 991 (1753). WILD RICE. INDIAN RICE. WATER-OATS. *Hydrophyllum* Link, Hort. Berol. 1:252 (1827). *Melinum* Link, Handb. 1:96 (1829).

Spikelets narrow, monœcious, 1-flowered, sessile or with short pedicels on the jointed branches of the jointed panicle. Glumes 2, surrounded at the base by a more or less prominent cartilaginous ring, slightly unequal, membranous, convolute, concave or slightly compressed, the outer broader, acute, or in the pistillate spikelet awned and empty, the inner floral glume scarcely shorter, and awnless; palea 0. Stamens 6. Styles more or less joined at the base, stigmatic hairs simply plumose. Grain included by the membranous glumes, but not adherent. A large aquatic grass with long flat inequilateral leaf-blades. Panicle terminal, ample, loosely flowering, having numerous long slender rays.

One well-known species found in North America. An imposing plant with a subtropical aspect.

1. **Z. aquatica** L. Sp. Pl. 991 (1753). WILD RICE.

Melinum palustre Link, l. c. *Z. palustris* L. Mant. 2:295 (1771). *Z. clavulosa* Michx. Fl. Bor. Am. 1:75 (1803). *Hydrophyrum esculentum* Link, Hort. Berol. 1:252 (1827).

Z. latifolia Griseb. Turcz. Bull. Soc. Nat. Mosc. 105 (1838).

Annual; 1-4 m. high, culm hollow with numerous delicate transverse partitions within the internodes. Ligule acute, 1 cm. long; lower blades 0.4-1 metre long, with winged petioles, upper broad at the base. Lower part of the pyramidal panicle staminate, spreading; the upper part pistillate, erect; pedicels slender, clavate, outer

glume with a rough awn 2 mm. long. Outer glume of the staminate flowers 5-nerved, inner 3-nerved. Styles stout, united for one-

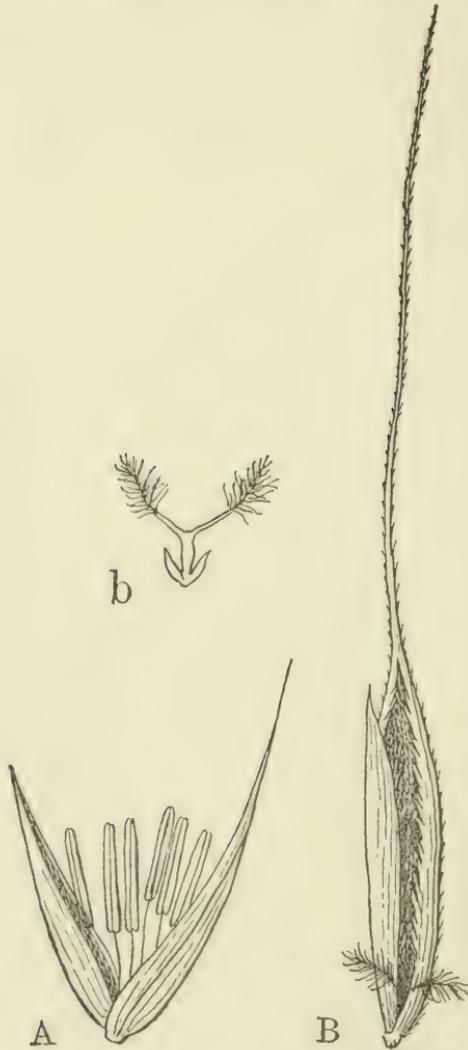


FIG. 34.—*Zizania aquatica*. A, staminate spikelet; B, pistillate spikelet; b, pistil. (Richardson.)

third of their length, diverging. Grain slender, dark brown, linear, 10–15 mm. long. Seed adherent to the thin pericarp.

Common northward in shallow lakes and in the borders of slow streams, also found in Siberia and Japan. Quality of grain fully equal to the common rice, but dark in color; more difficult to collect, as the grain drops, a few kernels at a time, as soon as ripe. Gathered by Indians; attractive to water-fowl. At the South it is cut for hay, offering two large crops in one season.

Vermont, *Pringle*; Ontario, *Fowler*; Michigan, *Clark* 688; Wisconsin, *Beal* 26; South Dakota, *Duffey*.

39. (40). **ZIZANIOPSIS** Döell. & Aschers. Mart. Fl. Bras. 2: Part 2, 12 (1871).

Perennial with much the habit of *Zizania*. The pistillate spikelets terminating the branches of the panicle. Styles united for three-fourths of their length. Grain not adherent to the glumes, hard, ovoid, smooth, shining. Seed easily separating from the pericarp, with 3 vertical ridges. Internodes destitute of transverse partitions.



FIG. 35.—*Zizaniopsis miliacea*. Pistillate spikelet. (Richardson.)

One species with two varieties found in the Southern States and extending to Brazil.

1. **Z. miliacea** (Michx.) Döell. & Aschers.; Baill. Hist. Pl. 12:

293 (1893). WILD RICE. *Zizania miliacea* Michx. Fl. Am. Bor. 1: 74 (1803).

Culms 0.5–3 m. high; blades narrower than those of *Zizania aquatica*. Outer glumes 7-nerved, terminating in a short awn, inner glumes 3-nerved, acute.

Florida, *Scribner* 3665; Louisiana, *Langlois*; Texas, *Nealley*.

40. (44). **ORYZA** L. Syst. Ed. 1 (1735). RICE. *Padia* Zoll. & Mor. Syst. Verz. Pfl. Zoll. 103 (1846).

Spiklets 1-flowered, flat, articulate on short pedicels or sessile along the flexuose branches of a terminal panicle. Glumes 4, 2 outer ones very small, lanceolate, 2 inner ones complicate and keeled, coriaceous, the outer one the largest, 3–5-nerved; no 2-nerved palea. Stamens 6. Styles short, barely united at the base. Grain oblong or narrow, enclosed in the hardened almost coherent upper glumes, but free from them. Pericarp thin, flexible, and, when wet, easily separating.

Large marsh cereal grasses with long flat, slightly inequilateral leaf-blades. Spikelets covered with minute scars.

There are 5–20 species, or possibly all belong to one variable species. Found in the East Indies and Australia; a cereal much cultivated in warm countries, where the land is wet or at certain times inundated.



FIG. 36.—*Oryza sativa*. Spikelet. (Richardson.)

1. *O. SATIVA* L. Sp. Pl. 333 (1753). RICE.

Stems with the base creeping or floating, ascending, 60–120 cm. high. Ligule often 2.5 cm. long, on the lower leaves, scabrid and jagged; blades long and rather broad, very scabrous, especially on the upper side. Panicle narrow, erect, 15–30 cm. long. Spikelets ovate-oblong, 7–10 mm. long. Upper glumes very prominently nerved, the keels usually ciliate, the outer one with 1 nerve on each side, beside the nerve-like margin, closely embracing and almost connate with the inner glume, which is as long, but narrower, with only 1 nerve on each side near the thin margin, both glumes either shortly awned or, in some cultivated varieties, awn-

less, or the outer one with a straight awn, 1-10 cm. long and the inner with only a short point.

Rice feeds more people than any other grain, excepting sorghum.

41. (45). **HOMALOCENCHRUS** Mieg, Hall. Hist. Stirp. Helv. 2: 201 (1768). FALSE RICE. WHITE GRASS. *Leersia* Soland. Sw. Prod. Veg. Ind. Occ. 21 (1788). *Ehrhartia* Wigg. Prim. Holsat. 63 (1780).

Asprella Schreb. Gen. Pl. 45 (1789), not Willd.

Endodia Rafin. Neogenyt. 4 (1825).

Brepharochloa Endl. Gen. Pl. 1352 (1841).

Pseudoryza Griff. Ic. Pl. Asiat. t. 144 (1847).

Laertia Gremow, Trautv. in Act. Hort. Petrop. 9: 354 (1884).

Spikelets 1-flowered, flat, articulate on short pedicels along the slender branches of a terminal panicle. Glumes 2, complicate and keeled, the outer the larger, surrounded at the base by a cartilaginous ring, which is often obscure; outer glume 5-nerved, broadly wing-keeled or with the margins ciliate, the inner 3-nerved. No 2-nerved palea. Stamens 6, 3, or fewer. Styles short, distinct. Grain enclosed in the slightly hardened glumes, but not adherent.

Marsh grasses, with narrow leaf-blades which quickly close when warm, if briskly rubbed. The main nerve one side of the middle of the blade. Panicle terminal, slender, with erect filiform rays. Spikelets smaller, more slender, and nearer together than in *Oryza*, and in *H. lenticularis* almost imbricate. Nerves of the glumes not very prominent.

Six or more species, five at least common to America. Nearly allied to *Oryza*, though having thinner glumes, a different inflorescence, and no small outer glumes.

The old and long-used name *Leersia* was first used to designate a genus of mosses, and therefore should not be used for any other plant.

Spikelets lance-oblong, 3 mm. long, scarcely imbricate.	1
Spikelets oval, 5 mm. long, imbricate.	2
Spikelets broad-oval, 6 mm. long, closely imbricate.	3

Spikelets lanceolate-oblong, 3.5 mm. long, loosely imbricate. 4
 Spikelets semiovate, 1.5 mm. long. 5

1. **H. Virginicus** (Willd.) Britton, Trans. N. Y. Acad. Sci. 9:14 [reprint 13] (1889). WHITE RICE. *Leersia Virginica* Willd. Sp. Pl. 1 : 325 (1797).

L. Virginica Michx. Fl. Bor. Am. 1:37 (1803).

Asprella Virginica R. & S. Syst. 2:266 (1817).

Culms 40-70 cm. high, often nearly smooth. Rootstocks 5 mm. diam., covered with closely imbricated scales. Leaf-blades 5-12 cm. long. Spikelets linear-oblong, 3 mm. long, scarcely imbricate, in slender simple panicles, the compressed floral glume curving to one side, becoming concave next to the axis, to which it is closely appressed; floral glume and palea ciliate. Stamens 2.

Michigan, *Cooley, Clark* 686, *Beal* 27, 28; North Carolina, *McCarthy*; Minnesota, *Holzinger* 12; South Dakota, *Duffey*; Texas, *Reverchon* 1036.

Wet woods, Canada to Florida and westward.

2. **H. oryzoides** (L.) Miég, Poll. Hist. Pl. Palat. 1:52 (1776). RICE-CUT GRASS. RICE'S COUSIN.

Phalaris oryzoides L. Sp. Pl. 55 (1753). *Ehrhartia clandestina* Wigg. Fl. Holsat. 695 (1780). *Asprella oryzoides* Lam. Ill. 1:167 (1791). *Leersia oryzoides* Sw. Fl. Ind. Occ. 1:21 (1797). *Oryza clandestina* A. Br. Asch. Fl. Brand. 799 (1864).

Culms 60-150 cm. high. Rootstocks narrow, with internodes 2-3 cm. long. Leaf-blades 15-20 cm. long, 10-25 mm. wide, supplied with stout recurved prickles. Panicles 15-20 cm. long, with callous glands inside the base of the rays. Spikelets oval, flat, somewhat ciliate, 5 mm. long. Stamens 3.

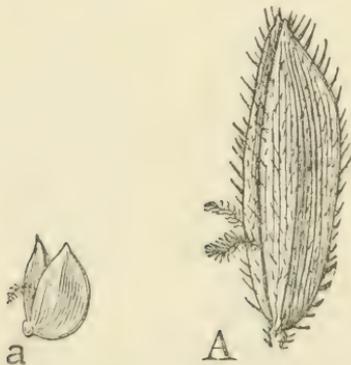


FIG. 37.—*Homalocenchrus oryzoides*.

A, spikelet; a, floret. (Scribner.)

Michigan, *Clark* 687, *Beal*, 27, 29; Ontario, *Fowler*; California, *Parish* 1752, *Sones* for M. A. C. 28.

Wet places, somewhat common; also found in South America, Europe, and Asia.

3. **H. lenticularis** (Michx.) Kuntze, *Rev. Gen. Pl.* 777 (1891). CATCH-FLY GRASS. *Leersia lenticularis* Michx. *Fl. Bor. Am.* 1:39 (1803). *Asprella lenticularis* R. & S. *Syst.* 2:267 (1817).

Culms stout, 60–100 cm. high, branching. Leaf-blades 15–20 cm. long, 10–13 cm. wide, smooth or with small recurved prickles. Panicle simple, 3–12 cm. long. Spikelets very flat, broadly oval, closely imbricate, 6 mm. long; floral glume and palea bristly ciliate. Stamens 2. A grass of striking appearance.

Wet grounds, Virginia, Illinois, and southward.

4. **H. hexandra** (R. & S.) Britton, l. c. *Asprella hexandra* R. & S. *Syst.* 2:267 (1817). *Leersia hexandra* Sw. *Prod.* 21 (1788).

Culms stout below, branching, 30–20 cm. high. Ligule of large plants 6 mm. long; blades narrow, firm. Panicle 15 cm. long, contracted, erect, simple. Spikelets lanceolate-oblong, ciliate, 3.5 mm. long, loosely imbricate. Stamens 6.

Lakes and ponds. Florida and westward. Buenos Ayres, Africa, East Indies, Australia.

5. **H. monandra** (R. & S.) Britton, l. c. *Leersia monandra* Sw. *Prod.* 21 (1788). *Asprella monandra* R. & S. *Mant.* 551 (1817).

Slender erect perennials, 30–50 cm. high. Leaf-blades flat or conduplicate, 12–15 cm. long, 5.3 mm. wide. Panicle exserted, about 10 cm. long, with 4–6 single spreading rays bearing spikelets beyond the middle. Spikelets smooth, pale green, mostly imbricate, broadly semi-ovate, pointed, 1.2–1.5 mm. long, glumes compressed, not winged-keeled, first 5-nerved and second 3-nerved. Stamen 1.

Texas, *Nealley* in 1888.

Florida, West Indies, Texas, Mexico.

DIVISION II.—POACEÆ.

Spikelets one to many-flowered, the rachilla often produced above the single or terminal flower; when more than one-flowered, the imperfect flower, if any, is uppermost (except *Hierochloë*); rachilla usually articulate above the lower glumes, which remain after the fall of the grain and floral glumes (except *Alopecurus*, *Cinna*, *Polypogon*, *Beckmannia*, *Thurbéria*, *Holcus*).

TRIBE VII.—PHALARIDÆ.

Spikelets each containing 1 perfect flower, or with 1-2 staminate flowers below; empty glumes usually 4; floral glume and palea alike, compressed, nerves one or none. Grain unfurrowed, embryo small.

The following notes concerning this tribe are adapted from Bentham:

The close affinity of this tribe and the *Oryzæ* has been generally admitted, and Bentham in his *Flora Australiensis* even proposed their consolidation. In common, the scale under the single perfect terminal flower is keeled and 1-nerved, so as to make it a matter of discussion whether it be a glume terminal on the main axis of the spikelet, or a palea at the base of a secondary floral axis. The deciduous part of the spikelet of *Phalaridæ* with its 4 glumes is precisely as in *Oryzæ*; but there are in addition, below the articulation, the 2 persistent empty glumes characteristic of *Poacæ*. The spikelet in this tribe consists of 6 glumes (or 5 and a palea), the lowest pair empty below the articulations; the second pair above the articulation, corresponding to the lowest 2 glumes of *Oryzæ*, 1 usually empty and small, sometimes reduced to a small bristle, rarely enclosing each a palea or male flower.

- A. Third and fourth glumes empty, reduced to small bristles, awnless. Plants not particularly fragrant. 42
- B. Third and fourth glumes equalling or exceeding the fifth. Plants particularly fragrant. (b)

- b. First glume about half as long as the second, third and fourth empty, awned on the back. 43
- b. First and second glumes subequal, third and often the fourth containing a staminate flower. 44

42. (102). **PHALARIS** L. Sp. Pl. 54 (1753). (CANARY-GRASS.)
Typhoides Moench, Meth. 201 (1794). *Baldingera* Gertn. Mey. & Schreb. Fl. Wett. 1:43 (1799). *Digraphis* Trin. Fund. Agrost. 127 (1820). *Endallex* Rafin. Ser. Bull. Bot. 1:220 (1830).

Spikelets 1-flowered, flat, densely crowded in an ovoid or cylindrical spike or spikelike panicle, the rachis articulate above the outer glumes. Glumes usually 6, two outer larger ones thin, complicate. 3-nerved, the keel sometimes winged, the third and fourth small, lanceolate or reduced to small bristles or one deficient, the fifth smaller, complicate, delicately 3-5-nerved, or apparently 4-nerved, the central nerve short and obscure, enveloping the sixth glume, which is also complicate, enclosing the flower, apparently 2-nerved, the external angle between the nerves longitudinally ciliate. No ordinary palea. Stamens 3. Styles distinct. Grain oblong, enclosed in the 2 upper glumes, but not adherent.

Annual or perennial grasses, with flat leaf-blades. Panicle either strictly spicate or in the form of a head, or having branches which form dense clusters.

There are ten species, found in Southern Europe, North Africa, and North America.

In this genus it is the lowest two persistent empty glumes that are the largest, the second pair very narrow, sometimes reduced to small bristles, those of the upper pair thin and hyaline; and sometimes in both of them the central nerve is very faint or quite obsolete, a character adduced as an argument that this upper one is a two-nerved palea on the floral axis, and not a glume on the main rachilla.

- A. Outer glumes with a broad-winged keel. 1, 2
- B. Outer glumes with a narrow-winged keel above the middle. 3
- C. Outer glumes not winged-keeled. (a)
 - a. Panicle short, dense. 4
 - a. Panicle slender or branching. 5

1. *P. CANARIENSIS* L. Sp. Pl. 54 (1753). CANARY-GRASS. *P. avicularis* Salisb. Prod. 17 (1796). *P. ovata* Mœnch, Meth. 208 (1794). *P. aquatica* Delile, Boiss. Fl. Orient. 5:471 ().

An erect leafy annual, 30–60 cm. high. Upper sheaths inflated; ligule 4 mm. long; blades 20 cm. long, 5–10 mm. wide. Spike ovoid, pale green, 4 cm. long. Spikelets nearly 6 mm. long. broadly ovate; lower glumes 5–6 mm. long, white, membranous, with 3 green nerves and a very broad or winged keel, third and fourth glumes lanceolate, half as long as the floral glume; floral glumes acute, three-fourths the length of the lower glumes, 5-nerved.

Massachusetts, *Beal* 30; District of Columbia, *McCarthy*; Michigan, *Clark* 4947; Dakota, *Duffey*; Arizona, *Toumey* 753.

Introduced from Europe. Raised for canary-birds.

2. *P. intermedia* Bosc. Poir. Encycl. Suppl. 1:300 (1810). SOUTHERN REED. CANARY-GRASS. GILBERT'S RELIEF-GRASS. STEWART'S CANARY-GRASS. CALIFORNIA TIMOTHY. *P. Carolini-*



FIG. 38. — *Phalaris intermedia*.
Spikelet. (Richardson.)

ana Walt. Fl. Car. 74 (1788). *P. angustata* Nees, Agrost. Bras. 2: 391 (1829). *P. microstachya* DC. Cat. Hort. Monsp. 131 (1813). *P. Americana* Ell. Bot. S. C. & Ga. 1:101 (1817). *P. arundinacea* Michx. Fl. Bor. Am. 1:43 (1803).

An erect annual, 60–360 cm. high. Sheaths inflated; blades of the upper leaves 0.5–2.5 cm. long. Spikes 2–3 cm. long, 13 mm. diam. Spikelets 5 mm. long, oval when closed; lower glumes acute, membranous, with 3 green nerves and a broad-winged keel, third and fourth glumes lanceolate, half as long as the floral glumes; floral glumes acute, the length of the lower glumes.

Texas, *Jenney*; Oregon, *Howell*; Arizona, *Toumey*, *Pringle* for U. S. Dept. Agricul. 214.

Var. *angustata* (Hort.). *P. angustata* Hort. Gryph. Schlecht. Linn. 24:187 (1851).

Spikes narrow, 5-15 or more, 20 cm. long.

California, *Pringle* in 1882.

Some consider it a good grass for winter pasture. Probably it is not very nutritious. Wet places, South Carolina, Texas, Oregon, California.

3. *P. amethystina* Trin. Mem. Acad. St. Petersb. (VI.) 3: 56 (1835). A stout grass, 70-250 cm. high. Sheaths inflated; upper blades about 2.5 cm. long. Spike 3-4 cm. long, oblong. Spikelets 4.5 mm. long, oval when closed; lower glumes membranous, scarcely acute. 3-nerved, third and fourth glumes lanceolate, half or more the length of the floral glume. Oregon, *Howell*.

Wet places, California and southward.

4. *P. Lemmoni* Vasey, Contrib. U. S. Nat. Herb. 3: 42 (1892). Culms 60 cm. high. Upper sheaths not inflated; blades short and narrow, 5-9 cm. long, the upper 2 cm. long. Spikelike panicle dense, 4 cm. long, 1 cm. broad. Spikelets elliptical; 2 lower glumes membranous, acute, with 3 strong nerves. keels not winged, ciliate above the middle, first a little less, second a little over 5 mm. long; third and fourth 1 mm. long, fifth broad-oval, 4 mm. long, including the abrupt point, silky hairy.

Found in Arizona.

5. *P. arundinacea* L. Sp. Pl. 55 (1753). REED CANARY-GRASS. *Arundo colorata* Ait. Hort. Kew. 1: 116 (1789). *P. colorata* Beauv. Agrost. 172 (1812). *Digraphis arundinacea* Trin. Fund. Agrost. 127 (1820). *Baldingera arundinacea* Dumort. Obs. Gram. Belg. 130 (1823).

Culms 70-200 cm. high. Sheaths scarcely if at all inflated. Spikes 10-20 cm. long, often with some distinct spikelike branches. Spikelets 3 mm. long, oval; lower glumes acuminate, membranous. 3-nerved, third and fourth less than half as long as the floral glume.

Vermont, *Pringle*; Michigan, *Beal* 31, *Farwell*, *Wood* 3559. *Clark* 1360, *Cooley*; Minnesota, *Bailey* B 446; Iowa, *Hitchcock*; Illinois, *Beal*; Montana, *Anderson*; Wyoming, *Buffum* C 93; Washington, *Suksdorf* 1186.

Wet places. Often called "Crazy Grass" in the Northwest, as it

is thought to injure horses. Of some promise for meadow and pastures. Grain good for fishes. Var. *picata* is known as "RIBBON-GRASS" or "STRIPED GRASS." "LADIES' TRACES."

Reed canary-grass is very widely distributed north in the temperate and arctic regions, extending into three continents.

43. (103). **ANTHOXANTHUM** L. Sp. Pl. 28 (1753). *Xanthonanthos* St. Lag. Ann. Soc. Bot. Lyon, 7: 119 (1880). *Xanthanthos* l. c. 8: 189 (1881).

Spikelets 1-flowered, narrow, slightly compressed, pedicellate, crowded into a cylindrical spikelike panicle; rachilla articulate above the 2 lower glumes. Glumes 6, 2 outer persistent below the joint, acute, keeled, mucronate, or very short awned, second longer than the others; third and fourth much shorter, empty, narrow, keeled, with an awn on the back or near the base, fifth broad, obtuse, hyaline, awnless with three very fine nerves, enveloping the sixth, which is narrower, with a very fine central nerve or keel, enclosing the flower. Stamens 2. Styles distinct with long plumose stigmas. Grain oblong, enclosed in the two upper glumes, but not adherent.

Aromatic or sweet-scented annuals or perennials with flat leaf-blades. The terminal panicle spikelike, pedunculate, dense, or rather loose.

Four or five species found in Europe. Introduced into cultivation.

In this genus at least one of the glumes of the lowest pair is the largest of the spikelet; those of the second pair, though small and without flowers, have dorsal awns.

1. **A. ODORATUM** L. l. c. SWEET VERNAL GRASS. *A. alpinum* Schur., Enum. Pl. Transs. 725 (1866). A rather slender erect perennial, 30-70 cm. high. Sheaths slightly inflated; ligule oblong, obtuse; blades slightly hairy, the upper ones about 2.5 cm. long. Spikelike panicle 3-8 cm. long. Spikelets 7-9 mm. long, linear-oblong, first lower glume ovate-acute, 1-nerved, as long as the second, which is elliptical when spread, third and fourth emarginate, obscurely 5-nerved below the apex; the straight awn of the former above the middle projecting half its length, the twisted awn of

the latter below the middle projecting twice the length of the glume.

Widely dispersed in temperate Asia, North America, Australia; often sown for pastures and lawns. See popular account in Vol I. p. 155, Fig. 73.

Vermont, *Pringle* for Pelton; Massachusetts, *Beal* 33; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 217; Michigan, *Clark* 1109.

Var. PUELI (Lecoq & Lamotte). *A. Puelii* Lecoq & Lamotte, Cat. Pl. Auver. 385 (). An annual 15–40 cm. high. Smaller, more slender, with shorter leaves. Spikes 2.5 cm. long, second lower empty glume when closed linear-lanceolate, when spread about two-thirds as wide as the corresponding glume of *A. odoratum*; third and fourth glumes narrower, darker, and closed; lower part of the twisted awn almost black. Of no value, though the seeds are often sold for those of the species.

Michigan, (M. A. C.) *Beal* 34.

44. (104). SAVASTANA Schrank. Baier. Fl. 1: 100, 337 (1789). HOLY GRASS. VANILLA-GRASS. *Hierochloë* Gmel. Fl. Sib. 1: 101 (1747). *Torresia* Ruiz & Pav. Prod. Fl. Peruv. 125 (1794). *Dis-sarrenum* Labill. Nov. Holl. Pl. 2: 82, t. 232 (1806). *Dimesia* Rafin. Am. Monthly Mag. 175 (1818). *Ataxia* R. Br. Parr. 1st Voy. App. 193 (1824). *Dimeria* Endl. Gen. 81, in Syn. (1836).

Spikelets with one perfect flower, slightly compressed, paniculate, rachilla articulate above the lower glumes, terminal flower perfect.

Empty glumes persistent below the joint, keeled, acute, glabrous, obscurely 1–3-nerved. Floral glumes of the staminate florets villous, scarcely shorter, obtuse, emarginate or bifid, keeled, the main nerve often extending into a short awn. Floral glume of the upper floret keeled, 5-nerved, obtuse, the keel often extending into a short awn; inner glume narrow, 3-nerved, or nerveless beyond the keel. Stamens in the staminate flowers 3, in the fertile often only 2. Styles distinct, very long, grain oblong, enclosed by the upper glumes, but not adherent.

Sweet-scented perennials with flat (and often broad) acuminate

blades. Panicle pyramidal, spreading or contracted, the spikelets often shining and scabrid.

There are eight or ten species found in the Southern as well as in the Northern Hemisphere.

In Northern Europe it was formerly strewn before the doors of churches on Christmas and other holy-days, hence one of its common names.

- a. Spikelets 4 mm. long, no projecting awn. 1
- a. Spikelets 7 mm. long, awn projecting 2-3 mm. 2, 3
- a. Spikelets 5 mm. long, no projecting awn. 4
- a. Spikelets 5 mm. long, awn projecting slightly. 5

1. *S. odorata* (L.) Scribn. Mem. Bull. Torr. Club, 5:34 (1894). NORTHERN HOLY GRASS. SENECA OR VANILLA GRASS. *Holcus odoratus* L. Sp. Fl. 1048 (1753). *H. repens* Host, Gram. 3:3. t. 3 (1801). *Hierochloë borealis* R. & S. Syst. 2:513 (1817).

A smooth tufted grass, 20-70 cm. high. Ligule 4-5 mm. long; blades flat, short. Panicle pyramidal, 5-12 cm. long, slightly 1-sided, rays smooth, in pairs. Spikelets broadly ovate, fulvous or brown, shining, empty glumes acuminate, about 4 mm. long, second one the longer, membranous, translucent; floral glumes of the lateral florets mucronate or short-awned at or near the apex, ciliate on the margins; floral glume of the terminal floret smaller, nearly glabrous, hairy above; palea narrower and 1-2-3-nerved.

Canada (Anticosti Island), *Verrell*; Vermont, *Pringle*; Massachusetts, *Faxon*, *Sturtevant*; Ontario, *Fowler*; New York, *Beal* 37; Michigan, *Cooley*, *Bailey* for M. A. C. 35, *Wheeler* for M. A. C. 36; Minnesota, *Bailey* B 451, *Holzinger*; Colorado, *Cassidy*; Wyoming, *Buffum*; Montana, *Anderson*; Alaska, *Funston* for Nat. Mus. 36; Oregon, *Howell*.

“Refused even by hungry mules,” says Sereno Watson.

Dr. I. A. Lapham is authority for the statement that this is the sacred grass of many of the Indian tribes, as of our own European ancestors.

Northern and subalpine.

2. **S. alpina** (Sw.) Scribn. Mem. Torr. Club, 5:25 (1894).
ALPINE VANILLA OR HOLY GRASS. *Holcus alpinus* Sw. Willd.
Sp. Pl. 4:527 (1806). *Hierochloë alpina* R. & S. Syst. 2:515
(1817).

A smooth brown or purplish grass, 15-40 cm. high. Leaf-blades short, narrow, involute. Panicles contracted, 2.5-5 cm. long, rays in pairs. Spikelets over 7 mm. long, oval, spreading; floral glume of the first lateral floret with a short awn 2 mm. long, below the bifid apex, awn of the second lateral floret longer and one-third or more below the apex; both lateral floral glumes ciliate on the margins, fulvous brown; floral glume of the terminal floret ciliate and mucronate, awned above; palea 1-nerved.

Vermont, *Faxon, Pringle*; Rhode Island, Congdon for *Clark* 4369.

“Alpine mountain-tops, New England and New York and northward. (Eu.)” A. Gray.

3. **S. Mexicana** (Benth.) *Hierochloë Mexicana* Benth. Journ. Linn. Soc. 19:77 (1881).

An erect tufted perennial, 60 cm. high. Leaves scabrous throughout, ligule 7-8 mm. long; blades flat, 8-15 cm. long, 3-4 mm. wide. Panicle spikelike, interrupted, 10-15 cm. long, rays in pairs, the longest 4-5 cm. long. Spikelets oval, brownish green, 7 mm. long, first glume oval when spread, 1-nerved, 5 mm. long, second 3-nerved, 7 mm. long; lateral florets equal, 5 mm. long, awn of floral glume of first floret near the apex but slightly projecting, awn of floral glume of second floret stout, attached near the base, projecting 3 mm.; floral glume of terminal floret 3 mm. long, glabrous, lateral nerves very obscure.

Mexico, *Pringle* 4700.

Dry ridges under pines, 9500 ft. altitude.

4. **S. macrophylla** (Thurb.) *Hierochloë macrophylla* Thurb. Boland. Trans. Calif. Agrl. Soc. 65 (1864-5). LARGE-LEAVED HOLY GRASS.

Culms 40-60 cm. high. Leaf-blades 30-50 cm. long, 9-13 mm. wide, with rough margins. Panicle thin, rays in pairs, or the lowest single. Empty glumes about 5 mm. long, greenish along

the nerves, purplish, obtuse, the inner one a little longer, barely equalling the lateral floral glumes; floral glumes of the lateral florets with ciliate margins, and a slight awn from the broad emarginate apex; floral glume of the terminal floret shining, ciliate above; palea 1-nerved. Lodicules half as long as the palea.

Oregon, *Howell*.



FIG. 39.—*Savastana macrophylla*. Spikelet. (Richardson.)

A very robust species, found in the redwoods of the Coast Range of the Western United States.

5. *S. pauciflora* (R. Br.) Scribn. Mem. Torr. Club, 5: 233 (1884).

Hierochloë pauciflora R. Br. App. Parry, 1st Voy. 193 (1824).

Culms erect, 20–40 cm. high. Leaf-blades of the sterile shoots involute, subulate, the upper one of the culm very sharp. Panicle erect, simple, contracted, 3.5–8 cm. long, containing about 40 spikelets, lower rays single, the upper in pairs. Spikelets broadly oval, about 5 mm. long. Empty glumes broadly ovate, acute, brownish purple, with tips and margins scabrous; floral glumes of the lateral florets scabrid throughout, as seen under a lens, chartaceous, ciliate on the margins, apex scarious, entire, mid-nerve stout, extending into a slight awn; palea linear; floral glume of the terminal floret brown, membranous, nerves distinct, slightly ciliate above; palea three-fourths as long as its glume, oval, 1–2-nerved, linear, hyaline. Lodicules acuminate.

Melville and Anticosta Islands and probably in many intervening places.

TRIBE VIII.—AGROSTIDEÆ.

Spikelets usually containing 1 perfect flower each, rachilla sometimes prolonged beyond the palea. Empty glumes 2 (none in *Coleanthus*, 4 in some species of *Sporobolus* and *Muhlenbergia*), usually as long as the floral glume or longer; palea (wanting in *Alopecurus* and some species of *Agrostis*) 2-nerved or nerveless (1-nerved in *Cinna*). Grain not furrowed, embryo small.

This large tribe is one of the most difficult to circumscribe satisfactorily, or to divide into definite genera. Their general character is to have a single flower in each spikelet, either terminal or with a slight bristle-like continuation of the rachilla. The single flower in the spikelet which separates the tribe from the following ones is not so positive a character, as it occurs also in one genus of *Aveneæ*, in a few genera of *Chlorideæ*, and occasionally in *Festuceæ*.

Trinius divided this tribe into three subtribes: *Vilfææ*, with the callus scarcely prominent or obsolete; *Agrosteæ*, with the callus globular; and *Stipeæ*, with the callus obconical. But the callus is not an appendage to the base of the floral glume, as he would have termed it, but only the upper part of the rachilla, to which the glume and the enclosed floret are attached. Its shape depends on the distance at which the floral glume is attached above the empty ones, a distance very variable throughout the Order. The length of the joint of the rachilla is a useful character, but never ranks as subtribal.

- A. Floral glume firmer than the empty glumes and very closely enveloping the grain.
- a. Spikelets each containing 1 perfect flower. (b)
- b. Floral glume entire, bearing a terminal 3-branched awn, the lateral branches often very short or sometimes obsolete. 45
- b. Floral glume 2-toothed, awn usually simple, twisted and bent. (c)
- c. Lodicules usually 3, floral glume and palea becoming very hard. (d)

- d. Floral glume narrow, usually with a curved sharp-pointed hairy callus, and a stout, twisted and persistent awn. 46
- d. Floral glume broad, with a very stout blunt callus, and a weak terminal caducous tortuose awn. 47
- d. Floral glume ventricose, with a short, stout, flat, oblique callus and a short, straight or curved awn. 48
- c. Lodicules 2; awns slender, sometimes minute. Palea membranous, closely enclosing the grain. Spikelets small. 50
- c. Floral glume broad, deeply 2-toothed and with palea only loosely enclosing the grain. 51
- b. Floral glume awnless. 49
- b. Floral glume with a straight terminal awn. Rachilla prolonged above the palea. 51
- a. Spikelets in pairs, one containing a perfect flower, the other staminate or sterile, forming the spikelike panicle. 53
- a. The spikelets containing perfect flowers surrounded at the base by numerous sterile (and a few staminate) spikelets which are reduced to bristles or bracts. 54
- B. Floral glume usually hyaline or membranous at maturity, not so firm as the empty glumes; grain loosely or not at all enclosed. (a)
- a. Empty glumes none; spikelets in umbel-like clusters, paniculate; stamens 2, plants very small. 58
- a. Empty glumes present. (b)
- b. Palea 1-nerved; stamen 1; floral glume raised on a distinct naked callus, panicle loose. 65
- b. Palea usually none, if present small and keeled; spikelets in a dense spikelike panicle or head; floral glume usually with a bent dorsal awn. 57
- b. Palea usually present, 2-nerved. (c)

- c. Empty glumes saccate at the base, much longer than the floral glumes. 67
- c. Empty glumes not saccate at the base. (d)
- d. Empty glumes subequal, longer than the floral glume, each abruptly terminating in a short awn; inflorescence spikelike. 56
- d. Empty glumes subequal, longer than the floral glume, usually bifid, each terminating in a slender awn; inflorescence spikelike, often interrupted. 62
- d. Empty glumes slightly unequal, a little shorter than the floral glume, acute; inflorescence spikelike. 55
- d. Empty glumes or inflorescence or both unlike those of (e). 55, 56, 62
- e. Plant annual, dwarf, 5-6 cm. high, empty glumes minute, awnless; spikelets 1.5 mm. long, awnless. Stamen 1. 59
- e. Plant annual, taller, empty glumes plumose. 72
- e. Plants usually much larger. Stamens 2-3; grain dehiscent, seed escaping, at least when wet, glumes all awnless. 60
- e. Plants unlike 59, 60. (f)
- f. Floral glume bearing a prominent awn 2-4 times its own length, a little below the apex. (g)
- g. Awn twisted. 63
- g. Awn not twisted. 71
- f. Floral glume without an awn or only a short slender awn. (g)
- g. Callus or prolongation of the rachis bearing a tuft of hairs, at least one-third as long as the floral glume. (i)
- i. Floral glume and palea thin, membranous. 68

- i. Floral glume and palea chartaceous, panicle spike-like. . . . 69
- i. Floral glume and palea chartaceous panicle open. 70
- g. Callus naked or with a very few short hairs. (i)
 - i. Spikelets in a long narrow panicle. 61
 - i. Spikelets in a pyramidal or oval panicle, or short and spike-like. . (n)
 - n. Empty glumes shorter than the floral glume. Spikelets large. 64
 - n. Empty glumes longer than the floral glumes, with no extension of the rachilla above the palea. 66

45. (108). **ARISTIDA** L. Sp. Pl. 82 (1753). *Kielboul* Adans. Fam. 2: 31 (1763). *Chataria*, *Curtopogon*, *Arthratherum* Beauv. Agrost. 30, 32 (1812). *Streptachne* H. B. K. Nov. Gen. et. Sp. 1: 124 (1815). *Moulinsia* Rafin. Ser. Bull. Bot. 1: 221 (1830). *Stipagrostis* Nees, Linn. Soc. 7: 290 (1833). *Schistachne* Figar. & De Not. Mem. Acad. Torin. (II.) 12: 252 (1852). *Ortachne* Nees, Seem. Bot. Her. 225 (1857).

Spikelets 1-flowered, narrow on slender pedicels or nearly sessile in a terminal panicle. rachilla articulate above the empty glumes. The 2 empty glumes persistent, keeled, awnless: the floral glume usually with a blunt hairy callus at the base, narrow rigid entire, with a terminal trifid awn, or the lateral awns erect or obsolete. Palea small or obsolete, 2-nerved. Stamens 3. Styles distinct. Grain narrow, enclosed in the hard floral glume, but free from it, the whole falling off with the stipes and awn.

Tufted grasses, with the narrow blades often involute, usually flowering late in the season. In the dry regions of the Southwest, including Mexico, many of the species contribute largely toward the upland pasturage.

There are over 100 species widely spread over the tropical and temperate regions of the New and the Old World.

The genus is nearly related to *Stipa*, though separated from it by having triple awns.

With few exceptions it is most readily recognized by the long fine three-branched awns, the lateral ones opposite and spreading. The genus is divided into three fairly marked sections, which by some have been raised to the rank of genera.

1. *Arthratherum* (Beauv., as a genus).—Here the awn is decidedly articulate on the glume, the three consolidated below and much twisted above the articulation below the branches, the floral glume much shorter than the lower empty glumes, instead of exceeding them as in *Chætaria*.

2. *Chætaria* (Beauv., as a genus).—The floral glume is continuous with the awn without any articulation, and is neither quite awnlike nor decidedly twisted below the three subequal branches. Amongst its species, *Curtopogon* was proposed as a genus, in which the lateral branches of the awn are short and erect. *Ortachne* (Nees, as a genus), *Streptachne* H. B. K., are two other old generic names.

3. *Stipagrostis* (Nees, as a genus).—The awn is articulate on the glume as in *Arthratherum*, but scarcely twisted, and above the branches elegantly plumose. *Schistachne* was once proposed as a genus, in which the central awn above is plumose, the lateral ones short and glabrous.

Not represented by species in our flora.

A. *Arthratherum*.

- a. Floral glume 10 mm. or more in length to the joint. (b)
- b. Empty glumes 10–15 mm. long, panicle few-flowered. 1
- b. Empty glumes 15–17 mm. long, panicle larger. . . 2
- a. Floral glume 8 mm. or less in length to the joint, the twisted beak 15 mm. or more in length. (b)
- b. Second empty glume 10 mm. long. 3
- b. Second empty glumes 13–18 mm. long, variety of 3

B. *Chætaria*.

- a. Awns united, solid and twisted at the base, 2 or more cm. long. 4

- a. Awns united, solid and twisted at the base less than 2 cm. long. (b)
- b. Floral glume to the base of the diverging awns 30 mm. long. 5
- b. Floral glume to the base of the diverging awns 15 mm. long. 6
- b. Floral glume to the base of the diverging awns 10 mm. long. 7
- b. Floral glume to the base of the diverging awns 6-10 mm. long. 8, 9
- a. Base of one or more awns with one or more wide curls at the base when dry. (b)
- b. Spikelets in a long strict spike. 10, 11
- b. Spikelets in simple panicles. 12
- a. Base of the awns spirally curled little if any, though often bent when dry. (b)
- b. Lower empty glume the longer (c)
- c. First glume 12 mm., second 7-9 mm. long, floral glume 8 mm. long. 13
- c. First glume 7-12 mm., floral glume 4-7 mm. long. 14
- b. Empty glumes equal or the upper one longer. . . (c)
- c. First glume half as long as the second, some of . 26
- c. Less than half difference in the glumes of any spikelet. (d)
- d. Floral glume 15 mm. long, first glume 3-7-nerved. 15
- d. Floral glume 4 mm. long, first glume 1-nerved. 16
- d. Floral glume 4.5 mm. long, first glume 1-nerved. 17
- d. Floral glume 5-14 mm. long, first glume 1-nerved. (e)
- e. Panicle 20-60 cm. long, rays 10-15 cm. long, flower-bearing above the middle. . . . 18
- e. Also some plants of 19
- e. Panicle spikelike 30 cm. long with no rays which are 10 cm. long or much interrupted. 20

- e. Panicle branched, little interrupted rays 2-15 cm. long. (g)
- g. Floral glume 10 mm. long. 19
- g. Also some plants of 25
- g. Floral glume less than 10 mm. (excepting some of 23). (h)
- h. First glume 3-5 mm., floral glume 5-9 mm. long. 21
- h. First glume 4-6 mm., floral glume 5-6 mm. long. 24
- h. First glume 7 mm., floral glume 5-6 mm. long. 23
- h. First glume 8-10 mm., floral glume 7-8 mm. long. 22
- h. First glume 6-9 mm., floral glume 7-14 mm. long, and in some varieties first glume 9-13 mm. long, floral glume 18-20 mm. long; very variable. 25
- C. *Awns three, not jointed with the floral glume, the lateral ones very short or obsolete.*
- a. Central awn stout, 2-3 cm. long, hooked-recurved at the base when dry. 26
- a. Central awn 5-6 mm. long, reflexed and twice coiled at the base when dry. 27
- a. Central awn not hooked nor coiled at the base when dry. (b)
- b. Floral glume 6 mm. long, culm erect filiform. 28
- b. Floral glume longer, culm stouter. (c)
- c. Empty glumes equal, or the first one longer. (e)
- e. First empty glume 7-8 mm. long or often obsolete. 32
- e. Empty glumes nearly equal, 6-8 mm. long. 29
- e. Empty glumes nearly equal, 9-11 mm. long. 30
- e. First glume 10-12 mm., second 7 mm. long. 31
- e. First glume 8-13 mm. long. 33
- c. Empty glumes unequal, second one longer. (d)

- d. Panicle spikelike, rays mostly sessile, first glume 4-5 mm. long. 21
- d. Panicle racemose or spreading, first glume 7-9 mm. long. 32

1. *A. desmantha* Trin. & Rupr. Mem. Acad. St. Petersb. (VI.) 7:109 (1849).

A slender sparingly-branched grass, 30-50 cm. high. Sheaths mostly shorter than the internodes; ligule short ciliate; blades involute, setaceous, smooth below, 8-20 cm. long, margins of the blade and sheaths also sometimes ciliate. Panicle simple, few-flowered, 8-15 cm. long, rays scabrous, remote. Empty glumes ciliate, 1-nerved, equal, 2-toothed, 10-13 mm. long, besides short bristles; floral glume about 10 mm. long to the jointed, separate awns, which are equal and horizontally spreading when dry.

Texas, *Reverchon* 1057.

Texas and Indian Territory.

2. *A. tuberculosa* Nutt. Gen. 1:57 (1818).

Culms 2-5 cm. high, branching below, nodes tumid; the internodes mostly naked, as the branches crowd the sheaths away.

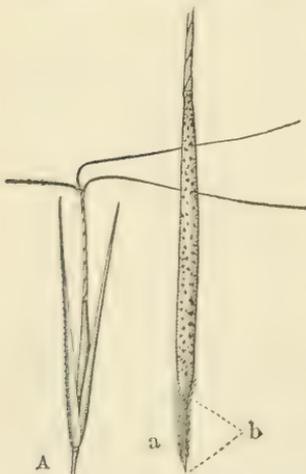


FIG. 40.—*Aristida tuberculosa*.
A, spikelet; a, floret; b, callous bearded base. (Scribner.)

Sheaths smooth, twice as long as the internodes, to which they really belong; ligule a ciliate fringe; leaves of sterile shoots very few and short, those of the culm 2-3 in number, blades involute, setaceous, 10-20 cm. long, scabrous above, smooth below. Panicle rigid, open, sparingly branched, 10-18 cm. long. Empty glumes brown, 15-17 mm. long, the strong nerves scabrid; first glume shorter, the awned tips 5-10 mm. long; floret nearly 15 mm. long, with a hairy pointed callus at the base, and at the apex the three awns are twisted and ankylosed or soldered together for about 8 mm., above which, at maturity,

the three nearly equal tips become divergent or reflexed for 3-4 cm.,

the awns and the twisted base separating by a joint from the glume.

Massachusetts, *E. Faxon* 20; New Jersey, *Beal* 37; Minnesota, *Holzinger* for Nat. Herb.

Sandy soil. Eastern Massachusetts to New Jersey, also in Mexico, Wisconsin, westward, and southward.

3. **A. Californica** Thurb. Boland. in Trans. Calif. Agr. Soc. 134 (1864). *A. Jonesii* Vasey, Contrib. U. S. Nat. Herb. 3: 48 (1892).

A slender densely tufted geniculate and much-branched grass, often pubescent at the nodes. Sheaths loose, shorter than the internodes, often pubescent; ligule ciliate; blades smooth or scabrous below, involute-setaceous, those of the sterile shoots 3-6 cm. long, those above shorter. Panicle racemose, few-flowered, 3-6 cm. long, the lower spikelets in pairs. Empty glumes 1-nerved, first 6 mm. long, second 10 mm. long; floral glume minutely scabrous, about the length of the first glume, often spotted; awns united below from the joint upwards for nearly 10 mm. bearing nearly equal spreading tips 2.5-5 cm. long.

California, *State Survey* 2217; Arizona, *Jones* 3895.

Arizona, California and Mexico.

Var. **fugitiva** Vasey, Contrib. U. S. Nat. Herb. 3: 49 (1892).

"Differs from the type chiefly in the lower and more condensed habit, and in the longer empty glumes." Vasey l. c.

Lower California, *Palmer* 501.

Sand-beaches near the sea; seeds easily blown about; spikelets varying from greenish yellow to purple and brownish black.

4. **A. spiciformis** Ell. Bot. S. C. & Ga. 1: 141 (1816).

Culms rigid, erect, sparingly branched, 30-60 cm. high. Sheaths shorter than the internodes; blades smooth, rigid, erect, involute, those of the culm 2 in number. Panicle dense, spike-like, 15 cm. long. Empty glumes narrow, 1-nerved; first 4 mm. long, with an awn 10 mm. long; second 10 mm. long, with an awn still longer; floret slender and with its beak 3-3.5 cm. long, the awns diverging, the central one stouter and as long as the floral glume, the lateral ones a little shorter.

Florida, *Curtiss* 3427, *Clark* 5050.

Low pine-barrens. South Carolina to Florida.

5. **A. appressa** Vasey, Contrib. U. S. Nat. Herb. 1: 283 (1893).

Culms slender, 60–120 cm. high. Lower leaves not seen, the upper narrowly setaceous, 10–15 cm. long. Panicle narrow, 20–30 cm. long, naked below. Empty glumes setaceous, subequal, about 10 mm. long; floral glume 30 mm. long, purple, beak somewhat twisted; awns nearly equal, 10–12 mm. long.

Mexico, *Palmer* in 1885.

The long stiff culms are tied together by the natives for brooms.

Var. **brevior** Vasey l. c.

Culms tufted, 60–90 cm. high. Leaves of culm 3–4; sheaths glabrous; ligule obsolete; blades flat or involute, 15–25 cm. long. Panicle 17–24 cm. long; rays appressed. Spikelets nearly as in the preceding, but the floral glume a little longer than the empty ones; awns a little longer.

Mexico (Rio Blanco), *Palmer* 516.

6. **A. Arizona** Vasey, Bull. Torr. Club, 13: 27 (1886).

An erect smooth unbranched grass, 30–60 cm. high. Ligule short; leaf-blades of the culm usually four, becoming involute, 10–20 cm. long. Panicle much exerted, narrow, simple, 10–25 cm. long, the lower internodes 5–7 cm. long; rays in twos below, the longest 8–10 cm. long, bearing a few spikelets along the upper half. Empty glumes nearly equal, hispid on the keels, toothed, 14–15 mm. long, besides the very short awns, first 1-nerved, second 1–3-nerved; floral glume including the hairy-beaked callus and the twisted apex to the base of the separate awns about 15 mm. long; awns divergent, the lateral ones 2 cm. long, the central a little longer.

Dr. Vasey says: “This species differs from *A. purpurea* Nutt., in a more rigid habit, longer leaves, more erect and rigid panicle, and especially in the comparative length of the glumes, in the larger flowering glume, and in the shorter awns.”

New Mexico, *Vasey*; Texas, *Nealley*.

Texas to California.

7. **A. Reverchoni** Vasey, Bull. Torr. Club, 13: 52 (1886).

A slender smooth perennial, 30–50 cm. high; culms unbranched. Sheaths shorter than the internodes; ligule a ciliate ring; blades of sterile shoots involute, filiform, often flexuose, 7–30 cm. long, those of the culm about 3 cm. long. Panicle erect, spikelike, narrow, 10–15 cm. long, rays erect and nearly sessile, closely appressed. Empty glumes purplish, first 6–7 mm. long, second 10–12 mm. long; floral glume 10–11 mm. long; awns slightly united and twisted at the base, spreading, nearly equal, 25–32 mm. long.

Vasey states that this grass “Differs from *A. purpurea* Nutt., in the narrower, denser panicle, with sessile branches, smaller flowers and shorter awns.”

Texas, *Reverchon* 1237.

8. ***A. barbata*** Fourn. Mex. Pl. Enum. Gram. 78 (1886). *A. scova* Vasey, ined.

A rather stout perennial, 60–90 cm. high; culm simple, smooth or pubescent. Sheaths longer than the internodes, smooth, ciliate with short hairs; ligule very short; blades involute, 30 cm. long, the lower setaceous, those on the culms 2–3 mm. wide. Panicle narrow; lower rays 3–5 cm. below the next above. Empty glumes narrow, involute, 1-nerved, first 8–10 mm. long, second as long or a little longer and bifid with a short awn; floret 6–10 mm. long to a twisted beak 4 mm. long; lateral awns 8–15 mm. long, the central one 3–5 mm. longer.

Mexico, *Palmer* 520, *Pringle* 1889, ticketed *A. lanuginosa* Scrib. n. sp.

9. ***A. Nealleyi*** Vasey, Contrib. U. S. Nat. Herb. 3:45 (1892). *A. stricta* var. *Nealleyi* Vasey, Contrib. U. S. Herb. 1:55 (1890).

A slender strict light-colored perennial, 40–60 cm. high. Culms with about three nodes. Sheaths half as long as the internodes; ligule a mere ring, sometimes ciliate; blades smooth, involute-setaceous, pungent-pointed, 10–30 cm. long. Panicle spike-like, very slender, interrupted, 10–30 cm. long; rays in twos, the longest about 3 cm. long, bearing three spikelets. Empty glumes mucronate, first about 5 mm. long, second 8 mm. long; floret

spotted, scabrid, about 9 mm. long, including the short twisted beak: lateral awns diverging, 10 mm. long, the central one a little longer.

West Texas, *Nealley* 514 in 1889.

Abundant on rocky soil.

10. **A. simplicifolia** Chapm. Coult. Bot. Gaz. 3: 18 (1878).

Culms erect, filiform, sparingly branched, 50–80 cm. high. Blades of sterile shoots 6–12 cm. long, those of the culm 2–3 in number, involute, 10–20 cm. long, 1–2 mm. wide. Raceme much exserted, simple, straight, 15–25 cm. long; spikelets mostly single on short pedicels; empty glumes nearly equal, 1-nerved, extending a little above the base of the awns, 10 mm. long. The awns widely spreading, nearly equal, a little longer than the empty glumes, all curved in a semicircle at the base when dry. Chapman says: “The lateral one straight, the middle one curving.”

Alabama (Mobile), *Mohr*.

Alabama and Florida.

11. **A. gyrans** Chapm. Coult. Bot. Gaz. 3: 18 (1878).

A slender glabrous strict purplish grass, 30–45 cm. high. Culms with about three nodes. Sheaths two-thirds as long as the internodes; ligule very short; blades involute-filiform, shorter than the culm. Panicle simple, strict, narrow, 12–15 cm. long; rays mostly single, the longest 2.5 cm. long, bearing 2–3 spikelets. Empty glumes very unequal, short-awned, first as long as the floret, 7 mm. long, including the point 10–11 cm. long; awns nearly equal, slender, loosely twisted at the base, diverging, 12–15 mm. long.

U. S. Dept. Agricul., *Chapman*.

South Florida (Robert's Key).

12. **A. basiramea** Vasey, Coult. Bot. Gaz. 9: 76 (1884).

An erect slender annual, 20–70 cm. high, much branched, bearing flowers from very near the roots to the apex of the culm; nodes tumid; internodes naked, as the branches crowd the sheaths away. Ligule very short; blades becoming involute, 8–18 cm. long, setaceous above, sparingly hairy on the margins below. Panicles erect, loose, simple, the lateral ones sheathed by the leaves, the lat-

ter 3-8 cm. long, the terminal one sometimes 10-12 cm. long; lower rays in twos or threes, the upper single. Spikelets with unequal 1-nerved glumes, first 5-10 mm. long, second 8-13 mm. long, the awns very short; floret spotted, 8-9 mm. long; lateral awns spirally twisted below when mature and dry, 7-12 mm. long, the central one a third longer.

Nearly related to *A. dichotoma* Michx.

Illinois, *Patterson* for U. S. Dept. Agricul. 232; Minnesota, *Holzinger* 24.

Illinois to Minnesota.

13. **A. Floridana** (Chapm.) Vasey, Gram. U. S. 21 (1883). *Streptachne Floridana* Chapm. Fl. S. States, 554 (1860).

Culms simple, erect, slender, 60 cm. high. Sheaths hairy at the throat; blades smooth, filiform, 15-25 cm. long. Panicle erect, narrow, slender, 30 cm. long; rays mostly in pairs. Spikelets on short pedicels, first glume 12-13 mm. long, second 7-9 mm. long, obtuse or bifid, with a very short beak; floret 8 mm. long; bent awn 1-2 cm. long.

South Florida, *Blodgett*.

14. **A. purpurascens** Poir. Encyc. Suppl. 1: 452 (1810). *Chætaria affinis* R. & S. Syst. 2: Mant. 210 ().

An erect glabrous perennial, 60-120 cm. high. Sheaths sometimes downy, longer than the internodes; ligule very short; blades about 5 to a culm, 20-30 cm. long, the lower portions tardily involute. Panicle exserted, purple and brown, slender, 20-40 cm. long; rays solitary, in pairs or rarely in threes. Empty glumes each with 1 scabrous nerve, and a very short awn, first 12 mm. long, second about 10 mm. long; floret often spotted, 5-7 mm. long, the lateral divergent awns 2 cm. long, the central one longer.

New Jersey, *Scribner* for U. S. Dept. Agricul. 250; Michigan, *Clark* 2020.

New England and Michigan to Texas; also West Indies.

Var. **depauperata** Vasey, ined. Panicle slender; first and second glumes 7 and 5 mm. long, respectively; floret 4 mm. long.

Mississippi, *Tracy*.

Var. **minor** Vasey, Contrib. U. S. Nat. Herb. 3: 46 (1892).

Panicle slender, 8-15 cm. long; first glume 7 mm. long, second 6 mm. long; awns of floret 1.5 mm. long.

Northeast Florida, *Curtiss* 3429; Mississippi, *Tracy* 133; New Jersey, *Beal* 38.

15. **A. oligantha** Michx. Fl. Bor. Am. 1:41 (1803). *A. Adscensionis* Walt. Fl. Car. 74 (1788), not L. *Chataria oligantha* Beauv. Agrost. 30 (1812).

Apparently annual; culms with tumid nodes, sparingly branched, 20-50 cm. high. Sheaths about as long as the internodes some of which are naked, as the branches crowd the sheaths; ligule very short, with a few long hairs above it. Panicle loose, few-flowered, racemose, 10-15 cm. long. Empty glumes nearly equal, 2 cm. long, first 3-5-nerved, with a very short awn, second 1-nerved, with an awn 1 cm. long; floret 15 mm. long; awns diverging when mature, the central one 4 cm. long, the lateral ones a little shorter.

District of Columbia, *McCarthy*; Massachusetts, *C. E. Faxon* 8; Mississippi, *Tracy*.

Virginia, Illinois, Arkansas and southward.

Var. **nervata**. Empty glumes shorter than the floret, first 7-nerved, the divergent awns 1-2 cm. long.

Oregon (Grant's Pass), *Howell*.

16. **A. Palmeri** Vasey, Bull. Torr. Club, 10:42 (1883).

Perennial; 15-30 cm. high. Leaf-blades involute, setaceous, the lower 2-5 cm. long, some of those above 10-12 cm. long. Spikelets 80-100 to a culm in some cases, in terminal and lateral panicles, 12 cm. long, 6 cm. wide; branches scabrous. Some of the lower spikes often more or less reduced or abortive. Spikelets mostly in pairs; first glume linear-lanceolate, 1-nerved, about 7 mm. long, 1 mm. wide; second membranous, narrowly linear, 8-9 mm. long; floret cylindrical, 4 mm. long, the awns nearly equal, erect or diverging, 10 mm. long.

Colorado, *Jones* 4138; West Texas, *Havard*; Nebraska, *Duffey*.

Nebraska, Arizona and Texas.

17. **A. virgata** Trin. Spreng. Neue Entdeck. 2:60 ().

Culms erect, slender, naked above, sparingly branching below.

40-60 cm. high. Sheaths not crowded from the internodes; ligule very short; blades 3, flat, 10-18 cm. long. Panicle often on a pedicel of its own length, spikelike, interrupted, the appressed rays mostly in couples. Spikelets 8 mm. long to the tips of the subequal, 1-nerved, empty glumes; floret 4.5 mm. long; the lateral awns 10 mm. long, the central one a third longer.

New Jersey, *J. H. Holmes* for Nat. Mus. Vasey says it has been classed with *A. gracilis*, and with forms of *A. purpurea*, but it is probably Trinius' old species. It much resembles *A. stricta* Michx.

18. **A. Humboldtiana** Trin. and Rupr. Mem. Acad. St. Petersb. (VI.) 7: 118 (1849). *A. divaricata* H. B. K. Willd. Enum. 99 (1809). *Chætium divaricata* Beauv. Agrost. 30 (1812).

An erect grass, 30-90 cm. high. Sheaths covering the nodes; blades convolute, rigid, 12-20 cm. long; ligule ciliate, short. Panicle often partially included, 20-30 cm. long, narrow or widely spreading; rays mostly in twos below, single above, some of them 10-12 cm. long, sparsely flower-bearing along the upper two-fifths. Empty glumes purplish, 1-nerved, equal, or the lower a little the longer, about 12 mm. long, besides a very short awn; florets often scabrid and spotted, 9 mm. long, some of them sterile and shorter; awns erect, the lateral ones about as long as the spikelet, the central one 2-6 mm. longer; palea 1 mm. long.

Mexico, *Palmer* 284, 768; Arizona, *Toumey* 784; California, *Jones*; New Mexico, *Vasey*.

New Mexico, Arizona to California.

19. **A. lanata** Poir. Encycl. Suppl. 1: 453 (1810). *Chætaria gossypina* Beauv. Agrost. 30 (1812). *Aristida lanosa* Muhl. Gram. 174 (1817).

An erect rather stout perennial, 60-120 cm. high. Sheaths covering the nodes, often woolly; ligule very short; blades 3 or more in number, rough or smooth above, smooth below, rigid, usually becoming involute, 30-60 cm. or more long. Panicle much exserted, 30-60 cm. long, spikelike; rays in couples, some of them 10-15 cm. long, flower-bearing along the upper two-thirds. Empty glumes with scabrous keels and straight awns, 1-2 mm. long, the

body of the first glume 10–12 mm. long, of the second 12–15 mm. long; floret nearly 1 cm. long, with the lateral divergent awns as long as the floret, the middle one a third or more longer; palea about 1 mm. long.

Florida. *Curtiss* 3430; Mississippi, *Tracy*; Maryland, *Canby*, *Clark* 1984 from Canby.

Delaware to Texas.

20. *A. stricta* Michx. Fl. Bor. Am. 1:41 (1803). *Chaetaria stricta* Beauv. Agrost. 30 (1812).

A slender strict perennial, 60–90 cm. high. Culms with about three nodes. Sheaths half as long as the internodes; ligule very short; blades involute, setaceous, downy, 10–40 cm. long. Panicle spikelike, interrupted, very slender, about 30 cm. long; rays apparently 2–3 together, some of the longest 5–6 cm. long, bearing a few flowers above the middle. Empty glumes scabrous on the keels, bifid, bearing an awn 2–4 mm. long, first glume (not including its awn) 7 mm. long, second 2–4 mm. long; floret as long as the second glume; the lateral divergent awns over 10 mm. long, the central one a little longer.

Florida, *Curtiss* 3426; Georgia, *Tracy*; Mississippi, *Tracy*.

Virginia to Florida and Alabama; also in West Indies and Cuba.

Var. *condensata* (Chapm.) Vasey, Contrib. U. S. Nat. Herb. 3:45 (1892). *A. condensata* Chapm. Coult. Bot. Gaz. 3:19 (1878).

Leaf-blades rigid, soon convolute, those of the sterile shoots 30–50 cm. long. Panicle contracted, densely many-flowered, 30–45 cm. long; empty glumes subequal, about 9 mm. long; awns 10 mm. long.

Florida.

21. *A. Americana* L. Amœn. Acad. 5:393 (1759). *A. dispersa* Trin. & Rupr. Mem. Acad. St. Petersburg. (VI.) 7:129 (1849). *A. bromoides* H. B. K. Nov. Gen. et Sp. 1:122 (1815). *A. nigrescens* Presl, Reliq. Hænk. 1:223 (1830).

A slender grass branching below, often geniculate, 8–35 cm. high. Sheaths shorter than the internodes; ligule reduced to a short fringe. Sterile shoots very few, the blades 2–8 cm. long, those

of the culm two or three in number, 2-6 (sometimes 10) cm. long, involute, setaceous, scabrid above. Panicle exserted, purplish, spikelike, secund, rays solitary or clustered, branching near the base, 3-10 cm. or more long. Spikelets on short pedicels, empty glumes narrow, linear, abruptly pointed when spread, scabrous on the back, first 3-5 mm. long, second 5-9 mm. long; floret linear, scabrous on the keel, about as long as the second glume, with a short hairy callus, central awn shorter to a little longer than its glume, the lateral ones a little shorter, all scabrous; palea less than 1 mm. long. Grain 7 mm. long, about 0.5 mm. diam.

Very variable and formerly described under several different names. "The same tuft has culms from 3 inches to a foot high; in the shorter ones the base of the panicle is included, but in the taller it is long exserted." Dr. Thurber in S. Wats. Bot. Calif. 2:289 (1880). In the above some use also was made of his description of this species.

Colorado, *Orcutt*; Mexico, *Palmer* 503; West Texas, *Wright* 741; Arizona, *Lemmon* 387.

"The different forms of this species, of which the *A. bromoides* H. B. K. is one, were all united by Trinius & Ruprecht under their *A. dispersa*. Genl. Munro, in his catalogue of the grasses in the herbarium of Linnæus, says that *A. Americana* L., from Jamaica, is called *A. dispersa*, but Linnæus' name ought to take precedence. Grisebach, in Flora of the British West Indies, unites *A. Americana* L., *A. dispersa* Trin., *A. bromoides*, *A. humilis*, *A. coarctata* H. B. K., and *A. cognata* Trin. under *A. stricta* Michx."

Dr. Thurber l. c.; also see Scribner in Bull. Torr. Club, 9:87 (1882). I am unable with data now at hand to perfect a list of synonyms that is reliable.

Colorado, *Orcutt*; Mexico, *Palmer* 503.

New Mexico, Mexico to California.

22. **A. Havardii** Vasey, Bull. Torr. Club, 13:27 (1886).

A smooth slender grass, sparingly branching below, 20-40 cm. high. Ligule very short with a ciliate fringe; blades erect, involute, setaceous, 8-15 cm. long. Panicle sometimes with its base included by the upper sheath, open, 12-15 cm. long, rays slender,

mostly in pairs, spreading or even reflexed with a spongy callus in the axils, the largest few-flowered, 5-6 cm. long, branching about 1 cm. from the base, empty glumes nearly equal, scabrous on the keels, 1-nerved, 8-10 mm. long; floral glume spotted, smooth, the apex scabrous, 7-8 mm. long, lateral awns 10-15 mm. long, the middle one a very little longer.

Western Texas, *Havard*; Arizona, *Toumey* 785.

23. **A. palustris** Vasey, Cat. Gram. U. S. 35 (1885). *A. virgata* var. *palustris* Chapm. Fl. S. States 555 (1860).

Culms branching near the base, 60-150 cm. high. Sheaths close; ligule very short; blades flat or involute, rigid, 10-20 cm. long, 3 mm. wide. Panicle loose, interrupted, 30-70 cm. long. Empty glumes compressed, keeled, nearly equal or the second longer, 1-nerved, 7-9 mm. long; floret 5-6 mm. long, the lateral awns 12-15 mm. long, the central a little longer, and when dry spreading more than the others.

Mississippi, *Tracy*; Northeast Florida, *Curtiss* 3425.

Pine-barrens, West Florida and South Alabama.

24. **A. setifolia** H. B. K. Nov. Gen. et Sp. 1:122 (1815). *Chetaria setifolia* R. & S. Syst. 2:396 (1817).

A tufted branching perennial grass, 30-90 cm. high. Sheaths shorter than the internodes; lower leaf-blades numerous, narrow, involute, 15-20 cm. long, those of the culm 3 to 4 in number. Panicle but little exerted, often included at the base, rather thin and spikelike, 12-15 cm. long, branches compound, 14.5 mm. from each other, 3-4 cm. long; empty glumes scabrous on the keel, abruptly pointed when spread, 1-nerved, first 4-6 mm. long, second 6-8 mm. long; floral glume scabrous, linear-lanceolate, 5-6 mm. long, the awns diverging, nearly equal, or the middle one slightly shorter or longer, 8-15 mm. long.

Mexico, *Palmer* 501, 769.

Also found in Brazil.

25. **A. fasciculata** (R. & S.) Torr. Ann. Lyc. N. Y. 1:154 (1824). *Chetaria fasciculata* R. & S. Syst. 2: Mant. 578 (1817). *A. purpurea* Nutt. Trans. Am. Philos. Soc. (II.) 5:145 (1837).

An extremely variable perennial; culms simple, slender, erect, 15-40 cm. high. Sheaths longer than the internodes, pilose at the throat; blades flat or involute, the lower numerous, 3-10 cm. long, those of the culm about 3 in number and variable in length. Panicle slender, loosely few-flowered, 7-15 cm. long, interrupted at the base; rays nearly sessile or on slender flexuose pedicels. Empty glumes 1-nerved, often bifid, with a very short straight awn, first 6-9 mm. long, second 9-18 mm. long; floret 7-14 mm. long, awns equal, spreading, 15-70 mm. long. A polymorphous species, with the extremes of which I am not certain that I am familiar.

Colorado to Texas.

Var. **Californica** Vasey, Contrib. U. S. Nat. Herb. 3:47 (1892).

Culms about 60 cm. high; panicle rather densely many-flowered, 15-20 cm. long; lower rays in clusters of 7-10, the longest 4 cm. long; first glume 8 mm. long, second 16 mm. long; floral glume 10 mm. long; awns 3-4 cm. long.

Arizona, *Lemmon* 402; California, U. S. Dept. Agric. 1549 from *Parish*.

Var. **Fendleriana** (Steud.) Vasey, l. c. *A. Fendleriana* Steud. Syn. Pl. Gram. 420 (1855).

Culms 10-20 cm. high; rays short, erect, mostly 1-flowered.

New Mexico, *C. Fendler* 973.

Var. **Hookeri** Trin. & Rupr. Mem. Acad. St. Petersburg. 5:129 (1842). Sixty cm. high; first glume 9-13 mm. long, second 8-20 mm. long; floret 13 mm. long; awns 5-7 cm. long.

It contributes to the forage on the plains, though rather dry and tough.

Kansas, *Drummond* 293, *Wright* 336, 2000, 2003, 2004; Montana, *Scribner* 83; Mexico.

Var. **micrantha** Vasey, Contrib. U. S. Nat. Herb. 47 (1892).

Culms erect to decumbent, much branched below, 30-50 cm. high. First glume 3.5-4 mm. long, second 7-8 mm. long; floret 7 mm. long; awns equal, spreading, 2 cm. long.

West Texas.

Var. **Nuttallii** Thurb. *A. longiseta* Steud. Syn. Pl. Gram. 420 (1855).

Culms 15–30 cm. long, rays in twos and threes, the lower flexuose, the upper appressed; awns 6–8 cm. long.

New Mexico, *Fendler* 987; Idaho, *F. E. Wilcox* in 1882.

26. **A. ramosissima** Engelm. A. Gray, Man. Ed. 5: 618 (1867).

Var. *uniseta* and *uniaristata* Engelm.

A diffusely branched annual, 12–40 cm. high, the main internodes naked. Sheaths mostly shorter than the internodes; ligule very shortly ciliate; blades involute, setaceous, 3–6 cm. long. Panicle racemose, 3–8-flowered, 4–8 cm. long; first glume of the spikelet 3-nerved, 12–15 cm. long, second equal or a little longer, 5-nerved; floral glume nearly as long as the second glume; awns not jointed, the lateral ones erect, 1–4 mm. long or shorter, the central hook-recurved at the base when dry, 2–3 cm. long.

Illinois, *Beal* 39.

Dry prairies, Kentucky, Illinois, and Missouri.

27. **A. dichotoma** Michx. Fl. Bor. Am. 1: 41 (1803). *Curtopogon dichotomus* Beauv. Agrost 32, t. 8, f. 7 (1812).

A tufted erect or ascending annual, 30–60 cm. high. Culms slender, dichotomously branched for most of their length, nodes tumid, internodes naked, as their leaf-sheaths enclose the branches. Sheaths less than half the length of the naked internodes; ligule very short; blades involute, setaceous, those from the sterile shoots 10–20 cm. long. Panicles terminal and lateral, simple, very narrow, 3–8 cm. long. Spikelets with 1-nerved equal empty glumes, about 7 mm. long, or the first a little shorter, scabrous on the keels; floret 5–6 mm. long, the erect lateral awns minute, the middle one reflexed and twice coiled when dry; about the length of the spikelet.

Connecticut, *Pringle*; Massachusetts, *Cooley*; Delaware, *Clark* 1910; District of Columbia, *McCarthy*, *Vasey* for U. S. Dept. Agricul. 237.

Dry sandy or gravelly soil from Maine to Texas.

Var. **Curtissii** A. Gray, Man. Ed. 6: 640 (1890).

Culms more slender; panicle slender, thin; first glume 7 mm. long, second 10 mm. long; floral glume 8 mm. long.

Bedford Co., Virginia.

28. **A. gracilis** Ell. Bot. S. C. & Ga. 1:142 (1817).

Culms erect, filiform, naked above, branching below, 15–50 cm. long. The lower blades borne by the branches, leaving the main internodes naked; ligule very short; blades of the culm about 5 in number, erect, filiform, 4–6 cm. long. Panicle exserted, very slender, interrupted, spikelike, the appressed branches mostly in couples. Spikelets about 6 mm. long, the one-nerved empty glumes and the floret nearly equal; the lateral awns one-third to one-half as long as the middle one, which is uncoiled, usually 10–15 mm. long.

New Jersey, *Scribner* for U. S. Dept. Agricul. 240; Delaware, *Clark* 2956; Pennsylvania, *Scribner* 3424; Rhode Island, *Clark* 4361 from Congden; New York, *Clark*; Iowa, *Hitchcock*.

Sandy soil, New England to Illinois and Texas.

Var. **depauperata** A. Gray, Man. Ed. 6:640 (1869).

More slender, the lateral awns erect, 1–3 mm. long, the middle one 0.5 cm. long.

Mississippi, *Tracy*; New Jersey, *Beal*.

Found with the former, into which it passes.

Florida, *Chapman*.

29. **A. divergens** Vasey, Contrib. U. S. Nat. Herb. 3:48 (1892).

A. Schiediana minor Vasey, Bull. Torr. Club, 13:28 (1886).

An erect perennial, 30–45 cm. high. Sheaths mostly longer than the internodes; ligule shortly ciliate; blades involute, 15–20 cm. long. Panicle included at the base, pyramidal, 15–17 cm. long, rays in pairs or solitary, 3–8 cm. long, flower-bearing from near the middle. Spikelets diverging, empty glumes subequal, 6–8 mm. long; floral glume 10 mm. long, becoming twisted with age; lateral awns obsolete or nearly so, middle arm 10–17 mm. long.

Very nearly allied to *A. Schiediana* Trin. & Rupr., and possibly hardly a good species.

Arizona, *Jones* 4234 in 1884, *Pringle*.

Texas to Arizona.

30. **A. Schiediana** Trin. & Rupr. Mem. Acad. St. Petersburg. (VI.) 7:120 (1849).

A straggling perennial, sometimes sparingly branching, 60–90 cm. high. Sheaths usually shorter than the internodes; ligule short; leaves of sterile shoots few, those of the culm 3–4 in number, scabrous, flat or involute, setaceous above, 20–30 cm. long. Panicle little exerted, thin, widely spreading, 20–40 cm. long, rays slender, in twos and threes, or even fours, flower-bearing from near the middle; some of them 8–13 cm. long. Spikelets few, appressed to the branches, empty glumes awnless, 1-nerved, nearly equal, 9–11 mm. long; floral glume spotted, hispid, scabrous above, 11–20 mm. long to the adnate lateral awns; middle awn about 10 mm. long, twisting at the base when mature.

Mexico, *Pringle* 387; Lower California, *Palmer* 268.

Texas to Arizona, Mexico, and Lower California.

Var. **minor** Vasey, Bull. Torr. Bot. Club, 13:28 (1886). Culms 30–50 cm. high; panicle 12–18 cm. long; rays single, but dividing immediately. Vasey thinks it might be considered a distinct species.

Arizona, *Pringle, Jones* in 1884.

31. **A. Orcuttiana** Vasey, Bull. Torr. Club, 13:27 (1886).

A leafy tufted perennial, stout below, slender above, 40–60 cm. high. Sheaths longer than the internodes; ligule very short and ciliate at the throat; leaves of sterile shoots numerous, blades tardily involute, 2–3 mm. wide, those of the culm narrower, 20–30 cm. long. Panicle exerted, open, 10–12 cm. long, rays distant, flexuose, usually single, some of the longest 8 cm. long. First glume 3-nerved, 10–12 mm. long, second 1-nerved, 7 mm. long; floral glume spotted, 12 mm. long to the apex of the adherent lateral awns, central awn twisted and bent when dry, about 5 mm. long.

Arizona, *Jones* 4233; Southern California, *Orcutt*; Mexico, *Pringle* 386, *Palmer* 769.

32. **A. manzanilloana** Vasey, Contrib. U. S. Nat. Herb. 1:282 (1893).

A slender diffuse tufted annual, much branched at the base, 30–75 cm. high. Culms compressed, the upper node 6–10 cm. from the roots. Sheaths 2 in number, the lower loose; ligule very short, slightly ciliate; blades flat or involute, slender, 6–10 cm. long. Panicles simple, spikelike, 6–10 cm. long, rays single or in twos and threes, the longest 2.5 cm. long, bearing 5–7 sessile diverging clusters, each of 3–5 spikelets; the pedicels and apex of the empty glumes usually containing a few hairs. Empty glumes narrowly linear, 1-nerved, apex acute, obtuse or 2-toothed, with a mucro or short awn, first glume (wanting in most spikelets) 7–8 mm. long, second 5–6 mm. long; floret hispid on the back and near the margins, very gradually tapering into a short, stout, slightly-curved central awn, the whole 2–3 cm. long; lateral awns obsolete.

Mexico, *Palmer* 1084.

33. **A. scabra** Kunth, *Rev. Gram.* 1: 62 (1829). *Streptachne scabra* H. B. K. *Nov. Gen. et Sp.* 1: 124, *t.* 40 (1815). *Ortachne scabra* Fourn. *Mex. Pl. Enum. Gram.* 80 (1886). Probably also *A. tenuis* Kunth, *Streptachne tenuis* H. B. K., *Ortachne tenuis* Fourn.

Perennial; culms erect, simple, terete, 60–100 or more cm. high, scabrid or smooth. Sheaths striate, glabrous or scabrid, mostly longer than the internodes; ligule very short, ciliate; blades ascending, loosely involute, 30–60 cm. long, 2–4 mm. wide, scabrous above and on the margins, pilose near the base, scabrid or glabrous below. Panicles little exerted, or the base included, diffuse, 30–60 cm. long, rays in twos or threes, scabrous, triquetrous, spreading, the longest 15–30 cm. long, sparingly branched and bearing a few spikelets along the outer third or half. Empty glumes tinged with purple, subequal, 8–13 mm. long, linear, acute, short awned, compressed, 1-nerved, the keel scabrous; floral glume spotted, coriaceous, scabrous, 13–15 mm. long to the tips of the very short lateral awns, the central awn slender, straight or slightly curved, not twisted, 10–15 mm. long.

Florida, *Garber*, *Curtiss* 3431; Arizona, *Toumey* 756; Mexico, *Palmer* 115, 161, *Pringle* 387, 3776.

46. (109). **Stipa** L. *Sp. Pl.* 78 (1753). *Jarava* Ruiz & Pav.

Prodr. Fl. Peruv. 2 (1794). *Streptachne* R. Br. Prodr. 1:174 (1810). *Achnatherum* Beauv. Agrost. 19 (1812). *Lasiagrostis* Link, Hort. Berol. 1:99 (1827). *Pristella* Bertol. Fl. It. 1:690 (1833). *Macrochloa* Kunth, Rev. Gram. 1:58 (1830). *Orthoraphium* Nees, Proc. Linn. Soc. 1:94 (1841). *Ptilagrostis* Griseb. in Led. Fl. Ross. 4:447 (1853).

Spikelets 1-flowered, on slender spreading pedicels or nearly sessile in a terminal panicle, rachilla articulate above the empty glumes. The two empty glumes persistent, membranous, keeled, unawned or rarely with a slender awn; the floral glume narrow, rigid, rolled around the flower, usually with a curved sharp-pointed hairy callus at the base, and a terminal undivided bent awn spirally twisted below the bend, sometimes with a tooth on each side the base of the awn, the awn tardily separating by a joint or rarely persistent. Palea enclosed by the floral glume, 2-nerved; lodicules often 3 and large. Stamens 3; anthers often tipped with a tuft of short hairs. The awn by twisting and untwisting often buries the fruit in the soil.

Tufted, usually tall grasses, the narrow leaf-blades often involute or convolute. There are about 100 species widely dispersed over the tropical and temperate regions of both hemispheres.

Stipa is strongly characterized as to the great majority of its species by the narrow rather hard fruiting glumes, carrying off a rather long or obconical internode of the rachilla or callus, by the long undivided awn more or less articulate on the glumes and usually twisted at the base, and by the presence of the lodicules; but there are numerous exceptions to one or more of these characters. The internode of the rachilla varies much in length and shape; the articulation and twist of the awn gradually disappear in some species. The genus is not very clearly divisible into sections. There are generic names which have been proposed for certain species of *Stipa* and now reduced to synonyms.

Stipa is closely allied to *Oryzopsis* Michx. and more remotely to *Aristida* L. and *Muhlenbergia* Schreb.

- | | |
|--|-----|
| A. Awn plumose, hairs over 1 mm. long. | (a) |
| a. Awn 10-15 cm. long. | 1 |

- a. Awn much shorter. (b)
- b. Floral glume 6-8 mm. long, hairs on the awn 1 mm. long. 2
- b. Floral glume 8-12 mm. long, hairs on the awn 3-6 mm. long. 3
- B. Awn not plumose, pubescence, if any, less than 1 mm. long (c)
- c. Awn 5 cm. or more long. (d)
- d. Awn stout, 9-17 cm. long, empty glumes 30-45 mm. long. 4
- d. Awn weak, tortuose, 10-15 cm. long, empty glumes 20-30 mm. long. 5
- d. Awn weak, tortuose, 10-15 cm. long, empty glumes 5-6 mm. long. 6
- d. Awn capillary, 7-8 cm. long, empty glumes 5-8 mm. long. 7
- d. Awn capillary, 12-18 cm. long, empty glumes 6-7 mm. long. 8
- d. Awn of medium size, 6-10 cm. long, empty glumes 16-20 mm. long. 9
- d. Awn of medium size, 4-6 cm. long, empty glumes 10-13 mm. long, floret 9-10 mm. long. 10
- d. Awn slender, 6 cm. long, empty glumes 7-13 mm. long, floret 6-7 mm. long. 11
- c. Awn less than 5 cm. long (possibly excepting some of No. 16). (e)
- e. Floral glume 9-10 mm. long, empty glumes unequal, first one the longer by 2-4 mm. 12
- e. Floral glume 4-7 mm long. (i)
- i. Floral glume 7 mm. long, first empty glume 12-15 mm., second 10-11 mm. long. 13
- i. Floral glume 7 mm. long, first empty glume 12-16 mm., second 10-14 mm. long. 14
- i. Floral glume 4-6 mm. long. (m)
- m. First glume 8-10 mm., second 6-8 mm.

long, awn slender, bent and flexuose, 25 mm. long.	15
m. Empty glumes subequal, awn twice bent. . (n)	
n. Empty glumes 8-10 mm. long, awn 20-40 mm. long, panicle very variable, many-flowered.	16
n. Empty glumes 5-10-13 mm. long, awn 20-40 mm. long, panicle few-flowered. .	17
n. Empty glumes 8 mm. long, awn 15-50 mm. long, culm branching, leaves of the culm 7.	18
n. Empty glumes 6-7 mm. long, awn 2-2.5 cm. long. <i>S. eminens</i> var. <i>Andersoni</i> .	15
n. Empty glumes 5 mm. long, awn 16-18 mm. long.	19

1. **S. var. pennata, Neo-Mexicana** Thurb.

A rather stout erect smooth grass, 40-60 cm. high. Sheaths mostly longer than the internodes; leaves of sterile shoots numerous, strict, blades narrow, 30-40 cm. high, those of the culm 4 in number. Panicle partly included by the upper sheaths, simple, few-flowered, 10-15 cm. long, besides the long awns. Empty glumes equal, 6-8-nerved, 3 or more mm. wide, and 3-4 cm. long including the long-drawn-out point; floret pubescent, 15 mm. long, including the long callus; awn pubescent or flexuose, plumose throughout (the hairs near the middle 2 mm. long), twice bent, the lower part 3-4 cm. long, the whole awn 10-15 cm. long.

Texas, *Reverchon* 1365; Arizona, *Jones, Pringle*.

Found in West Texas, New Mexico, Arizona, Colorado.

2. **S. occidentalis** Thurb. S. Wats. Bot. King's Expt. 380 (1871).

Culms erect, slender, scabrid, pubescent at the nodes, 30-60 cm. high. Sheaths shorter than the internodes; ligule 4-5 mm. long; blades rigid, slender, involute, scabrid, the lower 6-15 or more cm. long, those of the culm usually two in number, 1-10 cm. long. Panicle exerted or the base included, simple, narrow, 5-15 cm. long, the lower rays in twos or threes. Empty glumes thin, first 5-

nerved, 10-12 mm. long, second 3-nerved and 8-10 mm. long; floral glume pubescent, 6-8 mm. long, including the short acute callus and the crown of hairs at the apex; awn 2-4 cm. long, twice geniculate and plumose to the upper bend, the longest hairs about 1 mm. long. Anthers beardless.

Washington, *Sandberg* 269; Oregon, *Cusick* 1320, *Howell*; California, *Jones* 2583, *Pringle*, *Parish* 2491; Southern California, *Palmer* 232.

Found in Nevada, California, and Oregon.

3. **S. speciosa** Trin. et Rupr. Mem. Acad. St. Petersb. (VI.) 5: 45 (1842). *S. chrysophylla* Desv. C. Gay, Fl. Chil. 6: 278.

Perennial; culms erect, densely tufted, 20-50 cm. high. Sheaths tawny, shorter than the internodes, the upper one inflated; upper ligule 2 mm. long, the lower minute and fringed; leaves of sterile shoots erect, scabrid, blades half or two-thirds as long as the culm, those of the culm three in number, 5-15 cm. long, closely involute. Panicle often partially included, spikelike, 6-20 cm. long, the rays usually in pairs bearing 1-3 spikelets. Empty glumes nearly equal, hyaline, acuminate, about 16 mm. long, first 3-nerved, second 5-7-nerved; floret silky pubescent, 5-nerved, 8-12 mm. long including the short curved callus and the 2-toothed hairy apex; awn 3-4 cm. long, geniculate below the middle, the twisted portion plumose with the white hairs 3-6 mm. long. Anthers beardless.

California (Mojave Desert), *Parish Brothers* 879, *Pringle*; Nevada, *Shockley, Jones*; Arizona, *Lemmon* 279.

Found in Arizona to California, and in Chili.

4. **S. spartea** Trin. Mem. Acad. St. Petersb. (VI.) 1: 82 (1831).
PORCUPINE-GRASS.

Culms rather stout, 50-120 cm. high. Sheaths about the length of the internodes; ligule 3-5 mm. long; blades 3, smooth, all setaceous, the lower two-thirds as long as the culm, the upper one 10-20 cm. long. Panicle exerted, when mature contracted, 12-15 cm. long, rays usually in pairs or single, some of the longest 10 cm. long, bearing 1-2 flowers near the end. Empty glumes subequal, first 3-6-nerved, second 7-8-nerved, 30-45 mm. long including the long attenuated joint; floret about 2 cm. long, pubescent on

the lower half, smooth above, except a short thin row of hairs, the callus hard, acuminate, awn 9-17 cm. long, usually with two bends near the middle, about 2 cm. distant.

Illinois, *Clark* 1909 from *Bebb*, *Beal* 41; Iowa, U. S. Dept. Agricul. 282, from *J. C. Arthur*; British Columbia, *Macoun*.

The long awns when alternately wet and dried bore their way for several inches into the sand. They may also penetrate the flesh of sheep and dogs, causing much annoyance and even death.

Sandy oak-land or prairies; Michigan, Illinois, to California.

5. *S. comata* Trin. & Rupr. Mem. Acad. St. Petersburg. (VI.) 5: 75 (1842). BUNCH-GRASS.

A rather stout and usually scabrous grass, 30-120 cm. high. Sheaths mostly shorter than the internodes; ligule acute, 3-4-6 mm. long; leaves of sterile shoots a fourth to half the length of the culm, those of the culm 2-5 in number. Panicle partially included, open, 20-30 cm. long, rays distant in twos or threes, few-flowered. Empty glumes nearly equal, 5-nerved, 20-30 mm. long including the long slender point; floret pubescent with no crown of hairs at the apex, 10-13 mm. long including a long sharp callus, awn obscurely twice bent below, and variously curled and twisted above, 10-15 cm. long, sparsely pubescent to the second bend, shining above or minutely pubescent; palea as long as its glume. Stamens 3.

Colorado, U. S. Dept. Agricul. 268; Oregon, *Howell*; Montana, *Anderson*.

Found along the Rocky Mountains, furnishing considerable pasture.

6. *S. mucronata* H. B. K. Nov. Gen. et Sp. 1: 125 (1815).

A tufted erect perennial, 40-60 cm. high. Leaves of sterile shoots numerous, ligule a ring with very short hairs; blades conduplicate, 5-10 cm. long, 0.6 mm. diam., those of the culm 2 in number; upper ligule oblique, adherent, very short; blades 3-6 cm. long. Panicle exserted, simple, narrow, interrupted, 8-12 cm. long, rays in twos to fours, the longest 3-4 cm. long, bearing 3-4 spikelets on the outer half. Spikelets purplish brown, empty glumes chartaceous, linear-acute, subequal, 5-6 mm. long, 3-nerved,

first oval, acute, second narrower; floral glume about 4 mm. long, including the very short curved base, clothed with very short hairs; awn twice bent, 10–15 mm. long.

Mexico, *Pringle* 4229.

Mountain meadows.

7. *S. tenuissima* Trin. Bull. Sc. Acad. St. Petersburg. 1: 67 (1836).

Culms very slender, 60–80 cm. high. Sheaths shorter than the internodes; ligule 2–4 mm. long; blades scabrid, filiform, involute, about 0.5 mm. diam. even near the base, some of the leaves as high as the culm. Panicle more or less included, very slender, interrupted, 15–20 cm. long; rays in threes, fours, or fives, some almost sessile, the largest 4 cm. long. Empty glumes lance-acuminate, with bristle-like points, thin, white, tinged with purple, 3-nerved near the base, first 5–8 mm. long, or the bristle sometimes making it 20 mm. long, second about 5 mm. long; floret scabrid, 2 mm. long, including the abruptly-pointed hairy callus, a short crown of hairs at the apex; awn 7–8 cm. long, 0.2 mm. or less diam., with one bend a third of the distance from the base.

West Texas, *Havard, Buckley*; New Mexico, *Wright*, 1999; Mexico, *Pringle* 3274.

Western Texas, New Mexico and Arizona.

8. *S. Jarava* Beauv. Agrost. 19 (1812). *S. eriostachya* H. B. K. Nov. Gen. et Sp. 1: 127 (1815). *S. Ichu* Kunth, Rev. Gram. 1: 60 (1829).

A tufted erect perennial. Culms 60–180 cm. high, nodes 4–5 in number. Blades of sterile shoots involute, 40–60 cm. or more long, 0.5–0.7 mm. diam. Sheaths of the culm longer than the internodes (or shorter in tall plants), scabrous; ligule oblique, obtuse, 2 mm. long; blades involute, scabrous on the under side, 1–2 mm. diam. Panicle but little exerted, contracted, pale purplish green, 30–40 cm. long; rays in threes and fours, the longest 10 cm. or more long, branching and bearing numerous spikelets from a little above the base. Empty glumes subequal, narrowly lanceolate, delicate, 6–7 mm. long, 3-nerved, the upper sometimes 1-nerved; floral glume linear, 3 mm. long, clothed with short appressed hairs, the apex bearing a tuft of hairs as long as

the glume, capillary awn 12-18 cm. long, the base abruptly pointed. Anthers linear, 1 mm. long, apex pencil-tufted.

Mexico, *Pringle* 4281; also in Western South America.

Cool ledges.

9. *S. setigera* Presl, Reliq. Hænk. 1:226 (1830).

A rather stout and often scabrid grass, 30-90 cm. high; culms often pubescent at the nodes. Sheaths hairy at the throat, the lower shorter than the internodes; ligule truncate, 2 mm. long; blades of sterile shoots mostly involute, one-third as high as the culms, those on the culm 2-3 in number, often flat, 4-6 mm. wide, the upper one 15-30 cm. long. Panicle mostly included at the base by the loose sheath, flexuose, somewhat one-sided, 12-30 cm. long, the rays slender in pairs. Empty glumes subequal or the upper shorter, long-acuminate, 3-nerved, second glume sometimes with several finer intermediate nerves, 16-20 mm. long; floret 10 mm. long, silky hairy on the nerves, the callus curved and sharp, a crown of hairs at the apex, awn geniculate, above the middle bent again, twisted and pubescent below, 6-10 cm. long. Anthers bearded at the apex. A common bunch-grass on the dry hills.

California, *Pringle, Jones*; also in Kansas.

Kansas, Texas, New Mexico, Utah, California and Oregon.

10. *S. avenacea* L. Sp. Pl. 78 (1753). BLACK OAT-GRASS. *S. barbata* Michx. Fl. Bor. Am. 1:53 (1803). *S. Virginica* Pers. Syn. 1:99 (1805). *S. bicolor* Pursh, Fl. Am. Sept. 73 (1814).

Culms slender, 40-90 cm. high. Sheaths half as long as the internodes; blades filiform, the largest when spread scarcely 2 mm. wide, those of the sterile shoots about half as long as the culm, those on the culm 3 in number, the upper 4-7 cm. long. Panicle much exerted, open, 12-20 cm. long; rays very slender, mostly in twos, the largest 6 cm. long, including the two branches, each 2-3 cm. long, bearing a single flower. Empty glumes whitish, subequal, linear-lanceolate, 5-nerved, 10-13 mm. long; floret brown, scabrid, 9-10 mm. long, including the sharp curved callus, the apex bearing a short crown of hairs, and an awn 4-6 cm. long, once or twice bent above the middle.

Pennsylvania, *Scribner* 266; Delaware, *Canby*; also Lake Co., Michigan.

New England, Michigan, Wisconsin, and southward.

11. *S. flexuosa* Vasey, Bull. Torr. Club, 15: 49 (1888).

Culms erect, scabrid, 70-90 cm. high. Sheaths longer than the internodes; lower ligule 1 mm. long, the upper 5 mm. long; blades of sterile shoots about half as long as the culm, those on the culm 3 in number, the upper 10-18 cm. long. Panicle exerted when mature, thin, 12-25 cm. long; rays in threes, fours, or fives, spreading, the lower clusters 7-9 cm. distant from the next above, longest rays 10 cm. long, bearing a few spikelets near the apex. Empty glumes purplish, linear-lanceolate, 3-nerved at the base, first 11-13 mm. long with a very slender apex, second 7-10 mm. long; floret pubescent, 6-7 mm. long, including the curved acute callus below, and a short crown of hairs at the apex; awn once bent, about 6 cm. long; palea 2 mm. long.

Mexico, *Pringle* 384.

12. *S. coronata* Thurb. S. Wats. Bot. Calif. 2: 287 (1880). *S. Stillmannii* Boland. Proc. Calif. Acad. 4: 169 (1870).

An erect grass, 120-180 cm. high, the culm often 6-8 cm. diam. Sheaths very loose; ligule very short and a ciliate fringe; blades about 4 in number, scabrid above and sometimes below, the lower often 90 cm. long, 8-12 mm. wide, from the base gradually tapering into a very slender involute point, the upper one filiform, 15 cm. long. Panicle often partially included by the inflated upper sheath, narrow, many-flowered, 30-40 cm. long, lower branches in twos or threes, some of them often 15 cm. long. Empty glumes pale green, tinged with purple, acuminate and bristle-pointed, first 3-5-nerved, 16-22 mm. long, second 5-nerved and 12-20 mm. long; floret to the joint, including the short sharp curved callus, 9-10 mm. long, clothed with silky hairs, the upper of which are 4 mm. long; apex bifid, hairy, awn slender, twice bent near the middle, about 2.5 cm. long; palea 4-5 mm. long. Stamens 3; anthers naked.

S. Stillmannii Bolander is a small form of this species.

California (Passadena), *Jones* 3545; *U. S. Dept. Agricul.* 269, from Pringle.

Arizona and California.

13. **S. Scribneri** Vasey, *Bull. Torr. Club*, 11:125 (1884).

A stout smooth erect grass, 60-90 cm. high. Sheaths longer than the internodes; ligule less than 1 mm. long, hairy at the throat; blades flat below, involute and slender above, the lower half as long as the culm, 2-3 to the culm. Panicle partially enclosed by the upper narrow sheath, erect, spikelike, 15-20 cm. long; rays in twos and threes. Empty glumes acuminate and 3-nerved, first 12-15 mm. long, second 10-11 mm. long; floret about 7 mm. long from the tip of the short, sharp callus to the joint, thinly clothed with appressed hairs, the upper ones numerous and bearing a crown 2-3 mm. long; awn once or twice bent, 18-20 mm. long; palea about 2 mm. long.

New Mexico, *Vasey*; Colorado, *Patterson* 273.

14. **S. Parishii** Vasey, *Coult. Bot. Gaz.* 7:33 (1882).

Perennial; culms stout, 30-45 cm. high. Sheaths smooth, longer than the internodes; the margins of the throat pubescent; ligule very short; blades involute or convolute, rigid, smooth below, scabrous above, the lower ones 12-18 cm. long, the upper 8-10 cm. long. Panicle with the base enclosed, contracted or open, 12-15 cm. long, the lower rays in threes, those above in twos or single, the longest about 5 cm. long bearing 5-8 spikelets more or less tinged with purple; empty glumes linear-lanceolate, smooth, 3-nerved, first 12-16 mm. long, second 10-14 mm. long; floral glume about 7 mm. long, including the short stipe, densely clothed with silky hairs often 5 mm. long, 2-toothed, awn 16-20 mm. long.

California, *Parish*, 1079, 2487, *Shorkley* 283.

Arizona and California.

15. **S. eminens** Cavan. *Icon.* 5: *t.* 467, *f.* 1:42 (1799).

A slender scabrid erect grass, 30-90 cm. high, nodes often pubescent. Sheaths shorter than the internodes; ligule very short; blades involute, erect, slender, those from the sterile shoots as long as the culm; leaves of the culm four in number, 15-20 cm. long and 4 mm. wide, the terminal one 5-8 cm. wide. Panicle often

partially included, open, thin, 10–20 cm. long, rays very slender, mostly in pairs, the longest 10 cm. long, flower-bearing along the upper half. Empty glumes purplish, acuminate, 3-nerved, first 8–10 mm. long, second 6–8 mm. long; floret pubescent, bearing a short awn, crown of hairs 5–6 mm. long, including the short sharp callus, and the crown; palea one-third as long as the glume, awn slender, scabrid, bent once or twice near the middle, 25 mm. long. Stamens 3, anthers pencil-tufted. Some authors say “Stamen 1.”

California (Pasadena), *Jones* 3544.

Found in Arizona and California.

Var. **Andersoni** Vasey, *Contrib. U. S. Nat. Herb.* 3: 54 (1892).

Culms more slender, blades narrower, panicle smaller, much exerted, 5–12 cm. long, longest rays 4 cm. long; empty glumes 6–8 mm. long. The plants seen were from F. L. Scribner's herbarium, collected in California by Anderson and presented by Dr. Vasey.

16. **S. stricta** Vasey, *Bull. Torr. Club*, 10: 42 (1883).

An erect slender grass, 20–40 cm. high. Sheaths longer than the internodes, the upper one dilated; ligule very short; blades narrowly involute, those of the sterile shoots extending nearly to the panicle, those of the culm 3–4 in number. Panicle strict, narrow, partially included by the upper sheath, 8–20 cm. long, lower rays in twos or threes. Empty glumes thin, narrowly lanceolate, acuminate, 3-nerved, subequal, 10–13 cm. long; floret pubescent, about 6 mm. long, including the callus and the very short 2-toothed apex, awn twice bent, 30–40 mm. long, pubescent to the second bend, 1–3 mm. long.

Washington, *Suksdorf* 285.

Washington to California and Nevada.

Dr. Vasey observes that “It has been mistaken for *Stipa occidentalis*, which has longer plumose awns, 5-nerved glumes, a conspicuous ligule, and a shorter looser panicle. It has shorter more slender culms, narrower glumes, and shorter awns than *S. viridula*.”

17. **S. viridula** Trin. *Bull. Sc. Acad. St. Petersb.* 1: 67 (1836).

S. parviflora Nutt. *S. Bloomeri* Boland. *Proc. Calif. Acad.* 4: 168 (1870). *S. spartea* Hook. *Fl. Bor. Am.* 2: 237 (1840), not Trin.

Culms stout, strict, simple, 40–70 or even 150 cm. high.

Sheaths much shorter than the internodes; ligule very short, with some hairs at the throat; blades pale green, smooth or scabrid, involute-setaceous at the apex, those of sterile shoots about one-third as long as the culm, those of the culm 3-4 in number, and 2-6 mm. wide, the upper one 3-6 cm. long. Panicle exserted, narrow, 12-40 cm. long, the short erect rays in twos or threes. Empty glumes subequal, ovate, bristle-pointed, often tinged with purple, 5-13 mm. long, first 3-5-nerved, second 3-nerved; floret pubescent, 5-6 mm. long, including the very short acute callus and the 2 minute teeth concealed by the thin short crown of hairs; palea about half as long as the glume; awn slender, flexuose, usually twice bent, 20-40 mm. long. Anthers naked.

California, U. S. Dept. Agricul. 237, from *Jones*; Montana, *Canby* 340.

Some use is made above of Dr. Thurber's description in *S. Wats. Bot. Calif.* 2: 288 (1880). Prof. Scribner, *Coult. Bot. Gaz.* 13: 171 (1886), says: "It is a valuable forage plant, as it does not possess the long and very sharp-pointed rachilla below the flowering glume which renders *S. spartea* Trin. ('Porcupine-grass') so injurious to stock."

Rocky Mountains.

Var. **Lettermani** Vasey, *Contrib. U. S. Nat. Mus.* 3: 50 (1892). *S. Lettermani* Vasey, *Bull. Torr. Club*, 13: 53 (1886).

Leaf-blades filiform; panicle slender, 10-15 cm. long, interrupted; lower rays 3-4 cm. long, mostly single.

Utah, *Jones*; Idaho, *Letterman* 102 for U. S. Dept. Agricul.

Var. **minor** Vasey, *Contrib. Nat. Herb.* 3: 50 (1892). Culms, leaf, and spike slender.

Rocky Mountains, *Weiman*; Oregon, *Jones*.

Var. **pubescens** Vasey, l. c. Awn pubescent to the second bend. West Washington, *Suksdorf*.

Var. **robusta** Vasey l. c. Culms very stout, 1 cm. diam.; spike 30 cm. long.

California, *Vasey*.

18. **S. multinode** Scribn. ined.

Culms erect, slender, branching once below the middle, about

90 cm. high. Sheaths longer than the internodes; upper ligule less than 1 mm. long; blades of the sterile shoots few, those on the culms 7 in number, rigid, involute, the middle ones 15-25 cm. long, the upper about 12 cm. long. Panicle narrow, thin, interrupted, 10-20 cm. long; rays in fours, fives, and sixes in distinct half whorls, the longest ray 7 cm. long, flower-bearing above the middle. Empty glumes hyaline, tinged with purple, equal, or the lower a little longer, 7-9 mm. long, 3-nerved, the lateral nerves merging into the central one before reaching the middle; floret pubescent, narrow, 5 mm. long, including the blunt callus and the crown of short hairs; awn twice bent, 15-50 mm. long; palea pubescent, 2.5 mm. long. Stamens 3; anthers pencil-tufted.

Mexico, *Pringle* 385 in 1885.

Distributed as *Stipa*, without a specific name.

19. **S. Hassei** Vasey, *Contrib. U. S. Nat. Herb.* 1:267 (1893).

Culms very slender, erect, densely tufted, branching below, 30-45 cm. high. Sheaths narrow; ligule short; blades setaceous, 10-20 cm. long. Panicle open, narrow, erect, 5-7 cm. long, rays mostly in twos and threes, the longest 3 cm. long, naked below. Empty glumes linear-lanceolate, subequal, about 5 mm. long, first 1-3-nerved, second 3-nerved; stipe short, bearing a few short hairs; floral glume thin, about 4.5 mm. long, 4-nerved, the awn 16-18 mm. long, twisted below and bent above the middle; palea about as long as its glume. Grain oblong, about 2 mm. long. Nearly allied to *S. eminens Andersoni* Vasey.

California (Santa Monica), *Dr. H. E. Hasse*, for whom *Dr. Vasey* named it.

47. (110). **ORYZOPSIS** Michx. *Fl. Bor. Am.* 1:9 (1803). *Dilepyrum* Rafin. *Med. Repos. N. Y.* 5:352 (1808). *Piptatherum* Beauv. *Agrost.* 17, *t.* 5, *f.* 10, 11 (1812). *Urachne* Trin. *Fund. Agrost.* 109 (1820). *Caryochloa* Spreng. *Syst.* 4: *Cur. Post.* 22, 30 (1827). *Piptochætium* J. & C. Presl, *Rel. Hænk.* 1:222, (1830). *Nassella* E. Desv. C. Gay, *Fl. Chil.* 6:263, *t.* 75, *f.* 1 (1853). *Fendleria* Steud. *Syn. Pl. Gram.* 419 (1855).

Spikelets 1-flowered, usually ovoid or oblong, paniculate, rachilla articulate above the lower glumes, not produced above the floret,

with a very short blunt callus. Empty glumes 2, persistent, equal or the outer a little shorter, convex on the back, floral glume broad, shorter or longer than the other glumes, membranous, becoming hard, obtuse, truncate, usually producing a caducous awn, which is more or less bent near the base; palea 2-keeled. Stamens 3. Lodicules 2, conspicuous. Styles short or long, distinct. Grain oblong or ovate, enclosed by the hardened floral glume and palea, but not adherent.

Tufted perennial grasses: leaf-blades broad and flat or narrow and involute. Panicle terminal, lax.

There are about 24 species, mostly found in the temperate and subtropical regions of the northern hemisphere. The genus differs from *Stipa* in having a shorter awn, but little twisted or tortuose, a broader floret, the callus shorter and broader and obtuse. It is certainly very convenient, so far as our species are concerned, to leave *Eriocoma* as a genus; then *Oryzopsis* can be more clearly defined and separated from *Stipa*.

Bentham observes that it is nearly allied to *Milium*. The genus divides readily into three sections, regarded by some as distinct genera, but Trinius and Bentham and others agree in uniting them.

1. *Piptatherum* (Beauv., as a genus), often included in *Milium*, with awned glumes. The obliquity of the fruiting glume is much less marked than in the typical species of *Oryzopsis*.

2. *Euoryzopsis* includes *Caryochloa* Spreng., *Piptochetium* Presl and *Nassella* Desv., the rachilla bearing a ring of hairs under the floral glume.

3. *Eriocoma* Nutt., *Fendleria* (Steud.), differs from *Euoryzopsis* in the long silky hairs clothing the fruiting glumes.

A. Leaf-blades broad, flat, no rudimentary blades, ligule ciliate. 1

B. Leaf-blades long, involute, petiolate, evergreen, upper blades rudimentary. 2, 3

C. Leaf-blades very narrow, involute. (a)

a. Floret clothed with dense white conspicuous hairs, panicle open, rays diverging, awn 2 cm. long. . . . 4

- a. Hairs of floret not dense nor conspicuous. (c)
 c. Awn plumose. 5
 c. Awn stout, persistent, scarcely as long as the empty
 glumes, curved in one plane, spikelets 5 mm. long,
 panicle 2-5 cm. long. 6
 c. Awn deciduous, not over 4 mm. long, spikelets 4
 mm. long, panicle 4-8 cm. long. 7
 c. Awn 10-12 mm. long, spikelets 4 mm. long, panicle
 narrow, 5-8 cm. long 8
 c. Awn 9-16 mm. long, spikelets 4-5 mm. long, panicle
 7-12 cm. long. 9
 c. Awn 10-15 cm. long, spikelets 4 mm. long, panicle
 8-12 cm. long. 10
 c. Panicle 8-16 cm. long, awn deciduous, 5-10 mm.
 long. 11
 c. Leaf-blades flat or involute, ligule not ciliate. . . (d)
 d. Panicle 15-20 cm. long, awn 20 mm. long. . . 12
 d. Panicle 10-13 cm. long, awn 1.5-2 mm. long. 13

1. **O. melanocarpa** Muhl. Gram. 79 (1817). *Milium racemosum*
 Sm. Rees, Cyc. 23:n. 15 (1819?). *Piptatherum nigrum* Torr.
 Fl. U. S. 1:79 (1824). *Urachne racemosa* Trin. Unifl. 1:174
 (1824).

Culms erect, slightly rough, leafy at the top, 60-100 cm. high.
 Sheaths scabrous, about as long as the internodes; ligule short and
 bearded; blades flat, lanceolate, not quite smooth, tapering towards
 each end, 25-30 cm. long, 10-15 mm. wide. Panicle simple, nar-
 row, scarcely exserted, 12-20 cm. long. Spikelets elliptical, acute,
 about 7 mm. long, empty glumes subequal, reticulate-veined, 7-
 nerved; floret with a few appressed hairs, blackish, the awn 1.5-2
 cm. long.

Vermont, *Pringle*; Delaware, *Canby*; Ontario, *Fowler*; New
 York, *Beal* 42; Michigan, *Clark*, 703; Iowa, *Hitchcock*; Minne-
 sota, *Holzinger* 26^b.

New England, Delaware, Pennsylvania to Wisconsin.

2. **O. asperifolia** [Rich. in] Michx. Fl. Bor. Am. 1:51 (1803).
Urachne asperifolia Trin. Unifl. 174 (1828).

Culms erect, scabrid, 20-70 cm. high. Sheaths over half as long as the internodes; ligule a ciliate ring; blades scabrid, those of the culm very short or rudimentary, those below tapering into a long petiole, firm, involute, 30-50 cm. long, 5-7 mm. wide. Panicle exserted, simple, narrow, 6-10 cm. long. Spikelets elliptical, acute, about 7 mm. long, empty glumes subequal, reticulate-veined, 7-nerved; floret whitish, with a few appressed hairs and at the base a conspicuous tuft of dense hairs 1 mm. long, the awn about 1 cm. long. Lodicules almost as long as the palea. The firm leaves lasting through winter.

Vermont, *U. S. Dept. Agricul.* 291 from Hosford, *Clark* from Congden; Ontario, *Fowler*; Michigan, *Cooley*, *Wood*, *Farwell*, *Clark* 704, *Beal* 43.

Northern States to Colorado.

3. **O. Pringlei** Scribn. n. sp. ined.

Culms erect, nearly smooth, 40-60 cm. high. Leaves of sterile shoots scabrid, 25-30 cm. long, the blades 2-3 mm. wide, involute, pungent-pointed, those of the culm 3 in number, some of the sheaths shorter than the internodes; ligule 5 mm. long; the upper blade 1-5 cm. long. Panicle thin, spikelike, 12-16 cm. long, rays in twos and threes, the longest 4 cm. long, bearing four spikelets on the outer half. Spikelets purple or brown, elliptical, 5-5.2 mm. long, empty glumes subequal, broad near the apex, first 5-nerved, second 7-nerved; floret brown, clothed with short appressed hairs, awn 12-24 cm. long. Lodicules one-third the length of the palea.

Growing at an altitude of 10,000 feet.

Mexico (Oaxaca), *Pringle* 4759.

Professor Scribner identifies this grass as *Oryzopsis*, near *Stipa mucronata*, and at my request consents to give it a specific name.

4. **O. Sibirica** (Lam.). *Stipa Sibirica* Lam. Ill. 1: 158 (1791). *Stipa Bloomeri* Boland. Proc. Calif. Acad. 4: 168 (1873). *O. caduca* Beal, Coult. Bot. Gaz. 15: 111 (1890). *Stipa caduca* Scribn., Vasey Contrib. U. S. Nat. Herb. 3: 54 (1892).

Culms erect, rather stout, about 60 cm. high. Sheaths shorter than the internodes, ciliate on the margins; ligule 3-4 mm. long; blades of the culm 3, smooth, involute with long slender points,

the second reaching nearly to the base of the panicle, third 12-18 cm. long, sometimes extending beyond the panicle. Panicle but little exserted, open, 10-20 cm. long, rays in twos or threes, the half whorls 3-4 cm. distant, flower-bearing along the upper third. Empty glumes dull green, tinged with purple, equal, or the first a little longer, elliptical-lanceolate when the apex is spread, strongly 3-nerved, 6-7 mm. long; floret narrowly elliptical, 5 mm. long from the short scarcely acute callus to the joint of the awn, clothed with prominent white silky hairs over 1 mm. long; awn slightly twisted and bent, about 2 cm. long, caducous.

California, *Bolander* 6116, seen by *Scribner*.

Montana, *Scribner* in 1883.

5. *O. Mongolica* (Turcz.) *Beal*, *Coult. Bot. Gaz.* 15: 111 (1890).
Stipa Mongolica *Turcz. Trin. Bull. Soc. Acad. St. Petersb.* 1: 67 (1836).

A slender erect grass, about 30 cm. high. Sheaths shorter than the internodes; ligule 2 mm. long; blades rigid, very slender, involute, 2 in number, those of the sterile shoots half as long as the plant, those of the culm 3-5 cm. long. Panicle exserted, loose, few-flowered, 4-8 cm. long, the lower rays in twos or threes. Empty glumes membranous, subequal, purplish, obtuse, 5-6 mm. long, first 3-nerved, second 3-5-nerved; floral glume slightly hairy, about 4.5 mm. long including the short almost obtuse callus, and the 2-toothed apex; awn irregularly bent and plumose throughout, the longest hairs below and nearly 2 mm. long; palea as long as its glume or longer. Stamens 3.

Mountains of Colorado, *Hall* and *Harbour* 646.

6. *O. exigua* *Thurb. Wilkes Expd.* 481 (1854).

Culms very slender, 15-30 cm. high. Ligule not ciliate, about 3 mm. long; blades scabrid, those of the culm 1-6 cm. long, those below 6-15 cm. long, all of them conduplicate and cylindrical, threadlike. Panicle exserted, very simple and narrow, 2-5 cm. long, containing 4-8 spikelets. Spikelets linear-oblong, about 5 mm. long, the awn rather stout, curved when mature, and somewhat persistent, nearly as long as the spikelet, empty glumes subequal, oval, a little shorter than the floret, acute or irregularly

toothed, delicately 5-nerved near the base, greenish white; floral glume clothed with short hairs and very short tufts near the base.

“It has much the habit and appearance of *O. Canadensis* Torr., but differs essentially in its simple and contracted panicle, its shorter outer glumes, and its longer and somewhat persistent awn.” Scribn. Coult. Bot. Gaz. 11:169 (1886).

Montana, *Williams*; Wyoming, *Buffum* c 2, c 71. Oregon, *Cusick* for U. S. Dept. Agricul. 294.

Oregon to Montana.

7. *O. juncea* (Michx.) B. S. P. Prel. Cat. N. Y. 67 (1888). *Stipa juncea* Michx. Fl. Bor. Am. 1:54 (1803). *Stipa Canadensis* Poir. Lam. Encyl. 7:452 (1806). *Milium pungens* Torr. Fl. U. S. 1:78 (1824). *O. Canadensis* Torr. Fl. N. Y. 2:433 (1843).

Culms slender, 20–40 cm. high. Sheaths rough; ligule not ciliate, 3–4 cm. long; blades scabrid, those of the culm very short or sometimes long, those below tapering into a petiole, firm, involute, 15–20 cm. long, 2 mm. wide, when spread. Panicle exserted, simple, narrow or diffuse, 4–8 cm. long. Spikelets elliptical, acute, about 4 mm. long, awn short and deciduous or wanting, empty glumes subequal, first oval, truncate, membranous with 5 inconspicuous nerves below, second a little narrower; floret whitish, pubescent, with a very short thin tuft at the base.

Vermont, U. S. Dept. Agricul. 292, from *Pringle*; Massachusetts, *Cooley*; Rhode Island, *Clark* 3207; Michigan (Keweenaw), *Wood, Wheeler*; Minnesota, *State Survey* 38.

Northern States to Colorado, May.

8. *O. Hendersoni* Vasey, Contrib. U. S. Nat. Herb. 1:267 (1893).

A densely tufted grass, 15–20 cm. high. Lower sheaths rather loose; blades scabrous, conduplicate, rigid, pungent, 8–10 cm. long. Panicle narrow, 5–8 cm. long, rays mostly in twos, the longest 3–5 cm. long, bearing 2–4 spikelets near the apex. Spikelets 4 mm. long, empty glumes broadly oblong, obtuse and toothed, first 3-nerved, second 5-nerved; floral glume linear-oblong, 3.5 mm. long, smooth, coriaceous, obscurely 5-nerved, bearing 2 lateral teeth, awn curved, caducous, 10–12 mm. long.

Stamens 3, barbate.

Resembling *E. Webberi* and small forms of *O. exigua*, but the florets are smooth.

Washington, *Henderson* 2249, in 1892.

9. *O. Macounii* (Scribn.). *Stipa Macounii* Scribn., *Macoun. Cat. Can. Pl.* 5:390 (1890). *Stipa Richardsonii* A. Gray, *Man. Ed.* 2:249 (1856), not Link (1833). *O. Richardsonii* Beal, *Coult. Bot. Gaz.* 15:111 (1890).

Culms rather slender, 50-90 cm. long. Sheaths much shorter than the internodes; ligule about 2 mm. long on the lower leaves, and 5 mm. on the upper; blades of sterile shoots scabrid, slender, 20-40 cm. long, those of the culm three, flat or soon involute, the longest 2 mm. wide, the upper one 10-20 cm. long. Panicle exerted, loose, slender, 7-12 cm. long; rays mostly in pairs, the longest 2-4 cm. long, bearing a few spikelets near the apex. Empty glumes subequal, oblong, acutish, brittle when mature, mostly 3-nerved, 4-5 mm. long; floret pubescent, linear-oblong, becoming dark brown, about 3 mm. long; callus short and blunt; awn tortuose, slightly twisted, 9-16 mm. long.



FIG. 41.—*Oryzopsis Macounii*. A, spikelet; a, floret. (Scribner.)

Maine, *C. E. Faxon*, collected near Sebago Lake.

Maine, Lake Superior to Montana.

10. *O. Kingii* (Boland.). *Stipa Kingii* Boland. *Proc. Calif. Acad.* 4:170 (1870).

A slender erect tufted grass, 20–40 cm. high. Sheaths of the culm extending well up the culm; ligule 1.5–3 mm. long; blades of the sterile shoots involute, filiform, somewhat flexuose, 15–25 cm. long, those of the culm 5–8 cm. long. Panicle simple, thin, linear, 8–12 cm. long, the lower rays in pairs, the longest 2.5–3 cm. long, bearing 1–2 spikelets. Empty glumes membranous-chartaceous, purple at the base, linear, 1-nerved, first 3–3.5 mm. long, second 4 mm. long; floral glume sparsely clothed with short hairs on the lower half, ovate when spread, 3.3 mm. long, including the short obtuse callus and the 2-toothed apex; awn scabrous, irregularly bent and slightly twisted, 10–15 mm. long; palea oval, 2.5 mm. long. Grain elliptical, compressed, 2 mm. long.

California, *Bolander* 6097.

California and Nevada.

11. *O. micrantha* (Trin. et Rupr.). Thurb. Proc. Acad. Phila. 1863, 78 (1863). *O. micrantha* Thurb. Porter and Coult. Syn. Fl. Colo. 145 (1874). *Urachne micrantha* Trin. & Rupr. Mem. Acad. St. Petersb. (VI.) 5: 16 (1842).

Culms slender, 60 cm. high. Sheaths shorter than the internodes; ligule membranous, not ciliate, 1 mm. long; blades scabrid, involute, or flat, 10–30 cm. long, 2–2.5 mm. wide, in some cases reaching as high as the panicle, in others much shorter. Panicle exerted, thin, diffuse, 8–16 cm. long, rays mostly in pairs. Spikelets ovate-lanceolate, 2.5–3 mm. long; awn deciduous, 5–10 mm. long; empty glumes ovate-acute, hyaline, chartaceous, shining, subequal, 1–2-nerved near the base on either side of the mid nerve; floret smooth, elliptical, 2 mm. long.

Montana, *Anderson, Williams*; Colorado, *Letterman* 31; Utah, *Jones*; Arizona, *Vasey* for U. S. Dept. Agricul. 296, *Jones* 4034.

Colorado to Arizona and Montana.

12. *O. erecta* (Scribn.) Beal, Coult. Bot. Gaz. 15: 112 (1890). *Stipa Pringlei* Scribn., *Vasey*, Contrib. U. S. Nat. Herb. 3: 54 (1892).

Culms erect, rather slender, 60–120 cm. high. Sheaths longer than the internodes; ligule 2–3 mm. long; blades of the sterile shoots numerous, half or two-thirds as long as the culm, scabrous,

flat or involute, the largest 2 mm. wide, those of the culm 3, the upper one filiform, rigid, 3-6 cm. long. Panicle much exerted, open, thin, flexuose, 15-20 cm. long, rays slender in twos, threes or fours, some of them half as long as the panicle, bearing a few flowers above the middle. Empty glumes equal, green on the back, brownish towards the thin margins and apex, elliptical-lanceolate, 5-nerved, 8-10 mm. long; floret lance-ovate, flattened, pubescent, becoming dark brown, 6 mm. long; awn irregularly bent, twisted for the lower half, about 20 mm. long; palea firm, nearly as long as its glume. Stamens 3.

Mexico, *Pringle* 1410.

Arizona and Mexico.

13. *O. fimbriata* Hemsl.

Biol. Centr. Am. Bot. 3:538

(1880). *Stipa fimbriata* H. B.

K. Nov. Gen. et Sp. 1:126 (1815).

A slender tufted erect perennial, 50-80 cm. high. Sheaths of the culms smooth, shorter than the internodes; ligule very thin, 3 mm. long; blades of the sterile shoots numerous, softly smooth, erect or curved, involute, 15-40 cm. long, 1.2 mm. wide, the upper blade 5-10 cm. long. Panicle slightly exerted, simple, lax, secund, 10-13 cm. long; rays scabrous, mostly in remote pairs in the axils of the membranous bracts, the longest ray about 5 cm. long bearing 3-5 spikelets. Empty glumes chartaceous, oval, abruptly pointed, 3-nerved, about 5 mm. long; floret 4 mm. long, oval or obovoid-oval, clothed with short fuscous hairs; awn green, tortuose, irregularly twisted. 1.5-2 mm. long.

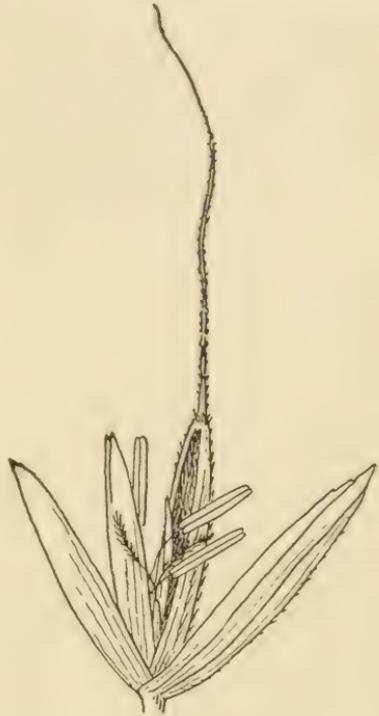


FIG. 42.—*Oryzopsis Pringlei*. Spikelet.
(Richardson.)

New Mexico, *Wright* 1997; California, *Lemmon* 2923; Arizona, *Pringle*.

This has been found in partial shade of calcareous cliffs.

New Mexico to Arizona.

48. (110). **ERIOCOMA** Nutt. Gen. N. Am. Pl. 1:40 (1818).

Panicle few-flowered with stiff, slender, flexuose, dichotomously branched rays. Spikelets solitary, 1-flowered. Empty glumes membranous, alternate, rostrate, first 3-, second 5-nerved, floret becoming coriaceous, ventricose, clothed with long white silky hairs, bearing at the base a short, stout, chisel-shaped callus and at or just below the apex a short straight or curved, obscurely triquetrous, caducous awn. Lodicules 3, as long as the ovary. Stamens 3.

1. **E. membranacea** (Pursh.). *Stipa membranacea* Pursh. Fl. Am. Sept. 2:728 (1814). *S. hymenoides* R. & S. Syst. 2:339 (1817). *Eriocoma cuspidata* Nutt. Gen. 1:40 (1818). *Milium cuspidatum* Spreng, Syst. 1:251 (1825). *Urachne lanata* Trin. Act. Petrop. 126 (1834). *Oryzopsis cuspidata* Benth. Vasey, Gram. U. S. 23 (1883).

Culms hard, smooth or scabrous, nearly solid, 30–60 cm. high.

Sheaths scabrous or smooth, mostly shorter than the internodes; ligule acute, 3–5 mm. long; blades scabrous, narrow, involute, the lower often equaling the culm, the uppermost very short or nearly as long as the panicle. Panicle often included at the base, diffuse, 12–15 cm. long; the rays flexuose, each bearing one spikelet, which is oval, acute, becoming ventricose, pubescent, 6–7 mm. long; empty glumes subequal, attenuate-rostrate, 1–2 nerves at the

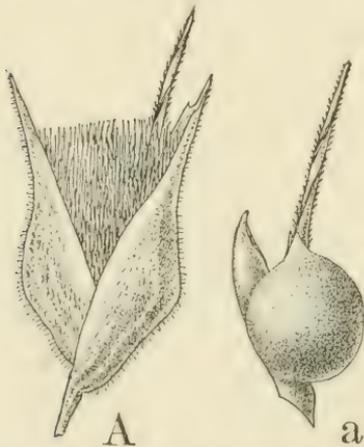


FIG. 43.—*Eriocoma membranacea*. A, spikelet; a, floret. (Richardson.)

base on either side of the prominent mid-nerve; floret hard, oval, 3–4 mm. long, densely clothed with white hairs, often extending 2

mm. above the apex, the stout awn usually extending beyond the glumes and hairs.

Montana, *Anderson*; Colorado, *Jones* 200; Arizona, *Jones* 4764; British Columbia, *Macoun*; Oregon, *Howell*.

A grass of peculiar appearance, prominent as a "bunch-grass" in poor land, from Missouri to the Sierras, New Mexico, Texas.

2. **E. Webberi** Thurb. S. Wats. Bot. Calif. 2:283 (1880). *Oryzopsis Webberi* Benth. Vasey, Gram. U. S. 23 (1883).

A densely tufted slender perennial, 8-15 cm. high. Sheaths of the sterile shoots smooth, crowded, the old ones often destitute of the deciduous blade; ligule rounded, obscure; blades scabrous, involute, rigid, pungent at the apex, 4-7 cm. long, 0.4-0.6 mm. diam.; upper ligule 1 mm. long; blades of the culm 3-4, the upper one 2-3 cm. long. Panicles narrow, simple, 3-6 cm. long; rays slender, erect, the lower in threes, bearing 1-3 spikelets. Empty glumes acuminate, often tinged with purple, about 8 mm. long; floret 6 mm. long with a short callus, deciduous; floral glume 5-nerved, the lateral nerves above approaching the central one, apex minutely 2-lobed, clothed with copious silky white hairs, 2 mm. long; palea as long as its glume and hairy on the back; awn 4 mm. long, slender, curved, caducous. Anthers naked.

California (Sierra Valley), *Bolander* and *Kellogg* in 1871; Nevada, *Jones* 1891.

49. (111). **MILIUM** L. Sp. Pl. 61 (1753). *Miliarium* Moench, Meth. 204 (1794).

Spikelets 1-flowered, loosely paniculate, rachilla articulate above the lower glumes, not extending above the floret. Empty glumes membranous, convex, obtuse, awnless, persistent, subequal, floral glume and palea coriaceous, the former awnless with 3 obscure nerves, the latter 2-nerved. Stamens 3. Styles short, distinct. Grain ovoid or oblong, enclosed in the shining floral glume and its palea, but not adherent.

Annuals or perennials with flat leaf-blades.

There are 5 or 6 species found in Europe and Asia, one of which is also widely dispersed in North America.

"Theoretically the lower glume is wanting, while the empty

single palet [floral glume] of the lower [neutral] flower, resembling the upper glume, fulfils its office, and stands opposite the narrow upper palet of the terete fertile flower." A. Gray, in Manual. This view places *Milium* near *Panicum*.

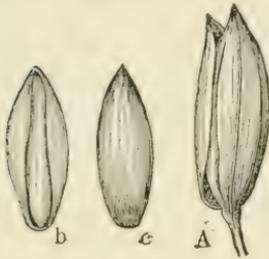


FIG. 44.—*Milium effusum*.
A, spikelet; b, c, florets.
(Scribner.)

1. *M. effusum* L. l. c. *M. transsilvanicum* Schur. Enum. Pl. Transs. 741 (1866).

An erect tufted perennial, smooth throughout, 90–150 cm. high. Sheaths two-thirds the length of the long internodes; ligule about 3 mm. long; blades thin, flat, 12–20 cm. long, 7–15 mm. wide. Panicle ovoid or oblong in outline, 15–18 cm. long, the slender rays in half-whorls of 2–6, bearing spikelets beyond the middle. Spikelets pale green, finely scabrid, ovoid-oblong, 3 mm. long. Empty glumes 3-nerved; floret elliptical, about 2.5 mm. long. Grain obcompressed.

New Hampshire, *Faxon* 21; Vermont, *Pringle, Clark*; Michigan, *Wheeler* for U. S. Dept. Agricul. 298, *Beal* 44, 45, *Cooley, Farwell, Wood*.

Cold woods, New England, New York, Illinois, and northward; also in northern Europe and Asia.

Bentham observes as follows: "Milium was formerly extended to several unawned Paniceæ with only two empty glumes, but it is now reduced to five or six species, all removed from Panicaceæ as having the empty glumes persistent below the articulation. They differ from *Oryzopsis* chiefly in their obtuse absolutely unawned flowering glume."

50. (113). **MUHLENBERGIA** Schreb. Gen. Pl. 44 (1789). *Dileprium* Michx. Fl. Bor. Am. 1: 40 (1803). *Clomena* Beauv. Agrost. 28. t. 7, f. 40 (1812). *Tosagris* l. c. 29. t. 8. f. 3 (1812). *Trichocholea* l. c. 2 (1812). *Podosæmum* Kunth, Mem. Mus. Par. 2: 72 (1815). *Dactylogramma* Link, Hort. Berol. 2: 248 (1827). *Diplachyrium* Nees, Fl. 11: 303 (1828). *Calycodon* Nutt. Journ. Acad. Phila. N. S. 1: 186 (1847). *Vaseya* Thurb. Proc. Acad. Phila. 79 (1863).

Spikelets 1-flowered, small, variously paniculate, rachilla articu-

late above the empty glumes, not extending above the floret, floral glume with a minute callus, usually bearded at the base. Empty glumes 2, persistent, membranous or hyaline, often unequal, the lower sometimes minute or obsolete, keeled, acute, mucronate, or sometimes extending into a short awn, first 1-nerved, second 1-3-nerved; floral glume 3-5-nerved, firm or slender, obtuse or acute, 2-toothed, mucronate or very often extending into a slender awn; palea hyaline, 2-keeled. Stamens usually 3. Styles distinct, stigmas plumose. Grain narrow, subterete, enclosed by the floral glume and palea, but not adherent.

Grasses very variable in habit, rarely annual, culms often wiry, leaf-blades often very thin. The genus includes 60 or more species, most of which are peculiar to North America. Some are found in South America, a few in Asia.

Bentham observes: "They connect in many respects, *Stipa* with *Agrostis* approaching very nearly to the small-flowered *Stipa*, though having thinner fruiting glumes, and usually with a more or less hairy rachilla. From *Agrostis* they may be distinguished by their narrow appressed fruiting glume with a terminal, never dorsal, awn. A very few unawned species are nearly allied to *Epicampes*. The inflorescence is very variable."

- A. *First glume 2-nerved, second 1-nerved, floral glume 3-nerved.* (a)
- a. Ligule a mere ring, empty glumes 2-3 mm. long, floral glume 2.5-3 mm. long. 1
- a. Ligule 0.5-1.5 mm. long, empty glumes 3-4 mm. long, floral glume 3 mm. long. 2
- B. *First glume sometimes 2-nerved, second 1-nerved, floral glume 3-nerved.* (b)
- b. Ligule 2 mm. long, empty glumes 0.5-1.7 mm. long, floral glume 3.5 mm. long. 3
- b. Ligule 5-7 mm. long, empty glumes 1.2 mm. long, floral glume 4.4 mm. long. 4
- C. *Second glume usually 2-3-nerved, floral glume 3-nerved.* . (c)
- c. Ligule 1 mm. long, empty glumes 1.5 mm. long, floral glume 1.5 mm. long. 5

- c. Ligule 3 mm. long, empty glumes 1.5-2 mm. long, floral glume 3 mm. long. 6
- c. Ligule 5-10 mm. long, empty glumes variable, floral glume 3.5 mm. long. 7
- c. Ligule 10-12 mm. long, empty glumes 4-6 mm. long, floral glume 4 mm. long. 8
- c. Ligule 10-18 mm. long, empty glumes 3.5-4 mm. long, floral glume 5-5.5 mm. long. 9
- c. Ligule 3-5 mm. long, empty glumes 1.5-3 mm. long, floral glume 3 mm. long. 7
- D. *Floral glume 5-nerved, 2 mm. long.* (m)
- m. Ligule very short, floral glume 2 mm. long. . . . 10
- m. Ligule 5-7 mm. long, floral glume 12 mm. long. . . 11
- E. *Floral glume 3-nerved and otherwise unlike those above.* . (e)
- e. Floral glume 2 mm. or less in length. (f)
- f. Floral glume about 1.5 mm. long, ligule a ring, perennial. 12
- f. Floral glume about 1.5 mm. long, ligule 0.5 mm. long, perennial. 13
- f. Floral glume 1.7-2 mm. long, ligule a ring, perennial. 14
- f. Floral glume 2 mm. long, ligule 2-3 mm. long, perennial. 15
- f. Floral glume 2 mm. long, ligule 5-6 mm. long, perennial. 16
- f. Floral glume 1.5 mm. long, ligule a ring, annual. . 17
- f. Floral glume 1.5 mm. long, ligule 1 mm. long, annual. 18
- f. Floral glume 1.5-2 mm. long, ligule 1.5-2 mm. long, annual. 19
- e. Floral glume usually more than 2 mm. long and less than 3 mm. long. (g)
- g. Floral glume 2.2-2.5 mm. long, ligule 2-3 mm. long, awn 10-20 mm. long. 20
- g. Floral glume 2.7 mm. long, ligule 1 mm. long, awn 3-6 mm. long. 21

- g. Floral glume 2.5 mm. long, ligule 2-2.5 mm. long,
awn 2-3 mm. long. 22
- g. Floral glume 2.5 mm. long, ligule 2-2.5 mm. long,
awn 1 mm. long. 23
- g. Floral glume 2-2.7 mm. long, ligule 2-3 mm. long,
1-3 mm. long. 24
- g. Floral glume 2-5 mm. long, ligule 0.6 mm long,
awn 1-3 mm. long. 25
- g. Floral glume 2.3 mm. long, ligule 5-8 mm. long,
awn 0. 26
- g. Floral glume 2-2.5 mm. long, ligule 0.5 mm. long,
awn 0. 27
- g. Floral glume 2.5-3.5 mm. long, ligule 0, awn 2-5
mm. long. 28
- e. Floral glume 3 or more rarely 4 mm. long. (h)
- h. Floral glume 3-4 mm. long, ligule 1.5-2 mm. long,
awn 20-30 mm. long. 29
- h. Floral glume 3 or less mm. long, ligule 1 mm. long,
awn 10-30 mm. long. 30, 31
- h. Floral glume 3 mm. long, ligule 8-10 mm. long,
awn 6-16 mm. long. 32
- h. Floral glume 3.5 mm. long, ligule 1 mm. long, awn
10-15 mm. long. 33
- h. Floral glume 3.5-2.5 mm. long, ligule 1 mm. long,
awn 10-15 mm. long. 28
- h. Floral glume 3.5 mm. long, ligule 3-4 mm. long,
awn 6-15 mm. long. 34
- h. Floral glume 3-4 mm. long, ligule 1 mm. long, awn
8-12 mm. long. 35
- h. Floral glume 3 mm. long, ligule 2.5 mm. long, awn
20-30 mm. long. 36
- h. Floral glume 2-3 mm. long, ligule 2-6 mm. long,
awn 6-10 mm. long. 37
- h. Floral glume 3.7-4 mm. long, ligule 5-6 mm. long,
awn 1-2 mm. long. 38

- h. Floral glume 3.7-4 mm. long, ligule 5-7 mm. long, awn 20-25 mm. long. 39
- h. Floral glume 3.5-4 mm. long, ligule 3-5 mm. long, awn 4-10 mm. long. 40
- h. Floral glume 3 mm. long, ligule 1 mm. long, awn 3-8 mm. long. 41
- h. Floral glume 3 mm. long, ligule 2 mm. long, awn 3-6 mm. long. 42
- h. Floral glume 3-4 mm. long, ligule a ring, awn 2-6 mm. long. 43
- h. Floral glume 3 mm. long, ligule 4-7 mm. long, awn 1-3 mm. long. 44
- h. Floral glume 3 mm long, ligule 3 mm. long, awn 3 mm. long. 45
- h. Floral glume 3 mm. long, ligule 0.7 mm. long, awn 1-2 mm. long. 46
- h. Floral glume 4 mm. long, ligule a ring, awn 1-2 mm. long. 47
- h. Floral glume 3.7 mm. long, ligule a ring, awn 1-1.5 mm. long. 48
- h. Floral glume 3.5-3.8 mm. long, ligule 3 mm. long, awn 1.5-2 mm. long. 49
- h. Floral glume 3 mm. long, ligule 1.5-2 mm. long, awn 0.5-1 mm. long. 50
- h. Floral glume 2.5-3.5 mm. long, ligule a ring, awn 0. 28
- e. Floral glume 4 mm. or more in length. (i)
- i. Floral glume 3-4 mm. long, ligule 1.5-2 mm. long, awn 20-30 mm. long. 29
- i. Floral glume 3-4 mm. long, ligule 1 mm. long, awn 8-12 mm. long. 35
- i. Floral glume 3.7-4 mm. long, ligule 5-6 mm. long, awn 1-2 mm. long. 38
- i. Floral glume 3.5-4 mm. long, ligule 3-5 mm. long, awn 4-10 mm. long. 40
- i. Floral glume 3-4 mm. long, ligule a ring, awn 2-6 mm. long. 43

- i. Floral glume 4 mm. long, ligule 2 mm. long, awn
10-20 mm. long. 51
- i. Floral glume 4 mm. long, ligule 1.5-2 mm. long,
awn 10-20 mm. long. 52
- i. Floral glume 4 mm. long, ligule 2 mm. long, awn
4-6 mm. long. 53
- i. Floral glume 4 mm. long, ligule 1-1.5 mm. long,
awn 8-12 mm. long. 54
- i. Floral glume 4 mm. long, ligule 1.5 mm. long, awn
8-12 mm. long. 55
- i. Floral glume 4 mm. long, ligule a ring, awn 1-2
mm. long. 47
- i. Floral glume 4-5 mm. long, ligule 5-6 mm. long,
awn 2-6 cm. long. 56
- i. Floral glume 4-5 mm. long, ligule 1 mm. long, awn
10-15 mm. long. 57

1. *M. lycuroides* Vasey, ined.

A densely tufted, diffuse and prostrate, much-branched, glaucous green annual (?), 10-18 cm. high. Culms slender, compressed. Sheaths shorter than the internodes, ligule very short; blades with white thick margins, scabrous, conduplicate, pungent-pointed, 1.5-3 cm. long, 1-2 mm. wide. The terminal panicles spikelike, 2-3 cm. long, 4-6 mm. diam., the lateral ones more slender and often partially enclosed by the sheaths. Spikelets purplish, subsessile; empty glumes scabrous on the keels, first 2-nerved, about 2 mm. long, including the short unequal bristles, second 1-nerved, about 3 mm. long; floral glume linear, acute, pubescent on the margins, 3-nerved, 2.5-3 mm. long, with a curved stout awn 1-2 mm. long; palea as long as its glume, sparingly pubescent, narrowly elliptical, terminating in 2 short setæ between the two thin lobes. Anthers nearly 2 mm. long.

Nearly allied to *M. Schaffneri* Fourn.

Mexico, *Palmer* 489.

2. *M. Schaffneri* Fourn. *Hemsl. Biol. Centr. Am. Bot.* 3:542 (1880). *M. depauperata* Scribn. *Coult. Bot. Gaz.* 9:187 (1884).

A light green or purplish densely tufted, much-branched an-

nual, 3-12 cm. high. Sheaths inflated; ligule variously cleft, 1.5-2 cm. long; blades scabrid on both sides, with white thickened margins, involute, pungent-pointed, 1-2.5 cm. long. Panicle erect, narrow, simple, 5-10 cm. long. Spikelets erect, sessile or on short stout pedicels in the notches of the rough, stiff, triquetrous rachis; empty glumes rigid, scabrous, linear-lanceolate, first 2-nerved, 1-3-4 mm. long, terminating in two unequal points, second a little longer, lanceolate, awn-pointed, 1-nerved; floral glume smooth or sparingly hairy below, ovate-lanceolate, 3-nerved, 1-3 mm. long; many of those of the sessile spikelets shortly mucronate, those of the pedicellate spikelets terminating in an awn, 2-6 mm. long; palea about the length of its glume. Nearly allied to *M. lycuroides* Vasey.

Mexico, *Schaffner* 1065, *Pringle* 404; New Mexico, *Wright* 2017, *Palmer* 3^a; Arizona, *Pringle*, *Jones*.

Arizona and Mexico.

3. *M. pulcherrima* Scribn. ined.

A reddish light green tufted and much-branched diffuse annual, 20-40 cm. high. Ligule thin, 2 mm. long; blades scabrid, flat, involute, or conduplicate, 4-6 cm. long, 1-1.3 mm. wide. Panicles red, slender, contracted, 6-10 cm. long, rays in threes and very unequal, the longest about 3 cm. long, bearing 8-12 spikelets on the outer two-thirds. Spikelets 1-3 mm. long, on rather stout pedicels; empty glumes 1-nerved, rarely 2-nerved, lanceolate, oval, or sometimes 2-lobed and 2-nerved, first about 0.5 mm. long, second 1.2-1.7 mm. long; floral glume thinly pubescent on the margins of the lower half, lanceolate, 2-toothed, the keel serrulate, 3-nerved, 3.5 mm. long, the awn tortuose, 8-16 mm. long; palea linear, almost obtuse when spread, 2.7 mm. long. Anthers 3, oval, 0.6 mm. long.

Mexico, *Pringle* 1416.

Dry ledges of porphyry.

4. *M. rigida* (H. B. K.) Trin. Unifl. 194 (1826). *Podosæmum rigidum* H. B. K. Nov. Gen. et Sp. 1: 129 (1815).

An erect glaucous and scabrous tufted perennial, 90-120 cm. high. Sheaths often crowded from the culm, involute; ligule thin, acuminate, 5-7 mm. long; blades 3, rigid, conduplicate, 30-

50 cm. long, 0.8–1.5 mm. diam. Panicle red, slender, 25–35 cm. long, rays mostly scattered, capillary, sparingly branched, the longest 12–15 cm. long, bearing 15–20 spikelets on the outer half. Spikelets on pedicels 3–10 mm. long; empty glumes subequal, ovate, apex variable, obscurely 1–2-nerved, about 1.2 mm. long; floral glume scabrid, lance-elliptical, 4.4 mm. long, 2-toothed, the awn 15–25 mm. long; palea linear, abruptly acute when spread, nearly as long as its glume. Anthers 3, linear, 2 mm. long.

Mexico, *Pringle* 401.

Mexico.

5. **M. Clomena** Trin. Unif. 194 (1826). *M. nana* Benth. Plant. Hartw. 262 (1846).

A slender tufted light reddish green annual, 10–15 cm. high, branching near the base. Lower sheaths inflated; ligule about 1 mm. long; blades thin, scabrous above, involute, 2–5 cm. long, 1 mm. wide. Panicles rather dense, linear to oval, 1–2 cm. long, the axis, rays, awns, and often the pedicels flexuose. Spikelets subsessile on the rather stout rays; empty glumes soft, scabrid, first ovate-lanceolate, obtuse, 1-nerved, 1.5 mm. long, second oblanceolate or obovate, truncate or 2–3-lobed or toothed, 2–3-nerved, 1.5 mm. long; floral glume pubescent, lance-oval, the apex with 2 lobes or truncate, obscurely 3-nerved, 1.5 mm. long, the awn coming from below and back of the tip, 1–1.5 cm. long; palea oval when spread, 1.2 mm. long. Stamens 3, anthers 0.5–0.6 mm. long. Grain lance-oval, 1 mm. long.

Mexico, *Pringle* 824, 1411.

Thin soils. Mexico and South America.

6. **M. Bourgæi** Fourn. Hemsf. Biol. Centr. Am. Bot. 3: 539 (1880).

A slender annual. Culms much branched and leafy below, naked above, 15–30 cm. high. Sheaths slightly distended; ligule acute, hyaline, 3 mm. long; blades flat, 1–3 cm. long, 1 mm. or less wide, very finely scabrous on the margin and minutely pubescent on the upper side along the nerves. Panicle rather narrow, 3–5 cm. long; rays solitary, ascending, the lower 1.5–2.5 cm. long, flower-bearing from near the base. Empty glumes unequal,

first lanceolate, 1-nerved, about 1.5 mm. long, second much broader. 2 mm. long, 3-nerved, and acutely 3-toothed; floral glume 3 mm. long, pilose below at the back and sides, scabrous above, awned just below the entire or bidentate apex; awn 8-12 mm. long, strongly flexuose. For another description see Scribner in Phil. Acad. Sci. 1891, p. 297.

Mexico, *Bourgeau* 1155, *Pringle* 3316.

7. *M. gracilis* (H. B. K.) Trin. Unifl. 193 (1826). *Podosæmum gracile* H. B. K. Nov. Gen. et Sp. 1: 131 (1815).

An erect pale rigid tufted perennial, 15-60 cm. high. Sheaths roughish, longer than the internodes; ligule 5-10 mm. or more (!) long, withered sheaths of the sterile shoots numerous; blades usually involute-filiform, scabrous, 6-10 cm. long, 1-2 mm. wide. Panicle very narrow, becoming dark with age, 8-15 cm. long, rays usually single, appressed, flower-bearing for nearly their whole length. Spikelets sessile or pedicellate; empty glumes very variable, more or less acute, first usually the shorter, second obtuse, erose or with several teeth, sometimes first and second both terminating in 1-2-3-nerved awns, 2-3 mm. long; floral glume with a short callus, bearded at the base, more or less pubescent, 3-nerved, 3.5 mm. long, the awn 8-20 mm. long. Grain 1.6 mm. long.

Arizona, *U. S. Dept. Agricul.* 316; Texas, *Jones*; Mexico, *Pringle* 392, 393.

British America to Mexico.

Var. *breviaristata* Vasey, *Contrib. U. S. Nat. Herb.* 3: 67 (1892). *M. subalpina* Vasey, *Cat. Gram. U. S.* 40 (1885).

Slender, 18-30 cm. high; panicle about 5 cm. long; awn 2-4 mm. long.

Colorado, *Vasey*, 642; New Mexico, *Vasey* in 1889.

High altitudes. Colorado, New Mexico to Wyoming.

Var. *enervis* Scribn. ined. Empty glumes distant, destitute of nerves or the second obscurely nerved.

Mexico, *Pringle* 1413.

8. *M. virescens* (H. B. K.) Trin. Unifl. 193 (1826). *Podosæmum virescens* H. B. K. Nov. Gen. et Sp. 1: 132 (1815).

A slender tufted erect perennial, 10-70 cm. high. Sheaths

longer than the internodes; ligule lanceolate, 10–12 mm. long; leaves of sterile shoots numerous, the blades firm, flat or involute, 30–40 cm. long, 2–3.5 mm. wide, those of the culm 2–3 in number. Panicles pale straw-colored, strict, 12–18 cm. long, rays appressed, single or in pairs, densely flowered to near the base, the longest 4–5 cm. long. Spikelets sessile or on rather stout pedicels, 1–3 mm. long; empty glumes sometimes tinged with purple, lanceolate, first 1-nerved, 4–4.5 mm. long, second 3-nerved, 5–6 mm. long, apex sometimes 3-toothed; floral glume pilose for the lower two-thirds, rather firm, ovate-lanceolate, 4 mm. long, the awn 12–20 mm. long; palea pilose, narrowly linear, acute, as long as its glume. Stamens 3 mm. long. Grain linear, terete, 2 mm. long.

Arizona, *Pringle*.

New Mexico, Arizona, and Mexico.

9. *M. firma*. *M. scabra* Scribn. n. sp. ined.

A rather stout erect tufted perennial, 90 cm. high. Ligule firm, acute, 10–18 mm. long; blades firm, closely involute, scabrous, 20–35 cm. long, pungent pointed, 1–15 mm. diam. Panicle brownish purple, erect, spikelike, the base very thin and interrupted, 15–18 cm. long, 1–2 cm. diam. Spikelets olive-brown, empty glumes equal, 3.5–4 mm. long, first 1-nerved, second 2-nerved; floral glume 5–5.5 mm. long, 3-nerved, the stout awn 1–2 mm. long; palea nearly as long as its glume.

The specific name proposed by Scribner had been used by S. Watson, Proc. Am. Acad. 17: 174 (1883).

Growing at the altitude of 10,500 feet.

Mexico (Oaxaca), *Pringle* 4914.

Scribner identifies it as near *M. Palmeri* Vasey, from which it differs in having a much longer ligule, second glume two-nerved, floral glume longer, awn shorter.

10. *M. ciliata* (H. & K.) Trin. Unifl. 193 (1826). *Podosæmum ciliatum* H. B. K. Nov. Gen. et Sp. 1: 128 (1815).

A very slender geniculate or diffuse light green or reddish annual, branching near the base, the culms and leaves more or less pubescent with very short fine hairs. Sheaths half as long as the internodes; ligule a ciliate ring; blades thin, convolute, invo-

lute or flat, often recurved, 1.5–2.5 cm. long, about 1.5 mm. wide. Panicle simple, racemose, 3–6 cm. long; rays single, subsecund, recurved, flower-bearing throughout, 1–2 cm. long. Spikelets mostly sessile; empty glumes subequal, 1-nerved, 1.3–1.6 mm. long, half of which is the awn; floral glume thin, linear-lanceolate, pubescent on 2 of the lateral nerves, 5-nerved, the intermediate lateral nerves obscure, 2 mm. long, the awn 1–20 mm. long; palea linear-lanceolate, 2-toothed, as long as its glume. Grain linear, 1.5 mm. long.

Mexico, *Pringle* 1435, 1845; the later has the longer awns with floral glume less pubescent.

Mexico.

11. **M. stipoides** (H. B. K.) Trin. Unifl. 194 (1824). *Podosæmum stipoides* H. B. K. Nov. Gen. et. Sp. 1:131 (1815).

A strict tufted grass 40–60 cm. high. Culms rather stout. Leaves of the culm 4, sheaths ribbed, mostly longer than the internodes; ligule narrow, 5–7 mm. long; blades strict, scabrid, involute, 6–15 cm. long. Panicle simple, narrow, 6–10 cm. long; rays in threes, the longest 5–6 cm. long, including the 3–4 spikelets on the outer half. Spikelets olive-green, brown at the base, empty glume 1-nerved, ovate-lanceolate, first 5 mm. long, second 7 mm. long; tuft of hairs at base of floret 2 mm. long, floral glume 12 mm. long, 5-nerved, the twisted awn rather stout, 12–15 mm. long, starting 4 mm. below the slender apex of the glume; palea about the length of its glume.

Growing at the altitude of 10,300 feet.

Mexico, *Pringle* 4905.

12. **M. sobolifera** (Muhl.) Trin. Unifl. 189 (1824).

Agrostis sobolifera Muhl.; Willd. Enum. 95 (1809). *Trichochloa sobolifera* Trin. Fund. Agrost. 117 (1820). *Cinna sobolifera* Link, Hort. Berol. 1:71 (1821).

A slender ascending perennial, rarely branching, 30–60 cm. high, from creeping scaly rootstocks. Sheaths longer than the internodes; ligule a mere ciliate ring; blades flat, scabrid, pungent-pointed, 5–10 cm. long, 3–5 mm. wide. Panicle very simple, slen-

der, contracted, 5–10–20 cm. long, longest rays appressed, 1–6 cm. long. Spikelets sessile or on pedicels 1–2 mm. long; empty glumes mostly subequal, mucronate, 1-nerved, two-thirds as long as the floret; floral glume thinly hairy on the lower half, ovate, abruptly short-mucronate, or bearing a slender awn 1–6 mm. long, 3-nerved, 1.5–2 mm. long; palea as long as its glume.

The eastern plants have an awnless floral glume; those from Texas have the awn.

Alabama, *Mohr*.

Open rocky woods, New England to Texas.

13. *M. breviseta* Griseb. Hensl. Biol. Centr. Am. Bot. 3:539 (1880).

A densely tufted perennial, branching near the base, 10–18 cm. high. Ligule 0.5 mm. long; blades glabrous, involute, recurved, 1.5–3.5 cm. long, 1–1.5 mm. wide. Panicle simple, linear, the base included by the sheath, 1–3 cm. long, longest rays half as long, each bearing 1–3 spikelets. Spikelets linear, 1.2–1.5 mm. long, tinged with violet; empty glumes ovate, acute when spread, 1-nerved, first 0.6 mm. long, second 1 mm. long; floral glume ciliate on the margins, ovate when spread, mucronate, 3-nerved, 1.5 mm. long.

Mexico (Michoacan), *Pringle* 3944; also, according to *Fournier*, *Muhl.*, numbers 1453, 2003, 2093; *Shaffner* 111.

Dry cool soils, and hills.

14. *M. Schreberi* Gmel. Syst. 171 (1747). DROP-SEED. NIMBLE WILL. *M. diffusa* Schreb. Besch. Gräs. 2:143, t. 51 (1772–79). *Dilepyrum minutiflorum* Michx. Fl. Bor. Am. 1:40 (1803).

Culms slender, hard, diffuse, much-branched, sometimes geniculate, 20–60 cm. high, from knotted rootstocks. Sheaths shorter than the internodes; ligule very short; blades flat, thin, scabrid, pungent-pointed, 3–8 cm. long, 2–3 mm. wide. Panicles terminal and lateral, slender, contracted, rather loosely many-flowered, 10–18 cm. long; rays slender, in twos and threes, very unequal, the longest 4–5 cm. long; spikelets sessile or on short pedicels; empty glumes very minute, first obsolete, second truncate; floral glume sparingly

hairy below, ovate-lanceolate. 3-nerved, 1.7-2 mm. long, awn 2-4 mm. long; palea nearly as long as its glume.

Vermont, *Pringle*; Pennsylvania, *U. S. Dept. Agricul.* 313 from Scribn.; Michigan, *Cooley, Beal* 45; Indiana, *Beal* 46; Texas, *Nealley*.

Dry Woods, New England to Iowa and New Mexico.

15. *M. elata* Vasey, *Contrib. U. S. Nat. Herb.* 1:283 (1893).

A harsh tufted erect perennial, 90-180 cm. high. Culms slightly compressed, almost solid, leaf-bearing only below. Lower sheaths compressed; ligule decurrent, firm, acute or 2-toothed, 2-6 mm. long; blades scabrous above, mostly conduplicate or involute, 30-90 cm. long, 1.5-3 mm. wide. Panicles brownish or of a reddish lead-color, terminal, narrow or spreading, 30-50 cm. long; rays numerous, scattered, capillary, 6-9 cm. long, bearing 2-6 spikelets to each branch of the ray. Spikelets on very slender pedicels that are 4-10 mm. long; empty glumes nearly equal, ovate, 1-nerved, 1-1.5 mm. long, often irregularly lacerate and terminating in a bristle, 0.2-3 mm. long; floral glume linear-lanceolate with a few short hairs at the base, 3-nerved, 2 mm. long, the awn 5-10 mm. long; palea oval, acute, as wide and as long as its glume.

Mexico, *Palmer* 523, 770; *Pringle* 2351.

16. *M. scoparia* Vasey, *Contrib. U. S. Nat. Herb.* 1:283 (1893).

An erect nearly smooth tufted perennial, 80-100 cm. high. Culms compressed. Ligule acute, 5-6 mm. long; blades of sterile shoots compressed, rigid, conduplicate, 30-50 cm. long, 3-4 mm. wide, those of the culm 2 or 3, narrower and 15-20 cm. long. Panicle linears or narrower, 30-60 cm. long, reddish brown, rays mostly scattered, numerous, erect and spreading, branches paniculate, thinly flower-bearing for the upper three-fourths, the longest 6 cm. long, bearing 50-70 spikelets. Spikelets on pedicels 1-4 mm. long; empty glumes subequal, 1-nerved, 1.5 mm. long, besides the bristly points; floral glume elliptical when spread, obscurely 3-nerved, about 2 mm. long, the awn 1-1.7 cm. long; palea acute, about the length of its glume; the anthers 1.3 mm. long.

Mexico, *Pringle* 2350.

17. *M. exilis* Fourn. *Hemsl. Biol. Cent. Am. Bot.* 3:540 (1880).

A soft slender light reddish-green, much branched and diffuse annual, 15-30 cm. high. Sheaths loose, smooth or thinly pubescent, about the length of the internodes; ligule very short; blades scabrous above, involute, spreading, 2-3 cm. long. Panicles mostly terminal, exserted, slender, 8-12 cm. long, rays in twos or single, appressed, 1-3 cm. distant, 0.5-3 cm. long. Spikelets in sessile tufts on the shortest rays or on the sides and apex of the longest ones. Empty glumes unequal, hyaline, with 1 stout nerve, oval, the first about 1 mm. long, second 1-1.4 mm long, including the awnlike points; floral glume thin, linear-lanceolate, only a pencil-tuft of hairs at the base, 3-nerved, 1.5 mm. long, the awn 1.5-2.5 mm. long; palea and grain linear, about the length of the floral glume.

Mexico, *Pringle* 1775, 2747.

Wet ledges, Mexico.

18. *M. nebulosa* Scribn. ined.

A slender purplish densely tufted much-branched diffuse annual, 8-12 cm. high. Ligule hyaline, 1 mm. long; blades soft, scabrid, involute, narrow, 1-2 cm. long. Panicles open, linear, 3-5 cm. long, rays single, rather stout, spreading, branched, bearing 5-10 spikelets each. Spikelets on short pedicels; empty glumes ovate-lanceolate, 1-nerved, first 0.5 mm. long, second 0.7 mm. long; floral glume lanceolate, hyaline, pubescent on the margins, 3-nerved, 1.4-1.5 mm. long, 2-toothed, the awn 3-5 mm. long; palea as long as its glume. Grain lance-ovoid 0.9 mm. long.

Mexico, *Pringle* 2366, in 1889.

Wet places, hills near Guadalajara.

19. *M. Buckleyana* Scribn. Vasey, Contrib. U. S. Nat. Herb. 3: 69 (1892).

A slender diffuse freely-branching annual, 20-40 cm. high, often purplish. Ligule acute, 1.2-5 mm. long; blades scabrid, convolute or flat, 3-6 cm long, 1-2 mm. wide. Panicles mostly included at the base, slender, open, linear to oval, 10-25 cm. long, rays single, scattered, capillary, sparingly branching, the longest 5-8 cm. long. Spikelets mostly on pedicels 1-3 mm. long, from branches along the upper three-fourths of the rays; empty glumes hyaline,

subequal, shortly hairy, ovate, bristle-pointed or mucronate, 1-nerved, 1-1.5 mm. long; floral glume almost hyaline, oval, acute, pubescent on the margins and keel for the lower two-thirds, 3-nerved, 2-toothed, 1.5-2 mm. long, the awn 2-2.1 mm. long; palea oval, obtuse or abruptly acute when spread, nearly as long as its glume. See note under *M. Porteri* Scribn.

Mexico, *Pringle* 399, 400.

Wet ledges, rocky hills, gravel bars of streams.

20. *M. Alamosæ* Vasey, Coult. Bot. Gaz. 16:146 (1891). Once distributed as *M. calamagrostidea* Kunth, Rev. Gram. 1:63 (1829).

A slender reddish scabrid erect sparingly-branched perennial, 60-80 cm. high; the nodes tumid. Sheaths two-thirds as long as the internodes; ligule thin, lacerate, about 2 mm. long; blades thin, flat, or convolute, 5-12 cm. long, 1.5-2.5 mm. wide. Panicles slender, linear or lanceolate, 12-16 cm. long; rays rigid, rather distant, solitary or in twos or threes, branching sparingly and flower-bearing from near the base. Spikelets sessile, at length spreading, recurved; empty glumes unequal, oval, acute, obtuse or 2-toothed, mucronate with one strong nerve, first about 1 mm. long, second 1.5 mm. long; floral glume shortly hairy for the lower third, scabrid above, linear-lanceolate, 2-toothed, 3-nerved, 2.2-2.5 mm. long, the awn 10-20 mm. long; palea linear-elliptical, acute, a little shorter than its glume. Grain linear-lanceolate, terete, 1.3 mm. long.

Mexico, *Pringle* 397, 428, *Palmer* 407.

Rocky Hills, under shrubs, etc.

Texas to Arizona and Mexico.

21. *M. sylvatica* Muhl. A. Gray, N. A. Gram. and Cyp. No. 13 (1834). *A. diffusa* Muhl. Gram. 64 (1817), not Host.

Culms hard, ascending, much branched and diffusely spreading, 60-120 cm. high, from scaly creeping rootstocks. Sheaths about the length of the internodes; ligule less than 1 mm. long; blades flat, thin, scabrous, pungent-pointed, 5-8 cm. long, 3 mm. wide. Panicles spikelike, slender, interrupted, 8-12 cm. long, 5-7 mm. diam., rays mostly in threes, very unequal, the longest slender, spikelike, flower-bearing from near the base, 3-4 cm. long. Spike-

lets sessile or on short pedicels, empty glumes subequal, 1-nerved, bristle-pointed, nearly as long as the floral glume; floral glume thinly pubescent on the lower half, 3-nerved, 2.7 mm. long, the awn 3-6 mm. long. Fig. 82, Vol. I. p. 184.

A very variable species. Low open woods.

New York, *Beal* 47; Michigan, *Clark* 698; Iowa, *Hitchcock*.

New England to the Rocky Mountains.

Var. **Californica** Vasey, Coult. Bot. Gaz. 7:93 (1882). *M. Parishii* Vasey, Bull. Torr. Club, 13:53 (1886).

Rays mostly single, the empty glumes rather exceeding the floral glume without its awn, and in the same panicle are spikelets in which the empty glumes including the awn are no longer than the floral glume; awn of floral glume about 3 mm. long.

This plant corresponds very well throughout with one collected by the author at Union Springs, Cayuga County, N. Y., about 1865.

California, *Parish* 1076, also for Nat. Mus.; Arizona, *Lemmon* for Nat. Herb.

Var. **gracilis** Scribn. Trans. Kans. Acad. Sci. 9:116 (1883-84).

"It resembles somewhat *M. monticola* Buckl., but in that species the empty glumes are much shorter than the floret, while in this they nearly equal it (exclusive of the awn), as in *M. sylvatica*."

Var. **setarioides** (Fourn.). *M. setarioides* Fourn. Hemsl. Biol. Centr. Am. Bot. 3:542 (1880).

Culms persistent and rooting; empty glumes slightly unequal, 1-nerved, 1-1.5 mm. long, awn of floral glume 5-10 mm. long; otherwise like the species.

Mexico, *Botteri* 70, 638, 698; *Borgeau* 3662.

Var. **setiglumis** S. Wats. Bot. King's Expd. 378 (1871).

Culms shorter, blades 8-15 cm. long, 4-6 mm. wide; panicle shorter: empty glumes two-thirds as long, but the awn longer, extending a little beyond the floret: floral glume scarcely pubescent.

Agricul. College, Mich., in 1885-86.

22. **M. flavida** Vasey, Contrib. U. S. Nat. Mus. 1:282 (1893).

A slender rather soft annual, 30-50 cm. high, branching throughout its length. Sheaths half as long as the internodes;

ligule lacerate, 2–2.5 mm. long; blades thin, involute or flat, 8–12 cm. long, 1.5–2 mm. wide. Panicles slender, linear (or spreading?), 10–15 cm. long, rays single or more or less clustered, the longest rarely branching, 4–5 cm. long, bearing 4–8 spikelets along the outer half or two-thirds. Spikelets racemose on pedicels about 1 mm. long; empty glumes equal, hyaline, awl-shaped, 1-nerved, 1.5–2 mm. long; floral glume 3-nerved, almost hyaline, linear-lanceolate, pubescent on the margins, 2-toothed, 2.5 mm. long, the awn about the same length; palea 2-toothed, as long as its glume. Anthers oval, 0.4 mm. long.

Mexico (Jalisco), *Palmer* 645.

23. *M. filiculmis* Vasey, *Contrib. U. S. Nat. Herb.* 1:267 (1893).

A slender erect smooth glaucous perennial, 20–30 cm. high. Ligule 2–2.5 mm. long; blades involute, about 0.5 diam. before spreading, none extending more than one-third the height of the culm. Panicle simple, narrow, 3–4 cm. long, longest ray 1–2 cm. long, flower-bearing for the outer two-thirds. Spikelets with first empty glume 1-nerved, 1 mm. long, second 3-nerved, 3-toothed, 5 mm. long; floral glume ciliate on the margins of the lower half, 3-nerved, 2.5 mm. long, shading into an awn about 1 mm. long; palea linear to elliptical when spread, as long as its glume. Anthers 3 in number, 1.4 mm. long.

Colorado (Ute Pass), *C. S. Sheldon* in 1892, at 8500 feet alt.

Nearly related to *M. gracilis breviaristata* Vasey, but more slender.

24. *M. monticola* Buckley, *Proc. Acad. Phila.* 91 (1862).

An erect or decumbent branching glabrous light reddish-green perennial, 30–60 cm. high. Sheaths shorter than the internodes, the lower ones crowded off by branches; ligule thin, lacerate, 2–3 mm. long; blades involute, 5–10 cm. long, 2 mm. wide. Panicle slightly exserted, or the base included, slender, interrupted, loosely spikelike, 4–10–15 cm. long; rays simple, appressed, flower-bearing for the entire length, 0.5–3 cm. long. Spikelets on pedicels 0.5–2 mm. long; empty glumes thin, linear, acute or obtuse, 1-nerved; first 1 mm. long, second 1.5–1.7 mm. long; floral glume acute,

lanceolate, pubescent on the margins, 3-nerved, 2-2.7 mm. long, the awn 1-2-3 cm. long; palea of same shape and nearly as long as its glume. Anthers 3 in number, 0.8 mm. long.

Arizona, *Pringle* in 1884; also, No. 396, Santa Eulalia Mts.; Mexico (Chihuahua), *Pringle* in 1885; New Mexico, *Jones* in 1884. West Texas to Arizona.

25. **M. Wrightii** Vasey, Coult. Man. Rocky Mt. Bot. 409 (1885).

An erect or decumbent perennial, 30-75 cm. high. Culms firm, compressed. Sheaths keeled, shorter than the internodes; ligule 0.6 mm. long; blades involute, rigid, 8-12 cm. long with filiform tips. Panicle spikelike, cylindrical, densely flowered, more or less interrupted below, 5-9 cm. long, 4-6 mm. diam. or more slender and interrupted; lower rays spikelike, appressed, 1-2 cm. long. Spikelets often 2-flowered; empty glumes subequal, 1-nerved, about 2 mm. long, base thin, ovate, awn-pointed; floral glume a little thicker and longer, very shortly pubescent, 3-nerved, ovate, acute, tipped with a very short stiff awn; palea ovate, acute, nearly as long as its glume. Anthers 1.3 mm. long.

Arizona, U. S. Dept. Agricul. 334, from *Lemmon*; Mexico, *Pringle* 1419.

Colorado, New Mexico, Arizona, and Mexico.

26. **M. elongata** Scribn. ined.

A densely tufted erect rather slender hard-stemmed light green perennial, 80-120 cm. high. Sheaths involute, leaving the culm for a third of their length; ligule lanceolate, 5-8 mm. long; blades rigid, involute, 20-35 cm. long, 0.3-0.8 mm. diam. Panicle terminal, often partially included by the sheaths, linear (or spreading (?), 25-35 cm. long, lower rays in clusters of 3-5, branching near the base, and mostly flower-bearing for their entire length, the longest 6-8 cm. long. The lateral spikelets on pedicels about 1 mm. long; empty glumes almost hyaline, obscurely 1-nerved, linear, acuminate, second a little the longer, 2-2.3 mm. long; floral glume thin, linear, a pencil-tuft of hairs at the base only, rather abruptly acute when spread, obscurely 3-nerved, 2.3 mm. long; palea acute, a little narrow, but about as long as the glume.

Mexico, *Pringle* 398, 3477.

27. **M. Mexicana** (L.) Trin. Unifl. 189 (1824). *Agrostis Mexicana* L. Mant. 1: 31 (1767). *A. lateriflora* Michx. Fl. Bor. Am. 1: 53 (1803). *Cinna Mexicana* Beauv. Agrost. 32 (1812). *Muhlenbergia foliosa* Trin. Unifl. 190 (1828).

Culms slender, wiry, ascending, much-branched, 60–100 cm. high, from scaly creeping rootstocks. Sheaths about two-thirds as long as the internodes; ligule 0.5 mm. long; blades thin, flat, scabrous, pungent-pointed, 10–15 cm. long, 3–5 mm. wide. Panicle often purplish, lateral and terminal often included at the base, contracted, 10–18 cm. long, rays mostly in threes, two of which are very short, the longest linear, 3–5 cm. long, and densely flowered nearly to the base. Empty glumes sharp-pointed or short-awned, slightly unequal, the lower a little longer than the floret, 2.5–3 mm. long; floral glume thinly pubescent on the lower half, lanceolate, very sharp pointed, 3-nerved, 2–2.5 mm. long.

Vermont, *Pringle*; New York, *Beal* 48; District of Columbia, *McCarthy*; Michigan, *Beal* 49, *Wheeler* 50; Minnesota, *Bailey* X 28, B 422.

Found rather abundantly on low lands from New England to Nebraska and Mexico; flowering too late in autumn to be of much value for hay.

Var. **filiformis** (Muhl.) Scribn. ined. *Agrostis filiformis* Muhl. Gram. 66 (1817).

Panicle very slender and simple, borne on long filiform pedicels. Illinois, U. S. Dept. Agricul. 318, from *Wolfe*.

28. **M. racemosa** (Michx.) B. S. P. Prel. Cat. N. Y. 67 (1888). *Agrostis racemosa* Michx. Fl. Bor. Am. 1: 53 (1803). *Polypogon glomeratus* Willd. Enum. 87 (1809). *Trichochloa glomerata* Trin. Fund. Agrost. 117 (1820). *M. glomerata* Trin. Unifl. 191 (1824). *Cinna racemosa* Kunth, Enum. 1: 207 (1833).

An erect simple sparingly-branched perennial, 60–90 cm. high. Sheaths nearly as long as the internodes; ligule a ciliate ring; blades flat, scabrous, pungent-pointed, 8–12 cm. long, 3–5 mm. wide. Panicle 5–10 cm. long, often purplish, exserted, oblong-linear, often interrupted below, rays very short and densely

flowered. Spikelets sessile or subsessile; empty glumes lanceolate, nearly equal, 1-nerved, about two-thirds as long as the floret, besides the awns, which are 2-5 mm. long; floral glume lance-ovate, mucronate, thinly pubescent on the lower two-thirds, 3-nerved, 2.5-3.5 mm. long; palea obovate, lanceolate but little shorter than its glume.

Massachusetts, *Cooley*, *Beal* 51; Ontario, *Fowler*; Michigan, *U. S. Dept. Agricul* 314, from *C. F. Wheeler*, *Clark* 1101, *Cooley*; Iowa, *Hitchcock*; Minnesota, *Sandberg* 42; Colorado, *Cassidy*; Montana, *Williams*; New Mexico, *Jones* 4158; British Columbia, *Macoun*.

Found in wet ground from New England to Canada, Colorado, Nevada, and Texas. Although the culms are, hard and the leaves thin, the grass is much prized for hay for horses. See Vol. I. Fig. 81.

Var. **brevifolia** Vasey, *Coult. Bot. Gaz.* 7:92 (1882). *M. Californica* Vasey, *Bull. Torr. Club*, 13:53 (1886). Blades 4-8 cm. long, 4-6 mm. wide, floral glume usually bearing an awn 1-2 mm. long.

California, *Parish Brothers* 1028.

Var. **ramosa** Vasey, *Contrib. U. S. Nat. Herb.* 3:68 (1892). A taller much-branched plant, leaves longer, empty glumes about as long as the floret, the awn shorter.

Colorado, *Tracy*.

Found from Illinois to Montana.

29. **M. microsperma** (D C.) Trin. *Unifl.* 193 (1824). *Trichochloa microsperma* D C. *Cat. Hort. Monsp.* 151 (1813). *Agrostis microsperma* Lag. *Gen. et Sp.* 2 (1816). *Podosemum debile* H. B. K. *Nov. Gen.* 1:128 t. 681 (1815). *Muhlenbergia debilis* Trin. *Mem. Acad. St. Petersb.* (VI.) 6:295 (1841). *Muhlenbergia purpurea* Nutt. *Journ. Acad. Phila.* (II.) 1:186 (1848).

Culms slender, ascending from a geniculate or stoloniferous much-branched base. Sheaths mostly shorter than the internodes, inflated or often crowded from them by the shortly calloused, bulb-like branches, the sheaths of which firmly enclose the fertile floret; ligule lacerate 1.5-2 mm. long; blades usually flat, often purple,

pubescent above and below, 4-6 cm. long, 1-1.5 mm. wide. Panicle often included at the base by the upper sheath, slender, racemose, 8-15 cm. long, rays mostly solitary, erect or spreading, distinct, distant. Spikelets mostly sessile and extending the whole length of the branches, 2-3 mm. long; empty glumes ovate, 1-nerved, subequal or the first shorter, 0.5-0.8 mm. long; floral glume 3-4 mm. long, scabrous, 3-nerved, linear-lanceolate, the slender awn 2-3 cm. long; palea scabrous, lanceolate, little shorter than its glume. Grain 1.6 mm. long.

Arizona, *Pringle*; California, *U. S. Dept. Agricul.* 310 from Jones, *Orcutt*; Mexico, *Palmer* 510.

Texas to California and Mexico.

30. *M. spiciformis* Trin. *Fund. Agrost.* 2:42 (1841). *Mem. Acad. St. Petersb.* (VI.) 6, 2:285 (1845).

A very slender, much-branched and diffuse annual, 30-60 cm. high, sheaths smooth, half to three-fourths the length of the internodes; ligule 1 mm. long; blade thin, flat, 6-10 cm. long, 1.5-2 mm. wide. In some of the lower axils are short turgid sheath-like bracts containing fertile flowers with hyaline glumes. Above are filiform branches bearing each a single spike, 8-15 cm. long with more or less distant spikelets which are single or branching once or twice. Terminal panicles thin, linear, 10-15 cm. long, rays in twos or single, the longest 2-3 cm. long, bearing short branches and 10-20 spikelets, sessile or on pedicels 2-3 mm. long. Empty glumes of these spikelets 1-nerved, the second less than 1 mm. long, but longer than the first; floral glume thinly pilose on the lower half of the central nerve and the margins, scarcely 3 mm. long, gradually tapering into an awn 1-2 cm. long; palea 2 mm. long, grain nearly as long as the palea. Sessile spikelets borne on a bearded pointed callus 2 mm. long in the axils of stiff lanceolate bracts about their own length, first glume awl-shaped, 1-2 mm. long, second linear-lanceolate, 6 mm. long, with a single double nerve; floral glume as long as the second glume, 3-nerved; palea pilose, rachilla constricted, 1-2 mm. long, bearing 3 awns 5-10 mm. long.

Mexico.

31. *M. brevifolia* Scribn. *ined.*

A smooth slender branching geniculate perennial, 10–40 cm. high, the internodes about 2 cm. long. Sheaths mostly shorter than the internodes; ligule 1 mm. or less in length; blade involute, obtuse, 1–3 cm. long. Peduncle slender, 10–15 cm. long, bearing an open ovoid panicle 3 cm. long. Empty glumes equal, 1-nerved, 2.5–3 mm. long; floral glume 3 mm. long, 3-nerved, the awn 8–14 mm. long.

Wet ledges.

Mexico (Jalisco), *Pringle* 4736.

32. *M. argentea* Vasey, Bull. Torr. Club, 13: 232 (1886).

A slender glaucous ascending perennial, 40–60 cm. high. Leaves of sterile shoots few and stout, short; sheaths of the culm-leaves about 6, longer than the internodes; ligule lanceolate, 8–10 mm. long; blade nearly smooth, loosely involute, 8–12 cm. long, 1.5–2 mm. wide. Panicle narrow or spreading (?) partly included, 12–18 cm. long, rays single or in twos, capillary, branching, the longest 5–7 cm. long, thinly flower-bearing for most of their length. Spikelets on pedicels 3–8 mm. long, light, silvery green or tinged with red; empty glumes subequal, linear-lanceolate, the apex more or less irregularly 2-toothed, 1-nerved, 2.5–3 mm. long; floral glume broadly linear, thinly pubescent on the lower half, 3 mm. long, 3-nerved, with two broad teeth at the apex, the awn 6–15 mm. long; palea oval, obtuse, nearly as long as its glume.

Mexico, *Palmer* 160.

33. *M. tenuiflora* (Willd.) B. S. P. Prel. Cat. N. Y. 67 (1888). *Agrostis tenuiflora* Wild. Sp. Pl. 1: 364 (1798). *Cinna tenuiflora* Link, Enum. 1: 71 (1821). *Muhlenbergia Willdenovii* Trin. Unifl. 188 (1824).

Culms upright, rather slender, simple or only sparingly branched, 65–90 cm. high, from scaly creeping rootstocks. Sheaths scabrous; ligule about 1 mm. long; blades flat, thin, pungent-pointed, scabrid, 10–14 cm. long, 4–7 mm. wide. Panicle very slender, loosely flowered, 20–40 cm. long, rays distant, mostly in pairs, the longest 8–10 cm. long, slender. Spikelets on pedicels, the shortest of which are 1–2 cm. long, empty glumes subequal, ovate, short-pointed, 1-nerved, about 2 mm. long; floral glume ovate-lanceolate, 3-nerved,

pubescent on the lower third, about 3.5 mm. long, the awn 10-15 mm. long; palea pubescent on the nerves, nearly as long as its glume.

Dry wood lands.

Pennsylvania, *Clark* 2953; District of Columbia, *McCarthy*; Michigan, *Clark* 699; Indiana, *Beal*.

New England to Arkansas.

34. *M. capillaris* (Lam.) Trin. Unifl. 191 (1824). *Stipa capillaris* Lam. Illustr. 1: 158 (1791). *Stipa diffusa* Walt. Fl. Car. 78 (1788). *Stipa sericea* Michx. Fl. Bor. Am. 1: 54 (1803). *Agrostis sericea* Ell. Bot. S. C. & Ga. 1: 135 (1817).

A tufted erect perennial, 60-100 cm. high; roots fibrous. Culms hard, simple, straight, erect. Ligule 3-4 mm. long; blades conduplicate, rigid, those of the culm 15-20 cm. long, those of the sterile shoots 25-40 cm. long, all pungent-pointed, subcylindrical, about 1 mm. diam. Panicle often purple, very loose, erect, open, ovoid or narrow, 25-35 cm. long, rays in twos, threes or single, spreading, branches diverging, very slender, stiff or flexuose. Spikelets single, pedicels 1-3 cm. long; empty glumes subequal, 1-nerved, 1.5-3 mm. long; first awned or not, second awned; floral glume smooth except the hairy tuft below, linear-lanceolate, 3-nerved, 3.5 mm. long, the central awn 6-15 mm. long; palea as long as its glume, sometimes awned.

Georgia, *U. S. Dept. Agricul.* 306, from Latimer; Florida, *Curtiss* 3401.

New England to Florida, Missouri and Texas.

Var. *filipes* (Curtis) Chapm. *M. filipes* M. A. Curt. Am. Journ. Sci. (I.) 44: 83 (1843).

Empty glumes about 1 mm. long, each with a slender awn 3-20 mm. long, floral glume with lateral awns 3-5 mm. long.

Florida, *Curtiss* 3401.

Var. *trichopodes* (Ell.) Vasey, Contrib. U. S. Nat. Herb. 3: 66 (1892). *Agrostis trichopodes* Ell. Bot. S. C. & Ga. 1: 135 (1816).

Leaf-blades flat or conduplicate, floral glume with an awn 1-6 mm. long, palea a little longer than its glume.

South Carolina, *Ravenel*; Florida, *A. H. Curtiss* 3204; Texas, *Wright*.

35. **M. Pringlei** Scribn. Bull. Torr. Club, 9: 89 (1882).

A slender erect rather rigid densely-tufted perennial, 30-40 cm. high. Sheaths longer than the internodes; ligule broad, decurrent, irregularly cut, 1 mm. long; blades involute, filiform, scabrid, about 7 to each culm, 6-15 cm. long, the lower ones shorter. Panicle slender, contracted, rather densely flowered, 6-10 cm. long. Spikelets subsessile or on short pedicels, empty glumes subequal, 1-nerved, with slender acuminate points, 2-3 mm. long; floral glume lanceolate, nearly or quite smooth at the base, 3-nerved, scabrous on the keel above, 3-4 mm. long, the awn 8-12 mm. long; palea nearly as long as its glume.

Arizona, *Pringle*.

36. **M. parviglumis** Vasey, Monog. Grasses U. S. and Brit. Am. 71 (1890); Contrib. U. S. Nat. Herb. 3: 71 (1892).

A branching scabrous grass, 50-70 cm. high. Sheaths rather loose, the lower ones longer than the internodes; ligule lacerate, 2.5 mm. long; blades flat or involute, 4-8 cm. long, about 2 mm. wide. Panicle partially enclosed, narrow, thin, 15-20 cm. long, rays single or the lower in twos, branching and flower-bearing to the base. Empty glumes 1-nerved, subequal or unequal 0.5-0.8 mm. long; floral glume linear-lanceolate, 3 mm. long, 3-nerved, pilose below, scabrous above, awn just below the acute bifid apex; awn hyaline, straight, 20-30, mm. long.

Texas, *Nealley*.

37. **M. longifolia** Vasey, Contrib. U. S. Nat. Mus. 1: 283 (1893).

An erect light-green stout tufted perennial, 120-180 cm. high. Culms hard but hollow. Sheaths sometimes spreading from the culm, slightly involute; ligule stout, decurrent, 2-6 mm. long; blades of the culm scabrous, convolute or conduplicate, 80-100 cm. long, 0.5-1 mm. diam., with very long slender points. Panicle yellowish brown, linear-lanceolate (or spreading?), 40-60 cm. long, rays scattered, appressed, capillary, branching, mostly flower-bearing on the terminal half, the longest 10-15 cm. long.

Spikelets on pedicels 5–15 mm. long; empty glumes serrulate on the single nerve, second the longer, about 1 mm. long, besides a short bristle; floral glume lanceolate, 3-nerved, 2–3 mm. long, the awn 6–10 mm. long; palea acute, as wide and as long as its glume. Anthers 3 in number, 1.4 mm. long.

Mexico (Rio Blanco), *Palmer* 523, 523a.

38. *M. laxiflora* Scribn. ined.

A rather slender erect light green tufted perennial, about 90 cm. high. Sheaths shorter than the internodes; ligule thin, lascerate, acute, 5–6 mm. long; blades scabrous, involute or conduplicate, those of the culm 3–4, and 4–15 cm. long, 0.5–0.7 mm. diam. Panicles terminal, thin, purplish, lanceolate (or spreading?), about 15 cm. long, rays mostly in twos and threes, erect, sparingly branched, bearing 8–15 spikelets on the terminal half. Spikelets on pedicels 1–4 mm. long, empty glumes ovate, acute, obscurely 1-nerved, second the longer, 1.5 mm. long, 3-nerved; floral glume scabrid, 3-nerved, 3.7–4 mm. long, linear when spread, acute or bearing a short bristle; palea obtuse when spread, as long as its glume.

Mexico, *Pringle* 1412.

Cool slopes of the Sierra Madre, Mexico.

39. *M. articulata* Scribn. Proc. Acad. Phila. 298 (1891).

An erect densely tufted perennial, 60–80 cm. high. Leaves of sterile shoots nearly as high as the culms; sheaths compressed, 12–18 cm. long; ligule very stout, rigid, 5–7 mm. long; blades strongly involute or conduplicate, smooth, 0.7–1 mm. diam., long-pointed, articulate at the sheaths, leaving the stout ligule projecting. Panicle loosely spikelike, about 30 cm. long, longest rays 3–6 cm. long. Spikelets linear-lanceolate, 4 mm. long; empty glumes lanceolate, 1-nerved, first 2.5 mm. long, second 3.2 mm. long; floral glume with a tuft of short hairs at the base, 3-nerved, bearing a slender tortuose awn 2–2.5 cm. long.

Mexico (San Luis Potosi), *Pringle* 3913.

On dry calcareous hills.

40. *M. Berlandieri* Trin. Mem. Acad. St. Petersb. (VI.) 6.2: 299 (1845).

A densely tufted strict light-green scabrous perennial, about 120 cm. high. Sheaths shorter or longer than the internodes; ligule firm, 3-5 mm. long; blades conduplicate, rigid, 25-40 cm. long, about 1 mm. diam. Panicle slender, spikelike, light green or purple, 20-30 cm. long, 5-10 mm. diam., rays numerous, erect, 1-3 cm. long. Spikelets on pedicels 1-3 mm. long, empty glumes nerveless, scabrid toward the tip, oval, 1.3-1.7 mm. long; floral glume with a very small pencil-tuft of hairs at the base only, linear, 3-nerved, 3.5-4 mm. long, apex 2-toothed, the awn 4-10 mm. long; palea linear acute, as long as its glume. Nearly allied to *M. affinis*.

Mexico, *Pringle* 403.

Texas to Arizona and Mexico.

41. *M. comata* (Thurb.) Benth. Vasey, Rep. Dep. Agric. t. 5: 247 (1881-82). *Vaseya comata* Thurb. Proc. Phila. Acad. 79 (1863).

A rather stout simple erect perennial, 30-90 cm. high, with creeping scaly rootstocks. Sheaths about 6, mostly smooth, shorter than the internodes; ligule a lacerate fringe 1 mm. or less in length; blades dull green, rough on both sides, flat or convolute, pungent-pointed, 8-15 cm. long, 3-5 mm. wide. Panicle pale green, lead-colored or purplish, 8-12 cm. long, 1-1.3 mm. diam., often with interruptions and short spikes below. Spikelets on very short pedicels; empty glumes conduplicate, linear-lanceolate, the single nerve serrulate, mucronate, first 2.5-3.3 mm. long, second a little longer; floral glume thin, linear-lanceolate, 3-nerved, 3 mm. long, with silky hairs from the callus as long as the floret, the awn 3-8 mm. long; palea acute, as long as its glume. Grain linear 1.3 mm. long.

Colorado, *Patterson, Cassidy*; Montana, *Williams*; California, *Kellogg and Havard* 1097, *Hall and Harbour* 185.

Colorado to California on alluvial banks of streams.

42. *M. Porteri* Scribn. in MS. *M. Texana* Thurb. Gram. Mex. Bound. ined. Porter and Coult. Syn. Fl. Col. 144 (1874).

A branching diffuse or decumbent perennial, often more or less purple or red, 30-60 cm. high. Culms solid or nearly so, nodes

numerous. Sheaths mostly half the length of the internodes; ligule ciliate, about 2 mm. long; blades flat or involute, bristle-pointed, 2-5 cm. long, 1.5 mm. wide. Panicle thin, pyramidal or ovoid, 8-10 cm. long; rays about 10 in number, single, the longest sparingly branched, bearing 5-10 spikelets. Spikelets on pedicels 2-5 mm. long; empty glumes linear-lanceolate, 1-nerved, 2.2-2.5 mm. long; floral glume thinly and shortly pubescent on the lower half, ovate, acute, 2-toothed, 3-nerved, 3 mm. long, awn 3-6 mm. long; palea much like its glume, excepting in the number of nerves. Anthers 1.8 mm. long.

The following is a note from Prof. Scribner: "Thurber's *M. Texana* was first described and published in Porter & Coulter's Synopsis of the Flora of Colorado (1874). It is there given as *Muhlenbergia Texana* Thurber in Gram. Mex. Bound. ined.' From this it appears that Buckley's name should stand, with *M. Buckleyana* Scrib. as a synonym, while a new name must be given to Thurber's grass. We will name this last *M. Porteri*, as it appears that Dr. T. C. Porter first described it."

Arizona, U. S. Dept. Agricul. from *Rusby, Pringle*; Texas *Nealley*.

Texas to Arizona, California, and Mexico.

43. *M. dumosa* Scribn. Vasey, Contrib. U. S. Nat. Herb. 3:71 (1892).

An erect perennial, 120-150 cm. high, profusely branching toward the top, from woody rootstocks. Culms very hard, nodes unusually numerous, 25-50, some of the slender upper branches with 25 nodes. Sheaths half or two-thirds as long as the internodes; ligule a mere ring; blades lanceolate, flat, 25 cm. long, passing gradually to those much shorter, those on the very slender branches often deciduous. Panicles very numerous, simple, 1-2.5 cm. long; rays single, about 5 in number, bearing a few sessile single or clustered spikelets. Spikelets often purplish; empty glumes nearly equal, ovate, about 1.5 mm. long, the single nerve ending in a mucro; floral glume pubescent on the margins along the lower half, oval-lanceolate, 3-nerved, 3-4 mm. long, the awn

2-6 mm. long; palea as long as its glume terminating in two setæ. Grain linear, terete, 2 mm. long.

Arizona (Santa Catalina Mts.), *Pringle* 884.

Var. *minor* Scribn. ined. Plant more slender, spikelets pedicellate, the bristles of the empty glumes often as long as the rest of glume, floral glume 2 mm. long, the awn more slender, often 10 mm. or more long.

Mexico, *Pringle* 2355.

44. *M. arenicola* Buekl. Proc. Phila. Acad. 91 (1862). *M. cespitosa* Chapm. Coult. Bot. Gaz. 3:18 (1878). *M. setifolia* Vasey, Coult. Bot. Gaz. 7:92 (1882). *M. Reverchoni* V. & S. Contrib. U. S. Nat. Herb. 3:66 (1882).

A slender erect tufted simple glaucous-green perennial, 30-60 cm. high, with fibrous roots. Sheaths half the length of the internodes; ligule thin, 4-7 mm. long; leaves of sterile shoots short, blades conduplicate, rigid, almost filiform, 8-15 cm. long. Panicle terminal, slender, diffuse, the base sometimes included, 20-30 cm. long, rays in twos or threes, capillary, sparingly flowered on short branches above the middle. Spikelets on pedicels 1-10 mm. long; empty glumes oval to lanceolate or bristly pointed, subequal, 1-nerved, one-fourth to two-thirds as long as the floret; floral glume thin, shortly hairy on the nerves for the lower two-thirds, linear, 2-toothed, 3-nerved, 3 mm. long, awn 1-3 mm. long; palea linear, 2-toothed as long as its glume.

Mexico, *Pringle* from Patterson.

Texas, *Wright*, *Reverchon*, *Hovard*, *Nealley*.

Texas and Mexico.

45. *M. gracillima* Torr. Pacif. Rail. Rep. 4:155 (1857).

A slender glabrous densely-tufted perennial, 20-40 cm. high. Ligule 3 mm. long; blades of sterile shoots numerous, conduplicate, 2-5 cm. long, 0.3 mm. diam., those of the culm 2-3 in number and much the same. Panicle slender, often purple, pyramidal or contracted, about 15 cm. long, rays capillary, mostly solitary, the lower in twos and threes, sparingly branched, the longest 5-6 cm. long, bearing 4-8 spikelets above the middle. Spikelets on pedicels 4-10 mm. long, empty glumes thin, equal, 1-nerved, lanceolate,

awl-shaped, about 2 mm. long; floral glume and palea lanceolate, 2-toothed, 3 mm. long, the former 3-nerved, nearly smooth, and bearing an awn about its length.

New Mexico, *U. S. Dept. Agricul.* 317; New Mexico, *Jones*; Colorado, *Cassidy*.

Plains of Colorado and New Mexico.

46. **M. Lemmoni** Scribn.; Vasey, *Contrib. U. S. Nat. Herb.* 3:70 (1892). *M. Huachucana* Vasey, *Monog. Grasses U. S. & Brit. Am.* 69 (1890); *Contrib. U. S. Nat. Herb.* 3:69 (1892).

A slender upright scabrous much-branched grass, 30-70 cm. high, with creeping rootstocks. Sheaths longer than the internodes; ligule fringed, 0.7 mm. long; blades numerous, erect, loosely involute, 8-15 cm. long, 1.5-2.5 mm. wide. Panicle narrow, interrupted, 8-20 cm. long, consisting mainly of interrupted, appressed, spikelike rays 2-4-7 cm. long. Spikelets sessile or nearly so; empty glumes equal, 1-nerved, scabrid, 2.5-3.5 mm. long, sometimes including a bristle one-third as long as the glumes; floret pubescent for the lower half, the glume strongly 3-nerved, 3 mm. long, linear, obtuse when spread, or with two short blunt barbs, the awn 1-2 mm. long; palea scarcely obtuse when spread, equal or a very little longer than its glume.

It differs from *M. pauciflora* Buckley in having shorter awns, longer and more pointed empty glumes, and a hairy floral glume.

Arizona, *Lemmon* 392, 2418, 2915, 4663; Texas, *Nealley*; Mexico, *Pringle* 395.

47. **M. pungens** Thurb. *Proc. Phila. Acad.* 78 (1863).

A tufted erect pale green perennial, 30-50 cm. high. Sheaths longer than the internodes; ligule a ciliate ring; blades firm, involute, rigid, pungent, those of the culm 3-6 cm. long. Panicle open, thin, ovoid, about 15 cm. long, rays solitary, branches capillary, spreading. Spikelets mostly with pedicels 2 cm. or more long, including the awn, 5-6 mm. long; empty glumes subequal, 1-nerved, bristly-pointed, about 2.5 mm. long; floret sometimes with a very minute rudiment of a second floret, floral glume very sparingly bearded at base, linear-lanceolate, 3-nerved, 4 mm. long, the awn 1-2 mm. long; palea nearly as long as its glume, bearing 2 setose teeth.

Arizona, *U. S. Dept. Agricul.* 322 from Jones.

Nebraska, Colorado, New Mexico, Arizona, Utah. Known in Arizona as *Black Gama* or *Gama China*.

48. **M. tenella** (H. B. K.) Trin. Unifl. 193 (1824). *Podose-mum tenellum* H. B. K. Nov. Gen. et. Sp. 1: 128 (1815). *Trichochloa tenella* R. & S. Syst. 2: 385 (1817).

A slender light reddish-green, much-branched and diffuse annual, 15–20 cm. high. Sheaths frequently crowded from, and but little longer than, the internodes; ligule a ciliate ring; blades thin, flat or involute, often pubescent, 2–6 cm. long, 1–1.5 mm. wide. Panicles lateral and terminal, slender, interrupted, spikelike, 8–12 cm. long; rays single or in twos, the longest 1 cm. long. Spikelets sessile or on pedicels 1–2 mm. long; empty glumes 1-nerved, subequal, 1.5–2 mm. long, including the bristle-point or awn; floral glume lanceolate, 3-nerved, about 3.7 mm. when spread, appearing shorter, gradually tapering to the awn, which is 1.5 cm. long; palea very narrow, as long as its glume. Grain lanceolate, 2.6 mm. long.

Mexico, *Palmer* 481, *Pringle* 175, 1745.

49. **M. strictior** (Scribn.). *M. flavida* var. *strictior* Scribn. ined.

A soft annual, much branched from near the base, 20–30 cm. high. Sheaths shorter than the internodes; ligule acute, 3 mm. long; blades scabrous, involute or flat, 2–5 cm. long, 1–2 mm. wide. Panicle linear, erect, yellowish or reddish green, 4–8 cm. long, rays single or clustered, sparingly branching, bearing 10–15 spikelets along the entire length. Spikelets on pedicels mostly about 1 mm. long; empty glumes equal, thin, linear-lanceolate, 1-nerved, 2.5–2.8 mm. long; floral glume almost hyaline, lanceolate, pubescent on the margins, 2-toothed, 3.5–3.8 mm. long, the awn 1.5–2 mm. long; palea 2-toothed, as long as its glume. Anthers linear, 0.8 mm. long.

Mexico, *Pringle* 1418.

50. **M. Arizonica** Scribn. Bull. Torr. Club, 15: 8 (1888).

A densely tufted perennial; culms slender, erect, 15–35 cm. high. Ligule thin, 1.5–2 mm. long; blades scabrid on the margins and keel, flat or conduplicate, 3–5 cm. long, 1–1.5 mm. wide, pungent-pointed. Panicle purple, thin, ovoid, 8–18 cm. long, rays

mostly single, capillary, with very slender scattered spreading branches. Spikelets on pedicels 2–10 mm. long, empty glumes subequal, ovate, obtuse or acute, obscurely 1-nerved, about 1.2 mm. long; floral glume linear when spread, finely pubescent on the 3 nerves, 3 mm. long, minutely 2-toothed, the awn 0.5–1 mm. long; palea linear, nearly as long as its glume.

Mexico, *Pringle* 402; Arizona, *Pringle*.

Arizona and Mexico.

51. *M. affinis* Trin. Fund. Agrost. 2:55 (1841). Mem. Acad. St. Petersb. (VI.) 6, 2:291 (1845).

Culms hard, scabrid, simple, erect, 60–90 cm. high, from perennial tufts. Sheaths longer than the internodes; ligule firm, 2 mm. long; blades light-colored, scabrous above, becoming involute, 20–40 cm. long, 2–3 mm. wide, with long setaceous points. Panicle purple, slender, narrow or open, 20–30 cm. long, rays finely capillary, in rather distant pairs, the longest 10 cm. long, sparingly branched, flower-bearing above the middle. Spikelets on pedicels 8–20 mm. long; empty glumes equal, ovate, apex variable, obscurely 1-nerved, about 1 mm. long; floral glume pencil-tufted at base, scabrid, linear-lanceolate, 3-nerved, 4 mm. long, awn 10–20 mm. long; palea linear, very nearly as long as its glume. Nearly allied to *M. Palmeri* Vasey and *M. Berlandieri*.

Mexico, *Palmer* 522, 954.

52. *M. implicata* (Willd.) Trin. Unifl. 193 (1824). *Agrostis implicata* Spreng. Syst. 1:262 (1825). *Podosœmum implicatum* H. B. K. Nov. Gen. et Sp. 1:127 (1815). *Trichochloa implicata* R. & S. 2:385 (1817).

A slender, rather soft, purplish, branching annual (?), 50–70 cm. high. Sheaths about as long as the internodes; ligule thin, 1.5–2 mm. long; blades conduplicate or flat, scabrous above, 10–15 cm. long, 1.5 mm. wide. Panicle thin, slender, ovate-lanceolate, 15–20 cm. long, rays single with spreading capillary branches, few-flowered. Spikelets on very slender flexuose, curved pedicels, which are 5–10 mm. long; empty glumes broad, truncate, erose, second 1-nerved, about 0.5 mm. long and longer than the first one; floral glume linear-lanceolate, scabrid, 3-nerved, 4 mm. long, in-

cluding the 2 slender bristles: awn very slender, 10-20 mm. long; palea lanceolate, acute, nearly as long as its glume. Anthers 3 in number, 0.5 mm. long.

Mexico, *Pringle* 818.

53. **M. Palmeri** Vasey, Bull. Torr. Club, 13: 231 (1886).

Culms rather stout, simple, erect, 65-120 cm. high, from creeping rootstocks. Ligule firm, 2 mm. long; blades firm, scabrous above, becoming involute or conduplicate, 30-60 cm. long, the point setaceous. Panicle often purple, erect, spikelike, 18-30 cm. long, 1-2 cm. diam., rays very numerous, erect, mostly flower-bearing to the base. Spikelets on pedicels 1-4 mm. long; empty glumes subequal, 1-nerved, about two-thirds as long as the florets, including the awn-point; floral glume scabrous, oblong-lanceolate, 3-nerved, about 4 mm. long, apex 2-toothed with an awn 4-6 mm. long; palea scabrous, linear, acute, as long as its glume. Nearly allied to *M. affinis* Trin.

Mexico, *Pringle* 1417.

54. **M. pauciflora** Buckl. Proc. Phila. Acad. 91 (1862).

An erect perennial, rather sparingly branched for the whole length, 50 cm. high; culms hard, scabrid, nodes tumid; sheaths mostly shorter than the internodes, some of them crowded off by the branches; ligule lacerate, 1-1.5 mm. long; blades of the culms smooth on the lower side, rather setaceous, 6-10 cm. long, those near the roots few and short. Panicle spikelike, slender, 6-8 cm. long, rays mostly single, appressed, flower-bearing to the base, the longest 2 cm. long. Spikelets on very short pedicels, empty glumes equal, lanceolate, 1-nerved, 2.5 mm. long; floral glume with a few short hairs at the base, linear-lanceolate, 3-nerved, nearly 4 mm. long, the awn 8-12 cm. long; palea linear, 4 mm. long.

Much like *M. Neo-Mexicana*, of which it is perhaps only a variety.

Arizona, *Nealley* in 1891.

55. **M. Neo-Mexicana** Vasey, Coult. Bot. Gaz. 11: 337 (1886).

An erect perennial, branching near the base. Culms hard, scabrous, 30-60 cm. high. Sheaths longer than the internodes;

ligule lacerate, 1.5 mm. long; blades of the culm scabrous, erect, setaceous, 6–10 cm. long, those of the sterile shoots about 1 cm. long. Panicle narrow, thinly spikelike, 10–15 cm. long, rays mostly in twos, appressed, flower-bearing at the base, the longest 3–5 cm. long, branches closely flowered. Spikelets on very short pedicels or sessile; empty glumes equal, ovate-lanceolate, acuminate or awl-pointed, 1-nerved, 2–2.5 mm. long; floral glume sparingly hairy at base, linear-lanceolate, 3-nerved, about 4 mm. long, the awn 8–12 mm. long; palea linear, nearly as long as its glume.

New Mexico, *U. S. Dept. Agricul.* from Vasey.

New Mexico and Arizona, on rocky hills and mountain-sides.

56. **M. longiglumis** Vasey, *Contrib. U. S. Nat. Herb.* 1:283 (1893).

A rather slender tufted unbranched light green perennial, 60–100 cm. high. Culms solid. The upper sheaths spreading from the culms and involute; ligule thin, decurrent, and 5–8 mm. long; blades of the sterile shoots conduplicate, scabrous, thickly clothed with silky hairs, 30–40 cm. long, 2 mm. wide, those of the culm about 3 mm. wide. Panicle often purplish, slender, loosely spike-like, 20–40 cm. long; rays scattered, numerous, appressed, sparingly branched, the longest about 4 cm. long, bearing 5–8 scattered spikelets. Spikelets on pedicels mostly about 1 mm. long; empty glumes scabrid or puberulent, thin, subequal, lanceolate, obscurely 1-nerved, 5.5–6 mm. long; floral glume ovate-lanceolate when spread, obscurely 3-nerved, 4–5 mm. long, 2-toothed, awn 2–6 cm. long; palea acute, as long and as broad as its glume. Anthers 3 in number, nearly 3 mm. long.

Mexico, *Palmer* 766, *Pringle* 2365.

57. **M. Trinii** Fourn. *Hemsl. Biol. Centr. Am. Bot.* 3:543 (1880). *Brachyelytrum Pringlei* Vasey, ined.

A very slender diffuse grass, 20–40 cm. high. Sheaths and nodes mostly pubescent; ligule ciliate, less than 1 mm. long; blades mostly pubescent, flat, acuminate, 2–4 cm. long, about 2 mm. wide. Panicle terminal and axillary, the latter mostly enclosed by the sheaths, the former exerted, 8–12 cm. long. Spikelets racemose

in pairs or threes in a 1-sided panicle, the lower on short bent capillary pedicels, which break at maturity; flowers of the lower spikelet small, of the upper perfect; empty glumes of *lower spikelet* equal, hyaline, 1-nerved or not, truncate, 0.3 mm. long, floret obtuse; floral glume thin, 3-nerved, marginal nerves serrulate-ciliate, 4-5 mm. long, often terminating in short stout awns, central nerve extending into an awn 10-15 mm. long; palea lanceolate, its two awns about 0.5 mm. long; *upper spikelet* with empty glumes 1-nerved, truncate, 0.3 mm. long; first outer glume bearing a bristle-like awn about 2 mm. long; floret about 1 mm. long. Stamens 3 in number, anthers oval, 0.3 mm. long. Grain linear-lanceolate, round on the back, 3.3 mm. long; embryo oblong, 1 mm. long.

Mexico, *Botteri* 700, *Bourgeau* 3369, *Pringle* 1739, 2661. The latter distributed as *Brachyelytrum Pringlei* Vasey.

51. (113a). **BEALIA** Scribn. Hack. True Grasses, 104 (1890).

Spikelets 1-flowered, loosely paniculate; rachilla articulate above the lower glumes, not extended above the flower; floral glume with a minute callus, bearded at the base. Empty glumes 2, persistent, membranous softly hairy, slightly unequal, round on the back, 1-nerved or nerveless; floral glume a little shorter than the empty glume, soft, pubescent, 3-nerved, 2-lobed, a slender awn between the lobes, only loosely enclosing the grain; palea pubescent, round on the back, delicately 2-nerved. Stamens 3. Styles distinct; stigmas racemose. Grain oval, only very loosely, if at all, enclosed by glume and palea.

There are two or more species found in Mexico.

1. **B. Mexicana** Scribn. l. c.

An elegant tufted perennial, 20-40 cm. high, densely branched at the base, usually light green more or less tinged with red. Sheaths short, mostly distended, those of the culm 2 in number; ligule acute, 2-3 mm. long; blades flat, conduplicate, 1-4 cm. long, about 1.5 mm. wide. Lower panicles partly enclosed, the upper much exserted, simple, thin, linear to ovoid, 3-8 cm. long; rays single, sparingly branched, the longest 1-3 cm. long, flower-bearing on the outer two-thirds. Spikelets on pedicels 1-3 mm. long; empty glumes linear, subacute, 4-5 mm. long,

1-nerved; floral glume 2-lobed, 3-4 mm. long, the awn flexuose, 3-5 mm. long; palea linear, obtuse, almost as long as its glume. Anthers linear, 1.4 mm. long.

Thin soil of dry porphyry on mountains. Mexico (Chihuahua), *Pringle* 819.

2. *B. speciosa* (Vasey). *Muhlenbergia speciosa* Vasey, Bull. Torr. Club, 13: 231 (1886).

A robust erect perennial, 90-120 cm. high. Culms, sheaths, and lower side of blades shortly tomentose. Sheaths compressed-keeled, longer than the internodes; ligule very short, ciliate; blades scabrous above, involute, 60 cm. long more or less, 3-4 mm. wide. Panicle 50-60 cm. long, linear; rays numerous, mostly single, branching freely, 8-10 cm. long, flower-bearing along the upper three-fourths. Spikelets



FIG. 45. — *Bealia Mericana*. *a*, empty glumes; *b*, floret. (Scribner.)

on pedicels 1-3 mm. long; empty glumes subequal, linear-lanceolate, obtuse or acute, flexuose, nerveless, about 2 mm. long; floral glume pubescent, oval, 2-toothed, 1.7 mm. long, awn 1-1.5 mm. long; palea linear, obscurely nerved, nearly as long as its glume. In texture the glumes and palea are much alike. Anthers linear, 1 mm. long.

Mexico (Chihuahua), *Palmer* 301 m 1885.

52. (114). **BRACHYELYTRUM** Beauv. Agrost. 39, t. 9, f. 2 (1812).

Spikelets 1-flowered, narrow, with a slender rudiment of a second flower along a groove on the back of the palea in a simple racemose panicle, rachilla articulate above the lower glumes. Empty glumes unequal, minute, persistent; floral glume chartaceous, involute, rigid, acuminate, 5-7-nerved, extending into a long straight awn; palea shorter, delicately 2-nerved, with a groove along the back. Stamens 2. Styles short, distinct. Grain linear, oblong, inclosed, but not adherent. Rachilla ciliolate.

There is one species and that peculiar to North America; nearly

allied to some species of *Stipa*, but the rachilla is produced beyond the floral glume into a little bristle, sometimes bearing a minute rudimentary glume.

1. *B. erectum* (Schreb.). Beauv. Agrost. 39 (1812). *Muhlenbergia erecta* Schreb. Gräs. 2:139, t. 50 (1772-79). *Dilepyrum aristosum* Michx. Fl. Bor. Am. 1:40 (1803). *Muhlenbergia aristata* Pers. Syn. 1:73 (1805). *Brachyelytrum aristatum* R. & S. Syst. 2:413 (1817). *Muhlenbergia brachyelytrum* Trin. Unif. 188 (1824). Mem. Acad. St. Petersb. (VI). 6, 2:306 (1845).

Culms slender, erect, tufted, 30-60 cm. high, coming from a dense perennial rootstock, often finely pubescent, especially at the nodes. Sheaths shorter than the internodes; ligule 2 mm. long;

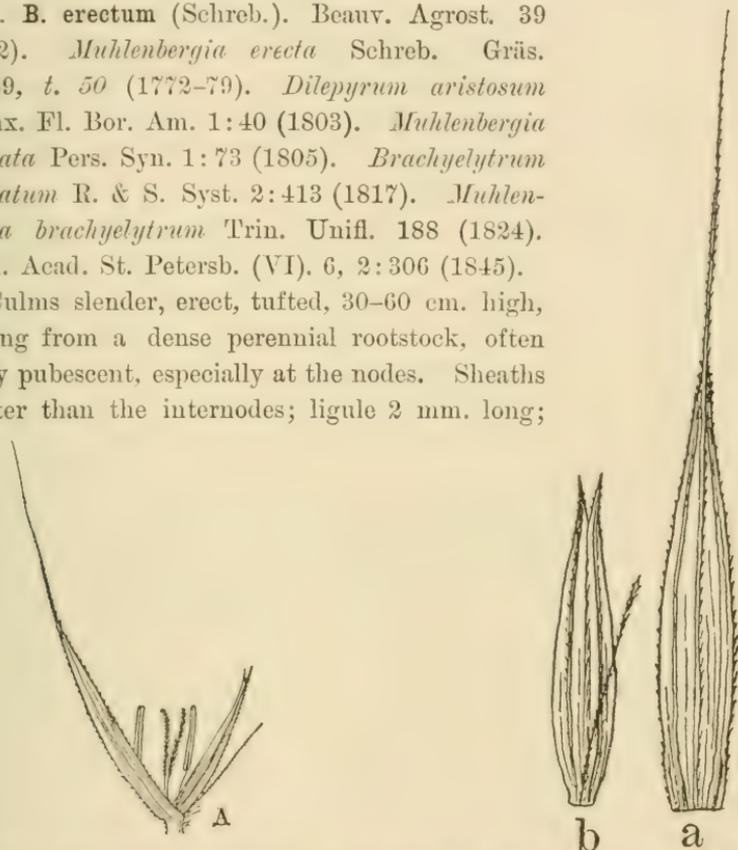


FIG. 46.—*Brachyelytrum erectum*: A, spikelet; a, floral glume; b, palea and bristle. (Richardson.)

blades flat, elliptical-lanceolate, scabrid, 9-nerved, 6-12 cm. long, 1-1.5 cm. wide. Floret appressed, more or less scabrous, linear-oblong, about 1 cm. long, bearing an awn 1-2 cm. long.

Vermont, *Pringle*; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 336; Virginia, *Small*; Michigan, *Clark* 1003, 1103, *Farwell*; Minnesota, *Bailey* B. 397.

Dry rocky places and in woods, usually in scattered bunches. Florida and northward.

53. (116). **LYCURUS** H. B. K. Nov. Gen. et. Sp. 1:141 (1815). *Cleopogon* Nutt. Journ. Acad. Phil. (II.) 1:189 (1847).

Spikelets 1-flowered, narrow, single or in pairs, sessile or on very short branches of the spikelike panicle, rachilla very short, subarticulate above the empty glumes and not produced beyond the flower. Empty glumes 2, membranous, the outer with 2-3 nerves, extending into bristles, second shorter, narrower, 1-awned; floral glume awned, longer and wider than the others, 3-nerved; palea slender, 2-nerved, or 2-keeled, briefly 2-toothed. There are some sterile spikelets. Stamens 3. Styles short, distinct. Grain inclosed by the firm floral glume and palea, but not adherent.

These grasses are tufted, ascending, or erect with solid culms, leaf-blades soon conduplicate. Spikes cylindrical, narrow, exerted or partially included by the sheaths.

There are two species found in Mexico so nearly alike that it is difficult to distinguish one from the other.

Following a suggestion of Bentham, I make one a mere variety of the other. As Bentham states: "The long dense cylindrical spike with sterile spikelets intermixed with the perfect ones bring the genus in connection with the subtribe Sesleriæ of Festuceæ; but there is never more than a single flower in a spikelet."

1. **L. phleoides** H. B. K. Nov. Gen. et. Sp. 1:142 (1815).



FIG. 47. — *Lycurus phleoides*.
Spikelets. (Richardson.)

Culms compressed, scabrous, branching sparingly, 30-50 cm. high. Sheaths compressed, about half as long as the internodes; ligule 3-4 mm. long; blades mostly scabrous above, smooth on the lower side, the lower ones 4-7 cm. long, 3 mm. wide, terminating rather abruptly in a short bristle; the longest on the culm are 12 cm. long. Spikes cylindrical, clavate or tapering each way from the middle, partially included when in flower, 4-7-10 cm. long, 5-8 mm. diam. Spikelets narrowly elliptical, acute, 3-3.5 mm. long, a ring of dark color at the base and apex,

first glume 1.5 mm. long, with 2 bristles 2-3 mm. long, second with an awn 4 mm. long; floral glume elliptical, hairy on the back near the margins; the awn 2 mm. long; palea awnless, pubescent on the back. Very variable.

Colorado, *Jones*; Arizona, *Pringle* in 1884; Mexico, *Palmer* 459, *Pringle* 426.

On plains and foot-hills, a plant of some value furnishing considerable pasture, much resembling timothy.

Var. **brevifolius** (Scribn.). *L. brevifolius* Scribn. ined.

Leaf-blades 1-8 cm. long, 0.5-1.5 mm. wide.

Mexico, *Pringle* 2470, *Botteri* 680, *Palmer* 489.

Var. **glaucifolius** nov. var. Glaucous, blades of sterile shoots conduplicate, falcate, 1-5 cm. long, 2-3 mm. wide, those of the culm 5 cm. long.

Mexico, *Pringle* 426; Texas, *Havard*, *Nealley*.

54. (115). **PEREILEMA** J. & C. Presl, Reliq. Hænk. 1:233 (1830).

Spikelets 1-flowered, borne on short spikes, which are branches of the main dense spike; rachilla articulate above the empty glumes, not produced above the flower; sterile or staminate spikelets intermixed with the fertile ones. The 2 outer empty glumes delicately hyaline, keeled, the nerve produced into a long slender awn, sometimes short or very short awns at the base; floral glume hyaline, 3-nerved, apex entire or 2-toothed, the awn much longer than those on the empty glumes; palea hyaline, 2-keeled. Stamens 3. Styles short, distinct. Grain ovoid-oblong, scarcely inclosed, but free.

Annual tufted or diffuse grasses, with narrow flat leaf-blades. Panicles terminal, spikelike, continuous or interrupted.

There are three or four species belonging to tropical America from Mexico to Brazil. Nearly allied to *Muhlenbergia*, but with the empty glumes awned as well as the floral one.

1. **P. crinitum** J. & C. Presl, l. c.

The whole plant light-colored. Culms slender, 50-80 cm. high. Sheaths scaberulous; ligule less than 1 mm. long, ciliolate; blades thin, narrow at the base, 10-15 cm. long. Empty glumes oval,

1-1.5 mm. long, the awn 1.5-3 mm. long; floral glume ovate, acute, with stiff hairs at the base, scabrous above, 2 mm. long, the slender wavy awn 1-2 cm. long; palea ovate, 1.5 mm. long, nerves very

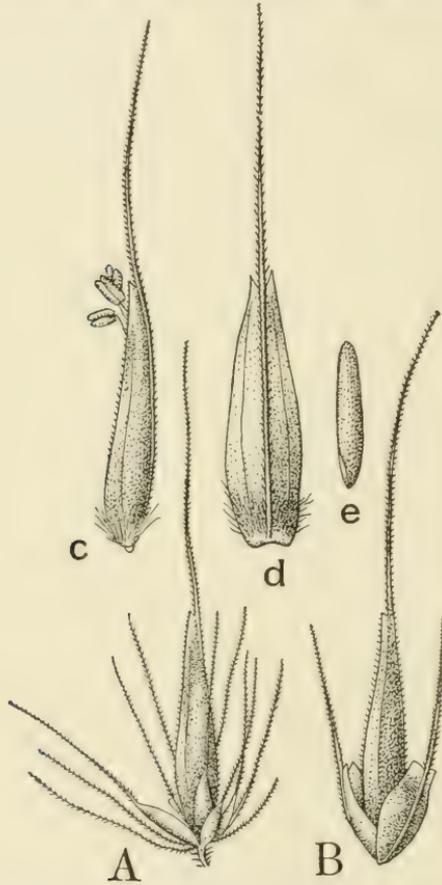


FIG. 48.—*Pereilema crinita*. A, spike; B, spikelet; c, floret; d, floral glume; e, grain. (Trinius.)

near each other. Grain nearly 1 mm. long. The sterile spikelets reduced to clusters of awns.

Mexico, *Pringle* 1744.

2. *P. ciliatum* Fourn. Hemsl. Biol. Centr. Am. Bot. 3:543 (1880).

Culms branching freely. Leaves like those of *P. crinitum*. Panicle with the base inserted or but little exserted, spikelike, 6-8 cm.

long, 3-5 mm. broad. Sterile rudiments of spikelets numerous, ciliate, empty glumes ciliate, bristles about as long as the florets; floral glume oval, 3 mm. long, the awn 2-20 mm. long; palea nearly as long as its glume.

Mexico, *Pringle* 4606; also found in Panama.

Dry shaded ledges.

55. (120.) **HELEOCHLOA** Host, Gram. 1: 23, t. 29, 30 (1801). *Crypsis* Lam. Tabl. Encycl. 1: 166 (1791), not Ait. *Pechea* Pour. Chlor. Narb. ex Kunth, Enum. Pl. 1: 22 in Syn. (1833). *Rhizocephalus* Boiss, Diagn. (I.) 5: 68 (1844); 13: 43 (1853).

Spikelets with one perfect flower crowded in a spike or dense spikelike panicle which is sometimes partially included in the enlarged sheath of the upper leaf, rachilla subarticulate above the lower persistent glumes and not extended beyond the flower. The 2 empty glumes slightly unequal, membranous, acute, conduplicate, awnless, with a keel more or less ciliate; floral glume similar, perhaps a little longer; palea shorter, hyaline, emarginate or 2-lobed, very delicately 2-nerved, or keeled. Stamens 3. Styles distinct. Grain oblong, loosely included, but not adherent. When soaked in water the ovary swells and the seed escapes, much as in *Sporobolus*.

Tufted perennials, usually low with spreading bases. Spikelike panicle ovoid or usually oblong or cylindrical.

There are 7-8 species found in the vicinity of the Mediterranean Sea and in Central Asia.

Kunth referred them to a section of *Crypsis*, but the resemblance is superficial. The axis of inflorescence in *Crypsis* is a flat disk; in *Heleochoa* it is a more or less elongated rachis. In *Crypsis* the empty glumes are above the articulation and fall off with the spikelet, and the glumes are quite those of *Oryzæ* without any two-nerved palea; in *Heleochoa* the empty glumes persist below the articulation, and the glumes and palea are entirely those of *Phleoidæ*. Beauvois gave the same name *Heleochoa* to a supposed genus, apparently made up of a *Sporobolus* and a *Phleum*.

- a. Spikes mostly exserted. 1
 b. Spikes with bases included. 2

1. *H. ALOPECUROIDES* Host, Gram. 1: 23 t. 29 (1801). *Crypsis alopecuroides* Schrad. Fl. Germ. 1: 167 (1806).

Culms geniculate, 7–20 cm. high. Sheaths about half as long as the internodes; ligule a fringe of hairs; blades scabrid above, soon involute, 2–4 cm. long, 2–3 mm. wide. Spike exserted, 1–4 cm. long, 4–5 mm. diam. Spikelets oval or cuneate-obovate, about 2 mm. long, empty glumes 1-nerved; floral glume longer, incurved, 1-nerved; palea deeply 2-lobed.

Sparingly introduced along the coast on ballast.

2. *H. SCHÆNOIDES* L. Host, Gram. 1: 23, t. 30 (1801). *Phleum schænoides* L. Sp. Pl. 60 (1753). *Crypsis schænoides* Lam. Tabl. Encycl. 1: 166 (1791).

Culms 7–20 cm. high. Sheaths inflated, less than half the length of the internodes; ligule a fringe of hairs; blades scabrid above, soon involute, 2–4 cm. long, 2–3 mm. wide. Spikes terminal and axillary, wholly or with bases included in the sheaths, 0.5–2 mm. long, 4–5 mm. diam. Spikelets elliptical or obovate,



FIG. 49.—*Helictrochloa schænoides*. A, spikelets; a, b, empty glumes. (Richardson.) about 2.5 mm. long; empty glumes 1-nerved, about 2 mm. long; floral glume and palea subequal, the latter emarginate.

Sparingly introduced along the coast on ballast. Our plants were collected on waste ground near Philadelphia.

56. (122). **PHLEUM** L. Sp. Pl. 59 (1753). L. Syst. Ed. 1 (1735). *Stelephuros* Adans. Fam. 2: 31 (1763). *Achnodonton* Beauv. Agrost. 24, t. 7, f. 5 (1812). *Chilochloa* l. c. 37, t. 7, f. 2 (1812).

Achnodon Link, Hort. Berol. 1: 65 (1827). *Plantinia* Bubani, in Nuov. Giorn. Bot. Ital. 5: 317 (1873).

Spikelets 1-flowered, flat and crowded into a cylindrical or ovoid spikelike panicle, rachilla very short, articulation above the lower glumes and sometimes extending beyond the flower as a short spine. Outer glumes 2, persistent, nearly equal, membranous, compressed-keeled, 1-3-nerved, subtruncate, the keels projecting into a point or very short awn; floral glume very thin, shorter, broader, truncate or denticulate, enclosing a narrow hyaline palea and a perfect flower; the palea sometimes containing a minute bristle on the back and near the base. Stamens 3. Styles distinct. Grain ovoid, enclosed by the delicate palea, but not adherent.

Erect annual or perennial grasses; blades flat; spike borne on a long peduncle, often pubescent.

A small genus containing about 10 species found in Europe, Central and Western Asia, Northern Africa, and the northern part of North America. Bentham says: "It has been proposed to separate generically *Chilochloa* Beauv. (*Achnodon* Link) for the few species in which the rachilla is produced beyond the flower into a minute bristle; the character is, however, in this instance very trifling and uncertain."

1. *P. alpinum* L. Sp. Pl. 59 (1753). MOUNTAIN-TIMOTHY.

An erect perennial, 30-60 cm. high. Sheaths two-thirds as long as the internodes; ligule short, truncate; blades smooth or scabrid, 5-8 cm. long. Spike ovoid or oblong, usually tinged with purple, 1.5-3 cm. long. Spikelets oblong, 3-4 mm. long, teeth nearly 2 mm. long, the keels strongly fringed with hairs, empty glumes 3-nerved; floret about 2 mm. long, floral glume 5-nerved.

Plants from the White Mountains, N. H.; Montana, Mt. Hood, and Oregon have spikelets 3 mm. long, while some from Colorado have spikelets 4 mm. long.

Vermont, *Hosford* for U. S. Dept. Agricul. 341; New Hampshire, *Clark* 4364; Colorado, *Cassidy*; Montana, *Anderson* 23. Utah, *Jones* 1201; Alaska, *Funston* for U. S. Nat. Herb. 119; British Columbia, *Macoun*; Oregon, *Howell*; Behring Sea, *Merriam*.

Found in the alpine regions of North America, Europe, Asia, and in Antarctic America.

2. **P. pratense** L. Sp. Pl. 59 (1753). TIMOTHY. HERD'S GRASS.

Perennial; scabrid or smooth, 30–100 cm. high, one or more of the lower internodes swollen into a corm or solid bulb. Sheaths close, shorter than the internodes; blades smooth, or scabrid if grown in a dry warm climate, 15–20 cm. long, 7–10 mm. wide. Spike cylindrical, 3–9–17 cm. long, 6–8 mm. diam. Spikelets oblong, nearly 3 mm. long, ciliate on the keels, the teeth 1–1.5 mm. long; empty glumes equal, 3-nerved; floral glume 2 mm. long, delicately 8–9-nerved. Stamens and styles protrude from the top of the spikelets. Fig. 62, Vol. I.

Massachusetts, *Beal* 56; Michigan, Agrl. College, *Beal* 54; Texas, *Gillespie*; Iowa, *Hitchcock*; Montana, *Anderson* 25; Arizona, *Toumey* 151.

The well-known meadow-grass, much cultivated. Found in Europe, Russia, Asia, and cultivated in North America. See Vol. I. for a more complete account of its value.

57. (107). **ALOPECURUS** L. Sp. Pl. 60 (1753). FOXTAIL. *Colobachne* Beauv. Agrost. 22 (1812). *Tozzettia* Savi, Mem. Ital. Soc. Sci. 8: 477 (1868).

Spikelets 1-flowered, flat, crowded into a terminal head or cylindrical spikelike panicle, articulate on the apex of the enlarged pedicel. Glumes 3 or 4, the 2 outer empty, conduplicate, acute, awnless, or short-awned, flat-keeled, the keel ciliate or slightly winged, floral glume shorter, broad, obtuse, hyaline, 3–5-nerved, with a short awn on the back, or mucronate, the margins joined at the base inclosing the flower; fourth (or palea) sometimes present next to the flower, narrow, hyaline, keeled, acute, partly included by the third; other palea or lodicules 0. Stamens 3. Styles distinct or rarely joined at the base or to the middle, stigmas shortly hairy. Grain enclosed in the scarcely hardened glumes, but not adherent. Annuals or perennials, erect or decumbent at the base, leaf-blades either flat or involute, upper sheaths often inflated.

This genus has much the habit of *Phleum*; the structure of the

spikelets that of *Oryzæ*. It has by some been placed in the tribe *Oryzæ*.

There about 20 species found in temperate and cold countries of both the Northern and the Southern Hemisphere.

- | | |
|---|-----|
| A. Spike 2 cm. long or less. | (a) |
| a. Spike 7-13 mm. diam. | 1 |
| a. Spike 5 mm. diam. | 2 |
| B. Spike 2.5 cm. or more long. | (b) |
| b. Empty glumes not ciliate. | 3 |
| b. Empty glumes ciliate. | (c) |
| c. Sheath much inflated, enclosing the base of the
spike. | 4 |
| c. Sheath moderately or little inflated, mature spikes
not included. | (d) |
| d. Erect, spikes 4-8 mm. diam. | 5-6 |
| d. Erect, spikes 10-15 mm. diam. | 7 |
| d. Base procumbent, spikes about 9 mm. diam. | 8 |

1. **A. alpinus** J. E. Sm. Engl. Bot. *t.* 1126 (1793). ALPINE
FOXTAIL.

A rather stout perennial, procumbent at base, 10-50 cm. high. Sheaths much inflated, longer than the blades; ligule 1 mm. long, obtuse; blades flat, 3-6 cm. long, 4-5 mm. wide. Spike 1-2 cm. long, 7-13 mm. diam., dense, branches with 4-6 spikelets. Empty glumes slightly unequal, connate at base, about 3 mm. long, ovate, purplish, silky all over the outer side.

Alaska, *Murdock*; Colorado, *Cassidy*.

Rocky Mountains.

2. **A. Howellii** Vasey, Bull. Torr. Bot. Club, 15: 127 (1888).

A. Macounii Vasey, Bull. Torr. Club, 15: 12 (1888).

Annual; culms 6-10 cm. high, erect or geniculate. Ligule 2 mm. long; lower blades narrow, exceeding the culm, the upper one short, those of the culm usually 3, the upper inflated. Spike oval-oblong, 1-2 cm. long, 5 mm. diam., often partially included. Empty glumes oblong, nearly 3 mm. long, obtuse, slightly united below, strongly ciliate on the keel; floral glume as long as the empty glumes, smooth, obtuse, edges united to the middle or higher,

5-nerved, awn from near the base about three times as long as the glume.

Oregon, *Howell*; Vancouver Island, *Mucoun*; Rocky Mountains, *Vasey*.

Var. **Merrimani** nov. var. Sheaths slightly inflated, spikes exserted, oblong or cylindrical, 1-2 cm. long, 4-5 mm. wide; spikes 2-2.3 mm. long; empty glumes a very little shorter than the floral glume, awn from the middle of the glume barely extending to its tip or a little higher.

Pribyloff Islands, Bering Sea, *Dr. C. H. Merriman* in 1891.

3. *A. AGRESTIS* L. Sp. Pl. Ed. 2:89 (1762). SLENDER FOX-TAIL.

An annual, 30-60 cm. high. Sheaths long, scarcely inflated; blades flat. Spike 5-8 cm. long, slender, curved, acute, often purplish. Empty glumes 7 mm. long, lanceolate, acute, incurved, connate to the middle, not ciliate, nerves green or purplish, wing-keeled above the middle; floral glume exserted, glabrous, awn protruding half its length.

A troublesome weed in Europe, northern Africa, Siberia; introduced into North America.

New Jersey, *Scribner* 3367a, for U. S. Dept. Agricul. 222; Colorado, *Cassidy*.

4. *A. saccatus* Vasey, Coult. Bot. Gaz. 6:290 (1881).

Culms 12-25 cm. high, erect, simple. Sheaths much inflated, generally including the base of the spike; blades of the culm about 3 in number, short. Spike oblong, 2-5 cm. long, rather loosely flowered. Spikelets 4 mm. long, clothed with silky hairs; empty glumes shorter than the floret, 3-5 mm. long, obtuse, slightly united at the base; floral glume oblong, obtuse, glabrous, the margins united half their length or more; awn one-fourth the distance from the base and protruding two or three times the length of the glumes. This has much the general appearance of *A. utriculatus* Sch.

Oregon, *Howell*; California, *Bolander* 35; Japan, *R. Oldham*.

5. *A. PRATENSIS* L. Sp. Pl. 60 (1753). MEADOW FOXTAIL.

A soft erect perennial, 30-90 cm. high. Uppersheath inflated, longer than its blade; ligule oblong truncate; blades flat. Spikes

5-8 cm. long, 4-7 mm. or more broad, dense, obtuse, soft, pale green. Spikelets 5-6 mm. long; empty glumes membranous, ciliate on the keel only, ovate-lanceolate, connate at the base; floral glume ciliate, as long as the empty glumes, awn near the base and projecting half its length. Anthers 3.5 mm. long.

Massachusetts, *Bailey*; Pennsylvania, *Clark* 2947; Oregon, *Howell*; Michigan, *Beal* 57.

Found in Europe, northern Africa, western Asia; introduced into America. Much cultivated in cool moist climates. For a popular account see Vol. 1, p. 152, Fig. 72.

6. **A. Californicus** Vasey, Bull. Torr. Club, 15:13 (1886).

Culms more or less geniculate, 30-50 cm. high. Leaves of the culm 5-6, sheaths over half as long as the internodes, the upper considerably inflated; ligule obtuse, 3 mm. long, blades scabrid, the upper 2-6 cm. long, 3-4 mm. wide. Spike exserted, 2-4 cm. long, 5-8 mm. wide. Spikelets oval, empty glumes ciliate, very slightly united below, elliptical when spread, about 3.5 mm. long; floral glume elliptical before opening, united for half its length, 2.8 mm. long, awn attached one-third the way from the base, and projecting about 4 mm.

California, *Dr. J. M. Bigelow, Bolander, Dr. C. L. Anderson.*

7. **A. occidentalis** Scribn. Coult. Bot. Gaz. 11:170 (1886). *A. pratensis alpestris* Wahl. Fl. Lapp. 21 (1812).

A glaucous erect grass, 30-60-90 cm. high. Sheaths much shorter than the internodes, loose, but not inflated; ligule 1-2 mm. long; blades flat, except near the tips, 5-15 cm. long, 4-7 mm. wide. Spikelike panicle 2-3 cm. long, 10-15 mm. broad. Spikelets 3.5-4 mm. long; empty glumes subequal, tinged with purple and red, ciliate on all the nerves; floral glume nearly as long as the empty glumes, the margins connate to near the middle, delicately 5-7-nerved, awn about 6 mm. long. Anthers 2.5 mm. long.

Professor Scribner says: "It differs from *A. pratensis* in its shorter and more ovoid spikes, more heavy, less conspicuously nerved and shorter empty glumes, in the shorter and more obtuse flowering glume." This closely resembles *A. arundineceus* Poir.

Montana, *Williams* 835.

Valuable for pasture in the regions in which it is found.

Colorado to Montana.

S. A. GENICULATUS L. Sp. Pl. 60 (1753). FLOATING OR WATER FOXTAIL.

A perennial; culms procumbent at base, 30–50 cm. high. Upper sheaths loose, with blade 4–20 cm. long, 1 cm. wide or less. Spike 2.5–5 cm. long, 9 mm. broad, obtuse, pale green. Spikelets 4 mm. long; empty glumes scarcely connate at base, silky-ciliate, on the lateral and mid-nerves, obtuse; floral glume slightly shorter than the empty glumes, its margins united one-third their length; the awn starting one-fourth of the way from the base and projecting half its length.

Massachusetts, *Mann*; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 225; Iowa, *Hitchcock*; Missouri, *C. G. Comstock*; Montana, *Williams*.

Wet meadows and ditches; found in Europe, northern Africa, western Asia, Australia; introduced into North America..

Var. *fulvus* (J. E. Smith) Scribn. Mem. Torr. Club, 5:38 (1894). *A. fulvus* Smith, Engl. Bot. t. 1467 (1793). *A. aristulatus* Michx. Fl. Bor. Am. 1:43 (1803). *A. geniculatus aristulatus* Torr. Fl. U. S. 1:97 (1824).

Blades of the upper leaves sometimes exceeding the spike. Spikes 5–8 cm. long, 1 cm. or less broad. Spikelets two-thirds as long as those of the species; empty glumes slightly shorter than the floral glume; awn starting very little below the middle of the glume and scarcely projecting at the apex.

Vermont, *Pringle*; Massachusetts, *Beal* 58; New York, *Clark* 1682. *Beal* 60; Pennsylvania, *Scribner* 3369; Michigan, *Beal* 59, *Clark* 689, *Cooley*, *Austin*; Minnesota, *Holzinger* 35; Utah, *Jones* 1074; Arizona, *Youmey* 759; Oregon, *Howell*; California, *Parish*, *Palmer* 234; Montana, *Williams*, *Anderson* 24; Washington, *Suksdorf* 1066; Wyoming, *Buffum* c 146.

Wet places, New England to California.

Var. *robustus* Vasey, Bull. Torr. Club, 15:13 (1886).

Culms thick, sometimes branching below, 30–45 cm. high, smooth. Sheaths loose, smooth, 8–12 cm. long, the lower longer

than the internodes; ligule acute, 4 mm. long; blades 8-15 cm. long, 6 mm. wide. Spike exerted when mature, 5-8 cm. long, 6-8 mm. wide, dense. Spikelets oval, about 2 mm. long; empty glumes little united below, the keels and lateral glumes ciliate-pubescent, obtuse and truncate; floral glume nearly as long as the empty ones, ovate, oblong, obtuse, smooth, edges united to the middle, awn starting from the middle, little exceeding the glume.

California, *Lemmon* in 1874, *Rattan* in 1884.

58. (124). **COLEANTHUS** Seid. R. & S. Syst. 2:276 (1817). *Schmidtia* Tratt. Fl. Austr. 1:12, t. 451 (1811). *Wilibaldia* Sternb. in Fl. 2:6 (1819).

Spikelets very small, with one perfect flower, pedicellate in umbellate clusters. Empty glumes 0; floral glume hyaline, persistent, ovate, keeled, short-awned; palea shorter, broader, persistent, 2-keeled, divided or 2-4-toothed. Stamens 2. Styles distinct. Grain narrowly oblong, slightly compressed, deciduous. Panicle partly exerted from the upper inflated sheaths. *Schmidtia* Tratt. is now applied to a very different genus of grasses. There is only one species known.

1. **C. subtilis** Seid. l. c.

Culms slender, forming loose tufts in the mud, geniculate, often branching below, only 2-7 cm. high. Sheaths loose with margins scabrous, the upper much inflated; ligule elongated; blades smooth, curved, conduplicate or involute, 1-1.5 cm. long. Panicle usually simple, 1-3 cm. long, bearing 3-5 umbels; pedicels scabrous, 1-2 mm. long. Floral glume narrow, 1-nerved, longer than the ripened grain, which is about 1 mm. long.

It is very nearly allied to *Phippsia* and *Sporobolus*; but the lower glumes are wanting.

Bohemia and Norway; also in Oregon (Sauvie's Island), where it was discovered by Thomas Howell. It may have escaped notice in other places, owing to its small size.



FIG. 50. — *Coleanthus subtilis*. Spikelet. (Richardson.)

59. (125). **PHIPPSIA** R. Br. Suppl. App. Parry's Voy. 285 (1824).

Spikelets 1-flowered, in a short spikelike or interrupted panicle, rachilla articulate above the lower glumes and not produced above the floret. Empty glumes minute scales, 2 in number and unequal, or only one; floral glume broad-oval, keeled, thin, 3-nerved, 1.5 mm. long; palea shorter, oval, hyaline, truncate, irregularly toothed, the two keels diverging. Stamen 1 or rarely 2-3. Styles short, distinct. Grain oblong, free.

It is allied to *Coleanthus* and *Sporobolus*. One species and that is found in the arctic regions of the northern hemisphere.

1. **P. algida** (Soland.) R. Br. l. c. *Agrostis algida*, Wohl. Phipp's Voy. 200 (1810?). *Trichodium algidum* R. & S. Syst. 2:283 (1817).

A smooth dwarf tufted annual, 5-7 cm. high, with short flat obtuse leaf-blades. Panicle erect, narrow, scarcely exceeding the leaves: chiefly distinguished from *Sporobolus* by the minute lower empty glumes.



FIG. 51. — *Phippsia algida*. Spikelet. (B. O. Longyear)

Point Barrow; arctic coast, *Dr. Murdock* in 1883. See Bot. Gaz. p. 25. 1886. A note by Scribner, to the effect that the plant was collected in wet gravelly places in Colorado, at Chicago Lake and Georgetown, by H. N. Patterson, of Illinois.

60. (126). **SPOROBOLUS** R. Br. Prodr. 1:169 (1810). *Vilfa* Beauv. Agrost. 16 (1812). *Agrosticula* Raddi, Agrost. Bras. 33 (1823). *Triachyrum* Hochst. Flora 24:1 (1841).

Spikelets small, 1-2-flowered, in a narrow or loose and pyramidal panicle, rachilla very short, glabrous, scarcely articulate, not continued beyond the flower. Empty glumes membranous, persistent or separately deciduous, unawned, slightly keeled or convex, obscurely 1-3-nerved, or the first nerveless; floral glume as long as the empty glumes, or longer; palea as long as its glume or shorter, with two nerves usually prominent, and readily splitting

between them. Stamens 2-3. Styles very short. Grain free, readily falling away from the glume, the pericarp loosely enclosing the seed or very thin and evanescent.

Perennials or rarely appearing to be annuals, often slender, the leaf-blades flat or convolute-terete.

There are about 80 species widely spread over the tropical, subtropical, and temperate regions of both the New and the Old World, mostly, however, American.

Sporobolus was included by the older authors in *Agrostis*. R. Brown first pointed out the differences in the fruit and took as the principal character the loose membranous pericarp readily detachable from the seed, but this is not apparent in the dried state in all species. When soaked in water the pericarp is easily removed. As a whole, *Sporobolus* is chiefly distinguished from *Agrostis* by the total absence of any dorsal awn, and by the grain so loosely enclosed in the glume that it usually protrudes from it when ripe, and often falls away. See Vol. 1, p. 43. The palea also generally splits readily into two, a character which Grisebach took for a new genus, *Diachyrium*, and which Nees figured and described as a two-valved pericarp, a character unknown in Gramineæ. Two species, *S. compressus* and *S. serotinus*, occasionally have two flowers to a spikelet.

- A. Plant slender, only 2-4 cm. high, spikelets 1 mm. long. 1
- B. Plants taller and stouter. (b)
 - b. Floral glume 5-6 mm. long. (c)
 - c. Panicle terminal. 2
 - c. Panicles terminal and lateral. 3
 - b. Floral glume 3-4.5 mm. long. (d)
 - d. Empty glumes subequal. (e)
 - e. Floral glume 4-4.5 mm. long. 4
 - e. Floral glume 3-3.5 mm. long. 5, 6
 - d. Empty glumes unequal. (f)
 - f. Floral glume 3.5 mm., first glume 1.6 mm., second glume 2.5 mm. long. 7
 - f. Floral glume 3-4 mm., first glume 2-3 mm., second glume 3.5-5.5 mm. long. 8

- f. Floral glume 4 mm., first glume 3.5 mm., second glume 4-4.3 mm. long. 9
- f. Floral glume 3 mm., first glume 1.5-2 mm., second glume 3 mm. long, panicle brownish. . . 10
- f. Floral glume 3 mm., first glume 2 mm., second glume 3-3.3 mm. long, light lead color. . . 11
- b. Floral glume less than 3 mm. long. (g)
- g. Floral glume prominently pubescent. 12
- g. Floral glume pubescent little or none. (h)
- h. Floral glume 3-nerved, second glume 1-nerved. (i)
- i. First glume nerveless, about 0.5 mm., floral glume 1.5 mm. long. 13
- i. First glume 1-nerved. (j)
- j. Floral glume 2-3.7 mm. long. (k)
- k. Leaves of sterile shoots 60 cm. or more long. 14
- k. Leaves of sterile shoots 6-10 cm. long. 15, 16
- k. Leaves of sterile shoots 1-3 cm. long. 17, 18
- j. Floral glume less than 2 mm. long. (l)
- l. Floral glume 1 mm. long or less. 19
- l. Floral glume 1.7 mm. long. (m)
- m. Panicle 1-3 cm., floral glume 1.7-2 mm. long. 20
- m. Panicle 2-5 cm. long. 21
- m. Panicle 8-20 cm. long. 22
- l. Floral glume 1.5 mm. long. (n)
- n. Lower sheaths flattened over flat culms. (o)
- o. Leaf-blades 4-12 cm. long, 1-2 mm. wide. 23
- o. Leaf-blades 30 cm. long, 3 mm. wide. 24
- n. Lower sheaths not prominently flattened. (p)

- p. Leaf-blades of culm about 2 cm.
long. 25
- p. Leaf-blades of culm 3 or more
cm. long. (q)
- q. Annual, roots fibrous. 26
- q. Perennial, with creeping
rootstocks. 27
- h.** Floral glume 1-nerved or nerveless. (r)
- r. Empty glumes both nerveless. (s)
- s. Panicle terminal, 20-30 cm. long. 28
- s. Panicle terminal, 8-16 mm. long. 29
- s. Panicles terminal and lateral, 4-8 cm.
long. 30
- r.** Empty glumes one or both 1-nerved. (t)
- t. Panicle spikelike, 1-4 cm., floral glume
2.7 mm. long. 31
- t. Panicle at length pyramidal, 3-5 cm.,
floral glume 1.5 mm. long. 32, 33
- t. Panicle ovoid, 4-6 cm., floral glume 1.7-
2.3 mm. long. 34
- t. Panicle spikelike, 3-7 cm., floral glume
2-3 mm. long. 35
- t. Panicle more than 7 cm. long. (u)
- u. Panicle broadly pyramidal, 10-16
cm. long, rays rigid, first glume 1
mm., second and floral glumes 2-2.3
mm. long. 36
- u. Panicle slender, pyramidal, 10-18 cm.
long, first glume 0.5 mm., second
glume 1 mm., floral glume 1.5 mm.
long. 37
- u. Panicle slender, 15-25 cm. long, first
glume 1 mm., second glume 1.5 mm.,
floral glume 1.7-2 mm. long. 38
- u. Panicle spikelike or pyramidal, 6-10
cm. long, first glume 0.6-0.7 mm.,

- second glume 2 mm., floral glume
2 mm. long. 39
- u. Panicle usually narrow, 8-20 cm.
long, first glume 0.5-0.7 mm., second
glume 1 mm., floral glume 1.7 mm.
long. 21
- u. Panicle usually narrow, 12-20 cm.
long, first glume 0.5-1 mm., second
1.5 mm., floral glume 1.5 mm. long. 40
- u. Panicle usually narrow, 30-45 cm.
long, first glume 1 mm., second
glume 1.5 mm. long. 41
1. **S. Wolfii** Vasey, Bull. Torr. Club, 10:52 (1883). *Vilfa minima* Vasey.

A very slender and small annual, branching at the base, only 2-4 cm. high. Lower sheaths inflated; blades mostly radical, flat or involute, 3-12 mm. long. Panicles spike-like, very simple, the lateral ones partly enclosed by the sheaths. Empty glumes oval, subequal, 0.7 mm. long; floral glume about 1 mm. long; palea as long as its glume.

The plants seen were from the herbarium of Prof. Scribner, No. 704, collected by J. Wolfe in 1873, on wet shores of Twin Lakes, Colorado; also No. 1, 1077, J. Wolfe in the Gray herbarium.

2. **S. interruptus** Vasey, Bull. Torr. Club, 15:8 (1886). *S. Arizonicus* Thurb. of some collectors.

A rather stout erect tufted perennial, culm solid as in Maize, about 40 cm. high. Sheaths longer than the internodes, throat and back of the throat ciliate; ligule very short; blades of sterile shoots scabrid above, flat or conduplicate, 10-15 cm. long, 2 mm. wide, those of the culm 2-3 in number, the upper 3-5 cm. long. Panicle terminal, barely exerted, interrupted, 10-18 cm. long, 1-2 cm. wide; rays mostly single, rather stout, erect, 3-5 cm. long, flower-bearing along the upper half. Spikelets often crowded toward the ends of the branches; empty glumes broadly lanceolate, acute, 1-nerved, first 3-4 mm. long, second 5 mm. long; floral

glume oval, acute, 1-nerved, 5 mm. long; palea but little shorter, emarginate, infolded on the back between the nerves.

Arizona, Jones, Coues & Palmer 50, 66.

3. *S. asper* (Michx.). Kunth, Rev. Gram 1:68 (1829). *Agrostis aspera* Michx. Fl. Bor. Am. L. 52 (1803). *Vilfa aspera* Beauv. Agrost. 16 (1812). *Agrostis clandestina* Muhl. Gram. 73 (1817). *A. longifolia* Torr. Flor. U. S. 1:90 (1824). *Muhlenbergia clandestina* Trin. Unifl. 190 (1824). *S. involuta* Muhl. Gram. 72 (1817).

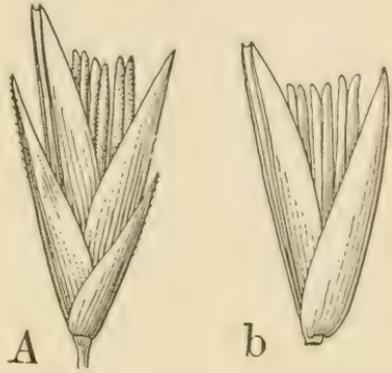


FIG. 52.—*Sporobolus interruptus*. A, spikelet; b, floret. (Scribner.)

A very variable tufted perennial, 60–100 cm. high; culms solid as those of Maize. Leaves of sterile shoots as long as the culm, or more than half as long, blades involute, tapering to a long thread-like point, those of the culm 5–7 in number, narrow with slender points, all blades rough on the edges, sheaths often distended with lateral panicles; ligule very short, throat ciliate. Panicles terminal and lateral, partly or almost wholly enclosed in the sheaths, spike-like, 5–15–30 cm. long, the rays erect, 3–8 cm. long. Empty glumes ovate-lanceolate, keeled, 1-nerved, first 2–3 mm., second 3–4–5 mm. long; floral glume pubescent or smooth, like the second glume, only 1–2 mm. longer; palea pubescent or smooth, acute, extending beyond its glume, or else obtuse, and equalled by or even shorter than its glume. Grain broadly elliptical, 1.5 mm. long.

Massachusetts, Cooley; Alabama, McCarthy; Texas, Nealley; Arkansas, Harvey 22.

Found from New England to Texas.

Var. *Drummondii* Vasey, Contrib. U. S. Nat. Herb. 3:60 (1892). *Vilfa Drummondii* Trin.

Culms very slender; panicles mostly terminal, only exserted or partially included; no lateral panicles, or very small ones.

Texas, Reverchon 1047.

Var. **Hookeri** (Trin.) Vasey. *Vilfa Hookeri* Trin. Fund. Agrost. 1: 84 (1820).

Blades of sterile shoots 6–15 cm. long, first glume 1.5 mm. long, second 2–2.5 mm. long, floral glume 3.5–4 mm. long.

Mississippi, *U. S. Dept. Agricul.* from Johnson.

4. **S. filiculmis** (Thurb.) Vasey, Cat. Grasses U. S. 44 (1885). *Vilfa filiculmis* Thurb.

A very slender tufted perennial, 15–20 cm. high, coming from stout rootstocks. Some of the sheaths shorter than the internodes; ligule about 1 mm. long; blades of sterile shoots strongly involute, recurved, 1–2 cm. long, those of the culm 3–4 in number, mucronate. Panicle terminal, much exserted, narrow, spikelike, interrupted, 2–5 cm. long. Empty glumes equal, 1-nerved, ovate-lanceolate, 3 mm. long; floral glume thinly pubescent on the lower half, lanceolate, cuspidate, 3-nerved, 4–4.5 mm. long; palea thinly pubescent on the lower half, linear, nearly as long as its glume.

New Mexico, *Scribner*, from Thurber, collected on the Whipple expedition Sept. 1853. A note by Munro with specimen reads: "A good species, very close to *V. fastigiata*, principally differing in size and having a hairy palea, in which respects it approaches *V. cuspidata*."

Texas, New Mexico.

5. **S. brevifolius** (Nutt.) Scribn. Mem. Torr. Club, 5: 105 (1894). *Agrostis brevifolia* Nutt. Gen. 1: 44 (1818). *Vilfa cuspidata* Torr.; Hook. Flor. Bor. Am. 2: 238 (1840). *S. cuspidatus* Wood, Am. Bot. & Flor. 385 (1871).

A very slender nearly smooth branching perennial, 30–40 cm. high, often with stout rootstocks. Sheaths two-thirds as long as the internodes; ligule very short; blades not over 3–4 cm. long, those of the culm 5–6 in number, erect, involute, filiform, 3–8 cm. long. Panicle terminal, interrupted, partially included by the upper sheath, consisting of 4–6 slightly overlapping spikelike branches. 2–5 cm. long, or in small plants reduced to a slender spike 3–5 cm. long. Empty glumes subequal, 1-nerved, ovate-lanceolate, 1–2 mm. long, floret with a callus; floral glume dark brown, slightly pubescent under a lens, lanceolate, 3-nerved, the lateral nerves ob-

scure, 3-3.5 mm. long, cuspidate or appearing so before flattening the involute tip; palea nearly as long as its glume, often terminating in two points.

Northern Maine, *Pringle*; Dakota, U. S. Dept. Agricul., from *Dr. Vasey*.

Found in Maine, Kansas, Colorado, and northward.

6. *S. inflata* Vasey & Dewey, Contrib. U. S. Nat. Herb. 1: 265 (1893).

Perennial, with knotted rootstocks. Culms slender, simple, 30-45 cm. high. Leaves of sterile shoots numerous, blades mostly involute, 10-30 cm. long, 2 mm. wide, those of the culm 2-3 in number, sheaths equalling or exceeding the long internodes, the upper often extending to the panicle; ligule lacerate, 4-7 mm. long. Panicle narrow, dark green, 10-15 cm. long, bearing spikelets to near the base. Spikelets 3-4 mm. long, subterete; empty glumes subequal, oval, nerveless, about half as long as the floret; floral glume lance-oblong, 3-3.5-nerved; palea much like its glume, the 2-nerves adjacent.

Texas (Presidio County), *Nealley* 127.

Nearly allied to *S. Jonesii*, but this has longer leaves and spikelets.

7. *S. Bolanderi* Vasey, Coult. Bot. Gaz. 11: 337 (1886).

Culms slender, smooth, the upper half naked, about 30 cm. high. Sheaths smooth; ligule about 0.5 mm. long; blades of sterile shoots flat, flaccid, 10-15 cm. long, 0.8-1.3 mm. wide, those on the culm 2-3 in number, 3-5 cm. long. Panicle open, lax, 5-8 cm. long, lower rays in twos and threes, filiform, 2-3.5 cm. long, flower-bearing above the middle. Spikelets on pedicels 3 or more mm. long; empty glumes unequal, ovate-lanceolate, first 1-nerved, 1.6 mm. long, second 3-nerved, 2.5 mm. long; floral glume oblong-lanceolate, 5-nerved, softly pubescent on the nerves below, 3.5 mm. long; palea as long as its glume, 2-toothed, ciliate on the keels, sterile pedicel 1.5 mm. long.

Collected at Oregon, *Bolander* for U. S. Dept. Agricul. and now at Harv. Univ.

8. *S. heterolepis* A. Gray, Man. Ed. 1: 576 (1848). *Vilfa heterolopis* A. Gray, Ann. Lyc. N. Y. 3: 233 (1836).

An erect perennial, 30–120 cm. high, culm solid as in Maize. Ligule very short; blades smooth below, scabrid above, all excepting 2 of them crowded at the base of the culms, involute, rigid with very long slender points, the lower 10–70 cm. long. Panicles terminal, exserted, thin, 15–30 cm. long, rays scattered, very slender with elongated bases, the longest 3–5 cm. long. Empty glumes olive-green or brown, 1-nerved, first lanceolate or awl-shaped, 2–3 mm. long, second ovate-lanceolate, 3.5–5.5 mm. long; floral glume 1-nerved, acute, 3–4 mm. long; palea oval, obtuse, as long as or nearly as long as its glume. Grain spherical, shining, thick, coriaceous, nearly 2 mm. diam.

Arkansas, *U. S. Dept. Agricul.*; Minnesota, *Holzinger*.

New England, New York, Wisconsin, Minnesota, and south to Texas.

9. **S. Floridanus** Chapm. *Fl. S. States*, 550 (1860).

An erect perennial, 60–120 cm. high. Ligule very short; blades flat or conduplicate, scabrous on the margins, those of sterile shoots 30–60 cm. long, those on the culm 2 in number, 8–20 cm. long, 2–3 mm. wide, holding their width well to the abrupt tip. Panicle slightly exserted, diffuse, 30–50 cm. long, rays mostly in threes, the longest 7–10 cm. long. Spikelets purplish, single at the ends of the stiff rough hairlike pedicels; empty glumes obovate-lanceolate, 1-nerved, first 3–5 mm. long, second 4–4.3 mm. long; floral glume 1-nerved, oval, scarcely acute when spread, 4 mm. long; palea oval, obtuse, reaching as high as its glume, infolded on the back between the 2 nerves.

Florida, *Curtiss* 3378.

Var. **Curtissii** Vasey, *ined.*

Leaf-blades 1–2 mm. wide; panicle more slender, glumes lanceolate, first and second 4–5 mm. long, floral glume 3–3.5 mm. long.

Florida, *Curtiss*.

10. **S. junceus** (Michx.) Kunth, *Rev. Gram.* 1:68 (1835). *Agrostis juncea* Michx. *Fl. Bor. Am.* 1:52 (1803). *Vilfa juncea* Trin. *Unifl.* 157 (1824).

An erect rather slender, smooth perennial, 30–70 cm. high. Sheaths about the length of the internodes; ligule very short;

blades of sterile shoots numerous, erect, narrow, involute, elongated, those of the culm 3 in number, slender, 5-10 cm. long. Panicle exserted or included at the base, open, ovate-lanceolate, 10-13 cm. long, rays in whorls of 5-10, diverging, flower-bearing along the upper two-thirds. Spikelets reddish brown; empty glumes ovate acute, 1-nerved, first 1.5-2 mm. long, second about 3 mm. long; floral glume like the second empty glume; palea a little shorter than its glume, broadly oval when spread, truncate, folded in from the back between the 2 nerves. Grain compressed, obovoid.

Florida, *Curtiss* 3377; Georgia, *Cooley*.

Dry soil, Pennsylvania to Wisconsin and southward to Florida.

11. *S. purpurascens* Hamilton, Prod. 5 (1825).

Culms simple, 60-90 cm. high. Sheaths smooth or hairy; ligule a villous ring; blades slightly scabrous above, smooth below, those of the sterile shoots 20-50 cm. long, flat or involute, 3-5 mm. wide, the upper one of the culm 1-4 cm. long. Panicle racemose, simple, 10-15 cm. long; rays in close whorls of about 6, the longest 3 cm. long, flower-bearing for nearly its whole length. Spikelets short-pedicelled, smooth, shining, light lead-color; empty glumes 1-nerved, first ovate-lanceolate, 2 mm. long, second ovate, barely acute when spread, 3.3 mm. long; floral glume 1-nerved, oval, obtuse or retuse, nearly as long as the second glume; palea broad, a little shorter than its glume.

Cuba, *Wright* 3427; Texas, *Buckley*.

Some use has been made of the meagre description by Chapman found in *Coult. Bot. Gaz.* 3: 18 (1878).

Texas and South Florida.

12. *S. tricholepis* (Torr.) Coult. Man. Rocky Mount. Bot. 411 (1885). *Vilfa tricholepis* Torr. Pacif. R. R. Rep. 4: 155 (1857).

A tufted erect perennial, 40-60 cm. high; culms solid as in Maize. Sheaths longer than the internodes; ligule short, or 2.5 mm. long on the Mexican specimens mentioned below; blades glabrous, strongly involute and curved, those of sterile shoots numerous, mostly 1.5-2 cm. long, those of the culm 4 in number, 8-15 cm. long. Panicle barely exserted, linear, or becoming ovate, 10-18 cm. long, rays mostly single, erect, some in twos or threes, the longest

5-7 cm. long, their branches very slender, bearing single-pedicelled spikelets which are light lead-color. Empty glumes elliptical or ovate-lanceolate, 1-nerved, first about 2 mm. long, second 2.5-3 mm. long; floret clothed with hairs on the nerves, 0.5 mm. long; floral glume ovate, acute or obtuse, 3-nerved, 2.7 mm. long; palea nearly as long, though narrower.

Arizona, *Lemmon* 376, *Jones*; Mexico, *Pringle* 822.

13. *S. JACQUEMONTII* Kunth, *Rev. Gram.* 2: 427 (1829).

A tufted slender erect perennial, 60-90 cm. high. Sheaths a little over half the length of the internodes; ligule very short; leaves of sterile shoots few, those of the culm 4, erect, involute, scabrid above, 10-15 cm. long, 2 mm. wide. Panicle exserted, erect, spreading, at length contracted, about 20 cm. long, rays slender, scattered or in twos and threes, the longest 3-4 cm. long, bearing scattered appressed spikelets for the entire length. Spikelets light brown, empty glumes broad, first a little less, the second a little more than 0.5 mm. long, the latter 1-nerved; floral glume ovate, acute, obscurely 3-nerved, 1.5 mm. long; palea oblong, truncate-erose, 1.5 mm. long. Grain oblong, 1 mm. long.

U. S. Dept. Agricult., collected in Jamaica.

A good pasture-grass in Jamaica, Haiti, etc., where it is found.

14. *S. tenacissimus* Beauv. *Agrost.* 26 (1812). *Vilfa tenacissima*, H. B. K. *Nov. Gen. et. Sp.* 1: 138 (1815). LIENDRILLA.

An erect stout grass, 90-140 cm. high; culms smooth. Sheaths smooth; ligule less than 1 mm. long; blades smooth except the upper side, those of sterile shoots 60 cm. or more long, those of the culm 4 in number, 15-35 cm. long, 5-7 mm. wide at the base, tapering into fine points. Panicle but little exserted, erect, 30-50 cm. long, 1-2 cm. diam., some of the lower appressed, rays 7-12 cm. long, those above gradually becoming shorter. Spikelets very numerous and crowded; empty glumes almost hyaline, obtuse, 1-nerved, first 0.7 mm. long, second 1-2 mm. long; floral glume oval when spread, concave, 3-nerved, 2.3 mm. long; palea nearly as long as its glume, 2-nerved. Grain broadly obovoid, pericarp persistent.

Mexico, *Palmer* 205.

Dr. Palmer reports that the Mexicans twist these grasses into

ropes, which, however, do not last long. Of little value for grazing except when young and tender.

15. **S. Jonesii** Vasey, Coult. Bot. Gaz. 6:297 (1881).

A densely tufted, erect slender perennial, 30–40 cm. high; culm solid as in Maize. Sheaths scabrous, 8–12 cm. long; ligule 3–4 mm. long; blades of sterile shoots numerous, rigid, involute, except the lowest, which are flat, 6–10 cm. long, those of the culm 1 or 2 in number, setaceous, 2–3 cm. long. Panicle much exserted, erect, thin, elliptical, 5–8 cm. long, rays solitary, the lowest and longest 2–3 cm. long. Spikelets streaked with light purple; empty glumes broad, subequal, 1-nerved, about 1 mm. long, first obtuse, narrower and a little shorter, second truncate-erose; floral glume scabrous and slightly pubescent, 2.3–3.7 mm. long, ovate, acute, 3-nerved, the lateral nerves obscure; palea scabrous, as wide and nearly as long as its glume, elliptical, hardly acute when spread.

California (Soda Springs), *Jones*.

16. **S. vaginæflorus** (Torr.) Vasey, Cat. Gr. U. S. 45 (1885).

Vilfa vaginæflora Torr., A. Gray, Gram. et. Cyp. 1:n. 3 (1834).
Agrostis Virginica Muhl. Gram. 74 (1817) not L.

A slender much-branched ascending annual, 15–30 cm. high. Sheaths one-half to one-third as long as the internodes, most of them swollen, each with a lateral spikelike panicle; blades involute, slender, scabrid, 3–10 cm. long, those of the culm about 7 in number. Panicles entirely or partially enclosed by the sheaths, 1.5–4 cm. long. Empty glumes keeled, 1-nerved, acute, subequal, 2–3 mm. long; floral glume and palea (the former 3-nerved, lateral nerves obscure), pubescent with short hairs as seen under a lens, acute, 2.7 mm. long. The spikelets in the terminal spikes are longest and often sterile. Grain oval, about 2 mm. long.

Pennsylvania, *U. S. Dept. Agricult.* 374, from Scribner; Michigan, *Clark* 2639; *Cooley, Beal*.

Barren soil from Maine to Texas.

17. **S. gracillimus** (Thurb.) Vasey, Bull. Torr. Club, 9:103 (1882). *Vilfa gracillima* Thurb. S. Wats. Bot. Calif. 2:268 (1880).

A densely tufted annual, 7–15–30 cm. high. Sheaths about as long as the internodes, loose, with hyaline margins; ligule obtuse,

lacerate, decurrent, about 2 mm. long; blades flat, involute at the apex, scabrid above, 1-2 cm. long, about 1 mm. wide. Panicle much exserted, few-flowered, spikelets scattered, interrupted below, and on plants of medium height, 5-7 cm. long, about 3 mm. diam.; rays erect, mostly in pairs, some of the lower 2-3 cm. long, flower-bearing nearly to the base. Empty glumes subequal, the lower a little the shorter, membranous, broadly ovate, 1-nerved, obtuse, erose or mucronate, a little less than 1 mm. long, floret with a callus at the base, minutely pubescent; floral glume ovate, acute, mucronate, 3-nerved, 2 mm. long; palea membranous, broadly oval, scarcely acute when spread, a little shorter than its glume.

California, *Jones* 2401; Oregon, *Howell*.

Oregon and California.

18. *S. auriculatus* Vasey, Contrib. U. S. Nat. Herb. 3: 64 (1892). *S. asperifolius* var. *brevifolius* Vasey, Contrib. U. S. Nat. Herb. 1: 56 (1890).

Culms much branched below, 15-25 cm. high, with short creeping rootstocks, nodes of the branches short and numerous. Leaves glaucous; sheaths scabrous or smooth, longer than the short internodes; ligule lacerate, 1.5 mm. long; blades of the sterile shoots scabrous, flat, subarticulate, 1-3 cm. long, 2 mm. wide, those of the culm 3-6 cm. long. Panicle mostly included at the base, thin, ovoid, 7-10 cm. long; rays single or in pairs, scabrous, some of them reflexed, bearing single spikelets at the ends of the stiff slender branches. Spikelets purplish; empty glumes 1-nerved, subequal, oval, nearly 1 mm. long; floral glume broadly oval, obtuse, 3-nerved, 2 mm. long; palea oval, as long as its glume. Vasey says: "*S. asperifolius* var. *brevifolius* of contributors." Perhaps a variety of *S. asperifolius*.

Texas, *Nealley* for Nat. Museum.

19. *S. confusus* Vasey, Bull. Torr. Club, 15: 293 (1888). *S. ramulosus* of authors, not of Kunth.

A very slender tufted annual, much branched below, 8-20 cm. high. Sheaths loose, longer than the internodes; ligule thin, 1.5-2 mm. long; blades scabrid above, flat, conduplicate or involute, 2-4 cm. long, 1-5 mm. wide. Panicle exserted or partially included,

pyramidal or ovoid, 8-15 cm. long, the rays very slender, solitary, spreading, and their branches bearing few flowers at the ends of the long pedicels. Spikelets purplish; empty glumes subequal or the lower shorter, often ciliate at the apex and on the back, ovate, 1-nerved, 0.5-0.7 mm. long; floral glume oval, obscurely 3-nerved, 1 mm. or less in length; palea as long and as wide as its glume, 2-nerved; floral glume and palea both thinly pubescent on the nerves.

Texas, *Nealley* for Nat. Mus.; Colorado, *John Wolfe*; Arizona, *Pringle* in 1884.

A delicate little annual found in moist places; Colorado, New Mexico, Arizona, Texas, Mexico.

20. **S. Sacatilla** Griseb. Sched. Fourn. Mex. Pl. Enum. Gram. 101 (1886).

An erect leafy and branching perennial, 20-40 cm. high, with creeping rootstocks. Culms with 10-12 nodes, each bearing a slender branch 12 cm. long, and each again usually branching. Leaves very numerous, sheaths mostly about the length of the internodes; ligule abruptly acute, less than 1 mm. long; blades involute, spreading or recurved, 0.5-3 cm. (mostly 1 cm.) long, 0.5 diam. Panicle very simple, spikelets terminal or lateral, 1-3 cm. long. Spikelets 1.7-2 mm. long, oval; empty glumes subequal, about 1 mm. long, 1-nerved, ovate; floral glume 3-nerved; palea nearly as long. Anthers 1.2 mm. long.

Texas (Del Rio), *Nealley* for U. S. Nat. Mus.

Also found in Mexico.

21 **S. depauperatus** (Torr.). Scribn. Bull. Torr. Club, 9: 103 (1882). *Vilfa depauperata* Torr.; Hook. Flor. Bor. Am. 2: 257 (1840). *Vilfa utilis* Torr. Pacif. R. R. Rep. 5: 365 (1853). *Vilfa plumbea* Trin. teste Fourn. Mex. Pl. Enum. Gram. 101 (1886).

A very slender and variable tufted decumbent and much-branched perennial, 10-60 cm. high, often with stout rootstocks. Sheaths loose, about as long as the internodes, which are from 4-12 in number, margins hyaline; ligule 0.5-3 mm. long, obtuse or acute; blades scabrid above, usually involute, recurved, 1-5 cm. long, about 1 mm. wide. Panicle but little exerted, slightly in-

interrupted, 2-5 cm. long, 4 mm. wide; rays 1.5 or less in length, covered with spikelets. Empty glumes colorless or light lead-color, equal or subequal, 1-nerved, ovate, almost acute, 1 mm. long; floret with a callus, smooth, floral glume ovate, acute, 3-nerved, 1.7 mm. long; palea as long as its glume, broadly oval, acute.

Oregon, *Howell*; Mexico (Chihuahua), *Pringle* 418.

A fine low grass filling much the place in grazing of *S. asperifolius*.

Rocky Mountain region.

Var. **filiformis** nov. var. Culm 10-12 cm. long, exserted for nearly half its length; panicle much reduced, 2 cm. long.

Montana, *Williams*; Utah, *Jones*.

22. *S. INDICUS* (L.) R. Br. Prodr. 1:170 (1810). SMUT-GRASS. *Agrostis Indica* L. Sp. Pl. 63 (1753). *A. elongata* Lam. Ill. 1:162 (1791).

An erect robust grass, 30-50 cm. high. Sheaths long, sometimes ciliate at the throat; ligule very short; blades chiefly at the base of the culms, smooth below, scabrid above, those of sterile shoots extending to the base of the panicle, 2-4 mm. wide at the base, tapering into fine points, those of the culm 2-3 in number. Panicle spike-like, but little exserted, sometimes interrupted, 8-20 cm. long and 3-6 mm. diam., or sometimes with diverging rays 1 cm. long. Spikelets very numerous and crowded; empty glumes almost hyaline, obtuse, 1-nerved, first 0.5-0.7 mm. long, second 1 mm. long; floral glume oval, concave, 1-3-nerved, 1.7 mm. long; palea nearly as long as its glume, 2-nerved. Grain broadly obovoid, pericarp often evanescent.

Bentham in *Flora Australiensis* has been followed in the description to some extent.

Florida, *Curtiss* 3383.

It was introduced from India, and has become naturalized in many warm countries, such as Florida, the Carolinas, etc. It is called *Smut-grass* in the South, as smut very often develops on it. The grass is esteemed for pasture and mowing when not too old.

23. *S. serotinus* (Torr.) A. Gray, Man. Ed. 1:577 (1848). *Agrostis serotina* Torr. Flor. U. S. 1:88 (1824). *Vilfa serotina*.

Torr.; A. Gray, Gram. et Cyp. n. 2 (1834). *Vilfa tenera* Trin. Mem. Acad. St. Petersburg. (VI.) 5:87 (1840). *Poa modesta* Tuckerm. Am. Journ. Sci. (I) 14:45 (1843).

A slender tufted erect perennial, 20–40 cm. high; culms compressed and solid as in Maize. Sheaths short; ligule 1–2 mm. long; blades flat or conduplicate, 4–12 cm. long, 1–2 mm. wide. Panicle much exserted, thin, 5–16 cm. long, narrow and few-flowered when short, ovate-lanceolate when large; rays single, very slender. Spikelets 1-, rarely 2-flowered, dark brown or purple; empty glumes ovate, obtuse, 1-nerved, first a little more than 0.5 mm. long; second a little longer; floral glume ovate, concave, 3-nerved, 1.5 mm. long; palea broad-oval, obtuse, nearly as long as its glume. Grain oval, flattened, less than 1 mm. long.

Maine, *U. S. Dept. Agricul.* 371 from Scribner; New Jersey, *Scribner* 3582; Delaware, *Canby*.

Maine to Delaware and Northern Michigan in sandy wet places.

24. **S. compressus** (Torr.) Kunth, Enum. Pl. 1:217 (1833). *Agrostis compressus* Torr. Cat. Pl. N. Y. 91 (1819). *Agrostis Torreyana* Schult. Mant. 2:203 (1824). *Vilfa compressa* Trin. Unifl. 158 (1824).

Culms tufted, erect, stout, flattened, solid, as in Maize, 30–60 cm. high, from a perennial rootstock with short joints covered with scales. Sheaths conduplicate, much longer than the internodes; ligule very short; blades erect, conduplicate, about 30 cm. long, 3 mm. wide. Panicle exserted, open, ovate-lanceolate, 10–30 cm. long; rays spreading, filiform, mostly scattered or some in twos and three. Spikelets brown, often 2-flowered; empty glumes subequal, ovate-lanceolate, 1-nerved, 1.5 mm. long; floral glume ovate, concave, 3-nerved, as long as the empty glumes, though overreaching them by one-third as united in the spikelet; palea oval, obtuse, as long as its glume. Grain oval, flattened, 1 mm. long.

New Jersey, *Scribner* 3381; *U. S. Dept. Agricul.* 353 from Scribner.

Bogs in the pine-barrens of New Jersey.

25. **S. repens** Presl, Reliq. Hænk. 1:241 (1830).

A slender creeping grass, culms 0.5 mm. diam., rising 1 cm.

above the ground from a long prostrate portion. Sheaths loose, half as long as the internodes; ligule nearly 2 mm. long; blades thin, scabrid, flat or involute, about 2 cm. long, nearly 1 mm. wide. Panicles terminal and lateral, all more or less included by the sheaths, spikelike, about 1 cm. long. Empty glumes subequal, 1-nerved, very broad, erose, about 0.5 mm. long; floret olive-green tinged with red; floral glume ovate when spread, 3-nerved, 1.5 mm. long; palea like its glume excepting the nerves, which are 2 in number.

Mexico, *Bourgeau* 3285, *Tracy* from Palmer, *Pringle* 3317.

26. *S. Shepherdi* Vasey, Bull. Torr. Club, 14: 8 (1887).

Apparently annual, branching at the base; culms smooth or scabrid, 20–40 cm. high. Sheaths loose, about the length of the internodes; ligule lacerate, 2–3 mm. long; blades of sterile shoots few and short, those of the culm 3–4 in number, involute, 4–8 cm. long, 2 mm. or less wide. Panicle exserted, open, 8–12 cm. long, rays mostly single, the longest 5 cm. long. Spikelets often nodding on extremely slender pedicels, which are thickened above; empty glumes obtuse when spread, obscurely 1-nerved, first only a little shorter than the second, which is 1.5 mm. long; floral glume hairy, oval, 3-nerved, as long as the second glume; palea hairy, broadly oval, obtuse, as long as its glume.

The plants examined were reddish throughout.

Mexico, *Pringle* 1424.

27. *S. asperifolius* (Nees) Thurb.; S. Wats. Bot. Calif. 2: 269 (1880). *Vilfa asperifolia* Meyen, Reise 1: 349, 408. Trin. Mem. Acad. St. Petersb. (VI.) 6: 95 (1840). *Sporobulus arenaceus* Buckl. Proc. Phila. Acad. 1862, 89 (1863).

Culms branching, 20–40 cm. high, ascending from stout creeping rootstocks. Sheaths smooth, loose, longer than the numerous short internodes; ligule very short; blades flat, scabrous, 3–8 cm. long, 2 mm. wide. Panicle included at the base; open, pyramidal, 10–17 cm. long; rays single or in pairs, scabrous, bearing single spikelets at the ends of the very slender stiff branches. Spikelets lead-color, tinged with purple; empty glumes colorless, lanceolate, scabrid under a lens, 1-nerved, first 0.3–0.5 mm. long, second but

very little longer; floral glume broadly oval, obtuse, sometimes with a mucro, obscurely 3-nerved, 1-1.5 mm. long; palea obovate-oval, as long as its glume.

Texas, U. S. Dept. Agricul. from *Reverchon*; Colorado, *Scribner* 3380a *Wolfe*; California, *Parish* 1030; Southern California, *Palmer* 230.

Two plants from different places in Colorado have 2-3 florets to the spikelet, and most of them distended with smut.

British America to Arizona, California and Texas.

A wiry-stemmed species restricted to very wet places, contributing a little to the forage.

28. *S. airoides* Torr. Pac. R. R. Rep. 7: Part 3, 21 (1856). *Agrostis airoides* Torr. Ann. Lyc. N. Y. t: 151 (1824). *Vilfa airoides* Trin. Steud. Syn. Pl. Gram. 162 (1855).

An erect rather stout tufted perennial, 40-90 cm. high; culms enclosed below with prominent wide sheaths. Sheaths a little shorter than the internodes, the throat ciliate; ligule very short; blades light green, soon fading, convolute, tapering to a filiform apex, those of sterile shoots 2-5 cm. long, 3 mm. in width; those of the culm 4-5 in number, the upper filiform, 2-3 cm. long. Panicle terminal, ovoid, often partly included at the base, 20-30 cm. long, rays solitary in twos or threes, again branching and bearing scattered spikelets above the middle. Spikelets light lead-color or brown; empty glumes obovate, without nerves, first 0.5-1 mm. long, second 1.5-2 mm. long, floret with a callus; floral glume concave, broadly oval, 1-nerved, 2 mm. long; palea broader than its glume and a little shorter, truncate, infolded between the nerves on the back.

Rocky Mountains, U. S. Dept. Agricul. 345; Montana. *Scribner*.

Kansas and Nebraska, Montana, California, Texas, and New Mexico.

29. *S. minutiflorus* (Trin.) Link. Hort. Berol. 1: 88 (1827). *Vilfa minutiflorus* Trin. Unifl. 158 (1826).

Culms slender, smooth, 20-40 cm. high. Sheaths 2. ligule very shortly ciliate; blades flat, 3-10 cm. long, 3 mm. or less broad. Panicle terminal, exserted, pyramidal, 8-16 cm. long; rays solitary

or rarely in pairs, the lower 4-6 cm. long, the lower two-fifths naked. Spikelets somewhat crowded, on short unequal pedicels, 1 mm. long; second glume nerveless, about 0.5 mm. long, obtuse, broader and a little longer than the first; floral glume and palea equal, obtuse, nerveless. Nearly allied to *S. atrovirens* Kunth. See notes by Prof. Scribner in Phil. Acad. Sci., p. 299. 1891.

Mexico, *Pringle* 3130.

Thin soil of limestone ledges, San Luis Potosi, Mexico.

30. *S. racemosus* Vasey, Bull. Torr. Club, 15:9 (1888).

A slender erect or decumbent freely branching annual, 18-35 cm. high. Sheaths loose, shorter than the internodes; ligule less than 0.5 mm. long; blades 4-7 in number, thin, flat or involute, 2-4 cm. long, 1 mm. wide or less. Panicles terminal and lateral, the former exserted, the latter more or less included, open, 4-8 cm. long, rays mostly single, simple, the longest 2-3 cm. long and few-flowered. Spikelets racemose on short, slender, glandular pedicels; empty glumes broad and obtuse, usually nearly equal, not over 0.5 mm. long; floral glume and palea ovate, smooth, nerves obscure, about 1 mm. long. Anthers 3, red, 1.8 mm. long, 1.8 mm. wide, very exceptional in the genus. So far as observed, the anthers of all other species have been linear. The plants throughout tinged with red.

Mexico (Chihuahua), *Pringle* 1425.

Cool, gravelly slopes, near water.

31. *S. ovatus*. *S. minor* Vasey, A. Gray Man. Ed. 6:646 (1890).

A slender geniculate scabrous perennial, 10-30 cm. high. Sheaths half as long as the internodes; ligule very short near it and above and below are scanty hairs with warty bases; blades involute, those from sterile shoots 1-4 cm. long, those of the culm 3-5 in number, and 2-5 cm. long, 1.5-2 mm. wide. Panicle scarcely exserted, very simple, 1-4 cm. long, 3-4 mm. wide; empty glumes nearly equal, ovate-lanceolate, 1-nerved, keeled toward the apex, about 3 mm. long; floret clothed with very short hairs as seen under a lens; floral glume ovate, acute, somewhat compressed toward the apex, 1-nerved, 2.7 mm. long; palea as long as and as wide as its

glume, folded in on the back. Vasey's name of the species was occupied by Kunth, Enum. Pl. 1:212 (1833), hence the selection of a new one.

Texas, *Nealley*; Mississippi, *Tracy*, both for U. S. Dept. Agricul.

32. *S. argutus* (Nees) Kunth, Enum. Pl. 1:215 (1833). *Vilfa arguta* Nees, Agrost. Bras. 2:395 (1829). *V. Arkansana* Trin. Mem. Acad. St. Petersburg. (VI.) 5:64 (1840).

Culms spreading or erect, 20-40 cm. high. Sheaths loose, a little shorter than the internodes, throat ciliate; ligule very short; leaf-blades of sterile shoots numerous, flat, or the apex involute, 2-4 cm. long, glaucous, scabrous, the margins ciliate-serrulate, 2-4 cm. long, those of the culm 3-4 in number, the upper one 3-10 mm. long. Panicle usually exserted, spikelike or pyramidal on the same plant, 3-5 cm. long; rays in half-whorls of 3-6 or even 8, flower-bearing on the upper two-thirds, the half-whorls 1-2 cm. distant. Spikelets shining, lead-color; first empty glume 0.4-0.5 mm. long, second and floral glume elliptical-lanceolate, 1-nerved, 1.5 mm. long; palea broader, a little shorter, splitting in the back by the maturing grain, which is compressed and broad, 0.7-1 mm. long.

Florida, *Palmer* 294; Texas, *Nealley* for Nat. Herb., *Reverchon*; Lower California, *Palmer* 188; Mexico (Chihuahua), *Pringle* 816.

Texas to Arizona and Mexico.

Very variable; number 224, of Dr. Palmer from Lower California has thicker rougher leaves and broader spikes.

33. *S. Nealleyi* Vasey, Coult. Bot. Gaz. 16:48 (1891).

A slender glaucous perennial, 10-20 cm. high, from strong rootstocks. Sheaths of the culm about 5 in number, mostly longer than the internodes; ligule a ciliate ring; blades involute, rigid, pungent-pointed, diverging almost at right angles to the culm, 0.5-3.5 cm. long, 0.5 mm. diam. Panicle slightly exserted on a capillary peduncle, simple, erect, racemose, oval or linear, 3-5 cm. long; rays 6, the longest about 1.5 cm. long, bearing a few spikelets on the outer two-thirds. Spikelets purplish, linear, about 1.5 mm. long; empty glumes lanceolate, 1-nerved, first glume half as

long as the floret, second as long as the floret; floral glume ovate-acute, 1-nerved.

Texas, *Nealley* in 1887 for U. S. Dept. Agricul.

34. **S. macrospermus** Scribn. ined.

A slender erect branching annual, 20-40 cm. high. Sheaths subcompressed, sparingly villous at the throat; ligule a ciliate ring, also ciliate above and below to a varying degree, 2-4 cm. long, 1-2 mm. wide, upper blades narrow, 1 cm. long. Panicle exerted, open, narrowly ovoid, 4-6 cm. long, lowest rays in half-whorls of 4-7, the longest 1.5 cm. long, bearing two spikelets near the apex. First glume awl-shaped, 1 mm. long, second and floral glume yellowish, 1-nerved, linear, acute, 1.7-2.2 mm. long; palea broad, oval, about as long as its glume, split by the maturing ovary. Seed oval, flat, brown, translucent, 1.6 mm. long.

Mexico (Jalisco), *Pringle* 2447.

35. **S. Virginicus** (L.) Kunth, Rev. Gram. 1: 67 (1835). *Agrostis Virginica* L. Sp. Pl. 63 (1753). *A. barbata* Pers. Syn. 1: 75 (1805). *A. littoralis* Lam. Ill. 161 (1791). *Vilfa Virginica* Beauv. Agrost. 16 (1812).

A smooth erect or decumbent perennial branching grass. 15-40 cm. high. Ligule very short, throat ciliate or glabrous; blades of the culm 14-16 in number, convolute or involute when dry, rather rigid, ascending, distichous, the longest 5-15 cm. long, 3-5 mm. wide. Panicle spikelike, dense, 3-7 cm. long, 5-7 mm. wide. Empty glumes 1-nerved, almost keeled, ovate when spread, first glume 1.5 mm., second 2.2 mm. long; floral glume 1-nerved, ovate, 2.3 mm. long; palea about the length of its glume, folded in from the back between the 2 nerves. Grain broadly obovoid, the very thin pericarp separable when softened, but indistinguishable in the dried state.

Florida, *Curtiss* 3376; Mexico, *Palmer* 338.

Virginia to Florida, Texas and Mexico, near the coast; also found in the West Indies, Brazil, Africa and Australia.

36. **S. Texanus** Vasey, Contrib. U. S. Nat. Herb. 1: 57 (1890).

A glaucous tufted perennial, 30-40 cm. high. Sheaths of the culm 4 in number, longer than the internodes; ligule a ciliate ring;

blades of the culm flat or involute, 5-15 cm. long, 2-3 mm. wide; blades and sheaths more or less ciliate with tubercled hairs. Panicle enclosed at the base or but slightly exerted, broadly pyramidal, 10-16 cm. long; rays diverging, slender, rigid, the longest 8-10 cm. long, bearing a few spikelets on long pedicels on the outer half. Spikelets linear-lanceolate, empty glumes 1-nerved, first about 1 mm. long, second equalling the floret, 2-2.3 mm. long; floral glume and palea equal, the former 1-nerved.

Texas (Presidio County), *Nealley* for U. S. Dept. Agricul. in 1890.

Texas and Indian Territory.

37. *S. capillaris* Vasey, Contrib. U. S. Nat. Herb. 1:283 (1893).

A rather slender erect tufted perennial with few culms, 30-60 cm. high. Sheaths slightly compressed, longer than the internodes, throat ciliate; ligule very short; blades of sterile shoots numerous, 3-20 cm. long, the base flat or involute, 2-3 mm. wide, the point long and filiform, those of the culm 3 in number, the upper filiform, 1-3 cm. long. Panicle exerted, often ovate or pyramidal, 10-18 cm. long; rays mostly single, some in pairs, the longest 4-7 cm. long, the branches diverging, very slender. Spikelets dark lead color or brown; empty glumes broadly oval, first about 0.5 mm. long, second 1-nerved, 1 mm. long; floral glume broadly oval, 1-nerved, sometimes with an obscure nerve on each side, obtuse when spread, 1.5 mm. long; palea emarginate, as broad and nearly as long as its glume.

Mexico (Jalisco), *Palmer* 512; *Pringle* 1426.

Found so far only in Mexico.

38. *S. Buckleyi* Vasey, Bull. Torr. Club, 10:128 (1883).

Culms slender, compressed, solid as in Maize, 40-60 cm. high. Sheaths compressed; those of the culms about 4 in number, with sheaths nearly as long as the internodes; ligule a short ciliate fringe; blades smooth, those of sterile shoots two-thirds as long as the culm, flat or conduplicate, 3-4 mm. wide. Panicle but little exerted, open, oblong, lax, 15-25 cm. long, rays single or in twos, capillary, the lower the longer, 8-10 cm. long, flower-bearing for the upper

two-thirds. Spikelets purple; empty glumes ovate-lanceolate, 1-nerved, first glume about 1 mm. long, second 1.5 mm. long; floral glume ovate, acute when spread, 1-nerved, 1.7–2 mm. long; palea but little shorter than its glume.

Texas, *Nealley*.

A small plant seen from the U. S. Dept. Agricul. Discovered by Dr. S. B. Buckley, for whom Dr. Vasey named it.

39. **S. Domingensis** (Trin.) Kunth, Enum. 1:214 (1833). *Vilfa Domingensis* Trin. Spreng. Neue Entdeck. 2:59 (1793). *Agrostis Domingensis* Schult. Mant. 3:570 (1824).

Culms erect, slightly compressed at the base, 20–40 cm. high. Sheaths crowded, compressed, throat ciliate; ligule very short; blades flat or becoming involute, 7–10 cm. long, 3–4 mm. wide, with filiform points, those of the culm 2–3 in number, the upper 1 cm. long or less. Panicle but little exerted, erect, spikelike or spreading, 6–10 cm. long, rays in threes to fives, the longest 3–5 cm. long, naked for a third of its length. Spikelets light lead-color or straw-color; empty glumes scabrid, membranous, first glume 0.6–7 mm. long, second ovate, acute, 1-nerved, 2 mm. long; floral glume like the second glume, only a little shorter; palea broad, emarginate, 1.5 mm. long. Grain broadly oval, 1 mm. long.

Florida, *Curtiss* for U. S. Dept. Agricul. 259.

40. **S. cryptandrus** (Torr.) A. Gray, Man. Ed. 1:576 (1848). *Agrostis cryptandra* Torr. Ann. Lyc. N. Y. 1:151 (1824). *Vilfa cryptandra* Torr.; Trin. Mem. Acad. St. Petersburg. (VI.) 5:69 (1840).

An erect perennial, 60–90 cm. high, usually branching below, culm solid as in Maize. Sheaths smooth, bearded at the throat; the lowest shorter than the internodes, the upper ones longer; ligule very short; blades 7–9 to the culm, flat or involute, scabrous above, 15–30 cm. long, 3–6 mm. wide. Panicle 10–20 cm. long, narrow, more or less enclosed in the upper sheath, which is 20–35 cm. long; rays mostly in pairs, often hairy in the axils, spreading, 3–8 cm. long, flower-bearing for the entire length. Spikelets numerous, lead-color, or fading to a straw color; empty glumes acute, 1-nerved, first 0.5–1 mm. long, second 1.5 mm. long; floral glume

much like the second empty glume; palea as long as its glume, split in the back by the enlarged grain, which is broad oval and 0.6 mm. long.

New York, *Beal* 61; Michigan, *Clark* 1292, 1293; Illinois, *Patterson* for U. S. Dept. Agricul. 354; Texas, *Nealley*; New Mexico, *Jones* 4161, 4126; Montana, *Anderson* 69; Wyoming, *Buffum* C. 13; Washington, *Suksdorf* 1019; Lower California, *Palmer* 65; Mexico (Chihuahua), *Pringle* 419, also collected by the author at Chicago, Ill., 1869.

In sandy soil, New England to Michigan, British America and Oregon to Mexico.

Var. *flexuosus* Thurb. Vasey, Wheeler's U. S. Geol. Surv. 6:282 (1878).

Panicle often elliptical or lanceolate in outline, rachis very slender and flexuose, the exerted portion 20–40 cm. long, besides the part included by the long sheath, which is 10–30 cm. long; rays very slender, spikelets darker; second empty glume 2.5 mm. long, floral glume 2 mm. long.

Mexico (Chihuahua), *Pringle* 815; New Mexico, *Jones*.

New Mexico, Arizona.

Var. *strictus* Scribn. Bull. Torr. Club, 9:103 (1882).

Culms erect, robust, 10–20 cm. high. Panicle light-colored, enclosed below by the sheath of the upper leaf, erect, densely flowered, spikelike, 40–50 cm. long; second glumes 2.3 mm. long.

Banks of the Rillita, near Camp Lowell, Arizona; collected by *Pringle*.

This species and some of the varieties in Mexico and the warmer dry regions north of there contribute a little to the support of herds roaming over the plains. In quality it ranks as poor.

41. *S. Wrightii* Munro, MS. Bull. Torr. Club, 9:103 (1882).

An erect robust perennial, branching below from creeping rootstocks; culms solid as in Maize, 90–140 cm. high. Sheaths mostly longer than the internodes; ligule a mere ring producing hairs 3 mm. long; blades involute, scabrous above, smooth below, those of the culm 6–7 in number, and some of them 50–80 cm. long, including the long slender point, 5 mm. wide at the base, the upper

leaf 20–30 cm. long. Panicle with the base enclosed, lanceolate, 30–45 cm. long; rays very numerous, mostly single, or some in half-whorls of 3–5, the longest 8–10 cm. long, flower-bearing for nearly their entire length. Spikelets light lead-color [tinged with red; empty glumes very thin, ovate-lanceolate, first 1 mm. or less long, second 1-nerved, 1.5 mm. long; floral glume a little longer and wider, otherwise like the second glume; palea with a groove on the back between the nerves, notched at the tip, wider and a little shorter than its glume.

New Mexico, *Vasey* for U. S. Dept. Agricul.; Arizona, *Pringle*.
New Mexico, Texas, and Arizona.

This grows along watercourses, principally forming great clumps nearly contiguous, four to six feet high, on which stock browse down to within a foot or two of the ground. Though the leaves are tough, they seem to be acceptable to animals. It is to this species mostly that the Mexicans apply the name of *Zacatón*. The name is also given to other tall grasses.

61. (127). **EPICAMPES** Presl, Reliq. Hænk. 1: 235, t. 39 (1830).
Crypsinna Fourn. Benth. Journ. Linn. Soc. 19: 87 (1881).

Spikelets with one perfect flower, collected in a long and narrow or spikelike panicle (diffuse in *E. Bourgei*), rachilla articulate above the persistent lower glumes, but not extended above the floret. Empty glumes more or less unequal, membranous, convex or almost keeled, delicately 1–3-nerved; floral glume usually about the length of the empty glumes, 3-nerved, obtuse or emarginate, with or without a slender dorsal awn a little below the apex; palea hyaline, about as long as its glume, 2-nerved or 2-keeled. Stamens 3. Styles distinct, short. Grain narrow, included, but not adherent. The panicles of our species are usually of a light lead-colored hue.

There are about 16 species peculiar to California, Mexico, and western South America.

Some species seem nearest to *Cinna*, others to *Muhlenbergia*, others to *Sporobolus* and all near to *Agrostis*. It seems to connect *Muhlenbergia* and *Sporobolus*, with *Agrostis*. The chief general feature is the long narrow dense panicle with very numerous rather small spikelets, the awn of the floral glume, when it exists, much

smaller than in *Mullenbergia* and often not quite terminal; the unawned species are distinguished from *Sporobolus* by the fruiting glume and grain which are nearly those of *Agrostis*.

- A. Empty glumes 7-8 mm. long. 1
- B. Empty glumes shorter. (a)
 - a. Plant softly pubescent, awn 1-6 mm. long. 2
 - a. Plant not pubescent. (b)
 - b. Awn 2-10 mm. long. 3
 - b. Awn 10-18 cm. long. 4
 - a. Plant unawned. (c)
 - c. Some plants of 2
 - c. Ligule 20-30 mm. long. 5
 - c. Ligule 10 mm. long. 6
 - c. Ligule shorter. (d)
 - d. Panicle 7-9 mm. broad. 7
 - d. Panicle broader. (e)
 - e. Ligule a mere ring. 8
 - e. Ligule 3 mm. long. 9

1. *E. stricta* (H. B. K.) Presl, l. c. *Crypsis stricta* H. B. K. Nov. Gen. et. Sp. 1:140 (1815). *Crypsinna stricta* Fourn. Hemsf. Biol. Centr. Am. Bot. 3: 549 (1880).

An erect tufted perennial, 50-80 cm. high. Sheaths scabrid; ligule 1-1.5 cm. long, decurrent; blade involute, about 1 mm. diam., those of the sterile shoots 30 cm. long, those of the culm 10-15 cm. long. Panicle plumbous, dense, 5-10 cm. long, nearly 1 cm. diam.; empty glumes subequal, 1-nerved, 7-8 mm. long; floral glume about 5 mm. long, 3-nerved, with an awn below the tip 1 mm. long.

Mexico, *Pringle* 4211.

Cool slopes under pines, 11,000 feet altitude.

2. *E. lanata* Presl, Reliq. Hænk. 1: 235 (1830).

A tufted erect perennial, clothed throughout with soft short pubescence. Culms compressed. Sheaths longer than the internodes; blades flat, conduplicate and distichous, scabrous on the margins and keel, 20-50 cm. long, 3-4 mm. wide. Panicle exerted, erect, 30-40 cm. long, 3-4 mm. diam.; rays numerous, erect

or ascending. Spikelets linear-lanceolate, 2.5–3 mm. long, the awn 1–6 mm. long (rarely unawned), thinly clothed with soft short hairs, empty glumes subequal, longer than the floret, elliptical, thin, soft, nerves obscure; floret pubescent, linear, about 2 mm. long.

Mexico (Chihuahua), *Pringle* 391.

This grows on cool mountain-slopes, scattered in slight clumps; a beautiful grass, soft, velvety, with purple panicles and of average quality for grazing purposes.

3. *E. distichophylla* (Presl) Vasey, Cat. Gr. U. S. 45 (1885). *Podosammum distichophyllum* Presl, Reliq. Hænk. 1:231 (1830). *Muhlenbergia distichophylla* Munro. Vasey, Cat. Gram. U. S. 45 (1885), not Kunth. *E. Emersleyi* Vasey, Contrib. U. S. Nat. Herb. 3:66 (1892).

A stout erect perennial, 1–2 metres high, culms and sheaths more or less compressed, the former hard and solid or with no hollow. Ligule thin, 5–15 mm. long; blades hard, scabrous, conduplicate below, above variously folded, 30–60 cm. long, 3–5 mm. wide, with long narrow points. Panicle contracted, lanceolate, or slightly spreading, purplish or plumbous, 15–30–60 cm. long; rays scattered, numerous, appressed, branching, flower-bearing along the upper three-fourths, the longest 8–10 cm. long. Spikelets on pedicels, which are 1–3 mm. long; empty glumes thin, subequal, oval, obtuse or acute, scabrid on the back, 1–3-nerved, 2–2.7 mm. long; floral glume obscurely 1-nerved, as long as the empty glumes or a little longer or shorter; floral glume shortly pilose on the margins below, oval, or with an obscure nerve on each side, apex split, the awn 5–10 mm. long; palea oval when spread, as long as its glume. Nearly allied to *E. grandis* (Vasey).

Arizona, U. S. Dept. Agricul. 379; Mexico, *Parry & Palmer* 920, 928, *Pringle* 2356.

Arizona, Mexico.

Var. **mutica** Scribn.

Empty glumes a trifle longer than the floral glume; floral glume obscurely 3-nerved, 1.5 mm. long, awnless or with a mucro; palea oval, obtuse or as long as its glume.

Arizona, *Toumey* 740, *Jones* 4219: Mexico, *Pringle* 1427, 2346, 2356.

4. *E. grandis* (Vasey). *Muhlenbergia grandis* Vasey, Contrib. U. S. Nat. Herb. 1: 283 (1893).

An erect stout light green perennial, 120–160 cm. high. Culms solid, compressed. Sheaths flattened; ligule firm, 3–5 mm. long; blades revolute or involute or conduplicate, hard, scabrous, 40–70 cm. long, 5–10 mm. wide. Panicle terminal, linear-lanceolate, brownish-yellow or purple, 40–70 cm. long; rays erect, 10–13 cm. long, numerous and freely branching and with the spikelets concealing the main axis, flower-bearing to near the base. Spikelets on pedicels 1–4 mm. long; empty glumes equal, scabrid, ovate-lanceolate, nerveless or very obscurely 1-nerved, about 2 mm. long; floral glume ovate, acute, obscurely 3-nerved, about 2 mm. long, the awn 10–18 mm. long; palea as long as its glume. Grain linear, 1.4 mm. long. Nearly allied to *E. distichophylla* Vasey.

Mexico, *Palmer* 515, 515a, *Pringle* 1760, 2765.

5. *E. macroura* (Kunth) Benth. Journ. Linn. Soc. 19: 87 (1881). *Cinna macroura* Kunth, Rev. Gram. 1: 67 (1829). *C. stricta* Kunth, Rev. Gram. 1: 67 (1829).

Perennial; culms erect, rigid, simple, smooth, 90–120 cm. high. Sheaths nearly smooth; ligule lanceolate, split, 2–3 cm. (!) long; blade long, scabrous above, involute, with long tapering points. Panicle plumbous, spikelike, dense, 30 cm. long, 1 cm. broad. First and second glumes lance-linear, equal or subequal, 4–4.5 mm. long; floret 3.5–4 mm. long, linear, abruptly acute when spread; palea as long and as wide as its glume. Anthers 5 mm. long.

Central Mexico, *Parry & Palmer* 919 in 1878.

Under this name Hemsley in Biol. Cent. Am. includes No. 940 of Parry & Palmer. The plant with the latter number in the herbarium of Harvard University is very different: among the differences the ligule is 6 mm. long, spike 18–20 cm. long; empty



FIG. 53.—*Epicampes macroura*. Spikelet. (Scribner.)

glumes 5-6 mm. long, floral glume 7 mm. long with a mucro; palea 5.5-6 mm. long. Like the latter plant in the herbarium of Harvard are others from Bolivia. No. 1, Dr. E. Palmer, Chihuahua, Mexico (1885), is named *E. macroura* Benth. This seems to be near No. 919 of Parry & Palmer; in this the spike is dense, 6 mm. wide: empty glumes a little longer than in 919, including a bristle point, apparently not more than a variety.

6. **E. Bourgæi** Fourn. Hems. Biol. Centr. Am. Bot. 3:548 (1880). *Sporobolus complanatus* Scribn. ined.

A rather stout erect perennial, 150 cm. high. Culms smooth, compressed below. Sheaths smooth, keeled, longer than the internodes; ligule hyaline, 10 mm. long, acute or lacerate; blades flat, 60 mm. long, 3-6 mm. wide, attenuate-pointed, scabrous on both sides. Panicle diffuse, 45 cm. long; rays irregularly scattered on the rachis, capillary, bearing spikelets on the outer half, the lower 10-15 cm. long. Spikelets nearly terete, 1-flowered, 1.5-2 mm. long; empty glumes ovate to oblong, obtuse, subequal, 1-nerved, equalling the floret or a little shorter; floral glume broadly obtuse, occasionally mucronate; palea as long as its glume. Grain nearly as long as the floral glume. Distributed as *Sporobolus complanatus* Scribn. n. sp.

Mexico, *Pringle* 3335.

Under cool cliffs, near Guadalajara, State of Jalisco.

Scribner says: "This grass differs from *Epicampes* as described by Benthams & Hooker in the widely diffuse panicle. The irregular disposition of the branches, the firm texture of the floral glume, large palea and terminal awn or mucro, separate it from *Agrostis*. The adherent pericarp alone separates it from *Sporobolus*. From *Muhlenbergia* it is distinguished by its loosely enclosed caryopsis."

7. **E. rigens** Benth. Journ. Linn. Soc. 19:88 (1881). *Cinna macroura* Thurb. not Kunth, S. Wats. Bot. Calif. 2:276 (1880).

Perennial; culms rigid, erect, smooth, 90-120 cm. high. Sheaths longer than the internodes, loose, smooth or glabrous; ligule 4-6 mm. long; blades scabrous, rigid, narrow, strongly involute, apex attenuate, 10-30 cm. long. Panicle exerted or with the base included, erect, dense, spikelike, interrupted below, 20-50 cm. long.

7-9 mm. diam. Spikelets narrowly elliptical, minutely scabrous; empty glumes white, the tip of the floret yellowish, about 3 mm. long, first and second glumes subequal, very obscurely nerved, about 2 mm. long; floret awnless, minutely pubescent, with a small hairy callus below. Anthers 2 mm. long.

Mexico, *Pringle* 417, *Palmer* 21.

California to Arizona and Mexico.

This forms, in Mexico, tall bunches along streams, and in character and quality resembles *Sporobolus Wrightii*, which ranks as fairly good.

8. *E. mutica* Rupr. Bull. Acad. Brux. 9: part 2, 230 (1842).

A stout erect tufted grass, 90-150 cm. high, culms compressed, without cavity, very hard. Sheaths longer than the internodes; ligule a mere ring; blades hard, rough, conduplicate, the lower 9-15 cm. long, 5-6 mm. wide; those of the culm 60 or more cm. long, the blade abruptly narrowed where it leaves the sheath, apex long, attenuate. Panicle exserted, erect, 50-60 cm. long, 3-5 cm. wide, compact with numerous erect branches, some of which are 15 cm. long. Spikelets short-awned or awnless, linear, acute, 2.2 mm. long; empty glumes equal, nearly 2 mm. long, elliptical, soft, the nerves very obscure; floral glume and palea equal, elliptical, acute, a little longer than the empty glumes, containing a few very short hairs.

There are some spikelets apparently sterile and about 3 mm. long, with a floret half as long, containing a very short awn.

Mexico (Jalisco), *Palmer* 518.

9. *E. anomala* Scribn. ined.; distributed as *Melica* (?) *anomala* Scribn. n. sp.

A tufted grass, 60-80 cm. high. Sheaths longer than the internodes; ligule firm below, white and very thin above, 3 mm. long; blades 4-5, scabrous, flat, the tips involute-filiform, 20-30 cm. long, 4-6 mm. wide, the upper one filiform, 5 cm. long. Panicle erect, exserted, lanceolate, interrupted below, 18-25 cm. long, rays erect, in threes and fours, the longest 5-7 cm. long, flower-bearing for most of its length, the upper 1-2 cm. long, bearing small spikelets in dense clusters. Spikelets purple, 1-flowered, with no rudiment of

a second, sessile or on short stiff straight or curved pedicels, linear, about 3 mm. long; the three glumes softly scabrid with small warts; first empty glume lanceolate, 1-2-3-nerved, often toothed, 2.5 mm. long, second ovate-lanceolate or lanceolate, 3-5-nerved, often toothed, 2-2.5 mm. long; floral glume very thin below, broadly oval, obtuse or truncate, often with very short teeth, 2-5-nerved, 3 mm. long; palea oval, hyaline, 2-nerved, 2 mm. long.

Mexico (Chihuahua), *Pringle* 1423.

62. (131). **POLYPOGON** Desf. Fl. Atl. 1:66 (1798). *Santia* Savi, Mem. Soc. Ital. Sc. (VIII.) 2:479 (1798). *Raspailia* Mem. Soc. Ital. Mod. 8:(2) 479 (1798). Presl, Reliq. Hænk. 1:238, t. 40 (1830). *Nowodworskya* Presl, Rel. Hænk. 1:238 (1830).

Spikelets 1-flowered in a dense spike-like or slightly interrupted and spreading panicle, pedicels articulate with a tuft of short hairs above the articulation; empty glumes subequal with a terminal straight awn, floral glume smaller, thinner, usually hyaline, entire or notched, with an awn in the notch or on the back, either twisted and bent at the base, or small and straight or reduced to a minute point. Palea smaller. Stamens 1-3. Styles short, distinct. Grain enclosed but not adherent.

These grasses are mostly annuals with decumbent bases. The panicle is terminal. There are ten species widely distributed over the globe. Bentham says: "The general structure is almost precisely that of *Garnotia* in tribe Tristegineæ, from which indeed *Polyogon* only differs in the inflorescence being dense and spike-like, not loosely paniculate."

- A. Awns nearly concealing the spikelets. 1, 2
- B. Awns not concealing the spikelets. (a)
 - a. Empty glumes linear-lanceolate. 3
 - a. Empty glumes obtuse when spread open. 4

1. *P. MONSPELIENSIS* (L.) Desf. l. c. ANNUAL BEARD-GRASS.
Alopecurus monspeliensis L. Sp. Pl. 89 (1753).

An erect or geniculate annual, 30-36 cm. high. Sheaths nearly as long as the internodes, the upper slightly inflated; ligule 4-6 mm. long; blades flat, scabrid. Spike-like panicle mostly exerted, oval or cylindrical, dense, showing branches more or less, often of a

yellowish shining green, 3-8 cm. long, 1-2 cm. diam. Spikelets narrow, very numerous, nearly concealed by the slender awns, the hairs at the base few and very short, narrow, about 2 mm. long; empty glumes pubescent or ciliate, obtuse or retuse, elliptical, 1-nerved, awns 4-7 mm. long; floral glume 1 mm. long, broad hyaline, truncate-jagged, awn as long as the floret, shorter or wanting; palea 2-toothed.

Georgia, *Clark* 2951; Kansas, *Henry*; Colorado, *Cassidy*; Montana, *Anderson* 18; Washington, *Lake*, *Sandberg* 280; Oregon, *Howell*; California, *Sones* 100, *Parish* 868; Arizona, *Toumey* 772.

Introduced on the coast of both oceans; also in Colorado, Montana, Nevada, Utah, Kansas; also found in Australia and in most temperate and subtropical regions of the Old World. It is considered a weed, though it is sometimes cultivated for ornament.

2. *P. MARITIMUS* Willd. Ges. Naturf. Fr. Neue Schr. 3:442 (1801). *Alopecurus maritimus* Poir. Encyc. 8:780 (1804).

An erect annual; culms simple, 15-30 cm. high. Ligule 4 mm. long; blades flat. Spike dense, 2-4 cm. long. Empty glumes equal, villous at the tips and 2-lobed, awn 4-6 mm. long; floral glume 7 mm. long, 4-toothed.

Introduced on the sea shore of North and South Carolina, *Chapman*.

3. *P. elongatus* (Poir.) H. B. K. Nov. Gen. et Sp. 1: 134 (1815). *Alopecurus elongatus* Poir. Encycl. Suppl. 5: 495 (1804).

Erect, geniculate below, 60-90 cm. high. Sheaths smooth, about the length of the internodes; upper ligule broad, obtuse, 4-6 mm. long; blades flat, nearly smooth, 12-16 cm. long, 4.7 mm.



FIG. 54.—*Polypogon elongatus*. A, spikelet; a, floret. (Scribner.)

wide. Panicle much exserted, erect or nodding, interrupted, 15-30 cm. long, pedicels scabrous, clavate, 4-6 mm. long. Spikelets linear-lanceolate, acute, 3-4 mm. long; empty glumes linear-lanceolate, awn-pointed, scabrous on the back, 1-nerved; floral glume thin, broad, truncate, 4-5-toothed, 4-5-nerved, with a straight awn on the back above the middle 1-2 mm. long; palea about half as long as its glume.

Southern California; by streams of Santa Rita Mountains in Arizona; Mexico.

Rarely met with by Mr. Pringle, and then only in damp shaded ledges.

4. *P. LITTORLIS* Sm. Comp. Fl. Brit. Ed. 2, 13 (1816). Bot. Calif. 2:270 (1880).

A tufted perennial, 30-60 cm. high, ascending from rootstocks. Sheaths nearly as long as the internodes; the upper slightly inflated; ligule acute, 4-5 mm. long; blades flat, narrow, scabrid. Panicle usually exserted, much lobed, often tinged with purple, 5-12 cm. long. Spikelets narrow, pointed, 2-2.7 mm. long, scabrid, the awns as long as the empty glumes, which are elliptical when spread, appearing acute as the apex is involute; floret 1 mm. long, bearing an exserted awn nearly twice its length; floral glume broadly truncate, jagged, hyaline; palea 2-toothed.

Oregon, *Howell* for U. S. Dept. Agricul. 414; California, *Jones* 2352, *Pringle*.

Apparently introduced in wet places.

Texas to Oregon and California.

63. (48). **THURBERIA** Benth. Journ. Linn. Soc. 19: 58 (1881). *Greenia* Nutt. Trans. Am. Phil. Soc. 5:142 (1837), not Walk. & Arn. *Sclerachne* Torr. Trin. Mem. Acad. St. Petersb. (VI) 6: 273 (1845).

Spikelets 1-flowered, narrow, in slender panicles, pedicel articulate. Glumes 3, empty, subequal, awnless, nerves obscure, the floral glume a little shorter, slender, usually torn so as to appear bifid, a long slender geniculate awn a little below the point; palea a little shorter, narrow, hyaline, 2-keeled. Lodicules 2, longer than the short anthers. Stamens 3. Styles short, distinct, stig-

mas with short hairs. Grain narrow-oblong, included, but not adherent.

Decumbent grasses with many culms or branches, the culms slender, ascending or erect, with narrow flat leaf-blades. Panicle terminal, narrow, elongated, with short slender erect branches.

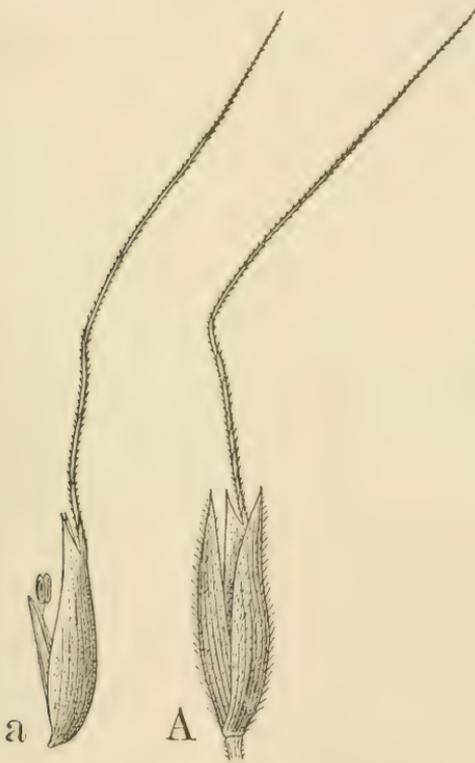


FIG. 55.—*Thurberia Arkansana*. A, spikelet; a, floret. (Scribner.)

Spikelets few or numerous, glabrous, pubescent, not surrounded with cilia.

Species 2, North American.

Bentham observes: “*Thurberia* was substituted for the names proposed by Nuttall and Torrey, because both of them had been preoccupied. The present name was for Dr. Geo. Thurber, an

eminent agrostologist. Dr. Gray also dedicated a genus to him, but it afterwards proved not to be distinct from *Gossypium*."

1. **T. Arkansana** (Torr.) Benth. l. c. *Sclerachne Arkansana* Torr. l. c. *Greenia Arkansana* Nutt. l. c.

A soft delicate slender annual, 30–60 cm. high. Ligule short; blades 5–8 cm. long. Panicle 12 cm. long, 1.5 cm. broad. Spikelets oval-lanceolate, 4 mm. long, with an awn three times as long; empty glumes and floral glume 3-nerved.

Texas, *Reverchon* for U. S. Dept. Agricul. 147, *Gillespie* for Nat. Herb., *Nealley* for Nat. Herb.

Florida to Arkansas and Southwest.

64. (132). **ARCTAGROSTIS** Griseb. Ledeb. Fl. Ross. 4:434 (1853).

Spikelets 1-flowered, panicle narrow, rachilla articulate above the lower glumes, smooth, not produced above the flower or very rarely extending as a minute bristle. Empty glumes slightly unequal, moderately acute, membranous; floral glume obtuse or 3-toothed, 5-nerved, the lateral ones obscure, unawned; palea as long as its glume or shorter, 2-nerved, obtuse, or 2-toothed. Stamens 2–3. Styles distinct, very short. Grain oblong, included but not adherent.

A tufted perennial grass. Leaf-blades flat. Panicles slightly branched, often compact. Spikelets in most respects like those of *Agrostis*. Two species are found in the arctic and subarctic regions of Europe, Asia, and America. A genus according to Brown related to *Colpodium*, according to Bentham related to *Deyeuxia*. The habit and size of the spikelets are more nearly like those of *Poa* than of *Agrostis*.

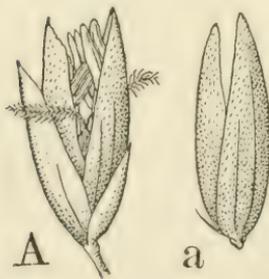


FIG. 56.—*Arctagrostis latifolia*. A, spikelet; a, floret. (Scribner.)

1. **A. latifolia** (R. Br.) Griesb. l. c. *Colpodium latifolium* R. Br. Suppl. App. Parry's Voy. cclxxxvi (1824). *Agrostis paradoxa* R. Br. Ross' Voy. App. ed. 2, 2: 198 (1819), name only.

Culms 10–18–80 (!) cm. high. Leaf-blades of the culm 2–7

cm. long, acute, sometimes 10-15 mm. wide. Panicle 4-6-20 cm. long, narrow. Spikelets 4-5 mm. long, ovate-lanceolate; empty glumes oboval, first a little over 2 mm. long, 1-nerved, second about 3 mm. long with 3 obscure nerves; floral glume oval, compressed-keeled, scabrid on the back, the margins and tip scarious; palea oblong, minutely scabrid.

The above notes under the species were made after a study of specimens collected by Lieut. A. W. Greely in 1882 and 1883 in Grinnell.

2. **A. arundinacea** (Trin.). *Vilfa arundinacea* Trin. Unifl. 157 (1824). *Sporobolus arundinaceus* Vasey, Cat. Gr. U. S. (1885). *Colpodium arundinaceum* Hook. Fl. Bor. Am. 2: 238 (1840).

A stout perennial, 30-90 cm. high, with creeping rootstocks; culms simple. Sheaths about half as long as the internodes; ligule lacerate, 3-4-7 mm. long; blades of sterile shoots few and short, the middle and upper ones 25 cm. long, 1 cm. wide. Panicle exerted, lanceolate, 20-30 cm. long; rays scabrous in half-whorls of 4-7, which are distant 4-5 cm.; some of them only 2-3 cm. long and flower-bearing for their whole length, the longest 10-12 cm., interrupted and naked for a half to a third of their length. Spikelets on short pedicels, appressed, light green, often tinged with purple; empty glumes thin, ovate-lanceolate, compressed, keeled, 1-3-nerved. first 3-4 mm. long, second 3-nerved, 4-5 mm. long; floral glume scabrid, compressed, ovate-lanceolate, 5-nerved, the lateral nerves obscure, 4.5 mm. long; palea elliptical, round on the back, nerves obscure, 4 mm. long.

Alaska, *Harrington* in 1871-2, *L. M. Turner* in 1884; Bering Sea (Pribylov Islands), *Dr. Merriam*.

Alaska and British America.

65. (134). **CINNA** L. Sp. Pl. 5 (1753). *Abola* Adans. Fam. 2: 31 (1763). *Blyttia* Fries, Novit. Fl. Suec. Mant. 2: 2 (1839).

Spikelets 1-flowered, compressed in an open spreading panicle, rachilla articulate above the outer glumes and often produced beyond the floret in a small pedicel. Empty glumes persistent, lanceolate, acute, with a hispid keel, first 1-nerved, second 1-3-nerved; floral glume usually stipitate above the empty glumes and

about the same length, 3-nerved, short-awned on the back near the apex; palea nearly as long as its glume, 2-nerved or the nerves united as one. Stamen 1 (2-3 in *C. Bolanderi*). Styles short, distinct. Grain linear, oblong, included, but not adherent.

Tall perennial grasses with flat leaf-blades.

Bentham says: "They have the tall reedlike habit of the large species of *Calamagrostis*, but with a glabrous rachilla and the palea with one nerve; the latter is a very remarkable character for the tribe. They have but one stamen to the flower. Several other grasses of America have been published as species of *Cinna*, but are now referred to *Epicampes* or *Deyeuxia*."

There are three species, two of which are common to Northern Europe and North America.

Spikelets 5-6 mm. long.	1
Spikelets 3-3.5 mm. long.	2
Spikelets about 2 mm. long, var. <i>glomerata</i> of number . . .	2
Spikelets 4.5-5 mm. long, floret sessile.	3

1. *C. arundinacea* L. Sp. Pl. 5 (1753). *Agrostis cinna* Lam. Ill. 1: 162 (1791). *Muhlenbergia cinna* Trin. Diss. 1: 191 (1824). *M. pendula* Bong. Vasey Monog. l. c. (1892). *Blyttia suaveolens* Fries, Mant. 2: 2 (1839).

Culms smooth, stout, simple, erect, 90-200 cm. high. Sheaths mostly shorter than the 5-7 internodes; blades flat, nearly smooth, 15-20 cm. long, 10-12 mm. wide. Panicle 15-40 cm. long, rays smooth, in clusters of 3-6, flower-bearing mostly above the middle. Spikelets green or purple, 5-6 mm. long, first 4-5 mm. long, second 3-nerved, 5-6 mm. long; floral glume 4.5-5 mm. long, awn obsolete or manifest.

Northern States entirely across the continent.

Michigan, *Cooley*, *Clark* 694, *Beal* 62, 63, 64; Massachusetts, *Sturtevant*.

Swamps and moist woods.

2. *C. latifolia* (Trev.) Griseb. Ledeb. Fl. Ross. 4: 435 (1853). *Agrostis latifolia* Trevir. Göppert, Beschr. Bot. 82 (1830) ap. Griseb. *Muhlenbergia pendula* Bong. Veg. Sitch. 172 (1833). *Cinna pendula* Trin. Mem. Acad. St. Petersb. (VI.) 6: 280 (1841).

Culms usually more slender than those of *C. arundinacea*; blades rather shorter. Panicle less robust, the rays rough, more slender, flexuose and nodding. Spikelets 3–3.5 mm. long, more delicate in texture, less scabrous, nerves less prominent; empty glumes equal or the lower 0.5 mm. shorter, second glume 1–3-nerved, otherwise like the preceding.



FIG. 57.—*Cinna latifolia*. Spikelet. (Scribner.)

New Hampshire, *Faxon* 22; Vermont, *Pringle* for Pelton; Minnesota, *Bailey* B 323; Colorado, *Cassidy*; Utah, *Jones* 1219; British Columbia, *Macoun*; Oregon, *Howell* for U. S. Dept. Agricul. 421.

For notes by Scribner comparing the two species, see Proceedings of the Acad. Nat. Sci. Phila. p. 289, in 1884.

Northern States across the continent.

Var. **glomerata** Scribn. ined. Empty glumes equal, 1-nerved, very narrow, acuminate-pointed and scarcely more than 2 mm. long; spikelets in dense clusters or glomerules along the extremities of the branches of the very diffuse panicle. The above was taken or adapted from Scribner in Proceedings of the Acad. Nat. Sci. Phil. p. 290, 1884.

British Columbia, *Macoun*.

3. **C. Bolanderi** Scribn. Proc. Phila. Acad. 290 (1884).

Culms stout, smooth, sometimes 20 cm. high. Leaf-blades firm, prominently striate and scabrous on both sides, those of the middle portion of the culm 30–60 cm. long, 2 cm. wide, all tapering to a sharp point. Panicle loose, widely spreading, 40–50 cm. long. Spikelets 4–5 mm. long; empty glumes scabrous, subequal, broadly lanceolate, second glume 3-nerved; floret extending as high as the second glume, 3-nerved, scarcely it at all stipitate.

Vasey considered it only a var. of *C. pendula*.

California, *Bolander* 6090.

66. (129). **AGROSTIS** L. Sp. Pl. (1753), in part. *Vilfa* Adans.

Fam. 2: 495 (1763). *Avena* Hall, Scop. Introd. 74 (1777). *Trichodium* Michx. Fl. Bor. Am. 1: 41 (1803). *Decandolia* Bast. Fl. Maine-et-Loire, 28 (1809). *Agraulus* Beauv. Agrost. 5 (1812). *Nesonema* Rafin. Neogenyt. 4 (1825). *Pereilema* Presl, Reliq. Hænk. 1: 233, t. 37 (1830). *Bromidium* Nees, Pl. Meyen. 154 (1835).

Spikelets 1-4 mm. long, 1-flowered, pedicellate in a loose spreading or narrow or even spikelike panicle, the rachilla articulate above the outer glumes, glabrous or nearly so, not produced beyond the flower. The two outer glumes persistent, narrow, keeled, acute, unawned; floral glume shorter, broad, delicately hyaline, unawned or with a slender twisted dorsal awn, attached below, or sometimes above the middle; palea very thin, not over half the length of its glume, often very minute or none. Stamens 3. Styles very short, distinct. Grain enclosed but adherent.

Elegant tufted or creeping annual or perennial grasses, the blades flat or setaceous, the panicles terminal, often slender with many filiform branches, spikelets very numerous.

There are about 100 species, very widely distributed in temperate and in cold climates; a few are almost cosmopolitan. A small number are prominent for meadows, pastures, and lawns.

It is very difficult to separate the genus into sections; the presence of a dorsal awn or the absence of an awn has been used, but this has been shown to be a very inconstant and unreliable character, as some of the seedlings from the same plant have awns on the florets, while others have none.

- | | |
|---|------|
| A. Floret awned. | (a) |
| a. Awn exerted. | (d) |
| d. Awn very slender, flexuose, over 5 mm. long. | 1, 2 |
| d. Awn bent, not flexuose, shorter. | (e) |
| e. Panicle thin, branches thin, flexuose. | 3 |
| e. Panicle stout, branches ascending. | 4 |
| e. Panicle slender, open, small. | 5, 6 |
| e. Panicle spikelike. | (p) |
| p. Plants dwarf, 4-10 cm. high. | 7 |
| p. Plants much taller. | 8 |

- a. Awn little or not exerted. (b)
- f. Panicle simple, branches capillary, awn usually slightly projecting, culms with few leaves . . . 9 and possibly some of 10, 11
- f. Panicle spikelike. 10
- B. Floret awnless. (b)**
- b. Spikelet less than 2 mm. long (rarely 2 in no., 18) . (g)
- g. Panicle narrow, thin, purple, empty glumes and floral glume reaching to the same height. . . . 15
- g. Panicle with long capillary rays, flower-bearing only near the ends, sometimes plants of 11
- g. Panicle dense, usually pale green. 17
- b. Spikelet 2-4 (very rarely less than 2) mm. long. . . (h)**
- h. Panicle dense, somewhat lobed, usually pale green, ligule 3-5 mm. long 17
- h. Panicle not dense, though sometimes simple. . . (i)
- i. Panicle 3-8 cm. long, purple. (j)
- j. Blades involute. 18
- j. Blades flat. 20
- i. Panicle of well-grown plants more than 8 cm. long. (k)
- k. Palea 1.3-2.3 mm. long, as long as its glume. (l)
- l. Ligule 3-5 mm. long, rays 8-15. 21
- l. Ligule 3-5 mm. long, rays 15-25, panicle denser, 15-25 cm. long. 22
- k. Palea 0 or minute. (m)
- m. Panicle light green, rays erect, spikelet 2-2.5-3 mm. 13, 14
- m. Plant 30-60 cm. high. (n)
- n. Panicle pale green, 10-18 cm. long, flower-bearing from near the middle. 12
- n. Panicle simple, thin, rays flower-bearing near the tips. (o)
- o. Panicle 10-12 cm. long. 23
- o. Panicle 20-30 cm. long, possibly some of 10

- m. Plant 60-90 cm high. (r)
 r. Upper ligule 3-5 mm. long, panicle
 raised 20 cm. above the upper leaf. 24
 r. Upper ligule 5-9 mm. long, culm
 60-80 cm. high. (s)
 s. Spikelets 2.5-3 mm. long, densely
 flowering on the upper third of the
 branches. 25
 s. Spikelets 3-4 mm. long, rays
 flowering from about the middle. 26

1. **A. Elliottiana** Schult. Mant. 2: 372 (1824). *A. arachnoides*
 Ell. Bot. S. C. & Ga. 1: 134 (1817), not Poir.
 (1810).

Culms tufted, weak and slender, 30-50 cm. high. Sheaths scabrous; ligule 3 mm. long; blades narrow, thin, 2-8 cm. long. Panicle exserted, weak and diffuse when mature, rays scabrous, capillary in remote half-whorls of 3-6, branching above the middle, flower-bearing at and near the tips. Spikelets nearly 2 mm. long; empty glumes subequal, scabrous on the keel, scarcely acute when spread; floral glume 1.5 mm. long, 5-nerved, with 2 minute bristles at the truncate apex, and a very slender flexuose awn 7 mm. long, on the back a little below the apex; palea smaller than its glume or wanting.

The panicles of this species much resemble those of *A. (scabra) hiemalis*, but the very slender awns enable us very readily to distinguish one from the other. Possibly it is an awned form of *A. hiemalis*.

Tennessee to Texas. April to May and June.

2. **A. exigua** Thurb. S. Wats. Bot. Calif. 2: 275 (1880).

A dwarf annual, 3-10 cm. high, sometimes branching near the base. Sheaths very loose; ligule about 2 mm. long, acute; blades 4-30 mm. long, mostly convolute, rough. Panicle half the length of the plant, included, at length open, lower rays about 5, others in pairs, the longest 2.5 cm. long, bearing 1-5 spikelets above the middle. Spikelets 1.5 mm. long, empty glumes obtuse, purplish, clothed with minute scattered hairs; floral glume as long as the

empty glumes, 5-nerved, scabrous, with few minute hairs, very acute, terminating in 2 setæ, awn one-fifth below the tips and projecting 5-6 mm.; palea 0 or minute. Not seen by me.

California, *Bolander*.

3. **A. Howellii** Scribn. Vasey, Contrib. U. S. Nat. Herb. 3: 76 (1892).

Perennial; culms weak, geniculate, 40-60 cm. high. Sheaths smooth, about 4 in number, nearly as long as the internodes; ligule 4-6 mm. long, blades flat, slightly scabrid, 20-30 cm. long, 4-5 mm. wide. Panicle greenish white, exerted, diffuse, flexuose, 18-20 cm. long, the lower rays in distant half-whorls of 5-7, the upper ones in pairs, capillary, branching at and above the middle, some of them 8 cm. long, flower-bearing near the tips. Spikelets 3-4 mm. long, scabrous on the keels, first glume 3.5 mm. long, a little longer than the second; floral glume 2.5-2.8 mm. long, lacerate-toothed, 4-nerved above, the awn attached below the middle, bent, not flexuose, exceeding its glume by 2-4 mm., hairs 0.5-0.7 mm. long; palea 0.

Oregon, *Howell* 198. In 1882, distributed as *A. Scouleri* Trin. Alaska to California.

4. **A. virescens** H. B. K. Nov. Gen. et Sp. 1: 135 (1815).

A stout erect perennial, 30-80 cm. high. Sheaths nearly smooth, the second from the top half as long as the internodes; ligule truncate, about 4 mm. long; blades erect, flat, scabrid, 12-16 cm. long, 5-9 mm. wide. Panicle exerted, pale green or brownish, tinged with purple, 15-18 cm. long, 3-4 cm. broad, the rays in clusters of 5-15, distant about 3 cm., the short ones flower-bearing nearly to the base, the longest flower-bearing from about the middle. Spikelets with empty glumes very acute, scabrid throughout; first glume 3.5 mm. long besides a bristle 1 mm. long, second 3 mm. long besides a short bristle; floral glume over 2 mm. long, with a few very short hairs at the base, very broad, truncate, 5-nerved below, the lateral nerves terminating in minute bristles, the awn rather stout, attached near the middle, projecting 4 mm.; palea 0.

The plants seen belong to Scribner and were collected by Bolander and ticketed "*A. viridis*, fide Munro. *A. pallida* fide Thurber."

California to Mexico.

5. *A. canina* L. Sp. Pl. 62 (1753). *Trichodium caninum* Schrad. Fl. Germ. 1: 198 (1806). *Agraulus caninus* Beauv. Agrost. 146 (1812). BROWN BENT GRASS. *A. Novæ-Angliæ* Vasey, in part.

Culms slender, erect or spreading, 20–60 cm. high, from matted perennial rootstocks. Sheaths smooth, mostly longer than the internodes; ligule obtuse, 2–3 mm. long; blades of sterile shoots involute, slender, 5–10 cm. long, the upper flat. Panicle purple, brown or greenish, open, 5–15 cm. long; rays scabrid, in clusters of 3–5–12, in pairs or solitary above, roughened, branching above the middle. Spikelets 2–3 mm. long; empty glumes slightly unequal, very acute; floral glume truncate with 5 excurrent nerves, one-third shorter than the empty glumes, bearing on the back at or below the middle a twisted, exerted awn; palea absent or very small. Very variable. Fig. 71, Vol. 1.

Vermont, *Pringle*; New Hampshire, *Flint* 4365 from Congdon.

Found in the mountains of New England to the Rocky Mountains; also in South America, Europe, Siberia, western Asia, Australia, New Zealand.

Var. *alpina* Oakes, Cat. Vt. Pl. [reprint 12] (1842), not *A. alpina* Scop. of Europe. Perhaps hardly a variety.

Culms 8–20 cm. high; blades all involute; panicle 2–8 cm. long, open; spikelets 2 mm. long.

Vermont, *Pringle*, *Clark* 2950 from Blake; New Hampshire, *C. E. Faxon*.

Mountains of Maine, Labrador, to New York.

Var. *stolonifera* Vasey, Monog. Grasses U. S. & Brit. Am. 75 (1890).

Stoloniferous; blades flat, thin, 2–4 mm. wide; empty glumes more unequal; floral glume but little shorter, awn straight.

Oregon, *Henderson*, *Howell*.

In looking over specimens from all parts of Europe, some from India and elsewhere, the chief peculiarity seems to be the presence of an awn. Almost any style of small brown slender *Agrostis* is called *A. canina*, provided it has an awn sticking out of the spikelet.

In carefully raising seedlings of many typical awned specimens of *A. canina*, Dr. Jenkins, of Connecticut, found that only a small per cent of them possessed awns. This being the case, what hinders uniting *A. vulgaris* with *A. canina*? I leave them as others have left them, thinking it best to give the subject further attention before uniting them.

6. *A. setifolia* Fourn. Hemsl. Biol. Centr. Am. Bot. 3:551 (1880).

A tufted erect perennial, 40-60 cm. high. Leaves of sterile shoots few, those of the culm 3, ligule decurrent, 1-2 mm. long; blades strict, filiform, involute, scabrous, 20-25 cm. long. Panicle thin, ovoid, purplish, 10-14 cm. long; rays in twos, threes, and fives, the longest 5-6 cm. long, bearing a few spikelets on the outer two-fifths. Spikelets 3 mm. long; empty glumes subequal, elliptical-lanceolate when spread; floral glume 2.2 mm. long, truncate, with 5 excurrent nerves, the twisted and bent awn projecting 3 mm. above its glume; palea 0. Very closely related to *A. canina* and perhaps merely a variety of that species.

Found at an altitude of 10,000 feet.

Mexico (Oaxaca), *Pringle* 4895.

7. *A. inflata* Scribn. ined.

A dwarf perennial, 4-10 cm. high. Sheaths smooth, the upper inflated; ligule about 1 mm. long; blades erect, flat, pungent-pointed, 2-5 cm. long, 2-3 mm. wide. Panicle partially included, spikelike, 1.5-5 cm. long, 4-6 mm. diam. Spikelets 2.5 mm. long; empty glumes equal or subequal, each bearing a short bristle; floral glume 1.6 mm. long, with a very few short hairs at the base, broad, truncate, 4-toothed, 5-nerved below, the awn attached near the middle and about 4 mm. long; palea 0.

British Columbia (Vancouver Island), *Macoun* 258 in 1893.

8. *A. microphylla* Steud. Syn. Pl. Gram. 164 (1855).

Annual; culms erect, 30-70 cm. high. Sheaths smooth or scabrid, shorter than the internodes; ligule decurrent, 3-5 mm. long; blades erect, flat or involute, scabrous, 6-20 cm. long, 3-4 mm. wide; blades of sterile shoots shorter and narrower. Panicle much exserted, erect, dense, interrupted, pale green and tinged with

purple. 10-15 cm. long. 1-1.5 cm. broad; rays rough, perhaps 40 at a node, most of them short and flower-bearing to the base. Spikelets acute, scabrous, 2-3 mm. long, terminated in addition by a bristle often 1 mm. long; floral glume 1.5-1.7 mm. long, awn below the apex and extending beyond its glume 2-4 mm., glume rather firm, brittle truncate, toothed, minutely hairy on the back, obscurely 5-nerved below; palea 0 or present.

Oregon, California, Nevada.

Var. **major** Vasey, Contrib. U. S. Nat. Herb. 3:72 (1892).
Agrostis exarata microphylla S. Wats.

Culms 30-75 cm. high; blades larger; panicle 20-30 cm. long, more loosely branched, some rays 8 mm. long. The same range as the species.

9. **A. geminata** Trin. Unifl. 207 (1824).

A tufted erect perennial, 15-40 cm. high. Ligule 2 mm. long; blades of sterile shoots slightly scabrid, mostly involute, 10-20 cm. long, 1-2 mm. wide, the upper node near the middle of the culm, exclusive of the panicle. Panicle exserted, purple, narrow or spreading, 8-10 cm. long; rays capillary, scabrous, in half-whorls of 4-6, some of the longest 6 cm. long, branching above the middle, flower-bearing at and near the ends. Spikelets 2.5-3 mm. long, scabrous on the keels: first glume a little longer, awn usually projecting slightly; floral glume 1.6 mm. long, broad, thin, obtuse, toothed, 5-nerved below, the awn attached near the middle; palea minute.

Alaska, *Harrington* in 1871-2, *Dr. Kellogg* 119.

Plants from British Columbia by *Macoun* are awnless.

Alaska to Oregon.

10. **A. densiflora** Vasey, Contrib. U. S. Nat. Herb. 3:72 (1892). *A. mucronata* Thurb., not Presl.

An erect tufted rather stout annual, 7-22 cm. high. Sheaths smooth, crowded at the base, rather loose, longer than the internodes; ligule decurrent, obtuse, about 3 mm. long; blades usually flat, erect, with scabrous margins, 2-6 cm. long, 2-3 mm. wide. Panicle dense, exserted, erect, 2-5 cm. long, 3-12 mm. broad, rays scabrous, appressed, 3-5 in each half-whorl. Spikelets very pale,

2.5-3 mm. long; empty glumes mucronate, minutely scabrous, hispid on the keels, first scarcely longer than the second; floral glume minutely scabrous, rather firm, truncate-toothed, a minute rough rather stout awn attached a little below the apex; palea very thin, 0.5-1 mm. long.

Distributed as *A. mucronata* Presl, but it does not answer to that description.

California, *Bolander* 6466, *Dr. C. L. Anderson*.

Oregon to California.

11. **A. hyemalis** (Walt.) B. S. P. Cat. N. Y. (1888). HAIR-GRASS. *Cornucopiæ hymale* Walt. Fl. Carol. 73 (1788). *A. scabra* Willd. Sp. Pl. 1: 370 (1799). *Trichodium laxiflorum* Bigel. Michx. Fl. I. 42 (1803). *T. scabrum* Muhl. Gram. 61 (1817). *A. Michauxii* Trin. Unifl. 206 (1824).

An erect slender tufted biennial or perennial, 30-60 cm. high. Ligule of the upper leaves 4 mm. long; blades scabrous, soon involute, 3-10 cm. long, 2 mm. wide. Panicle exerted when mature, purple or brown, thin, 20-30 cm. long, branches rough, capillary, purplish, 3-12 in each half-whorl, 4-7 cm. distant from each other, spreading, 10-18 cm. long, branching above the middle, flower-bearing only at and near the tips. Spikelets 1.5-2.5 mm. long, usually about 2 mm., scabrous on the keels, glumes very acute, the lower one the longer; floral glume 1.2-1.7 mm. long, obtuse, 5-nerved, sometimes short-awned; palea minute or obsolete. Very variable.

New Brunswick, *Fowler*; Massachusetts, *Sturtevant*, *Beal* 69; Vermont, *Pringle*; New Jersey, *Scribner* for U. S. Dept. Agricul. 403; Michigan, *Clark* 690, *Beal* 65, 66, 67, *Farwell*, *F. E. Wood* 3386; Illinois, *Beal* 68; Iowa, *Hitchcock*; Minnesota, *Bailey* B 129; Colorado, *Patterson* 263; Montana, *Anderson* 46, 60; Wyoming, *Buffum* c 25, c 88, c 90; Arizona, *Jones* 4015, *Toumey* 737, 738, 777, 937 b; Washington, *Lake*; Oregon, *Howell*; California, *Parish* 1560 A, 1560; Southern California, *Palmer* 238, 239; Texas, *Nealley*; Mexico, *Pringle* 1420.

Common from New England to Alaska and southward; also in

Siberia. When mature the panicles break away and are carried for long distances by the wind.

12. **A. perennans** (Walt.) Tuckerm. Am. Journ. Sci. (II.) 45: 44 (1843). THIN GRASS. *Cornucopia perennans* Walt. Fl. Carol. 73 (1788). *Trichodium decumbens* Michx. Fl. Bor. Am. 1: 42 (1803). *T. perennans* Ell. Bot. S. C. & Ga. 1: 99 (1823).

Culms weak, slender, erect from a decumbent base, 30-60 cm. high. Sheaths smooth, about the length of the internodes; ligule 3-4 mm. long; blades flat, thin, scabrid, the upper 10-15 cm. long, 2-4 mm. wide. Panicle often included at the base, diffuse, pale green, 10-18 cm. long; rays capillary in clusters of 2-4-10, the clusters 3-4 cm. distant, some rays 6 cm. long, dividing and flower-bearing from near the middle. Spikelets acuminate, scabrid on the keels, 2-2.5 mm. long; first glume the longer; floral glume thin, awnless or rarely short-awned, 1.7 mm. long, truncate-toothed, 5-nerved; palea 0 or minute. Nearly allied to *A. hyemalis*.

Damp shade; July, August, New England, Michigan, to Texas.

13. **A. Diegøensis** Vasey, Bull. Torr. Club, 13 55 (1886). *A. foliosa* Vasey, Bull. Torr. Club, 10: 63 (1883). *A. multiculmis* Vasey in numerous distributions.

Culms smooth or scabrid, stout, 60-100 cm. high, sometimes with rootstocks. Ligule acute, 4 mm. long; blades of the culm about 5 in number, erect, scabrid, flat, or involute, 10-18 cm. long, 2-4 mm. wide. Panicle lanceolate, 15-20 cm. long, light green; rays erect in clusters of 5-10, the lower clusters 3-5 cm. distant, the longest ray 5 mm. long and flower-bearing above the middle, the shorter bearing spikelets to the base. Spikelets 2.5-3 mm. long; first glume scabrid on the keel, ovate-acute, second smooth, shorter, 1-3-nerved; floral glume broad-oval when spread, obtuse, minutely scabrid, 1.8-2 mm. long, 4-nerved above, awn near the middle, minute or obsolete, hairs at the base very few and short; palea 0.

“The panicle resembles that of *A. alba*, but is narrower, shorter, and more closely flowered.” Vasey.

Washington, *Howell*; Oregon, *Bolander*; California, *Orcutt*.

14. **A. Scouleri** Trin. Mem. Acad. St. Petersb. (VI.) 6: 329 (1845). *A. repens* Scribn., not Sincl.

An erect perennial, 30-75 cm. high, from running rootstocks. Sheaths smooth, longer than the internodes; ligule obtuse, 2 mm. long; blades 7-10 cm. long, the upper much shorter, flat or involute, 3 mm. wide. Panicle exerted, lanceolate, 7-12 cm. long; longest rays 3 cm. long, bearing a few spikelets above the middle. Spikelets 2 mm. long, very pale or tinged with purple; empty glumes acute, the lower a little the longer, 2.5-3 mm. long; floral glume a little shorter, 5-nerved, truncate, sometimes bearing a slender awn; palea 0 or very minute. Not seen by me.

California, *Bolander, Lemmon.*

Alaska to California.

15. *A. æquivalvis* Trin. Fund. Agrost. 2:116 (1841). *A. canina* var. *æquivalvis* Trin. Bong. Fl. Sitch. Act. Petrop. 171 (1832).

A slender tufted pale green perennial, 20-60 cm. high, smooth or nearly smooth throughout. Sheaths shorter than the internodes; ligule 0.5-2 mm. long; blades flat, 8-15 cm. long, 2-3 mm. wide, the upper 1-2 cm. long. Panicle thin, smooth, very narrow, 5-15 cm. long, rays in distant half-whorls of 2-5 or those above solitary, 3-5 cm. long, mostly flower-bearing above the middle. Spikelets usually in pairs, reddish purple to pale green, about 1.7 mm. long, empty glumes and floral glume extending to the same height; empty glumes oblong when spread, acute, first 1-nerved, second delicately 3-nerved; floral glume broad-oval, toothed at the apex, 5-nerved, with a minute hairy callus at the base; palea three-fourths as long as its glume.

Washington, *U. S. Dept. Agricul.* 383, from *Suksdorf* and *E. C. Smith.*

Alaska to California.

16. *A. verticillata* Vill. Prosp. 16 (1785), or Fl. Delph. 16 (1785).

Culms decumbent and rooting at the lowest nodes, 30-60 cm. high, nodes sometimes 8-10 in number. Sheaths smooth, loose, nearly as long as the internodes; ligule truncate, decumbent, 2-3 mm. long; blades scabrous or very rough, especially above on the margin, flat or finally involute, 2-5-8 cm. long, 2-4 mm. wide.

Panicle dense, often lobed or interrupted, 5-10-25 cm. long, rays crowded and flower-bearing from the base. Spikelets pale green or purple, minutely pubescent, about 1-5 mm. long; empty glumes nearly equal, abruptly-pointed, when spread; floral glume broad, oval, obtuse, minutely 5-toothed, 5-nerved, awnless, but little over 1 mm. long; palea from half the length of its glume to nearly its length.

Utah, *Jones* 1014; Oregon, *Howell*; Mexico (Jalisco), *Palmer* 341, 230.

Texas to California and Mexico in moist places; also found in southern Europe and Asia.

17. *A. exarata* Trin. Unif. 205 (1824). *A. constrictus* Vasey, in numerous distributions. *A. arenaria* Scribn., not Gouan. nor Schur.

Culms erect, 30-60, sometimes 90-120 cm. high, from perennial or annual roots. Sheaths smooth or scabrid, the lower often longer than the internodes; ligule decurrent, 3-5 mm. long; blades usually erect, flat, slightly scabrous or very rough, those of the culm 6-15 cm. long, 2-5-8 mm. wide; leaves of sterile shoots shorter. Panicle exserted, erect, dense, somewhat lobed, pale green or tinged with purple, varying much in size, 6-20 cm. long, 6-30 mm. broad, often interrupted more or less below; rays in sets of 3-6, numerous, rough, mostly flower-bearing to the base. Spikelets acute, 2.1-3 mm. long, empty glumes very nearly equal, though the lower usually the longer, scabrous, strongly so on the keel; floral glume awnless, thin to rather firm and brittle, broad, concave, truncate-toothed, grooved on the back, 4-nerved above, 5-nerved below, 1.3-1.8 mm. long; palea 0-0.5 mm. long. Stamens 3.

Wisconsin to Oregon, California, and Arizona.

“It occurs in various forms in all the collections made in the State [California], ranging from Sitka to California and eastward to Colorado and New Mexico. No other grass found upon the coast presents such a variety of puzzling disguises as this. Specimens from wet grounds are 3-4 feet high, while those from dry mountain-sides are only as many inches. The panicle varies from a few inches to 1 foot in length. In mountain forms the leaves are

narrow and involute. The presence of awns is more conspicuous in the dwarf forms; the upper palea does not appear to be associated with any other character. The following are names which have been given to forms of this species: *A. grandis* Trin., spikelet slender, 10–20 cm. long, *A. asperifolia* Trin., *A. pallens* Trin., *A. Californica* Trin., *A. microphylla* Steud.” Dr. G. Thurber S. Wats. Bot. Calif. 2: 273 (1880).

18. **A. varians** Trin. Fund. Agrost. 2: 66 (1841). *A. humilis* Vasey, Bull. Torr. Club, 10: 21 (1883). *A. Rossæ* Vasey.

A slender erect tufted perennial, 10–40 cm. high. Sheaths striate, smooth, longer than the internodes; ligule 2–3 mm. long; blades scabrid above, often involute, 1–3–8 cm. long, 1 mm. wide. Panicle often dark purple, 3–7 cm. long, 5–8 mm. broad, rays 1–3 cm. long. Spikelets 2–2.5 mm. long, rough on the keels; floral glume 1.5–1.7 mm. long, awnless, broad, truncate, toothed, 4-nerved above, 5-nerved below; palea 0.

Mexico, *Pringle* 1421; Oregon, *Howell* 4631, *Cusick* 797; California, *Pringle* in 1882; Montana, *Anderson* at Great Falls.

Montana, Oregon, California, and Mexico.

19. **A. tenuis** Vasey, Bull. Torr. Club, 10: 21 (1883).

An erect slender tufted perennial, 15–25 cm. high. Ligule about 2 mm. long; blades about 2 to the culm, flat, nearly smooth, 3–6 cm. long, 1–1.5 mm. wide. Panicle pyramidal, thin, 5–8 cm. long; rays capillary in half-whorls of 3–8, or 2 or single above, the longest 3–5 cm. long, flower-bearing above the middle. Spikelets tinged with purple, 2–2.5 mm. long; empty glumes acute, first toothed on the keel, a little the longer; floral glume awnless, 1.3–1.4 mm. long, thin, oval, obtuse, 5-nerved [3-nerved in original description]; palea 0.

Oregon to southern California.

20. **A. fasciculata** (H. B. K.) R. & S. Syst. 2: 362 (1817). *Vilfa fasciculata* H. B. K. Nov. Gen. et Sp. 1: 139 (1815).

Culms ascending, 15–20 cm. high, from creeping rootstocks. Sheaths longer than the internodes; ligule truncate, 2.5 mm. long; blades flat, scabrous, 3–6 cm. long, 2–2.5 mm. wide. Panicle linear to elliptical, brown and purple, 4–7 cm. long; rays in half-

whorls of 4-6, the longest 2 cm. long, bearing 6-14 spikelets below the middle. Empty glumes equal or subequal, ovate when spread, abruptly acute, scabrid on the keel, 2 mm. long, a little more or less; floral glume broadly oval, truncate, a little shorter than the empty glumes; palea broad, 0.7 mm. long.

Mexico, *Pringle* 4251, near brooks, at an altitude of 12,000 feet; also found in Quito, S. A.

21. *A. ALBA* L. Sp. Pl. 63 (1753). RED TOP. CREEPING BENT. FIORIN.

Culms 40-100 cm. high, often decumbent at the base from perennial rootstocks making a close turf. Sheaths smooth, about as long as the internodes; ligule oblong or linear, 3-5 mm. long; blades 5-7, flat, smooth or roughened, 8-18 cm. long, 3-7 mm. wide. Panicle exserted, oblong, green, purple or brown, 12-20 cm. long, spreading when in flower and contracting afterwards; rays rough, the lower in half-whorls of 8-30, some very short, others sometimes 7 cm. long, flower-bearing along the upper two-thirds. Spikelets 2-2.5 mm. long; first glume exceeding the second but very little or none; floral glume truncate, 1.5-2 mm. long or a little less, 3-5-nerved, rarely with a short awn; palea one-third to two-thirds as long as its glume.

Vermont, *Pringle*; Massachusetts, *C. E. Faxon*, *Beal* 72, *Sturtevant*; Ontario, *Fowler*; Pennsylvania, *Scribner* for. U. S. Dept. Agricul. 411; Michigan, *Clark* 692, 693, *Cooley*, *Beal* 73, 74, 75, *Farwell*, *Prentiss* 130; Minnesota, *Bailey* B 127, *Holzinger*; Illinois, *Sandberg* 35; Colorado, *Cassidy*; Wyoming, *Buffum* C 51; Montana, *Anderson* 72; District of Columbia, *McCarthy*.

No. 4485 of *Pringle's* Plants of Mexico in 1893, labelled *A. Schiedeana* Trin., seems to belong here.

A very variable grass, often abundant on river bottoms and marshes. In Michigan it is the only grass known among farmers as "Red Top." In Pennsylvania it is known as "Herd's Grass." It is a native of Europe.

"Its different forms have given grounds for over 30 nominal species. *A. alba* has an elongated acute ligule, and the panicle contracted after flowering; the form once known as the species *A. vul-*

garis has a short truncate ligule, and the panicle after flowering more or less spreading." S. Wats. Bot. Calif. 271 (1880).

A. vulgaris thrives on dry land, *A. alba* loves marshes. *A. stolonifera* is a stoloniferous state of this species. Michigan, *Clark* 2307, 2309. For further particulars see Vol. 1, p. 148, Fig. 70.

22. *A. GIGANTEA* Gaud. Agrost. Helv. 1:189 (1811) not Roth.

Culms robust, 60–120 cm. high, more or less creeping at the base. Sheaths scabrid or smooth; ligule lacerate, 3–5 cm. long; blades flat, scabrous above and below, pungent-pointed, 12–18 cm. long, 6–11 mm. wide. Panicle linear-lanceolate or ovate-lanceolate, usually brownish or reddish green, 15–25 cm. long; rays of lower node of panicle crowded, scabrous, 15–25 in number, the longest 6–12 cm. long, branching and flower-bearing on the upper half; some of the rays less than 1 cm. long, second whorl 3–5 cm. distant, with somewhat fewer rays. Spikelets about 2 mm. long, in detail varying, and apparently much like those of *A. alba* L. Massachusetts (moist land near Boston Harbor), *C. E. Faxon* in 1878, *E. L. Sturtevant*; Sackett's Harbor, Lake Ontario, in 1833, labelled *A. alba* L. by A. Gray, in his herbarium.

In the herbarium of Harvard University are several plants of this appearance from various parts of Europe, and variously labelled, most of them as *A. alba* L., though often with another name below.

23. *A. Oregonensis* Vasey, Bull. Torr. Club, 13:55 (1886).

Culms smooth, slender, about 60 cm. high. Sheaths smooth; ligule 2 mm. long; blades of the sterile shoots filiform, those of the culm soft, 3 in number, very narrow, involute, 6–10 cm. long. Panicle thin, dark purple, lanceolate, nodding, 10–12 cm. long, rays smooth, capillary, in clusters of 3–5, the longest 4–5 cm. long, flower-bearing for about two-fifths of the extremities. Spikelets lanceolate, slightly scabrous on the keels, 2–2.5 mm. long, the three glumes reaching to the same height; first glume 1-nerved, second faintly 3-nerved below; floral glume broad-oval when spread, 5-nerved, obtuse, apex lacerate-toothed, unawned; palea 0; hairs at the base very few and short.

"The panicle approaches that of *A. hiemalis*, but is shorter,

and with much shorter and erect branches, and a firmer culm." Vasey.

Oregon, *Howell* in 1881; Washington, *Suksdorf*.

24. *A. attenuata* Vasey, *Coult. Bot. Gaz.* 11:337 (1886).

Perennial; culms smooth, slender, 60-90 cm. high. Sheaths smooth, shorter than the internodes; ligule 3-5 mm. long; blades scabrous, about 2 mm. wide, the lower ones 5-10 cm. long, those above, 3 in number, 8-18 cm. long. Panicle sometimes exserted, 25 cm. long, pyramidal or narrower, thin, 10-20 cm. long; rays capillary, rough, bearing few spikelets above the middle, the lowest ones on long pedicels 10-12 cm. long, and 10-15 in a cluster, on smaller panicles in threes, fives, or sevens. Spikelets purplish, 2.5-3 mm. long, oblong-lanceolate, scabrous on the keels, first glume a little longer than the second, both 1-nerved; floral glume broadly oval, obtuse, 5-nerved, 1.5-2.3 mm. long, a few very short hairs on the callus at the base, unawned; palea 0. Very variable as received from collectors.

Washington, *Henderson* 1611, collected near the ocean in moist fields; Oregon, *Howell*, springy places along the Applegate, also near Mt. Hood.

25. *A. altissima* (Walt.) *Tuckerm. Am. Journ. Sci.* 45:44 (1843). *Cornucopia altissimum* Walt. *Fl. Car.* 74 (1788). *Trichodium elatum* Pursh, *Fl. Am. Sept.* 1:61 (1814).

Perennial; culms erect, stout, 60-90 cm. high. Sheaths scarcely smooth, mostly longer than the internodes; the upper ligule acute, 5-9 mm. long; blades of sterile shoots narrow and mostly involute, the upper flat, scabrous, 10-15 cm. long, 3-6 mm. wide. Panicle exserted, spreading, green or purple, 15-25 cm. long, rays scabrous in rather remote clusters of 5-10 below, branching above the middle, flower-bearing in dense clusters along the upper third of the branches. Spikelets crowded, 2.5-3 mm. long; empty glumes acuminate, scabrous on the keels, first a little the longer; floral glume rather firm, broad, awnless, a little shorter than the second empty glume; palea 0.

New Jersey, *Scribner* for U. S. Dept. Agricul. 390; Mississippi, *Tracy*; California, *Bolander* 6103.

In swamps, Massachusetts to Texas; also in California.

26. **A. Hallii** Vasey, Contrib. U. S. Nat. Herb. 3:74 (1892).

Perennial; culms slender, erect, 60-80 cm. high. Sheaths scabrid, a little shorter than the internodes; upper ligule acute, 5-7 mm. long, the lower ones shorter; blades flat, scabrous above, 12-20 cm. long, 3-5 mm. wide. Panicle exserted, whitish, green or brown, linear, thin, 10-18 cm. long, the rays capillary in half-whorls of 5-20, some of the longest 5-7 cm. long, branching and flower-bearing above the middle. Spikelets lanceolate, 3-4 mm. long; empty glumes thin, the keels toothed, first glume scarcely longer than the second floral glume, about 2.4 mm. long, the hairs at the base about 1.5 mm. long, awnless, obtuse, toothed, minutely scabrid, 5-nerved, the central one not always extending to the tip; palea 0.

Southern Oregon, *Henderson* 1608; California, *Pringle* in 1882.

67. (135). **GASTRIDIVM** Beauv. Agrost. 21, t. 6. f. 6 (1812).

Spikelets 1-flowered in a close tapering spikelike panicle: rachilla articulate above the persistent lower glumes and produced beyond the perfect flower as a short bristle. Empty glumes very acute, the base shining, enlarged, ventricose, concave below, keeled above, first glume longer than the second; floret about one-fourth as long as the second glume, having a tuft of very minute hairs at the base, also hairy on the back, apex truncate-dentate, usually with a slender twisted awn on the back below the apex exceeding the spikelet; palea as long as its glume. Stamens 3. Styles short, distinct. Grain subglobose included, but not adherent.

Tufted annuals with flat leaf-blades. Spike exserted.

By some authors this genus has been included with *Agrostis*. The older authors included it in *Milium* on account of the hardness in the glume.

There are 2 species from the Mediterranean region, one of which is also found in tropical Africa and in South America.

1. **G. AUSTRALE** Beauv. l. c. NIT-GRASS. *G. lendigerum* Gaud. Fl. Helv. 1:176 (1828). *G. laxum* Boiss. & Reut. Pugill. Pl. Nov. 126. *G. vestitum* Spreng. Neue Entdeck. 2:36 (1793).

Culms erect, branching below, 15-60 cm. high. Sheaths shorter than the internodes; ligule 4-5 mm. long; blades flat or involute, pale green, 5-12 cm. long. Spikelike panicle, 5-15 cm. long, nearly 1 cm. broad, shining with a lustre like satin. Spikelets lanceolate, slightly scabrous on the keels, 5-6 mm. long, first glume with a shiny enlargement at the base.

California near the sea coast, also in Chili, and in the vicinity of the Mediterranean Sea.

The grass appears to be unpalatable to stock.

68. (140). **CALAMAGROSTIS** Adans. Fam. Pl. 2: 31 (1763). *Deyeuxia* Clar. Beauv. Agrost. 43, t. 9, figs. 9, 10 (1812). *Lachnagrostis* Trin. Fund. Agrost. 128 (1812). *Relcheta* Steud. Syn. Pl. Gram. 101 (1854).



FIG. 58.—*Gastridium australe*. A, spikelet; a, floret. (Scribner.)

Spikelets 1-flowered, pedicellate or rarely sessile, the panicle either loose and spreading or narrow and spikelike, the rachilla articulate above the outer glumes, usually bearing a tuft of hairs round the floral glume and produced beyond it in a small ciliate (rarely glabrous) bristle, very rarely bearing an empty glume or imperfect flower, sometimes very minute, or deficient. The two outer glumes persistent, keeled, unawned; floral glume shorter and very thin, about as long (rarely longer and membranous), broad, 5-nerved below the awn, with a fine dorsal awn, usually bent and twisted, rarely short and straight or sometimes absent; palea thin, more than half as long as its glume, faintly or prominently 2-nerved. Styles distinct, short. Grain enclosed and sometimes partially adhering to floral glume and palea.

There are about 120 species widely spread over the warmer and temperate regions of both the Eastern and the Western Hemispheres, being particularly numerous in the Andes of South America.

Bentham says: "They are frequently regarded as forming a section of *Agrostis*, from which they differ chiefly in the more developed palea and the usual presence of the bristle continuing the rachis of the spikelet, whilst others again refer *Deyeuxia* to the supposed distinct tribe *Arundinææ*, on account of the hairs surrounding the flowering glume. But these hairs are present in almost all species of *Agrostis*."

The northern species differ from *Agrostis* in the prolongation of the rachilla into a bristle or stipes, usually, but not always, hairy, in the larger spikelets, with the palea nearly as long as the glume, and the usually hairy rachilla.

Bentham still retains the genus *Calamagrostis* Adans. for some 5 species, none of which are found in North America.

Hackel places *Deyeuxia* as a section of *Calamagrostis*.

- A. Leaf-blades involute, setaceous or rigid. (a)
- a. Panicle thin, 4-7 cm. long, purple, spikelets 3.5 mm. long. 1
 - a. Panicle thin, 6-12 cm. long, whitish, spikelets 6-7 mm. long. 2
 - a. Panicle thin, 10-15 cm. long, spikelets 4 mm. long. 3
 - a. Panicle thin, 10-14 cm. long, spikelets 5.5 mm. long. 4
 - a. Panicle rather close, 8-10 cm. long, fine pubescence at the base of the blade, light green, spikelets 3-4 mm. long. 5
 - a. Panicle dense, 7-10 cm. long, fine wool at the base of the blades; spikelets 4 mm. long. 6
 - a. Panicle dense, blades scabrous, 5-8 cm. long; spikelets 4-4.7 mm. long. 7
- B. Leaf-blades flat or sometimes involute. (b)
- b. Base of the blades softly woolly; panicle open, thin, whitish. 8
 - b. No soft wool at the base of the blade; a ring of short hairs in 11. (c)

- c. Spikelets 2 mm. long, panicle purplish, open, 10-12 cm. long. 9
- c. Spikelets 3-4 mm. long; panicle lanceolate, 15 cm. long. 10
- c. Spikelets 4-6 mm. long, glumes acuminate, panicle open, purplish. 11
- c. Spikelets 4.5 mm. long, panicle spikelike, 6-8 cm. long. 12
- c. Spikelets 4-5 mm. long, acute, panicle spikelike, 5-7 cm. long. 13
- c. Spikelets 5 mm. long, panicle open, silvery green, 6-12 cm. long. 14
- c. Spikelets 5-6 mm. long, panicle thin, 8-12 cm. long. 15
- c. Spikelets 5-6 mm. long, panicle rather loose, 12-25 cm. long. 16
- c. Spikelets 5-7 mm. long, panicle rather dense, 8-15 cm. long. 17
- c. Spikelets 6-7 mm. long, acuminate, panicle dense, 6-10 mm. long. 18, 19
- c. Spikelets 2.3-4 mm. long. (d)
- d. Unawned. 20
- d. Awn starting at the apex of the notch of its glume, panicle open, whitish green, 10-15 cm. long. 21
- d. Awn starting below the notch of its glume. (e)
- e. Panicle rather dense, purple, spikelets 4 mm. long. 22
- e. Panicle interrupted, 12-15 cm. long, spikelets 4 mm. long. 23
- e. Panicle open, 10-20 cm. long, spikelets gaping, 2.5-3.5 mm. long, awn very slender, straight. 24
- e. Panicle lanceolate, 15 cm. long, spikelets 2-3 mm. long. 10
- e. Panicle loose, 4-20 cm. long, spikelets 4 mm. long. 25

e. Panicle lobed, rather dense, 10–16 cm. long,
 spikelets 3.5–4 mm. long, awn straight. . . . 26

1. **C. deschampsioides** Trin. Ic. Gram. t. 3:354 (1836). *Deyeuxia deschampsioides* Vasey, Cat. Gr. U. S. 50 (1885).

An erect slender densely tufted perennial, 15–35 cm. high. Sheaths close, half as long as the internodes; ligule acute, decurrent, 3 mm. long; blades involute, setaceous, those below 6–10 cm. long, those of the culm 2 in number, 2–4 cm. long. Panicle thin, erect, oblong or narrowly pyramidal, 4–7 cm. long, rays in sets of 1–3, bearing 1–3 spikelets near the tips. Spikelets blackish purple, elliptical, acute, about 3.5 mm. long, the bent awn projecting 1–2 mm. Empty glumes equal, ovate-lanceolate, obscurely nerved; floral glume a little shorter, 4-toothed, the awn attached near the base, the hairs short, in two bunches, the hairy rudiment 1.5–2 mm. long, aside from its hairs; palea a little shorter than its glume.

California, *Brewer* from the summit of Carson Pass, at an altitude of 8000 feet.

In several parts of California at high altitudes.

2. **C. Howellii** Vasey, Coult. Bot. Gaz. 6:271 (1881). *Deyeuxia Howellii* Vasey, Agric. Grasses U. S. 70, t. 61 (1884).

A slender erect smooth densely tufted perennial, 30–50 cm. high. Ligule 3 mm. long; blades involute-setaceous, the lower as long as the culms, the others about 3 in number, 10–20 cm. long, the upper often exceeding the panicle. Panicle scarcely exerted, open, thin, pyramidal, 6–12 cm. long; rays slender, mostly in fives, flower-bearing above the middle. Spikelets whitish green, tinged with purple, lanceolate, 6–7 mm. long, bearing a twisted and bent awn projecting 6–10 mm. Empty glumes subequal, membranous, elliptical-lanceolate, first 1-nerved, second a little shorter, 3-nerved; floral glume about 5 mm. long, terminating in 2–4 mucronate teeth, the awn inserted one-third the way from the base to the apex; palea slender, but little shorter than its glume, bidentate, basal hairs over half the length of the floret, hairy rudiment about 1.5 mm. long.

Oregon, *Howell, Scribner, Henderson.*

Washington and Oregon.

3. **C. Orizabæ** (Rupr.) Steud. Syn. Pl. Gram. 193 (1855).
Deyouisia Orizabæ Rupr. Bull. Acad. Brux. 9, part 2: 233 (1842).

A slender erect tufted perennial, about 90 cm. high. Sterile shoots numerous, the blades conduplicate, 40–60 cm. long, 0.5 mm. diam., those of the culm 2 in number; sheaths smooth; ligule very short; blades 5–10 cm. long. Panicle slender, thin, drooping, 10–15 cm. long, rays mostly in threes, rather distant, the longest 6–8 cm. long, sparingly branched and flower-bearing on the outer half. Spikelets linear, 4 mm. long; empty glumes and floral glume equal, first glume 1-nerved, second 3-nerved; floral glume oval when spread, obtuse, tuft of hairs very short, awn one-third the way below the apex and projecting about 1 mm., rudiment 1.5 mm. long; palea linear, hyaline, 3 mm. long.

Mexico, *Pringle* 4243; found 12000–14000 feet above the sea-level.

4. **C. erecta**. *C. plumosa* (Fourn.) Scribn. ined. *Achæta plumosa* Fourn. Mex. Pl. Enum. Gram. 109 (1886).

An erect tufted perennial, 60–80 cm. high. Sterile shoots numerous, the blades involute, filiform, 30–40 cm. long, 0.3–0.6 mm. diam., those of the culm 3 in number, the sheath of the middle one smooth, two-thirds as long as the internode; ligule, 3 mm. long; blades 10–15 cm. long, the upper blade shorter. Panicle purple, slender, thin, slightly drooping, 10–14 cm. long, rays mostly in pairs, the longest 3–5 cm. long, bearing spikelets on the outer two-thirds. Spikelets linear-lanceolate, 5.5 mm. long; empty glumes equal, first 1-nerved, second 3-nerved; floral glume pubescent when seen under a lens, 4.5–4.7 mm. long, truncate-toothed; awn 0.5–1 mm. long, attached but little below the apex of its glume; rudiment puberulent, 2.1 mm. long; palea hyaline, 3.5 mm. long.

The specific name *plumosa* under *Calamagrostis* had been used by Spreng, hence the new name here given.

Mexico, *Pringle* 4726, found under pines at an altitude of 10,400 feet.

5. **C. Suksdorfii** Scribn. Bull. Torr. Club, 15: 9 (1888). *Dey-*

euxia Suksdorfii Scribn. Vasey, Desc. Cat. Gr. U. S. 51 (1885).

A slender tufted perennial, 60–90 cm. high. Sheaths shorter than the internodes; ligule 3–5 mm. long, often more or less woolly pubescent on the back near the base of blade; blades of sterile shoots 15–30 cm. long, 3–5 mm. broad, tapering into very long and slender points, scabrous below and strigose pubescent above; those of the culm usually three. Panicle pale straw-color, strict, more or less interrupted, 8–10 cm. long, 1.5–2 cm. wide; rays in crowded clusters, 2–3 cm. distant, the longest 4 cm. long, all densely flowered. Spikelets 3–4 mm. long, empty glumes subequal, lanceolate, acute, first 1-nerved, second 3-nerved at the base; floral glume oblong, truncate-toothed, 2.7 mm. long, the stout twisted awn starting below the middle and extending 1–2 mm. above its glume, hairs less than 1 mm. long, in two bunches near the margins of the base of the glume; palea as long as its glume, rudiment 1 mm. long, with hairs making it appear still longer.

In the Montana plants, the woolly pubescence at the base of the blade is wanting.

Montana (Great Falls). *Anderson* 54: British Columbia, *Macoun* in 1885; Oregon, *Cusick* 1317.

Montana, British America, Washington, Oregon, and California.

6. *C. rubescens* Buckl. Proc. Phila. Acad. 92 (1863). *Deyeuxia rubescens* Vasey, Cat. Gr. U. S. 51 (1885).

A slender erect tufted perennial, more or less purple throughout, 60–90 cm. high, from strong rootstocks. Sheaths half as long as the internodes; ligule acute, lacerate, decurrent, 3–5 mm. long; blades of sterile shoots numerous, involute, setaceous, glaucous, scabrous, 10–20 cm. long, 3 mm. wide, those of the culm 3–4 in number, 10–15 cm. long, the upper one 4 cm. long, short woolly hairs usually appearing on the lower side at the base of the blade. Panicle much exserted, strict, dense, interrupted, 7–10 cm. long, 1.5 cm. broad, the short rays densely flowered to the base. Spikelets rough, elliptical, acute, nearly 4 mm. long; empty glumes equal or slightly unequal, ovate-lanceolate, first 1-nerved, second 3-nerved; floral glume a little shorter, narrowly elliptical, acute, bifid.

the stiff twisted and bent awn starting a little below the middle and extending to the apex of its glume or a little beyond, hairs in 2 tufts, one on either side, less than half as long as the glume; rudiment 1 mm. long, with a few short hairs reaching beyond the apex.

California (Mendocino), *Pringle* in 1882.

Oregon to California.

7. **C. Montanensis** (Scribn.). *Deyeuxia Montanensis* Scribn. Soc. Pro. Agricul. Sci. 6 (1883).

A rigid glaucous perennial, 20–40 cm. high, with slender rootstocks. Sheaths 3, nearly smooth, the upper extending nearly half way to the top of the plant, or almost to the panicle; ligule firm, decurrent, 3 mm. long; blades involute, rigid, pungent-pointed, 6–12 cm. long, 2–2.5 mm. wide, scabrous above and below. Panicle linear, dense or slightly interrupted, 5–8 cm. long; rays in half-whorls of 3–7, the longest 2.5 cm. long, flower-bearing on the outer three-fifths. Spikelets pedicellate, linear-lanceolate, 4–4.7 mm. long; empty glumes equal or subequal, scabrous, first 1-nerved, second 3-nerved, the lateral nerves obscure, rudiment 1 mm. long, the hairs extending to the top of the palea; floral glume scabrid, oval, truncate, 4–5-toothed, about 3 mm. long, awn from near the middle reaching to its apex; palea oval, erose or toothed, 2.5 mm. long. Anthers linear, 2.2 mm. long.

British America, *E. Bourgeau* in 1858.

Montana, *Canby & Scribner* 363 in 1883.

8. **C. Porteri** A. Gray, Proc. Amer. Acad. 6: 79 (1862). *Deyeuxia Porteri* Vasey, Cat. Gr. U. S. 51 (1885):

Perennial, from creeping rootstocks. Culms slender, erect, 60–120 cm. high. Sheaths close, half as long as the internodes; ligule 2–3 mm. long; blades flat, scabrous, with a woolly-bearded ring at the base on the outside, 12–20 cm. long, 5–7 mm. wide, apex attenuate, base narrow. Panicle exserted, open or thin, 7–14 cm. long, 1.5 cm. wide; rays few to many, the clusters 2–3 cm. distant, 1–5 cm. long. Spikelets rough, pale green, elliptical, acute, 3.5–4 mm. long; empty glumes nearly equal, appearing lanceolate, owing to the upper part having involute margins, first 1-nerved, second obscurely 3-nerved; floral glume 2.5 mm. long, ovate, truncate-

toothed, the stout twisted awn starting below the middle and extending 0.5 mm. above the floret. hairs few and weak, half as long as the floral glume, the hairy rudiment 0.5 mm. long.

Pennsylvania (dry woods in Huntington County), *Porter*; New York, *Dudley*.

9. **C. Macouniana** Vasey, Contrib. U. S. Nat. Herb. 3: 81 (1892). *Deyeuxia Macouniana* Vasey, Coult. Bot. Gaz. 10: 297 (1885).

Culms from creeping rootstocks, slender, erect, branching sparingly along the middle, 60–90 cm. high, internodes about 5 in number, besides the very short ones below. Sheaths nearly smooth, longer than the internodes; ligule lacerate, thin, 2 mm. long; blades scabrous, flat or involute, apex attenuate, the blade 15–25 cm. long, 2–3 mm. wide. Panicle open, 10–12 cm. long, 2–4 cm. broad; rays mostly in fives, erect, slender, clusters 1–1.5 cm. distant. Spikelets purple below, mostly on the upper part of the branches, oval-lanceolate, about 2 mm. long; first glume ovate-lanceolate, 1-nerved, second a little shorter, 3-nerved, otherwise like the first; floral glume ovate, oblong, 2-lobed, 1.5 mm. long, awn near the middle of its glume, straight, reaching a little beyond its apex; palea oval, 1 mm. long, apex truncate-toothed, hairs as long as the floret, hairy rudiment one-third mm. long.

British America, *Macoun* for U. S. Dept. Agric. 44.

Borders of marshes.

10. **C. Scribneri**. *Deyeuxia dubia* Scribn. Coult. Bot. Gaz. 11: 174 (1886). *Calamagrostis dubia* Vasey, Contrib. U. S. Nat. Herb. 3: (1892).

Perennial; culms rather slender, erect, 60–90 cm. high. Sheaths scabrid, much shorter than the internodes; ligule 3 mm. long, decurrent; blades scabrous, about 20 cm. long, 4 mm. wide. Panicle lanceolate, about 15 cm. long; rays erect, 3–6, the longest 4–6 cm. long, flower-bearing on the outer three-fifths. Spikelets sessile or pedicellate, linear-lanceolate, 3–4 mm. long; empty glumes equal, scabrid, second 3-nerved, bristle 0.5 mm. long, hairs twice as long; floral glume oval, truncate, 4-toothed, 2–3 mm. long, awn rather short, attached below the middle and extending

above its glume; palea very nearly as long as its glume, erose or 2-toothed.

Professor Scribner says: "It differs from both in the less spreading and more densely flowering branches of the panicle, the stouter branches at each joint flower-bearing to the base. From *D. Canadensis* it is at once distinguished by the longer and stouter awn, shorter hairs surrounding the flowering glume, and firmer and longer palea. The spikelets are smaller than in *D. Langsdorffii*, the empty glumes are much smoother and less rigid or firm in texture, the hairs are less copious as well as shorter, and the palea is proportionally longer." The specific name *dubia* was used with *Calamagrostis* by Bunge, Lehm. Rel. 348 (1847), hence the change above to *Scribneri*, for the discoverer.

Montana (Yellowstone Park), *Tweedy* 365.

Montana, Washington, Oregon.

11. *C. Langsdorffii* (Link) Trin. Unifl. 225, t. 4, fig. 10 (1824). *Arundo Langsdorffii* Link, Hort. Berol. 1: 74 (1821). *Deyeuxia Langsdorffii* Kunth, Rev. Gram. 1: 77 (1829).

Much the same as *C. Canadensis*, excepting the ligule may be 8-12 mm. long, the spikelets 4-6 mm. long, empty glumes attenuate-acuminate, first 1-3-nerved, second a little shorter, 3-nerved; floral glume 3.5-4 mm. long, oval, truncate-toothed, awn straight, stouter, attached a little below the middle, hairs longer than the floret, or of the same height or a little shorter; rudiment 1-1.7 mm. long, with hairs extending to the tip of the floret.

New Hampshire, *Pringle*; Minnesota, Geol. Surv., *B* 519; Montana, *Williams*.

Canada, New Hampshire, to the Rocky Mountains and Alaska.

12. *C. Vaseyi*. *Arundo purpurascens* Schult. Mant. 3: 603 (1824). *Deyeuxia purpurascens* Kunth, Rev. Gram. 1: 7 (1829), not *Calamagrostis purpurascens* R. Br. Richards. App. Frank, which is *D. sylvatica* Kunth.

A tufted, rather slender perennial, 60-75 cm. high. Sheaths about 5 in number, mostly half to two-thirds as long as the internodes; ligule lacerate, 3-4 mm. long; blades flat, scabrous, long-pointed, 15-20 cm. long, 4-8 mm. wide, with a ring of short hairs at

the base. Panicle spikelike, purple, 6–8 cm. long, 1 cm. broad, more or less interrupted. Spikelets lanceolate, about 4.5 mm. long; first glume a little the longer, second elliptical, acute, 3-nerved; floral glume oblong when spread, 3 mm. long, toothed, the awn rather stout, straight, 3–4 mm. long, starting 1 mm. from the base of its glume; palea nearly as long as its glume, hairs of the callus few, 1 mm. long, rudiment nearly 2 mm. long, including the hairs.

Washington (Cascade Mountains), *Vasey*.

Alaska to Washington.

13. **C. kœlerioides** Vasey, Coult. Bot. Gaz. 16:147 (1891).

Perennial; culms rather stout, smooth, 90 cm. high. Ligule 3–4 mm. long; blades flat or involute, 10–12 cm. long, the upper 1–4 cm. long, 4–5 mm. wide, apex punctate. Panicle exserted, spike-like, more or less interrupted, 5–7 cm. long, 6–10 mm. broad. Spikelets linear-lanceolate, scabrid, 4–5 cm. long, empty glumes subequal, the lower the shorter, linear, acute, first 1-nerved, second 3-nerved; floral glume 3.5–4.5 mm. long, scabrous, ovate when spread, with a few hairs one-fourth its length; awn bent, stout, starting one-third the way from the base of its glume, which it equals or slightly exceeds; rudiment 1.3 mm. long, bearing a few short stiff hairs at the apex.

California (San Diego), *Orcutt* for U. S. Nat. Herb.

Var. **densa** (Vasey). *Calamagrostis densa* Vasey, Coult. Bot. Gaz. 16:147 (1891).

A little taller, the upper blades 6–8 cm. long, ligule a little longer; panicle enclosed at the base when young, some of the rays 3 cm. long.

Found with the species.

14. **C. Pringlei** (Scribn.). *Deyeuxia Pringlei* Scribn. ined.

Perennial; culms erect, stout, 40–70 cm. high. Sheaths mostly longer than the internodes; ligule 1–2 mm. long, decurrent; blades about 5 to the culm, flat, few, leaves of sterile shoots slightly scabrid, 15–20 cm. long, 3 mm. wide. Panicle exserted, silvery green, tinged with purple, rather thin, 6–12 cm. long, pyramidal or narrow; rays capillary, 6–8 in half-whorls, 2–3 cm. distant, the longest 2–5 cm. long, erect, flower-bearing on the upper half.

Spikelets with empty glumes subequal, about 5 mm. long, lanceolate, acute when spread, appearing keeled, first 1-nerved, second obscurely 3-nerved, rudiment 1.5 mm. long with a pencil-tuft still longer; hairs in 2 tufts, 1 mm. long; floral glume scabrid, oval, acute, 4 mm. long, the rather slender twisted and bent awn attached just below the middle and exceeding the empty glumes about 2 mm; palea lanceolate, nearly as long as its glume.

Mexico, *Pringle* 1422 in 1887, 9000 feet altitude.

15. *C. lactea* (Suksdorf). *Deyeuxia lactea* Suksdorff in herb. (1890).

Perennial; culms stout, scabrous, 90 cm. high. Sterile shoots few. Leaves scabrous; sheaths of the culm half or two-thirds as long as the internodes; ligule 2-3 mm. long, decurrent; blades 20-30 cm. long, 5-7 mm. wide. Panicle slightly exerted, silvery green, rather thin, pyramidal, 8-12 cm. long, rays in half-whorls of 4-6, the longest 3-5 cm. long, flower-bearing on the upper half. Spikelets with empty glumes subequal, 5-6 mm. long, lanceolate when spread, first 1-nerved, second 3-nerved; hairs surrounding the base of the floret numerous, 3.5 mm. long, rudiment 0.5 mm. long, pencil-tufted; floral glume oval, acute, 4.3 mm. long, the slender awn attached 1 mm. above the base and extending to the tips of the empty glumes; palea 2.5-3 mm. long. Anthers 2 mm. long. Nearly allied to *D. Pringlei* Scribner.

Washington, *Suksdorf* 1022; banks of the North Fork of Nooksack River, near Mount Baker.

16. *C. Aleutica* Bong. Veg. Ins. Sitcha 171 (1831). *Deyeuxia Aleutica* Munro. Hook. Trans. Linn. Soc. 23: 345 (1862).

Perennial; culms stout, erect, 60-150 cm. high. Sheaths loose, shorter than the long internodes; ligule ovate or truncate, 4-7 mm. long; blades of the culm rather firm, scabrous, flat or involute, 20-40 cm. long, those of sterile shoots longer, 5-8 mm. wide. Panicle much or little exerted on a scabrous peduncle, rather loose, slightly interrupted, nearly acute, erect, 12-25 cm. long, 2-3 cm. broad; rays in crowded clusters, 4-8 cm. long, the branches bearing spikelets for nearly their whole length. Spikelets pale or brownish purple, elliptical-lanceolate, 5-6 mm. long, usually longer than their

pedicels; empty glumes nearly equal, elliptical-lanceolate, roughish, first 1-nerved, second 3-nerved; floral glume nearly smooth, oval-lanceolate, 4-toothed or lacerate, 5 mm. long, awn attached near the middle and extending to the tip of its glume, hairs about half the length of the glume, rudiment minute; palea nearly as long as its glume, truncate or obtuse, ciliate at the apex.

A very robust species forming dense tufts on the hillsides. According to Dr. Thurber, the lower leaves break off near the sheaths, leaving these erect and rigid. The length of the 2 empty glumes is quite variable.

Alaska, *U. S. Dept. Agricul.* 424; Unalaska, *Harrington* in 1871-2, *E. Hall* 623; Oregon, *Howell*, *E. Hall* 623; California, *Bolander* 4.

Alaska to California.

17. *C. sylvatica* var. *Americana* Vasey, *Contrib. U. S. Nat. Herb.* 3: 83 (1892).

Perennial; culms erect, 20-60 cm. high. Sheaths rather loose, as long as the internodes, or in tall plants, two-thirds as long; ligule truncate, 1-2 mm. long; blades scabrid, often with many dead sheaths below, those of sterile shoots reaching nearly to the panicle or above it, those of the culm rigid, 7-18 cm. long, 3-4 mm. wide, flat or involute, point attenuate. Panicle enclosed at the base or exserted, strict, spikelike, dense, sometimes slightly interrupted below, 8-15 cm. long, 1.5-2 cm. broad, the color pale, light to dark purple; rays appressed, scabrid, 1-2 cm. long, in clusters of 4-8. Spikelets very variable even in the same panicle or on different panicles of the same plant, 5-7 mm. long, the twisted and bent awn extending 1-3 mm. above the glumes; empty glumes ovate-lanceolate, mostly appearing very acute when the margins of the upper portion are involute, scabrous on the keel, first 1-nerved, second 3-nerved and a little shorter; floral glume scabrous, ovate, grooved on the back, 4-toothed, 4.5-5 mm. long, awn attached near the base, hairs mostly in two clusters at the sides, one-third the length of the floret; palea a little shorter, the rudiment about 2 mm. long, with hairs reaching to the tip of the palea.

“The plant seems to be much more leafy at the coast than

upon the mountains. The color of the panicle is very variable, running from greenish straw-color, through various degrees of purple to deep purple all over." Dr. Thurber in Bot. Calif., Vol. 2, p. 282.

Montana, *Canby* 362; Washington, *Sandberg* 825, 1025.

New England to the Rocky Mountains, Oregon, California.

Var. **longifolia** Vasey, Contrib. U. S. Nat. Herb. 3: 83 (1892).

Blades of sterile shoots as long as the culm, involute-setaceous; empty glumes 8 mm. long, acuminate; hairs more prominent, the awn projecting 10 mm. above the floral glume.

California, *Bolander* 6470.

18. **C. cinnoides** (Muhl.) Scribn. Mem. Torr. Bot. Club, 5: 41 (1894). *Arundo cinnoides* Muhl. Gram. 187 (1817). *A. coarctata* Torr. Fl. U. S. 1: 94 (1824). *Calamagrostis cinnoides* Spreng. Syst. 1: 252 (1824). *C. Nuttalliana* Steud. Nom. Ed. 2. 1: 251 (1841). Pl. Gram. 190 (1855). *C. Canadensis* Nutt. Gen. 1: 46 (1818), not Beauv.

Perennial; culms stout, smooth or scabrous below, 90–150 cm. high. Ligule 2–3 mm. long; blades flat, scabrous, 2–4 cm. long, 4–7 mm. wide, apex not attenuate. Panicle exserted, 6–10 cm. long, 1–2 cm. broad, and then very dense or slightly interrupted below, or larger, 10–20 cm. long, 2–3 cm. broad, and then interrupted, bearing spikelike interrupted branches, 3–6 cm. long. Spikelets lanceolate, scabrous, 6–7 mm. long; empty glumes spreading, nearly equal, lanceolate, with awl-shaped tips. first compressed-keeled, 1-nerved, second compressed-keeled above, 3-nerved; floral glume 4–5 mm. long, scabrous, keeled, acute, with a few hairs half its length on the back, on the margins numerous, longer and rather stout; awn straight, stout, starting one-fourth the way from the tip of its glume, which it slightly exceeds; rudiment 1–1.5 mm. long, bearing copious stiff hairs at the apex.

Rhode Island, *Tweedy*; Massachusetts, *Sturtevant*; Delaware, *Canby*; District of Columbia, *McCarthy*.

Moist land, New England to Pennsylvania, North Carolina and southward. Flowering in August.

19. **C. Tweedyi** Scribn. Vasey, Contrib. U. S. Nat. Herb. 3: 83

(1892). *Deyeuria Tweedyi* Scribn. Bull. Torr. Club, 10: 64 (1883).

A robust perennial, 75–100 cm. high. Sheaths smooth, shorter than the internodes; ligule decurrent, 3–5 mm. long; blades flat, firm, rather abruptly pointed, 10–20 cm. long, 6–10 mm. wide. Panicle spikelike, more or less interrupted, about 10 cm. long, the longest rays 3 cm. long, flower-bearing on the upper half. Spikelets 6–7 mm. long, empty glumes subequal, elliptical-lanceolate, first 1-nerved, second 3-nerved; floral glume slightly shorter, toothed, and bearing 2 setæ, the awn stout, twisted, attached about 1.5 mm. above the base, extending 4–6 mm. above the glumes; palea a little shorter than its glume, hairs of callus few, less than 1 mm. long, the bristle 2 mm. long, with hairs projecting 1 mm.

Washington (Cascade Mountains), *Tweedy, Vasey*.

20. *C. poæformis* (Fourn.). *Cinnastrum poæforme* Fourn. Mex. Pl. Enum. Gram. 90 (1886).

A light green perennial, 90–120 cm. high. Sheaths scabrid, about the length of the internodes; ligule many-nerved, lacerate, 8–10 mm. long; blades of the culm 4 in number, flat, nearly smooth, taper-pointed, 20–30 cm. long, 7–10 mm. wide. Panicle green, thin, flexuose and nodding, 20–30 cm. long; rays slender, in fours and fives, the sets 5–6 cm. distant, longest ray 8–10 cm. long, flower-bearing on the upper half. Spikelets green, ovate-lanceolate, 2.5 mm. long; empty glumes scabrous, 3-nerved, first ovate, sub-acute when spread, second elliptical-lanceolate, a little the longer; floral glume unawned, destitute of hairs at the base, ovate, as long as the first glume, the rudiment 1 mm. long, another bristle near it; palea nearly as long as its glume. Stamens 2. Ovary ovate-lanceolate, stigmas narrow. In color, leaves, and panicle it much resembles *Cinna pendula*.

Mexico, *Pringle* 4184, in cool moist soil.

21. *C. blanda*. *C. pallida* Vasey & Scribn., Contrib. U. S. Nat. Herb. 3: 79 (1892), not *C. Muell.* (1868). Walp. Ann. 6: 986 (1868).

An erect perennial, 120–150 cm. high. Culms smooth, rather slender, composed of 5–7 lengthened internodes. Sheaths close,

two-thirds as long as the internodes; ligule lacerate, 4 mm. long; blades flat, scabrous, 30–40 cm. long, 5–8 mm. wide. Panicle exerted, pale, whitish green, open, pyramidal, 10–15 cm. long; rays mostly in fives, slender, scabrous, flower-bearing above the middle. Spikelets spreading, open, the glumes thin, scabrid, lanceolate-acuminate, first 3.5 mm. long, 1-nerved, second 3 mm. long, 3-nerved below; floral glume 2.3 mm. long, bifid, toothed, the twisted awn attached at the notch and projecting above its glume 1 mm., hairs somewhat in two sets, as long as the floret; palea 1.7 mm. long, rudiment less than 0.5 mm. long, with hairs extending in all 2 mm.

Washington, *Suksdorf* in 1883 in Herb. Scribner.

22. *C. breviseta* (A. Gray), Scribn. Mem. Torr. Club, 41 (1894).
C. sylvatica var. *breviseta* A. Gray, Man. Ed. 1: 582 (1848). *C. Pickeringii* A. Gray, Man. Ed. 2: 547 (1856).

Perennial, with creeping rootstocks. Culms slender, rather stout, 30–50 cm. high, each bearing about 3 leaves. Sheaths longer than the internodes; ligule 3–5 mm. long, decurrent; blades flat, slightly rough, those of the culm 8–14 cm. long, 4–5 mm. wide. Panicle slightly exerted or the base included, purplish, pyramidal, interrupted, 8–12 cm. long; rays rather stout, appressed or diverging. Spikelets narrowly elliptical, acute, rough, hardly 4 mm. long; empty glumes rather firm, nearly equal, oblong, pointed when flattened, first 1-nerved, second 3-nerved; floral glume rough, ovate, pointed when spread, nerves obscure, 2.5–3.5 mm. long, the stout straight or bent awn starting below the middle and exceeding its glume a very little, hairs very few and short, rudiment, including its hairs, but little over 1 mm. long.

New Hampshire (Mt. Washington), *E. Faxon*.

New England and Canada.

23. *C. Cusickii* Vasey, Contrib. U. S. Nat. Herb. 3: 81 (1892).
Deyeuxia Cusickii Vasey, Coult. Bot. Gaz. 10: 224 (1885).

Culms from creeping rootstocks, erect, smooth, 90–120 cm. high, internodes about 4 in number, besides the short ones near the base. Sheaths nearly smooth, about half as long as the internodes; ligule 4 mm. long, decurrent; blades of sterile shoots numerous, flat, flexible, scabrid, 30 cm. or more long, 4 mm. wide, those of the

culm 20-30 cm. long, 5 mm. wide. Panicle erect, interrupted, 12-15 cm. long, 2-3 cm. broad; rays numerous in dense clusters, 2-3 cm. distant. Spikelets crowded from the apex to near the base of the branches, narrow, smooth, acute, about 4 mm. long; empty glumes subequal, oval-lanceolate, 4 mm. long, first 1-nerved, second a little the shorter, 3-nerved; hairs thin, about half as long as the floret, the hairy rudiment about 0.3 mm. long; floral glume thin, bifid, as wide as the empty glumes, about 3.5 mm. long, awn straight, inserted a little below the middle and but little longer than its glume; palea hyaline.

U. S. Dept. Agricul. 1159 from *Cusick*, collected on Eagle Creek. Eastern Oregon on mountains at the altitude of 5000 feet.

Washington and Oregon.

24. **C. Canadensis** (Michx.) Beauv. *Agrost.* 157 (1812). BLUE-JOINT. *Arundo Canadensis* Michx. *Fl. Bor. Am.* 1:73 (1803). *Arundo agrostoides* Pursh. *Fl. Am.* 86 (1814). *C. Mexicana* Nutt. *Gen.* 1:46 (1818).

A perennial with creeping rootstocks. Culms erect, smooth, usually bearing sterile branches near the middle or above, 90-150 cm. high. Sheaths close, but little shorter than the internodes; ligule lacerate, 4 mm. long; blades glaucous, flat, scabrid, 15-30 cm. long, 6-8 mm. wide, tapering toward the base, apex attenuate. Panicle exserted, loose, open, oblong, mostly tinged with purple, 10-20 cm. long; axis and rays mostly scabrous, some branches flower-bearing above the middle only, others for the whole length. Spikelets scabrid, open in flower and in fruit, 2.5-3.5 mm. long; empty glumes ovate-lanceolate, first 1-nerved, second 1-3-nerved; floral glume 2-3 mm. long, ovate, acute, bifid, bearing a very slender straight awn attached near the middle, reaching the tip of its glume or shorter or longer, the hairs from two thirds as long as the floret to a little exceeding it; rudiment minute.

Vermont, *Pringle*; New York, *Thurber*; Massachusetts, *Beal* 76; Michigan, *Cooley*, *Clark* 701, 3235; *Farwell*, *Beal* 77, 78; Illinois, *Beal*; Minnesota, *Bailey* B 10, B 256, B 529, *Sandberg* 36, 613, 795; Colorado, *Cassidy*; Wyoming, *Buffum* C 86, C 91; Utah, *Jones* 1274; Washington, *Saksdorf* 1023, 2127; Oregon, *Howell*.

Moist places in the north, Canada, New England to California; wide-spread and quite variable. See Vol. 1, p. 179. Fig. 80.

25. **C. Bolanderi** Thurb. S. Wats. Bot. Calif. 2: 280 (1880). *Deyeuxia Bolanderi* Vasey, Desc. Cat. Gr. U. S. 50 (1885).

Perennial; more or less scabrous throughout. Culms with about 3 internodes, geniculate, unbranched, 60–120 cm. high. Sheaths rather loose, scarcely half as long as the internodes; ligule 4 mm. long, truncate; blades pale green, flat, 15–25 cm. long, 4–7 mm. wide. Panicle dark purple, loose, pyramidal, 4–20 cm. long; the rays in threes to fives, capillary, the half-whorls 3–5 cm. distant. Spikelets on clavate pedicels above the middle of the branches, lanceolate, 4 mm. long, awn exserted, 1–3 mm. long; empty glumes equal, ovate-lanceolate, 4 mm. long, scabrous on the keel, first 1-nerved, second obscurely 3-nerved; floral glume rough, ovate, 3 mm. long with 4 cusps at the apex, awn attached near the base, hairs at base few, short, in two clusters, hairy rudiment about 1 mm. long; palea narrower but little shorter than its glume.

California (Mendocino County), *Bolander* 6471, *Pringle*; in moist woods.

26. **C. neglecta** (Ehrh.). Gært. Mey. & Schreb. Fl. Wett. 1: 94 (1799). *Arundo neglecta* Ehrh. Beitr. 6: 137 (1791). *Calamagrostis stricta* Beauv. Agrost. 15 (1812). *Arundo stricta* Timm. Siem. Meckl. Mag. 2: 236, ex Kunth.

Culms 20–60 cm. high, erect, scabrous, coming from creeping rootstocks. Sheaths smooth, nearly as long as the internodes; ligule decurrent, 3 mm. long; blades of the culm 2–3 in number, usually involute, erect, scabrous above and sometimes below, 15–20 cm. long, 3–5 mm. wide. Panicle exserted, erect, 10–16 cm. long, 1.5–2.5 cm. broad, somewhat lobed; rays crowded, rather stout, rough. Spikelets rough, crowded, extending nearly to the base of the branches, elliptical, acute, varying from straw-color to dark purple, 3.5–4 mm. long; empty glumes equal or slightly unequal, first 1-nerved, second 3-nerved; floral glume but little shorter, rough, ovate, truncate-toothed, the straight awn starting a little below the middle and extending to the tip or a little above its glume, the hairs two-thirds the length of the floret, rudiment about 1 mm. long.

Vermont, *C. E. Faxon* 11, 12; Michigan, *Beal* 80, *Clark* 702, 2992; Canada, *Macoun*; Minnesota, *Holzinger*; Montana, *Anderson* 21, 42, *Williams*; Wyoming, *Buffum* C 105; Dakota, *Duffey*; Utah, *Jones* 1145; Washington, *Sandberg* 325, 535, *Suksdorf* 1024; Oregon, *Howell*.

Concerning the above species and its synonyms, see *Bot. Gaz.* 11:175 (1886), for notes by F. L. Scribner.

Canada, New England to Oregon and California.

Var. **crassiglumis** (Thurb.). *Calamagrostis crassiglumis* Thurb. S. Wats. *Bot. Calif.* 2:281 (1880). *Deyeuxia crassiglumis* Vasey, *Cat. Gr. U. S.* 50 (1885).

Leaves of sterile shoots as long as the culm, which is 20–30, cm. high; blades of the culm 7–10 cm. long, rigid, reaching to the panicle. Panicle dense, 4–6 cm. long.

California (Mendocino County), *Bolander* 4766.

Var. **confinis** (Willd.). *Arundo confinis* Willd. *Enum.* 1:127 (1809). *Calamagrostis confinis* Nutt. *Gen.* 1:47 (1818). *Deyeuxia* (?) *confinis* Kunth, *Rev. Gram.* 1:76 (1835).

Culms more slender than the species; panicle less compact; hairs exceeding the floret a little.

New York to Minnesota.

Var. **gracilis** Scribn. *Coult. Bot. Gaz.* 11:175 (1886).

Culms 2–3 cm. high; rudiment 0.4 cm. long, hairs as long as the floret.

Yellowstone Park, *Tweedy* 58, teste Scribner.

69. (141). **AMMOPHILA** Host. *Gram. Austr.* 4:24, *t.* 41 (1809). *Psamma* Beauv. *Agrost.* 143 (1812).

Spikelets 1-flowered in large spikelike panicles, the rachilla articulate above the outer glumes, bearing a tuft of hairs around the floral glume, produced beyond it in a small bristlelike rudiment. Empty glumes persistent, chartaceous, thick, lanceolate, acute, compressed-keeled; floral glume 5-nerved, similar in texture and about the same length, the apex dentate or sometimes mucronate; palea about as long as its glume, of like texture, 2-keeled, 2-toothed, sulcate between the keels. Stamens 3. Styles distinct. Grain obovoid, enclosed but not adherent.

A coarse perennial with creeping rootstocks, blades rigid, narrow and involute.

Very nearly related to *Calamovilfa* Hack.

1. **A. arenaria** (L.) Link, Hort. Berol. 1:105 (1827). BEACH-GRASS. SAND-GRASS. *Arundo arenaria* L. Sp. Pl. 82. (1753). *Psamma littoralis* Beauv. Agrost. 176, t. 6, f. 1 (1812). *Calamagrostis arenaria* Roth, Fl. Germ. 1:34 (1788).

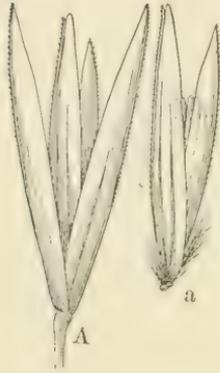


FIG. 59.—*Ammophila arenaria*. A, spikelet; a, floret. (Scribner.)

Culms stout, 60–90 cm. high. Leaves erect. Panicle dense, cylindrical, 12–25 cm. long, 1–2 cm. broad. Spikelets compressed, 10–12 mm. long. Empty glumes compressed, linear or lanceolate, scabrous on the keel, first 1-nerved, second 3-nerved; floral glume scabrous, compressed, lanceolate, emarginate, often slightly mucronate; palea 4-nerved, hairs and rudiment less than half as long as the spikelet.

Atlantic coast and along the Great Lakes; seacoast of the British Isles.

Owing to the abundant hard rootstocks, sometimes 40 feet long, it is excellent for preventing the drifting of sands along the shore.

70. (141a). **Calamovilfa** Hack. True Grasses, 113 (1890).

Spikelets 1-flowered, in panicles more or less diffuse, rachilla articulate above the outer glumes, bearing a tuft of hairs around the floral glume, not produced beyond it. The 2 empty glumes persistent, unequal, chartaceous, thick, compressed-keeled; floral glume and palea of like texture, the former 1-nerved, awnless, the latter 2-keeled, 2-toothed.

Very nearly allied to *Ammophila* and *Calamagrostis*.

There are three species, all North American.

- a. Spikelets 3.5–4.5 mm. long. 1
- b. Spikelets 4–5 mm. long. 2
- c. Spikelets 5–6 mm. long. 3

1. **C. brevipilis** (Torr.) Hack. l. c. *Arundo brevipilis* Torr. Flor. U. S. 1:95 (1824). *Calamagrostis brevipilis* A. Gray; Man.

Ed. 1:582 (1848). *Ammophila brevipilis* Benth. Vasey, Cat. Gr. U. S. 52 (1885).

Culms rather slender, 90–120 cm. high. Sheaths shorter than the internodes; blades very narrow, nearly flat or involute, attenuate. Panicle pyramidal, purple. Spikelets 3.5–4.5 mm. long; empty glumes ovate, mucronate, first 2–2.5 mm. long; floral glume a little shorter than the second; palea equal to its glume or a little longer, hairs about 1 mm. long.

Pennsylvania (Philadelphia), *J. B. Brinton*.

Sandy swamps, pine-barrens of New Jersey.

2. *C. Curtissii* Vasey, Contrib. U. S. Nat. Herb. 3:85 (1892). *Ammophila Curtissii* Vasey, Bull. Torr. Club, 11:7 (1884).

Culms single or in tufts, 90–180 cm. high, base of culms clothed with the rigid imbricated sheaths. Sheaths 3–4 in number, distant, shorter than the internodes; ligule obscure, a ciliate ring; blades very smooth, firm, 10–30 cm. long, the apex setaceous. Panicle 12–20 cm. long; rays close, single or in pairs, the lower 4–10 cm. long, 3–5 cm. distant, thinly flowered. Spikelets on short pedicels 4–5 mm. long; empty glumes ovate, acute or ovate-lanceolate, first 3–4 mm. long, second 4.5–5 mm. long; floral glume ovate-lanceolate, 5 mm. long, thinly clothed with short hairs 1–2 mm. long; palea about 4 mm. long, containing a few short hairs; basal hairs few, one-third as long as the floret.

Dr. Vasey says: "It differs from *A. brevipilis* Benth. in its greater size, its longer involute leaves, and its much longer and narrower panicle, with branches subdivided and flowering nearly to the base; the latter has a ring of very short hairs at the base of the outer glumes besides those at the base of the flowers."

Florida, *A. H. Curtiss*.

3. *C. longifolia* (Hook.). Hack. True Grasses, 113 (1890). *Ammophila longifolia* Vasey, Cat. Gr. U. S. 71 (1885). *Calamagrostis longifolia* Hook. Fl. Bor. Am. 2:241 (1840).

Culms stout, 60–180 cm. high. Sheaths longer than the internodes, smooth or more or less clothed with soft wool; blades very long and narrow, involute, points attenuate. Panicle variable, 10–40 cm. long, at first rather narrow and close, but later spread-

ing, rays smooth, rather distant, bearing spikelets above the middle.

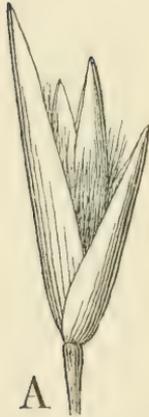
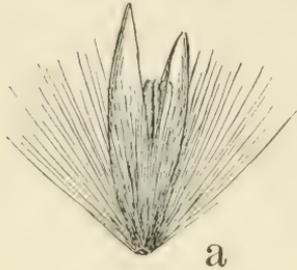


FIG. 60.—*Calamovilfa longifolia*. A, spikelet; a, floret. (Scribner.)

Spikelets compressed, 5–6 mm. long; first glume cuneate, 4–5 mm. long, second lance-linear; floral glume as long as the second glume, cuneate-lanceolate, hairs copious, straight, two-thirds as long as the palea.

Sands about the Great Lakes and in the interior part of British America to Colorado and Arizona. Of some use as a fodder-plant.

71. (138). **APER**A Adans. Fam. 2: 495 (1763). *Anemagrostis* Trin. Fund. Agrost. 128 (1820).

Annual; spikelets 1-flowered, small, in an elegant loose panicle with numerous slender branches, the rachilla articulate above the empty glumes and produced beyond the perfect flower as a short bristle. Empty glumes persistent, delicately membranous, keeled, pointed, but awnless, the second one larger, 3-nerved; floral glume a little shorter, membranous, with a slender flexuose dorsal awn below the 2-toothed apex; palea thin, shorter than its glume, 2-keeled, 2-toothed. Stamens 3. Styles distinct, short. Grain narrow, enclosed, but not adherent.

Blades flat, narrow; panicle terminal, diffuse or contracted.

Species or perhaps varieties, two, found in Europe, western Asia and northern Africa.

The characters come very near those of *Calamagrostis*, while the elegant panicle and numerous glabrous spikelets resemble many species of *Agrostis*, where the species has often been placed.

1. A. SPICA-VENTI (L.) Beauv. Agrost. 151 (1812). SILKY AGROSTIS. *Agrostis Spica-venti* L. Sp. Pl. 61 (1753). *A. pur-*

purca Gaud. Agrost. Helv. 1:70 (1811). *A. effusa* S. F. Gray, Nat. Arr. Brit. Pl. 2:148 (1821).

Culms densely tufted, 30-60 cm. high. Ligule 5-7 mm. long; blades on large plants 15 cm. long, 3-4 mm. wide. Panicle with its base included or barely exerted above the upper sheath, usually spreading, 20-30 cm. long, the scabrid rays in half-whorls of 5-9.



FIG. 61. — *Apera Spica-venti*.
Spikelet, destitute of stamens
and pistil. (Richardson.)



FIG. 62.
Lagurus ova-
riatus. Spikelet.
(Richardson.)

Spikelets narrow, first glume 1.5-2.5 mm. long, second 2.3-3.3 mm. long; fertile floret linear-lanceolate, 2-2.5 mm. long, the awn 5-10 mm. long; palea bearing 2 minute tufts of hairs at the base.

Introduced with cultivated grasses and in ballast.

Var. INTERRUPTA (L.). *Agrostis interrupta* L. Sp. Pl. Ed. 2, 1:91 (1762). *Apera interrupta* Beauv. Agrost. 31 (1812).

This may be looked for. Plant slender, about 20 cm. high, panicle interrupted, narrow, 10-15 cm. long.

72. (145). **LAGURUS** L. Sp. Pl. 1:81 (1753).

Spikelets 1-flowered, in a very soft dense ovoid or oblong spike-

like panicle or head, rachilla articulate above the lower glumes, slender, produced above the perfect floret. Empty glumes 2, linear, clothed with fine hairs; floral glume narrow, smooth, delicately membranous, terminating in 2 slender awns, and bearing a long bent and twisted awn below the apex: palea narrow, hyaline, 2-keeled. Stamens 3. Styles short, distinct. Grain narrow, scarcely enclosed by the glume and palea.

A soft annual grass with short flat blades.

Species 1, found in western and southwestern Europe and northern Africa.

1. *L. OVATUS* L. l. c. HARE'S-TAIL GRASS.

Culms 15-25 cm. high, pubescent, branching below. Sheaths soft, inflated; ligule pubescent, 1-1.5 mm. long. Spikes whitish, 2-4 cm. long. Empty glumes threadlike, plumose, 8-10 mm. long; floral glume 3.5 mm. long, bristles of the same length; the awn 2-4 times as long as its glume.

Often cultivated for ornament.

TRIBE IX.—*AVENÆÆ*.

Spikelets 2- to several-flowered (1-flowered in *Anisopogon*), flowers perfect or one of them staminate, in open or spikelike panicles. Empty glumes often persistent, usually longer than the florets; rachilla bearing tufts of hairs under the floral glumes and usually produced above the upper one; awn of the floral glume dorsal, or near the apex between the lobes, more or less twisted and bent; palea 2-keeled. Style short or none; stigmas feathery. Grain furrowed with embryo small, enclosed in the floral glume and palea, adherent to the palea or free.

This tribe has been very generally recognized and very little modified for a long time past.

- A. Spikelets 2-flowered, rachilla not prolonged. 74
- B. Spikelets 2- to several-flowered, rachilla prolonged above the upper flower. (a)
- a. Spikelets deciduous as a whole, 2-flowered, lower one perfect, awnless, upper one awned, usually staminate. 73

- a. Florets deciduous, empty glumes persistent. . . . (e)
- c. Awn of floral glume on the back. (d)
- d. Spikelets 1 cm. or less long. (e)
 - e. Flowers all perfect or the upper ones staminate or neuter. (i)
 - i. Floral glume obtuse or denticulate. . . (k)
 - k. Awns taper-pointed, not articulate. . . 76
 - k. Awns cylindrical, articulate near the middle, apex clavate. 75
 - i. Floral glume 2-toothed, lower floret awned. 77
- e. Florets 2, the lower one staminate and strongly awned, the upper one perfect and more or less awned. 79
- d. Spikelets more than 10 mm. long. 78
- c. Awn of floral glume between 2 teeth or lobes. . . (m)
 - m. Spikelets 2-flowered, the upper one perfect or pistillate, the lower staminate, spikelets in threes. 80
 - m. Spikelets 3- to several-flowered, all perfect or the upper imperfect. 81

73. (157). *HOLCUS* L. Sp. Pl. 1047 (1753).

Spikelets deciduous as a whole, 2-flowered, numerous and crowded in an open panicle, the lower flower perfect, the upper staminate; rachilla articulate above the outer glumes. Empty glumes 2, nearly equal, conduplicate, acute, the second broader, 3-nerved, acute or extended into an awn; floral glume shorter, membranous, the lower awnless, the upper with a short dorsal bent awn; palea 2-keeled. Stamens 3. Styles distinct. Grain oblong, included but not adherent.

Soft annual or perennial grasses, with blades flat or rarely conduplicate.

Species 8, found in Europe, Africa, and one or more spread by the agency of man.

The genus *Holcus* was made by Linnaeus and continued by Robert Brown to include species now separated and placed in *Sar-*

glum, a subgenus in *Andropogoneæ*. *Holcus* is nearly allied to *Deschampsia*, but the upper floret of each spikelet is male with an awned glume, the lower unawned and perfect.

- A. Spikelets about 4 mm. long, awn scarcely protruding. 1
 B. Spikelets 5 mm. long, awn protruding. 2

1. *H. LANATUS* L. Sp. Pl. 1048 (1753). VELVET-GRASS. *H. glaucus* Willk. Willk. & Lange, Prod. Fl. Hisp. 1:307 (1861).

Perennial with creeping rootstocks; culms ascending, 30–60 cm. high, clothed throughout more or less with a very short pubescence, giving the plant a soft light color. Panicle 5–10 cm. long, 2.5 cm. broad, of a pale or reddish color. Spikelets oval, oblong, nearly 4 mm. long, the awn scarcely protruding; lower floret narrowly-ovoid, 2 mm. long, with 5 obscure nerves; palea as long as its glume, obtuse; upper floret narrower and shorter than the lower; floral glume obscurely nerved, awn as long as its glume, starting a third the way below the apex; palea obtuse, two-thirds as long as its glume.

U. S. Dept. Agricul. 465, distributed in 1881.

Found in moist meadows and pastures of Europe, probably in Russian Asia; introduced into Austria, Tasmania, northern and southern Africa, and many parts of North America.

It grows well on poor lands, but the quality is not good under any circumstances. For further remarks see Vol. 1, p. 193, Fig. 86.

2. *H. MOLLIS* L. Syst. Ed. 10:1305 (1759). *H. densus* Peterm. Flora, 27:233 (1844).

A smooth perennial grass, rootstocks creeping extensively; culms 20–70 cm. high, villous at the nodes. Leaf-blades shorter than those of the former species, the upper 2–6 cm. long. Panicle much as in *H. lanatus*. Spikelets lance-elliptical, 5 mm. long, awn protruding half the length of the spikelet; rachilla bearing tufts of hairs below each floret; lower floret narrowly ovoid, 2.5 mm. long; palea as long as its glume, obtuse; upper floret narrow, nearly 3 mm. long, awn starting from below the tip, 4 mm. long; palea a little shorter.

Found in nearly the same countries and locations as *H. lanatus*, though much less common.

Introduced on ballast ground, Philadelphia.

74. (152). *AIRA* L. Sp. Pl. 63 (1753). *Aspris* Adans. Fam. 2: 496 (1763). *Leptophoba* Ehrh. Beitr. 4: 146 (1789). *Proincia* l. c. 149 (1789). *Antinoria* Parl. Fl. Palerm. 1: 92 (1845). *Fiorinia* Parl. Fl. Ital. 1: 232 (1848). *Molineria* l. c. 236 (1848). *Periballia* Trin. Fund. Agrost. 133 (1848). *Fussia* Schur. Enum. Pl. Transs. 754 (1866).

Spikelets 2-flowered, small, in a loose or rarely contracted panicle with capillary rays; rachilla articulate, minutely hairy and not at all or scarcely produced beyond the perfect flowers. Empty glumes thinly scarious, nearly equal, acute; floral glume close above them, shorter, thin and hyaline, finely pointed or shortly bifid, with a fine dorsal twisted awn below the middle; palea 2-nerved, hyaline, about as long as its glume. Styles short, distinct. Grain enclosed and more or less adnate to the glume and palea.

Delicate slender grasses, usually annuals with narrow blades.

A small genus with 4-5 species, all of which are European, though some of them are now widely disseminated in other temper-



FIG. 63.—*Aira caryophyllea*. Spikelet. (Richardson.)

ate regions. The genus formerly was made to include *Deschampsia*, *Airopsis*, *Corynephorus*, and others. It is nearly allied to *Avena*, *Isachne*, *Micraira*, *Cœlachne*.

- A. Panicle loosely spreading, almost trichotomous. 1
 B. Panicle narrow and dense, spikelike. 2

1. A. CARYOPHYLLEA L. Sp. Pl. 66 (1753). *A. capillaris* Salzm. Steud. Nom. Ed. 2, 1:44 (1840-41). There are at least 17 other synonyms.

A slender and elegant tufted annual, 10-20 cm. high. Ligule 2-4 mm. long; blades 1-3 cm. long, soft, narrow, soon involute and twisted. Panicle loose and spreading, rays in pairs or threes. Spikelets erect, silver-shining; empty glumes about 2.3 mm. long, ovate, acute, sub-scarious, 1-nerved; floral glume shorter, 2 mm. long, dorsal awn projecting over 1 mm. above.

Generally distributed over the area of the genus. Introduced and naturalized in various portions of the United States from Delaware to California.

2. A. PRÆCOX L. Sp. Pl. 65 (1753). *A. pusilla* Schur, Enum. Pl. Transs. 754 (1866).

A slender annual, 4-12 cm. or rarely more in height. Ligule about 2 mm. long; blades 5 in number, 0.5-2 cm. long, soft, narrow, soon involute and twisted. Panicle contracted, 1-2 cm. long. Spikelets erect, seldom over 10-20 in number; empty glumes scarious, shining, ovate, acute, 2.5 mm. long, 1-nerved; floral glume 2 mm. long.

A west European and Mediterranean grass, introduced into Delaware, Pennsylvania, and elsewhere.

75. (153). **WEINGAERTNERIA** Bernh. Syst. Verz. Erf. 23:51 (1800). Name used earlier. *Corynephorus* Beauv. Agrost. 90, t. 18, f. 2 (1812).

Spikelets 2-flowered, in a loose panicle, rachilla articulate below the floral glumes and produced beyond them. Glumes thinly scarious, 2 empty ones subequal, acute, awnless; floral glume shorter, hyaline, entire, with a fine awn dorsally attached below the middle, articulate near the middle, where there is a tuft of short hairs, lower part firm and twisted, the upper part more slender with a clavate apex; palea shorter than its glume, narrow, 2-toothed. Stamens 3. Styles short, distinct. Grain included, more or less adherent to the glume and palea.

Delicate annuals with the habit of *Aira*, having narrow cæspitose blades. Panicle slender, contracted, with capillary rays. Species 2, found in the vicinity of the Mediterranean sea and northward and introduced into other countries.

The rachilla is continuous as in *Deschampsia*, but the genus is readily distinguished by the peculiar club-shaped awn of the floral glume.

1. *W. CANESCENS* Bernh. l. c. *Corynephorus canescens* Beauv. Agrost. 159 (1812).

Tufted glaucous or slightly purplish, 20–30 cm. high, with fine stiff convolute blades, the lower 5–10 cm., those on the culm about 1 cm. long. Panicle 4–6 cm. long. Spikelets about 3 mm. long; empty glumes pointed, concealing the florets, awn scarcely protruding; floral glume 1.5 mm. long.

In sandy soil. Introduced into the United States with grass-seed.

76. (154). **DESCHAMPSIA** Beauv. Agrost. 91, t. 8, f. 3 (1812). *Airidium*

Steud. Syn. Pl. Gram. 423 (1854). There are at least 10 other synonyms.

Spikelets 2-flowered, in a loose or rarely contracted panicle with slender rays, rachilla articulate, hairy, more or less produced between the floral glumes and beyond the upper one as a hairy bristle, or rarely bearing an empty glume. Empty glumes keeled, rather acute, the sides thinly scarios; floral glume membranous or nearly hyaline, obtuse or truncate, 2- to several-toothed, with a fine dorsal awn attached near the middle, the lower floret sessile, the upper raised on a stipe: palea narrow, prominently 2-nerved, often 2-toothed. Stamens 3. Styles short, distinct. Grain enclosed, but usually not adherent. Perennial grasses with the shining spikelets of *Trisetum* and *Aira*, usually smaller than the former, larger than those of the latter genus. There are about 20 species, generally distributed over the temperate regions of the northern

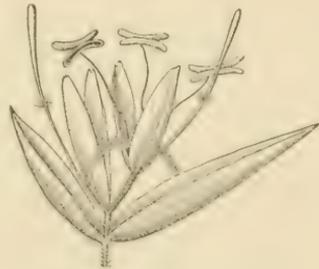


FIG. 64.—*Weingartneria canescens*. Spikelet. (Scribner.)

hemisphere, also represented outside the tropics in the southern hemisphere. *D. cæspitosa* ranges over the entire area above specified.

Deschampsia bears the same relation to *Aira* that *Calamagrostis* does to *Agrostis*; plants usually perennial and stouter than *Aira*, spikelets longer, rachilla produced beyond the upper floret into a bristle or sometimes an empty glume or even a staminate flower; floral glume often more or less denticulate. Six of the species have been proposed as distinct genera. The above comments concerning the position of the genus are mainly the views of Bentham.

- A. First empty glume 1-nerved. (a)
 - a. Florets overlapping, about four-fifths of their length. (b)
 - b. Awn straight, short, a dwarf arctic grass. 1
 - b. Awn bent, protruding, panicle spikelike. 2
 - b. Awn bent, protruding, panicle thin, spreading. 3
 - a. Florets overlapping one-third to half of their length. (c)
 - c. Empty glumes extending above the florets, awn near or above the middle of the glume. (d)
 - d. Blades flat, 3-6 mm. wide. 4
 - d. Blades 3-4 mm. wide, involute, floret conspicuously hairy. 5
 - c. Empty glumes usually not extending to the tip of the upper floret. (e)
 - e. Awn twisted, starting below the middle of its glume. 6
 - e. Awn straight, starting at the middle of its glume. 7
- B. First empty glume 3-nerved. (h)
 - h. Empty glumes 5-7 mm. long. 8
 - h. Empty glumes 3-4 mm. long. (i)
 - i. Rays of panicle mostly in twos. 9
 - i. Rays of panicle mostly in threes. 10
- 1. *D. brevifolia* R. Br., Parry's Voy. Suppl. 191 (1823). *Aira arctica* Spreng. Syst. 2:32 (1825.)

A smooth perennial, 6-30 cm. high. Ligule oblong; blades of sterile shoots 6-12 cm. long, those of the culm 1-3 cm. long, 2-3 mm. wide, involute, reaching nearly to the panicle. Panicle

simple, ovoid or irregularly oblong, 2-3-10 mm. long. Spikelets 2-flowered, brown above, red or purple below; empty glumes nearly equal, about 2.5 mm. long, first 1-nerved, second 3-nerved, the lateral nerves obscure; florets 2.5 mm. long, overlapping for four-fifths of their length, very sparingly clothed at the base with short weak hairs, rachilla smooth, rudiment above the second flower twice as long as the joint of rachilla between the florets, bearing a small glume or rarely a third floret; floral glume broadly oval, truncate, irregularly toothed, thinner than the empty glume, delicately 5-nerved; a straight awn a little below the middle, scarcely reaching to the tip of its glume; palea broad, not keeled, a little shorter than its glume, irregularly 4-toothed; the two obscure nerves diverging. Perhaps this should be included in *D. cuspidata* Beauv.

Grinnell Land, *Lieut. Greely* in 1882; Colorado, *Parry* 367; Alaska, *Harrington, Dall*.

2. *D. Pringlei* Scribn. Proc. Acad. Phila. 300 (1891).

Culms erect, panicle simple, 60-90 cm. high. Sheaths scabrid, smooth, shorter than the internodes, oblique at the throat; ligule truncate, fringed, decurrent, about 2 mm. long; blades scabrous, involute, rigid, 10-15 cm. long, 2-4 mm. wide. Panicle dense, spikelike, somewhat interrupted below, 7-17 cm. long, the lowest rays branching, spikelike, appressed, 2-5 cm. long. Spikelets linear-lanceolate; empty glumes equal, 4.3-5.3 mm. long, 1-nerved, keel scabrous, joint of rachilla between florets about 0.3 mm. long; floral glume linear, about 3-4 mm. long, with 2 blunt lobes, awn one-third the way from the base and projecting above its glume 3-4 mm.; palea thin, 2-keeled, 2-toothed, a little shorter than its glume. Anthers linear, 1.2 mm. long.

This has much the aspect of *Trisetum*.

Mexico, *Pringle* 1429.

3. *D. flexuosa* (L.) Trin. Bull. Sci. Acad. St. Petersburg. 1:66 (1836). *Aira flexuosa* L. Sp. Pl. 65 (1753). There are many other synonyms.

A tufted perennial, 40-60 cm. high, culms nearly naked. Ligule short; blades very narrow, those at the base 3-12 cm. long, those of the culm 2-5 cm. long. Panicle spreading, 8-12 cm. long,

rays capillary in twos, bearing the spikelets near the tips. Spikelets with the awns usually protruding one-third of their length; empty glumes thinner than the floral glume, ovate-lanceolate, first 3.5 mm. long, 1-nerved, second 4.5 mm. long, 3-nerved, the lateral nerves short and sometimes obscure or wanting; florets 4 or more mm. long, overlapping for five-sixths of their length, sparingly silky-hairy at the base; floral glume ovate, 5-nerved, eroded or toothed, awn starting about 1 mm. above the base; palea as long as its glume, or longer or shorter. Grain not grooved, free.

Mt. Washington, *D. C. Eaton*; Massachusetts, *Beal* 81; New Jersey, *Scribner* for U. S. Dept. Agricul. 460; New York, *Clark* 130? from Clinton; Michigan Isle Royale, *Robbins* 75^a; Colorado, *Brandegee*.

New England, Michigan, to the south and west; northern Europe and Asia.

4. *D. atropurpurea* (Wahl.) Scheele. Flora (27) 1: 56 (1844). *Aira atropurpurea* Wahl. Fl. Lapp. 37 (1812). *D. latifolia* Vasey, Cat. Gr. U. S. 53 (1885).

A smooth perennial, 20-40 cm. high. Leaves 3-4; sheaths as long as the internodes, shorter or longer; oblique at the throat; ligule obtuse, 2-3 mm. long; blades flat, those of the sterile shoots 4-15 cm. long, those of the culms 2-6 cm. long, 3-6 mm. wide. Panicle simple, open, more or less exserted, 5-11 cm. long, rays in pairs, spreading, the longest 4-8 cm. long, bearing 5-10 spikelets near the apex. Spikelets mostly pedicellate, a few subsessile, often purple; empty glumes compressed, subequal, first shorter, linear-lanceolate, 1-nerved, 4.7-6 mm. long, second ovate-lanceolate, 3-nerved, 5-6 mm. long; florets overlapping for one-third to one-half their length; rachilla above the upper floret about 0.6 mm. long; floral glume 2.3-2.7 mm. long, the silky hairs reaching to the middle or above, the stout awn attached a little above the middle, 2.5-4.5 mm. long, broadly oval, truncate, silky, irregularly 3-4-toothed, obscurely 5-nerved; palea as long as its glume, or a little shorter, truncate or irregularly toothed.

Labrador, *A. A. Allen*; White Mountains, *Tuckerman*, *Oakes*, *C. E. Faxon*; British Columbia, *Macoun*.

Alpine summits of New Hampshire, New York, to California and northward.

After some hours in comparing the original description of *D. atropurpurea* and *D. latifolia* Vasey, in seeing the figures of the latter in Hooker's Flora of N. A., comparing step by step authentic plants from both the east and the west sides of the continent, I conclude that if we make two species, they will both be found on each side of the continent. It seems to me that the distinctions are not broad enough to warrant at most more than two varieties, and to show this, even, I should need to see more good plants. From the Grand Gulf, Mount Washington, is a plant from C. E. Faxon; from the Rocky Mountains Hooker sends a plant collected by Drummond, the type for *D. latifolia*. These two plants are of equal height; the western plant has leaves possibly not quite so long-pointed, those of the culm about 1 cm. longer and 1 mm. wider, the panicle 4-5 cm. longer, the longest ray 3 cm. longer, bearing some 20 more spikelets, second empty glume 1 mm. longer; floral glume 0.1-0.2 mm. longer, awns the same. Hooker in Fl. Bor. Am. 2:243 (1840) says in regard to *D. latifolia*: "It is remarkable for the breadth of the leaves and for the large opaque (not glossy), purple-green color of the glumes."

5. *D. danthonioides* (Trin.) Vasey. *Aira danthonioides* Trin. Mem. Acad. St. Petersb. (VI.) 1:57 (1830).

A slender erect smooth annual, 2-4 cm. high. Sheaths about 3 in number, longer than the internodes, the upper one reaching about half way to the top of the plant; ligule lanceolate, decurrent, 4 mm. long; blades thin, involute, filiform, erect, 5-8 cm. long, 0.3 mm. broad. Panicle thin, purple, linear or spreading, 10-15 cm. long, rays in pairs, 2-3 cm. distant, the longest 5 cm. long, narrow, flower-bearing on the outer three-fifths. Spikelets pedicellate; empty glumes subequal, linear-lanceolate, 3.5-4 mm. long, first 1-nerved, second 3-nerved, rachilla hairy, florets overlapping for one-third their length, 1.4 mm. long, oval before opening, truncate, irregularly 4-5-toothed, awn near the middle 4.5 mm. long; palea as long as its glume, apex truncate, ciliate.

California, *Pringle* in 1882.

This has been confounded with *D. calycina* Presl, which see.

6. *D. cæspitosa* (L.) Beauv. Agrost. 91, t. 18, f. 3 (1812). *Aira cæspitosa* L. Sp. Pl. 64 (1753). There is a very large number of other synonyms.

A tufted perennial, 60-120 cm. high. Ligule short, or long and acute; blades rather stiff, the lower 20-50 cm. long, 3 mm. or less in width, often flat, deeply grooved on the upper side, scabrid. Panicle pyramidal or oblong, 1-3 cm. long, rays slender, bearing spikelets above the middle. Spikelets 2- (rarely 3-) flowered, compressed, shining, brownish, lead-colored or purplish, first empty glume linear, acute or obtuse or linear-lanceolate, 1-3-nerved, 3-6 mm. long, second glume oval, acute, a little longer, 3-nerved, the lateral nerves obscure; florets 2.7-4 mm. long, overlapping about half their length, the base sparingly hairy, awn starting 1 mm. or less from the base, equalling the glume or longer or shorter; floral glume usually thinner than the empty glumes, oval, truncate, 4-5-toothed or jagged, 5- (rarely 7-) nerved; palea broad, as long as its glume or shorter, 2-toothed.



FIG. 65.—*Deschampsia cæspitosa*. A, spikelet; a, florets. (Scribner.)

Vermont, *Pringle*; Michigan, *Beal* 82, *Clark* 25, 30; Minnesota, *Bailey* B 424; Montana, *Anderson* 59, *Buffum* C 43, C 53, C 63, C 73; Colorado, *Cassidy*; Alaska, *Merriam* for Nat. Herb. 111, 133; California, *Jones* 2579, *Parish* 1543.

Very variable and widely distributed in the north and south temperate and arctic and mountain regions. Found in New England and across the continent to Alaska. The European form is often viviparous. See Vol. 1, p. 37.

Var. *alpina* Vasey ined.

Culms 20-30 cm. high; blades soft, often flat; empty glumes about 5 mm. long; floral glume 4.5 mm. long.

Alaska, *Elliott*; Colorado, *Letterman*.

Var. **Bottnica** (Wahl.) Vasey ined. *Aira Bottnica* Wahl. Fl. Lapp. 1:36, t. 4 (1812). *D. Bottnica* Trin. Fund. Agrost. 158 (1820).

A plant with a long panicle and projecting awns. Empty glumes 3-nerved, 6 mm. long; floral glume oval, truncate, irregularly toothed, often 7-nerved.

Alaska, *Harrington* in 1871-2; Oregon, *Howell*, *Cusick*.

A note in Dr. J. T. Rothrock's Sketch of the Flora of Alaska, in Smithsonian report 458 (1867), speaks of specimens which he had collected in that territory, as follows:

"In looking over the specimens of *A. cæspitosa* in Herb. Gray I find one from the Sandwich Islands and another from Ft. Vancouver, both of which appear identical with our forms from Sitka. They having been authoritatively named by Colonel Munro as *Aira cæspitosa* var. *Bottnica*, I have labelled the Sitkan specimens in accordance with his determination. I find a specimen in Herb. Gray similar to the Sitkan ones marked (but from Ounalaska) as *A. cæspitosa* var. *longiflora*."

Var. **brevifolia** (Bieb.) Vasey ined. *Aira brevifolia* Bieb. Fl. Taur. Cauc. 3: 63 (1819). Blades soft, rather firm, 6-10 mm. long.

Var. **Confinis**. Vasey ined. Ligule 8-10 mm. long; spikelets about 5 mm. long.

California, *Palmer* 231.

Var. **longiflora**.

Panicle ample; spikelets 3-flowered, awns projecting; empty glumes nearly equal, 3-nerved; floral glume 5-nerved.

Vancouver Island, *John Macoun* 1887.

Var. **montana** (Schur.) Vasey. *D. montana* Schur, Enum. Pl. Transs. 753 (1866).

Leaf blades thick and coarse, involute, and awns projecting.

Arizona, *Rothrock* 23.

Rocky Mountains.

Var. **maritima** Vasey, Bull. Torr. Club, 15: 48 (1888).

Smooth, 12-20 cm. high; panicle slender, few-flowered; spikelet about 5 mm. long.

James Bay, *Macoun* 144; Colorado, *Jones* 475.

7. *D. holciformis* Presl, Reliq. Hænk. 1:251 (1830). *Aira holciformis* Steud. Syn. Pl. Gram. 221 (1855).

A smooth perennial grass, 50-70 cm. high, the upper nodes above the sheaths; ligule acute, 3 mm. long; blades scarcely 2 mm. wide, the lower 40 cm. long, the upper 4-6 cm. long. Panicle erect, interrupted, rather compact, 12-15 cm. long, about 2 cm. broad, rays in fives or sixes, flower-bearing nearly to the base. Spikelets 4.5-5.5 mm. long, florets overlapping for one-third their length, awns protruding about 1 mm., rachilla villous, rudiment about two-thirds as long as the floret; empty glumes subequal, hispid on the nerves, about 5 mm. long, first linear, acute, 1-nerved, second acute, narrowly obovate, 3-nerved; floral glume oblong, 5-nerved, 4 mm. long, 4-toothed, faintly hispid toward the apex, awn nearly straight, starting at the middle of its glume; palea oblong, as long as its glume, 4-toothed.

California, *Bolander* 6071.

8. *D. calycina* Presl, Reliq. Hænk. 1:251 (1830). *D. danthonioides* Munro, Benth. Pl. Hartw. 342 (1857). *Aira danthonioides* Trin. Mem. Acad. St. Petersb. (VI.) 1:57 (1830).

Annual; glabrous, culms slender, 10-100 cm. high. Ligule 2-3 mm. long, acute; blades 1-5-10 cm. long, very narrow, often exceeding the internodes. Panicle simple, spreading or narrow, erect, rays 2-4, in half-whorls, naked below. Empty glumes oblong-acute to linear-lanceolate, 3-nerved, first 5.5-7.5 mm. long, second but little shorter, extending beyond the florets. The lower floret reaching one-third onto the second; floral glume ovate, 2-2.5 mm. long, minutely 4-toothed, 5-nerved, awn mostly extending beyond the empty glumes; palea nearly as long as its glume, curved on the back. Grain flattened, not grooved, straight next the floral glume, curved next to the palea.

Arizona, *Lemmon*; Washington, *Brandege* 1175; Oregon, *E. Hall* 664.

This has been confounded with *D. danthonioides* Vasey, which see.

Texas, Colorado, California to Alaska.

9. *D. gracilis* Vasey, Coult. Bot. Gaz. 10: 224 (1885).

Culms smooth, slender, 30-70 cm. high. Ligule 4-5 mm. long, acuminate; blades smooth, filiform, 6-10 cm. long. Panicle 15-20 cm. long, lax and open, rays mostly in twos, the lower ones 6-10 cm. long, slender, flower-bearing to or below the middle. Empty glumes equal, linear-lanceolate, tinged with purple and brown, 3-nerved, and about 3.5 mm. long; florets overlapping for one-third their length, an awn starting near the middle of each floret, 5-6 mm. long, rachilla villous; floral glume 1.5 mm. or more long, 1 mm. wide, 4-toothed, faintly nerved; palea as long as its glume, narrow, incurved, ciliate above, 2-toothed. Grain compressed, half oval, 1 mm. long.

California, *Orcutt* in 1884.

10. *D. elongata* (Hook.) Munro. Benth. Pl. Hartw. 342 (1857). *Aira elongata* Hook. Fl. Bor. Am. 2: 243 (1840).

Culms very slender, often tufted, 20-60 cm. high. Ligule acute, 4 mm. long; blades very narrow, 4-15 cm. long, mostly smooth. Panicle narrow, simple or branching, about one-third as long as its culm, rays capillary, scabrous, appressed, bearing spikelets above the middle. Empty glumes equal, oval-lanceolate or linear-lanceolate, 3-4 mm. long, 3-nerved, longer than the florets, green and scabrous on the keel; florets 2 mm. long, shining, overlapping for one-third or more of their length, silky hairs reaching to the middle; floral glume broad, nerves very obscure or none, apex apparently 5-toothed or lacerate, the slender awn starting near or below the middle and twice the length of its glume; terminal part of the rachilla about two-thirds as long as the upper floret; palea about as long as its glume, 2-toothed, curved. Grain 1.5 mm. long, flattened, straight on the outside, grooved.

Jones for U. S. Dept. Agricul. 4591.

British America to California.

Var. *ciliata* Vasey, ined.

Culms 60-80 cm. high; ligule 8 mm. long; blades less involute and softer; panicle often 30 cm. long; awns longer.

Oregon, *Howell*; California, *Dr. Anderson*.

Var. *tenuis* Vasey.

A very small plant, 8-10 cm. high.

California, *Jones* 2201.

77. (158). **TRISETUM** Pers. Syn. Pl. 1:97 (1808). *Trichæta* Beauv. Agrost. 86 (1812). *Acrospelion* Bess. Trin. Mem. Acad. St. Petersb. (VI.) 1:59 (1831). *Rostraria* Trin. Fund. Agrost. 149 (1820).

Spikelets 2- rarely 3-6-flowered, in a narrow and dense or loose panicle, rachilla articulate, hairy or smooth, more or less produced between the floral glumes and beyond the upper one as a hairy bristle or bearing a terminal empty glume or male flower. Empty glumes keeled, thinly scarious on the sides, first 1-5-nerved, second 3-nerved; floral glume more hyaline, keeled, acute or shortly bifid, with a dorsal awn attached above the middle, usually twisted at the base and more or less bent; palea narrow, hyaline, prominently 2-nerved, usually 2-toothed. Stamens 3. Styles distinct, stigmatic from near the base. Grain oblong, not furrowed, glabrous or pubescent at the apex, enclosed but not adherent.

Tufted perennial, or rarely annual, grasses with flat blades.

There are about 50 species; and the genus is generally distributed over the temperate and cooler or mountain regions of both the northern and the southern hemispheres.

Bentham observes: "They are all very near to the section *Avenastrum* of *Avena*, but the floral glume is decidedly toothed at at the apex, the two teeth often produced into straight awns; grain glabrous or slightly pubescent at the apex, with the longitudinal furrow of *Avena*. The inflorescence is also more dense, the spikelets smaller and shining."

- A. Lower floret unawned. (b)
 - b. First glume 1-nerved. 1
 - b. First glume 3-nerved. 2
- B. Lower floret awned. (c)
 - c. Empty glumes both 1-nerved, 6-7 mm. long. . . . 3
 - Empty glumes both 1-nerved, 3.5-4 mm. long. . . 4
 - c. One or both empty glumes 3-nerved. (d)
 - d. First empty glume 3-nerved. (e)

- e. Panicle slender, awn on the floral glume very short and straight. 4
- e. Panicle very slender, awn of lowest floral glume longer and bent when dry. 6
- e. Panicle dense. 7
- d. First glume 1-nerved. (i)
- f. Panicle usually spikelike. 7, 8, 9
- f. Panicle not spikelike. (g)
- g. Spikelets 2-flowered. 11, 12
- g. Spikelets 3-4-flowered. 12, 13, 14, 15

1. **T. palustre** (Michx.) Torr. Fl. U. S. 1: 126 (1824). *Avena Pennsylvanica* L. Sp. Pl. 79 (1753)? *Avena Caroliniana* Walt. Fl. Car. 81 (1788)? *Avena palustris* Michx. Fl. Bor. Am. 1: 72 (1803). *T. Pennsylvanicum* B. S. P. Prel. Cat. N. Y. 67 (1888).

A smooth and slender erect perennial, 50-90 cm. high. Leaf-blades flat, 8 cm. long, 5 mm. wide. Panicle narrow, loose, 10-20 cm. long, rays capillary. Spikelets 2-flowered, compressed, lower floret awnless, the upper awned and raised on a slightly hairy rachilla nearly 2 mm. long and continued beyond as much farther; first empty glume lanceolate, 1-nerved, 4-5 mm. long, second about one-fifth longer, elliptical-lanceolate, 3-nerved; floral glume of the lower floret 5 mm. long, awnless, nearly smooth at the base, 3-nerved, closely resembling the second empty glume; floral glume of the upper floret shorter and narrower than the lower one, bearing a slender spreading or bent awn next the short bifid tip; paleæ about two-thirds as long as their glumes, bifid, nerves diverging. Anthers over 1 mm. long.



FIG. 66.—*Trisetum palustre*. Spikelet. (Scribner.)

For an account of a supposed hybrid between this species and *Eatonia Pennsylvanica*, see Bull. Torr. Club, 13: 118 (1886).

Low grounds, New York, to Illinois and southward.

2. *T. Ludovicianum* Vasey, Bull. Torr. Club, 12: 6 (1885).

Culms 60–80 cm. high, smooth, leafy. Some of the lower blades 15–25 cm. long, the upper larger, with smooth sheaths. Panicle 15–25 cm. long, about 3 cm. wide, nearly erect, rather loose, rays mostly in fives. Spikelets 2–3-flowered, the lower floret unawned, rachilla stout, very sparsely hairy, raising the lower floret two-thirds of 1 mm., second 2 mm. higher, the rudiment sometimes bearing a glume or a floret. Empty glumes smooth, equal, about 5 mm. long, 3-nerved, acute, first elliptical-lanceolate, second obovate; floral glume scabrous, 3-nerved, not bifid, that of the lower floret nearly 6 mm. long, elliptical-lanceolate, unawned; second floral glume smaller, with a bent awn as long as itself, arising 1 mm. below the acuminate apex; paleæ broad, one-third shorter than their glumes, bifid, the two nerves widely diverging.

Nearly allied to *T. palustre*. E. Hackel considers it a species of *Ventenata*.

Louisiana, *Rev. A. B. Langlois*.

3. *T. deyeuxioides* (H. B. K.) Kunth, *Rev. Gram.* 1: 102 (1829). *Avena deyeuxioides* H. B. K. *Nov. Gen. et Sp.* 1: 147, *t.* 687 (1815). *Deyeuxia triflora* Nees, in *Linnaea* 19: 691 (1847).

Culms 60–90 cm. high. Leaf-blades of the culm 12–18 cm. long, 3 mm. wide. Panicle 15–25 cm. long, 2–4 cm. broad, loose with spikelike rays. Spikelets purplish, 2–3-flowered, rachilla clothed with numerous long bristly hairs, some of which extend to the tip of the florets; empty glumes lanceolate, equal, 6–7 mm. long, 1-nerved; floral glumes narrow, 3.5–4.5 mm. long, 5-nerved, bearing an awn near the middle, reaching about 4 mm. above the nerveless tips of the glumes; palea hyaline, lanceolate, three-fourths as long as its glume. Grain linear, 2.5 mm. long, acute at the base.

The plant is evidently intermediate between *Deyeuxia* and *Trisetum*.

Mexico, *Pringle* 821, *Palmer* 210.

Var. *pubescens* Scribn. ined. Leaves and branches of the panicle pubescent.

Mexico, *Pringle* 3950.

4. *T. filifolium* Scribn. ined.

A densely tufted perennial, about 60 cm. high. Culms few, simple, erect. Leaves of sterile shoots numerous, scabrous, glaucous, involute, filiform, 8-12 cm. long, 0.5 mm. broad. Sheaths of the culm 2, much shorter than the internodes, the upper reaching to the middle of the culm; ligule 1 mm. long; blades filiform, 5-8 cm. long. Panicle rather dense, contracted, lanceolate, 7-10 cm. long, the lowest rays in half-whorls of 4-8, the longest 4-5 cm. long, flower-bearing beyond the middle. Spikelets subsessile or the terminal ones on short pedicels, linear, 2-3-flowered; empty glumes acute, 1-nerved, first linear-lanceolate, 3.5 mm. long, second oval-lanceolate, 3.7-4 mm. long, the hairy joint of rachilla 1.2 mm. long; floral glume obscurely keeled below, lateral nerves obscurely 2-nerved, scabrous, oval, 3-3.5 mm. long, truncate, 2-lobed, with a very short straight awn in the notch; palea linear before spreading, 3 mm. long, with two scabrous keels.

Mexico (Chihuahua), *Pringle* 1431.

Cool slopes of the Sierra Madre, at the altitude of 9000 feet.

Var. *aristatum* Scribn. ined.

Leaves of sterile shoots 30-40 cm. long; panicle thin, narrow, 12-20 cm. long, half-whorls of rays 3.5-4.5 mm. distant, the longest filiform ray 4-6 cm. long. Spikelets tipped, pedicellate; empty glumes with a bristle 0.5 mm. long; floral glume thin, keeled, oval, 4 mm. long, obscurely 5-nerved, the apex with 1-2 bristling teeth on each lobe extending one-third the way down, awn in the notch twisted and reaching three-fourths of 1 mm. beyond the apex of its glume. A very marked variety at least, perhaps a species.

Mexico. *Pringle* 1430, on cool slopes of the Sierra Madre, at an altitude of 9000 feet.

5. *T. Hallii* Scribn. Bull. Torr. Club, 11: 6 (1884).

Culms smooth, slender, 15-45 cm. high. Leaf-blades flat, involute near the apex, those of the culm 2-7 cm. long, 1-2 mm. wide, minutely scabrous. Panicle contracted, 5-10 cm. long, the erect densely flowered rays 2 or more cm. long. Spikelets 2-3-flowered, rachilla nearly smooth, prolonged above the upper floret, often

bearing between them a hairlike awn; empty glumes equal or subequal, mucronate or obtuse, 3.5–4 mm. long, hispid on the keels, first narrowly oblong, 3-nerved, second obovate, 5-nerved; floral glume of first floret narrowly oval, tuberculate-roughened, 3.5 mm. long, 3-nerved, terminating in two acute teeth and bearing a straight scabrous awn a little below the tip, 2 mm. long, teeth of second and third florets prolonged into slender setae, awn twisted and bent one-third the way from the tip and 3–4 mm. long; palea about two-thirds as long as its glume. Grain smooth.

Named for the late Elihu Hall, in whose Texan collection (1872) it was distributed under No. 799, mixed with *Trisetum elongatum* Kth. (*T. interruptum* Buckl.), No. 3546* of Curtiss's distribution of 1883, to which it is closely allied and which it much resembles in habit, but from which it differs essentially in its broader and obtuse outer glumes, and in having the lowest awn straight and shorter than the others.

Texas (Brazos County), *Nealley* in 1883.

6. *T. elongatum* (H. B. K.) Kunth, Rev. Gram. 1: 101 (1829). *Avena elongata* H. B. K. Nov. Gen. et Sp. 1: 148 (1815). *T. interruptum* Buckl. Proc. Acad. Phila. 100 (1862). *T. Californicum* Vasey.

Culms slender, branching, 20–50 cm. high. Sheaths frequently including the base of the panicles; blades flat and narrow, those of the culm 2–7 cm. long, often puberulous. Panicle simple, 4–10 cm. long, 1 cm. broad, dense or interrupted with spikelike branches. Many of the spikelets 2–3-flowered, sessile on the branches, where there are 5–7, one at a node, on alternate sides of the slender rachis. Empty glumes subequal, mucronate or acute, ovate-lanceolate, 3.5–4.5 mm. long, first 3-nerved, second 5-nerved, nerves prominent; floral glume scabrous, elliptical-lanceolate, 4–5 mm. long, 5- (sometimes 3–4-) nerved, bearing a bent awn one-third or two-fifths the way below the acuminate or cuspidate points; palea narrow, hyaline, bifid, about half the length of its glume. Grain smooth, 2 mm. long.

Arizona, *Pringle*; Lower California, *Orcutt*.

Texas, Arizona, New Mexico, southern California.

7. **T. spicatum** (L.) Richter, Pl. Eur. 1:59 (1890). *Aira spicata* L. Sp. L. 63 (1753). *Aira subspicata* L. Syst. Veg. Ed. 10:673 (1759). *T. subspicatum* of authors.

A variable tufted perennial, 10–60 cm. high. Sheaths pubescent, 3 cm. long, 4 mm. wide; ligule variable, scarious; blades flat, glabrous or scabrous. Panicle 3–10 cm. long, 0.5–2 cm. diam., dense and spikelike or interrupted, silvery-shining, often purple. Spikelets flattened, 2–3-flowered, rachilla produced beyond into a slender bristle or terminal glume; empty glumes 4–6 mm. long, linear-lanceolate or oval-lanceolate, first 1–3-nerved, second 3-nerved; floral glume obscurely 3–5-nerved, 3–6 mm. long to the tips of the teeth, awn very short or usually extending more than half its length above its glume; palea 2-toothed. Anthers short.

Utah, *Jones* 1156; Montana, *Tweedy* 619; Wyoming, *Buffum* C 39; Washington, *Sandberg*, *Howell* 423; Oregon, *Howell*; California, *Pringle*.

Var. **molle** (Michx.). A. Gray, Man. Ed. 2:572 (1856). *Avena mollis* Michx. Fl. Bor. Am. 1:72 (1803). *T. molle* Kunth, Rev. Gram. 1:101 (1829–35).

Culms and leaves minutely soft downy.

New Hampshire, *Faxon* 17; Vermont, *Pringle*; Michigan, *Farwell*; Utah, *Jones* for *Scribner* 3545; U. S. Geol. Surv. of 40th Par., *S. Watson* 1343; Oregon, *Howell*.

This polymorphous species is widely distributed in the mountainous regions of Europe, Australia, New England, Lake Superior, Rocky Mountains, California to Alaska, Canada and British America. The quality for feeding is probably not very good, but in some portions of the country it furnishes a good deal of pasture.

8. **T. Toluccense** H. B. K. Kunth, Gram. 1:101, 297, t. 60 (1835). *Avena Toluccense* H. B. K. Nov. Gen. et. Sp. 1:148 (1815).

A perennial 25–35 cm. high, with rootstocks and numerous sterile shoots; culms clothed with short pubescence. Leaves slightly scabrous, sheaths loose, covering the nodes; ligule lacerate, 2–3 mm. long; blades flat, 3–8 cm. long, 3–4 mm. wide. Panicle 4–6 cm. long, 8–12 mm. diam., dense and spikelike or interrupted below,

shining, green and purple. Spikelets slightly flattened, 2-flowered, rachilla slightly hairy, produced beyond into a bristle, sometimes bearing a rudiment of a third spikelet; empty glumes oval, acute, first 4-5 mm. long, 1-nerved, second 5-5.5 mm. long, 3-nerved; floral glume oval, acute, 4.5-5.5 mm. long, including the short teeth, obscurely 5-nerved, the upper third brown-scarious, the bent awn extending 3-5 mm. beyond its glume; palea nearly as long as its glume; anthers 1.3 mm. long.

Nearly allied to *T. spicatum*.

Mexico, *Pringle* 4303, on the mountains.

9. *T. sesquiflorum* Trin. Bull. Sc. Acad. St. Petersb. 1:66 (1836).

Perennial; culms 15-25 cm. high, and glabrous throughout. Leaf-blades of sterile shoots often reaching to the top of the panicle, those of the culm shorter, the upper one 1 cm. long. Panicle dense, linear-oblong, 3-4 cm. long. Spikelets narrow, purple; some of them consisting of four empty glumes, first and second 1-nerved, third bifid, awned, 3-nerved, fourth 2-nerved; the other spikelets 1-2-flowered, empty glumes lanceolate, compressed-keeled, very nearly equal, 6-7 mm. long, first 1-nerved, second 3-nerved, rachilla consisting of a few short hairs; floral glume thin, 5 mm. long, 2 mm. wide, obscurely 5-nerved, the tips lacerate, awn starting but little below the middle, and reaching 4 mm. above its glume; palea obtuse, lacerate, a little shorter than its glume, 1.5 mm. wide. Anthers linear, 3 mm. long, which is three times the length of those in *T. subspicatum*, collected in the same locality. The plants have much the aspect of those last named.

Alaska, *Harrington* with the U. S. Coast Survey.

Alaska and Kamtchatka.

10. *T. Sandbergii* n. sp.

Panicle purple, lax, flexuose or nodding, 15-20 cm. long, rays in distant half-whorls of 3-4, the longest 4-6 cm. long, bearing a few spikelets on the outer third. Spikelets 2-flowered, the hairy pedicel nearly 3 mm. long; first glume lanceolate, 3-4 mm. long, 1-nerved, second oval when spread, about 5 mm. long, 3-nerved; first floral glume elliptical, acute when spread, with a few very short

hairs at the base, 6 mm. long, the awn 6-8 mm. long, starting two-thirds the way from the base; palea 5 mm. long; upper floret 1 mm. shorter, the awn also shorter.

Washington (Mt. Stuart, altitude 7000-8000 feet), *Sandberg* and *Leibig*.

11. *T. montanum* Vasey, Bull. Torr. Club, 13: 118 (1886).

Culms 40-70 cm. high, smooth. Leaves of sterile shoots 15-25 cm. long, the upper sometimes equalling the panicle, slightly scabrous. Panicle 10-15 cm. long, loose, open, rays in clusters of three to five, 1-4 cm. long, flower-bearing nearly to the base. Spikelets 2-flowered besides a hairy pedicel 1.5 mm. long, first glume lanceolate, 4 mm. long, 1-nerved; second ovate-lanceolate, over 5 mm. long, 3-nerved; floral glume linear-lanceolate, bearing short hairs at the base, over 5 mm. long, obscurely 5-nerved, terminating in two slender setæ, the awn diverging when dry, 3-5 mm. long, starting two-thirds of the distance from the base; palea linear, 4.5 mm. long, 2-toothed.

This has been mistaken for an open-panicled form of *T. subspicatum*.

Colorado, *Vasey* for U. S. Dept. Agricul.

Colorado to New Mexico.

12. *T. cernuum* Trin. Mem. Acad. St. Petersb. (VI) 1: 61 (1831).
Avena cernua Kunth, Enum. Pl. 1: 306 (1833).

Culms slender, 30-90 cm. high, blades flat, 15-20 cm. long. Sheaths smooth or pubescent; blades flat, 15-20 cm. long, 5-10 mm. wide. Panicle very open, slender, nodding, 12-24 cm. long, rays in distant clusters, capillary. Spikelets 2-3- (rarely 4-) flowered, 6 mm. long or longer, rachilla bristly hairy; empty glumes much shorter than the florets, first lanceolate-subulate, 1-nerved, about 3 mm. long, second oval, abruptly pointed, over 4 mm. long; floral glume firm, scabrous, with a few hairs at the base, oval-lanceolate, obscurely 5-nerved, bearing a bent awn once or twice its length; palea short with two hispid keels. Grain 3 mm. long with a spongy hairy apex.

Washington, *Lake, Suksdorf* for U. S. Dept. Agricul. 425, *Sandberg*.

Var. *canescens* (Buckl.) *T. canescens* Buckl. Proc. Acad. Phila. 100 (1862). Gray in same 337.

Sheaths soft, pubescent, first empty glume lanceolate, 5 mm. long, about one-fourth shorter than the second.

Oregon, *Suksdorf* 154 for U. S. Dept. Agricul. 475.

Alaska to California.

13. *T. Virletii* Fourn. Hems. Biol. Centr. Am. Bot. 3: 556 (1880).

Culms hard, robust, often 2-3 m. high. Leaves scabrous, upper ligule lacerate-pilose, 5-7 mm. long, blades involute, long-pointed, the upper often extending to the top of the panicle. Panicle oblong, lax or closer, 30-40 cm. long, rays in fives to sevens, glabrous. Spikelets 3-4-flowered, 7-8 mm. long, oblong, the hairs half as long as the florets, first empty glume 4 mm. long, second 5 mm. long; floral glume oblong when spread, about 5 mm. long, erosely subacute, not toothed [4-toothed. Fourn.], the awn of all florets attached three-fourths the distance from base to apex, recurved, 3-4 mm. long; palea linear, nearly as long as its glume, with two sharp teeth or entire.

Mexico (Michoacan), *Pringle* 3979, "*Virletii* 1384, *Müll.* 651, *Bourg.* 1149, *Schaffn.*" Fourn.

Cool slopes of mountains near Potzcuaro.

14. *T. PRATENSE* Pers. Syn. 1: 97 (1805). *A. flavescens* L. Sp. Pl. 80 (1753). YELLOW OAT-GRASS.

An erect smooth glabrous perennial, 30-60 cm. high. Sheaths hairy; ligule truncate, ciliate; blades flat, narrow. Panicle open, oblong, 8-12 cm. long, with slender rays in half-whorls. Spikelets compressed, shining, often yellowish, 3-5-flowered, 5-7 mm. long; first empty glume 1-nerved, 4 mm. long, second 3-nerved, 4-7 mm. long; floral glume keeled, 2-cleft, 5-nerved, 4-6 mm. long, awn twisted, divergent, 4-7 mm. long, starting two-thirds the way from the base; palea a little shorter than its glume.

Found in Europe, northern Africa, some parts of Asia, and sparingly introduced into North America. In Great Britain it is cultivated in meadows and lawns. See Vol. 1, p. 191, Fig. 85, under *Avena flavescens*.

Vermont, *Hosford* 23, *Pringle*; Michigan, *Beal* 83.

15. *T. paniculatum* Fourn. Hemsl. Biol. Centr. Am. Bot. 3 : 556 (1880).

Culms erect, 90-120 cm. high. Blades of sterile shoots scabrous, involute, 10-20 cm. long, 3 mm. wide. Leaves of the culm scabrous, sheaths shorter than the internodes; ligule 1-2 mm. long; blades flat or involute, 20-30 cm. long, 3-5 mm. wide. Panicle linear or oblong, rather thin, 10-25 cm. long, rays in fives, the longest 5-10 cm. long, flower-bearing on the outer half. Spikelets 2-flowered, 5-6 mm. long, hairs on rachilla and florets 1 mm. or less in length, first empty glume 3.5-4.5 mm. long, second a little longer; floral glume oblong when spread, 4.3 mm. long, 4-toothed, the awns attached near the middle, 4-5 mm. long; palea as long as its glume.

Mexico, *Pringle* 4919, distributed as *T. paniculatum* Fourn. ?

Cool pine woods, at an altitude of 9500 feet.

78. (160). **AVENA** L. Sp. Pl. 79 (1753). *Elicotrichon* Bess. Andr. Rys. Botan. 1:9 (1823). *Helicotrichium* Bess. Reichb., Fl. Germ. Excurs. 140⁶ n. 352 (1832). *Heuffelia* Schur. Enum. Pl. Transs. 760 (1866).

Spikelets few-flowered, rarely 1-flowered, in a loose panicle; rachilla articulate above the 2 outer glumes, hairy under the floral glumes. Empty glumes scarious, at least at the apex, nearly equal, lanceolate; floral glumes smaller, rounded on the back, 5-11-nerved, 2-cleft at the top, bearing a long dorsal twisted awn, the terminal glume often small and empty; palea narrow, 2-toothed. Stamens 3. Styles short, distinct. Grain pubescent or hairy, rarely smooth, frequently adhering to the palea, deeply grooved.

There are 40 species of annuals or perennials, widely spread over the temperate and cooler regions of the world.

The genus has been divided into two sections which are quite clearly marked. By cultivation, probably, the dorsal awn of the common oat has been lost or much reduced.

A. *Avenastrum*. Perennial; spikelets erect or spreading.

Panicle small, narrow, spikelets with more than two perfect flowers; empty glumes 3-5-nerved. (a)

a. Exotic; awn as long as its glume starting one-third

the way down the back; may be looked for here. See *Trisetum flavescens*.

- a. Native; awn as long as its glume, starting near the base of the teeth. 1
- a. Native; awn starting near the middle and projecting above its glume. 2
- B. *Crithe*. Annual; spikelets heavy, hanging, each containing no more than two fertile flowers, and often only one, and the empty glumes 7-9-nerved.
 - b. Not cultivated for grain or forage. (c)
 - c. Floral glume having two or more bristles. . . . 3, 4
 - c. Floral glume not bristly-pointed. 5
 - b. Cultivated for grain. (d)
 - d. Floral glume firm, enclosing the grain. (e)
 - e. Panicle spreading in all directions. . . . 6, 7, 8
 - e. Panicle 1-sided. 9
 - d. Floral glume thin, not enclosing the grain; empty glumes much shorter than the spikelet. 10

1. **A. striata** Michx. Fl. Bor. Am. 1:73 (1803). *Trisetum purpurascens* Torr. Fl. U. S. 1:127 (1824).

A smooth glabrous slender tufted perennial, 30-100 cm. high. Ligule short; blades narrow, not numerous. Panicle simple, loose, 10-20 cm. long. Spikelets 1-1.5 cm. long, 3-6-flowered; empty glumes purple, lateral nerves obscure, first 3-nerved, 3-4 mm. long, second 5-nerved, about 7 mm. long; rachilla smooth, except the beards at the base of the florets; floral glume oval-lanceolate when spread, 7-nerved, 6-10 mm. long; awn slightly twisted and bent, springing from near the base of the teeth, as long as its glume; palea rather firm, 5-6 mm. long, 2-toothed, keels short-ciliate.

New Hampshire (White Mountains), *D. C. Eaton, Faxon* 15, *Oakes*; Vermont, *Pringle*; Canada, *Fowler, J. Macoun* 2241; Michigan, *Farwell, Wood, Robbins, Beal, Clark* 2626; Minnesota, *Sandberg*; Rocky Mountains, *Hall & Harbour* 623; Yellowstone Park, *Tweedy*; Montana, *Williams, Canby & Scribner* 371; Oregon, *Howell*.

New England, New York, Michigan and northwestward.

2. **A. Hookeri** Scribn. Hack. True Grasses 123 (1890). *A. verticillata* Hook. Fl. Bor. Am. 2: (1840), not Vill. *A. pratensis* L. var. *Americana* Scribn. Coult. Bot. Gaz. 11: 177 (1886).

An erect smooth perennial, 30–40 cm. high. Ligule ovate, acute; blades narrow, 5–20 cm. long. Panicle simple, 8 cm. long, 2 cm. broad. Spikelets erect, shining, 4–5-flowered; empty glumes lanceolate, subequal, 3-nerved, scarious above, about as long as the spikelet; floral glume lanceolate or oval-lanceolate, 12 cm. long, lower part scabrid, the upper scarious, 5-nerved, awn near the middle, reaching 1 cm. above its glume; upper florets gradually shorter; palea oblanceolate, two-thirds as long as its glume, keels ciliate.

Montana, *Scribner, Williams* 581; Yellowstone Park, *Tweedy*; Saskatchewan, *Bourgeau*; N. Trans. Cont. Surv., *Canby & Scribner* 372.

Montana and British America.

3. **A. BARBATA** Brot. Flor. Lusit. 1: 108 (1804). *A. hirsuta* Roth. Cat. 3: 19 (1806). *A. atheranthera* Presl. Cyp. et Gram. Sic. 30 (1826). *A. fatua* Viv. Fl. Lib. Spec. 6 (1824). *A. segetalis* Bianca, Nym. Consp. 810 (1878). *A. sesquiteria* Hort. Steud. Nom. Ed. 1: 95 (1821).

An erect glabrous annual, 60–100 cm. high. Leaf-blades scabrous, flat, 4–25 cm. long, 3–7 mm. wide. Panicle loose, 20–30 cm. long, with unequal filiform pedicels. Spikelets 2-flowered, narrow, drooping; empty glumes oval-lanceolate, subequal, about 2.5 cm. long, 9-nerved; floral glume membranous, lanceolate, 2.3 cm. long (including 2 slender teeth), 5 mm. wide, 7-nerved, hairy below, some of them 5 mm. long, awn starting near the middle, 2–4 cm. long, with several firm twists, abruptly bent near the middle; palea oblanceolate, 13 mm. long, 2 mm. wide, the nerves clothed with very short diverging hairs. Much like *A. fatua*, from which it differs in having a floral glume thinner, narrower, a little shorter, 7-nerved, with two shorter teeth, hairs on the back longer and more numerous.

Lower California, *Palmer* 668.

Introduced into Southern California.

4. **A. STERILIS** L. Sp. Ed. 2: 118 (1762). ANIMATED OATS. *A.*

affinis Bernh. Steud. Nom. Ed. 2, 1: 171, 173 (1840-1). *A. ludoviciana* Dur. Bull. Soc. Linn. Bord. 20: 41 (1855). *A. macrocarpa* Moench. Meth. 196 (1794). *A. fatua* Schreb. Berchr. Graes. 109, t. 15 (1769). *A. nutans* St. Lag. Rech. Hist. Cf. Bull. Soc. Bot. Fr. 31: Bibl. 201 (1884). *A. syriaca* Boiss. & Bal. Boiss. Fl. Orient. 5: 542 (1867).

A slender annual, 60-120 cm. high, bearing a narrow panicle of a few nodding spikelets. Spikelets 2- or more-flowered, 2.5-3 cm. long; empty glumes 9- and 11-nerved respectively; floral glume of the lower floret 2.5 cm. long, extending into 2-3 slender teeth, glume clothed on the lower half with numerous long bristles, awn 6 cm. long, stout, lower half brown and twisted. There are varieties differing from the above description in several respects.

A native of Barbary, sometimes cultivated as a curiosity. When moistened, the long awns slowly turn around till straight; in this way the spikelets move about. Said also to be used as an artificial fly as a bait for fish.

5. *A. STRIGOSA* Schreb. Spic. 52. *A. agraria* Brot. Fl. Lusit. 1: 105 (1804). *A. agraria-mutica* l. c. 106 (1804). *A. agraria-sesquialtera* l. c. *A. alta* Cav. R. & S. Syst. 2: 691 (1817). *A. arduensis* Lej. Steud. Nom. Ed. 2, 1: 171 (1840-1). *A. hispanica* Hort. R. & S. Syst. 2: 691 (1817). *A. nervosa* Lam. Ill. n. 1115 (1791).

Spikelets 2-flowered; empty glumes 7-9-nerved; floral glume and pedicels glabrous. Smaller and more slender than *A. fatua*; leaves sometimes hairy; panicle unilateral, rays fewer; floral glume more deeply bifid, segment awned.

Found in similar places with *A. fatua*. Description mainly taken from Hooker's Flora of the British Islands. By Hooker and some others it is considered a mere variety of *A. fatua*.

Not yet known in North America, but may be looked for. Here mentioned because some consider it the parent form of our cultivated oats.

6. *A. FATUA* L. Sp. 80 (1753). WILD OATS. *A. ambigua* Schoenb. Nym. Consp. 810 (1878). *A. hybrida* Peterm. Reichb. Fl. Saxon. 17 (1846-49). *A. intermedia* Lindgren, Bot. Notiser.

151 (1841). *A. lanuginosa* Gilib. Exercit. 2: 539 (1766). *A. sterilis* Delile, Boiss. Fl. Orient. 5: 543 (1867).

An erect glabrous annual, 60–100 cm. high. Leaf-blades flat, long and broad, scabrous. Panicle 20–35 cm. long, loose, with filiform unequal pedicels. Spikelets 2–3-flowered, drooping; empty glumes ovate-lanceolate, about 2.5 cm. long, with 9 prominent nerves; floral glume 9-nerved, firm, rough, brown, thinly hairy, the longest glume less than 2 cm. long, 7 mm. wide, awn from near the middle 2–4 cm. long, with several firm twists, abruptly bent near the middle; palea 14 mm. long, 3 mm. wide, the nerves clothed with very short diverging hairs. Grain hairy, much like that of *A. barbata*, which see.

We have this species from Minnesota, Oregon, California, where it has been introduced. It is probably native to the eastern Mediterranean region and is a weed in cultivated fields of Europe, Australia, South America. In California it is often cut while young for making hay. The late Professor J. Buckman of England continued experiments from 1851 to 1860 and succeeded in inducing this species to so change, that he obtained what were called good samples of two sorts of oats, the *Potato* and the *Tartarian*.

From this we conclude that our cultivated races of oats have descended from *A. fatua*.

7. *A. SATIVA* L. Sp. Pl. 79 (1753). COMMON OATS. *A. anglica* Hort. R. & S. Syst. 2: 669 (1817). *A. dispermis* Mill. Gard. Dict. Ed. 8, n. 1 (1768). *A. fusca* Ard. Saggi Acc. Padov. 2: t. 4 (1789). *A. Georgiana* R. & S. Syst. 2: 669 (1817). *A. georgica* Zuccag. Roem. Collect. 126. *A. trisperma* Auct. R. & S. Syst. 2: 669 (1817). *A. cinerea* Auct. R. & S. Syst. 2: 669 (1817). *A. flava* Hort. R. & S. Syst. 2: 669 (1817). *A. rubra* Zuccagni, Roem. Collect. 126.

A stout annual, 60–120 cm. high. Panicle 20–30 cm. long, erect, spreading equally in all directions. Spikelets 2–3-flowered, nodding, empty glumes 9–11-nerved, 2–2.5 cm. long; floral glume 7-nerved, about 2 cm. long, nearly destitute of hairs, light or dark colored, awn short or none.

This form is found only in cultivation in the temperate regions of the world. See *A. fatua* for a reference to experiments showing that common oats have been or may be derived from that species. By cultivation and selection the grain has become larger, the awns removed or much reduced, the hairs have left the florets, which are often light in color.

8. *A. BREVIS* Roth, Tent. Fl. Germ. 1:40 (1788).

A smaller species or race, with short spikelets, about 13 mm. long, cultivated in mountainous districts of Europe, where the seasons are cool and short.

9. *A. ORIENTALIS* Schreb. Spicil. 52. TARTARIAN OATS. *A. tartarica* Ard. Saggi Acc. Padov. 2: t. 1, 101 (1789). *A. unilateralis* Brouss. ex R. & S. Syst. 2:669 (1817).

This name is often applied to cultivated oats in which the panicle is narrow and the spikelets turned to one side.

10. *A. NUDA* L. Amoen. Acad. 3:40 (1759). *A. Chinensis* Fisch. R. & S. Syst. 2:669 (1817). BOHEMIAN OATS. NAKED OATS. PILCORN.

A smooth annual about 60 cm. high. Panicle 20-40 cm. long, erect, spreading mainly in one direction. Spikelets 2-5-flowered, the 2 lower florets separated 5-6 mm. by a long smooth internode of the rachilla; empty glumes about 2 cm. long, 9- and 11-nerved respectively, much shorter than the spikelet; floral glume membranous (not firm), 13-nerved, over 2 cm. long, often leaving the ripened grain, awnless or with a short awn; palea 1.3 mm. long, 2-toothed, finely ciliate on the nerves. Grain hairy, easily escaping from the ripe floral glume and palea.

This is cultivated in China, and was at one time occasionally raised in gardens as a curiosity. Numerous cases of swindling were practiced by selling these oats to farmers of the northern United States about 1885-8.

79. (163). *ARRHENATHERUM* Beauv. Agrost. 55, t. 11, f. 5 (1812).

Spikelets 2-flowered, in loose panicles, the lower floret staminate, the upper perfect or pistillate, rachilla hairy, articulate below the lower flower and produced into a short point or bristle above

the upper one. Empty glumes unequal, persistent, acute, keeled, thinly scarious on the margins; floral glume thinly scarious, 5-7-nerved, apex slightly dentate, the lower enclosing a staminate flower, with a dorsal twisted awn attached near the base, the upper unawned or with a minute awn near the apex of the glume, or with a dorsal, twisted awn; palea hyaline, prominently 2-nerved. Stamens 3. Stigmas sessile. Grain ovoid, enclosed in the glume and palea, but not adhering. Seed not furrowed.

Tall perennial grasses with flat leaf-blades. Panicle erect, often 1-sided.

Species 3, found in Europe, northern Africa, and the cooler parts of Asia.

This genus is often included in *Avena*, but differs from it in having the lower flower staminate and the upper fertile.

1. *A. ELATIOR* (L.) Beauv.; M. & K. Deutsch. Fl. 1:546 (1823). TALL OAT-GRASS. *Avena elatior* L. Sp. Pl. 79 (1753). *Avena tuberosa* Gilib. Exercit. 2:538 (1766). *Avena secunda* Salisb. Prod. 22 (1796). *Avena bulbosa* Willd. Ges. Naturf. Fr. Berl. Neue Schr. 2:116 (1799). *Arrhenatherum avenaceum* Beauv. Agrost. 152 (1812), name only. *Arrhenatherum precatatorium* Beauv. Agrost. 56 (1812). *Arrhenatherum bulbosum* Presl, Cyp. et. Gram. Sic. 29 (1826). *Arrhenatherum palestinum* Boiss. Diagn. (I.) 13:51 (1842-59). *Arrhenatherum biaristatum* Peterm. Fl. Lips. Excurs. 106 (1846). *Arrhenatherum asperum* Opiz, in Lotos, 3:65 (1853). *Arrhenatherum cechicum* Opiz, in Lotos, 3:66 (1853). *Arrhenatherum exserens* l. c. 65 (1853). *Arrhenatherum zavadilianum* Opiz. Lotos, 3:66 (1853).

An erect tufted grass, 60-120 cm. or more high. Leaf-blades few and flaccid. Panicle narrow and loose, 15-20 cm. long, 3 cm. broad. Spikelets 8-10 mm. long, second glume nearly as long as the floral ones, the outer one shorter; lower floral glume 5-7-nerved, awn about twice as long as its glume, floral glume of the upper floret usually 7-nerved. Grain pubescent.

For a full account of its economic value consult Vol. 1, p. 121, Fig. 64.

In the forms introduced into this country the bulb (or corm

more properly) is much reduced. Herbarium specimens from Europe, when dry, show 3 corms, in all 2.5–3 cm. long, 1–1.5 cm. wide.

80. (164). **TRISTACHYA** Nees, *Agrost. Bras.* 458. (1829). *Monopogon* Presl. *Rel. Hænk.* 1:324 (1830).

Spikelets 2-flowered, collected in threes, sessile or raised on short subequal pedicels at the ends of the branches of the panicles; rachilla hairy, not extending above the upper flower, the lower one male, the upper perfect or female. Empty glumes 2, slightly unequal, persistent, membranous, awnless, glabrous or the outer ciliate, floral glume of the lower spikelet membranous, awnless, that of the upper bifid bearing a long twisted awn between the teeth of the apex; palea enclosed by the floral glume, membranous, 2-nerved. Lodicules 2. Stamens 2 or 3. Styles distinct, very slender. Grain oblong or linear, enclosed, but not adherent.

Perennials or rarely annuals, usually firm, blades flat or convolute. Panicle loose, spikelets few and large, erect or nodding or smaller and more numerous.

There are eight species, two American; the others are found in tropical Africa, Australia, or western Asia.

Here the lower flower is staminate as in *Arrhenatherum*; spikelets always 3 together, sessile or equally pedicellate, the long twisted awn of the floral glume terminal and between two lobes or the awns straight.



FIG. 67.—*Tristachya Mexicana*. A, spikelet; a, floret. (Richardson.)

1. **T. leiostachya** Nees, *Agrost. Bras.* 459 (1829). *T. Mexicana* Kunth, *Enum. Pl.* 1:308 (1833). *Monopogon avenaceus* Presl, *Rel. Hænk.* 1:325, *t.* 44 (1830).

An erect glabrous perennial, 30–40 cm. high. Leaf-blades flat, 5 mm. wide, the upper blade 8 cm. long. Panicle simple, narrow, 20 cm. long. Empty glumes with three prominent nerves, tips scarious, first 2.5 cm. long, second 3 cm. long, 3 mm. wide;

floral glume of lower floret about 3 cm. long, 3 cm. wide, smooth, with 3 prominent and 2 obscure nerves; palea less than 1.5 cm. long; floral glume of upper floret about 1 cm. long, with an awn 8 cm. long, the lower half of which is twisted; palea shorter than its glume, firm, 2-nerved.

A careful comparison of the original description of both species, and the cuts in Presl, shows this to be correctly identified as above.

Mexico, *Palmer* 304.

81. (167). **DANTHONIA** DC. Fl. Fr. 3:32 (1805) in part. *Pentameris* Beauv. Agrost. 92 (1812). *Merathrepta* Rafin. Ser. Bull. Bot. 1:221 (1830). *Chætobromus* Nees, Lindl., Introd. Nat. Syst. ed. 2, 449 (1836). *Streblochæte* Hochst. Pl. Schimp. Abyss. n. 412 (1835?). *Triraphis* Nees, Pl. Afr. Austr. 270 (1841). *Monachather* Steud. Syn. Gram. 247 (1855). *Plinthanthesis* Steud. l. c. 14 (1855). *Crinipes* Hochst. Flora, 38:279 (1855).

Spikelets several-flowered, pedicellate or rarely almost sessile, in a panicle either loose or reduced to a single raceme, rachilla articulate above the outer glume, hairy, extending above the flowers. Empty glumes 2, narrow, keeled, acute, unawned, persistent, 3-7-nerved, rarely 1-nerved, usually as long as the spikelet; floral glume convex on the back, 7-9-nerved, with two firm or scarious terminal lobes more or less 1- or 3-nerved, at least at the base, and a twisted and bent awn between them; palea broad, as long as the entire part of the glume or usually longer, obtuse or 2-pointed. Stamens 3. Styles distinct. Grain varying in shape, enclosed, glabrous, but not adherent.

Perennials or rarely annuals, varying in habit.

Species about 100, widely dispersed in temperate regions of both hemispheres, with a few tropical species, especially abundant in south Africa.

This large genus is polymorphous, but all species are characterized by the spikelets containing three or more perfect flowers; the terminal awn of the floral glume more or less twisted, usually flattened at the base, often 1-2 teeth each side of the awn. No good

natural sections have yet been proposed. Among the synonyms above are several which some one or more persons have proposed as generic names for one or more species of *Danthonia*.

- A. Floral glume clothed with numerous long silky hairs. . . 1
 - B. Floral glume with few silky hairs. (a)
 - a. Empty glumes 5-7-nerved. 2
 - a. Empty glumes 8-9-nerved. 3
 - a. Empty glumes 3-5-nerved. (b)
 - b. Leaf-blades short, the lower curly. 4
 - b. Leaf-blades long, not curly. 5, 6
1. **D. sericea** Nutt. Gen. 1: 71 (1818).

Culms not tufted, 30-100 cm. long. Sheaths silky hairy; blades narrow, often 30 cm. long. Panicle narrow, 4-12 cm. long. Spikelets 7-flowered, empty glumes nearly equal, 17 mm. long, 5-6-nerved, much exceeding the florets; floral glume 6 mm. long to the base of the teeth, which are over half as long, conspicuously hairy, especially near the margins; awns about 14 mm. long, flat and brown at the base, twisted two to three times; palea shorter, 4-5 mm. long.

Massachusetts, *J. W. Robbins*; New Jersey, *Parker* for Scribner 3542; South Carolina, *Canby*; Florida, *Curtiss* 3542.

Dry soil, New England to Florida, Colorado and California.

2. **D. Californica** Boland. Proc. Calif. Acad. 2: 182 (1863).

Culms sometimes decumbent, 20-100 cm. high. Sheaths sparingly hairy; blades smooth, narrow, involute, 3-10 cm. long. Raceme simple, of 3-10 spikelets. Spikelets broad, 5-10-flowered, on pedicels of their own length; empty glumes nearly equal, 1.5-2.5 cm. long, reaching as far as the florets, 5-7-nerved, cross-veins conspicuous under a lens; floral glume broad, firm, shining, hairy near the margins, about 9 mm. long to base of the teeth, which are one-third as long, 9-nerved; awn brown at the base, about 1 cm. long, and twisted once around; palea reaching nearly to the base of the teeth on the floral glumes, obtuse, with many short spreading hairs on the nerves. Grain oblong, flattened, concave, 4 mm. long.

Montana, *Watson* 452; California, *Bolander* 10, *Howell* 363, *Hall* 660, *Kellogg* 1106.

Rocky Mountains, Washington, California.

Var. *unispicata* (Munro). *D. unispicata* Munro, Vasey, Cat. Gr. 59 (1885).

Culms 10–20 cm. high, densely tufted. Leaves silky hairy, the hairs on the sheaths coming from white papillæ. Spikelets usually solitary and terminal.

Dr. Thurber in Bot. Calif. say this occurs with the species sometimes coming from the same tufts.

California, *Tweedy* 596; *Howell, Lemmon* 467, *Parish* 1785, N. Trans. Cont. Surv. *Canby & Scribner* 347.

3. *D. Mexicana* Scribn. Proc. Phila. Acad. 301 (1891).

Culms 60–90 cm. high, erect, firm, scaberulous. Ligule acute, 3 mm. long; blades of sterile shoots numerous, firm, erect, scaberulous, convolute, 20–30 cm. long, those of the culm 3, the upper 10–12 cm. long. Panicle spikelike, strict, 15–22 cm. long, the lowest rays rather remote, bearing 1–3 spikelets. Spikelets 3–4-flowered, purple, about 15 mm. long; empty glumes elliptical-lanceolate, 8–9-nerved, first 9 mm. long, second a little longer; floral glume 7–9-nerved, silky hairy below, 5 mm. long to base of teeth, which are 5 mm. long, awn 1–1.4 cm. long; palea extending to the middle of the teeth of its glume.

Ovary 3 mm. long, with a pubescent cushion-like summit.

Mexico, *Pringle* 3279, limestone ledges in September.

4. *D. spicata* R. & S. Syst. 2: 690 (1817). *A. glumosa* Beauv. Agrost. 92 (1812).

Culms tufted, 30–60 cm. high. Leaf-blades short, narrow, involute, the lower ones curly, sparingly silky hairy. Simple panicle or raceme 2–6 cm. long. Spikelets 4–7-flowered, empty glumes



FIG. 68.—*Danthonia spicata*. A, spikelet; c, grain and palea. (Scribner.)

3-nerved (or with 4–5 obscure nerves), first 10–12 cm. long, second a little shorter; floral glume about 3 mm. long to the teeth, which are half as long or longer, lower floral glume 7-nerved, awn flat,

brown, 5-8 mm. long, twisted two to three times around; palea broad, less than 3 mm. long. Flowers sometimes cleistogamous, as discovered by C. G. Pringle. See Am. Jour. Sci. p. 71, Jan. 1878.

Vermont, *Pringle*; Massachusetts, *Beal* 85; New York, *Clinton* for Clark 1417; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 493; Michigan, *Cooley*, *Beal* 84, *Wood*, *Wheeler*, *Farwell*; Minnesota, *Bailey* 12.

New England to Minnesota and Texas, dry sterile soil.

5. *D. compressa* Austin. Peck in 22d Rept. Reg. N. Y. State Univ. 54 (1869). *D. Alleni* Austin, Bull. Torr. Club, 3: 21 (1872).

Culms tufted, slender, 10-20 cm. high. Sheaths naked, with silky hairs at the throat; blades narrow, long, the lower ones often reaching to the panicle. Spikelets about 10, in a narrow panicle, 5-7-flowered, empty glumes equal, reaching to the top of the florets, 10-11 mm. long, 5-nerved; floral glume broad, 7-nerved, over 3 mm. long, silky hairy on the back and near the base and margins, teeth 3-4 mm. long with an awn twice its length, making two turns; palea broad, reaching to the base of the teeth of its glume, obtuse, with numerous fine short hairs on the nerves.

Vermont, *Pringle*; North Carolina (Roan Mt.), *Scribn.*, 490, *Curtiss* 3541*.

Found with *D. spicata* in the mountains of North Carolina.

New England, New York, Pennsylvania, mountains of North Carolina.

Very likely this has been confused with the former species in other localities.

6. *D. intermedia* Vasey, Bull. Torr. Club, 10: 52 (1883).

Culms 30-50 cm. high, leafy below; ligule a hairy ring; blades of sterile shoots 15-25 cm. long, narrow. Panicle narrow, dense, about 4 cm. long. Spikelets 5-flowered; empty glumes broad, nearly equal, 12 cm. long, 5-nerved, with cross veins; floral glume 7-nerved, 5-6 mm. to base of teeth, which are 1-1.5 mm. long, smooth on the back, silky hairy near the margins; palea reaching to near the middle of the teeth of its glume, 2-toothed. Grain 2.5 mm. long, flattened, obovate.

U. S. Dept. Agricul. 491; *Nor. Trans. Surv., Canby & Scribner;* *Brandegee* 375, 1179; *Yellowstone Park, Tweedy* 597, 1070 in part.

Lower Canada to Rocky Mountains, British America to Oregon, California.

TRIBE X.—CHLORIDEÆ.

Spikelets 1- to several-flowered, sessile or nearly so in two rows on the outer side of a rachis that is neither notched nor articulate. Spikes usually several and often digitate. The inflorescence resembles that of *Paspalum*; the spikelets those of *Festuceæ*. The awns when present are terminal and straight; palea 2-nerved; grain not adherent, unfurrowed.

- A. One or more perfect flowers in each spikelet. (a)
 - a. One perfect flower (very rarely two) in each spikelet. . (b)
 - b. No sterile glumes, and only rarely a prolongation of the rachilla above the single flower. (c)
 - c. Spike single, terminal, floral glume shorter than the 1-nerved empty glumes; perennial. 82
 - c. Spikes 2-6, digitate; perennial. 83
 - c. Spikes 3-10, recurved, floral glume longer than the 1-nerved empty glumes. 89
 - c. Spikes 3-30, racemose, straight, spikelets falling from the rachis entire when mature. . . . 84
 - b. One or more sterile glumes (very rarely a sterile flower) above the perfect flower. (d)
 - d. Spikes 1-2, terminal, usually curved, pectinate. 85
 - d. Spikes 1-20, digitate, nearly straight, not pectinate, floral glume with 1 awn or awnless. . . . 86
 - d. Spikes 15-30 in approximate whorls or digitate, straight, floral glumes with 3 awns. 87
 - d. Spikes 10-30, remote, racemose, straight, slender, spikelets remote. 88
 - d. Spikes few to many, racemes remote, straight or curved, often pectinate, spikelets crowded. . 90

- d. Spikes numerous, erect, racemose; spikelets deciduous as a whole, empty glumes 2, inflated. 91
- a. Two to three perfect flowers in each spikelet. (e)
- e. Spikes digitate, rarely somewhat scattered, spikelets crowded. 92
- e. Spikes remote, paniculate, spikelets remote. 93
- e. Spikes numerous, erect, racemose; spikelets deciduous as a whole, empty glumes 2, inflated; exotic plants have more than 1 flower to the spikelet, our variety has only one. 91
- B. Plants diœcious, rarely monœcious, the two sorts of spikelets very unlike. (m)
- m. Staminate spikelets 2-3-flowered. 94
- m. Staminate spikelets 1-flowered. 95
- C. Plants monœcious, spikelets 1-2 in each spike, accompanied by 1-4 awnlike rudiments, 2-flowered, resembling some species of *Bouteloua*. 96
82. (168). **MICROCHLOA** R. Br. Prod. 1:208 (1810).

Spikelets 1-flowered, awnless, sessile in two rows on one side of a simple slender spike, the rachilla articulate above the outer glumes, and not produced beyond the floret. Empty glumes 2, linear, membranous, nearly equal, persistent, the lower flat with a prominent nerve, the second keeled; floral glume shorter, broader, hyaline; palea nearly as long, narrow, with approximate keels, often ciliate. Stamens 3 (or 2?). Styles distinct. Grain smooth, enclosed, but not adherent. Slender tufted grasses, with firm narrow convolute leaf-blades. The very thin and reduced floral glume and palea connect it with *Andropogoneæ*, but the articulation of the spikelet is above, not below, the outer glumes.

Three species are known in tropical and subtropical regions of the eastern and western hemispheres.

1. **M. setacea** R. Br. l. c.

A slender tufted perennial, 10-18 cm. high. Leaf-blades filiform, ciliate at the throat, the upper 1 cm. long, more or less. Spike 3-8 cm. long, very slender, with the rachis curved towards the spikelets. Spikelets about 2.5 mm. long, appressed to the

rachis, overlapping for about one-half their length; empty glumes narrow, each with one broad nerve; floral glume hyaline, oval, silky hairy, about 1.5 mm. long, 3-nerved; palea as long as its glume, hairy on the keels. Grain oblong, smooth.

Mexico, *Pringle* 425, *Dr. Palmer* 198, 616, *Schaffner* 100.

It has also the range of the genus.

A tiny perennial tuft, not rare on plains in Mexico, enjoying the attention of close-nibbling goats.

83. (170). **CAPRIOLA** Adans. Fam. 2:31 (1763.) *Dactilon* Vill. Hist. Pl. Dauph. 2:69 (1787). *Fibichia* Kœl. Gram. Gall. et Germ. 308 (1802). *Cynodon* Rich.; Pers. Syn. 1:85 (1805).

Spikelets 1-flowered, awnless, singly sessile in 2 rows on one side of slender spikes, digitate at the end of the peduncle, rachilla articulate immediately above the outer glumes, and either not produced beyond the floret or continued into a minute point behind the palea. Empty glumes keeled, persistent, or deciduous; floral glume broader, boat-shaped, with a prominent keel; palea narrow or rather broad, the nerves prominent, distinct or closely contiguous. Stamens 3. Styles distinct, stigmas clothed with short hairs. Grain oblong, smooth, enclosed by the glume and palea, but not adherent.

Perennials; tufted, creeping or stoloniferous, with short or rarely long, narrow, flat leaf-blades.

There are four species found in warm regions.

The genus has the slender spikes and small spikelets of *Microchloa*, but the spikes are several and digitate and the rachilla is produced beyond the rachis into a small joint or bristle.

1. *C. DACTYLON* (L.) Kuntze, Rev. Gen. Pl. 764 (1891).

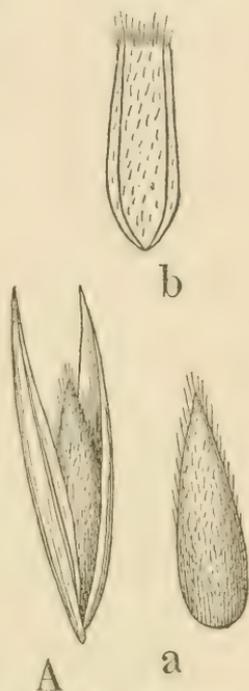


FIG. 69.—*Microchloa setacea* A, spikelet; a, floral glume; b, palea. (After Doell.)

BERMUD GRASS. *Panicum Dactylon* L. Sp. Pl. 58 (1753). *Cynodon Dactylon* Pers. Syn. 1: 85 (1805). *Cynodon repens* Dulac. Fl. Hautes-Pyr. 76. *Cynodon stellatus* Willd. Hort. Berol. 90.

Culms 10–30 cm. high, from hard rootstocks. Ligule and sometimes sheaths ciliate; blades 3–8 cm. long. Spikes 3–5 in number, 3–4 cm. long. Spikelets closely imbricated; empty glumes ovate-lanceolate, nearly equal, about 1.5 mm. long, membranous except the single nerve; floret narrowly oval, 2 mm. long; floral glume compressed, 1-nerved; palea longer than its glume, 0.7 mm. wide when spread, with the nerves close together. Stigmas 1.5 mm. long, the upper half feathery. Rachilla produced into a point or bristle, often minute.

New Jersey, *Scribner* for U. S. Dept. Agricul. 495; Philadelphia, *Canby* for Dr. Clark; North Carolina, *McCarthy*; Florida, *Curtiss* 3446; Michigan, *Beal* 86; California, *Jones*.

Naturalized and cultivated, seldom seeding. For a further account see Vol. 1, p. 163, Fig. 75.

84. (19). **SPARTINA** Schreb. Gen. Pl. 43 (1789). CORD-OR MARSH-GRASS. *Trachynotia* Michx. Fl. Bor. Am. 1: 63 (1803).

Spikelets 1-flowered, flattened, subsessile, articulate with the pedicels, arranged in rows on two sides of a triangular rachis. Empty glumes compressed-keeled, unequal, acute or bristle-pointed; floral glume as long as the second empty glume or shorter, or longer and wider; palea slender, longer than its glume, or equal to it, almost hyaline. Stamens 3. Styles long, more or less united. Grain included, but not adherent.

Perennials, often maritime, with creeping rootstocks, and simple culms. Sheaths smooth; blades long and tough, soon involute; spikes forming an erect racemose panicle, rachis extending beyond the base of the upper spikelet.

There are 5 or 6 species and many varieties widely dispersed in America, Europe, and Africa.

Spartina has usually been placed among Chlorideæ. Bentham places it in Paniceæ, saying: "The spikelets, themselves containing a single terminal flower, and the articulation of their pedicels, are quite those of Paniceæ, not of Chlorideæ."

Prof. Scribner protests against this transfer of *Spartina*, giving his reasons in Bull. Torr. Club, 10: 85 (1883).

- a. Spikes 1-3 cm. long, 25-30, in a dense spike. 1
- a. Spikes 2-4 cm. long, 30-50, closely imbricated. 6
- a. Spikes 2-7 cm. long, 3-8 in an uninterrupted spike. 5
- a. Spikes 3-5 cm. long, blades narrow, 10-30 cm. long. (b)
- b. Spikes 4-5, slightly imbricated, glumes hispid-serrulate. 3
- b. Spikes 4-10, slightly imbricated, glumes ciliate-hispid. 4
- a. Spikes 5-10 cm. long, 5-20 in a loose raceme, blades 60-100 cm. long. 2
- a. Spikes 5-10 cm. long, 20-50 in a close raceme. var. of 2

1. *S. densiflora* Brongn. Duperrey, Itin. Bot. 14. *S. Gouini* Fourn. Hems. Biol. Centr. Am. Bot. 3: 509 (1880).

A glabrous perennial; culms nearly solid, 90 cm. high. Sterile shoots numerous, blades rigid, involute, pungent-pointed, 30-45 cm. long, 1-1.5 mm. diam., leaves of the culm 3; ligule a mere ring; the upper blade 3-6 cm. long. Spikes 1-3 cm. long; 25-30 in a close spikelike raceme. Spikelets linear, hispid on the keels, first glume linear, 1-nerved, 3.5 mm. long, second linear-lanceolate when spread, 1-nerved, about 5 mm. long, mucronate; floral glume linear, obtuse or emarginate, 1-nerved, 5.5 mm. long; palea a little longer than its glume.

Mexico (San Luis Potosi), *Pringle* 3760.

Alkaline meadows.

2. *S. cynosuroides* (L.) Willd Enum. 80 (1809). *Dactylis cynosuroides* L. Sp. Pl. 71 (1753).

FRESH-WATER CORD-GRASS.

Culms rather slender, 60-180 cm. high. Leaf-blades rough on the margins, involute, the apex long pointed, 60-120 cm. long, 7-15 mm. wide. Spikes 5-20, in a loose raceme, rachis hispid on 2 angles. Spikelets elliptical-lanceolate, hispid on the keels, first glume elliptical-lanceolate, 1-nerved,

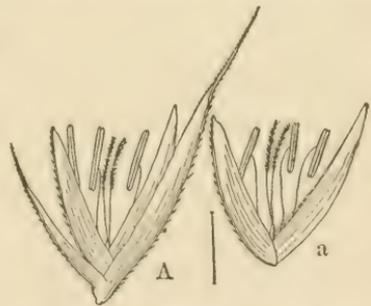


FIG. 70. — *Spartina cynosuroides*. A, spikelet; a, floret. (Richardson.)

about 10 mm. long, besides the short awn, second incurved, lanceolate, 4-6 mm. long; floral glume incurved, 1-nerved, hispid on the keel, obtuse, retuse or bifid, 6-8 mm. long; palea ovate-lanceolate, obtuse, 2-nerved.

“Certainly distinct from the next (*S. polystachya*), to which in strictness the Linnæan name belongs.” A. Gray, Man. Ed. 1: 586 (1848). “The characters based upon the spikelets alone are not sufficient to separate them.” Scribn. Bull. Torr. Club, 10: 85 (1883). See illustrated article in which Scribn gives reasons for his conclusions. Prof. S. considers *S. polystachya* only a variety of this species, and in my opinion his reasons are good.

Vermont, *Pringle*; Rhode Island, *Tweedy* for U. S. Dept. Agricul., 24; Canada, *Fowler*; Michigan, *Clark* 1294, 1376; Illinois, *Beal* 87; Montana, *Anderson*; Colorado, *Cassidy*; Oregon, *Howell*.

Found along banks of rivers and lakes, from New England to the Rocky Mountains. The hard leaves have been manufactured into paper.

Var. *polystachya* (Michx.) Scribn. Bull. Torr. Club, 10: 86 (1883). *Trachynotia polystachya* Michx. Fl. Bor. Am. 1: 64 (1803). SALT REED-GRASS.

Culms stout, 120-250 cm. high. Blades 60 cm. or more long, 15-25 mm. wide. Spikes 20-50 in number, 5-10 cm. long. Otherwise like *S. cynosuroides* Willd., of which it is likely only a variety. See notes on the species.

Salt or brackish marshes, near the eastern coast.

Delaware, *Canby* for Clark 1912; North Carolina, *McCarthy*; Florida, *Curtiss* 3433; Mississippi, *Tracy*.

3. *S. patens* (Ait.) Muhl. Gram. 55 (1817). *Dactylis patens* Ait. Hort. Kew. 1: 104 (1789). *S. juncea* Ell. Bot. S. C. & Ga. 1: 94 (1817). *Trachynotia juncea* Michx. Fl. Bor. Am. 1: 64 (1803). RUSH SALT-GRASS.

Culms slender, 30-60 cm. high. Leaf-blades smooth, narrow, rushlike, 6-16 cm. long. Spikes usually 4-5 in number, 3-5 cm. long, slightly imbricated, erect or spreading, on peduncles 3 mm. long or nearly sessile, rachis smooth, or hispidulous towards the apex. Spikelets oblong-linear, 6-8 mm. long, empty glumes hispid-serru-

late on the keel, first recurved, linear, mucronate, 3-3.5 mm. long, second linear-lanceolate with 2 nerves on one side of the keel, 6-9 mm. long; floral glume nearly smooth on the 1-nerved keel, emarginate 5-5.5 mm. long; palea oval, 0.5-0.7 mm. longer than its glume.

Very variable and often much like *S. gracilis*. The glumes are not so hispid on the keels; there is a greater difference between the length of the first and second glumes, and the palea when detached is still longer than its glume; culms more slender, and blades smaller and harder.

Vermont, *Pringle*; Massachusetts, *Sturtevant*, *Beal* 87; New Jersey, *Brinton* for U. S. Dept. Agricul. 126; Delaware, *Canby* for Clark 1913; North Carolina, *McCarthy*; Mississippi, *Tracy*.

Abundant on the salt marshes of the Atlantic coast, where it is cut and cured as "salt hay."

U. S. Dept. Agricul. 126 from *Brinton* in 1881.

4. *S. gracilis* Trin. Mem. Acad. St. Petersburg. (6) 5 (1840). *S. junceiformis* Engelm. & Gray, Bost. Journ. Nat. Hist. 5: 238 (1845).

Culms 30-90 cm. high. Leaf-blades rough above, very smooth below, 6-30 cm. long. Spikes 4-10 in number, nearly sessile, 2-5 cm. long, appressed, slightly imbricate. Spikelets elliptical or linear-oblong, 6.5-9 mm. long; empty glumes ciliate-hispid on the keel, first linear, acuminate, 3.5-4 mm. long, second linear-lanceolate with 2 nerves on one side of the keel, 6-9 mm. long; floral glume oval, 1-nerved, obtuse, 5-8 mm. long, ciliate on the upper part of the keel; palea oval, emarginate, and when removed just as long as its glume.

Very variable; compare with *S. juncea*.

Mississippi, *Tracy*; Utah, *Jones* 1089; Colorado, *Cassidy*; Oregon, *Howell*.

Dakota to Oregon, south to Texas and Arizona.

5. *S. stricta* (Ait.) Roth, Neue Beitr. 1:101. *Dactylis stricta* Ait. Hort. Kew. 1: 104 (1789). SALT MARSH-GRASS.

Rootstocks long-branched, extensively creeping. Culms erect, strict, smooth, leafy to the top, 30-60 cm. high. Sheaths longer than the internodes; ligule short, silky; blades firm, soon convo-

lute, strict, pungent, glaucous above, 5-8 mm. wide at the base, more or less deciduous from the sheaths. Panicle strict, 7-18 cm. long; spikes 3-8 in number, 2-7 cm. long, point of rachis often twice as long as the upper spikelet. Spikelets linear, yellowish green, 12-18 mm. long; smooth, except the scabrous keels of the glumes, first glume narrow, acuminate, second 1-3-nerved, 2-toothed, and tipped with a stiff awn.

Texas, *Nealley* for U. S. Nat. Herb. 105.

Marshes near the coast on both sides of the continent. Eaten by stock when young.

Var. *maritima* (Curt.) Scribn. *Dactylis maritima* Curt. Enum. Brit. Gr. 4 (1785). *S. lavigata* Willd. Trin. Mem. Acad. St. Petersburg. (VI.) 6:113 (1840). *S. glabra* Muhl. Gram. 54 (1817). *S. stricta glabra* Muhl.; A. Gray, Man. Ed. 2:552 (1856).

Culms and blades longer, spikes more slender, 6-12 cm. long. Spikelets crowded or remote, 12-18 mm. long, first glume 7-8 mm. long, second 5-nerved.

Vermont, *Pringle*; Massachusetts, *Beal* 88, 89, *Sturtevant*; Rhode Island, *Twedy* for U. S. Dept. Agricul. 130; southern California, *Palmer* 274.

Common on the Atlantic coast; also along Onondaga Lake in New York, and in California.

6. *S. junciformis* Engelm. & Gray, Bost. Jour. Nat. Hist. 5: 238 (1845). *S. Gouini* Fourn. ?

Culms stout, very smooth, 60-180 cm. high, Lower sheaths mostly shorter than the internodes, the upper longer; ligule a hairy fringe; blades of sterile shoots 30-60 cm. long, those of the culm 5-6, smooth, involute, rigid. Panicle truly spikelike, 10-22 cm. long, tapering to the apex; spikes 30-50, sessile, imbricate, 2-4 cm. long, the lower ones longer. Spikelets linear, 6-8 mm. long; empty glumes subequal, ciliate-hispid on the keel, first linear, obtuse or acute when spread, 4-6 mm. long, second broadly linear, truncate-toothed or emarginate; floral glume a little longer and broader; palea narrowly ovate, about as long as its glume.

Nearly allied to *S. gracilis*, and possibly to *S. densiflora* Brongm. Florida, Nat. Mus. from *J. H. Simpson*, distributed as *S. mul-*

tiflora Vasey, MS., but corrected as above in Coult. Bot. Gaz. 16: 292 (1891).

Mississippi (Ocean Springs), *Tracy*; Texas *Nealley*.

85. (172). **CAMPULOSUS** Desv. Bull. Soc. Philom. 2: 189 (1810). *Ctenium* Panz. Denkschr. Acad. Muench. 1813, 288, t. 13 (1814). *Monocera* Ell. Bot. S. C. & Ga. 1: 176 (1817). *Campuloa* Desv. Journ. Bot. 1: 69 (1813). *Monathera* Rafin. Am. Monthly Mag. 190 (1819).

Spikelets 1-2-flowered, slender, sessile, crowded, pectinate in 2 rows on one side of a curved rachis, rachilla articulate above the lower glumes, lower flower perfect, the upper staminate or neutral. First empty glume small, slender, almost hyaline, keeled, awnless, second larger, membranous or firm, 2-3-nerved, acute or briefly bifid, the middle nerve spreading horizontally from the back as a stout recurved awn or reduced to a tubercle, third and fourth glumes empty or including narrow paleæ, often long-ciliate, with an erect awn below the apex, shorter and more slender than the second; fifth or floral glume shorter and more slender than the empty ones, clothed with long hairs with a slender awn below the apex. The 1-2 upper glumes narrow, empty or enclosing narrow paleæ. Stamens 3. Styles distinct, stigmas feathery. Grain oblong, without a groove, loosely included by the glume, but not adherent; pericarp easily removed from the seed.

Blades broad or narrow, flat or convolute.

Spikes solitary, rarely 2-3 in number, terminal, erect, sessile, often curved.

There are seven species known, of which 4 are American and 3 African.

The spikelets are elegantly pectinate, but when carefully examined are very distinct from *Harpechloa* or *Bouteloua*.

1. **C. aromaticus** (Walt.) Scribn. Mem. Torr. Bot. Club, 5: 45 (1894).

Egilops aromatica Walt. Fl. Car. 249 (1788). *Chloris monostachya* Michx.

Fl. Bor. Am. 1: 59 (1803). *Campulosus monostachyos* Beauv.



FIG. 71. — *Campulosus aromaticus*. Spikelet. (Richardson.)

Agrost. 64, t. 13, f. 1 (1812). *Ctenium carolinianum* Panz. Denkschr. Acad. Muench. 311 (1814). *Monocera aromatica* Ell. Bot. S. C. & Ga. 1:77 (1817). *Ctenium Americanum* Spreng Syst. 1:274 (1825). TOOTHACHE-GRASS.

Perennial; culms 50–100 cm. high, rough, with a tuft of old dead sheaths at the base. Blades narrow, involute, 5–12 cm. long, those of sterile shoots longer. Spike 1 (rarely 2), 4–10 cm. long. First empty glume 1-nerved, hyaline, 2 mm. long, including the short point, second 5 mm. long, the nerves warty-glandular, awn above the middle, about 4 mm. long, third 4 mm. long, ciliate, 3-nerved, short-awned, divided at the apex, fourth or floral glume much like the third, ciliate, 5.5 mm. long, enclosing a small hyaline palea. The fifth glume (a floral glume) 4.5 mm. long, ciliate, 3-nerved, a short awn back of the apex; palea longer than its glume. Next floret smaller neutral, with a small glume above. Taste of the plant very pungent.

North Carolina, *McCarthy*; Alabama, *Mohr*; Florida, *Palmer* 618, *Curtiss* for U. S. Dept. Agricul., also 3437; Mississippi, *Tracy*. Low pine-barrens, southern Virginia and southward.

86. (174). **CHLORIS** Swartz. Prodr. 25 (1788). *Eustachys* Desv. Bull. Soc. Philom. 2:188 (1800). *Schultesia* Spreng. Pugill. 2:17 (1815). *Phacellaria* Willd. Steud. Nom. Ed. 2, 1:353 (1840); 2:313 (1841). *Macrostachya* Hochst. A. Rich. Tent. Fl. Abyss. 2:408 (1851). *Chloroides* Fisch. Regel. in Ind. Sem. Hort. Petrop. 28 (1863). *Heterolepis* Ehrenb. Boiss. Fl. Orient. 5:554 (1881).

Spikelets 1-flowered [or 2–3-flowered], sessile, crowded in 2 rows on one side of a rachis, rachilla articulate above the lower glumes, extending beyond the flower, bearing a glume (or male flower). The two lower glumes empty, persistent, unequal, keeled, narrow or very narrow, acute, mucronate, rarely obtuse or truncate, or the second one with a short awn; floral glume narrow or broad, 1–3-nerved, acute, obtuse, emarginate, or with two short points, the mid-nerve



FIG. 72.
Chloris adiata.
Spikelet. (Scrib-
ner.)

extending into a slender awn or rarely awnless. The 1 to several empty glumes towards the apex of the rachilla short, broad and truncate or narrow, often awned or bristle-pointed, rarely awnless; palea scarcely shorter than its glume, folded, nerves prominent. Stamens 3. Styles distinct, stigmas feathery. Grain included by the glume, but not adherent, oblong-lanceolate or almost linear, subterete or nearly 3-sided, rarely grooved. Pericarp very thin and loose as in *Sporobolus*. Mostly perennials, culms compressed, blades flat, often with cross-veins. Spikes solitary or in pairs, erect, or many and digitate at the apex of the terminal peduncle. The floral glume often clothed with hairs.

It is a natural though somewhat polymorphous genus. In a number of species the upper empty glumes are broad and truncate at the apex.

There are forty species, widely dispersed in the warmer regions of the world.

- A. Floral glume with hairs 2-2.5 mm. long. 1, 2
- B. No conspicuous hairs on the floral glume. (a)
 - a. Awns prominent, spikelets rather remote, no spikelets on rootstocks. 3
 - a. Awns prominent. Spikelets of the panicle rather remote; spikelets on the rootstocks also. 4
 - a. Awns very short, spikelets crowded. (b)
 - b. Empty glumes longer than the floral glumes. 5
 - b. Empty glumes as long as the floral glumes. 6
 - b. Empty glumes shorter than the floral glumes. (c)
 - c. Spikes about 3 cm. long, light-colored. 7
 - c. Spikes over 5 cm. long, brown when mature. (d)
 - d. Spikes 1-2. 8
 - d. Spikes 3-8. 9
 - d. Spikes 8-20. 10

1. **C. elegans** H. B. K. Nov. Gen. et Sp. 1: 166. (1815). *C. alba* Presl. Rel. Hænk. 1: 289 (1830).

Culms 30-60 cm. high. Sheaths slightly inflated; blades lanceolate, 2-15 cm. long, slightly scabrous. Spikes 8-12, umbellate, 4-6 cm. long, sometimes included, with internodes 1 mm. long.

Empty glumes membranous, 1-nerved, first ovate, 1.7 mm. long, second lanceolate, 2.5 mm. long, with a short awn; floret ovate-elliptical, 2.5 mm. long, with short stiff hairs at the base; floral glume obscurely 3-nerved, gibbous in the middle, ciliate on the mid nerve and margins with hairs towards the summit 2 mm. long, apex 2-toothed, awn 5 mm. long; palea as long as its glume: empty glume above the flower truncate, with an awn 4 mm. long, rachilla terminated by a second rudimentary glume. Grain elliptical.

New Mexico, *Vasey* for U. S. Dept. Agricul. 498; Arizona, *Towney*; California, *Orcutt*; Mexico, *Palmer* 118, 133, *Schaffer* 1073.

Texas, Arizona, and Mexico.

“Naturally selecting moist places of plains and mesas, this annual falls into line with the needs of tillage. Its rather succulent stems and leaves are acceptable to grazing animals. Owing to its spreading habit, it would hardly serve as a grass for mowing. Eaten by all kinds of stock. It is not so abundant in Chihuahua, a region of elevated tablelands and mountains, as on the dry mesas and desert hills of southern Arizona and western Sonora. There the Indians bring it during winter and spring long distances into the towns to sell, the men tying the bundles behind and beside them on their ponies and the women carrying them on their backs or heads and trudging painfully behind the ponies. How many times I have contended with the horrid musquite bushes, to gather an armful of this grass to carry joyfully to my hungry and jaded horses!” C. G. PRINGLE.

2. *C. polydactyla* (L.) Sw. Prod. 26 (1788). *Andropogon polydactylon* L. Amoen. Acad. 5:412 (1759); Sp. Pl. Ed. 2, 1483 (1763).

Culms erect, simple, glabrous, 45–100 cm. high. Sterile shoots few, leaves of the culm 7, sheaths nearly smooth, strongly ciliate at the throat; ligule very short, blades mostly involute, 15–20 cm. long, 7–10 mm. wide, pungent-pointed, the upper much shorter. Spikes umbellate, 13–20, sessile, 9–12 cm. long, the rachis scabrous. Spikelets crowded; empty glumes linear-lanceolate, 1-nerved, first 2 mm. long, second 2.5 mm. long; floral glume 2.2 mm. long, 3-nerved, broadly oval, ciliate on the keel, the hairs on the marginal

nerves 2.5 mm. long, the awn 2-3.5 mm. long; rudimentary floret 1.3 mm. long, bearing an awn about its own length.

Florida (southern part), *J. H. Simpson* for U. S. Nat. Herb.; also found in West Indies and Brazil.

3. *C. verticillata* Nutt. Trans. Am. Phil. Soc. (II.) 5: 150 (1833-37).

Culms 20-30 cm. high. Ligule a fringe of short hairs; blades rough, abruptly pointed, conduplicate, 3-9 cm. long, the upper shorter, 3-4 mm. wide. Spikes 9-12 in number, 4-8 cm. long, the lowest in whorls, purple, a middle internode of a spike about 15 mm. long. Empty glumes narrow, membranous, 1-nerved, toothed, first 2 mm. long, including the short awn, second over 2 mm. long besides the short awn: floret 2.3-2.7 mm. long: floral glume compressed, broadly oval when open, short-ciliate on the margins, emarginate, awn 3-4 mm. long; palea narrowly elliptical, emarginate, ciliate on the keels; empty glumes above the floret mostly excluded from the floral glume, obovate, truncate, 3-nerved, 1.5 mm. long, awned, sometimes a second rudiment above. Grain elliptical, flat, triquetrous.

Texas, *E. Hall* 773, *Reverchon*, *Nealley*, *Curtiss* 23, 3440.*

4. *C. longifolia* (Fourn.) Vasey, Contrib. U. S. Nat. Herb. 1: 284 (1893). *Gymnogogon longifolius* Fourn.; Hemsl. Biol. Centr. Am. Bot. 3: 560 (1880).

A rather stout caespitose grass, 60-100 cm. high, bearing fertile spikelets on panicles of two sorts, one in the soil among the roots or just above the surface, the other at the apex of the culms or in the axils of the upper leaves. Sheaths mostly longer than the internodes; ligule very short, ciliate; blades smooth excepting near the auriculate base, flat, 15-25 cm. long, 5-8 mm. wide. The upper panicle 10-20 cm. long of 5-10 racemose spikes. Spikes mostly in three sets of three each, 8-16 cm. long, flower-bearing for the whole length. Spikelets 1-2-flowered; first empty glume 0.7 mm. long, second twice as long; floral glume linear with a short hairy callus at the base, 5-7 mm. long, scabrid on the 3 nerves and margins, 2-toothed, awn back of the teeth, 6-10 mm. long; palea as long as its glume, terminating in 2 slender teeth; second floret imperfect, borne on a pedicel 2 mm. long, its awn about

3 mm. long. Grain linear. The lower panicles numerous, 5-15 cm. long, branching irregularly. Spikelets 4-6 mm. long, ovoid, abruptly pointed. Empty glumes subequal and ovate, but little shorter than the spikelets, many-nerved; floral glume oval, rather thick, many-nerved; palea nearly as long and as wide as its glume. Grain oblong, abruptly pointed, about 4 mm. long, much larger than those borne on the upper panicles; hilum half as long as the grain.

Mexico (Ymala Simaloa), *Dr. Palmer* 1763.

Dr. Vasey had a little doubt regarding the identity of this grass with *G. longifolius* Fourn.

5. *C. submutica* H. B. K. Nov. Gen. et. Sp. 1:167. *t.* 50 (1815).

A slender perennial, 30-100 cm. high. Ligule a fringe of hairs; upper blades 3-6 cm. long, 2-4 mm. wide, obtuse, rough, conduplicate, reaching to or above the spikes. Spikes 6-12, each 4-12 cm. long, umbellate or in close whorls, an internode about 1 mm. long. Empty glumes narrow, acute, membranous, 1-nerved, the lower nearly 2 mm. long, second over 3 mm. long; floret 3.5 mm. long, with fine bristles at the base; floral glume membranous, 3-nerved, cuneate-oval when spread, margins ciliate, apex emarginate, awn very short; palea oblanceolate, emarginate, ciliate; upper empty glumes at the apex of the rachilla extending nearly to the apex of the floret, 1.7 mm. long, 3-nerved, truncate with a very short awn. Grain oblong, 2 mm. long, 3-sided.

Mexico, *Bourgeau*, *Palmer* 242, *Pringle* 424, *Schaffner* 1074.

Northern Mexico and vicinity.

This is similar to *C. elegans* in character and quality, but rather more erect in habit.

6. *C. ciliata* Sw. Fl. Ind. Occ. 1: 25 (1797).

An erect annual, 30-60 cm. high. Sheaths about the length of the internodes; ligule very short; blades flat, smooth, acuminate, 15 cm. long, 3-5 mm. wide. Spikes 3-6, digitate, purplish, the apex curved, 4-6 cm. long. Spikelets 3-flowered, crowded, sessile, flattened, cuneate, truncate, 2.5 mm. long, awns projecting about 1 mm.; floral glume of the perfect floret elliptical, long-ciliate on the

margins and keel, second floret truncate, subincluded in the first, third floret included in the second.

There is some doubt as to whether this is the same as the European plant passing by this name.

Texas, *Nealley* in 1888-89.

Texas, Mexico, West Indies.

7. *C. cucullata* Bisch. Ann. Sc. Nat. (III.) 19: 357 (1853).

Culms slender, 30-40 cm. high. Blades narrow, rough, 5-10 cm. long, 2 mm. wide, the upper one obsolete. Spikes 8-12, umbellate, light-colored, 3 cm. long with internodes 0.5-0.7 mm. long. Empty glumes hyaline, 1-nerved, broadly oval, first obtuse, 0.7 mm. long, second one-third longer, cuspidate; floret white, 3-sided, oval, floral glume 3-nerved, ciliate on keel and margins, emarginate, mucronate, 1.7 mm. long; terminal empty glume mostly excluded from the floral glume, triangular when spread, 1 mm. long, 2 mm. wide; apex truncate, involute, emarginate, mucronate, lateral nerves forked, making in all 5 nerves above. Grain ovoid, 3-sided.

Texas, *Wright* 761, *Palmer*, *Pringle* 2405, *Reverchon*.

Texas to Arkansas.

8. *C. Floridana* (Chapm.) Vasey, Cat. Grass. U. S. 61 (1885).

Eustachys Floridana Chapm. Fl. S. States, 557 (1860).

A smooth slender glaucous perennial, 30-60 cm. high. Blades 5-25 cm. long, 5-7 mm. wide, the upper abortive or very short, cross-veins apparent. Spikes single or in pairs, 6-8 cm. long, each internode 1 mm. long. Spikelets 2-flowered; empty glumes 1-nerved, first ovate, acute, 2 mm. long, second oval, apex truncate, 2.5 mm. long, awn 1 mm. long; floral glume light-brown, firm, compressed at the back, oval when closed, 3-nerved, 3 mm. long, hispid on the back and margins, short-awned; palea oval, floral glume of the terminal floret truncate, short-awned, enclosing a palea, 3 stamens, and a terminal empty glume. Grain 1.5 mm. long, elliptical, 3-sided.

Florida, *Blodgett*, *Curtiss* 3445.

Dry pine-barrens, Florida.

9. **C. Swartziana** Doell. Mart. Fl. Bras. 2: Part 3, 68 (1878).
C. petraea Sw. Prod. 25 (1788).

A tufted glaucous perennial, 30-60 cm. high. Blades obtuse, 5-10 mm. long, 4-6 mm. wide, cross-veins apparent, the upper 0.5-2 mm. long. Spikes 3-8 in number, 4-7 cm. long. Empty glumes not extending to the apex of the floret, white, hispid, 1-nerved, first incurved, ovate, acute, 1 mm. long, second a fourth longer, oblong, emarginate, with a short point, floret oval, bearded at the base, brown, flat-compressed at the back, 1.7 mm. long; floral glume coriaceous, 3-nerved, hispid on the back and margins, entire, mucronate below the apex; palea brown, oval, 1.5 mm. long. Grain ovoid, 3-sided, 1 mm. long. Terminal empty glume brown, truncate, half included by the floral glume.

Florida, *Curtiss* 3443, *Palmer* 617, *Hall* 775.

10. **C. glauca** (Chapm.) Vasey, Cat. Grass. U. S. 61 (1885).
Eustachys glauca Chapm. Fl. S. States, 557 (1860).

A smooth glaucous annual, 1-1.5 m. high. Blades 7-8 mm. wide, obtuse, some of the lower 30-200 cm. long, the upper less than 1 cm. long. Spikes 8-20, umbellate, 5-10 cm. long. Spikelets 2 to each mm. of the spike; empty glumes curved, reaching to the top of the floret, 1-nerved, first obtuse, about 1 mm. long, second truncate, cuspidate, 1.5 mm. long; floret ovoid, 1.7 mm. long, floral glume brown, 3-nerved, coriaceous when mature, mid-nerve hispid above the middle, obtuse, awnless; palea brown, oval, as long as its glume, terminal empty glume brown, truncate, mostly above the floral glume. Grain oval, 3-sided, 1 mm. long.

Florida, *Curtiss* 3444.

Brackish marshes, West Florida.

87. (176). **CHLOROPSIS** Hack. Engl. & Prantl. Pfl. 2: 59 (1887-93). *Trichloris* Fourn. Benth. Journ. Linn. Soc. 19: 102 (1881).

Spikelets 1, rarely 2-4-flowered, sessile, crowded in two rows on one side the rachis, rachilla articulate above the lower glumes, extending beyond the flowers, terminating in a glume. Empty glumes small, membranous, subhyaline, first often very narrow, acute, awnless or short-awned, second short-awned; floral glume membranous, faintly 3-nerved, 3-awned, the awns long, straight, subequal, or

broader and much shorter; empty glumes sometimes 2-3, the lowest much like the floral glume, those above smaller, 1-awned or awnless or sometimes only one; palea included by its glume, hyaline, 2-keeled near the margins. Stamens 3. Styles distinct, stigmas feathery. Grain narrow, oblong, subterete, pericarp easily removed from the seed.

Tall grasses with flat blades. Spikes many, slender, sessile, erect or spreading on the peduncle, forming a dense oblong panicle, softly echinulate with many long bristles. Spikelets slender, erect.



FIG. 73.—*Chloropsis pluriflora*. Spikelet dissected. (Scribner.)

There are four or five species known, of which 2 are found from Texas to Arizona and two in South America. Nearly allied to *Trisetaria* and to *Chloris*.

Spikelets 3-5-flowered.	1
Spikelets mostly 2-flowered.	2

1. **C. pluriflora** (Fourn.) Kuntze, Rev. Gen. Pl. 2: 771 (1891).
T. pluriflora Fourn. Hemsf. Biol. Centr. Am. Bot. 3: 560 (1880).

Culms 40-50 cm. high. Leaves 6-7, sheaths subcompressed, shorter than the internodes, ciliate at the throat; ligule a ciliate ring: blades flat, scabrous, narrowed at both extremities, 12-15 cm. long, 5-7 mm. wide. Spikes 10-22 in number, 5-7 cm. long, in 2-4 whorls. Spikelets 3-5-flowered; empty glumes hyaline, bristle-pointed, 1-nerved, first about 1.5 mm. long, second about 2.5 mm. long; lower floral glume linear, ciliate on the margins, lateral awns 1-2 mm. long, central 7-11 mm. long; palea as long as its glume, scabrid on the keels. Grain triquetrous, 2.2 mm. long.

Texas, *Nealley* for Nat. Mus.; Mexico, *Pringle* 2512.

2. **C. fasciculata** (Fourn.) Kuntze, Rev. Gen. Pl. 2: 771 (1891).
Trichloris fasciculata Fourn. Benth. Journ. Linn. Soc. 19: 102 (1881).

Culms smooth, about 60 cm. high. Blades 20-30 cm. long, 7-10 mm. wide, upper sheath often partially including the panicle. Panicle 12-16 cm. long, with 15-30 rays in close whorls. Spikelets 1-3-flowered, the florets much shorter towards the top of the spikelet; first empty glume awl-shaped, about 2 mm. long including the awn, 1-nerved, second ovate-lanceolate, 1-nerved, not toothed, 2 mm. long, with an awn half its length; floral glume ovate-lanceolate, hairy on the margins and at the base, over 3 mm. long, bearing a central awn 5-10 mm. long, and two lateral ones 1-2 mm. long; palea as long as its glume. Grain 1.5 mm. long.

C. Wright 263, 2025.

Texas to Arizona.

88. (177). **GYMNOPOGON** Beauv. Agrost. 41, t. 9. f. 3 (1812).
Anthopogon Nutt. Gen. 1: 81 (1818). *Biatherium* Desv. Opusc. 72 (1831). *Dichætaria* Nees, Steud. Syn. Pl. Gram. 145 (1855).

Spikelets 1-flowered, subsessile, remotely alternate on two sides of a slender triquetrous rachis, rachilla jointed above the lower glumes, extending above the floret and bearing a glume. Empty glumes 2, more or less unequal, narrow, 1-3-nerved, acute or the second bearing a short awn; floral glume a little broader, 3-nerved, the mid-nerve extending into a straight awn; terminal glume

empty, bearing an awn; palea narrow, 2-keeled. Styles distinct. Grain linear, subterete, enclosed by a firm glume, but not adherent. Tall grasses with short firm or long and flaccid leaves. Spikes numerous, slender or filiform, at first erect, finally spreading, scattered, or those below in whorls.

Species 5 or 6, belonging to America or the Old World.

A genus nearly allied to *Chloris*. Our species are perennial from short rootstocks, with short firm blades, 1-nerved empty glumes, the floret bearing short hairs at the base.

Gymnopogon differs from *Trichloris* in not having the spikelets closely crowded, although sessile in two unilateral rows, the spikes scattered or verticillate.

1. *G. ambiguus* (Michx.) B. S. P. Prel. Cat. N. Y. 69 (1888). *Andropogon ambiguus* Michx. Fl. Bor. Am. 1: 58 (1803). *G. racemosus* Beauv. Agrost. 164 (1812). *G. scoparius* Trin. Unifl. 237 (1824).

Culms wiry, leafy, clustered, 30 cm. high. Ligule a fringe of hairs; blades flat, lanceolate, 3-8 cm. long. Spikes 15-30 in number, 7-17 cm. long, each bearing 7-20 spikelets, remote at the base. Empty glumes 1-nerved, first 5 mm. long, second 6 mm. long, including a short awn; floral glume cylindrical, involute, 4 mm. long, with an awn as long; empty terminal glume raised on a rachis over 2 mm. long, bearing an awn of equal length. Grain narrowly oblong, 2 mm. long.

Maryland, *Bebb*; Florida, *Curtiss* 3441.

Sandy pine-barrens, New Jersey to Texas.

2. *G. brevifolius* Trin. Unifl. 238 (1824). *G. fastigiatus* Nees, Agrost. Bras. 430 (1829).

Culms slender, wiry, leafy, 30-60 cm. high. Ligule obsolete, destitute of hairs; blades 2-5 cm. long. Spikes 15-20, very slender, 8-20 cm. long, containing 8-30 spikelets, sometimes borne on the upper half or two-thirds. Empty glumes pointed, slightly unequal, 3-3.5 mm. long; floral glume 2.5 mm. long, with an awn 1 mm.



FIG. 74. — *Gymnopogon ambiguus*. Spikelet. (Richardson.)

long; terminal empty glume on a rachilla 1.5 mm. long, bearing a very short awn. Grain less than 2 mm. long.

Florida, *Curtiss* 3442.

Delaware and southward.

89. (179). **SCHEDONNARDUS** Steud. *Flora*. 33:228, 229 (1850) name; *Syn. Pl. Gram.* 146 (1855).

Spikelets 1-flowered, acuminate, sessile in the excavations on 2 sides of a 3-sided rachis, rachilla very short, articulate above the lower glumes, not bearing a flower, flower perfect. Empty glumes 2, unequal, 1-nerved, narrow, membranous, acuminate; floral glume longer, firm, membranous, 3-nerved, pointed, enclosing the palea and the flower. Styles distinct. Grain linear, included by the glume and palea, but not adherent.

A tufted annual. Spikes 3-10 in number, simple, slender, spreading on the curved axis.

Species 1, belonging to North America. The genus is more nearly allied to *Gymnopogon* than to *Lepturus* Nutt.

1. **S. paniculatus** (Nutt.) Trelease, Branner & Coville, *Rep. Geol. Surv. Ark.* 1888, Part 4, 236 (1891). *Lepturus paniculatus* Nutt. *Gen.* 1:81 (1818). *Rottbællia paniculata* Spreng. *Syst.* 1 300 (1825). *Schedonnardus Texanus* Steud. l. c.

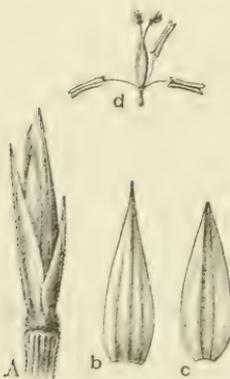


FIG. 75.—*Schedonnardus paniculatus*. A. Spikelet; b, floral glume; c, on and between the nerves; d, flower.

Culms 20-60 cm. high, naked above. Ligule ovate, over 1 mm. long; blades numerous below, narrow, keeled, conduplicate, twisted, 3-5 cm. long. Spikes 3-10 in number, recurved, secund, distant, 3-9 cm. long. First empty glume ovate, 1 mm. long, with an awn half its length, second ovate-lanceolate, 2 mm. long, with a very short awn; floret cylindrical, acuminate, over 3 mm. long; floral glume elliptical-lanceolate, the lower part sparsely hairy; palea with 2 nerves near each other extending into the cusps, silky hairy on and between the nerves. Grain cylindrical.

Illinois, *Mead*; Kansas, *Cunby*; Colorado, *J. Wolfe* 1178; Mon-

tana, *Havard, Canby & Scribner* 376; Texas, *Drummond* 360, *Bolander*; Mexico, *Fendler* 901.

From Illinois to Texas, Kansas, Colorado, Montana, and California.

90. (181). **BOUTELOUA** Lag. Var. *Cienc.* 2: Part 4, 134 (1805). GRAMA-GRASS. MUSQUIT-GRASS. *Atheropogon* Muhl. Willd. Sp. Pl. 4:937 (1805). *Heterosteca* Desv. Nov. Bull. Soc. Philom. 2:188 (1810). *Triathera* Desv. l. c. *Corethrurum* Vahl, Skr. Naturk. Selsk. Kiobenh. 6:85 (1810). *Chondrosium* Desv. Journ. Bot. 3:68 (1813). *Dinebra* DC. Cat. Hort. Mons. 104 (1813) in part. *Triæna* H. B. K. Nov. Gen. et Sp. 1:178 (1815.) *Polyodon* l. c. 174 (1815). *Heterostega* Kunth, Mem. Mus. Par. 2:73 (1815). *Actinochloa* Willd. R. & S. Syst. 2:22, 417 (1817). *Eutriana* Trin. Fund. Agrost. 161 (1820). *Aristidium* Endl. Gen. 94 (1836). *Triplathera* Endl. l. c. *Nestlera* Willd. Steud. Nom. Ed. 2, 2:192 (1841).

Under each synonym above given may be found synonyms for species.

Spikelets 1-2 flowered, complanate, sessile and densely crowded in 2 rows on one side of a flattened rachis, rachilla continuous or articulate above the lower glumes, bearing 1-3 glumes or bristles or rarely staminate flowers above the single perfect flower. Empty glumes 2, narrow, acute, keeled, equal or unequal; floral glume broader, usually firmer, 3-toothed or 3-cleft at the apex; empty glumes at the apex of the rachilla 3-5-awned or deeply divided; palea of the perfect floret narrow, hyaline, entire or 2-toothed. Stamens 3, usually orange-colored or red. Lodicules 2, fleshy. Styles distinct. Grain oblong, included, but not adherent. Slender annuals or perennials, low or tall, blades narrow, flat or convolute. Spikes single and terminal, or several on the side of the axis, first erect, finally drooping.

There are about 25 species, all American. Bentham divided the genus into 3 sections, founded mainly on the inflorescence. Plants of this genus are most abundant in the warmer and dryer portions of North America, especially in western Texas, in Arizona and

northern Mexico. Often called "Grama-grass," and some of them called "Buffalo-grass."

The following division into tribes shows the variation of this genus very well.

- A. *Chondrosium* Desv. as a genus. *Spikes one to several, linear or oblong, more or less falcate, the usually very numerous spikelets pectinately crowded on one side of the rachis; terminal empty glumes usually 3-awned.* . . . (a)
- a. Spike always solitary. (b)
- b. Empty glumes glabrous.* (c)
- c. Floral glume 2.5-3 mm. long. 1
- c. Floral glume 5-6 mm. long. 2
- b. Empty glumes villous. Plant 20-40 cm. high; empty glumes 2-3 mm. long. 3
- a. Spikes usually 2 or more. (e)
- e. Spikes very dense, oblong, linear; empty glumes villous. (f)
- f. Rachilla above fertile floret glabrous, spikes 2 cm. long. 4
- f. Rachilla above fertile floret bearded. 5
- e. Spikes dense, narrowly linear; empty glumes usually glabrous. (h)
- h. Floral glume 1.5 mm. long. 6
- h. Floral glume 2 mm. long, besides the teeth, hairy. 7
- h. Floral glume 2.5-3 mm. long, spikes 1.5-2.5 cm. long. 8
- h. Floral glume 3 mm. long, spikes 2-3 cm. long. 9
- h. Floral glume about 3 mm. long; spikes 5-7 in number, 2.5-3 cm. long. 10
- e. Spikes looser and more slender; lower glumes glabrous. (i)
- i. Peduncles villous; floral glume 1-awned. 11

* *B. tenuis* Griesb. in part. A densely tufted perennial 20-40 cm. high. This may be expected from Mexico.

- i. Peduncle smooth; floral glume 3-awned. . . (j)
 j. Floral glume 2 mm. long. 12
 j. Floral glume 1 mm. long. 13
- B. *Atheropogon* Muhl. as a genus. *Spikes several or numerous, usually short, straight, not pectinate, the few (3-12) spikelets often fascicled; the terminal empty glume 3-awned, or more or less reduced and rudimentary.* . . (k)
 k. Spikes 30-60, axis scabrous, each bearing 4-10 spikelets. 14
 k. Spikes 5-11, axis glabrous, each bearing 3-6 spikelets. 15
 k. Spikes 4-6, axis silky villous, each bearing 7-10 spikelets. 16
 k. Spikes 3-5, each axis bearing 3-4 spikelets. . . . 17
- C. *Triathera* Desv. as a genus. *Spikes several, short and narrow, the 1-3 slender spikelets closely appressed to the rachis; terminal glume reduced to a triple awn or having a palea.* (m)
 m. Spikes 5-10, each bearing 2-3 spikelets. 18
 m. Spikes 35-50, each bearing 1 spikelet. 19, 20
- D. *Polyodon* H. B. K. as a genus. *Spikes few, short, of few spikelets; floral glume 3-awned, the 2-3 terminal empty ones crowded together and each 3-5-awned.* . . . 21
1. **B. prostrata** Lag. Varied. Cienc. 2:141 (1805). *B. pusilla* Vasey, Bull. Torr. Club, 11:6 (1884). *Atheropogon humilis* Spreng. Syst. 1:293 (1824). *B. tenuis* Griseb. Goett. Abh. 24:303 (1879), as ticketed by Vasey.

A loosely tufted slender annual. Culms many, geniculate, 10-20 cm. high. Leaf-blades 1-4 mm. long, 1 mm. wide, flat or convolute. Spike solitary, much curved, pedicel velvety, bent, bract about as long as pedicel or shorter. Empty glumes lance-elliptical, 1-nerved; first 1.5-2 mm. long, second 3.5 mm. long; floral glume firm, hairy on the outside, oval when closed, nerves obscure, 2.5-2.8 mm. long, lateral setæ about 1 mm. long, central one a little longer; palea as long and as wide as its glume. Grain compressed, 2 mm. long, embryo on one thin edge. Rachilla above the floret about 1

mm. long, hairy above, bearing 3 awl-shaped setæ, 2 mm. long, the lateral ones bearing a thin marginal appendage; rachilla terminating in a minute truncate empty awnless glume.

New Mexico, *Pringle, Vasey*; Mexico, *Pringle* 1434, *Palmer* 3400, *Schaffner* 1016.

Colorado, Arizona to New Mexico.

2. **B. stolonifera** Scribn. Proc. Acad. Phila. 302 (1891). *B. scopioides* S. Wats. in Proc. Am. Acad. 18: 176 (1883) not Lag.

Culms slender, 3–10 cm. high, bearing racemes. Leaf-blades narrow, glabrous, 1–3 cm. long. Spikes solitary, rachis 1.5–2 cm. long. Spikelets not crowded, empty glumes 1-nerved, first lanceolate, 3 mm. long, with an awn 1 mm. or more long, second broader, about 6 mm. long, short awned, thinly pubescent on the keel; floral glume 5–6 mm. long, 3-lobed for about one-fourth of its length, central seta 5–7 mm. long, lateral ones a third shorter; palea about 6 mm. long; rachilla nearly smooth, 3 mm. long, bearing some setæ 15 mm. long.

Mexico, *Pringle* 3174, on the plains, La Houda Station.

3. **B. ramosa** Scribn. Vasey, Grasses Southwest 1: t. 44 (1890). *B. oligostachya* var. *ramosa* Scribn.

A densely tufted slender light green perennial, 20–40 cm. high. Culms branching below, nodes smooth. Lower sheaths 2 cm. long, ciliate at the throat, those of the culm 5–7, the lower nearly as long as the internodes; ligule a ciliate ring; blades of sterile shoots and culms 3–8 cm. long, about 2 mm. wide, involute, apex filiform, curved. Spikes 1–2 in number, 1.2–1.7 cm. long, linear, very slightly falcate, pubescent, pedicels 2 mm. long. Empty glumes villous, lanceolate, 1-nerved, first 1.7 mm. long, second 3.2 mm. long; floral glume oval-ovate, the back shortly pubescent, 4 mm. long, the 3 setæ about 1 mm. long; palea as long as its glume, with 3 very short setæ; rachilla hairy, 0.7 mm. long, bearing 3 setæ 3–4 cm. long.

Southwestern Texas, *Nealley* for Nat. Museum.

It grows in bushy clumps with much-branching perennial culms, with the habit of *Muhlenbergia Texana*, and is confined to calcare-

ous bluffs and hills, occupying such peculiar situations to the profit of the stock visiting them in their wide ranging.

4. **B. hirsuta** Lag. Var. Cienc. 2: Part 4, 141 (1805). *Chondrosium hirtum* H. B. K. Nov. Gen. et. Sp. 1:176, t. 59 (1815). *Actinochloa hirsuta* R. & S. Syst. 2: 149 (1817). *Atheropogon papillosus* Engelm. Am. Jour. Sci. 46 (1843). *Chondrosium fenum* Torr. Marcy Rep. 157 (1848). *Bouteloua fenum* Bigelow, Whipple Exped. Add. p. ii. (1856).

Culms slender, 20-50 cm. high. Blades narrow, papillose-hairy or glabrous. Spikes 1-4 in number, pectinate, dense, about 2 cm. long, on short hairy pedicels, bracts about twice as long, axis projecting beyond the spikelets 7 mm. Sterile florets much projecting from the side of the fertile. Empty glumes villous, 1-nerved, first hyaline, narrow, 2 mm. long; second warty-hairy, lanceolate, 4 mm. long; floral glume pubescent, 3-lobed for nearly half its length, nearly 5 mm. long including the central seta, lateral setæ shorter; palea shorter, obtuse, ciliate on the nerves, rachilla smooth, 1 mm. long, bearing funnel-shaped or 2 fan-shaped empty glumes 1 mm. long, with 3 equal setæ 3 mm. long, enclosing 1-2 very small empty glumes.

A common grass on rocky or dry soil of hills and plains of Chihuahua: culms rather wiry; quality equal to the most of the species enumerated; furnishes an important proportion of the forage of the region.

Illinois, *Patterson*; Florida, *Garber*; Texas, *Drummond*; Mexico, *Pringle* 409, *Palmer* 29, *Parry & Palmer* 943.

From Florida to British America and Mexico.

Var. **Palmeri** Vasey. *B. Bolanderi* Vasey. Much larger, often a metre high; spikes 3-6 in number, broader, often 4 mm. long.

Mexico, *Palmer*.

5. **B. oligostachya** (Nutt.) Torr. A. Gray, Man. Ed. 2:553 (1856). GRAMA, MESQUITE-GRASS. *Actinochloa gracilis* Willd. R. & S. Syst. 2: 418 (1817). *Atheropogon oligostachyus* Nutt. Gen. 1:78 (1818). *Eutriantia oligostachya* Kunth, Rev. Gram. 96 (1829). *Chondrosium oligostachyum* Torr. Marcy's Rep. 300 (1853).

Perennial, 20–60 cm. high. Leaf-blades smooth or rough above, 3–15 cm. long, 1.5–2 mm. wide, hairy at the ligule. Spikes 1–3 in number, rarely 4 to 5, remote, 2–4 cm. long; pedicels 2–3 mm. long, short, hairy, often with a bract 2–4 times as long; rachilla not projecting beyond the spikelets. Spikelets 7 mm. long; empty glumes villous, 1-nerved, first lanceolate, 4.5 mm. long, second ovate-lanceolate, 7.5 mm. long, sparsely hairy on warty glands; floral glume hairy on the back, 5.5 mm. long, not including setæ, and 1.5 mm. wide; lateral setæ extending to the top of the 2-cleft middle lobe, not including a seta about 1 mm. long; palea as long as its glume; rachilla above the floret about 1.5 mm. long, clothed above the middle with soft hairs 2–3 mm. long, bearing 3 setæ about 6 mm. long, the lateral ones wing-margined on the inside above; still another, broad involute emarginate 3-lobed empty glume 1.5 mm. long.

Nebraska, *Duffey*; Texas, *Nealley*; Montana (Nor. Trans. Cont. Surv.), *Canby & Scribner*.

Wisconsin, California to Texas and Mexico.

Var. **major** Vasey, ined. Much larger, culms often 70 cm. high; leaves longer, spikes 3–5 cm. long. Spikelets, glumes, and palea about the same as those of the species.

Mexico.

Var. **pallida** Scribn. ined. Spikes light yellowish green.

Mexico, *Pringle* 407.

Var. **ramosa** Scribn. *B. ramosa* Scribn.; Vasey's Grasses S. W. Part 1, 44 (1891). Much branched.

Mexico, *Pringle* 414.

Mr. Pringle says: "The most abundant species of the plains, especially abundant and forming a close sod in the low arid portions. In amount of yield and quality it is surpassed by no common grass of the plains, and is the one native species adapted to forming permanent mowing, and one, I believe, which would, as well as any species employed in American agriculture, bear the effects of close grazing in enclosed areas."

6. **B. polystachya** (Benth.) Torr. Pacif. R. Rep. 5:366, *t.* 10

(1857). *Chondrosium* [*Chondrosium*] *polystachyum* Benth. Bot. Sulph. 56 (1844).

Culms smooth, erect, or spreading and geniculate, 20-40 cm. high. Leaf-blades narrow, 3-6 cm. long, ciliate at the ligule. Spikes 3-6 or more, erect, linear, about 2 cm. long. Empty glumes hyaline, glabrous, oval, 1-nerved, mucronate or short-awned, often lobed or emarginate, first 1 mm. long, second 1.5 mm. long; floral glume broadly oval, the margins and back densely hairy, 1.5 mm. long, 3-lobed with stout setæ scarcely longer than the lobes, ventral awn slightly longest; palea as long as its glume, 3-lobed, rachilla hairy, bearing 3 setæ, a small neutral floret, and above this a minute empty glume.

Texas, *Nealley* for Nat. Mus.; Lower California, *Palmer* 126, 508.

Texas, Arizona, to California.

7. *B. arenosa* Vasey, Grasses of S. West. Bull. 12, Part 1, 34 (1890).

A slender diffuse annual, 15-25 cm. high. Sheaths loose, 3-4 in number, half as long as the internodes; ligule lanceolate, 5 mm. long, ciliate at the base; blades flat, 3-5 cm. long, 1.5-2 mm. wide. Panicle 5-6 cm. long, bearing 3-4 straight or curved one-sided spikes. Spikes subsessile, about 2 cm. long, bearing about 20 spikelets. Spikelets closely imbricate, each containing 1 perfect and 1 rudimentary floret, about 3 mm. long, with awns projecting 3 mm. Empty glumes 1-nerved, often 2-toothed, first lanceolate, 2 mm. long, second oval, 3 mm. long, short-awned; floral glume of the lower floret 2 mm. long, besides the teeth, clothed with fine pubescence, ovate, 2-toothed, awns equal or subequal; palea as long as its glume, 2-4-toothed, with 2 short awns, second floret 1.5 mm. long, the 3 subequal, awns 4-5 mm. long. Neutral floret bearing 3 subequal awns, 4-5 mm. long.

Mexico (near Gulf of California), *Palmer* 189, *Orcutt*.

8. *B. vestita* (S. Wats.) Scribn. ined. *B. polystachya* Torr. var. *vestita* S. Wats. Proc. Amer. Acad. 18: 177 (1883).

A tufted erect or diffuse grass apparently annual, 20-60 cm. high. Sheaths ciliate at the throat; ligule very short; blades of the

culms involute, bristle-pointed, 2-5 cm. long, those of the sterile shoots rather shorter. Spikes 4-6 in number, more or less curved, 1.5-2.5 cm. long. First glume hyaline, bristle-pointed, 2-2.5 mm. long, second linear, about 3 mm. long, 2-toothed, pubescent on the keel, the seta 1-2 mm. long; floral glume pubescent on the back, oval, 2.5-3 mm. long, 2-lobed, lateral and central setæ reaching to the same height 1-2 mm. above the glume; palea linear to oval, 2.2-3 mm. long, 4-toothed with 2 short setæ, the pedicelled rudiment bearing 3 equal bristles about 2.5 mm. long.

Mexico, *Parry & Palmer* 943½, *Palmer* 1357, *Pringle* 413; Arizona, *Nealley*.

Apparently confined to sandy alluvium of mountain streams.

9. **B. breviseta** Vasey, *Contrib. U. S. Nat. Herb.* 1: 58 (1890).

A tufted more or less glaucous and rather slender perennial, 25-35 cm. high, from stout creeping rootstocks. Culms hard, with no cavity. Sheaths 6-11 in number, mostly a little longer than the internodes; ligule a mere ring, slightly ciliate; blades rigid, involute, 2-6 cm. long, 0.5-0.7 mm. diam. Spikes mostly in twos, sometimes single, 2-3 cm. long, about 3 mm. diam. Spikelets crowded, empty glumes lanceolate, 1-nerved, first 3 mm. long, second 4 mm. long; floral glume of lower floret oval, 3 mm. long, 3-nerved, setæ equal, about 1 mm. long; palea incurved, oval; second floret 1.5 mm. long with hairs of the same length, the awns 2.5-3 mm. long.

Texas, *Nealley* in 1889.

10. **B. Rothrockii** Vasey, *Contrib. U. S. Nat. Herb.* 1: 268 (1893). *B. polystachya* var. *major* Vasey, *U. S. Geog. Surv.* by *Wheeler*, 6: 287 (1878).

Culms 40-60 cm. high, racemose, usually bearing 5-7 spikes 2.5-3 cm. long, sessile, about 2.5 cm. distant. Leaf-blades flat, 6-10 cm. long, scabrous above. Empty glumes hyaline, glabrous, oblong, 1-nerved, mucronate or short-awned, lobed or with lateral teeth, first glume 1.5 mm. long, second 2.5 mm. long; floral glume ovate in outline, hairy near the base and on the margins, about 3 mm. long, 1.5 mm. wide, 4-lobed with 3 setæ, lateral ones slightly long-

est; palea with 2 setæ, 3-lobed, as long as its glume, the middle lobe emarginate.

Mexico, *Palmer* 166; also found in Arizona.

11. **B. eriopoda** Torr. Pacif. Rail. Rep. 4: Bot. 155 (1857).

Culms tufted, white woolly below, 20-30 cm. high. Leaf-blades very narrow, involute, 1-4 cm. long. Spikelets 3-6, rather loose and slender, oval or narrowly elliptical, 1.5-2.5 cm. long, on short hairy pedicels. First empty glume oblong, mucronate, about 2 mm. long, with the single nerve towards one side, second glume 4.5 mm. long, lance-elliptical, acute, without a cusp, with an obscure nerve toward the apex on each side the middle; floret hairy at the base, floral glume lance-ovate, 5 mm. long, central seta 1-2 mm. long, lateral setæ obscure or absent; palea about equal to its glume, nerves weak or obscure at the apex; rachilla slender, 2 mm. long, hairy near the apex, bearing 3 bristles 4-5 mm. long, the middle one at the base twice as wide as the lateral ones.

New Mexico, *Wright* 748, 2018; Arizona, *Lemmon* 395; Mexico, *Pringle* 411.

Texas, New Mexico, Arizona, and Mexico.

Bunched on dry rocky or gravelly mesas and foot-hills; the wiry culms more or less elongated and trailing; quality and value equal to *B. hirsuta*.

12. **B. trifida** Thurb. Gram. Mex. Bound. Surv. ined. S. Wats. Proc. Amer. Acad. 18:177 (1883).

A densely cæspitose glaucous perennial, 5-18 cm. high. Blades 3 cm. long, 1 mm. wide. Spikes 3-5, slender, smooth, rather loose, nearly straight, 1-2 cm. long. Empty glumes lanceolate, mucronate, scarious, 3-awned, first 4 mm. long, second a little longer; floral glume scarious or nearly smooth, 2 mm. long, the nerves obscure, lateral awns about 1 mm. long, the central a little stouter and longer; palea rather firm, equalling its glume; rachilla smooth, 1 mm. long, bearing 3 nearly equal setæ, slightly dilated below, about 6 mm. long.

Texas, *Reverchon* 1408, *Nealley* for Nat. Mus.; New Mexico, *Wright* 46, 226, 749, 2020; Arizona, *Pringle*; Mexico, *Parry* 412, 945, *Pringle*, *Palmer* 1355.

A pretty reddish-topped grass found in the regions above enumerated on dry mesas at the foot of hills, doubtless infrequent.

13. **B. Burkei** Scribn. S. Wats. in Proc. Am. Acad. 18:179 (1883). Bull. Torr. Club, 11: 5 (1884).

A tufted perennial, 10-30 cm. high. Culms very slender, erect or geniculate. Blades glaucous, 10-40 cm. long, 1 mm. wide, often with a few scattered hairs. Spikes 3-6, rather loose, nearly erect, about 1.5 cm. long. Empty glumes smooth, ovate, nearly equal, first about 3 mm. long, second longer, both usually very short-awned just below the bifid tip; floral glume broad, hairy, over 1 mm. long, bearing 3 nearly equal-winged setæ, about 4 mm. long; palea oval, with no projecting setæ; rachilla slender, smooth, 0.7 mm. long, bearing 3 equal setæ 5 mm. long, widening below.

Texas, *Mrs. Anna B. Nichols*, communicated to Professor Scribner by Isaac Burk of Philadelphia, for whom the species is named.

Sandy plains of Upper Concho, western Texas, *Reverchon* 1361, *Curtiss* 3440*; distribution of North American Plants, *Berlandier* 167, 1427; *U. S. Dept. Agricul.* 510; Mexico, *Pringle* 1974.

14. **B. curtispindula** (Michx.) Torr. Emory's Rep. 153 (1848). *Chloris curtispindula* Michx. Fl. Bor. Am. 1: 59 (1803). *Bouteloua racemosa* Lag. Var. *Cienc.* 2: Part 4, 141 (1805). *Dinebra curtispindula* DC. Cat. Hort. Monsp. 105 (1813). *Eutriana curtispindula* Trin. Fund. Agrost. 161 (1820).

A tufted perennial, 30-100 cm. high, from short rootstocks. Lower leaves from the taller culms sometimes 40 cm. long, 4 mm. wide, the upper usually 5-10 cm. long; sheaths and ligule often hairy. Spikes 30-60, about 1 cm. long, on short bent pedicels on one side of an axis 15-30 cm. long. Spikelets purple, brown, or green, 4-10 in a spike, 5-8 mm. long, the lowest the shortest; empty glumes 1-nerved, first lanceolate, 2.5-4 mm. long, with an awn 1 mm. long or less, second glume ovate-lanceolate, 3.5-8 mm. long, including a short awn; floral glume sparsely hairy, membranous, ovate-lanceolate, 5-6 mm. long, mucronate, the lateral setæ a little shorter; palea as long and as wide as its glume, 2-toothed; rachilla 0.5 mm. long, bearing a broad divided empty glume 2 mm.

long; the lateral setæ as long, the middle one twice as long, or in the terminal florets the lateral setæ 0. and the terminal seta 4 mm. long. Anthers orange-red or yellow. Very variable and widely distributed.

Pennsylvania, *Burk* for Scribner 3440; Michigan, *Cooley*, *Wheeler* 90; Illinois, *Bebb* for Clark; Texas, *Hall* 772, *Drummond* 354; Arizona, *Rothrock* 284, 586, 677, *Lemmon* 431; Mexico, *Palmer* 206, 1503, *Pringle* 408.

Southern New York, Pennsylvania to Wisconsin, British America, Texas, Arizona, Mexico, South America.

Often the most common species in Chihuahua, Mexico, scattered over mountains, hills, and plains. Unlike *B. oligostachya*, it grows in strict bunches, is more leafy than that species, but of similar quality.

15. **B. bromoides** (H. B. K.) Lag. Gen. et Sp. Nov. 5 (1816). *Dinebra bromoides* H. B. K. Nov. Gen. et Sp. 1: 172, t. 51 (1815). *Eutriana bromoides* Kunth, Rev. Gram. 1: 95 (1829), not Trin. *Heterosteca juncifolia* Desv. Nouv. Bull. Soc. Philom. 2: 188 (1810).

Under the synonyms of the genus may be found large numbers of other names.

An erect tufted perennial, 30-60 cm. high. Sheaths half to two-thirds as long as the internodes; ligule a ciliate ring; blades sparsely hairy, 4-12 cm. long, 2-3 mm. wide, the upper shorter. Spikes 5-11 in number, 1-3.5 cm. long, ascending, horizontal or drooping on velvety pedicels, the latter 2 mm. long, borne on an axis 5-12 cm. long. Spikelets 3-6-11 to a spike; empty glumes ovate-lanceolate, 1-nerved, ciliate on the back, first 3.5-4 mm. long, second 5-6.5 mm. long; floral glume of the perfect floret membranous, oval-lanceolate, 5-6 mm. long, central seta about 1 mm. long; palea as wide as its glume and as long or longer; floral glume of staminate floret 4.5 mm. long, lateral setæ 3-5 mm. long, the central stouter and reaching higher; rachilla extending above the staminate flower, but bearing no awn or glume.

S. Watson in Am. Acad. Sci. p. 178, 1883, says: "Somewhat variable in size, habit, and number of spikelets, but the floral

characters uniform within narrow limits in all the specimens examined from the United States, Mexico, Panama, and the West Indies. There can be little hesitation in referring all the following to Lagasca's species, viz., *Heterosteca junceifolia* H. B. K., Nov. Gen. 1:173, t. 54. *Dinebra repens* H. B. K., l. c., 172, t. 52. *Bouteloua Humboldtiana* Griseb. Probably also *Dinebra bromoides* H. B. K., l. c., t. 51."

Texas, *Nealley* for Nat. Mus.; Mexico, *Schaffner* 1001, 1003, *Palmer*, 115^a, 188, 201, 135⁺, *Pringle* 1436.

Western Texas, Arizona, Mexico, Central America.

16. **B. Havardi** Vasey, S. Wats. in Proc. Am. Acad. 18:179 (1883).

An erect tufted perennial, 20-40 cm. high. Ligule a ciliate ring; blades numerous below, flat, firm, 7-15 cm. long (the upper 2-3 cm.), 2 mm. wide, sparingly silky hairy. Spikes 4-6, white, silky, villous, about 1 cm. long, on a slender axis 4-5 cm. long. Spikelets 7-10 to each spike, crowded, first glume hyaline, lanceolate, 2.5 mm. long, including a short seta, second ovate-lanceolate, 3.5 mm. long besides a seta 2 mm. long, the nerve very heavy; floral glume hairy, broadly oval, 5 mm. long, 1.7 mm. wide, the lobes about equal; palea a little shorter, 2-toothed; rachilla and the 3 setæ very slender and weak, 3-6 mm. long, the middle one with membranous margins or none.

Texas, *Havard*, *Nealley*; New Mexico, *Wright* 753; Arizona, *Pringle*; Mexico, *Pringle* 410.

Texas, New Mexico, Arizona, Mexico.

Mr. Pringle says: "This I have found to be the most valuable pasture-grass of the hills and mesas around the city of Chihuahua. Being perennial it forms a sod, more or less interrupted however. Its leaves are mostly radical, and are abundant, its culms slender and about a foot in height; to the tender and nutritious quality of its herbage the animals, which kept it closely cropped down throughout most of the season, gave abundant testimony."

17. **B. Allamosana** Vasey, Contrib. U. S. Nat. Herb. 1:115 (1891).

Tufted, diffuse, 7-15 cm. high. Leaves with pubescence from

tubercles, sheaths loose, longer than the internodes; ligule a fringe of hairs; blades flat, 3-6 cm. long, 2 mm. wide. Panicle racemose, 3-5 cm. long, bearing 3-5 spikes 1 cm. long, besides the awns, each consisting of 3-4 spikelets. Spikelets 2-flowered; empty glumes 1-nerved, first 5 mm. long, second 6-7 mm. long, the latter scabrous on the keel; floral glume of lower floret oblong-lanceolate, 6 mm. long, 5-nerved, lateral awns extending to the tips of the slender teeth, central awn about 1.5 mm. long; palea as long as its glume, 2-toothed. Grain obcompressed, 4 mm. long. Sterile floret about 5 mm. long, the three awns subequal, about 8-10 mm. long.

Mexico (Sonora), *Palmer* 698, on rocky ridges.

18. **B. aristidoides** (Kunth) Griseb. Fl. Brit. W. Ind. 537 (1864). *Dinebra aristidoides* H. B. K. Nov. Gen. 171, t. 695 (1815). *Eutriana aristidoides* Trin. Unifl. 242 (1824); Kunth, Rev. Gram. 1: 95 (1829).

A slender tufted annual (?), 10-30 cm. high. Leaf-blades rough with slender scattered hairs on the upper side, 2-4 cm. long, less than 2 mm. wide. Spikes 5-10 in number, 1-15 cm. long, more or less hairy, usually spreading on one side of an axis, 4-6 cm. long. Spikelets narrow, appressed to the hairy rachis, 2-3 to a spike, the lower with no awns, the upper with awns projecting; empty glumes lanceolate, 1-nerved, first 2 mm. long, with a seta 1 mm. or more long, second pubescent with no seta; floral glume of the lower spikelet about 5 mm. long, oval-lanceolate, central seta very short, lateral ones obsolete; palea as long and as wide as its glume, setæ very short. No empty glume or seta above. Grain linear, 2.5-3 mm. long. Floral glume of the second and third spikelets like the floral glume of the lower spikelet; rachilla slender, 1.5 mm. long, hairy in middle or above, bearing 3 setæ, the lateral ones 6 mm. long, the central a little shorter, bearing near its base two short slender lateral lobes or not.

Mexico, *Parry & Palmer* 941, *Palmer* 51, 162, 1353.

Arizona, *Pringle*; California, *Palmer* 400, 543.

Texas, New Mexico, Arizona, southern California, and Mexico.

A low diffuse and firm-stemmed annual appearing scattered over

the plains and mesas after the rainy season; less abundant and of less utility than *B. polystachya* Torr. var. *major*. Vasey.

19. **B. uniflora** Vasey, Coult. Bot. Gaz. 16: 26 (1891).

A slender perennial, 30–40 cm. high. Leaves of the culm 4, sheaths shorter than the internodes; ligule a ring of short hairs; blades rigid, becoming involute, 8–15 cm. long, 1.5–2 mm. wide. Panicle included at the base, racemose, 8–12 cm. long, bearing 35–50 spikes. Spikes 7–8 mm. long, 1-flowered, rachis linear, 4–6 mm. long; empty glumes conduplicate, 1-nerved, first linear, 3–4 mm. long; floral glume 5–6 mm. long; palea 4–5 mm. long, usually a capillary pedicel present.

Texas, *Nealley* in 1890.

20. **B. Triathera** Benth. Journ. Linn. Soc. 19: 104 (1882).

Triæna racemosa H. B. K. Nov. Gen. et Sp. 1: 178 (1815).

Atheropogon Triæna Spreng. Syst. 1: 293 (1824).

A slender tufted perennial, 30–40 cm. high. Ligule a fringe of hairs; blades of sterile shoots involute, 6–12 cm. long, those of the culm shorter, about 2 mm. wide. Panicle racemose, 8–12 cm. long, bearing 35–50 spikes. Spikes 6 mm. long, 1-flowered, rachis bristlelike, 2 mm. long, empty glumes linear, conduplicate, 1-nerved, first 2 mm. long, second 4.5 mm. long; floral glume 5–6 mm. long, palea but little shorter; rudiment 3–4 mm. long, with 3 awns 8–10 mm. long.

Mexico, *Pringle* 4782.

21. **B. Texana** S. Wats. Proc. Am. Acad. 18: 196 (1883).

A densely tufted glabrous or sparingly villous perennial. Culms erect or geniculate, 20–30 cm. high. Blades flat or involute, thinly pubescent on the upper surface, the lower blades 6–18 cm. long. Spikes 5–10, secund, cuneate, 1–1.5 cm. long, including the setæ, borne on an axis 4–5 cm. long. Spikelets 4–6, crowded on the very short hairy rachis, first glume lanceolate, 2 mm. long, with a seta half as long, second ovate-lanceolate, pubescent on the back, 3–5 mm. long, bifid, the strong midnerve produced into an awn about 2 mm. long; floral glume elliptical-ovate, about 4 mm. long, with 3 nearly equal setæ reaching above the apex about 1 mm.; a membranous tooth on each side of the middle seta; palea as long and as

wide as its glume; floral glume of the second spikelet cuneate, about 5 mm. long, including 2 slender lobes, 3 stout setæ extending beyond

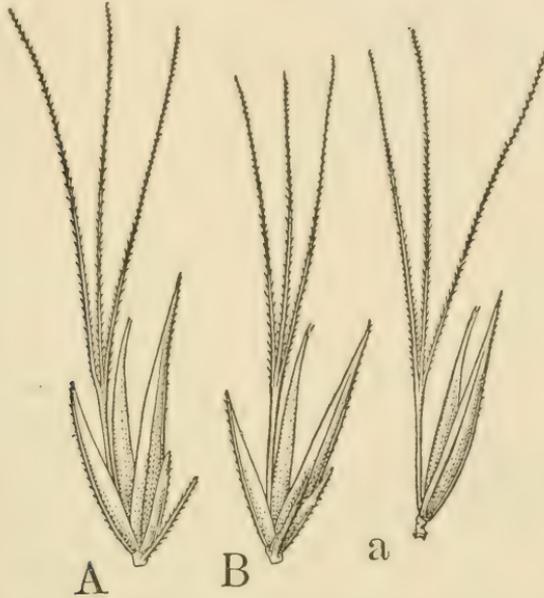


FIG. 76.—*Bouteloua Texana*. A, B, spikelets; a, floret. (Scribner.)

for 5 mm.; palea small, hyaline; floral glume of third floret smaller than the one below and including a rudimentary palea and an empty glume.

Texas, *Reverchon*, *Nealley*; also found in Arkansas.

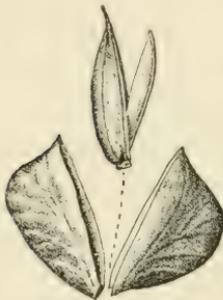
91. (6). **BECKMANNIA** Host, Gram. Austr. 3:5, t. 6 (1805). *Joachimia* Tenore, ex R. & S. Syst. 2:695 (1817). *Bruckmannia* Nutt. Gen. 1:48 (1818).

Panicle terminal, long and narrow. Spikelets subsessile on 2 sides of a subtriangular rachis, articulate with the very short pedicels, broad, compressed, 1-2-flowered; empty glumes 2, membranous, compressed, concave-inflated, obtuse or abruptly pointed, 2 floral glumes narrow, subequal, concave-keeled, acute or mucronate, delicately membranous; palea hyaline, 2-keeled, nearly as long as its glume. Stamens 3. Styles distinct. Grain oblong, included, but not adherent. An erect grass with flat blades having much the

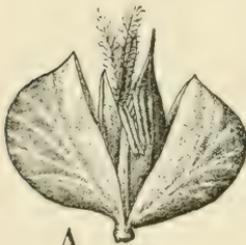
habit of *Panicum colonum*. A genus containing only one species, which has a very wide range. It is found in southern Europe, temperate Asia, and North America.

1. *B. erucæformis uniflorus* Scribn., Vasey, Deser. Cat. Gram. U. S., 8 (1885), name only.

Annual; culms rather stout, simple, 60-90 cm. high. Ligule elongated; blades roughish, 10-20 cm. long, 5-8 mm. wide. Panicle 10-30 cm. long, rays single or in twos or threes, 1.5-4 cm. long. Spikelets 1-flowered, nearly orbicular or broadly obovate, 2.5-3 mm. long, first and second glumes with 3 principal nerves and some transverse nerves.



a



A

FIG. 77.—*Beckmannia erucæformis uniflorus*. Spikelet dissected. (Scribner.)

Ontario, *Fowler*; South Dakota, *Duffey*; Colorado, *Cassidy*; Montana, *Anderson*; Washington, *Lake*; Oregon, *Howell*.

Mountain regions mainly west of the Mississippi. A grass of some prominence as a forage plant for certain localities.

Beckmannia has been usually placed in Phalarideæ, but Bentham believed it belonged to Paniceæ. The habit and inflorescence are those of *Panicum colonum*; but it is exceptional in Paniceæ as having both the flowers perfect; the lower flower is, however, usually sterile. A similar character is to be found in some of the species of *Setaria*, and very rarely in *Panicum* itself, next to which the genus appears to be placed in Chlorideæ.

92. (191). **ELEUSINE** Gært. Fruct. 1:7, t. 1 (1788). *Dactyloctenium* Willd. Enum. Hort. Berol. 1029 (1809). *Acrachne* Wight & Arn. Lindl. Introd. Nat. Syst. Ed. 2, 381 (1836).

Spikelets several-flowered, flat, imbricate in 2 rows on one side of the digitate or scattered branches of a simple panicle, rachilla articulate above the outer glumes, flowers perfect or the upper one staminate. Glumes spreading, keeled and conduplicate, thin but

stiff, empty ones usually shorter, unequal, obtuse, acute, or tapering to a short point; floral glume obtuse or abruptly pointed; palea folded. Styles short, distinct. Grain loosely enclosed by the glume and palea, but not adherent. Seed rugose within a loose membranous pericarp, which either persists or breaks up and falls away.

Species about 7, widely distributed in the tropics. The flat spikelets have sometimes been mistaken for those of *Eragrostis*; but their arrangement in two rows is always that of Chlorideæ.

A. Spikelets very closely crowded, spreading at right angles. 1

B. Spikelets imbricate. (a)

a. Spikes 1-3 cm. long. 2

a. Spikes 5-7 cm. long. 3

1. *E. ÆGYPTICA* (L.) Desv. Pl. Atlant. 1: 85 (1798). *Cynosurus Ægypticus* L. Sp. Pl. 72 (1753). *E. cruciata* Lam. Ill. 1: 203 (1791). *E. pectinata* Mœnch. Meth. Suppl. 68 (1802). *Chloris mucronata* Michx. Fl. Bor. Am. 1: 59 (1803). *Dactyloctenium Ægyptiacum* Willd. Enum. 1029 (1809). *E. radulans* R. Br. Prod. 186 (1810). *E. mucronata* Stokes, Bot. Mat. Med. 1: 150 (1812). *E. ciliata* Rafin. Desv. Journ. Bot. 4: 273 (1814). *E. prostrata* Spreng. Syst. 1: 350 (1824).

Culms tufted or creeping and rooting like *Capriola Dactylon*, 30-50 cm. high. Blades short, flat, ciliate, with long points. Spikes usually 3-5 in number, digitate, 2-5 cm. long, the angular rachis prominent on the upper side. Spikelets very closely packed, spreading at right angles to the rachis, 2-flowered, with rudiments of 2 other flowers, first glume acute, 1-nerved, 1.5 mm. long, second a little longer, 1.5 mm. wide, emarginate, the keel extending into a dorsal awn 2 mm. long; floral glume broad, complicate, abruptly pointed, 3-nerved, about 3 mm. long; palea shorter than its glume.

New Jersey, *Parker* for U. S. Dept. Agricul. 525; Delaware, *Canby* for Clark 1916; Florida, *Curtiss* 3447.

A common weed of warm countries, introduced into North America.

2. *E. BARCINONENSIS* Costa. Ind. Sem. Hort. Borcin. (1859).

Culms tufted, 15-30 cm. high. Leaf-blades short, about 2 mm. wide, obtuse or abruptly pointed, slightly ciliate about the short

ligule. Spikes broad, 2-4 in number, digitate, 1-3 cm. long, often purple. Spikelets closely imbricate, 5-flowered, first glume 1-nerved, 1.5 mm. long, second broadly ovate, 5-6-nerved near the middle; floral glume 3 mm. long, 2 mm. wide, when spread out, a double or triple nerve toward each margin, 1 below in the middle, with 5 above; palea 2.5 mm. long, with a double nerve at each keel.

New Jersey, *Scribner* for U. S. Dept. Agricul. 526; Alabama, *Mohr*; Michigan (Cult.), *Beal* 91.

Introduced on ballast.

3. *E. Indica* (L.) Gærtn. Fruct. et Sem. 1: 8 (1788). *Cynosurus Indicus* L. Sp. Pl. 72 (1753). *E. distans* Mœnch. Meth. 210 (1794). *E. domingensis* Sieber, Schult. Mant. 2: 323 (1794). *E. gracilis* Salisb. Prod. 19 (1796). *E. distachya* Trin. Steud. Nom. Ed. 2, 7: 549 (1841).

There are many more synonyms.

A coarse erect tufted grass, 30-60 cm. high. Sheaths flattened, ciliate with a few soft hairs; blades rather abruptly pointed, narrow. Spikes 2-5 in number, 5-7 cm. long, digitate, or one or more inserted rather lower down, rachis flattened and prominent on one side. Spikelets loosely imbricate, 3-5-flowered, first empty glume 1-nerved, 2.7 mm. long, second ovate, acute, 3-7-nerved at the base, 3.5 mm. long; floral glume broadly ovate, 3-5-nerved near the middle and 1-nerved near each margin, 3-4 mm. long; palea 2.5-3 mm. long. Pericarp persistent, membranous, very loose.



FIG. 78.—*Eleusine Indica*. A, spikelet; a, floret; b, ovary. (Scribner.)

New York, *Clinton* 1299; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 542; District of Columbia, *McCarthy*; Florida, *Curtiss* 3448; Mexico, *Palmer* 35, 328, 478.

A common tropical and subtropical weed.

93. (192, 202). **LEPTOCHLOA** Beauv. Agrost. 71, t. 15, f. 1 (1812). *Diplachne* Beauv. Agrost. 80, t. 16, f. 9 (1812). *Rabdochloa* Beauv. Agrost. 84, t. 17, f. 3 (1812). *Oxydenia* Nutt.

Gen. 1:76 (1818). *Leptostachys* G. F. W. Mey. Prim. Fl. Esseg. 73 (1818).

Spikelets 2- to many-flowered (very rarely 1-flowered), sessile or very shortly pedicellate in 2 rows along 1 side (in one section, along 3 sides of a triquetrous rachis of the slender rachis of a simple spike or of the numerous branches of a simple panicle, flowers all perfect or the upper one staminate; rachilla articulate above the outer glumes, usually hairy and more or less produced above the florets. Empty glumes 2, membranous, keeled, acute or obtuse, unequal, unawned, first 1-nerved, second 1-3-nerved; floral glume 1-3-nerved, often with a sharply 2-lobed apex, the keel produced into a sharp point or awn between or a little below the lobes; palea thin, shorter than its glume, prominently 2-nerved. Stamens 2-3. Styles short, distinct. Grain smooth or nearly so, enclosed, but not adherent. Seed loose or easily freed from the pericarp.

Professor Scribner's reasons for uniting *Diplachne* to *Leptochloa* seem to me good, as given in Proc. Acad. Phila. 303 (1891). Bentham in some of his descriptions of *Diplachne* defines the floral glume as 1-nerved, but in *Flora Australiensis* 7:618 (1878) three of the species there mentioned are described as having the floral glume 3-nerved.

The following sections have been proposed:

A. *Leptochloa* proper. Spikelets flat, ovate or oval, sessile in the regular rows on the numerous branches of a simple panicle.

Pseudocynodon, one or two flowers to the spikelet.

Euleptochloa, two or more flowers to the spikelet.

- | | |
|-------------------------------------|-----|
| a. Floral glume mucronate. | 1 |
| a. Floral glume emarginate. | (a) |
| b. Sheaths sparingly hairy. | 2 |
| b. Sheaths smooth. | (c) |
| c. Spikes 2.5 cm. long. | 3 |
| c. Spikes 3.4 cm. long. | 4 |

B. *Diplachne* as a section. Spikes of the panicle long and slender, spikelets almost linear, scattered along the

- rachis in 2 irregular rows. Second empty glume 1-nerved. (d)
- d. Panicle spikelike. 5
- d. Panicle branching. (e)
- e. Floral glume less than 3 mm. long. (m)
- m. Panicle 2-8 cm. long. 6
- m. 15-25 cm. long. 7
- e. Floral glume 3 mm. long. 8
- e. Floral glume 3.5 mm. long. 9
- e. Floral glume 4 mm. long. (n)
- n. Second empty glume 3 mm. long. 10
- n. Second empty glume 4-5 mm. long. 11
- C. *Gouinia* Fourn. as a genus. Spikes of the panicle long and slender. Spikelets scattered along the three sides of the rachis, 1-nerved, floral glume 3-nerved. (o)
- o. Awn 1-3 mm. long. 12
- o. Awn 8-12 mm. long. 13

1. **L. scabra** Nees, *Agrost. Bras.* 435 (1829). *L. Langloisii* Vasey, *Bull. Torr. Club*, 12:7 (1885). *L. Ludoviciana* Vasey.

Culm smooth, stout, leafy, 100-130 cm. high. The lower blades one-third as long as the culm; sheaths loose, compressed, glaucous, 30 cm. long, about 1 cm. wide. Panicle scarcely protruding or partially included by the upper leaf, racemose, 20-30 cm. long, about 5 cm. wide, loose, simple, spikes 100 or more, crowded below, single or 2-3 together, 5-7 cm. long. Spikelets 3-4-flowered, sessile, loosely imbricate, 4 mm. long; the internode of the rachilla for each floret 1 mm. long; empty glumes membranous, ovate, acute, 1-nerved, first 0.7 mm. long, second a third longer; floral glume oval when spread, mucronate, 3-nerved, hairy on the back, 2.5 mm. long; palea about as long as its glume, ciliate on the nerves, 2-toothed. Grain 3-sided.

Louisiana, *Langlois*.

2. **L. mucronata** (Michx.) Kunth, *Gram.* 1:91 (1829-35). *Eleusine mucronata* Michx. *Fl. Bor. Am.* 1:65 (1803). *L. filiformis* J. & C. Presl, *Rel. Hænk.* 1:288 (1830). *L. attenuata* Steud. *Syn. Pl. Gram.* 209 (1855). *L. pellucida* l. c.

A sparingly branched annual 30–60 cm. high. Sheaths thinly clothed with slender hairs from warty bases; blades flat, scabrous, 8–12 cm. long. Spikes 20–50 in number, 3–7 cm. long, in a paniclelike raceme, 20–30 cm. long, often partially enclosed by the upper sheath. Spikelets loosely imbricate, 2–4-flowered, 2–3 mm. long; empty glumes membranous, with one scabrous nerve, first lanceolate, nearly 2 mm. long, second a little broader and longer, mucronate, 3-nerved; floral glume membranous, 3-nerved, broadly oval, emarginate, hairy on the back and margins, 1.3 mm. long; palea broadly hairy, equalling its glume. A form with a few slender spikes and rather distant spikelets is var. *tenella* Scribn.



FIG. 79.—*Leptochloa mucronata*. Spikelet. (Scribn.)

Tennessee, *Curtiss* 3449 from Gattinger; Texas, *Hell* 777, *Reverchon*, *Lindheimer* 212; New Mexico, *Wright* 756; Arizona, *Pringle* in 1884; California, *Coulter* 785; Mexico, *Palmer* 117, 1364.

Virginia, Illinois, south and west.

Var. *pulchella* Scribn. Bull. Torr. Club, 9: 147 (1885).

Culms slender, tufted, erect, 12–24 cm. high, including panicle; blades 2–7 cm. long, 2–4 mm. wide; panicle erect, spikes 2–3 cm. long.

Texas (El Paso), *Pringle*; Arizona (near Tucson), *Pringle*; southern California, *Orcutt* for Nat. Mus.; Mexico, *Palmer* 50, 694.

3. *L. Nealleyi* Vasey, Bull. Torr. Club, 12: 7 (1885).

A smooth grass, 60–80 cm. high. Blades 15–25 cm. long, 4 mm. wide; upper sheaths long and including the base of the panicle. Panicle 20–25 cm. long, narrow. Spikes closely flowered, 2.5 cm. long, in threes or fives or scattering. Spikelets oval, 3 mm. long, 3–5-flowered, empty glumes ovate, 1-nerved, first 0.7 mm. long, second twice as long; floral glume oval, 1–1.7 mm. long, 3-nerved, mucronate in the emarginate apex, pubescent on the nerves; palea oval, as long as its glume, obtuse, pubescent on the nerves.

Texas, *Nealley* in 1884.

4. **L. Domingensis** (Jacq.) Trin. Fund. Agrost. 133 (1820); Link, Enum. 1:103 (1821). *Cynosurus Domingensis* Jacq. Icon. 1:22 (1781). *L. virgata* Wight. Steud. Syn. Pl. Gram. 213 (1855).

Culms erect, sparingly branched, 30–90 cm. high. Sheaths longer than the internodes; ligule very shortly ciliate; blades flat, smooth; 15–30 cm. long, 4–7 mm. wide. Panicle 10–15 cm. long, spikes 15–30 in number, 3–4 cm. long. Spikelets purplish, 2–3-flowered, 1.7 mm. long; empty glumes 1-nerved, first about 1 mm. long, second 1.5 mm. long; floral glume 3-nerved, 1.5 mm. long, oval, slightly ciliate on the margins, emarginate, the awn 1.5 mm. long; palea as long as its glume.

Southern Florida, *Simpson* for U. S. Nat. Herb. in 1892; Texas, *Nealley* in 1888 for U. S. Nat. Herb.

5. **L. spicata** (Döell) Scribn. Proc. Acad. Phila. 304 (1891). *Diplachne spicata* Döell, Benth. Jour. Linn. Soc. 19:111 (1881). *Triodia Schaffneri* S. Wats. Proc. Amer. Acad. 18:181 (1883). *D. Reverchoni* Vasey, Bull. Torr. Club, 13:118 (1886).

Cæspitose; culms erect, simple, 10–25 cm. high. Blades mostly from sterile shoots, numerous, setaceous, smooth, 2–10 cm. long. Raceme simple, spikelike, 5–8 cm. long. Spikelets sessile, appressed, mostly imbricate, linear-lanceolate, 7–9-flowered, 5–9 mm. long; empty glumes linear, 1-nerved, rather obtuse, compressed; first 2 mm. long, second 2.5 mm. long; floral glume ovate-lanceolate, 3-nerved, slightly pubescent on the base and on the rachis, lateral nerves not extending into the obtuse lobes, awn 0.5 mm. long; palea contracted at the base appearing stalked.

Texas (Lano County), *Reverchon* 1613, *Nealley*; Mexico, *Pringle* 3267.

5. **L. viscida** (Scribn.). *D. viscida* Scribn. Bull. Torr. Club, 10:30 (1883).

Similar in habit and inflorescence to *L. fascicularis*, but usually smaller throughout and “covered with acrid viscid glands,” and often more or less tinged with light red or purple. Culms 5–40 cm. high. Sheaths loose. Panicle 2–8 cm. long, terminal or sessile in the axils of the leaves, mostly enclosed by the inflated

sheaths; rays ascending, densely flowered, 1-2.5 cm. long. Spikelets nearly sessile, 4-6-flowered, 3-5 mm. long; empty glumes ovate, acute, 1-nerved, first 1.5 mm. long, second 2-2.5 mm. long; floral glume oval, 3-nerved, 2-2.5 mm. long, shortly ciliate below on all the nerves, two-lobed at the apex, the awn 0.7-1 mm. long; palea scabrous on the keels.

Arizona, *Pringle* for U. S. Dept. Agricul.; Mexico, *Pringle* 692, 814, *Palmer* 551.

Texas to Arizona and Mexico.

7. *L. imbricata* Thurb. Gram. Mex. Bound. ined.; S. Wats. Bot. Calif. 2: 293 (1880). *D. imbricata* (Thurb.) Scribn. Bull. Torr. Club, 10: 30 (1883).

Culms erect, simple or sparingly branched below, 30-60 cm. high. Sheaths loose; blades scabrous, setaceous above, 15-20 cm. long, 3-4 mm. wide. Panicle erect, usually included at the base, 15-25 cm. long, spikelike, rays very numerous, ascending. Spikelets nearly sessile, appressed, imbricate, acute, 6-9-flowered, 5-7 mm. long; empty glumes 1-nerved, first ovate, 1.5 mm. long, second oval or ovate, mucronate, 2.5 mm. long; floral glume oblong, lateral nerves long-pilose below, obtuse, mucronate, 2.3-2.5 mm. long; palea contracted below, but little shorter than its glume, puberulent on the nerves.

Arizona, *Pringle* in 1881 for U. S. Dept. Agricul. 549; Mexico, *Pringle & Palmer*.

Southern California, Arizona, Mexico.

Dr. Palmer notes that it is abundant in fields and gardens; thrifty on alkali plains and near soft water; abundant in August and September, when alfalfa is dried up; a good forage-plant, cut and fed to animals.

8. *L. fascicularis* (Lam.) A. Gray, Man. Ed. 1: 588 (1848). *Festuca fascicularis* Lam. Tabl. Encycl. 1: 189 (1791). *D. fascicularis* Beauv. Agrost. 160 (1812).

Smooth, light green; culms geniculate and branching. Sheaths mostly shorter than the internodes; ligule fringed, 2-3 mm. long; blades flat or involute, 15-20 cm. long, 2-3 mm. wide. Panicle usually included below, 8-17 cm. long, rays mostly single, erect,

spikelike. Spikelets on short pedicels, 7-11-flowered, 6-10 mm. long; empty glumes 1-nerved, mucronate, first 1.5 mm. long, second 3 mm. long; floral glume 3-nerved, 3 mm. long, pubescent on the margins along the lower half; palea linear, shorter, pubescent on the margins.

U. S. Dept. Agricul. 548; Texas, *Jones* 4203, *Nealley*; Mexico, *Pringle* 815.

New England to Arizona and Mexico, often on brackish marshes.

9. **L. Tracyi** (Vasey). *D. Tracyi* Vasey, Bull. Torr. Club, 15: 49 (1888).

An erect grass, 50-90 cm. high. Sheaths smooth or nearly so; ligule fringed, 3 mm. long; blades 3-5, scabrid, narrow, involute, 20-40 cm. long. Panicle 20-30 cm. long, rays 1-3 together, of very unequal length, the longest spikelike, 10 cm. long, bearing about 14 spikelets. Spikelets purple, appressed, slightly imbricate, pedicels 1-3 mm. long, 8-10-flowered, 8-12 mm. long; empty glumes lanceolate or ovate-lanceolate, 1-nerved, mucronate, first 2 mm. long, second 3-3.5 mm. long; floral glume linear, 3.5 mm. long, pubescent on the lower half of the lateral nerves, each of which terminates in a mucro; apex 2-lobed or 2-toothed with an awn 1-2 mm. long; palea linear, pubescent on the nerves, 3 mm. long.

Dr. Palmer says of it: "Found quite abundantly in little oases of thin soil on the rocks, high up the mountains where it was well watered."

Nevada, *Tracy* for U. S. Dept. Agricul. 691; Mexico, *Palmer* 691.

10. **L. Pringlei** (Vasey). *D. Pringlei* Vasey ined.

Culms 30 cm. high. Ligule a mere ring bearing short hairs; blades 4-5, scabrid, compressed, 2 mm. wide. Panicle little exerted or enclosed at the base, purplish, rays simple, 5 in number, spikelike, 4-6 cm. long. Spikelets slightly imbricate, 2-3-flowered; empty glumes lanceolate, 1-nerved, first 2.5 mm. long, second 3 mm. long; floral glume ovate-oblong, 4 mm. long, truncate or emarginate, the midnerve barely extending to the base of the notch at the apex, the three nerves sparingly and shortly hairy near the base; palea 3.5 mm. long.

Arizona, *Pringle* in 1884.

11. **L. dubia** (H. B. K.) Nees, Syll. Ratisb. 1:4 (1824); Agrost. Bras. 2:433 (1829). *Chloris dubia* H. B. K. Nov. Gen. et Sp. 1:169 (1815). *D. dubia* Scribn. Bull. Torr. Club, 10:30 (1883).

Culms rather slender, 20–30 cm. high. Sheaths smooth or scabrous; ligule very short, bearing long hairs; blades scabrous, flat or involute, 20–40 cm. long, 3 mm. wide. Panicle barely exerted, 15–20 cm. long, spikelike, rays 8–15, ascending, 5–12 cm. long. Spikelets on short pedicels, slightly imbricate, 4–6-flowered, 5–7 mm. long; empty glumes lanceolate, 1-nerved, first 3–4 mm. long, second 4–5 mm. long; floral glume ovate-oblong, about 4 mm. long, the three nerves pubescent and disappearing a little below the two obtuse lobes of the apex; palea linear, 3.5 mm. long, the nerves densely clothed with short pubescence.

Florida, *Curtiss* 3450, *Garber*; Texas, *Jones*, *Nealley*; Arizona, *Lummon* 368; Mexico (Chihuahua), *Pringle* 422, *Palmer* for U. S. Dept. Agricul. 547, *Palmer* 270.

Dr. Palmer says: "In shady places among the rocks of the mountains."

12. **L. Mexicana** Scribn. Proc. Acad. Phil. Sc. 308 (1891).

Culms simple, terete, solid, erect, 1 mm. or more high from a strong rootstock. Sheaths about the length of the internodes, ligule a ring of stiff hairs, 2–3 mm. long; blades glabrous, flat, lanceolate, 30–40 cm. long, 1–2 cm. broad, tapering gradually to the very acute apex, midrib white and prominent below. Panicle pyramidal, 30–40 cm. long; rays simple solitary or the lower subverticillate. Spikelets 10–14 mm. long, 3–4-flowered, erect, remote below; pedicels mostly shorter than the spikelets; empty glumes membranaceo-chartaceous, broadly lanceolate, first 4–5 mm. long, second 6–7 mm. long, scabrous on the nerve; floral glume 8 mm. long, densely silky-villous for half or more of its length, mid-nerve extending into an awn 1–3 mm. long beyond the entire apex, lateral nerves evanescent above; palea 2-toothed, callous, densely pilose. Stamens 3. Ovary smooth.

Mexico, *Pringle* 3252, on limestone ledges.

13. **L. polygama** (Fourn.). *Gouinia polygama* Fourn. Hemsl.

Biol. Centr. Am. Bot. 3:581 (1880). *Hackelia* (?) *angustifolia* Vasey, MS.

Culms simple, terete, solid, 60-70 cm. high. Sheaths longer than the internodes; ligule fringed, 1 mm. long; blades flat, smooth, 20-30 cm. long, 7-10 mm. wide, midnerve white. Panicle pyramidal, 30-40 cm. long. Spikelets 8-12 mm. long, 2-3-flowered, subsessile, empty glumes membranous, first 3.5-4 mm. long, second 5 mm. long; floral glume lanceolate, 6-8 mm. long, shortly silky-villose, midnerve extending into an awn 8-12 mm. long, lateral nerves evanescent above; palea 2-toothed, callous, pilose.

Mexico, *Palmer* 1087.

94. (193). **BULBILIS** Rafin. Am. Month. Mag. 4:190 (1819). *Sesleria* Nutt. Gen. 1:64 (1818), not L. *Calanthera* Nutt. ex Hook. Kew Journ. 8:18 (1856). *Buchloë* Engelm. Trans. St. Louis Acad. 1:432 t. 14, figs. 1-17 (1859).

Spikelets diœcious, very dissimilar; those of the staminate plant 2-3-flowered, sessile, complanate in 2 rows on one side of the rachis, rachilla not articulate; empty glumes 2, membranous, awnless, inequilateral, elliptical, 1-nerved, mucronate, first about 2 mm. long, second 3 mm. long; floral glume elliptical, 3-nerved, mucronate, 3.5 mm. long; palea a little shorter than its glume, 2-nerved. Lodicules 2, deltoid. Stamens 3. Rudimentary pistil none. The spikelets of the pistillate plant 1-flowered, sessile on one side of a very short rachis, forming a cluster partly enclosed by the upper leaves. The lowest glume of the lowest spikelets small, 1-3-nerved, lanceolate-subulate, adnate to the second empty glume, this glume firm with a 3-lobed apex, the central lobe longest; lowest glumes of the other spikelets free, much smaller, membranous, ovate-lanceolate, acute, 1-nerved; floral glume narrow, firm or almost hyaline, 2-cleft or subentire, enclosing a broad convolute 2-nerved palea and a flower. Staminodia 0. Styles distinct, long, stigmas with short hairs. Grain ovate, obcompressed with a groove. Blades flat, narrow. Staminate spikes 2-3 on one side of the apex of the culm; pistillate spikes usually 2.

Nuttall had male plants only for establishing the genus *Sesleria*, while Steudel founded the genus *Antephora* on the female

plant. Dr. Engelmann was the first to discover the true nature of the plant.

One species, extensively spread over the great plains from Mexico to British America.

1. *B. dactyloides* (Nutt.) Rafin. Kuntze, Rev. Gen. Pl. 2:763 (1891). BUFFALO-GRASS. *Sesleria dactyloides* Nutt. Gen. 1:65 (1818). *Anthephora* (*Antephora*) *axilliflora* Steud. Syn. Pl. Gram. 111 (1855). *Buchloë dactyloides* Engelm. Trans. St. Louis Acad. 1:432 (1859).

Densely tufted, extensively spreading by stolons. Culms of the male plant 9-20 cm. high, those of the pistillate plant 4-7 cm.

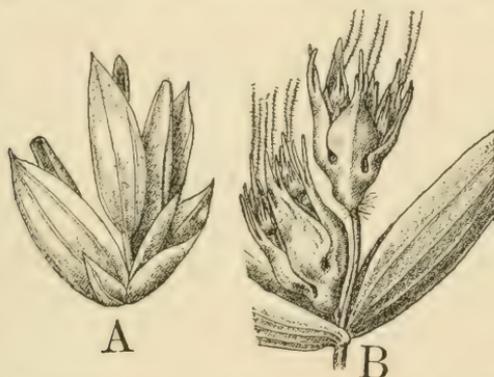


FIG. 80.—*Bulbilis dactyloides*. A. Staminate spikelet; B, pistillate spikelet. (After Engl.)

high. Blades 5-10 cm. long, 2 mm. wide, nearly smooth or slightly hairy, bearded at the ligule.

Texas, *Hall* 770, *Drummond* 359, 378; New Mexico, *Wright* 517, 785, 2079; Colorado, *Parry* 369; Mexico, *Schaffner* 1004, 1021, *Parry & Palmer* 922.

This famous grass disappears rapidly with close feeding of live stock.

95. (195). *Opizia* J. & C. Presl, Rel. Hænk. 1:293, t. 41, f. 1 to 11 (1830). *Casiostega* Rupr. Galeotti, in Bull. Acad. Brux. 9: Part 2, 232 (1842).

Spikelets monœcious or diœcious, 1-flowered, the staminate in slender 1-sided spikes. Empty glumes entire, 1-nerved, the lower the

smaller, second not as long as the spikelet: floral glume obtuse, 3-nerved; palea 2-nerved. Lodicules long, obtuse. Pistillate flowers arranged in a one-sided spike. First empty glume short, obtuse, pilose, second coriaceous, involute, tipped by 3 long awns; floral glume large, compressed, 2-lobed, with a sterile rudiment above bearing 2-3 awns; palea shorter than its glume, obtuse, 2-keeled, enclosing the compressed mucronate and subcordate grain; pericarp loose. Lodicules lanceolate.



FIG. 81.—*Opizia stolonifera*. Spikelets. (Scribner.)

A low creeping grass with short rigid flat or conduplicate leaf-blades.

One species known, and that is found in Mexico.

1. *O. stolonifera* Presl, l. c. *Casiostega anomola* Rupr. Bull.

Acad. Roy. Brux. 9: (II) 232 (1842); Steud. Syn. Gram. 218 (1855), male plant.

Diffuse, 4–10 cm. high. Sheaths compressed; ligule very short; blades 1.5–2.5 cm. long, 1.5 mm. wide, apex abruptly acute. Spikes of staminate flowers 1–1.5 cm. long. Spikelets linear, 3 mm. long, first glume 1 mm. long, second 2 mm. long. Anthers linear, 1.7 mm. long. Second glume of the pistillate spikelet 3 mm. long, sterile rudiment of a stipe 1.4 mm. long, the three awns 4–5 mm. long, the lateral ones with a broad expansion on one side near the base.

Mexico, *Palmer* 615.

96. **PENTARRHAPHIS** H. B. K. Nov. Gen. 1:177, *t.* 60 (1815). *Strombodurus* Willd. Steud. Nom. Ed. 2, 2: 647 (1841).

Monœcious; spikelets 2-flowered, 1–2 in each fasciclelike spike, accompanied by 1–4 shorter awnlike rudiments, the first flower pistillate, the second pistillate or staminate; rachilla produced into a short bristle. The two empty glumes 1-nerved, the second the larger, usually 2-toothed, with an awn between the teeth; floral glume 5–7-toothed, the middle and marginal teeth extending into long divergent awns; palea strongly 2-nerved, 2-toothed. Stamens 3. Styles distinct. Grain oblong, free. Low, slender, tufted grasses with flat blades. Spikes very short, secund along the flexuose rachis, articulate with the very short pedicels, falling off entire.

They resemble *Egopogon* in the disposition and appearance of the clusters of spikelets and their deciduous character. It is nearly allied to *Melanocenchrus*. From *Bouteloua*, section *Triathera*, this genus may be distinguished by its 2-flowered spikelets and simple, bristlelike prolongation of the rachilla.

There are three species; two and probably the third are Mexican.

1. **P. Fournierana** (Vasey), Hack. & Scribn. Bull. Torr. Club, 17: 232 (1890). *Bouteloua Fournierana* Vasey ined.

Culms crowded, 18–25 cm. high, from creeping rootstocks, nodes villous. Leaves hairy, ligule a ring of short hairs; blades of sterile shoots 3–7 cm. long, about 1 mm. wide, those of the culm 15–30 cm. long. Spikes 3–6, rachis compressed. Spikelets 2 in each cluster, sessile, about 5 mm. long, not including the short awns,

rudiment simple or bifid; empty glumes pilose, much shorter than the spikelets; floral glume densely hairy.

Mexico, *Palmer* 200, *Pringle* 2559, labeled *P. geminata*.



FIG. 82.—*Pentarrhaphis Fournierana*. Spike spread open. (Scribner.)

2. *P. scabra* H. B. K. Nov. Gen. 1:178, t. 60 (1815).

Culms branching, taller; leaf-blades longer and broader; spikelets only one at each node of the rachis, first empty glume and the bristlelike rudiments scabrous. Not seen by me.

3. *P. paupercula* (Presl). Scribn. Bull. Torr. Club, 17:233 (1890). *Polyschistis paupercula* Presl, Rel. Hænk. 1:294, t. 41 (1830).

Blades of sterile shoots short, like those of the culms; spikelets only one at each node of the rachis, the short pedicel of the second floret pilose. Not seen by me.

TRIBE XI.—FESTUCEÆ.

Spikelets 2- to many-flowered, very rarely 1-flowered, in a spreading, narrow or spikelike panicle, rachilla articulate or continuous, usually produced above the upper floret or bearing 1 or more terminal empty glumes. Empty glumes usually narrow, keeled, acute or obtuse, shorter than the nearest floral glumes; floral glume usually broader, entire, awnless or with 1- to many terminal (rarely dorsal) straight awns; palea 2-keeled, usually as long as its glume or nearly so. Embryo usually small. Grain free from the palea or adnate. A very large tribe containing the most important meadow-grasses of cool regions.

A. Spikelets usually few-flowered. Floral glumes divided into 3 to many awns or lobes, or the awns dorsal. . . (a)

- a. Panicle spikelike, floral glumes terminating in 9-23 plumose awns. 97
- a. Panicle lax, floral glumes terminating in 9-11 irregular lobes. 98
- a. Panicle racemose, floral glumes terminating in 3-5 rigid lobes. 103
- a. Panicle subspicate, floral glumes terminating in 5 delicate awns. 104
- a. Spikelets in threes on a jointed rachis, floral glumes deeply 4-cleft with awns between the lobes. 99
- a. Plant dioecious, floral glumes of fertile florets 3-cleft. 100
- B. Floral glumes entire or 2-toothed to 2-cleft, awnless or with 1 awn. (b)
- b. Tall reedlike grasses. (c)
- c. Floral glumes clothed with long hairs. 105
- c. Rachilla (alone) clothed with long hairs. 106
- b. Not reedlike, floral glumes naked or containing hairs shorter than the glumes. (d)
- d. Stigmas with short hairs on all sides. (e)
- e. Spikelets dioecious, solitary, terminal, enclosed by terminal bracts. 101
- e. Spikelets in twos and threes, terminating in leafy branches. 102
- e. Spikelets in an ovoid or cylindrical panicle, lowest spikelets with bracts at the base. 104
- d. Stigmas plumose. (f)
- f. Spikelets of two forms, the fertile 1-3-flowered; the sterile with awned glumes. (g)
- g. Fertile spikelets 1-flowered. 125
- g. Fertile spikelets 2-3-flowered. 124
- f. Spikelets all alike. (h)
- h. Floral glumes 2-3-toothed, lateral nerves and callus usually hairy. (i)
- i. Spikelets 3- to many-flowered. 107
- i. Spikelets 3-5-flowered. 108
- h. Floral glumes of some other structure. (j)

- j. Floral glumes 1-3-nerved, flowers perfect, or the upper one staminate or rudimentary. (k)
- k. Rays spirally arranged. (l)
- l. Panicle narrow, spikelets small, conical, 2-4-flowered, rachilla articulate. 110
- l. Panicle variable, spikelets not conical, usually densely many-flowered, rachilla usually continuous. 111
- k. Rays distichous. (m)
- m. Panicle narrow, spikelets 2-4-flowered, empty glumes much longer than the floral. . . . 109
- m. Empty glumes shorter or but little longer than the floral glumes. (n)
- n. Panicle narrow, spikelets 2-4-flowered, second empty glume broader and longer than the floral glumes, which are broadly obtuse, awnless. . . . 112
- n. Panicle spikelike, second empty glume not broader or longer than the floral glumes. 113
- n. Panicle diffuse, spikelets small, 2-4-flowered, empty glumes subequal. 114
- j. Floral glumes 3-5- to many-nerved, with two or more of the upper glumes empty and closely enveloping each other, spikelets but little compressed. (o)
- o. Stamens 3, lodicules 1, empty glumes usually clavate. 115
- o. Stamens 1-2, lodicules 2, upper empty glumes not clavate. 116

- j. Floral glumes 5- (rarely 3-) to many-nerved (p)
- p. Blades broad, containing transverse veins. 117
- p. Blades narrow, transverse veins none. (q)
- q. Panicle racemose, secund, palea winged-ciliate. 118
- q. Panicle variable. Spikelets flat, broad, lower empty glumes 3-6, palea not winged. 119
- q. Plant diœcious, panicle narrow, empty glumes 2, firm. 120
- q. Flowers perfect, panicle lax, floral glumes cordate. 121
- q. Floral glumes not cordate. . . (r)
- r. Spikelets closely imbricate in a spikelike panicle, floral glumes 7-nerved with glandular hairs at the base. 122
- r. Spikelets in glomerate clusters of the secund panicle. . . . 123
- r. Spikelets in panicles or racemes, neither imbricate nor fasciculate, rays in half-whorls of 1-5 or more. (s)
- s. Stigmas 2, inserted at or near the apex of the ovary; empty glumes awnless. (t)
- t. Empty glumes longer than the rest of the spikelet. 128
- t. Floral glumes project above at least some of the empty glumes . . . (u)
- u. Lateral nerves of the floral

- glumes nearly parallel,
not converging. . . . (v)
- v. Empty glumes not
shorter or very little
shorter than the near-
est floral glumes. . . (w)
- w. Floral glumes with
two very short
obscure lateral
nerves on each side. 127
- w. Floral glumes
with 3-4 lateral
nerves on each
side. 129
- v. Empty glumes much
shorter than the near-
est floral glumes. . . (x)
- x. Styles distinct,
lodicles united. . 131
- x. Styles none, lodi-
cles distinct. . 132
- u. Lateral nerves of the
floral glumes arched, con-
verging above. . . . (y)
- y. Rachilla with a fringe
of stiff hairs. . . . 130
- y. Rachilla naked,
downy or with
crinkled hairs. . . (z)
- z. Floral glumes
strongly keeled on
the back, hilum
punctiform. . . (aa)
- aa. Floral glumes
cartilaginous
at the base. . 129

- aa. Floral glumes
membranous or
herbaceous at
the base. . . 126
- z. Floral glumes
rounded on the
back at least below. (bb)
- bb. Palea scabrid
or minutely
fringed on the
keels. . . . 133
- bb. Palea pectinate
on the keels . 135
- s. Stigmas below the apex. . 134

97. (197). **PAPPOPHORUM** Schreb. Gen. Pl. 2: 787 (1791).
Polyraphis Trin., Lindl. Veg. Kingd. 115 (1847). *Enneapogon*
Desv. Beauv. Agrost. 81 (1812). *Euraphis* Trin. Lindl. l. c.

Spikelets with one perfect flower and one or more male or rudimentary flowers or empty glumes above it, in a dense and spikelike or narrow and loose panicle, the rachilla articulate above the outer glumes and hairy around the floral glume. Empty glumes membranous, persistent, acute, keeled, 1-3- or many-nerved; floral glume broad, subcoriaceous, convex on the back, obscurely many-nerved, with 9-23 more or less plumose and unequal awns; palea 2-nerved, as long as its glume or longer. Styles short, distinct. Grain ovoid or oblong, enclosed in the glume and palea, but not adherent.

Perennial (or rarely annual) grasses with narrow and often convolute leaf-blades.

Species about 20, widely dispersed in warm regions. *Polyraphis* Trin. is an abandoned generic name for species in which the floral glume has thirteen to twenty-three very unequal awns; and *Enneapogon* is another one in which the floral glume has nine awns, all nearly equal.

1. **P. apertum** Munro, Scribn. Bull. Torr. Club, 9: 148 (1882).

A tufted erect perennial, 30-80 cm. high. Sheaths smooth, as

long as the nodes, ciliate at the throat; blades involute, smooth below, those of the culm 15–40 cm. long with filiform tips. Panicle scarcely exerted, pale, 15–20 cm. long, 6–10 mm. wide. Spikelets 2-flowered; empty glumes very thin and scarious, 1-nerved, apex irregularly 2–3-toothed, first 3 mm. long, second 3.5 mm. long; floral glume broad, truncate, 2.2 mm. long, hirsute below on the keel and lateral nerves, 5–7-nerved, awns about 17, the stouter ones 4–5 mm. long. Grain 1.7 mm. long.

Texas, *Nealley* for U. S. Nat. Mus.; New Mexico, *Wright* 435, 2029; Mexico, *Palmer* 350, 1360, 1362, *Pringle* 1973.

Texas to Arizona and Mexico. Very nearly allied to, if not identical with, *P. laguroideum* Schrad.

2. *P. Wrightii* S. Wats. Proc. Am. Acad. 18:178 (1883). *P. boreale* Torr., not Griseb.

A rather slender branching erect or geniculate perennial, 20–40 cm. high; nodes villous. Sheaths puberulent, ciliate at the throat; blades involute, those of the culm 2–8 cm. long, 0.3–0.8 mm. diam. Panicles terminal and axillary, often more or less included by the sheaths, lead-colored or pale, spikelike, 1–7 cm. long, 5–8 mm. diam. Spikelets 1–3-flowered; empty glumes thin and scarious, 5–7-nerved, acute or toothed, sparingly puberulent under a lens, first 3.5–4.5 mm. long, second 1 mm. longer; floral glume hirsute on the central and lateral nerves, oval, 2-mm. long, 9-nerved, the 9 awns 3–5 mm. long.

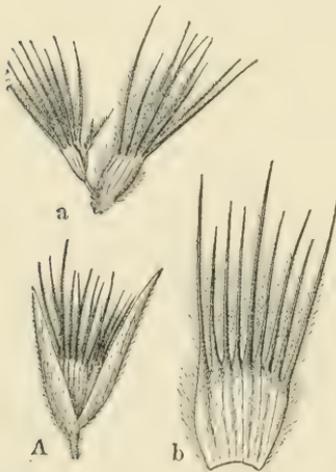


FIG. 83. — *Pappophorum Wrightii*. A, spikelet; a, florets; b, floral glume. (Scribner.)

Texas, *Havard*, *Jones*; Arizona, *Pringle* in 1884, *Lemmon* 3063; California (Los Angeles), *Palmer* 511. The latter says: "Rare, found only in the higher ridges back of the bay." Mexico, *Parry & Palmer* 847, *Palmer* 1361.

Texas to Arizona, California and Mexico.

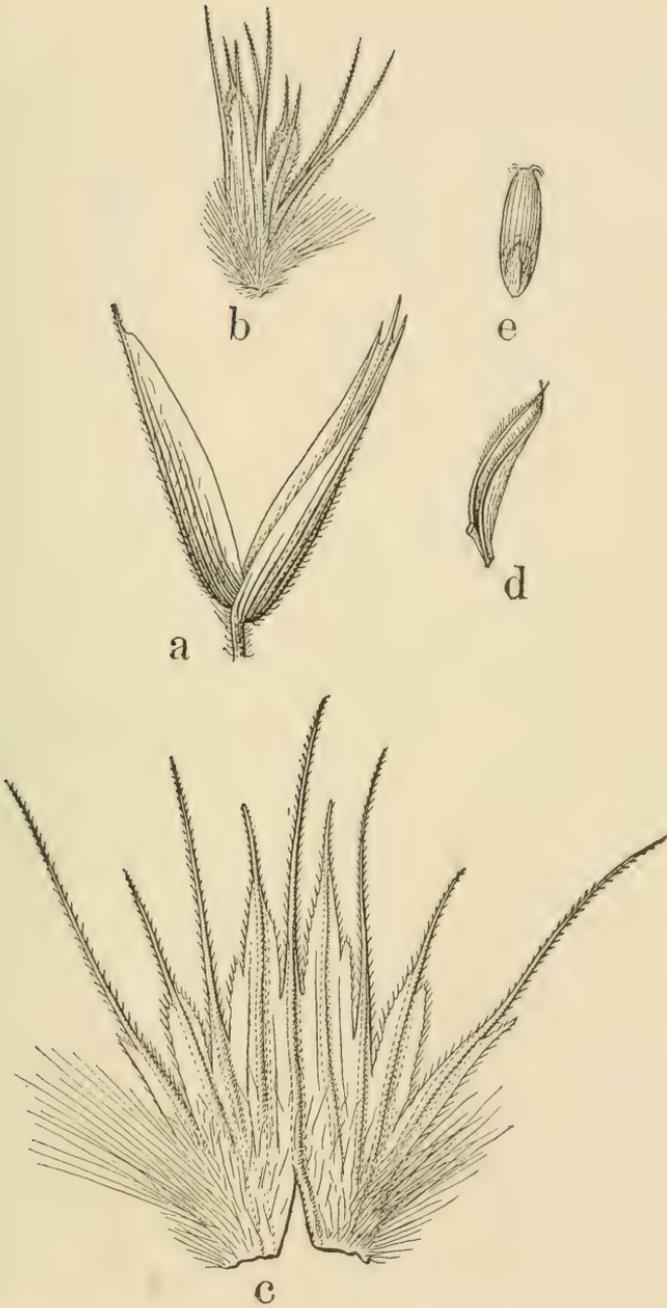


FIG. 84.—*Cottea pappophoroides*. Spikelet dissected. (Scribner.)

98. (198). **COTTEA** Kunth, Rev. Gram. 1: 84, 281, *t.* 52 (1830). Spikelets 2-9-flowered in a spreading oblong panicle, rachilla articulate below the flowers; flowers perfect or the upper ones male or neutral. Empty glumes persistent, membranous, acute or 3-toothed, 7-9-nerved; floral glume 9-13-nerved, irregularly 9-13-lobed, the lobes tapering into awns; palea broad, membranous, elliptical, ciliate on the keels. Stamens 3. Styles distinct, stigmas plumose. Grain ovate or oblong, slightly compressed on the back, enclosed by glume and palea, but not adherent.

There is only one species known, found from Peru and Brazil to Mexico, Texas, and Arizona.

Nearly allied to *Pappophorum*, from which it differs in the looser panicle, and in the florets, which are usually more than two.

1. **C. pappophoroides** Kunth, l. c.

An erect perennial. The whole plant from culm and leaf to the empty glumes thinly clothed more or less with short pubescence. Culms 40-60 cm. high. Sheaths loose; ligule a ciliate ring of short hairs; blades 8-10, involute with very slender tips, 10-20 cm. long, 3-6 mm. wide. Panicle 15-18 cm. long, rays solitary, more or less spreading. Spikelets about 8 mm. long, exceeding their pedicels; empty glumes lanceolate, subequal, 4-5 mm. long; floral glume 4 mm. long, pilose along the margins near the base, longest awns about 2 mm. long.

New Mexico, *Wright* 2057; Arizona, *Jones, Lemmon* 3061; Lower California, *Palmer* 239; Mexico, *Pringle* 420, *Palmer* 162, 339.

Texas to Arizona and Mexico.

99. (62). **CATHESTECUM** Presl, Rel. Hænk. 1: 294, *t.* 42 (1830).

Spikelets in threes, sessile on alternate sides of a slender-jointed rachis. Spikelets unisexual, those of the fertile spikes 5 mm. long, villous. On *fertile spikes*, lateral spikelets 1-flowered, neutral with a second rudiment in the terminal spikelet, the lower flower pistillate, the second neutral, a third rudimentary. Lower empty glumes minute, broad, irregularly toothed, or obliquely truncate, the upper 3 mm. long, ovate-lanceolate, 1-nerved, villous, mucronate; floral glume of lateral spikelets 3 mm. long, elliptical, 4-lobed for a third

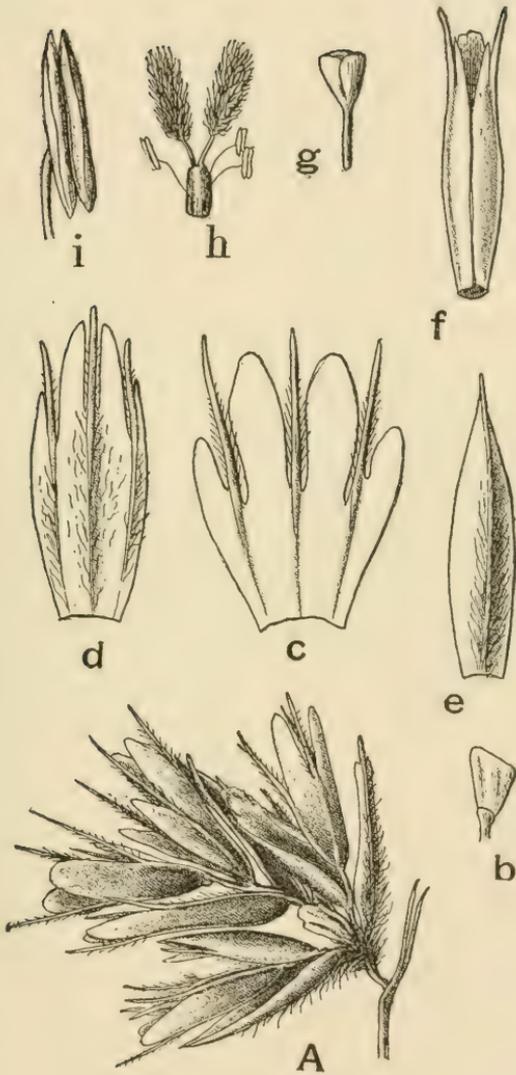


FIG. 85.—*Cathestecum erectum*. Spikelets dissected. (Scribner.)

of the apex, with awns projecting between the lobes; palea two-thirds as long as its glume, 2-nerved, with two projecting awns; floral glume of lower floret of terminal spikelet like those of the lateral spikelets, only a little longer; floral glume of neutral floret of terminal spikelet broadly oval, 4-lobed for half its length or more, with 3 projecting awns between the lobes; palea smaller than in pistillate florets. Ovary obovate, styles distinct, with long purplish hairs on two-thirds of the upper portion. On *staminate spikes*, lateral spikelets with 2 florets and a third rudiment. Lower empty glumes of lateral spikelets minute, broadly truncate; of terminal spikelet smaller, narrower. Upper empty glume of lateral flowers 2 mm long, elliptical-lanceolate, compressed, inequilateral, 1-nerved; of terminal spikelet oval, 3-nerved; floral glume 2 mm. long, oblong, 4-lobed for one-third of its length, with awns between the lobes; paleæ oblong-lanceolate, as long as their glumes, with two parallel nerves slightly projecting. Stamens 3.

There are three species found in Texas and Mexico.

1. **C. erectum** Vasey & Hack. Bull. Torr. Club, 11: 37 (1884) and 14: 100 (1887).

A tufted erect perennial, 15-30 cm. high, stoloniferous, nodes villous; light green, tinged with purple. Ligule a ciliate ring; blades of sterile shoots 5-8 cm. long, narrow, flat or becoming involute, slightly hairy on the margins and upper surface. Culms simple or branching. Spikes about 3 cm. long, containing 5-9 clusters of spikelets. Spikelets of the sterile spike 7 mm. long.

Texas and Mexico.

2. **C. Mexicanum** Presl, Rel. Hænk. 1: 295, t. 42 (1830).

Nodes smooth, spikelets of the sterile spikes shortly pubescent, 4-5 mm. long; very variable and apparently only a variety of *C. erectum* V. & H.

West Texas. *Havard* 62.

3. **C. prostratum** Presl, l. c.

Sheaths ciliate at the throat. Lower leaves 1-4 cm. long, upper shorter. Spikelets of the sterile spikes nearly smooth, 3-4 mm. long. Description incomplete for want of abundant material.

Mexico, *Palmer* 270.

100. (204). **SCLEROPOGON** Philippi. Sert. Mendoc. 2: 47 (1871).
Lesourdia Fourn. Bull. Soc. Bot. Fr. 27: 102, 3, t. 4 (1880).

Plant dioecious; spikelets 2- to many-flowered, in a scanty panicle, rachilla elongated. In *male spikelets*, rachilla glabrous, inarticu-



FIG. 86.—*Scleropogon Karwinskiannus*. A, staminate spikelet; B, pistillate spikelet. (Scribner.)

late; empty glumes thin, narrow, acute, unawned, 3-nerved, unequal; floral glume a little longer, sometimes minutely 3-toothed at the apex, the middle tooth stouter and longer; palea narrow, firm, about as long as its glume, 2-keeled, 2-toothed. Stamens 3. *Fertile spikelets* 1- to many-flowered, upper ones sterile, their empty glumes persistent, unequal, larger than in the male spikelets; floral glumes several, firm, narrow, enclosing the flower, the 3 nerves ex-

tending into very long firm awns, which are sometimes twisted. Short lanceolate hyaline lobes, each side the central awn and outside of each lateral awn; palea firm, narrow. Styles distinct, elongated, stigmas shortly plumose.

Tufted or creeping perennials, the culms stoloniferous. They are all remarkable for the unisexual spikelets, those of the two sexes so different in aspect that without positive evidence it would have been difficult to suppose them to belong to the same plant.

There are four species, one found in Chili, the others in Mexico or Texas.

1. **S. Karwinskianus** (Fourn.) Benth. S. Wats. Proc. Am. Acad. 18: 181 (1883). *Lesourdia Karwinskiana* Fourn. Bull. Soc. Bot. Fr. 27: 102 (1880).

Culms solid, 15–25 cm. high. Leaves of sterile shoots numerous, ligule a mere ring, ciliate; blades firm, glaucous, sparsely pubescent, flat or conduplicate, 1–3 cm. long, those of the culm 2–3 in number, and usually less than 5 cm. long. Staminate spikelets about 15-flowered, 3–4 cm. long; floral glume 7–8 mm. long; pistillate spikelets about the length of the staminate ones; floral glume linear, 10 mm. long, the twisted awns equal or the lateral ones shorter, the longest 6–10 cm. long.

New Mexico, *Vasey* 557 for U. S. Dept. Agricul.; Arizona, *Pringle*.

Texas to Arizona and Mexico.

101. (213). **MONANTHOCHLOË** Engelm. Trans. St. Louis Acad. 1: 436, *tt.* 13, 14, *f.* 18–27 (1859).

Spikelets unisexual, slightly dissimilar, 2- or rarely 3-flowered, single or clustered, almost hidden by the leafy bracts. Empty glumes firm, similar to the distichous leafy bracts; floral glume firm, obtuse or denticulate, covering the 2-nerved palea and the flower. Stamens 3. Styles distinct, long, clothed with short hairs. Grain narrowly oblong, subtriquetrous, enclosed by the palea, but not adherent.

A creeping or stoloniferous grass, with crowded distichous leaves 0.5–10 mm. long, including the sheath. There is one species found in Texas and Mexico.

M. littoralis Engelm. l. c.

Culms firm, much branched, erect or creeping, 12-20 cm. high. Leaf-blades rigid, curved, conduplicate, obtuse, many-nerved, mostly crowded on the short branches. Floral glumes 9-12-nerved above.

Florida, *Curtiss* 3646, *Garber*; Texas, *U. S. Dept. Agricul.* 560; southern California, *Palmer* 123.

This has been compared to *Bulbilis* on account of its unisexual spikelets and creeping habit, but the two sexes are very similar to

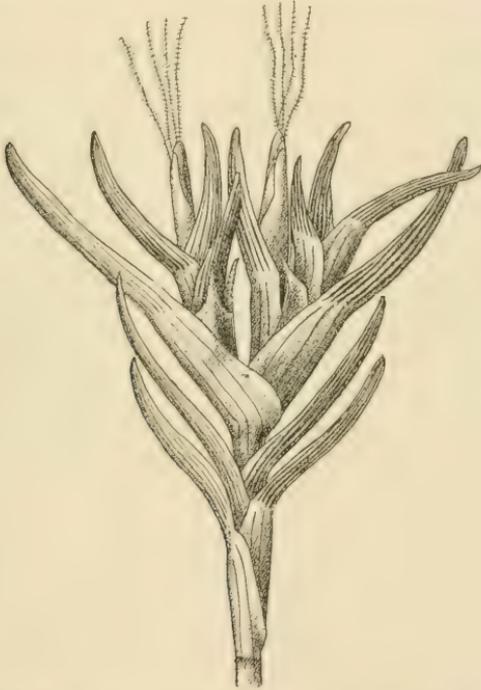


FIG. 87.—*Monanthochloë littoralis*. Spikelets. (After Engel.)

each other in this genus, and there is no indication in the inflorescence of any affinity with Chlorideæ.

102. (214). **MUNROA** Torr. Pac. R. R. Rept. 4:158 (1856).

Spikelets 2-3 together, in small sessile leafy clusters at the ends of numerous branches, each about 3-flowered, rachilla articulate above the lower glumes, the upper flower imperfect. Empty

glumes persistent, lanceolate, hyaline, 1-nerved; floral glume larger, 3-nerved, firm, entire, retuse or 3-pointed, the central nerve terminating as a mucro; palea hyaline, 2-keeled, complicate. Stamens 3. Styles elongated, clothed with short hairs. Grain ovate or oblong, enclosed, but not adherent. Low annual grasses, with many stiff creeping stems, the leaves pointed, firm, mostly on very short branches. Spikelets sessile and almost concealed by the leaves.

Species 3 or 4, one of which belongs to Texas and Mexico, and northward to Alberta; the others further south.

1. *M. squarrosa* (Nutt.) Torr. l. c. *Crypsis squarrosa* Nutt. Gen. 1:49 (1818).



FIG. 88.—*Munroa squarrosa*. Spikelet. (Scribner.)

Culms firm, stoloniferous, 5–30 cm. high. Sheaths 2–5 mm. long; ligule a mere ring; blades flat or conduplicate, 1–3 cm. long. Second glume and floral glume 5 mm. long.

Colorado, *Ward* for U. S. Dept. Agricul. 516, also *Cassidy*.

The genus is a perfectly isolated one, showing only some slight affinity with *Monanthochloë*, especially in having the very few spikelets sessile within a cluster of floral leaves. The flowers are not unisexual.

Var. *floccuosa* Vasey ined. Plants 3–5 cm. high; leaf-blades 10–13 mm. long; second glume 3 mm. long; floral glume 4 mm. long.

Arizona. *Jones*.

103. (214a). *ORCUTTIA* Vasey, Bull. Torr. Club, 13: 219 (1886.)

Spikelets 5–10-flowered, sessile, compressed in a simple dense panicle, 1–5 cm. long, rachilla articulate above the empty glumes. Empty glumes sparsely pubescent, green, thickish, broad, mostly 3-lobed, each lobe 3-nerved, 3–4 mm. long, margins scarious, un-awned; floral glume a little longer, many-nerved, round on the back, 5-lobed, otherwise like the empty glumes; palea as long as its

glume, hyaline, narrow, strongly keeled, 2-toothed. Stamens 3. Styles slightly united below, long, shortly plumose.

Two species of low annuals, found in California.

1. *O. Californica* Vasey, l. c.

Plant diffuse, 3-10 cm. high, often branching, growing in small clusters of 10-20 or more culms from the same root. Sheaths open and inflated; ligule obsolete; blades 2-3, flat or involute, acuminate, sparingly pubescent, 8-25 mm. long.

Lower California (near San Quintin Bay),
C. R. Orcutt for U. S. Dept. Agricul.

2. *O. Greenii* Vasey, *Coult. Bot. Gaz.* 16: 146 (1891).

Plant soft, erect, light green, 20-30 cm. high, branching near the base, clothed from culm to floral glume more or less with soft short hairs, some of them from tubercled bases. Culms containing 6-10 purple nodes separated by internodes 1.8-2.5 cm. long. Sheaths open, nearly as long as the internodes; ligule a ciliate ridge; blades thin, easily splitting, involute, erect, 2-4 cm. long, 1.5-2 mm. wide. Panicle with base included, dense, linear or oblanceolate, 3-5 cm. long, the axis and short rays triquetrous. Spikelets mostly sessile, somewhat flattened, linear, 7-13 mm. long, 5-10-flowered, rachilla smooth; empty glumes subequal, about 4 mm. long, the margins scarious, slightly keeled near one margin, first linear-lanceolate or linear, 5-7-10-nerved, 1-3-toothed, second oval, 7-10-nerved, irregularly 2-3-toothed; floral glume oval, 3.5-5 mm. long, translucent below and 5-7-nerved, obscurely keeled above with 11-17 green nerves, 3-5-toothed; palea hyaline, oval, 2-nerved, truncate, irregularly 2-4-toothed, nearly as long as its glume. Stamens 3; anthers 2 mm. long. Ovary oval, 1 mm. long, stigmas 2.5-3 mm. long.

California, *Green*.

104. (218). *SESLERIA* Scop. *Fl. Carn.* Ed. 1.63 (1772). *Psilanthera* Link, *Hort. Berol.* 1:121 (1827).



FIG. 89.—*Orcuttia Californica*. A, panicle; a, spikelet; b, floral glume; c, palea. (Scribner.)

Spikelets 2-6-flowered, in nearly sessile clusters, crowded into an ovoid or cylindrical spikelike panicle, rachilla articulate above the lower glumes, flowers mostly perfect. Empty glumes persistent, membranous, nearly equal and pointed; floral glume 3-5-toothed at the apex, the central tooth extending into a point or short awn; palea 2-keeled. Stamens 3. Grain free from the palea.

Perennial tufted grasses with flat or convolute leaf-blades. Base of the lower spikelets usually subtended by a glumelike bract.

A small genus of about 8 species, chiefly found in Europe and western Asia. *Sesleria* is nearly allied to *Koeleria* and *Poa*.

1. *S. CÆRULEA* (L.) Arduin. Sp. 2:18, t. 6 (1807). BLUE SESLERIA. *Cynosurus cæruleus* L. Sp. Pl. 72 (1753).

Rootstocks creeping; culms erect, 15-40 cm. high. Leaves of sterile shoots densely tufted, blades rather stiff, abruptly pointed,



FIG. 90.—*Sesleria cærulea*. Spikelet. (Richardson.)

apex scabrid, those of the culm 2-3, the upper about 1 cm. long. Panicle bluish-gray, shining, 1-3 cm. long. Spikelets mostly in pairs, one sessile, the other on a short pedicel; empty glumes thin, acute, faintly nerved, about 5 mm. long; floral glume oval, ciliate, 3-toothed, 5 mm. long. Sparingly introduced in grass-seeds from Europe.

Found in Europe and western Asia.

105. (211). **ARUNDO** Journ. L. Gen. Ed. 1:19 (1737). *Donax* Beauv. Agrost. 77 (1812), in part. *Scolochloa* Mert. & Koch, Roehl. Deutschl. Fl. 1:528 (1823). *Amphidonax* Nees, Lindl. Introd. Nat. Syst. Ed. 2, 449 (1836). *Donacium* Fries, Bot. Notiser, 131 (1843).

Spikelets 2-6-flowered, borne on an ample panicle, rachilla silky-bearded, articulate above the lower glumes and between the florets, which are perfect or the upper staminate. Empty glumes narrow, glabrous, slightly unequal, lanceolate, keeled, 3-nerved; floral glume membranous, slender, often more or less divided with a mucro between the lobes; palea hyaline, shorter than its glume, pubescent on the keels. Stamens 3. Styles distinct. Grain oblong, included, but not adherent.

Tall perennials with large flat blades. Panicle variable, dense or more or less spreading.

There are 6 or 7 species widely diffused in warm countries of Europe, India, Malay and Madagascar islands, New Zealand, and America.

1. A. DONAX L. Sp. Pl. 81 (1753). GIANT REED-GRASS. *Arundo scriptoria* L. Amoen. Ac. 4:150 (1759). *Arundo sativa* Lam. Fl. Fr. 3:616 (1778). *Donax arundinaceus* Beauv. Agrost. 78, t. 16 (1812). *A. Ægyptia* Delile, Fl. Æg. Illustr. 4 (1813). *Donax sativus*. Presl, Cyp. et Gram. Sic. 32 (1826).

Culms 3-6 m. high, from stout rootstocks. Leaf-blades lanceolate-acuminate, 5-7 cm. wide. Panicle tawny, 30-60 cm. or more long. Spikelets 2-3-flowered; empty glumes 10-14 mm. long; floral glume slender, acuminate, shorter than the empty glumes, silky-pubescent below, 7-9-nerved, awn erect, often twice as long as the teeth.

This majestic grass is often cultivated for its large size, broad leaves, and beautiful panicles. A variegated form is also cultivated.

Introduced from southern Europe.

106. (212). **PHRAGMITES** Trin. Fund. Agrost. 134 (1820), in part. *Trichoon* Roth, Roem. Arch. 1:3, 73 (1798). *Arundo* Beauv. Agrost. 60 (1812). *Czernya* Presl, Cyp. et Gram. Sic. 22 (1826). *Oxyanthe* Steud. Sym. Pl. Gram. 197 (1855).

Spikelets 2- to many-flowered, in a large much-branched panicle, rachilla elongated and articulate between the florets, and covered with very long silky hairs. Empty glumes thin, keeled, acute or slightly pointed; floral glume like the empty glumes except the longer point, the lower one enclosing a male or rudimentary flower; palea much shorter than its glume, hyaline, 2-ribbed. Stigmas nearly sessile.



FIG. 91.—*Arundo Donax*. A, spikelet; b, palea; c, pistil. (Scribner.)

A small genus of 2 species or well-marked varieties, nearly allied to *Arundo* and only separated from it by having the lowest flower male or abortive.

It extends over the tropical and temperate and some of the colder regions of both hemispheres, growing in wet places with rootstocks often 40 cm. below the surface of the soil. The culms are 1-6 m. high; the blades firm, broad and flat.

1. *P. Phragmites* (L.) Karst. Deutsch. Fl. 379 (1880-83). REED-GRASS. *Arundo Phragmites* L. Sp. Pl. 81 (1753). *P. al-*

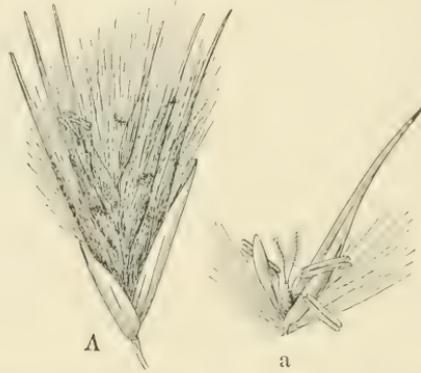


FIG. 92.—*Phragmites Phragmites*. A, spikelet; a, floret. (Scribner.)

tissimus Mabile, Rech. Pl. Corse, fasc. 2: 39 (1867-9). *P. arundinacea* Allam. Munro, Journ. Linn. Soc. 6: 49 (1862). *P. australis* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. Berlandieri* Fourn. Bull. Soc. Bot. Fr. 24: 178 (1877). *P. capensis* Nees, Fl. Afr. Austr. 356 (1841). *P. chilensis* Steud. Nom. Ed. 2, 2: 324 (1841). *P. chrysanthus* Mabile, Rech. Pl. Corse, fasc. 2: 37 (1867-9). *P. congesta* Lowe, Trans. Camb. Phil. Soc. 6: part 3, 529 (1838). *P. explanatus* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. flavescens* Hegetschw. Fl. Schw. 68 (1840). *P. gigantea* J. Gay. F. Schultz, Arch. Fl. Fr. et Allem. 200 (1848). *P. graeca* Steud. Nom. Ed. 2, 2: 324 (1841). *P. hispanica* Nees, Nov. Act. Nat. Cur. 19: Suppl. 1, 152 (1843). *P. humilis* De Not. Cat. Hort. Genuen. 27 (1846). *P. isiaca* Reichb. Fl. Germ. Excurs. 140b (1832). *P. japonica* Steud. Syn. Pl. Gram. 196 (1855). *P. Karka* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. laxiflora* Steud. Syn.

Pl. Gram. 196 (1855). *P. macer* Munro, Journ. Bot. 15: 350 (1877). *P. maritimus* Mabilie, Rech. Pl. Corse, fasc. 2: 42 (1867-9). *P. martinicensis* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. mauritanica* Kunth, Rev. Gram. 1: 80 (1829). *P. Naya* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. nepalensis* Nees, Steud. Syn. Pl. Gram. 196 (1855). *P. nigricans* Mabilie, Rech. Pl. Corse, fasc. 2: 44 (1867-9). *P. nudus* Nees, Fl. Afr. Austr. 356 (1841). *P. occidentalis* Trin. Steud. Nom. Ed. 2, 2: 324 (1841). *P. pumila* Willk. Iber Halb. 157. *P. Roxburghii* Steud. Nom. Ed. 2, 2: 324 (1841). *P. ruscinonensis* Mabilie, Rech. Pl. Corse, fasc. 2: 41 (1867-9). *P. splendens* Mabilie l. c. *P. vulgaris* Trin. Fund. Agrost. 134 (1820). *P. Willkommianus* Mabilie, Rech. Pl. Corse, fasc. 2: 58 (1867-9). *Arundo altissima* Benth. Cat. Pl. Pyr. 62 (1826). *Arundo bengalensis* Boj. Hort. Maurit. 368 (1837). *Arundo græca* Link, Linn. 9: 136 (1834). *Arundo isiaca* Delile, Fl. Aeg. Illustr. 82 (1824). *Arundo maxima* Forsk. Fl. Aeg. Arab. 24 (1775). *Arundo palustris* Salisb. Prod. 24 (1796). *Arundo Pseudophragmites* Lejeune, Fl. Spa, 64. *Arundo pungens* Auct. Steud. Nom. Ed. 2, 1: 144 (1841). *Arundo rivularis* Auct. l. c. *Arundo Vallatoria* S. F. Gray, Nat. Arr. Brit. Pl. 2: 128 (1821). *Arundo vulgaris* Lam. Fl. Fr. 3: 615 (1778). *Arundo vulnerans* Gilib. Exercit. 2: 541 (1776). *Czernya arundinacea* Presl, Cyp. et Gram. Sicul. 22 (1818). *Oxyanthe japonica* Steud. Syn. Pl. Gram. 197 (1855).

Culms 2-3 m. high. Blades often 3 cm. wide. Panicles loose or dense, slightly nodding, often purplish, 15-35 cm. long; rays very numerous. Spikelets 3-5-flowered, 14-18 mm. long, the silky hairs as long as the florets, glumes with nerves anastomosing toward the apex, the empty ones 3-nerved, first 5 mm. long, second 8 mm. long, more or less; floral glume 5-nerved, about 12 mm. long.

Ontario, *Fowler*; New York, *Clinton* for Clark 1301, *Beal* 92, 93; Michigan, *Cooley*, *Farwell*, *Clark* 727; Florida, *Simpson* 158; South Dakota, *Duffey*; Montana, *Anderson* 1; Washington, *Lake*; Lower California, *Palmer* 38.

New York to Mexico and the Rocky Mountains, northern Europe and Asia, Japan, Australia.

107. (201). **SIEGLINGIA** Bernh. Syst. Verz. Pfl. Erf. 40 (1800). *Triodia* R. Br. Prod. 182 (1810). *Tricuspis* Beauv. Agrost. 77, t. 15, f. 10 (1812). *Triplasis* Beauv. Agrost. 81, t. 16, f. 10 (1812).

Spikelets several-flowered, paniculate, rachilla articulate above the empty glumes and between the florets, hairy round them or glabrous, flowers perfect or the upper ones male. Empty glumes firm, acute, unawned, 1-3-nerved, keeled, glabrous or the keel, scabrous-ciliate; floral glume unawned, the lower part rounded on the back, more or less 3-nerved at first, often hardened and nerveless in fruit, with 3 terminal 1-3-nerved lobes or teeth; palea broad, about as long as the entire part of its glume, with two prominent nerves. Stamens 3. Ovary glabrous, styles very short, distinct. Grain somewhat dorsally compressed, enclosed by glume and palea but not adherent.

Perennial grasses, often firm and branching or stoloniferous at the base; blades narrow, firm, often involute. Panicles narrow and simple, with few spikelets, or ample like those of many species of *Eragrostis*. Spikelets mostly erect.

There are about 20 species, mostly found in temperate regions of Europe, America, Africa, Australia. It has the typical characters of the tribe without the peculiarities of the other genera, the lobes of the floral glume reduced to short teeth or points, or the central one sometimes lengthened into a short awn.

Four sections have been proposed:

1. *Isotria*,—three lobes of the floral glume narrow, lanceolate, and equal.

2. *Uralepsis* (*Sieglingia* Bernh., *Merisachne* Trin.),—the lateral teeth of the glumes broad and not pointed, and sometimes very minute.

3. *Tricuspis* Beauv. (*Windsoria* Nutt.),—nerves of the lateral teeth produced into short points.

4. *Leptocarydion* Hochst.,—the dense soft panicle almost of *Trichloris*, but with the spikelets of *Triodia*.

A. Second empty glume 3-nerved. 1, 2

B. Second empty glume 1-nerved. (a)

a. Floral glume 2-3 mm. long. (b)

- b. Panicle spikelike. 3
- b. Panicle at length open, second glume 2.5-3 mm. long. (c)
- c. Panicle 30 cm. long. 4
- c. Panicle 10-14 cm. long. 5
- a. Floral glume more than 3 mm. long. (d)
- d. Panicle at length open. (e)
- e. Panicle 2-10 cm. long. 6
- e. Panicle 10-15 cm. long. 7
- e. Panicle 20-40 cm. long. 8
- d. Panicle capitate or spicate. (i)
- i. Culms 3-10 cm. high, blades 1-3 cm. long. 9
- i. Culms more than 10 cm. high, blades more than 3 cm. long. (m)
- m. Second glume 3 mm., floral glume 4 mm. long. 10
- m. Second glume 3.5-4 mm., floral glume 4.5 mm. long. 11
- m. Second glume 4.5 mm., floral glume 3-3.5 mm. long. 12
- m. Second glume 4.5-5 mm., floral glume 5 mm. long. 13
- m. Second glume 5-6 mm., floral glume 4 mm. long. 14
- m. Second glume longer, floral glume usually longer. (n)
- n. Panicle dense, 4-6 cm. long. 15
- n. Panicle slender, 10-20 cm. long. 16

1. *S. trinerviglumis* (Munro) Kuntze, Rev. Gen. Pl. 2: 789 (1891). *Tricuspis trinerviglumis* Munro. A. Gray, Proc. Acad. Sc. Phil. 333 (1863.)

An erect tufted rather slender grass, 40-60 cm. high. Sheaths about as long as the internodes, ciliate at the throat; ligule a mere brown ciliate ring; blades of the culm 3, scabrous, with scattering hairs, flat or involute, slender pointed, 1-2 cm. long, 2-3 mm. wide. Panicle spikelike, interrupted, the appressed lower spikelike rays

2.5–3.5 cm. long. Spikelets purplish, ovate-lanceolate, slightly compressed, 8–11-flowered, 9–12 mm. long; empty glumes ovate-lanceolate, rounded on the back, first 1-nerved, 4–5 mm. long, second 3-nerved, 5 mm. long; floral glume ovate, awnless, pubescent on the lower two-thirds of the nerves, 4.5 mm. long; palea elliptical, hyaline in the middle, ciliate on the keel, 3 mm. long.

Texas, *Reverchon* for U. S. Dept. Agricul. 545.

Texas to Arizona.

2. **S. Wrightsii** Vasey, Contrib U. S. Nat. Herb. 1:269 (1893).
Poa Texana Vasey.

An erect or decumbent dioecious perennial, 30–60 cm. high, from creeping rootstocks. Culms rather stout, nearly solid. Blades of the sterile shoots flat or involute, 3–7 cm. long; leaves of the culm 5–8, nearly smooth, sheaths shorter than the internodes, loose; ligule a short fringe of hairs; blade smooth, 10–20 cm. long, 5 mm. wide, staminate panicle narrow, simple, 5–10 cm. long, rays single. Staminate spikelets glabrous, flat, oval, 5–8-flowered, 8–11 mm. long; empty glumes subequal, 5 mm. long, first 1-nerved, second 3-nerved; floral glume broadly ovate, 5–6 mm. long, 3-nerved; palea nearly as long as its glume. Pistillate panicles 12–30 cm. long, rays mostly single, usually appressed, about 5 cm. long, bearing 6–8 nearly sessile spikelets on the outer three-fourths. Spikelets compact, nearly terete, 5–7-flowered, 12–20 mm. long; empty glumes ovate-lanceolate, membranous, first 3-nerved, 6 mm. long, second 3–5-nerved, 7–10 mm. long; floral glume ovate, acute, often mucronate, 7–10 mm. long, 5-nerved, coriaceous with scarious margins; palea but little shorter than its glume, broad and coriaceous at the base. Styles 10 mm. long and protruding.

Texas (Presidio County), *Nealley* 136, 137. Dr. Vasey says: "It was first collected in Texas or New Mexico by C. Wright (2038) and was distributed as *Tricuspis albescens* Munro, from which it is very different."

Some doubt exists as to its affinity, but I prefer not to attempt a change at present.

3. **S. stricta** (Nutt. Kuntze, Rev. Gen. Pl. 2:789(1891). *Windsoria stricta* Nutt. Gen. 70 (1818). *Tricuspis stricta* Thurb. MS.

A smooth erect tufted rather stout grass, 50-80 cm. high. Sheaths compressed; ligule a ciliate ring; blades of the culm 3-4, involute, some of them 60-70 cm. long, 4-5 mm. wide. Panicle exerted, spikelike, more or less interrupted below, 12-20 cm. long, 1-1.5 cm. diam. Spikelets often tinged with light pink or purple, ovate or oval, 5-7-flowered, 4-5 mm. long; empty glumes lanceolate, 1-nerved, subequal, 3-4 mm. long; floral glume ciliate on the nerves, lance-oval, lateral nerves without a margin, 2.7 mm. long, awn 0.3-0.5 mm. long; palea ovate-lanceolate, slightly revolute.

Texas, *Drummond*, *Reverchon*.

Texas to Arizona.

4. *S. eragrostoides* (Vasey & Scribn.) L. H. Dewey, Coult. Contrib. U. S. Nat. Herb. 2:539 (1894). *Triodia eragrostoides* Vasey & Scribn. Contrib. U. S. Nat. Herb. 1:58 (1890).

A slender erect light-colored, nearly smooth grass, 80-120 cm. high; nodes smooth, culm solid, compressed. Sheaths compressed, longer than the internodes; ligule obtuse, 1-2 mm. long, blades 10, long-pointed, scabrous, involute, 20-30 cm. long, 4 mm. wide, often breaking at the base. Panicle scarcely exerted, slender, simple, open, 30 cm. long, rays single, distant, the lower ones at length drooping, the longest 15 cm. long, bearing a few slender branches, which are flower-bearing for four-fifths of their length. Spikelets slightly tinged with purple, ovate-lanceolate, 5-8-flowered, 5-6 mm. long; empty glumes ovate-lanceolate, 1-nerved, second 2.5-3 mm. long; floral glume oval or ovate, obtuse, 2-2.3 mm. long, nerves short-hairy below; palea linear, about the length of its glume.

Believed to be of value for cultivation.

Texas, *Reverchon*, *Nealley*; New Mexico, *Wright* 426, 478, 2054; Mexico (Nuevo Leon), *Pringle* 1972.

Florida, Texas, Mexico.

Var. *scabra* Vasey ined. Plant scabrous throughout; lower blades broader.

Texas, *Nealley* for Nat. Mus.

5. *S. ambigua* (Ell.) Kuntze Rev. Gen. Pl. 2:789 (1891). *Poa ambigua* Ell. Bot. S. C. & Ga. 1:165 (1816). *Windsoria ambigua* Nutt. Gen. 70 (1818). *Tricuspis ambigua* Chapm. Fl. S. States 559 (1860).

A smooth erect rather slender grass, 60-90 cm. high. Sheaths shorter than the internodes, compressed; ligule a ciliate ring; blades of the culm 3-4 in number, flat, 20-40 cm. long, 3-4 mm. wide, the apex long and slender. Panicle much exserted, becoming ovoid or pyramidal, 10-14 cm. long, rays mostly single, smooth in the axils, clammy, rarely branching, bearing nearly sessile spikelets on the outer three-fourths. Spikelets purple, ovate, oval or deltoid, compressed, 5-7-flowered, 5-6 mm. long; empty glumes 1-nerved, ovate, acute or 2-toothed, 3 mm. long with a mucro; floral glume villous on the nerves, oval, 3 mm. long, with three short awns; palea ovate, obtuse, the folded margins wide, 2.3 mm. long.

Florida, *Curtiss* 3455; Texas, *U. S. Dept. Agricul.* 536.

Florida, Texas to Arizona.

6. **S. Americana** (Beauv.). *Triplasis Americana* Beauv. *Agrost.* 81, *t.* 16. *f.* 10 (1812).

A slender erect purplish grass, 40-90 cm. high; nodes pubescent. Leaf-blades scabrous above, those of the culm 1-8 cm. long, those of the sterile shoots 10-20 cm. long, 1.5-2 mm. wide. Panicles thin, simple, the lateral ones included by the sheaths of the leaves, the terminal exserted, 2-5-10 cm. long, rays capillary. Empty glumes obtuse or lobed, 3.5-4 mm. long; floral glume linear-lanceolate, about 5 mm. long; awn pubescent, 5-7 mm. long from where it leaves the notch of the glume; palea 3 mm. long, acute.

Alabama, *Mohr*; Florida, *Curtiss* 3457, *Garber*, *Chapman*; Louisiana, *Langlois* in 1882; Mississippi (Ocean Springs), *Tracy*.

Low pine-barrens, North Carolina to Florida and Mississippi.

7. **S. Texana** (Thurb.) Kuntze, *Rev. Gen. Pl.* 2: 789 (1891). *Tricuspis Texana* Thurb. *S. Wats. Proc. Am. Acad.* 18: 180 (1883).

A slender erect tufted grass, 50-70 cm. high, culm, leaves, and branches of panicles more or less pubescent with short spreading hairs, the nodes glabrous. Sheaths shorter than the internodes, villous at the throat; ligule a mere ring; blades mostly involute, 15-20 cm. long, 1.5-3 mm. wide. Panicle thin, diffuse, 10-15 cm. long, rays single, hairy in the axils, longest 4-7 cm. long, bearing 3-5 spikelets above the middle. Spikelets ovate-oblong, 5-

12-flowered, 9–11 mm. long, more or less tinged with red; empty glumes thin, 1-nerved, second ovate, obtuse or shortly mucronate, glabrous, 4 mm. long; floral glume oval, 4 mm. long, villous toward the base upon the 3 green nerves, the middle nerve shortly excurrent between the short teeth; palca broad, the keels revolute below.

Texas, *Reverchon*; New Mexico, *Wright* 776, 777, 2045; Mexico, *Pringle* 1970, *Palmer* 1371.

Louisiana, New Mexico, western Texas, and Arizona.

8. *S. seslerioides* (Michx.)

Scribn. Mem. Torr. Club, 48 (1894).

Poa seslerioides Michx. Fl. Bor.

Am. 1: 68 (1803). *Poa quinque-*

*fid*a Pursh. Fl. Am. Sept. 1: 81

(1814). *Triodia cuprea* J. F. Jacq.

Eclog. Gram. 2: 21, t. 16 (1814).

Tricuspis seslerioides Torr. Fl. U.

S. 1: 118 (1824). *Sieglingia flava*

Kuntze, Rev. Gen. Pl. 789 (1891).

Poa flava L. = *P. crocata* Michx.

teste Munro, Journ. Linn. Soc. 6: 43

(1862). *S. Chapmanii* Small. in herb.

A smooth upright showy grass, 80–150 cm. high. Sheaths compressed, about the length of the internodes, ciliate near the throat; ligule a ciliate ring; blades 3–5, flat, conduplicate or involute, 30–40 cm. long, 5–8 mm. wide. Panicle ample, finally pyramidal, 20–30 or more cm. long, rays clammy, capillary in sets of 2–4 or single, flower-bearing but little below the middle, hairy in the axils. Spikelets very numerous,

linear-oblong, purple, 5–7-flowered, 8–10 mm. long; empty glumes 1-nerved, ovate, mucronate, second 3.5–4 mm. long; floral glume 4

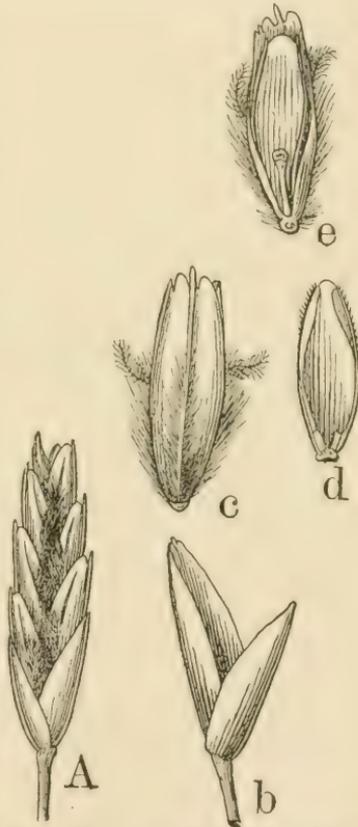


FIG. 93. — *Sieglingia seslerioides*. A, B, C, D, E, spikelet and dissections. (Scribner.)

mm. long, villous on the lower half of the 3 projecting nerves, including two intermediate teeth; palea oval, revolute at the base, as long as its glume.

U. S. Dept. Agricul. 542 (no locality); Massachusetts, *Cooley*; Illinois, *Cooley*; District of Columbia, *McCarthy*; Florida, *Curtiss* 3454, *J. K. Small*.

Dry or sandy fields, Massachusetts, New York, to Texas. A grass apparently of poor quality for pasture or meadow.

9. **S. pulchella** (H. B. K.) Kuntze, *Rev. Gen. Pl.* 2: 789 (1891). *Triodia pulchella* H. B. K. *Nov. Gen.* 1: 155. *t.* 47 (1815). *Kœleria pulchella* Spreng. *Syst.* 1: 322 (1824). *Uralepis pulchella* Kunth, *Rev. Gram.* 1: 108 (1829).

A densely tufted yellowish or whitish green grass, 3–4 cm. high. Culm scabrous, very slender, branching or stoloniferous. Leaves of sterile shoots glaucous, recurved, involute, 1–3 cm. long, 0.4–0.5 mm. diam. Panicle spicate in umbellate clusters, terminating the leafy branches. Spikelets flattened, ovate-oblong, 6–9-flowered, 9–11 mm. long; empty glumes subequal, lanceolate, 1-nerved, 6–7 mm. long; floral glume oblong, pubescent with white hairs, 4–5 mm. long, apex bifid nearly half way to the base, with a straight awn between and exceeding the lobes; palea oblong-spatulate, ciliate on the keels, 4 mm. long.

Arizona, *Rothrock* 575, *Pringle* in 1882; *U. S. Dept. Agricul.* 540; New Mexico, *Wright* 2059; California (Los Angeles), *Palmer* 500, 652, 1359.

Of the last, Dr. Palmer says: "Rare, in crevices of rocks on a bare promontory, 1785 feet above the sea-level."

Texas to Arizona and California.

Var. **parviflora** Vasey ined.

Smaller in every way; leaves 1 cm. or less in length; spikelets 3–4-flowered; empty glumes, floral glumes, and palea a little shorter than in the species.

Southern California, *Orcutt*.

Texas to California.

10. **S. congesta** L. H. Dewey, *Coult. Contrib. U. S. Nat. Herb.* 2: 538 (1894).

Culms 30-40 cm. high; leaves much like those of *S. albescens*. Panicle dense, 6-8 cm. long, 1.5-2 cm. diam. Spikelets tinged with purple, tumid, oval or oblong, 6-12-flowered, 7-9 mm. long; empty glumes broadly oval, 1-nerved, obtuse, subacute or mucronate, first 2.5 mm. long, second 3 mm. long; floral glume soft, spongy on the lower half near the nerves, hirsute on the lower half of the keel and the base of the lateral nerves, the glume subcircular when spread, mucronate, 4 mm. long: palea 3 mm. long, deltoid-ovate before spreading the broad infolded margins, the base near the keels thick and spongy.

Clearly distinct from *S. albescens*, with which some have confounded it.

Texas, *Nealley* in 1893.

11. *S. purpurea* (Walt.) Kuntze, Rev. Gen. Pl. 789 (1891). *Aira purpurea* Walt. Fl. Car. 78 (1788). *Uralepis purpurea* and *U. aristulata* Nutt. Gen. 1: 62, 63 (1818). *Tricuspis purpurea* A. Gray, Man. Ed. 1: 589 (1848).

A tufted procumbent or ascending annual, often purple; culms solid, 20-40 cm. high, with numerous bearded nodes. Leaf-blades 2-8 cm. long, 1.5-2 mm. wide. Panicles terminal or lateral, the latter included by the sheaths, very simple, 3-6 cm. long, rays spikelike. Empty glumes subequal, linear, 3.5-4 mm. long; floral glume linear, 4.5 mm. long, the awn 1-2 mm. long.

New York (Buffalo), *G. W. Clinton* 43; New Jersey (Sandy Hook); Virginia, *U. S. Dept. Agricul.* 553; Florida, *Curtiss* 3456; Illinois, *Paterson*; Mississippi (Ocean Springs), *Tracy*.

In the herbarium of Harvard University and the Dept. Agricul. at Washington are plants under the name *T. sparsiflora* Chapm. Both of these are affected with smut. After careful examination, I am confident that they are deformed specimens of *S. purpurea*.

Sandy soils, Massachusetts to Florida near the coast, also near Lake Erie at Buffalo, and parts of Illinois.

12. *S. albescens* (Munro) Kuntze l. c. *Triodia albescens* Benth. Vasey, Gr. U. S. 35 (1885).

A smooth erect tufted grass, 40-70 cm. high. Blades of sterile shoots flat or involute, taper-pointed, 15-30 cm. long, 2-4 mm.

wide, those of the culm 3-4, and shorter; ligule a ciliate ring. Panicle slightly exserted, dense, slightly interrupted, 9-14 cm. long, 7-14 diam. Spikelets pale or tinged with purple, oblong or ovate, 7-10-flowered, 4.5-5.5 mm. long; empty glumes broad, ovate, acute, 1-nerved, first 2.5-4 mm. long, second a little longer; floral glume nearly smooth, broad oval, mostly mucronate, 3-3.5 mm. long; palea ovate, obtuse before spreading, 2.5-3 mm. long, margins broad and infolded.

Texas, *Reverchon*, *Nealley* for U. S. Dept. Agricul., *Jenny*.

13. **S. acuminata** (Munro) Kuntze l. c. *Tricuspis acuminata* Munro, A. Gray, Proc. Acad. Sc. Phila. 335 (1863). *Triodia acuminata* Benth. Vasey, Gr. U. S. 35 (1885).

A slender erect tufted glaucous grass, 15-20 cm. high, nodes smooth. Leaves of sterile shoots numerous, curved, conduplicate, 3-8 cm. long, 1.5-2 mm. wide, apex obtuse, not recurved, those of the culm 2; ligule a ciliate ring, all blades with light-colored mid-nerve and a similar one on each margin, the width very uniform throughout. Panicle much exserted, very simple, dense, oblong, 1.5-2.5 cm. long. Spikelets whitish or purplish, ovate-lanceolate, 8-10-flowered, 9-11 mm. long; empty glumes subequal, linear-lanceolate, 4.5-5 mm. long; floral glume with keel pubescent near the base and lateral nerves throughout, ovate-lanceolate, acute or 2-toothed, 5 mm. long, the awn 0.5-1.5 mm. long; palea oval or spatulate, ciliate on the keels, 3.5-4 mm. long.

Texas, *Reverchon* for U. S. Dept. Agricul. 534, *Hall* 779, *Lindheimer* 738; Arizona (Hackberry), *Jones*, *Pringle* in 1884; Mexico, *Pringle* 406.

Very nearly allied to *S. avenacea* (H. B. K.), and perhaps one should be considered a variety of the other.

14. **S. Nealleyi** (Vasey) L. H. Dewey, Coult. Contrib. U. S. Nat. Herb. 2: 538 (1894). *Triodia Nealleyi* Vasey, Bull. Torr. Club, 15: 49 (1888).

A slender erect tufted glaucous perennial, 30-40 cm. high, nodes villous. Leaves of sterile shoots numerous, recurved, conduplicate, 5-8 cm. long, 2.5 cm. wide, apex obtuse, recurved, those of the culm 3; ligule a brown ciliate callous ring; all leaves with a con-

spicuous light-colored mid-nerve and a similar one on each margin, the width of leaf nearly uniform throughout. Panicle much exserted, dense, linear or ovoid, slightly interrupted below, 4-5 cm. long. Spikelets whitish, tinged more or less with purple, oblong, 6-7-flowered, 7 mm. long; empty glumes oval-lanceolate, 1-nerved, first 4-4.5 mm., second 5-6 mm. long; floral glume with keel pubescent toward the base, and lateral nerves throughout, ovate-oval, obtuse, 4 mm. long, the awn projecting none or but little above the lobed apex of its glume; palea falcate, spatulate, ciliate on the nerves, 2.5 mm. long. Nearly allied to *S. grandiflora*.

Texas, *Nealley* for Nat. Mus., Chenate Mountains, Presidio county.

15. *S. grandiflora* (Vasey). *Triodia grandiflora* Vasey, Contrib. U. S. Nat. Herb. 1:59 (1890).

A slender erect or geniculate tufted glaucous grass, 20-50 cm. high; nodes villous. Leaves of sterile shoots numerous, recurved, conduplicate, 5-8 cm. long, 2.5 mm. wide, apex obtuse, those of the culm 3; ligule a brown ciliate callous ring; all blades with a conspicuous light-colored mid-nerve and a similar one on each margin, the width of blade nearly uniform throughout. Panicle much exserted, dense, linear or ovoid, 4-6 cm. long. Spikelets whitish, tinged more or less with purple, linear to oval, 4-6-flowered, 8-10 mm. long; empty glumes lanceolate, 1-nerved, first 5-6 mm. long, second 7-8 mm. long; floral glume with keel pubescent toward the base and lateral nerves throughout, ovate-lanceolate, obtuse, 5-6 mm. long, the awn 0.5 to 1 mm. long; palea falcate-spatulate, ciliate on the nerves, nearly 4 mm. long.

Texas, *Nealley* for Nat. Mus.; Mexico, *Pringle* 406. The latter was distributed as *T. avenacea* H. K., by which name this grass has been known for some years. Dr. Vasey, after comparing the drawings of *T. avenacea* with the above plant, decided that the grasses are identical, hence the new name.

Texas to Arizona and Mexico.

16. *S. mutica* (Torr.) Kuntze, l. c. *Tricuspis mutica* Torr. Pac. R. R. Rep. 4:156 (1857).

A slender erect or rigid glaucous tufted grass, 40-70 cm.

high. Culms solid, scabrid, nodes smooth or sparingly pubescent. Sheaths mostly longer than the internodes; ligule truncate, ciliate, 1 mm. long; leaves of sterile shoots erect, slender, often breaking at the top of the sheath, those of the culm 4 in number, blades rigid, scabrid, involute, pungent-pointed, 20-30 cm. long, less than 1 mm. diam. Panicle slender, erect, spikelike, interrupted, 10-20 cm. long. Spikelets linear, purplish, nearly terete, 6-11-flowered, 12-17 mm. long; empty glumes linear-lanceolate, 1-nerved, first 5.5-6.5 mm. long, second 6.5-7.5 mm. long; floral glume linear or oval, emarginate, awnless, pubescent on the nerves, 5.5-7 mm. long; palea elliptical, pubescent on the keels, 3.5-4 mm. long.

Texas, *Reverchon* for U. S. Dept. Agricul. 239; Arizona, *Pringle* in 1882; Mexico (Chihuahua). *Pringle* 405. *Palmer* 2220.

Texas to Arizona and Mexico.

108. (261a). **REDFIELDIA** Vasey, Bull. Torr. Club, 14:133 (1887).

Spikelets 3-5-flowered, pedicellate in a lax spreading panicle half or more than half the length of the culm, rachilla short, articulate under the floral glumes, beset with white hairs. Empty glumes about half as long as the spikelet, ovate-lanceolate, 1-nerved; floral glume compressed, rather rigid, ovate-lanceolate, 3-nerved, the mid-nerve curved, the lateral nerves prominent and midway to the margin, base more or less pubescent; palea equalling or longer than its glume, of nearly the same texture, folded lengthwise in the middle and with two prominent keels folded in the opposite direction.

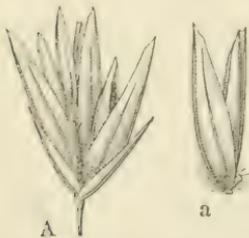


FIG. 94.—*Redfieldia flexuosa* A, spikelet; a, cal floral glumes, not rounded on the back and only 3-nerved.

Dr. Vasey believes it nearest allied to *Festuca*, from which it differs in having the flowers crowded on the rachilla, in the 1-nerved empty glumes, in the pointed or conical floral glumes, not rounded on the back and only 3-nerved.

Named for the late J. H. Redfield of Philadelphia.

1. *R. flexuosa* (Thurb.) Vasey l. c. (*Grappheporum* (?) *flexuosum* Thurb. Proc. Phila. Acad. 78 (1863).

Rootstocks strong, creeping. Culms smooth, flexuous, 20-90 cm. high. Sheaths longer than the internodes, smooth; ligule a hairy ring; blades 30-50 cm. long, mostly near the base, rigid, smooth, involute. Panicle with distant alternate spreading rays, naked below, the lower 10-15 cm. long, branches filiform, divergent. Spikelets on pedicels 2-3 cm. long, ovate, compressed, 4-7 mm. long, florets crowded; first empty glume 2-2.5 mm. long, second a little longer and broader; floral glume with white hairs at the base, 1-2 mm. long, compressed, acute to erose.

Kansas, *Vasey* in 1889 for Nat. Mus., also found in Colorado.

109. (226). **DISSANTHELIUM** Trin. *Linnæa* 10:305 (1836). *Phalaridium* Nees, *Nov. Act. Nat. Cur.* 19: Suppl. 1, 161 (1843). *Stenochloa* Nutt. *Journ. Acad. Phila. Ser. 2, 1:189* (1847).

Spikelets 2-4-flowered, in a narrow usually dense panicle, rachilla glabrous, articulate between the flowers and produced beyond as a minute bristle. Empty glumes persistent, narrow, keeled, 1-3-nerved, acute or acuminate, slightly unequal; floral glume much shorter, broader, rather obtuse, awnless, keeled, 3-nerved; palea shorter than its glume, 2-keeled, 2-toothed. Stamens 1-3. Grain oblong, subtriquetrous, slightly furrowed or not, included, but not adherent. Low tufted annuals or perennials with narrow flat blades. Panicle shortly exerted.

There are two or three species found in America from *California* to *Bolivia*.

1. **D. Californicum** (Nutt.) Benth. Hook. *Icones. Pl.* 14:56, *t.* 1375 (1881). *Stenochloa Californica* Nutt. *Journ. Acad. Phila.* 1:189 (1847).

Annual; culms sparingly branched below, 10-30 cm. high. Sheaths smooth, rather loose, striate, about as long as the internodes; ligule obtuse, 2-3 mm. long; blades flat or conduplicate, broad at the base, acuminate, 10-20 cm. long, 2-4 mm. wide. Panicle loosely spike-like, 5-12 cm. long, rays erect, mostly in pairs (in large plants



FIG. 95.—*Dissanthelium Californicum*. Spikelet dissected. (Scribner.)

4-6 rays), the longest 2-4 cm. long simple and densely flowered at the base. Spikelets mostly sessile, pale green, 2-3-flowered; empty glumes spreading, subequal, about 3 mm. long, first 1-nerved, second 3-nerved; floral glume loosely pubescent below, ovate-acute, the second 6 mm. long; palea pubescent.

Lower California (Guadalupe Island), *Palmer* 96.

2. *D. sclerochloides* (Steud.) Fourn. Mex. Pl. Enum. Gram. 2: 112: (1886). *Poa sclerochloides* Steud. Herb. (fide Fourn.).

A smooth tufted grass, 5-7 cm. high. Ligule obtuse, 1.5 mm. long; blades involute or conduplicate, 1-2.5 cm. long, about 1 mm. diam. Panicle 1-2 cm. long, oval, rather dense, rays in twos to fours, the longest bearing two spikelets. Spikelets on short pedicels, 2-flowered, oval, acute, spreading with age, 3-3.5 mm. long; empty glumes 3-nerved, the margins white; floral glume smooth, broad, ovate when spread, 2-2.3 mm. long. Stamen 1.

Mexico, *Pringle* 4222, also in Chili.

Moist places in the bottom of a crater, 13,500 feet above the sea-level.

110. (227). **MOLINIA** Shrank, Baier. Fl. 1: 100, 334 (1789). *Enodium* Gaud. Agrost. Helv. 1: 145 (1811). *Monilia* S. F. Gray, Nat. Arr. Brit. Pl. 2: 110 (1821). *Amblytes* Dulac, Fl. Hautes-Pyr. 80 (1867).

Spikelets 2-4-flowered, in a narrow loose subterete panicle, rachilla smooth, articulate between the flowers, and often produced

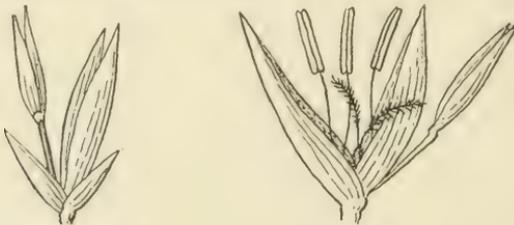


FIG. 96.—*Molinia caerulea*. Spikelets. (Richardson.)

above them. Empty glumes persistent, awnless, 1-nerved, unequal, shorter than the florets; floral glume firm, membranous, awnless, convex, 3-nerved; palea obtuse, 2-keeled, scarcely shorter than its

glume. Stamens 3. Grain oblong, furrowed, subquadrangular, enclosed, but not adherent.

There is only one species, and that belongs to Europe, northern Africa, and western Asia.

1. *M. CÆRULEA* (L.) Mœnch, Meth. 183 (1794). *Aira cœrulea* L. Sp. Pl. 63 (1753).

A slender tufted perennial, 30–90 cm. high. Culm with one to two leaves only, and those near the base. Sheaths smooth, bearded at the throat; ligule none; blades smooth, involute, rigid, tips very slender, 10–15 cm. long. Panicle 3–30 cm. long, rachis compressed, flexuose. Empty glumes 2–3 mm. long; floral glumes 4–5 mm. long. Anthers violet-brown. Sparingly introduced or likely to be introduced with grass-seeds.

111. (230). **ERAGROSTIS** Host, Ic. Gram. 4: 14 (1809); Beauv. Agrost. 70. *t.* 14. *f.* 11 (1812). *Megastachya* Beauv. Agrost. 74 (1812). *Erochloë* Rafin. Neogenyt. 4 (1825). *Exagrostis* Steud. Nom. Ed. 2, 1: 622 (1840). *Harpachne* Hochst. Cf. Flora, 24 (1841). Intell. 20, nomen; et ex Rich. Tent. Fl. Abyss. 2: 431 (1850). *Cœlachyrum* Nees, Linnæa 16: 221 (1842). *Macrolepharus* Philippi, Linn. 29: 100 (1857–58). *Cladoraphis* Franch. ex Dur. l. c. (1888).

Spikelets usually many-flowered, in a loose and spreading or narrow and clustered panicle, rachilla usually glabrous and articulate under the floral glumes, rarely inarticulate, flowers perfect or variously unisexual. Empty glumes unequal, rather shorter than the floral glumes, keeled, first 1-nerved, second 1–3-nerved (ours all 1-nerved), floral glumes obtuse or acute, unawned, 3-nerved, the keel prominent, the lateral nerves sometimes obscure; palea shorter than its glume with a prominent nerve or keel, often persisting after the glume and grain have fallen away. Stamens 2–3. Styles distinct, short; grain globose, ovoid or oblong, usually not furrowed, enclosed, but not adherent, often deciduous with the floral glume.

There are about 100 species widely spread in warm and temperate regions, not found in very cold countries or on high mountains. Two or three are cosmopolitan and several difficult to limit. Nearly allied to *Poa*, to which genus the species have sometimes been re-

ferred; some species have been variously referred to *Festuca*, *Briza*, *Dactylis*, *Eleusine*, or *Leptochloa*; some have been proposed as genera. Bentham proposed the following sections:

1. *Cataclastos* Dæll.,—those with short spikelets with few flowers and fragile rachilla.

2. *Plagiostachya*,—the inflorescence approaching that of Chlorideæ.

3. *Myriostachya*,—a complicated inflorescence.

4. *Peteroëssa* Dæll., or *Eragrostis* proper, —many-flowered spikelets, with the rachilla continuous or rarely articulate when old, floral glumes usually deciduous, leaving the palea persistent. Species numerous and may be subdivided into three subsections:

a. *Cylindrostachyæ*,—narrow almost terete spikelets.

b. *Leptostachyæ*,—with narrow-linear flat spikelets.

c. *Megastachyæ*,—broad-linear or oblong flat spikelets.

5. *Platystachya*,—broad, flat, many-flowered spikelets with rather paleaceous glumes, and the rachilla articulate as in *Cataclastos*.

6. *Sclerostachya*,—paleaceous glumes and articulate rachilla, as those of *Platystachya*; but the spikelets are not so broad and the rigid leaves are long and rushlike or short and pungent.

- | | | |
|----|---|-----|
| A. | A prostrate, creeping annual. | 1 |
| B. | Erect or spreading annuals, panicle spikelike. | (a) |
| | a. Spikelets 10-50-flowered. | 2 |
| | a. Spikelets 4-7-flowered. | 3 |
| C. | Diffuse annuals, not creeping, floral glume 1 mm. long. (b) | |
| | b. Panicle spikelike, spikelets 5-10-flowered. | 4 |
| | b. Panicle spreading, spikelets 2-5-flowered. | 5 |
| D. | Diffuse annuals, floral glume 2.7-2.8 mm. long, panicle spikelike, spikelets 4-24-flowered. | 6 |
| E. | Diffuse annuals, panicle not spikelike, floral glume usually 1-1.5 mm. long. | (c) |
| | c. Spikelets 2-5-flowered, floral glume 1.2-1.4 mm. long. | 7 |
| | c. Spikelets 2-10-flowered, floral glume 1-1.2 mm. long. | 8 |
| | c. Spikelets 2-4-flowered, floral glume 1.2-1.5 mm. long. | 9 |
| | c. Spikelets 2-20-flowered, floral glume 1.5 mm. long. . | 10 |

- F. Perennials, floral glume more than 2 mm. long. . . . (d)
- d. Panicle racemose or capitate, spikelets 15-30-flowered, floral glume 2.7-3.2 mm. long. . . . 11
- d. Panicle usually ovoid. (e)
- e. Spikelets 2-12-flowered, floral glume 2.5-3 mm. long, ligule not bearded. 12
- e. Spikelets 4-12-flowered, floral glume 2.5 mm. long, ligule bearded. 13, 14
- e. Spikelets 10-18-flowered, floral glume 2.5-3 mm. long, ligule bearded. 15
- G. Annuals or perennials, floral glume 1.8-2 mm. long. . . (f)
- f. Panicle narrow, 10-15 cm. long, spikelets 10-40-flowered, floral glume 1.6 mm. long, annual. . . . 16
- f. Panicle spreading, annual. (i)
- i. Panicle 15-35 cm. long, spikelets 5-14-flowered, floral glume 1.5-1.7 mm. long. 17
- i. Panicle 18-25 cm. long, pyramidal, spikelets 7-11-flowered, floral glume 2 mm. long. 18
- i. Panicle 8-16 cm. long, spikelets 10-50-flowered, floral glume 2 mm. long. 19
- i. Panicle 12-30 cm. long, spikelets 5-20-flowered, floral glume 1.5-1.8 mm. long. 20
- f. Panicle spreading, perennials. (k)
- k. Panicle 20-30 cm. long, spikelets 6-12-flowered, floral glume 1.7-2 mm. long. 21
- k. Panicle 30-60 cm. long, spikelets 6-20-flowered, floral glume 1.7-2.1 mm. long 22
- k. Panicle 20-30 cm. long, spikelets 5-12-flowered, floral glume 1.8-1.9 mm. long. 23
- k. Panicle 20-30 cm. long, spikelets 4-7-flowered, floral glume 1.8-1.9 mm. long. 24
- k. Panicle 25-35 cm. long, spikelets 4-8-flowered, floral glume 1.7 mm. long. 25
- k. Panicle 30-40 cm. long, spikelets 3-4-flowered, floral glume 1.5 mm. long. 26
1. **E. hypnoides** (Lam.) B. S. P. Prel. Cat. N. Y. 69 (1888).

Poa hypnoides Lam. Tabl. Encycl. 1: 185 (1791). *Poa reptans* Michx. Fl. Bor. Am. 1: 69 (1803). *Eragrostis reptans* Nees, Agrost. Bras. 514 (1829).

Prostrate and creeping annuals, culms much-branched, 5–30 cm. long, ligule a ciliate ring; blades flat or involute, 1–5 cm. long, 1–2 mm. wide. Panicle ovoid or pyramidal, 3–6 cm. long, or capitate. Spikelets flat, elliptical, ovate or linear, imperfectly dioecious, almost sessile or even capitate, 10–40-flowered, 5–14–22 mm. long; empty glumes acute, 0.5–1 mm. long; floral glume broadly ovate, acute, 1.8–2.2 mm. long, with lateral nerves obscure or prominent; palea shorter than its glume, ciliate on the keels. Grain oval, compressed, 0.7–0.8 mm. long.

U. S. Dept. Agricul. 591; Illinois, *Canby* in 1868; Florida, *Chapman*; Texas, *Palmer* 1369, *Nealley*; Oregon, *Hall* 631; California, *Pringle* in 1882.

Very variable in size, mode of growth, and arrangement of spikelets.

In some the geniculate stems are 60 or more cm. long, with internodes 10 cm. long. In No. 431, T. J. Howell, Oregon, the spikelets are in very large numbers (hundreds) in a tuft 8–10 cm. diam.

Wet places, New England to Oregon and Texas.

2. **E. VahlII** (R. & S.) Nees, Agrost. Bras. 2: 499 (1829). *Poa VahlII* R. & S. Syst. 2: 563 (1817). *E. amæna* Presl, Rel. Hænk. 1: 275 (1830). *Megastachya amæna* Fourn. Hemsl. Biol. Centr. Am. Bot. 3: 572 (1880).

An erect or ascending annual, 5–30 cm. high. Culms simple, branching below. Sheaths slightly compressed, striate, pilose at the throat; blades flat, attenuate-acuminate, smooth above, usually pilose. Panicle 3–10–15 cm. long, spikelike or with rays more or less remote and spreading, bearing spikelets to the base. Spikelets nearly sessile, crowded, erect or spreading, 5–25 mm. long, linear or linear-oblong, much compressed, 10–50-flowered; empty glumes lanceolate, subequal, about 2.5 mm. long, scabrous on the keel; floral glume 2.3–2.7 mm. long, ovate, acuminate, nerves distinct, keel scabrous above; palea incurved, a third shorter than its glume,

the keels finely ciliate. Grain ovoid, compressed, 0.5–0.6 mm. long. Distributed as *E. Pringlei* Scribn.

Mexico, *Pringle* 3334, on the sandy plains of Jalisco.

3. *E. pallida* Vasey, Contrib. U. S. Nat. Herb. 1:285 (1893).

An erect or spreading sparingly branched annual, 30–50 cm. high. Sheaths 3, nearly smooth, shorter than the internodes; ligule very short; blades scabrid on both sides, flat, 8–12 cm. long, 3–5 mm. wide. Panicle spikelike, interrupted below, light-colored, 15–20 cm. long, rays often densely clustered, flower-bearing to the base, 3–5 cm. long. Spikelets on short pedicels, ovate or ovate-lanceolate, slightly compressed, 1.5–2.3 mm. long, 4–7-flowered; empty glumes 1-nerved, oval, obtuse or acute, first 0.6 mm. long, second 0.8–0.9 mm. long; floral glume ovate or oval, acute or obtuse, 1.1–1.2 mm. long, lateral nerves less than the length of the glume; palea about 0.9 mm. long.

Nearly allied to *E. alba* Presl.

Mexico (State of Colima), *Palmer* 1268.

4. *E. ciliaris* (L.) Link, Hort. Berol. 1:192 (1827). *Poa ciliaris* L. Sp. Pl. Ed. 2:102 (1762). *Megastachya ciliaris* Beauv. Agrost. 74 (1812). *Poa elegans* Poir. Lam. Encycl. 5:87 (1804).

A diffuse slender branching annual, 20–50 cm. high. Sheaths smooth or sparingly ciliate, bearded at the throat; blades thin, flat or involute, 5–10 cm. long, about 2 mm. wide. Panicle spiked, cylindrical, more or less interrupted, 5–10 cm. long, 5–7 mm. diam. Spikelets oval, 5–10-flowered, 2.5–3 mm. long; empty glumes ovate-lanceolate, 1-nerved, subequal, 0.8–1.2 mm. long; floral glume elliptical, lateral nerves very near the margin, mucronate, 1 mm. long, rough or ciliate on the back; palea as long as its glume, linear, the keels fringed with slender bristles often 1 mm. long. Grain ovoid, slightly flattened on the side opposite the embryo, 0.4–0.5 mm. long.

Georgia, *Curtiss* 3493; Mississippi (Ocean Springs), *Tracy*; Mexico (Jalisco), *Pringle* 1851.

South Carolina to Mexico.

Var. *patens* Chapm. ? Blades broader; panicle more open. 2 cm. diam.; spikelets purplish, 3–5-flowered; empty glumes shorter

and broader; floral glume 0.7 mm. long; palea with cilia on the nerves 0.1–0.2 mm. long. Very likely a good species.

Georgia, *Curtiss* 3493*; U. S. Dept. Agricul. 575, no locality; Florida (Key West).

5. **E. Frankii** Meyer, Steud. Pl. Gram. 273 (1855).

A slender much-branched diffuse annual, 10–30 cm. high. Ligule short, ciliate; blades flat, thin, nearly smooth, variable in length, 1–2 mm. wide. Panicle ovoid-oblong, 7–15 cm. long, rays and their branches capillary, very numerous, rather stiff. Spikelets pedicellate, oval, acute, 2–5-flowered, 2–3 mm. long; empty glumes slightly unequal, 1-nerved, acute, about 1 mm. long; floral glume broadly ovate, acute, 1 mm. long, lateral nerves obscure; palea incurved, 3-toothed, broadly oval, ciliate on the nerves 0.7 mm. Grain slightly compressed, obliquely oval, 0.5–0.6 mm. long.

Pennsylvania, *Porter* for Clark 2962; Michigan, *Wheeler* 96; Illinois, *Canby* in 1868; Missouri, *Hitchcock*; Tennessee, *Gattinger* for U. S. Dept. Agricul. 578.

Low or high land, sandy or clay loam. Pennsylvania to Minnesota and southward.

6. **E. diversiflora** Vasey, Contrib. U. S. Nat. Herb. 1:285 (1893).

A diffuse annual, much branched below, 40–240 cm. high. Sheaths 4–5, smooth, striate when mature, shorter than the internodes; throat pilose, ligule very short; blades scabrous above, smooth below, 20–30 cm. long, 2–3 mm. wide, involute with long capillary points. Panicle narrow, 15–20 cm. long, the largest appearing spikelike, rays in clusters or scattered, the longest 4–8 cm. long, flower-bearing to near the base, or when young or feebly developed, thin with a few short spikelets. Spikelets very variable, flattened more or less, either linear-lanceolate, 10 mm. long, 18–24-flowered, or reduced and ovate-lanceolate, 3–5 cm. long, 4–6-flowered, with all intermediate grades; empty glumes 1-nerved, ovate-acute, first 1.3 mm. long, second 1.2 mm. long, scaberulous on the keel; floral glume oval-acute, 2.7–2.8 mm. long; palea 1.5–1.7 mm. long, with keels ciliate. Grain triquetrous-ovoid, 0.7 mm. long.

Mexico (State of Colima), *Palmer* 1335.

7. *E. pusillus* Scribn. ined.

A slender glandular diffuse branching annual, 15–30 cm. high. Ligule very short, puberulent; blades and sheaths pubescent, the former flat or involute, 3–6 cm. long, 3–6 mm. wide. Panicle linear or elliptical, many-flowered, rays single or in twos or threes, diffusely branched throughout. Spikelets light green, becoming brown, pedicellate, ovate or oval, 2–5-flowered, 1.2–3 mm. long; empty glumes ovate, acute, 1-nerved, scabrid on the keel, first 0.5–0.8 mm. long, second 0.8–1.2 mm. long; floral glume smooth, broadly oval, abruptly acute, obscurely 3-nerved, 1.2–1.4 mm. long; palea incurved, smooth, oval before spreading, margins from the obscure keels wide, about 1 mm. long. Grain globose, slightly compressed, 0.5 mm. long.

Mexico (Jalisco), *Pringle* 2327.

8. *E. glomerata* (Walt.) L. H. Dewey, Coult. Contrib. U. S. Nat. Herb. 2: 543 (1894). *Poa glomerata* Walt. Fl. Car. 80 (1788). *Poa conferta* Ell. Bot. S. C. & Ga. 1: 158 (1816). *E. conferta* Trin. Act. Petrop. VI, 1: 409 (1831).

An erect rather stout branching annual, 60–90 cm. high. Sheaths smooth; ligule 1 mm. long; blades flat, 20–30 cm. long, 3–4 mm. wide. Panicle whitish, linear or lanceolate, 25–60 cm. long, branches numerous, clustered, erect. Spikelets pedicellate, appressed, covering the branches to the base, oblong, 2–7–10-flowered, 2.5–3 mm. long; glumes all smooth, very thin; empty glumes ovate, acute or obtuse, second about 1 mm. long; floral glume a little longer, obtuse, with three conspicuous nerves; palea nearly as long as its glume.

U. S. Dept. Agricul. 576, no locality; Florida, *Curtiss* 3497.

River banks, South Carolina, Florida to Texas, Cuba, Brazil.

9. *E. capillaris* (L.) Nees, Agrost. Bras. 505 (1829). *Poa capillaris* L. Sp. Pl. 68 (1753).

Tufted erect annuals (?), branching only at the very base, spreading above, 30–70 cm. high. Throat bearded; blades rather rigid, glabrous or sparingly hairy, involute, 40–60 cm. long, 2–3 mm. wide. Panicle open, elliptical, obovate or pyramidal, rays

numerous, branching, capillary, stiff, mostly naked in the axils. Spikelets mostly single on long pedicels, 1-4 cm. long, oval, greenish or tinged with purple, scarcely flattened, 2-4-flowered, 2.5-3.5 mm. long; empty glumes subequal, acute, 1-nerved, 1-1.3 mm. long; floral glume ovate, obtuse when spread, obscurely 3-nerved, 1.5 mm. long; palea incurved, 3-toothed, ciliate on the keels.

Massachusetts, *Cooley*; District of Columbia, *McCarthy*; Tennessee, *Gattinger*; Florida, *Curtiss* 3499.

New England to Texas.

10. *E. ERAGROSTIS* (L.) Karst. Deutsch. Fl. 389 (1880-83). *Poa Eragrostis* L. Sp. Pl. 68 (1753). *E. minor* Host, Fl. Austr. 1: 135 (1827). *E. poaoides* Beauv. Agrost. 162 (1812).

Annual; culms variously spreading or erect, 10-25 cm. high. Blades flat, smooth, 1-15 cm. long, 1-2.5 mm. wide, the margins and glumes containing more or less glands secreting an offensive substance. Panicle ovoid or linear, rather dense, 5-15 cm. long. Spikelets flat on short pedicels, oblong-linear, lead-colored, 8-20-flowered, 4-10 mm. long; floral glume broadly oval and obtuse when spread, 1.5 mm. long, lateral nerves prominent, keel usually smooth, sometimes glandular; palea oval, ciliate on the nerves. Grain globular-oval or ovoid, 0.6 mm. long.

Sandy waste places, eastward, perhaps elsewhere. Introduced from Europe.

Mexico, *Schaffner* 1027.

11. *E. interrupta* (Nutt.) Trelease; Branner & Coville, Rep. Geol. Surv. Ark. 1888, Part. 4, 237 (1891). *Poa interrupta* Nutt. Trans. Am. Phil. Soc. (II.) 5: 146 (1837). *E. oxylepis* Torr. Rept. Bot. Whipple Exped. 156 (1856).

A tufted erect slender annual or perennial, 15-50 cm. high. Sheaths smooth; ligule very short, often bearded; blades rigid, becoming involute, 10-20 cm. long, 2-3 mm. wide. Panicle racemose, capitate or spikelike with interrupted clusters, often tinged with light purple, 4-12 cm. long, 1-3 cm. diam. Spikelets on short pedicels or nearly sessile, much flattened, linear or elliptical, 15-30-flowered, 10-16 mm. long; empty glumes lanceolate, 1-nerved, first 2 mm. long, second 2.5-3 mm long; floral glume ovate-lanceolate,

nerves prominent, smooth, 2.7-3.2 mm. long; palea incurved, emarginate, ciliate on the keels, 2-2.3 mm. long. Grain oval, slightly compressed, 1 mm. long more or less.

Texas, *Hall* 787, *Lindheimer* 734, 735, *Palmer* 1370, *Reverchon* for U. S. Dept. Agricul. 584, *Pringle* 1969, *Nealley*; Mississippi (Ocean Springs), *Tracy*; New Mexico, *Fendler* 913.

Mississippi, Texas, and New Mexico.

12. *E. tenuis* (Ell.) A. Gray, Man. Ed. 2, 564 (1856). *Poa tenuis* Ell. Fl. S. C. & Ga. 1:156 (1817).

Erect tufted perennials, 60-120 cm. high. Sheaths smooth or more or less softly tomentose, the lower ones leaving the culm. 5-30 cm. long, the upper extending a third to half the height of the plant, throat ciliate; ligule a mere ring; blades smooth, firm, involute with long slender tips, 30-60 cm. long, 3-5 mm. wide at the base. Panicle usually but little exerted, open, ovoid or linear, 30-75 cm. long, rays numerous, mostly single, sometimes bearded in the axils and with many capillary branches, the longest often 20 cm. long. Spikelets on very slender pedicels, 2-20 cm. long, somewhat flattened, oval or linear, 2-6-12-flowered; empty glumes 1-nerved, lanceolate or awl-shaped, first 1.5-2.5 mm. long, second 2-3 mm. long; floral glume with three strong nerves, ovate-acute or ovate-lanceolate, 2.5-3 mm. long; palea slightly incurved, oval when spread, obtuse, nearly as long as its glume. Grain subglobose, with a slight groove on one side, 1 mm. long.

Illinois, *Geyer*, *Patterson*; Texas, *Drummond* 736, *Lindheimer*, *Nealley*; New Mexico, *Wright* 771, 1317.

Sandy soils, New England to Texas and New Mexico.

13. *E. erosa* Scribn. ined.

A tufted perennial, about 90 cm. high. Sheaths smooth; ligule bearded; blades involute, rigid, smooth below, 30-40 cm. long, about 3 mm. wide. Panicle diffuse, ovoid, 30-40 cm. long, rays diverging, some of them in twos and threes, sparingly branched, branches capillary and bearing 2-5 pedicellate spikelets. Spikelets light lead-color, moderately flattened, linear, 4-12-flowered, 6-12 mm. long; empty glumes smooth, thin, ovate, 1-nerved, first about 1.6 mm. long, second about 2 mm. long; floral glume broadly ovate, obtuse

or acute, obscurely 3-nerved, easily splitting, about 2.5 mm. long; palea slightly incurved, spatulate or narrowly obovate when not spread open, truncate, crose or slightly 3-lobed, nerves very obscure, smooth, 2-2.5 mm. long. Grain not seen.

Mexico (Chihuahua), *Pringle* 415.

14. **E. sessilispicata** Buckl. Proc. Acad. Phila. 97 (1862).
Diplachne rigida Benth. Vasey, Grasses U. S. 35 (1855). *Eragrostis rigida* Scribn. Proc. Acad. Phila. 304 (1891).

Culms erect, slender, 30-50 cm. high. Blades of sterile shoots scabrid, involute or flat, 3-15 cm. long, 2 mm. wide, those of the culm 1-2; ligule a mere ring bearing thin hairs. Panicle much exserted, simple, open, pyramidal, 12-20 cm. long; rays single, the longest 6-8 cm. long, bearing about six appressed spikelets. Spikelets sessile, 6-9-flowered, 6-12 mm. long; empty glumes lanceolate, subequal, 4-5 mm. long; first 1-nerved, second 3-nerved; floral glume firm, lanceolate, 3-nerved, 4 mm. long; palea firm, incurved or tumid at base, 3 mm. long.

Texas, *Reverchon* for U. S. Dept. Agricul. 550, *Curtiss* 3453; New Mexico, *Wright* 760.

15. **E. plumbea** Scribn. ined.

A tufted erect rather slender perennial, 40-60 cm. high. Sheaths smooth; ligule bearded; blades flat or involute-rigid, smooth below, scabrid above, 8-12 cm. long, 3-5 mm. wide. Panicle simple, ovate or pyramidal, 8-12 cm. long, rays single, bearded in the axils, bearing a few short branches. Spikelets mostly pedicellate, lead-colored, flattened, ovate-lanceolate or linear, 10-18-flowered, 6-10 mm. long; empty glumes ovate-lanceolate, 1-nerved, scabrid on the keel, first 2 mm. long, second 3 mm. long; floral glume ovate-lanceolate, scabrid on the keel, lateral nerves less prominent, 2.5-3 mm. long; palea slightly incurved, linear before spreading, acute, keels scaberulous. Grain very slightly compressed, ovoid, 1 mm. long.

Mexico (Guadalajara), *Palmer* 240, *Pringle* 2311.

16. **E. Brownei** (Kunth) Nees, Steud. Nom. Ed. 2. 1:562 (1841). *Poa polymorpha* R. Br. Prod. 1:180 (1810). *Mega-*

stachya polymorpha Beauv. Agrost. 74 (1812). *Poa Brownei* Kunth, Rev. Gram. 1: 112 (1829).

A very variable plant in stature and aspect, usually above 30 cm. high. Ligule sometimes with a few cilia; blades flat or involute, glabrous, 8–15 cm. long, 1.5–2 cm. wide. Panicle sometimes simple and dense or spikelike and interrupted, 10–15 cm. long, sometimes 30 cm. long, with short spreading rays bearing a few scattered or clustered spikelets. Spikelets sessile or very nearly so, flat, 10–40-flowered, 0.5–1.5 mm. long, rachilla very tardily articulate; empty glumes 1-nerved, about 1.5 mm. long; floral glume broadly ovate, acute, 1.6 mm. long, nerves 3, prominent and strictly parallel when the glume is spread; palea incurved, the keels usually minutely ciliate, about 1.5 mm. long. Stamens 3, or rarely 2. Grain ovoid, compressed, 0.5 mm. long. Perhaps only a variety.

Florida, *Garber*; also found in Australia; widely spread in India.

17. **E. Neo-Mexicana** Vasey ined. (?)

A diffuse or erect annual, branching near the base, 60–90 cm. high. Sheaths smooth, bearded at the throat; ligule a ciliate ring; blades flat or involute, scabrous, 12–20–30 cm. long, 2–4–6 mm. wide. Panicle often included at the base, light lead-color, ovoid to linear, 15–25–35 cm. long, rays rigid, mostly single, naked for a fifth part of the length, branches numerous, appressed. Spikelets pedicellate, tinged with red, slightly flattened, linear or linear-lanceolate, 5–8–14-flowered, 5–9 mm. long; empty glumes thin, 1-nerved, first 1–1.3 mm. long, second ovate-acute, 1.5 mm. long; floral glume smooth, thin, oval, broadly ovate or deltoid-oval, obtuse or abruptly acute when spread, the nerves all prominent, 1.5–1.7 mm. long; palea incurved, linear before spreading, obtuse, ciliate on the keels, 1.3–1.5 mm. long. Grain broadly oval, slightly grooved, 0.7–1 mm. long.

Mexico, *Parry & Palmer* 936, *Pringle* 416, *Palmer* 237, 367.

18. **E. Orcuttiana** Vasey, Contrib. U. S. Nat. Herb. 1: 269 (1893).

Apparently annual; culms 60–90 cm. high, branching slightly below, smooth. Sheaths shorter than the internodes, smooth; lig-

ule very short, ciliate; blades flat or becoming involute, 8–15 cm. long, 4–6 mm. wide. Panicle spreading, pyramidal, 18–25 cm. long, rays with smooth axils, scattered, decompound. Spikelets lead-colored on capillary pedicels mostly shorter than themselves, narrowly linear, 5–8 mm. long, 7–11-flowered; empty glumes purplish, lanceolate, first 1.5 mm. long, second broader, 2 mm. long; floral glume oval, subacute, 2 mm. long, lateral nerves prominent; palea nearly as long as its glume, scaberulous on the keel. Grain 1 mm. long.

Dr. Vasey says: "Type specimens collected at San Diego, California, by C. R. Orcutt, in 1885 (No. 1313), and others at San Bernardino by S. B. Parish. Well distinguished by its large, many-flowered panicle and slender spikelets. It is most nearly related to *E. Mexicana* Link."

California, *Parish* 2484 in 1892.

19. *E. MAJOR* Host, Gram. 4: t. 14 (1809). *Briza Eragrostis* L. Sp. Pl. 70 (1753). *E. poæoides* var. *megastachya* A. Gray, Man. Ed. 2:563 (1862). *Eragrostis Eragrostis* MacM. Met. Minn. 75 (1892), not Karst.

A diffusely spreading annual, 15–50 cm. high. Leaves with glands on the principal nerves; ligule a fringe of hairs; blades flat, 5–15 cm. long, 3–5 mm. wide, smooth or nearly so. Panicle rather dense, ovoid or oblong, 8–16 cm. long. Spikelets linear or oblong, flattened, on short pedicels, ovate when young, 10–50-flowered, 6–20 mm. long, whitish when old, olive green or tinged lead-color when young; empty glumes subequal, broadly ovate, acute when spread, 1-nerved, 1.5–1.8 mm. long; floral glume broadly oval, abruptly acute, lateral nerves conspicuous, about 2 mm. long; palea linear-spatulate, ciliate on the keels. Grain almost spherical, often only 0.5 mm. diam.



FIG. 97.
Eragrostis
major. Spike-
let. (Scribner.)

The glands secrete a substance emitting an unpleasant odor offensive to animals.

Massachusetts, *Faxon* 4; New Jersey, *Scribner* for U. S. Dept. Agricul. 582; District of Columbia, *McCarthy*; Iowa, *Hitchcock*;

Colorado, *Cassidy*; Montana, *Anderson* 1611; Arizona, *Toumey*; Texas, *Nealley*; Mexico, *Palmer* 40½.

Introduced from Europe, and very generally distributed over this continent.

20. *E. pilosa* (L.) Beauv. Agrost. 71 (1812). *Poa pilosa* L. Sp. Pl. 68 (1753). *Poa Caroliniana* Spreng. Mant. Fl. Hal. 33 (1807). *Poa pilosa* Muhl. Gram. 141 (1817). *Eragrostis Purshii* Hort. Schrad. Linnaea, 12: 451 (1838). *E. Caroliniana* (Spreng.) Scribn. Mem. Torr. Club, 5: 49 (1895).

A tufted erect or ascending annual, 30–50 cm. high. Ligule a bearded ring; blades soft, smooth below, flat or becoming involute, the tips often filiform, 10–15 cm. long, 2–3 mm. wide. Panicle narrow at first, spreading when in fruit, 15–30 cm. long, rays numerous, branching, some of the lower slightly bearded in the axils. Spikelets on pedicels usually 4–8 mm. long, narrowly linear, purplish or dark lead-color, becoming pale with age, loosely 6–20-flowered, 4–8 mm. long, rachilla scarcely articulate; empty glumes thin, first 0.8–1.2 mm. long, second 1-nerved and 1.2–1.7 mm. long; floral glume broadly ovate, obtuse or emarginate or abruptly acute when spread, lateral nerves obscure, 1.5–1.8 mm. long; palea curved inwards, slightly ciliate on the keels, 1.3–1.6 mm. long. Grain ovoid-oblong, slightly compressed, 1–1.2 mm. long. I have reluctantly abandoned the separation of this from *E. Purshii* Schrad. I had thought in *E. pilosa* the panicle was narrower, spikelets narrower and acute, pedicels longer, lateral nerves more obscure, the floral glume obtuse or emarginate. I have spent much time examining every specimen marked *E. pilosa* in the herbarium of Harvard University. In every one so named the floral glume is 3-nerved.

Texas, *Nealley*; New Mexico, *Jones*; California, *Parish Brothers* 1601; Lower California, *Palmer*, *Orcutt*; Mexico, *Pringle* 42, 49.

Sandy or sterile open places, New England to Arizona and Mexico; also in Europe, Australia and elsewhere.

21. *E. curtipedicellata* Buckl. Proc. Acad. Phila. 97 (1862).

Perennial; erect or decumbent at the base, 60–90 cm. high. Sheaths smooth, ciliate at the throat; blades flat or involute, smooth or nearly so, 10–15 cm. long, 3–8 mm. wide. Panicle diffuse, ovate,

20–30 cm. long, rays single or in twos, diverging, bearing spikelets nearly to the base, rigid, ciliate in the axils. Spikelets light-colored, on pedicels 1–2 mm. long, appressed or spreading, linear to ovate, compressed, 6–12-flowered, 4–6 mm. long; empty glumes ovate-lanceolate, 1-nerved, scabrid on the keel; first about 1.5 mm. long, second about 2 mm. long; floral glume ovate-lanceolate, thin, the 3 nerves moderately conspicuous, 1.7–2 mm. long; palea slightly incurved, linear when not spread, obtuse, slightly ciliate on the keels, 1.5 mm. long. Nearly allied to *E. pectinacea*.

Texas, *E. Hall* 785, *Reverchon*; New Mexico, *Wright* 772.

22. *E. refracta* (Muhl.) Scribn. Mem. Torr. Club, 5: 49 (1895).
Poa refracta Muhl. Gram. 146 (1817). *E. campestris* Trin. Bull. Sci. Acad. St. Petersb. 1:70 (1836). *E. pectinacea* var. *refracta* Chapm. Fl. S. States, 564 (1860).

Perennial; light lead-colored or purplish, culms branching only at the very base, erect, firm, 40–60 cm. high. Throat of sheath bearded; blades rigid, smooth, flat, or involute, 20–30 cm. long, about 2 mm. wide. Panicle open, thin, oval, 30–60 cm. long, rays bearded at the base. Spikelets mostly sessile along the stiff branches, linear, flat, 8–30-flowered, 7–12 mm. long; empty glumes lanceolate, 1-nerved, 1.7–2 mm. long; floral glume ovate, deltoid, acute when spread, with 3 prominent nerves, 1.7–2.1 mm. long; palea incurved, linear, ciliate on the keels, 1.3 mm. long. Grain oval, very slightly compressed, 0.7 mm. long.

Delaware and Maryland, *Cunby*; South Carolina, *Ravenel*; Florida, *Curtiss* 3500; Mississippi, *Tracy*.

Delaware, Florida, Mississippi and Texas.

23. *E. pectinacea* (Michx.) Nees, Fl. Afr. Austr. 406 (1841).
Poa pectinacea Michx. Fl. Bor. Am. 1: 69 (1803).

A tufted firm grass, culms simple, 30–60 cm. high. Sheaths hairy, the throat prominently so; blades rigid, flat or involute, mostly smooth below, often hairy or scabrid above, 20–40 cm. long, 3–5 mm. wide. Panicle usually purple, widely diffuse, compound, oval, 20–30 cm. long; rays in twos, threes or mostly single, rigid, diverging, bearded in the axils, the capillary pedicels 0.5–3 mm. long, appressed when young, but diverging with age. Spikelets

oval or linear, becoming purple, 5-12-flowered, 4-8 mm. long; empty glumes subequal, 1-nerved, ovate, acute, scabrid on the keels, 1.4-1.7 mm. long; floral glume ovate, acute, lateral nerves conspicuous, 1.5-1.9 mm. long; palea incurved, obtuse, hirsute on the nerves, shorter than its glume. Grain oval, scarcely compressed, 0.6 mm. long.

Massachusetts, *Pringle*; Michigan, (Howard City) *Beal*. (Muir) *Wheeler*; Florida, *Curtiss* 3501; Kansas, *U. S. Dept. Agricul.* 585.

Var. **spectabilis** (Pursh) A. Gray, *Man. Ed.* 2: 565 (1862). *E. spectabilis* A. Gray, *Man. Ed.* 1: 598 (1848). *Poa spectabilis* Pursh, *Fl. Am. Sept.* 1: 81 (1814). *Poa amabilis* Walt. *Fl. Car.* 80 (1788), not L.

Sheaths and blades mostly glabrous; branches of the panicle shorter; spikelets rather larger. Found with the species.

Massachusetts to Texas and Kansas.

24. **E. Palmeri** S. Wats. *Proc. Am. Acad.* 18: 182 (1882-3).

An erect tufted rather slender perennial, 60-90 cm. high, from creeping rootstocks. Culms numerous, smooth, simple. Leaves of sterile shoots erect, blades 40 cm. long, involute with long filiform points; sheaths of the culm smooth, slightly compressed, shorter than the internodes; ligule a ring; blades smooth, mostly involute, often 30 cm. long, the upper 10-18 cm. long, 2-4 mm. wide. Panicle much exserted, linear or ovoid, 20-30 cm. long; rays mostly single, rather distant, the longest 9-12 cm. long; bearing branches and spikelets for most of their length. Lateral spikelets on pedicels about 1 mm. long, those terminating the branchlets 3-5 mm. long; but slightly flattened, linear-lanceolate, 4-7-flowered, 4-5 mm. long; empty glumes ovate, acute, 1-nerved; first 1.5 mm. long, second 1.8 mm. long; floral glume broadly ovate, obtuse, 1.8-1.9 mm. long; palea slightly curved, emarginate, broadly oval when spread, as long as its glume. Anthers linear, 1 mm. long. Grain subglobose, 1-5 mm. long. Allied to *E. lugens* Nees.

Mexico, *Palmer* 1368.

25. **E. lugens** Nees, *Agrost. Bras.* 2: 507 (1829). *Poa lugens*

Kunth, Enum. Pl. 1: 331 (1833). *E. pilifera* Scheele, Linnæa 22: 344 (1849).

A tufted erect perennial, 30–60 cm. high. Sheaths of sterile shoots slightly compressed-keeled, more or less pubescent, throat pubescent; ligule a ciliate ring; blades ciliate, flat or involute with filiform points, 4–10 cm. long, 2–3 cm. wide, those of the culm much the same. Panicle often partly enclosed, thin, narrow or ovoid, 25–35 cm. long; rays in twos to fours, with hairy axils, 12–16 cm. long, branching from near the base. Spikelets on stiff slender pedicels, 0.5–1.5 cm. long, oval, 4–8-flowered, 3–4 mm. long; empty glumes ovate, acute, 1-nerved; first 1 mm. long, second 1.5 mm. long; floral glume 1.7 mm. long, broadly oval, lateral nerves not prominent; palea incurved. Grain compressed, oval, 0.7 mm. long.

Texas, *Parry & Palmer* 938, *Nealley*; Colorado, *Jones* in 1884; Arizona, *Pringle* in 1884; Mexico, *Palmer* 203, *Bourgeau* 2643, *Schaffner* 1026.

Texas to Arizona and Mexico.

26. *E. spicata* Vasey, Coult. Bot. Gaz. 16: 146 (1891).

A tufted rather stout erect perennial, 90–120 cm. high. Sheaths 5, longer than the internodes; ligule a ciliate ring; blades smooth below, scabrous above, involute, 25–40 cm. long, 4–6 mm. wide with long filiform points. Panicle dense, 30–40 cm. long, 4–6 mm. wide with a few rays slightly projecting. Spikelets oval, 1.7–2.5 mm. long, 3–4-flowered; empty glumes oval, second 1-nerved, 1.2 mm. long; floral glume oval, mucronate, 1.5 mm. long, the lateral nerves obscure; palea oval, 1.2 mm. long. Grain terete, oval, 0.7–0.8 mm. long.

Lower California, *Brandege* 10, in 1890.

112. (225). **EATONIA** Raf. Journ. Phys. 89: 104 (1819). *Reboullea* Kunth, Rev. Gram. Suppl. 29, t. 84 (1829–35). *Colobanthus* Trin. Mem. Acad. St. Petersb. (VI.) 1: 66 (1830).

Spikelets usually 2-flowered, with an abortive rudiment, numerous, smooth, in a dense or interrupted panicle, rachilla articulate below the flowers. Empty glumes subscarios, the first narrow, 1-nerved, the second broadly obovate or elliptical, 3-nerved; floral

glume obscurely 3-nerved, narrower, obtuse or acutish, awnless or in one case with a bent awn on the back, compressed, chartaceous; palea narrow, hyaline, 2-nerved. Stamens 3. Grain linear-oblong, not grooved, enclosed, but not adherent.

Tufted slender perennials.

There are six species, all found in temperate North America.

- | | |
|--|-----|
| A. Lower blades filiform. | 1 |
| B. Lower blades flat. | (a) |
| a. Floral glume often with a bent awn. | 2 |
| a. Floral glume awnless. | (b) |
| b. Upper blades 3-5 cm. long, panicle very simple
and narrow. | 3 |
| b. Upper blades 8-12 cm. long, panicles stouter, race-
mose. | (c) |
| c. Panicle dense, second and third glumes about
2 mm. long. | 4 |
| c. Panicle lax, second and third glumes 2.2-3 mm.
long | 5 |
| c. Panicle lax, second and third glumes about 4
mm. long. | 6 |

1. *E. filiformis* (Chapm.) Vasey, Coult. Bot. Gaz. 11:117 (1886). *E. Pennsylvanica* var. *filiformis* Chapm. Man. Fl. S. States 560 (1860).

Culms very slender, 30-70 cm. high. Sheaths very shortly woolly-pubescent; blades soft, rigid, filiform, those of the sterile shoots 30-50 cm. long, the upper 3-5 cm. long. Panicle very slender and narrow, the few racemose rays appressed, 1-3 cm. long. Spikelets often 3-flowered; first empty glume conduplicate, linear when spread, 1-5 mm. long, second obovate, 2.3 mm. long; floral glume linear when spread, 2.8 mm. long; palea as long as its glume.

Florida, *Curtiss* 3463.

Dry pine-barrens; South Carolina to Florida.

2. *E. hybrida* Vasey, Coult. Bot. Gaz. 9:165 (1884)

Culms very slender, 40-60 cm. high. Lower sheaths softly scabrous or very shortly woolly-pubescent; blades scabrous, involute, narrow, the two upper 1-3 cm. long. Panicle simple, very

narrow, racemose, 8-12 cm. long. Spikelets 1-flowered, first glume narrow, scabrid, 1.7 mm. long, second narrowly obovate, 2 mm. long; floral glume scabrous, elliptical when spread, 2.2 mm. long, sometimes bearing a bent awn on the back 2 mm. long, starting one-fifth of the way below the apex; sometimes 1-2 short bristles on the rachilla. Labelled *E. obtusata* var. *hybrida*.

Judging from the spikelets, it is nearly allied to *E. obtusata*; from the leaves and panicle to *E. Dudleyi*. Whether it is a sport, or a hybrid between *Eatonia obtusata* or *E. Dudleyi* and *Trisetum* is still a question. Those interested will do well to read Dr. Vasey as above, in which he speaks of finding near Alexandria, Virginia, a hybrid grass nearly intermediate between *E. Pennsylvanica* Gray and *Trisetum palustre* L.

Florida, *Curtiss* for S. M. Tracy, labelled *E. obtusata* var. *hybrida*.

Dry pine-woods, Florida.

3. **E. Dudleyi** Vasey, *Coult. Bot. Gaz.* 11:116 (1886).

Culms very slender, 60-75 cm. high. Sheaths clothed with very short soft hairs; blades of the culm abruptly acute, 3-5 cm. long, those of the sterile shoots scabrous, 8-15 cm. long, 2-4 mm. wide. Panicle very slender, 8-15 cm. long, rays few, short, and mostly appressed. Empty glumes equal, 2.2 mm. long, first linear-obovate, second rhombic-obovate when spread; floral glume concave-oval when spread, 2.1 mm. long; rachilla scabrid. It differs from *E. Pennsylvanica* in having shorter cauline leaves, lower sheaths shorter, pubescent, first glume wider and more obtuse, second glume shorter.

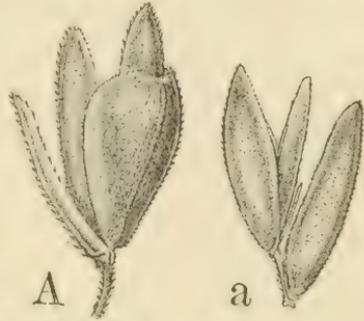
New York (Union Springs, Cayuga County), *Beal* 97 in 1866; West Virginia, *Small*; Michigan, *Cooley, Wheeler* (Hubbardston), 98, *Beal* 99.

Often found on dry land.

Long Island to Michigan and South Carolina.

4. **E. obtusata** (Michx.) A. Gray, *Man. Ed.* 2:558 (1856). *Aira obtusata* Michx. *Fl. Bor. Am.* 1:62 (1803). *Aira truncata* Muhl. *Gram.* 83 (1817). *Kæleria truncata* Torr. *Fl. U. S.* 1:116 (1824). *Reboulea obtusata* A. Gray, *Man. Ed.* 1:591 (1848).

Culms 40-70 cm. high. Ligule fringed, 1.5 mm. long; blades flat, scabrous, those of the culm 8-16 cm. long, 2-3 mm. wide. Panicle dense, contracted, usually interrupted, 6-11 cm long, 8-12 mm. diam., sometimes tinged with purple. Spikelets crowded; first empty glume 1.2-2 mm. long, second 2-2.2 mm. long; floral glume obovate, 1.8-2.2 mm. long.



Illinois, *Wolfe* for U. S. Dept. Agricul. 564; Iowa, *Hitchcock*; Colorado, *Cassidy*; Wyoming, *Buffum* C 104, C 148; California, *Parish* 1640; Washington, *Lake*; southern California, *Parish* 1640.

Dry soil, Pennsylvania to Florida, Michigan, Colorado, and Oregon.

Var. *robusta* Vasey, ined. Stouter, blades 5-7 mm. wide. Panicle branched, 15-18 cm. long.

New Mexico, Vasey; State of Washington, *U. S. Dept. Agricul.*

5. *E. Pennsylvanica* (DC.) A. Gray, Man. Ed. 2: 558 (1856). *Kæleria Pennsylvanica* DC. Cat. Hort. Monsp. 117 (1813). *Aira triflora* Ell. Bot. S. C. & Ga. 1: 153 (1817). *Aira mollis* Muhl. Gram. 82 (1817). *Eatonia purpurascens* Rafin. Journ. Phys. 89: 104 (1819). *Reboulia Pennsylvanica* A. Gray, Man. Ed. 1: 591 (1848).

Culms 60-90 cm. high. Leaf-blades scabrous, 8-15 cm. long, acuminate. Panicle slender or stouter, considerably interrupted, 12-20 cm. long, branches lax, racemose, often 3-5 cm. long. Empty glumes thin, scabrid on the keels, first very slender, 1.5-2.2 mm., second obovate or abruptly pointed, 2.2-3 mm. long; floral glume lance-linear, mucronate-pointed or scarcely acute when spread, 2.2-3 mm. long; palea 2 mm. long.

Very large forms with ample panicles have been called var. *major* Torr.

New York, *Beal* 101, 102; Ontario, *Fowler*; Pennsylvania (Phila.), *Scribn.* for U. S. Dept. Agricul. 565; Illinois (Chicago), *Beal* 100 in 1869; Minnesota, *Bailey* B 32; Montana, *Kelsey* for *Anderson* 53; Washington, *Lake*.

Moist land, New England to Montana.

6. *E. longiflora* (Vasey). *E. Pennsylvanica longiflora* Vasey, Dewey, Coult. Contrib. U. S. Nat. Herb. 2: 544 (1894).

Rather stout, 60–80 cm. high. Sheaths smooth; ligule 2 mm. long; blades scabrid, flat, 9–13 cm. long, 3–5 mm. wide. Panicle linear-lanceolate, 15 cm. long, rays spreading, 2–6 cm. long. Spikelets 2-flowered; empty glumes scabrid on the keels, first glume compressed, linear-lanceolate when spread, 3.3–3.7 mm. long, second elliptical, acute when spread, about 4 mm. long; floral glume elliptical, almost acute when spread, about 4 mm. long; palea 2.3–2.7 mm. long. Nearly allied to *E. Pennsylvanica*, but all the glumes and palea longer.

Texas, *Nealley* for U. S. Dept. Agricul. in 1888.

113. (223). **KÆLERIA** Pers. Syn. Pl. 1: 97 (1805). *Collinaria* Ehrh. Beitr. 4: 147 (1789). *Aegialitis* Trin. Fund. Agrost. 127 (1820). *Aegialina* Schultes, Mant. 2: 13 (1824). *Airochloa* Link, Hort. Berol. 1: 126 (1827). *Poarion* Reichb. Consp. 51 (1828). *Lophochloa* Reichb. Fl. Germ. Exc. 42 (1830). *Wilhelmsia* C. Koch, Linnæa 21: 400 (1848). *Brachystylus* Dulac. Fl. Hautes. Pyr. 85 (1867).

Spikelets 2–5–7-flowered, rarely 1-flowered, flat, shortly pedicellate, numerous in a dense spikelike cylindrical or interrupted panicle, rachilla glabrous, articulate between the floral glumes. Empty glumes keeled, acute, or produced into short straight awns or points, unequal, scarious on the margins; floral glume similar but more scarious or hyaline, the upper ones gradually smaller, 3- or rarely 5-nerved; palea hyaline, 2-keeled, acute, 2-toothed or 2-pointed. Stamens 3. Styles very short. Grain enclosed in the glume and palea, but not adhering.

Annual or perennial, tufted grasses, blades flat or almost setaceous. Nearly allied to *Poa* and *Dactylis*.

A small genus of about twelve species, extending over the tem-

perate regions of the Northern Hemisphere, Australia, and some parts of Africa and South America.

It is difficult to assign to *Kæleria* any positive character. The glumes are more scarious and have fainter nerves than in the others of the subtribe. It has been divided into two sections:

1. *Airochloa* Link. The glumes obtuse or acute without distinct points.

2. *Lophochloa* Reichb. The floral glume with a distinct point or short awn at or just below the tip.

1. **K. cristata** (L.) Pers. Syn. 1: 97 (1805). *Aira cristata* L. Sp. Pl. 63 (1753). *Festuca cristata* Vill. Dauph. 2: 93 (1787). *Poa pyramidata* Lam. Ill. 1: 183 (1791). *P. cristata* Willd. Spec. 1: 402 (1797). *Kæleria nitida* Nutt. Gen. 1: 74 (1818). *K. parviflora* Bert. Schult. Mant. 2: 344 (1824).

An erect very variable perennial, 30–70 cm. high. Ligule very short; blades flat or involute, the lower sparingly hairy or downy, 10–20 cm. long, about 2 mm. wide, obliquely auriculate at the base. Panicle spikelike, more or less interrupted or lobed, 5–12 cm. long, axis and rays downy. Spikelets 2–4-flowered, 4–5 mm. long; first empty glume 2.5–3.5 mm. long, second and floral glumes 3.4 mm. long.



FIG. 99.—*Kæleria cristata*. Spikelet. (Richardson.)

Michigan, *Beal* 103, *Wheeler* (Hubbardston) for U. S. Dept. Agricul. 563, *Cooley*; Illinois, *Beal*, *Bebb* for Clark 3390; South Dakota, *Duffey* in 1889; Colorado, *Cassidy*, *Jones* 254; Wyoming, *Buffum*, c. 14, c. 15, c. 27, c. 50, c. 60; Arizona, *Toumey* 721, 921, *Jones* 4013; Geol. Surv. Canada, Vancouver Island; Washington, *Lake*; Oregon, *Howell*; California, *Torrey* 569 in 1865, *Bolander* 31.

114. (229). **CATABROSA** Beauv. Agrost. 97 (1812).

Spikelets 2–rarely 3–4-flowered, in a loose panicle, rachilla articulate between the flowers, smooth. Empty glumes thin, membranous, broad, unequal, very obtuse, nerves obscure, much shorter than the floral glume; floral glume firm, membranous, obtuse or barely 3-toothed, conspicuously 3-nerved, the upper one smaller, empty or enclosing an imperfect flower: palea scarcely shorter than

its glume, conspicuously 2-keeled. Stamens 3. Styles distinct. Grain obovoid-oblong, subterete, with a narrow groove or without one.

A creeping perennial grass, erect or spreading. Leaf-blades flat. Branches of the panicle spreading, capillary.

There is one species widely dispersed over the temperate parts of Europe, Asia, and North America. Nearly related to *Colpodium*, *Panicularia*, *Eragrostis*.

1. *C. aquatica* (L.) Beauv. l. c. *Aira aquatica* L. Sp. Pl. 64 (1753).



FIG. 100. — *Catabrosa aquatica*. A, spikelet; a, florets. (Scribn. (ner.)

Culms 10–60 cm. high, rather stout. Sheaths loose, longer than the internodes; ligule 2–3 mm. long; blades 5–15 cm. long, 2–8 mm. wide, obtuse. Florets overlapping about half their length, first glume 1 mm. long or less, 1-nerved or nerveless, second 1–2–3-nerved, about 1.5 mm. long, obovate or oval, the apex variously toothed or truncate; floral glume about 2.5 mm. long, broadly oval, concave, the apex thin and truncate; palea equal to its glume, irregularly truncate.

Dakota; Montana, *Canby & Scribner* 383; Europe.

115. (237). *Melica* L. Sp. Pl. 66 (1753). *Dalucum* Adans. Fam. 2:323 (1763). *Chondrachyrum* Nees, Lindl. *Introd. Nat. Syst. Ed.* 2:449 (1836.)

Spikelets 2–8- (rarely 1-) flowered, in a narrow or open panicle, rachilla continuous and finally articulate above the empty glumes, mostly bearing 1 or more rudimentary florets above. Empty glumes membranous or hyaline, obtuse or acute, awnless, unequal, convex or somewhat compressed on the back, first 3.5- (rarely 1- or 7-) nerved, second 5–9-nerved, lateral nerves often vanishing within the broad margin, often united by cross-veinlets; floral glume thin or firm, rounded on the back, 5 to many-nerved, the scarious tip blunt or acute, ending in 2 teeth, central nerves sometimes slightly excurrent, as in *Bromus*; palea 2-nerved, often emarginate or 2-toothed,

ciliate on the nerves above the middle, except *M. anomala*. Stamens 3. Styles distinct. Grain oblong-fusiform, smooth, compressed on the back, included by its glume, but not adhering.

Erect perennials; blades flat or involute; culms often with corms at the base.

There are about thirty species, widely distributed throughout the temperate and subtropical regions of the world.

In most instances I have followed Scribner in his "Revision of the North American Melicæ." See Proc. Phila. Acad. Nat. Sci. p. 40, in 1885.

Bentham observes that the typical representative of the sub-tribe has been universally recognized since the days of Linnaeus, and less tampered with than any other genus of equal extent. In the typical *Melicæ*s, however varied the panicle, long and narrow, or very loose and spreading, the spikelets are generally nodding, with rarely more than two flowers; floral glumes more or less scarious and never awned, the terminal empty glumes one within the other. In a section proposed by Thurber for some northwest American species under the name of *Bromelica*, the spikelets are erect, with more rigid glumes, occasionally awned and 3-8-flowered, the upper empty glumes narrower and not so closely packed, giving the plants altogether so different an aspect that he hesitated whether or not, as suggested by Thurber, to raise the section to the rank of a genus.

GLYCERIE.

Spikelets 1-5-flowered, floral glumes herbaceo-coriaceous, with a narrow scarious margin above, strongly 7-9-nerved.

- | | |
|--|-----|
| A. Culms not bulbiferous. | (b) |
| b. Empty glumes shorter than the spikelet. | (c) |
| c. Panicle 20-30 cm. long. | 1 |
| c. Panicle 4-6 cm. long. | 2 |
| b. Empty glumes as long as the floret. | 3 |
| B. Culms bulbiferous. | d |
| d. ligule 3-4 mm. long. | 4 |
| d. ligule 2-3 mm. long. | 5 |
| d. ligule very short. | 6 |

EUMELICA.

Spikelets 6-16 mm. long, with 2-8 (rarely 1) perfect florets, floral glume apparently many-nerved below (at least when dry), with a broad margin scarious above.

- C. Culms not bulbiferous. (e)
- e. Empty glumes very unequal and decidedly shorter than the 3-5-flowered spikelets. (f)
- f. Panicle diffusely branched, many-flowered. 7
- f. Panicle narrow, the slender branches erect. 8
- e. Empty glumes unequal, the second nearly or quite as long as the spikelet. (g)
- g. Panicle with 6-15 large pendulous spikelets, forming a simple secund raceme. 9
- g. Panicle strict, densely many-flowered above, pedicels erect. 10
- e. Empty glumes subequal, nearly as long as the spikelets. (h)
- h. Ligule 2-3 mm. long, floral glume 5.5 mm. long. 11
- h. Ligule 3 mm. long, floral glume 9 mm. long. 12
- h. Ligule 5-7 mm. long, floral glume 6-7 mm. long. 13
- h. Ligule 1-2 mm. long, floral glume 8-10 mm. long. 14
- D. Culms bulbous, excepting some plants of no. 13. (i)
- i. Second glume decidedly shorter than the third, floral glume 7-8 mm. long. 15
- i. Second glume as long as the third, or nearly as long. (k)
- k. Floral glume 6-7 mm. long. 16
- k. Floral glume 9 mm. long. 17

BROMELICA.

Spikelets of 2-8 perfect florets, the lower exceeding the empty glumes; floral glume prominently 7-nerved, apiculate or distinctly awned by the excurrent midnerve at the notched or bifid or narrowly truncate or rarely long attenuate tip. (Thurber.)

- E. Culms bulbiferous, panicle with spreading, very unequal few-flowered rays. (m)

- m. Floral glume 9-12 mm. long. 18
 m. Floral glume 8-10 mm. long. (n)
 n. Awn less than 2 mm. long. 19
 n. Awn 4-6 mm. long. 20
 F. Culms not bulbiferous, panicle contracted. (o)
 o. Floral glume 8-10 mm. long, ligule 1 mm. long. 21
 o. Floral glume 9-11 mm. long, ligule 4 mm. long. 22
 1. **M. imperfecta** Trin. Bull. Sc. Acad. St. Petersb. 1: 68
 (1836). *M. colpodoides* Nees, Ann. Nat. Hist. 1: 283 (1838). *M.*
panicoides Nutt. Journ. Acad. Phila. Sci. 1: 188 (1847).

Culms slender, 30-100 cm. high. Sheaths longer than the internodes; ligule white, fringed, 3-4 mm. long; blades 6-7, flat or becoming involute, from smooth to scabrous and pilose-pubescent, 15-20 cm. long, about 2 mm. wide. Panicle linear to lanceolate, 20-30 cm. long; rays in remote fascicles, very unequal, the shorter densely flowered to the base, the longer 5-7 cm. long. Spikelets scabrid, 1-flowered, with an imperfect floret, or rarely 2-flowered; empty glumes nearly ovate, first 3-nerved, about 3 mm. long, second but little longer, 5-nerved, the lateral nerves obscure; floral glume about 4 mm. long, ovate, obtuse when spread, 7-nerved, often purplish; palea nearly as long as its glume; rudiment short-pedicelled.

Shady places, very variable in size and appearance.

California, *Parish brothers* 856, U. S. Dept. Agricul. 640 from *Jones* 3092; Lower California, *Palmer* 660, 662, *Pringle* in 1882.

Oregon to Lower California.

Var. **flexuosa** Boland. Proc. Calif. Acad. 4: 101 (1873).

“Branches of the few-flowered simple panicle generally in pairs, widely spreading, often reflexed; florets larger, acute, paler and more coriaceous.” *Thurber* in *Bot. Calif.*

Var. **minor** Scribn. Proc. Acad. Phila. 42 (1885).

“Low and densely tufted, short and chiefly radical leaves, compressed or angular culms, slender few-flowered panicles, the short branches divergent or even reflexed; the spikelets generally smaller than in the species, the outer glumes usually shorter and more obtuse.” *Scribner*, l.c.

Southern California.

Var. *refracta* Thurb. S. Wats. Bot. Calif. 2: 303 (1880).

“Densely velvety pubescent throughout; panicle slender, flexuous, the few distant few-flowered rays all strongly refracted; flowers very acute.” The floral glume hardly acute when spread, but appearing so owing to the involute margins.

Southern California, *Lemmon* 1471.

2. *M. Parishii* Vasey ined.

Culms very slender, 20–30 cm. high. Ligule white, 1.5 mm. long; blades 3–4 in number, scabrous, mostly involute, 8–12 cm. long, 1–2 mm. wide. Panicle simple, narrow, 4–6 cm. long; rays in twos or threes or single, the longest about 2 cm. long and bearing 2–3 spikelets. Spikelets brown and purple on straight pedicels with 1 perfect floret and a rudiment of a second, rachilla 0.5 mm. long; empty glumes ovate acute, first 2.5–3 mm. long, 3-nerved, second 3 mm. long, 3–5-nerved; floral glume 4 mm. long, broadly oval, obtuse, and sometimes 2-lobed, 9-nerved; palea linear before spreading, 2-toothed, as long as its glume.

Southern California, *Parish* 1997.

Mossy mountain-slopes.

3. *M. Torreyana* Scribn. l. c. *M. imperfecta* var. *sesquiflora* Torr. in Herb.

Culms 90 cm. or more high. Ligule 6–8 mm. long, lacerate; blades numerous, flat, 15–20 cm. long, 4–6 mm. wide. Panicle diffuse, 15–25 cm. long, the slender flexuose branches few-flowered at the ends, naked below, 5–10 cm. long. Closely allied to *M. imperfecta*, but distinguished from that species by its more membranous, longer, and more acute glumes, the second equalling or exceeding the floret, by the hairs on the back of the floral glume above the middle, and by the long-pedicelled rudimentary floret.

Forms with 2-flowered spikelets occur, but the second floret and rudiment are long-pedicelled, while in similar 2-flowered forms of *M. imperfecta* these are both nearly sessile. The above description is adapted from the original by Scribner.

California, *Dr. Bigelow* in 1853–4, *Bolander*, *Dr. Torrey* 586.

4. *M. inflata* Vasey, Contrib. U. S. Nat. Herb. 1: 269 (1893).

Culms rather slender, 90-180 cm. from a bulbous base. Sheaths smooth or scabrid, about the length of the internodes; ligule white-fringed, 3-4 mm. long; blades 4 in number, erect, scabrous, 15-25 cm. long, 3-5 mm. wide. Panicle simple, 15-25 cm. long; rays in twos, the longest 4-9 cm. long, bearing 2-5 spikelets on the outer three-fifths. Spikelets 5-8-flowered, 12-18 mm. long, joint of rachilla 2-2.5 mm. long, glumes scabrid, empty ones oval, first 3-5-nerved (the lateral nerves very short), 7 mm. long, second 5-7-nerved, 8 mm. long; floral glume oval, scabrous, the very tip obtuse, 7-nerved, 8 mm. long; palea elliptical without spreading, 6 mm. long.

California, *Lemmon* 5448, *Bolander* 6121, in herb. U. S. Dept. Agricul.

5. *M. fugax* Bolander, Proc. Calif. Acad. 4:104 (1870). *M. Geyeri* Thurber, Bot. Wilkes Exp. 491, not Munro. *Glyceria bulbosa* Buckley, Proc. Phila. Acad. 95 (1862).

Culms slender, 20-60 cm. high, from bulblike bases. Ligule white, lacerate, 2-3 mm. long; blades 2-3 in number, flat, 10-15 cm. long, 2 mm. wide, smooth or scabrid, the lowest short and obtuse, the others setaceous. Panicle simple, 6-12 cm. long, rays remote, soon horizontal, 1-6-flowered, the longest 3 cm. long. Spikelets 3-5-flowered, tinged with purple, joint of rachilla thick, soft, spongy, 2.3 mm. long; first empty glume 4 mm. long, ovate, 3-nerved, second 5 mm. long, broadly oval, 5-7-nerved; floral glume 5 mm. long, firm, broadly oval, 7-9-nerved; palea incurved, 5 mm. long.

Oregon, *Howell*, *Cusick* 1032; California, *Bolander*, *Mrs. Austin*, *Lemmon*.

Idaho, Oregon, and California.

6. *M. multinervosa* Vasey.

Culms geniculate, 50-90 cm. high, with enlarged bases. Sheaths 3, slightly scabrous, about the length of the internodes; ligule very short, ciliate; blades flat or involute, 20-40 cm. long, 2-4 mm. wide. Panicle much exerted, simple, 15-17 cm. long; rays single, the longest 5 cm. long, bearing about 5 spikelets on the outer three-fifths. Spikelets 10-20 mm. long, appressed, linear-

lanceolate, 5-12-flowered, rachilla pubescent with short silky hairs; glumes with prominent green nerves, first empty glume 4 mm. long, ovate, 3-nerved, second 5.5 mm. long, oval when spread, 7-nerved; floral glume pubescent at the base, 7-nerved, ovate-cuneate, apex obtuse; palea softly pubescent, nearly 4 mm. long. Anthers ovate, 0.7 mm. long.

Texas, *Nealley* for Nat. Mus.

7. *M. diffusa* Pursh, Fl. Am. Sept. 1:77 (1814). *M. altissima* Walt. Fl. Car. 78 (1788), not L. *M. mutica* var. *diffusa* A. Gray, Man. Ed. 2:558 (1856).

Culms rather stout, 80-120 cm. high. Sheaths about the length of the internodes; ligule white, lacerate, 4 mm. long; blades 5 in number, flat, slightly scabrid, about 15 cm. long, 6-8 mm. wide. Panicle linear or becoming oval, 20 cm. long, rays mostly in threes, the longest 5-7 cm. long, bearing a few spikelets above the middle. Spikelets borne on weak flexuose or bent pedicels, 2-3-flowered with one or more rudiments, longest joint of rachilla 2.5 mm. long; first empty glume 7 mm. long, broadly oval, 5-7-nerved (if 7-nerved the lateral nerves obscure), second obovate-oblong, 9 mm. long, scarcely acute, 5-nerved; floral glume 9 mm. long, elliptical, 7-nerved above, 21-nerved below; palea spatulate-oval, 7 mm. long.

Pennsylvania, *T. C. Porter*; Kentucky, *C. W. Short*; New Mexico, *Wright* 2062.

Pennsylvania, Texas, Arizona, and Mexico.

Var. *nitens* Scribn. Proc. Phila. Acad. 44 (1885).

"It differs from the species in its more leafy culms, narrower leaves, more densely flowered panicle, and in its much broader and more unequal outer glumes, the second one being nearly as long as the spikelet." Scribner, l. c.

Texas, *Reverchon*, *Curtiss* 3464a, *Nealley*; New Mexico, *Wright* 2063, *Jones* 4334; Arizona, *Pringle*, *Rothrock* 805; Rocky Mountains, *Hall & Harbour* 228.

Texas, Nebraska, Colorado, Arizona.

8. *M. parviflora* (Porter) Scribn. Mem. Torr. Club, 5:50 (1895). *M. mutica* var. *parviflora* Porter, Porter & Coulter, Fl.

Col. 149 (1874). *M. Porteri* Scribn. Proc. Phila. Acad. 1885, 44, t. 1, f. 44 (1885).

Culms slender, 60–80 cm. high. Sheaths scabrous, longer than the internodes; ligule white, 4 mm. long; blades 6–7 in number, flat or becoming involute, scabrous, 20–30 cm. long, 3–4 mm. wide. Panicle simple, 20–30 cm. long, rays in threes and fours or fewer in half-whorls, remote from each other 4–7 cm., the longest 6–7 cm. long, bearing a few spikelets above the middle on hairy pedicels turned to one side. Spikelets 3–5-flowered, longest joint of rachilla 2.5–3.5 mm. long, first glume 5–7 mm. long, ovate, 5-nerved; second 6–7 mm. long, broadly oval, acute, 7-nerved; floral glume 7–9 mm. long, firm, scabrous, elliptical, acute, 7–14-nerved; palea 5–6 mm. long, spatulate, acute.

Texas, *Nealley*; New Mexico, *Wright* 2063, *Jones* 4134; Arizona, *Pringle*. *Rothrock* 805; Rocky Mountains, *Hall & Harbour* 228.

Nebraska, Colorado, and Arizona.

9. *M. stricta* Boland. Proc. Calif. Acad. 3:4 (1863).

Densely tufted, 20–50 cm. high. Sheaths longer than the internodes, scabrid or pubescent; ligule white, lacerate, 4 mm. long; blades 4–5 in number, sometimes scabrous above and pubescent beneath, the apex convolute and rigid, 10–15 cm. long, 4 mm. wide. Panicle very simple, or instead often a secund raceme, 10–15 cm. long, bearing 9–12–20 spikelets. Spikelets borne on slender curved, finely pubescent pedicels, 2–4-flowered, longest joint of slender rachilla 2.5 mm. long; empty glumes subequal, 12–15 mm. long, elliptical when spread, acute, almost hyaline, 5-nerved; floral glume narrowly elliptical, 5-nerved; palea spatulate-linear, 5 mm. long.

Oregon (Stein's Mountain), *Howell*; California, *Gray*, *Greene*, *Bolander*, *Pringle*; Nevada, *Watson* 1305.

Montana, Oregon, California, and Nevada.

10. *M. frutescens* Scribn. Proc. Phila. Acad. 45 (1885).

Culms stout, 70–100 cm. high, simple or branched near the base or near the top. Sheaths about 8 in number, longer than the internodes; ligule 4–5 mm. long, rather firm and brown below; blades

scabrous, 20-30 cm. long, 4-5 mm. wide, involute near the tip. Panicle 15-30 cm. long, strict, densely flowered and spicate above, interrupted below, the appressed branches 3-7 cm. long, the longer ones naked for one-fourth of their length. Spikelets on stout erect pedicels, usually 5-flowered, joint of rachilla 2 mm. long; empty glumes elliptical-lanceolate, 5-7-nerved, first 11-12 mm. long, second 12-13 mm. long; floral glume 9 mm. long, elliptical, 9-11-nerved; palea 5 mm. long, spatulate-oval.

California (San Diego), *Orcutt*; Mexico, *Jones* 3748. The plant from Mr. Jones is more slender, blades involute, 6-10 cm. long, 2-3 mm. wide, distichous; spikes more slender, fewer-flowered; perhaps a distinct variety.

Southern California, Arizona, Mexico.

11. *M. nana*, new name. *M. argenta* (Howell) Beal, Bull. Torr. Club, 17: 153 (1890), not Desv. *Poa argentea* Howell, Bull. Torr. Club, 15: 11 (1888).

An erect tufted perennial, 15-20 cm. high. Sheaths loose, membranous; ligule 2-3 mm. long; leaves of sterile shoots numerous, curved, blades conduplicate, 3-7 cm. long, in cross-section oblong, 0.6-0.8 mm. diam., bulliform cells wanting, apex obtuse; ligule of the culm-leaves acute, 3-5 mm. long; blades of the culm 2 in number, conduplicate, 11-nerved, 1.5 cm. long, 1.3 mm. diam. Panicle oblong, spikelike, 2-3 cm. long. Spikelets oblong-linear, 6-8 mm. long, 3-5-flowered, joint of rachilla 1.7-2 mm. long, all of the glumes brownish, shining and with broad scarious margins; empty glumes subequal, 3.5-5 mm. long, 3-4-5-nerved, obovate, ovate, lobed, toothed or entire; floral glume 5.5 mm. long, oval or obovate when spread, denticulate, 5-6-7-nerved, minutely scabrid or smooth; palea lanceolate, about the length of its glume. Anthers 3 in number, 2.5 mm. long. The following, among other things, indicate that this is a *Melica*: the soft smooth or scarious obovate or irregularly toothed glumes, empty glumes often 4-5-nerved, the long spongy joints of the rachilla, floral glume without hairs at the base, 5-6-7-nerved, the nerves evanescent, not connivant above. The specific name *argentea* had been previously used when this was transferred from *Poa* to *Melica*, hence the new name.

Oregon (Siskiyou Mountains), *Howell* in July, 1887.

12. *M. mutica* Walt, Fl. Car. 78 (1788). *M. glabra* Michx. Fl. Bor. Am. 1 : 62 (1803) in part. *M. mutica* var. *glabra* A. Gray, Man. Ed. 3 : 555 (1856).

Culms slender, 60–90 cm. high. Ligule brown below, 3 mm. long; blades 6–7 in number, flat, smooth or scabrid, 10–15 cm. long, 3–5 mm. wide. Panicle racemose, 12–17 cm. long, rays single or in couples, distant, few-flowered, the longest 4–5 cm. long. Spikelets on slender curved pedicels, with 2 fertile flowers, longest joint of rachilla 2 mm. long; first empty glume 6.5–9 mm. long, broadly oval, 5–9-nerved, second 8–9 mm. long, nearly elliptical-lanceolate, 5–7-nerved; floral glume elliptical, 7–17-nerved, 9 mm. long; palea spatulate-elliptical, about 6 mm. long. Professor Scribner says: “Distinguished from *M. diffusa*, with which it has been united by some authors, by its more slender habit, less-branched and fewer-flowered panicle, which is often reduced to a single raceme. The spikelets also rarely have more than two perfect florets, the outer glumes are more nearly equal in length, and often quite as long as the spikelet, while the flowering glumes are broader and more obtuse.”

Pennsylvania, *Garber*; District of Columbia, *McCarthy*; Florida, *Curtiss*.

Pennsylvania, Illinois, southward and westward to Texas.

13. *M. laxiflora* Cavan. Ic. 5, 48. t. 473, f. 2 (1799).

A tufted grass, 50–60 cm. high. Sheaths scabrid, longer than the internodes; ligule white, thin, split, 5–7 mm. long; blades of sterile shoots narrow, 2–10 mm. long, those of the culm 3–4 in number, flat or involute, scabrid, 7–12 cm. long, 2–3 mm. wide. Panicle open, 12–19 cm. long, rays at length spreading or drooping, mostly in threes, the longest 5–8 cm. long, flower-bearing but little below the middle. Spikelets on slender curved or reflexed pedicels, 1–2-flowered, rachilla about 2 mm. long; empty glumes white, thin, 5-nerved, first oval, 7 mm. long, second linear, obtuse, apex sometimes notched, 6–7 mm. long; floral glume 6–7 mm. long, ovate-oblong, obtuse, scabrid, 11- to many-nerved; palea linear-spatulate, 5 mm. long.

Mexico (Chihuahua), *Pringle* 430 ; also said to grow in Chili.

14. **M. macrantha** (Vasey) Beal, Bull. Torr. Club, 17:153 (1890). *Poa macrantha* Vasey, Bull. Torr. Club, 15:11 (1888).

A smooth stout grass, 30–40 cm. high, ascending from creeping rootstocks. Sheaths compressed, loose; ligule 1–2 mm. long; blades of the culm, excepting 2 or 3 of the upper ones, bearing in their axils non-flowering leafy branches; blades of the branches conduplicate, curved and flexuose, often reaching to the panicle, the extreme apex obtuse or abruptly pointed, in cross-section oval or circular, 5–10 mm. diam., a set of small bulliform cells on each side near the middle; blades of the culm a little wider, the upper one 1–5 cm. long. Panicle erect, dense, sometimes interrupted below, 4–10 cm. long, rays in twos and threes, stout, erect, the longest 3–5 cm. long. *Staminate spikelets* 10–15 mm. long, compressed, ovate-lanceolate or oval, 4–7-flowered, light green or yellowish, joint of rachilla large, soft, sparingly pubescent, 1.5–2 mm. long; empty glumes oblong-lanceolate, softly scabrid, first 7–10 mm long, 3–4–5-nerved, second 8–11 mm. long, 3–7-nerved; floral glume 8–10 mm. long, oval or oval-lanceolate, with soft hairs at the base and lower part of the keel, apex notched, awnless, 3–10-nerved; palea but very little shorter than its glume, linear, ciliate on the keels, apex notched. Anthers 5 mm. long. *Pistillate spikelets* with shorter joints of the rachilla; empty glumes and floral glume a little shorter. The compressed spikelets and conduplicate blades point to affinities with *Poa*. The following features show its affinity with *Melica*: large, soft, scabrid, light green or yellowish spikelets, glumes oval, rachilla long, large and soft; empty glumes usually more than 3-nerved and floral glume more than 5-nerved and notched at the apex.

Oregon, *Howell*. Sand-dunes, Tilamook Bay.

15. **M. spectabilis** Scribn. Proc. Phila. Acad. 45 (1885). *M. bulbosa* Porter & Coult. Fl. Colo. 149 (1874).

A slender tufted stoloniferous grass, about 60 cm. high, with a corm at the base of each culm. Sheaths mostly longer than the internodes; ligule white, about 2 mm. long; blades 3–4 in number, scabrous, flat or involute, 15–20 cm. long, 2–4 mm. wide. Panicle slightly nodding, simple, 10–16 cm. long, racemose, rays slender,

flexuose, single or in pairs, sometimes in threes, the longest 3-4 cm. long, bearing 2-4 spikelets. Spikelets 3-8-flowered, joint of rachilla 1.5 mm. long; empty glumes ovate, obtuse, or acute with transverse nerves near the middle, first glume 3-nerved, 4-5 mm. long, second 5-nerved, 5-6 mm. long; floral glume 7-8 mm. long, abruptly tapering, oval, the apex with 2 very short teeth or a notch, 7-9-nerved, with cross nerves; palea elliptical, 5 mm. long. Professor Scribner says: "This grass has been referred to Geyer's *M. bulbosa* by authors, but aside from its affecting higher elevations, it is readily distinguished from that species by its usually taller and more slender culms, by its more open and nodding panicle, by the more slender and flexuose pedicels, by its shorter empty glumes, and by its broader flowering glumes, which taper abruptly to a rounded and usually two-lobed summit."

Montana, *Anderson, Williams*; Oregon, *Cusick* 851.

Montana, Oregon, and California.

16. *M. Californica* Scribn. Proc. Phila. Acad. 46 (1885). *M. poaeoides* Torr. Pac. R. Rep. 4:157 (1857), not Nutt. *M. bulbosa* Thurb. S. Wats. Bot. Calif. 2:304 (1880), not Geyer (1856).

Culms slender, 30-80 cm. high, with corms and woolly-pubescent roots. Leaves 4-5 in number, sheaths shorter than the internodes, scabrous, ligule 3 mm. long, brown and pubescent below; blades firm, scabrous, involute, 8-12 cm. long, 2-3 mm. wide. Panicle 10-15 cm. long, spikelike, interrupted below, rays mostly in pairs, the longest 3-4 cm. long. Spikelets scabrid, 2-3-flowered on erect stout pedicels, joint of rachilla 2 mm. long, first empty glume ovate, 3-5-nerved, about 6 mm. long, second elliptical, 5-7-nerved, about 7 mm. long; floral glume 6-7 mm. long, oval, apex obtuse or notched, minutely scabrous, 7-9-nerved; palea elliptical, about 5 mm. long. The plant seen was marked *M. bulbosa* Geyer, and from M. E. Jones, collected at Kelsey, California.



FIG. 101.—*Melica Californica* Spikelet. (Scribner.)

Utah, *Watson* 1303; Wyoming, *Parry* 295; Idaho, *Watson* 455; Oregon, *Cusick* 815; California, *Jones*.

Wyoming, Utah, Oregon, California.

17. *M. bulbosa* Geyer, Hook. Jour. Bot. 8:19 (1856). A. Gray, Proc. Am. Acad. 8:409 (1873).

Culms slender, growing singly or in dense tufts, with corms at the base. Sheaths scabrous, or sometimes pubescent, about the length of the internodes; ligule white, thin, about 4 mm. long; blades 3-4 in number, erect, scabrous, 10-15 cm. long. Panicle erect, spikelike, more or less interrupted below, 7-12 cm. long; rays in twos, threes, or single, stout, erect, appressed. Spikelets 5-8-flowered, joint of rachilla 2.2-5 mm. long; empty glumes scabrid, first glume elliptical-lanceolate, 3-5-nerved, 6-7 mm. long, second elliptical, obtuse-retrorse, 5-nerved, 8 mm. long; floral glume 9 mm. long, scabrous, oblong-lanceolate, obtuse or notched at the tip, 7-nerved, with some shorter nerves intervening; palea elliptical without spreading, 7 mm. long.

Montana, *Williams*; Washington, *Brandege* 1182; Oregon, *Howell*, *Cusick* 900, *Hall* 637; Nevada, *Watson* 1304.

Montana, Washington, Nevada, California, Utah, Wyoming.

18. *M. subulata* (Griseb.) Scribn. Proc. Phila. Acad. 47 (1885). *Bromus subulatus* Griseb. Ledeb. Fl. Ross. 4:358 (1853). *M. acuminata* Boland. Proc. Cal. Acad. 4:104 (1870).

A slender grass, 60-120 cm. high, the culms scabrous with corms at the base. Sheaths shorter than the internodes; ligule a white ciliate fringe 1 mm. long; blades 4-5 in number, scabrous, flat, 12-18 cm. long, 4-6 cm. wide. Panicle slender, few-flowered, 12-15 cm. long; rays slender, plumose, the lower in threes or fours, the longest 5-7 cm. long, bearing 2-5 spikelets above the middle. Spikelets about 5-flowered, rachilla zigzag, each joint 3-4 mm. long, with an unequal callus-like swelling just below the empty glumes; lower glume ovate-lanceolate, 3-nerved, first 5 mm. long, second 6 mm. long; floral glume 9-12 mm. long, hirsute or scabrous, oval-acuminate, 7-nerved; palea linear, 5-6 mm. long.

Oregon, *Kellogg* & *Havard* 1112, *Howell* 445.

Montana, Idaho, Washington, Oregon, California.

19. *M. bromoides* A. Gray, Proc. Am. Acad. 8:409 (1873). *M. Geyeri* Munro, Boland. Proc. Calif. Acad. 4:103 (1870).

Culms 90-100 cm. high, with corms at the base. Sheaths often scabrous, half as long as the internodes; ligule 3 mm. long; blades scabrous, flat or involute, 20-40 cm. long, 5-12 mm. wide. Panicle much exerted, thin, pyramidal, 12-15 cm. long; rays in twos or threes or single, the longest 5-7 cm. long, bearing 2-5 spikelets on the outer three fifths. Spikelets 4-5-flowered, 16-20 mm. long; empty glumes ovate, narrowed above, acute or obtuse, first 4 mm. long, second 7 mm. long; floral glume 8-9 mm. long, 7-nerved, scabrid, linear-lanceolate, acute, with 2 teeth, the 3 nerves extending to the apex, the middle one ending in a point; palea a little shorter, ciliolate on the keels.

Washington, *Vasey*; California, *Bolander* 40.

Washington, Oregon, California.

Var. **Howellii** Scribn. Proc. Phila. Acad. 47 (1885).

This differs from the type in its more open and fewer-flowered panicle; the floral glumes are also considerably longer, and entire or but slightly notched at the tip, without any awn. It has a decidedly festucoid look.

Oregon, *Howell* 335.

20. **M. Smithii** (Porter) *Vasey* ined. *Avena Smithii* T. C. Porter, A. Gray Man. Ed. 4: 640.

A slender grass, 60-140 cm. high; culms with corms at the base. Sheaths about the length of the internodes; ligule acute, thin, 4-5 mm. long; blades 5-6 in number, flat, thin, scabrous, 15-20 cm. long, 6-8 mm. wide. Panicle open, thin, 15-30 cm. long; rays mostly single, 5-7 cm. long, distant, at length spreading, slightly curved, the lowest 8-12 cm. long, bearing a few spikelets usually above the middle. Spikelets 2-5-flowered, joint of rachilla hispid, 3-4 mm. long; empty glumes scabrid, first 5 mm. long, linear-lanceolate, 3-nerved, second 6-7 mm. long, lance-elliptical, 5-nerved; floral glume 8-10 mm. long, linear-lanceolate, 2-toothed, 7-nerved, awn 4-6 mm. long; palea linear, 6-7 mm. long. Nearly allied to *M. aristata* Thurber.

Michigan, near Sault St. Marie, Grand Traverse (*Beal* 104), Benzie, Kewenaw Co. (*Farwell*), Otsego County, Isle Royale;

Montana, *Anderson* 30; British America, *Macoun*; Washington, *E. R. Lake*.

Growing in woods.

Michigan, British Columbia, Washington, and at intervening points.

21. **M. Harfordii** Boland. Proc. Calif. Acad. 4:102 (1870); Thurb. S. Wats. Bot. Calif. 2:305 (1880).

A slender grass, 40–100 cm. high, the lower nodes somewhat enlarged. Sheaths mostly as long as the internodes, often ciliate at the throat; ligule about 1 mm. long; blades 4 in number, glaucous, smooth or scabrous above, flat or involute, 12–25 cm. long, about 3 mm. wide. Panicle erect, pale, slender, spikelike, 10–20 cm. long; rays mostly in pairs, the longest 5–6 cm. long, bearing about 3 spikelets above the middle. Spikelets 4–8-flowered on erect pedicels, joint of rachilla 3–4 mm. long, easily breaking when young; empty glumes elliptical, 5-nerved, 7 mm. long, second 7-nerved, 8–9 mm. long; floral glume 8–10 mm. long, nearly oblong, tapering above, scabrous-pubescent, ciliate near the margins on the lower half, apex notched or truncate, 7-nerved, with an awn 1–3 mm. long; palea linear when not spread, 8 mm. long.

U. S. Dept. Agricul. 603; Washington, *Howell*; Oregon, *Howell*; California, *Bolander* 53.

Washington, Oregon, and California.

Var. **minor** Vasey ined. A grass 20–30 cm. high; spikes very simple, 3–8 cm. long; spikelets about 3-flowered.

Oregon (Siskiyou Mountains), *Howell* in 1887.

22. **M. aristata** Thurb. Boland. Proc. Calif. Acad. 4:103 (1870); S. Wats. Bot. Calif. 2:305 (1880).

A rather slender grass, 50–70 cm. high, scabrous throughout. Sheaths as long as the internodes; ligule scabrous, about 4 mm. long; blades 5–6 in number, flat, pubescent, about 10 cm. long, 3–4 mm. wide. Panicle very slender, simple, 20–30 cm. long; rays in threes, the longest 5–7 cm. long, bearing 2–4 spikelets above the middle, the sets of rays remote, the lower often partly included. Spikelets purplish, erect, mostly 3-flowered, joints of rachilla brittle, 3–3.5 mm. long; empty glumes elliptical-oblong, barely

acute, each 5-7-nerved, first 9 mm. long, second 11 mm. long; floral glume 9-11 mm. long, strongly scabrous, a few hairs near the margins at the base, linear, 7-nerved, central nerve excurrent below the bifid tip, an awn 6-10 mm. long; palea linear before spreading, 7-8 mm. long. Blades shorter and broader than those of *M. Harfordii*; the panicle fewer-flowered.

California (Emigrant Gap), *Bolander, Jones.*

Washington, Oregon, California.

116. (238). **KORYCARPUS** Zea. Act. Matr. (1806); ex Lag. Gen. et. Sp. Nov. 4 (1816). *Diarina* Rafin. Med. Repos. N. Y. 5: 352 (1808). *Diarrhena* Beauv. Agrost. 142 (1812). *Ræmeria* Zea, R. & S. Syst. 1: 61, 287 (1817). *Corycarpus* Zea, Spreng. Syst. 1: 123 (1825). *Onœa* Franch. & Sav. Enum. Pl. Jap. 2: 178 (1879).

Spikelets 3-5-flowered in a narrow strict sparingly branched panicle, one or two of the uppermost flowers sterile, rachilla very easily articulate between the flowers. Empty glumes very unequal, coriaceous, keeled, first narrow, acute, 1-nerved, second larger, broader, ovate, acute or mucronate, 5-nerved; floral glume broadly ovate, round on the back, coriaceous, shining, 3-nerved, the nerves united at the apex in a strong abrupt or awl-shaped tip; palea shorter, rigid, 2-keeled. Stamens 2, rarely 1. Styles short, distinct. Grain very large, obliquely ovoid, obtusely pointed, rather longer than the floral glume; pericarp not adhering to the seed. Tall erect perennials with flat blades.

There are two species, one peculiar to eastern North America, the other to Japan; nearly allied to *Melica*, but the floral glumes have only three nerves and are hardened round the grain, which usually exceeds them, and the stamens are reduced to two or one. The habit is much that of the section *Eromelica* of the genus *Melica*.

1. **K. diandrus** (Michx.) Kuntze, Rev. Gen. Pl. 772 (1891). *Festuca diandra* Michx. Fl. Bor. Am. 1: 67 (1803). *Diarrhena Americana* Beauv. Agrost. 142 (1812). *Korycarpus arundinaceus* Zea, Act. Matr. (1806).

Culms erect, unbranched, 60-90 cm. high, nearly smooth, compressed, almost solid, with running rootstocks. Ligule very

short; blades flat, 30-60 cm. long, 1-1.5 cm. wide. Panicle very simple, 15-20 cm. long, rays single, few and few-flowered. Spikelets shortly pedicellate, obliquely curving from the axis; first empty glume 2-2.5 mm., second about 3.5 mm. long; floral glume 4 mm. or more long, besides the point. Grain compressed, semi-oval, 4.5 mm. long.



FIG. 102.—*Korycarpus diandrus*. Spikelet. (Richardson.)

Indiana, *Pringle, Beal*.

Shady river-banks and rich woods, Ohio to Illinois and southward. "Rare in Michigan, as far north as Hubbardston, Ionia County." C. F. Wheeler.

117. (243). **ZEUGITES** P. Br. Hist. Jamaic. 341 (1756); Schreb. Gen. Pl. 810 (1791). *Sennites* Adans. Fam. 2:39 (1763). *Despretzia* Kunth, Rev. Gram. 2:485 (1830). *Krombolzia* Rupr. Bull. Acad. Brux. 9:(2). 247 (1842).

Spikelets many-flowered, paniculate, rachilla continuous or tardily articulate under the fertile floret, the lower flower female, the upper ones male. Empty glumes delicately membranous, many-nerved, very broad, slightly unequal, the apex round, truncate, often sub-denticulate, awnless, usually with transverse nerves; floral glume with transverse nerves, enclosing the female flower, larger, sometimes mucronate, those of the male flowers narrower, mucronate; palea narrow, hyaline, 2-keeled. Stamens in the male flowers 3. Styles of the female flowers distinct. Grain oblong, enclosed by the glume and palea, but not adherent to them.

Branching grasses, usually tall with very broad blades having short petioles, the blade reticulate-nerved. Panicle terminal, open or dense. There are five or six species dispersed in Mexico, West Indies, and South America.

1. **Z. latifolia** (Fourn.) Benth. *Krombolzia latifolia* Fourn. Bull. Soc. Bot. Belg. 15:464 (1876).

A robust grass, 2-3 m. high from thick rootstocks. Sheaths

smooth, longer than the internodes, the brown margins at the throat revolute; ligule 1 mm. long; blades linear to ovate-lanceolate, 20–30 cm. long, with 10–15 nerves each side the midrib. Panicle pyramidal, about 20 cm. long, lower rays ternate and remote, more numerous above, the longest 10 cm. long, bearing 10–15 spikelets from base to apex. Spikelets linear or ovate-lanceolate, 8–9 mm. long; empty glumes 7-nerved, first 3 mm. long, 3 mm. wide, second narrower and a little longer; floral glume of female floret tumid, 4–5 mm. long, 11-nerved; palea obovate, 4 mm.



FIG. 103. — *Zeugites latifolia*. A, spikelet; a, floret. (Scribner.)

long, ciliolate on the keels; floral glume of male florets broadly ovate, subacute, 3.5 mm. long, 7-nerved, with a few cross-nerves near the apex; its palea oval, 3 mm. long. Anthers 2.2 mm. long.

Mexico, *Pringle* 2046, 2322.

2. **Z. Mexicana** (Kunth) Trin. Steud. Nom. Ed. 2. 2: 798 (1841). *Desprezta Mexicana* Kunth, Rev. Gram. 2: 485 (1829).

Culms slender, branching, 20–50 cm. high, from creeping rootstocks. Sheaths shorter than the internodes, smooth; ligule 1.5–2 mm. long; petiole distinct, 4–10 mm. long, puberulent next the blade; blades ovate, acute, 5 cm. long. Panicle thin, ovoid, 4–6 cm. long, lower rays in twos, threes, or single, bearing each 1–6 spikelets. Spikelets glabrous, 3-flowered, 4–7 mm. long; empty glumes equal, 3 mm. long, 5-nerved, truncate, 5-toothed; floral glume oval, about 5 mm. long, many-nerved; palea longer and narrower than its glume.

Mexico (San Luis Potosi), *Pringle* 3919. Rich woods.

118. (244). **PLEUROPOGON** R. Br. Parry, First Voy. Suppl. 289. (err. typ. 189) (1824). *P. Lophochlæna* Nees, Ann. Nat. Hist. (1) 1: 283 (1838).

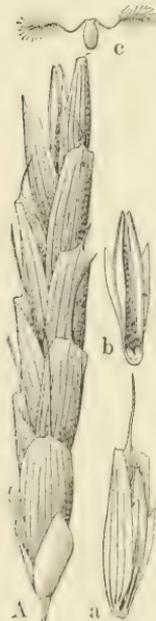
Spikelets 8–14-flowered, secund, racemose, on a simple rachis, rachilla articulate above the empty glumes and between the florets. Empty glumes membranous, subhyaline, 1-nerved or the second with an obscure nerve on each side the central one, awnless, unequal; floral glume longer, membranous, rather firm, 5–7-nerved, apex

hyaline, entire, emarginate or 2-toothed, the midnerve terminating in a mucro or short awn; palea scarcely shorter than its glume, hyaline, with 2-winged ciliate keels. Stamens 3. Grain oblong, hard, enclosed, but not adherent. Soft upright perennial grasses with flat leaf-blades. Racemes simple, shortly pedicellate, lax. Spikelets large, distant, erect or pendulous on short pedicels.

There are three species; one arctic, two in California.

1. *P. Californicum* (Nees) Benth.; Vasey, Grass. U. S. 40 (1855). *Lophochlana Californica* Nees, l. c.

Culms 40–60 cm. high; nodes constricted and dark-colored. Sheaths shorter or as long as the internodes; ligule thin, 6 mm. long; blades 10–15 cm. long (the upper 3–5 cm.), 4 mm. wide. Raceme flexuose, 15–20 cm. long, containing 6–12 spikelets. Spikelets 1.5–2.5 cm. long, on flattened pedicels, 3–6 mm. long, suberect or spreading; empty glumes shining, second 3-nerved, notched at the apex; floral glume very scabrous, 5–6 mm. long, the 3 central nerves uniting above, the awn 8–16 mm. long, lateral awns very short; palea curved, cuneate, 5 mm. long, the winged keels toothed.



California, Bolander 41, Douglas in 1833.

Bolander believed it worthy of cultivation as a forage-plant.

2. *P. refractum* (Gray) Benth. Proc. Am. Acad. 402 (1872). *Lophochlana refracta* A. Gray, Proc. Am. Acad. 8: 409 (1872).

Culms stout, 90–120 cm. high. Sheaths scabrous or smooth; ligule obtuse, 3–6 mm. long; lower blades flat, about 20 cm., the upper 3–5 cm. long, 6–8 mm. wide. Rachis very slender, flexuose, 20–30 cm. long. Spikelets refracted by the curving of the pedicels, 2.5–3.5 cm. long, rather loosely flowered; floral glume 7–8 mm. long, scabrous, oblong, apex truncate-croze, awn about 6 mm. long; palea 7 mm. long, the wings ending each in a blunt tooth.

FIG. 104.—*Pleuropogon refractum*. A, spikelet; a, floret; b, palea; c, pistil. (Scribner.)

Oregon, Hall 636, Howell.

Very nearly allied to *P. Californicum*, into which, perhaps, it passes.

3. *P. Sabinii* R. Br. Parry's First Voy. Suppl. 289, (err. typ. 189), (1824).

Culms erect, smooth, simple, 6–15 cm. high. Sheaths slightly compressed, closed almost to the apex; ligule very short; blades of the culm flat, smooth, 2–4 mm. wide, the upper 0.5–2 cm. long, those of the sterile shoots longer and narrower. Rachis 5–8 cm. long, pedicels of spikelets but little longer than the empty glumes, recurved. Spikelets subterete, drooping, 5–8 mm. long, 3–10-flowered; empty glumes 1–3 mm. long, the first ovate, acute, the second obovate, obtuse, a little the longer and broader; floral glume obovate-oblong, about 4 mm. long, 5-nerved, clothed with very fine appressed pubescence, the upper half white, scarious; palea ciliate on the keels, deeply emarginate, as long as its glume. There are two varieties.

Melville Island, *U. S. Dept. Agricul.* from the British Museum. Only a fragmentary specimen was examined somewhat superficially.

119. (246). **UNIOLA** L. Sp. Pl. 71 (1753). *Trisiola* Rafin. in Fl. Ludov. 144 (1817). *Chasmanthium* Link, Hort. Berol. 1: 159 (1827).

Spikelets closely 3–20-flowered, very flat with thin edges, one or more of the lowest neutral or consisting only of an empty glume, rachilla articulate between the florets. Empty glumes lanceolate, compressed-keeled, rigid, many-nerved, awnless; floral glume longer, usually acute or pointed, entire; palea rather firm, with two narrowly winged keels. Stamens 3. Grain oblong, compressed, loosely enclosed, but not adherent.

Erect tufted smooth perennials from creeping rootstocks, with blades flat or involute. Panicle loose or spikelike. There are five or six species known, all belonging to North America, and one extending into South America; all with broad, flat spikelets in which the 3–6 lower glumes are empty, in size and shape gradually passing into the floral ones.

- A. Spikelets 2–3 cm. long. (a)
 a. Empty glumes thin. 1

- a. Empty glumes spongy 2
 B. Spikelets 3-4 mm. long. 3
 C. Spikelets 7-8 mm. long. 4
 D. Spikelets 12-16 mm. long. 5

1. *U. latifolia* Michx. Fl. Bor. Am. 1:71 (1803).

Culms rather stout, 60-120 cm. high. Leaves numerous, sheaths mostly shorter than the internodes; ligule a fringe of very short hairs; blades lanceolate, about 11-ribbed, 10-18 cm. long, 1.5-2.5 cm. wide. Panicle loose, nodding, 18-30 cm. long. Spikelets pedicellate, drooping, oblong, acute, 2-3 cm. long, 10-15-flowered, empty glumes subequal, linear-lanceolate, 5-9 mm. long; floral glume 10-13 mm. long, ovate-lanceolate, the keel winged and ciliate; palea falcate, shorter than its glume. Stamen 1.



FIG. 105.—*Uniola latifolia*. Spikelet. (Scribner.) Delaware, *Canby*; Illinois, *Mead*; Texas, *Hull* 793, *Drummond*; New Mexico, *Fendler* 914.

River-banks, southern Pennsylvania to Illinois, Florida, and New Mexico.

2. *U. paniculata* L. Sp. Pl. 71 (1753). SEA-OATS.

Culms stout, hard, 1-3 m. high. Ligule a fringe of hairs; blades very long, rigid, soon involute or convolute. Panicle open, drooping, 30-60 cm. long. Spikelets on short pedicels, whitish or straw-colored, 2-2.4 cm. long, oblong, about 12-flowered; empty glumes glabrous, 6-8 mm. long, spongy, 3-nerved; floral glume 10-12 mm. long, 7-nerved, keel not winged nor ciliate; palea scarcely falcate, serrulate on the keels. Stamens 3.

North Carolina, *Hyams*; Florida, *Garber*; Texas, *Wright*.

Sand-hills along the seacoast, Virginia to Florida, and Mexico to Ecuador.

3. *U. laxa* (L.) B. S. P. Prel. Cat. N. Y. 69 (1888). *Holcus laxus* L. Sp. Pl. 1048 (1753). *U. gracilis* Michx. Fl. Bor. Am. 1:71 (1803).

Culms slender, 60-120 cm. high. Sheaths smooth or downy; ligule a ciliate ring; blades 20-30 cm. long, 3-5 mm. wide, flat or

involute, scabrid above, smooth below. Panicle erect, slender, 20–30 cm. long, rays spikelike, appressed, 1–4 cm. long. Spikelets short-pedicelled, broadly wedge-shaped or oval, about 3 mm. long, 3–4-flowered; the two lower empty glumes equal, awl-shaped, 1.6 mm. long; first floral glume obtuse, ovate-lanceolate when spread, 2 mm. long, keels smooth, not winged, about 7-nerved; palea sub-falcate, 2 mm. long. Stamen 1.

Maryland, *Garber*; District of Columbia, *McCarthy*; (Georgia, *Small*).

Sandy, damp soil, near the coast, Long Island to Florida.

4. ***U. longifolia*** Scribn. Bull. Bot. Club. 21: 229 (1894).

More robust than *U. laxa*. Sheaths two-thirds the length of the internodes or longer; ligule a dense ring of soft hairs; blades of the culm 30–45 cm. long, 6–10 mm. wide. Panicle 25–60 cm. long. Spikelets broadly oval or cuneate, 7–8 mm. long, 3–4-flowered; first and second empty glumes subequal, nearly 2 mm. long, first floral glume ovate, truncate when spread, 3.5–5 mm. long, 9–11-nerved, upper floral glume longer. Some of Mr. Small's plants seem to connect this with *U. laxa*.

Georgia (Little Stone Mountain), *J. K. Small* July 1895; Florida, *Curtiss*, 3521; Mississippi, *Tracy*.

5. ***U. sessiliflora*** Poir. Encyc. 8: 185 (1804). *U. nitida* Baldw. Ell. Bot. S. C. & Ga. 1: 167 (1816).

Culms slender, 30–90 cm. or more high from scaly rootstocks. Leaves 6–10, ligule a fringe of hairs; blades flat, smooth, 15–20 cm. long, 3–4 mm. wide. Panicles spikelike, simple, 2–8 mm. long. Spikelets sessile, wedge-shaped, 6–8-flowered, 12–16 mm. long; empty glumes awl-shaped or lanceolate, first 2 mm. long, second about 3 mm. long; floral glume 6–8 mm. long, acute, ovate-lanceolate when spread, keels scabrous, about 13-nerved; palea falcate as long as its glume. Stamen 1.

South Carolina, *Ravenal*; northern Alabama, *U. S. Dept. Agricult.* 619; Florida, *Curtiss* 3521; Mississippi (Ocean Springs), *Tracy*.

Swamps of South Carolina to Texas.

120. (247). ***DISTICHLIS*** Rafin. Journ. Phys. 89: 104 (1819).

Brizopyrum Presl, Rel. Hænk. 1: 280 (1830), not Link. *Dischlis* Phil. Sert. Mend. Alt. 51 (1871).

Spikelets several-flowered, diœcious, shortly pedicellate in a narrow panicle, often reduced to 2 or 3 spikelets, rachilla glabrous, articulate between the fertile florets only; outer empty glumes narrow, keeled, acute: floral glume firm, broader, keeled, obscurely many-nerved, all acute, unawned; palea folded, the keels very prominent or narrowly winged. Stamens in the male flowers 3, ovary rudimentary or 0; staminodia in the female flowers very rare. Ovary pedicellate, glabrous, tapering into 2 rather long styles with exserted stigmas. Grain obovoid or elliptical, free, with a thick spongy pericarp. Rigid grasses, having creeping rootstocks. *Brizopyrum* Presl has been used as a generic name for those with perfect flowers. The genus consists of a single species, usually maritime, which is very variable and has been often separated into 4 or 5 species. It has a wide range in North America, both along the sea-coast and on saline or alkaline lands; also found in Australia.

1. *D. spicata* (L.) Greene, Bull. Calif. Acad. 2: 415 (1887). *Uniola spicata* L. Sp. Pl. 71 (1753). *D. maritima* Rafin. Journ. Phys. 89: 104 (1819). *Brizopyrum spicatum* Hook. & Arn. Bot. Beech. Voy. 403 (1840). *B. Americanum* Link, Hort. Berol. 1: 160 (1827).

Culms rigid, much-branched, leafy, 15-60 cm. high, from wiry rootstock. Leaves 8-15, sheaths longer than the internodes; blades 5-10 cm. long, narrow, rigid, very acute or pungent-pointed, usually distichously spreading. Panicles slender to ovoid, 3-8 cm. long. Pistillate spikelets 8-16 mm. long, flat, but rather thick, 4-13-flowered; staminate spikelets 8-18 mm. long, on slender pedicels, 6-18-flowered; empty glumes straw-colored, first 2-3 mm., second 4 mm. long; floral glume of sterile spikelets 3-5 mm. long, of fertile spikelets 5-6 mm. long.

New Jersey, *Brinton* for U. S. Dept. Agricul. 621; Delaware, *Canby*; Connecticut, *Hitchcock*; North Carolina, *McCarthy*; Florida, *Simpson*; Texas, *Nealley*; Mexico, *Palmer* 43; Minnesota, *Holzinger* 38; Montana, *Anderson* 56; Oregon, *Cusick* 1319, *Howell*; Southern California, *Parish* 852, *Palmer*.

The grass is not liked by cattle.

Var. *laxa* Vasey ined. More slender, sheaths often shorter than



FIG. 106.—*Distichlis spicata*. A, spikelet; b, floral glume; c, palea.
(After Trinius.)

the internodes, blades flat, 10–15 cm. long, 2 mm. wide, panicle racemose.

Utah (Lake Park), *S. M. Tracy* in 1887.

121. (253). **BRIZA** L. Sp. Pl. 70 (1753). QUAKING-GRASS. *Calotheca* et *Chascolytrum* Desv. Nov. Bull. Soc. Philom. 2:190 (1810). *Poa* Adans. Fam. 2:34 (1763). *Tremularia* Heist. Syst. 12 (1748). For additional synonyms see names of sections.

Spikelets several-flowered, ovate or cordate, flattish-tumid on filiform pedicels, in a simple or compound panicle, rachilla glabrous, articulate between the flowers. Empty glumes membranous or scarious, unequal, very concave, unawned, 3–5–11-nerved; florets imbricate, floral glume very broad, concave or inflated, obtuse, acute or shortly awned, 5- to many-nerved; palea much smaller, but very broad and flat with 2 ciliate keels. Stamens 3. Stigmas branched, plumose. Grain obcompressed, broadly ovoid, slightly adhering to glume and palea or free from them.

Annual or perennial grasses, the narrow blades flat or sometimes involute-setaceous. Panicles usually spreading with capillary drooping branches, sometimes narrow, strict or spikelike.

There are 10-12 species, widely spread over the temperate regions of the Northern and Southern Hemispheres. All are characterized by the very concave, sometimes almost vesicular glumes, the grain much flattened from back to front.

They may be placed in three sections:

- A. *Eubrizia*. Spikelets broad in loose panicles with capillary pedicels, floral glume obtuse, awnless. (a)
- a. Spikelets deltoid, empty glumes longer than the first floral glume, 3-4 mm. long. 1
- a. Spikelets half oval, 6 mm. long, empty glumes shorter than the first glume. 2
- a. Spikelets ovate, 10-17 mm. long. 3
- B. *Chascolytrum* Desv. Spikelets awnless, panicle rather compact, spikelets almost sessile. Panicle rather dense, erect. 4
- C. *Calotheca* Desv. Panicle loose and spreading, glumes broadly scarious, awned; floral glumes with projecting lateral angles.

1. B. MINOR L. Sp. Pl. 70 (1753). SMALLER QUAKING-GRASS.

B. aspera Knapp. Gram. Brit. t. 61 (1804). *B. viridis* Pall. Steud. Nom. Ed. 2. 1: 226 (1841).

An erect graceful annual, 15-40 cm. high, ligule 3-6 mm. long; blades 5-8 cm. long, 2-4 mm. wide. Panicle erect, open, broadly oval, 3-8 cm. long, rays in twos or single, branching. Spikelets deltoid, 4-6-flowered, 3-4 mm. long; empty glumes subequal, 5-nerved, longer than the first floral glume.

Virginia, *U. S. Dept. Agricul.* 624 from J. W. Chickering, Jr.; Oregon (Grant's Pass), *Howell*.

Found in Europe and northern Africa, and sparingly naturalized in North America.

2. B. MEDIA L. Sp. Pl. 70 (1753). MEDIUM QUAKING-GRASS.

B. elatior Sibth. & Sm. Fl. Graec. 1: t. 75 (1806). *B. lutescens* [Foucault, in] Desv. Journ. 3: t. 24, f. 2 (1814). *B. Clusii* Schult. R.

& S. Mant. 2: 294 (1824). *B. virens* Trin. Mem. Acad. St. Petersb. (VI.) 1: 362 (1831). *B. serotina* Dum. Obs. Gram. Belg. 110 (1878). *B. tremula* Lam. Fl. Fr. 3: 587.

Perennial; 20-60 cm. high. Ligule 1-2 mm. long; blades thin, scabrous, flat, 5-10 cm. long, 2-3 mm. wide, rather abruptly pungent-pointed. Panicle ovoid or pyramidal, open, rays capillary. Spikelets 6 mm. long, 5-9-flowered, green or purplish, half oval; empty glumes shorter than the first floral one.

Vermont, *Pringle*.

Sparingly introduced from Europe.

3. *B. MAXIMA* L. Sp. Pl. 70 (1753). LARGE QUAKING-GRASS. *B. monspessulana* Gouan, Hort. Monsp. 45 (1768). *B. rubens* Poir. Suppl. 1: 699. *B. rubra* Lam. Ill. 1: 187 (1791). *B. grandis* Salisb. Prod. 21 (1796). *B. capensis* Schrank, Hort. Monac. t. 43 (1818). *B. major* Presl, Cyp. et Gram. Sic. 42 (1826).

Annual; 40-60 cm. high. Ligule 3-5 mm. long; blades flat. Panicle simple, ovoid, 5-10 cm. long, rays single or in twos, capillary, each bearing 1-3 spikelets. Spikelets nodding, ovate, 10-17 mm. long, 8-10-flowered; empty glumes 7-9 mm. long, 11-nerved; floral glume sparingly puberulent on the back, 8 mm. long, concave-spherical, 11-nerved; palea oval, 4 mm. long.

Massachusetts, *Beal* 105; Michigan, *Clark* 2327; Colorado, *Cassidy*.

Found in Europe; cultivated for ornament.

4. *B. rotundata* (H. B. K.) Steud. Syn. Pl. Gram. 284 (1855). *Bromus rotundatus* H. B. K. Nov. Gen. et Sp. 1: 152 (1815). *Briza Lamarkiana* Cham. & Schlecht. Linnæa 6: 39 (1831).

A tufted erect perennial, 60-90 cm. high. Leaves scabrous, ligule 1-2 mm. long; blades 15-30 cm. long, 2-3 mm. wide. Panicle simple, 8-10 cm. long, rays mostly in twos and threes, erect. Spikelets ovoid, slightly compressed, 6-8-flowered, 4-15 mm. long; empty glumes green, first 3-nerved, second 5-nerved, about 2.5 mm. long; floral glume 3 mm. long, firm, circular, tumid on the back, apex contracted, subacute; palea flat, broadly oval, subacute, 1.7 mm. long.

Mexico, *Parry & Palmer* 935, *Schaffner* 1035, *Pringle* 2051, 3243.

There is some doubt about the correct identification of this grass.

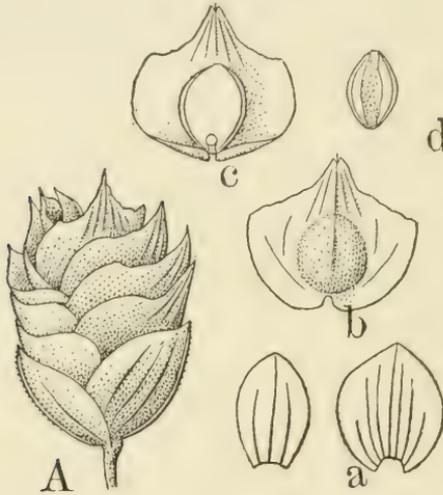


FIG. 107.—*Briza rotundata*. Spikelet dissected. (Scribner.)

122. (251). **DEMAZERIA** Dum. *Comm. Bot.* 26 (1822). *Desmazeria* Dum. *Obs. Gram. Belg.* 46 (1823). *Brizopyrum* Link, *Hort. Berol.* 1: 159 (1827).

Spikelets many-flowered, compressed, sessile or some of the lower pedicellate, rachilla articulate between the flowers. Glumes keeled, coriaceous, obtuse or mucronate-acute, awnless, the empty ones persistent, 3-5-7-nerved, shorter than the floral glumes; floral glumes 7-nerved; palea rigid, about the length of its glume, 2-keeled near the margins. Stamens 3. Styles short, distinct, stigmas feathery. Grain oblong, slightly obcompressed, concave in front, enclosed, but not adherent to glume and palea.

Annuals or perennials with narrow involute leaf-blades. Spikelets conspicuously distichous on two sides of a 3-sided rachis.

There are about four species known, one of them in the vicinity of the Mediterranean, the others in South Africa. Nearly allied to *Distichlis*.

1. *D. SICULA* Dum. l. c.

A smooth erect annual, 20-30 cm. high. Leaves 3-4 in number, ligule 1.5-2 mm. long; blades thin, 5-8 cm. long, 1.5-2 mm. long. Panicle spikelike, 4-6 cm. long. Spikelets ovate to linear, 8-20-flowered, 10-15 mm. long; empty glumes ovate, first 3-5-nerved, second 4-7-nerved; floral glume 4-5 mm. long.

Colorado, *Cassidy* in 1885.

Not unfrequently cultivated for ornament.



123. (249). **DACTYLIS** L. Sp. Pl. 71 (1753). *Amacitis* Adans. Fam. 2:34 (1763). FIG. 108. — *Demazeria sicula*. A, spikelet; a, floret. (Richardson.)

Spikelets several-flowered, much flattened, sessile and densely crowded in thick one-sided clusters, arranged in a short irregular spike or at the ends of the short branches of a dense irregular one-sided panicle, rachilla glabrous, inarticulate or tardily articulate between the florets. Empty glumes firm, thin, keeled, mucronate, unequal, 3-nerved; floral glume larger, scabrous, cartilaginous, 3-5-nerved, the ciliolate keel produced into a point or short awn; palea little shorter than its glume, 2-keeled. Stamens 3. Grain obcompressed, concave or broadly furrowed, included by glume and palea, but not adhering.

A perennial tufted grass with flat-keeled or conduplicate leaf-blades.

There is only a single species, sometimes separated into two or more. Common in Europe, temperate Asia, and northern Africa, and now naturalized in many parts of Australia and North America.

1. *D. GLOMERATA* L. l. c. ORCHARD-GRASS. COCK'S-FOOT. *D. altaica* Bess. Schult. Mant. 2:626 (1824). *D. abbreviata* Bernh. Link, Hort. Berol. 1:153 (1827). *D. capitata* Schult. Mant. l. c. *D. ciliata* Opiz, Nym. Consp. 819. *D. glaucescens* Willd. Enum. Hort. Berol. 111. *D. hispanica* Roth, Catalecta, 1:8. *D. Ortmanniana* Opiz, Seznam, 36. *D. pendula* Dum. Obs. Gram. Belg. 146. *D. villosa* Tenore, Prod. Fl. Nap. p. 9.

A coarse stiff grass, 40–90 cm. high. Sheaths of sterile shoots compressed, those above keeled; ligule 3–5 mm. long; blades scabrous, 20–60 cm. or more long. Clusters of spikelets often pinkish, ovoid, forming a panicle, 5–15 cm. or more long; floral glume lanceolate, 4–6 mm. long; palea bifid, nerves ciliate.

Vermont, *Pringle*; New York, *Clinton* for Dr. Clark 1296; Michigan, *Beal* 106, 107, *Clark* 1999.

A grass which has been long and favorably known in cultivation in Europe and some other countries; now exhibiting a remarkable number of forms, varieties, and races. See Vol. 1, Fig. 63, for a more extended account.

124. (222). **CYNOSURUS** L. Sp. Pl. 72 (1753). *Falcona* Adans. Fam. 2:496 (1763). *Phalona* Dum. Agrost. Belg. 86, 114 (1823).

Spikelets dimorphous, clustered on a unilateral spikelike panicle, the outer spikelet of each cluster consisting of several glumes, all empty; the other spikelets containing 2–5 flowers; empty glumes linear or sublanceolate; floral glume broader, membranous, 1–3-nerved (rarely 5-nerved), mucronate or sometimes awned; palea with two ciliate nerves. Stamens 3. Grain adherent to the floral glume and palea.

There are 3 or 4 species with a wide range over the temperate regions of the Old World, and one is now naturalized in several other countries. It is remarkable for having the lower spikelets barren, and the spikes are elegantly pinnate with empty glumes.

1. **C. CRISTATUS** L. l. c. CRESTED DOG'S-TAIL. *C. neglectus* Opiz, Natural. 9:151 (1825). *C. polybracteatus* Poir. Voy. Barb. 2:97.

A rather slender slightly tufted erect perennial, 30–60 cm. high. Sheaths smooth, shorter than the internodes, the upper ones slightly inflated, often reaching only to the middle of the plant; ligule oblique, about 1.5 mm. long, blades of culm flat, 2–10 cm. long, 1.5–3 mm. wide. Spike semi-cylindrical, oblong or linear, 3–10 cm. long, the clusters of spikelets all regularly turned to one side, the empty spikelets forming involucre to each cluster.

Massachusetts, *Faxon*; Michigan, *Beal* 108.

Common in Europe: introduced into lawns and some old northern pastures. See Vol. 1, p. 194, Fig. 87.

125. (221). **LAMARKIA** Mœnch, Meth. 201 (1794). *Chrysurus* Pers. Syn. 1: 80 (1805). *Pterium* Desf. Journ. Bot. 1: 75 (1813). *Tinea* Garzia, Rel. Accad. Zel. Aci Reale, Ann. 3-4, 24; ex Parl. Fl. Polerm. 1: 138 (1845).

Fertile spikelets 1-flowered, intermixed with sterile ones in little clusters on the very short branches of a 1-sided spikelike panicle, rachilla glabrous, inarticulate and often produced above the flower, bearing a narrow awnlike glume and sometimes a second rudimentary one above it. Empty glumes narrow, awnless, slightly unequal, floral glume broader, bearing a small dorsal awn. Sterile spikelets longer, with several truncate awnless empty glumes above the two outer acute ones; palea of the perfect flowers narrow, 2-keeled. Stamens 3. Styles short, distinct. Grain slightly compressed, included by the floral glume and palea, but free from them. A low grass with many branches and flat leaf-blades. There is only one species known, a native of the Mediterranean. Introduced into many parts of the world, including Australia and the United States. Nearly allied to *Cynosurus*.

1. **L. AUREA** (L.) Mœnch, l. c. *Hookeriana* Griff. Itin. Not. 349. *Cynosurus aureus* L. Sp. 107 (1753). *Chrysurus aureus* Beauv. Agrost. 123 (1812).

An elegant tufted annual, 10-18 cm. high. Leaf-blades thin, 5-8 mm. wide; ligule 1-8 mm. long, panicle linear or oval, 5-8 cm. long. Empty glumes of the fertile spikelets very narrow, keeled with five points, 4-4.5 mm. long, floral glume inserted 1 mm. above, oval, 3 mm. long, bearing a dorsal awn a little below the apex, 6-9 mm. long.

California, Jones 3214, Pringle in 1882, Mrs. Jones for U. S. Dept. Agricul. 562.

Introduced into California.

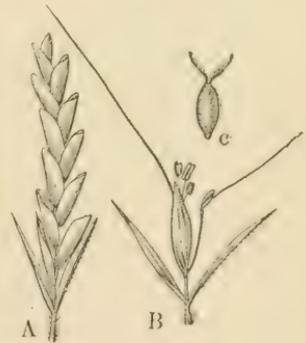


FIG. 109.—*Lamarkia aurea*. A, B, spikelets; c, ovary. (Richardson.)

126. (256). **Poa** L. Sp. Pl. 67 (1753). *Poidium* Nees, Lindl. *Introd. Nat. Syst.* Ed. 2, 450 (1836). *Allagostachyum* Nees, *Stead. Nom.* Ed. 2, 1:50 (1840). *Plotia* Schreb. *Stead. Nom.* Ed. 2, 2:356 (1841).

Spikelets of medium size, compressed-keeled, 2-6- (rarely 7-10-) flowered, pedicellate in a panicle usually loose and spreading, rarely narrow and spikelike, rachilla articulate between the floral glumes, glabrous or rarely pilulose, flowers perfect or some of the upper ones imperfect. Empty glumes membranous, keeled, acute or obtuse, unawned, persistent, 1-3-nerved, commonly shorter than the floral glumes; floral glume membranous or herbaceous with a delicate scarious margin, usually obtuse and surrounded by a few loose woolly hairs, 5, rarely 7, nerved, the nerves usually bending toward each other near the apex; palea nearly as long as its glume, prominently 2-nerved or 2-keeled. Stamens 2-3. Styles short, or very short, distinct, stigmas plumose. Grain ovoid, oblong, or almost linear, compressed, and rarely with a broad groove, glabrous, included by glume and palea, free or adhering more or less to the palea when mature.

There are about 80 species, though some authors have extended the number to 200. The genus is the most widely diffused over the globe of any in the family, chiefly in temperate and cool regions, reaching the Arctic circle and Alpine summits; very few in the tropics. The genus is a very natural one, well distinguished from *Eragrostis*, *Panicularia* (*Glyceria*), and *Festuca* by the nerves usually connivant in the apex of the floral glumes. By many authors *Poa* is made to include *Atropis*.

The species differ from *Eragrostis* in their 5-nerved floral glumes, from *Panicularia* and *Festuca* in their glumes keeled from the base; but there are species apparently intermediate between these large genera. *Poa* has also been distinguished from *Festuca* by the obtuse, always unawned glumes, and the non-adherence of the grain to the palea. Several species of *Poa*, however, have acute glumes, and in one species they bear fine points. There are some Chilian and Australian species and some Asiatic ones where the grain is adherent to the palea, as in *Festuca*; even in *Poa pratensis*

the floral glume often adheres more or less, whilst there are several true *Festucas* where it is quite free.

Most of the species widely dispersed are very variable and difficult to define. Bentham proposes no sections for the genus, but refers to some proposed by C. Koch:

1. *Pseudopoa*, spikelets very small and with nearly the habit of *Nephelochloa*.

2. *Leucopoa* Griseb., spikelets rather larger than usual, and with glumes somewhat scarious and shining.

3. *Dioicopoa* Desv., spikelets usually, possibly not always, dioecious. As will be seen, I have made a purely artificial key for our species of *Poa*.

- | | | |
|----|--|------|
| A. | First empty glume 1-nerved, annuals. | (a) |
| a. | Ligule 2-3 mm. long, spikelets 3-7-flowered, floral glume 2-3 mm. long. | 1 |
| a. | Ligule 2 mm. long, spikelets 2-4-flowered, floral glume 3 mm. long. | 2 |
| B. | First empty glume 1-nerved, perennials. | (a') |
| a' | Upper ligule 5-6 mm. long, rays in sets of 5-6, floral glume 2.5-3 mm. long. | 3 |
| a' | Upper ligule 5 mm. long, rays 3-4, floral glume 5.5-6.5 mm. long. | 4 |
| a' | Upper ligule 4 mm. or less in length. | (b) |
| b. | Floral glume 6 mm. long; both empty glumes 1-nerved. | 5 |
| b. | Floral glume 4.2-5 mm. long, ligule 2-3 mm. long | 6 |
| b. | Floral glume less than 5 mm. long, except some of no. 16. | (c) |
| c. | Ligule 0.7 mm. long, rays in twos, floral glume 2.7-3.2 mm. long. | 7 |
| c. | Ligule 1 mm. long, rays 2-4, floral glume 4 mm. long, upper leaf 1.5 cm. long. | 8 |
| c. | Ligule 1 mm. long, rays 3-5, floral glume 3.5-4 mm. long. | 9 |
| c. | Ligule 1-2 mm. long, floral glume 3-4.5 mm. long. | 10 |

- c. Ligule 1-1.5 mm. long, rays 4-7. (d)
- d. Floral glume 3.5-4 mm. long. 11
- d. Floral glume 2.5-3 mm. long. 12
- c. Ligule 1-2 mm. long, rays 2-3, floral glume
 2.5 mm. long. 13
- c. Ligule 1.5 mm. long, rays 3-4, floral glume
 3.5-4.5 mm. long. 14
- c. Ligule 2 mm. long, floral glume 3-3.5 mm. long 15
- c. Ligule 2-3 mm. long, rays 2-3, floral glume 4-5
 mm. long. 16
- c. Ligule 2.5-3 mm. long, floral glume 4.2-4.7
 mm. long. 17
- c. Ligule 2.5-4 mm. long, rays 2, floral glume
 2.4-4 mm. long. 18
- c. Ligule 2-3 mm. long, rays 2, floral glume 3.5-
 4.5 mm. long. 19
- c. Ligule 3-4 mm. long, rays 2, floral glume 3.5-4
 mm. long. 20
- c. Ligule 4 mm. long, rays 3-7, floral glume 2.4-
 2.7 mm. long. 21
- c. Empty glumes 1-3-nerved, leaves very abruptly
 pointed. (e)
- e. Ligule 2-3 mm. long, rays 2, spikelets
 broadly oval, floral glume 3.5-5 mm. long,
 no rootstocks. 22
- e. Ligule 1.5 mm. long, rays 3-6, spikelets
 oval or ovate-lanceolate, 3-6-flowered, floral
 glume 3-4 mm. long; creeping rootstocks. 23
- C. First empty glume 1-3-nerved. (a)
- a. No running rootstocks, ligule 1-2 mm. long, rays 2. . 1, 22
- a. No running rootstocks, ligule 2-3 mm. long, some-
 times number 6
- a. Running rootstocks, ligule 1.5 mm. long, rays 3-6. . 23
- D. First empty glume 3-nerved (or sometimes 1-nerved in
 numbers 1, 6, 22, and 23).
- s. Annual (?) dwarf. (a)

- a. Floral glume 2 mm. long 1, 24
- a. Floral glume, 2.5 mm. long. 25
- a. Floral glume 3-3.5 mm. long. 26
- s. Perennial. (c)
- c. With creeping rootstocks. (d)
- d. Culms much compressed, firm. 27
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- i. Blades 2 mm. wide. 32
- i. Blades 8-12 mm. wide. 33
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1. *P. ANNUA* L. Sp. Pl. 68 (1753). LOW SPEAR-GRASS. ANNUAL POA. *P. supina* Schrad. Fl. Germ. 1: 289 (1806). *P. triangularis* Gilib. Exercit. 2: 531. *P. duriuscula* Willd. Spring. Syst. 1: 339 (1824). *P. humilis* Lej. Fl. Spa. 1: 49. *P. ovalis* Tineo, Pl. Rar. Sicil. 21 (1846).

A soft smooth bright, light-green annual, sometimes glaucous; culms weak, compressed, 5-30 cm. high. Ligule 2-3 mm. long; blades of the sterile shoots half or two-thirds as long as the culm, often with wavy margins, those of the culm 3, flat or conduplicate, abruptly acute, the upper 1-4 cm. long, about 2 mm. wide. Panicle sometimes purplish, ovoid or pyramidal, subsecund, 2-5 cm. long, rays mostly in pairs, the longest 2.5 cm. long, sometimes drooping, bearing spikelets on the upper half. Spikelets very short-pedicelled, 4-6 mm. long, 3-7-flowered, oval or ovate-lanceolate, joint of rachilla 0.7 mm. long; empty glumes compressed, first 1-3-nerved, second 3-nerved, broadest at or above the middle, usually 2.5 mm. long; floral glume ovate-oval, smooth, arose at apex, 2.8-3.1 mm. long, with soft hairs on the keel for half or two-thirds of its length and on the lower part of the lateral nerves, the 4 lateral nerves parallel or divergent, evanescent one-third of the way from the apex; palea 2.5-2.8 mm. long, ciliate or pubescent on the keels.

Cultivated and waste grounds, almost everywhere.

In central Michigan three or more crops may be grown from the seed in one season. In shady places, where carefully watered, it produces a very nice lawn, especially noticeable owing to the pleasant light-green foliage.

Vermont, *Pringle*; Pennsylvania, *Scribner* for U. S. Dept.

Agricul. 632; Michigan, *Farwell, Beal* 120, *Cooley*; Utah, *Jones* 1639; Arizona, *Tracy*; Oregon, *Howell*; California, *Sones*.

Introduced from Europe.

2. *P. infirma* H. & K. Nov. Gen. et Sp. 1:158 (1815). *P. annua* Cham. & Schlecht. Linnaea, 6: 38 (1831).

A soft slender diffuse annual, 10–20 cm. high. Sheaths compressed, loose; ligule 2 mm. long; blades smooth, 3–8 cm. long, obtuse or abruptly pointed, 1.5–2 mm. wide. Panicles mostly exserted, ovoid or pyramidal, 2–4 cm. long, rays mostly in pairs bearing 2–5 spikelets on the outer half. Spikelets sessile or on short pedicels, oblong, 2–4-flowered, 3–4 mm. long, empty glumes obtuse or acute, tips and margins scarious, first 1-nerved, second longer than the first, elliptical when spread, 3-nerved, 2–2.2 mm. long; floral glume broadly oval, about 3 mm. long, obtuse, margins and upper fourth scarious, ciliate on the keels and margins up to the middle; palea nearly as long, linear, ciliate nearly the whole length of the keels.

Mexico (Jalisco), *Palmer* 483; Guatemala, *J. D. Smith* 907.

3. *P. TRIVIALIS* L. Sp. Pl. 67 (1753). ROUGH MEADOW-GRASS. *P. angustifolia* Ucria, Hort. Reg. Panorm. 53 (1789). *P. dubia* Leers, Fl. Herborn. 28 (1775). *P. Hohenackeri* Trin. Bull. Sc. Acad. St. Petersb. 1: 69 (1836). *P. palustris* O. F. Muell. Fl. Dan. t. 750 (1761). *P. pratensis* Pollich, Hist. Pl. Palat. 1: 87. *P. Pseudo-hybrida* Schur. Enum. Pl. Transs. 769 (1866). *P. scabra* Ehrh. Beitr. 6: 83 (1787). *P. setacea* Huds. Fl. Angl. Ed. 1, 34 (1762).

Culms 40–60 cm. high, rough or nearly smooth, erect from a slightly decumbent base, with no running rootstocks. Sheaths rough; upper ligule 5–6 mm. long, the others shorter; blades of sterile shoots short or as long as the culm, those of the culm 3, flat or conduplicate, abruptly pointed, the upper 5–10 cm. long, about 3 mm. wide. Panicle linear, oblong or more open, 10–15 cm. long, rays in half-whorls of 5–6, sets of rays 3–4 cm. distant, the longest 5–6 cm. long, flower-bearing along the upper half. Spikelets oval or linear-oblong, 2–4-flowered, 3–4.5 mm. long, joint of rachilla about 0.5 mm. long; first empty glume lanceolate, 1-nerved, 2–2.5

mm. long, second linear-lanceolate or oval-lanceolate, 3-nerved 2.5–3 mm. long; floral glume 2.5–3 mm. long, sparingly webbed at the base, the lower half of the keel thinly pubescent or nearly smooth, nerves conspicuous, the lateral ones usually smooth, oval, acute; palea a little shorter, keels nearly smooth. Anthers 1.5 mm. long. Nearly allied to *P. pratensis*. Bentham in his Handbook of the British Flora says: “There are no creeping scions; the stems are usually taller and more slender than those of *P. pratensis*; the ligule of the leaf longer; the panicle more slender, with slender spreading branches; the spikelets have seldom more than 3 flowers, and usually only 2; the lateral nerves of the flowering glumes are much more conspicuous.”

Massachusetts, *Horsford*, *Beal* 121; Pennsylvania, *Scribner* for U. S. 673; Michigan, *Clark* 2088.

Prominent in pastures of Europe and sparingly cultivated in the older northern States.

Var. *filiculmis* Scribn. ined.

Culms more slender; ligule shorter; panicle 4–7 cm. long. Perhaps only a slender plant of the species.

Vancouver Island, *Macoun* 282 in 1893.

4. *P. Vaseyana* Scribn. ined.

An erect robust perennial, 60–70 cm. high. Leaves 3–4, scabrid throughout; sheaths about the length of the internodes; upper ligule broad, abruptly pointed, 5 mm. long, the lower shorter; blades flat or conduplicate, those of sterile shoots 20–30 cm. long, 4–5 mm. broad, the tips acute, rather firm, those of the culm 7–10 mm. long. Panicle ovoid, 12–15 cm. long, rays in threes and fours, 2.5–3 cm. distant, the longest 6–8 cm. long, bearing 5–10 spikelets on the outer half or three-fifths. Spikelets tinged with purple, linear to broadly oval, 4–6-flowered, about 10 mm. long; empty glumes ovate, acute, first one-nerved, 4–5 mm. long, second three-nerved, 4–5.5 mm. long; floral glume 5.5–6.5 mm. long, the keel and lateral nerves hairy on the lower third, ovate when spread, the apex usually obtuse; palea incurved, 4–5 mm. long, linear before spreading, ciliate on the keels, two-toothed.

Colorado, *Patterson* in 1885 in herb. U. S. Dept. Agricul.

5. *P. subaristata* Scribn. Macoun Cat. Can. Pl. 4: 227 (1888).

No description.

A slender densely tufted perennial, 20-40 cm. high. Blades of sterile shoots conduplicate, scabrid, 5-10 cm. long, 0.5-1 mm. diam., sheaths of culm 2, smooth, the upper extending to near the middle of the whole height; ligule 1 mm. long; upper blade pungent, 0.5-2 cm. long. Panicle linear to oval, dense, somewhat interrupted, 3-6 cm. long, more or less tinged with purple. Spikelets linear-lanceolate, 4-7-flowered, 6-9 mm. long; empty glumes subequal, linear-lanceolate, 5 mm. long, one-nerved; floral glume 6 mm. long, scabrid on the nerves, not webbed, linear-lanceolate; palea narrowly linear before spreading, 5 mm. long, ciliolate on the keels.

Yellowstone Park, *F. Tweedy* 633.

6. *P. Cusickii* Vasey, Contrib. U. S. Nat. Herb. 1: 271 (1893).

A glabrous tufted perennial, 30-40 cm. high. Sterile shoots numerous, blades conduplicate or involute-filiform, 10-15 cm. long, 0.3 mm. diam.; leaves of the culm 2, the lower sheaths longer than their internodes; ligule decurrent, 2-3 mm. long, blades flat or involute, acute, 3.5-5 cm. long, 1.5 mm. wide. Panicle more or less exserted, narrow, 6-10 cm. long, rays mostly in twos, the longest 3-4.5 cm. long, bearing 4-8 spikelets on the outer half. Spikelets narrowly to broadly oval, 6.7 mm. long, 2-3-flowered, rachilla hispidulous, empty glumes with broad chartaceo-hyaline margins, first ovate-lanceolate when spread, 3.5 mm. long, 1-nerved, rarely 3-nerved; second oval, erosely acute, 4-4.5 mm. long, 3-nerved; floral glume keeled, 4.2-5 mm. long, scabrous, oval when spread, subacute; palea 4.4 mm. long, 2-toothed, ciliate on the keels.

Oregon, *Cusick* for U. S. Dept. Agricul. 1219.

7. *P. autumnalis* Muhl.; Ell. Bot. S. C. & Ga. 1: 159 (1817).

P. flexuosa Muhl. Gram. 148 (1817), not J. E. Smith. *P. pungens* Torr. Fl. U. S. 1: 109 (1824), not Nutt. (1818). *P. Campyle* Schult. Mant. 2: 304 (1824). *P. Elliottii* Spreng. Syst. 1: 338 (1824).

A soft slender smooth tufted perennial, 30-80 cm. high;

culms flattish, sheaths usually much shorter than the internodes; ligule obtuse, lacerate, 0.7 mm. long; leaves of sterile shoots flat, scabrous or smooth, 10–12 cm. long, 1.5–2 mm. wide, very gradually taper-pointed, those of the culm 3–4 in number, 4–7 cm. long, flat or conduplicate. Panicle very diffuse, pyramidal, 7–10 cm. long, rays capillary, flexuose, mostly in pairs or threes, the longest 5–6 cm. long, bearing 2–4 pedicelled spikelets near the apex. Spikelets pale green, rarely tinged with purple, open, oval, 3–6-flowered, 4–7 mm. long, joint of rachilla 0.8–0.9 mm. long; first empty glume lanceolate, 1-nerved, 1.7–2.3 mm. long, second linear-lanceolate, scabrid on the keel, 3-nerved; 2.5–3.5 mm. long, floral glume 2.7–3.2 mm. long, thin, a few webby hairs at the base, pubescent on the marginal nerves and lower half of the keel, oval, obtuse or emarginate, the lateral nerves within 0.6 mm. of the conspicuously scarios apex; palea 2–3 mm. long, linear, 2-toothed, scabrid on the keels.

Michigan, *Scribner* 3489 from Wheeler; District of Columbia, *Vasey* 641; Tennessee, *Curtiss* 3849 from Gattinger; Mississippi, *Tracy*.

Dry or wet woods or swamps, Pennsylvania, Michigan to Texas.

Var. **robusta** Vasey, *Contrib. U. S. Nat. Herb.* 1:271 (1893).

Culms 75–90 cm. high, sheaths shorter than the internodes; ligule 2–4 mm. long; blades 4–6 mm. wide; panicle 17–25 cm. long. It differs from the species in having webby hairs at the base of the florets and in the erect panicle.

Colorado, *Vasey* 367, alt. 8000–9000 feet, *Jones*.

Not seen by me.

S. ***P. brevifolia*** Muhl. *Gram.* 138 (1817). *P. pungens* Nutt. *Gen.* 1:66 (1818). *P. cuspidata* Nutt. *Barton, Comp. Fl. Phila.* 1:61 (1818). *P. brachyphylla* Schult. *Mant.* 2:304 (1824).

Culms smooth flattish, 20–50 cm. high, from creeping root-stocks. Leaves of sterile shoots rather numerous, the blades mostly flat, 20–30 cm. long, 2–3 mm. wide, apex acute, leaves of the culm 3 in number, sheaths scabrous; ligule obtuse, 1 mm. long; blades 1–5 cm. long. Panicle open, thin, oval or pyramidal, 6–10 cm. long, rays in twos, threes, or fours, slender, spreading, the lower often

drooping, the longest 4-7 cm. long, bearing a few spikelets on the outer third or quarter. Spikelets 5-6 mm. long, 3-5-flowered, linear or oval, pale green, often tinged with purple, joint of rachilla about 1 mm. long; empty glumes acute, first lanceolate, 1-nerved, 3.2 mm. long, second oval-lanceolate, 3-nerved, 3.7-4.2 mm. long; floral glume 4 mm. long, thin, oval, erose-obtuse, the upper third scarious, pubescent on the marginal nerves and on the lower three-fifths of the keel; palea linear, about 3 mm. long, scabrid on the keels.

Delaware, *Canby*; Pennsylvania (Phila.) *Scribner* 1; Tennessee (Knoxville), *Scribner*.

Rocky or hilly woodlands, Pennsylvania to Virginia and sparingly westward.

9. *P. arachnifera* Torr. Marcy, Exp. Red Riv. of La. 301 (1853). *P. densiflora* Buckl. Proc. Acad. Phila. 96 (1863). TEXAS BLUE GRASS.

A light green grass, 30-90 cm. high, with an abundance of creeping rootstocks. Leaves of sterile shoots numerous and long, those of the culm 3 in number, ligule 1 mm. long; blades flat or involute, scabrous or smooth, 10-20 cm. long, 4-6 mm. wide, pungent-pointed. Panicle contracted, linear or oblong, 8-16 cm. long, rays in threes to fives, erect, the longest 4-6 cm. long, bearing bunches of spikelets from near the base to the apex. Spikelets oval, 5-6 mm. long, 4-5-flowered, joint of rachilla 0.6 mm. long, empty glumes acute, scabrid on the keels, first lanceolate, 1-nerved, 2-5 mm. long, second oval-lanceolate, 3-nerved, 3-3.3 mm. long; floral glume 3.5-4 mm. long, thin, copiously webbed at base, more or less pubescent on the lateral nerves and the lower half of the keel, oval, acute, or almost mucronate, the lateral nerves obscure and extending two-thirds of the way to the apex; palea linear, 3.2 mm. long.

Mississippi, *Tracy*; Kansas, *Kellermann*; Texas, *Reverchon* for U. S. Dept. Agricul. 633, *Nealley*.

Texas to New Mexico. See Vol. I. 143, Fig. 69.

Var *glabrata* Vasey, Cat. Grass. U. S. 79 (1885). Floral glumes shorter, glabrous, and destitute of webbed hairs. Found with the species.

10. *P. reflexa* V. & S. Vasey, Cat. Grass. U. S. 83 (1885); Contrib. U. S. Nat. Herb. 1:276 (1893).

A slender perennial, 50-70 cm. high. Leaves of culm 4 in number, ligule 1-2 mm. long; blades 4-8 cm. long, 2.5-3 mm. wide, nearly smooth, flat, abruptly pointed. Panicle open, pyramidal, 4-7 cm. long, rays often reflexed, the longest 5-8 cm. long, bearing 3-4 spikelets near the apex. Spikelets purple, linear, 7-8 mm. long, 2-4-flowered, first glume 2.5-3 mm. long, 1-nerved, second 3.3-4.3 mm. long, 3-nerved, oval, obtuse or acute, lowest joint of rachilla 1.5 mm. long; floral glume slightly pubescent at the base, 3-4.5 mm. long, oval, abruptly pointed; palea almost as long as its glume.

Utah, *Tracy*; Montana, *Scribner* 362 in 1883, *Tweedy* 274, 638; Colorado, *Wolfe* 1144; New Mexico, *Fendler* 929.

Wet meadows.

11. *P. alsodes* A. Gray, Man. Ed. 2:562 (1856). *P. nemoralis* Torr. Fl. U. S. 1:111 (1824), not L.

A soft smooth weak light-green tufted perennial, 30-80 cm. high. Blades of sterile shoots 20-30 cm. long, 2.5-4 mm. wide, flat or conduplicate, acute or abruptly pointed, those of the culm 3 in number, ligule 1-1.5 mm. long, truncate, lacerate; blades 5-10 cm. long. Panicle often partially included by the upper sheath, 20-45 cm. long, slender, open, lanceolate, or loosely linear or oval, rays slender, in fours to sixes, the longest 10-14 mm., bearing scattered spikelets from the middle or above the middle. Spikelets 3.5-5.5 mm. long, 2-3-flowered, oval or linear-oval, joint of rachilla 0.5-0.7 mm. long, first empty glume 2-3 mm. long, ovate-lanceolate, 1-nerved, second ovate-lanceolate, 2.5-3.5 mm. long, 3-nerved; floral glume 3.5-4 mm. long, oval, acute, webbed at base, pubescent or nearly smooth on the lower half of the keel, the tip scariosus for one-fourth its length; palea linear, 2.5-3 mm. long, keels nearly smooth. Plants from Grand Traverse and Alcona counties, Michigan, have the keel of floral glume nearly smooth. Wet woods, New England, Alleghany Mountains to Wisconsin.

Vermont, *Pringle*; Massachusetts, *Faxon* 19; New York, *Clin-*

ton; Michigan, *Scribner* 3488 from Wheeler, *Cooley, Beal* 122, 123. (Flint) *Clark* 1298.

12. *P. sylvestris* A. Gray, *Man. Ed.* 1:596 (1848).

A soft smooth pale-green tufted erect perennial, 60–80 cm. high; culms flattish. Sheaths smooth or scabrid, mostly shorter than the internodes; ligule obtuse, lacerate, 1.5 mm. long; blades of sterile shoots soft, flat, acuminate, 10–15 cm. long, 2–3 mm. wide, those of the culm 4 in number, acute or acuminate, 6–10 cm. long, 3–4 mm. wide. Panicle open, oblong-pyramidal, 10–15 cm. long, rays slender, in fours to sevens in about ten sets, often drooping, the longest 4–6 cm. long, bearing a few branches beyond the middle. Spikelets pedicellate, oblong or wider, 3–4 mm. long, usually 2–3-flowered, joint of rachilla 0.6–0.7 mm. long, first empty glume 1.7–2.3 mm. long, ovate-acute, 1-nerved, second oval-acute, 3-nerved, 2–2.7 mm. long; floral glume oval, obtuse or subacute when spread, 2.5–3 mm. long, keel and marginal nerves villous for nearly their entire length to the narrow scarious apex, sparingly webbed at the base; palea oval, 2-toothed, 2–2.2 mm. long, ciliate on the keels.

Delaware, *Canby*; District of Columbia, *Vasey* for U. S. Dept. Agricul. 669; Michigan, *Beal & Wheeler* 124.

Woods, Delaware, New York to Wisconsin and southward.

13. *P. conglomerata* Rupr. *Bull. Acad. Brux.* 9:Part 2, 235 (1842).

A rather soft and nearly smooth light-green perennial, 30–50 cm. high. Culms weak and compressed; nodes 2–3. Leaves of sterile shoots not numerous; ligule 2 mm. long; blades flat, acute, 5–8 cm. long, 1.5 mm. wide, blades of the culm much the same. Panicle slender, spikelike, 8–15 cm. long, rays mostly in pairs, appressed, the lowest distant 2–3 cm., the longest 2–4 cm. long, bearing short nearly sessile branches for most of its length. Spikelets oval, acute, 3-flowered, 3–4 mm. long, first empty glume lanceolate, 1-nerved, 1.7–2 mm. long, second oval, acute when spread, 3-nerved, 2.3 mm. long; floral glume sparingly webbed on the lower third of the 3 nerves, oval, acute when spread, 2.5 mm. long; lateral nerves evanescent one-third the way below the apex; palea 2 mm. long. Anthers oblong, 5–6 mm. long.

Mexico, *Pringle* 4307.

Under dry cool cliffs.

14. *P. nervosa* (Hook.) Vasey, Ill. N. A. Gr. 2: 81 (1893). *Festuca nervosa* Hook. Fl. Bor. Am. 2, 251, 232 (1840).

Culms rather slender, 45-75 cm. high. Blades of sterile shoots 15-24 cm. high, those of the culm about 3, upper ligule rounded, 1.5 mm. long; blades erect, flat, 3-7 cm. long, 2-4 mm. wide. Panicle thin, pyramidal, 5-12 cm. long, rays spreading or somewhat erect, the lower in twos to fives, the longest 6-8 cm. long, each bearing 3-6 spikelets near the apex. Spikelets 3-8-flowered, flat-tish, 4-5 mm. long, first empty glume 3 mm. long, 1-nerved, second 3-nerved, 3.3-3.6 mm. long; floral glume linear-lanceolate, 5-nerved, 3.5-4.5 mm. long, scabrid on the nerves; palea as long as its glume. Ovary linear, 1.5 mm. long. Stigmas 3 mm. long.

Montana, *Canby & Scribner* 379, 395; Washington, *Vasey*; Oregon (Columbia River), *Howell*.

Alaska to Oregon.

Var. *Tracyi* (Vasey), *Poa Tracyi* Vasey, Contrib. U. S. Nat. Herb. 1: 276 (1893).

Floral glume webbed at base, pubescent on the lateral nerves and on the keel.

New Mexico (Raton), *S. M. Tracy*.

15. *P. acuminata* Scribn. ined.

Tufted, erect, 25-35 cm. high, smooth throughout. Sheaths of culm 3 in number, ligule truncate, 2 mm. long; blades flat or conduplicate, abruptly pointed, 3-6 cm. long, 3-4 mm. wide. Panicle ovoid, 7-10 cm. long, rays slender, capillary, flexuose, 4-5 cm. long, bearing on the outer half 10-16 spikelets. Spikelets much compressed, ovate to linear, about 5 mm. long, 3-5-flowered, tinged with purple and brown; first empty glume 3 mm. long, oval-lanceolate, 1-nerved, second 3.5 mm. long, oval-acute, 3-nerved; floral glume 3-3.5 mm. long, the keel and lateral nerves clothed with webby hairs for two-thirds of their length, ovate, obtuse when spread; palea 2.5 mm. long.

Montana, *F. Tweedy* 639 in 1885, 1027 in 1886 for U. S. Dept. Agricul.

Subalpine bogs.

16. *P. Idahoënsis*. new name. *P. filifolia* Vasey, Contrib. U. S. Nat. Herb. 1: 271 (1893). *P. Sandbergii* Vasey, l. c. 276.

A slender tufted erect perennial, 40–60 cm. high. Leaves of sterile shoots, 10–25 cm. long, the blades involute, filiform; leaves of the culms 2–3 in number, upper ligule 2–3 mm. long; blades 3–5 cm. long. Panicle simple, subsecund, 6–8 cm. long, rays flexuose, in twos and threes, the sets rather close, longest ray 3–4 cm. long, bearing 1–3 spikelets. Spikelets smooth throughout or scabrid, oval to linear, pale green, 2–5-flowered, 7–10 mm. long, first empty glume ovate-lanceolate, first 1-nerved, 2–3 mm. long, second 3-nerved, ovate-lanceolate, 3–4 mm. long; floral glume much compressed, rather thin, oval when spread, 4–5 mm. long, 5-nerved; palea nearly as long, ciliate on the keels. Nearly allied to *P. occidentalis*.

The name *filifolia* had been previously used, hence the need of a new one.

Rocky slopes, Idaho, *Sandberg* 138, 164, for U. S. Dept. Agricul. in 1892.

17. *P. occidentalis* Vasey & Scribn., Contrib. U. S. Nat. Herb. 1: 274 (1893). *P. trivialis occidentalis* Vasey, Desc. Cat. Gr. 85 (1885).

Culms and leaves more or less scabrous; culms 60–80 cm. high, slightly compressed. Ligule ovate, 2.5–3 mm. long; leaves of culm 5–6 in number, blades 10–15 cm. long, 3–4 mm. wide. Panicle 10–15 cm. long, spikelets oval or ovate-lanceolate, 7 mm. long, first empty glume lanceolate, 1-nerved, 3 mm. long, second ovate-lanceolate, 4 mm. long; floral glume oblong-lanceolate, 4.2–4.7 mm. long, very thinly pubescent on the marginal nerves and the lower half of the keel, oval-acute; palea 3.5 mm. long, otherwise like *P. flexuosa*, to which it is nearly allied.

Oregon (Swave's Island), *Howell* in 1886.

18. *P. debilis* Torr. Fl. N. Y. 2: 459 (1843). WEAK SPEAR-GRASS.

A soft smooth weak light-green tufted perennial, 50–80 cm. high; culms terete. Blades of sterile shoots flat or conduplicate, 5–8 cm. long, leaves of the culm 4, ligule 2.5–4 long; blades acute

or acuminate, 4-10 cm. long, about 4 mm. wide. Panicle slender, open, oval, or long-pyramidal, 10-15 cm. long, rays mostly in pairs, slender, flexuose or nodding in fruit, the lower ones often distant, the longest 5-9 cm. long, bearing a few spikelets, for 1.5-2 cm. at the end. Spikelets broadly oval, 2-3-flowered, 3-4 mm. long, joint of rachilla 0.4-0.6 mm. long; first empty glume 2-2.5 mm. long, 1-nerved, ovate-lanceolate or obtuse, second 2.5-3 mm. long, 3-nerved, oval-lanceolate; floral glume 2.4-4 mm. long, membranous to very near the tip, broadly oval, slightly webbed at base, minutely scabrid on the keel; palea oval, 2-2.5 mm. long, minutely scabrid on the heavy keels.

New Hampshire, *Faxon* 18, 26; Vermont, *Pringle*; Pennsylvania, *F. E. Fernow*; Michigan, *Cooley, Dr. Clark* 711, 715, 713, *Beal* 125, *Wheeler* 126.

Woodlands and hillsides.

Lower Canada, to New York and Wisconsin.

19. **P. Kelloggii** Vasey, Ill. N. A. Gr. 2: 79 (1893).

Erect slender, 40-60 cm. high, smooth throughout except the nerves of floral glumes and palea. Ligule 2-3 mm. long; blades of the culm 2 in number, flat, acute, 2-7 cm. long, 2-2.5 mm. wide. Panicle thin, pyramidal, 7-10 cm. long, rays mostly in pairs, capillary, rather distinct, often curved or reflexed, the longest 4.5 cm. long, bearing a few spikelets on the outer third. Spikelets purplish, oval or linear-lanceolate, 5-7 cm. long, 2-4-flowered, joint of rachilla 0.7 cm. long; empty glumes acute, first lanceolate, 1-nerved, 2.3 mm. long, second oval-lanceolate, 3.3-4 mm. long, 3-nerved; floral glume 3.5-4.5 mm. long, tinged with brown as well as purple, sparingly webbed at the base, and slightly pubescent on the lower part of three nerves, narrowly oval, acute, subacute or obtuse, 5-nerved, the intermediate nerve on each side obtuse, all the lateral nerves extending about two-thirds the length of the glume; palea linear, 3 mm. long.

Montana, *Tweedy* 638; Alaska, *Harrington*; British Columbia, *M. Kay*; Oregon, *Cusick* 977; California, *Bolander* 4705.

Colorado to Alaska and California.

20. **P. Bolanderi** Vasey, Coult. Bot. Gaz. 8: 32 (1882).

A tufted erect rather slender perennial, 30-60 cm. high. Culms compressed; sheaths striate, smooth, loose, shorter than the internodes; upper ligule obtuse, 3-4 mm. long; blades of the culm 3 in number, nearly smooth, flat or conduplicate, 2-10 cm. long, 2-3 mm. wide, acute or acuminate. Panicle contracted or open, 10-15 cm. long, rays mostly in pairs, 3-5 cm. distant, the longest 5-8 cm. long, mostly flower-bearing along the upper third. Spikelets sessile or pedicellate, linear-lanceolate, 1-3-flowered, 3-6 mm. long, joint of rachilla 1.5 mm. long; empty glumes thin, green, scarious-margined, first 1-nerved, 2-3 mm. long, second ovate-lanceolate, acute or obtuse, often lacerate, 3-nerved; floral glume tinged with violet, linear-lanceolate, 3.5-4 mm. long, thinly webbed at the base, otherwise smooth or scabrid; palea a little shorter than its glume, adherent to the grain when mature. Nearly related to *P. arctica*.

Oregon, *Howell*; Southern California, *Palmer* 242.

Oregon and California.

21. *P. Howellii* Vasey & Scribn.; Vasey, Cat. Grass. U. S. 82 (1885).

A slender erect perennial, 45-60 cm. high. Sheaths nearly smooth; ligule acute, lacerate, 4 mm. long; leaves of sterile shoots few, 4-8 cm. long, those of the culm 3, blades flat or becoming conduplicate, smooth, thin, acuminate, 2-7 cm. long, 3 mm. wide. Panicle thin, linear or ovate-lanceolate, 12-25 cm. long, rays in threes to sevens, remote, rather rigid, the longest 4-10 cm. long with short appressed branches bearing spikelets on the upper half. Spikelets light green, ovate-lanceolate, 2-4-flowered, 3.5-4.2 mm. long, joint of rachilla slender, 1 mm. long; empty glumes thin, scabrid on the keel, first lanceolate, 1-nerved, 1.5-2.5 mm. long, second oval-lanceolate, 3-nerved, 2-2.7 mm. long; floral glume thin, sparingly webbed at the base, ciliate-pubescent on the margins and on the lower two-thirds of the keel, 2.4-2.7 mm. long, ovate, subacute or obtuse, erose; palea about 2.4 mm. long, ciliate on the keels. Much like *P. Bolanderi*. See description for the differences in floral glumes.

Once distributed as *P. trivialis* L. var.

Montana, *Williams*; Colorado, *Jones*; Oregon, *Howell* for U. S. Dept. Agricul. 350; California, *Brandegee*, *Anderson*.

Montana, Colorado, Oregon to California.

22. *P. alpina* L. Sp. Pl. 67 (1753). *P. divaricata* Vill. Hist. Pl. Dauph. 2:127 (1786-9). *P. variegata* Lam. Illustr. 1:181 (1791). *P. stolonifera* Bell. Mem. Acad. Turin, 5:215 (1793). *P. badensis* Haenke, Willd. Sp. Pl. 1:392 (1797). *P. collina* Host, Gram. Austr. 2:t. 66 (1801-9). *P. thermalis* Pers. Syn. 1:90 (1805). *P. brevifolia* Gaud. Alpina, 3:34 (1808). *P. discolor* Hoppe, Trin. Mem. Acad. St. Petersburg. (VI.) 1:375 (1831). *P. stricta* Hegetschw. & Herr, Fl. Schw. 85 (1840). *P. subtilis* Schur, Verh. Siebend. Ver. Naturw. 4:86 (1853). *P. stenantha* Janka, Oestr. Bot. Zeitschr. 14:383 (1864). *P. coronensis* Schur, Enum. Pl. Transs. 773 (1866). *P. oreophila* Schur, Enum. Pl. Transs. 773 (1866). *P. gelida* Schur, Enum. Pl. Transs. 775 (1866).

A soft erect tufted perennial, 12-40 cm. high, smooth or nearly so. Blades of sterile shoots rather thick, flat or conduplicate, 1.5-7 mm. long, 2-4-5 mm. wide, apex abruptly acute, those of the culm 2-3 in number, 1-4 cm. long; ligule 2-3 mm. long. Panicle 2-6 cm. long, densely ovate or oblong, or more open and pyramidal, apex sometimes nodding, rays in pairs, spikelets bunched at the ends. Spikelets broadly oval or ovate, usually green, purple, and brown, 3-4-9-flowered, 5-8 mm. long; empty glumes subequal, ovate or oval, acute, short-villously pubescent on the lower half of the keel and margins, first 1-3-nerved, 3-4 mm. long, second 3-nerved, 3.2-5 mm. long, extending two-thirds the way or entirely over the floral glume next above; floral glume concave-elliptical, acute, almost acute or obtuse, 3.5-5 mm. long; palea elliptical, acute at both ends, 2-toothed, keels ciliate, 2.5-3.5 mm. long. Anthers 1.7 mm. long.

Labrador, *Blodgett*; Lower Canada, *A. Allen*; Michigan (Isle Royale), *T. C. Porter*; Montana, *Williams*, *Scribner*, *F. Tweedy*, 338, 627; Colorado, *Jones*, *J. Wolfe*, 1126; Utah, *Jones*, 1268.

Greenland, Canada, New Hampshire to Rocky Mountains.

Var. *minor* Scribn. ined. In every respect diminutive, 5–10 cm. high; blades 1–2 cm. long; panicle 1–2.5 cm. long; spikelets shorter, 3–4-flowered.

Montana, *Scribner* in 1883. Rocky Mountains.

Var. *purpurascens* (Vasey). *P. purpurascens* Vasey, *Coult. Bot. Gaz.* 6: 297 (1881).

Culms smooth, 3–4.5 cm. high; panicle oblong or pyramidal, 5–8 cm. long; spikelets ovate, 8–9 mm. long, 3–5-flowered, second glume 5–6 mm. long; floral glume oval acute when spread, 6–7 mm. long, palea 5.5 mm. long.

Washington, *U. S. Dept. Agricul.* 628 from Suksdorf.

A very distinct variety, perhaps a species.

Washington, Oregon, Rocky Mountains.

23. *P. pratensis* L. *Sp. Pl.* 67 (1753). JUNE GRASS. KENTUCKY BLUE GRASS. SPEAR-GRASS. *P. anceps* Hegetschw. *Fl. Schw.* 81 (1840). *P. angustifolia* L. *Sp. Pl.* 67 (1753). *P. attica* Boiss. & Heldr. *Diagn. (I.)* 13: 57 (1842–59). *P. cœrulea* Knapp, *Gram. Brit. t.* 118 (1846). *P. cinerea* Vill. *Hist. Pl. Dauph.* 2: 126 (1786–9). *P. costata* Schum. *Enum. Pl. Saell.* 1: 28. *P. depressa* J. & C. Presl, *Fl. Cech.* 20. *P. dubia* [Honek.] Verz. *Aller. Gew. Teutschl.* 235. *P. eragrostiformis* Schur, *Verh. Siebenb. Ver. Naturw.* 4: 88 (1853). *P. filifolia* Schur, *Enum. Pl. Transs.* 768 (1866). *P. glabra* Ehrh. *Beitr.* 6: 82 (1792). *P. gregalis* Suter, *Fl. Helv.* 1: 48. *P. heterophylla* Scheele, *Flora*, 27: 58 (1844). *P. humilis* Ehrh. *Beitr.* 6: 84 (1792). *P. Lejeunii* Dum. *Obs. Gram. Belg.* 112 (1823). *P. malmundariensis* Lej. *Fl. Spa.* 1: 50. *P. narifolia* Schur, *Enum. Pl. Transs.* 767 (1866). *P. pubescens* Lej. *Fl. Spa.* 1: 51. *P. selacea* Hoffm. *Deutschl. Fl. Ed.* 2, 1: 44. *P. strigosa*, l. c. *P. subcœrulea* Sm. *Engl. Bot. t.* 1004. *P. sylvicola* Guss. *Enum. Pl. Inar.* 371 (1854). *P. trivialis* Guss. *Fl. Sic. Prod.* 1: 89 (1827). *P. Villarsii* Gmel. *Syst.* 182 (1778). *P. viridis* Gilib. *Exercit.* 2: 530.

A very variable, common, and widely distributed perennial. Culms terete, glabrous, slender or rather stout where not crowded, 30–60 (rarely 10–120) cm. high, from copious running rootstocks. Sheaths smooth, subcompressed; ligule truncate, 1.5 mm. long;

blades of sterile shoots flat, or oftener more or less conduplicate, very abruptly concave-pointed, 5-30 cm. long, those of the culm 3, smooth or scabrous, the upper one shorter than its sheath, usually 6-10 cm. long, 2-2.5, rarely 4-7 mm. wide. Panicle rather close or open pyramidal, the diameter of the base about the same as the length, 1-19 (mostly about 10) cm. long, rays scabrous or smooth in half-whorls of 3-6, the longest 3-11 cm. long, rather densely flower-bearing on the upper half. Spikelets often tinged with purple, many with pedicels 1 mm. or less in length, oval, ovate, ovate-lanceolate, 3-6-flowered, 4-7 mm. long, joint of rachilla 0.5 mm. long; empty glumes acute, scabrous on the keels, first 2.5-3 mm. long, 1- (rarely 3-)nerved, ovate-lanceolate, second 3-3.5 mm. long, 3-nerved, oval-lanceolate; floral glume thickly webbed at the base, pubescent on the marginal nerves and on the lower two-thirds of the keel, 3-4 mm. long, oval, subacute when spread, the apex scabrous for 0.5 mm. or less; palea linear, 2.5-3 mm. long, scabrous on the keels. Anthers 1.5 mm. long.

Variety *angustifolia* is a name applied to forms with narrow radical leaves, but is scarcely a variety. A very valuable pasture-grass. See Vol. I. p. 133, Fig. 51. Nearly allied to *P. trivialis* L., under which see note.

Pennsylvania, *U. S. Dept. Agricul.* 662 from Scribner; Montana, *Canby & Scribner* 393; Yellowstone Park, *Frank Tweedy* 277, 646; Oregon, *Howell*, the indigenous form. Several forms cultivated at Agricultural College, Michigan.

Common throughout Europe, central and Russian Asia, also North America and in the Southern Hemisphere.

24. *P. Brandegei* Scribn.

An alpine annual (?) 2-4 cm. high. Ligule truncate, 1 mm. long; blades thin, flat or conduplicate, 1-3 cm. long, 0.5-1 mm. wide. Panicle sparingly branched, 0.5-1 cm. long. Spikelets purplish, broadly oval, 3-4 mm. long, 3-4-flowered, joint of rachilla 0.5-0.7 mm. long; empty glumes thin, 3-nerved, second oval, acute or obtuse, 2.7-3.1 mm. long; floral glume not webbed nor pubescent, about 2 mm. long, very broadly oval, erose, thin, obscurely 5-nerved; palea linear, incurved, smooth, nearly 2 mm.

long. Anthers 0.6 mm. long. Distributed as *P. abbreviata* Thurber.

Colorado (Gray's Peak), *Jones* 714, 14,000 feet altitude.

25. *P. Chapmaniana* Scribn. Bull. Torr. Club, 21: 38 (1894).

Poa cristata Chapm. Fl. S. States, 562 (1860), not Walt.

An erect light green, nearly smooth annual, 10-20 cm. high. Ligule 3 mm. long; blades of sterile shoots one-quarter the length of the culm. Sheaths of the culms 3 in number, usually shorter than the internodes; blades flat or conduplicate, acuminate or abruptly pointed, 3-5 cm. long, 1.5-2 mm. wide. Panicle obtuse, linear or pyramidal, 2-8 cm. long, rays in twos or threes, one of the longest 2-4 cm. long, bearing spikelets on the outer half. Spikelets shortly pedicellate or almost sessile, 3-3.5 mm. long, 3-5-flowered, narrowly or broadly elliptical or rhomboidal, joint of rachilla 0.5 mm. long; empty glumes subequal, ovate, subacute, 3-nerved (first rarely 1-nerved), second 2.2 mm. long; floral glume thin, webbed at base, pubescent on marginal nerves and two-thirds of the keel, the 4 lateral nerves obscure, 2.5 mm. long, concave, elliptical, the upper fourth scarious; palea thin, 1.7-2 mm. long, pubescent on the lower two-thirds of the keels when seen through a lens.

Much like *Poa annua* and likely to be confounded with it. When compared, this species is more nearly erect, blades of sterile shoots shorter, empty glumes narrower, with narrower scarious margins, floral glume oval (not ovate) and shorter.

Tennessee, *Scribner*; Mississippi (Tupelo & Starkville), *Tracy*; Missouri, *Hitchcock*.

Tennessee, Florida, and Mississippi.

26. *P. Bigelovii* Vasey & Scribn. Vasey, Cat. Grass. U. S. 81 (1885). *P. annua* var. *stricta* Vasey, Scribn. Bull. Torr. Club, 31 (1883).

A glaucous annual or perennial; culms flat, green or purple, 20-70 cm. high. Leaves of sterile shoots few, the blades 2-4 cm. long, those of the culms 3 in number, flat or conduplicate, 3-10 cm. long, 1.5-2 mm. wide, apex acute (not abruptly acute as in *P. annua*); ligule 2 mm. long. Panicle linear, secund, very simple,

interrupted, 5-20 cm. long, rays in pairs, the longest 3-4 cm. long, densely flowered on the upper half; in a very long panicle, the lowest rays 5-7 cm. from the next above. Spikelets oval or ovate-lanceolate, 3-6-flowered, 5-7 mm. long, joint of rachilla 0.7 mm. long; empty glumes 3-nerved, first ovate-lanceolate, 2.5-3.5 mm. long, second oval-lanceolate, 3-4 mm. long; floral glume oval, acute or obtuse, notched at the apex, 3-3.5 mm. long, the nerve on each side next the midnerve obscure, webby hairs at base often 4 mm. long, hairs on the keel for three-fourths of its length and half the length of the glume on the lateral nerves, 0.7 mm. long; palea lanceolate, 2.7 mm. long, pubescent on the keels. Certainly a good species.

Texas, *Curtiss* 3477a from Reverchon, *Fendler* 93; New Mexico, *Vasey* for U. S. Dept. Agricul. 635; Arizona (Santa Catalina Mountains), *Pringle* 458.

Texas to Arizona.

27. *P. COMPRESSA* L. Sp. Pl. 69 (1753). FLAT-STEMMED POA. BLUE GRASS. WIRE-GRASS. *P. anceps* Presl, Cyp. & Gram. Sic. 43 (1826). *P. complanata* Schur, Enum. Pl. Transs. 770 (1866). *P. Langeana* Reichb. Fl. Germ. Excurs. 140* (1833). *P. muralis* Wibel, Prim. Fl. Werth. 114. *P. polynoda* Parn. Grass. Scotl. 84 (1842). *P. subcompressa* Parn. l. c.

Glaucous, bluish green, culms 30-60 cm. high, smooth, firm, much compressed, ascending from creeping rootstocks. Sheaths mostly much shorter than the internodes, ligule obtuse, about 1 mm. long; sterile shoots few, those of the culm 4, blades flat or conduplicate, 4-10 cm. long, 3-4 mm. wide, the apex abruptly pointed as in *P. annua*. Panicle usually contracted, linear or open and ovoid, secund, 5-10 cm. long, lower rays scabrous, in pairs or single, the middle ones in threes or fours, the longest 3-4 cm. long, flower-bearing on the outer half. Spikelets sessile, oval or ovate-lanceolate, 3-10-flowered, 4-6 mm. long, bluish green, often tinged with purple, joint of rachilla 0.5 mm. long; empty glumes subequal, 3-nerved, acute, ovate or elliptical-lanceolate, second 2.5-3 mm. long; floral glume 2.5-3 mm. long, firm, smooth or scabrid, webby hairs few or wanting, pubescent on the keel and lateral

nerves near the base, oval, abruptly acute, the 5 nerves obscure; palea nearly as long as its glume, scabrid on the keels. For a further account see Vol. I. p. 137, Fig. 67.

Vermont, *Pringle*; New Jersey, *Scribner* for U. S. Dept. Agricul. 642; Michigan, *Clark* 711, 717, *Beal* 127, 128, *Cooley*; Minnesota, *Arthur* X 18, B 527; Colorado, *Letterman* 30; Arizona, *Toumey* 122; Oregon, *Howell*.

Dry soil, rarely seen in woods. Extensively naturalized from Europe, and possibly indigenous northward.

28. **P. Wheeleri** Vasey, *Rothr. Rep. Bot. U. S. Surv.* 6:291 (1878).

Perennial, with running rootstocks. Culms 20–60 cm. high. Ligule 1.5 mm. long; blades of sterile shoots 15–20 cm. long, 3 mm. wide, rigid, conduplicate or involute with a firm oblique point, upper blade of culm 1–3 cm. long. Panicle open, thin, 8–12 cm. long, ovoid, rays slender, mostly in pairs, the longer 3–5 cm. long, bearing a few spikelets near the apex. Spikelets lance-elliptical, 6–7 mm. long, 3-flowered, lower joint of rachilla 1.5 mm. long; empty glumes subequal, ovate-lanceolate, 3-nerved, second one 3.7 mm. long; floral glume not webbed, 4.2 mm. long, ciliate on the lateral nerves and on the lower two-fifths of the keel, oval, subacute when spread, margins scariosus; palea truncate, very nearly as long as its glume, ciliate on the keels.

Colorado (South Park), *Wolfe* 1131^a, in herb. *Scribner*, *Dr. Engelman*, *Letterman* 29, 44.

29. **P. confinis** Vasey, *Ill. N. A. Gr.* 2:75 (1893).

An erect tufted diœcious perennial, 10–20–30 cm. high, from slender creeping rootstocks. The second and often the third and fourth leaves from the top of the culms containing erect leafy, non-flowering branches in their axils. Sheaths smooth; ligule involute, acute, 1–2 mm. long; blades of the branches smooth, extending to the base or the apex of the panicles, conduplicate, in cross-section ovate or oval, destitute of bulliform cells, 6–8 mm. diam., 7-nerved with 9 bands of sclerenchyma, the extreme apex obliquely obtuse, the upper blade 1–3 cm. long, with the upper part of the sheath involute like the blade. Panicle dense, linear, subsecund, 2–4–5

cm. long, rays smooth, in pairs, the longest 1.5–3 cm. long, densely flower-bearing above the middle. Spikelets oval, 4–6 mm. long, 3–5-flowered, softly scabrid; empty glumes lance-ovate, acute, 3-nerved, second 3.5–4.2 mm. long, reaching three-fourths to four-fifths over the glume above; floral glume with a few webby hairs at the base, 3–3.7 mm. long, involute, broadly ovate, abruptly acute; palea linear-lanceolate, ciliate on the keels.

Oregon, *Howell* in July 1882, and in 1887.

Some of these have been distributed as *P. abbreviata* R. Br., but Dr. Vasey had an opportunity for comparison and I follow him in the selection of name.

Oregon to the Arctic Coast.

30. **P. Grayana** Vasey, Contrib. U. S. Nat. Herb. 1:272 (1892).

Rootstocks and sterile shoots numerous; culms 30–50 cm. high. Blades of sterile shoots conduplicate, abruptly pointed, 15–20 cm. long, 2 mm. wide; leaves of the culm 2 in number; ligule decurrent, 2–4 mm. long; upper blade 4–6 cm. long. Panicle open, 8–12 cm. long, rays in pairs, the longest 4–6 cm. long, bearing 3–6 spikelets on the outer third. Spikelets tinged with purple, the margins of the glumes brown, 6–8 mm. long, 3–5-flowered; empty glumes oval, subacute, 3-nerved, first about 3.5 mm. long, second 4–4.5 mm. long; floral glume pubescent on the keel and marginal nerves of the lower two-fifths, 3.5–7 mm. long, ovate, obtuse, erose; palea but little shorter than its glume, linear when closed, ciliate on the keels.

Colorado, *Patterson* 14 in 1885.

High Mountains about Gray's Peak; altitude 10,000–12,000 feet.

In herb. U. S. Dept. Agricul.

31. **P. Thurberiana** (Kuntze) Vasey(?)

An erect light-green rather slender perennial, 50–80 cm. high, culms and leaves smooth or scabrid. Sterile shoots few, the blades 20–40 cm. long, leaves of the culm 4–5, sheaths mostly longer than the internodes, smooth; ligule truncate, lacerate, 4 mm. long; blades mostly flat, acuminate, 2 mm. wide, the upper extending to the base of the panicle or beyond. Panicle narrow, thin, 15–25 cm. long, rays in threes and fours, some of them very short, the

longest 3-5 cm. long, thinly flower-bearing for the whole length. Spikelets 2-flowered, the upper floret rudimentary; empty glumes subequal, 3 mm. long, the first a little the longer, both 3-nerved, the lateral nerves merging into the midnerve above the middle; floral glume subearinate, smooth, 7-nerved, oval and subacute when spread, 3.7 mm. long; palea as long as its glume; the second floret consisting of an obtuse floral glume nearly 2 mm. long and a palea much shorter. Stamens 3 in number, 1.5 mm. long.

California, *Bolander*.

32. *P. Douglasii* Nees, *Ann. Nat. Hist. Ser. I*, 1:284 (1838).
Poa Californica Steud. *Syn. Pl. Gram.* 261 (1855).

A slender smooth diœcious tufted perennial, 10-20 cm. high, with short slender creeping rootstocks. Leaves of sterile shoots numerous, sheaths loose; ligule obsolete; blades of sterile shoots conduplicate, curved, 5 cm. long, 2 mm. wide, the extreme apex usually oblique and obtuse, in cross-section oval or circular, 0.7-1 mm. diam., 9-nerved, blades of the culm like those below, 1-5 cm. long, usually extending to the spike or beyond it. Panicle pale green, dense, globose, ovoid or linear, 2-6 cm. long, 1.5 diam. *Pistillate* spikelets compressed, oval, 3-6-flowered, 7-10 mm. long, joint of rachilla 0.75 mm. long, empty glumes subequal, linear-lanceolate, 4.5-6.5 mm. long, 3-nerved, scabrous on the keel; floral glume oval or ovate, acute, 5.5-7 mm. long, finely pubescent on the lower half of the keel and marginal nerves; palea linear, 2-toothed, ciliate on the keels, 4.7-5.5 mm. long. *Staminate* spikelets 5 mm. long; empty glumes 2.5 mm. long, floral glume 3.5 mm. long; palea as long as its glume.

California, *Jones* 3258.

California, along the seacoast in loose sand.

33. *P. glumaris* Trin. *Mem. Acad. St. Petersburg. (VI.)* 1:379 (1831). *P. Kingii* S. Wats. *Bot. King's Exp.* 387 (1871).

A more or less glabrous, strict, very stout diœcious perennial, 30-60 cm. high, and a diameter of the culm of 5-6 mm. near the base; rootstocks creeping. Ligule nearly obsolete; blades firm, smooth or scabrid, usually conduplicate, 10-30 cm. long, 8-12 mm. wide, those of the culm 3 in number, 2-8 cm. long. Panicle

strict, dense, linear, spikelike or more or less interrupted, 6-18 cm. long, rays stout, nearly erect, in clusters of 3-5, densely flowered for most of their length. *Pistillate* spikelets linear-oblong, 7-9 mm. long, 3-5-flowered, longest joint of rachilla about 1 mm. long; empty glumes smooth, subequal, ovate-lanceolate or linear-oblong, 3-nerved, first 5-9 mm., second 7-8 mm. long; floral glume tinged with purple, carinate, puberulent, 5 mm. long, often pubescent near the base, oval, acute, mucronate or obtuse-erose; palea as long as its glume, linear, puberulent, ciliate on the nerves. Lodicules 1 mm. long. Ovary obovoid-oblong, pubescent, 1-1.7 mm. long, stigmas terminal plumose, 2-2.5 mm. long. *Staminate* spikelets with glumes and palea each 1-2 mm. longer. Anthers 3.2 mm. long.

In my opinion this is a very good *Poa* and need not be placed in a distinct genus, as some have proposed. Plants seen were from the lower St. Lawrence and Alaska.

Labrador, *J. A. Allen* 24; Canada, *Pringle*; Alaska, *Harrington*, *Turner*.

Lower Canada to Alaska, along the coast in gravelly beaches.

34. *P. pseudopratensis* Scribn. & Rydb. in herb.

A smooth perennial, 20-30 cm. high with creeping rootstocks. Culms terete. Sheaths longer than their internodes; ligules 2 mm. long; blades flat, tapering toward the abruptly keeled apex, 10-18 cm. long, 2.5-3 mm. wide. Panicle ovoid or oval, rays smooth in pairs, the longest about 4 cm. long; pedicels mostly 1.5 mm. or more in length. Empty glumes 3-nerved, subequal, 5-5.5 mm. long, 3-nerved; floral glume 5.5-6 mm. long; palea about 5 mm. long.

Alaska (Adakh Island), *Voyage of Albatross* July 1, 1893.

35. *P. flava* L. Sp. Pl. 68 (1753). FOWL MEADOW-GRASS. *P. serotina* Ehrh. Beitr. 6: 83 (1791), name only. *P. crocata* Michx. Fl. Bor. Am. 1: 68 (1803), fide Munro. *P. palustris* II. Mart. Prod. Fl. Mosq. 19 (1812). *P. nemoralis* Pursh, Fl. Am. Sept. 1: 79 (1814). *P. hydrophyla* Thuill. Steud. Nom. Ed. 1, 636, 638 (1821). *P. triflora* Gilib. Exercit. 531. *P. elegans* Hall. f. Steud. Nom. Ed. I, 2: 359 (1841). *P. angustifolia* Reichb. Fl. Germ. Excurs. 47 (1850).

Loosely tufted, erect from a decumbent base, 40-120 cm. high; no creeping rootstocks. Ligule 4-5 mm. long; blades of sterile shoots 3-8 cm. long, soon fading, those of the culm 5-6, erect, soft and smooth or scabrous, flat or conduplicate, pungent, acuminate, 7-15 cm. long, 2.5-3 mm. wide. Panicle ample, oblong or pyramidal, at length nodding, 20-35 cm. long, rays scabrous in half-whorls of 4-10, some of the lower sets of rays 5-7 cm. distant, the longest 10-15 cm. long, branching freely, bearing numerous scattered spikelets on the upper half or three-fifths. Spikelets short-pedicelled, often tinged with violet and brown, elliptical or linear-lanceolate, 2-5-flowered, a long joint of rachilla about 0.5 mm. long; empty glumes subequal, 3-nerved, first ovate-lanceolate, second oval-lanceolate, 2.3-3.7 mm. long; floral glume sparingly webbed at base, and thinly pubescent on the lateral nerves and lower half of the keel, 2.3-2.5 mm. long, apex often tinged with yellowish brown, elliptical, obtuse or subacute when spread, though appearing acute when closed, obscurely nerved; palea almost as long as its glume, linear, scabrid on the keels.

New Hampshire, *E. Faxon* 9; Massachusetts, *E. L. Sturtevant*, *Beal* 128; New York (Buffalo), *Clinton* for Clark 1685; Michigan, *Cooley*, *Clark* 714, *Beal* 130, 131, *Wheeler*, *Farwell*; Illinois, *Beal* 129; Iowa, *Hitchcock*; Minnesota, *Arthur* X 6, B 183, B 426, B 510; Colorado, *Cassidy*; South Dakota, *Duffey*; Washington, *Lake*; Oregon, *Howell*.

Wet or moist ground, Canada, New England, Alaska, Pennsylvania, Colorado.

For a further account see Vol. I. p. 140, Fig. 68, under *P. serotina*.

Colonel Monroe, the most acute agrostologist of his day, placed this with *P. nemoralis* L., while Grisebach, Fries, A. Gray, and Anderson keep it distinct. See Dr. J. D. Hooker, on Distribution of Arctic Plants, Trans. Linn. Soc. vol. 23, 1860. Monroe observes that stunted or arctic specimens of *P. nemoralis* L., *P. serotina* Ehrh., *P. cæsia* Sm., if not identical are extremely difficult to distinguish the one from the other.

36. *P. flavicans* Ledeb. Fl. Ross. 4: 373 (1853).

Plant rather soft, 25-60 cm. high. Leaves of the culms 3, sheaths covering the internodes, ligule broad, decurrent, toothed, 3 mm. long; blades of the sterile shoots thin, flat or irregularly involute, 5-10 cm. long, 2 mm. wide, abruptly pointed, those of the culm 4-15 cm. long. Panicle exserted, oval or pyramidal, 8-12 cm. long, rays in twos and threes, 1.5 cm. distant, the longest 4-6 cm. long, bearing 3-4 spikelets on the outer three-fifths. Spikelets lax, oval, 8 mm. long, 3-flowered with a minute rudiment of a fourth, joint of rachilla slender, 1.5 mm. long; empty glumes thin, elliptical, 3-nerved, first 4.5 mm. long, second 5 mm. long; floral glume thinly pubescent on the lower half of the nerves, oval, 5 mm. long; palea thinly pubescent on the keels, nearly as long as its glume.

Unalaska, *Turner*.

Its nearest affinities are *P. hispidula* Vasey and *P. gracillima*.

37. *P. nemoralis* L. Sp. Pl. 69 (1753). *P. cæsia* Am. authors in part. *P. bryophila* Trin. Bull. Sc. Acad. St. Petersburg. 1:69 (1836). There are at least 35 other synonyms.

A loosely tufted erect perennial, 40-70 cm. high, with no creeping rootstocks; culms compressed or subterete, smooth. Sheaths smooth; ligule 0.5 mm. long; blades of culm 4 in number, scabrous, erect, flat or conduplicate, pungent-acuminate, 7-12 cm. long, 2.5-3 mm. wide. Panicle linear, ovoid or pyramidal, erect or nodding, 5-12 cm. long, rays scabrous, in half-whorls of 4-7, distant 3-3.5 cm., the longest 5-6 cm. long, bearing spikelets almost clustered on the outer half or third, some with pedicels 0.7 mm. long. Spikelets often tinged with violet, elliptical or linear-lanceolate, 3-6-flowered, 5-6 mm. long, a long joint of rachilla 0.8 mm. long; empty glumes acuminate, 3-nerved, first ovate-lanceolate, 2.7-3 mm. long, second oval-lanceolate, 3.5 mm. long; floral glume sparingly webbed at base, 3-3.2 mm. long, pubescent (not thinly) on the lateral nerves and lower half of the keel, apex tinged with yellowish brown, elliptical or subacute when spread, obscurely nerved; palea linear, scabrid on the keels, 2.7 mm. long.

The above is a description of well-grown typical plants introduced from Europe into Michigan.

Vermont, *Pringle* in 1877; Rocky Mountains, *Hall* and *Harbour* 247; Montana, *Tweedy* 647, *Canby & Scribner*, 394, 369; Colorado, *Letterman* 12^a, 35, 37, 62 in 1885-86 for U. S. Nat. Herb.

Var. **glauca** (Vahl). *Poa glauca* Vahl, Fl. Dan. t. 964 (1790). *P. cæsia* J. E. Smith, Engl. Bot. t. 1719 (1793). *P. aspera* Gaudin, Alpina 3: 38 (1808).

Culms 20-60 cm. high, firm, flattened; ligule obtuse, 2 mm. long; blades 3-4 in number. Panicle erect, 3-6 cm. long, subsecund and spikelike, or 10-12 cm. long and open, the longest rays 5 cm. long. Spikelets 2-4-flowered, part of them sessile; empty glumes oval, acute, first 3.3 mm. long, second 3.5-4 mm. long; floral glume 3.7-4 mm. long; palea 3.5 mm. long. Anthers 1.7 mm. long.

New Hampshire, *C. E. Faxon*; Montana, *Williams*; Arizona, *Rusby* 899.

Maine to Oregon and Rocky Mountains.

Var. **firmula** Host. Gram. Aust. 2: t. 71 (1804). *P. cæsia* var. *strictior* A. Gray, Man. Ed. 5: 629 (1868).

Culms 15-30 cm. high, flattened; panicle contracted or open, grayish purple; empty glumes subequal, broad, 2-2.7 mm. long; floral glume 2.5 mm. long; palea 2.5-2.7 mm. long; anthers 1.2 mm. long.

Vermont, *Faxon*, *Hosford*, *Pringle*; Michigan (Keweenaw Co.), *Farwell*; Canada, *Faxon*; Minnesota, *Arthur*; Montana, *Canby & Scribner* 387, 389, *Williams*.

38. **P. Wolfi** (Vasey), Scribn. Bull. Torr. Club, 21: t. 228 (1894). *P. alsodes* A. Gray, var. *Wolfi* Vasey ined.

Culms slender, 60-80 cm. high. Blades of sterile shoots 25-35 cm. long, 1.5-2 mm. wide; ligule 1-1.3 mm. long; blades of culm 5-10 cm. long, acuminate. Panicle lax, 7-15 cm. long, rays in distant pairs, slender, the longest 7-10 cm. long, bearing 4-7 spikelets near the apex. Spikelets open, 6.7 mm. long, 3-4-flowered; empty glumes oval when spread, acute, 3-nerved, first 3.5 mm. long, second 4 mm. long; floral glume 4.4-5 mm. long, pubescent for most of its length, elliptical, acute; palea 3.5 mm. long, puberulent

on the keels. Nearly allied to *P. flexuosa*, but its first glume is 3-nerved, the floral glume longer and strongly pubescent.

Illinois, *U. S. Dept. Agricul.* 360 from J. Wolfe.

39. *P. laxa* Hænk. Sudet. 118 (1791). *P. flexuosa* J. E. Smith, Fl. Brit. 1:101 (1800), not Wahl. (1824), not Muhl. (1817).

Tufted, smooth, flaccid throughout, slender, ascending or erect from a geniculate base, 10–25 (rarely 35) cm. high. Ligule 2–2.5 mm. long; blades flat, acuminate, 4–6 cm. long, 1.5–2 mm. wide, those of the culm 2–3 in number. Panicle 5–10 cm. long, simple, linear, dense and interrupted or spreading and nodding, rays flexuose, 1–5 (mostly 2–3) at a node of panicle. Spikelets often purplish, sometimes tinged with brown, oval or oval-lanceolate, 2–4-flowered, 5–6 mm. long, joint of rachilla 0.7 mm. long; empty glumes subequal, ovate-lanceolate or oval-lanceolate, 3-nerved, second 3.5–4.2 mm. long; floral glume 3.2–4 mm. long, thin, sparingly webbed at base, pubescent on the marginal nerves and the lower half of the keel, oval, obtuse, subacute, emarginate or erose with an extended scarious apex; palea thin, 3–3.5 mm. long, ciliolate on the keels. Nearly allied to *P. alpina* L.

New Hampshire, *Faxon*; Vermont, *Hosford* for U. S. Dept. Agricul. 654, *Pringle*.

New England to Rocky Mountains and well northward; also in Europe. In Hooker's Flor. Bor. Am. this is treated as *P. flexuosa*.

40. *P. gracillima* Vasey, Contrib. U. S. Nat. Herb. 1:272 (1893).

A slender, densely tufted perennial, 30–50 cm. high, the upper node extending one-fourth or less than the length of the culm. Blades of sterile shoots thin, smooth, acute, flat or conduplicate, filiform, 5–10 cm. long, 0.6–1 mm. wide, those of the culm 2; ligule 2.5 mm. long. Panicle open, pyramidal or ovoid, 5–8 cm. long, rays scabrous in twos to fives, the longest 3–5 cm. long, bearing 3–4 spikelets on the outer third. Spikelets tinged with violet, oval or ovate-lanceolate, 3–5-flowered, 6–10 mm. long, a long joint or rachilla 1.5 mm. long; empty glumes oval-lanceolate, 3-nerved, first 3–4 mm. long, second 3.5–5 mm. long; floral glume elliptical, 3–5 mm. long, 5-nerved, subacute or obtuse with a wide scarious tip.

scabrid, pubescent on the nerves of the lower half; palea linear, as long as its glume, strongly ciliate on the nerves. Anthers 3 mm. long. Vasey says some of the plants approach *P. tenuifolia* Nutt.

Oregon, *Howell*, *Cusick* for U. S. Dept. Agric. 649.

Washington and Oregon.

41. *P. hispidula* Vasey, Contrib. U. S. Nat. Herb. 1: 272 (1893).

A stout perennial, 50-70 cm. high. Culms simple, decumbent at base. Sheaths shorter than the internodes; ligule obtuse, the central portion 3 mm. long, appearing longer; leaves of the culm 4 in number, blades smooth, flat or conduplicate, 5-15 cm. long, 5-7 mm. wide, the apex pungent. Panicle pyramidal to linear, 6-15 cm. long, rays in threes to fives, the half-whorls rather close, the longest 3-6 cm. long, bearing spikelets on the outer half. Spikelets broadly oval to narrowly oval, 3-5-flowered, 7-9 mm. long. Joint of rachilla about 1 mm. long; empty glumes membranous, subequal, linear-lanceolate or elliptical-lanceolate, 3-nerved, second 5-7 mm. long; floral glume 5.5-6.7 mm. long, densely webbed at base, marginal nerves and three-fourths of the keel densely and conspicuously pubescent, thinly clothed between the nerves with very short hairs or nearly smooth, oval, subacute, denticulate; palea linear, ciliate on the keels, 5.2 mm. long.

Unalaska, *Harrington* for U. S. Coast Surv. in 1871; Alaska, *L. M. Turner* in 1881 for Scribner; Behring Island, *Macoun* 49 in 1891.

42. *P. Ruprechtii* Peyr. Linnæa, 30: 6 (1859).

A densely tufted perennial, 20-50 cm. high. Leaves of sterile shoots scabrous, blades conduplicate, long-pointed, 30-40 cm. long, 3 mm. wide, when old breaking near the ligule; those of the culm 2-3 in number, ligule 4 mm. long; blade 10 cm. long. Panicle thin, ovoid or pyramidal, 8-15 cm. long, rays scabrous, in pairs remote from each other, the longest 4-6 cm. long, bearing 3-6 spikelets on the upper third. Spikelets linear-lanceolate or ovate-lanceolate, 4-6-flowered, 6-9 mm. long, joint of rachilla 0.8 mm. long; first empty glume ovate-lanceolate, 1-nerved, 2.5 mm. long, second oval-lanceolate, 3-3.2 mm. long; floral glume scabrid on the keel,

not webbed at the base, ovate, acute, 4 mm. long, the upper third scarious; palea linear, 3.7 mm. long, scabrid on the keels.

Mexico, *Pringle* 1437, *Palmer* 1316; New Mexico, *Tracy*.

43. **P. Orcuttiana** Vasey, West. Am. Scientist in Aug. 1887.

An erect perennial, about 60 cm. high. Leaves of the culm 3 in number, sheaths smooth; ligule scarious, fringed, 5 mm. long; blades of sterile shoots thin, flat, taper-pointed, 10–15 cm. long, the upper blade of the culm 5–7 cm. long. Panicle purplish, 12–15 cm. long, rays in fours and fives, the longest 8–9 cm. long, bearing about 25 spikelets on the outer half. Spikelets linear, purplish, 6–8 mm. long, 3–5-flowered, scaberulous; empty glumes thin, 3-nerved and green only near the base, first 3 mm. long, second 3–4 mm. long; floral glume thin, 3.4–4.5 mm. long, with a trace of a tuft of hairs at the base, oval, subacute, apex often erose; palea about the length of its glume, linear before spreading, 2-toothed, ciliolate on the keels. Stamens 3. Anthers 2.5 mm. long.

Lower California (northern part), *Orcutt* in 1886 for U. S. Dept. Agricul.

127. (257). **COLPODIUM** Trin. Fund. Agrost. 119 (1820). *Arctophila* Rupr. Beit. Pfl. Russ. Reich. 2: 62 (1845).

Spikelets 1–2-flowered, rarely 3-flowered, rachilla articulate above the lower glumes and between the florets. Empty glumes awnless, softly membranous or hyaline, 1–3-nerved or destitute of nerves, obtuse or rather acute, unequal; floral glume with the texture of the empty glumes, very broad, obtuse, more or less 5-nerved, the lateral ones short or almost obsolete; palea about as long as its glume, hyaline, 2-nerved. Stamens 3. Styles short; distinct. Grain oblong, without a groove, included, but not adherent. Annual or perennial grasses. Leaf-blades flat or almost setaceous. Panicle slender, effuse, pyramidal, branches capillary. Spikelets often small, sometimes colored.

Ten species are known in Asia, Europe and North America. The genus is very closely allied to *Poa* and by some made a section of that genus.

The spikelets are small, containing only one or two flowers, thus connecting *Poa* with the Agrostæ. The Arctic plant pub-

lished by R. Brown as a doubtful *Colpodium* now forms Grisebach's genus *Arctagrostis*.

1. *C. fulvum* (Trin.) Griseb. Ledb. Fl. Ross. 4:385 (1853). *Poa fulva* Trin. Act. Petrop. (VI.) 1:378 (1831). *Glyceria fulva* Fries, Summ. Veg. Scand. 244 (1846-9). *Grappheporum fulvum* A. Gray, Ann. Bot. Soc. Canada, 57 (1861).

A stout perennial, 20-60 cm. high, smooth from culm to floral glume. Leaves 4-6-12; ligule lacerate, 3 mm. long; blades flat, pungent-pointed or sometimes obtuse, 5-25 cm. long, 5-8 mm. wide. Panicles exserted, open, thin, ovoid, 8-15 cm. long, rays in fours and fives, drooping, the longest 5-8 cm. long, bearing a few spikelets on the outer half. Spikelets pedicellate, oval or oblong, 4-6-flowered, 5-6 cm. long; first glume lance-ovate, 1-nerved, about 3 mm. long; second oval-acute or obtuse, 3-nerved, 4.5 mm. long; floral glume broad-oval, obtuse, 3-5-nerved, about 4 mm. long; palea obtuse or 2-toothed, 2.5 mm. long. Anthers 1.8 mm. long.

Alaska, *Harrington*, *Murdock* 55; British Columbia, *McKay*; Greenland, *Wright*; Bering Sea, *Dr. C. Hart Merriam* in 1891.

2. *C. pendulinum* Griseb. Ledb. Fl. Ross. 4:386 (1853). *Grappheporum pendulinum* A. Gray, Ann. Bot. Soc. Canada

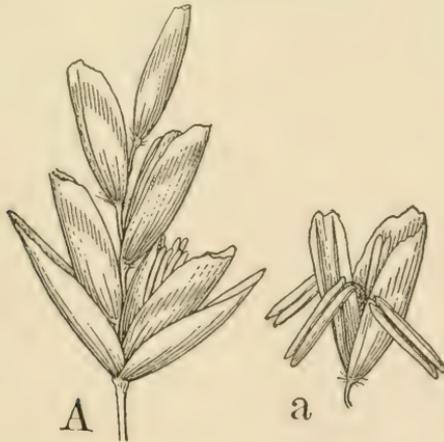


FIG. 110.—*Colpodium pendulinum*. A, spikelet; a, floret. (Scribner.) (1861). *Poa Læstadii* Rupr. Beitr. Pfl. Russ. Reich. 2:62 (1845). *Arctophila Læstadii* Rupr.; Beitr. Pfl. Russ. Reich. 2:62 (1845).

Glyceria pendulina Laestad. Wahlenb. Fl. Suec. 1088 (1824-6).
Poa pendulina J. Vahl, Fl. Dan. t. 2343 (1761).

An erect smooth perennial, 60-70 cm. high. Sheaths half as long as the culm; ligule chartaceous, 4 mm. long; blades flat, acuminate, 10-17 cm. long, 3-4 mm. wide. Panicle much exserted, nodding, ovoid, 12 cm. long, rays in clusters of 3-5, and 2.5-3 cm. distant, reflexed, sparingly branching, bearing 3-4 spikelets near the apex. Spikelets oval, 4-6-flowered, 4-6 mm. long; empty glumes subequal, 3-nerved, 4 mm. long, joint of rachilla smooth, 0.6 mm. long, floret with a few short hairs at the base; floral glume broadly oval or ovate, 3-3.5 mm. long, 3-nerved, lateral nerves short, the central extending to the irregularly toothed or lobed apex; palea elliptical, 2-lobed, nearly 3 mm. long.

British America (Muckelung River), in 1882, for U. S. Dept. Agricul.

3. **C. mucronata** (Hack.). *Arctophila mucronata* Hack.; Vasey, Cat. Grasses U. S. 88 (1885).

A smooth stout grass, 15-25 cm. high. Leaves 6-8 in number, crowded; ligule broad, lacerate, 2 mm. long; blades flat, abruptly pointed, 5-12 cm. long, 6-9 mm. wide. Panicle shining, yellowish, open, partially included, narrow or pyramidal, 5-7 cm. long, rays in twos to fours, reflexed, the longest 3-7 cm. long, bearing 2-3 spikelets near the apex. Spikelets 2-flowered, joint of rachilla 0.6 mm. long, smooth or very sparingly hairy; empty glumes subequal, 3-3.3 mm. long, soft, thin, first ovate, 1-nerved, second broader, 3-nerved; floral glume broadly oval, 3.5 mm. long, 3 mm. wide, 5-nerved, margin scarious, apex irregularly toothed or torn, the central nerve extending to the tip or into a short mucro; palea broad, 1.5 mm. long.

Point Barrow on Arctic coast, *Dr. Murdock* in 1883 for U. S. Dept. Agricul.

128. (258a). **DUPONTIA** R. Br. Parr. Voy. App. 290 (1824).

Spikelets 2-3-flowered in a contracted panicle, rachilla articulate above the glumes and between the florets. Empty glumes subequal, scarious, unawned, longer than the floral glume; floral glume

delicately membranous, unawned, distinctly hairy at the base. Ovary glabrous. In other respects the same as *Colpodium*.

There is one, possibly two, species which belong to the Arctic regions.

1. **D. Fisheri** R. Br. l. c.

A smooth erect grass, 15–25 cm. high. Ligule obtuse, 1–1.5 mm. long; blades flat or concave, 4–10 cm. long, 2–3 mm. wide. Panicle simple, shining, yellowish purple, interrupted, 4–7 cm. long. Spikelets 2- (rarely 3-) flowered, joint of rachilla 1.5 mm. long; empty glumes soft, thin, membranous, first 1-nerved, 5 mm. long, second 3–5-nerved, 7.5 mm. long; floral glume puberulent, broadly ovate, acute, 3-nerved, 4.5–5 mm. long; palea a little shorter, hyaline, 2-toothed.



FIG. 111.—*Dupontia Fisheri*. Spikelet. (Richardson.)

Hudson's Bay near Bering Straits, *R. Bell, Wright* in 1853–6; Pt. Barrow, *Prof. Murdock* 88 in 1882.

Arctic coast to Hudson's Bay.

2. **D. psilosantha** Rupr. Fl. Samoj. Cisural. t. 6 (1848).

A smooth erect grass, 20–40 cm. high. Ligule obtuse, 2–3 mm. long; blades concave. Panicle simple, 7–12 cm. long, rays spreading. Spikelets 1–2-flowered, 6–7 mm. long; empty glumes equal, 1-nerved; floral glume a little shorter, 3-nerved.

Behring Sea collection, *Macoun* 40.

129. (258b). **SCOLOCHLOA** Link, Hort. Berol. 1: 136 (1827). *Fluminia* Fries, Summ. Veg. Scand. 247 (1846).

Spikelets 3–4-flowered, subterete in a loose or narrow ample panicle, rachilla articulate between the flowers. Empty glumes membranous, unequal, apex toothed, first 3-nerved, second 5-nerved; floral glume rigid, not keeled, 7-nerved, toothed at the apex, callus hairy. Anthers 3. Ovary hairy; stigmas sessile.

There are two tall perennial species found growing in water in the northern temperate zone of both hemispheres.

1. **S. arundinacea** (Lilj.) MacMillan, Metasp. Minn. Vol. 1: 79 (1892). *Festuca arundinacea* Lilj. Sv. Fl. Ed. 2. 2: 47 (1792).

Arundo festucacea Willd. Enum. Hort. Berol. 1:126 (1809).

Donax festucaceus Beauv. Agrost. 78 (1812).

Culms 120–180 cm. high. Sheaths smooth to scabrous, thin, mostly longer than the internodes; ligule lacerate, 5–10 mm. long;

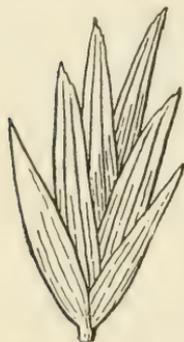


FIG. 112. — *Scolochloa arundinacea*. Spikelet. (Richardson.)

blades flat, scabrous, with long narrow points, 30–45 cm. long, 5–10 mm. wide. Panicle 20–30 cm. long, more or less exerted, rays in half-whorls of 2–4, distant 4–6 cm., the longest 8–12 cm. long, bearing 4–12 spikelets on the outer half or three-fifths. Lateral spikelets on pedicels about 2 mm. long, linear-lanceolate or wider, 3–5-flowered, 8–9 mm. long; first empty glume linear-lanceolate, 5–7 mm. long, second oval-lanceolate, 7–8 mm. long, apex lacerate; floral glume oval, about 6 mm. long, apex hyaline; palea linear-lanceolate before spreading, ciliolate on the keels, 6 mm. long.

Saskatchewan, *Bourgeau* in 1858; Northwestern Territory, *Macoun* in 1880; British Columbia, *Macoun* in 1887; Iowa, *R. J. Crotty* in 1883.

130. (258). **GRAPHEPHORUM** Desv. Nouv. Bull. Soc. Philom. 2: 189 (1810).

Spikelets 2–5-flowered, in a narrow or spreading panicle, rachilla hairy, articulate below the florets, extending above them as a slender stipe, flowers perfect. Empty glumes membranous, awnless, slightly unequal, more or less keeled, as long as the floral glumes or shorter, first 1–3-nerved, second 3–5-nerved; floral glume round on the back, 3–5–7-nerved, the lateral ones obscure, denticulate or torn at the apex, awnless; palea narrow, 2-keeled, keels ciliolate. Stamens 3. Styles distinct. Grain oblong, flattened on the back, concave in front, often tipped with a soft appendage, enclosed by the glume and palea, but not adhering to them.

Erect grasses with flat leaf-blades. There are three or four species known, peculiar to the cooler regions of America, Europe, and Asia. The genus differs chiefly from *Panicularia* (*Glyceria*) in having a hairy rachilla. If there were a twisted dorsal awn on the

floral glume, it would be placed near *Avena*, to which it is closely allied.

- | | |
|---|-----|
| A. Floral glume 2.8-3 mm. long. | 1 |
| B. Floral glume 3.5-3.7 mm. long. | 2 |
| C. Floral glume 4-6 mm. long. | (a) |
| a. Floral glume unawned. | 3 |
| a. Floral glume awned. | 4 |

1. *G. altijugum* Fourn. Bull. Soc. Bot. Fr. 24: 182 (1877).

An erect rather slender slightly tufted light-colored perennial, 30-60 cm. high. Sterile shoots few; leaves of the culm 2-3; sheaths smooth, as long as the internodes; ligule lacerate, truncate, 0.7 mm. long; blades nearly smooth, flat, 4-6 cm. long, 1.5-2 mm. long, apex acuminate. Panicle spikelike, slender, slightly interrupted, 6-12 cm. long, 3-5 mm. diam., the longest ray about 3 cm. long; flower-bearing from near the base. Spikelets 2-flowered, 3.5-4 mm. long; rachilla slightly hairy, produced above the upper floret; first empty glume ovate-lanceolate, 1-nerved, projecting beyond the rest of the spikelet, second a little shorter and 3-nerved; floral glume oval, truncate, 5-nerved, 2.8-3 mm. long; palea lanceolate before spreading, as long as its glume.

Mexico, *Pringle* 4306.

Dry ledges under firs.

2. *G. Pringlei* Scribn. ined.

A slender tufted erect perennial, 40-60 cm. high. Leaves of the culm 3; sheaths and lower side of blades velvety, middle sheath half as long as its internode; ligule 1 mm. long; blades involute or flat, 3-8 cm. long, 1-1.5 mm. wide. Panicle very thin, flexuose, 8-12 cm. long, rays in twos and threes, the longest 4-7 cm. long, bearing a few spikelets on the outer three-fifths. Spikelets soft, 2-flowered, 5-6 mm. long, first empty glume linear, 1-nerved, about 2 mm. long, second elliptical, 3-nerved, 3-4 mm. long; floral glume oval, puberulent on the lower half, 5-nerved, 3.5-3.7 mm. long, truncate-erose, the midnerve often protruding as a mucro; palea 2.5-3 mm. long.

Mexico, *Pringle* 4765.

Summit of Sierra San Felipe at the altitude of 10,000 feet.

3. *G. melicoideum* (Michx.) Desv. l. c. *Aira melicoides* Michx. Fl. Bor. Am. 1:62 (1803). *G. melicoides* Beauv. Agrost. 77, t. 15, f. 8 (1812).

An erect rather slender slightly tufted, light-colored perennial, 30–60 cm. high. Sterile shoots few; leaves of the culm 5; sheaths about the length of the internodes; ligule about 2 mm. long; blades



FIG. 113.—*Graphophorum melicoides*. Spikelet. (Richardson.)

scabrous, erect, flat, 15–20 cm. long, 3–5 mm. wide, apex long-pointed. Panicle open, slightly nodding, 6–14 cm. long, rays in twos and threes, the longest 7 mm. long, flower-bearing on the outer half. Spikelets usually 2-flowered, 6–8 mm. long, rachilla flattened, hairy on the margins and slightly so on the outside; first empty glume 1-nerved, 4–5 mm. long, second a little longer, 3-nerved, widest above the middle; floral glume 4–6 mm. long, 5-nerved, mucronate-pointed; palea 3.5–3.7 mm. long. Nearly allied to *Trisetum*.

Maine and Vermont, *Pringle*; Massachusetts, *Faxon* 21; Michigan, (Macomb Co.) *Cooley*, (Hubbardston) *Wheeler* 111.

Dry bluffs, northern Maine, northern Vermont, central Michigan and northward; not common.

Var. *Cooleyi* (A. Gray) Scribn. Mem. Torr. Club, 5: 53 (1895). *Dupontia Cooleyi* A. Gray, Man. Ed. 2, 556 (1852). *G. melicoides* var. *major* A. Gray, Ann. Bot. Soc. Can. 1: 57 (1861).

A luxuriant form, 60–90 cm. high.

Borders of swamps, Michigan, (Macomb Co.) *Cooley*, (Hubbardston) *Wheeler* 109, (Agricul. College) *Beal* 110.

4. *G. Wolfii* Vasey, Desc. Cat. Grasses U. S. 55 (1885); Coult. Man. Roc. Mt. Bot. 423 (1885). *Trisetum Wolfii* Vasey, Wheeler's

U. S. Geol. Surv. 6: 294, *t.* 27 (1878). *Trisetum subspicatum* var. *muticum* Boland. S. Wats. Bot. Calif. 2: 296 (1880). *Trisetum Brandegei* Scrib. ined.

Culms and blades like those of *G. melicoideum*. Panicle upright, subspicate, 6–18 cm. long. Spikelets 2–3-flowered, rarely 4-flowered, purplish, rachilla villous, empty glumes elliptical-lanceolate, nearly equal, about 6 mm. long, first 1-nerved, second 3-nerved; floral glume of a large floret over 5 mm. long, less than 2 mm. wide, obscurely 5-nerved, obtuse, lacerate, sometimes split or 2-toothed, bearing an awn often 1 mm. long; palea shorter or nearly equal to its glume. Grain oblong, linear. Very nearly allied to *G. melicoideum*, and perhaps only a large form having awns on the floral glume.

Montana, *Williams*; Colorado, *French*; Oregon, *Cusick* 1314.

Montana, Colorado, Oregon, California.

131. (259). **PANICULARIA** Fabr. Enum. Pl. Hort. Helmst. 373 (1763). *Glyceria* R. Br. Prodr. 179 (1810). *Hydrochloa* Hartm. Gram. Skand. 8 (1819), not Beauv. (1812). *Exydra* Endl. Fl. Poson. 119 (1830). *Devauxia* Beauv. Kunth, Enum. Pl. 1: 367, in syn. (1833). *Diachroa* Nutt. Steud. Nom. Ed. 2, 1: 497 (1840). *Puccinellia* Parl. Fl. Ital. 1: 366 (1850). *Porroteranthe* Steud. Syn. Pl. Gram. 287 (1854).

Spikelets several-flowered, pedicellate in a narrow or spreading panicle, rachilla articulate under the floral glumes, glabrous or rarely hairy. Empty glumes obtuse or acute, unawned, slightly unequal, shorter than the floral glume, without nerves or 3–5-nerved; floral glume obtuse, unawned, convex or flattish on the back, nerves 3–9, conspicuous, the nerves not reaching to the hyaline, obtuse, sometimes slightly denticulate apex; palea nearly as long as its glume, 2-keeled. Stamens 3. Styles very short, distinct, the plumose stigmas frequently more branched than in other genera. Lodicules truncate. Grain glabrous, grooved on the inner side, enclosed in the glume and palea, free from them or slightly adherent.

Perennials or rarely annuals, often tall, not unfrequently aquatic, sheaths nearly entire, blades usually flat.

There are about 30 species, widely distributed over the temperate and some of the warmer regions of the globe. It differs from *Poa* in having the floral glume round on the back and not keeled, from *Festuca* in having broader and more obtuse floral glumes, and the grain usually free from the palea, and from both in the shortness of the nerves of the glumes. Bentham was somewhat in doubt as to whether to include *Atropis* Rupt. in this genus or not, but finally concluded to do so. The characters given for the sections are not constant.

- A. Spikelets ovate, oblong or linear-oblong, 2-8 mm. long. (b)
 - b. Spikelets turgid, flattened laterally, panicle nodding. 1
 - b. Spikelets somewhat turgid and flattened, panicle narrow. (c)
 - c. Panicle oblong, dense, erect, 8-12 cm. long. . . . 2
 - c. Panicle slender, nodding, 20-30 cm. long. . . . 3
 - b. Floral glume truncate, obtuse, panicle diffuse. . . (d)
 - d. Floral glume contracted near the apex, 7-nerved, 2.5-3 mm. long. 4
 - d. Floral glume not contracted near the apex. . . (c)
 - e. Floral glume obtuse, 7-nerved, 1.7-2 mm. long. 5
 - e. Floral glume obtuse, 7-nerved, 2-2.3 mm. long. 6
 - e. Floral glume obtuse, often denticulate, 7-nerved, 2.5 mm. long. 7
 - e. Floral glume obtuse, irregularly toothed, 5-7-nerved, 2.2-3 mm. long. 8
- B. Spikelets linear, appressed, terete when not in flower, 20-30 mm. long. (f)
 - f. Floral glume 3-5 mm. long. 9
 - f. Floral glume 7-8 mm. long. 10

1. *P. Canadensis* (Michx.) Kuntze, Rev. Gen. Pl. 783 (1891).
Briza Canadensis Michx. Fl. Bor. Am. 1: 71 (1803). *Glyceria Canadensis* Trin. Mem. Acad. St. Petersb. (VI.) 1: 366 (1831).

A stout perennial, 60-90 cm. high. Sheaths rough, slightly compressed, about the length of the internodes; ligule 2 mm. long; blades 6, scabrous, flat, erect, 20-30 cm. long, 4-7 mm. wide. Panicle exserted, oblong-pyramidal, soon drooping, 18-25 cm.

long, rays mostly in twos and threes, the longest two-thirds as long as the panicle, branching and flowerbearing for two-thirds of its length. Spikelets ovate, becoming broader, tumid, like those of *Briza*, 5 mm. long, 5-9-flowered, pale, sometimes tinged with purple, joint of rachilla about 0.5 mm. long, and brittle; empty glumes ovate, often acute, 1-nerved, first 1.5-2 mm. long, second 2-3 mm. long; floral glume oval, acute or blunt-pointed, 7-nerved, 3-3.5 mm. long; palea broadly oval, 2-5 mm. long, 2-keeled, 2-toothed, the keels bent backward.

Vermont, *Pringle*; Massachusetts, *Beal* 112; Rhode Island, *Tweed* for U. S. Dept. Agricul. 680; Michigan, *Houghton*, *F. E. Wood*, *Farwell*, *Wheeler*; Minnesota, *Arthur* B 264.

Wet places, Maine, Canada to Minnesota and south to Pennsylvania.

2. *P. obtusa* (Muhl.) Kuntze, Rev. Gen. Pl. 783 (1891). *Poa obtusa* Muhl. Gram. 147 (1817). *Glyceria obtusa* Trin. Mem. Acad. St. Petersb. (VI.) 1: 366 (1831).

An erect stout perennial, 30-70 cm. high. Sheaths mostly longer than the internodes; ligule firm, less than 1 mm. long; blades of the culm 6-7, besides those of sterile shoots, scabrous above, thick, flat or the margins involute, 15-30 cm. long, 4-7 mm. wide. Panicle erect, rigid, narrowly oblong, dense, 8-12 cm. long, rays numerous, very short. Spikelets 4-8 mm. long, ovate, 3-6-8-flowered, joint of rachilla about 0.5 mm. long; empty glumes nearly equal when separated and measured, 2.2 mm. long, ovate, 1-nerved; floral glume concave, coriaceous, 3.5 mm. long, oblong before spreading, indistinctly 7-nerved; palea firm, oval before spreading, nearly as long as its glume. Grain nearly 2 mm. long, roughened, compressed, oval, pointed at the base.

Massachusetts, *W. P. Conant*, *R. J. Congden*, *Sturtevant*; New Jersey, *Scribner* for U. S. Dept. Agricul. 690, *Clark* 1918, *Canby*, *Scribner* 3466, *Dr. J. B. Brinton*, *Beal* 113.

Low grounds, New England to North Carolina, near the coast. A striking plant, when once seen not soon forgotten.

3. *P. elongata* Torr. Kuntze, Rev. Gen. Pl. 783 (1891). *Poa*

elongata Torr. Fl. U. S. 1:112 (1824). *Glyceria elongata* Trin. Bull. Sci. Acad. St. Petersb. 1:68 (1836).

A slender perennial, 60–90 cm. high. Sheaths closed, about the length of the internodes; ligule 1 mm. long; blades 7–8 in number, smooth or scabrid, flat, 20–30 cm. long, 3–4 mm. wide. Panicle exerted, slender, recurving, 20–30 cm. long, rays single or in pairs, distant, appressed, the longest 5–8 cm. long, spikelike. Spikelets 4–5 mm. long, 3–4-flowered, oval or oblong, rachilla brittle, a joint 0.7 mm. long; empty glumes ovate-lanceolate, 1-nerved, almost keeled, first 1.5–2 mm. long, second 2–2.5 mm. long; floral glume oval, sub-acute or obtuse, 7-nerved, 2.7–3.3 mm. long; palea spatulate-oblong, apex obtuse, entire, about the length of its glume.

New Brunswick, *J. Vroom*; Maine, *Fernald* 189; Vermont, *Pringle*, *Hosford*, *C. E. Faxon* 10.

Wet woods from Canada, New England to Minnesota.

4. *P. pallida* (Torr.) Kuntze, Rev. Gen. Pl. 783 (1891). *Windsoria pallida* Torr. Cat. Pl. N. Y. 91 (1819). *Glyceria pallida* Trin. Bull. Sci. Acad. St. Petersb. 1:68 (1836). *Poa dentata* Torr. Fl. U. S. 1:107 (1824); Torr. Fl. N. Y. 2: t. 155 (1843).

A pale slender ascending perennial, 30–60 cm. high, from a creeping base. Sheaths about the length of the internodes; ligule 3–5 mm. long; blades 4–6, flat, pale, usually smooth, sharp-pointed, 10–15 cm. long, 3–4 mm. wide. Panicle often included at the base, open, linear or oval, 10–13 cm. long, rays mostly in pairs, subequal, the longest 5–8 cm. long, flower-bearing for the upper two-thirds. Spikelets 4–6 mm. long, 5–9-flowered, oblong-linear, joint of rachilla 0.7 mm. long; empty glumes ovate or oval, first 1.5 mm. long, 1–2–3-nerved, second 3–4-nerved, 1.5–2 mm. long; floret scabrid, oblong, contracted or pinched near the apex, floral glume 2.5–3 mm. long, oval when spread, 7-nerved, marginal nerves obscure, apex irregularly toothed; palea linear, scabrid on the keels, as long as its glume or a little longer.

Vermont, *Pringle*; Massachusetts, *Cooley*; Michigan, *Farwell*, *Clarke* 2054, *Beal* 114, *Wheeler*.

Shallow water in margins of ponds.

Virginia and Tennessee to Maine, Michigan, and northward.

A form in northern Michigan is more robust; blades 6-8 mm. wide, panicle 15-18 cm. long, rays in threes.

5. *P. nervata* (Willd.) Kuntze, Rev. Gen. Pl. 783 (1891). *Poa nervata* Willd. Sp. Pl. 1: 389 (1797). *G. Michauxii* Kunth, Rev. Gram. 1: 118, 343, t. 85 (1829). *Glyceria nervata* Trin. Mem. Acad. St. Petersb. (VI.) 1: 365 (1831).

Perennial; culms usually rather slender, sometimes robust, 60-120 cm. high. Sheaths often scabrous, variable in length; ligule 2 mm. long; blades 5-7 in number, variable, flat, often scabrous above, 15-30 cm. long or more, 3-10 mm. wide. Panicle exserted, erect when young, at length diffuse and pendulous, 10-20 cm. long, rays in twos and threes, the longest two-thirds as long as the panicle. Spikelets ovate-oblong, 4-5 mm. long, 4-7-flowered, often purple; rachilla 0.5 mm. long, very brittle and soon separating, a joint 0.5 mm. long; empty glumes variable, first 1-nerved, 1 mm. long, second 1-1.5 mm. long; floral glume 1.7-2 mm. long, scabrid, strongly convex near the obtuse apex, 7-nerved; palea elliptical, often incurved, about as long as its glume.

Vermont, *Pringle*; Massachusetts, *Beal*; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 689; Michigan, *Cooley*, *Dr. Clarke* 708, 2054, *Beal* 14, *Wheeler*, *Farwell*, *Wood*; Minnesota, *Arthur* B 103, B 249, 349, *Sandberg* 14, 507; Montana, *Anderson* 66, *Williams*; Washington, *Lake*; Oregon, *Howell*.

It thrives on wet land from the Atlantic to the Pacific. In some places known as "fowl meadow-grass"; a name more appropriate for *Poa flava* (*serotina*).

6. *P. laxa* Scribn. Bull. Torr. Club, 37 (1894).

A stout perennial, 60-120 cm. high. Leaves scabrous throughout, sheaths slightly compressed, mostly longer than the internodes; ligule 2 mm. long; blades 5-6 in number, flat, acuminate, 16-40 cm. long, 6-8 mm. wide. Panicle exserted, oval, 18-24 cm. long, rays scabrous, mostly in twos and threes, the longest nearly two-thirds as long as the panicle, flower-bearing on the outer half. Spikelets green or tinged with purple, broadly oval, 3-5-flowered, 4-5 mm. long; empty glumes ovate, first 1.3 mm. long, second 1.5

mm. long; floral glume broadly oval when spread, 2-2.3 mm. long, 7-nerved; palea nearly as long as its glume, incurved. Spikelets smaller, less turgid and greener than those of *P. Canadensis*.

Maine (Mt. Desert, Seal Harbor), *J. H. Redfield* in 1894.

7. *P. Americana* (Torr.) MacMillan, *Metasp.* Minn. 1:81 (1892). *Poa aquatica* var. *Americana* Torr. Fl. U. S. 1:108 (1824). *G. aquatica* J. E. Smith, *Engl. Fl.* 116 (1824), not Wahl. *G. grandis* S. Wats. A. Gray, *Man. Ed.* 6, 667 (1890). *Panicularia aquatica* (L.) Kuntze, *Rev. Gen. Pl.* 782 (1891).

A robust perennial, with creeping rootstocks; culms 90-150 cm. high. Sheaths mostly shorter than the internodes; ligule 2-3 mm. long; blades 4-5 in number, flat, smooth or scabrid, 30-60 cm. long, 8-15 mm. wide. Panicle oblong or oval, 20-40 cm. long, rays numerous, ascending, nodding, bearing many spikelets. Spikelets oblong or linear-oblong, usually purplish, 5-9-flowered, 4-6 mm. long, joint of rachilla 0.7 mm. long; empty glumes oblong or oval, acute or obtuse, 1-nerved, first 1.5-2 mm. long, second 2.5-3 mm. long; floral glume oval, 2.5 mm. long, 7-nerved, apex truncate, obtuse, often denticulate under a lens; palea elliptical, 2-toothed, nearly 2.5 mm. long.

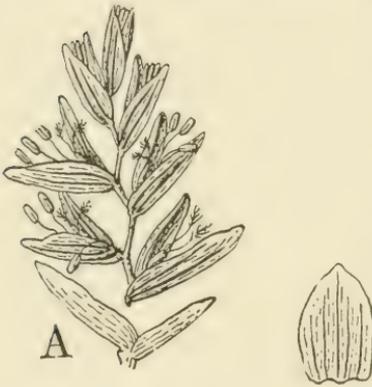


FIG. 114.—*Panicularia Americana*. Spikelet. (Richardson).

Massachusetts, *Beal* 115; Michigan, *Cooley, Clark* 2055; Minnesota, *Arthur* B 97, B 263; Montana, *Anderson* 70; Colorado, *Cassidy*; Dakota, *Duffey*; Wyoming, *Buffum* C 52.

Wet grounds, Canada to Montana, New Mexico, Northern States to Tennessee.

8. *P. pauciflora* (Presl) Kuntze, *Rev. Gen. Pl.* 783 (1891). *Glyceria pauciflora* Presl, *Rel. Hænk.* 1:257 (1830).

A robust perennial, 30-120 cm. high, from creeping rootstocks. Sheaths shorter than the internodes, or longer, in small plants; lig-

ule broad, obtuse, 5-7 mm. long; blades about 6 in number, smooth or scabrous below and on the margins, 12-30 cm. long, 6-15 mm. wide. Panicle loose, oval, 15-20 cm. long, rays in twos and threes, flower-bearing from near the middle. Spikelets elliptical, 4-6 mm. long, 4-6-flowered, joint of rachilla 0.7 mm. long; first empty glume elliptical, 1-1.3 mm. long, 1-nerved, acute, the apex denticulate, second rhombic-oval, nearly 2 mm. long, 3-nerved; floral glume 2-3 mm. long, 5-nerved, scabrid, sometimes with one more obscure nerve on either side, often broadly oval, obtuse, irregularly toothed; palea but little shorter than its glume.

Montana, *Williams*; Washington, *Suksdorf* for U. S. Dept. Agricul. 63, *Lake, Howell* in 1886.

British America to California.

9. *P. fluitans* (L.) Kuntze, 782 (1891). *Festuca fluitans* L. Sp. Pl. 75 (1753). *Poa fluitans* Scop. Fl. Carn. Ed. 2, 1: 73 (1772). *Glyceria fluitans* R. Br. Prodr. 179 (1810). *Devauxia fluitans* Beauv. Kunth, Enum. Pl. 1: 367, in Syn. (1833). *Hydrochloa distans* Hartm. Gram. Skand. 8 (1819). *Parroteranthe Drummondii* Steud. Syn. Fl. Gram. 287 (1855). *Glyceria acuminata* Schur, Enum. Pl. Transs. 781 (1866). *Glyceria declinata* Breb. Fl. Norm. Ed. 3, 354. *Glyceria denticulata* Dum. Obs. Gram. Belg. 107 (1823). *Glyceria hybrida* Towns. Trans. Bot. Soc. Edinb. 4: 27 (1853). *Glyceria integra* Dum. l. c. *Glyceria loliacea* Godr. Fl. Lorr. 3: 168 (1862). *Glyceria pedicellata* Towns. Ann. & Mag. Nat. Hist. (II.) 5: 105 (1850). *Glyceria plicata* Fries, Mant. 3: 176. *G. spicata* Guss. Fl. Sic. Syn. 2: 784 (1845).

Perennial, with creeping rootstock; culms 60-150 cm. high. Sheaths smooth, compressed; ligule broad, lacerate, 4-7-10 mm. long; blades 5-6, flat, usually smooth, often floating, 15-25 cm. long, 3-7-15 mm. wide. Panicle usually narrow, loose, 30-60 cm. long, rays mostly in threes and erect, the longest usually about 10 (rarely 20) cm. long, bearing few spikelets. Spikelets pale, terete, except when in flower, erect, 1.5-2.5 cm. long, 6-20-flowered, joint of rachilla 1.3 mm. long; empty glumes obtuse, hyaline or membranous, 1-nerved, first 2-3.5 mm. long, ovate to linear, second elliptical, 2.5-5 mm. long; floral glume scabrid, oblong, 2.5-5

mm. long, 7-nerved, apex subacute to truncate, entire, slightly denticulate or obscurely lobed; palea narrow, 2-toothed, about 3.5 mm. long.

Vermont, *Pringle*; Massachusetts, *Beal* 119; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 685; Michigan, *Dr. Clark* 207, *Cooley*, *Beal* 116, 117, *Wheeler*, *Farwell*; Illinois, *Beal* 118; Minnesota, *Arthur* X 5, B 20; Oregon, *Howell*.

Found in shallow water in temperate regions of North America, Europe, northern Africa, western Siberia, Himalaya, and Australia. The Australian plant has narrow blades; so have plants (No. 45) of Nat. Hist. Surv. of Minn. In the latter they are often conduplicate. The floral glume of a plant from Berlin, Germany, is 5.5 mm. long, while one from Minnesota is 3.5 mm. long. The blades of the plants from Niles, Michigan, and one from Oregon are scabrid.

10. *P. acutiflora* (Torr.) Kuntze, Rev. Gen. Pl. 782 (1891).
Glyceria acutiflora Torr. Fl. U. S. 1:104 (1824).

Perennial, with creeping rootstocks; culms 60–120 cm. high. Sheaths smooth, compressed; ligule about 6 mm. long; blades of the culm about 4 in number, erect, nearly smooth, flat, 10–12 cm. long, 3–4 mm. wide. Panicle included at the base, simple, slender, loose, 20–30 cm. long, lowest rays in pairs, one very short, the other 2 cm. long, beside the single spikelet. Spikelets erect, pale, terete, 2–3 cm. long, 7–13-flowered, joint of rachilla 3 mm. long; empty glumes linear-lanceolate, 1-nerved, first 4 mm. long, second 6 mm. long; floral glume scabrid, oblong-lanceolate, usually acute, 7–8 mm. long, 7-nerved; palea lanceolate, 8–9 mm. long, 2-toothed, scabrous on the keels.

Massachusetts, *Dr. Sturtevant*; Pennsylvania, *Scribner* 248, *Martindale*.

Wet places, Maine to Tennessee; rather rare.

132. (259 a). *ATROPIS* Rupr. Fl. Samoj. [Beitr. Fl. Russ. Reich. 2:] 64 (1845). *Hydrochloa* Hartm. Gram. Skand. 8 (1819), not Beauv. *Puccinellia* Parl. Fl. Ital. 1:366 (1848).

Spikelets 2–9-flowered in a panicle usually contracted after flowering, rachilla articulate between the flowers. Empty glumes

3-nerved or the first 1-nerved, much shorter than the florets; floral glume usually chartaceous, rarely herbaceous, convex on the back, sometimes slightly keeled, obscurely 5-nerved, the midnerve often reaching the denticulate apex or extending as a mucro, the lateral nerves all vanishing at some distance below the broad scarious apex; palea with converging ciliolate nerves, 2-toothed. Stamens 3. Styles short, the stigmas nearly sessile, short, slightly branched. Grain more or less obcompressed, enclosed, but not adherent, obscurely grooved.

Perennials or annuals, differing from *Poa* in the rounded floral glume and in the parallel nerves of the same, in the more or less scarious or chartaceous glumes, and from *Panicularia* in the obscure nerves of the floral glume, and the narrower and simpler nearly sessile stigmas.

- | | | |
|----|--|-----|
| A. | First glume 1-nerved. | (a) |
| a. | Ligule 1.5 mm. long, rays in sets of 2, floral glume 2.5-3.5 mm. long. | 1 |
| a. | Ligule 1-2 mm. long, rays 3-5, floral glume 2.5-3 mm. long. | 2 |
| a. | Ligule 2-3 mm. long, rays 4-9, floral glume 2.7-3.2 mm. long. | 3 |
| a. | Ligule 2 mm. long, floral glume 3.2-4.2 mm. long. | 4 |
| a. | Ligule 2-3 mm. long, rays 2, floral glume 5-5.5 mm. long. | 5 |
| a. | Ligule 2 mm. long, rays 1-3, floral glume 3 mm. long. | 6 |
| a. | Ligule 3-4 mm. long, rays 2-7, floral glume 2.7-4 mm. long. | 7 |
| a. | Ligule 3-5 mm. long, rays 2-3, floral glume 4-5 mm. long. | 8 |
| B. | First glume 3-nerved. | (c) |
| c. | Ligule 2-3 mm. long, rays in sets of 1-3, floral glume 4-5.2 mm. long. | 9 |
| c. | Ligule 2 mm. long, floral glume 3.2-4.2 mm. long. | 4 |
| c. | Ligule 2-4 mm. long, rays 3-5, floral glume 4-5 mm. long. | 10 |
| c. | Ligule 2-3.5 mm. long, floral glume 5-5.5 mm. long. | 11 |

- c. Ligule 3 mm. long, rays 1-2, floral glume 2-2.5 mm.
long. 12
- c. Ligule 3-4 mm. long, rays 2-3, floral glume 3 mm.
long. 13
- c. Ligule 3-4 mm. long, rays 2-3, floral glume 3. 4.5
mm. long. 14
- c. Ligule 3.5 mm. long, rays 2-3, floral glume 4-5 mm.
long. 8
- c. Ligule 4-6 mm. long, rays 3-5, floral glume 3.5-4.5
mm. long. 15
- c. Ligule 4-6 mm. long, rays 3-5, floral glume 4-5 mm.
long. 16
- c. Ligule 5-12 mm. long, rays 2, floral glume 3-3.2 mm.
long. 17

1. **A. angustata** (R. Br.) Griseb. Ledeb. Fl. Ross. 4: 390 (1853).

Poa angustata R. Br. Parry's 1st Voy. Suppl. [err. typ. 187] 287 (1824). *Glyceria angustata* Fries, Mant. 3, 76 (1842).

A smooth soft tufted grass, 20-30 cm. high. Sheaths about the length of the internodes; ligule 1-5 mm. long; blades 2-3, erect, flat or conduplicate, 3-6 mm. long, about 2 mm. wide. Panicle often included at the base, lanceolate or ovate, 6-10 cm. long, rays mostly in pairs, the longest half the length of the panicle, flower-bearing on the upper half. Spikelets linear to oval, tinged with purple, 4-6-flowered, joint of rachilla 1 mm. long; empty glume oval to ovate-lanceolate, first 1-nerved, about 1.5 mm. long, second 2-3 mm. long; floral glume 2.5-3.5 mm. long, very slightly hairy towards the base, oval, obtuse or acute, mucronate or irregularly toothed; palea ciliolate on the keels, nearly as long as its glume.

Hudson Strait (Digge's Island), *R. Bell*; Alaska, *Harrington, Turner*; Oregon, *Howell*, collected on tide flats, Umpqua River, in 1888.

Alaska to Oregon and Hudson's Bay, Arctic Coast.

2. **A. DISTANS** (Host.) Rupr. Fl. Samoj. 64; Griseb. Ledeb. Fl. Ross. 4: 388 (1853). *Poa distans* L. Mant. 32 (1767). *Glyceria pumila* Vasey, herb. *Poa airoides* Nutt. Gen. 68 (1818). *Hydrochloa distans* Hartm. Gram. Skand. 8 (1819). *Glyceria distans*

Wahl. Fl. Ups. 36 (1820). *Puccinellia distans* Parl. Fl. Ital. 1: 367 (1850). *G. airoides* A. Gray, Proc. Acad. Sc. Phila. 336 (1863), and many other synonyms.

Perennial; culms geniculate at the base, ascending, 30–60 cm. high, without creeping rootstocks. Leaves 2–3 in number; ligule 1–2 mm. long; blades scabrid above, mostly flat or becoming involute, 5–10 cm. long. Panicle erect, oval or pyramidal, 10–20 cm. long, rays in half-whorls of 3–5, spreading or even deflexed from a curved thickened callus base, the longest 6–8 cm. long, flower-bearing from a little below the middle. Spikelets oblong or linear, 3–6-flowered, joint of rachilla slender, 0.7 mm. long; empty glumes membranous, rounded on the back, first 1-nerved, about 1 mm. long, second 3-nerved, about 2 mm. long; floral glume 2.5–3 mm. long, slightly pubescent below, tinged with purple, oval, obtuse or subacute; palea nearly or fully as long as its glume.

Bentham in “British Flora,” when comparing it with *G. maritima*, says: “The leaves are flatter, the stem taller and more slender, the panicle much more spreading, with long slender branches, and the spikelets smaller, the glumes not above a line long.” Dr. Thurber includes here *G. maritima* Wahl., *G. angustata* Griseb., *G. festuceiformis* Reich., *G. airoides* Thurb., *G. montana* Buckl.

Introduced along the coast.

Var. CONFERTA (Fries). *Glyceria conferta* Fries, Mant. 2: 10 (1842).

Stoloniferous, branches of the panicle scabrid, rachis not furrowed, spikelets crowded, smaller, florets 4–7, apex of floral glume 3-toothed. Intermediate between *A. maritima* and *A. distans*.

Found in western Europe. Introduced with ballast.

The above notes are adapted from Hooker’s Students’ Flora of British Islands.

3. **A. Lemmoni** (Vasey). *G. Lemmoni* Vasey, Grass. U. S. 43 (1885), name only.

A slender erect tufted perennial, smooth or nearly smooth throughout, 20–40 cm. high. Sheaths longer than the internodes: ligule rather firm, 2–3 mm. long; blades involute, filiform, those of the sterile shoots numerous, erect, 5–10 cm. long, those of the

culm 2-3, rigid, 1-6 cm. long. Panicle exserted, linear, oval or pyramidal, 6-10 cm. long, rays in half-whorls of 4-9, the longest 2-4 cm. long, and flower-bearing above the middle. Spikelets tinged with red, linear, 2-4-flowered, joint of rachilla 1 mm. long; empty glumes keeled, acute, 1-nerved, first 1-2 mm., second 2-3 mm. long; floral glume oval, abruptly pointed, 2.7-3.2 mm. long; palea linear, ciliolate or scabrid on the keels, as long or nearly as long as its glume.

Nearly allied to *A. distans*, and perhaps it should be included in that species.

Oregon (alkali flats), *Howell*; California, *Lemmon*.

Alkaline soils, Nevada, Oregon, and California.

4. **A. Suksdorfii** (Vasey). *Poa Suksdorfii* Vasey ined.

A densely tufted light-colored grass, 10-15 cm. long; no root-stocks. Ligule truncate, decurrent, 2 mm. long; blades of sterile shoots rigid, recurved, conduplicate, pungent-pointed, 5-7 cm. long, those of the culm erect and shorter. Panicle narrow, simple, spike-like, purplish, 2-5 cm. long. Spikelets linear-lanceolate, 1-3-flowered, 4-6 mm. long; empty glumes linear-lanceolate, first 3- (rarely 1) nerved, 3-4 mm. long; second a little longer; floral glume chartaceous, ovate when spread, 3.2-4.2 mm. long; palea ciliate on the keels.

Washington, *Suksdorf* 1116.

Gravelly places near glaciers. September.

5. **A. pulchella** (Vasey). *Poa pulchella* Vasey, Coult. Bot. Gaz. 7: 32 (1882).

Densely tufted, the decumbent base from much-branched root-stocks; culms slender, smooth, erect, 10-20 cm. high. Leaves of sterile shoots numerous, blades conduplicate, abruptly pointed, 2-4 cm. long, less than 1 mm. wide when spread, those of the culm 1-2 in number, 1-2 cm. long; ligule 2-3 cm. long. Panicle ovoid or pyramidal, 2-4 cm. long, with rays mostly in pairs, smooth, each bearing a single spikelet. Spikelets purplish, oval or linear, 3-5-flowered, 6-8 mm. long, joint of rachilla scabrid, 1.2 mm. long; empty glumes obtuse or acute, often erosely denticulate, broadly scarious-margined, first ovate-lanceolate, 1-nerved, second oval-lan-

ceolate, 3-nerved, 3.5 mm. long; floral glume 5-5.5 mm. long, 5-nerved [3-nerved Vasey], ovate-lanceolate, sometimes obtuse, scaberulous, not pubescent nor webbed at the base; the lateral nerves only extending half or two-thirds the way to the apex, and two of them obscure; palea curved, linear, 4.5 mm. long, 2-toothed, scabrous on the keels.

Allied to *Poa laxa* and *Poa arctica*.

Oregon, Howell, U. S. Dept. Agricul. 664, Suksdorf.

Oregon and Washington.

6. A. PROCUMBENS (Curtis) Thurb. S. Wats. Bot. Calif. 2:309 (1880). *Poa procumbens* Curt. Fl. Lond. fasc. 6:11 (1817-28). *Sclerochloa procumbens* Beauv. Agrost. 98 (1812). (*Glyceria procumbens* Dum. Obs. Gram. Belg. 145 (1823). *Festuca procumbens* Kunth, Rev. Gram. 1:129 (1829).

A stout tufted glaucous decumbent annual, 15-25 cm. high. Sheaths smooth, loose, longer than the internodes; ligule 2 mm. long; blades of the culm 3-4 in number, flat or becoming conduplicate, 2-5 cm. long, 2-4 mm. wide, scarious above. Panicle often included at the base, rather dense, ovate-lanceolate, 2-6 cm. long, rays stout, solitary or more often in twos or threes, erect or spreading, the longest 1-2 cm. long, bearing distichous spikelets. Spikelets subsessile, linear or lanceolate, 2-5-flowered, joint of rachilla 1.3 mm. long; empty glumes ovate or oval, first 1-nerved, 1-2 mm. long, second 3-5-nerved, 2-3 mm. long; floral glume 3 mm. long, pubescent below, oval, obtuse, erose-toothed or mucronate; palea ciliate, as long as its glume.

Pennsylvania (Philadelphia), Scribner 3473 a, from Dr. Brinton.

Introduced from Europe with ballast on the coast at various places.

7. A. MARITINA (Huds.) Griseb. Fl. Ross. 4:389 (1853). *Poa maritima* Huds. Fl. Angl. Ed. 1, 35 (1762). *Puccinellia maritima* Parl. Fl. Ital. 1:367 (1850). *Sclerochloa maritima* Reichenb. Fl. Exc. 36 (1830-2). *Glyceria maritima* M. & K. Deutsch. Fl. 1:588 (1823). *Diachroa maritima* Nutt. ex Steud. Nom. Ed. 2, 1:497 (1840). *Hydrochloa maritima* Hartm. Gram. Skand. 8 (1819), and many more synonyms.

A decumbent or erect perennial. 30-50 cm. high, with creeping rootstocks. Blades of sterile shoots 5-8 cm. long, 2-3 mm. wide; ligule 3-4 mm. long; blades of culm smooth, usually 3, mostly involute. Panicle erect, 8-12 cm. long, rays mostly in twos to sevens, erect or the lower ones spreading, the longest 6 mm. long; flower-bearing above the middle. Spikelets oblong or linear, turned to one side of the rays, 2-4-8-flowered, joint of rachilla 1.3 mm. long; empty glumes scarious, rounded on the back, first 1-nerved, 1.5-3 mm. long, second 3-5-nerved, 2-3.5 mm. long; floral glume 2.7-4 mm. long, slightly pubescent below, tinged with purple, oval, obtuse, or subacute; palea but little shorter.

Much like *A. distans*, which see. I have followed European authors in keeping them distinct, though perhaps they should be united.

Oregon, *Howell*; California, *Lemmon*.

S. A. Fendleriana (Steud.). *Eragrostis Fendleriana* Steud. Syn. Pl. Gram. 1: 278 (1855). *A. Californica* Munro, A. Gray, Proc. Acad. Sci. Phila. 336 (1862). *Poa andina* Nutt. S. Wats. in Bot. King's Exp. 388 (1871). *Poa Eatoni* S. Wats. Bot. King's Exp. 386 (1871). *Poa arida* Vasey, Contrib. U. S. Nat. Herb. 1: 270 (1893). *Poa lucida* Vasey, Contrib. U. S. Nat. Herb. 1: 274 (1893).

A strict scabrid densely tufted pale-green perennial, 30-50-70 cm high, usually diœcious, from short rootstocks. Blades of sterile shoots flat or conduplicate, 6-10 cm. long, 2 mm. wide; leaves of culm 2-3 in number, upper ligule 3-5 mm. long; blades conduplicate, 1-4-10 cm. long or reduced to a mucro. Panicle spikelike, lanceolate or slightly spreading, 5-10-15 cm. long, rays in twos or threes, the longest 3-6 cm. long, flower-bearing on the upper half. Spikelets ovate-lanceolate, flattish, pale green, often tinged with purple, 3-7-flowered, joint of rachilla 0.6-0.7 mm. long; empty glumes subequal, compressed, oval, acute, irregularly toothed or obtuse, first 1-3-nerved, 3-4-5 mm. long, second 5-5.5 mm. long; floral glume oblong, 4-5 mm. long, often denticulate at the apex, scabrous, a few short hairs at the base; palea lanceolate,

scabrous, as long as its glume or shorter. A very variable and puzzling species.

Oregon, *Howell*; California, *Pringle* in 1881, *Parish* 588.

Utah, Wyoming, Oregon, California, and vicinity.

9. **A. Nevadensis** (Vasey). *P. Nevadensis* Vasey, Bull. Torr. Club, 10:66 (1883).

An erect light-green or glaucous perennial, 50–80 cm. high; culms and leaves often scabrous, sometimes, if not always, dicecious. Second sheath from the top longer than the internode, or half as long on plants of the same height; ligule obtuse or acute, firm, 2–3 mm. long; blades conduplicate or flat, those of sterile shoots 10–30 cm. long, about 2 mm. wide, the point often long and narrow, those of the culm 2–3 in number, erect, the upper 5–20 cm. long. Panicle linear or slightly spreading, rather densely flowered, 10–20 cm. long, many of the rays single, but some near the middle in threes or fours, the longest 5–7 cm. long, flower-bearing on the upper third to two-thirds. Spikelets linear, linear-lanceolate or oval, 3–8-flowered, 6–12 mm. long, a long joint of rachilla, 1.3–1.7 mm. long; empty glumes scabrid, subequal, or the second usually the longer, 3-nerved, first ovate-lanceolate to elliptical, 3–5 mm. long, second oval-lanceolate to oval, 3.2–6 mm. long; floral glume scabrid, oval, narrowly elliptical, with a few short hairs at the base, purple and yellowish brown above, 4–5.2 mm. long, apex often erose and with a mucro, the 4 lateral nerves extending two-thirds the distance from base to apex; palea linear, 2-toothed, scabrid, ciliate on the keels, 3.5–4.2 mm. long. The above is the result of careful measurements in all the details of nine different plants; no two are alike in all important respects. I must either make each a variety, or rather prefer for the present to make no varieties. It shades off into *A. lævis*.

Montana, *Scribner* for U. S. Dept. Agricul. 658, *Williams* 579; Nevada, *Jones*; Oregon, *Howell*.

Utah, Nevada, Montana to Oregon.

10. **A. lævis** (Vasey). *Poa lævis* Vasey, Contrib. U. S. Nat. Herb. 1:273 (1893), not Borb. (1877).

A tufted rather slender perennial, 30–80 cm. high, with creep-

ing rootstock. Blades of sterile shoots flat or conduplicate, scabrous above, holding their width to near the pungent apex, 10-30 cm. long, 3-4 mm. wide, those of the culm 2-3 in number, 5-10 cm. long; ligule 2-4 mm. long. Panicle thin, open, ovate-lanceolate or linear when in fruit, 12-20 cm. long, rays scabrous, slender or rather stout, the middle ones in threes, fours, or fives, the longest 4-6 cm. long, flower-bearing on the upper third or half. Spikelets oval or ovate-lanceolate, 3-5-flowered, 5-7 mm. long; empty glumes subequal, thin, scabrid, 4-5 mm. long, 3-nerved, linear-lanceolate, each nearly covering the floral glume above it; floral glume 4-5 mm. long, scarios or puberulous, ovate or oval, acute or obtuse, a few short hairs near the base; palea 4 mm. long, linear, scabrid on the keels, 2-toothed. It shades off into *A. Nevadensis* and *A. Fendleriana*.

Colorado, *Vasey* 653, *Letterman* 13, 15, 54, etc.; Montana, *Scribner*, *Williams* 578, *Anderson* 41; Nevada, *Tracy*; Washington.

Var. **rigida**. Leaves of sterile shoots numerous, rigid, 20-40 cm. long.

Utah, *Jones*.

Distributed as *P. tenuifolia*.

11. **A. Pringleii** (Scribn.). *Poa Pringleii* Scribn. Bull. Torr. Club, 10: 31 (1883). *Poa Pattersoni* Vasey, Contrib. U. S. Nat. Herb. 1: 275 (1893).

A densely tufted strict glabrous perennial, 15-20 cm. high, from creeping rootstocks. Sterile shoots numerous, the blades 3-5 cm. long, conduplicate, curved, smooth, 7-10 mm. diam., the apex obtuse; leaves of the culm 1, starting below the middle of the culm; ligule 2-3.5 mm. long; blades 5-12 mm. long, apex pungent or obtuse. Panicle linear, strict, 2-3 cm. long, bearing few spikelets. Spikelets brown and purplish, 5-7 mm. long, 3-5-flowered, linear-lanceolate; empty glumes broadly lanceolate, about 5 mm. long, 3-nerved below, margins scarios, broad, subequal; floral glume elliptical-lanceolate, 5-5.5 mm. long, minutely punctulate-scabrous throughout; palea one-fourth shorter than its glume, 2-toothed, ciliate on the keels. Spikelets variable, of a membranous or char-

laceous appearance, apparently dioecious, the staminate plant the more slender, with more acute florets.

California, *Pringle* in 1882.

Mountains about the head-waters of the Sacramento River.

12. **A. Lettermani** (Vasey). *Poa Lettermani* Vasey, Contrib. U. S. Nat. Herb. 1:273 (1893):

A dwarf tufted perennial, 4-10 cm. high. Sheaths loose; upper ligule 3 mm. long acute, laciniate; blades conduplicate, 1-2.5 cm. long, 1.5 mm. wide, abruptly pointed. Panicle linear, 1-2.5 cm. long, rays in pairs or single. Spikelets tinged with purple and brown, oval, 3-3.5 mm. long, 2-4-flowered, empty glumes subequal, extending nearly to the tip of the upper floret, elliptical-lanceolate. 3-nerved; floral glume 2-2.5 mm. long, minutely scabrid, broadly oval when spread, denticulate; palea but little shorter than its glume.

Colorado (Gray's Peak), *Letterman* in 1885, *Jones*. Collected 12,500 feet altitude on the mountains.

13. **A. pauciflora** Thurb. S. Wats. Bot. Calif. 2:310 (1880). *Poa pauciflora* Benth. Vasey, Cat. Grass. U. S. 42 (1885).

A pale-green tufted perennial, 60-75 cm. high. Blades of sterile shoots about 30 cm. long, 2-3 mm. wide, conduplicate, scabrous, pungent-pointed, leaves of the culm 2-3 in number; ligule 3-4 mm. long, wider than the blades, the upper blade 3-7 cm. long, 3-4 mm. wide. Panicle 12-30 cm. long, linear, rather thin, interrupted below, rays mostly in twos and threes, 3-7 mm. long, branching, flower-bearing to near the base. Spikelets 1-2-flowered; sometimes with a rudiment of a third; empty glumes subequal, smooth, first 3-nerved, 3-3.5 mm. long; floral glume 3 mm. long, scabrid, oval; palea as long as its glume.

California, *Bolander*, growing in wet meadows.

14. **A. tenuifolia** Thurb. S. Wats. Bot. Calif. 2:310 (1880). *Poa tenuifolia* Buekl. in Proc. Acad. Sci. 96 (1863), not Rich. (1851). *Poa Sheldoni* Vasey, Contrib. U. S. Nat. Herb. 1:276 (1893).

A strict slender tufted perennial, 40-60 cm. high, usually glabrous and tinged with brown or pink. Ligule acute, 3-4 cm. long; blades conduplicate, those of the sterile shoots 5-15 mm. long, 1-2

mm. wide, apex abruptly pointed, those of the culm 2 in number, 0.5–5 cm. long. Panicle erect, rarely spreading, 5–15 cm. long, rays in twos or threes. Spikelets rather firm, 5–8 mm. long, 2–5- (mostly 3-) flowered, pubescent, elliptical-lanceolate, joint of rachilla 1–1.5 mm. long; empty glumes obtusely keeled, 3-nerved near the base, first linear-lanceolate, about 3 mm. long, second elliptical-lanceolate, about 4 mm. long; floral glume 3.5–4.5 mm. long, elliptical or linear-oblong, acute or obtuse, entire or erose, bluntly keeled or almost round on the back, pubescent on the lower third, puberulent above; palea linear, 2-toothed, 3.5 mm. long, minutely scabrous on the back and keels.

Dr. Vasey, after prolonged study of large numbers of specimens, found them very variable and perplexing, and says in *Coult. Bot. Gaz.* 6: 297 (1881): "It may well be conjectured that Nature is now engaged in the work of differentiation, and that in process of time the lines will become more sharply defined, and several new species established."

Montana, *Scribner* 396, and for *U. S. Dept. Agricul.* 670, *Tweedy* 632, 637; Oregon, *Howell*.

Rocky Mountains to California.

Var. *stenophyla* Vasey, ined.

Panicle slender, open, first glume 4 mm. long, second 5 mm. long; floral glume 5 mm. long; the latter minutely scabrid below or smooth; palea 4.7 mm. long.

Oregon, *Howell* in 1887.

Montana, Oregon, and California.

15. **A. Canbyi** (Scribn.). *Glyceria Canbyi* Scribn. Bull. Torr. Club, 10: 77, t. (1883).

An erect smooth stout perennial, 60–90 cm. high, culms simple. Sheaths shorter than the internodes; ligule broad, obtuse, 4–6 mm. long; blades of the culm 3–4 in number, flat below, conduplicate above, scabrous, the upper about 15 cm. long, 4–6 cm. wide. Panicle exserted, linear or lanceolate, usually interrupted below, about 15 cm. long,



FIG. 115.—*Atropis Canbyi*. Spikelets. (Scribner.)

rays 3-5 in half-whorls, erect or ascending, densely flowered, the longest 4-8 cm. long. Spikelets 3-5-flowered, the longest joint of rachilla 1 mm. long; empty glumes oval, acute or obtuse, almost keeled, 3-nerved, first 2-3 mm. long, second 3-4 mm. long; floral glume oval, scabrous, 3.5-4.5 mm. long, 5-nerved, apex acute, often irregularly toothed; palea 3.5 mm. long, narrow, 2-toothed, shortly ciliate on the nerves. Allied to *A. tenuifolia* Thurber.

Scribner 73 from Tweedy; Washington (Cascade Mountains), *Brandegee* 645, 1190.

16. **A. unilaterale** (Scribn.). *Poa unilaterale* Scribn. ined.

A tufted glaucous perennial, 20-30 cm. high, from ascending bases; culms smooth, rather stout. Ligule acute, 4-6 mm. long; blades of sterile shoots flat or conduplicate, soft, flexuose, 8-12 cm. long, 2 mm. wide, those of the culm 2 in number, the blades shorter and wider. Panicle spikelike, dense, oval-lanceolate, 5-6 cm. long, rays stout, very short, in threes, fours, or fives. Spikelets oval or linear, 5-7-flowered, 7-10 mm. long, joint of rachilla 1 mm. long; empty glumes oval, obtuse or mucronate, subcarinate; first 3-nerved, 3.5-4 mm. long, second 3-5-nerved, 4-5 mm. long; floral glume 4-5 mm. long, nearly smooth, chartaceous, subcarinate, oval, abruptly or irregularly acute, mucronate; palea linear, 4-5 mm. long. Grain nearly terete, 2.5 mm. long, including the spongy apex.

California (Santa Cruz), *C. L. Anderson*.

17. **A. scabrella** Thurb. S. Wats. Bot. Calif. 2:310 (1880). *Poa scabrella* Vasey, Cat. Grass. U. S. 84 (1885).

A slender perennial, 40-70 cm. high, scabrid. Blades of sterile shoots flat or conduplicate, 12-20 cm. long, 1-2 mm. wide, curved; leaves of the culm 2-3, ligule 5-12 mm. long, acute; blades 5-7 cm. long. Panicle narrow, 12-15 cm. long, rather dense, rays in pairs, the longest 5-7 cm. long, branching and mostly flower-bearing to the base. Spikelets 5-6 mm. long, 3-5-flowered, joint of rachilla 1 mm. long; empty glumes 3-nerved, first about 2.5 mm., second about 3 mm. long; floral glume 3-3.2 mm. long, oval, rough-hairy on the lower part of the nerves, apex denticulate, often mucronate; palea but little shorter.

Lower California, *Miss F. E. Fish* for Nat. Mus.

California and Lower California, and probably in Mexico.

133. (260). **FESTUCA** L. Sp. Pl. 73 (1753). *Amphigenes* Janka, Linnæa 30: 619 (1859-60). *Castellia* Tineo, Pl. Rar. Sic. 17 (1817). *Catapodium* Link, Hort. Berol. 1: 44 (1827). *Chloamnia* Rafin. Neogenyt. 4 (1825). *Distomischus* Dulac, Fl. Hautes-Pyr. 91 (1867). *Drymonætes* Ehrh. Beitr. 4: 147 (1789). *Festucaria* Link, Linnæa, 17: 398 (1843). *Gouinia* Fourn. Benth. & Hook. f. Gen. 3: 1178 (1883). *Helleria* Fourn. l. c. 1199 (1883). *Loretia* Dural.-Jouv. Rev. Sc. Nat. (II.) 2: 38 (1880). *Micropyrum* Link. Linnæa, 17: 397 (1843). *Mygalurus* Link, Enum. Hort. Berol. 1: 92 (1821). *Nordurus* Reichb. Nom. 39 (1841). *Prosphysis* Dulac, Fl. Hautes-Pyr. 67 (1867). *Schedonorus* Beauv. Agrost. 99. t. 19. f. 2 (1812). *Sclerochloa* Reichb. Ic. Fl. Germ. 1: 23. t. 58 (1834). *Scleropoa* Griseb. Spicil. Fl. Rumel. 2: 431 (1844). *Synaphe* Dulac, Fl. Hautes-Pyr. 90 (1867). *Vulpia* C. C. Gmel. Fl. Bad. 1: 8 (1805). *Zerna* Panz. Denkschr. Akad. Muench. 296 (1814), in part.

Spikelets 2-many-flowered, pedicellate, variously paniculate, rachilla articulate under the floral glumes and between the florets. Empty glumes persistent, narrow, usually acutely keeled, more or less unequal, first 1-nerved, second usually 3-nerved; floral glumes narrow, membranous, chartaceous, acute or tapering into an untwisted awn or rarely obtuse, rounded on the back below, often keeled above, faintly 5-nerved; palea a little shorter, narrow, with two prominent keels. Stamens 1-3. Ovary glabrous or pilose at the apex. Styles very short, distinct. Grain enclosed in the glume and palea and more or less adherent. Mostly perennial grasses, usually tufted, low or tall, blades flat or conduplicate. Panicle sometimes narrow, secund and strict, sometimes open and nodding. The genus is very widely spread over the globe, especially in temperate or mountainous regions. There are about 80 well-marked species, though some authors have extended the number to 230 species.

The genus is one as to whose limits botanists are the least agreed. It is generally distinguished by having the floral glumes round, without any prominent keel at least at the base, and acute

or awned at the end, and by the glabrous grain adhering to the palea. But there are exceptions to each of these characters; some species run very much into *Poa* and *Atropis*, others into *Bromus*.

If we had only European species, *Vulpia* might well have been retained as a genus; but in some of the South American species the panicle is loose, the awn sometimes very short and the inflorescence rather that of *Eufestuca*. Bentham proposed as sections the following:

1. *Vulpia* (Gmel. as a genus).

2. *Eufestuca*. Panicle loose, spreading or narrow, empty glumes nearly equal, floral glumes acute or mucronate; stamens 3, anthers and stigmas projecting from the glumes at the time of flowering; perennials.

3. *Schedonorus* (Beauv. as a genus). Panicle loose, narrow or spreading, glumes awnless and the grain quite free from the palea.

4. *Catapodium* (Link, as a genus). Inflorescence nearly simple, like that of *Hordea*, but the rachis not notched, and the spikelets not quite sessile, the lower ones often two or three together on a very short branch.

5. *Scleropoa* (Griseb. as a genus).

I have nearly followed E. Hackel in the selection and use of the sections of *Festuca*, believing them preferable to those given by Bentham or others.

- A. VULPIA. *Leaf-blades soft, thin, involute. Panicle secund, usually narrow and dense, empty glumes usually very unequal, the first 1-nerved, second 3-nerved, floral glumes awned, 5-nerved. Stamens usually 1-2. Anthers and stigmas remaining within the glume and palea at time of flowering. Ours are annuals.* (a)
- a. Spikelets 1-5-flowered, floral glume 4-7 mm. long. 1
- a. Spikelets 5-8-flowered, floral glume 4-6 mm. long. 2
- a. Spikelets 7-13-flowered, floral glume 3-4 mm. long. 3
- B. SCLEROPOA. *Leaf-blades thin, flat. Panicle secund, rays short, rigid, bearing few almost sessile spikelets, floral glumes subcarinate toward the apex, awnless, hilum punctate. Annuals.* 4

- C. BOVINÆ Hack. *Ligule very short, truncate, throat of sheath often falcate-auriculate, blades usually all flat, rarely subconvolute. Ovary obovoid, glabrous. Grain often adherent to glume and palea.*
- a. Arctic grasses, small. 5
 - a. Not arctic, larger. (b)
 - b. Upper ligule 1-2-5 mm. long, floral glume 6-8 mm. long. 6
 - b. Upper ligule 1 mm. long, or less. (c)
 - c. Floral glume 4 mm. long, coriaceous, obscurely nerved. 7
 - c. Floral glume 5 mm. long, chartaceous, obscurely nerved. 8
 - c. Floral glume 5-9 mm. long, not coriaceous. (d)
 - d. Floral glume 6-8 mm. long, scabrid, awn 8-12 mm. long. 9
 - d. Floral glume 8-9 mm. long, scabrous, short awned. 10
 - d. Floral glume 7-8 mm. long, scabrous, short awned. 11
 - d. Floral glume 6 mm. long, scabrous, short awned. 12
 - d. Floral glume 6-7 mm. long, scabrid toward the apex, rarely awned. 13, 14
 - d. Floral glume 5-7 mm. long, awn 5-12 mm. long. 15
- D. OVINÆ Hack. *Ligule very short, truncate, usually biauriculate, blades all conduplicate or those of the culm more or less flattened. Ovary obovate-oblong, glabrous, or the apex rarely thinly hispid. Grain adhering closely to floral glume and palea.* (e)
- e. Ligule very short, symmetrically biauriculate, blades more than 2 cm. long, all conduplicate, in transverse section, oval to oblong or cuneate, oblong. Ovary very smooth. (m)
 - m. Leaves of culm 2-3. 16

- m. Leaves of culm 4-5. 17
- c. Ligule 1-2 mm. long, biauriculate, blades of the culm 1-2 cm. long, rigid, curved, setaceous. Ovary obovate, glabrous. 18
- e. Ligule minutely biauriculate, blade conduplicate, subsetaceous, in transverse section obtusely six-angled. . . 19
- e. Ligule symmetrically biauriculate, blade involute or conduplicate. (n)
- n. Apex of ovary pubescent. 20, 21
- n. Apex of ovary glabrous. (k)
- k. Rays single. 22
- k. Rays in twos, threes, or fours. 23, 34
- e. Ligule of culm-leaves inequilaterally biauriculate. . . (o)
- o. Blades filiform, involute. 25
- o. Blades usually flat, rarely conduplicate, 2 mm. diam. . . 26
- e. Ligule of culm-leaves auriculate on one side, blades often of two forms. 27

1. **F. microstachys** (Monro) Nutt. Journ. Acad. Phila. N. S. 1: 187 (1847). *Vulpia microstachya* Munro, Benth. Pl. Hartw. 342 (1839-57).

Culms slender, erect, 10-40 cm. high. Sheaths shorter than the internodes, smooth or pubescent; ligule 0.5 mm. or less in length; blades 2-4, erect, slender, 3-8 cm. long. Panicle erect, racemose or spicate, 3-9 cm. long, rays stiff, channelled, single or some of the lowest in pairs, erect, spreading or deflexed, the longest 1-3 cm. long bearing 1-8 spikelets. Spikelets 1-5-flowered on clavate pedicels, joint of rachilla over 1 mm. long; empty glumes involute, first 3-5 mm. long, second 5-8 mm. long; floral glume convex, involute, acuminate, scabrous, 4-7 mm. long, besides the awn, which is 6-10 mm. long; palea scabrous, bearing two short awns. Stamen 1. Very variable.

Oregon, *Howell*; California, *Jones*, *Orcott*.

Arizona to British America.

Var. *ciliata* A. Gray. Axis, rays of panicle, glumes and floral glume strongly ciliate.

Oregon, *Howell*; also found in California.

Var. *pauciflora* Scribn.; Vasey, Cat. Grasses U. S. 90 (1885), without description. Spikelets 1-2-flowered.

Oregon, *Howell*.

2. *F. MYUROS* L. Sp. Pl. 74 (1753). *Vulpia Myurus* Gmel. Fl. Bad. 1: 8 (1806).

Culms slender, smooth, geniculate or erect, 30-80 cm. high. Sheaths smooth, longer than the internodes; ligule less than 1 mm. long; blades of the culms 3-5 in number, erect, slender, 6-12 cm. long. Panicle narrow, 8-20-35 cm. long, rays scabrous, triquetrous in twos and threes below, appressed, the longest racemose, 6-12 cm. long. Spikelets on stout pedicels, linear, 5-8-flowered, 8-10 mm. long besides the awns, joint of rachilla a little more than 1 mm. long; first glume 2 mm. or much less in length, second involute, lanceolate, 4-6 mm. long; floral glume scabrous, involute, acuminate, 4-6 mm. long, besides the awn, 5-18 mm. long; palea lanceolate, scabrous on the keels, nearly as long as its glume, bearing 2 very short awns. Stamen 1.

Pennsylvania (Philadelphia, ballast grounds), *Scribner* 3503 from Burk; Virginia, *Curtiss*; Oregon, *Howell*; California (San Bernardino), *Parish* 6, 55.

Introduced from Europe and naturalized.

3. *F. octoflora* Walt. Fl. Car. 81 (1788). *F. bromoides* Michx. Fl. Bor. Am. 1: 66 (1803). *F. setacea* Poir. Encyc. Suppl. 2: 638 (1804). *F. tenella* Willd. Enum. 1: 113 (1809).

An erect slender annual or biennial, culms sparingly branched on large plants, 20-40 cm. high. Sheaths shorter than the internodes, sometimes pubescent; ligule about 1 mm. long; blades of the culm 2-5 in number, erect, slender, mostly 4-7 cm. long. Panicle simple, erect, 5-10 cm. long, narrow or spreading at the base, rays in pairs or single, the longest 2-4 (rarely 7), cm. long. Spikelets flat, oval, 6-10 mm. long, 7-13-flowered, often becoming brown when old, joint of rachilla 0.5-0.7 mm. long; empty glumes involute so as to appear subulate, first 3 mm. long, second about 4 mm. long; floral glume convex, involute, acuminate, scabrous, nerves obscure, 3-4 mm. long besides the awn, which is 1-7 mm. long; palea lanceolate, a little shorter than its glume. Stamens 2. Plants

in which the awns were 5-7 mm. long were called var. *aristulata* by Torrey, but florets are often long-awned, while others on the same plant are short-awned.

Massachusetts, *Dr. Cooley*; Michigan, *Dr. Cooley, Dr. Clark, Wheeler, Beal* 133; Illinois, *Beal* 132; Minnesota, *Holzinger* 16; Iowa, *Hitchcock*; Colorado, *Cassidy*; Montana, *Anderson* 22; Texas, *Reverchon* 1211, *S. Jenney, Jones* 3752, *Nealley*; Washington, *Lake*; Oregon, *Howell*.

Dry barren land, New England and Canada to Florida and the Pacific.

4. *F. RIGIDA* (L.) Kunth. Rev. Gram. 1:129 (1829). *Poa rigida* L. Cent. Pl. Rar. 1:5 (1755).

Culms slender, geniculate or erect, 10-40 cm. high. Sheaths smooth, shorter than the internodes; ligule about 3 mm. long; blades 3-4 in number, smooth, 5-15 cm. long, about 2 mm. wide. Panicle oblong, 4-9 cm. long, rays single, large, stiff, triquetrous, diverging, branching, the longest 1.5-2 cm. long. Spikelets linear-lanceolate, 5-12-flowered, 7-10 mm. long, joint of rachilla 1 mm. long; empty glumes ovate, oblong, acute or obtuse, first 1.5 mm. long, second 1.5-2 mm. long; floral glume scabrid, ovate-elliptical, 2.5-2.7 mm. long; palea nearly as long as its glume, short-ciliate on the keels, 2-toothed.

Introduced on ballast from Europe.

5. *F. Richardsonii* Hook. Fl. Bor. Am. 2:250, *t.* 230 (1840).

A tufted brown geniculate perennial, 15-20 cm. high. Blades of the sterile shoots flaccid, 3-8 cm. long; ligule very short; blades of the culm flat, the upper 10-15 mm. long, 2 mm. wide. Panicle dense, more or less interrupted, 3-4 cm. long; spikelets 6-12 in number, approximate, ovate on short pedicels, densely pilose. Spikelets 3-4-flowered, 6-7 mm. long; empty glumes oblong-ovate, unequal, obtuse; floral glume broadly ovate, yellowish purple, 5-6 mm. long, acuminate or with a short awn; palea hirsute on the keels.

Arctic coast, Alaska.

6. *F. confinis* Vasey, Bull. Torr. Club, 11:126 (1884).

A tufted stout rigid, light-green perennial, 40-120 cm. high.

Blades of sterile shoots half as long as the culm, with long slender points, leaves of the culm 2 to 3 in number; sheaths on small plants loose, shorter than the internodes; ligule truncate, 1-2-5 mm. long; blades 15 cm. long, 4-6 mm. wide, flat or involute, smooth or scabrous, panicle narrow, strict, 7-13 cm. long, rays in twos and threes, erect, the longest 2-3 cm. long, flower-bearing above the middle. Spikelets oblong or ovate-lanceolate, 6-10 mm. long, 3-5-flowered, joint of rachilla 0.7-1 mm. long; empty glumes chartaceous, first ovate, acute or obtuse, 3-4.5 mm. long, 1-nerved, second linear-lanceolate, 5-6 mm. long, 3-nerved; floral glume 5.5-8 mm. long, linear-lanceolate, scabrous, rather firm, subcarinate or round on the back, acute to acuminate, awnless; palea elliptical, obtuse, nearly as long as its glume, keels scabrous-ciliate. Grain with apex truncate and pubescent. Anthers 4.5 mm. long.

Dr. Vasey says: "This differs from *Poa* chiefly in the rigidity of the culms and the thicker, harsher, more rounded flowering-glumes."

Utah, *Jones* 1124, *Hayden*, *Tracy*; Yellowstone Park, *Tweedy*; Oregon (Stein's Mountain), *Howell* in 1885.

7. *F. nutans* Spreng. Fl. Hal. Mant. 34. *Poa nutans* Link, Enum. Hort. Berol. 1:86 (1827).

A tufted perennial, 60-120 cm. high. Sterile shoots few, leaves of the culm 3-4 in number, sheaths much shorter than the internodes; ligule 1 mm. or less long; blades flat, scabrous or pubescent, taper-pointed, 15-20 cm. long, 4-6 mm. wide. Panicle 12-22 cm. long, erect, bending with age, simple, open, secund, rays in remote pairs, the longest 8-12 cm. long, bearing 3-12 spikelets on the upper third or fourth. Spikelets pedicellate, ovate-oblong 5-8 mm. long, 3-6-flowered, joint of rachilla 0.6 mm. long; empty glumes firm, scabrid, first lanceolate, about 3 mm. long, second oval-lanceolate, 3-4 mm. long; floral glume 4 mm. long, ovate-oblong, subacute, coriaceous; palea firm, narrowly elliptical, nearly as long as its glume.

Vermont, *Pringle*; Pennsylvania (Phila.), *Scribner* 710; New York (Cayuga County), *Beal*; Michigan, *Cooley*, *Clark*, *Beal*, *Wheeler*; Minnesota, *Goodhue*, *Holzinger*.

It varies considerably in length of panicle and in number of spikelets.

Open woods, New England to Minnesota and Texas.

Var. **Shortii** (Kunth) *F. Shortii* Kunth, Wood's Class-book, 794 (1863). *F. obtusa* Spreng. Mant. Fl. Hal. 34 (1807). *F. nutans*, var. *palustris* Wood, Bot. and Flor. 399 (1873). *F. nutans major* Vasey, Grasses U. S. Sp. Rept. U. S. Dept. Agr. No. 63, 43 (1883), name only.

Panicle more or less contracted, rays bearing more numerous clustered spikelets.

Iowa, *Hitchcock*; Mississippi, *Tracy*; Minnesota, *Sandberg*.

Kentucky, Illinois, Missouri to Iowa, and Minnesota.

8. **F. versuta**, new name. *F. Texana* Vasey, Bull. Torr. Club, 13: 119 (1886), not Steud. 1855).

Culms rather stout, 60–80 cm. high. Sheaths shorter than the internodes; ligule a mere callous ring; blades of the culm 3–4 in number, flat or involute, scarios, 10–20 cm. long, 6–10 mm. wide, apex taper-pointed. Panicle thin, pyramidal, about 15 cm. long, rays in pairs below, scabrous, nodding, somewhat distant, the longest 7–10 cm. long, few-flowered on the outer fourth or third. Spikelets pedicellate, light green, glaucous, linear, 3–5-flowered, about 8 mm. long, joint of rachilla 0.6 mm. long, empty glumes rigid, scabrous on the nerves, first linear-lanceolate, 3.5–4.5 mm. long, second broader, 4.5–5 mm. long; floral glume 5 mm. long, ovate-lanceolate, subacute, mucronate or short-awned, chartaceous; palea nearly as long as its glume.

Texas, *Reverchon* in 1884 for Scribn.

9. **F. denticulata**, new name. *F. ambigua* Vasey, Contrib. U. S. Nat. Herb. 1: 277 (1893), not Le Gall. (1852).

A rather stout erect perennial, 60–90 cm. high. Leaves of sterile shoots rather rigid, 15–20 cm. long, 2–4 mm. wide; those of the culm 4, sheaths scabrous, longer than the internodes; ligule very short, slightly unsymmetrical; blades attenuate, pointed, flat or becoming involute. Panicle 15–20 cm. long, the nodes distant, rays flexuose, chiefly in pairs, the longest 7–10 cm. long, bearing spikelets above the middle. Spikelets purplish, 3–4-flowered, empty

glumes narrow, first 2 mm. long, second 4 mm. long, 3-nerved; joint of rachilla about 2 mm. long, scabrid, bent and enlarged and disarticulating nearly midway between the contiguous florets; floral glume 6-8 mm. long, obscurely 5-nerved, scabrid, acuminate, teeth unequal, awn 8-12 mm. long; palea as long as its glume, 2-toothed. Anthers 3 mm. long. Apex of ovary pubescent.

Oregon, *Howell* in 1880 for U. S. Dept. Agricul. 20.

10. **F. Californica** Vasey, Contrib. U. S. Nat. Herb. 1:277 (1893).

An erect rather stout perennial, 90-120, rarely 30-60 cm. high. Leaves of sterile shoots scabrous, blades involute, half as long as the culm, about 4 mm. wide, the blades breaking away, leaving the sheaths, those of the culm usually 2 in number, the upper 5-20 cm. long; sheaths scabrous, shorter than the internodes, hairy at the throat; ligule a ciliate fringe. Panicle open, pyramidal, 8-15 cm. long, the lower rays slender, flexuose; distant in pairs, the longest 5-10 cm. long, flower-bearing above the middle. Spikelets 4-6-flowered, 10-15 mm. long, joint of rachilla scabrid, 2 mm. long, empty glumes ovate-lanceolate, first 5 mm., second 6 mm. long; floral glume scabrous, linear-lanceolate, 8-9 mm. long, besides the awn 2 mm. long; palea scabrid, linear, 2-toothed, about the length of its glume. A native grass valuable for cattle.

Oregon (near Portland), *Howell* in 1886, distributed as *F. scabrella*.

Rocky Mountains to Oregon.

11. **F. viridula** Vasey, Ill. N. A. Gr. 2:93 (1893). *F. gracilima* Thurb. S. Wats. Bot. Calif. 2:318 (1880), not Hooker.

Culms tufted, erect, 50-70 cm. high, mostly smooth throughout. Leaves of sterile shoots numerous, blades mostly involute, narrow, 30-40 cm. long. Sheaths of the culm mostly 2 in number, the lower about the length of its internode; ligule short, blades 5-8 cm. long, 2-3 mm. wide. Panicle 8-10 cm. long, rays erect, mostly in pairs, the longest 5-7 cm. long, bearing 1-4 spikelets. Spikelets 10-15 mm. long, 6-9-flowered, rachilla scabrous-pubescent; empty glumes lanceolate; floral glume oval-lanceolate, 7-8 mm. long, awn 1-6

mm. long, intermediate nerves sometimes obscure; palea nearly as long, ciliolate on the keels. Anthers 5 mm. long.

Montana, *Canby & Scribner* 407; Washington, *G. R. Vasey*; California, *Bolander & Kellogg* in 1872.

12. **F. Howellii** Hack.

An erect perennial, about 70 cm. high. Blades of sterile shoots short, those of the culm 2-3 in number, scabrid, erect, involute, 8-16 cm. long, 3-4 mm. wide; sheaths of the culm-leaves much shorter than the internodes; ligule less than 1 mm. long. Panicle erect, open, thin, secund, 10-12 cm. long, rays scabrous, mostly in pairs, spreading, the longest 6-7 cm. long, bearing a few spikelets on the outer third. Spikelets tinged with red, linear-lanceolate, 8-12 mm. long, 4-5-flowered, joint of rachilla 1 mm. long; first empty glume ovate-lanceolate, 2-3 mm. long, second linear-lanceolate, about 4 mm. long; floral glume about 6 mm. long, awn 2 mm. long, scabrous, membranous, linear-lanceolate, with five conspicuous nerves; palea lanceolate, a little exceeding its glume, scabrous below and on the keels.

Oregon (Deer Creek Mountains), *Howell* in 1887, distributed by U. S. Dept. Agricul.

13. **F. ELATIOR** L. Sp. Pl. 75 (1753). TALL FESCUE. *F. apennina* De Not. Prosp. Fl. Ligust. 56. *F. arctica* Schur, Enum. Pl. Transs. 799 (1866). *F. articulata* De Not. Parl. Fl. Ital. 1:455. *F. australis* Schur, l. c. 798 (1866). *F. cretica* Hack. Nym. Consp. 825 (1878). *F. Fenas* Lag. Gen. et Sp. Nov. 4 (1816). *F. heteromalla* Pourr. Mem. Acad. Toul. 3:319 (1788). *F. interrupta* Desf. Fl. Atlant. 1:89 (1798). *F. latifolia* Dulac, Fl. Hautes-Pyr. 93 (1867). *F. laxa* Gaud. Agrost. Helv. 1:261 (1811). *F. litorea* Hack. Monog. Fest. Eu. 153 (1882). *F. loliacea* Lam. Encyc. 2:462 (1783). *F. orientalis* Kern. Hack. Monog. Fest. Eu. 154 (1882). *F. radicans* Steud. Syn. Pl. Gram. 309 (1855). *F. simplex* Boiss. & Bal. Diagn. (II.) 4:138 (1859). *F. spadicea* Mœnch, Meth. 190 (1794).

A tufted perennial, 50-120 cm. high, often with short creeping rootstocks. Sheaths smooth, striate, shorter than the internodes; ligule of upper sheath short, blades of the culm 3 in number, flat,

smooth or scabrid above, 15-20 cm. long, 4-6 mm. wide. Panicle contracted after flowering, 8-15-20 cm. long, rays mostly in pairs, the longest 6-10 cm. long, flower-bearing for three-fifths of the upper part. Spikelets linear-oblong, green or tinged with purple, 6-11-flowered, 12-18 mm. long, joint of rachilla 1.5 mm. long; empty glumes lanceolate, first 3 mm., second about 4 mm. long; floral glume oblong, acute, scabrid toward the tip, rarely awned, 5-nerved, 6-7 mm. long; palea linear before spreading, as long as its glume, scabrid on the keels.

Introduced from Europe; cultivated and very variable. See Vol. 1, Fig. 65, for a full account of this and subspecies *arundinacea*, Fig. 66, Vol. 1.

Var. *PRATENSIS* (Huds.) Hack. Monog. Fest. Europ. 150 (1882). *F. pratensis* Huds. Fl. Angl. Ed. 1, 37 (1762). SMALLER MEADOW-FESCUE.

Panicle subsecund, narrower, simpler; rays shorter, very near the above, into which it passes imperceptibly. Found with other varieties and subvarieties in cultivation. When the spikelets are racemose it is the form known as *loliacea*.

14. *F. fratercula* Rupr. Bull. Acad. Brux. 9; part 2, 326 (1842).

A slender perennial, 60-80 cm. high, glabrous throughout excepting the spikelets. Sterile shoots few, with leaves like those of the culm. Sheaths shorter than the internodes; ligule a mere fringe, slightly oblique; blades flat, 12-18 cm. long, 3-4.5 mm. wide. Panicle slender, 15-20 mm. long; rays single or the lower in pairs, 10-15 cm. long, bearing 12-20 spikelets on the outer half or third. Spikelets linear-lanceolate, 7-8 mm. long, 3-flowered, first glume subulate, 3 mm. long, 1-nerved, second oval, 6 mm. long, 3-nerved, subacute; floral glume membranous, scabrous, 6-7 mm. long, 5-nerved, ovate-lanceolate, the awn 0.5-2 mm. long; palea linear obtuse, 6.5 mm. long. Apex of ovary hairy. Somewhat nearly allied to *F. subulata*.

Arizona, *Nealley* for U. S. Dept. Agricul. 177 in 1891.

Dr. Vasey placed this under the above name "with much doubt" I do the same.

15. **F. Jonesii** Vasey, Grass. U. S. 43 (1885); Contrib. U. S. Nat. Herb. 1: 278 (1893).

A slender erect perennial, 40-120 cm. high. Sheaths usually scabrous, shorter than the internodes; ligule usually not over 1 mm. long; blades of radical tufts about half as long as the culm, those of the culm 3-4 in number, flat or involute, smooth or scabrous, 10-30 cm. long, 3-8 mm. wide. Panicle slender, open, 15-30 cm. long, rays capillary, spreading, flexuose, in pairs or single, rarely in threes, the lowest remote, the longest 7-10 cm. in length, sparingly branching above the middle. Spikelets narrow, 3-5-flowered, 7-10 mm. long, joint of rachilla scabrous, 1.5-2 mm. long, second 3-5 mm. long; floral glume scabrous, convex-subcarinate, linear-lanceolate, 5-7 mm. long, 3-5-nerved, lateral nerves obscure, awn slender, 5-12 mm. long; palea linear-lanceolate before opening, as long as its glume. Stamens 3. Grain hairy. Sometimes distributed as *F. occidentalis* Hook. and *F. pauciflora*.

Idaho, *Bolander* 6073; Utah, *Jones* 1868; Washington, *Suksdorf*, *Sandberg*, *Lake*, *Henderson*; Oregon, *Howell*.

Idaho, Oregon to British America.

Var. **conferta** E. Hackel ined. Panicle denser, rays bearing many spikelets on the upper half, awn 1-3 mm. long.

California, *U. S. Dept. Agricult.* from Normal School San José, now in Herb. Scribner and seen by E. Hackel.

16. **F. ovina** L. Sp. Pl. 73 (1753). SHEEP'S FESCUE. The number of synonyms and varieties is very large.

A slender densely tufted or slowly creeping glaucous-green perennial, 15-60 cm. high. Sheaths split lengthwise more or less, 3-8-nerved, throat conspicuously and symmetrically biauriculate; ligule very short; blades of sterile shoots very numerous, those of the culm 2-3 in number, the blades all more or less conduplicate, especially toward the apex, often with longitudinal grooves, oval, subcircular, oblong or cuneate-oblong in transverse section, 3-9-nerved on the upper or inner side, 1-3- (rarely 5-) ribbed, the sclerenchyma even and continuous on the lower side or more or less interrupted; bulliform cells absent. Panicle rather compact and subsecund, 3-10 cm. long. Spikelets elliptical or oblong-elliptical,

3-8-flowered; floral glume narrow, with scarios margins, involute with age. Ovary obovate-oblong, smooth, rarely with a hispidulous line on one side. Styles terminal. Grain oblong, with a deep groove, adhering to glume and palea.

A wonderfully variable or polymorphous species, widely distributed in the Northern Hemisphere. Those interested are referred for details to *Monographia Festucarum Europæarum* by E. Hackel.

Var. *CAPILLATA* (Lam.) Hack. Monog. Fest. Eu. 85 (1882).
Festuca capillata Lam. Fl. Fr. 3: 597 (1778).

Densely tufted, 20-30 cm. high. Culms filiform, 0.3-0.4 mm. diam., compressed or four- to five-sided. Blades of sterile shoots 5-15 cm. long, filiform, 0.3 mm. diam., those of the culm 2-3 in number, 2-3 cm. long. Panicle 4-6 cm. long, rays single, soon dividing, 1.5-3 cm. long. Spikelets elliptical, 3-8-flowered, 4-7 mm. long, first glume 2 mm. long, second 3 mm. long; floral glume 3-3.5 mm. long, awnless. Anthers nearly 2 mm. long. A very pretty grass.

Michigan, *Beal* for U. S. Dept. Agricul. 712, for Agricul. Coll. 134.

Introduced into lawns at Agricultural College, Michigan, and elsewhere.

Var. *vulgaris* Koch. Syn. Ed. 1, 2: 812 (1837); Hack. Monog. Fest. Eu. 86 (1882).

Densely tufted, 20-30 cm. high; culms slender, firm, with two nodes. Sheaths scaberulous or smooth; blades setaceous, firm, obtuse, 0.4-0.6 mm. diam., 5-7-nerved, cylindrical or compressed, sclerenchyma continuous on the lower side. Panicle oblong, erect, rather dense, 5 cm. long, rachis and rays scabrid. Spikelets elliptical or oblong-elliptical, 6-7.5 mm. long, densely 3-8-flowered, more or less purplish; empty glumes unequal, second ovate-lanceolate, 4 mm. long; floral glume 3.5 mm. long, the awn 1-2 mm. long.

Minnesota (Vermillion Lake, Agate Bay, respectively), *Arthur & Bailey* B 450, 489.

Var. *supina* (Schur) Hack. *F. supina* Schur, Enum Pl. Transs. 784 (1866).

Culms 12-30 cm. high, firm with two nodes, four-angled, and

scaberulous below the panicle. Sheaths smooth; blades setaceous, 0.3-0.6 diam., smooth, green, extending more or less above the middle of the culm. Panicle linear-oblong, 2-4 cm. long, dense, rachis and rays scaberulous. Spikelets 6-8 mm. long, variegated; floral glume 3.5-5 mm. long, bearing an awn of varying length. Some of the florets viviparous, i.e. becoming foliaceous.

New Hampshire (Mt. Washington, Great Gulf), *C. E. Faxon*.

Alpine summits of the White Mountains of New Hampshire and high northward; also in Europe.

Var. *DURIUSCULA* (L.) Hack. Monog. Fest. Eu. 89 (1882). *F. duriuscula* L. Sp. Pl. 74 (1753). HARD FESCUE.

Culms 15-30-70 cm. high, usually firm with 2 nodes, the upper one-third the way to the top and more or less angled below the panicle, smooth or scaberulous. Sheaths smooth or scaberulous or slightly pubescent; blades firm, 0.6-1.1 mm. diam., green or glaucous, usually smooth, 7-9-nerved, sclerenchyma continuous on the lower side, rarely interrupted. Panicle variable. Spikelets elliptical or oblong-elliptical, 6-10 mm. long, 4-9-flowered; floral glume lanceolate, 4-6 mm. long, more or less awned. Variable, exhibiting many subvarieties and forms.

Common in cultivation in the older Northern States.

Sub. var. *TRACHYPHYLLA* Hack. l. c.

Culms 50-70 cm. high. Blades firm, 0.7-0.8 mm. diam. Panicle 4-10-15 cm. long, oblong, erect, rather dense, rachis and rays scabrous. Spikelets green or tinged with violet, 6-10 mm. long; floral glume broadly lanceolate, 4-6 mm. long, with a short awn.

Chickering for U. S. Dept. Agricul. 700; also cultivated at Cambridge, Massachusetts, and elsewhere.

Var. *pseudovina* Hack. l. c. *F. pseudovina* Hack. Wiesb. Oestr. Bot. Zeit. 30:126 (1880).

Culms slender, 20-40 cm. high. Blades filiform, 5-nerved, about 0.5 mm. diam., sclerenchyma in three bundles, scabrous. Panicle ovate-oblong, 5-9 cm. long, rachis and rays scabrous. Spikelets elliptical-oblong, 5-6 mm. long, 4-8-flowered, green or tinged with violet, glumes all subulate-lanceolate, second 3 mm.

long, 3-nerved; floral glume 4 mm. long, the awn 1-5 mm. long. Anthers 1.5 mm. long.

Michigan (Benzie, Bay, Crawford, and Macomb counties), probably indigenous; also in Europe.

A pretty careful examination of many plants has been made, all compared with Hackel's description.

Subsp. *sulcata* Hack. Monog. Fest. Eu. 100 (1882). *F. sulcata* Hack. Bot. Centralb. 8:405 (1881).

Culms 70 cm. high, with two nodes, leaf-blades 5-7-nerved, capillary, 0.5-0.6 mm. diam. Panicle 5-10 cm. long. Spikelets 8-10 mm. long, 5-flowered.

Montana, *Canby & Scribner* 407.

Var. *MARGINATA* Hack. l. c.

Densely tufted; culms slender, 30-40 cm. high, with 2 nodes, the upper one one-fifth to one-third the height of the culm, angled below the panicle. Sterile shoots numerous, the leaves half as long as the culm, the blade obtuse, conduplicate, 3-ribbed, the sclerenchyma in three bands (at the keel and the margins only), 0.6-0.8 mm. diam., rigid, glaucescent; ligule obsolete, ciliate, blades of the culm 3-6 cm. long. Panicle 3-8 cm. long, ovate, spreading when in flower, rachis and rays scabrous. Spikelets oblong-lanceolate, 6-10 mm. long, 5-8-flowered; empty glumes slightly unequal, first oblong, second linear-oblong, subulate, extending two-thirds of the way over the floral glume next above; floral glume linear-lanceolate; 4.5-5 mm. long, glabrous, smooth, mucronate or aristate; palea linear-oblong, with 2 short teeth, scabrous on the keels. Anthers 2.2 mm. long.

Michigan, *Beal* 135; Colorado, *Clark* 4068.

In cultivation on the lawns, Agricultural College, Michigan, and elsewhere. often mistaken for var. *duriuscula*.

Subspecies *Borderii* Hack. Monog. Fest. Eu. 113 (1882). *F. Borderii* Hack. Bot. Centralb. 8:406 (1881).

Culms firm, smooth, 10-20 (in this case 40) cm. high, with one node, and another among the lower leaves. Blades of sterile shoots 0.7-0.8 mm. diam., rigid, glabrous, compressed, the sclerenchyma in 9 bands. Sheaths smooth, entire almost to the

apex; ligule obsolete, of those on the culm biauriculate, ciliate; blades of the culm loosely conduplicate when living. Panicle 2.5-7 cm. long, dense, linear, oblong, lower rays bearing 3-4 spikelets. Spikelets with short pedicels, 7-10 mm. long, oblong-elliptical, 3-6-flowered, strongly tinged with violet or red; empty glumes acute, subequal, first 3 mm. long, second 4 mm. long and reaching three-fourths of the distance over the floral glume next above it; floral glume lanceolate, 4-5 mm. long, acute, keeled even below the middle, scabrous on the keel, awn 2 mm. long; palea linear-oblong, obsoletely bidentate, keels ciliate. Anthers 1.75-2 mm. long. Ovary obovate-cuneate, truncate, apex smooth.

Vermont, Hosford for C. E. Faxon, collected in lumber-yards at Burlington. Specimens are larger than the European plants. Probably introduced from Europe.

Subspecies, *brevifolia* (R. Br.) Hack. Monog. Fest. Eu. 117 (1882). *F. brevifolia* R. Br. Parry, 1st Voy. Suppl. 289 (1824).

Densely tufted. Culms rigid, 5-10 cm. high, nodes 1-2 in number, the upper one near the ground, nearly terete above, glabrous or puberulent. Blades of sterile shoots setaceous, 0.5-0.6 mm. diam., 2-6 cm. long, smooth or scabrid, those of the culm shorter or almost obsolete, 3-5-nerved, 1-3-ribbed on the inside, sclerenchyma in 5-7 bundles; sheaths entire to the throat, soon splitting with age. Panicle dense, linear, simple, racemose, 3-6 cm. long, the lowest branch bearing 2-3 spikelets. Spikelets elliptical, 6 mm. long, 1-4-flowered, varying from green to violet; empty glumes scarcely equal, second broadly lanceolate, acute or obtuse, scarcely exceeding the middle of the floret; floral glume 3-4 mm. long, elliptical-lanceolate, smooth or scabrid, keeled above the apex, awn about 1-2 mm. long; palea oblong, acute, 2-toothed. Anthers oblong, 0.75-1 mm. long.

Colorado, *Letterman* for U. S. Dept. Agricul. 714; Arizona, *Knowlton* in 1889, *Leemmon* in 1884.

Rocky Mountains, also Melville Island and Europe.

Var. *polyphylla* Vasey ined.

Culms 60-70 cm. high, grooved below the panicle. Leaves of sterile shoots numerous, sheaths split for most of their length;

blades 20-40 cm. long, obtuse or pungent, smooth, rather soft, 5-angled, 7 bundles of sclerenchyma, 5.7 mm. diam., those of the culm 2 in number, of same form as those below. Panicle thin, open, 8-16 cm. long, rays in pairs or single, distant, the longest 5-7 cm. long, bearing a few spikelets on the upper one-third. Spikelets linear-lanceolate, 10 mm. long, 5-flowered, second glume ovate-lanceolate, 3.2 mm. long, 3-nerved; floral glume slender, 5-6 mm. long, the awn 3-6 mm. long; palea about the length of its glume. Anthers 2-2.2 mm. long.

Oregon, *Howell & Henderson*.

Oregon and California.

Var. **Arizona** (Vasey) Hack. ined. *F. arizonica* Vasey, Contrib. U. S. Nat. Herb., 1: 77 (1893).

A rather stout scabrid, pale, glaucous grass, 50-60 cm. high; nodes 2 in number, the upper two-fifths of the way up the culm. Blades of sterile shoots numerous, 30-40 cm. long, scabrous, conduplicate, in cross-section circular or oval with obtuse angles, sclerenchyma in 5-7 rather broad bands, about 0.5 mm. diam.; ligule consisting of two equal ciliate teeth, 0.7 mm. long; blades of the culm like those of the sterile shoots; ligule symmetrically biauriculate, 1.3 mm. long. Panicle simple, erect, 10-15 cm. long, rays single, erect, rather stout, scabrid, soon branching, the longest ray 4-7 cm. long, bearing a few spikelets. Spikelets linear or linear-lanceolate, 7-9-flowered, 10-15 mm. long; empty glumes keeled above, scabrid, first awl-shaped, 4-5 mm. long, second ovate-lanceolate, 5-6 mm. long, reaching two-thirds of the way to the apex of the floral glume next above; floral glume 6-7 mm. long, elliptical-lanceolate, obscurely nerved, slightly keeled below the apex, the awn 0.5-1 mm. long; palea linear, 5.5-8 mm. long, 2-toothed. Anthers 3.7 mm. long. Ovary obovate, apex pubescent under a lens.

Colorado, *Wolfe* in 1873, labelled *F. ovina* var.; Arizona, *Tracy*.

The plant from Flagstaff, Arizona, collected by Tracy, is the same as one above named by Hackel, and comes under *F. ovina* as defined by him.

Var. **ingrata** Hack. in herb.

Culms 40-60 cm. high. Leaves of sterile shoots scabrous, 18-20

cm. long, elliptical in section, 0.5 mm. diam., 5-nerved, those of the culm 7-9 cm. long. Panicle 8-11 cm. long, rays in pairs or single, the longest about 4 cm. long, bearing 4-7 spikelets on the outer half. Spikelets 6-8-flowered; second glume linear, acute, 3-nerved, about 6 mm. long; floral glume elliptical-lanceolate, about 6 mm. long, the awn 1-5 mm. long; palea about 7 mm. long. Anthers 3.5 mm. long.

Identified by E. Hackel and named "*ingrata*" because he presumed it would be disagreeable to cattle.

Oregon, *Howell* in 1880 for U. S. Dept. Agricul.

Var. **Columbiana** n. var.

Culms 40-60 cm. high, with 2 nodes, scaberulous. Sheaths smooth, entire at the base, split for most of their length; blades 0.4-0.6 mm. diam., those of the sterile shoots 15-25 cm. long, firm, glaucous, scabrous, 5-7-nerved, nearly cylindrical, grooved. Panicle thin, oblong or ovate-oblong, 9-14 cm. long, the erect rachis and branches scabrous, longest ray 4-7 cm. long, bearing 1-4 spikelets. Spikelets lanceolate to elliptical, 8-16 mm. long, rather loosely 3-7-flowered, first empty glume narrow, 4-5 mm. long, second linear, acute, 6-7 mm. long; floral glume 6-8 mm. long, the awn 1-5 mm. long; palea 7-8 mm. long. Anthers about 4 mm. long. Ovule obovoid, 0.7 mm. long. So far as I am able to learn this is new, possibly a species, but I think better to consider it a variety. There were three plants, one of which had the longer florets.

Washington (Pulman in 1892), *E. R. Lake*.

Var. **Oregona** Hack. ined.

Culms slender, 25-35 cm. high. Leaves of sterile shoots 8-13 cm. long, the blades 0.5-0.6 diam., in section cuneate-oblong, 5-nerved; upper blade 2-6 cm. long. Panicle thin, 5-7 cm. long, rays single, the longest 3-4 cm. long, bearing 2-4 spikelets on the outer two-thirds. Spikelets 2-6-flowered, second glume linear, sub-acute, 5.5 mm. long; floral glume linear when spread, 7 mm. long, the awn about 4 mm. long; palea a little longer than its glume. Anthers 3 mm. long.

Oregon, *Cusick* in 1884, *U. S. Dept. Agricul.* 753.

17. *F. parviflora* Ell. Bot. S. C. & Ga. 1: 170 (1816).

A slender glabrous perennial. Culms geniculate, 30–60 cm. high. Leaves of the culm 4–5 in number, sheaths about the length of the internodes; ligule a ciliate fringe, subauriculate; blades involute-filiform, scabrous above, 6–12 cm. long, 0.2–0.6 mm. diam. Panicle scarcely exerted, narrow, 8–16 cm. long, rays mostly in pairs, the lowest internode of panicle 4–5 cm. long, longest ray 5–8 cm. long, bearing 4–7 spikelets on the outer half. Spikelets 4–5-flowered, about 6 mm. long; empty glumes lanceolate, even when spread, first 1-nerved, 4 mm. long, second 3-nerved, 5 or more mm. long; floral glume 5-nerved, 5–6 mm. long, lanceolate when spread, awn 4–6 mm. long; palea acuminate, 5.5 mm. long. Anthers 1.2 mm. long. Ovary glabrous, stigmas linear.

Texas, *Nealley* in 1890 for U. S. Dept. Agricul.

There is some uncertainty about the correct identification of this grass, though the plant answers well to Elliott's description.

South Carolina to Texas.

18. *F. HYSTRIX* Boiss. Elench. 89 (1838). *F. duriuscula* var. *Hystrix* Boiss. Voy. Esp. 2: 671 (1845). *F. indigesta* var. *Hystrix* Willd. Prod. Fl. Hisp. 94 (1870).

Culms slender, erect, 8–30 cm. high, the upper node 4–6 cm. from the roots and concealed. Ligule biauriculate, 1–2 mm. long, blades of sterile shoots ascending, curved, 4–6 cm. long, terete, smooth; those of the culm 1–2 cm. long, 3-nerved, setaceous, rigid, curved. Panicle 1–4 cm. long, dense, linear, simple, rachis scabrous. Spikelets pedicellate, lanceolate, 3–5-flowered, the longest 7 mm. long; empty glumes unequal, acute, dark violet, second lanceolate reaching to the middle of the floral glume next above; floral glume 4 mm. long, lanceolate, acute, subcarinate below the apex, smooth, nerves obscure, green or light-colored near the apex, margins scarious, the awn short; palea oblong-lanceolate, acute, 2-toothed, ciliate on the keels. Anthers 2. mm. long. Ovary obovate-oblong, glabrous.

Michigan, (Hancock,) *F. E. Wood*.

Probably introduced from Europe. The description answers

well to that given by E. Hackel, excepting that the plant is a little taller and the spike a little longer.

19. **F. amethystina** L. Sp. Pl. 74 (1753).

Perennial; culms rather slender, 50–80 cm. high, slightly geniculate at the base, with 2–3 nodes. Sheaths shorter than the internodes, auriculate; ligule a mere ciliolate ring; blades of sterile shoots flaccid, conduplicate, 5–6-sided in cross-section, 10–30 cm. long, about 0.5 mm. diam., those of the culm 2–3 in number, the upper 6–10 cm. long. Panicle simple, secund, narrow or spreading, 8–15 cm. long, lower rays usually in pairs, scabrous, flower-bearing on the upper half or two-thirds, the longest 8–10 cm. long. Spikelets linear-lanceolate or oval, green or tinged with violet, 3–7-flowered, 7–8 mm. long, joint of rachilla 1.3 mm. long; first empty glume lanceolate, 3 mm. long, second linear-lanceolate, about 5 mm. long; floral glume scarious, lanceolate-oblong, 5–6 mm. long, involute, awnless, or with an awn 1–2 mm. long, subcarinate toward the apex; palea linear, 2-toothed, scabrid on the keels.

Oregon, *Howell* for U. S. Dept. Agricul.

Oregon and California; also in Europe.

Var. **asperrima** Hack. ined. Plant rather taller and more slender, panicle more slender, empty glumes sharper pointed, floral glume narrower, subcarinate, palea a little longer.

Arizona, *H. H. Rusby* 901.

20. **F. Vaseyana** Hack ined.

A tufted erect perennial, 30–80 cm. high. Blades of sterile shoots erect, scabrid, conduplicate, filiform, 20–40 cm. long, 0.4–0.5 mm. diam., those of the culm 2 in number (the upper node below the middle of the culm), filiform, 10–30 cm. long; ligule ciliate, symmetrically biauriculate, 1 mm. long. Panicle linear-lanceolate, strict, 9–12 cm. long, rays scabrous, single, soon branching, the longest 4–7 cm. long, bearing 2–5 spikelets on the outer two-thirds. Spikelets purplish, linear-oblong, 6-flowered, 11–13 mm. long, joint of rachilla 1.5 mm. long; first empty glume awl-shaped, 4 mm. long, second linear-lanceolate, 6 mm. long; floral glume oval-lanceolate, 6–7 mm. long, the awn 2 mm. long; palea 7 mm. long, keels scarcely scabrid. Ovary obtuse, hispidulous.

Colorado (Veta Pass), Vasey in 1884.

The plants were mixed with those labelled *F. scabrella*.

21. *F. dasyclada* Hack. ined.

A geniculate perennial, 20–40 cm. high. Sheaths smooth, shorter than the internodes; ligule very short, symmetrically biariculate; blades of sterile shoots involute or conduplicate, the extreme apex obtuse, 10–15 cm. long, 2 mm. wide when spread, those of the culm 3–4 in number and shorter. Panicle barely exerted, ovoid or pyramidal, 7–12 cm. long, rays in twos, threes, and fours, flat, with ciliate margins, the longest 5–7 cm. long, bearing spikelets on one side of the upper half or third. Spikelets elliptical-lanceolate, 2-flowered, 7 mm. long, joint of rachilla 1.5 mm. long; empty glumes lanceolate, first 1–3-nerved, second 3-nerved, 6 mm. long; floral glume scabrous, oval-lanceolate, 5-nerved, 6 mm. long, including the short teeth, awn 3 mm. long; palea linear, ciliate on the keels, almost as long as its glume. Anthers 1.7 mm. long. Ovary obovoid, apex pubescent.

Utah, *Parry* in herb. Scribner; and Rocky Mountains.

22. *F. livida* Willd. Spreng. Syst. 1:353 (1806). *Bromus lividus* H. B. K. Nov. Gen. et Sp. 1:150, t. 689 (1815). *Schedonorus lividus* R. & S. Syst. 2:707 (1817). *Helleria livida* Fourn. Hems. Biol. Centr. Am. Bot. 3:582 (1880).

Culms and leaves glabrous, the former 15–20 cm. high. Sterile shoots numerous, the ligule 0.2 mm. long; blades involute, striate 5-sided, pungent-pointed, 2–5 cm. long, 0.6–0.8 mm. diam. Panicle simple, rays single, the longest 2–2.5 cm. long, including the 3–4 spikelets. Spikelets purple, 10–12 mm. long, 4-flowered, first empty glume often 2-nerved, 10–11 mm. long, second 1–2 mm. longer; floral glume, elliptical, acute at both ends, 9 mm. long; palea 2–8 mm. long, smooth. Grain flat. Anthers elliptical, 0.8–0.9 mm. long.

Mexico, *Pringle* 4304. In the crater of a volcano 14,000 feet altitude.

23. *F. amplissima* Rupr. Bull. Acad. Brux. (II.) 9:236 (1842).

Culms rather stout, 30–180 cm. high, subscabrid. Leaves of

the culm 7-8 in number, scabrous, sheaths shorter than the internodes; ligule very short; blades involute, very long, some of them usually extending to the top of the panicle, long-pointed, 4-8 mm. wide. Panicle spreading, about 30 cm. long, rays mostly in twos, flexuose, 15-30 cm. long, bearing capillary branches, the spikelets on the outer half. Spikelets scabrid, oval, 10-12 mm. long, 5-6-flowered, joint of rachilla 1.2 mm. long; empty glumes lanceolate, first about 3.5 mm. long, 1-nerved, second 5-6 mm. long, 3-nerved; floral glume 6-7 mm. long, linear, mucronate, 5-nerved; palea acute, as long as its glume. Anthers 3.7 mm. long. Ovary glabrous.

Mexico, *Pringle* 3945, mountains at an altitude of 8500 feet.

Var. *elliptica* n. var.

Culms glabrous. Sterile shoots rather numerous, their sheaths mostly split to the base; leaves of the culm 2-3 in number, blades a little wider than those of the sterile shoots. Panicle much exerted, simple, thin, 14-18 cm. long, scabrid, the longest ray 5-8 cm. long, bearing 4-6 spikelets on the outer half. Spikelets 10-17 mm. long, 6-10-flowered, hispidulous; first empty glume awl-shaped, 4 mm. long; floral glume 7-9 mm. long, ovate-lanceolate, palea linear, minutely 2-toothed, as long as its glume. Anthers 2.7 mm. long.

Mexico (Chihuahua), *Pringle* 1438; distributed as *F. ovina* L., var. ?

Moist canyons of the Sierra Madre.

24. *F. altaica* Trin. Ledeb. Fl. Alt. 1: 109 (1829). *F. subulata* Vasey, Grass. Pacif. Slope 2: 92 (1893), not Bong.

An erect tufted perennial, 60-90 cm. high. Sheaths nearly smooth; ligule very short, symmetrical; blades of sterile shoots 15-30 cm. long, usually deciduous at the sheath, those of the culm 7-12 cm. long, involute. Panicle open, 10-17 cm. long, rays mostly in pairs, flexuose, flower-bearing above the middle. Spikelets brown, 3-5-flowered, 12-14 mm. long, first empty glume narrowly ovate, hispid on the keel, 6 mm. long, second broader, 3-nerved, 8 mm. long; floral glume lanceolate, scabrous, 5-nerved, 10-12 mm. long; palea a little shorter than its glume. Ovary glabrous.

Alaska, *Turner* 1186 in 1880 for U. S. Dept. Agricul.

There may be some doubt as to the correct identification of this specimen.

25. **F. pauciflora** Thunb. Fl. Jap. 52 (1784). *F. occidentalis* Hook. Fl. Bor. Am. 2:249 (1840).

An erect perennial, 50–70 cm. high. Leaves of the sterile shoots numerous, blades smooth, involute, 5-angled, filiform, 20–40 cm. long, 0.3–0.6 mm. diam., leaves of the culm 3 in number; sheaths longer than the internodes; ligule very short, slightly unsymmetrically biauriculate; blades 6–10 cm. long. Panicle slender, 12–18 cm. long, but little exerted, rays mostly in pairs, the lowest two half-whorls 6–7 cm. distant, the longest ray 6–8 cm. long, bearing a few scattered spikelets on the outer half. Spikelets linear, 4-flowered, 10 mm. long, first acute, 1-nerved, 4 mm. long, second subacute, 3-nerved, 5 mm. long; floral glume scabrous, 5-nerved, 5.5–6.5 mm. long, 2 mm. wide when spread, the terminal awn 5–10 mm. long; palea 6 mm. long. Anthers 2.3 mm. long. Ovary obovoid, pubescent above.

California, *Bolander*, *Nash* for Thurber, and both now in Herb. U. S. Dept. Agricul.

26. **F. scabrella** Torr. Hook. Fl. Bor. Am. 2:252, *t.* 233 (1840). *F. Thurberi* Vasey, Rothr. Rep. Bot. U. S. Surv. 6:292 (1878).

An erect tufted perennial, 40–90 cm. high. Leaves of sterile shoots numerous, the sheaths smooth and persistent; blades smooth or scabrous, involute, 15–40 cm. long, 0.8–1.2 mm. diam., mostly deciduous at the base, leaves of the culm 2 in number, sheaths striate, smooth; ligule acute, 3–4 mm. long, unsymmetrically auriculate, blades smooth below, scabrous above, involute, rigid, 6–10 cm. long, about 2 mm. diam. Panicle thin, 10–15 cm. long, rays mostly in twos, 6–9 cm. long, flower-bearing on the outer half. Spikelets more or less red, 3–5–7-flowered, 8–10–14 mm. long; empty glumes chartaceous, ovate-lanceolate, first 1-nerved, 5–6 mm. long, second 3-nerved, 4–7 mm. long; floral glume oblong, scabrid, 5-nerved, 6–7 mm. long, sometimes with a stout awn about 1 mm. long; palea as long as its glume. This resembles some species of *Melica* considerably.

Yukon River, *Macoun* in 1887; Mt. Albert Gaspe, *Macoun* in

1882, both for the U. S. Dept. Agricul.; Colorado, *Patterson* in 1892.

Canada, Iowa, Colorado, British America.

Var. *Vaseyana* Hack. ined.

Blades of sterile shoots filiform, firm, scabrous, 10–25 cm. long. 0.3–0.5 mm. diam., those of the culm 2–3 in number, narrow, involute; ligule truncate, very short. Spikelets linear or elliptical-lanceolate, 5–6-flowered; first glume 1-nerved, second almost keeled, lanceolate, 3-nerved, 6–7 mm. long, the lateral nerves extending half the length of the glume; floral glume obscurely nerved, ovate-lanceolate, keeled above, 7 mm. long, the awn 1 mm. long. Anthers 2.7 mm. long. Ovary cuneate-obovoid, apex hispidulous under the lens.

Colorado (Veta Pass), *Vasey*, at an altitude of 9300 feet.

27. *F. rubra* L. Sp. 74 (1753). The number of synonyms and varieties is very large.

Culms geniculate, ascending at the base, terete or more or less angled. Sheaths of the sterile shoots all entire, thin, splitting with age, destitute of longitudinal grooves, closely filled by the culms, 5–9-nerved, the nerves except the marginal ones extending into the blade; ligule very short, those of the culm unsymmetrically biauriculate or auriculate on one side; blades often of two forms, rarely of one form. Floral glume obtusely keeled below the apex, rather obscurely 3–5-nerved, with a narrow scarious margin. Anthers linear, about half as long as the palea.

Widely distributed from the Atlantic to the Pacific.

Subspecies *hetrophylla* (Lam.) Hack. Monog. Fest. Eu. 130 (1882). *F. heterophylla* Lam. Fl. Fr. Ed. 1, 600 (1778).

Densely caespitose, 50–90 cm. high, nodes of culm often 3 in number, blades of two forms, smooth, soft, those of the sterile shoots deltoid in section, 0.4–0.6 mm. diam., 3-nerved, obtuse, sheaths triangular; blades of the culm wider, flat, 7–11-nerved. Panicle 6–16 cm. long, lax, ovate, nodding, rays scabrous in twos or threes. Spikelets linear-oblong, 8–10 mm. long, remotely 3–9-flowered, green or tinged with violet; empty glumes unequal, very acute, second subulate-lanceolate, 3-nerved, the lateral nerves short; floral glume

linear-lanceolate, 5-6.5 mm. long, very acute, glabrous, the awn half as long as the glume or longer; palea linear-oblong, apex entire or with two short teeth.

Northern Michigan, *Farwell, Wheeler*; British Columbia, *Macoun*; Washington, *E. R. Lake*.

Var. *glaucescens* Hack. Monog. Fest. Eu. 139 (1882). *F. glaucescens* Hegetschw. Fl. Schw. 93 (1840).

It resembles *F. vulgaris*, excepting that the spikelets are 10 mm. or more long; floral glume 6-7 mm. long, the awn rather long. Tennessee (Cumberland River), *Gattinger* in 1886.

Var. *fallax* (Thuill) Hack. Fes. Eu. 142 (1882). *F. fallax* Thuill Fl. Par. Ed. 2: 50 (1799).

Densely cæspitose, glaucous, strongly tinged with purple or violet, 40-60 cm. high, blades obtuse, in section obtusely 6-angled, rarely suboval, 0.7-0.8 mm. diam. Panicle 6-8 cm. long, rays densely flowered, the longest 3-4 cm. long. Spikelets elliptical-lanceolate, 5-7-flowered, 8-10 mm. long, second glume lanceolate, 3-nerved, extending to the middle of the floral glume; floral glume 5-6 mm. long, rather abruptly pointed, with a very short awn. Anthers 2.7 mm. long.

Montana, *Anderson*; Washington (Seattle), *Howell* in 1886.

Washington, Oregon, and Rocky Mountains.

Var. *trichophylla* Gaud. Hack. Monog. Fes. Eu. 141 (1882). *F. trichophylla* Ducros, Gaud. Fl. Helv. 1: 288 (1828).

Culms slender, about 60 cm. high, curved below and ascending from creeping rootstocks. Blades obtuse at the extreme apex, folded, setaceous, destitute of bulliform cells, 0.4-0.5 mm. diam., the lower sheaths torn into shreds, glabrous. Panicle linear-oblong, 6-10 cm. long. Spikelets lanceolate, 7 mm. long; floral glume linear-lanceolate, 4.5-5 mm. long, glabrous, bearing a very short awn.

Oregon, *Howell*; also found in Europe.

Var. *longiseta* Hack. ined. *F. longiseta* Hegetschw. Fl. Schw. 92 (1840).

Culms 20-70 cm. high. Leaves 3 in number, blades involute or conduplicate, smooth, faintly nerved, terete or oval, 15-20 cm. long,

0.7–1.2 mm. diam. Panicle thin, open, 6–12–18 cm. long, rays single, branching, 2.5 cm. long, bearing a few spikelets. Spikelets lanceolate, 2–3–6-flowered, about 7 mm. long, joint of rachilla 1.5 mm. long, jointed near the middle; second glume lance-linear, 3-nerved, 3.5 mm. long; floral glume rather thin, oval-lanceolate, 5 mm. long, bearing an awn twice its length; palea longer than its glume.

Vancouver Island, *Macoun* in 1887.

Var. *pubescens* Vasey ined.

Loosely tufted, 50–80 cm. high. Sheaths of sterile shoots mostly torn into strips, blades erect, 20–40 cm. long, in section triangular, 7–9 mm. diam., those of the culm flat or conduplicate, 2 mm. wide, 7–9-nerved. Panicle 10–15 cm. long, interrupted, more or less pubescent throughout; lower rays in pairs, 5–8 cm. long, rather densely flowered on the upper two-thirds. Spikelets linear-lanceolate, 11–13 mm. long, 5–8-flowered, more or less tinged with violet, second glume oblong, abruptly acute, 3-nerved to near the apex; floral glume oval, acute, 6 mm. long, the awn 2–5 mm. long; palea linear, acute, subentire, longer than its glume. Anthers over 3 mm. long.

Oregon, *Howell* for U. S. Dept. Agricul.

Var. *littoralis* Vasey ined.

Glaucous and smooth; culms 10–15 cm. high from creeping rootstocks. Blades obtuse, involute, grooved, 5-ribbed, oval to triangular, about 0.7 mm. diam. Panicle dense, scarcely exerted, secund, 3–5 cm. long, 6–8 mm. diam. Spikelets oval to linear-lanceolate, 5-flowered, 7–8 mm. long; second glume ovate-lanceolate, 3-nerved; floral glume oval, acute, 5 mm. long, awn 1–2 mm. long; palea as long as its glume. Anthers 2.7 mm. long.

Oregon (on sand-dunes by the sea), *Howell* in 1882.

Var. *genuina* Hack. Monog. Fest. Eu. 132 (1882).

Loosely caespitose, creeping more or less, 30–50 cm. high. Blades of sterile shoots obtuse, setaceous, obtusely hexagonal, 5–7-nerved, 0.6–0.7 diam., those of the culm flat, pubescent above; sheaths glabrous. Panicle secund, 3–7 cm. long, rather dense. Spikelets oblong-lanceolate, 7–8 mm. long; second glume lanceo-

late, 3-nerved, extending to the middle of the glume near it; floral glume glabrous, 4-5 mm. long, mucronate or with a short awn.

Vancouver Island, *Macoun* in 1887; found also in Europe.

134. (263). **BROMUS** L. Sp. Pl. 76 (1753). *Anisantha* C. Koch, *Linnaea*, 21: 394 (1848). *Bromopsis* Fourn. Ann. Soc. Linn. Lyon. N. S. 17: 187 (1869). *Ceratochloa* Beauv. Agrost. 75. t. 15. f. 7 (1812). *Lasiopoa* Ehrh. Beitr. 4: 147 (1789). *Libertia* Lej. Nov. Act. Nat. Cur. 12: 755. t. 65 (1825). *Michelaria* Dum. Obs. Gram. Belg. 77. t. 16 (1823). *Schedonorus* Beauv. Agrost. 99 (1812), in part. *Serrafalcus* Parl. Pl. Nov. 75 (1842). *Triniusa* Steud. Syn. Pl. Gram. 328 (1854). *Zerna* Panz. Denkschr. Acad. Muench. 296 (1814), in part.

Spikelets several-flowered, oval to lanceolate, pedicellate, erect or drooping, in a more or less branched exserted panicle, rachilla articulate between the floral glumes, glabrous or scabrous-pubescent. Empty glumes unequally acute or fine-pointed, unawned, 1-5-nerved or the second with a very short awn; floral glume longer, keeled or convex on the back, 5-9-nerved, the hyaline apex usually shortly bifid, the midrib produced into a straight or curved awn, free from or little below the apex; palea nearly as long as the glume, the two prominent keels usually pectinate-ciliate. Stamens 3, or rarely fewer. Ovary obovate or linear, crowned by a hairy membranous appendage, the very short distinct styles more or less lateral. Grain oblong or linear, often more or less conduplicate, adhering to the palea or more or less to the base of the floral glume.

Annuals or perennials, with flat blades, the sheaths often closed. The genus is a fairly natural one, widely distributed over the temperate regions of the globe, and contains about 40 species. It is very closely allied to *Festuca*, into which it passes imperceptibly through *F. gigantea* Vill.

Bentham proposed the following sections:

1. *Festucoides* Coss. & Dur.—tall perennials coming near to *Festuca*, with the awns usually very short or reduced to small points.

2. *Stenobromus* Griseb.—mostly annuals, with narrow long-awned glumes.

3. *Zeobromus* Griseb.—spikelets usually broad and thick, the floral glume awned, and the nerves of all the glumes more numerous than in the preceding sections.

4. *Ceratochloa* D C. (or Beauv.).—spikes flat, not unlike those of *Uniola*, but at length often thickened as in *Zeobromus*, floral glume scarcely notched at the end, and the awn very short.

The following artificial key may be found easier for the student than the sections above named:

- | | |
|---|-----|
| A. Panicle densely obovate-cuneate. | 1 |
| B. Panicle otherwise than the above. | (a) |
| a. Floral glume 22–27 mm. long, awn 35–45 mm. long . | 2 |
| a. Floral glume about 20 mm. long, awn 4–8 mm. long. | 3 |
| a. Floral glume shorter. | (b) |
| b. Panicle 5–10 cm. long; floral glume about 18 mm.
long, awn 20–25 mm. long. | 4 |
| b. Panicle 12–18 cm. long; floral glume 9–10 mm.
long, awn very short or 0. | 5 |
| b. Panicle 15–18 cm. long; floral glume 11 mm. long. | 6 |
| b. Panicle 15–25 cm. long; floral glume 16–19 mm.
long, awn 20–30 mm. long. | 7 |
| b. Panicle 15–30 cm. long; floral glume 15–17 mm.
long, awn 5–12 mm. long. | 8 |
| b. Panicle about 30 cm. long; floral glume about 14
mm. long, awn 5 mm. long. | 9 |
| b. Panicle 8–18 cm. long; floral glume 10 mm. long,
awn 3–5 mm. long. | 10 |
| b. Panicle 5–15 cm. long; floral glume 13 mm. long,
awn 4–6 mm. long. | 11 |
| b. Panicle about 30 cm. long; floral glume about
10–14 mm. long, awn 20 mm. long. Var. <i>major</i> . | 10 |
| b. Panicle 15–20 cm. long; floral glume 12–18 mm.
long, awn 2–4 mm. long. | 12 |
| b. Plant otherwise than those above. | (c) |
| c. Branches of panicle drooping; spikelets smooth,
flat, oval; floral glume broad-oval, awn 1 mm.
long or less. | 13 |

- c. Branches of panicle flexuose; spikelets smooth, flat, oval, floral glume broadly oval, awns 5-10 mm. long. 14
- c. Branches of panicle short, ascending; spikelets pubescent, flat, oval, floral glume broadly oval, awn 6-8 mm. long. 15
- c. Plant otherwise than those above. (d)
- d. First glume 1- (rarely 3-) nerved, second 3-nerved. (e)
- e. Joint of rachilla 2 mm. long or less, spikelets 7-12-flowered. 16
- e. Joint of rachilla 2 mm. long, spikelets 3-6-flowered. 17
- e. Joint of rachilla more than 2 mm. long. . (f)
- f. Blades involute, 2-3 mm. wide. 18
- f. Blades flat, 2-3 mm. wide. 19
- f. Blades flat, 4 or more mm. wide. . . (g)
- g. Awn 2-3 mm. long. 20
- g. Awn 4 or more mm. long. . . . (h)
- h. Longest rays 8-10 cm. long, an exotic annual. 21
- h. Longest rays 3-5 cm. long, a native perennial. 22
- d. First glume 3-nerved (rarely 1-nerved), second glume 3-nerved. 23
- d. First glume 3-nerved, second 5-7-nerved. . (i)
- i. Spikelets scabrid. 24
- i. Spikelets densely silky hairy. 25
- d. First glume 3-nerved (rarely 5-nerved), second glume 7-nerved, spikelets firm, flat, floral glume turgid, broadly oval, apex obtuse, exotics. 26, 27, 28

1. *B. RUBENS* L. Cent. 1: 5 (1755). *Festuca rubens* Pers. Syn. 1: 94 (1805). *B. canescens* Viv. Fl. Lyb. Spec. 5 (1824).

A soft densely tufted slender annual, 20-40 cm. high. Leaves 3 in number, ligule lacerate, 1.5-2 mm. long; blades pale

green, pilose, 3-6 cm. long, 2 mm. wide. Panicle erect, dense, tinged with purple, obovate-cuneate, 4-6 cm. long. Spikelets 6-9-flowered, joint of rachilla 2.5 mm. long; first glume narrowly lanceolate, nearly 10 mm. long, 1-nerved, second linear-lanceolate, 3-nerved, about 14 mm. long; floral glume linear-lanceolate, 7-nerved, about 15 mm. long, including the two hyaline points, awn 12-18 mm. long; palea linear-lanceolate, ciliate-pectinate, 12 mm. long.

Kansas; California, *Sones*.

Introduced from Europe.

2. *B. RIGIDUS* Roth. Roem. & Ust. Mag. Bot. 4: 21 (1790). *B. maximus* Desf. Fl. Atl. 1: 95. (1800). *B. ambigens* Jord. Nym. Consp. 821 (1878). *B. asperipes* Jord. l. c.

An erect annual, 30-50 cm. high. Sheaths scabrid; ligule broad, lacerate, 4 mm. long; blades of the culm dark green, scabrous or pubescent, 5-15 cm. long, 4-7 mm. wide. Panicle erect, 12-20 cm. long, rays mostly in twos and threes, the longest 4 cm. long, each usually bearing a single nodding spikelet. Spikelets scabrid, 5-8-flowered; joint of rachilla 4 mm. long, empty glumes narrow, first 1-nerved, 14-18 mm. long, including the narrow apex, second linear-lanceolate, 5-nerved, 18-25 mm. long, including the narrow apex; floral glume linear-lanceolate, convex below, compressed above, 5-7-nerved, 22-27 mm. long to the tip of the two slender teeth (4 mm. long), awn 35-45 mm. long; palea linear, pectinate-ciliate, 15 mm. long.

Michigan, *H. E. Owen*; Colorado, *Cassidy*; California, *Sones*, *Pringle*.

Colorado, California, and Arizona, introduced from Europe.

3. *B. aleutensis* Trin. Ledb. Fl. Ross. 4: 361 (1853).

Culms smooth, erect, stout, 90-120 cm. high. Sheaths smooth, shorter than the internodes; ligule fringed, 5 mm long; blades flat, scabrous, 30-40 cm. long, 7-10 mm. wide. Panicle erect, simple, lanceolate, 15-25 cm. long, rays scabrous, stiff, single or in pairs, the longest 5-8 cm. long, bearing 2-3 spikelets, other rays mostly bearing single spikelets. Spikelets erect, compressed, 5-7-flowered, joint of rachilla 5 mm. long, first glume ovate, acute, 5-nerved, 10

mm. long, second oval, acute, 7-nerved, 12 mm. long; floral glume scabrous, compressed, elliptical, acute when spread, 11-nerved, about 20 mm. long, awn 4-8 mm. long; palea narrowly elliptical, 2-toothed, keels pectinate-ciliate, 14 mm. long.

An incomplete specimen examined. The spikelets resemble those of *B. unioloïdes*, though larger.

Alaska, *M. W. Harrington* in 1871-2.

4. *B. MADRITENSIS* L. Cent. Pl. 1:5 (1755). *B. ciliatus* Huds. Fl. Angl. Ed. 1, 40 (1762). *B. muralis* Huds. Fl. Angl. Ed. 2, 1:50 (1778). *B. gynandrus* Roth. Roem. & Ust. Mag. 4:20 (1790). *B. multispicatus* R. & S. Syst. 2:650 (1817). *B. diandrus* Curt. Fl. Lond. fasc. 6: t. 5 (1828). *B. polystachyus* DC. Fl. Fr. 6:276.

A soft erect slender annual, 20-40 cm. high, from a geniculate base. Sheaths longer than the internodes; ligule entire, obtuse, nearly 2 mm. long; blades of the culm 5-6, scabrous, 7-10 cm. long, 2-3 mm. wide. Panicle oval, compressed, 5-10 cm. long, rays scabrid, mostly in threes or fours, the longest about 3 mm. long, not including the spikelets. Spikelets dull green, 7-10-flowered, joint of rachilla 3 mm. long; first glume slender, 1-nerved, about 10 mm. long, second linear-lanceolate, 3-nerved, about 15 mm. long; floral glume linear-lanceolate, 7-nerved, about 18 mm. long, including the two slender points, awn 20-25 mm. long; palea linear, pectinate-ciliate, 14 mm. long.

Michigan, *H. E. Owen* 137, *Beal* 138; California, *Parish* 1994; southern California, *Parish*.

Introduced from Europe.

5. *B. INERMIS* L. Mant. 2:186 (1767). AWNLESS BROME GRASS. *Festuca inermis* DC. Fl. Fr. 3:49 (1805). *B. erectus* Ledeb. Fl. Ross. 4:358 (1853).

A rather coarse erect perennial, 60-120 cm. high, with creeping rootstocks. Sheaths striate, smooth or pilose; ligule truncate, lacerate, 1 mm. long; blades scabrous or pilose, flat, 10-20 cm. long, 6-10 mm. long. Panicle oval, erect, 12-18 cm. long, rays in fives and sevens. Spikelets 5-9-flowered, 2-3 cm. long, rachilla pubescent, first glume 1-nerved, 5-6 mm. long, second 3-nerved

and longer; floral glume slightly keeled, elliptical when spread, 5-7-nerved, 9-10 mm. long, awnless or with a very short awn.

Introduced from Europe, and in some places highly spoken of as a rather coarse grass for light soil.

6. **B. depauperatus** Presl. Rel. Hænk. 1: 263 (1830).

A rather slender erect annual, 60-90 cm. high. Blades of sterile shoots convolute-setaceous, 30-40 cm. long, sheaths of the culm-leaves smooth or pubescent, half or two-thirds as long as the internodes; ligule 2 mm. long; blades of the culm flat, smooth or scabrous, 7-12 cm. long, 3-5 mm. wide. Panicle much exerted, thin, pyramidal or ovoid, 15-18 cm. long, rays in twos or threes, 3-5 cm. distant, spreading, the longest 4-7 cm. long, bearing 2 spikelets. Spikelets lanceolate, 3-flowered, about 2 cm. long; empty glumes thin, first $\frac{1}{2}$ mm. long, second 10 mm. long; floral glume lanceolate, becoming terete, scabrous, 5-nerved, 11 mm. long; palea as long as its glume or longer.

California (San Diego), *Bolander*, *Kellogg*.

7. **B. STERILIS** L. Sp. Pl. 77 (1753). *B. amplius* C. Koch, *Linnaea*, 21: 418 (1848).

A soft erect annual, 30-90 cm. high. Sheaths about the length of the internodes, throat ciliate; ligule fringed, 2 mm. long; blades of the culm 4 in number, flat, pilose, 12-15 cm. long, 3-6 mm. wide. Panicle lax and open, 15-25 cm. long, rays scabrous in half-whorls of three to four, the longest 8-10 cm. long, and nearly all bearing each only a single drooping spikelet. Spikelets linear-lanceolate, 6-8-flowered, joints of rachilla 3 mm. long; empty glumes tapering from the base, first 1-nerved, 8-10 mm. long, less than 1 mm. wide at the base, second 3-nerved, 10-14 mm. long, 1.7 mm. wide; floral glume 5-7-nerved, 16-19 mm. long, including the slender hyaline points, awn 20-30 mm. long; palea concealed by the boat-shaped grain. Widely distributed in cultivation in waste places.

Introduced from Europe.

8. **B. virens** Buckl. Proc. Acad. Phila. 98 (1863). *Ceratochloa grandiflora* Hook. Fl. Bor. Am. 2: 253, (1840). *B. Hookerianus* Thurb. Bot. Wilkes Exped. 2: 493 (1844).

An erect tufted rather slender perennial, 20-60 cm. high.

Sheaths smooth or densely ciliate, ciliate at the throat; ligule 1-2 mm. long; blades of the culm 3-4 in number, smooth or scabrid or thinly pubescent, 15-25 cm. long, 4-6 mm. wide. Panicle simple, very variable, rays erect or the lower spreading, 15-30 cm. long, rays in threes, fours, or fives, or the lowest and those above in twos, the longest bearing 2-4 spikelets. Spikelets compressed, linear or oval-lanceolate, 6-10-flowered, longest joint of rachilla 5 mm. long; empty glumes smooth, compressed, oval-lanceolate, acute, first 5-nerved, 11-13 mm. long, second 7-9-nerved, 13-14 mm. long; floral glume oval-lanceolate, conduplicate, scabrous or pubescent, 9-nerved, 15-17 mm. long, awn 5-12 mm. long, starting below the entire apex of its glume; palea linear, 13 mm. long, finely pectinate-ciliate.

Wyoming, *Buffum* 102; Washington, *Suksdorf*; Oregon, *Howell*.
British America to California.

Var. *minor* Scribn. Macoun, Cat. 4: 238 (1888).

Leaves finely pubescent, blades scarcely 3 mm. wide; panicle thin, slender, with few spikelets.

Arizona and Oregon.

9. *B. segetum* H. B. K. Nov. Gen. et Sp. 1: 152 (1815).

Annual; culms simple, erect, glabrous, 80-120 cm. high. Sheaths about the length of the internodes; ligule 2 mm. long; blades 4 in number, flat, scabrous, 15-20 cm. long, 3-7 mm. wide. Panicle simple, secund, nodding, about 30 cm. long, axis and rays scabrous, the lowest half-whorl of rays 5 in number, the next above fewer, 8-9 cm. distant, the longest 12-15 cm. long, bearing about 3 spikelets near the apex. Spikelets scabrous, compressed, linear-oblong, nearly 3 cm. long, 3-10-flowered, joint of rachilla 2 mm. long, empty glumes linear-lanceolate, compressed, first 5-nerved, about 10 mm. long, second 7-nerved and about 12 mm. long; floral glume oval-lanceolate, 7-nerved, about 14 mm. long to the acute single joint, awn 5 mm. long, more or less; palea concealed in the conduplicate grain.

Introduced into California from Mexico and South America.

10. *B. barbatoides*, *Trisetum barbatum* Steud. Syn. Pl. Gram., 229 (1855).

Culms smooth erect branching below, 30-50 cm. high. Leaf-blades flat, sparsely pubescent, 3-8 cm. long, 2 mm. wide. Panicle simple, 8-18 cm. long, rays in half-whorls of 4, the lowest often remote from those above. Spikelets 2-4-flowered, the rachilla smooth, each joint 5 mm. long. Glumes rough, pubescent, narrowly lanceolate, first 1-nerved, 8 mm. long, with a bristle 4 mm. long, second ovate-lanceolate, 3-5-nerved, 17 mm. long, with a bristle 3 mm. long, the margins and space between the nerves thin and pubescent; floral glume compressed, softly membranous, oval-lanceolate, 7-nerved, 10 mm. long to the bases of the awn, and setæ, the latter 3-5 mm. long; palea pubescent on the keels, 10 mm. long.

The following are some of the reasons for considering this a species of *Bromus* and not *Trisetum*: the sheaths mostly closed, florets of a large spikelet several to many, and large second empty glume 5-nerved; floral glume 7-nerved, grain plicate and adhering to glume and palea.

Guadaloupe Island, off Lower California, *Palmer* 99; California, *O. D. Allen*, *Orcutt*.

Oregon, California, and Chili.

Var. *sulcatus*, *T. barbatum major* Vasey, ined.

A rather stout grass, branching near the base, 60-70 or more cm. high. Sheaths about the length of the internodes, mostly closed, clothed with short pubescence; ligule obtuse, 1 mm. long; blades flat, scabrous, 15-20 cm. long, 8-12 mm. wide. Panicle ovate-lanceolate, 30 cm. long, rays in half-whorls of 5-7, the sets 5-9 cm. distant, the longest 10 cm. long, bearing about 5 spikelets on the outer half. Spikelets somewhat compressed, 5-8-flowered, 3-4 cm. long; empty glumes subequal, bristly-pointed, 1.5-2 cm. long; floral glumes scabrid-pubescent, compressed, 7-nerved, 10-14 mm. long to the base of 2 teeth, which are 4 mm. long; awn from the notch between the teeth, irregularly twisted and bent, about 2 cm. long. Grain compressed, deeply grooved, adherent to floral glume and palea.

Mexico, *Palmer* 667.

11. *B. laciniatus* n. sp.

Perennial; 10–90 cm. high. Leaves of the culm 3 in number, the sheath of the middle one usually shorter than the internode; ligule truncate, laciniate, 1 mm. long; blades flat, 5–15 cm. long, 3–4 mm. wide. Panicle erect, thin, 5–15 cm. long, rays of the larger panicles mostly in fours, the longest 6–10 cm. long, bearing 1–2 spikelets. Spikelets 3–5-flowered, 20 mm. long, first glume ovate-lanceolate, 3–5-nerved, 6–7 mm. long, second oval, 7-nerved, 8 mm. long, joint of rachilla 3 mm. long; floral glume chartaceous, ovate-lanceolate, 5-nerved, 13 mm. long, awn 4–6 mm. long; palea 10 mm. long.

Mexico (Oaxaca), *Pringle* 4897, growing at an altitude of 9500 feet. Professor Scribner identifies it as near *B. grandiflorus* Hook.

12. **B. unioloides** (Willd.) H. B. K. Nov. Gen. et Sp. 1:151 (1815). SCHRADER'S BROMUS. RESCUE-GRASS. *Festuca unioloides* Willd. Hort. Berol. 1:3, t. 3 (1806). *Bromus catharticus* Vahl, Symb. Bot. 2:22 (1790–94). *Ceratochloa festucoides* Beauv. Agrost. 75 (1812). *Ceratochloa unioloides* DC. Cat. Hort. Monsp. 92 (1813). *Bromus Willdenowii* Kunth, Rev. Gram. 1:134 (1829–35). *Ceratochloa pendula* Schrad. Ind. Sem. Hort. Gotting. (1830). *B. Schraderi* Kunth, Enum. Pl. 1:416 (1833). *Bromus Haenkeanus* Kunth, Enum. Pl. 1:416 (1833). *Ceratochloa australis* Spreng. Steud. Nom. Ed. 2, 1:332 (1841).

A stout erect annual, 60–90 cm. high. Sheaths shorter than the internodes, often pubescent, throat sparingly ciliate, ligule 3–5 mm. long; blades flat, 4–5 in number, mostly smooth on the lower side, scabrous on the upper, 20–30 cm. long, 5–8 mm. wide. Panicle strict, linear or spreading, 15–20 cm. long, rays rather stout, mostly in twos and threes, rather remote, 10–18 cm. long, bearing each 1 to few spikelets along three-fifths of the upper part. Spikelets much compressed, oval to linear-lanceolate, 2.5–3.5 cm. long, joint of rachilla scabrid above, about 3 mm. long; empty glumes firm, lanceolate, first 5-nerved, 9–12 mm. long, second 7–9-nerved, 11–14 mm. long; floral glume firm, scabrid, ovate-lanceolate, 9-nerved, 12–18 mm. long, the awn 2–4 mm. long; palea linear, pectinate-ciliate, incurved, 10 mm. long. Grain conduplicate.

Washington (D. C.), *Vasey* 756; Mississippi, *Tracy*; Colorado, *Cassidy*; Texas, *Jenny*.

Texas to Arizona.

This has been cultivated for fodder to a limited extent, but doubtless almost every region which can grow this can grow something better. At one time it was extensively advertised under one or both of the above common names.

13. *B. BRIZÆFORMIS* Fisch. & Mey. Ind. Sem. Hort. Petrop. 3:30 (1836).

A soft nodding annual or biennial, 20-50 cm. high. Leaves 5 to 7, soft-pubescent, ligule about 2 mm. long; blades flat, 7-10 cm. long, 3 mm. wide. Panicle at length nodding, 10-15 mm. long, rays in threes to fives, the longest 5-7 cm. long, usually bearing single spikelets. Spikelets nodding, ovate-oblong, compressed, 10-15-flowered, 2-2.5 cm. long, joint of rachilla 1.5 mm. long; first glume ovate-oblong, almost acute, 3-5-nerved, 5-6 mm. long, second broadly oval, acute or obtuse, 7-nerved, 7-8 mm. long; floral glume compressed, broadly oval or rhombic-obovate when spread, 9-nerved, awn seldom 1 mm. long; palea obtuse, pectinate-ciliate on the keels, about 6 mm. long.

Vermont, *Pringle*; Nevada, *Tracy*.

Introduced into cultivation as an ornamental grass from southeastern Europe. It has considerably the appearance of *Briza maxima*.

14. *B. SQUARROSUS* L. Sp. Pl. 76 (1753). *B. hirsutus* Schrank, Denkschr. Bot. Ges. Regensb. 161 (1818).

A soft slender erect grass, 30-40 cm. high. Sheaths pubescent, shorter than the internodes; ligule short; blades 3 in number, flat, pubescent or scabrid, 5-10 cm. long, 2 mm. wide. Panicle simple, 6-10 cm. long, rays in twos, threes, or fours, filiform, flexuose, the longest 4-5 cm. long, bearing a single spikelet. Spikelets flat, scabrid, linear or ovate, elliptical, 8-10-flowered, joint of rachilla 1.5 mm. long; first empty glume ovate, acute, 5-nerved, 5 mm. long, second acute, 7-nerved, 7 mm. long; floral glume oval-obovate, 9-nerved, 10 mm. long, apex entire or notched, hardly acute, awns of lower florets 5 mm. long, straight, those above 10 mm. long, bent and slightly twisted; palea oblanceolate, 8 mm. long, pectinate ciliate.

The plant seen for description came from Italy from the Herbarium of I. Burk, and is now owned by F. L. Scribner.

15. *B. HORDEACEUS* L. Sp. Pl. 77 (1753). *B. mollis* L. Sp. Pl. Ed. 2: 112 (1762).

A tomentose or pubescent glaucous green erect or geniculate grass. 30-50 cm. high. Sheaths about the length of the internodes: ligule 1 mm. long; blades flat, 4-5 in number, 8-15 cm. long, 4-6 mm. wide. Panicleo void, erect or nodding, rays in fours or fives, few-flowered, the longest 2-4 cm. long beside the spikelets, but most of them less than 1 cm. long. Spikelets 6-10-flowered, oblong, acute, slightly compressed, 1.5-2 cm. long, joints of the rachilla 1 mm. long; empty glumes ovate, acute, first 3-5-nerved, 6-8 mm. long, second 7-9-nerved, 8-10 mm. long; floral glume oval-obovate, 5-7-nerved, bifid, 6-8 mm. long, the awn from the sinus 6-8 mm. long; palea pectinate-ciliâte, reaching nearly to the sinus of its glume. Grain linear, flat. Regarded by Bentham as only a variety or form of *B. arvensis* L., but usually named as above.

Pennsylvania, *Canby* for Clark 1922; Michigan, *Beal* 140; California, *Pringle*.

Introduced from Europe into meadows and lawns.

16. *B. ciliatus* L. Sp. Pl. 76 (1753). *B. Canadensis* Michx. Fl. Bor. Am. 1: 65 (1803). *B. pubescens* Muhl. Willd. Enum. Hort. Berol. 120 (1809).

An erect perennial, 60-90 or even 150 cm. high. Sheaths longer than the internodes, smooth, scabrous, or hairy; ligule a firm ring, 1 mm. or less in length; blades 6-9 or rarely 14 in number, flat or involute above when dry, tapering toward the base, smooth, scabrous or somewhat hairy, 20-30 cm. long, 5-10-17 mm. wide. Panicle open, oval or pyramidal, slightly nodding, 16-25 cm. long, rays in twos, threes, or fours, the longest 6-10 cm. long, branching near the middle, each bearing 1-2 or few spikelets. Spikelets teretelanceolate when young, but when older flattened, oblong or oval-cuneate, 7-12-flowered, longest joint of rachilla 1.5-2 mm. long, with a few hairs at least on the convex side; first empty glume compressed, linear-lanceolate, 5.5-7 mm. long, usually 1-nerved, sometimes 3-nerved, both forms on the same panicle, second glume

slightly compressed, linear, 7-9 mm. long, 3-nerved, usually obtuse when spread, mucronate, appearing acute owing to the involutions of the margins near the apex, rarely acute; floral glume almost rounded on the back below, usually compressed above when in flower, or later narrowly elliptical, apex nearly flat, entire, obtuse, when spread, 10-16 mm. long, 7-nerved, the alternate nerves longer, pubescent near the margins, usually on the lower half only, awn back of the apex, about 4 mm. long; palea linear, pectinate-ciliate, 8-10 mm. long.

Massachusetts, *Beal* 146; Michigan, *Douglas Houghton*, *Beal* 142, 144, 145, *F. E. Wood*, *Wheeler* 141, 143; Ohio, *Frank* in 1837; Iowa, *Arthur* 734 of the U. S. Dept. Agricul.; Minnesota, *Arthur* B 5, *Sandberg* 1, 499; Kansas, *Peter Felker*; Colorado, *Cassidy*; Wyoming, *Buffum* C 20; Montana, *Scribner*, *Williams*, *Anderson* 10; Arizona, *Toumey* 746; Washington, *Lake*; Oregon, *Cusick* 1289; California, *Jones* 2287.

Var. **Coloradensis** Vasey, Bull. Torr. Club, 15:10 (1888). A small form; florets 3-7; floral glume densely pubescent.

Var. **minor** Munro; Vasey, Grasses U. S. Dept. Agric. Spec. Rept. 44 (1883), name only. About 40 cm. high; leaves nearly smooth; panicle 6-8 cm. long; spikelets 15-18 mm. long, florets 6-7 mm. long.

Texas, *Havard*, *Nealley*; Arizona, *Jones* 4071.

Var **montanis** Vasey, Bot. Wheel. Expt. 292 (1878).

Culms 30-60 cm. high; panicle erect; spikelets 5-6-flowered.

Colorado, *Patterson* 264, also found in Arizona.

Var **pauciflorus** Vasey, Macoun, Cat. 4:238 (1888). Plants 60 cm. high, slender, smooth, spikelets 5-10 in number and in a raceme. Oregon, *Howell*.

Var. **purgans** (L.) A. Gray, Man. Ed. 1, 600 (1848). *B. purgans* L. Sp. Pl. 76 (1753). Floral glume clothed over the back with appressed hairs.

17. *B. GIGANTEUS* L. Sp. Pl. 77 (1753).

An erect glabrous perennial, 90-120 cm. high. Sheaths smooth, about as long as the internodes; ligule a mere ring; blades flat, scabrous above, 30 cm. long, 10-15 mm. wide. Panicle loose,

drooping, 20–30 cm. long, rays scabrous, single or in pairs, 3-angled, the lowest remote, 10 cm. long, besides the spikelets, which are few and borne above the middle. Spikelets 3–6-flowered, joint of rachilla 2 mm. long; first empty glume awl-shaped, 1-nerved, 6 mm. long, second linear-lanceolate, 3-nerved, 8–9 mm. long; floral glume scabrous, lance-elliptical, obscurely 5-nerved, 8–9 mm. long, including two very short hyaline points, awn slender, 15–20 mm. long; palea scabrous on the keels, lance-elliptical, 8 mm. long.

Introduced from Russia.

18. *B. ERECTUS* Huds. Fl. Angl. Ed. 1, 39 (1762). *B. arvensis* Lam. Fl. Fr. 3: 607 (1778). *B. agrestis* All. Fl. Ped. 2: 249 (1785). *B. asper* Pall. Ind. Taur. ex Bieb. Fl. Taur. Cauc. 1: 73 (1808). *B. angustifolius* Schrank, Baier. Fl. 1: 366 (1811). *Bromopsis erecta* Fourn. Ann. Soc. Linn. Lyon, N. S. 17: 187 (1869).

An erect glaucous-green perennial, 30–60 cm. high, from short, stout rootstocks. Sheaths two-thirds as long as the internodes, pubescent; ligule a mere callus or ring; blades thinly pubescent, narrow, involute, those of the sterile shoots 30 cm. long, those of the culm 4 in number, 10–15 cm. long, 2–3 mm. wide. Panicle strict, linear, 10–12 cm. long, 2–3 cm. wide, rays scabrous, in twos and threes, the longest 3–5 cm. long, bearing 2–3 spikelets, mostly on short pedicels. Spikelets linear, often tinged with purple, 6–10-flowered, joint of rachilla 3 mm. long; first glume lanceolate, 1-nerved, 7–9 mm. long, second linear-lanceolate, 3-nerved, 9–10 mm. long; floral glume scabrid, lance-oval, 5-nerved, 10–12 mm. long, including the 2 hyaline points, awn 5 mm. long; palea linear, ciliate on the keels, 10 mm. long.

Vermont, *Pringle* for U. S. Dept. Agricul. 738; Mississippi, *Tracy*; California, *Jones* 3270.

Introduced from Europe.

19. *B. TECTORUM* L. Sp. Pl. 77 (1753). *B. avenaceus* Lam. Illustr. 1: 194 (1791). *B. abortiflorus* St. Amans, Fl. Agen. 44 (1811). *Anisantha pontica* C. Koch, Linnæa 21: 394 (1848).

A rather soft and slender perennial, 20–70 cm. high. Sheaths pubescent, shorter than the internodes; ligule very short; blades 4

in number, flat, softly pubescent, 5-10 cm. long, 2-3 mm wide. Panicle pyramidal, 7-12 cm. long, rays very slender, flexuose in half-whorls of 4-6, the longest 4-5 cm. long besides the spikelet, each bearing 1-4 pubescent spikelets. Spikelets slender, 5-6-flowered, joint of rachilla 3 mm. long; empty glumes narrow, with slender, hyaline points, first 1-nerved, 6 mm. long, second 3-nerved, 8-10 mm. long; floral glume narrowly elliptical, 5-7-nerved, 10-12 mm. long including the hyaline teeth at the apex, awn 10-20 mm. long; palea shorter. Grain concave, round on the back, 7-8 mm. long.

U. S. Dept. Agricul. 755; Vermont, *Pringle*; Massachusetts, *L. H. Bailey*; New Jersey, *Scribner* 3517 a.

Introduced from Europe.

20. **B. Pumpellianus** Scribn. Bull. Torr. Club, 15:9 (1888).

An erect stout perennial, 50-100 cm. high, with creeping rootstocks. Sheaths 4-5, smooth, or sparingly pubescent; ligule firm, 1.5 mm. long; blades smooth below, scabrous above, flat, with long involute points, the blades 15-25 cm. long, 4-8 mm. broad. Panicle usually erect, linear, rather dense, 8-20 cm. long, rays 2-5 at each joint, the longest 5-10 cm. long, each bearing 1-3 spikelets. Spikelets linear-lanceolate, compressed, tinged with purple, 4-10-flowered, 2-4 cm. long, the longest joint of rachilla pubescent, 3 mm. long; empty glumes smooth, first linear-lanceolate, 1-nerved, 5-9 mm. long, second elliptical-lanceolate, 3-nerved, 7-11 mm. long; floral glume softly pubescent, oval-lanceolate, 7-9-nerved, the lateral nerves obscure, 10-17 mm. long, including the entire acute apex, awn 2-3 mm. long; palea linear, 13 mm. long, finely ciliate on the keels.



FIG. 116.—*Bromus Pumpellianus*. A, spikelet; a, floret. (Scribner.)

Colorado, *Vasey* for U. S. Dept. Agricul. 746; Wyoming, *Buffum* C 35.

Nearly allied to *B. breviaristatus*. The italicized words above mark the most distinctive points which separate this from *B. breviaristatus*.

Rocky Mountains, Colorado to Montana.

Var. **Tweedyi** Scribn. ined.

Panicle villous, smaller, rather slender, more pubescent.

Montana, *Tweedy* 587.

21. *B. ASPER* Murr. Prod. Stirp. Gott. 42 (1770). *B. altissimus* Web. Wigg. Prim. Fl. Hols. 9 (1780), teste Kunth. *Festuca aspera* M. & K. Deutsch. Fl. 1: 672 (1823).

An erect annual or perennial, 60–150 cm. high. Sheaths clothed more or less with reflexed hairs; ligule short; blades 5–6, flat, scabrous or thinly pubescent, 3–4 cm. long, 5–8 mm. wide. Panicle open, 8–15 cm. long, lowest rays scabrous, mostly in twos and threes, the longest 8–10 cm. long, branched sparingly. Spikelets oblong or lanceolate, compressed, 6–10-flowered, 2–3 cm. long, joint of rachilla scabrid, with few hairs, 3.5 mm. long; first empty glume lanceolate, 1-nerved, 6 mm. long, second oval-lanceolate, 3-nerved, 9 mm. long, with the apex mucronate; floral glume scabrid, hairy, elliptical-lanceolate, 5–7-nerved, 13 mm. long including the very short teeth, awn 5–8 mm. long; palea narrowly oblanceolate, short-ciliate on the keels, 9–10 mm. long.

Michigan (near Lansing), *Bailey* in 1886.

Introduced from Europe.

22. *B. Orcuttianus* Vasey, Coult. Bot. Gaz. 10: 223 (1885).

An erect perennial, leafy below, scabrous above, 90–120 cm. high; nodes pubescent. Sheaths pubescent; ligule firm, 1 mm. long; blades 4, besides several crowded near the base of the culm, or 8 on tall plants from the forest, erect, firm, nearly smooth, 10–15–30 cm. long, 5–9 mm. wide. Panicle erect, thin, 10–15 cm. long, rays in twos and threes, the longest 3–5 cm. long, not including the 2–3 spikelets, spreading. Spikelets 4–8-flowered, longest joint of rachilla scabrous, 3.5 mm. long, first empty glume linear, acute, 1–3-nerved, 7 mm. long, second linear, almost acute, 3-nerved, 9–11 mm. long; floral glume scabrous-pubescent, round on the back, lance-elliptical, 5–7-nerved, 10–12 mm. long, apex entire, obtuse,

awn 4-8 mm. long; palea linear, unevenly ciliate on the keels, nearly as long as its glume.

Washington, *Suksdorf*, *Howell*; Oregon, *Howell*; southern California, *Palmer*, 233; Lower California, *Orcutt*.

Washington to southern California.

23. **B. Suksdorfii** Vasey, Coult. Bot. Gaz. 10:223 (1885).

A stout erect tufted smooth perennial, 60-80 cm. high. Sheaths smooth, all except the lower, shorter than the internodes; ligule thick, 1 mm. long; blade, 5-6s erect, flat, smooth, rather abruptly pointed, 8-15 cm. long, 6-8 mm. wide. Panicle erect, linear, 7-10 cm. long; rays in twos and threes, the longest 3-4 cm. long, bearing 2-3 spikelets. Spikelets linear-lanceolate, 3-5-flowered, longest joint of rachilla scabrous, 3 mm. long; empty glumes smooth, scarcely acute, first lanceolate, 3-nerved, the lateral nerves obscure, 9 mm. long, second oblong-lanceolate, 3-nerved, 12 mm. long; floral glume oblong-lanceolate, round on the back, softly pubescent, 5-7-nerved, 12-14 mm. long, including the entire rather obtuse apex, awn 4 mm. long, leaving its glume on the back a little below the apex; palea linear, finely pectinate-ciliate, 3 mm. shorter than its glume.

Washington, *Suksdorf*; Oregon, *Howell*.

Washington and Oregon, 7000 feet above the sea.

24. **B. breviaristatus** (Hook.) Buckl. Proc. Acad. Phila. 98 (1863). *Ceratochloa breviaristata* Hook. Fl. Bor. Am. 2:253 (1840).

A rather stout erect perennial, 50-70 cm. high. Sheaths about the length of the internodes, often pubescent; ligule 1 mm. long; blades 4 in number, flat, pubescent or scabrous, 12-20 cm. long, 4-8 mm. wide. Panicle loose, mostly erect, 10-20 cm. long, rays erect, in twos or threes or often single, the longest 5-7 cm. long, not including the 1-3 spikelets. Spikelets lanceolate, compressed, scabrid, 6-8-flowered, joint of rachilla scabrid, 3 mm. long, first empty glume lanceolate, 3-nerved, 8-10 mm. long, second oval-lanceolate, 5-7-nerved, 10-12 mm. long; floral glume shortly pubescent or scabrous, elliptical-lanceolate, obscurely 7-nerved, 11-13 mm. long, including 2 very short tips, awn 3-8 mm. long;

palea lanceolate, pectinate-ciliate, 7-9 mm. long. Grain conduplicate.

Michigan, (Petoskey) *Wheeler*, (Charlevoix) *Spalding*; Wyoming, *Buffum* c 34; Montana, *Anderson* 12, 13, *Williams*; Utah, *Jones*; Vancouver Island, *Macoun*; Washington, *Lake*, *Sandberg* 450; Oregon, *Howell* for U. S. Dept. Agricul. 742; California, *Jones* 2487, 3108; Arizona, *Pringle*, *Tracy*, *Toumey* 747.

Northern Michigan, Rocky Mountains to Oregon.

25. **B. Kalmii** A. Gray, Man. Ed. 1:600 (1848). *B. ciliatus* Muhl. Gram. 169 (1817), not L. *B. purgans* Torr. Fl. N. Y. 2:468 (1843), not L.

An erect slender perennial, 60-90 cm. high, with drooping panicles. Sheaths mostly shorter than the internodes; ligule about 0.5 mm. long; blades 4-5, usually conspicuously hairy, flat or becoming involute in a dry climate, 12-18 cm. long, 5-8 mm. wide. Panicle 8-15 cm. long, rays slender, mostly in twos and threes, the longest 4-6 cm. long, bearing 1-2 spikelets. Spikelets oval, drooping, 7-13-flowered, the glumes densely silky all over, especially the floral glume, joint of rachilla pubescent, about 2 mm. long; first glume linear-lanceolate, 3-nerved, 5-6 mm. long, second oval, scarcely acute, 7-nerved, 7 mm. long; floral glume round on the back, oval, obtuse, even near the apex when mature, 7-9-nerved, 9-11 mm. long; awn 2-3 mm. long; palea linear, strongly pectinate-ciliate, 7 mm. long. Dr. Gray was followed in some respects in the above description.

Michigan, *Beal* & *Wheeler* 147; Minnesota, *Arthur*; Montana, *Anderson*.

Dry grounds, New England, New York, Michigan, Montana, and northward.

Var. **occidentalis** Vasey, ined.

Blades narrower, not so hairy, joint of rachilla 3 mm. long, first glume obtuse, 5-7.5 mm. long, second oval, almost obtuse, 6-8.5 mm. long; floral glume with shorter hairs.

Montana, *Cunby* & *Scribner* 384, *Anderson* 11; Colorado, *Cassidy*.

Rocky Mountains.

26. *B. SECALINUS* L. Sp. Pl. 76 (1753). CHESS. CHEAT. *B. arvensis* Oed. Fl. Dan. t. 293 (1769). *B. badensis* C. Gmel. Fl. Bad. 4: 75. t. 5 (1826). *B. Billotii* Sch. Bip. Fl. 32: 233 (1849). *B. Ehrharti* Gaud. Roem. Collect. 19. *B. grossus* D C. Fl. Fr. 3: 68 (1805). *B. hordeaceus* D C. Gmel. Fl. Bad. 4: 68 (1805-26). *B. maximus* Gilib. Exercit. 2: 535. *B. nitidus* Dum. Obs. Gram. Belg. 119 (1823). *B. segetalis* A. Braun, Nym. Consp. 822 (1878).

An erect stout annual, nearly smooth, 30-120 cm. high. Sheaths about the length of the internodes; ligule 1.5 mm. long; blades 4 in number; scabrid above, 12-20 cm. long, 4-6 cm. wide. Panicle oblong, 8-18 cm. long, rays in threes, fours, and fives, the longest 6-7 cm. long, bearing a few spikelets near the end. Spikelets compressed, oblong-ovate, 8-16 mm. long, 5-10-flowered; joints of rachilla nearly 2 mm. long, first empty glume ovate-acute, 3-nerved, 5 mm. long, second broadly oval, mucronate, 7-nerved, 6 mm. long; floral glume broadly oval when spread, 7-9-nerved, at length coriaceous, 7 mm. long, awn variable, usually 5 mm. or less long; palea as long as its glume, pectinate-ciliate. Grain in section shaped like a horse-shoe. Regarded by Bentham as only a variety or form of *B. arvensis* L.

Pennsylvania, *Scribner* for U. S. Dept. Agricul. 749; Michigan, *Cooley*, *Beal* 148, 149, 151, *Wheeler* 150.

Introduced from Europe and too common in fields of winter wheat.

27. *B. RACEMOSUS* L. Sp. Pl. Ed. 2: 114 (1762). CHESS. CHEAT. *B. arvensis* Knapp, Gram. Brit. t. 82 (1804), not L. *B. commutatus* Schrad. Fl. Germ. 1: 353 (1806). *B. agrarius* Hornung, Steud. Nom. Ed. 2. t. 226 (1841).

An erect annual, 60-90 cm. high. Sheaths half or two-thirds as long as the internodes; ligule 2 mm. long; blades and sheaths smooth or more often pubescent, 4 in number, 8-15 cm. long, 3-6 mm. wide. Panicle narrow, about 15 cm. long, rays in threes, fours, and fives, the longest 4-5 cm. long, besides the spikelet. Spikelet ovate-lanceolate, 6-10-flowered, 15-25 mm. long, joint of rachilla nearly 2 mm. long; empty glumes oval, acute, nearly smooth, first 3-nerved, 6 mm. long, second 7-nerved, 8 mm. long;

floral glume oval-obovate, 5-7-nerved, bifid, 7-8 mm. long, the awn from the sinus about the length of its glume; palea pectinate-ciliate, extending nearly to the sinus.

Hooker in his British Flora says: "Very similar to *B. mollis*, but subglabrous, often 2-3 ft., rigid; leaves rigid, more ciliate; branches of panicle 3-5-nate, long and slender; spikelets narrower, more acute, scabrid; empty glumes narrower, especially the lower; floral glume broadest above the middle, margin obtusely angled."

Dr. Thurber in Bot. Calif. says: "Some European botanists regard this species, *B. mollis* and *B. secalinus*, all as varieties of *B. arvensis*."

Vermont, *Pringle*; Massachusetts, *Beal* 152, 153; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 747; Michigan, *Farwell*; Washington, *Lake*.

Introduced from Europe.

28. *B. ARVENSIS* L. Sp. Pl. 77 (1753). *B. altissimus* Gilib. Exercit. 2: 537.

An erect annual or biennial, often softly downy, 30-60-90 cm. high. Sheaths mostly shorter than the internodes; ligule 2 mm. long; blades flat, 6-12 cm. long, 2-3 mm. wide. Panicle erect or at length nodding, oval, 8-15 mm. long, rays in threes to fives, the longest 4-5 cm. long, usually bearing a single spikelet. Spikelets slightly compressed, lanceolate or ovate-lanceolate, 6-10-flowered, 15-25 mm. long, joint of rachilla over 1 mm. long, first empty glume lanceolate, 3-5-nerved, 5-6 mm. long, second oval, acute, 7-nerved, 6-7 mm. long; floral glume oval, acute, or sometimes almost rhombic-obovate, 7-9 mm. long, the awn 3-7 mm. long; palea linear, pectinate-ciliate. Grain involute.

New Jersey, *Scribn.* for U. S. Dept. Agricul. 730; Michigan, *Beal* 154.

Bentham in his British Flora says: "Many of the forms assumed by this ubiquitous species, difficult as they are to distinguish, and passing gradually into one another, have been universally recognized as species, although with characters very differently marked out by different authors." He includes as varieties or forms of the

above *B. scalinus* L., *B. mollis* L., *B. racemosus* L., *B. multiflorus* L.

Introduced from Europe.

135. (264). **BRACHYPODIUM** Beauv. Agrost. 100 (1812). *Disticheia* Ehrh. Bertr. 4: 148 (1789). *Trachynia* Link, Hort. Berol. 1: 42 (1827). *Hemibromus* Steud. Syn. Pl. Gram. 1: 317 (1855).

Spikelets many-flowered, compressed or subterete, few in a simple spike, sessile or with short pedicels, rachilla glabrous, articulate between the florets. Empty glumes shorter than the floral glume, shortly awned or awnless; floral glume firm, narrow, round on the back, 7-9-nerved, entire or producing a short awn; palea but little shorter than its glume, broad, 2-keeled, ciliate. Stamens 3, rarely 2. Ovary ciliate, styles very short. Grain linear or narrowly oblong, flattened on the back, grooved or concave in front, adhering more or less to glume and palea.

Erect perennials or annuals, blades flat or involute, terete. Spikelets distant.

There are six to eight species found in Europe, Asia, Africa, Mexico, and South America, three of which belong in North America.

1. **B. Pringlei** Scribn. ined.

A densely tufted slender branching perennial, erect or diffuse, 20-70 cm. high. Culms slender, sometimes capillary, nodes pilose. Sheaths often loose; ligule very short; blades of the culm variable, firm and closely involute, rigid, 3-4 cm. long, or thin, flat, scabrid, 10-15 cm. long, 3-4 mm. wide, tapering from the middle toward each end. Spikes bearing 4-6 erect spikelets, which are linear, 5-9-flowered, 16-23 cm. long. Empty

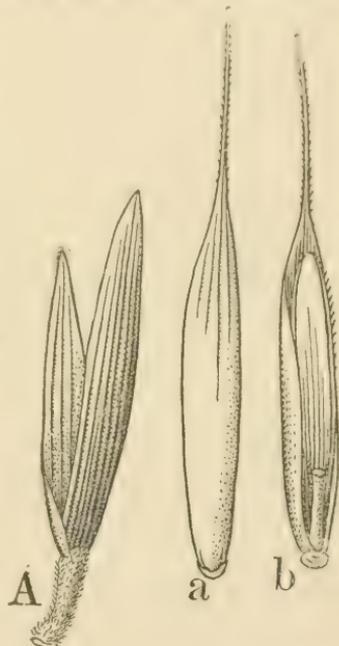


FIG. 117.—*Brachypodium Mexicanum*. Spikelets. A, empty glumes; a, b, views of floret. (Scribner.)

glumes linear, obtuse, 5-nerved, first 4 mm. long, second about 5 mm. long; floral glume about 6 mm. long; palea 6.5 mm. long, spatulate-linear before spreading, revolute.

Mexico, *Pringle* 2525 in 1889.

Moist banks near Monterey.

2. **B. Mexicana** (R. & S.) Link, Hort. Berol. 1:41 (1827). *Festuca Mexicana* R. & S. Syst. 2:732 (1817). *F. scabra* Lag. Gen. et Sp. Nov. 4 (1816).

A slender branching perennial, 20–30 cm. high, with a few rootstocks. Culms slender, nodes smooth. Sheaths shorter than the internodes; ligule about 0.5 mm. long; blades mostly flat, scabrid, pungent-pointed, 3–4 cm. long, 1.5–2.5 mm. wide, tapering towards the base. Spikes bearing 1–3 erect linear-lanceolate spikelets, 3–6-flowered, 1.5–2 cm. long; empty glumes ovate-lanceolate, abruptly pointed, first 5-nerved, 5–6 mm. long, second 7–9-nerved, 7–8 mm. long; floral glume elliptical, 7-nerved, 8 mm. long, the terminal awn 2–4 mm. long.

Mexico, *Pringle* 4231.

TRIBE XII.—HORDEÆ.

Spikelets 1-many-flowered, sessile in the alternate notches of the rachis of a simple spike, rachilla usually produced beyond the upper floret.

136. (265). **LOLIUM** L. Sp. Pl. 83 (1753). *Cræpalia* Schrank, Baier. Fl. 1:102, 382 (1789). *Crypturus* Link, Linnæa, 17:387 (1843). *Arthrochortus* Lowe, Hook. Kew. Journ. 8:301 (1856).

Spikelets several-flowered, sessile, single (or abnormally branching) at each joint of the single spike, distichous, compressed, turning one edge (or the backs of one row of glumes) to the rachis; rachilla articulate between the florets, which are perfect, or the upper one imperfect. Glumes firm, 5–7-nerved, round on the back, not keeled, obtuse, acute, acuminate or the nerves above extending into an awn; the lower glume of the lateral spikelets and the 2 lower glumes of the terminal spikelets empty; palea shorter than the floral glume, narrow, 2-keeled. Stamens three. Styles

distinct, very short, with feathery stigmas. Grain oblong, glabrous when mature, adhering to the palea.

Annuals or perennials with flat blades. Spikes terminal, often quite long.

According to some authors there are twenty or more species, but Bentham reduced them to 2 or 3.

Indigenous to Europe, the cooler parts of Africa and Asia; cultivated in other countries also.

The genus is at once distinguished from all others of the tribe by the position of the flat spikelets with their edge to the rachis.

1. *L. PERENNE* L. Sp. Pl. 83 (1753). PERENNIAL RYE-GRASS OR RAY-GRASS. DARNEL. *L. agreste* Hort. Rœm. & Schult. Syst. 2:748 (1817). *L. annuum* Bernh. Sem. Hort. Erf. (1801). *L. arenarium* Rouv. Monog. 38. *L. asperum* Roth, Kunth, Enum. Pl. 1:436 (1833). *L. canadense* Bernh. Rouv. Monog. 27. *L. aristatum* Pers. Syn. 1:110 (1805). *L. Pseudo-italicum* Schur, Enum. Pl. Transs. 812 (1866). *L. remotum* Schrank, Baier. Fl. 1:382 (1789). *L. strictum* Presl. Cyp. & Gram. Sicul. 49 (1820). *L. tenue* L. Sp. Pl. Ed. 2, 122 (1763). *L. vulgare* Hort, Gram. Austr. 1:25 (1801); and other synonyms.

A smooth erect or slightly decumbent perennial, 60-90 cm. high. Culms slightly compressed. Ligule short; blades of sterile shoots abundant, shining. Spike strict, 10-30 cm. long, slender. Spikelets 8-20 in number, the lower often separated 2-3 cm., obtuse or acute, 8-13 mm. long; empty glumes stiff, linear-lanceolate, strongly nerved, shorter than the spikelet; floral glume 6-16 mm. long, linear-oblong, obtuse, acute or rarely short-awned.

Europe and Northern Asia.

Extensively cultivated and very variable. (See p. 159 and Fig. 74 of Vol. I.)

2. *L. MULTIFLORUM* Lam. Fl. Fr. 3:621. ITALIAN RYE OR RAY-GRASS. *L. aristatum* Lag. Nym. Consp. 445. *L. cœchicum* Opig. Oekon. Teekn. Fl. Boehm. 379 (1836). *L. elongatum* Hort. Rouv. Monog. 35. *L. italicum* A. Br. Flora, 17:259 (1834); and other synonyms.

An annual, taller and more vigorous than the species; floral glumes terminated by slender awns. Much employed in Great Britain for irrigated meadows. See p. 161, Vol. I.

Michigan, *Clark* 1687, *Beal* 155, 156.

3. *L. TEMULENTUM* L. Sp. Pl. 83 (1753). POISON-DARNEL. *L. ægypticum* Bell. Rouv. Monog. 43. *L. album* Steud. Nom. Ed. 1, 493 (1821). *L. annuum* Lam. Fl. Fr. 3:620 (1778). *L. decipiens* Dum. Obs. Gram. Belg. 98 (1823). *L. infelix* Rouv. Monog. 39. *L. lucidum* Dum. l. c.; and other synonyms.

Annual; taller and stouter than *L. perenne*. Empty glumes equal or usually exceeding the 5-7-flowered spikelet; floral glume shorter, broader, firmer and more turgid than in *L. perenne*, usually terminating in an awn as long as the spikelet.

Europe, north Africa, west Siberia, India; introduced into North America.

A weed in waste places, seldom very common. Said to be very poisonous, though this statement is questioned by many.

Delaware, *Canby* for Scribner 3527; Virginia, *Chickering* for U. S. Dept. Agricul. 760.

Var. *ARVENSE* (With.). *L. arvense* With. Arr. Brit. Pl. Ed. 3, 2:168 (1796).

Spikelets more turgid, awn very short or none.

Europe.

(194). *JOUVEA* Fourn. Bull. Soc. Bot. Belg. 15:475 (1876).

“Spikelets unisexual, diceious, very dissimilar, the staminate ones compressed, many-flowered, spicate on slender terminal or lateral pedicels, rachilla continuous. Empty glumes 2, thin, the second 1-nerved and longer than the first (in old specimens the empty glumes, particularly the first, are rarely present); flowering glumes longer and broader, carinate, acute, herbaceo-chartaceous, 3-nerved; palea broad and prominently 2-keeled. Stamens 3. Female spikes 1-several in terminal fascicles on the culm or its branches, enclosed below by the leaf-sheaths or broad prophylla, terete, acute, articulated at base and falling off entire. Spikelets 1-flowered, embedded in the continuous rachis, adnate below. Outer glume cartilaginous, abruptly narrowed towards the free

apex. Style single, long, exserted, stigmas 2, plumose. Grain subterete, free."

F. L. Scribner, Bull. Torr. Club, 17:227 (1890).

1. *J. straminea* Fourn. l. c.

Rootstocks creeping. Culms erect, branching, about 30 cm. high, smooth, solid, flattened. Sheaths short, slightly inflated; ligule a ciliate fringe; blades scabrous, narrow, conduplicate, 1-10 cm. long, pungent-pointed. Staminate spikes 3-6 cm. long. Spikelets 3-6 in number, sessile on alternate notches of the slender rachis, much compressed, 1.5-3 cm. long, about 3 mm. wide, 10-18-flowered, floral glume 4-5 mm. long, broadly lanceolate; palea a little shorter than its glume. Pistillate spikes 2-3 cm. long, mostly terete, sharp-pointed; spikelets 1-3 in number, 6-8 mm. long, deeply embedded in the rachis; glumes adnate for four-fifths of their length. Style emerging through the conical apex of the glumes. Grain about 6 mm. long.

From imperfect specimens Dr. A. Gray referred the plant to *Distichlis*. Fournier placed this near *Buchloë*. Prof. E. Hackel placed it near *Monerma*.

Lower California and Mexico.

2. *J. pilosa* Scribn. Bull. Torr. Club, 23:143 (1896). *Juvea straminea* Scribn. not Fourn. *Rachidiospermum Mexicanum* Vasey, Coult. Bot. Gaz. 15:110 (1890). *Uniola pungens* Rupr. Bull. Acad. Roy. Brux. 9: excluding the synonym. *Brizopyrum pilosum* Presl, Rel. Hænk. 1:280.

"*J. straminea* Fourn. is readily distinguished from *J. pilosa* Scribn. by its more slender habit, less rigid leaves, less crowded inflorescence, more slender and proportionately much longer spikelets. In *J. pilosa* the glumes are grown to the axis for almost their entire length, and there are paleas or rudimentary pistils of a second flower within the floral cavities." Scribner, l. c.

138. (269). **LEPTURUS** R. Br. Prod. 207 (1810). *Rottbællia* Host, Gram. Austr. 1:t. 24 (1801). *Leptocercus* Rafin. Am. Month. Mag. 190 (1819). *Pholiurus* Trin. Fund. Agrost. 131 (1820). *Lepiurus* Dum. Obs. Gram. Belg. 140 (1823).

Spikelets 1-2-flowered on a simple spike, single, sessile, narrow,

distichous in the excavations of the jointed rachis. Rachilla very short, articulate above the lower glumes, extending as a short awn

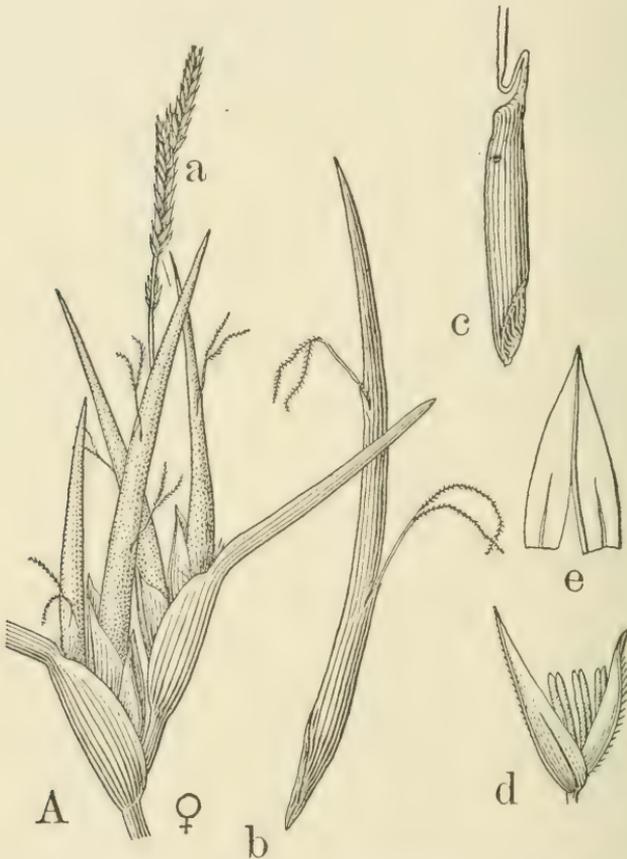


FIG. 118.—*Jouvea straminea*. A, pistillate spikelets; a, portion of staminate inflorescence; b, two-flowered pistillate spike; d, staminate floret; e, floral glume of same; c, grain. (Scribner.)

above the flowers, which are perfect or the upper one imperfect. Empty glumes 1-2, persistent, narrow, firm, acute, 5-nerved; the floral glume much shorter, slender, hyaline; palea hyaline, 2-nerved. Stamens 3 or fewer. Styles short, distinct, distant, stigmas feathery. Grain narrow, glabrous, enclosed by the glumes, but not adherent.

Low branching annuals or sometimes taller and perennial, blades

narrow. Spike terminal, slender, firm, straight or curved, one glume spreading when in flower. They are distinguished by rigid outer glumes, one or two in number, much longer than the hyaline floral glume, showing a relationship to *Rottbællia*. Some species have been placed in *Ophiurus*.

There are 6 species belonging to the Eastern Continent, and 1 to California and Oregon.

1. *L. FILIFORMIS* (Roth). Trin. Fund. Agrost. 123 (1820). *Rottbællia filiformis* Roth, Usteri, Ann. Bot. 10:38 (1794).

A slender branching glabrous decumbent annual, 20-30 cm. high. Sheaths shorter than the internodes; ligule about 1 mm. long; blades 1-3 cm. long, firm, involute. Spike enclosed at the base, 5-15 cm. long, straight or curved, rachis stiff. Spikelets 5-7 mm. long; empty glumes oblique, linear-oblong, acute; floral glume 1-nerved.

Borders of brackish marshes.

Occasional; introduced from Europe.

Var. *INCURVATUS* (L.). Trin. Fund. Agrost. 173 (1820). *Rottbællia incurvata* L. f. Suppl. 114 (1781).

Culm and spike stouter; the latter much curved.

Pennsylvania, *Scribner* 3525a.

139. (269a). *SCRIBNERIA* E. Haek. Coult. Bot. Gaz. 13:105 (1888).

Spikelets 1-flowered, sessile and half embedded in the alternate notches of a more or less articulate, usually simple spike. Rachilla very short, articulate above the lower glume, extending as a short hairy awn beside the floret. Empty glumes 2 in number, narrow, firm, acute, slightly unequal, inequilateral, having no nerves next the rachis and two beside the keel in front; floral glume a third shorter than the first, membranous, keeled, bearing a stout awn between the teeth; palea hyaline, 2-nerved, 2-toothed, longer than its glume. Stamen 1, anthers 3 mm. long. Stigmas short, sessile, feathery. Grain linear, laterally compressed, free, without a groove, embryo



FIG. 119.—*Lepturus filiformis*. A, a portion of spike; a, spikelet. (Richardson.)

small. A low slender annual with short, narrow blades. Spike terminal, slender, firm, straight, slightly compressed. Its affinities are with *Lepturus*, *Kralikia* and *Psilurus*.

A genus named for Prof. F. Lamson Scribner by Ernest Hackel, and by Thurber included in *Lepturus*.

1. *S. Bolanderi* (Thurb.). Hack. l. c. *Lepturus Bolanderi* Thurb. Proc. Am. Acad. 7:401.

The characters of the genus.

California and Oregon.

140. (266). **AGROPYRON** J. Gärttn. Nov. Comm. Petrop. 14: (I) 539 (1770). *Anthosachne* Steud. Syn. Pl. Gram. 237 (1855).

Braconotia Godr. l. c. Ed. 1.3:191 (1844). *Costia* Willk.

Bot. Zeit. 377 (1858). *Cremopyrum* Schur,

Enum. Pl. Transs. 807 (1866). *Crithopyrum*

Hort. Prag. Steud. Syn. Pl. Gram. 344

(1855). *Elytrigia* Desv. Nouv. Bull. Soc.

Philom. 2:190 (1810). *Eremopyrum* Jaub.

& Spach, Illustr. Pl. Or. 4:26 (1850-53).

Haynaldia Schur, Enum. Pl. Transs. 807

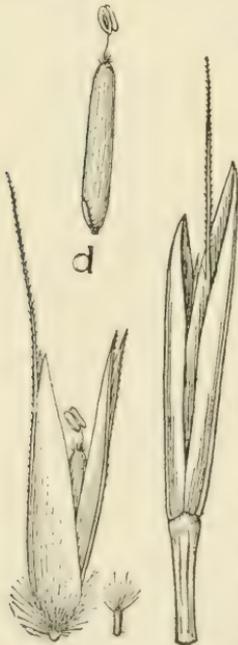
(1866). *Heterantheium* Hochst. Jaub. &

Spach, Illustr. Pl. Or. 4:24 (1850). *Ræg-*

neria C. Koch, Linnæa, 21:413 (1848). *Se-*

calidium Schur, Verh. Siebenb. Ver. Naturw.

4:91 (1853).



a

A

FIG. 120.—*Scribneria Bolanderi*. A, spikelet; a, floret; d, grain. (Scribner.)

with fewer nerves; floral glumes firm, round on the back, very little if at all keeled, 5-7-nerved, obtuse, acute, or the upper nerves extending into an awn, the upper smaller, often empty or enclosing an imperfect flower; palea shorter (sometimes longer) than the

floral glume, keels often ciliate. Stamens 3. Styles very short, distinct. Grain narrowly oblong, compressed from the back, often concave on the inside, more or less hairy at the apex, when dry adhering to the palea or free.

Perennials or annuals, with leaf-blades flat or convolute. Spike terminal, usually stiff, spikelets large. Species 20-30, belonging to temperate regions of America and Europe.

Bentham proposed sections as follows:

1. *Agropyron* proper, mostly perennials, spikelets more or less distant along the common rachis, outer glumes usually unequal-sided and not keeled.

2. *Eremopyrum* Ledeb.—mostly annuals, spikelets distichous and close together in a short dense spike, the narrow empty glumes nearly equal-sided and keeled.

- | | |
|---|------|
| A. Spike 1-sided. | 1 |
| B. Spike not 1-sided | (a) |
| a. Florets soft, woolly. | 2 |
| a. Florets not woolly. | (b) |
| b. Rootstocks numerous, plant not glaucous. | 3 |
| b. Rootstocks present, plant glaucous. | 4 |
| b. No rootstocks. | (c) |
| c. Awns slender, recurved. | 5-6 |
| c. Spike long, flexuose, nerves of empty glumes
conspicuous. | 7 |
| c. Like No. 7, only with short erect spikes. | 8, 9 |

1. *A. violacescens* (R. Pound). *A. caninum* (forma) *violacescens* R. Pound. Minn. Bot. Studies, Bull. 9 (III) 107 (1894). *A. unilaterale* Cassidy, Bull. Col. Agr. Exp. Sta. 12: 63 (1890). *A. caninum unilaterale* Vasey, Contrib. U. S. Nat. Herb. 1: 279 (1893). *A. unilaterale* Beauv. is a synonym of *Festuca tenuiflora* Schrad.

A perennial, 60-80 cm. high; culms strict, smooth. Leaves 3-4 in number, sheaths shorter than the internodes; ligule very short; blades rough, involute, pungent-pointed, 5-7 cm. long, 5-12 mm. wide. Spike exserted, 1-sided, 7-10 cm. long, 5-8 mm. wide, often purple; internodes of rachis at the middle 3-4 mm. long. Spikelets 3-4-flowered, regularly breaking in pieces, first glume 9

mm. long, with 3 strong nerves, short-awned, second 11 mm. long, with 5 very strong nerves, awn 5 mm. long; floral glume 8-9 mm. long, with 5 obscure nerves, awn about 2 mm. long; palea shorter than its glume, with 2 ciliate nerves. Grain adherent.

Montana, *Scribner* 422, the type; Colorado, *Cassidy*, *Vasey*; Iowa, *Hitchcock*; northern Michigan, *Beal*.

The specific name *unilaterale* had been used before Cassidy applied it to this species.

2. *A. dasystachyum* (Hook.) Scribn. Bull. Torr. Club, 10: 78 (1883); Vasey, Grasses U. S., Special Rept. U. S. Dept. Agr. No. 63, 45 (1883). *Triticum repens* var. *dasystachyum* Hook Fl. Bor. Am. 2: 254 (1840), teste A. Gray. *T. dasystachyum* A. Gray, Man. Ed. 1, 602 (1848).

A smooth glaucous perennial, 60-90 cm. high, with slender rootstocks having internodes 3-4 cm. long. Leaves of sterile shoots numerous, blades involute, 30-40 cm. long, 2-4 mm. wide, those of the culm 3-4 in number, sheaths nearly as long as the internodes; ligule a mere ring; blades 6-12 cm. long. Spike exerted, 14-20 cm. long, joints of rachilla 1 cm. long, or near the base longer. Spikelets narrow, 2 or more cm. long, 5-9-flowered; empty glumes smooth or puberulent, first 7 mm. long, 3-nerved, second 10-12 mm. long, 5-nerved; floral glume 11 mm. long, soft-hairy throughout, awnless or with short awns, margins scariosus. Abnormal or thrifty plants bear branching spikes.

Michigan, *Wheeler* 156, 157, 158, *Beal* 158, 159.

Shores of the Great Lakes, British America and the Rocky Mountains.

3. *A. repens* (L.) Beauv. Agrost. 102 (1812). QUICK-, TOUCH-, QUACK-, TWITCH-GRASS. *Triticum repens* L. Sp. Pl. 86 (1753).

A smooth pale green or glaucous perennial, very variable, 30-120 cm. high, with the internodes of the rootstock 1-1.5 cm. long. Ligule very short; blades flat, scabrous, 5-10 mm. wide, the upper 10-20 cm. long. Spike 6-20 cm. long, erect or bending, mostly rigid, joint of rachis 5-15 mm. long. Spikelets 10-20 mm. long, 2-8-flowered, florets at the middle of the spike overlapping for three-fourths of their length or more; empty glumes each un-

symmetrical, 7-11 mm. long, first strongly 5-6-nerved, second 7-8-nerved, acute or notched, margins scarious; floral glume about 1 cm. long, those above shorter, 5-nerved at the cuspidate or short-awned apex.

Found in Europe, north Africa, Asia, and extensively naturalized in cultivated grounds in North America.

Vermont *Pringle*; Massachusetts, *Beal* 161; Pennsylvania, *Scribner* for U. S. Dept. Agricul. 767; Michigan, *Beal* 159, 160, *Clark* 2310; Iowa, *Hitchcock*; Minnesota, *Arthur* B 511; Montana, *Anderson* 9.

For an extended notice see Vol. I., p. 167, Fig. 76.

Var. *tenerum* (Vasey). *A. tenerum* Vasey, Coult. Bot. Gaz. 10:258 (1885).

Destitute of rootstocks; blades usually narrower and shorter and rather more rigid; spike rather more slender, sometimes tinged with purple. After growing patches, from seed obtained from more than one source, in a variety of soils for more than 15 years, I am unable to indicate any differences other than those here given to distinguish this from *A. repens* L.

A promising grass for cultivation.

Colorado, *Cassidy*; Montana, *Anderson* 37; Arizona, *Toumey*, *Sandberg* 239, 331; California, *Lemmon*.

4. *A. glaucum* (Desf.) R. & S. Syst. 2:752 (1817). *Triticum glaucum* Desf. Tabl. Bot. Mus. 16 (1804). *A. repens*, various authors.

A smooth usually glaucous perennial, 30-100 cm. high. Creeping rootstocks numerous. Sterile shoots numerous; leaves of the culm 3-4 in number, blades 3-12 cm. long, narrow, involute. Spike 12-14 cm. long, with internodes about 7 mm. long, the lower sometimes twice as long. Spikelets occasionally 2 at a node, 2 cm. long, 5-9-flowered, smooth or rough, florets in the middle of the spike overlapping for three-fourths of their length: empty glumes narrowly lanceolate, first 7 mm. long, 3-nerved, second 10 or more mm. long, 5-nerved, inequilateral; floral glume a little longer than the empty glumes, lanceolate, obtuse, acute or awn-pointed, 5-nerved.

Iowa, *Hitchcock*; Colorado, *Vasey*, *Cassidy*, *Jones*; Montana, *Anderson* 36; Texas, *Nealley*; Utah, *Jones*; New Mexico, *Vasey*; Wyoming, *Buffum* C 5, C 46, C 95; New Mexico, *Vasey*; Washington, *Sandberg* 310, 435, 466; Oregon, *Howell*; Arizona, *Jones* 4012.

A native of the western plains from Texas to Montana, much valued for hay. See Vol. I., pp. 92, 93. Also found in Europe and Asia.

5. *A. divergens* Nees, Steud. Syn. Pl. Gram. 347 (1855). *Triticum strigosum* Les. Linnæa, 9:170 (1834).

A slender densely tufted glaucous perennial, 30–80 cm. high. Leaves 3–4 in number, sheaths about the length of the internodes; ligule very short; blades narrow, convolute, setaceous, nearly smooth, the upper 4–8 cm. long. Spikes 6–14 cm. long, very slender. Spikelets 3–6-flowered, rather distant, first empty glume 6 mm. long, 3-nerved, margins scarious, second 8 mm. long, 5-nerved, with the midrib at one side, awnless; floral glume 7–8 mm. long, plainly 5-nerved above, awn stout, diverging or recurved when dry, longer than the floral glume; palea about as long as its glume or longer.

Colorado, *Cassidy*; New Mexico, *Vasey*; Montana, *Anderson* 35, 40; Wyoming, *Buffum* C 94, C 97; Washington, *Sandberg* 583, *Lake*; Oregon, *Howell*, *Cusick*; California, *Parish*; Mexico, *Pringle* 1439.

Rocky Mountains to the Pacific.

6. *A. Scribneri* Vasey, Bull. Torr. Club, 10:128 (1883).

Culms densely tufted, geniculate and decumbent near the base, 30–60 cm. high, rather slender. The upper sheath thrice as long as the blade; ligule obsolete; blade 2.5–3.5 cm. long, involute, narrow, rigid. Spikes exerted, 5–7 cm. long, their internodes 4–5 mm. long. Spikelets 3–6-flowered; empty glumes 5–7 mm. long, linear-lanceolate, 3–5-nerved, extending into a long point, 10–25 mm. long; floral glume oblong-lanceolate, the base about 8 mm. long, smooth, 5-nerved, sometimes slightly bidentate, the mid-nerve extended into a strong, spreading or recurved hispid awn; palea equalling the floral glume, acute, margins hispid. The spike resembles that of *A. caninum*, but the plant differs in its tufted

habit, low size, and smooth, rigid, sometimes glaucous leaves. Found only high up on mountains near the timber line, growing in scattered tufts. Named for Prof. F. L. Scribner.

In the Sierras, *Pringle*; Colorado, *Patterson*; Montana, *Scribner*; Washington, *Tweedy*.

7. *A. caninum* (L.) Beauv. Agrost. 102 (1812). *Triticum caninum* L. Sp. Pl. 86 (1753).

A smooth perennial, 70–90 cm. high, culms slender, rather weak. Leaves 4–5 in number, sheaths smooth; ligule very short; blades thin, 10–25 cm. long, 5–12 mm. wide, taper-pointed. Spike narrow, flexuose or slightly nodding, 10–17 cm. long. Spikelets 3–5-flowered; empty glumes with scarious wing-margins above, nearly equal, with 3–5 conspicuous nerves, first 7–9 mm. long, second a little longer; floral glume 8–9 mm. long, awn 2–18 mm. long, flexuose; palea longer than the floral glume. Grain adherent.

Maine, *Fernald* 196; Vermont, *Pringle*; Michigan, *Prentiss*, *Beal* 164, 166, *Wheeler* 165, *Farwell*; Montana, *Anderson* 28; Utah, *Jones*; Arizona, *Toumey* 761; Minnesota, *Arthur* B 42.

New England to California.

8. *A. violaceum* (Hornm.) Vasey, Grass. U. S., Special Rept. Dept. Agricul. 45 (1883). *Triticum violaceum* Hornm. Fl. Dan. t. 2044 (1832).

Perhaps this is a northern or alpine form of *A. caninum* R. & S., from which it differs in having a culm 30–50 cm. high, leaves 3–4 in number, blades proportionally shorter. Spike 3–8–12 cm. long, narrow, strict, more or less tinged with violet. Spikelets 3–5-flowered; floral glume wider than in *A. caninum*, not so firm, nerves more prominent, awn short or none; palea shorter than the floral glume, pectinate-ciliate.

New Hampshire, *Pringle*, *Faxon* 20, 23, *Hosford*; Colorado, *Cassidy* for U. S. Dept. Agricul.; Michigan, *Wheeler*, *Farwell*; Minnesota, *Arthur* B 494; Wyoming, *Buffum* C 30, C 45.

Mountains of New England, New York, northern Minnesota, Colorado, California, and northward; also found in Europe.

Plants collected in Grinnell Land by Lieut. Greely are 8–15 cm. high, with short spikes and densely pubescent glumes, which

are very broad with short awns. Plants are found in various places which shade off almost imperceptibly into *A. caninum*.

9. *A. caninoides* (R. Pound). *A. violaceum* (forma) *caninoides* R. Pound, Minn. Bot. Studies, Bull. 9 (III), 107 (1894).

Perennial with no rootstocks. Culms rigid, 30–140 cm. high. Leaves 5–6 in number, sheaths shorter than the internodes; ligule 1 mm. or less long; blades flat, rather thin, pungent-pointed, 15–30 cm. long, 5–7 mm. wide. Spike 15–18 cm. long, erect, rachis with green margins. Spikelets 2–3-flowered; empty glumes 7–9 mm. long, with scarious margins, 5–7-nerved, the awn 2–5 mm. long; floral glume 7 mm. long, bearing a rather stiff awn, 10–20 mm. long. Usually compared with *A. caninum*.

Michigan (Agricultural College), *Beal & Wheeler*, 162, 163.

Dry knolls or low land and borders of woods; growing in isolated bunches. Promising for cultivation.

New Hampshire, Michigan, Minnesota to Rocky Mountains.

141. (267). **SECALE** L. Sp. Pl. 84 (1753). RYE.

Spikelets usually 2-flowered in a cylindrical or flattened spike, sessile, compressed, one at each joint on alternate sides of the rachis, not inflated, convex on the outer side and flat next the rachis, rachilla becoming a slender stipe above the flowers. Empty glumes firm, narrowly linear, compressed-keeled, acute, acuminate or with a short awn; floral glume broader, compressed-keeled, scarcely longer, not counting the long awn, 5-nerved, the outer ones prominent, those next the rachis obscure; palea a little shorter than the floral glume, narrow, 2-keeled. Stamens 3. Styles very short, distinct, stigmas feathery. Grain oblong, subterete, furrowed on the inside, hairy at the apex, included by the glume and palea, free or slightly adhering to the palea.

Erect annuals with flat blades. Spike terminal, compact, jointed at the nodes of the slender rachis, which is usually hairy.

Species 2 or perhaps only 1, indigenous to the country bordering the Mediterranean Sea. The genus differs slightly from the section *Eremopyrum* of *Agropyron* in the dense cylindrical spike, and in the spikelets usually containing only 2 flowers.

1. S. CEREALE L. l. c.

An erect glaucous annual, with slender but stiff culms 1-2 m. high. Glumes 1-nerved.

A valuable cereal, the grain inferior to that of wheat. Much grown in cool regions where the land is light and poor; also grown as a forage-crop and for green manuring. See Vol. I.

141. (268). **TRITICUM** L. Sp. Pl. 85 (1753). WHEAT. ("Corn" in England.) *Ægilops* L. Coroll. Gen. 20 (1837). *Bromus* Scop. Introd. 74 (1777). *Crithodium* Link, Linnæa, 9:132 (1834). *Cryptopyrum* Heynh. Nom. 2:174 (1846).

Spikelets 2-5-flowered, the fertile ones inflated, distichous, sessile, somewhat compressed, single at the alternate notches of the



FIG. 121.—*Secale cereale*. Spikelet. (Richardson.)

rachis of a simple spike, one side of the spikelet next the rachis; rachilla often jointed between the flowers, 1-5 of the lower flowers perfect, the upper often male or neuter. Empty glumes firm, shorter and often narrower than the floral glume, usually inequilateral, with few nerves, awn short or none, floral glume ventricose, broadly oblong, round on the back or keeled above, often toothed or awned, 5-9-nerved, nerves not meeting at the apex; palea shorter than its glume, with two ciliate keels. Stamens 3. Styles 2, very short, stigmas plumose. Grain ovoid or oblong, usually villous at the apex, with a groove on the inside, included by the glume and palea, not adhering to them or slightly adhering to the palea. Erect

annuals or winter annuals with flat leaf-blades. Spikes terminal, cylindrical, or somewhat flattened. Species not over 10, found in the vicinity of the Mediterranean Sea.

The genus *Triticum* excludes *Agropyron*, the species of which were at one time included in it, and now includes *Ægilops*. In *Triticum* the lateral nerves of the floral glume are not connivent, but parallel or nearly so, and either stop short of the apex or are produced beyond it into distinct teeth or awns. There are three groups:

1. *Wheats* in cultivation. Floral glumes keeled at the apex and sometimes at the base, and terminate in a single awn; lateral nerves usually barely reaching to the end of the glume.

2. *Crithodium* Link. Spikelets with only 1 fertile flower, floral glume keeled from the base and ends in a single awn. One species sometimes has two or even three fertile flowers, and the lateral nerves of the floral glumes sometimes produced into short teeth.

3. *Ægilops* L. Differing from the cereal wheats in having a floral glume more rounded on the back and not at all keeled, lateral nerves of floral glume often produced into long awns; hybridizes freely with the cultivated wheats.

1. *T. VULGARE* Vill. Hist. Pl. Dauph. 2: 153. WHEAT.

This includes all the well-known races cultivated in this country, whether "bearded" or "bald," "red chaff" or "white chaff," spring wheat or winter wheat. The native country of this very valuable cereal is not known. It is not improbable that a wild plant of southern Europe known as

FIG. 122.—*Triticum vulgare*. Spikelet. (Richardson.)

Ægilops L. is the original form.

143. (274). **HORDEUM** L. Sp. Pl. 84 (1753). BARLEY. *Cuviera* Koel. Gram. 328 (1802). *Zeocriton* Beauv. Agrost. 114 (1812). *Critesion* Rafin. Journ. Phys. 89: 103 (1819). *Critho* E. Mey. Ind. Sem. Hort. Regiom. 5 (1848).

Spikelets 1-flowered, 3 together, distichous, sessile or on short

stipes, one side next the rachis at the nodes or notches of a simple spike. Rachilla very short, articulate above the lower glumes, extending above the flower as a long slender awn or a very narrow glume, flowers perfect or those of the lateral spikelets male or rudimentary. Empty glumes subulate or lance-linear, firm, persistent, the 6 at each joint appearing like an involucre; floral glume lanceolate, round on the back, 5-nerved above, extended into a straight or spreading awn; palea but little shorter than the floral glume, 2-keeled. Stamens 3. Lodicules 2, ciliate. Styles very short, distinct. Grain ovoid-oblong or narrow, hirsute at the apex, grooved on the inside, adhering to the palea or rarely free. Erect annuals or rarely perennials, with flat leaf-blades. Spike cylindrical, usually densely flowered with long, or rarely short awns.

Species 12-16, indigenous to Europe, north Africa, temperate Asia, North and South America.

Beauvois restricted *Hordeum* to the common cultivated barley, which appears in a great variety of forms. The genus, as here understood, is distinguished from *Elymus* by the single flower in each spikelet, and is distributed into three sections:

1. *Zeocriton* Beauv. Central spikelet alone of each three is fertile, the lateral ones sterile or reduced to empty glumes.

2. *Crithopsis* Jaub. Two perfect spikelets at each notch, the intermediate one deficient or rarely represented by one or two empty glumes.

3. *Cuviera* Koel. Spikelets 3 and collateral, all fertile.

- A. Not in cultivation. (a)
- B. Cultivated for grain. (e)
 - a. Awns 4-6 cm. long. 1
 - a. Awns 3 cm. long or less. (b)
 - b. Empty glumes 0.5-0.7 mm. wide, upper blades 1-3 cm. long. 3
 - b. Empty glumes 0.3-0.5 mm. wide, upper blades 10-15 cm. long. 2
 - b. Empty glumes narrower. (c)
 - c. Spike 7 mm. wide. 3
 - c. Spike wider. (d)

- d. Joint of rachis 1 mm. long 4, 5
 d. Joint of rachis 3 mm. long 6
 e. Spikelets all fertile. 7
 e. Spikelets with the lateral ones sterile. 8

1. *H. jubatum* L. Sp. Pl. 85 (1753). SQUIRREL-TAIL GRASS.
Critesion geniculatum Rafin. Jour. Phys. 89: 103 (1819).

A smooth annual or biennial, 30-45 cm. high. Culms slender, protruding 5-15 cm. above the sheath. Sheaths shorter than the internodes; ligule 1 mm. long; blades of the upper leaves 4-7 cm. long. Spike 4-7 cm. long, rachis very slender, breaking in pieces when mature, each piece 1.3 mm. long. Lateral spikelets on pedicels 1 mm. long, central one sessile; empty glumes capillary, pale straw-color or purple, 4-6 cm. long, recurved when mature and dry; floral glume of the lateral florets small and short-awned, that of the perfect floret with an awn much like those of the empty glumes. Grain elliptical, flat-concave, 3 mm. long.

Vermont, *Pringle*; Michigan, *Clark, Beal, Farwell*; Iowa, *Hitchcock*; Illinois, *Bebb, Beal* 161; Minnesota, *Arthur* B 128; Montana, *Anderson* 39; Colorado, *Cassidy*; Washington, *Lake, Sandberg* 245; Oregon, *Howell*.

On the seacoast and saline soil, about the Great Lakes and elsewhere.

Widely distributed.

Were it not for the breaking of the spikes so freely, it would be cultivated as an ornamental grass.

2. *H. Montanense* Scribn. ined.

Culms smooth, slender, about 80 cm. high. Leaf-blades flat, scabrid, 10-15 cm. long, 4-7 mm. wide. Spike exserted, sometimes purplish, 6-8 cm. long, with internodes about 3 mm. long. Empty glumes 10-20 mm. long, 0.3-0.5 mm. wide. Central spikelet 9 mm. long, the perfect floret bearing an awn 15-25 mm. long; second floret merely an empty glume; floral glume scabrid or shortly hairy, 5-nerved; palea a little shorter than its glume; florets of lateral spikelets raised on a pedicel about 1 mm. above the central, each consisting of floral glume, palea, lodicules, a rudimentary pistil and sometimes a second floret reduced to a small empty glume.

Montana, *Scribner* 429, 430.

Shaded borders, Hound Creek, and by springs near the head of Jan Coulie or Tiger Battle, Aug. 3, 1883. Number 430 has the shorter awns, and the floral glumes scabrid; number 429 has the longer awns and the floral glumes puberulent.

3. *H. pratense* Huds. Fl. Angl. Ed. 2, 56 (1762). *H. nodosum* L. Sp. Pl. Ed. 2, 126 (1762). *H. secalinum* Schreb. Spicil. Fl. Lips. 148 (1771). *H. pusillum* Nutt. Gen. 1: 87 (1818).

Culms 20-70 cm. high, often geniculate below. Leaf-blades flat or involute, usually nearly smooth, 10-12 cm. long. Spike exserted, 3-7 cm. long, about 7 mm. wide, readily separating when mature, each joint of rachis 1.3-2 mm. long. Empty glumes all very narrow, subulate from the base and slightly scabrous; lateral spikelets borne on stipes 0.5-0.7 mm. long, lanceolate, awn-pointed; central floret cylindrical, about 8 mm. long with a short awn. Grain elliptical.

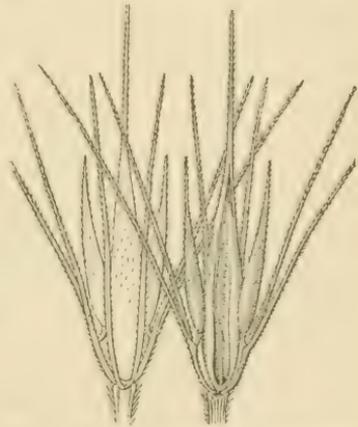


FIG. 123. — *Hordeum pratense*.
Two views of a spikelet. (Scribner.)

Col. W. Munro in Proc. Lin. Soc. p. 50, 1862, says in reference to the grasses of Linnaeus' Herbarium: "*H. nodosum* 2d Edit. Sp. Pl. p. 126, is certainly *H. pratense* Huds., of which there are also two other specimens without any name, and the species does not seem to have been taken up by Linnaeus."

Iowa, *Hitchcock*; Illinois, *Patterson* for U. S. Dept. Agricul. 778. *Canby*, *Bebb* for Dr. Clark 2966; Missouri, *Bebb*; Montana, *Williams* 584; Louisiana, *Langlois*; Wyoming, *Buflum* C 42; Arizona, *Towney* 763, 773; Vancouver Island, *Macoun*; Washington, *Lake*, *Suksdorf*; California, *Jones* 2522.

Found in western States and Territories, usually in alkaline soils.

4. *H. MARITIMUM* With. Bot. Arr. 1: 172 (1776). SEA-BARLEY. *H. chilense* R. & S. Syst. 2: 796 (1817). *H. geniculatum* All. Fl.

Pedem. 2:259 (1785). *H. Hystrix* Roth, Catalect. 1:23 (1797).
H. pubescens Guss. Fl. Sic. Prod. 1:144 (1827).

A smooth somewhat glaucous and decumbent annual, 10–30 cm. high. Sheaths about the length of the internodes, the upper one inflated; ligule a mere ring; blades 2–6 cm. long, mostly involute. Spike subterete, scarcely exerted, 2–4 cm. long, rachis breaking when ripe, the joints 1 mm. long. Spikelets 1 cm. long, including the stiff spreading awns; stipes of lateral spikelets 1.2 mm. long; empty glumes all lanceolate, not ciliate, one of each lateral spikelet a little broader.

New Jersey (ballast-grounds), *Scribner* for U. S. Dept. Agricul. 776; Oregon, *Howell*.

Found along the coast in the Old World from Denmark to north Africa. Introduced into North America.

5. *H. GUSSONEANUM* Parl. Pl. Palerm. 244, obs.—Sicil.

Culms smooth, often decumbent, 20–30 cm. long. Leaf-blades flat, thin, finely pubescent, 2–5 cm. long, 2 mm. wide. Spikes subterete, not included, 2–4 cm. long, 1 cm. diameter, breaking when ripe, joints of the rachis 1 mm. long. Lateral spikelets raised on stipes 1 mm. long; empty glumes mere bristles 12 mm. long, excepting that the inner one to each lateral spikelet is twice as wide as the others; central floret 6 mm. long; the floral glume rough, oval when spread, 5-nerved, the awn 12 mm. long; palea as long as its glume. Lateral florets small rudiments 2–4 mm. long, including the awn. This is much like our specimens of *H. maritimum*. When compared, *H. Gussoneanum* has the inner lateral empty glumes half as long as wide, the rachis and base of glumes less callous, the lateral florets smaller, softer and less developed.

Introduced into Oregon and California from Europe.

6. *H. MURINUM* L. Sp. Pl. 85 (1753). WALL-BARLEY. WAY BENT. *H. ciliatum* Gilib. Exercit. 2:520. *Zoocriton murinum* Beauv. Agrost. 115 (1812). *H. leporinum* Link, Linnæa, 9:133 (1835).

A coarse decumbent annual, 30–60 cm. high. Leaves often hairy; sheaths about the length of the internodes; ligule very short; blades 3–6 cm. long. Spike 4–8 cm. long, often partially

included in the upper sheath, slightly compressed, light green, soon breaking when mature, each joint of the rachis 3 mm. long, about 1 mm. wide. Spikelets, including awns, 4-5 cm. long; empty glumes of the middle one lanceolate, ciliate on the margins; floral glume scabrous above, flat on the back, 12-14 mm. long; palea but little shorter. Stipes of lateral spikelets 1.5 mm. long; empty glumes setaceous, 2-3 mm. long; floral glumes and palea like those of the central floret. Grain flat, narrowly elliptical, 5.5 mm. long.

New Jersey (ballast-grounds), *Scribner* for U. S. Dept. Agricul. 777.

A native of Europe, but now widely distributed in many parts of the world, rather sparingly introduced into North America.

7. *H. HEXASTICHON* L. Sp. Pl. 85 (1753). SIX-ROWED BARLEY. *H. heterostychon* Beauv. Agrost. 114 (1812).

An erect annual, 60-80 cm. high. Spikes compressed, about 10 cm. long, not counting the erect awns, which are often 15 cm. long; rachis stout, each joint 4 mm. long, not readily separating. Spikelets all sessile and all fertile; empty glumes slender, bristles 1-2 cm. long; floral glume prominently nerved above, 10-12 mm. long, adhering to the grain.

A well-known valuable plant, cultivated in a wider range of climate than any other cereal.

8. *H. DISTICHON* L. Sp. Pl. 85 (1753). TWO-ROWED BARLEY. *Zoocriton distichum* Beauv. Agrost. 115 (1812). *H. imberbe* Arduini. R. & S. Syst. 2: 793 (1817). This differs from the above chiefly as follows: lateral spikelets stipitate, neutral; floral glume of lateral spikelets obtuse, acute, or short awned.

Often cultivated.

144. (275). *ELYMUS* L. Sp. Pl. 83 (1753). *Crithopsis* Jaub. & Spach, Illustr. 4: 30, t. 321 (1850). *Leymus* Hochst. Flora 31: 118 (1848) in foot-note. *Orthostachys* Ehrh. Beitr. 4: 146 (1789). *Polyantherix* Nees, Ann. Nat. Hist. (I) 1: 284 (1838). *Sitanion* Rafin. Journ. Phys. 89: 103 (1819). *Sitospelos* Adans. Fam. 2: 36 (1763).

Spikelets 2-6-flowered, 2-6 together, sessile at the nodes of the more or less excavated rachis of the simple spike, rachilla articulate below the florets, flowers perfect or the upper imperfect or reduced

to an empty glume. Empty glumes firm, narrowly linear, 1-3-5-nerved, short- or long-awned, persistent, all those at one node resembling an involucre, rarely the glumes split into many awns; floral glume shorter, oblong or lanceolate, round on the back, 5-nerved, obtuse or acute, awned or awnless; palea as long as the floral glume or shorter, 2-keeled. Stamens 3. Styles very short, distinct, stigmas feathery. Grain oblong, hairy at the apex, grooved on the inside, adhering to the palea.

Perennial grasses, usually with broad flat or firm convolute blades. Spikes terminal, cylindrical, compact, often covered with many awns, rachis breaking in pieces or not, densely or loosely many-flowered.

Species 25-30, belonging to the temperate regions of Europe, Asia, and North America.

Elymus is distinguished from *Hordeum* in having two or more flowers to each spikelet, and is distributed into three sections:

1. *Sitanion* Rafin. *Polyantheryx* Nees. Rachis articulate; floral glume usually 3-awned.

2. *Clinelyna* Griseb. Rachis continuous; spikelets usually 2 only at each notch, floral glume with one long awn.

3. *Psammelyna* Griseb. Tall rigid species, often with more than two spikelets to each notch; floral glume unawned or with only very short awnlike points.

- | | |
|---|------------|
| A. Spike soft, ciliate, awn short or none. | 1, 2, 3, 4 |
| B. Spike smooth or hirsute, awns none or very short. | 5, 6, 7 |
| C. Glumes awned. | (a) |
| a. Some of the empty glumes divided. | 7, 8, 9 |
| a. Empty glumes not divided. | (b) |
| b. Spike rigid, upright. | (c) |
| c. Spike stout, partly included. | 10 |
| c. Spike narrow, exserted. | 11 |
| c. Spike stout, short, exserted. | 12 |
| b. Spike exserted, usually nodding. | (d) |
| d. Spike large, 10-15 cm. long, floral glume often
flexuose. | 13 |
| d. Spike more slender, awns more slender. | 14 |
| d. Spike dense, villous, awns straight. | 15 |

1. *E. arenarius* L. Sp. Pl. 83 (1753). RAUCHERIA GRASS.

Culms stout, glaucous, 1-2 m. or more high, from creeping rootstocks. Sheaths smooth, ligule very short; blades strict, pungent, 30 cm. long, 10-15 mm. wide, the upper short. Spike dense, strict, 15-30 cm. long, 1.5 cm. broad; rachis hirsute. Spikelets 2-3 at a joint, 2-3 cm. long, appressed, pubescent, mostly 3-flowered; empty glumes linear-lanceolate, 3-5-nerved; floral glume rigid, ciliate, keeled toward the cuspidate apex: palea as long as its glume.

It considerably resembles *E. mollis*.

Alaska, *Funston* for Nat. Herb. 140; Washington, *Howell*, *Suksdorf* 1028.

Sandy seashores, Alaska to California, also in Europe and northern Asia.

2. *E. mollis* Trin. Spreng. N. Endt. 2:72 (1821).

Culms stout, 80-170 cm. high. Leaves much like those of *E. arenarius*. Spike erect, 20-30 cm. long. Spikelets 2-3 at each joint, 2-3 cm. long, 5-8-flowered, more or less soft-pubescent. Empty glumes as long as the spikelets, 5-7-nerved; floral glume 15-20 mm. long, 7-nerved.

This is much like *E. arenarius*. The leaves and spikes are softer, the empty glumes more ciliate and broader and often 7-nerved.

Maine (Eastport), *Beal* 162; Isle of Shoals, *Canby*.

3. *E. dasystachys* Trin. Ledeb. Fl. Alt. 1:120 (1829). *E. Vancouverensis* Vasey, Bull. Torr. Club, 15:48 (1888).

Culms smooth, rather stout, 60-80 cm. high from creeping rootstocks. Leaves scabrous throughout, or the sheaths smooth; ligule very short; blades rigid, more or less involute, pungent-pointed, 20-35 cm. long, 5-8 mm. wide. Spike strict, 8-12 cm. long. Spikelets 2 at each joint, 15-20 mm. long, closely imbricate, 4-7-flowered; empty glumes equal, 13-15 mm. long, more or less ciliate, short-awned, narrowly-lanceolate, 3-nerved; floral glume slightly ciliate, the lower one 12 mm. long, besides the short awn.

Montana, *Williams*; Vancouver Island, *Macoun*; Washington, *Howell*.

Alaska to Washington.

4. *E. innovatus* n. sp.

A rather slender perennial, 60-70 cm. high, from creeping rootstocks. Sterile shoots abundant, blades 20-30 cm. long, 2-3 mm. wide, scabrous, flat or involute, leaves of the culm 3 in number, sheaths shorter than the internodes; ligule very short; blades 4-10 cm. long. Spike erect, slightly exerted, 7-10 cm. long. Spikelets puberulent, 2 at a joint, 3-4-flowered, 15 mm. long; empty glumes mere bristles, 4-12 mm. long; floral glume oval-lanceolate, 8-9 mm. long; palea as long as its glume.

Montana (north fork of the Sims River in 1887), *R. S. Williams*.

5. *E. triticoides* Buckl. Proc. Acad. Phila. 99 (1863). *E. Orcuttianus* Vasey, Coult. Bot. Gaz. 10:258 (1885).

Rootstocks at least sometimes present. Culms rather slender, 60-100 cm. high, nodes 3-5. Ligule very short; blades 15-25 cm. long, erect, narrow, often involute, smooth or scabrous, the upper equalling or exceeding the culm. Spike 7-15 cm. long, erect, loosely or rather closely flowered. Spikelets 2, sometimes 3 or only 1 at a joint, 4-8-flowered, sometimes glaucous: empty glumes equal, linear-lanceolate, rigid, long-pointed, 6-10 mm. long, about as long as the floret; floral glume firm, lanceolate, acuminate or short-awned, nerves indistinct below, 7 above.

Very near to *Agropyron*, for which it would pass in cases where this plant is slender and has 1 spikelet at a joint. *E. Orcuttianus* Vasey is a slender or small form of the above, and perhaps even that passes insensibly into *E. condensatus*, which see for a full account.

Washington, *Suksdorf* 2124; Oregon, *Howell*; California, *Parish* 1162, 1162 A, *Orcutt*; Arizona, *Rusby* 909½, *Pringle*, *Toumey* 750, 762.

Rocky Mountains, Colorado, Oregon, and California.

6. *E. condensatus* Presl. Reliq. Hænk. 1:265 (1830). GIANT RYE-GRASS.

Culms in dense tufts, stout, reed-like, 1-4 m. high. Ligule very short, auricled; blades flat, smooth, often glaucous, 2 cm. or more wide. Spike 15-40 cm. long, compact or interrupted, bearing branching clusters of spikelets at each joint. Spikelets 3-6-

flowered; empty glumes subulate, setaceous, as long as the florets or longer or shorter; floral glume 8-10 mm. long, firm, smooth or rough, mucronate, 5-nerved above.

“This is perhaps the most strikingly variable grass upon the coast, and would furnish several species were the characters constant. At one extreme its stems, according to Mr. Bolander, are 12 ft. high and its roots do good service in retaining the soil of the banks of streams. In these luxuriant forms the culm is as large as the little finger, and the leaves, an inch or more broad, are over 2 ft. long. The spike is sometimes an inch and a half thick, dense and continuous, with erect appressed branches 2 inches long, or it is much lobed or sometimes interrupted, with the branches in separate clusters. In most of these large forms the florets are pale straw-colored, membranaceous, though in some they are greenish and coriaceous, in which respect they approach the variety *triticoïdes*; indeed no strict line can be drawn to separate them, and the variety is proposed for those forms that are liable to be taken for some large *Triticum*. When it violates the character of the genus so far as to have but 1 spikelet at a joint, there is nothing to distinguish the specimens from *Triticum*, though none have been noticed in which there were not somewhere upon the spike two spikelets to the joint. The triticoïd forms sometimes branch, and Nuttall collected on Wapatoo Island a subpaniculate form, with branches naked below.” Thurb. S. Wats. Bot. Calif. 2: 326 (1880).

Colorado, *Cassidy*; Montana, *Anderson* 6; Washington, *Sandberg* 437, *Suksdorf* 1172; California, *Orcutt* 473; Lower California, *Orcutt*.

Colorado to Washington and California.

7. *E. ambiguus* V. & S. Contrib. U. S. Nat. Herb. 1: 280 (1893).

A densely tufted, rigid perennial, 90-120 cm. high. Leaves of the sterile shoots erect, the blades involute, smooth or scabrous, 30-45 cm. long, 2-4 mm. wide, leaves of the culm about 4 in number; ligule very short; blades 15-25 cm. long. Spikes erect, 8-13 cm. long; rachis scabrous. Spikelets 2 at each joint or sometimes single at the extremities of the spike, scabrous, 5-9-flowered, 8-22

mm. long, empty glumes subulate, 12–15 mm. long, 0.5–0.7 mm. wide; floral glume firm, obscurely 5-nerved, 8–12 mm. long, the short teeth unequal, awn about 2 mm. long; palea as long as its glume. Grain about 7 mm. long.

Type specimen, Colorado (Pen Gulch), *Vasey* in 1884; also collected in Montana by *Anderson* in 1889.

8. *E. elymoides* (Rafin.) Sweezy, Cat. Neb. Pl. 15 (1891). *Ægilops hystrix* Nutt. Gen. 1: 86 (1818). *Sitanion elymoides* Rafin. Jour. Phys. 89: 103 (1819). *E. Sitanion* R. & S. Mant. 2: 426 (1824).

Culms tufted, 10–60 cm. high. Leaves glabrous, scabrous, or hirsute; sheaths of the culm 3–4 in number, longer than the internodes, the upper inflated; ligule a mere line; blades mostly flat, the apex setaceous pungent, the upper one 2–5 cm. long, 2–3 mm. wide. Spikes included at the base or on short pedicels, 5–15 cm. long, easily breaking into pieces. Spikelets 2, sometimes 3, at each joint of the rachis, 2–4-flowered; empty glumes single, or some or all of them unequally divided to the base, extending insensibly into stiff diverging awns 4–9 cm. long; floral glume 7–10 mm. long, scabrous, 5-nerved above, bearing an awn as long as those of the empty glumes, often with a short awn on either side of the apex; palea entire, emarginate or bearing 2 short bristles.

A very variable grass, concerning a collection of which General Munro, as quoted by Dr. Thurber in *S. Wats. Bot. Calif.*, said: “A valuable series, showing how many species and even genera might be made out of this one.”

Colorado, *Jones* 531, *Patterson* 153, *Letterman* 88; Montana, *Anderson* 32, *Williams*; Arizona, *Rusby*, *Toumey* 795, 797; Washington, *Howell*; California, *Pringle*, *Orcutt*.

Rocky Mountains to Texas, California, and Mexico.

9. *E. Saundersii* Vasey, Bull. Torr. Club, 11: 126 (1884).

This is closely related to *E. elymoides*, of which it is perhaps only a variety. The leaves are a little longer, spikelets often only one at a joint of the spike, empty glumes narrowly elliptical, with a shorter awn, unequally divided at the apex.

Colorado, *Vasey*.

10. *E. Virginicus* L. Sp. Pl. 84 (1753). *E. Carolinianus* Walt. Fl. Car. 82 (1788).

Culms upright, firm, slender, 60–100 cm. high. Leaves 5–7 in number, sheaths about the length of the internodes; ligule very short, auriculate; blades flat, scabrous, 15–20 cm. long, 8–10 mm. wide. Spike usually partially included by the sheath, rigid, dense, 5–15 cm. long, 1 cm. thick. Spikelets 2–3 at each joint, 2–4-flowered, empty glumes glabrous, 12–15 mm. long, thick, spreading at the base, incurved, each usually unsymmetrical, 6–8-nerved, pointed or short-awned; floral glume 8–10 mm. long, firm, hirsute, short-awned. *E. Canadensis* var. *minor* Vasey, from Texas, belongs here.

Rhode Island, *Twedy*; New York, *Clinton*; Pennsylvania, *Scribner* 3535; Michigan, *Beal* 163; Iowa, *Hitchcock*; Minnesota, *Arthur* B 265; Kansas, *Cassidy*; Wyoming, *Buffum* C 41.

Low land, New England, Minnesota, Colorado to Texas.

Var. *glaucus* n. var. Glaucous throughout and seedlings also glaucous, 15–20 cm. taller than the species.

Michigan (Agricultural College), *Beal* 164, 165.

Var. *submuticus* Hook Fl. Bor. Am. 2:255 (1840). Awns none, empty glumes acute or acuminate. This passes insensibly into the species.

Michigan, *Beal*; Illinois, *J. Wolfe*.

11. *E. Macounii* Vasey, Grass. U. S. 46 (1883), name only; in Bull. Torr. Club, 13:119 (1886). *E. nitidus* Vasey, l. c.

Culms in dense tufts, 60–90 cm. high. Leaves of culms 3 or 4 in number, ligule 1 mm. long; blades erect, scabrous, 8–15 cm. long, 4–10 cm. wide. Spike erect, slender, cylindrical, exserted, 5–12 cm. long, 0.5–1 cm. broad, an internode of the rachis near the middle 4 mm. long. Some of the lower spikelets in pairs, those above often single, 1–3-flowered; empty glumes 2 to a spikelet, 8 mm. long, about 1.3 mm. wide, 3–5-nerved, or for 1 or 2 spikelets there may be 3 empty glumes, 1 each side and 1 in front, all alike or the middle one wider, awns slender, 1.5 cm. long, some of them with a short awn at one side. Spikelets when in pairs are alike or one is smaller and raised on a pedicel; floral glume oblong-lanceolate, scabrous, margins hyaline, ciliate; 2 lower florets of a spikelet very

nearly the same height, the third raised 2 mm. or more. In one case a 10-nerved glume with 2 awns covered 2 paleæ and the stamens and pistil; palea obtuse or retuse, equal to its glume. This resembles *Agropyron* in having some single spikelets, *Hordeum* in having a small spikelet raised on a pedicel, and *Elymus* in other particulars.

Colorado, *Vasey* in 1884; Montana, *Anderson* 33; British America, *Macoun* (4500 ft. alt.); Oregon, *Cusick* (6000 ft. alt.).

Mountains of Colorado to Oregon and British America.

12. *E. CAPUT-MEDUSÆ* L. Sp. Pl. 84 (1753). *E. crinitus* Schreb. Besch. Graes. 15. t. 24 (1810).

Culms slender, geniculate, 30–40 cm. high, the upper node not over one-fifth as high as the culm. Leaves of the culm 2 in number, upper sheath slightly inflated; ligule very short; blades involute, narrow, 3–6 cm. long. Spike dense, stout, 3–4 cm. long, with spreading awns, some of which are 5 cm. long. Spikelets 2 at a joint or only 1 on the lower part of the spike, 1-flowered, rachilla bearing an empty glume of a second floret; empty glumes narrow, rough, spreading, 2 cm. long; floral glume hispid, 7 mm. long, gradually merging into the long awn.

Oregon, *Howell* 1326.

Introduced from Europe.

13. *E. Canadensis* L. Sp. Pl. 83 (1753). *E. Philadelphicus* L. Amœn. Acad. 4:266 (1759).

Culms stout, 60–120 cm. high. Leaves rough, 4–5, sheaths mostly longer than the internodes; ligule about 1 mm. long, auriculate; blades flat or involute, 15–30 cm. long, 5–15 mm. wide. Spikes exserted, nodding, 12–15 cm. long. Spikelets usually 2 at a joint, 3–5-flowered; empty glumes subulate, 1 mm. wide, 3–4-nerved, the nerves tapering into an awn usually shorter than itself; floral glume 10–12 mm. long, rough hairy with a slender awn 2–3-cm. long, usually spreading.

Michigan, *Beal* 166; Illinois, *Beal* 167; Colorado, *Cassidy*; Montana, *Anderson* 27.

New England to California.

Var. *glaucofolius* (Muhl.) Torr. Fl. U. S. 1:137 (1824). *E. glaucofolius* Muhl. Willd. Enum. 1:131 (1809).

Pale and glaucous throughout; awns usually more slender.

Massachusetts, *Cooley*; Michigan, *Wheeler*; Texas, *Nealley*.

14. *E. glaucus*. Var. *tenuis* Vasey, Contrib. U. S. Nat. Herb. 1: 280 (1893). *E. Sibiricus* Hook. Fl. Bor. Am. 2: 255 (1840), not L. *E. Americanus* V. & S. Macoun, Cat. Can. Pt. 4, 245 (1888). *E. Sibiricus* var. *Americanus* Wats. & Coult. A. Gray, Man. Ed. 6, 673 (1890).

Smooth throughout excepting the awns, or scabrous, or culms and leaves puberulent, rather slender, 60–100 cm. high. Leaves 4 in number, sheaths three-fourths as long as the internodes; ligule very short; blades flat, 15–25 cm. long, 7–10 mm. wide. Spikes exserted, 5–18 cm. long, erect or nodding. Spikelets in pairs, sometimes single, 2–6-flowered; empty glumes about 8 mm. long, linear-lanceolate, 3–5-nerved, with an awn 3–35 mm. long; floral glume rough, firm, 10 mm. long, with an awn 1–3 cm. long. For some years supposed by American authors to be *E. Sibiricus* L.



FIG. 124.—*Elymus glaucus*. A, spikelet; b, empty glume. (Richardson.)

Washington, *Howell*, *E. C. Smith*; Oregon, *Howell*, *Cusick*; southern California, *Parish*. Very variable.

Lake Superior to the Pacific Coast.

15. *E. striatus* Willd. Sp. Pl. 1: 470 (1797). *E. striatus villosus* A. Gray, Man. 1: 603 (1848).

Plant usually more or less pubescent. Culms slender, 30–60 cm. high, often not over 0.7 mm. diam. just below the spike. Leaves 5–6 in number, sheaths about as long as the internodes, unsymmetrically auriculate; ligule very short; blades scabrous, flat, 15–18 cm. long, 5–12 mm. wide. Spike dense, often nodding, 5–10 cm. long. Spikelets usually in pairs, 2–3-flowered; empty glumes awl-shaped, 1–4 nerved, twice as long as the florets and half as wide as the floral glume, which is 6–7 mm. long, not including the slender awn 1–3 cm. long.

New York, *Clinton* for *Dr. Clark* 1426; Delaware, *Martindale*; District of Columbia, *McCarthy*; Michigan (Flint), *Dr. Clark*, (*Rollin*) *Beal*.

River-banks, New England to Minnesota and southward.

145. (276). **ASPERELLA** Humb. Roem. & Ust. Mag. part 7, 3: 5 (1790). *Hystrix* Mœnch, Meth. 294 (1794). *Gymnostichum* Schreb. Besch. Græs. 2:127, t. 47 (1810). *Asprella* Willd. Enum. Hort. Berol. 132 (1809).

Spikelets 1-4-flowered, 2 or rarely 3 in number, sessile at the nodes of the excavated rachis of the simple spike, rachilla articulate below the florets, which are perfect or the upper imperfect. Empty glumes 0, or represented by 1-2 small spines below the spikelets; floral glume narrowly lanceolate, involute, firm, round on the back, 5-nerved above, extending into an awn; palea shorter than the glume, 2-keeled. Stamens 3. Styles very short, distinct, stigmas plumose. Grain narrow, oblong, villous at the apex, grooved on the inside, adhering to the palea. Perennial grasses; spikes terminal, looser and more slender than in *Elymus*.

Species 4, of which 2 belong to North America, 1 to Siberia, and a fourth to New Zealand.

1. **A. Hystrix** (L.) Mœnch, Meth. 294 (1794). BOTTLE-BRUSH GRASS. *Asprella Hystrix* Willd. Enum. 132 (1809). *Elymus Hystrix* L. Sp. Pl. 560 (1753). *Gymnostichum Hystrix* Schreb. Besch. Græs. 2:127 (1810). *Gymnostichum majus* Heynh. Nom. 1:371. *Hystrix patula* Mœnch, Meth. 295 (1794); *Hystrix Hystrix* Millsp. Fl. W. Va. 474 (1892).

A rather smooth or sparingly scabrous tufted grass, 60-120 cm. high. Leaves 5-6 in number; sheaths shorter than the internodes; ligule a mere ring; blades flat, inverted, 15-20 cm. long, 8-15 mm. wide. Spike loose, rachis slender, 6-15 cm. long. Spikelets 1-3 at a joint, spreading, early deciduous; empty glumes sometimes represented by slender rudiments; floral glume smooth or rough, 9 mm. long, tipped with an awn 2-4 times its length; palea as long as its glume, obtuse. Glaucous plants were found by C. F. Wheeler in Ionia County, Michigan.

Vermont, *Pringle*; Pennsylvania, *Scribner* for U. S. Dept.

Agricul. 796; New York, *Beal* 168; Michigan, *Wheeler*. *Beal*, *Clark* 734; Wisconsin, *Holzinger*.

Moist woods, New England to Minnesota and Texas.

2. **A. Californica** (Boland.). *Gymnostichum Californicum* Boland. Cat. 35 (1870); Thurb. S. Wats. Bot. Calif. 2:327 (1880). *Asprella Californica* Benth.

Culms 1-2 m. high. Sheaths, at least the lower, clothed with short stiff spreading hairs; ligule very short; blades flat, ample, scabrous, 10-25 mm. wide. Spikes 15-25 cm. long, flexuose, interrupted below, dense above. Spikelets mostly in pairs, 1-3-flowered, on very short callus-like pedicels, with little trace of empty glumes, appressed, at least when young; floral glume 12 mm. long, broadly lanceolate, 5-6-nerved above, the nerves, especially the marginal ones, ciliate-hispid with short stiff rather distant white hairs; awn stout, rough, straight, one-half longer than its glume; palea equal to its glume, ciliate above. When young much resembling *Elymus condensatus*.

California, *Anderson* for U. S. Nat. Herb.
California.

TRIBE III.—BAMBUSEÆ.

Spikelets 2-8- (rarely 1-) flowered, in panicles or racemes. Empty glumes 2 to many, shorter than the nearest floral glumes; floral glume many-nerved, awnless or with a short straight terminal awn; palea 2- to many-nerved, rarely nerveless. Lodicules usually 3, very large. Stamens 3 to many. Styles 2-3, often united at the base. Grain free. Tall woody grasses, with broad blades usually articulate at the sheath.

151. (277). **ARUNDINARIA** Michx. Fl. Bor. Am. 1:73 (1803). *Miegia* Pers. Syn. 1:101 (1805). *Ludolfia* Willd. Ges. Naturf.



FIG. 125. — *Asprella Hysterix*. Spikelet. (Scribner.)

Fr. Berl. Mag. 2 : 320 (1808). *Macronax* Rafin. Med. Repos. N. Y. 5 : 352 (1808). *Triglossum* Fisch. Cat. Jard. Gorenk. (1812). *Thamnocalamus* Munro, Trans. Linn. Soc. 26 : 33 (1868).

Spikelets many-flowered, often long, compressed, racemose or paniculate, rachilla at length articulate below the flowers, which are perfect or the upper imperfect, rarely the lower male. Empty glumes 1-2, unequal, the lower sometimes absent: floral glume longer, membranaceo-herbaceous, convex on the back, not keeled, many-nerved, acute, acuminate, or bristle-pointed; palea a little shorter than its glume, or equal to it, strongly 2-keeled. Lodicules 3. Stamens 3. Ovary often hairy above; styles 2-3, joined for a little way at the base; stigmas clothed with long feathery branches. Grain oval or narrowly oblong, grooved, included by the glume and palea, but not adherent.

Tall woody grasses, with clustered branches, broad, flat, persistent blades, often with short-jointed petioles, transverse nerves obscure or conspicuous. Inflorescence usually terminal, simple and close, or loosely paniced. Spikelets large, green or colored, the long glumes finally spreading.

Species 24, belonging to the warmer or tropical parts of Asia and America.

The Bamboos have been admirably monographed by General Munro in the twenty-sixth volume of the Transactions of the Linnean Society.

1. *A. macrosperma* Michx. Fl. Bor. Am. 1:74 (1803). CANE. *A. bambusiana* Trin. Fund. Agrost. 97 (1812). *A. gigantea* Chapm. Fl. S. States, 561 (1860).

Culms erect, hard, woody, 3-12 m. high, 0.5-7 cm. diam., jointed every 20-30 cm. for half its length, simple the first year, branching the second, fruiting after (?) years, and then dying to the ground. Ligule cut-fringed; blades lanceolate, acuminate, nearly smooth, 2-5 cm. wide. Panicles lateral, racemed. Spikelets purple, erect, elliptical-lanceolate, 4-5 cm. long, 7-12-flowered, first empty glume 5 mm. long, ovate-obtuse, 7-nerved, second 10 mm. long, clasping, ovate-acute, 11-nerved; floral glume ovate,

short-pointed, 17-nerved, margins ciliate; palea equal to its glume, 2-toothed, 11-nerved, two of which are ciliate.

Arkansas, *Worthington* for U. S. Dept. Agricul.

Banks of the larger rivers in the Southern States.

The young growth is sometimes used for forage; the mature stems for fish-rods, scaffolds for drying cotton, pieces for pipe-stems and pipes, and the bottoms of chairs, mats, and for other purposes.

Var. **tecta** (Walt.).
SWITCH-CANE. SMALL CANE.
REED. *Arundinaria tecta*
Muhl. Desc. Uber. 191 (1817).
Arundo tecta Walt. Fl. Car.
81 (1788), teste Muhl.

Culms suffruticose, slender, branching, 60-300 cm. high. Sheaths bearded at the throat, often purple; blades linear-lanceolate, acuminate, nearly smooth.

Spikelets solitary or racemed on leafless radical

culms, lance-elliptical, 2-3 cm. long, 5-9-flowered; first empty glume oval, abruptly pointed, 7-nerved, 5 mm. long; second oval, abruptly pointed, 15-nerved, 9 mm. long; floral glume ovate, mucronate, 17-nerved, 13 mm. long; palea emarginate, equalling its glume, about 13-nerved, hispid on 2 nerves.

Virginia, *Chickering* for U. S. Dept. Agricul. 798.

General W. Monro, in his Monograph, says: "This one species bears no less than nine different generic and nineteen specific names. It varies much in form."

Swamps, Maryland, Illinois, and south.



FIG. 126.—*Arundinaria macrosperma*.
A, spikelet; a, floret. (Scribner.)

GEOGRAPHICAL DISTRIBUTION OF THE
GRAMINEÆ OF NORTH AMERICA.

GRASSES are very widely distributed over the earth's surface. The species are most numerous in tropical regions, where the plants are usually scattered, while in a moist, temperate climate, though the species are less numerous, the number of plants is enormous, often clothing vast areas and open places with a close growth. In temperate regions, where sufficient moisture is wanting to sustain a dense growth, the grasses appear in tufts or bunches more or less isolated.

The species of grasses of many parts of North America have not yet been sufficiently studied to enable any one to outline with much precision their distribution. This is partly owing to the difficulty of the subject and partly to the lack of thorough exploration in the newer sections, especially in Mexico and countries to the south.

In *Genera Plantarum* of Bentham and Hooker the genera of Gramineæ have been recorded at 298; the species, at the highest, about 3200. The number of genera is now known to be a little larger, and the number of species discovered has increased considerably.

Many botanists are inclined to separate grasses into more genera and more species than have the authors of the standard work above mentioned.

The number of genera native to North America, including the West Indies, so far as discovered and described, is about 140.

The number of genera introduced, mostly as weeds, 25.

The number of species native to North America, about 1275.

The number introduced as weeds, etc., about 105.

The whole number of genera, 165.

The whole number of species now known here, 1380.

No doubt there are still a considerable number especially of native southern species yet to be discovered, and some others will ere long find a home as emigrants from foreign lands.

The lists of grasses to be found in Asia, Africa, and South America are too imperfectly known to be mentioned here.

For Europe we are more fortunate in having the excellent *Conspectus* of C. F. Nyman, published in 1882. According to Nyman, the number of genera of grasses in Europe is 47; the number of species, 570.

In 1877 was published Bentham's *Flora Australiensis*. In this work the author records the number of genera of grasses, native and exotic, as 41; the species as 338.

In these enumerations it must be remembered that the European report is the more recent, that the grasses of Europe have been the more thoroughly studied, and that Nyman makes more species than would Mr. Bentham in the same territory. No doubt by this time a considerable number of species have been added to that given by Bentham in his Australian Flora.

Most likely the various persons who have from time to time described the grasses found on this continent have made many more species, and some more genera, than Mr. Bentham would have done, and we are using his list as our standard in comparing the grasses of these countries. Even with these explanations, the reader must understand that the figures here given are somewhat misleading and in favor of North America.

Below I include the species introduced and established, as well as those which are endemic.

Among the genera of grasses in the world there are at least twenty-four which contains each thirty or more species.

	Species.	In N. A.	Per Cent of all in N. A.
Panicum.....	250	85	34
Paspalum.....	160	74	46
Andropogon { Chrysopogon } { Heteropogon }	130	59	45
Calamagrostis.....	120	31	26
Agrostis.....	105	37	35
Aristida.....	100	51	51
Eragrostis.....	100	38	38
Stipa.....	100	31	31
Danthonia.....	100	6	6
Muhlenbergia.....	89	76	85
Poa and Atropis.....	80	58	73
Sporobolus.....	80	49	61
Festuca.....	80	46	57
Trisetum.....	50	18	36
Chamæraphis (Setaria).....	42	40	95
Bromus.....	40	27	67
Pennisetum.....	40	18	42
Chloris.....	40	17	42
Avena.....	40	11	27
Melica.....	32	22	68
Bouteloua.....	30	30	100
Panicularia (Glyceria).....	30	16	53
Chusquea.....	30	8	27
Ischæmum.....	30	1	3

Of genera of medium or small size, containing from 2-28 species each, the following are named, viz.:

	Species.	In N. A.	Per Cent of all in N. A.
Leptochloa (Diplachne).....	28	18	64
Oryzopsis.....	24	10	40
Arundinaria.....	24	4	17
Arundinella.....	24	4	17
Bambusa.....	24	2	8
Cenchrus.....	20	19	95
Elymus.....	20	18	90
Sieglingia (Triodia).....	20	14	70
Agropyron.....	20	12	60
Deschampsia.....	20	12	60
Alopecurus.....	20	7	35
Eriochloa.....	20	7	35
Ichmanthus.....	20	7	35
Pappophorum.....	20	6	30
Olyra.....	20	4	20
Isachne.....	20	3	15
Manisurus (Rottbællia).....	18	3	17
Oplismenus.....	16	16	100
Epicampes.....	16	13	81
Gaudea.....	15	6	40
Hordeum.....	12	8	41
Arthrostyloidium.....	12	3	25
Elionurus.....	12	3	25
Erianthus.....	12	3	25
Saccharum.....	12	2	17

	Species.	In N. A.	Per Cent of all in N. A.
Koeleria.....	12	1	8
Trachypogon.....	11	3	27
Polypogon.....	10	5	50
Phalaris.....	10	5	50
Briza.....	10	4	40
Phleum.....	10	2	20
Pariana.....	10	1	10
Savastana (Hierochloë).....	9	5	55
Spartina.....	8	6	75
Grappheporum.....	8	4	50
Heleochloa.....	8	2	25
Campulosus (Ctenium).....	7	3	43
Eleusine.....	7	3	43
Brachypodium.....	6	3	50
Eatonia.....	6	6	100
Gymnopogon.....	6	5	83
Zeugites.....	6	5	83
Hilaria.....	6	4	66
Lepturus.....	6	2	33
Luziola.....	6	2	33
Milium.....	6	1	17
Homalocenchrus (Leersia).....	5	5	100
Distichlis.....	5	3	60
Trichloris.....	5	3	60
Pharus.....	5	2	40
Arthophora.....	5	1	20
Oryza.....	5	1	20
Platonia.....	5	1	20
Uniola.....	5	5	100
Ammophila.....	4	4	100
Tripsacum.....	4	4	100
Imperita.....	4	3	75
Scleropogon.....	4	2	50
Munroa.....	4	1	25
Reimaria.....	4	1	25
Ægopogon.....	3	3	100
Anthænanthia.....	3	3	100
Cathestechum.....	3	3	100
Chaetium.....	3	3	100
Cinna.....	3	3	100
Euchlæna.....	3	3	100
Triplaspis.....	3	3	100
Asperella.....	3	2	67
Disanthelium.....	3	2	67
Pleuropogon.....	3	2	67
Gynericum.....	3	1	33
Hemarthria.....	3	1	33
Amphicarpum.....	2	2	100
Bealia.....	2	2	100
Eremochloë.....	2	2	100
Eriocoma.....	2	2	100
Oreuttia.....	2	2	100
Orthoclada.....	2	2	100
Thurberia.....	2	2	100
Konycarpus (Diarrhena).....	2	1	50
Phragmites.....	2	1	50

The following genera of only one species each are found in North America and elsewhere: *Catabrosa*, *Coleanthus*, *Cottea*, *Phippsia*.

The following genera, containing one species each, are limited to North America: *Bauckea*, *Brachyelytrum*, *Bulbilis*, *Calamachloa*, *Hydrochloa*, *Monanthochloa*, *Opizia*, *Rachidospermum*, *Redfieldia*, *Reynadia*, *Schaffnera*, *Schedonnardus*, *Scribneria*, *Zizania*, *Zizaniopsis*.

The following species found in North America are very widely distributed elsewhere, viz.:

Agrostis (scabra) hyemalis B. S. P. Cool N. A. and Australia.

Andropogon contortus. Tropical and subtropical America, Asia, Africa, Australia.

Arctagrostis latifolia Gris. Arctic Asia, Europe, and North America.

Beckmannia erucæformis Host. Temperate Europe, Temperate Asia, Western North America.

Catabrosa aquatica Beauv. Temperate Europe, Asia, North America.

Cenchrus tribuloides L. North America, South America, Asia, Africa.

Coleanthus subtilis Seid.

Cottæa pappophoroides Kunth.

Deschampsia cæspitosa Beauv. Temperate and cool regions of the world.

Distichlis maritima Raf. Seacoast of America and Australia.

Eragrostis ciliaris Link. North America, South America, East Indies, Africa.

Eragrostis reptans hypnoides B. S. P. North America, South America.

Festuca ovina L. Temperate regions of the world.

Panicularia (Glyceria) fluitans R. Br. Temperate and cool Northern Hemisphere and Australia.

Savastana (Hierochloë) alpina R. & S. Cold Northern Hemisphere.

Savastana (Hierochloë) borealis R. & S. Cold and temperate Northern Hemisphere.

Koeleria cristata Pers. Temp. and subtrop. N. Hemis. and Aust.
Homalocenchrus (Leersia) hexandra Swz. South Eastern North America to Buenos Ayres, Africa, Australia, East Indies.

Lycurus phleoides H. B. K.

Manisurus granularis Swz. All tropical regions.

Panicum capillare L. All cool and warm regions.

Panicum Crus-galli L. All cool and warm regions.

Panicum colonum L. Most warm and tropical regions.

Panicum prostratum Lam. Most warm and tropical regions.

Paspalum conjugatum Borg. Warm parts of North America, South America, Australia, Africa.

Paspalum distichum L. Warm parts of North America, South America, Australia, Africa.

Phippsia algida R. Br.

Spartina cynosuroides Willd.

Spartina polystachya Willd.

Spartina stricta Roth.

{ New England to Rocky
Mountains.

Sporobolus Virginicus Kth. All warm regions.

Chamæraphis (Setaria) glauca Beauv. All temp. and trop. regions.

Nuzia (Tragus) racemosus Hall.

Trisetum subspicatum Beauv. Temperate and cool North America and Australia.

The following species of North America are confined to limited areas, viz. :

<i>Amphicarpum Floridanum</i> Fla.	<i>Oreuttia Greenii</i> Vasey. Calif.
<i>Andropogon arctatus</i> Chap.	<i>Uniola Palmeri</i> Vasey. Mouth of Colorado River.
“ <i>brachystachyus</i> Chap.	} Fla. <i>Aristida Floridana</i> Vasey. Fla.
“ <i>aracilis</i> Spreng.	
“ <i>longiberbis</i> Hack.	
<i>Eriochloa mollis</i> Kth. Fla.	“ <i>gyrans</i> Chap. Fla.
<i>Homalocenchrus (Leersia) monarda</i> Swz. Fla.	“ <i>Jonesii</i> Vasey. Arizona.
<i>Luziola Alabamensis</i> Chap. Ala.	“ <i>Oreuttiana</i> Vasey. Arizona.
<i>Eriochloa Lemmoni</i> V. & S. Arizona.	“ <i>Palmeri</i> Vasey. Arizona.
<i>Hilaria rigida</i> Vasey. Arizona.	“ <i>palustris</i> Vasey. Fla.
<i>Phalaris Lemmoni</i> Vasey. Arizona.	“ <i>scabra</i> Chap. Fla.
<i>Oreuttia Californica</i> Vasey. South Calif.	“ <i>simplicifolia</i> Fla.
	“ <i>spiciformis</i> Ell. Fla.

Ninety genera are represented by species in both hemispheres.

In comparing some of the genera of Europe with some of those of North America, we find that

Europe has 40 species of <i>Avena</i> ;	North America has 11 species.
“ “ 28 “ “ <i>Festuca</i> ;	“ “ “ 46 “
“ “ 12 “ “ <i>Koeleria</i> ;	“ “ “ 1 “
“ “ 9 “ “ <i>Phleum</i> ;	“ “ “ 1 “
North America has 171 species of <i>Panicum</i> ;	Europe has 6 species.
“ “ “ 76 “ “ <i>Muhlenbergia</i> ;	“ “ 0 “
“ “ “ 59 “ “ <i>Andropogon</i> ;	“ “ 7 “
“ “ “ 51 “ “ <i>Aristida</i> ;	“ “ 1 “
“ “ “ 49 “ “ <i>Sporobolus</i> ;	“ “ 1 “
“ “ “ 74 “ “ <i>Paspalum</i> ;	“ “ 0 “
“ “ “ 38 “ “ <i>Eragrostis</i> ;	“ “ 5 “
“ “ “ 30 “ “ <i>Bouteloua</i> ;	“ “ 0 “
“ “ “ 10 “ “ <i>Oryzopsis</i> ;	“ “ 0 “

One species each of four small though conspicuous European genera are cultivated in North America, viz.: *Anthoxanthum*, *Arrhenatherum*, *Dactylis*, *Lolium*.

In comparing some of the genera of Australia with some of those of North America, we find that Australia has no large genus of grasses not represented in North America, though that country has a few genera of medium size and many of a small size not represented in this country.

North America has 76 Sp. of <i>Muhlenbergia</i> ;	Australia has 0 Sp.
“ “ “ 30 “ “ <i>Bouteloua</i> ;	“ “ 0 “
“ “ “ 10 “ “ <i>Oryzopsis</i> ;	“ “ 0 “
“ “ “ 6 “ “ <i>Hilaria</i> ;	“ “ 0 “
“ “ “ 6 “ “ <i>Spartina</i> ;	“ “ 0 “
“ “ “ 12 “ “ <i>Deschampsia</i> ;	“ “ 1 “
“ “ “ 46 “ “ <i>Festuca</i> ;	“ “ 3 “
“ “ “ 37 “ “ <i>Agrostis</i> ;	“ “ 3 “
“ “ “ 74 “ “ <i>Paspalum</i> ;	“ “ 4 “
“ “ “ 49 “ “ <i>Sporobolus</i> ;	“ “ 6 “
“ “ “ 76 “ “ <i>Poa (Atropis)</i> ;	“ “ 8 “

North America, as would be expected from its extent and configuration, has a greater number and variety of grasses than Europe, and Europe a greater number and variety than Australia. Europe lacks many of the species found in tropical and subtropical North America and Australia. North America compares favorably with both Europe and Australia combined. In the north of North America are species of European genera; in the south, species of many of the Australian genera.

CENTRES OF CERTAIN LARGE GENERA, SO FAR AS
NORTH AMERICA IS CONCERNED.

- Agrostis*. Cool west North America.
Andropogon. East of Rocky Mountains in warm states.
Aristida. East of Rocky Mountains in warm states.
Bouteloua. Arizona and Texas.
Bromus. Cool west North America.
Eragrostis. Warm east North America.
Melica. Pacific coast to Rocky Mountains.
Muhlenbergia. Arizona and New Mexico.
Panicum. Warm southeastern North America.
Paspalum. Warm southeastern North America, especially Florida.
Poa. Cool regions of west North America.
Sporobolus. Warm regions of west North America.
Stipa. Warm regions of west North America.

The following upon the same subject was taken from a paper read at a meeting of the A. A. A. S. in 1893 by Prof. S. M. Tracy:

“*Agrostis*, with its 37 species and great number of varieties, is, as the manuals say, ‘common everywhere,’ New England having 6 species, Minnesota 3, Oregon 21, Texas 6, and Florida 3; 14 of the 37 species are confined to the Pacific coast.

“*Agropyron*, with its 9 species, is distinctively western, all the species being found in Colorado, the only instance in which so large a genus has representatives of all its forms in a single state.

“ *Alopecurus* is a Pacific-coast genus, 7 of its 9 species being found in Oregon, while only one other state, Colorado, has more than 3.

“ *Andropogon*. If we omit those species which have commonly been called *Chrysopogon* and *Sorghum*, we shall still have 33 left, and these are largely southern and eastern. Florida leads the list with 25, of which 7 are peculiar to that state.

“ *Aristida* is well distributed over the entire country, though more abundant in the south and west. *A. purpurascens* is the common type of the genus, being credited to 31 states.

“ *Bouteloua* finds its home on the southern plains, 18 of its 22 species being found in Texas, and 4 are confined to that state.

“ *Bromus*, with its 20 species, is found from the Atlantic to the Pacific, though more abundantly in the far West, 14 species being found in California and 10 in Colorado, against 7 in New England, 1 in Florida, and 5 in Tennessee. *B. secalinus* and *B. Kalnii* are the most widely distributed species, and 10, half the entire number, are immigrants, mostly on the Pacific coast, and the number of these will doubtless be largely increased in the near future.

“ The famous *Buchloë*, which was formerly supposed to cover the entire Western plains with a dense mat of turf, seems now to be confined to eight or ten states, and to be nowhere abundant.

“ *Calamagrostis* is essentially a Northern genus, reaching its greatest development along the slopes of the Rocky Mountains and among the hills of New England. New England and Minnesota have 9 each, Oregon 11.

“ *Conchrus tribuloides* makes trouble from Maine to California, and from Minnesota to Florida, but is not reported from the extreme Northwest.

“ Of the 9 species of *Chloris* only 1 is found beyond the southern tier of states, and even that does not venture beyond Kansas and Tennessee.

“ *Cinna*, whether it have 1, 2, 3, or 4 species, as published by different authors, covers nearly the entire country with some of its many forms.

“ *Danthonia*, with its 7 species, is quite local, 3 species being

confined to the Western coast, while the other 4 are all east of the mountains and, with a single exception, east of the Mississippi River. Almost the same may be said of the 9 species of *Deschampsia*.

“ *Elymus*, with its 18 species, has representatives in nearly every state excepting Florida, but is most abundant in the Rocky Mountain region and on the Pacific slope, California and Oregon having 8 species each, while New England has but 3 and Texas 5.

“ *Eragrostis* is another genus of wide distribution, 5 of its 25 species being found from the Atlantic to the Pacific, while but 3 species, 1 in California and 2 in Florida, are confined to single states.

“ *Festuca* is also widely dispersed, and is so extremely variable that it is very difficult to define the limits of many of the so-called species or their geographical range.

“ *Glyceria* and *Atropis* form a group with representatives in nearly every state, though more abundant northeast than elsewhere; New England having the greatest number, 12, while Minnesota has 6, Oregon 7, Texas 2, and Florida only 1.

“ *Melica* with its 18 species is strongly western, having 12 species in California and 11 in Oregon, while only 2 are found east of Colorado and Texas.

“ *Muhlenbergia* centres in the arid regions of the Southwest, 28, or more than half of its 46 species, being found in Texas, while Arizona has no less than 30, or about two-thirds of the entire number.

“ *Oryzopsis* in some form is found in nearly the whole country excepting south of the Ohio River, where its occurrence is noted but once.

“ *Panicum*, with some of its 83 species, covers the entire country, but its distribution is very unequal and appears to be influenced by both climate and the cultivation of the soil. Many of its forms are rarely seen excepting in cultivated fields, where they may grow ‘as thick as crab-grass,’ and many others have a limited range. Many species which are annuals in the North become perennials in a milder climate, and so we find both species and individuals becoming more numerous as we go South. New England has 21 species, while Florida has 45; Minnesota has 14, and Oregon only 5, while

Texas claims 59. California, usually so prolific in local species of large genera, has only 11 in all, and none which are peculiar to that state.

“*Paspalum*, with its 39 species, has a still more marked liking for the southern country, having 29 species in Florida and 28 in Texas, against 3 in New England, none in Minnesota, and only 1 in Oregon. It is a genus which flourishes best in heat and moisture, and is almost wholly absent from the plains or among the mountains; Tennessee having 9 species, the greatest number in any inland state.

“*Poa*, with its 62 species, finds a place for some of its forms in every state, but it is most at home in the cool mountain regions of the North. Oregon and Colorado each has 26 species, many of them being local, while California follows closely with 23, and Utah with 19. New England, New York, and Pennsylvania each has 10, while Texas has but 6, and Florida 3.

“*Sieglingia (Triodia)*, with its 18 species, is almost wholly Southern and largely Southwestern, Arizona and New Mexico having 10 each, Texas 16, and the other Gulf States 5 each.

“*Spartina*, with its 7 distinct forms, whether they be called species or varieties, has some representatives in marshy soils everywhere.

“*Stipa*, with its 29 species, has but 3 species east of the Mississippi River and but 2 south of the Ohio, but is more abundant westward, having 7 in Colorado, 15 in Arizona, and 18 in California.

“*Trisetum* finds a place for just one-half of its species in California, while Oregon and Colorado have 4 each, and Texas 3.”

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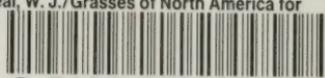
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