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A MONOGRAPH OF THE GENUS ARISTIDA

BY

DR. J. TH. HENRARD.

FIRST VOLUME.
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J. TH. HENRARD.

JARDIN BOTANICO

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CONTENTS.

Introduction.

A. GENERAL PART.

I. History of the nomenclature and systematic of the genus Aristida L. 7

II. The genus Aristida L. and the seclions 11

a. Place of the genus in the system of the grasses. 11

b. Morphological and biological characters 14

c. Anatomical characters. 17

d. Characters to be used for the limitation of the species. 18

e. Incorporation in sections. 22

f Plantgeography 24

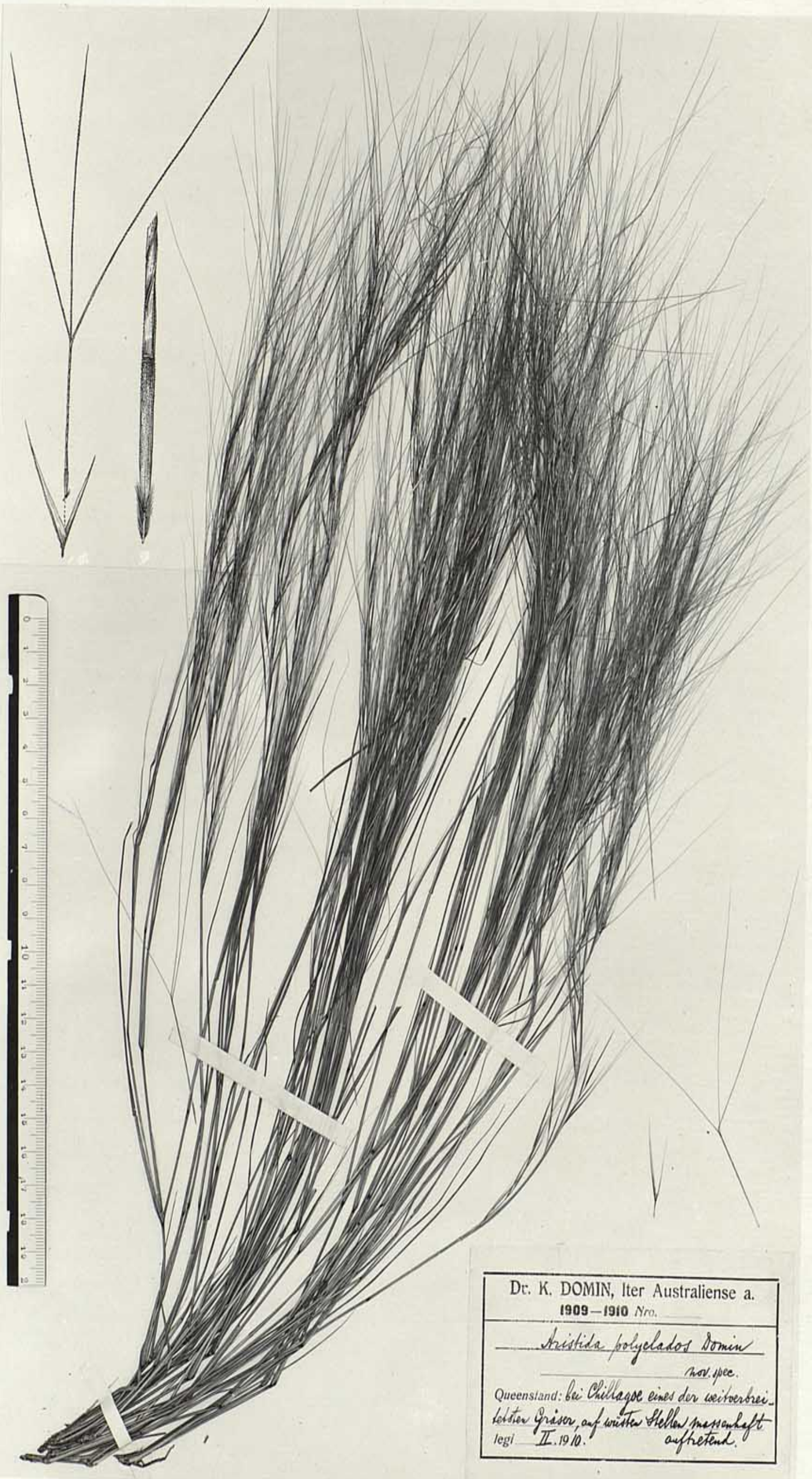
B. SYSTEMATIC PART.

I. Description of the genus Aristida. 30

II. Key to the sections 34

III. Keys to the species 36

General Index.



Dr. K. DOMIN, Iter Australiense a.
1909—1910 *Nro.*

Aristida polyclados Domin
nov. spec.

Queensland: *bei Chillagoe eines der weitverbreitetsten Gräser, auf wüsten Stellen massenhaft auftretend.*

legi II. 1910.

INTRODUCTION.

In a preliminary work: „A critical Revision of the genus Aristida", I have given a review of all the hitherto described species of this genus with the citation of the literature, the exact copies of the authentic descriptions and the figures of the spikelet-characters, taken from the type specimens so far as I could locate them. In many cases it was necessary to enter into critical observations, because the nomenclature and the ideas found in the different manuals are exceedingly entangled. The Revision, although very important for botanists who wish to know the exact data of a fixed species, is not to use if we wish to determine an arbitrary plant of our genus, therefore we must have a monograph and I indicated already that it was my intention to write such a work. I must however observe that this work differs somewhat from other monographs and that it is in the first place a practical manual to the knowledge of this very difficult genus. It contains descriptions of all the species I have accepted as valid and keys for their determination. I was therefore obliged to omit in this work all the data already given in the Revision and to take into consideration that, with this monograph before us, we must, after being somewhat familiar with the genus and the different characters, without great difficulties, get a clear idea of it and with the keys before us find the name of a specimen belonging to our genus. It is therefore advisable to read the chapter where I have treated the different characters used for the limitation of the species. Anatomical characters are for practical reasons not taken up in the keys. No attempt is made to bring the allied species together in groups, because such groups are not easy to limit and the habit of such groups is scarcely to explain in a key. The keys to the species of each section are thus entirely artificial. On the other hand there are in our genus many very striking morphological characters of great constancy we can use with profit in the keys to recognize the species. American authors have divided the sections of a genus they studied, into minor groups, each group received a name, which was the plural of the most characteristic species of the group. In our genus we can give the names of „*ripariae*, *cognatae*, *purpurascentes*, *adscensiones*" to the groups containing all the allies of *Aristida cognata*, *riparia*, *purpurascens* etc. The monographer recognizes these different groups often by indefinite characters of growth, colour or habit in general. I have therefore not accepted in this work the method of American botanists.

Aristida is indeed a very difficult genus, not because the characters of the plants are difficult to understand, but because all the characters were taken hitherto — and there was no other way — from dried specimens, which are often damaged in

course of time. I found an enormous diversity in the genus *Aristida* and although I studied about 15000 specimens, I could not expect to settle the characters definitively. No attention was given by taxonomists to the numerous intermediate forms, and hybrids were never observed or indicated in the literature of our genus. I am convinced that these hybrids occur in greater abundance than I have hitherto found in the different herbaria. For the knowledge of our genus in the future, agrostologists must study the species in the field and also by cultivation. Field study is very important when different species grow together and we can study and collect the intermediate forms. This was already done accidentally by some famous collectors, but no attention was given to the facts. Cultivation is also very important, not only to know somewhat more about the constancy of different characters, but also because we get quite undamaged specimens at our disposal. We know that the glumes and the awns are very fragile in our genus and that it is not always possible to give the different exact data of a species from herbarium-specimens. The different characters of the glumes and awns are in the future to verify with the living specimens.

A. General Part.

I. History of the nomenclature and systematic of the genus Aristida.

In the history of our genus we can distinguish four periods, the first period runs to the year 1753 when the genus was described by LINNAEUS, the second period from 1753 to the publication of the „Essai d'une nouvelle Agrostographie" by PALISOT DE BEAUVOIS in the year 1812, the third period from 1812 to 1842 when the Russian monographers TRINIUS and RUPRECHT published their Species graminum Stipaceorum, the fourth period from they year 1842 to the publication of the Critical Revision of the author.

In pre-linnean time there was but little known about grasses of our genus. We find in the old literature for the first time in the year 1696 a grass mentioned by PLUKENET [1]) as „*Gramen maderaspatanum avenaceum panicula sparsa aristis longis ornata*". This grass is the Indian *Aristida Hystrix*, afterwards described by LINNÉ's son. In the year 1696 we find once more a grass in SLOANE's [2]) Catalogus and History as „*Gramen avenaceum panicula minus sparsa, cujus singula grana tres aristas longissimas habent*", with the locality Funchall in ins. Madeira. It is not exactly known if this grass is the annual *A. adscensionis* or the perennial *A. coerulescens*. In the year 1703 TOURNEFORT [3]) mentioned a „*Gramen orientale tomentosum, spicatum, minus, aristis pennatis.*" This is undoubtly the Oriental *Aristida plumosa*. We now come to the year 1753 the beginning of the important second period with LINNÉ's Species Plantarum and the publication of the genus with the only species *Aristida adscensionis* which is therefore the type. Although LINNAEUS cited in this work the phrase-names of PLUKENET and SLOANE, he described the plants collected on the Island of Ascension by OSBECK. The citation of the grasses from PLUKENET and SLOANE is incorrect. In the works of LINNAEUS we find, that he described four species of *Aristida*. The *Aristida adscensionis* is universally accepted as the type of our genus, TOURNEFORT's grass, mentioned above, was described by him as *Aristida plumosa* and belongs to an important section of our genus. In the Systema Naturae ed.X., he described in the year 1759 his *Aristida americana*, which is a very different species and belongs to the genus *Bouteloua*. The fourth species is *Aristida arundinacea*, described in the Mantissa plantarum altera in the year 1771. It is very curious that LINNAEUS described this plant as an *Aristida*, because LINNAEUS gives in the diagnosis the „*calyx sub-5-floris, 2-valvis*" and we have thus before us a genus of a quite different tribe, the *Festuceae;* in the genus *Bouteloua* the spikelets are 1-flowered with a 3-awned rudiment and LINNÉ's conception is thus easy to explain, but in *Aristida arundinacea* there is not a single character present, to place the plant in our genus. LINNÉ's plant was described as *Arundo madagascariensis* by KUNTH and in the

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[1]) PLUKENET, Almag. 174. t. 191. f. 3.

[2]) SLOANE, Catal. p. 35 et Hist. 1. p. 16. tab. 2. fig. 5 et 6.

[3]) TOURNEFORT, Instut. rei Herb. Corollarium: p. 39.

year 1897 accepted by HOOKER as a distinct genus, he called NEYRAUDIA. Although this genus is much allied to the genus TRIODIA, I think that it is better to keep it separated and to name the plant *Neyraudia arundinacea* (L.) HENR.. In this second period many new species of *Aristida* were described, among them many we accept as valid species in modern time. It is noteworthy that ADANSON gave in the year 1763 to our genus the name of *Kielbul*. In this linnean period I mention here the following authors: FORSKÅL (1775), LINNÉ F. (1781), RETZIUS (1786), WALTER (1788), LAMARK and SWARTZ (1791), THUNBERG (1794), DESFONTAINES (1798 and 1809), CAVANILLES (1799), MICHAUX (1803), WILLDENOW (1809), POIRET and R. BROWN (1810). The third period begins with the valuable work of BEAUVOIS and in this work, already mentioned above, we find different new genera, at first the genus *Curtopogon*, which was based upon the *Aristida dichotoma* of MICHAUX, this is an *Aristida* with very short erect lateral awns and a central awn which is spreading and spirally coiled at the base, this grass was named *Avena paradoxa* by WILLDENOW and cited under this name by KUNTH. Another genus of BEAUVOIS is *Arthratherum*, based upon *Aristida hygrometrica* and *stipoides* of ROB. BROWN and *Aristida pungens* of DESFONTAINES. Here BEAUVOIS mentions the articulated awn as a generic character, agrostologists have afterwards accepted this genus of BEAUVOIS as a very distinct section of the genus *Aristida*. BEAUVOIS's concept of LINNÉ's *Aristida* was entirely false and he probably accepted LINNÉ's *Aristida plumosa* as the type of the genus, although he cited *Aristida lanata*, a species described by FORSKAL and indeed allied to *Aristida plumosa*. So it is to understand that BEAUVOIS gave a new name *Chaetaria* to those species of *Aristida* which have naked awns. Under *Chaetaria*, which is thus a synonym of LINNÉ's *Aristida*, 25 species are cited by BEAUVOIS, some of them with a ? Modern authors have accepted the name *Chaetaria* for a section of *Aristida*. In this period we find many new species described by: DELILE (1813), HUMBOLDT, BONPLAND and KUNTH (1815), LAGASCA and ELLIOTT (1816), MUHLENBERG and ROEMER and SCHULTES (1817), ROTH (1820), TRINIUS ap. SPRENGEL (1821), LABILLARDIÈRE and TORREY (1824), GAUDICHAUD (1826), TRINIUS, KUNTH and NEES (1829), the latter described in his Agrost. Brasil. many new species under *Chaetaria;* PRESL (1830), NEES (1832), here the genus *Stipagrostis* was described, and recognized as a very distinct section by other authors. KUNTH (1833), DECAISNE (1835), TAUSCH and TRINIUS (1836), SAVI and NUTTALL (1837), whereas at the end of this period NEES described in the year 1841 a great many different species in his African flora under *Stipagrostis*, *Arthratherum* and *Chaetaria*. He placed all his species together with the genera *Stipa* and *Lasiagrostis* in the tribe of the *Stipeae*.

In the year 1842 a famous work on the genus was published by TRINIUS in conjunction with RUPRECHT. This work is an example of extraordinary exactness, a work that testifies to the talents of the authors, it is of the greatest value to agrostologists and a guide to the knowledge of the genus *Aristida* at that time. In this work: Species graminum Stipaceorum are enumerated and described 98 species of *Aristida*, these are divided into the following sections:

§ I. *Aristida* (genuina). *Chaetaria* P. B. *Aristae persistentis setis nudis.*

71 species are treated here, many of them described for the first time.

A few species taken up here do not belong to this section and the authors overlooked some characters or they had not sufficient materials at their disposal.

§ II. *Arthratherum* P. B. ref. *Aristae caducae setis nudis.* There are 9 species mentioned under this section, all belong to this tribe.

§ III. *Stipagrostis* N. E. ref. *Aristae caducae setis pennatis* (Aristida P. B.). The 18 species mentioned under this section belong for the greater part to this tribe, a few ones belong to the group where the lemmas are articulated at the middle and these species are accepted as belonging to a different tribe. The excellent descriptions of these eminent authors are much better than many diagnoses of species given in modern time and we find in their book a great many valuable observations, the study of this book was therefore the starting point for the knowledge of the genus. Since the year 1842 a great many other species were described, but a revision of the whole genus was never undertaken. I will enumerate here in chronological order the principal authors of the new species and the arrangements given in some of the valuable manuals.

In the year 1851, a genus *Schistachne* was published by Figari and Denotaris, based upon *Aristida ciliata* of Desfontaines. The striking character of this genus is that the lemma is articulated at or above the middle and the awn is thus deciduous with te upper part of the valve. I have taken up this genus as a very distinct section of *Aristida.*

Edgeworth (1848), Scheele (1849), Jaubert and Spach (1850—53), Steudel (1854). In his Synopsis Plantarum Graminearum we find under *Aristida* that Steudel copied the 3 sections of the Russian monographers, 144 species are accepted by him, many of them are however not valid.

Hochstetter (1855), F. von Mueller (1855), Cosson and Balansa (1858), Munro (1860), Andersson (1861), Edgeworth (1862), Grisebach (1866), Welwitsch and Philippi (1871). In the year 1878 Doell's Gramineae for the great Brazilian Flora founded by Martius were published. The genus *Aristida* with 18 species is divided here into 2 sections: *A. Rhabdatheron*, where the lemma bears a not or slightly twisted, short or wanting prolongation. The other section *B. Schoenatheron* has a well-developed strongly twisted column.

Both sections are not sharply to limit and *Aristida recurvata* and *A. riedeliana*, both belonging to the section *Rhabdatheron* according to Doell, have a very distinct twisted column, some of Doell's species of the section *Schoenatheron* have only a very short, not or scarcely twisted column. In the section *Chaetaria* there are all transitions from a short strict beak at the summit of the lemma, to the very long densely twisted column of some species and we cannot use this character for the sections, although it is valuable to recognize different species. Let us continue our chronological series with Chapman (1878), Bentham (1878), Thurber (1880), Ascherson (1880), Regel (1881), Fournier (1881). We now come to Bentham's Notes on Gramineae

in the Journal of the Linnean Society, Vol. XIX. (1882) p. 14. Here we find the system I mentioned already at the beginning of this chapter, the genus *Aristida* was „divided into 3 fairly marked sections which Beauvois, Nees, and others have raised to the rank of genera" says BENTHAM, the sections we accept are however given by BEAUVOIS and NEES as genera and afterwards proposed as sections by other botanists, this is something else. BENTHAM has copied the ideas of TRINIUS and RUPRECHT and misunderstood the genus *Schistachne*, giving no attention to the important character of the articulated lemma. In the following years many other species of our genus were described by different botanists. VASEY (1883), ENGELMANN (1884), BOISSIER (1884), VASEY (1886), TRABUT (1887), BATTANDIER and TRABUT (1888), HACKEL (1888 and 1889). BOISSIER gives the same 3 sections as BENTHAM but in the section *Arthratherum* he includes *A. cyanantha* which is a member of the *Chaetaria*-group and *A. Schweinfurthii* where the articulation is placed at the summit of the column and therefore belongs to another section. I must observe that the treatment of the section *Stipagrostis* is not exact, under the species where all the awns are feathery he placed *A. acutiflora* and *A. Zittelii*, both have however quite naked lateral awns. BOISSIER used in his key the articulated lemma to distinguish *Aristida ciliata.*

STAPF (1892), TERRACCIANO (1892), VASEY (1892, 1893, 1894), COSSON (1895), ROBINSON and GREENMAN (1895), HACKEL (1895), SPEGAZZINI (1896), FRANCHET (1896), STAPF (1899), RENDLE (1899) and CHIOVENDA (1899).

CHIOVENDA's work on the grasses in the Flora della Colonia Eritrea is important because here is given under *Aristida* a better arrangement. We find in this work 4 sections, the first one is *Chaetaria*, but here *Aristida hordeacea* is included and the characteristic articulation overlooked, for the first time there is given great attention to those species of *Aristida* where the column bears an articulation at the summit just below the branching point of the 3 awns. This section was named by him *Pseudo arthratheum*. CHIOVENDA accepts the column as a part of the lemma, he says: „gluma III in $^1/_2$ superiore convoluta et ad apicem articulata".

In the year 1912 CHIOVENDA uses for this section the name *Pseudarthratherum*, a name I have definitively accepted for this section.

LINDMAN (1900), NASH (1900—1903), HACKEL (1900—1912), SCRIBNER and BALL (1901), LITWINOW (1902), ARECHAVALETA (1903), PILGER (1903—1915), CHIOVENDA (1905, 1912), BAILEY (1907), VIERHAPPER (1907), STAPF (1907, 1910), HITCHCOCK (1909, 1912—13), DOMIN (1911), EKMAN (1911), WOOTON and STANDLEY (1913), HUBBARD (1913), COUTINHO (1914).

In the year 1915 DOMIN's important study on the flora and plantgeopraphy of Australia was published and in this work we find important data on the genus *Aristida.* The Australian *Aristidas* were divided by him into 5 sections. His section *Arthratherum* is the section as commonly accepted by agrostologists. A second section was named by him: *Holatherum* with the description: „*a sectione praecedente differt aristis continuis, a glumella haud articulatis*". This section agrees

perfectly with DOELL's section *Schoenatheron*, see my observations on this section already given above.

His third section is *Streptachne* with the diagnosis: „*arista a glumella haud articulata*; *arista trifida sed ramis valde inaequalibus, lateralibus abbreviatis, subnullis vel interdum nullis*". As already explained by me, this section is accepted in the monograph. I am quite of the same opinion as Prof. DOMIN that we cannot unite the genus *Streptachne* with the genus *Stipa*. DOMIN indicates that many American *Aristidas* belong to this section, as *Aristida scabra*, *A. jorullensis* and *A. schiedeana*, other species as *A. tuberculosa* and *A. californica* do not belong to this section but are true members of the section *Arthratherum*. The following section is the well-known section *Chaetaria*. New in DOMIN's work was the section *Arthrochaetaria* with the diagnosis: „*ut Chaetaria, sed aristae a glumella conspicue articulatae.*" The species mentioned by DOMIN under this section, and I could study the authentic specimens, have no articulation at all, a special tissue was not present and the supposed articulation proved to be erroneous. The section thus had no basis and I was obliged to accept for this group of *Aristidas*, hitherto only observed in Africa, a new name *Pseudochaetaria*.

Since that time we find in the literature no other arrangements, although many new species were described by Mss. CAMUS (1919, 1926), MEZ (1921), CHIOVENDA (1924) and HITCHCOCK (1924). During the revision of the genus many new species were found by me in the different herbaria placed at my disposal and among the sets I received from different agrostologists. Prof. MEZ described 29 new species, only 12 of them are accepted as valid in my work, 12 species were already previously described by other botanists, 3 species were a mixtum of different already known species, and 2 are hitherto doubtfull. In the year 1924 HITCHCOCK published a revision of the North American species of Aristida. He divided the American species into 3 sections. Besides *Chaetaria* and *Arthratherum* he proposed for the group with very short or wanting lateral awns the name *Uniseta*. This name is superfluous, we have for it DOMIN's name *Streptachne*. Nearly all the authors have a great tendence for uniting different species, without taking into consideration the geographic distribution and the existence of hybrids.

II. The genus Aristida and the sections.

a. *Place of the genus in the system of the grasses.*

BENTHAM and HOOKER placed our genus in the Genera Plantarum Vol. III. (1883) p. 1076 in the tribe of the „*Agrostideae*", a tribe they divided into 4 subtribes and *Aristida* is there a member of the first one, the *Stipeae*. Sharp characters to recognize these subtribes are not given by these authors. The shape of the panicle is a character too variable to separate the subtribes, the prolongation of the rhachilla beyond the floret occurs not only in the *Phleoideae* and *Euagrosteae* but

also in a member of the *Sporoboleae* [1]). Generally the rhachilla is not produced in the *Stipeae* and there is nearly always but one flower in the spikelets. Rarely however there occur two-flowered spikelets. NEES [2]) mentioned such flowers in *Aristida namaquensis* (varietatem memorabilem spiculis nonnullis bifloris at Platklip legit Drège) and I observed such spikelets in different North American species of the section *Chaetaria*, but in all the cases only a few flowers had two well-developed lemmas, each lemma bearing three awns. Such a spikelet has a very curious aspect, but these anomalous flowers are rare among hundreds of normal ones.

The subtribe *Stipeae* as it was accepted by BENTHAM and HOOKER is very heterogeneous because such genera as *Muhlenbergia*, *Brachyelytrum* and *Pereilema* are placed together with *Stipa* and *Aristida*, although the texture of the lemmas is used to make two opposite groups. HACKEL [3]) accepted the tribe *Agrostideae* of BENTHAM and HOOKER and also the subtribe of the *Stipeae* but he placed there many other genera as *Amphipogon*, *Nassella*, *Piptochaetium* and *Podophorus*. It is a fact that many agrostologists were not satisfied with this system and found it better to divide the large tribe of the *Agrostideae* in more natural groups. So we find in more recent literature two tribes the *Stipeae* and the *Agrosteae*, accepted for instance by STAPF and by ASCHERSON and GRAEBNER. All the genera with an indurated lemma must be placed in the tribe of the *Stipeae*, those with a membranaceous lemma in the *Agrosteae*. A genus as *Muhlenbergia* comes therefore in the *Agrosteae* and the affinity with the genus *Sporobolus* is better to express.

In the tribe of the *Stipeae* the articulation is without exception placed above the glumes and the outer valve or lemma is very rigid and indurate, it is convolute or the margins at least involute. This group of the *Stipeae* is a more natural one and many genera, having characters in common with another, can be placed without difficulty in this tribe. Even the genus *Aciachne*, although very anomalous, finds its place here.

The genus *Ortachne*, described by STEUDEL in 1854, with the only species *O. retorta* NEES, does not belong to the *Stipeae*, the lemma is of about the same texture as the glumes. This species is the same as *Stipa rariflora* BENTH., it was for reasons of priority called *Ortachne rariflora* by Mss. HUGHES (Kew Bulletin 1913 p. 302), there is no articulation between lemma and awn, this, in connection with the texture of the lemma excludes it from the genus *Stipa*. The genus *Ortachne*, if we will maintain it, must be placed under the *Agrosteae*, next to *Muhlenbergia*. Another genus, described by R. BROWN, is anomalous, it is the genus *Streptachne* with the species *S. stipoides*. It is however easy to place in the tribe of the *Stipeae*, because the lemma is coriaceous, but we cannot include it into the genus *Stipa*, because

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[1]) STAPF in Flora Capensis by THISELTON-DYER, Vol. VII. p. 588. *Sporobolus subtilis*. Here the presence of a bristle-like continuation of the rhachilla is unique in the genus.

[2]) NEES, Fl. Afric. austral. (1841) p. 186. Specimen in the Berlin Herb.

[3]) ENGLER-PRANTL, Nat. Pflanzenf. II. (1887). Abt. 2. p. 44.

there is no trace of articulation between the lemma and the column of awns. Therefore we are obliged to place it among the *Aristidas* as did DOMIN, who called this plant *Aristida Streptachne* and who accepted R. BROWN's genus as a section of *Aristida* where the lateral awns are suppressed or wanting. If in an *Aristida* belonging to the section *Arthratherum* — a section having an articulation between the valve and the trifid awn-stipe — the lateral awns disappear, it is technically impossible to distinguish such an *Aristida* from a *Stipa*. It may be that some well-known *Stipa*-species are already such mutated *Aristidas*. If in the Australian *Aristida utilis*, a species with distinct but thin lateral awns, those lateral awns disappear, we have (as to the spikelets) before us the *Streptachne stipoides* of R. BROWN. From a theoretical point of view we must be consequent and unite the genera *Stipa* and *Aristida*, for practical reasons it is however better to accept them as two different genera.

In this work the tribe of the *Stipeae*, is formed by 8 genera with the following diagnosis: The flowers with but one floret, rhachilla not produced beyond the floret, fertile valve (lemma) hardened when mature and tightly enveloping the caryopsis, nerves of the valve anastomosing or closely approaching at the top, awns always terminal or from a slightly bilobed apex, rarely wanting.

To distinguish the 8 genera we have the following key:

I. Lemma awnless, ovoid, dorsally compressed, smooth and shining . . . . . **MILIUM.**

II. Lemma always awned, laterally compressed or quite terete, sometimes quite smooth, commonly striate, more or less rough or punctulate under a lens, sometimes papillose or tuberculate.

A. Spikelets solitary on long peduncles, lemma produced into a short point, no articulation between lemma and awn. Glumes very obtuse and broad, rounded at the apex . . . . . **ACIACHNE.**

B. Spikelets never in 1-flowered inflorescences, always in open or contracted many-flowered panicles, lemma always produced into a long awn or with three awns at the summit, articulated with the body of the lemma or not.

a. Awns eccentrically attached, the lemma mostly asymmetrical epiblast very large, endosperm very small.

1. Palea very thin, short, membranaceous, nerveless, not keeled . . . . . **NASSELLA.**

2. Palea coriaceous, long, firm, with two keels and a prominent depression between them . . . . . **PIPTOCHAETIUM.**

b. Awns not eccentrically attached, the lemma symmetrical or nearly so, epiblast small, endosperm large.

aa. Awn long and slender, simple, always articulated with the valve.

aaa. Lemma narrowly linear, long and slender, awn bent, twisted below, callus long and sharp-pointed . . . . . **STIPA.**

bbb. Lemma not narrowly linear, elliptic or very broad, plump, awn falling off at maturity, very deciduous, not twisted but somewhat bent, callus short or very obtuse or nearly wanting, never acute and pointed.

AA. Lemma not bilobed at the apex, the awn very thin not from a sinus . . . . . **ORYZOPSIS.**

BB. Lemma distinctly bilobed at the apex, the straight awn rather firm, from the sinus . . . . . **TIMOURIA.**

bb. Awn trifid or tripartite, lateral divisions sometimes short, the awn articulated with the lemma or not, rarely the awn simple but in that case never articulated with the valve. . . . . **ARISTIDA.**

b. Morphological and biological characters.

As to the special characters of the family of the grasses I have little to observe, a full description of the genus *Aristida* is given in another chapter of this work. Besides typical grasses there occur in our genus very characteristic suffrutescent species, these are mostly observed in the African deserts. Different of these desert-species have very long roots which are covered with a tomentose tissue as a tunic, mostly the surface of this tunic is covered with sand.

I have treated the most characteristic morphological characters which are very valuable to recognize different species, in a special chapter and I will only discuss here the structure of the spikelets. Grasses generally have a normal position of

the glumes, the lower one or outer glume is less developed and much shorter or about as long as the better-developed upper or inner one. In our genus however we find that there are numerous species with a so-called „*inverse position*", the lower glume is in that case better developed, more-nerved and much longer than the upper one, this phenomenon is however not a generic character of *Aristida*, it occurs also in other genera f i. in the genus *Stipa*. I have used this character to distinguish some allied species, few botanists have given attention to this inverse position, which is a very useful guide.

Other morphological characters I will discuss here are found in the spikelets and especially in the valve or palea inferior, the so-called lemma of the agrostologists. This lemma has in our genus always a prolongation upwards, we call awn or arista, or a very long, twisted, sterile part, we call column or column of awns. I must observe here that morphologically spoken, we have two very different kinds of awns. Palisot de Beauvois already called attention to the different awns and it was Duval Jouve who studied this question intensively. Let us take a spikelet of an *Aristida* belonging to the section *Arthratherum*, here the lemma is produced upwards into a strongly twisted, very firm sterile part, we call „column" and which passes into three „awns", in this case the prolongation or „column" is in reality the „awn" and what we commonly call „awns" are the „setae". In the development of the lemma of an *Arthratherum*-species, we see that the 3 awns are visible at the beginning only as 3 separate points, which are supported by a small wart, in young states, the lemmas and the 3 awns are often quite developed before there is a visible column, gradually the wart becomes elongated without dividing itsself and grows out to what we call the „column of the awn", bearing at the summit 3 „awns" we must call „setae"; this column has quite as in the genus *Stipa* three fibro-vascular bundles. The evolution of the awn in the *Arthratherum*-group shows clearly that the awn is not a prolongation of the midnerve, but that the setae are prolongations of the midnerve. We therefore must speak of an „*arista completa*", formed by a lower part or column and an upper part or seta. French botanists called the column: *arête* or arista and the seta they named *soie*. The dorsal awn of our common *Avena fatua* is thus an *arista completa*, consisting of a twisted column and a not twisted upper part we call subula. The awn of a species of *Bromus* is thus not an awn but a subula only, because there is no column and the history of the development shows that a wart which produces the column is absent, such an awn we call „*arista incompleta*". The 3 awns of *Arthratherum* form together with the column the arista completa of this section.

Duval Jouve compared the column with the petiole of the blades, the presence or absence of a petiole, although important to recognize species, is not to use as a generic character and in our genus *Aristida* we cannot separate as genera the *Aristidas* with complete or incomplete awns. In all the sections of our genus there occur species with complete awns.

Another interesting question is the development of the callus, this organ is very

important to recognize different allied species and therefore studied here more in detail. The flowering glume or lemma extends a little downwards at the point of insertion on the axis of the spikelet, this portion is composed of the true callus, which is commonly hairy, and a naked coriaceous prolongation. The callus is not a part of the lemma or an appendage to the base of the flowering glume, but it is only a part of the rhachilla or axis of the spikelet, mostly the upper or the principal part, which breaks off above the persistent empty glumes. This callus and its prolongation have in the different species a quite different shape, a shape which depends on the distance between the true base of the lemma and the point of insertion of the empty glumes; this distance is very variable, we have thus in our genus all transitions between very long and very short forms of the callus. In *Aristida hygrometrica* of Australia, the callus is about 5 mm. long and very pungent, other species as *A. oligospira* and *A. tincta* have a very short callus, which is sometimes only a fraction of a millimeter. The interval between lemma and insertion of the glumes is very constant in the different species and the naked firm prolongation is so constant in shape, that it is of great importance to recognize different species. Hitherto little attention was given to this character and it is very curious that there was not a single author who has seen, what I have called, the „*bifid callus*", that is thus in reality the bifid prolongation of the callus. This shape of the callus and its prolongation depends not only on the length of the interval, but also on its tendency of development. If the interval is long, the long callus has a conical and sharp-pointed prolongation, if the interval is short and the tendency of development very pronounced, there are different possibilities; if there is no place enough for the prolongation, the point is forced away laterally and we have the oblique laterally developed callus of the *Aristida megapotamica*, but it occurs, that the naked point is developed on both sides of the rhachilla and in that case we have the bifid prolongation found in *Aristida riparia*, *A. hystricula* and in nearly all the members of the African group of the „*diffusae*", (*Aristida diffusa*, *A. vestita*, *A. stipoides* etc.), if the tendency of growth is in accordance with the length of the interval, the callus may be subobtuse or very obtuse or even rectangularly truncate.

Because the shape of the callus and its prolongation is proved to be of great importance as a constant character of each species, I have discussed this question here more in detail.

The callus is at the same time of great biological importance; together with the whole lemma and the twisted column and awns, it serves to fasten it to other objects, the callus makes the penetration easy and the stiff shorter or longer hairs of the upper part of the callus, pointing upwards, make it difficult to draw out a lemma that has penetrated the soil or the clothes of men; the strong, very hygroscopic column, twisted like a rope, often acts as a motor, the coils unroll when moistened and when drying up they return to their former condition. By this rotation and nutation, the lemma with the fruit bores deeply into the soil. The fruits are often so sharp that they penetrate into the skin of animals or men and cause dangerous

inflamations or even the death, the lemmas of the smaller species become often very troublesome to passengers.

Some species have very long awns, so the North American *Aristida longiseta*, but especially the South American *Aristida pallens*, where they are sometimes 20 cm. long, these long awns are divergent at maturity and are a distinct aid in transportation by the wind, in *A. pallens* the long panicles are drooping and the lemmas with the awns form a parachute and are driven through the air. The long feathery awns of many African species act in the same way.

Cleistogamic species are observed in our genus. Here, the self-fertilisation is finished at or before the moment that the panicles protrude above the sheaths. In such species there is but one stamen, which is 0, 3—0, 5 mm. long and the lodicules are absent. *Aristida longespica*, *A. oliyantha* and *A. basiramea* belong to these cleistogamic species, the latter is very characteristic, at the very base of the culm there are 1—2 leaves with small panicles hidden by the sheaths.

c. Anatomical characters.

There is an extensive literature on the anatomical characters of the grasses; as to those of the genus *Aristida*, I have to discuss here only a question which is important for our genus, because it gives an idea of the relationship of the sections with other genera.

The nerves of the blades, the fibro-vascular bundles, have a parenchyma-sheath and inside this sheath we find the leptome and hadrome of the structure and disposition, characteristic of the grasses in general This parenchyma-sheath consists of thin-walled cells filled with chlorophyll. In a transverse section of the blade of an *Aristida* of the section *Chaetaria* f. i. the North American *Aristida purpurea*, the thin-walled parenchyma-sheath is of coarse present, but this sheath encloses another sheath of iarger cells with slightly thickened walls also filled with chlorophyll. We have thus here what is called a „double parenchyma-sheath"; it is observed in the species of the section *Chaetaria*, in *Aristida funiculata* of the section *Arthratherum*, in *Aristida mutabilis* of the section *Pseudarthratherum*, in *Aristida dichotoma* and other representatives of the genus *Curtopogon* of Beauvois and the same structure occurs in the species of Hitchcock's *Uniseta*, *Aristida ternipes*, *A. divergens* and *A. Schiedeana*, which belong to the section *Streptachne*. This section is anatomically thus inseparable from *Chaetaria* and we know that many intermediary forms occur between the two sections.

It is however very striking that this double parenchyma-sheath is not observed in the two sections *Stipagrostis* and *Schistachne*; Duval-Jouve who studied the North African *Aristida pungens*, a member of the *Stipagrostis*-group, found only the normal case, one parenchyma-sheath, filled with chlorophyll and many other species of this section possess only one parenchyma-sheath around the mestome-bundles, these species of the *Stipagrostis*-group are thus anatomically quite distinct from

the others mentioned above. This structure is f. i. observed in the allied species *Aristida pennata*, in *Aristida plumosa* and its allieds, in *Aristida acutiflora* and *A. brachyathera* and also in the chief representative of the section *Schistachne*, the *Aristida ciliata*. In the genus *Stipa*, so far as studied, a double parenchyma-sheath was never observed and anatomically the sections *Stipagrostis* and *Schistachne* are thus more allied to the genus *Stipa*; if we take the anatomical characters as a basis for classification, the genera *Aristida* and *Stipa* must be sharply separated but in that case we must unite *Stipagrostis* and *Schistachne* with *Stipa* and the latter genus is than only a 1-awned *Stipagrostis* or *Stipagrostis* a 3-awned *Stipa*. All the other genera of the *Stipeae*, so far as studied, are readily distinguished from the genus *Aristida*, by their having only one parenchyma-sheath and in the tribe of the *Stipeae*, the genus *Aristida* (if we exclude the sections mentioned above) is thus a well-marked one.

We must observe here that the mestome-sheath, described by SCHWENDENER, a sheath that occurs inside the ordinary parenchyma-sheath, is not to confound with the inner parenchyma-sheath, this mestome-sheath of SCHWENDENER is prominently thick-walled and easy to distinguish from the surrounding parenchyma-sheath by treating the transverse section with concentrated sulphuric acid. The mestome-sheath of SCHWENDENER does not occur in the sections *Stipagrostis* and *Schistachne*, but it is present in the genus *Stipa* and in all the other genera of the *Stipeae* and most of the *Agrostideae*. The absence of this mestome-sheath in *Stipagrostis* and *Schistachne* may possibly indicate a closer affinity to the other sections of the genus *Aristida*, the single parenchyma-sheath indicates at the same time a closer relation to the genus *Stipa*. It would be consequent to remove the sections *Stipagrostis* and *Schistachne* from *Aristida* proper, their morphological characters are also very distinct, but it is to my opinion not allowed to divide *Aristida* on account of peculiarities in structure of the blades. We know that RIKLI divides the genus *Cyperus*, on account of the presence or absence of the inner green parenchyma-sheath, into *Chloro-* and *Eu-Cyperus;* the morphological characters are however in this case too much neglected. In *Aristida* the species of the section *Stipagrostis* are merely plumose members of the section *Arthratherum*, if there was f.i. an *Aristida pungens* with naked awns, we had to place it without difficulty in the section *Arthratherum*. We must moreover call attention to the fact that *Aristida secalina* is probably a naked-awned *Stipagrostis*, while *Aristida sericans* on the other hand is a feathery-awned *Chaetaria*, because there is no articulation between lemma and column and for this reason excluded by me from the section *Stipagrostis*.

d. Characters to be used for the limitation of the species.

As is already indicated in my work, it would be advisable to make in each section of the genus smaller groups, especially in those sections where there are so many species as in the section *Chaetaria;* only the botanists who have intensively studied

a number of species of a group can recognize it, mostly by indefinite characters of habit and growth. I have therefore used as much as possible only the morphological characters. Species with quite the same habit are often quite different in the spikelet-characters, characters we find only after a very careful examination of the different parts of the lemmas and glumes, on the other hand there are different species with about the same spikelet-characters which are totally different in the vegetative parts. The South American species *Aristida riparia* and *Aristida Trinii* have quite the same habit and agree in the vegetative characters, to distinguish them, we must open a spikelet and examine the callus and its prolongation, to recognize these two species at once. To distinguish the species I have used the characters already found in the literature, but I was so fortunate to find other very valuable characters, some of them never observed in our genus ore overlooked. One of the most valuable characters is the position of the glumes. The normal position is commonly found in grasses, here, the lower glume is shorter than the upper one. I have named the position „inverse", when the lower glume is prominently longer than the upper one and moreover always is better developed. In the section *Arthratherum*, the whole group of the „*funiculatae*" is to recognize by the inverse position of the glumes *(A. funiculata, A. Royleana, A. polyclados)*. In *A. Stocksii* this character is extraordinarily striking. The South American *A. mendocina* and *A. inversa* have this character and also the South American group of the „*circinales*" *(A. circinalis, A. Spegazzinii)*, different African and Australian species are easy to recognize by this character. In some species with inverse position of the glumes the spikelets are dimorphous, f.i. in *Aristida jorullensis*, here the shorter awned lateral spikelets are smaller and the glumes are subequal. Other important characters are found in the nervation of the glumes. In the group of the American „*longisetae*", the South American *Aristida venustula* is to recognize from the North American *A. longiseta*, which has quite the same habit, by the characteristic anastomosing nerves of the lower glume, in *A. longiseta* the lower glume is but 1-nerved. The shape of the callus and its prolongation give us other very valuable characters for the discrimination of the species. So we recognize *Aristida megapotamica* with its oblique callus, *A. riparia*, with the bifid prolongation of the callus, *A. oligospira* with the very obtuse callus and *A. Trinii* and *A. Ekmaniana* by the very acute one. *Aristida gyrans* we recognize from the allied *A. refracta* and *A. Rosei* by the length of the callus. A quite naked or only sparingly pubescent callus is only observed in the group of the „*pungentes*" of the section *Stipagrostis*. Spikelets of *Aristidas* attacked by a black fungus have mostly a naked callus.

Another important character is the presence or absence of a column to the lemma or a beak at the summit. It is not always easy to recognize the sterile upper part of a lemma from the column or beak. A column or beak is always filled, the sterile prolongation of a lemma is a hollow cone and in transverse section a ring.

A very important character is observed at maturity in different species, in most of the species of our genus the lemmas are tubulous with overlapping margins.

There are however different species where the margins of the lemma are inrolled at maturity, here we find thus at the ventral side a very prominent furrow from the base to the branching point of the awns. This character is never observed by other botanists or totally overlooked, but it is of great importance and makes it easy to distinct some difficult species. We find this character in the group of the South American *„circinales" (A. circinalis, A. Spegazzinii, A. acuminata, A. leptochaeta)*; in the rare Brazilian *Aristida subaequans* and in *A. tarapotana*, but also in species of the Old World. Here it is observed in the African *A. rhiniochloa* and its allied species. In the Australian species it serves to recognize the *Aristida calycina* from *Aristida ramosa* and is observed there in different other species such as *A. praealta*, *A. armata* and *A. inaequiglumis*, the latter ones are moreover very curious by the spiny hairs, placed in the furrow of the lemma. Much attention must also be given to the summit of the glumes in our genus. It is however very disagreeable that in herbarium-specimens the glumes are often damaged and the old descriptions are thus often difficult to controll. In the types of many species the points of the glumes are not rarely broken off, although the authentic descriptions mention the acute or awned glumes, in some species the long awns of the glumes are very fragile and a careful study of numerous spikelets must give us the right idea of the shape of the summit of the glumes, the awns of the lemmas are not rarely damaged and we must study the tips under a strong lens if we will controll their length.

Most of the species of our genus are perennial, if the plants are collected with sufficient basal parts, it is commonly not difficult to see if the species is annual or perennial, there are also species where the basal parts are not or very insufficiently known. Annual are the *A. adscensionis*, the African *A. mutabilis* and the allied species *A. meccana*, *A. Cassanellii* and *A. astroclada*, further the species of the *„funiculatae" (A. funiculata, A. polyclados, A. Royleana, A. Stocksii)* and *A. hystricula*, the elegant desert-species *A. subacaulis* is an annual and also the South African *A. curvata*. In North America the following species are annual: *Aristida tuberculosa*, *A. desmantha*, *A. intermedia*, *A. longespica*, *A. oligantha*, *A. basiramea* and *A. dichotoma*, in South America we find the *A. capillacea* and the *A. setifolia*. In the Old World we find in Africa the section *Pseudochaetaria* with its 3 annual species: *A. hordeacea*, *A. Kunthiana* and *A. Cardosoi*, annual are further *A. Cumingiana* and *Aristida hirtigluma* of the section *Stipagrostis*. Some perennial species blossom already in the first year of their development and are not easy to recognize at the beginning of the flowering-time, they afterwards produce sterile innovations and are better to recognize as perennial. Such a species is f. i. *Aristida coerulescens*.

The internodes furnish us other important characters, they are glabrous or scabrous, pubescent in some species or very characteristically lanate or woolly. The wool is often fugacious and easy to rub off, old herbarium-species have lost this tomentum, in this case we find it however always on those parts of the culms which are concealed by the leaf-sheaths. The internodes are different in length,

sometimes alternately long and short and the species has than a very characteristic habit (*Aristida geminifolia*, *A. macilenta*, *A curtifolia*), sometimes the culm is nodeless or the basal node is only present (*A. enodis*, *A. recta*, *A. venustula*, *A. teretifolia*). The leaf-sheaths are sometimes very scabrous (*A. hirta*), some species have lanate or woolly sheaths (*Aristida lanosa*, *A. Dewildemani*, *A. Scribneriana*, *Aristida plumosa*), sometimes the sheaths are coarsely hairy and the hairs tubercle-based (*Aristida rufescens*).

The ligule is in our genus very uniform and of little value, the auricles however are more important, sometimes beautifully bearded with very long hairs. Very striking and valuable is the prominent villous or pubescent line across the collar, a line which is sometimes developed as a so-called „ligula externa" (*Aristida Friesii*, *A. laevis*, *A. Wrightii*, *A. Eggersii*).

In the keys I have used the characters of the auricles very sparingly, although they are given in nearly all my descriptions of the species. The hairs are often deciduous in old specimens and the character of the hairy auricles ought to be studied with living or fresh material. The blades of the *Aristidas* have not rarely much thickened margins with bands of sclerenchyma (*Aristida marginalis*, *A. laxa*, many Mexican species), sometimes the blades are quite flat and rather thin or slightly folded only (*A. hordeacea*). Desert-species have not rarely very firm and pungent almost junciform blades (*A. pungens*, *A. vulnerans*, *A. scoparia* and *A. sabulicola*), some species have very curled or strap-shaped blades (*A. nemorivaga*, *A. circinalis*, different Mexican species).

The panicles are very different in form and outline, the axils sometimes ciliate or bearded or with a flake of wool. This character is important to recognize *Aristida vulnerans* immediately from *Aristida scoparia* and *pungens*. *Aristida lanosa* has a very prominent tuft of wool in the axils, other species as *Aristida adoensis* have only a pencil of hairs. The shape of the panicle is in many species very constant, but in others (*A. adscensionis*) it is exceedingly variable.

It was of course impossible to give in this work all the variations I observed; if we have f. i. the subspecies *bromoides* of *Aristida adscensionis*, a subspecies very characteristic for the high Andes (Ecuador, Peru and Bolivia) on account of the acuminately awned not bifid tips of the glumes, the material of this subspecies, placed together, proves to be very multiform, there are dwarf plants or very long ones, some specimens have a very dense, spike-like panicle, other ones are rather few-flowered with looser panicles, there are simple and much-branched forms, shorter and longer leaves occur, etc.. It may be that some of the forms are induced by diversity in environment but certainly not all these forms. The study of those minor variations can only be carried out in field work by competent agrostologists.

Different plants of a certain group we recognize often by a single character, but usually such plants differ by several or many characters and the more frequent combinations in nature catch our attention. Different existing combinations are often neglected or overlooked or accepted as „intermediates". If we study a very variable

group of plants it often happens that a considerable number of the possible combinations is wanting. This is not because they do not exist, but mostly, such combinations are not yet found. In South America we have a small group of *Aristidas* with inverse position of the glumes and erect awns, all the species of this group have at the same time the very curious character of the deeply furrowed lemma. The combination of the deeply furrowed lemma with the normal position of the glumes is possible and certainly to find, and a plant with such characters belongs to what I call a „theoretical species". I have assiduously looked for such species in all the numerous collections I had at my disposal and I have found expected constant combinations here and there in the different collections, each new exploration of little-kncwn regions brings us such new combinations. Of course, the minor variations are not so striking and easily overlooked by the collectors. Parallel variations described by the eminent French botanist DUVAL-JOUVE are more and more accepted, if we have discovered all the various combinations, these will fit into an artificial prearranged system, as is suggested by VAVILOV who has based his method upon what he calls the law of homologous series in variation. It is evident that these parallel combinations are proposed within the range of a species, but in working out a monograph of a genus with numerous species, distributed all over the world, we can use this suggestion of VAVILOV with great profit. In the genus *Aristida* there are certainly more unknown species and I am convinced that we find them when we can study more material, it is not only a necessity but also a duty of all the institutes of the world, to bring together the most extensive material of herbarium-specimens before it is too late and I will finish this chapter with the motto: Multum et multa.

e. Incorporation in sections.

We have already seen that it is not so very easy to give a sufficient arrangement of the many species of our genus; we find apart from the anatomical characters but few data which are apt for an incorporation Since the time that agrostologists called attention to the articulation in the family of the grasses, this character has often be used: the articulation of the rhachis of a panicle in our spontaneous species of *Triticum* and *Hordeum*, the articulation of the rhachilla of the spikelets in *Avena* and the articulation of the pedicels just below the glumes in many grasses.

It is therefore not surprising, that the articulation, found in our genus at the summit of the lemma or just below the branching-point of the awns, is accepted by many authors as a basis to make large groups or sections. Especially those species with all the awns or at least the central one feathery, were united together in one section if there was an articulation between the column and the lemma. This section was first described by NEES as a genus under the name of *Stipagrostis* and based upon the *Stipagrostis capensis* which is the same as *Aristida obtusa*. Here there is a prominent articulation at the summit of the lemma, but NEES gave more weight to the character that the column is placed between the obtuse lobes of the

lemma, it is curious that NEES placed other species of this section with quite the same character of the bilobulate apex of the lemma in the section *Arthratherum* of our genus. Because the type of the genus *Stipagrostis* is the species we now name *Aristida obtusa*, for reasons of priority, I have united under the section *Stipagrostis* all those species with the combination of the articulation at the summit of the lemma and at the same time with at least the central awn more or less feathery.

The exact place of the articulation we accepted as very important, and as a basis for our sections. We had therefore to exclude those species of *Stipagrostis* where the articulation is not at the summit of the lemma but where the lemma is articulated at or above the middle. This character was indicated by FIGARI and DENOTARIS for their genus *Schistachne* with the type *Aristida ciliata*, which has a great affinity with the section *Stipagrostis*, we find moreover a hybrid between *Aristida ciliata* and an important member of the section *Stipagrostis*, the *Aristida capensis*.

If there is an *Aristida* with plumose awns but the articulation is absent, the species is taken from the section *Stipagrostis*, and consequently placed under the *Chaetarias*. *Aristida secalina* is anomalous in the section *Schistachne* but is insufficiently known.

The *Aristidas* without plumose awns are to divide into two large groups, one without and one with a prominent articulation. The first group is the most difficult one, it contains nearly 200 species, among them we find a small group where the lateral awns are reduced or wanting, or if somewhat developed, they are much thinner than the central one. This is the section *Streptachne*, it is not very important and merely consists of reduced *Chaetarias*, it is connected with *Chaetaria* by many intermediary forms. Most of the species of this section are rather characteristic and readily recognized and I have therefore maintained *Streptachne* as a section of *Aristida* in this work. To avoid mistakes in the determination, I have mentioned some species in the keys under both sections *Chaetaria* and *Streptachne*. The section *Chaetaria* in the proper sense contains thus all the unarticulated *Aristidas* with well-developed lateral awns. This section is very heterogeneous and it is difficult to divide this section into natural groups. We know that DOELL has proposed two groups, characterized by the absence or presence of a column and although there are names for those groups in the literature, I have not taken up them; between the species with a very long column and those where the column is developed only as a beak or rostrum, there are so many intermediates that a limitation of such groups is scarcely to give as a system, although we can use the length of the column for our keys to the species.

Let us now look for the articulated *Aristidas* without feathery awns.

Here we can sharply distinguish the species without a column, these species are simply organized, the lemma passes immediately into the 3 awns with an articulation at the summit of the valve. They belong to a section I have named *Pseudochaetaria*, a section with only 3 annual African species. The remaining articulated *Aristidas* have always a more or less developed, sometimes straight, mostly twisted column

or beak. As to the place of the articulation there are two possibilities, the articulation is placed at the summit of the lemma or at the summit of the column just below the branching point of the awns. The two groups are very characteristic, the first group was already recognized and described as the genus *Arthratherum* by BEAUVOIS, the second group received a name in modern time by CHIOVENDA as *Pseudarthratherum*, the old botanists however had not overlooked this group but not given so much weight to this character. In the section *Arthratherum* we have a very natural group of about 40 species, all have a very stiff column and a very prominent articulation, the column falls off quite spontaneously at maturity. The other section where the column is articulated just below the branching point of the 3 awns is also very natural, the species of this section are not so numerous, about 20 are known, they have always a much thinner, more elegant column, the awns are not deciduous, the articulation is mostly visible as a nodule below the awns, the latter break off at maturity only when we force them to diverge. A nodule below the branching point of the awns is however no indication of the presence of an articulation, there must be at the same time a special tissue, there are among the *Chaetarias* such species where we find an indication of such a nodule, although a true articulation is not present at all.

We know nothing about the real value of systematic characters in general and their value in a definite genus does not give us the right to applicate these characters as value in other genera. In some genera the characters of the inflorescence sharply differentiate the species, in our genus *Aristida* the shape and characters of the panicle are of no value for subgenera or sections Although an immense material has been studied, this work is but an attempt for the classification of such a complex genus as *Aristida*. Characters, suited for the formation of sections, I have only found in the structure of the spikelets and especially in the lemmas and the articulation of the awns. I have accepted in this work 7 sections, one of them is not very natural but maintained for practical reasons only.

f. Geographical characteristic of the sections and species of the genus Aristida.

The species of *Aristida* are widely distributed over the warm and temperate regions of the world, but the area shows many interruptions. As to the different sections of our genus we note that they are very irregularly distributed. Beginning with the sections *Stipagrostis* and *Schistachne* it is very striking that they are limited to the Old World and especially to its western part. The section *Schistachne* has about 8 species, 7 of them are represented in South West Africa (*A. Dinteri*, *A. Hochstetteriana*, *A. prodigiosa*, *A. proxima*, *A. Schaeferi*, *A. namaquensis*) where also the anomalous *A. secalina* is found, which seems to be allied to *A. Hochstetteriana*. All the species are desert-plants with very distinct characters and generally rather uniform. The common *Aristida ciliata* occurs not only in South Africa but is very common in the deserts of North Africa, from the Sahara to Nubia, Lybia and

Arabia, and occurs also on the Sinai and in Persia. In its northern range this species is not so very variable, but in South West Africa a greater diversity is observed. The 38 species of the section *Stipagrostis* have about the same distribution, most of them occur in South Africa, the supposed origin of the section. A common member of the section is the uniform *Aristida obtusa*, found also in the northern area, it reaches Arabia but is wanting in tropical Africa. North Africa has a series of characteristic species, some of them are endemic f. i. *Aristida oranensis* in Tunis, *A. brachyathera* in the Algerian Sahara, *A. sahelica* in Algeria, *A. Zittelii* in Lybia, *A. vulnerans* in Egypt. Other species have a somewhat wider range f. i. *Aristida acutiflora* from Nubia and Egypt, *A. brachypoda* with the same range, *A. scoparia* from Egypt to Syria. *Aristida sokotrana* is endemic on the islands of Sokotra. Very curious is the distribution of two much allied species, the *Aristida Raddiana*, which is found in northern Egypt to Sinai and South Persia, and the *Aristida paradisea*, which is limited to Somaliland and S. W. Arabia (Aden). Widely distributed species are more variable and some of them are very rich in varieties. *Aristida papposa* is found from the Cape Verd Islands and the Senegal to Nubia and Abyssinia, *Aristida hirtigluma* occurs from Egypt to the Sinai, south to Eritrea and Arabia, east to British India, but it occurs also in South West Africa. *Aristida pungens* is a Sahara-species, distributed from Tunis and Algeria to Nubia and Egypt, with a subspecies in South West Africa. *Aristida pennata* ranges from the Caspian desert to Transkaspia, Turkestan and East Persia. *Aristida lanata* is found from Egypt to Sinai and Syria, *Aristida arachnoidea* in the Transkaspian desert and *Aristida Griffithii* in Afghanistan. The very variable *Aristida plumosa* has a horizontal distribution from the Algerian Sahara to Egypt, Nubia and Palestine, east to Arabia, Persia, Turkestan and West Tibet, north to Armenia. A beautiful species is the *A. pogonoptila*, only observed from Beluchistan to British India.

From the following remaining 17 species there is none observed in North Africa above the equator and they are limited to the western part of South Africa. In South West Africa, Damaraland, Little and Great Namaqualand and the western part of the Cape Colony we find: *Aristida geminifolia*, *A. fastigiata*, *A. Dregeana*, *A. lutescens*, *A. Marlothii*, *A brevifolia*, *A. damarensis*, *A. sabulicola*, *A. garubensis*, *A. gonatostachys*, *A. lanipes*, *A. Hermanni*, *A. subacaulis*, *A. gracilior* and *A. uniplumis*, the latter has a wider range and goes west to Transvaal and south to the Cape Colony. Angola has an endemic species, the *A. tenuirostris*. One species the *Aristida capensis* is very variable and occurs from the Coast Region of South Africa to Little Namaqualand. From the geographical distribution of both sections, treated here, one might conclude that we have here a distinct genus before us, a hypothesis we cannot wholly reject if we consider the morphological and anatomical characters of these sections. The section *Pseudochaetaria* contains but 3 species. *Aristida Kunthiana* with the habit of *A. mutabilis* is only observed in Senegambia, a second species, *Aristida Cardosoi*, with the habit of *Aristida adscensionis* is endemic on the Cape Verd Islands, the third species, *Aristida hordeacea* is more widely distributed and found from

Senegal to the Algerian Sahara, east to Abyssinia and is also observed in South West Africa. All the other sections of *Aristida* are also found in the New World. The section *Arthratherum* with its 40 species has but 5 representatives in North America (*A. tuberculosa*, *A. desmantha*, *A. californica*, *A. peninsularis* and *A. glabrata*), all the other *Arthratherums* are found in the Old World. In South Africa we find a very characteristic group of this section with a bifid prolongation of the callus (*A. diffusa*, *A. vestita*, *A. meridionalis*, *A. Engleri*, *A. spectabilis*, *A. dasydesmis*); a member of this group, the *A. stipoides*, is found in North Africa from the Senegal to Kordofan and Abyssinia, south to British East Africa. *Aristida Sieberiana* is only found in Palestine, the very characteristic annual *A. Kerstingii* from Senegambia to Nigeria, *Aristida pallida* from the French Sahara to Nubia and *A. longiflora* from Senegambia and Tunis to Kamerun. An interesting annual group, the „*funiculatae*", has a nearly horizontal dispersion; the most common species of this group is *A. funiculata*, and rather variable, it ranges from the Cape Verd Islands (var. *paradoxa*) and Senegambia to Abyssinia, Eritrea and Arabia, and extends as var. *mallica* to British India. The allied *A. Royleana* and *A. Stocksii* are only found in British India, a very curious, very different typus, the annual *A. hystricula*, is found from Beluchistan to British India. Another group of allied species inhabits South Africa, *A. mollissima* and *A. stipitata* in South West Africa and the Kalahari desert, *A. ramifera* is known from Mozambique and *A. graciliflora* from Transvaal to Delagoa Bay. Madagascar has but one species of this section, the *A. ambongensis*. The Australian continent has at least 7 species, one, belonging to the group of the „*funiculatae*", is annual (*A. polyclados*), another group of 2 characteristic species is only found in Queensland (*A. superpendens*, *A. hirta*), a third group consists of 4 species (*A. hygrometrica*, *A. Muelleri*, *A. Browniana* and *A. arenaria*). It is curious that the islands of the Pacific and the Malayan Archipelago do not contain a single species of this section. One species (*A. tenuisetulosa*) is found on the Philippine Islands.

Let us turn now to the section *Pseudarthratherum*, where we have another very curious geographical distribution. About 20 species of his section are known, none of them is found in North America, and South America has but 2 species in Brazil (the annual *A. setifolia* and the perennial *A. Doelliana*), the articulation of the column in the latter species was detected by me afterwards and the affinity with *A. setifolia* established by the discovery of intermediates of probably hybrid origin. The Galapagos Islands, famous for their great many endemic species, have no less than 5 representatives of this section (*A. villosa*, *A. repens*, *A. caudata*, *A. subspicata* and *A. divulsa*). The other species of the section are African, one of them with an eastern distribution to Central Asia. In North Africa we find *Aristida tunetana* in Tunis, *A. elytrophoroides* and *A. astroclada* in Eritrea, *A. nigritiana* in Nigeria. *Aristida meccana* has a strange distribution, it is observed in South West Arabia (Aden), Mecca and the Sinai, but also in the so-called Arabian desert. The occurence on the Island Gran Canaria (Mas Palomas) may be explained by introduction in recent time from the Orient. *Aristida mutabilis* is distributed from the Senegal to Abyssinia,

east to British India, the allied *A. Cassanellii* from Eritrea to Abyssinia. In South Africa we find different species of our section, *A. congesta*, *A. barbicollis*, *A. Rangei*, *A. Lommelii*, *A. Pilgeri*, *A. alopecuroides*, the *A. longicauda* is only known from Mozambique.

The section *Streptachne* is, as already observed by me, not very natural, the New World species are probably descendants of *Chaetaria* species. In the New World we find the annual *A. jorullensis* from Mexico to Panama, *Aristida divergens* from Texas to Nicaragua, *A. floridana* in southern Florida, *A. geminiflora* in Mexico and *A. Purpusiana* in California. A rather common species is *A. ternipes*, it ranges from New Mexico to Columbia but occurs also on the Bahamas and Cuba. Two species *A. Schiedeana* and *A. Orcuttiana* are often confused, the latter is the northern species that ranges from Texas to New Mexico and Arizona, the former is the southern species, found from Mexico to Ecuador. Hybrids occur between them and also between *Aristida Schiedeana* and *A. laxa* of the *Chaetaria*-section. The Old World-species of the section *Streptachne* form a more natural group, their distribution is very curious, one species *(A. abnormis)* is found from Eritrea to Somaliland and east to Persia, an allied species (*A. redacta)* is only found in British India. The Australian continent has 3 remarkable species in Queensland, *A. Streptachne*, *A. spuria* and *A. utilis*, the latter is also observed in East New Guinea.

We now come to the true *Aristidas*, forming the section *Chaetaria*, with about 200 species, distributed in the New and in the Old World. It is noteworthy that there is but one cosmopolitan species among them. In the New World the species are found from British Columbia and Canada all over the United States and Mexico to Panama and in South America to the Rio Negro in Argentina. The species are found on the sandy plains and prairies, also on the mountain slopes of Western America or on the moist pine-barrens of Florida, in South America on the pampas and savannas or high plateaus and on the mountains of the high Andes. In the Old World we find our genus but sparingly represented in South West Europe. In the Orient better represented from Syria and Palestine to Arabia and Persia, east to Tibet, Cochinchina, southern China and Formosa, south to Ceylon and the Philippines. The genus is wanting in Siberia and Japan and in the Malayan Archipelago.

The Australian continent has many species, a few species are endemic in New Caledonia; Tasmania and New-Zealand have no representatives. In Africa a great many species are found on both sides of the equator. Madagascar and the adjacent islands have their own species, some species are also found on the islands of the West Coast of Africa: Madeira, the Canaries, Cape Verd Islands, St. Helena and Ascension.

Let us consider now the distribution of the different species of our genus and begin with North America. Here we find a number of characteristic annuals: *A. dichotoma*, *A. Curtissii*, *A. longespica*, *A. basiramea*, *A. intermedia*, *A. oligantha* and *A. ramosissima*. Another group in America is that of the „*purpureae*" with *A. longiseta*, *A. Fendleriana*, *A. Wrightii*, *A. purpurea*, *A. rariflora*, *A. Roemeriana* and *A. glauca*, species from the plains or rocky hills; other species are found in

the low pine barrens and flatwoods: *A. condensata*, *A. tenuispica*, *A. Mohrii*, *A. simpliciflora*, *A. palustris*, or in dry sandy soil, as *A. patula*, *A. spiciformis*, *A. gyrans*, *A. virgata*, *A. lanosa*, *A. purpurascens*. The southern States of America have a series of characteristic species, many of them also found in Mexico *(A. barbata*, *A. divaricata*, *A. hamulosa*, *A. gentilis*, *A. imbricata*, *A. Parishii*, *A. arizonica)*. Chiefly Mexican are *A. Scribneriana*, *A. curvifolia*, *A. Lagascae*, *A. laxa*, *A. Jacquiniana*, *A. mexicana*, *A. orizabensis*, *A. Liebmanni*, *A. Hitchcockiana*, *A. appressa*. Central America has moreover some species also found in South America *(A. megapotamica*, *A. sorzogonensis*, *A. recurvata*, *A. tincta* and *A. capillacea)*. The West Indian Islands have a series of endemic species, *A. refracta* (Cuba, Jamaica and Porto Rico), *A. Rosei* (Haiti), *A. Brittonorum* (Cuba), *A. vilfifolia* (Cuba), *A. neglecta* (Cuba), *A. Chaseae*, *A. portoricensis* (Porto Rico), *A. erecta* (Cuba), *A. cognata* (Virgin and Windward Islands), *A. Swartziana* (Jamaica), *A. Eggersii* (Cuba), *A. arubensis* (Aruba and Curaçao), *A. Suringari* (St. Eustatius) and *A. curtifolia* (Cuba).

South America furnishes us a considerable number of new species, growing on the savannas and high plateaus and on the mountain slopes of the high Andes up to altitudes of 3500 meter. The North American group of the „*purpureae*" is represented by about 5 species *(A. venustula*, *A. subulata*, *A. trachyantha*, *A. Arechavaletae* and *A. vexativa)*, allied to this group we have here that of the „*pallentes*" with a series of beautiful species *(A. murina*, *A. pallens*, *A. valida*, *A. teretifolia*, *A. altissima*, *A. laevis)*. Very characteristic for South America is the group of the „*circinales*" with furrowed ventral side of the lemma *(A. circinalis*, *A. acuminata*, *A. leptochaeta*, *A. succedanea*, *A. tarapotana*, *A. subaequans*, *A. Spegazzinii)*. The „*divaricatae*" are represented by *A. Asplundii* (Bolivia) and *A. Parodii* (Argentina) and two outlying species in Brazil *(A. flaccida* and *A. longifolia)*. Another very characteristic group is that of the „*ripariae*" with 7 species *(A. chapadensis*, *A. macrantha*, *A. megapotamica*, *A. Ekmaniana*, *A. Trinii*, *A. riparia*, *A. oligospira)*, more or less allied to this group are *A. Neesiana*, *A. recurvata* and *A. macrophylla*. Another group is formed by *A. Mandoniana* (Bolivia), *A. achalensis* and *A. decipiens* in Argentina and *A. gibbosa* in Brazil. The group of the „*tinctae*" is represented by *A. torta*, *A. tincta*, *A. rigida*, *A. Friesii* and *A. marginalis*, that of the „*inversae*" by *A. inversa*, *A. mendocina*, *A. Glaziovii* and the outlying *A. Hassleri;* the „*cognatae*" by *A. Moritzii*, *A. venesuelae* and *A. Pittieri*. Not allied to one of the groups mentioned here are *A. multiramea* from Argentina, *A. elliptica* from Brazil, *A. enodis* and *A. Antoniana* from the Andes and *A. Hackeli* from Uruguay. All the species enumerated here are perennials, there are in South America but 3 annuals of the section, *A. Sanctae Luciae*, limited to Brazil, *A. capillacea*, widely distributed from Brazil to Guiana and Central America. The third annual species is the common *A. adscensionis*, a cosmopolitan species with numerous varieties in the Old World.

The section is represented in the Old World by many species, let us take the African continent with the surrounding islands. Here we have the following groups: the „*bipartitae*", limited to South Western Africa, with *A. bipartita*, *A. scabrivalvis*

A. effusa, *A. Waibeliana*, further the „*junciformes*", all South or Tropical African ones, with *A. junciformis*, *A. denudata*, *A. macilenta*, *A. Welwitschii*, *A. nemorivaga*, *A. canescens*, *A. Galpinii*, *A. huillensis*, *A. monticola*. A very characteristic group is that of the „*rhiniochloae*" with inverse position of the glumes, deeply furrowed lemma and triquetrous awns (*A. rhiniochloa*, *A. serrulata*, *A. andoniensis*). Endemic species are *A. Burkei* (Kalahari Region), *A. somalensis* (Somaliland), *A. Sciurus* (Transvaal to Natal), *A. Pennei* (Eritrea), *A. furfurosa* (Uganda), *A. leucophaea* (Rhodesia), *A. chrysochlaena* (Angola), *A. Deuildemani* (Belgian Congo), *A. Vanderysti* (Angola to Congo), *A. textilis* (Nyasaland), and *A. adoensis* (Abyssinia to Uganda). *Aristida recta* ranges from the French Congo to South West Africa and east to Natal. *Aristida sericans* from the Kalahari Region is an outlying species with plumose awns. Madagascar has several endemic species (*A. similis*, *A. multicaulis*, *A. Perrieri*, *A. chaetophylla* and *A. rufescens*, the latter is also found on the Comores and Nossi Bé). A very curious annual species (*A. mauritiana*) is found on Mauritius. The group of the „*adscensiones*" has besides *A. adscensionis* a subspecies *guineensis* in West Tropical Africa and two other annual ones, the *A. curvata*, limited to South Africa and *A. submucronata* in Tropical Africa. The annual *A. adscensionis* has a more northern range, it is very variable and is found from the west coast to Abyssinia, as a whole the area is strongly narrowed in latitudinal direction, extending east through Arabia and Persia but underbroken by the mountain systems of Central Asia, it is oncemore found in southern China. Another interesting species is the perennial *A. coerulescens*, a species with two distinct areas, one is entirely western-Mediterranean, from the Canaries to Morocco, Tunis and Algeria, an area also including the occurrence in southern Spain and southern Italy. In this area the species is not so very variable. The other area is eastern-Mediterranean. *Aristida coerulescens* is a mountain-species and we find it thus in Syria, Arabia and a part of Asia Minor. Two species of Africa have another very curious distribution, one of them is the *A. Cumingiana* with an interrupted area. In Africa, it is found from the Senegal to Abyssinia. We find it in Asia from British India, Siam and Tonkin to the Philippines. The other species is *Aristida setacea*, not observed on the African continent but only on the Mascarene Islands (Mauritius and Bourbon). We find the same species also in Western India south to Ceylon.

Besides the two species, mentioned here, there are in Asia some endemic species as *A. culionensis* (Cochinchina to the Philippines), *A. Balansae* (Cochinchina), *A. annamensis* (Annam), *A. Hystrix* (British India), *A. cyanantha* (Afghanistan to the Western Himalaya) and *A. chinensis* (Cochinchina to China and Formosa). The annual *A. depressa*, a member of the *adscensionis*-group is the vicarious species of the *A. adscensionis*. *Aristida adscensionis*, and *A. depressa* both occur in Asia but the latter is limited to Central Asia (British India and Cochinchina).

The whole geographical area of the section *Chaetaria* in Australia must be divided in an eastern region, very rich in species and a western region where the *Aristidas* of this section are very sparingly represented. New Caledonia has two endemic

species, *A. pilosa* and *A. novae-caledoniae*, both allied to the *A. queenslandica*, the latter only found in Queensland. The continent of Australia has a number of characteristic species, we find here the group of the „*holatherae*" in Queensland with *A. latifolia*, *A. perniciosa*, *A. holathera*, *A. macroclada* and *A. Schultzii*, the latter in North Australia. The *vagans*-group is represented by *A. vagans*, *A. ramosa*, *A. anthoxanthoides*, *A. caput medusae*, and *A. longicollis*. Outlying species are *A. Behriana*, *A. obscura* and *A. Leichhardtiana*, *A. leptopoda*, *A. gracilipes*, *A. heterochaeta* and *A. personata*. A very characteristic group form the „*calycinae*" with inrolled lemmas and a furrowed ventral side, to this group belong: *Aristida calycina*, *A. praealta*, *A. pruinosa*, *A. armata*, *A. sciuroides* and *A. inaequiglumis* and also the less allied *A. echinata*, *A. ingrata* and *A. jerichoensis*. *Aristida adscensionis* is recorded by some authors from Australia but the specimens so-named belonged to quite different species and if it is met with, it must be regarded as adventitious.

Natural hybridization occurs between different species of our genus in the places where allied species meet another and we must admit new species, subspecies or varieties by way of natural hybridization. Different badly known regions of the world are inhabited by unknown species of our genus which must be detected by fundamental exploration.

B. SYSTEMATIC PART.

I. Description of the genus Aristida.

Delicate annual or robust perennial plants, sometimes more or less suffrutescent at the base. Roots of the annual species thin, more or less fusiform, those of the perennials much thicker and in desert-plants often provided with a tunic. Culms caespitose, many from a rootstock or simple, the rootstock more or less and sometimes suffrutescently branched or creeping with short rarely long stolons and covered with scales; innovations if present intravaginal or extravaginal or in some species with both kinds of innovations, sometimes there are at the flowering time but few innovations present; culms solitary, mostly numerous, simple or branched from the base or from most of the nodes, erect or ascending, terete to strongly compressed, quite smooth or striate and grooved, glabrous, rough or very scabrous with short hyaline hairs, not rarely pubescent with adpressed or spreading hairs or densely lanate or woolly, if the lower internodes are lanate, the upper ones are not rarely quite glabrous; nodes glabrous and smooth, often constricted, sometimes pubescent or densely long-bearded, the hairs spreading, sometimes a viscid ring below the nodes, the culm-nodes not rarely tumid, much swollen and protruding above the sheath-nodes; sheaths tight, terete or compressed, striate or quite smooth, more or less scrabous between the nerves, not rarely with spreading long hairs or densely lanate-pubescent all over or somentimes very woolly with a more or less deciduous

tomentum, sometimes coarsely hairy by tubercle-based hairs, especially along the margins and in the upper part, the margins mostly rather broad and more or less hyaline and sometimes with a characteristic pubescence or finely ciliate there; in much branched plants the sheaths more or less slipping from the stems, keeled below and more or less open and rolled up at the summit, the lower ones falling off at maturity and most of the lower internodes thus naked, the lowermost sheaths not rarely reduced to scales with very short or wanting blades, the scales mostly pale and shining or sometimes more or less lanate with a fugaceous wool; internodes very different in length, mostly about equal with exception of the uppermost one which is the peduncle of the inflorescence, in some species the internodes alternately very long and very short, thus bringing the leaves approximately in pairs, the culms sometimes but few-noded and the nodes placed together at the base of the stems in which case the sheaths and blades are not rarely very long, forming groups of aggregated blades, the culms sometimes without a node, in reality 1-noded, the node placed at the very base of the culm, the leaves in that case quite basal; ligules nearly always a very short ciliate rim, sometimes with longer hairs and ciliate, the auricles thickened or not, nearly glabrous or mostly densely pubescent, in different species with long, white, spreading hairs or bearded laterally with a tuft of spreading or reflexed hairs, sometimes with a villous or distinctly pubescent line across the collar of the sheath or with a very short membrane as a so-called ligula externa, the auricles of the leaves of the innovations mostly long-bearbed even if those of the culm-leaves are ciliate only; blades different in form and length, sometimes quite flat and up to 5 mm. broad, or rarely 9 mm. broad, nearly always with a xerophytic structure, sometimes flat only at the very base, soon becoming involute or convolute, or convolute throughout, sometimes very rigid and almost junciform, ending in a long setaceous point, not rarely very acute and pungent, the blades erect and adpressed or divaricately spreading, sometimes very short and spine-like, sometimes extraordinarily long, mostly shorter than the culms but in some species much overtopping the panicles, lower surface of the blades striate, glabrous or scaberulous, the upper surface scabrous or hirtellous or densely pubescent and sometimes lanate on both surfaces, few- to many-nerved, the nerves prominent, the midnerve not or sometimes much thickened, the marginal nerves not rarely different from the other ones and very thick, forming bands of sclerenchyma with scabrous margins; panicles exserted or more or less sheathed by the uppermost leaf, the peduncle sometimes very short, glabrous or scabrous, very different in form and outline, sometimes much reduced and consisting only of a few spikelets, commonly more compound with numerous flowers, dense and spike-like, more or less interrupted at the base, the branches spikelet-bearing to the base, sometimes interrupted all over, or very lax and open, the branches erect or ascending or divaricately spreading, sometimes reflexed or drooping, more or less naked at the base, sometimes naked over a very long distance, the axis of the panicle terete or angulous, sometimes triquetrous, glabrous to very scabrous sometimes with long hairs here and there, branches nearly always

thickened in the axils, the axils smooth or pubescent and ciliate, sometimes with a very prominent tuft of hairs or a flake of wool, the branches and branchlets glabrous or scabrous, erect or ascending or divaricately spreading, the flowers equally distributed over the panicle, or the spikelets not rarely densely congested at the summit of the branches and branchlets, forming there false spikes with imbricate spikelets, the pedicels scarcely developed, commonly as long as or much shorter than the glumes, sometimes very long, very thin and capillary, flexuous or curved and the spikelets more or less drooping, the pedicels very scabrous to glabrous, terete or compressed, clavate or subclavate at the apex, not rarely with a pencil of hairs at the tip or with a lateral, small tuft of hairs; spikelets typically 1-flowered, sometimes, but very rarely, with a prolongation of the rhachis and a second flower, such spikelets always mixed with the normal flowers of a panicle, the spikelets very variable, yellowish to straw-coloured, often with a dark spot near the base or tinged with red or purple, sometimes purple throughout or golden-yellow, sometimes shining, glabrous and smooth or scabrous and pubescent on the back, sometimes with spreading long or short hairs all over or only at the middle or along the margins, rarely the hairs with tubercles at the base, the glumes mostly scabrous on the keel, at least the lower one, the upper glume mostly with a smooth keel, the glumes 1-nerved to 5-nerved, sometimes many-nerved, not rarely with more or less developed additional side-nerves, the lateral nerves mostly shorter or much shorter than the midnerve, sometimes arching and anastomosing with the midnerve, the tips acute to acuminate, sometimes very long-awned and the awns longer than the body of the glume, not rarely one or both glumes distinctly bifid at the apex with an awn or mucro from the sinus, the lateral lobes or setulae more or less developed, sometimes very long and subulate, sometimes short and obtuse or rounded at the tip; lower glume much shorter or about as long as the upper one, not rarely the position of the glumes inverse and the lower one much longer than the upper, the upper one sometimes extraordinarily short and in that case nearly totally hidden by the lower glume; lemma consisting of a body and a prolongation at its base, called the callus, the body of the lemma quite glabrous and shining or mostly punctulate under a strong lens, sometimes more or less scabrous, especially above or tuberculate-scabrous in lines from below the middle to the summit, the raised parts whitish at maturity and the background dark, sometimes tuberculate all over, very rarely with some adpressed or spreading hairs, the lemma mostly tightly inrolled, tubulous, the margins overlapping, or sometimes the margins only slightly inrolled and the lemma thus deeply furrowed at the ventral side and there sometimes with rows of spiny hairs, the callus more or less oblique, compressed and laterally hairy, with longer hairs at the junction with the lemma, the hairs sometimes longer and exceeding the base of the lemma or sometimes up to half as long as the body, the callus sometimes very short and scarcely $^1/_2$ mm. long, sometimes up to 5 mm. long, with a naked tip which is very obtuse and rounded or subtruncate at the tip, sometimes very acute, conical and pungent, sometimes

very distinctly and deeply bifid, the two lobes very acute and more or less spreading, sometimes the callus is nearly quite glabrous or with a slight pubescence only at the junction with the lemma; body of the lemma gradually narrowed above or equally broad, passing into a column or awnstipe which is more or less developed and which is sometimes quite absent and the body of the lemma directly passing into the awns, sometimes there is only a short rostrum in which case we call it a beak, the beak or the column is perfectly straight or mostly strongly twisted, sometimes very thin and elegant, sometimes very thick, the column is rarelymore or less pubescent or hairy, in some species the summit of the lemma is lobed and the column placed between the short obtuse lobes, in that case there is always an articulation at the summit between the lobes, the articulation, if present, is sometimes found at the summit of the column in which case the awns are not deciduous, sometimes we find that the body of the lemma is articulated in or above the middle, if there is no articulation at the summit of the column we find sometimes an indication in the form of a nodule just below the branching point of the awns; the awns are nearly glabrous or commonly rough or very scabrous, in some sections all the awns or the central one is feathery and the feathers are erect or much spreading, white or canescent or sometimes golden-yellow, the hairs are not always of the same length, they mostly become gradually shorter upwards, the very tip is not rarely exserted as a naked scaberulous point, the feathery part of the awns is very obtuse in outline or very acute, in both cases with or without a naked tip, the awns are equal or very unequal, sometimes the central one strongly curved in a semicircle and reflexed, sometimes all the awns reflexed, not rarely all the awns are spirally contorted at the base or the central one arcuate-contorted only, or all the awns form at the base a loose spiral and the upper parts are straight, sometimes the lateral awns are very short or nearly wanting and the place of the lateral awns is only indicated as a well-marked spot under a strong lens, the lateral awns are sometimes very thin and of a different structure; the inner valve (pale) always very short, narrow to oblong, nerveless or 2-nerved, sometimes many-nerved; lodicules finely nerved, two or three, sometimes absent; stamens 1 or 3. Ovary always glabrous, the styles distinct but short; stigmas plumose, laterally exserted; caryopsis slender, cylindric to oblong-cylindric, terete or sometimes grooved, tightly embraced by the lemma, the hilum linear, nearly as long as the grain; embryo different in form, long or short.

There are 490 described species, 7 of them do not belong to our genus, about 320 species are accepted as valid in this work, the other ones are synonyms or treated by me as varieties or subspecies.

The species are distributed over the tropical and temperate parts of the world, mostly on plains or savannas and on open ground, many of them also on rockey hills and highlands, in the mountains ascending to elevations of 3500 meter, many of them typical desert-plants and not rarely forming there the only vegetation.

II.

KEY TO THE SECTIONS OF THE GENUS ARISTIDA.

1. The fertile valve (lemma) or its prolongation to the awns (column) bears an articulation. This articulation is sometimes placed at the summit of the column below the branching-point of the 3 awns . . . . . 2.

There is no articulation at all, neither between the body of the lemma and the column, nor between the column and the awns. Very rarely the prolongation of the lemma breaks off at maturity, but in that case there is no special tissue and the rupture which is artificial is caused by the different texture of the coriaceous lemma and the thin, papery prolongation . . . . . 6.

2. Body of the lemma not articulated in or above the middle, column of awns falling off at maturity without a part of the lemma . . . . . 3.

Body of the lemma with an articulation placed at or above the middle, the awns with the column break off at maturity together with the conical upper part of the lemma. Central awn plumose, lateral ones commonly much thinner, naked or feathery, rarely in one insufficiently known species all the awns are so far as known naked. . . . . . *Section* **SCHISTACHNE HENR.**

3. Awns never plumose, scabrous only or hirtellous, column well-developed or sometimes totally wanting . . . . . 4.

Central awn always feathery, at least in the upper part, lateral awns feathery or quite naked, there is a more or less developed column which is articulated with the summit of the lemma . . . . . *Section* **STIPAGROSTIS TRIN. et RUPR.**

4. There is always a prolongation of the lemma as a more or less developed twisted column or beak . . . . . 5.

There is no prolongation of the lemma, a column or beak is totally absent, the body of the lemma immediately passes into the 3 awns, the articulation placed just between the awns and the summit of the lemma. . . . . *Section* **PSEUDOCHAETARIA HENR.**

5. The articulation is placed at the base of the column or beak, at the summit of the lemma . . . . . *Section* **ARTHRATHERUM REICHB.**

The articulation is placed at the summit of the column, just below the branching-point of the 3 awns . . . . . *Section* **PSEUDARTHRATHERUM CHIOV.**

6. Lateral awns much reduced, very short, minute, obsolete or totally wanting, sometimes developed and up to 6 mm. long, but in that case always very thin and different in texture, very fine, merely bristles, whereas the central one is a true awn . . . . . .
. . . . . *Section* **STREPTACHNE DOMIN**

Lateral awns well-developed, sometimes much shorter than the central one or only half as long, sometimes much shorter although in that case of quite the same structure as the central awn, column of awns well-developed or not present at all, there is sometimes only a short beak.
. . . . . *Section* **CHAETARIA TRIN.**

SECTION SCHISTACHNE (FIG. et DENOT.) HENR.

Schistachne was described as a genus by A. FIGARI and J. DENOTARIS *) in the year 1851 as follows: „Gluma 2-valvis, uniflora, cum secundi floris rudimento ad valvulae superioris axillam. Valvulae papyraceae, canaliculatae, 3-nerviae, subaequales. Inferior apice rotundato emarginata superiorem angustiorem, convolutam, apice breviter bifidam, amplectens, utraque flosculo stipitato duplo longior. Palea inferior membranacea, convoluta, glabra, obsolete 3-nervis, ad medium lineola anulari, horizontali notata, ibique in anthesi circumscissa, parte superiore cuculliformi cum arista continua, decidua. Arista supra basim 3-partita; laciniae laterales filiformes scabridae, media supra ad apicem plumosa dimidio minores. Palea superior membranacea, glabra, enervis, brevissima. Paleolae 2, membranaceae, obovatae. Stamina 3. Antherae lineares nudae. Ovarium glabrum. Stigmata 2 plumosa. Flos abortivus, stipituliformis, glaber."

The type is **Schistachne ciliata,** the only species mentioned, based upon *Aristida ciliata* DESF.-DELIL. Fl. aegypt. ill. p. 75. 174. tab. 13. fig. 3. a. b. c. KUNTH Agrost. I. p. 195. DECAISN. Fl. sinaic. n. 54. TAUSCH Aristid. l. c. p. 127.

In sabulosis.

Clarissimus DELILE structuram paleae inferioris huiusce speciei, iam antea bene novit, l. enim c. inquit *„elle est articulée circulairement, son sommet caduc est roulé en cornet"*. Character, ni fallimur, maioris momenti ac ille quo Stipagrostides a reliquis Aristidis discriminantur."

In the year 1813, four years after the publication of *Aristida ciliata*, DELILE found the character of the articulated lemma. The striking rupture of the lemma was afterwards also observed by other botanists. NEES, describing his *Arthratherum ciliatum* in Linnaea VII. (1832) p. 289, says: *„singulare hac in specie, quod stipes aristae basi in conum cavum convolvatur."* In his Agrostographia capensis (1841) this

*) Accad. Rle delle Sc. di Torino Class. di Sc. Fis. et Mat. Ser. II. Tom. XII. p. 252; Agrostographiae aegyptiacae Fragmenta, Pars I.

is repeated under *Arthratherum Schimperi* NEES, which is the same as *Aristida ciliata*, but it seems that NEES was not convinced that this character was important, he described another species belonging to our section and indicated only the tubulous stipe. (Compare *Arthratherum namaquense* on p. 185 of the Agrost. capensis).

TRINIUS and RUPRECHT, the monographers of the genus *Aristida* fixed in the year 1842 no more attention to the curious articulation as did NEES, they mentioned in their descriptions only the „*stipite conico intus cavo*" on p. 164 and 174 of their work Spec. Gram. Stipac. and STEUDEL, who described a third species, did the same.

In my work the sections of the genus are based on the absence or presence of the articulation and on the place of it, therefore I have taken up the genus *Schistachne* as a section of *Aristida*, and characterized it in the same way as did FIGARI and DENOTARIS. All the species of this section have an articulation nearly at, or slightly above the middle of the lemma, and the column, if present, is deciduous with the upper half of the valve.

The species of this section are limited to Africa, hitherto there are about 8 species known, one of them very common in South and North Africa.

Key to the species of the section Schistachne.

1. Panicle very dense, spike-like, the spikelets nearly sessile, position of the glumes inverse, the lower distinctly longer than the upper one . . 2.
   Panicle not dense or spike-like, loose or more or less contracted, the spikelets pedicelled, position of the glumes not inverse, the lower shorter or much shorter than the upper one . . . . . 3.

2. Lower glume scabrous, articulation above the middle of the lemma, mostly in upper 1/4 part, column about 4 mm. long, straight, not twisted. Insufficiently known species, probably perennial, with glabrous upper sheaths and internodes; panicle 6–7 cm. long, up to 1 cm. broad, with glabrous rhachis, spikelets with short, about 3 mm. long, glabrous pedicels; lower gluwe 3-nerved, awned, the summit somewhat laciniate, 17 mm. long, upper one 1-nerved, smooth, 13 mm. long; lemma smooth, inclusive of the densely hairy, acute, about $1^1/_2$ mm. long callus, up to 6 mm. long, column firm, not or scarcely twisted, glabrous; awns strictly erect, the central one thick and firm, at least 4 cm. long, naked, the upper part is broken off and it is not known whether the upper part of the central awn is plumose or not, lateral awns much shorter, finer, merely bristles, at least 2 cm. long. South West Africa: Damaraland . . . . . **Aristida secalina Henr.**

   Lower glume hairy, articulation at the middle of the lemma, column longer, up to 10 mm. long, strongly twisted.

Glaucous perennial, fascicled or subcaespitose from a more or less branched rootstock, innovations few, extravaginal; culms simple, up to 50 cm. high, erect or geniculate at the nodes, terete, substriate, minutely scaberulous or glabrous, 2—4-noded, nodes glabrous, those of the culms slightly swollen and protruding; lower sheaths reduced and scale-like, with very short, scarcely 1 cm. long blades, striate, scaberulous, upper sheaths tight, scaberulous or scabrous, pruinose, shorter than the internodes, ligule a short ciliate rim, auricles shortly ciliate, collar smooth; blades convolute or setaceous, those of the innovations up to 6 or 7 cm. long, the culm-blades up to 20 cm. long, ending in a long setaceous point, glabrous and pruinose beneath, hirtellous on the upper surface; panicle 4—7 cm. long, exclusive of the awns, up to 1 cm. broad, axis scaberulous, the lowermost axils of the branches sometimes with a tuft of hairs, branches solitary, divided nearly from the base, the scabrous branchlets very short, the flowers densely congested with scabrous, 1 mm. long, subclavate pedicels; spikelets yellowish or greenish, glumes narrowly linear or lanceolate, acuminate, both 3-nerved, the midnerve much stronger, the lower glume very scabrous and with long spreading hairs, especially on the back, 16—17 mm. long, the upper glume about 14 mm. long, glabrous or scaberulous only; lemma with a 2 mm. long, very acute callus which is adpressedly hairy below and long-pilose above, the body of the lemma 8—9 mm. long, the lower part below the articulation densely punctulate-scabrous, strongly 3-nerved and together with the callus 5 mm. long, the upper part of the lemma above the articulation quite smooth, conical, gradually narrowed into the slightly scaberulous column, central awn plumose and long-feathery above the middle with an excurrent naked tip, the feathery part obtuse in outline, 6—8 cm. long, the lateral awns very fine, scaberulous or smooth, up to $2^1/_2$ cm. long. South West Afrika: Hereroland and Damaraland . . . . . **Aristida Hochstetteriana Beck**

3. All the awns of the lemma plumose, mostly all over or the lateral ones not so densely feathery as the central one . . . . . 4.

Only the central awn plumose, naked in lower half part, densely feathery in upper part . . . . . 6.

4. Internodes glabrous or scaberulous; panicle-branches and branchlets scabrous or glabrous, never woolly-pubescent or tomentose, pedicels not or scarcely thickened, scabrous . . . . . 5.

Internodes woolly or pubescent, especially below the nodes; panicle-branches

and branchlets woolly-pubescent, the pedicels with subclavate woolly tips. Elegant, erect or ascending glaucous perennial, culms simple, branched from a more or less suffrutescent base, 15—20 cm. or sometimes up to 30 cm. high, densely woolly at and below the nodes, otherwise pubescent, terete or subcompressed; sheaths somewhat shorter than the internodes, tight, pubescent with adpressed hairs, the sheath-nodes with a ring or tuft of long white hairs, densely tomentose or woolly, ligules a ciliate rim, auricles densely bearded, the hairs united into a ring at the junction of the blade and the sheath; blades convolute, filiform, subpungent, rigid, glaucous, adpressed-pubescent in lines or becoming glabrous beneath, more or less scabrous-hirtellous on the upper surface, curved, gradually narrowed but not setaceously pointed; panicle narrow but rather loose, up to 10 cm. long, mostly shorter, shortly exserted or sheathed by the uppermost leaf at the base, peduncle pubescent or hairy, angulous or subterete, axis of panicle subterete, adpressed-hairy, the axils densely woolly, branches binate, erect, simple or the lowest branched above the middle, naked in lower part, up to 5 cm. long, few-flowered, mostly only 2—4-spiculate, pubescent, the pedicels erect or more or less curved, up to 7 mm. long or sometimes as long as the glumes; spikelets yellowish, glumes unequal, glabrous and smooth, 3-nerved, the lateral nerves shorter than the midnerve and slightly anastomosing with it, the lower glume 9 mm. long, the upper one 11 mm. long, both acuminate and mucronate from a slightly bifid apex, both scaberulous only on the keel above; lemma glabrous, lanceolate-oblong, rounded at the base, abruptly narrowed into the 2 mm. long, very acute, long-pointed, very narrow, densely hairy callus, the body of the lemma exclusive of the callus about 3 mm. long, disarticulating just above the middle, keeled and strongly 3-nerved especially above the articulation, awns deciduous with the upper half of the lemma, subequal or the central one slightly longer, plumose all along, 6—7 mm. or sometimes up to 10 mm. long, tips not exserted, feathery part very obtuse in outline. South Africa: Central Region, Aliwal North . . . . . **Aristida proxima Steudel**

5. Culms 4—5-noded, the nodes glabrous.

Suffrutescent with a long creeping rhizome, stoloniferous, with extravaginal innovations, covered with densely imbricate scale-like sheaths, the latter glabrous except the woolly lower margins, with reduced spine-like blades, culms fascicled, ascending or prostrate, woody below, simple or often with fascicles of erect branches from the lower and the middle nodes, sometimes very long and more than 1 meter high,

glabrous and smooth; sheaths very tight, firm, pallid, glabrous and smooth or more or less hairy, especially along the margins, longer or shorter than the internodes, ligules and auricles minutely ciliate only, collar smooth; blades setaceous or subulate, convolute, the lower ones very short, very rigid and pungent, the upper ones longer, up to 20 cm. long, glaucous, glabrous and smooth beneath, hispidulous on the upper surface; panicles more or less exserted, narrow, linear, more or less contracted but rather loose, up to 20 cm. long or mostly shorter, rhachis straight or subflexuous, nearly smooth, branches solitary, nearly sessile, erect or suberect, bipartite nearly from the base or the branchlets fascicled, the lower ones up to 5 cm. long, scabrous and filiform like the branchlets, lateral spikelets with pedicels much shorter than the glumes; spikelets yellowish, erect, glumes rather firm, unequal, lanceolate to linear-lanceolate, acuminate, tips minutely truncate or slightly bifid, 3-nerved, glabrous, involute, the lower 12 mm., the upper one 15 mm. long; lemma subcylindric, glabrous, the conical callus about 2 mm. long, acute and pointed, hairy, the lemma produced into a straight or slightly twisted very short beak, the body articulated at or below the middle, total length of lemma and column up to 10 mm.; awns somewhat unequal, the central one about 25 mm. long, the lateral ones about 20 mm., all the awns plumose to the very tips, the central one subobtuse, the lateral ones subacute in outline, the side-bristles finer than the central awn and scantily adpressedly plumose at the base, more densely so above. South Africa: From Great and Little Namaqualand to Griqualand West, south to the Central and Coast Region. . . . . **Aristida namaquensis Trin. et Rupr.**

Culms 1—2-noded, the nodes hairy, bearded with more or less spreading long white hairs.

A hybrid between *Aristida capensis* and *Aristida ciliata*, agreeing in habit and vegetative characters with the former but the nodes with divaricate deciduous hairs, the sheaths striate with densely bearded auricles; blades rather short, curved, 5—6 cm. long; panicle exserted, strictly erect, rather few-flowered as in *A. ciliata*, the branches erect or ascending only, slightly scabrous like the pedicels; spikelets lanceolate, agreeing with those of *A. capensis* but the glumes not papery or thin, but very firm or chartaceous in texture, both 3-nerved, yellowish-brown purple-mottled at the base as in *A. ciliata*, about equal, 14—16 mm. long, acutish or subobtuse, with minutely ciliolate tips, the column slightly twisted and glabrous; awns very unequal, the central one feathery all along to the very tip, obtuse in outline, up to 4 cm. long, the lateral ones half as long as the central one or scarcely up to

$2^1/_2$ cm. long, with scabrous long-exserted tips, more or less sparingly or remotely hairy at the middle; feathers mostly longer than in *A. capensis* and more spreading, as in *A. ciliata*; articulation at the summit of the body of the lemma as in *A. capensis*, or the lemma is articulated at about 1/4 below the summit. See also in the section *Stipagrcstis*. The hybrid is observed between the parents in South West Africa: Little Namaqualand . . . . . .
. . . . . **Aristida Schlechteri Henr.**

6. Glumes of a very firm texture, cartilaginous, glabrous or rigidly ciliate, linear-oblong, subequal, not convolute, obtuse, with emarginate and slightly ciliate tips . , ... 7.

Glumes of a thin structure, hyaline, papery, glabrous or softly hairy, linear-lanceolate, unequal, mostly convolute, acuminate, with minutely truncate tips . . . . . 8.

7. Nodes perfectly glabrous and smooth

Compactly caespitose perennial, culms up to 50 cm. long, 2—3-noded, many in a tuft, fascicled, erect to geniculately ascending from a robust more or less suffrutescent rootstock; innovations forming rather short and dense tufts with densely lanate sheaths and short recurved firm, subulate blades, culms terete, smooth, slightly striate, swollen and somewhat viscous below the sheath-nodes, which are more or less constricted and perfectly smooth, sheaths of the culm-blades shorter than or as long as the internodes, scabrous or shortly pubescent only, especially along the margins, ligule a shortly hairy rim, auricles pubescent or very shortly ciliate, collar glabrous; blades of innovations 1—2 cm. or sometimes up to 6 cm. long, very firm, those of the culm-leaves much longer and up to 12 cm. long, all the blades nearly glabrous beneath and densely shortly villous-pubescent or pilose on the upper surface, ending in a pungent tip; panicle exserted or at first more or less sheathed by the uppermost leaf, up to 15 cm. long or mostly shorter, axis terete or subcompressed, striate or grooved above, nearly smooth, many-flowered, somewhat contracted but loose with erect or adpressed filiform solitary branches, the latter divided nearly from the base, bipartite or more or less fascicled, nearly smooth, the lower and longer ones up to 7 cm. long, exclusive of the awns, bearing rather remote mostly solitary flowers, the lateral spikelets very shortly pedicelled, the nearly glabrous pedicels swollen and clavate at the tips, sometimes the pedicels as long as the glumes; spikelets straw-coloured, a purple spot at the base, glumes about equal, 10 and 11 mm. long or sometimes shorter, 3-nerved, boat-shaped, very firm, glabrous or sometimes rigidly ciliate; lemma tubulous, glabrous, smooth, with a long-hairy, acute,

nearly 2 mm. long callus, up to 10 mm. long, articulated just above the middle, column of awns nearly totally wanting, slightly indicated only as a beak; central awn up to $3^1/_2$ cm. long, naked in lower $^1/_3$ part, plumose above nearly to the very tip, the tip short, naked and slightly exserted, the feathery part subacute in outline, lateral awns naked, up to 2 cm. long, all the awns geniculate at the branching-point and somewhat contorted at the base. South West Africa: Great Namaqualand and Damaraland . . . . . **Aristida Schaeferi Mez**

Glumes very obtuse, not or scarcely ciliate at the apex, 8 and 9 mm. long, the upper one with long, rigid, hyaline hairs in the upper part near the midnerve. Damaraland . . . . **var. biseriata Henr.**

Nodes long-bearded with spreading hairs, the hairs sometimes deciduous in old culms.

Compactly caespitose perennial with numerous short innovations or not rarely with longer up to 15 cm. long innovation-blades, culms exserted, few-noded, erect or geniculately ascending, terete, nearly smooth, with a prominent viscous ring below the nodes, up to 60 cm. long or not rarely much shorter and only 30 cm. long, inclusive of the panicle; sheaths crowded at the base, the lowermost very broad, pale-yellow or whitish, firm and persistent, densely striate, glabrous or more or less woolly along the margins, sometimes quite villous, the upper sheaths tight, shorter than the internodes, striate, glabrous or more or less pubescent in some varieties, ligule a short ciliate rim, auricles shortly ciliate, those of the innovations long-bearded, collar glabrous; blades very different in length, those of the innovations sometimes very short, coarsely setaceous, mostly convolute throughout, more or less recurved or not rarely up to 15 cm. long, rigid, striate, glabrous and smooth beneath, minutely hairy or hirtellous on the upper surface, sometimes more or less pungent; panicle narrow, but open and sometimes very loose, usually contracted and strictly erect, linear-oblong, 10—15 cm. long with a glabrous nearly smooth axis, branches erect, solitary, or bipartite nearly from the base with filiform few-flowered branchlets, the tips of the pedicels clavate, those of the lateral flowers very short; spikelets linear-oblong, pale or straw-coloured often with a purple spot at the base, the glumes nearly equal, linear-oblong, emarginate at the apex, very obtuse or subacute, not awned, very firm, 3-nerved, usually glabrous but sometimes with hyaline

hairs, nearly always pubescent at the summit; lemma cylindric much shorter than the 9 and 10 mm. long glumes, the long-hairy very acute callus about 2 mm. long, the body of the lemma smooth, gradually narrowed into a straight or slightly twisted filiform, well-developed column, the latter reaching the summit of the glumes or distinctly exserted, total length of lemma with callus and column 12—14 mm.; central awn up to $4^1/_2$ cm. long or sometimes longer, divaricate, geniculate at the branching-point of the 3 awns, naked or scantily and adpressedly pubescent at the base, plumose from the middle to the very tip or with a scabrous excurrent point, lateral awns very fine, mostly erect, minutely scabrous only, $1^1/_2$—2 cm. long, not contorted at the base. Widely distributed from South Africa to the Sahara, east to Sinai and Arabia . . . . . **Aristida ciliata Desf.**

Sheaths and blades, especially those of the innovations densely lanate or villous; summit of the central awn but slightly excurrent and shortly hairy, the plumose part of the central awn acute in outline. Great Namaqualand . . . . . **var. villosa Hack.**

Sheaths and blades not woolly or villous, slightly hairy sometimes near the margins below or with a short pubescence only.

Glumes or at least one of them with long hyaline hairs.

Both glumes with spreading hyaline hairs, the lower one rigidly ciliate nearly all over except the very obtuse tip, the upper glume ciliate-pectinate only on the back, the hairs placed in rows between the nerves, exserted part of the column nearly 5 mm. long; central awn sparingly feathery at the base, densely plumose above with a naked scabrous rather long-exserted tip, the plumose part very obtuse in outline. . . . . **var. pectinata Henr.**

Only the upper glume with rigid spreading hairs on the back, column exserted; lemma, inclusive of the callus and column up to 15 mm. long, central awn naked or scaberulous only in lower part, the tip excurrent as a scabrous point, the feathery part subobtuse or subacute in outline. Together with the type, but rare . . . . . **var. tricholaena Hack.**

Glumes glabrous without spreading hyaline hairs.

Central awn plumose from the middle to the very tip, without a naked exserted tip, the feathery part very obtuse in outline. South Africa: . . . . . **var. capensis Trin. et Rupr.**

Central awn with an excurrent naked scabrous tip, the feathery part more or less acute in outline . . . . . **var. genuina Trin. et Rupr.**

8. Pedicels long, capillary, as long as or longer than the glumes, the latter about 8 mm. long. panicles more or less effuse.

Densely caespitose elegant erect perennial with a not very thick, abbreviate rootstock, mostly 30—50 cm. high, but not rarely much shorter or longer, culms mostly sheathed all along, simple, erectly ascending, 2—4 noded, the purplish nodes glabrous and constricted, internodes terete and slightly striate; sheaths glaucous, glabrous or puberulous, the lower ones shorter, the upper ones very long, ligule a ciliate rim, auricles bearded, collar glabrous; radical leaves densely congested, somewhat curved or suberect, convolute throughout, acuminate, rigid, up to 5 cm. long, or in robust specimens up to 10 cm. long, those of the culms very narrow, plicate-convolute, subulate-acuminate, sulcate-striate and scabrid-puberulous on both surfaces; panicle erect, many-flowered or few-flowered in meagre specimens, rather loose, linear-oblong, up to 30 cm. long in robust specimens, mostly much shorter and less than 15 cm. long, axis compressed or angulous, glabrous, branches mostly solitary, divided nearly from the base, the branchlets fascicled or nearly so, iterately branched, the branchlets few-flowered and ascending, flexuous and filiform, nearly smooth, pedicels slightly thickened and nearly glabrous; spikelets pale, yellow or greenish, purplish at the base, glumes nearly equal, keeled, acute, not awned, hairy all over or the margins and tips glabrous, the hairs very soft and more or less spreading, both glumes 3-nerved, the lower one 7 mm., the upper one 8 mm. long; lemma tubulous, glabrous, 3-nerved, the very acute densely hairy callus scarcely 2 mm. long, the body of the lemma gradually narrowed into a scarcely developed not twisted beak, the total length of the lemma with the callus to the branching-point of the awns is 6-7 mm., articulation just above the middle of the lemma; central awn naked at the base, densely adpressedly feathery above to the very tip, up to 2 cm. long, the tip scantily feathery and very acute in outline, lateral awns spreading, naked, about half as long as the central one. South West Africa:

Lower Guinea, Angola . . . . . .
. . . . . **Aristida prodigiosa Welw.**

Glumes commonly shorter than in the type, 6 and 7 mm. long, quite glabrous. South Angola . . . . . **var. calva Henr.**

Pedicels very short, nearly sessile, glumes 13—14 mm. long, panicle more or less contracted.

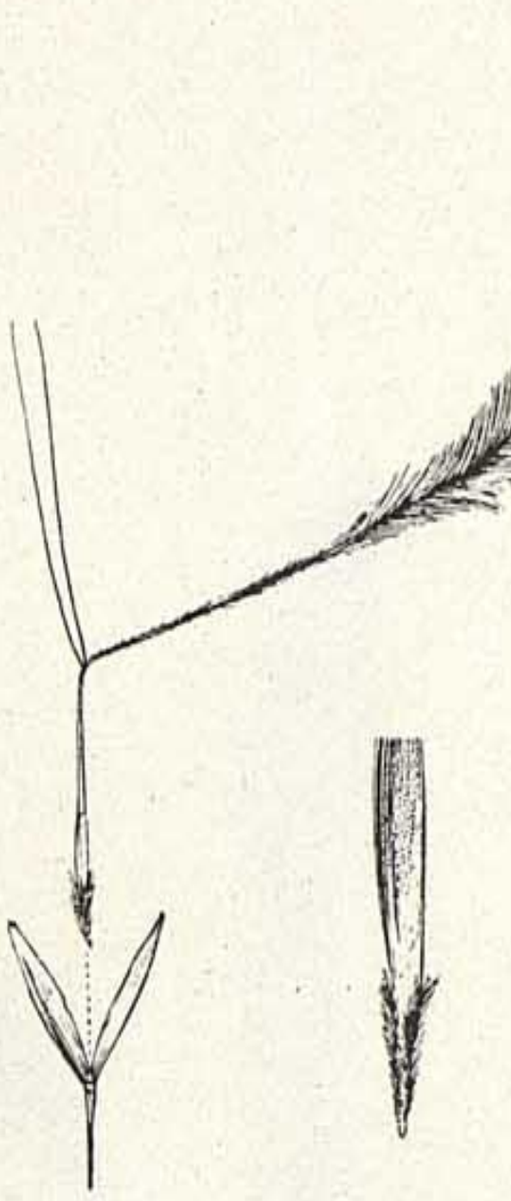
Densely caespitose glaucous erect perennial with intravaginal innovations, culms erect, sometimes geniculate at the nodes, elegant, 25—40 cm. high, simple, 2—3-noded, the glabrous nodes equally distributed, internodes terete, scarcely striate, slightly thickened and grooved below the nodes and with depressed crateriform glands, smooth or scaberulous; sheaths of the lower blades more or less reduced, 1—2 cm. long, rather thin, sometimes papery, densely striate, scabrous, pale yellowish with broad hyaline margins, those of the culm-leaves tight, terete, scaberulous or scabrous especially along the margins, striate, sometimes slightly keeled, shorter than the internodes, ligule a ciliolate rim, auricles densely ciliate and more or less bearded or the long hairs wanting, collar glabrous; blades erect, linear, not very rigid, setaceously convolute throughout, scarcely 1 mm. wide when expanded, acuminate, 12—15 cm. long, very scabrous on both surfaces and hirtellous on the upper surface, ending in a long setaceous point; panicle erect, linear, contracted and very narrow but rather lax and interrupted at the base, including the spikelets and awns up to 20 cm. long, exserted or at first sheathed by the uppermost leaf, axis terete and nearly smooth below, like the lower branches with depressed crateriform glands, more or less angulous and scabrous above, branches solitary or binate, scaberulous or nearly smooth, up to 10 mm. long, branchlets bearing but one erect adpressed flower, the lateral pedicels very short, nearly sessile and up to 3 mm. long, the other ones longer pedicelled but the pedicels always much shorter than the glumes, all the pedicels scabrous, laterally grooved and slightly thickened; spikelets strictly erect, whitish, glumes linear-lanceolate, about equal or slightly unequal, the lower 12—13 mm. long, 3-nerved or sub-5-nerved by additional shorter side nerves, acute, shortly awned, more or less hairy with soft spreading hairs, the upper glume 13—14 mm. long, narrower, 3-nerved or sub-5-nerved, acute, or with an inrolled subobtuse summit, not so densely hairy as the lower glume; lemma glabrous, linear-tubulous, the callus $1^1/_2$ mm. long, very acute, densely hairy, the body of the lemma inclusive of the callus 10—11 mm. long, articulation at the middle, gradually narrowed into a nearly smooth, distinctly twisted



×5⅓ ×2
ARISTIDA SECALINA
Henrard.

×1⅓ ×3⅓
ARISTIDA
HOCHSTETTERIANA Beck.

×2 ×8
ARISTIDA SCHLECHTERI
Henrard.



× 1 1/3 × 3 1/3

ARISTIDA CILIATA Desfontaines.



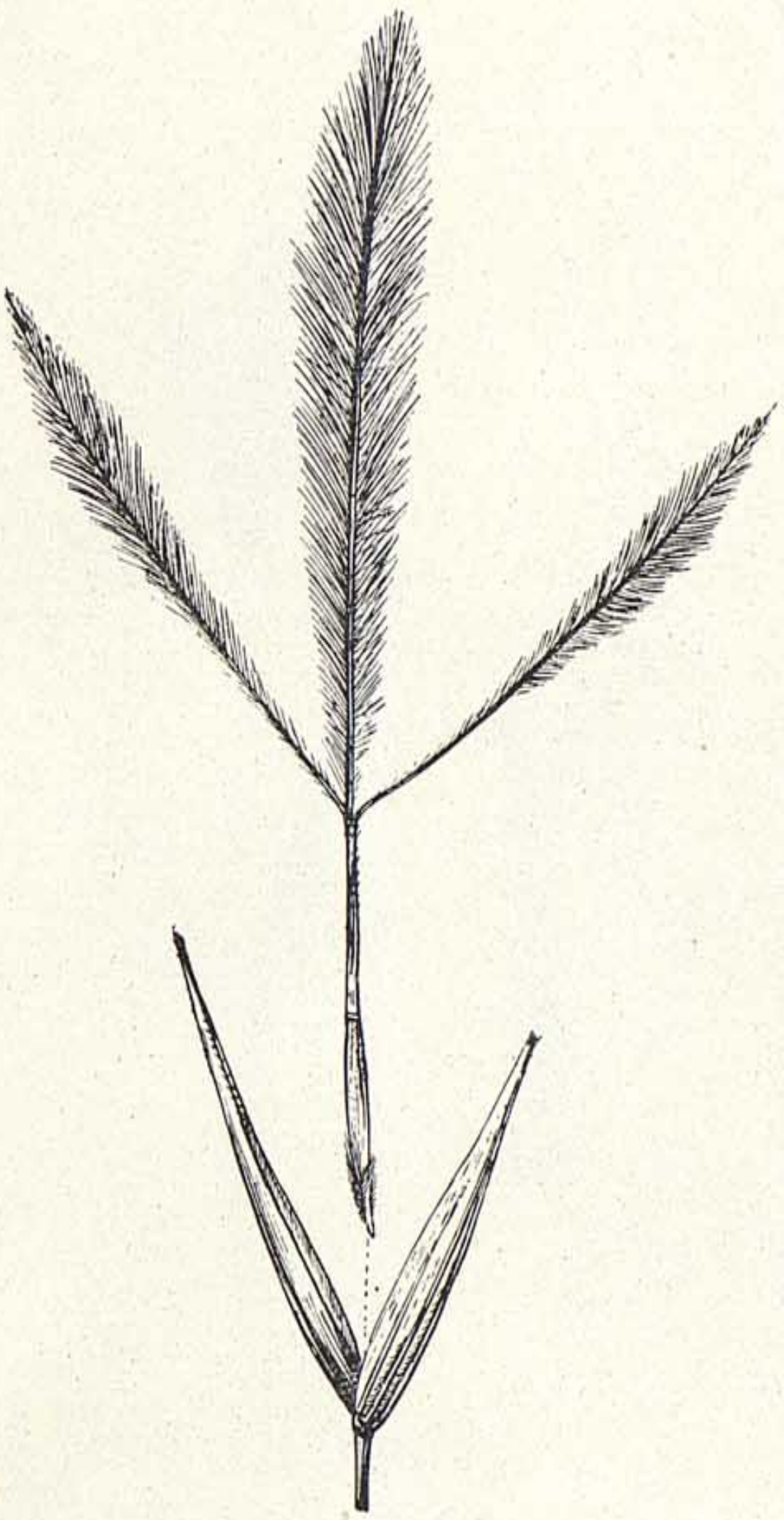
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ARISTIDA CILIATA Desfontaines.
var. capensis Trin. et Rupr.



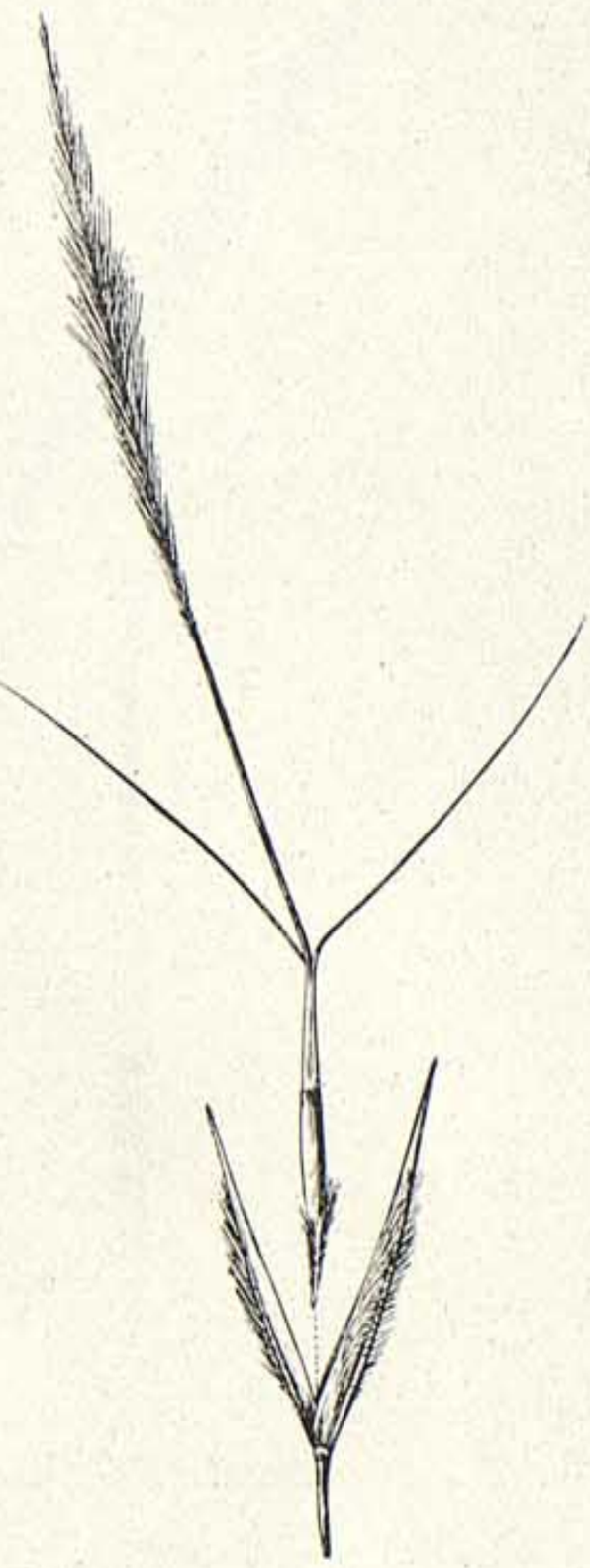
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ARISTIDA SCHAEFERI Mez.



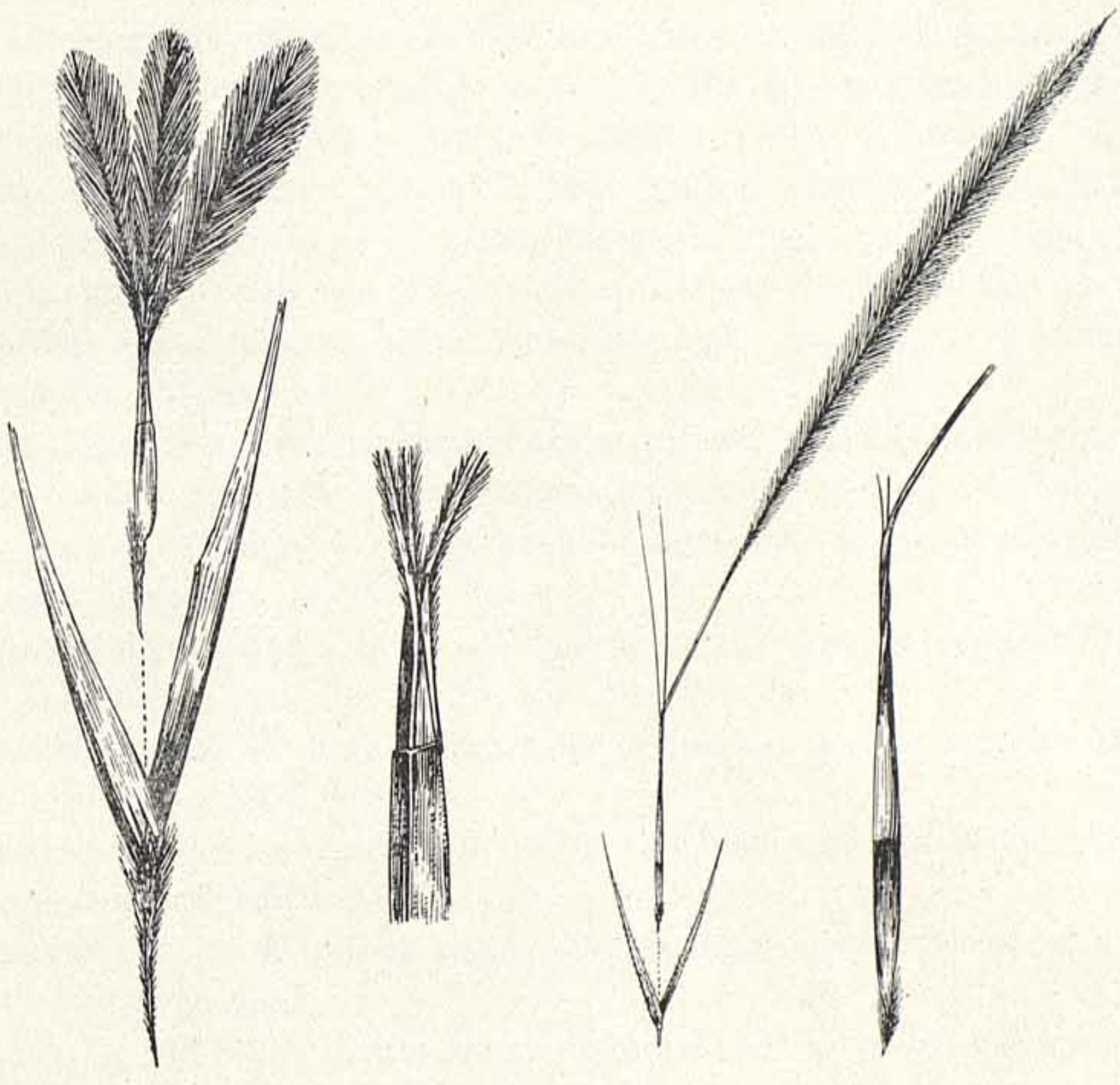
×3

ARISTIDA NAMAQUENSIS (Nees) Trin. et Rupr.



×3 1/3

ARISTIDA PRODIGIOSA Welwitsch.



×5 ×10 ×1⅓ ×3⅓

ARISTIDA PROXIMA Steudel. ARISTIDA DINTERI Hackel.

about 4 mm. long column; central awn spreading, up to 6 cm. long, naked in lower 1/4 part, densely long-plumose above, with an excurrent naked tip, the feathery part acutish in outline, lateral awns very thin, erect, naked, up to 15 mm. long. South West Africa: Hereroland and Damaraland . . . . . **Aristida Dinteri Hackel**

SECTION STIPAGROSTIS (NEES) TRIN. et RUPR.

The genus *Stipagrostis* was described by NEES in Linnaea, Vol. VII. (1832) p. 290 as follows: „Spicula uniflora. Glumae duae membranaceae, aequales, flosculo longiores. Flosculus callo pedicellatus, bivalvis: valvula inferior chartaceo-membranacea, convoluta, apice emarginato-biloba, inter lobos arista articulo inserta decidua trifida instructa; superior brevior obtusa. Lodiculae magnae membranaceae, spathulato-cochleariformes. Caryopsis subcylindrica, unisulcata, libera, valvula flosculi subindurata tecta. Inflorescentia racemoso-paniculata. Glumae carinatae, trinerves. Aristae dens medius apice plumosus, barba obtusa nec nudo dentis apice mucronata. — Folia angusta, filiformia.

Differt *Stipagrostis* a reliquis Stipeis arista trifurca praeditis arista inter lobos valvulae inserta, neque a valvula in aristam attenuata proficiscente. Quorum generum, nisi, cl. Trinio praeeunte, in unum omnia conjungere placeat, breves facilesque characteres invenies:

Stipeae. Aristideae (Arista valvulae inferioris flosculi terminalis trifida):

Arthratherum Pal. de Beauv. Arista annulo discreta apicique valvulae attenuato integro applicata, integra decidua.

Adnot. *Arthratherum ciliatum*, ob aristae stipitem basi convolutum latumque, proprii generis esse videtur.

Stipagrostis N. ab E. Arista annulo discreta, inter lobos valvulae apice bilobae inserta, integra decidua.

Aristida Pal. de Beauv. Arista annulo discreta, inter setas valvulae apice bisetae inserta, simplex, decidua cum valvulae setis aristam trifidam fingens. (Si talis structurae vera exempla inveniantur.)

Chaetaria Pal. de Beauv. Arista, seu potius seta, trifida cum apice attenuato flosculi continua, persistens."

The only species described was *Stipagrostis capensis* N. ab E., which is the type of the genus. From the very accurate description and from the specimen in the Berlin Herbarium, we see that it is quite the same as *Aristida obtusa*, described already by DELILE from North Africa in the year 1813. It is necessary to observe that NEES described the sheaths of his species as glabrous („vaginae glabrae, ad latus ejus minute barbatae"), because in the year 1841 he gives on p. 171 of his Flora Africae the same description but on p. 180 under the description of *Arthratherum obtusum* the sheaths are described as „lanuginosae". DELILE's specimens have

glabrous sheaths and it is very curious that the plants of *Aristida obtusa* mentioned by NEES himself (Schimper no. 163, Sieber) have glabrous sheaths. TRINIUS and RUPRECHT say under *Aristida obtusa*: „culmo nodis vaginisque glaberrimis, Vaginae in speciminibus examinatis semper glabrae, ut quoque Delile describit." NEES described thus the same species under two different genera and the statement of the woolly sheaths under *Arthratherum obtusum* was erroneous.

The Russian monographers accepted the genus of NEES as a section of *Aristida* but modified the character and they placed all the species with plumose awns in this section with the character: „Aristae caducae setis pennatis".

The most important character mentioned by NEES in his description of the genus *Stipagrostis* is the obtusely bilobed valve with a column from the sinus and this is the only diagnostic character. If we base the section *Stipagrostis* only on this character of the bilobed summit of the lemma, we must exclude many species with a very short column or a nearly wanting awnstipe. In *Aristida sabulicola* the summit of the valve is so strongly bilobed that the two lobes are produced beyond the insertion of the 3 awns as two hairy well-developed appendages, on the other hand we find in *Aristida pennata* that the lobes are united with the lower part of the column. Species as *A. uniplumis*, *A. brevifolia* and *A. subacaulis*, true *Stipagrostis*-species as to the bilobed apex of the lemma, were described by NEES himself under the genus *Arthratherum*. It is not advisable to make more sections in this group; the character so accurately observed by NEES is not always easy to fix and is absent or present on the same specimen. I have therefore accepted the section with the following characters: „*Lemma always articulated at the summit, with or without a well-developed column, awns at least the central one long-feathery.*"

A group of about 38 species, totally limited to the western part of the Old World, distributed from South Africa to the Sahara, Arabia, Turkestan and Persia to Western Tibet. One species occurs also in European Russia.

Key to the species of the section Stipagrostis.

1. All the awns plumose with long spreading hairs, or the lateral ones naked at the base and plumose only above the middle, sometimes the central awn with longer and more copious hairs than the lateral ones . . . 2.
   Only the central awn plumose with spreading hairs, the lateral ones quite naked or sometimes very sparingly and scantily adpressed-ciliate-pubescent . . . . . 12.

2. Internodes at least the lower ones always densely woolly, awns not plumose all over, mostly the central awn bearded nearly from the base to the summit and the lateral ones naked below and plumose in the upper part. 3.
   Internodes glabrous or minutely puberulous only, awns plumose from the base to the very tip or sometimes the tip slightly excurrent as a naked or scabrous bristle. . . . . 5.

3. Glumes glabrous . . . . . 4.

Glumes hairy in the lower part with a short, spreading pubescence.

Caespitose erect or ascending about 30 cm. high perennial, branched only at the base, with a stout rootstock and intra- and extravaginal innovations, culms terete, few-noded, the nodes and internodes densely lanate-woolly; sheaths densely woolly, or the lower ones becoming glabrous and shining on the back at maturity, striate, many-nerved, the lowermost yellow, reduced to scales, the other ones shorter than the internodes, tight and terete, densely woolly all over, ligules, auricles and collar woolly-pubescent; blades erect, convolute, filiform but firm and pungent, lanate-woolly al over, except at the summit, 10 cm long and about $^1/_2$ mm. wide when inrolled, the old ones becoming glabrous beneath and scabrous on the upper surface; panicle scarcely exserted, the peduncle lanate, rather depauperate bearing about 5—6 large spikelets or not rarely but 1—2 flowers, axis of panicle woolly or becoming more or less glabrous, the branches binate or solitary, bearing but one long-pedicelled spikelet, the lateral spikelets with a shorter pedicel, the others with a pedicel as long as the glumes, the tips of the pedicels clavate and densely woolly; spikelets erect, white-woolly, becoming yellow and more or less glabrous at maturity, glumes very unequal, the lower longer than the upper, narrowly lanceolate, subulate-acuminate but with erose or denticulate, obtuse tips, shortly mucronate, densely lanate below, more or less glabrescent in upper half, lower one 9—11-nerved, 4—5 cm. long, upper one 7-nerved, 3—$3^1/_2$ cm. long, lemma lanceolate-oblong, glabrous, including the callus 10 mm. long, the densely hairy, 3—4 mm. long callus with a very acute naked point, column firm, glabrous, slightly twisted, about 2—$2^1/_2$ cm. long; central awn 7—10 cm. long, naked only at the very base for 1—$1^1/_2$ cm., densely plumose with erectly spreading feathers and a scabrous naked exserted tip of about 1 cm. long, lateral awns 5—7 cm. long, thin, scabrous and more or less plumose at the middle. Asiatic Russia: Transkaspia . . . . . **Aristida arachnoidea Litw.**

4. Glumes very long, many-nerved, with inverse position.

Caespitose erect or ascending perennial from a thick rootstock, 40 cm. or more high, innovations intravaginal and probably also extravaginal, with leafless scales at the base of the flowering culms, internodes terete, striate, densely woolly-tomentose, the upper ones becoming more or less glabrous afterwards, nodes few, pubescent or becoming glabrous; sheaths striate, tight, shorter than the internodes, densely covered with white wool or the upper ones glabrescent, ligules, auricles and collar

woolly; blades rigid, striate, flat below or somewhat complicate, inrolled upwards, somewhat curved, lanate-woolly on both surfaces, glabrescent in upper part; panicle shortly exserted or sheathed by the uppermost leaf, rather lax but contracted, axis terete, striate, glabrous or here and there with a few hairs, branches subsolitary, densely lanate in the axils, the longer ones 5—6-flowered, the shorter ones 1—2-flowered, not rarely all the branches bearing but one flower, the branchlets and pedicels striate, glabrous or slightly pubescent or with a few long hairs, the pedicels with a glabrous or slightly pubescent clavate tip; spikelets erect, the lateral ones rather shortly pedicelled, the other ones with a pedicel nearly as long as the glumes, lower glume glabrous, 9-nerved, linear-lanceolate, obtuse, erosely dentate at the apex, about $3^1/_2$ cm. long, upper glume slightly narrower about $2^1/_2$ cm. long, 5-nerved, glabrous, erosely dentate or subbifid at the apex with a mucro; lemma smooth, including the callus 10 mm. long, the densely bearded, very acute, pungent callus about 3 mm. long, column smooth, spirally contorted, up to 3 cm. long, awns very long, the central one plumose nearly from the branching-point of the 3 awns, 7—$7^1/_2$ cm long, the tip naked and adpressed-hairy or scabrous, lateral awns shorter, 4 – $4^1/_2$ cm. long, naked below, shortly plumose in upper part, the tip naked and scabrous. Affghanistan. . . . . .
. . . . . **Aristida Griffithii Henr.**

Glumes rather short, 3-nerved, the lower shorter than the upper.

Geniculately ascending, densely caespitose perennial with long tomentose roots and a more or less developed rootstock, 20—50 cm. high, including the panicle, branched from the base and from the lower culm-nodes, with intravaginal innovations and probably also with extravaginal ones; culms terete, shorter than the internodes, densely lanate and woolly, the upper ones puberulous only or quite glabrous, 5 – 6-noded or in small specimens 2—3-noded, the nodes glabrous and often geniculate; sheaths glabrous, striate, terete or slightly compressed, with broad hyaline margins, tight or more or less slipping from the stems, the lower sheaths often reduced to leafless scales and somewhat villous along the margins, ligules a long-ciliate membrane, auricles woolly or bearded, collar woolly, the upper sheaths with ciliolate auricles and glabrous collar; blades narrow, convolute, more or less curved or flexuous, acute, narrowed into a setaceous somewhat pungent tip, up to 10 cm. long, about $^1/_2$ mm. wide when inrolled, glabrous or slightly scaberulous beneath, densely hirtellous or scabrous on the upper surface, margins not thickened; panicle up to 10 cm. long, more or less contracted, cuneate at the base and V-shaped in outline, sheathed by the

uppermost leaf, about 3 cm. wide at the summit, the peduncle very short, axis striate, compressed, scaberulous, branches binate, shortly pedicelled, spikelets bearing nearly from the base, the axils more or less pubescent or pilose, the longer branches including the awns up to 7 cm. long, 7—8-flowered, the shorter ones 4—5 cm. long or shorter, 2—3-flowered, the branches and spikelets erect and adpressed, the pedicels shorter than the glumes or the laleral spikelets nearly sessile, pedicels pubescent, clavate at the tips, compressed, more or less laterally bearded; spikelets yellowish, lower glume 11—12 mm. long, 3-nerved, the lateral nerves half as long as the midnerve, scabrous on the keel and sometimes more or less puberulous on the back, rather obtuse or erose with a short awn or mucro, the upper one about 15 mm. long, 3-nerved, the short lateral nerves close to the midnerve, obtuse at the apex; lemma with the callus 5 - 6 mm. long, smooth and shining, the very acute, pungent callus adpressedly hairy below, the hairs at the summit longer, about 2 mm. long or slightly longer, the articulation somewhat oblique, column straight, not twisted, about 4—5 mm. long; awns erect or the central one somewhat spreading, the latter up to $3^1/_2$ cm. long, naked in lower 1/4 part, plumose upwards, the very tip adpressed-pubescent or naked, plumose part of the awn very obtuse in outline, lateral awns shorter, up to $2^1/_2$ cm. long, naked in lower half part, bearded above the middle with long exserted naked or scaberulous tips. Northern part of Egypt, Sinai and Syria. . . . . .
. . . . . **Aristida lanata Forsk.**

5. Column of awns well-developed, 4—10 cm. long, more or less twisted, glabrous or bearded . . . . . 6.
Column wanting, or sometimes only a very short or minute, not twisted beak. . . . . 7.

6. Nodes glabrous; tip of central awn always very acute in outline.
Compactly caespitose glabrous perennial, culms simple or scarcely branched from the base, slender, striate, erect, up to 60 cm. high, wiry, smooth or minutely scaberulous, 1—2-noded; sheaths firm, tight, glabrous and smooth or slightly scaberulous with here and there a few long hairs, more or less striate, not rarely purplish, shorter than the internodes, ligule a ciliate membrane, auricles ciliate or densely bearded, collar smooth; blades setaceously convolute or filiform, acute up to 30 cm. or more long, sometimes very long and overtopping the panicle, rather firm, more or less flexuous, smooth beneath, scabrous or hispidulous on the upper surface; panicles erect or somewhat nodding, more or less contracted or rather loose and effuse, often secund, up to 30 cm.

long, with smooth nearly terete rhachis, branches solitary, bi- or tripartite from the base, the lowest up to 10 cm. or sometimes up to 15 cm. long, remotely and sparingly branched, filiform or capillary, nearly smooth, pedicels clavate-tipped, the lateral ones half as long as the glumes; spikelets erect or nodding, brownish or purple, glumes glabrous, unequal or subequal, linear-lanceolate, subulate-acuminate, acute or minutely truncate, both 3-nerved, the lateral nerves not reaching the tips, the lower glume 12—15 mm., the upper one 15—17 mm. long or sometimes longer; lemma smooth or punctulate, tubulous or fusiform, including the up to $2^1/_2$ mm. long very acute callus 6—8 mm. long, the callus densely hairy with a curved naked point, column more or less twisted, hairy or quite glabrous, very variable in length, sometimes only $2^1/_2$ mm. long or up to 14 mm. long; awns unequal, the central one up to 3 cm. long, the lateral ones about 2 cm. long. South Africa: Coast Region from Port Alfred to Capetown, north to Little Namaqualand. . . . . **Aristida capensis Thunb.**

Column of awns quite glabrous.

Feathers of awns golden yellow, central awn $2^1/_2$ cm. long, densely plumose to the very tip, lateral awns about 18 mm. long, with a naked, exserted tip; lower glume 15 mm., upper one 17 mm. long, slightly ciliolate at the apex, column much exceeding the glumes, 13—14 mm. long; auricles of sheaths bearded . . . . . **var. macropus Trin. et Rupr.**

Feathers of awns white or canescent, central awn about 3 cm. long, lateral ones up to 2 cm. long, all plumose with naked exserted tips; lower glume 15 mm., upper one 17 mm. long, rather acuminate, column not exceeding the glumes, densely twisted, about 9 mm. long; auricles ciliate . . . . . **var. genuina Henr.**

Column of awns densely hairy nearly all over, all the awns with naked excurrent tips, feathers white or canescent.

Sheaths long-bearded at the mouth, blades very long, curled, overtopping the panicle, column of awns rather short, about $2^1/_2$ mm. long, glumes nearly equal, about 20 mm. long, culms sheathed all along . . . . . **var. barbata Stapf**

Sheaths not bearded at the mouth, ciliate only, blades shorter or very short not overtopping the panicle, column longer than $2^1/_2$ mm.

Panicle more or less contracted, often secund, lowest branches 5—10 cm. long, glumes unequal, the lower 12 mm., the upper 16 mm. long; lemma including the callus 6 mm. long, column up to 4 mm. long, slightly twisted. central awn $2^1/_2$ cm., lateral ones, 2 cm. long . . . . . **var. Zeyheri Walp.**

Panicle more effuse, lower branches mostly longer or rarely shorter than 15 cm., glumes less unequal, the lower 17 mm., the upper about 18 mm. long; lemma including the callus 7—9 mm. long, column 6—9 mm. long. central awn $2^1/_2$, lateral ones 2 cm. long . . . . . **var. canescens Trin. et Rupr.**

Nodes more or less but always distinctly bearded; tip of the central awn not exserted, obtuse in outline.

Habit and vegetative characters agreeing with *A. capensis*, culms 1—2-noded, the nodes with divaricately spreading hairs, the hairs deciduous; sheaths striate with densely bearded auricles; blades rather short, curved, 5—6 cm. long or shorter, especially the upper ones; panicle exserted, strictly erect, rather few-flowered as in *A. ciliata*, the branches somewhat ascending only and slightly scabrous, especially the pedicels; spikelets lanceolate, agreeing with those of *A. capensis* but the glumes not papery or thin but very firm in texture or chartaceous, both 3-nerved, yellowish-brown with a purple or dark spot at the base as in *A. ciliata*, about equal, 14—16 mm. long, acutish or subobtuse, the tips minutely ciliolate, column glabrous, slightly twisted; awns of the lemma very unequal, the central one plumose all over to the very tip, up to 4 cm. long, the lateral ones half as long or scarcely up to $2^1/_2$ cm. long, sparingly hairy or naked below, more densely hairy upwards with scabrous long-exserted tips, not rarely the lateral awns only very sparingly and remotely hairy only at the middle, feathers of the awns mostly longer than in *A. capensis* and more spreading; articulation between lemma and column placed at the summit of the body as in *A. capensis* or the lemma is articulated as in the section *Schistachne* and the articulation placed at about 1/4 below the summit. A hybrid between *Aristida capensis* and *Aristida ciliata*. South West Africa: Little Namaqualand . . . . . **Aristida Schlechteri Henr.**

7. All the awns of equal length or the central one a little longer than the lateral ones . . . . . 8.

Awns very unequal, the central one about 2 cm. long, sometimes somewhat longer, twice as long as the lateral ones.

Rather robust laxly caespitose nearly 1 meter high perennial, innovations so far as observed intravaginal, extravaginal innovations probably also present, culms simple or scarcely branched from the base, 2 mm. thick, 3—4-noded, nodes equally distributed, terete, glabrous and smooth, minutely striate, only slightly compressed and furrowed just below the nodes; lower sheaths distichous and flabellate or overlapping, gaping, yellow, striate, glabrous, rounded at the back, 5—6 cm. long, the keeled prophyllum more or less pubescent, the hyaline margins of the sheaths sometimes minutely hairy, upper sheaths much longer, up to 15 cm. long, tight, terete, striate, glabrous or slightly pubescent on the margins above, scaberulous between the nerves, shorter than the internodes, ligule a scarcely ciliolate rim, auricles thickened, pubescent, or with a few long hairs, collar smooth, auricles of the innovations strongly developed, densely bearded with spreading hairs; culm-blades very firm, almost junciform, the lower ones up to 8 cm. long, the upper ones up to 40 cm. long, narrowly convolute, glaucous, glabrous and smooth beneath, scabrous on the upper surface with many bands of sclerenchyma, up to 2 mm. wide when flattened after being treated with lactic acid, narrowed into a pungent tip, blades of innovations shorter, the margins more conspicuously pubescent above; panicle sheathed at the base by the uppermost leaf, at least up to 30 cm. long, rather narrow, scarcely 1 cm. wide, contracted but not very dense or spike-like, axis subterete, deeply striate or grooved, glabrous, angulous above, branches solitary, divided or tripartite just above the base, the longer ones 6—8 cm. long, 10—12—flowered, naked at the base, the shorter ones few-flowered, all the branches and branchlets strictly erect and adpressed, more or less scaberulous, pedicels subclavate, shorter or slightly longer than the glumes; spikelets erect, yellow, glumes with an inverse position, scabrous or shortly pilose between the nerves, the lower 3-nerved or sub-5-nerved, rather abruptly narrowed into the short awn, scabrous on the keel, 16 mm. long, the upper one 3-nerved, lateral nerves half as long as the midnerve, the keel scabrous upwards, 14 mm. long, tip subacute or truncate with a mucro; lemma glabrous, including the hairy, subacute callus and the very short column, 8—9 mm. long; awns strictly erect, the central one densely long-plumose, especially above, feathers spreading, obtuse in outline, without naked tips, the lateral ones more adpressedly plumose, up to 10 mm. long. South West

Africa: Damaraland . . . . . .
. . . . . **Aristida damarensis Mez**

8. Panicle loose and open, mostly not over 20 cm. long, sometimes somewhat contracted but never dense and spike-like; blades 30 cm. long or mostly much shorter, not overtopping the panicle. . . . . 9.

Panicle dense and spike-like, up to 30 cm. long; blades very long, up to 40 cm., overtopping the panicle.

Very robust, tall and stiff perennial plant more than 1 meter high, with much branched vigourous rhizomes, sending out subterranean branches in all directions, with scale-like leaves and fibrous roots at the nodes, culms rigid, glabrous, fasciculately branched, the branche, strictly erect; sheaths long, longer than the internodes, tight, striate, glabrous, the lower ones merely short scales, yellow, quite glabrous, ligule a very short ciliolate rim, auricles pubescent or nearly glabrous; blades very rigid, thick, stiffly erect, 25–40 cm. long or commonly much longer, involute or complicate, junciform, very acute and pungent, quite terete, smooth beneath, hirtellous and scabrous on the upper surface, many-nerved, the margins not thickened, flattened out up to 5 mm. wide at the base; panicle shorter than the blades, narrow, densely spiciform, 10–30 cm. long, about 1–2 cm. broad at the base, with short branches, divided and spikelet-bearing nearly from the base or the lower branches up to 5 cm. long, adpressed and more or less naked at the base; spikelets densely congested, yellowish, glumes quite smooth, slightly unequal, subobtuse or acutish, the lower 3-nerved, 11 mm. long, the upper 1-nerved, 12 mm. long; lemma punctulate or smooth, including the very acute, pungent, curved callus about 5–6 mm. long, the $1^1/_2$mm. long callus densely bearded especially above, the hairs long, much surpassing the base of the lemma, column very short, a scarcely 1 mm. long beak only; awns about equal, 8—10 mm. long, the central one commonly slightly longer than the lateral ones, densely plumose to the very tips, acutish in outline, branching-point of awns produced into 2 thin, hairy appendages, bearing at the subobtuse tip a pencil of hairs. A very remarkable species, resembling the *Ammophila* of the downs, especially as to the vegetative parts. South West Africa: Damaraland, downs near Walfish Bay . . . . . .
. . . . . **Aristida sabulicola Pilger**

9. Articulation between lemma and awns not oblique, margins of the lemma not united with the short column by a membrane; leaves always rather short, rigid, junciform and pungent 10

Articulation (observed laterally) very oblique, not totally separating the

lemma and the short column, the margins of the lemma united with the base of the awns by a hyaline membrane; leaves mostly flaccid, rarely stiff and pungent.

Rather robust erect perennial, including the panicle up to 50 cm. long, with a much branched more or less creeping rootstock, culms erect, fasciculately branched at the base or sometimes simple, few-noded, terete, quite smooth, sheathed all along; sheaths longer than the internodes, tight, terete or slightly compressed, striate, the lower ones more or less gaping, distinctly scabrous nearly all over (very characteristic!), with hyaline margins; ligule a ciliate membrane, auricles shortly but densely bearded; blades flaccid, acute not pungent, or rarely pungent and rigid in one variety, more than 20 cm. long, flat below, more or less inrolled or convolute above, not rarely divaricately spreading, scabrous on both surfaces, rough like the sheaths, the upper surface hirtellous, the margins not thickened, 2—3 mm. wide when expanded, ending in a long fine setaceous point, more or less glaucous; panicle shortly exserted or sheathed by the uppermost leaf, erect, at first somewhat contracted, very effuse, commonly more than 20 cm. long, up to 15 cm. broad, rhachis glabrous, angulous or subterete and striate, the branches thin, elongate, subflexuous, solitary but divided nearly immediately above the base, trichotomous or tripartite, reiterately branched, spreading or the branchlets ascending, axils naked or slightly bearded, the branchlets and pedicels slightly scabrous, the pedicels commonly much longer than the glumes; spikelets yellow, glumes unequal with an inverse position, both acute or acuminate, more or less erose at the apex, with a mucro, glabrous or scabrous, the lower 5-nerved, 16 mm. long, the upper 3-nerved, 13–14 mm. long, sometimes the glumes are much shorter; lemma including the callus 5—6 mm. long, with broad margins, strongly keeled, 3-nerved, base cordate, suddenly contracted into the oblique, sharp-pointed, laterally bearded, 1—1½ mm. long callus, column very short, awns densely plumose with long spreading feathers, tips obtuse or acute with a naked exserted scabrous point, the awns equal or somewhat unequal, 10—15 mm. long. European Russia (Caspian desert) to Transcaspia, eastern Persia and Turkestan, ... **Aristida pennata Trin.**

Blades short, not over 10 cm. long, mostly shorter, divergent, very rigid and convolute throughout, pungent, culms 10—15 cm. high, densely fascicled, the panicle very short, 5—6 cm. long, more contracted, few-flowered, glumes 13 and 12 mm. long, scaberulous, awns feathery with a naked scabrous exserted

tip. Soongaria . . . . . .
. . . . . **var. rigida Roshevitz**

Blades much longer, mostly up to 20 cm. long or longer, divergent not rigid, flaccid, flat at the base or in the lower half part, acuminate but not pungent.

Awns feathery to the very tips, with long hairs of nearly equal length, very obtuse in outline, glumes glabrous, smooth, the lower 16 mm., the upper about 13 mm. long, awns up to 11 mm. long. South East Russia to Soongaria . . . .
. . . . . **var. typica Henr.**

Awns not feathery all over, the tips naked, plumose part acute in outline, glumes scabrous all over.

Lower glume 12—13 mm., upper one 10—11 mm. long, awns of the lemma about 10—11 mm. long, plant not very robust, with shorter culms. Transkaspia . . . . . .
. . . . . **var. minor Litwinow**

Lower glume about 16 mm., upper one 14—15 mm. long. Awns very long, up to 15 mm. long or slightly longer. Transcaspia to Turkestan. . . .
. . . . . **var. Karelini Trin. et Rupr.**

Awns shorter, not over 10 mm. long, commonly shorter. Persia . . . . . .
. . **var. scabriglumis Hausk. et Bornm.**

10. Lower glume shorter than the upper one or the glumes of nearly equal length 11

Lower glume longer than the upper.

Somewhat suffrutescent stoloniferous much branched glabrous perennial, culms erect, up to 60 cm. long or much longer, smooth, terete; sheaths terete, striate, glabrous or minutely scaberulous only, longer than the internodes, the lower ones not rarely purplish, the upper ones yellow, ligule a densely ciliate rim, auricles shortly bearded; blades stiff and rigid sometimes curved or flexuous, convolute throughout, very pungent, 15 cm. long or much longer, glabrous beneath, hirtellous or pubescent on the upper surface, about 1 mm. wide when inrolled; panicle effuse, oblong, strictly erect or slightly nodding at the summit, rather few-flowered up to 15 cm. long, exserted, with solitary erectly spreading

branches, divided nearly from the base, reiterately branched, axils of panicle and main-branches much thickened, quite glabrous and smooth, branchlets and pedicels nearly glabrous and smooth, the pedicels very long, clavate at the tips, sometimes more or less curved and flexuous, longer than the glumes; spikelets yellow, solitary, glabrous, lower glume 5-nerved, 18—20 mm. long, the upper one 3-nerved, 15—16 mm. long, both linear-lanceolate, acute or acuminate, subobtuse or slightly awned, tips very scrabrous or not rarely somewhat ciliolate or pubescent; lemma tubulous mostly compressed and slightly narrowed above, including the callus 7—8 mm. long, smooth, the callus broadly conical, abruptly acuminate, very acute, almost glabrous, column about 1 mm. long, straight, awns densely plumose to the tips, not exserted, about equal, up to 10 mm. long, the plumose part acute in outline. Egypt to Syria . . . . . **Aristida scoparia Trin. et Rupr.**

11. Panicles with bearded axils; glumes distinctly awned, pedicels pubescent. Glabrous suffrutescent branched perennial, agreeing in the vegetative characters with *Aristida scoparia*, the sheaths and ligules quite as in that species, the blades however strictly erect or but slightly spreading, stiff and subulate, not curved or flexuous; panicle not effuse, lanceolate-ovate or oblong, strictly erect, rather dense, up to 15 cm. long, 4—5 cm. broad, cuneate at the base and more or less sheathed by the uppermost leaf, branches strictly erect or slightly spreading, solitary but divided nearly from the base, axis of panicle, branches and branchlets more or less pubescent, lower branches up to 7 cm. long, the other ones gradually becoming shorter, all the branches many-flowered, the pedicels as long as or much shorter than the glumes, with clavate tips: spikelets yellow, adpressed and somewhat congested, glumes subequal or somewhat unequal, the lower 9 mm. long, broadly lanceolate, suddenly contracted at the apex into a $1^1/_2$ mm. long awn, the upper one 10—11 mm. long, lanceolate, erosely dentate at the summit with a 1 mm. long awn from the sinus, both glumes 1-nerved or not rarely with very short basal additional sidenerves, the keels scabrous especially above; lemma including the callus up to 5 mm. long with a very short straight not twisted column, the callus nearly smooth, oblique, scarcely 1 mm. long; awns about equal, long-plumose, about 10 mm. long, feathery nearly to the tips, with a minute naked exserted point, acute in outline. Egypt . . . . . **Aristida vulnerans Trin. et Rupr.**

Panicles with quite glabrous axils; glumes not awned or the upper one with

a very short awn or mucro, pedicels glabrous or scaberulous.
Glabrous, suffrutescent, branched perennial with long, oblique rhizomes as in *A scoparia* and *A vulnerans*; culms up to 1 meter high or much longer, glabrous and smooth; sheaths smooth or scaberulous, longer than the internodes, ligules and auricles as in *A. scoparia*, blades very rigid, subulate, very acute and pungent, 10–30 cm. long or slightly shorter than 10 cm, smooth beneath, scabrous or hirtellous on the upper surface; panicle not so dense as in *A. vulnerans*, linear-ovate, usually interrupted and more or less loose, sometimes rather depauperate or more than 20 cm. long, axis striate, subcompressed, glabrous, branches solitary, much divided from the base, the lower ones semi-whorled in robust specimens, naked in the lower part, up to 10 cm. long, ascending or somewhat spreading, the upper branches gradually becoming shorter, branches and branchlets nearly smooth, pedicels clavate, adpressed-hairy above, mostly strictly erect or somewhat spreading or flexuous, those of the lateral spikelets much shorter than the glumes; spikelets yellow, glumes nearly glabrous on the keels, somewhat unequal, the lower 13 mm. long, gradually narrowed into a short awn, with a strong midnerve and more or less developed additional short sidenerves and sometimes sub-5-nerved, upper glume 14—15 mm. long with an erosely dentate or bifid summit and a very short awn from the sinus, 1-nerved or sometimes sub-3-nerved; lemma as in *A. vulnerans*, strongly 3-nerved, the callus nearly glabrous or slightly hairy; awns nearly equal, the lateral about 12 mm. long, the central one slightly longer or up to 15 mm. long, densely plumose with excurrent naked tips, the plumose part acute in outline. Africa: From Nubia and Egypt to Tunis and Algeria, with a subspecies in South West Africa. . . . . **Aristida pungens Desf.**

Sheaths except the lowermost ones adpressedly pubescent, blades more or less densely pubescent on both surfaces. Algeria. . . . . **var. pubescens Henr.**

Blades much shorter than in the North African plants, only $1^1/_2$—4 cm. long, divaricate; panicle elegant, with much thinner flexuous or curved branches and pedicels; glumes narrower, the lower one more obtuse, both very distinctly ciliolate on the keel above. South Africa: Great Namaqualand . . . . . **subsp. Peyeri Henr.**

12. Internodes at least the lower ones densely lanate-woolly, or if not woolly always with a dense pubescence, especially below the lower nodes, the uppermost internodes are nearly always glabrous . . . . . 13.
Internodes quite glabrous or scaberulous only, sometimes with a minute or very scanty pubescence . . . . . 19.

13. Sheaths, especially the lower ones, with a dense woolly pubescence, the upper ones sometimes with a short pubescence or glabrous . . . . 14.
Sheaths quite glabrous, the lower sometimes scabrous or with a scanty pubescence, but never woolly . . . . . 15.

14. Sheaths and blades densely woolly, whole plant densely tomentose.
Laxly caespitose perennial with a suffrutescent, thick, ascending or creeping rhizome, with extravaginal innovations, covered with old scales, culms simple, terete, slightly striate, erect or geniculate, elegant, 2-noded, the nodes glabrous, together with the panicle up to 20 cm. high, internodes densely tomentose or woolly, the uppermost internode glabrous: sheaths tight, shorter than the internodes, the lower ones with white hyaline margins, all the sheaths and scales woolly or the uppermost one glabescent, ligule a densely woolly rim, auricles with a flake of wool, collar pubescent; blades rigid, convolute, curved, quite lanate-tomentose, narrow, scarcely 1 mm. wide when expanded, 2—3 cm. long, pungent; panicle exserted, narrow but rather lax, axis angulous, scabrous, branches binate or solitary upwards, scaberulous, branchlets 1—3-flowered, pedicels very scabrous with a tuft of longer hairs at the subclavate tip; spikelets erect, adpressed, violaceous or purplish-brown, glumes unequal, the lower with hyaline margins, pilose on the middle, scabrous on the keel, 3-nerved, lateral nerves shorter than the midnerve, acute, not awned, about 14 mm. long, the upper one distinctly 3-nerved, the nerves approximate and about equal, percurrent, glabrous and smooth on the keel, acuminate, about 18 mm. long; lemma very smooth with a very acute pungent densely bearded 2 mm. long callus, the hairs reaching nearly half the length of the lemma, which is about 5 mm. long, column elegant, straight, quite glabrous, not twisted, 6—7 mm. long, awns unequal, the central one spreading, up to 35 mm. long, long-feathery nearly from the base, the lower part less feathery and pilose only or quite naked only at the very base, with a slightly excurrent tip, acute in outline, lateral awns very thin, glabrous, much shorter, up to 15 mm. long. North Africa: Tunis. . . . . **Aristida oranensis Henr.**

Sheaths woolly, the upper ones always glabrous; blades glabrous or scabrous not with a densely woolly tomentum.

Densely caespitose erect or ascending perennial with a short, not creeping rootstock, culms erect or geniculately ascending, simple or somewhat branched from the upper nodes, dwarf or up to 30 cm. high, terete, woolly, 2—3-noded, the nodes glabrous, upper part of the culms shortly hairy or quite glabrous; lower sheaths scale-like with reduced very short blades, striate, somewhat keeled, with a fugacious wool, the following more or less lanate, mostly soon becoming more or less glabrous, the upper ones glabrous and smooth throughout, ligule a ciliolate rim or a flake of wool, auricles densely bearded, those of the innovations very woolly, those of the upper leaves shortly bearded or ciliate only, collar glabrous; sheaths shorter than the internodes, the latter sometimes slightly tomentose or pubescent only, blades narrowly convolute, stiff but not very rigid, with a pungent tip, slightly curved, scarcely 1 mm. wide when expanded, up to 10 cm. long, mostly shorter, glabrous or slightly scabrous beneath, scabrous-hirtellous on the upper surface; panicle strictly erect, lanceolate in outline, rather loose but narrow, mostly sheathed by the uppermost leaf, the sheaths of the latter with a well-developed more than 3 cm. long, bicarinate, many-nerved ciliolate prophyllum; panicles including the awns up to 15 cm long, axis striate angulous more or less scabrous, branches binate, one up to 7 cm. long, including the spikelets, many-flowered, naked at the base, strictly erect, the other 3—4 cm. long, branched from the base, 2—4-flowered, strictly erect and adpressed, the branches somewhat distant, gradually becoming shorter upwards, branchlets and pedicels scaberulous, the latter with a subclavate more or less pubescent or hairy tip, sometimes laterally bearded or with a collar of long hairs, the pedicels of the lateral spikelets shorter the other ones longer than the glumes; spikelets greenish or yellowish, sometimes tinged with purple, glumes unequal, lanceolate, the lower mostly 15 mm. long, sub-3-nerved, the lateral nerves shorter, glabrous or sometimes with a short pubescence, scabrous on the keel, obtuse, the upper one narrower, 1-nerved, up to 18 mm. long, glabrous, sometimes with scattered long hairs; lemma with a densely hairy, very acute, 2 mm. long callus, the hairs surpassing the true base of the lemma but not reaching the middle, 6—7 mm. long, column up to 10 mm. long, straight, not twisted, glabrous; central awn mostly with a naked tip, $4^1/_2$—5 cm. long, naked below, lateral awns about 2 cm. long, nearly smooth. From the Algerian Sahara to Egypt, Nubia Palestine and Arabia, Armenia, Persia, Turkestan to western Tibet . . . . . **Aristida plumosa L.**

Central awn with long, spreading hairs, plumose to the very tip, the feathery part rounded and more or less obtuse in outline, naked only at the base, the naked part sometimes adpressed-pubescent and commonly only 7 mm. long; plant more or less glaucous, ligules long-ciliate, panicles linear-oblong, finally somewhat exserted, lower glume 16 mm., upper one 20 mm. long, lemma including the callus 6—7 mm. long, column 9—10 mm. long, central awn 5 cm. long, the lateral ones about half as long. Aderbeischan . . . . . **var. Szovitsiana Trin. et Rupr.**

Central awn with more or less spreading or ascending hairs, tip of awn exserted, naked, adpressed-pubescent or scabrous, naked basal part of the central awn at least 1/5 the length of the whole awn.

Internodes not tomentose or lanate, with a characteristic dense and short pubescence only, lemma including the callus 5 mm. long, the column about 10 mm. long, lateral awns 15—18 mm. long, the central one naked in lower half part, 4 cm. long. Northern Egypt . . . . . **var. alexandrina Trin. et Rupr.**

Internodes at least the lower ones densely tomentose or lanate.

Upper glume remotely rather long-ciliate or hairy above, especially along the margins. glabrous at the base and summit; pedicels pubescent, without a lateral tuft of hairs at the tips, feathers of central awn longer and more spreading than in typical *A. plumosa*. Southern Persia. . . . . **var. Haussknechtii Boiss.**

Upper glume glabrous or scabrous, without long hairs.

Pedicels densely pubescent, densely ciliate at the subclavate tips with a collar of longer hairs, surrounding the base of the glumes; plants yellow, culms much branched and geniculate, panicles not exserted, ligules shortly ciliate, lower glume 14 mm., upper 18 mm. long, lemma including the callus 5 mm. long, column 7–8 mm. long, lateral awns about 18 mm., the central one $4^1/_2$ cm. long, the naked lower part 15 mm. long, the naked tips up to 3 mm. long. Transkaspia. . . . . **var. Eichwaldiana Trin. et Rupr.**

Pedicels scabrous or minutely pubescent, tips slightly clavate and pilose with a lateral tuft of hairs, but not with long hairs as a collar at the base of the glumes.

Lower glume remotely adpressed-pilose, especially on the margins, glabrous on the back and at te summit; pedicels with a lateral tuft of hairs, lemma including the callus 4–6 mm. long, column about 5 mm. long, central awn naked in lower half part. the exserted naked tip about 2 mm long. Nubia. . . . . **var. aethiopica Trin. et Rupr.**

Lower glume without long hairs, glabrous or scabrous only.

Central awn with shorter, more adpressed-plumose feathers, the lower half part naked, column of awns about 5 mm long; other characters as in the type. Egypt . . . . . **var. seminuda Trin. et Rupr.**

Central awn with long, more or less spreading feathers, naked only in lower 1/3 or 1/5 part.

Central awn naked in lower 1/5 part, the pedicels with a lateral tuft of hairs, the central awn with a naked excurrent tip. Transkaspia. . . . . **var. intermedia Litw.**

Central awn naked in lower 1/3 part, pedicels and central awn as in the preceding variety. . . . . **var. genuina Henr.**

A more densely woolly plant with lanate-floccose lower sheaths and lower internodes, is common in Algeria and Tunis. . . . . **var. floccosa Durand et Schinz.**

15. Central awn not feathery to the very tip, ending in a naked, glabrous or scabrous point . . . . . 16.

Central awn plumose to the summit, bearing feathers of nearly equal length, the feathery part very obtuse in outline.

Erect caespitose glaucous-gray perennial, branched from the base and

from most of the nodes, innovations few, at flowering time nearly wanting, culms erect or geniculate-ascending, terete, striate, with densely scabrid-pubescent internodes, up to 25 cm. high; sheaths longer than the internodes, striate, scaberulous, especially between the nerves, slightly compressed, gaping at the summit, ligule a densely ciliate rim, auricles ciliate; blades striate, up to 15 cm. long, or the lower much shorter, the lowermost ones scale-like with reduced blades, involute, filiform, more or less curved, ending in a long setaceous point, scabrous beneath, hirtellous on the upper surface; inflorescence sheathed by the uppermost leaf, oblong or linear-lanceolate, lax, 12—15 cm. long, composed of spurious leafy or spathaceous panicles with well-developed up to 3 cm. long prophylla, axis of panicle rather thin, compressed, scaberulous, branches binate, with scabrous branchlets and pedicels, erect or ascending, naked at the base, the longer ones up to 8 cm. long, the others up to 5 cm. long, all rather few-flowered, lateral pedicels shorter than the glumes, with subclavate pubescent tips; spikelets yellow, erect, distant, glumes about equal, the lower acuminate, 8 mm. long, scabrous on back and keel, with hyaline margins, 3-nerved, the upper one 9 mm. long, nearly glabrous with a distinctly bifid apex and a mucro from the sinus, 1-nerved; lemma including the callus about 5 mm. long, smooth, the very acute, densely hairy callus 2 mm. long, the long hairs much surpassing the base of the lemma, column short, scarcely 1 mm. long, central awn naked below, plumose in upper half, 13—15 mm. long, erect, lateral awns very thin, glabrous, about half as long as the central one. Libia . . . . . **Aristida Zittelii Aschers.**

Panicle more diffuse ad open, branchlets and pedicels thinner and longer than in the type, lower glume densely shortly pubescent, more or less ciliate on the keel and along the margins below. Algeria . . . . . **var. algeriensis Henr.**

16. Central awn plumose from the branching-point of the 3 awns; column of awns short or long, but always distinctly twisted; lower glume longer than the upper one. . . . . 17.

Central awn naked at the base; column of awns short or nearly wanting, never twisted; lower glume shorter than te upper one. . . . . 18.

17. Central awn about as long as the lateral ones, scarcely 1 cm. long, erect, the plumose part obtuse in outline; column of awns very short but twisted, not exserted above the glumes; callus broadly conical with an acute naked point, shortly pubescent all over with a collar of long hairs at the base of the lemma.

Branched, slender and elegant erect, caespitose or more or less creeping, glaucous perennial, without sterile innovations at the flowering time; culms including the panicles up to 80 cm. high, simple or commonly more or less branched, terete, striate, densely pubescent, nodes glabrous; sheaths shorter than the internodes, striate, compressed, scaberulous, ligule a ciliolate rim, auricles ciliate; blades 10—15 cm. long, narrow, setaceous, filiform, flaccid, more or less curved, narrowed into a fine point, not pungent, scaberulous beneath, hirtellous on the upper surface; inflorescence more or less composed of spurious leafy panicles, not rarely more exserted, linear-lanceolate, 10—20 cm. long, sometimes still longer, axis of panicle scabrous, subterete or laterally sulcate, with distant erect solitary branches, the axils bearded or distinctly ciliate, branches up to 7 cm. long, gradually becoming shorter, many-flowered, divided from the base, adpressed, reiterately branched with scaberulous branchlets and pedicels, the latter slightly compressed and subclavate; spikelets erect and adpressed, yellowish-green, glumes about equal, lanceolate or oblong-lanceolate, acuminate, the lower 8 mm. long, 1-nerved, minutely pubescent on back and keel, the upper one 7 mm. long, nearly glabrous, minutely scaberulous on the keel, 3-nerved; lemma smooth, together with the very characteristic callus and the about 2 mm. long column, about 8 mm. long; central awn scarcely 10 mm. long, erect, the lateral ones spreading, glabrous and about 8 mm. long. North Africa: Algerian Sahara. . . . . **Aristida brachyathera Coss. et Balansa**

Central awn much longer than the lateral ones, up to 5 cm. long or longer, spreading, the plumose part acute in outline; column of awns about 10 mm. long, scarcely twisted, exserted above the glumes; callus narrowly conical with an acute naked point, densely hairy along the margins. Laxly caespitose almost suffrutescent erect perennial with a much branched rootstock, innovations intra- and extravaginal; culms erect or more or less ascending, 3—4-noded, nodes constricted and glabrous, lowermost internode always tomentose, upper ones more or less pubescent, except a small portion below each node, uppermost one scaberulous only, sheaths tight, striate, terete the old ones gaping, scaberulous or becoming smooth, shorter than the internodes, ligule a densely ciliate membrane, auricles densely bearded, collar smooth; blades narrow, convolute throughout, curved, pointed, 7—8 cm. long or mostly shorter, those of the innovations much shorter and only a few cm. long, strongly nerved, scaberulous beneath, hirtellous on the upper surface; panicle shortly exserted or more or less sheathed by the uppermost leaf but not composed of spurious panicles, simple, erect, narrowly linear or

lanceolate, together with the spikelets 10—15 cm. long, axis, branchlets and pedicels scaberulous, branches binate, bipartite nearly from the base, bearing few erect or adpressed spikelets, axils not bearded or ciliate, sometimes pubescent; spikelets yellow, not rarely tinged with purple, glumes glabrous, linear-lanceolate, acuminate, the lower 3-nerved, 15—16 mm. long, scaberulons on the keel, the upper one 1-nerved or with an additional sidenerve, 13 mm. long, keel smooth; lemma including the callus 4 mm. long, the body smooth below, very distinctly scabrous in upper part, the densely bearded callus about 1 mm. long, central awn plumose from the branching-point of the 3 awns, the lateral ones naked, 15—16 mm. long. Egypt and Sinai to southern Persia.
. . . . . **Aristida Raddiana Savi**

18. Glumes not over 1 cm. long, the lower 8 mm., the upper one 9 mm. long, very acute, mostly shortly awned or the upper with a mucro or short awn from a bifid apex, glabrous; lemma ovate-acuminate, column nearly wanting or a scarcely $^1/_2$ mm. long beak; internodes pubescent or sericeous, but not woolly.
Slender and elegant, caespitose or more or less stoloniferous perennial, branched from the base and most of the lower nodes, culms erect or geniculately ascending, terete, striate, few-noded, nodes nearly glabrous, up to 40 cm. high including the panicles; sheaths mostly shorter than the internodes, striate, more or less compressed with hyaline margins, scaberulous, ligule and auricles ciliate; blades narrowly convolute, somewhat curved, 5—6 cm. long or sometimes much longer, those of the innovations commonly much shorter, acute and pointed, scaberulous beneath, hirtellous on the upper surface; panicle linear, ovate-lanceolate or pyramidal, lax, sheathed by the uppermost leaf or shortly exserted, the peduncle pubescent, the axis scaberulous, about 10 cm. long or somewhat longer, the lateral panicles mostly much shorter, branches somewhat remote, the lower ones much divided from the base and semi-whorled, many-flowered, the other ones bipartite, naked at the base or the lateral ones subsessile and few-flowered, branchlets and pedicels scaberulous, axils not bearded, glabrous or puberulous; spikelets yellowish-green, glumes slightly unequal, the lower 1-nerved or sometimes with very short lateral nerves, minutely scabrous on the keel, the upper 3-nerved, smooth; lemma smooth, 5 mm. long including the densely hairy, acute, about 1 mm. long callus; central awn up to 15 mm. long, naked in lower half part, the tip excurrent, the feathery part very obtuse in outline, lateral awns spreading, about half as long as the central one. North Africa: Western Sahara to Nubia and Egypt. . .
. . . . . **Aristida acutiflora Trin. et Rupr.**

Glumes more than 1 cm. long, the lower 12 mm., the upper one 13 mm. long, very obtuse, unawned, with erosely dentate tips, both scabrous on the keels and more or less so on the back; lemma tubulous, column short, 2—4 mm. long; internodes densely lanate-woolly, at least the lower and middle ones.
Caespitose, more or less branched, dense or somewhat lax perennial, commonly 20—30 cm. high, sometimes more than 40 cm. long, culms erect or geniculately ascending, few-noded, the nodes glabrous, the internodes densely woolly, the upermost one pubescent only and grooved laterally; sheaths glabrous or more or less scaberulous, tight or the lower slipping from the stems, slightly compressed, striate, with broad hyaline margins, shorter than the internodes, ligule a ciliate rim, auricles ciliate or bearded, collar glabrous; blades mostly up to 10 cm. long or in robust specimens not rarely more than 15 cm. long, those of the sterile shoots much shorter and only a few cm. long, convolute-filiform, acute, pointed but not pungent, soft and flexuous; inflorescence narrow, 10—15 cm. long, 2–3 cm. broad, composed of spurious leafy panicles with $3^1/_2$ cm. long, many-nerved ciliately keeled prophylla, axis of panicle hirtellous, branches remote but adpressed, binate, the longer ones with a 1 cm. long peduncle, up to 5 cm. long, including the spikelets, 5–7-flowered, the shorter ones about 3-flowered, subsessile, gradually becoming shorter upwards, pedicels very short, or if of sufficient length shorter than the glumes, pubescent or hairy and pilose at the subclavate tips, axils of branches more or less pilose; spikelets yellowish-green, glumes scabrous, both 3-nerved, the lateral nerves half as long as the keel and close to the midnerve; lemma glabrous with the acute, densely hairy about 1 mm. long callus, about 5 mm. long, scarcely narrowed into the straight column; central awn up to 3 cm. long, naked in lower $^1/_3$ part, feathery part subobtuse in outline, the naked tip scabrous, lateral awns erect, up to 15 mm. long. Africa: Northern part of Egypt and Nubia . . . . . **Aristida brachypoda Tausch**

19. Glumes hirsute or pilose all over or sometimes glabrous only at the tips. 20.
Glumes glabrous and smooth or scaberulous, sometimes with a few long hairs along the margins or on the tips . . . . . 23.

20. Lemmas smooth, column of awns glabrous below the branching-point of the awns, central awn plumose to the very tip, very obtuse in outline; glumes very hirsute; perennial plants . . . . . 21.
Lemmas papillose-muricate, column of awns hairy below the branching-point of the awns or rarely quite glaubrous, central awn with a naked,

glabrous or scabrous exserted tip; glumes shortly hairy or pubescent; annual plants . . . . . 22.

21. Innovations intravaginal with an alternation of short and long internodes; leaves crowded near the base of the few-noded culms, which have also very unequal internodes, alternately long and short, bringing the leaves together approximately in pairs, the lowest leaves shortly sheathed, the uppermost subopposite with somewhat longer sheaths; column of awns short, about $1^1/_2$ mm. long, slightly twisted.
Almost suffrutescent densely caespitose perennial, branched from the base, 15 cm. long or less, culms erect, slender, glabrous or hairy below the panicle, terete, striate, internodes very unequal, the lowest short and quite sheathed, the following long exserted, 5—10 cm. long, the next very short, scarcely 5 mm. long, the uppermost one slightly longer and shortly exserted, nodes bearded or becoming glabrous afterwards; sheaths tight, very short, about 5 mm. long, striate, glabrous with ciliate or slightly woolly margins, ligule a ciliolate rim, auricles bearded, collar glaubrous; blades very short, almost rudimentary, subulate, involute, subpungent, 3—10 mm. long, or very rarely longer and somewhat curved, very rigid, more or less divaricately spreading, smooth and striate below, pubescent on the upper surface; panicle not rarely nodding, very short, spike-like and often secund; including the awns up to 3 cm. long and about $1^1/_2$ cm. broad, rhachis hairy, branches very short, branched from the base, hairy, pedicels short, almost sessile; spikelets crowded, yellowish-brown, tinged with purple, glumes unequal, linear-lanceolate, acuminate, long-awned, the lower 11—12 mm. long, hirsute all over, manifestly 3-nerved, the upper one 16 mm. long, narrower, more or less glabrous at the base, very hirsute above, 1-nerved or with one or very rarely two additional sidenerves, tips of both glumes convolute and slightly bifid but the setulae very inconspicuous; lemma 4–6 mm. long, including the acute densely hairy sometimes more than 1 mm. long callus, the body of the lemma smooth, minutely bilobed, pale or purplish; central awn spreading, up to 3 cm. long, lower part shortly hairy, upper part long-feathery to the very tip, obtuse in outline, lateral awns naked, up to 15 mm. long. South West Afrika: Namaqualand. . . . . **Aristida geminifolia Trin. et Rupr.**

Innovations extravaginal, culms 4—5-noded, with nearly equal internodes, blades not crowded near the base of the culms, the lowest reduced to scales with rudimentary blades, the upper ones long-sheathed with well-developed blades; column of awns 5 mm. long, not twisted.

Suffrutescent laxly caespitose perennial, with a much branched thick rhizome; culms elegant, erect, up to 30 cm. high, sheathed all along, simple, terete, only slightly striate, laterally sulcate, somewhat scaberulous, nodes annular, densely bearded with long spreading white hairs; sheaths much shorter than the internodes, slightly scabrous, terete, tight, ligule a short ciliate rim, auricles densely divaricately bearded, collar glabrous; blades linear-lanceolate, acute, gradually narrowed into a setaceous point, more or less curved, flat at the base and 2–3 mm. wide, convolute upwards, $2^1/_2$—7 cm. long, many-nerved, the margins not thickened, scaberulous beneath, pubescent or densely hirtellous on the upper surface; panicle shortly exserted or sheathed by the uppermost leaf, more or less obovate, short, rather few-flowered, dense and subsecund or subfastigiate, dried, fan-shaped, without the awns 4—5 cm. long or shorter, up to 2 cm. broad, axis striate, scaberulous, branches scabrous, solitary, scarcely $^1/_2$ cm. long, bearded in the axils, very shortly peduncled with few (2–6) congested spikelets on very short, hairy pedicels; spikelets greenish-white with a brownish or dark base, densely hairy all over or the tips more or less glabrescent, glumes unequal, 3-nerved, the lower 11—14 mm. long, acute, the upper 16–18 mm. long, acuminate, with a minutely bifid apex and inrolled tips; lemma oblong, smooth, truncate, emarginate, bilobed at the apex, $5^1/_2$ mm. long inclusive the 2 mm. long, densely hairy acute callus; central awn $3^1/_2$ cm. long, feathery all over, tip obtuse in outline, lateral ones naked up to 2 cm. long. South West Africa: Great Namaqualand. . . . . **Aristida fastigiata Hack.**

22 Panicle narrow, strictly erect, contracted but not spike-like, somewhat dense, up to 20 cm. long and up to 4 cm. broad, with short subsessile, few-flowered branches; glumes unequal, obtuse, the lower one broadest, 3-nerved; column of awns twisted; central awn sparingly hairy in lower part or sometimes naked, densely bearded upwards, except the naked tip. Compact, caespitose annual plant with fascicled erect glabrous 2—4-noded culms, the nodes glabrous, up to 40 cm. high, internodes terete, striate, slightly scabrous; sheaths shorter than the internodes, very striate, scabrous, especially on the nerves, slightly compressed with broad hyaline margins, ligule shortly ciliate, auricles long-bearded, collar glabrous; blades convolute, setaceous, thin and flaccid, 6—10 cm. long, scarcely 1 mm. wide when expanded, narrowed into a fine point, scaberulous beneath, hirtellous on the upper surface and with a few long hairs especially near the base; spikelets pale greenish or yellowish, hirtellous, glumes subequal or somewhat unequal, the lower ovate-

lanceolate, 3-nerved, the lateral nerves about half as long as the midnerve, the summit of the glume rather suddenly contracted or truncate and erose with a short mucro, the very tip of the glume smooth, ciliate on the keel, up to 6 mm. long or slightly longer, the upper glume narrower, ciliate on the keel and hairy on the back, the hyaline margins and tips glabrescent, 3-nerved, the lateral nerves close to the midnerve, the excurrent tip subobtuse or subacute, slightly bifid or emarginate with a short awn from the sinus, up to 10 mm. long; lemma including the callus about 4 mm. long, the column up to 10 mm. long, the body of the lemma tuberculate-scabrous nearly all over, the callus very curious with an oblique glabrous long and sharp point, and two collars of hairs, one shortly hairy at the insertion of the glabrous point, the other with long hairs at the base of the lemma and surrounding it, the lateral hairs reaching half the length of the lemma, column hairy or sometimes naked or partly hairy, the hairs more or less spreading or ascending, central awn up to 5 cm. long, feathery part obtuse in outline, tip long, excurrent, the basal part of the awn sometimes more or less naked or sparingly hairy, lateral awns naked, about 1 cm long. Egypt and Sinai to Abyssinia and Eritrea, east to Arabia and British India (The Panjab). Also in South West Africa: Hereroland and Damaraland.
. . . . . **Aristida hirtigluma Steudel**

Panicle broad, erect, very effuse and open, up to 30 cm. long and 20 cm. wide, with long, erect-divaricate branches, divided nearly from the base, bearing spikelets on long pedicels; glumes unequal, subacute, more or less shortly awned, the lower as broad as the upper, both 3-nerved or not rarely sub-5-nerved, column of awns slightly twisted; central awn equally plumose all over, except the naked tip, or sometimes naked in lower part.
Elegant, erect, caespitose annual, including the panicle up to 1 meter high, culms straw-coloured, erect, 4—5-noded, long-exserted, few in a tuft, up to $1^1/_2$ mm. thick, terete, slightly striate, glabrous and conspicuously scaberulous between the nerves; sheaths shorter than the internodes, lower ones very short, laxly aggregate with short blades, upper ones very long, tight or somewhat gaping, subcompressed, striate and asperulous, with glabrous nodes and hyaline margins, ligule a short ciliolate rim, auricles more or less densely bearded, collar glabrous; blades erect or more or less curved, narrow, plicate-convolute, subfiliform, acuminate, asperulous beneath, hirtellous on the upper surface, up to 20 cm. long and up to 2 mm. wide when flattened; panicle elongate, lax, ovate in outline, axis terete, asperulous with glabrous axils, branches thin, elongate, solitary, divided nearly from the base

and bi- or tripartite, erectly spreading with scabrous branches and pedicels, the lower ones up to 10 cm. long, spikelets long-pedicelled, much longer than the glumes and not rarely up to 2 cm. long, glumes hirtellous, scabrous and ciliate on the keels, the acutish tips glabrescent, the lower one 10 mm. long, the upper 11 mm. long, slightly bifid at the apex with a short awn from the sinus; lemma including the callus about $3^1/_2$ mm. long, black at maturity, glabrous below, more or less tuberculate-asperulous above the middle, the column up to 9 mm. long, hairy in upper half or sometimes glabrous, callus of nearly the same shape as that of *Aristida hirtigluma* but the hairs of the upper collar more copious and slightly shorter, not reaching half the length of the lemma, the lower collar with longer hairs, therefore the two collars not so sharply separated as in *A. hirtigluma*; central awn up to 4 cm. long, feathery part obtuse in outline, lateral awns naked, up to 10 mm. long. South West Africa: South Angola and Damaraland, east to Rhodesia. . . . . **Aristida gracilior Pilger**

Column naked, not bearded at the branching-point of the awns, the central awn scabrous only in lower part, bearded in upper half. South Angola . . . . . **var. Pearsonii Henr.**

[*Aristida hirtigluma* is well to recognize in its northern range, but is connected with *A gracilior* by intermediary forms in South West Africa, where *A. gracilior* is endemic, such intermediary forms are probably hybrids between the two species].

23. Position of the glumes inverse, the lower conspicuously longer than the upper one . . . . . 24.
Position not inverse, the glumes subequal, the lower however always shorter than the upper one . . . . . 27.

24. Central awn feathery only above the middle, glabrous or scabrous below, column of awns 2—6 mm. long, not or scarcely twisted, tip of central awn not naked and not exserted . . . . . 25.
Central awn feathery from the branching-point of the 3 awns, the tip short, naked and exserted, column of awns strongly twisted, up to 15 mm. long.
Laxly caespitose or more or less compact perennial, much-branched and almost suffrutescent at the base, innovations probably intra- and extravaginal, culms erect and simple or sparingly branched at the very base, up to 30 cm. high inclusive of the panicle, 2—4-noded, terete,

smooth, minutely striate or grooved laterally, nodes smooth; sheaths tight, striate, glabrous and smooth, the lower ones reduced to straw-coloured scales, the upper ones terete and shorter than the internodes, ligule a densely ciliate rim, auricles long-bearded, the hairs up to 2 mm. long, collar smooth; blades glaucous, narrow, up to 15 cm. long, mostly reaching or overtopping the base of the panicle, the lower blades commonly shorter, convolute, expanded about 1 mm. wide, mostly curved or more or less flexuous, linear-filiform, rather rigid, ending in a fine acute point, not pungent, glabrous and striate beneath, hirtellous on te upper surface; panicle shortly exserted or not rarely sheathed by the uppermost leaf, very narrow, linear-lanceolate, erect, contracted but somewhat interrupted especially at the base, up to 10 cm. long and about 2 cm. wide, rhachis filiform, terete, striate, slightly scaberulous, branches solitary, divided nearly from the base, rather short, strictly erect and adpressed, shortly peduncled, the pedicels much shorter than the glumes or the lateral ones subsessile, branchlets and subclavate pedicels scaberulous, axils of panicle smooth; spikelets erect, yellowish-green, glumes linear-lanceolate, glabrous, the lower 15 mm. long, subobtuse at the tip with a fine mucro, 3-nerved, the lateral nerves half as long as the midnerve and anastomosing, scabrous on the keel only above, the upper one 13 mm. long, rather suddenly acuminate from the middle, acutish, slightly scaberulous above and on the keel in upper part; lemma ovate-lanceolate, scaberulous or tuberculate especially above, up to $4^1/_2$ mm. long inclusive of the long hairy very acute callus, column scaberulous, strongly twisted; central awn up to $5^1/_2$ cm. long, feathery part obtuse in outline with a scabrous excurrent tip, lateral ones erect up to $1^1/_2$ cm. long. Southern Arabia and Somaliland . . . . . **Aristida paradisea Edgew.**

25. Culms and panicles exserted above the leaves . . . . . 26.

Culms and panicles very short, totally hidden by the radical leaves, only the bearded awns exserted above the tufts.

Compactly tufted up to 3 cm. high annual, inclusive of the very short, slender, 1-noded, slightly hairy culms and the very reduced panicles, forming small hemispheric cushions, scarcely 5 cm. in diameter; sheaths glabrous, scabrous above with broad hyaline margins, the lowest reduced to membranaceous scales, the upper strongly striate, ligule a small ciliolate rim, auricles bearded, collar smooth; blades very short, setaceously convolute, about 1 cm. long, scarcely 1 mm. wide when expanded, rather rigid, more or less curved, striate, ending in a fine not pungent tip, scabrous on both surfaces or hirtellous on the upper

surface; panicle few-flowered, much reduced, contracted, with hispidulous rhachis and branches, pedicels short, hispidulous or more or less pilose especially at the subclavate tip; spikelets whitish, erect, glumes linear-lanceolate, acuminate, both 3-nerved, the lateral nerves about half as long as the midnerve and slightly scabrous only on the keels above, the lower up to 10 mm., the upper one 8 mm. long; lemma with the long-hairy, very acute callus about 6 mm. long, lanceolate-ovate, quite smooth, column of awns short, smooth, 2 mm. long, scarcely twisted, slightly hairy or pubescent at the branching-point of the three awns; central awn mostly purplish, the feathers yellowish-white, scaberulous below, adpressedly plumose above the middle to the very tip, up to $2^1/_2$ cm. long, lateral awns very fine, nearly 1 cm. long. Very characteristic species. South West Africa: Namaqualand and Hereroland.
. . . . . **Aristida subacaulis Steudel**

26. Culms naked, with one glabrous node at the middle, column of awns up to 6 mm. long; central awn about $2^1/_2$ cm. long, lateral awns up to $1^1/_2$ cm. long.
Compact caespitose perennial, forming up to 5 cm. high, dense tufts with numerous innovationshoots, culms exserted, very variable in length, sometimes dwarf and only 5 cm. long or up to 30 cm. long, inclusive of the panicle, very slender, geniculate at the node, glabrous, slightly striate or smooth; lower sheaths short, firm and persistent, glabrous, more or less woolly near the margins, with more or less reduced blades, upper sheaths much shorter than the internode, tight, striate, somewhat compressed-keeled with hyaline margins, ligule a short ciliolate rim, auricles densely bearded, collar smooth; blades setaceous, convolute, rigid, curved or flexuous, glaucous, striate, glabrous and smooth or scaberulous beneath, minutely villous or hirtellous on the upper surface, $1^1/_2$—8 cm. long, rarely up to 10 cm. long, scarcely $^1/_2$ mm. wide when expanded, ending in a very obtuse thickened tip; panicle very narrow, erect, contracted but rather loose and interrupted at the base, $2^1/_2$—15 cm. long, axis terete or striate, glabrous or scaberulous above, branches solitary, bipartite nearly from the base, filiform, strictly erect or somewhat spreading with scaberulous branchlets and pedicels, axils not bearded, lateral pedicels short, always shorter than the glumes; spikelets yellow, sometimes tinged with purple or with a dark spot at the base, glumes nearly equal, scaberulous on the back, the lower lanceolate, obtuse, 3-nerved, scabrous on the keel, the upper narrower and less obtuse, 1-nerved or with additional sidenerves and sub-3-nerved, smooth on the keel, about 8 mm. long; lemma oblong-cylindric, about $2^1/_2$ mm. long or

but slightly longer, including the long-hairy, nearly 1 mm. long, acute callus, column straight or but slightly twisted, placed between the two obtuse lobes of the lemma, central awn scaberulous only in lower half, densely feathery in upper part, without a naked tip, very obtuse in outline, the lateral awns naked. North Africa: deserts of the western Sahara, Tunis and Algeria to Egypt, Sinai and Arabia. Also in South Africa: from Damaraland and Namaqualand to Griqualand West (Kimberley), south to Clanwilliam, Carnavon and Beaufort West . . . . . **Aristida obtusa Delile**

Culms 4-noded, sheathed all along, shortly pilose at the nodes, column of awns up to $2^1/_2$ mm. long; central awn about 4 cm. long, lateral awns about 10 mm. long.

Caespitose, geniculate-ascending annual, up to 10 cm. high, inclusive of the panicle, without sterile innovations, culms geniculate at nearly all the nodes, subterete or angulous, striate and densely pubescent, exserted above the basal tufts; lower sheaths densely aggregate, loose, white and papery, about 1 cm. long, keeled, densely striate and hirtellous, especially on the nerves, with shortly pilose or ciliolate broad hyaline margins, upper sheaths much longer, up to 3 cm. long, very broad, inflated, the uppermost one by far the longest and up to 4 cm. long, all the sheaths gaping or more or less slipping from the stems, the margins of the upper sheaths less ciliate, ligule a ciliolate rim, auricles bearded, collar constricted; blades of all the leaves much reduced, those of the lower sheaths more or less flat at the base, spirally curved and torted, scabrous-hirtellous on both surfaces, $1-1^1/_2$ cm. long, about 1 mm. wide at the base or slightly broader, ending in a subobtuse point, the other blades curved only and scarcely 1cm. long, blades of the culm-leaves still more reduced, convolute, strictly erect and scarcely curved, much narrower than the sheaths; panicle scarcely exserted, concealed by the base of the uppermost sheath, forced away laterally, ovate-oblong, dense, up to 3 cm. long and about 1 cm. broad, exclusive of the awns of the lemma, axis striate, subterete, scabrous-hirtellous, branches short, solitary, divided nearly from the base, fascicled branchlets and pedicels short, scabrous, 3—4-flowered, axils pubescent or hirtellous, pedicels scabrous, slightly thickened and shorter than the glumes, here and there sometimes with a few long hairs; spikelets pallid or yellowish, glumes lanceolate, glabrous or minutely scabrous, acute, shortly awned, the lower scabrous on the keel, about 10 mm. long, 3-nerved, the lateral nerves half as long as the midnerve and anastomosing with it, the upper glume 9 mm. long, 3-nerved, scabrous only on the keel above, the shorter lateral nerves

not anastomosing; lemma punctulate-scabrous under a lens, including the acute conical callus about 4 mm. long, linear-tubulous with a somewhat oblique articulation and a minutely bilobed apex, the lobes acutish with the column placed between them, the about 1 mm. long densely hairy callus with much longer lateral hairs, reaching nearly to the middle of the lemma, column very scabrous, slightly twisted, more or less pubescent below the branching-point of the awns, central awn scabrous in lower 1/3 part, plumose above, the tip slightly exserted and naked, acutish in outline. South West Africa: Great Namaqualand . . . . . **Aristida Hermanni Mez**

Glumes more acuminate than in the type and more unequal, the lower $11^1/_2$—12 mm. long, the upper 9 mm. long; column elongate, 5—7 mm. long, distinctly twisted, central awn up to $3^1/_2$ cm. long, naked in lower half part, the lateral ones up to 15 mm. long. Hereoland . . . . . **var. hereroensis Henr.**

27. No tubercular glands on culms, sheaths and blades . . . . . 28.
Blades, especially the culms and sheaths more or less dotted with tubercular glands.

Suffrutescent perennial with a much branched woody rootstock, up to 30 cm. high, not rarely much longer, culms many-noded, erect or ascending, terete, striate, slender, minutely puberulous and covered with many glands, lower internodes short, more or less aggregated, upper ones gradually longer, exserted; sheaths tight, the lower ones slightly shorter than the internodes, terete, striate, gland-dotted, covered with evanescent wool near the mouth and the margins, the nodes with a flake of wool, those of the thick cylindric innovations very broad with rudimentary spiny blades, upper sheaths much longer, conspicuously shorter than the internodes, glandular or becoming more or less glabrescent, ligule a short ciliate rim, auricles bearded with a flake of wool, collar a more or less pubescent villous line, becoming glabrous; blades of the culm-leaves densely striate, convolute, sometimes flat below, subpungent, very rigid, spreading, glaucous, asperulous beneath, hispidulous or pubescent on the upper surface, mostly scarcely 1 cm. long, sometimes longer and up to 5 cm. long; inflorescence exserted, the peduncle terete, striate, puberulous and glandular, panicle contracted, linear, somewhat spike-like but loose and interrupted at the base, up to 10 cm. long, sometimes much reduced, rhachis striate, angulous, glabrous, dotted here and there with glands, especially below, branches short, solitary, divided from the base, few-flowered or

sometimes 1-flowered, smooth, the smooth pedicels much shorter than the glumes and slightly thickened at the tips, uppermost pedicels longer and sometimes half as long as the glumes; spikelets light-green or yellowish, tinged with purple, glabrous, glumes lanceolate, acuminate, minutely truncate, unequal, the lower 11 mm. long, 3-nerved, the lateral nerves more than half as long as the midnerve and slightly anastomosing, smooth on the keel, the upper glume 15 mm. long, 3-nerved or sub-5-nerved, nerves not anastomosing, smooth on the keel; lemma linear-oblong, smooth with an obtusely slightly bilobed tip, up to 6 mm. long inclusive of the long-hairy, very acute, pungent, up to 2 mm. long callus, column slender, twisted, about 5 mm. long; central awn glabrous or sometimes very scantily plumose at the base, densely feathery above to the very tip, the plumose part very obtuse in outline, the length of the central awn nearly 3 cm., the lateral ones erect, naked and up to 15 mm. long. South West Africa: Great and Little Namaqualand, south to Calvinia and Prince Albert Division . . . . . **Aristida brevifolia Steudel**

28. Column of awns long-hairy at the tip below the knee, the hairs forming a pencil, which much surpasses the branching-point of the three awns. 29.
Column of awns without a pencil of hairs at the tip just below the branching-point of the awns, very rarely the branching-point somewhat pubescent . 31.

29. Panicle rather narrow, somewhat dense; pedicels as long as or shorter than the glumes, the latter less than 10 mm. long, the nerves not anastomosing; central awn 2—3 cm. long, naked at the base, bearded only above the middle, rarely scantily and adpressedly pilose in lower part . . . . . 30.
Panicle more oblong, lax; pedicels mostly longer than the glumes, the latter more than 10 mm. long with anastomosing nerves; central awn up to 5 cm. long, feathery all along or sometimes loosely long-pilose at the base only and densely plumose above.
Densely caespitose perennial with few or wanting sterile innovations and an oblique rootstock, culms up to 50 cm. high inclusive of the panicle, erect or geniculate-ascending, simple or sparingly branched below, elegant, many in a tuft, terete, glabrous and smooth, slightly striate, naked upwards, the leaves almost basal, few-noded, the nodes glabrous and dark coloured; sheaths shorter than the internodes, the lower ones scale-like, chartaceous, striate, glabrous, broadly ovate-lanceolate, upper sheaths tight, terete, striate, smooth, more or less hairy or bearded at the summit, ligule a densely ciliate rim, auricles bearded; blades involute, subulate-filiform, glaucous, rigidulous but rather thin, more or less flexuous or curved, rarely

erect, striate, scabrous beneath, pilose or hirtellous on the upper surface, those of the lower leaves mostly 10 cm. long or sometimes much longer, those of the upper leaves much shorter and up to 5 cm. long; panicle shortly exserted, the peduncle mostly concealed by the uppermost sheath, up to 15 cm. long, elongate, strictly erect, rather many-flowered, rhachis filiform, subterete, scabrous, branches capillary, flexuous or erect, scabrous, solitary, much divided nearly from the base, few-flowered or sometimes 1-flowered, gradually becoming shorter above, pedicels capillary, flexuous, scabrous, subclavate at the tips, commonly longer than the glumes; spikelets pale-greenish or yellowish, tinged with purple, glumes linear-lanceolate, the lower 9–10 mm. long, subulate-acuminate, rather abruptly narrowed into the short awn, 3-nerved, the lateral nerves much shorter and anastomosing, glabrous or slightly hairy or pubescent on the margins, serrulate-ciliolate at the erose tip above, upper glume narrower, 12 mm. long, narrowed above, tip obtusely emarginate or subbifid, not awned, 3-nerved with anastomosing nerves, both glumes nearly smooth on the keels; lemma papillose-scabrous in upper part, lanceolate-oblong, up to 5 mm. long, inclusive of the 1 mm. long, acute callus, the latter with two collars of hairs, the upper collar at the very base of the lemma with very long hairs, reaching half the length of the lemma, which is pale or dark coloured and obtusely emarginate at the summit, column about 8 mm. long, strongly twisted, long-bearded in upper part, especially below the knee, feathery part of central awn obtuse in outline without exserted point, lateral awns naked, 10—12 mm. long. Beluchistan to British India (The Panjab). . . . . .
. . . . . **Aristida pogonoptila Boissier**

30. Central awn plumose in upper part with an exserted naked tip, the feathery part acutish in outline.

Densely caespitose erect perennial with few innovations and not very robust root-system, up to 60 cm. high, inclusive of the panicles, culms sparingly branched, erect, rather few-noded with smooth, constricted sometimes geniculate nodes, terete, slightly striate, glabrous or minutely puberulous or scaberulous; lower sheaths with reduced blades or scale-like, yellow, glabrous, smooth and striate, the upper ones narrower and tight, more or less slipping from the stems where the culms are branched, much shorter than the internodes, more or less compressed, striate and scaberulous with hyaline margins, ligule a densely ciliate rim, auricles long-bearded, the hairs more or less spreading, the collar glabrous; blades narrow, linear, involute or not rarely flat at the base, slightly scaberulous beneath, rough on the upper

surface with long white hairs especially near the base, not rigid, ending in a setaceous not pungent tip; panicles erect, rather narrow but loose, especially below, up to 10 cm. long or somewhat longer, in depauperate specimens much shorter, mostly exserted or at first sheathed by the uppermost leaf, axis angulous, scabrid, lower branches semi-whorled or in less-developed panicles binate, capillary, naked at the base over a short distance, branchlets and pedicels scaberulous, the latter with subclavate tips; spikelets yellowish-white with a dark spot at the base, glumes slightly unequal, glabrous, lanceolate-acuminate, notched at the apex or slightly bifid with a mucro, the lower 8 mm. long, the upper one 9 mm. long, both 3-nerved, the nerves of the lower glume distinctly anastomosing, the keels smooth or slightly scaberulous only at the tips; lemma punctulate or minutely papillose in upper part, scarcely 3 mm. long inclusive of the 1 mm. long, acute callus which is densely hairy, the hairs at the very base of the lemma reaching half its length, the summit of the lemma scarcely lobed, column of awns 5—7 mm. long, laxly twisted, with a very prominent tuft of long hairs just below and above the knee, central awn up to 3 cm. long, feathery in upper part, naked or sometimes adpressed-pilose below, lateral awns naked, up to 10 mm. long. North Africa: Cape Verd Islands and Senegambia to Nubia and Abyssinia . . . . . **Aristida papposa Trin. et Rupr.**

Central awn plumose above the middle to the very tip, the feathery part obtuse in outline.

Very dense and compact caespitose erect perennial with a very robust rootstock, intravaginal innovations and a few extravaginal ones; culms erect, slender, 3—4-noded, elegant, strictly erect, simple, over 60 cm. high, about 1 mm. thick, internodes nearly smooth, slightly striate and terete, the terete nodes glabrous; lower sheaths yellow, reduced to leafless scales, glabrous, upper sheaths tight, terete, substriate, nearly smooth or scaberulous above, much shorter than the internodes, ligule a short ciliate rim, auricles long-bearded, collar glabrous; blades setaceously convolute, thin, mostly curved or flexuous, more or less glaucous-green, glabrous and striate beneath, slightly scaberulous on the upper surface with scattered long hairs and a tuft of long hairs near the base at the mouth, ending in a setaceous not pungent point, the basal-blades not over 4 cm. long, the culm-blades 5—8 cm. long or sometimes up to 10 cm. long; panicle long-exserted or at first sheathed by the uppermost leaf, the peduncle terete and nearly smooth, axis terete below, angulous and scaberulous above, straight, branches capillary, mostly binate or divided nearly from the base,

sometimes fascicled, more or less peduncled, axils smooth, branchlets and pedicels sligthly scaberulous, the latter not rarely more or less flexuous with scaberulous subclavate tips, mostly longer than the glumes; spikelets yellowish not rarely tinged with purple, glabrous, glumes thin and papery, lanceolate-acuminate, the lower 8—9 mm. long, sub-3-nerved, the lateral nerves about 1/3 as long as the midnerve and anastomosing, the keel smooth or slightly scaberulous below the subobtuse apex, the upper glume narrower, 3-nerved, the lateral nerves excurrent, not or scarcely anastomosing, close to the midnerve, with a smooth keel, minutely bilobed or bifid at the apex with a mucro from the sinus, mostly 9—10 mm. long; lemma cylindric, slightly bilobed at the summit, 4 mm. long inclusive of the 1 mm. long callus, smooth, densely punctulate-papillose all over under a strong lens, callus densely hairy all over, the long hairs not reaching half the length of the lemmas, column of awns 5 mm. long, twisted, pilose and feathery only at the branching-point; central awn up to 2 cm. long, naked below or sometimes nearly all along, lateral ones very fine, up to 9 mm long. Western South Africa: South Angola to Great Namaqualand, east to Griqualand West, Transvaal and Orange Free State, south to Prince Albert. . . . . **Aristida uniplumis Lichtenst.**

Panicles more contracted with fasciculate branches, glumes more equal, longer, about 14 mm. long, lemma 5 mm. long inclusive of the callus, column slightly longer than in the type, 7—8 mm. long, central awn up to $2^1/_2$ cm. long, plumose nearly from the base, lateral awns slightly longer than in the type, 12—13 mm. long. South Africa: Colesberg Division . . . . . **var. Neesii Trin. et Rupr.**

Glumes of the same length as in the type, but the column bearded in upper part and on the knee, the central awn feathery from the base to the tip, with a naked scabrous point. South Angola. . . . . **var. Pearsonii Henr.**

31. Column of awns 5 mm. or more long. . . . . 32.
Column of awns less than 5 mm. long. . . . . 34.

32. Central awn plumose only in upper half part, feathers long but compact and not divaricate; column of awns more or less twisted . . . . . 33.
Central awn plumose all along, feathers very lax and long, divaricate; column of awns up to $7^1/_2$ mm. long, not twisted.
Glaucous laxly caespitose rather robust perennial, the stout rootstock with decumbent or ascending almost suffrutescent branches, culms up

to 50 cm. high inclusive of the panicle, erect or somewhat geniculate-ascending, 2—3-noded, elegant, about 1 mm. thick, terete, somewhat striate, slightly but distinctly puberulous or scaberulous, pruinose especially at the region of the nodes, the latter constricted and glabrous; lower sheaths scale-like with reduced blades, the other ones tight or somewhat open above, about half as long as the internodes, striate, minutely puberulous, with hyaline margins, ligule a densely ciliolate rim, auricles very shortly bearded, collar glabrous; blades involute, filiform but rigid and rather stiff, those of the innovations short, more or less curved, 2—4 cm. long, the culm-blades up to 10 cm. long or in very robust specimens sometimes up to 15 cm. long, ending in a rigid subpungent tip, striate, glabrous beneath, scaberulous-hirtellous on the upper surface; panicle strictly erect, exserted, rather narrow, up to 20 cm. long, axis smooth, subterete or angelous with smooth branches and pedicels, branches erect, solitary, bipartite above the base or more or less fascicled in robust panicles, with smooth axils, the longer branches inclusive of the spikelets 6—7 cm. long, commonly much shorter and few-flowered, pedicels variable in length but always shorter than the glumes; spikelets erect, pale-yellowish, sometimes tinged with purple, glabrous, lower glume 10—13 mm. long, lanceolate, acuminate and more or less truncate, emarginate or minutely bifid at the apex and minutely mucronate, 3-nerved, the lateral nerves half as long as the midnerve and anastomosing with it, the upper glume narrower, linear, 18—19 mm. long, involute above, subulate with an obtuse tip, 3-nerved, the lateral nerves close to the midnerve and excurrent, more than half the length of the glume; lemma smooth below, slightly scaberulous above, inclusive the long-pilose very acute callus, 4—5 mm. long, callus about 2 mm. long; central awn with a minute naked tip, 4 cm. long, the lateral ones very fine, naked, up to 15 mm. long. North Africa: Algerian Sahara . . . . . **Aristida sahelica Trabut**

33. Densely caespitose up to 15 cm. high perennial; glumes 5-nerved with scabrous nerves; central awn geniculate at the base, pubescent at the branching-point of the three awns, feathery part very obtuse in outline.
Plants forming rather small, dense, about 2 cm. high tufts, with long-exserted, 2-noded culms, the latter geniculately ascending, 5—15 cm. long, terete, striate, quite glabrous and smooth; lower sheaths and those of the innovations much reduced, the lowermost ones scale-like, yellowish-white, deeply grooved or striate, glabrous, those of the innovations with very rigid, curved and pungent up to 1 cm. long blades, the margins ciliolate above, sheaths of the culm-leaves tight,

more or less keeled, striate and glabrous, much shorter than the internodes, with more or less curved up to $1^1/_2$ cm. long blades, ligule a minute ciliolate rim, auricles shortly bearded or pilose, collar glabrous; blades narrowly convolute, many-nerved, glaucous, glabrous beneath, scaberulous or hirtellous on the upper surface; panicle exserted, contracted, narrow, rather few-flowered, up to 5 cm. long, peduncle scaberulous or pubescent, axis sulcate and pubescent with ciliate axils, branches scabrous-hirtellous, short, binate, the longer ones peduncled, few-flowered, the shorter ones at the base are 1—2-flowered and nearly sessile, strictly erect, pedicels pubescent with subclavate more or less ciliate tips, much shorter than the glumes or the lateral ones subsessile; spikelets glabrous, yellowish-green, tinged with purple, quite yellow at maturity, glumes unequal, lanceolate-oblong with membranaceous margins, the lower up to 13 mm. long, shortly cuspidate, the upper one up to 20 mm. long, gradually acuminate not awned, very scabrous on the nerves only; lemma punctulate and rough under a strong lens, up to 5 mm. long inclusive of the very acute, densely pilose up to 2 mm. long callus, column of awns twisted, up to $5^1/_2$ mm. long; central awn $3^1/_2$—4 cm. long, adpressed-short-pilose in lower 1/3 part, densely long-feathery in upper 2/3 part to the very tip, plumose part obtuse in outline, lateral awns naked, very thin, up to 2 cm. long. North East Africa: Sokotra Islands. . . . . .
. . . . . **Aristida sokotrana Vierh.**

Laxly caespitose almost suffrutescent, more or less creeping up to 40 cm. high perennial, from a much-branched nearly woody rootstock; glumes 3-nerved, glabrous; central awn straight, glabrous at the branching-point, feathery part acute in outline.

Culms strictly erect or slightly ascending, rather thin and elegant, compared with the very robust divaricately branched root-system, terete, smooth, about 3-noded, innovations extravaginal, probably also with few intravaginal ones; lower sheaths reduced to pale, striate, smooth leafless scales, upper sheaths tight, shorter than the internodes, glabrous and terete below, striate upwards, quite smooth, ligule a minute ciliate rim, auricles minutely pubescent only or sometimes glabrous, collar smooth; blades very narrow, linear, convolute, setaceous, acute and subpungent, rather rigid, somewhat curved, 4—8 cm. long, smooth beneath, hirtellous on the upper surface, glaucous, gradually passing into the tip; panicle shortly exserted up to 20 cm. long, rather depauperate, contracted but very lax and open, rhachis terete and smooth below slightly scaberulous and more or less angulous above with glabrous axils, lower branches solitary or 2—3-partite from the

base, upper ones single, all rather few-flowered and scaberulous, the longer ones erectly ascending, naked below, 3—5-flowered, the shorter ones 2-flowered or not rarely with only 1 flower, pedicels minutely scaberulous, subclavate, about as long as the glumes or the lateral ones much shorter; spikelets erect, pale-yellow and tinged with purple at the base, glabrous, glumes lanceolate, the lower up to 12 mm. long, shortly bidentate at the subobtuse apex, the lateral nerves very short, scarcely 1/3 the length of the glume, not anastomosing, upper glume acutish, up to 15 mm. long, 3-nerved, the side-nerves much longer and close to the midnerve; lemma smooth, $5^1/_2$ mm. long, inclusive of the $1^1/_2$ mm. long, acute, hairy callus; column of awns 8 mm. long, sligthly twisted; central awn up to 4 cm. long, naked in lower $^1/_3$ part, feathery to the very tip but acute in outline, lateral awns naked, very thin, up to 15 mm. long. South West Africa: Great Namaqualand . . . . . **Aristida garubensis Pilger**

34. Sheaths of the innovations densely white-woolly or at least the margins villous. 35.
Sheaths of the innovations and those of the culm-leaves glabrous or scabrous, very rarely the leafless scales at the base somewhat subtomentose or slightly villous . . . . . 36.

35. Sheaths of the radical leaves glabrous with villous margins, culms with one geniculate node placed just below the inflorescence with a leafless sheath involving the base of the panicle.
Densely caespitose dwarf probably perennial species with elongate roots, forming $2-3^1/_2$ cm. high tufts, culms naked, long-exserted from the tufts, up to 10 cm. long, the portion below the panicle 5—6 cm. long, straight, very thin, terete, subclavate at the summit, quite smooth or slightly scabrous and pubescent only just below the node; basal outer sheaths reduced to white or yellow, broad scales, which are sulcate-striate and glabrous or scaberulous with sparingly hairy margins, villous especially along the margins above, the inner sheaths with developed blades, more or less tight, subcompressed, densely striate-sulcate, scaberulous or rough with long spreading hairs above along the hyaline margins, ligule a short ciliolate rim, auricles densely long-bearded, collar glabrous, the sheaths are commonly only about 1 cm. long; blades up to 2 cm. long, narrowly involute, obtuse, striate-sulcate, scaberulous beneath, hirtellous on the upper surface and at the same time villous with long hairs on both surfaces, becoming more or less glabrous afterwards, curved, glaucous, the sheath below the inflorescence scabrous without villous margins, up to 2 cm. long, the peduncle of the inflorescence very minute, the panicle nearly sessile, geniculate or not rarely horizon-

tally refracted; panicle very narrow, 3—4 cm. long, about 3 mm. wide, rather depauperate, axis striate and pubescent, lower branches binate, 1-flowered, one shortly peduncled, the other nearly sessile, upper branches solitary, 1-flowered, pedicels pubescent and slightly clavate at the tips; spikelets yellowish-white, often secund, glumes about equal, 7—9 mm. long, lanceolate, acuminate, scaberulous, the lower 3-nerved, the lateral nerves about half as long as the midnerve or somewhat longer, scarcely anastomosing, minutely scaberulous on the keel, the upper glume sub-3-nerved, the lateral nerves sometimes very indistinct; lemmas with a slightly bilobed summit, including the oblique, densely hairy, very acute, about 1 mm. long callus, up to 4 mm. long, hairs at the base of the lemma more than half the length of the nearly smooth lemma, column of awns loosely twisted, up to 4 mm. long; central awn geniculate at the branching-point, about 1 cm. long, naked below, densely plumose in upper part to the very tip, feathery part very obtuse in outline, lateral awns 6—7 mm. long, naked. South West Africa: Great Namaqualand . . . . . .
. . . . . **Aristida gonatostachys Pilger**

Sheaths of the radical leaves densely white-woolly, culms strict, not geniculate below the panicle, nodes glabrous.

Densely caespitose, minute, probably annual plants, forming small hemispheric cushions, with densely aggregate leaves, culms glabrous, ligule a short pilose rim; panicle few-flowered, laxly subspicate, bearing about 4 spikelets, the lateral flowers nearly sessile, glumes glabrous, about equal, up to 9 mm. long, acutish and irregularly denticulate at the apex, 3-nerved; lemma with a twisted about 2 mm. long column, the densely hairy callus up to 2 mm. long, central awn $1^1/_2$ cm. long, densely but shortly plumose in upper half, lateral awns naked, about 10 mm. long. South West Africa: Great Namaqualand . . . . . .
. . . . . **Aristida lanipes Mez**

36. Glumes obtuse, at least the upper one; column of awns loosely twisted or straight, but always well-developed and up to 4 mm. long, culm-nodes glabrous . . . . . 37.

Glumes very acute; column of awns not twisted, nearly wanting or very short, up to 1 mm. long, culm-nodes retrorsely bearded.

Strictly erect. 40 - 50 cm. high perennial with a rather thick rhizome and extravaginal innovations, densely obtected at the base by the reduced firm, mucronate scales, culms ascending, simple, terete, glabrous, many-noded, leaves congested at the base of the culms, glaucous; sheaths tight, terete, lower ones longer, upper ones shorter than the

internodes, ligule a short ciliate rim, auricles pubescent only, collar glabrous; blades linear, acuminate, pungent, 3—4 cm. long, very rigid, spreading, convolute and junciform, $1^1/_2$ mm. in diameter, glabrous beneath, puberulous on the upper surface, prominently equally 5—7-nerved; panicle effuse, pyramidal, 15—20 cm. long, very lax and open, with a glabrous axis and filiform glabrous branches, the latter distinctly bearded in the axils, lower branches subfascicled or semiwhorled, mostly solitary and divided from the base, all the branches more or less iterately branched, the longer branchlet in each branch 5—6-flowered, the others 2—3-flowered, pedicels glabrous, filiform, slightly thickened above, not rarely flexuous or curved, as long as or longer than the glumes; spikelets linear-lanceolate, yellowish or greenish, glumes lanceolate, acuminate, shortly awned, glabrous, 3-nerved, the lateral nerves shorter and close to the midnerve, slightly anastomosing with it, the lower glume up to 10 mm. long, smooth on the keel below, slightly scaberulous or hirtellous on the keel above, the upper glume quite smooth, up to 13 mm. long; lemma 3-nerved, linear-oblong, lead-coloured, glabrous, punctulate-scaberulous under a strong lens, narrowed above into a very short smooth beak, rounded at the base and suddenly contracted into an oblique, laterally densely hairy, very acute, 2 mm. long callus, the body of the lemma about 8 mm. long; awns somewhat unequal, the central one erect, up to 20 mm. long, slightly pubescent or glabrous below, soon becoming long-feathery to the very tip, the plumose part very obtuse in outline, lateral awns naked, spreading, 16 mm. long, sometimes shortly adpressedly ciliate in upper part. South West Africa: Hereroland . . . . . .
. . . . . **Aristida Marlothii Hackel**

37. Culms with more than one node, mostly 3—4-noded or many-noded . . 38.
Culms but one-noded.

Densely caespitose erect or ascending perennial, branching from the base, culms very slender, up to 15 cm. high, inclusive of the panicle, erect or geniculate, 1-noded or sometimes 2-noded and the lowermost node basal or nearly so, the other node at about half the length of the culm, internodes terete or somewhat compressed, glabrous and smooth; sheaths very tight, distinctly striate, slightly scaberulous, shorter than the internodes the lowest broad, pallid, firm and persistent, much reduced and scale-like, with very short blades, ligule a short ciliolate rim, auricles pubescent, collar glabrous; blades setaceously convolute, subacute, up to 5 cm. long, rigid, glabrous and smooth beneath, more or less hirtellous or pubescent on the upper surface; panicle erect or somewhat nodding at the summit, rather lax and loose, more or less

secund, 5—8 cm. long, with smooth rhachis and binate smooth branches, the branchlets 1—2-flowered, the lowest branches up to 2 cm. long, erect or ascending, filiform, nearly quite smooth; spikelets yellowish or purple, glabrous, rather long-pedicelled or the lateral pedicels much shorter than the glumes, glumes linear-lanceolate, subacuminate, subequal, 3-nerved, quite smooth on the keels, the lower $12^1/_2$ mm. long, acuminate not awned, the upper one 13 mm. long, obtuse, emarginate or distinctly bifid, mucronate from the sinus, the lateral lobes rounded; lemma oblong-cylindric, glabrous, purplish with a very acute, densely hairy, at least $1^1/_2$ mm. long callus, the body of the lemma 3 mm. long, column of awns 3—4 mm. long, slightly twisted; central awn 4 cm. long, feathery above the middle to the very tip, plumose part very obtuse in outline, lateral awns naked, up to 17 mm. long. South West Africa: Great and Little Namaqualand and Hereroland . . . . . .
. . . . . **Aristida Dregeana Trin. et Rupr.**

38. Blades setaceous, not rigid, spikelets rather small, the glumes 8—10 mm. long, column af awns as long as the lemma, feathery part of the central awn very obtuse in outline.

Caespitose perennial with few innovations, culms elongate, erect or geniculately ascending, about 3-noded, nodes glabrous, equally distributed, terete, slightly striate, glabrous, 20 cm. long or longer, scarcely 1 mm thick, with firm, pallid, subtomentose scales at the base; sheaths shorter than the internodes, striate, slightly keeled, glabrous, ligule a minute ciliolate rim, auricles densely long-bearded; blades complicate-convolute, scarcely 1 mm. wide when expanded, 3—6 cm. long, somewhat curved and spreading, scaberulous beneath, scabrous on the upper surface and with long hairs especially near the base, the margins thickened; panicle narrow, shortly exserted or sheathed by the uppermost leaf, rather lax and subinterrupted with a scabrous axis, the branches binate at least the lower ones, capillary, very scabrous, naked in lower half, spikelets bearing only above, the pedicels very scabrous; spikelets narrow, purplish or yellowish, the pedicels as long as the glumes or those of the lateral flowers shorter, glumes unequal, the lower subacute or subobtuse, quite smooth, 3-nerved, the lateral nerves much shorter and anastomosing with the midnerve, 8 mm. long, upper glume 10 mm. long, 3-nerved, the lateral nerves more than half as long as the midnerve, quite smooth, obtuse at the summit, slightly bifid or emarginate, shortly awned from the sinus; lemma tubulous, smooth with a densely hairy acute callus, about 4 mm. long, the callus up to 1 mm. long, column nearly straight, 3 - 4 mm. long, not twisted. from a more or less bilobed apex of the lemma, articulation rather oblique; awns very unequal,

the central one scabrous below, feathery to the very tip, not exserted, the plumose part very obtuse, 20—27 mm. long, the plumose part 14—20 mm. long, lateral awns scabrous, 8—10 mm. long. South West Africa: Angola. . . . . **Aristida tenuirostris Henr.**

Blades rigid and pungent, spikelets larger, the glumes 11—13 mm. long, column of awns shorter than the lemma, feathery part of the central awn acute in outline.

Perennial with a creeping rhizome, covered like the base of the culms and the innovation-buds with scale-like pallid sheaths, the lowest scales more or less hairy or villous, the upper glabrous, with much reduced blades, culms erect, slender, fascicled, terete, glabrous and smooth, 30–60 cm. long, many-noded; sheaths of the culm-leaves very tight, striate, glabrous and smooth or minutely scaberulous under a strong lens, longer than the internodes or the upper ones slightly shorter, ligule a ciliolate short rim, auricles minutely pubescent only, collar glabrous; blades subulate, convolute and pungent, up to 5 cm. or sometimes up to 10 cm. long, very rigid, mostly curved and spreading, glabrous and smooth beneath, puberulous and hirtellous on the upper surface; panicle ovate to pyramidal, very lax and open or sometimes somewhat contracted, erect, up to 15 cm. long by 5—8 cm. broad, with smooth rhachis, branches 2—3-nate or solitary and bipartite nearly from the base, remotely and very scantily branched, finely filiform, flexuous and smooth, the axils thickened and glabrous, lowest branches up to 8 cm. long and 5—6-flowered, the upper branches 2—3-flowered, pedicels smooth, curved or flexuous, rather long, those of the lateral spikelets shorter than the glumes; spikelets very scattered, often nodding, light green or yellowish, glumes lanceolate, gradually narrowed, not awned, with an obtuse, truncate or toothed apex, glabrous, 3-nerved, the lateral nerves not or scarcely anastomosing, the lower glume 11 mm. long, the upper one 13 mm. long; lemma subcylindric, smooth, rounded at the base and suddenly narrowed into the oblique laterally shortly hairy, very acute callus, which is nearly 3 mm. long, the body of the lemma slightly narrowed above into a distinctly twisted about 3 mm. long column, the total length of lemma, column and callus about 10 mm.; central awn up to 2 cm. long, scantily hairy at the base, soon becoming densely plumose to the very tip, the feathery part acutish in outline, lateral awns 15 mm. long, very fine, glabrous or sometimes scantily and adpressedly ciliate above. South West Africa: Little Namaqualand and Hereroland . . . . . **Aristida lutescens Trin. et Rupr.**

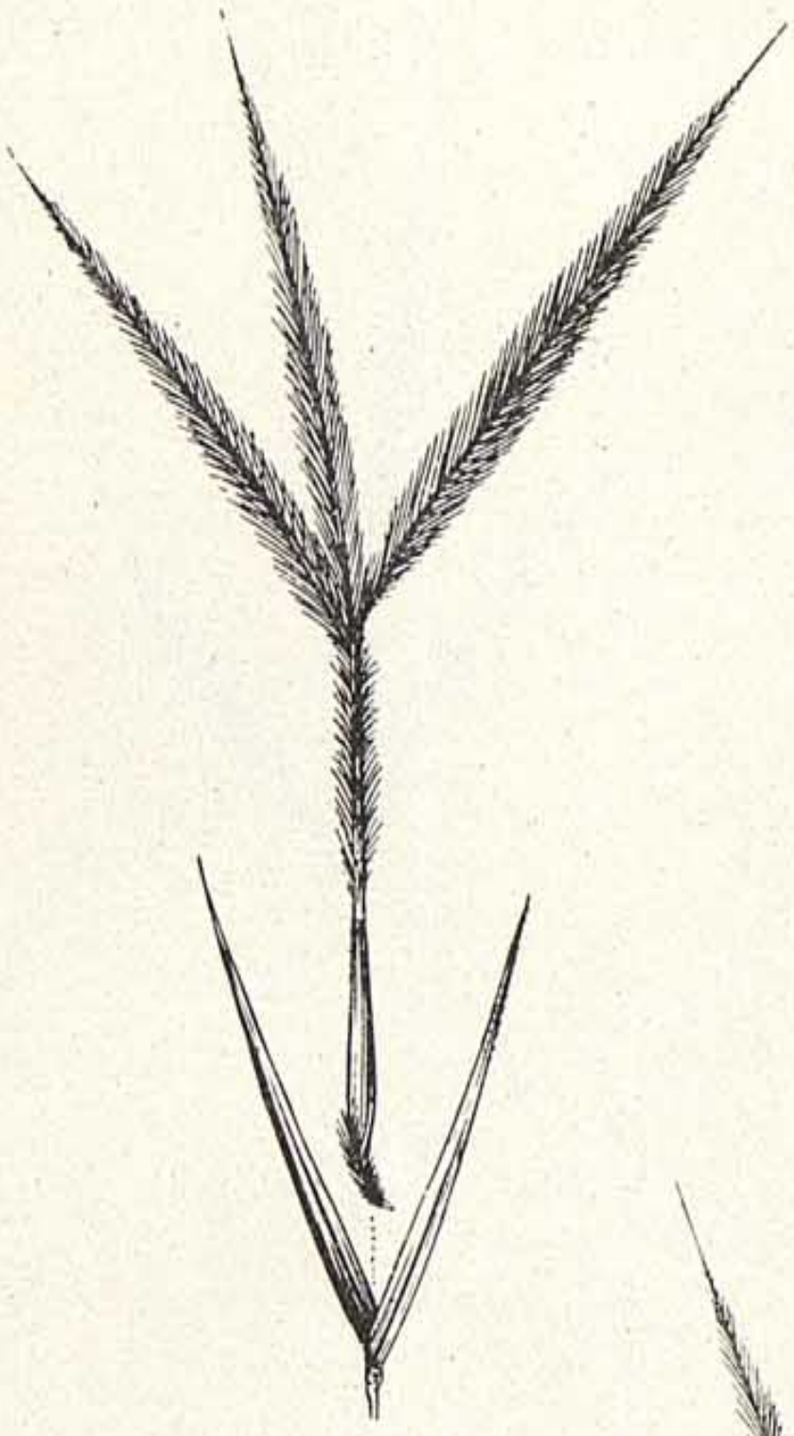


× 1⅓
ARISTIDA GRIFFITHII
Henrard.



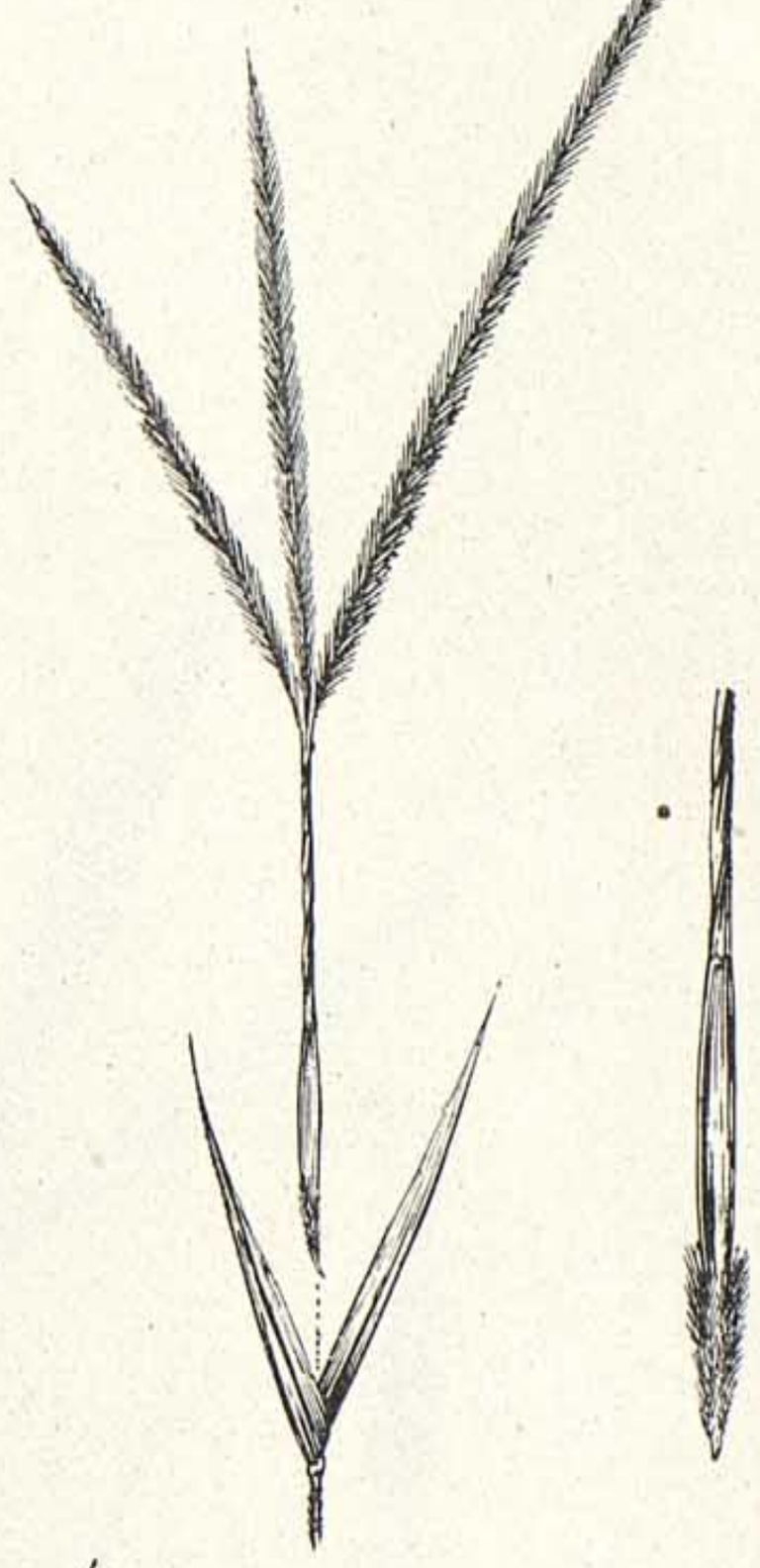
×1 ×4
ARISTIDA ARACHNOIDEA Litwinow.

Plate VI.



×2

ARISTIDA CAPENSIS Thunberg.
var. canescens Trin. et Rupr.



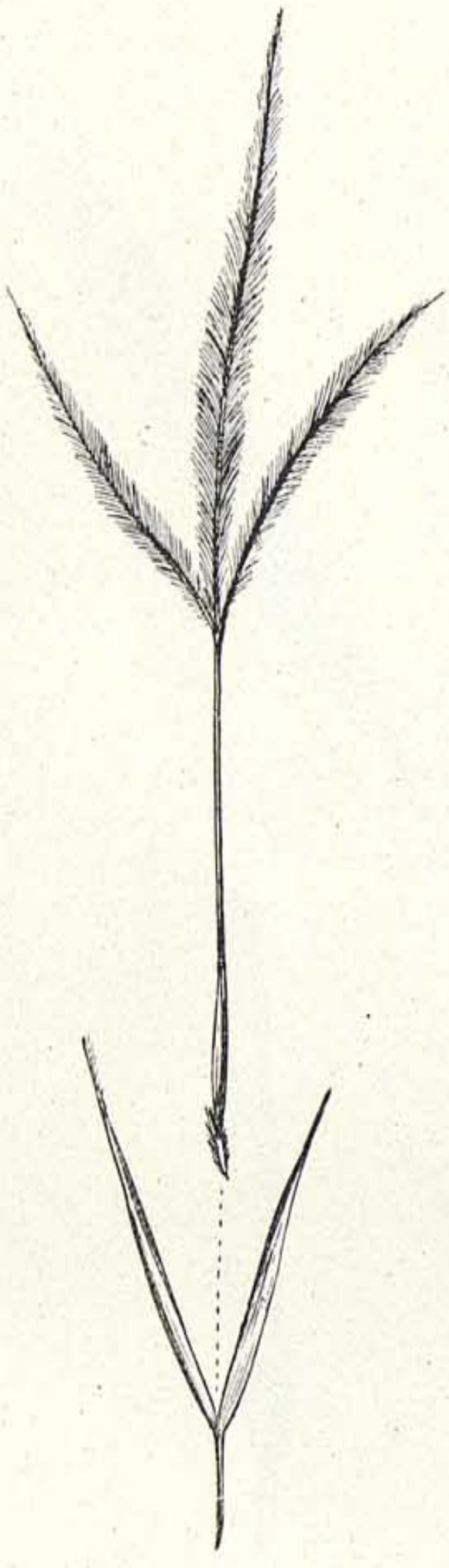
×2 ×4

ARISTIDA CAPENSIS Thunberg.



×2

ARISTIDA CAPENSIS Thunberg.
var. barbata Stapf.



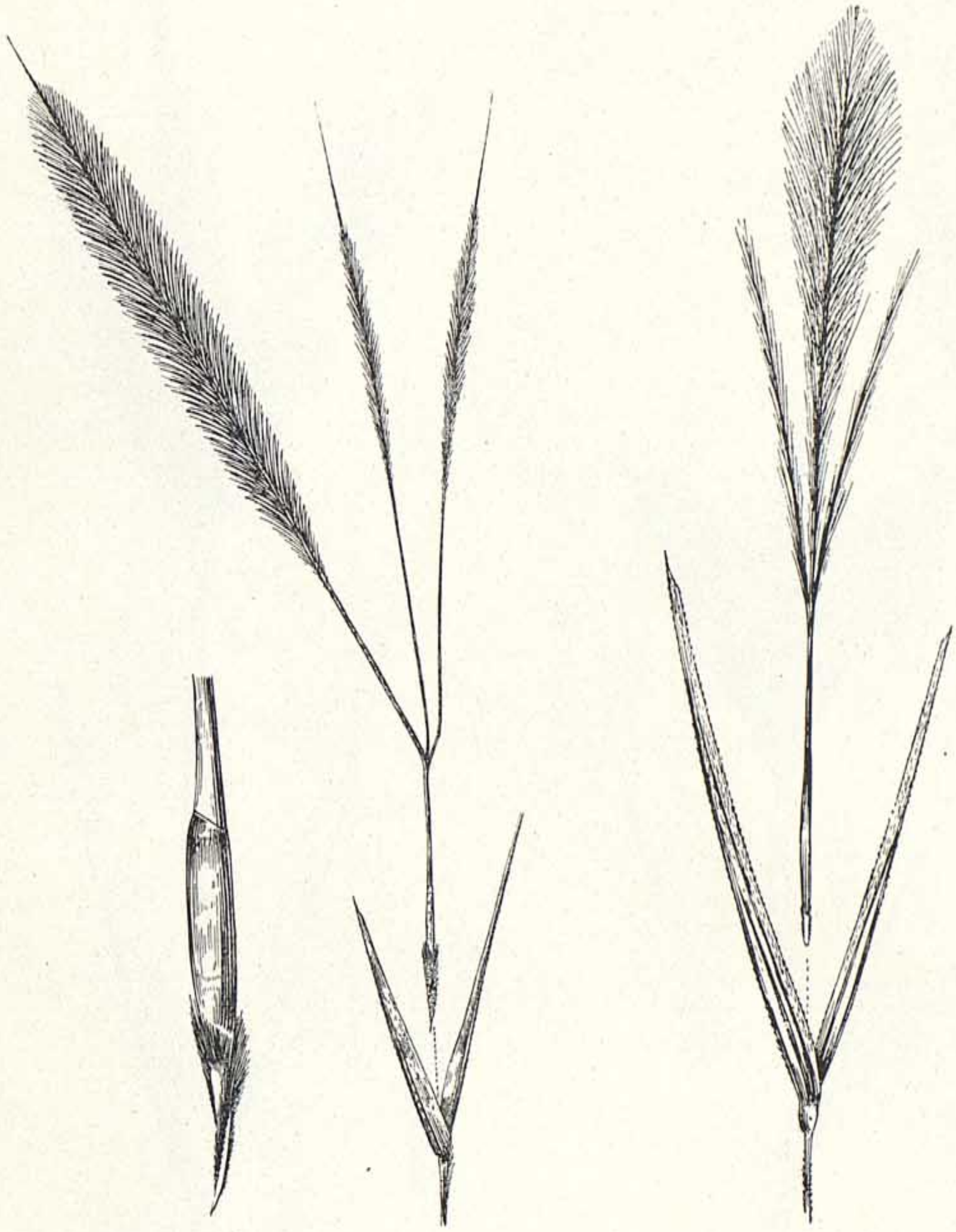
×2

ARISTIDA CAPENSIS Thunberg.
var. macropus (NEES) Trin. et Rupr.



×3⅓ ×6⅔

ARISTIDA CAPENSIS Thunb.
var. Zeyheri (NEES) Walp.

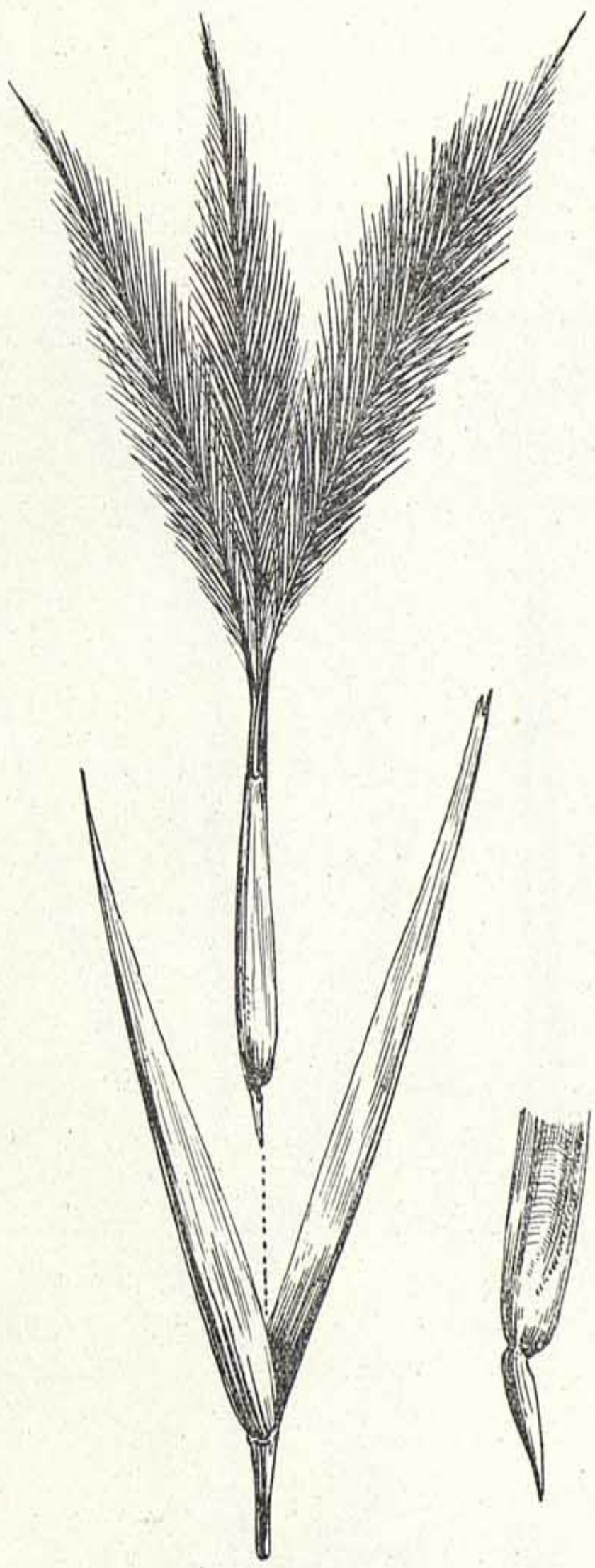


×6⅔ ×2⅔

ARISTIDA LANATA Forsk.

×4

ARISTIDA DAMARENSIS Mez.



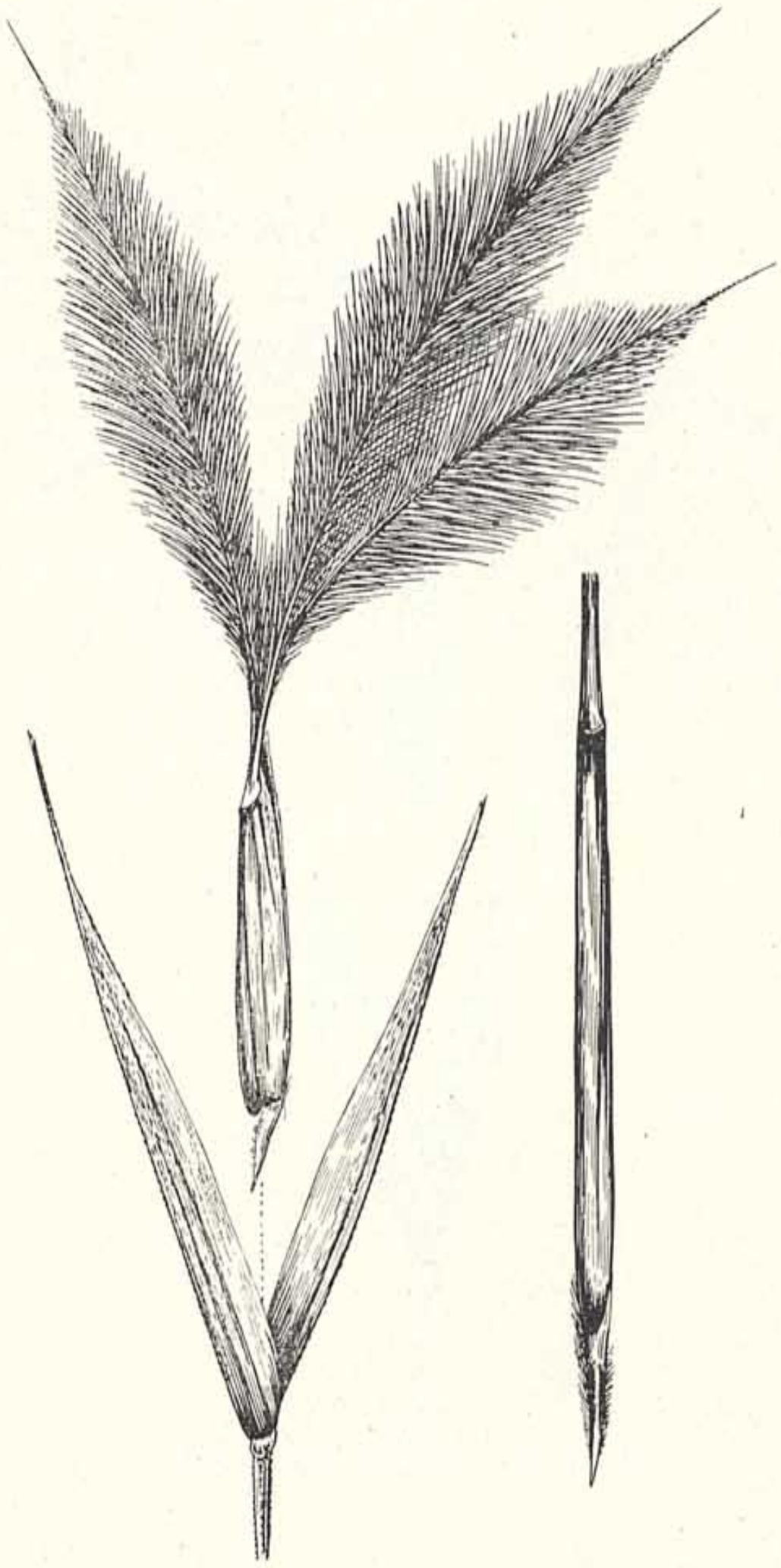
×5 ×10

ARISTIDA PUNGENS Desfontaines.



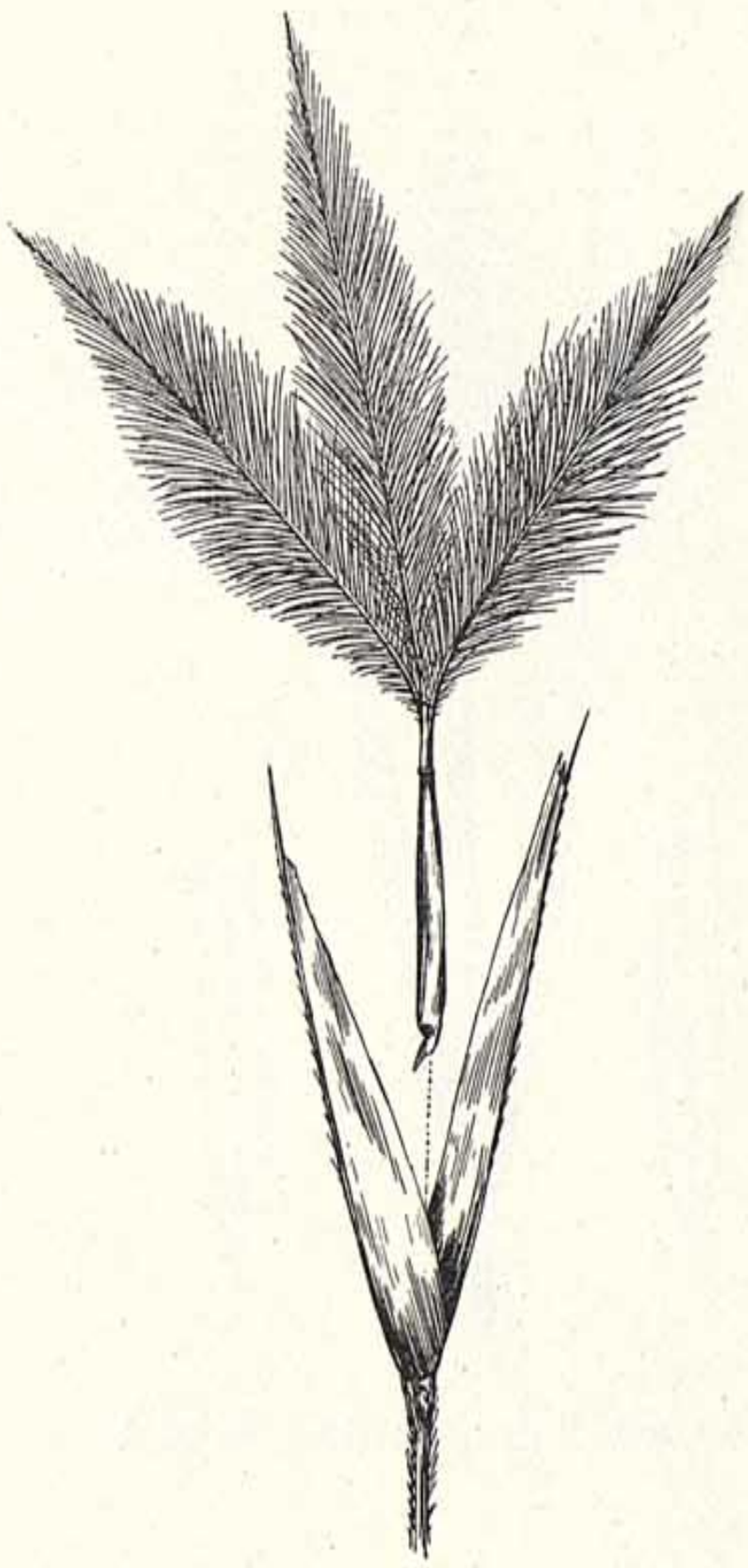
×4 ×8

ARISTIDA PENNATA Trinius.



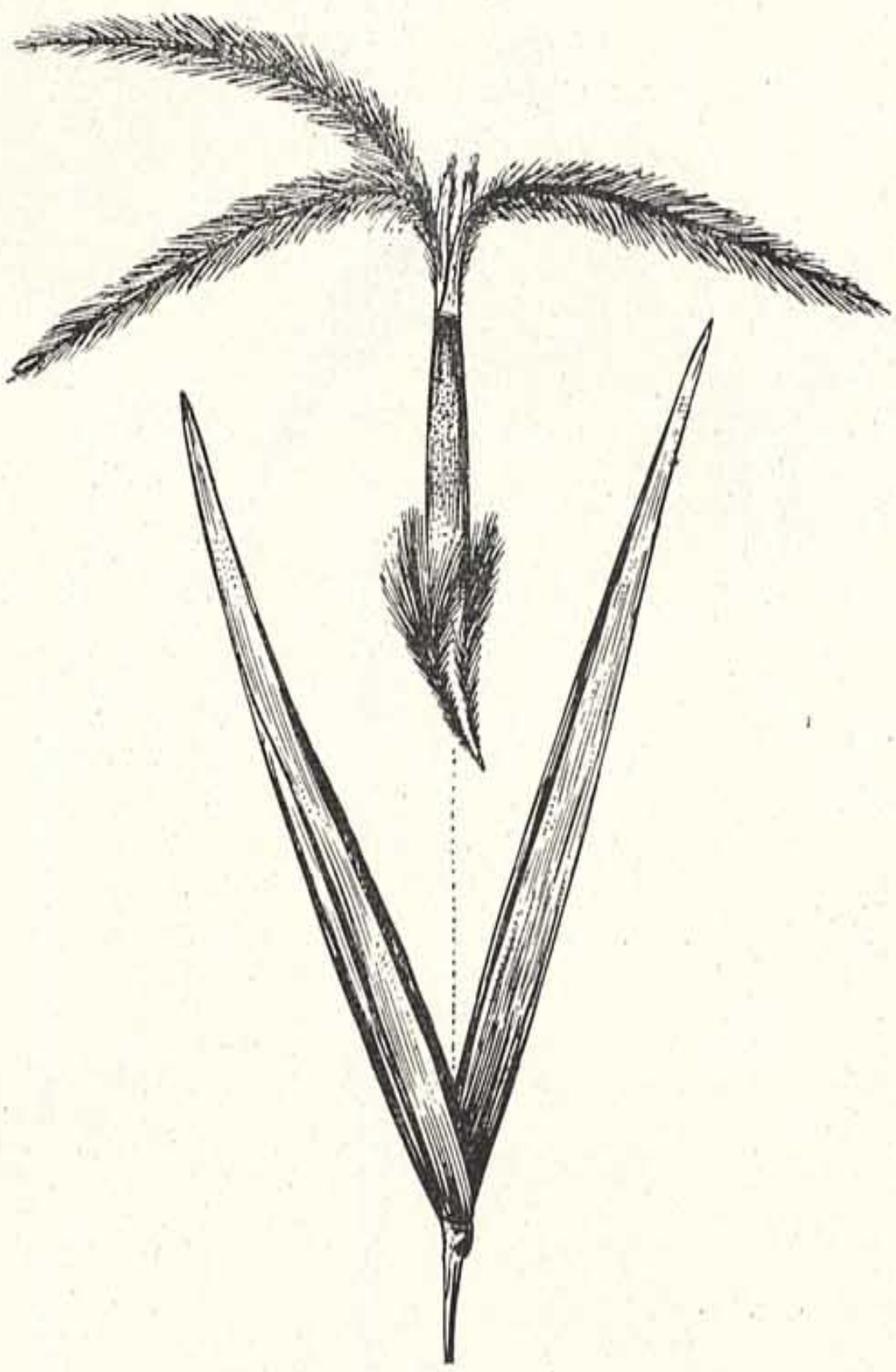
×4 ×8

ARISTIDA PENNATA Trinius.
var. Karelini Trin. et Rupr.



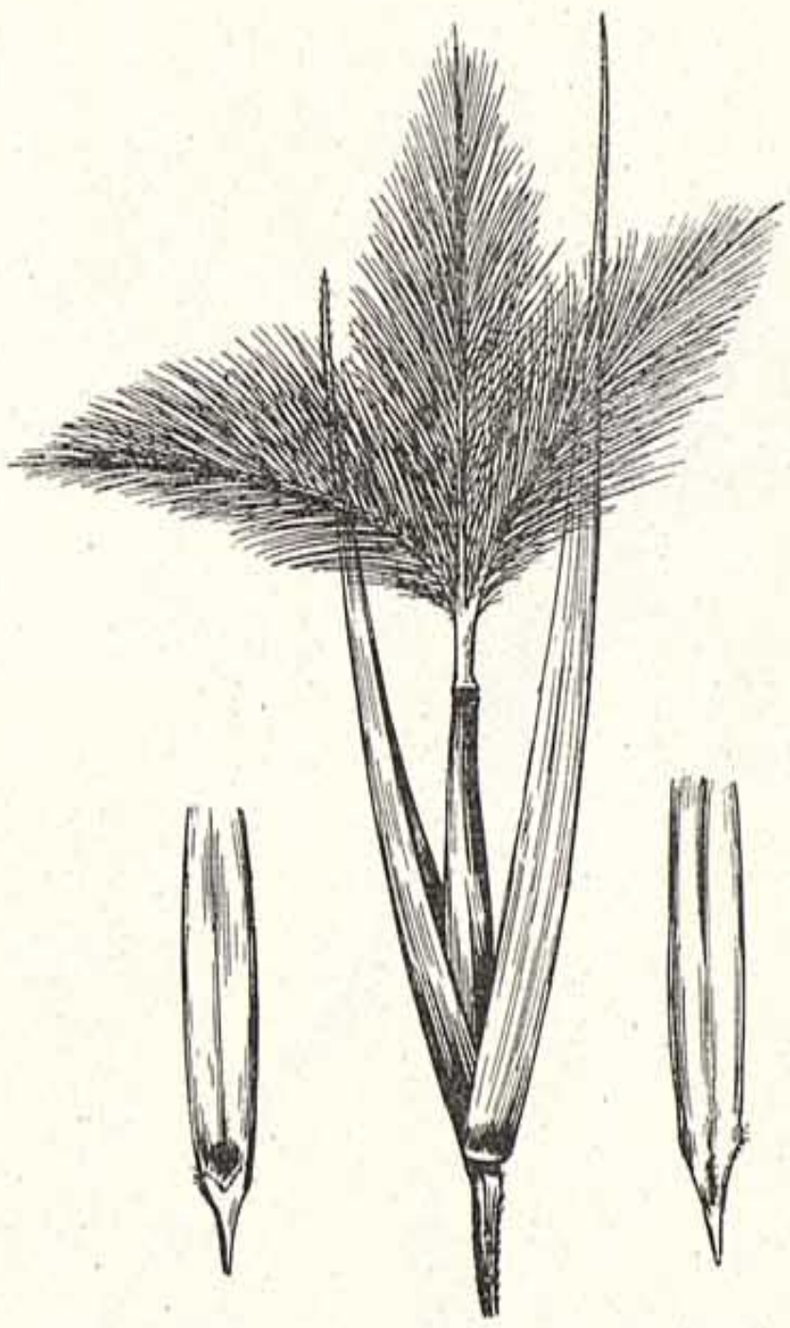
×4

ARISTIDA VULNERANS Trinius et Ruprecht.



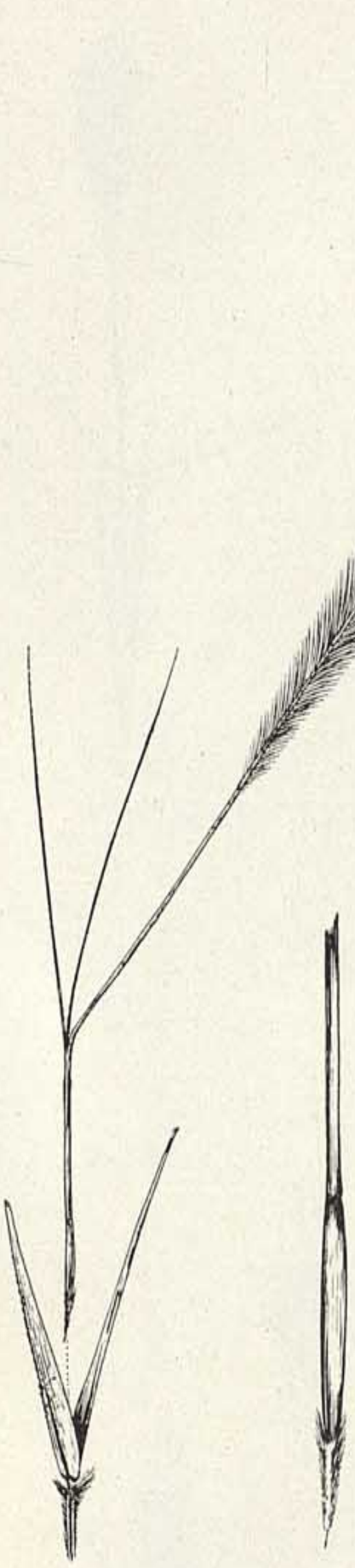
×6

ARISTIDA SABULICOLA Pilger.



×5 ×4 ×5

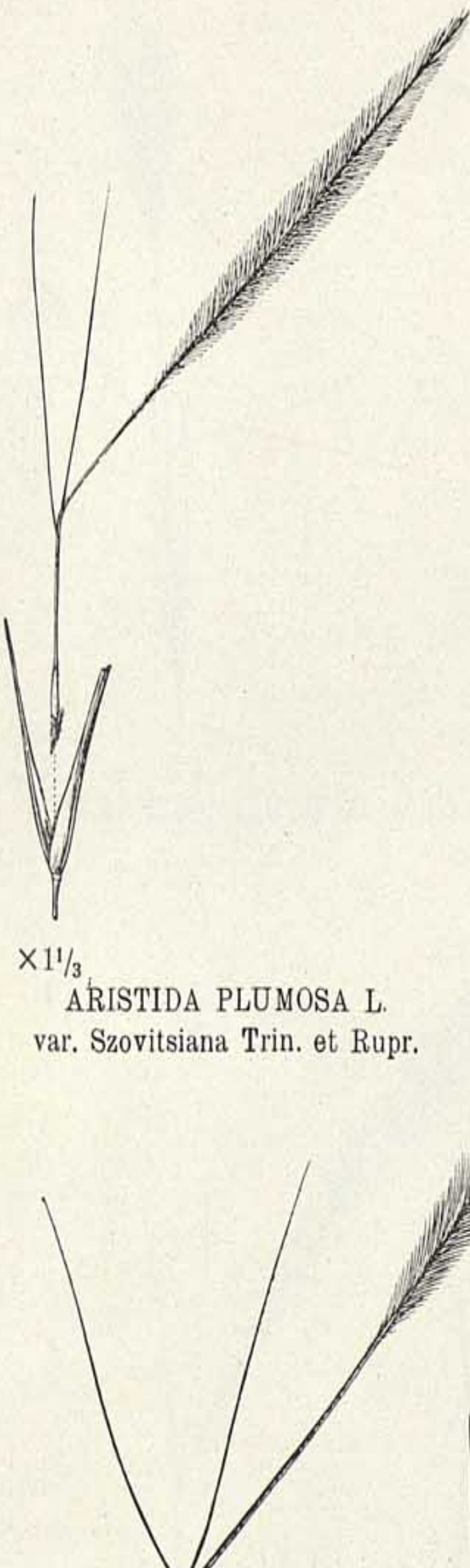
ARISTIDA SCOPARIA Trinius et Ruprecht.



×2

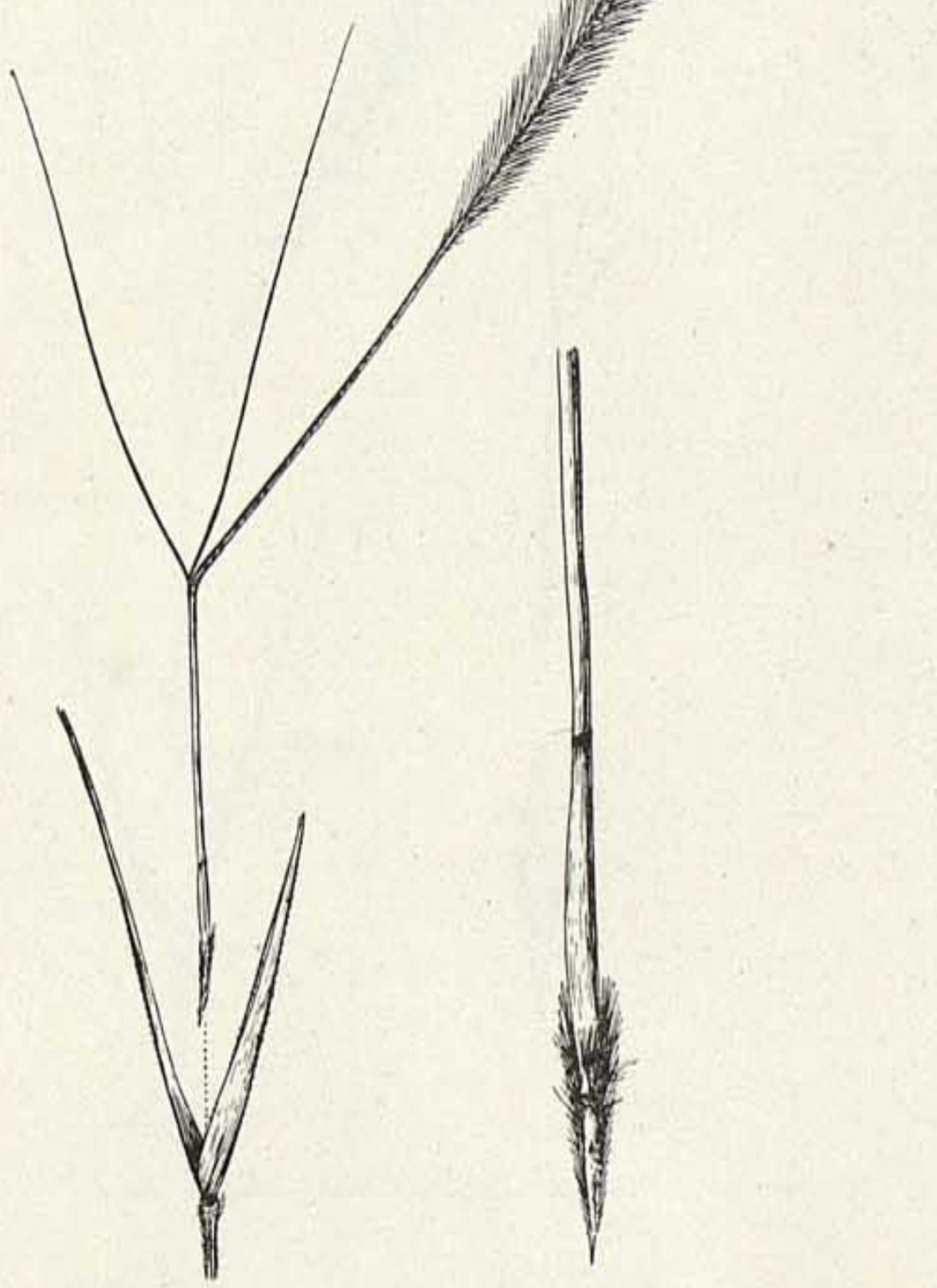
× 6

ARISTIDA PLUMOSA L.
var. Eichwaldiana Trin. et Rupr.



×1⅓

ARISTIDA PLUMOSA L.
var. Szovitsiana Trin. et Rupr.



×2

×6

ARISTIDA PLUMOSA Linné.

Plate XIII.

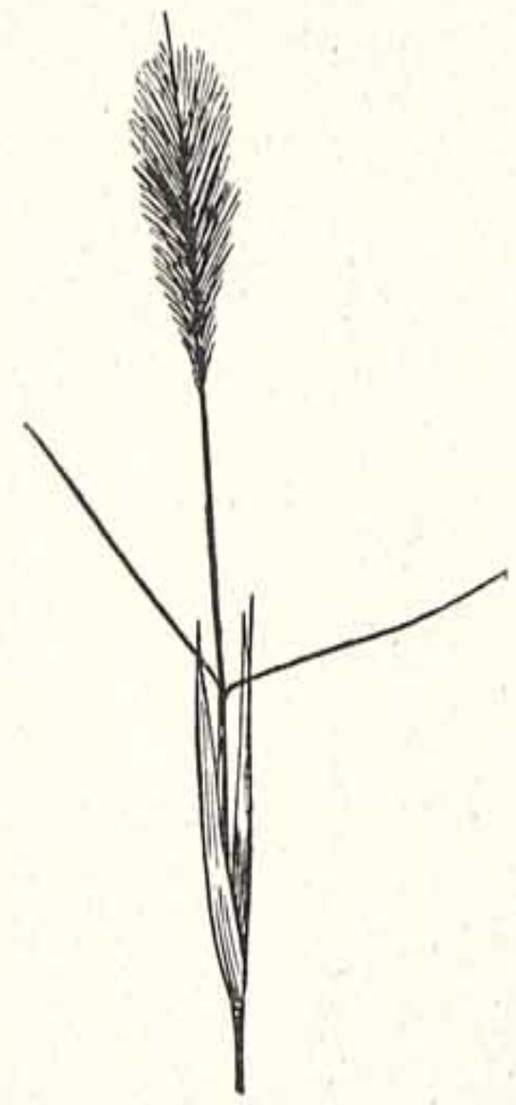


×3



×8

ARISTIDA ZITTELII Ascherson.



×3



×8

ARISTIDA ACUTIFLORA Trin. & Rupr.

×9



×3

×3

ARISTIDA BRACHYATHERA Coss. et Balansa.



×2

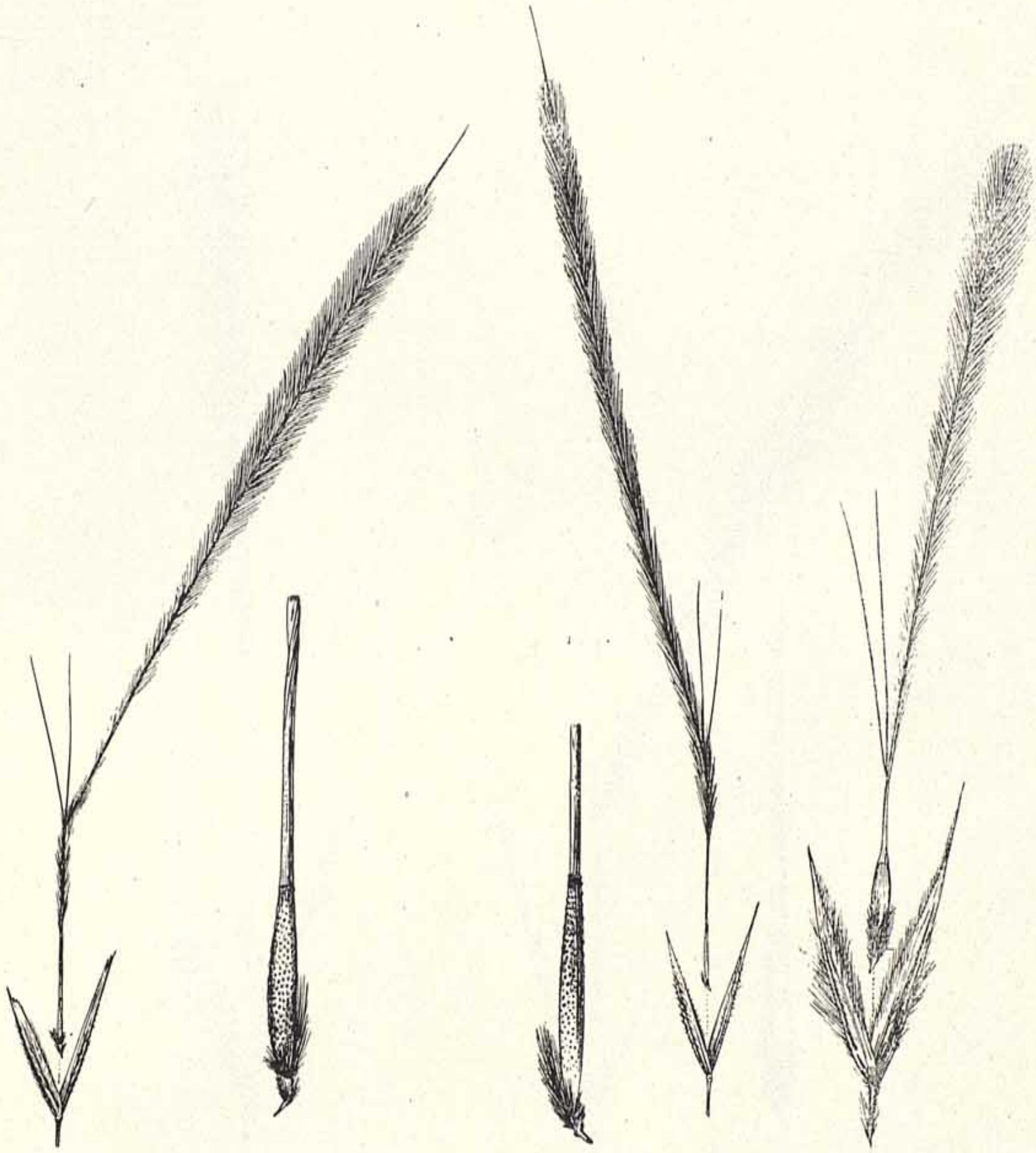
×4

ARISTIDA ORANENSIS Henrard.



×2⅔ ×5⅓
ARISTIDA BRACHYPODA Tausch.

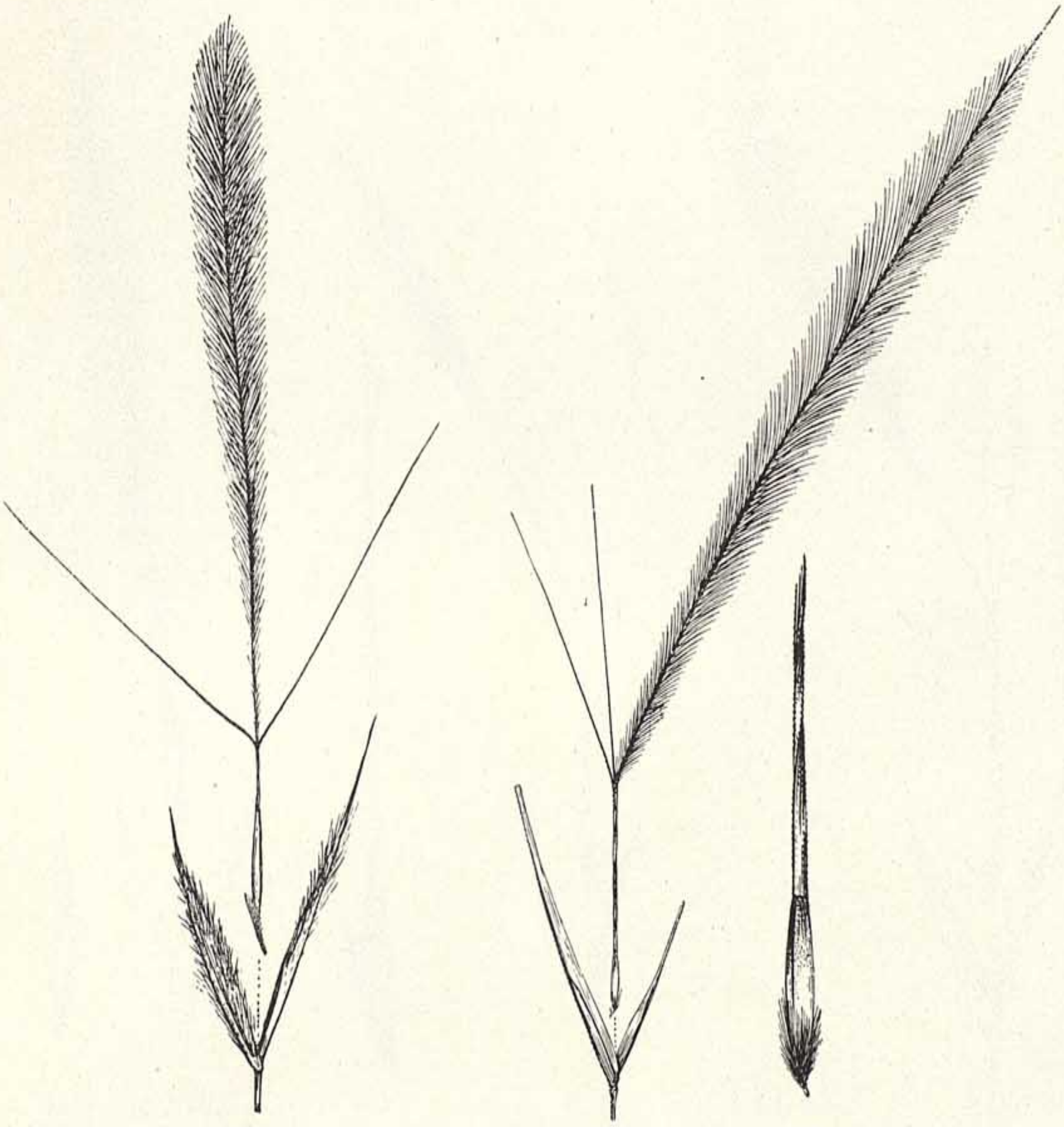
×2 ×10
ARISTIDA RADDIANA Savi.



×2 ×6⅔
ARISTIDA HIRTIGLUMA Steudel.

×9 ×2
ARISTIDA GRACILIOR Pilger.

×2
ARISTIDA FASTIGIATA Hackel.

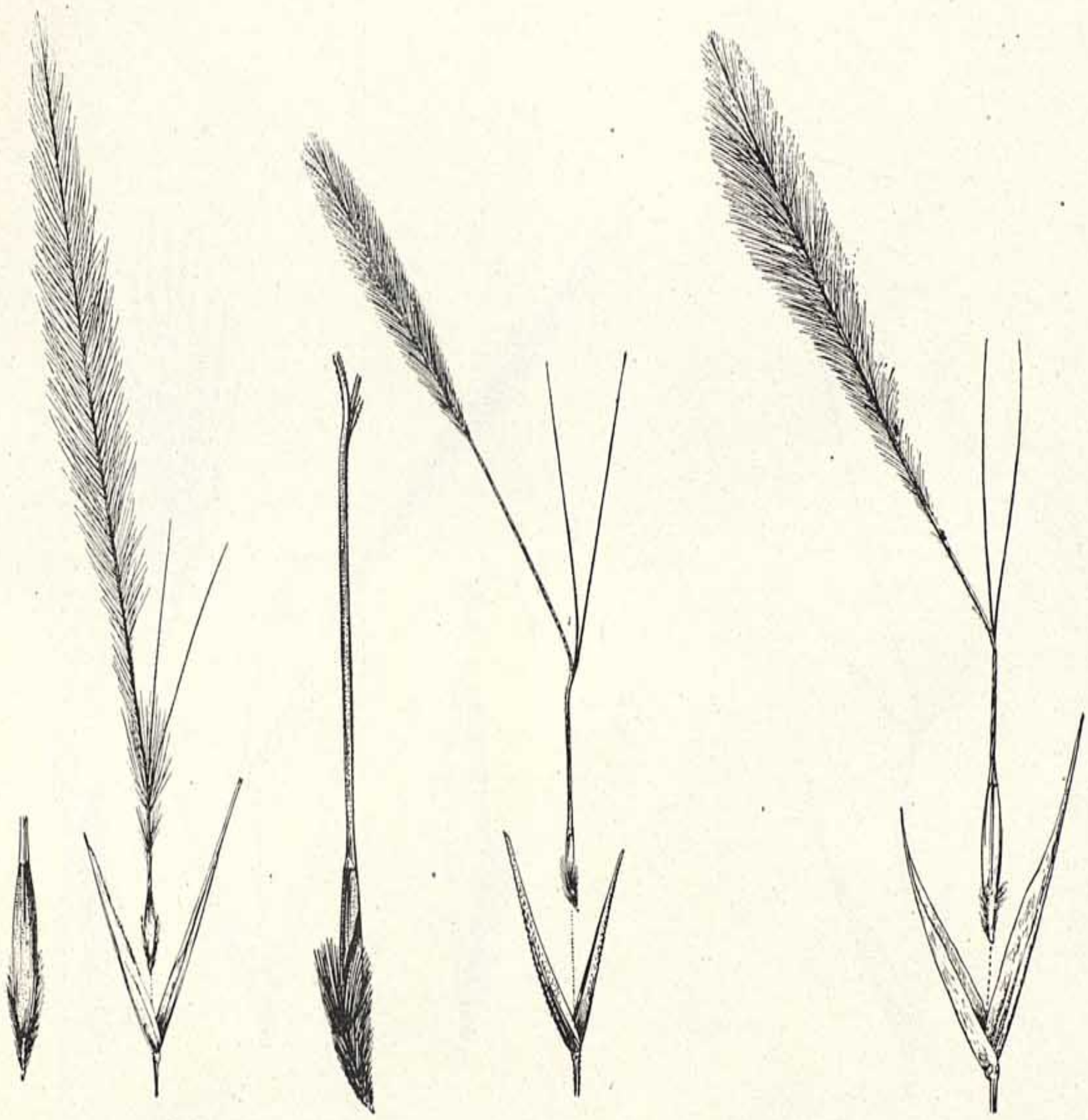


×2⅔

ARISTIDA GEMINIFOLIA (Nees) Trin. et Rupr.

×2 ×6

ARISTIDA PARADISEA Edgew.



×6⅔ ×2⅔ ARISTIDA POGONOPTILA (Jaub. et Spach) Boissier.

×8 ×2⅔ ARISTIDA OBTUSA Delile.

×2⅔ ARISTIDA BREVIFOLIA (Nees) Steud.

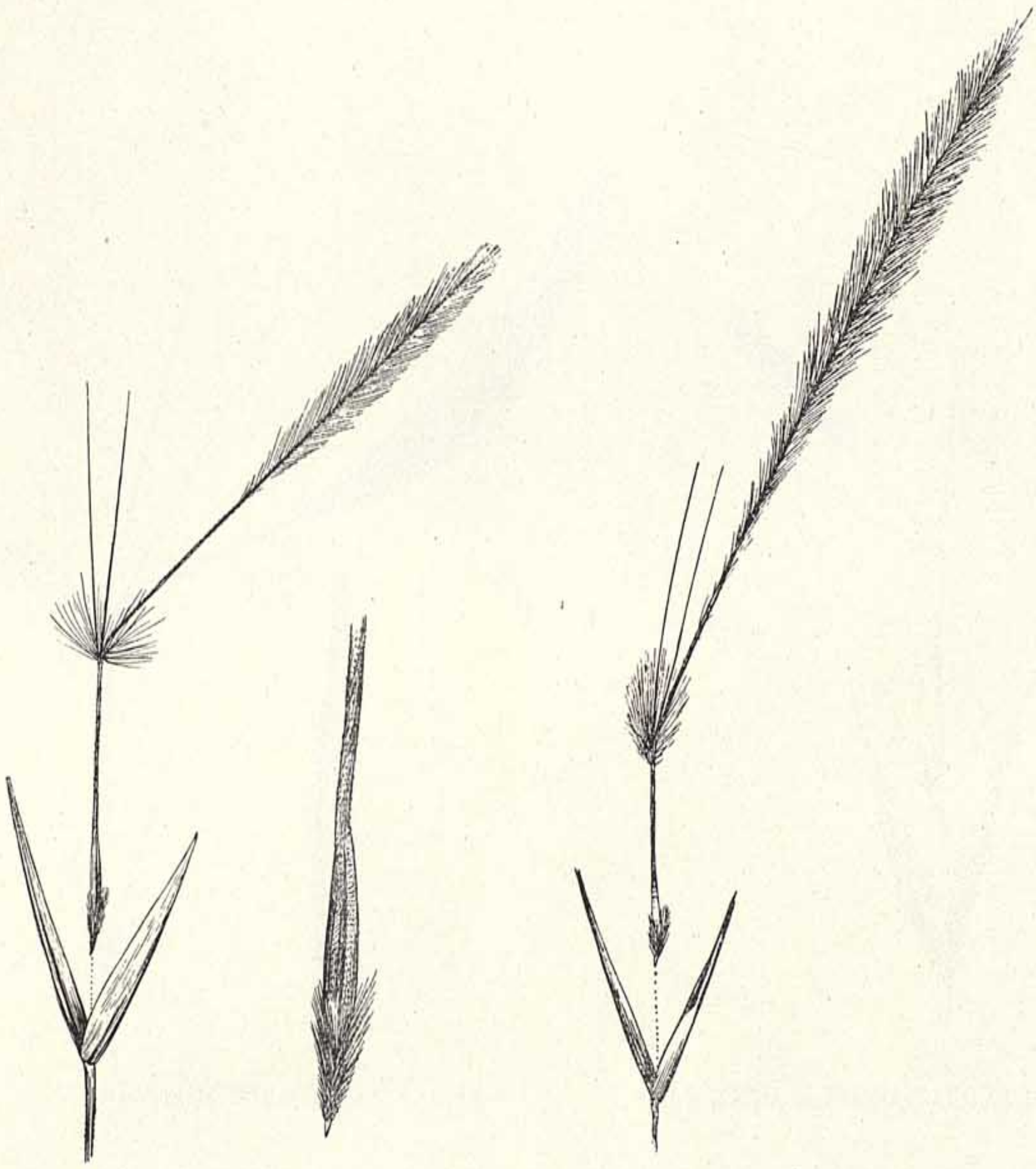


×3 ×1 ×3 ×10

ARISTIDA HERMANNI Mez.

×2

ARISTIDA SUBACAULIS
(Nees) Steudel.

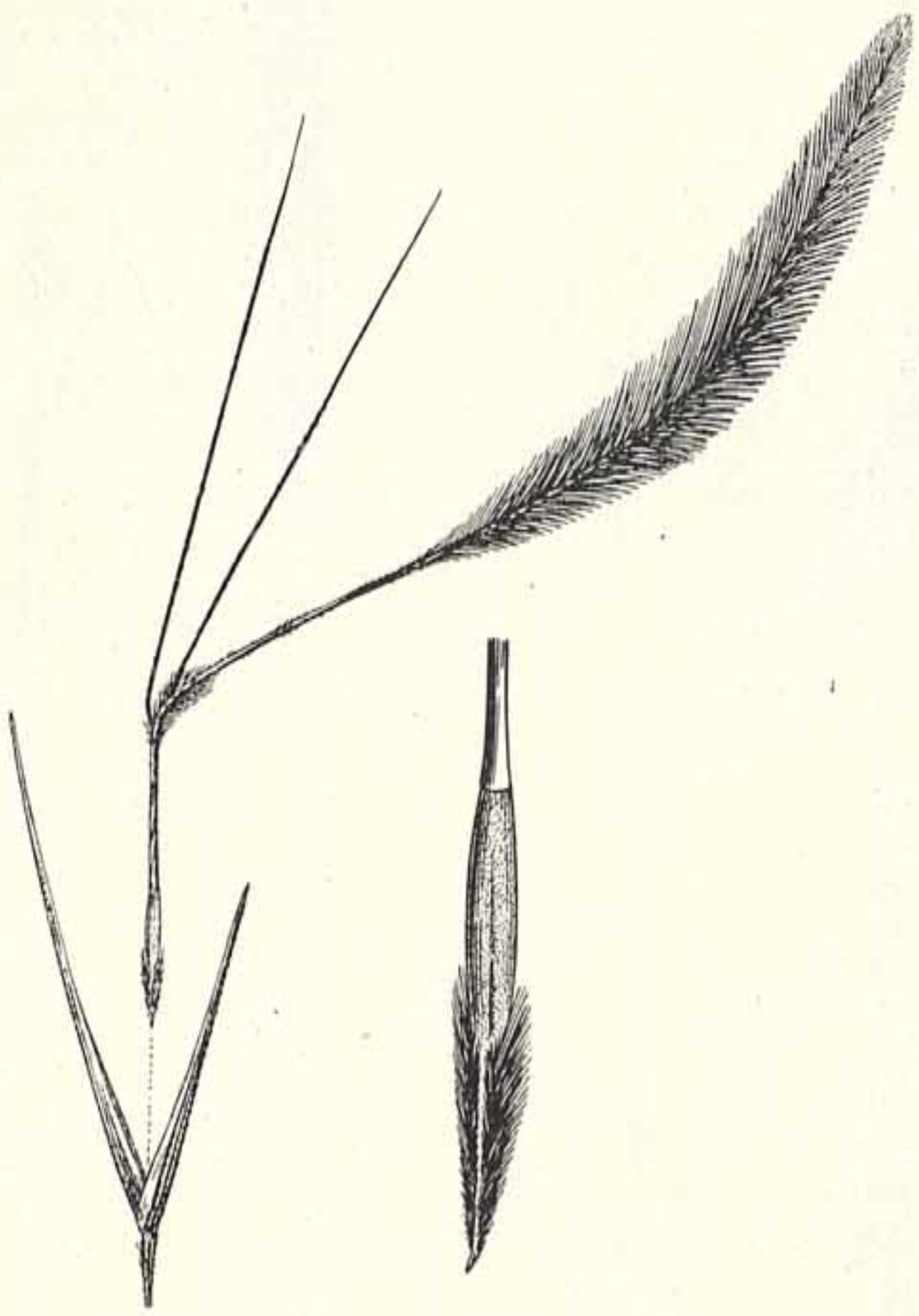


×3⅓ ×8

ARISTIDA UNIPLUMIS Lichtenstein.

×3

ARISTIDA PAPPOSA Trinius et Ruprecht.



×2 ×6⅔

ARISTIDA SOKOTRANA Vierhapper.



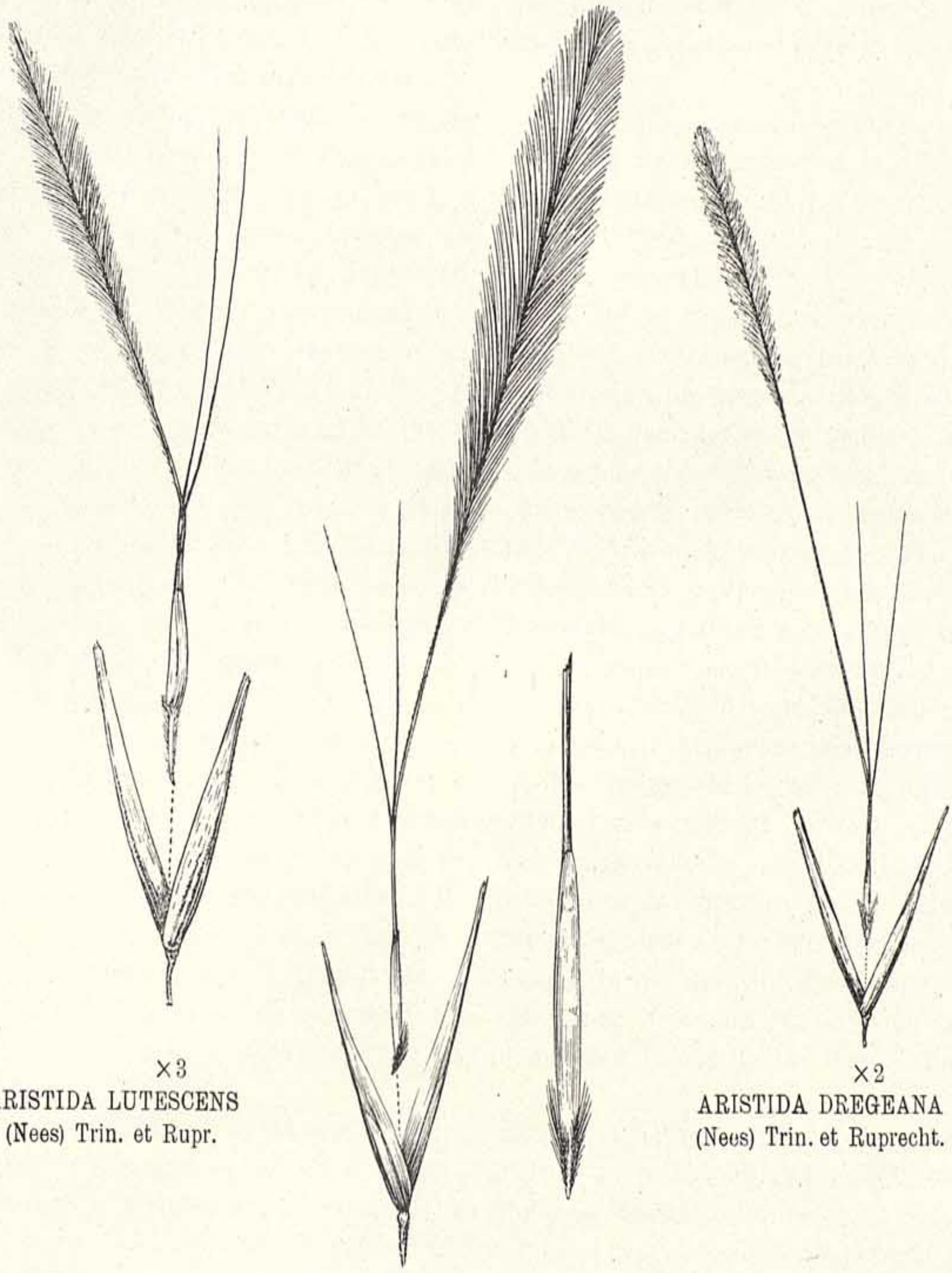
×4

ARISTIDA GONATOSTACHYS Pilger.



×6⅔ ×3⅓ ×2 ×6 ×5 ×2

ARISTIDA MARLOTHII Hackel. ARISTIDA SAHELICA TRABUT. ARISTIDA GARUBENSIS Pilger.



×3
ARISTIDA LUTESCENS
(Nees) Trin. et Rupr.

×4 ×10
ARISTIDA TENUIROSTRIS Henrard.

×2
ARISTIDA DREGEANA
(Nees) Trin. et Ruprecht.

SECTION ARTHRATHERUM (BEAUV.) REICHB.

Palisot de Beauvois gives us in the year 1812 the new genus *Arthratherum* which he described on p. 32 of his Essai d'une nouvelle Agrostographie as follows:

„*Aristidae spec.* Rob. Brow., Desf.

Axis paniculatus: Panicula subcomposita, laxa.-Glumae membranaceae, saepius mucronatae: *superior Paleis longior*.-Palea infer. nuda vel barbata, aristata; Aristâ 3-partitâ, paleae infer. apici articulatâ, caducâ. — Squamae.... Stylus 2-partitus: Stigmata villosa. — Semen oblongum, sulcatum.

Spec. Aristida *hygrometrica*, *Stipoïdes* Rob. Brow.; *pungens* Desf."

Aristida hygrometrica and *pungens* are figured. The first species is taken as the type of our section. Important for us is the statement that the lemma (palea inferior) is awned, with an articulation at the apex of the valve, the awn tripartite. *Aristida pungens* having no column and all the awns feathery, belongs to the section *Stipagrostis*. On p. 33 of his work Beauvois gives in a note the following observation:

„Le caractère le plus essentiel du *Stipa*, genre adopté par tous les Botanistes, celui qui le distingue de tous les autres genres, est d'avoir une Arête articulée au sommet de la Paillette inférieure. Le même motif doit servir à séparer *l'Arthratherum* des *Aristida*, sans quoi les caractères deviendraient négatifs, arbitraires, et cesseraient d'être conséquens entre eux. Ce genre me parait donc très-naturel."

As to the differences with the genus *Stipa*, we have already indicated that a species of *Aristida* belonging to this section, becomes a *Stipa*, if the lateral awns disappear and that from a theoretical point of vieuw the two genera ought to be united.

Although Reichenbach accepted *Arthratherum* as a section of *Aristida* in the year 1828, Nees still considered it to be a distinct genus in the year 1832. (Linnaea. Vol. VII. p. 287). He described 3 species. His first species *Arthratherum Hystrix* (which is the same as *Aristida diffusa* Trin.) is a true *Arthratherum*, the two other species belong to the sections *Stipagrostis* and *Schistachne*. In his Agrostographia capensis in the year 1841 Nees gives 10 species of this genus *Arthratherum*, only the first one mentioned is an *Arthratherum*, the other ones belong to the two sections already mentioned.

The monographers of the genus *Aristida*, Trinius and Ruprecht, accepted *Arthratherum* as a section of the genus in the year 1842 on p. 155 of their work, they described 9 species, all belonging to this group as limited in our work, a section having an articulation at the summit of the valve, always a well-developed column or at least a distinct beak and naked awns. Although other ways of articulation were known to the Russian authors, they based no sections on them. It is curious that two North American species *Aristida tuberculosa* and *Aristida desmantha* were not placed by them in the *Arthratherum*-group, although *A. tuberculosa* is easy to recognize as a distinct member of this section.

Hirtherto there are about 40 species of this section known. Five of them occur in North America, in South America there are no representatives of this section.

All the other species of this section are Old World ones, Australia has about 7 species, and India 4 species, the great bulk of the species is found in Africa, only a few of them reach Palestine and Persia.

Key to the species of the section Arthratherum.

1. Awns arcuate-contorted at the base; annuals. . . . . 2.
   Awns straight, erect or somewhat spreading, not arcuate-contorted at the base; annuals or mostly perennials. . . . . 3.

2. Column of awns very short, scarcely 2 mm. long, straight, not twisted. Culms more or less branched, slightly striate, nearly smooth, up to 80 cm. high; sheaths glabrous and striate, or more or less hairy and villous especially along the margins, variable in length, slipping from the stems or the upper ones tight, ligule short, ciliolate, auricles more or less bearded, the collar glabrous; blades convolute, glabrous beneath, scabrous above, 2—3 mm. wide or mostly scarcely 1 mm. when inrolled, as much as 20 cm. long; panicle rather loose and open, up to 20 cm. long and nearly half as broad, the axis slightly striate and smooth below, scabrous and subangulous above, the branches distant, ascending, mostly binate or subsolitary, very scabrous, rather stiff naked over a long distance, branched only at the summit with very scabrous branchlets bearing a few spikelets on short or sometimes up to 10 mm. long pedicels, the latter very scabrous; spikelets strictly erect and adpressed or the lower ones more or less spreading, yellowish-brown, tinged with red, glumes linear-lanceolate to lanceolate, subequal, the lower one with a longer awn and the position thus inverse, both 1-nerved, bifid at the apex with acute lateral lobes and a very prominent awn from the sinus, the lower one scabrous on the keel, especially above, up to 14 mm. long, tapering into an awn about half as long as the body of the glume, the upper one narrower, smooth on the keel, 13—14 mm. long with an awn about 6 mm. long, lemma glabrous below, somewhat hispidulous or scabrous above, more or less mottled, somewhat laterally compressed, up to 11 mm. long, inclusive of the very acute, densely hairy, nearly $2^1/_2$ mm. long callus, awns very scabrous, up to 3 cm. long, the bases curved in a semicircular slightly contorted bend and the upper part of the awns straight and deflexed. North America: Illinois to Texas . . . . . **Aristida desmantha Trin. et Rupr.**

Column of awns longer, 8 mm. or more long, mostly 10—15 mm. long, distinctly twisted and scabrous.

Culms strictly erect. much branched, smooth and slightly striate or minutely scaberulous, subterete, 30 to 60 cm. or sometimes as much as 1 meter high; sheaths more or less compressed, striate, glabrous or sparingly hairy or the lowermost hairy throughout, mostly longer than the internodes but slipping from the stems, ligule a ciliolate rim, auricles of the upper leaves pubescent or glabrous, those of the lowermost leaves sometimes more or less laterally bearded, the collar mostly glabrous; blades convolute, glabrous beneath, scabrous and strongly nerved on the upper surface and along the margins, 2—4 mm. broad when expanded. up to 20 cm. long, more or less flexuous; panicle loose, about 20 cm. long with rather distant very scabrous, stiffly ascending branches and branchlets, bearing at the summit a few spikelets on very rough pedicels, the latter about 5 mm. long or not rarely longer and as long as the glumes; spikelets strictly erect. yellowish-brown tinged with purple. glumes linear-lanceolate gradually acuminate and more or less awned, subequal, the lower including the awn slightly longer than the upper one, both glabrous on the back, the lower scabrous on the keel, lanceolate, 1-nerved, not bifid at the apex but gradually narrowed into the awn, glumes inclusive of the up to 10 mm long awns, 25—30 mm. long; lemma glabrous except the slightly scabrous apex, 11—13 mm. long inclusive of the densely pubescent up to 4 mm. long very acute callus; awns scabrous, 3—4 cm. long, the bases forming a semicircular bend, the terminal parts of the awns straight but more or less deflexed. North America: From the atlantic coast, Massachusetts to Indiana and Wisconsin, south to Georgia and Mississippi. Also found in Mexico. . . . . **Aristida tuberculosa Nutt.**

3. Position of the glumes distinctly inverse, the lower glume always longer than the upper one . . . . . 4.
Position of the glumes not inverse, the glumes about equal, mostly very unequal and the lower one much shorter than the upper one . . . 7.

4. Column of awns 2 cm. long or longer, mostly 3—4½ cm. long . . . . 5.
Column of awns always less than 2 cm. long, mostly not over 8—10 mm. long.
Caespitose erect elegant annual, 20—30 cm. high, inclusive of the panicle, culms erect or geniculately ascending, branched from the lower nodes, glabrous, slightly striate, distinctly scaberulous, subterete; sheaths as long as or somewhat shorter than the internodes, rarely much longer, the uppermost internode long-exserted, sheaths compressed, glabrous or slightly scaberulous, striate, ligule shortly ciliate, auricles more or less bearded with scattered long hairs; blades sometimes

quite flat, mostly involute, nearly smooth beneath, scaberulous or hirtellous on the upper surface and with long hairs near the base and along the margins, narrow, up to 20 cm. long, with a long setaceous point, those of the innovations commonly shorter; panicle erect somewhat secund, nearly half the length of the whole plant and about 12 cm. long, linear-lanceolate, contracted but loose and open, branches distant, unilateral, subgeminate, the longest erect or somewhat spreading, naked in the lower part, many-flowered, the shorter branches at the base are shortly peduncled or subsessile, few-flowered, branches and branchlets very scabrous but without long white hairs in the axils and on the pedicels (difference with te allied *A. funiculata*), the pedicels rather short, those of the lateral spikelets very short and the flowers nearly sessile; spikelets yellowish-brown or straw-coloured, erect and adpressed, glumes slightly unequal, the lower up to 14 or 15 mm. long, gradually narrowed and very shortly awned, merely acute, glabrous, scabrous on the keel, sub-3-nerved, the upper one quite smooth, 1-nerved, 10—11 mm. long inclusive the about 1 mm. long awn; lemma smooth, scabrous only at the summit, more or less punctulate all over, 10 mm. long, inclusive of the densely hairy very acute 1 mm. long callus, the column strongly twisted, about 5—10 mm. long, rarely longer, articulation at the summit of the lemma very distinct; awns scabrous, more or less spreading, the central one up to 30 mm. long, the lateral ones about 25 mm. long. British India: Panjab. . . . . **Aristida Royleana Trin. et Rupr.**

5. Glumes unequal but not so extraordinarily as in the following species, the lower acute, not bifid, upper glume mostly 3/4 the length of the lower one. 6.

Glumes extraordinarily unequal, the lower 25—28 mm. long, inclusive of the 3 mm. long awn, bifid at the apex, the awn from the sinus; upper glume very short, scarcely 6 mm. long, acute, nearly totally hidden by the lower one. Slender, elegant up to 20 cm. high annual, branched from the base; culms glabrous, smooth, geniculately ascending; sheaths slightly shorter than the internodes, glabrous, striate or deeply grooved with scaberulous nerves, ligule a densely hairy rim, auricles long-bearded; blades flat below, convolute upwards, acuminate, subpungent, base broader than the sheaths, prominently striate, glabrous beneath, the upper surface densely scaberulous or hirtellous, bearing scattered long hairs, especially along the margins and near the base, the blades about 5 cm. long and about 1 mm. broad; panicle short and depauperate, narrow, shortly exserted or mostly involved by the uppermost sheath, bearing scattered spikelets on short pedicels; axils of the panicle, branches and pedicels with long flexuous white hairs, the pedicels subtriquetrous; spikelets

pale-coloured, glabrous, glumes narrow, 1-nerved; lemma smooth, somewhat punctulate, with a 2 mm. long, hairy, acute callus, about 5 mm. long, not narrowed above, the column at the base as broad as the lemma, the lower part white, smooth and straight, not twisted and broader than the upper part which is strongly twisted, the whole column about 20 mm. long, very characteristically hairy nearly all over, the hairs more or less spreading; awns scabrous, spreading or suberect, the central one up to 7 cm. long, the lateral ones shorter, 6—6$^1/_2$ cm. long. British India: Concan. . . . . .
. . . . . **Aristida Stocksii Domin**

6. Culms much branched from all the nodes; glumes long-awned, the awns about 3—4$^1/_2$ mm. long.

Somewhat rigid, glaucous, tufted annual; culms elegant, erect or geniculately ascending, glabrous, more or less striate and slightly scaberulous, inclusive of the panicles 35—55 cm. high; sheaths glabrous, shorter than the internodes, slipping from the stems and rolling in, the internodes naked nearly all over, deeply striate or grooved, more or less compressed and keeled, slightly scaberulous, ligule a shortly ciliate rim, auricles pubescent and more or less bearded with long flexuous hairs; blades glaucous, flat at the base, narrowly setaceous and convolute upwards, erect, longer than the sheaths, 10—15 cm. long, about 1 mm. broad at the base, glabrous beneath, scaberulous on the upper surface and bearing scattered long white hairs at the base and on the margins; panicle up to 20 cm. long, contracted, very narrow, somewhat dense, few-branched or sometimes nearly simple, the branches somewhat distant, binate or subsolitary, erect and adpressed, the branches and branchlets scaberulous, capillary, bearing scattered long hairs; spikelets pale or brownish, more or less tinged with red, erect, glabrous, glumes linear, narrow, keeled, the lower one 3-nerved, the midnerve scabrous, the lateral nerves very short, running into the midnerve, lower glume inclusive of the awn up to 30 mm. long, broader than the 1-nerved, mostly up to 25 mm. long upper glume, which is smooth on the keel, the glumes are sometimes shorter and only 25 and 20 mm. long in less-developed spikelets; lemma tubulous ore more or less compressed, 4—5 mm. long, glabrous, punctulate, scaberulous above, the very acute hairy callus up to 1$^1/_2$ mm. long, the column as broad as the summit of the lemma, very scabrous, strongly twisted, 2$^1/_2$—3 cm. long, awns scabrous, subequal or the central one longer, up to 6 cm. long or sometimes much longer and about 9 cm. long, the tips of the awns not rarely purplish. Australia: Queensland. . . . . .
. . . . . **Aristida polyclados Domin**

Culms simple or nearly so, sometimes branched from some of the lower nodes; glumes acuminate-cuspidate or only very shortly awned.

Culms erect, densely tufted up to 30 cm. high, straight or somewhat geniculate at the base, pale-green or somewhat glaucous, striate and distinctly scaberulous; sheaths striate, glabrous, more or less compressed, keeled, slightly scaberulous, much shorter than the internodes, ligule a short ciliate rim, auricles bearded with long weak hairs, collar glabrous; blades mostly flat or becoming involute afterwards, glabrous beneath, very scabrous on the upper surface, prominently nerved, narrowly linear, erect or divergent, with long white hairs especially near the base and along the margins; panicles rather depauperate, contracted, linear, few-flowered, up to 10 cm. long, mostly sheathed by the uppermost leaf, branches rather distant, shortly peduncled, sparingly long-hairy, subsimple or binate, erect and adpressed, mostly bearing a subsessile spikelet at the base; spikelets green, tinged with brown or sometimes purplish, erect, glabrous, glumes narrow, linear, the lower sub-3-nerved, the midnerve scabrous, the lateral nerves very short and anastomosing with the midnerve, the upper glume 1-nerved, narrower than the lower one, the first glume about 20 mm. long or not rarely longer and up to 30 mm. long, the upper glume 3—5 mm. shorter than the lower; lemma glabrous and more or less punctulate below, mottled, scabrous at the summit, without the callus about 4 mm. long, the broadly conical, about 2 mm. long, shortly hairy callus with a sharp naked point, a tuft of long white hairs at the very base of the lemma, the hairs at the base nearly as long as the length of the callus; column very scabrous as broad as the summit of the lemma, straight and not twisted over a short distance, soon becoming strongly twisted with flat windings, up to $4^1/_2$ cm. long, awns subequal or slightly unequal, the lateral ones about $4^1/_2$ cm. long, the central one mostly up to 5 cm. long. North Africa: From Senegambia to Abyssinia, Eritrea and Arabia. . . . . **Aristida funiculata Trin. et Rupr.**

Lower glume about 22 mm. long as in the type but the upper one much shorter and about 15 mm. long. Column much shorter than in the type, only 3 cm. long. Cape Verd Islands. . . . . **var. paradoxa Henr.**

Glumes shorter than in the type, column much shorter, commonly scarcely 2 cm. long, sometimes slightly longer; awns of the lemmas much shorter than in typical *A. funiculata* and *A. paradoxa*, only 3—$3^1/_2$ cm. long. British India. . . . . **var. mallica Henr.**

7. Callus with a bifid prolongation. . . . . 8.
   Callus conical, acute, without bifid prolongation. . . . . 16.
8. Annuals. . . . . 9.
   Perennials. . . . . 10.

9. Culms 50—70 cm. high, lower blades very long, up to 20 cm. long; mouth of the sheaths and auricles not bearded; glumes narrowly linear, both long-awned, the lower $2^1/_2$ cm., the upper one bout $3^1/_2$ cm. long; lemma glabrous, somewhat punctulate; column of awns villous.
   Thin elegant glabrous annual, culms erect, simple; sheaths tight, glabrous and smooth, ligule obsolete, a minute ciliolate rim; blades very narrow, filiform, involute, glabrous and smooth beneath, scaberulous on the upper surface with long hairs near the base and along the margins; panicles very narrow, densely spiciform, up to 20 cm. long with very short branches, bearing mostly but a few spikelets on very short pedicels, rhachis and branches scabrous; spikelets erect, mostly pale or straw-coloured, glumes glabrous, 1-nerved, the lower scabrous on the keel, the upper quite smooth; lemma terete, 5—6 mm. long, the callus rather short, but long-hairy, the hairs exceeding the base of the lemma, the naked lower part of the callus longer than its body, deeply cleft with diverging acute lobes; column strongly twisted, up to $6^1/_2$ cm long, villous all over with long white hairs; awns suberect, scabrous, somewhat unequal, the central one about 11 cm. long, the lateral ones 9—$9^1/_2$ cm long. West Africa: Senegambia to Nothern Nigeria. . . . . **Aristida Kerstingii Pilger**

Culms low, inclusive of the panicle up to 15 cm. long, branched below; blades short about 2 cm. long; mouth of the sheaths and auricles long-bearded; lower glume broadly ovate-lanceolate, slightly bifid with a short mucro from the sinus, upper glume twice as long, strongly bifid with a long awn from the sinus; lemma with spreading, scattered long hairs; column of awns scabrous, without long hairs.
Culms filiform, densely tufted, thin and elegant, few-noded, internodes terete or slightly compressed, glabrous and smooth, striate; sheaths shorter than the internodes, glabrous and smooth, striate more or less keeled, with hyaline margins, ligule short, densely bearded or ciliate, the collar glabrous; blades narrow, filiform, involute, sometimes subpungent, glabrous beneath, scaberulous on the upper surface, striate, 5-nerved, the lateral nerves thickened, with scattered hairs especially near the base, blades scarcely $^1/_2$ mm. wide or expanded about $^3/_4$ mm. broad; panicles narrow and loose, strictly erect, axis terete, minutely scaberulous, branches binate, one long- the other shortly peduncled, the longer one about 2 cm. long exclusive of the awns, 3—5-flowered,

the shorter one nearly sessile, 1—2-flowered, branchlets and pedicels scaberulous, the pedicels as long as the glumes or mostly shorter, the lateral ones nearly sessile; spikelets brownish or yellowish, glumes very unequal, 1-nerved, the lower obtusely emarginate with rounded lobes and a mucro between them, slightly scabrous on the keel, about 5 mm. long, the upper about 10—11 mm. long, smooth on the keel, with a delicate 2 mm. long awn from a rather deeply bifid apex, the lateral lobes very acute; lemma up to 4 mm. long, nerved and punctulate under a lens, the soft white scattered hairs erect or somewhat spreading, narrowed into a scaberulous densely twisted, about 10 mm. long column, rarely the column up to 15 mm. long, articulation prominent, somewhat oblique, the callus long-hairy, the hairs exceeding the very base of the lemma, the naked part of the callus deeply cleft, the lobes spreading; awns scabrous, somewhat spreading, the central one up to 25 mm. long, the lateral ones about 15 mm. long. British India: Panjab and Scind to Beluchistan. . . . . **Aristida hystricula Edgew.**

10. Glumes very unequal . . . . . 11.
Glumes equal, or nearly so.

Caespitose rather robust perennial, culms stout, up to 1½ meter high, terete, simple, smooth, sheathed nearly all along, sheaths longer than the internodes, glabrous, striate, sometimes a flake of wool at the mouth and with fugacious adpressed wool near the base, ligule a line of short hairs, collar glabrous; blades linear, involute, rather firm, tapering to a setaceous point, smooth beneath, prominently nerved and scabrous on the upper surface, up to 60 cm. long, 4—5 mm. broad at the base, glaucous; panicle oblong to ovate, lax and open, nodding, up to 30—40 cm. long, the axis smooth with distant, binate or solitary branches, lowest up to 20 cm. long, obliquely spreading, reiterately branched nearly from the base, with filiform scaberulous branchlets and capillary pedicels, the latter more or less flexuous and as long as the spikelets or longer; spikelets glabrous, yellowish or greenish, glumes linear-lanceolate, acute, rather firm with hyaline erosely dentate tips and narrow margins, 1-nerved, smooth, the upper 10 mm. long, the lower about 1 mm. shorter or as long as the upper; lemma linear, tubulous or convolute, about 7½ mm. long inclusive of the 1 mm. long callus, smooth, the callus densely bearded, strongly bifid, the lobes subacute, the hairs of the callus much exceeding the very base of the lemma, articulation very distinct, column strongly twisted, nearly glabrous, rather short, about 5—6 mm. long; awns scaberulous, erect or slightly spreading, somewhat unequal, the central one 20—25

mm. long, the lateral ones 15—18 mm. long. South Africa: Kalahari Region; Transvaal to Rhodesia. . . . . .
. . . . . **Aristida spectabilis Hackel**

11. Foot of the awns shorter than 2 cm., mostly not longer than 15 mm., not rarely only 3—6 mm. long. South African species . . . . . 12.
Foot of awns always more than 2 cm. long, mostly longer and $2^1/_2$—3 cm. long. North African species.
Loosely tufted robust perennial with rather few innovations, culms simple or somewhat branched from the upper nodes, stout, thick, up to 1 meter high, internodes glabrous, obsoletely striate and punctulate; sheaths shorter than the internodes, glabrous, striate, with slightly scaberulous nerves, culm-nodes swollen and protruding above the annular, dark, glabrous sheath-nodes; ligule a shortly hairy rim, auricles of the sheaths woolly; blades narrow, involute or more or less flat at the base, about 20 cm. long, 3—4 mm. wide when expanded, smooth beneath, prominently nerved and scabrous on the upper surface; panicle more than 30 cm. long, effuse, very lax and open, rather few-flowered for such a large inflorescence, branches binate or tripartite, striate, iterately branched, glabrous or scaberulous, pedicels scaberulous with subclavate tips, much longer than the glumes, spreading, curved or flexuous, the flowers nodding, glumes pale or tinged with red or purple, especially at the base, not rarely with a black spot, 1-nerved, very unequal, glabrous, the lower one up to 7 mm. long, broadly ovate-lanceolate, minutely bifid, the upper margins minutely serrulate-ciliate, much broader than the narrowly linear, 15—20 mm. long, upper glume, which is bifid at the apex and shortly mucronate; lemma terete, including the callus up to 9 mm. long, smooth, punctulate under a strong lens, the callus slender, up to 2 mm. long, densely hairy with long hairs, the naked prolongation manifestly bifid, column of awns scabrous, prominently twisted, awns subequal, scabrous, up to $5^1/_2$ cm. long. Northern tropical Africa: From the Senegal and the French Sahara to Kordofan and Abyssinia, south to Uganda. . . . . .
. . . . . **Aristida stipoides Lamark**

12. Ligule a more or less woolly fringe, or a dense line of long soft hairs, surrounding the mouth of the sheaths like a flake of wool. . . . . 13.
Ligule a line of very short hairs, no flake of wool present. . . . . 14.

13. Lower internodes densely woolly, the uppermost ones glabrous; column of awns rather short, about $6^1/_2$ mm. long.
Robust, densely caespitose up to 60 cm. high plant, sparingly branched

from the base only or from some of the culm-nodes; lower sheaths broad and papery, straw-coloured, adpressedly lanate on the back and along the margins, soon becoming glabrous, shorter than the internodes, nodes glabrous, lower internodes densely adpressedly woolly, the uppermost villous only or becoming glabrous, ligule a very short ciliate rim, passing into a dense flake of wool at the auricles; blades up to 2 mm. broad at the flat base, involute above, striate, glabrous beneath, scabrous and shortly hairy or somewhat villous on the upper surface, becoming glabrous afterwards, 10—15 cm. long with a subpungent tip; panicle sub-pyramidal, subeffuse or more or less contracted but lax and open, rather thin, the axis with scattered white hairs and long-bearded in the lower axils, branches fine, suberect or somewhat spreading, very scabrous, up to 4 cm. long, pedicels as long as the glumes or the lateral ones somewhat shorter, capillary, more or less pilose, subclavate at the tips; glumes glabrous, 1-nerved, the lower broadly lanceolate, up to $5^1/_2$ mm. long, rounded at the tip and somewhat denticulate along the upper margins and ciliolate at the apex by a pencil of short hairs, the upper one narrower, slightly emarginate, 11—13 mm. long, lemma glabrous with a hairy, up to 1 mm. long callus, column strongly twisted, awns unequal, the central up to 25 mm. long, the lateral ones about 15 mm. long. South Africa: Kalahari Region; Griqualand West . . . . . **Aristida vestita Thunberg**

Lower and other internodes glabrous; column mostly rather long, up to 15 mm. long.

Compactly caespitose perennial with many innovations, culms erect, simple or sparingly branched, up to $1^1/_2$ meter high, 2—3-noded, lower sheaths densely woolly, especially those of the innovations, afterwards becoming glabrous, upper sheaths glabrous, smooth, somewhat loose, nodes glabrous, tumid, ligule a short ciliolate line, auricles bearded or long-hairy, with a flake of wool; blades narrowly linear, involute up to 50 cm. long, sometimes flat below and up to 5 mm. broad, smooth beneath, scabrous and shortly hairy on the upper surface; panicle large, effuse, very lax, up to 50 cm. long and 6—10 cm. broad, many-flowered, with smooth rhachis, branches 2—3-nate with filiform branchlets and capillary flexuous pedicels as long as the glumes or longer; glumes firm, glabrous, 1-nerved, the lower linear-oblong, obtuse or emarginate, slightly ciliate upwards along the margins, half as long as the upper one, which is linear-lanceolate, bifid at the apex and 10—13 mm. long; lemma terete, linear, 7—9 mm. long, smooth, mottled with purple, slightly punctulate below, scabrous at the summit,

callus densely long-hairy, the naked base deeply cleft, 1½—2 mm. long, column slender, strongly twisted, scabrous or glabrescent, variable in length, mostly abont 15 mm. long, or sometimes only half as long, awns nearly equal, up to 25 mm. long. South Africa: Oranje Free State and Griqualand West to Bechuanaland, Great Namaqualand, Damaraland to Angola . . . . . **Aristida meridionalis Henr.**

14. Culms simple, tufted with a short rhizome; panicles many-flowered, lax and open, the branches spreading or ascending. . . . . 15.

Culms fascicled from much branched almost suffrutescent many-noded rhizomes or stolons; panicle rather short, few-flowered, contracted and rather dense and narrow or thyrsiform, with erect and adpressed branches. Quite glabrous, lower sheaths brownish, soon disappearing, the internodes quite naked below, upper sheaths longer than the internodes, sometimes slipping from the stems, nodes tumid; blades stiffly erect, smooth beneath, firm, pungent, narrowly involute, terete, almost junciform, not easy to expand, when flattened (after boiling with lactic acid) scarcely up to 1 mm. wide with 2 marginal nerves and 3 much stouter and broader scaberulous middle nerves; ligule a minute ciliolate rim, auricles very shortly pubescent; panicle up to 10 cm. long and up to 3 cm. broad, exserted, lower branches binate, upper ones mostly simple, erect and stiffly adpressed, axis of the panicle, axils and branches glabrous, branchlets and pedicels slightly scaberulous, the latter as long as the glumes or the lateral pedicels somewhat shorter, with subclavate tips; glumes 1-nerved, the lower broadly lanceolate, 5 mm. long, minutely ciliate at the tip, the upper one linear-lanceolate, 8 mm. long with an obtuse or erose tip; lemma smooth, punctulate under a strong lens, inclusive of the long-hairy callus about 8 mm. long, the scarcely 1 mm. long callus obtusely bifid at the naked tip, column twisted, about 5 mm. long, awns scabrous, the central one 23—25 mm. long, the lateral ones up to 18 mm. long South Africa: Little and Great Namaqualand. . . . . **Aristida dasydesmis Mez**

15. Culms many-noded; panicles somewhat contracted not effuse and lax, rather narrow but not dense as in *A. dasydesmis*, much longer than broad, 15—20 cm. long, up to 3 cm. wide, the lower branches erect or somewhat spreading, up to 4 cm. long, the spikelets erect or somewhat divergent, glumes rather thin, the lower very broad, scarcely 5 mm long, the upper one narrow, lanceolate, 9—10 mm. long, lemma about 6½ mm. long, the column scarcely 4½ mm. long; awns nearly

equally spreading or the central one more divergent, the latter about 20 mm. long, the lateral ones about 15 mm. long.
Densely caespitose plants; sheaths shorter than the internodes, smooth, scarcely striate; nodes and mouth of the sheaths glabrous, ligule a shortly ciliate rim, auricles pubescent; blades narrow, convolute, with a long subpungent tip, about 10 cm. long, strongly nerved, glabrous and smooth beneath, scabrous to hirtellous on the upper surface; branches and branchlets of the panicle scabrous, the scabrous pedicels as long as or longer than the glumes, or the lateral pedicels shorter, tips of the pedicels subclavate and densely scaberulous, the lower glume somewhat scaberulous all over, rather broad and abruptly narrowed into the subobtuse minutely ciliolate tip, the upper glume gradually narrowed into a scarcely emarginate subacute tip; callus deeply bifid, long-hairy, up to 1 mm. long, the lemma slightly scaberulous, often mottled, the column scaberulous and strongly twisted. South West Africa: Great Namaqualand . . . . . .
. . . . . **Aristida Engleri Mez**

Culms 1—2-noded; panicles effuse, nearly as long as broad, up to 15 cm. long, lower branches spreading, up to 7 cm. long, spikelets nodding or suberect, glumes rather firm, the lower linear-oblong, 6—7 mm. long, the upper narrower, lanceolate to linear, 13—15 mm. long; lemma 11—12 mm. long, the column up to 6 mm. long, awns nearly equally spreading, the central one up to 35 mm. long, the lateral ones 30 mm. long.
Somewhat glaucous densely caespitose perennial, 30—60 cm. high, culms terete, firm, glabrous and smooth; sheaths tight, smooth, scarcely striate, glabrous or the lower ones covered with a fugacious wool, shorter than the internodes, ligule a line of very short hairs, auricles pubescent only; blades convolute, those of the internodes short, the culm-blades up to 30 cm. long, scarcely $2^1/_2$ mm. broad when expanded, rigid, curved or flexuous, smooth beneath, scabrous or hispidulous on the upper surface; rhachis of the panicle strict or slightly flexuous, the branches 2—3-nate, sparingly and remotely branched, the branchlets filiform or capillary, scabrous, flexuous, pedicels very fine, often curved, the longer ones as long as the glumes; spikelets yellowish-brown, sometimes purplish, glumes rounded on the back, glabrous, 1-nerved, the lower obtuse, the upper one with an obtuse bidentate tip; lemma almost smooth or scaberulous at the summit, the callus shortly bifid, densely hairy, column scabrous, strongly twisted, variable in length, awns scaberulous. South Africa: From the Coast Region to Transvaal, west to Namaqualand. . . . . .
. . . . . **Aristida diffusa Trinius**

Sheaths glabrous.

Panicle effuse, large and open, 20 cm. long or longer, the branches spreading or divaricate, about 7—8 cm. long, naked below, lower glume about 8—9 mm., upper one 16—18 mm. long, lemma 12—14 mm., column 7—8 mm. long. . . . . **var. genuina Henr.**

Panicle subcontracted, more dense, the branches erectly ascending or somewhat adpressed, much shorter than in the type, upper glume 12—15 mm. long, column 7—8 mm. long. . . . . **var. densa Henr.**

Sheaths lanate or woolly pubescent, especially the lower ones, the uppermost ones always glabrous.

Column elongate, 7—8 mm. long.

Panicle contracted, somewhat narrow, 10—12 cm. long, the branches erectly ascending, lower glume 6—7½ mm., upper one 15 mm. long, the lemma 10 mm. long, blades short or rather short, mostly not reaching the panicle. . . . . **var. Eckloniana Henr.**

Panicle contracted as in var. Eckloniana, upper glume 17—18 mm. long, the lower one about 10 mm. long, lemma 12—13 mm. long; blades longer mostly reaching the panicle. . . . . **var. Schraderiana Henr.**

Column short or very short not longer than 4 mm.

Column very short, scarcely developed, only a not twisted about ½ mm. long beak, upper glume 11—12 mm. long, the lower much shorter, about 4 mm. long; lemma about 10 mm. long, blades short, about 5 cm. long. . . . . **var. pseudohystrix Henr.**

Column well-developed, 2½—4 mm. long, twisted, glumes 6—7 and 12—15 mm. long, lemma 11—12 mm. long, panicle about 10 cm. long, blades longer than 5 cm. . . . . **var. brevestipitata Henr.**

16. Internodes densely woolly or at least very distinctly pubescent. . . . . 17.
Internodes quite glabrous or minutely scaberulous only, never pubescent. 19.

17. Plants perennial . . . . . 18.
Plant a very delicate annual.
Bushy-branched very elegant plant, culms very slender, 10—20 cm. high, ascending, the lowermost internode by far the longest, more than half the length of the culm without the panicle, terete, densely pubescent, the nodes glabrous; sheaths glabrous, pubescent only at the throat and on the auricles and collar, shorter than the internodes, the uppermost ones rather broad with hyaline margins and more or less reduced blades, the latter flat or somewhat involute, spreading, glabrous beneath, puberulous on the upper surface, strongly nerved, 1—3 cm. long, mostly ending in a fine acute point; panicles rather long-peduncled, very numerous, fasciculately arising from the uppermost node, sheathed together at the base by the uppermost sheath, each panicle very narrow, mostly 1—3-flowered, the axis angulous and scaberulous, the branches very short, about 1-flowered, the pedicels short, the spikelets erect and subsessile; glumes unequal, 1-nerved, the lower glabrous and smooth, slightly scaberulous only on the keel above, acute, the tip bifid with a mucro from the sinus, about 10 mm. long, the upper glume twice as long as the lower one, narrowed into a scarcely awned acute tip; lemma about 8 mm. long, glabrous below, scaberulous at the summit, the densely pubescent very acute callus about 2 mm. long, column strongly twisted, scabrous, up to 20 mm. long, awns subequal, divergent but not contorted at the base, about 4—5 cm. long, very fine. Lower California. . . . . .
. . . . . **Aristida peninsularis Hitchc.**

18. Internodes pubescent only, not lanate woolly.
Densely caespitose erect perennial, much branched from the base and more or less so from the nodes; culms slender, 3—4-noded, 10—30 cm. high, subcompressed, striate, densely pubescent or the upper ones hirtellous, nodes glabrous; sheaths glabrous or more or less puberulous, compressed and striate, pubescent at the throat and on the collar, the ligule a ciliate rim; blades strongly nerved, mostly less than 5 cm. long, involute, ending in a fine acute point, scabrous on both surfaces and pubescent on the upper surface; panicles few-flowered, strictly erect, very narrow, inclusive of the awns up to 10 cm. long, the axis puberulous, angulous or triquetrous, branches solitary or the lower ones binate, bearing only a single flower, one flower nearly sessile, the other one with a pedicel as long as or somewhat shorter than the glumes, pedicels compressed, subclavate, scaberulous; spikelets erect, purplish, glumes unequal, 1-nerved, the lower scaberulous on the keel, up to 9 mm. long, with a bifid tip and a mucro from the

sinus, the upper one up to 16 mm. long, inclusive of the nearly $1^1/_2$ mm. long awn from a bifid apex, the lateral lobes acute; lemma fusiform, glabrous or slightly punctulate below, distinctly scabrous above, together with the 1 mm. long, acute, callus, up to 6 mm. long, the callus shortly hairy below, with longer hairs at the summit, the hairs much surpassing the true base of the lemma, column scabrous, densely twisted, up to 15 mm. long, awns scabrous. spreading, more or less contorted at the base, otherwise quite straight, nearly equal, about $3^1/_2$—4 cm. long. North America: California and northwestern Mexico. . . . . **Aristida californica Thurber**

Internodes densely woolly or lanate-tomentose.

Culms many-noded, strictly erect; sheaths glabrous, shorter than the internodes, smooth, terete and tight. ligule a shortly hairy rim; blades filiform, involute, the lower up to 30 cm. long, the upper 10—15 cm. long, very narrow, erect or somewhat spreading, very acute but not pungent; panicle shortly exserted, narrow, very dense and almost spike-like, 15—20 cm. long, axis densely lanate, the branches numerous and very short, adpressed, the spikelets nearly sessile, narrow, glabrous, the glumes unequal, both shortly awned, the lower one 11—14 mm. long, the upper one 20—24 mm. long; lemma with a very acute, elongate, shortly pilose, up to 2 mm. long callus, the column 2—$2^1/_2$ cm. long, strongly twisted, scabrous, the awns about equal, scabrous, spreading, about 5 cm. long. South West Africa: Kalahari desert . . . . . **Aristida mollissima Pilger**

19. Panicles very dense and spike-like, the pedicels very short, the spikelets nearly sessile. Somaliland species. . . . . 20.

Panicles not dense and spike-like, mostly loose and subcontracted, sometimes linear or very narrow, but interrupted and never spiciform. . . . . 22.

20. Awns very unequal, the lateral ones nearly half as long as the central one; column of awns well-developed, 10 mm. long or longer . . . . . 21.

Awns nearly equal or the lateral ones but slightly shorter than the central one; column of awns less-developed, about 6 mm. long.

Densely caespitose perennial with intravaginal innovations, culms about 30 cm. high inclusive of the panicles, erect or slightly geniculate at the nodes, terete, glabrous, simple, scabrous below the panicle, the uppermost internode rather short; sheaths tight or somewhat gaping, longer than the internodes, subterete, striate, more or less scabrous, ligule a minute ciliate rim, auricles pubescent; blades narrowly linear, complicate, scarcely 1 mm. broad when expanded, glabrous beneath,

hirtellous on the upper surface, with scabrous thickened margins, when dried almost cylindriform, 20 cm. long or longer, those of the innovations still longer, overtopping the panicle; inflorescence sheathed at the base by the uppermost leaf, pale, shining, very densely spiciform, inclusive of the long awns about 15 cm. long, without the awns 5–7 cm. long, cuneate at the base, ovate in outline and about 3 cm. broad, axis glabrous and smooth, branches very short, spikelets bearing from the base, the flowers densely congested, the pedicels scabrous, short, about 2—3 mm. long; spikelets yellow, glumes very unequal, 1-nerved, the lower minutely scabrous, gradually passing into the 3 mm. long awn, up to 12 mm. long, the keel scabrous above, upper glume glabrous with a smooth keel, much narrowed above, the margins more or less inrolled, without the awn about 25 mm. long, bifid at the apex, the lateral lobes about 1 mm. long, long-awned from the sinus with a 9—10 mm. long awn; lemma fusiform, brownish, smooth or slightly scaberulous at the summit, inclusive of the very acute densely bearded about $1^1/_2$ mm. long callus, up to $6^1/_2$ mm. long, the column erect, glabrous, slightly twisted, about 6 mm. long, more or less dilatated below the branching-point of the awns which are about 8 cm. long or the central one up to 9 cm. Northern East Africa: Somaliland. . . . . .
. . . . . **Aristida protensa Henr.**

21. Both glumes bifid; column about 10 mm. long.

Caespitose perennial, culms erect, elegant, simple or somewhat branched from the middle nodes, sheathed all along, glabrous, scaberulous only below the panicle, up to 30 cm. high; sheaths glabrous, striate, shorter than the internodes, ligule a short ciliolate rim, auricles ciliate only not bearded; blades rather short, narrow, linear, convolute-setaceous, acute, filiform, glabrous, scabrous only along the margins; panicle exserted, spike-like, very dense, ovate-oblong, without the awns up to 4 cm. long, scarcely 1 cm. broad, axis glabrous, the branches very short, adpressed, 3—5-nate, spikelets bearing from the base, the flowers densely fascicled and crowded, very shortly pedicelled, glumes linear-lanceolate, yellowish, very unequal, 1-nerved, scabrous, the lower 6 mm. long, the upper 10 mm. long, both bidentate at the tip with a mucro or a short awn from the sinus; lemma lanceolate, nearly smooth, inclusive of the 1 mm. long, very acute, somewhat oblique, long-hairy callus, up to 4 mm. long, the hairs of the callus much surpassing the very base of the lemma, column scaberulous loosely twisted or scarcely so, awns erect, scabrous, the central one

about 40 mm. long, about twice as long as the lateral ones. North East Africa: Somaliland. . . . . .
. . . . . **Aristida Kelleri Hackel**

Lower glume not bifid, acute or shortly awned; column 15—20 mm. long.

Culms erect or somewhat arcuate, terete, striate, glabrous, glaucous, elegant, with glabrous nodes; sheaths tight at least the upper ones, striate, smooth, about 5 cm. long, ligule a rather long-pilose rim, auricles long-bearded, collar glabrous; blades of the upper leaves flat at the very base, convolute, glaucous, setaceously acuminate, glabrous beneath, puberulous or hirtellous on the upper surface, the margins not thickened, 9—11 cm. long, expanded scarcely 1 mm. broad; panicle shortly exserted, narrow, densely contracted, spiciform, without the awns about 10 cm. long, about 1 cm. broad, strictly erect, rather stiff, axis subterete or subangulous, somewhat scaberulous, not visible, the dense panicle not interrupted, branches solitary, strictly erect, much divided to the base, the branchlets erect and adpressed, scaberulous, the pedicels subcompressed, subsessile and slightly scabrous; spikelets yellowish-green or glaucous, erect and adpressed, glumes unequal, glabrous, 1-nerved, the lower 6—8 mm. long, scabrous on the keel, acute or acuminate, shortly awned, the upper one smooth on the keel, narrower than the lower one, 15-16 mm. long, distinctly bifid at the apex with a scarcely 5 mm. long awn from the sinus; lemma glabrous, slightly punctulate-scabrous at the summit, rounded at the base, inclusive of the callus about 5 mm. long, the callus curved, very acute, about 1 mm. long and densely bearded laterally, the lemma not narrowed above, the scabrous, twisted column about 20 mm. long, awns scabrous, yellowish or purplish, the lateral ones erect, 25—35 mm. long, the central one slightly divergent and curved at the base, about 6 cm. long. North East Africa: Somaliland. . . . . .
. . . . . **Aristida triticoides Henr.**

22. Column of awns less than 5 cm. long, mostly not longer than 4 cm., glumes not of a very firm texture, commonly thin or papery, very unequal or subequal, the upper however never longer than 3 cm. . . . . 23.

Column of awns very long, always more than 5 cm. long, mostly $7^1/_2$—8 cm. long, glumes of a very firm coriaceous structure, the lower 2 cm. long, the upper one about 4 cm. long.

Culms slender, rigid, glabrous, branching at the base, up to 60 cm. high; sheaths closely adpressed, minutely ciliate at the mouth, deeply grooved and compressed, not rarely more or less hairy, the hairs arising from tubercles, especially hairy along the sheath-margins, ligule

a short ciliate rim, auricles rather long-pilose, collar glabrous; blades rather short, rigid, subulate, up to 10 cm. long or longer, convolute, expanded scarcely 1 mm. broad, nearly smooth beneath, scaberulous on the upper surface; panicle very narrow, nearly simple, up to 25 cm. long without the awns, the branches strictly erect, adpressed, binate, bearing mostly but a single spikelet, one spikelet shortly, the other long-pedicelled, pedicels stout and rigid, stiffly erect, scabrous on the margins, otherwise smooth, with a subclavate tip which has a lateral tuft of short hairs; spikelets brownish to reddish, glumes glabrous, the lower with an obtuse bifid tip and a short awn from the sinus, prominently 5-nerved or sometimes sub-3-nerved by the fusion of the lateral nerves, upper glume acute, 1-nerved, somewhat convolute, with a nearly 6 mm. long awn; lemma narrow, convolute, glabrous, punctulate under a lens, without the callus 8 mm. long, the densely hairy callus up to $4^1/_2$ mm. long, the point naked and very acute, column very strongly twisted, nearly glabrous, awns somewhat unequal, the central one about 13 cm. long, the lateral ones about 12 cm. long, lodicules striate, as long as the 3 mm. long palea. North Australia and Queensland . . . . . **Aristida hygrometrica R. Br.**

23. Central awn curved in a semicircle, strongly reflexed, much stouter than the lateral ones. Panicles very elegant, flexuous and nodding at the summit, the branches and spikelets drooping . . . . . 24.

Central awn not curved or reflexed, straight. Panicles stiffly erect or slightly curved, the branches and spikelets erect and adpressed, not drooping. . . 25.

24. Sheaths glabrous and smooth, spikelets coloured, large, the lower glume 12—14 mm. long, the upper one 24—26 mm. long; lemma about 9 mm. long inclusive of the callus; column of awns 21—24 mm. long.

Densely caespitose, branched below and from most of the nodes, rather rigid, glabrous and glaucous. Culms slender, 3—4-noded, up to 80 cm. high or longer, the panicles nearly half the length of the whole plant, internodes terete, slightly scaberulous only, laterally grooved; sheaths much shorter than the internodes, slipping from the stems, more or less compressed and striate, with hyaline margins, ligule a very short, ciliolate rim, auricles long-bearded, the collar a villous or bearded line; blades somewhat rigid, glaucous, erect or spreading, rather long to very long, at least up to 20 cm. long, those of the innovations commonly much shorter, the culm-blades flat at the base over a long distance or becoming convolute upwards, ending in a setaceous point, glabrous beneath, scaberulous or hirtellous on the upper surface, about 2 mm.

broad; panicle very lax, about 4 dm. long with very distant, rather short, flexuous or curved, capillary branches which bear at the summit 2--5 flowers on very long pedicels, the axis of the panicle striate and angulous, more or less scaberulous, the branches binate or the upper ones solitary, without the spikelets about 5 cm. long, very scabrous, the scabrous pedicels subcompressed and subclavate at the summit; spikelets glabrous, nodding, glumes very unequal, the lower prominently 3-nerved, very acute but scarcely awned, the upper one 1-nerved, finely acuminate but not distinctly awned; lemma with a densely hirsute about 2 mm. long, very acute callus, narrow, convolute, nearly glabrous and smooth, column of awns strongly twisted, gradually narrowed above to the central awn, which is scabrous and rigid and up to 10 cm. long or slightly shorter, the lateral awns thinner, somewhat spreading and curved, about 9 cm. long. Australia: Queensland. . . . . **Aristida superpendens Domin**

Sheaths scabrous or hirtellous, the whole plant rough, spikelets pale, much smaller, the lower glume about 11 mm. long, the upper one about 17 mm. long; lemma 5½—6 mm. long inclusive of the callus; column of awns 14—15 mm. long.

Culms numerous, densely tufted, somewhat glaucous, rigid and slender, up to 70 cm. long or longer, glabrous, sheathed all along, the panicles shorter than half the length of the whole plant, internodes terete, slightly striate, distinctly scabrous; sheaths tight, not slipping from the stems, which are simple or scarcely branched at the base, the sheaths terete and striate, very scabrous, about as long as the internodes or somewhat shorter, ligule a short ciliate rim, auricles pubescent and shortly ciliate, the collar without a villous line, scaberulous only; blades up to 3 dm. long, somewhat ciliate at the mouth, rigid, glaucous, very narrowly convolute, subjunciform, more or les spreading, curved or flexuous, ending in a subpungent setaceous tip, very scabrous on both surfaces, those of the innovations sometimes with bearded auricles; panicle very narrow, lax, much interrupted, 25—30 cm. long, slender and elegant with very scabrous axis, branches binate or the upper ones solitary, very scabrous, naked at the base, at first erect or adpressed, afterwards curved and flexuous, drooping, the shorter branch 1—2-flowered, the longer branch 2—3-flowered, the pedicels very scabrous, subclavate at the apex, those of the lateral spikelets rather short, the other ones much longer and about as long as or longer than the glumes; spikelets pale-yellowish, tinged with brown, ad maturity nodding, glumes acuminate, but not or scarcely awned, the lower one 3-nerved, the upper one 1-nerved, both glabrous; lemma narrow,

convolute, smooth, with a shortly and adpressedly hairy, scarcely $1^1/_2$ mm. long very acute callus, the column strongly twisted, very scabrous, gradually passing into the curved, rigid central awn, which is about 7 cm. long or shorter, the less rigid, erect, flexuous lateral awns mostly somewhat shorter than the central one. Australia: Queensland. . . . . **Aristida hirta Domin**

25. Awns not curved at the very base, quite straight, stiffly erect or somewhat spreading. Culm-blades more than 3 cm. long, mostly long to very long, rarely short, but in that case the lower glume is always longer than 10 mm. Old World species. . . . . 26.

Awns curved at the very base, otherwise straight, equally nearly horizontally spreading. Culm-blades very short, mostly 1-3 cm. long, very rarely somewhat longer. New World species.

Densely caespitose with intravaginal innovations, much branched from the base and nearly all the nodes; culms erect or ascending, rather thin and elegant, glabrous, 20—40 cm. high, terete, slightly striate; sheaths much shorter than the internodes, subcompressed, glabrous, with hyaline margins, ligule a ciliolate rim, auricles shortly pubescent, collar glabrous; blades involute, more or less spreading, scaberulous beneath, pubescent on the upper surface, deeply striate or grooved, ending in a fine point, very narrow, scarcely 1 mm. broad when expanded, mostly not over 3 cm. long, or rarely some of the lower blades in very robust specimens longer and up to 10 cm. long; panicles narrow, 3—6 cm. long or rarely longer, few- to several-flowered, the spikelets single or in pairs, one longer, the other shortly pedicelled, adpressed, the pedicels slightly scaberulous, up to 5 mm. long or the lateral ones only 1—2 mm. long; spikelets pale or greenish, sometimes tinged with purple, glumes glabrous, unequal, 1-nerved, the lower acute, 5–6 mm. long, slightly scabrous on the keel above, the upper one narrowed into a slender point, scarcely awned, 10—12 mm. long, smooth on the keel; lemma mottled at maturity, glabrous below, scaberulous at the summit, 5—7 mm. long, the densely pubescent very acute callus about $1^1/_2$ mm. long, column very slender, twisted, scabrous, somewhat variable in length, mostly 10—15 mm. long or sometimes only 6 mm. long; awns about equal, fine, scaberulous, 2—3 cm. long. North America: Arizona to Lower California. . . . . **Aristida glabrata Hitchcock**

26. Glumes not awned, or shortly awned, sometimes the upper one with a rather long awn, but in that case this awn always from a deeply bifid apex with long lateral setulae. . . . . 27.

Glumes extraordinarily long-awned, the awns 8—10 mm. long, those of the upper glumes up to 15 mm. long and not from a bifid apex. Laxly caepitose perennial with intra- and extravaginal innovations, culms strictly erect, simple, about 50 cm. long, inclusive of the panicles, glabrous and smooth, few-noded, the nodes glabrous; sheaths mostly shorter than the internodes, glabrous, striate, with hyaline margins, ligule a densely ciliolate rim, auricles long-bearded; blades linear, $1^1/_2$—2 mm. broad, gradually long-acuminate, up to 30 cm. long, erect, scaberulous beneath, scabrous on the upper surface and along the margins, those of the innovations narrower, convolute, setaceous, $^1/_2$ mm. thick, expanded about 1 mm. broad; panicle elongate, narrow but not dense, more or less interrupted, the scabrous branches binate or solitary upwards, elongate and adpressed, naked below, about 6—7 cm. long, gradually becoming shorter, rather few-flowered the spikelets adpressed, the terminal ones with a 10 mm. long pedicel, the lateral ones shortly pedicelled, all clavate at the summit; spikelets narrow, glabrous, glumes lanceolate, gradually long-acuminate-awned, 1-nerved, tho lower one 12—13 mm. long, with a 8—9 mm. long, fine awn, scabrous on the keel, the upper one smooth on the keel, 18—19 mm. long with a 13—14 mm. long awn; column erect, at least 10 mm. long, not known in a mature state; awns erect, somewhat unequal, the central one about $6^1/_2$ cm. long, the lateral ones 5 cm. long. North East Africa: Somaliland . . . . . .
. . . . . **Aristida schebehliensis Henr.**

27. Column of awns long or rather long, always more than 20 mm. long, commonly 25—30 mm. long or sometimes much longer and up to 40 mm. long. . . . . 28.

Column of awns short or rather short, less than 20 mm. long or rarely as much as 20 cm. long or but very slightly longer, commonly 10—15 mm. long . . . . . 32.

28. Both glumes awned, the upper one mostly deeply bifid at the summit with long and fine lateral lobes, the awn from the sinus . . . . . 29.

Both glumes acute or acuminate, the upper one if shortly awned, not bifid at the summit . . . . . 31.

29. Column of awns always less than $3^1/_2$ cm. long, mostly 10—30 mm. long or rarely a little longer and up to 32 mm. long. . . . . 30.

Column of awns more than $3^1/_2$ cm. long. mostly 37—40 mm. long.

Densely caespitose, strictly erect up to 1 meter high, robust, somewhat glaucous perennial, culms simple below, stiffly branched from some

of the middle and upper nodes, glabrous, nearly smooth, internodes compressed, lowermost one rather short, about 5 cm. long, naked, the sheaths delapsed, the following internode very long, up to 20 cm. long, the sheaths shorter than the internodes, broad, slipping somewhat from the stems, ligule obsolete, very minutely ciliolate, the auricles shortly pubescent; blades flat or becoming involute, 10—16 cm. long, acute, 2—3 mm. wide, glabrous beneath, minutely scabrous on the upper surface, glaucous with scabrous margins; panicle 20—25 cm. long, narrow, linear, contracted and rather dense, the branches binate, divided from the base, the branchlets rather short, bearing but a few spikelets, the spikelets more or less condensed, pale or greenish; glumes glabrous, very unequal, 1-nerved, with slightly scabrous keels, the lower scabrous, acuminate, shortly awned, about 10—12½ mm long, the upper one narrower, inclusive of the scarcely 5 mm. long awn from the bifid apex, about 20—22 mm. long; lemma 9—10 mm. long inclusive of the densely hairy, very acute, about 3 mm. long callus, linear or tubulous, gradually narrowed into the column, finely punctulate under a strong lens, column scabrous, strongly twisted, awns very fine, subequal, scabrous, up to 6 cm. long or the lateral ones 55—57 mm. long. South West Africa: Damaraland. . . . . **Aristida stipitata Hackel**

30. Glumes 1-nerved, the lower shortly bifid with a 5—6 mm. long awn, the upper one deeply bifid with a 14 mm. long awn from the sinus, the very fine lateral setulae about 7—8 mm. long, the central part of the upper glume more or less pilose with long spreading scattered white hairs, sometimes adpressedly hairy only along the margins, the hairs often hidden by the margins of the lower glume and easy to overlook. Culms simple below, branched from the lower and upper nodes, mostly 40—60 cm. high, robust, pale-coloured, with old broad and papery sheaths at the base, culm-nodes tumid and protruding above the annular sheath-nodes; sheaths shorter than the internodes which are more or less scabrous, commonly very distinctly rough and more or less compressed, rather deeply striate and with hyaline mostly inrolled margins, ligule shortly ciliate, the auricles pubescent-ciliate, those of the few innovations long-bearded, the collar scabrous; blades flat at the base, soon becoming involute, nearly glabrous beneath, scabrous on the upper surface and along the margins, up to 20 cm. long or even longer, 2—4 mm. wide when expanded; panicle exserted, somewhat flaccid or more or less curved at the summit, with up to 10 cm. long branches which are more or less drooping or suberect, lower branches binate, the upper ones solitary, all naked at the base, axis of the panicle

scabrous, the axils of the branches shortly ciliate-pubescent, the pedicels very scabrous, subcompressed or subangulous and subclavate at the tips; spikelets golden-yellow, glumes slightly scabrous on the keels, the lower one 22 mm., the upper one 32 mm. long, inclusive of the awns; lemma with the shortly pilose or pubescent, acute, about 2 mm. long callus, up to 10 mm. long, the body somewhat compressed, not or scarcely narrowed above, finely punctulate, glabrous and smooth below, scabrous at the summit, column strongly twisted, 25—32 mm. long, awns erect, scaberulous, the central one up to 7 cm. long, the lateral ones about $6^1/_2$ cm. long. North Africa: Nubia and the French Sahara. . . . . **Aristida pallida Steudel**

Lower glume 3-nerved, the lateral nerves short but very prominent and anastomosing with the midnerve, not bifid at the apex, shortly awned only, the upper glume 1-nerved, bifid at the apex, with a 5 mm. long awn from the sinus and about $2^1/_2$ mm. long lateral setulae, glumes without long hairs, quite glabrous.
Caespitose erect perennial with rather few innovations, branched from the base and from some of the lower nodes, up to 40 cm. long, commonly shorter, elegant, terete, glabrous and smooth; sheaths slightly shorter than the internodes, glabrous and smooth, striate, tight, not slipping from the stems, ligule a shortly ciliate rim, auricles pubescent, those of the innovations long-bearded; blades narrow, convolute-setaceous, glabrous beneath, scaberulous on the upper surface, up to 20 cm. long or those of the innovations much shorter, about 1 mm. broad; panicle rather few-flowered, narrow, elongate, more or less interrupted especially at the base, the branches somewhat distant, rather short and few-flowered, binate or subsolitary at the summit, strictly erect or adpressed, not rarely all the branches with one spikelet, the branches geminate, one longer peduncled, the other nearly subsessile, the pedicels more or less scaberulous, subcompressed, shorter than the glumes; spikelets yellowish, tinged with brown, glumes lanceolate, glabrous, the lower long-acuminate, subulate, inclusive of the 2 mm. long awn about 15—17 mm. long, scabrous on the keel, the upper one subulate, inclusive of the 5 mm. long awn about 20—24 mm. long, smooth on the keel, the very fine lateral setulae closely adpressed; lemma smooth, inclusive of the callus 9 mm long, the callus about 2 mm. long, acute, densely hairy with a sharp, naked point; column mostly 25—30 mm. long, rarely shorter, strongly twisted, scaberulous, awns scabrous, about equal, or the central one somewhat longer, 6—7 cm. long. Philippine Islands. . . . . **Aristida tenuisetulosa Mez**

Plants smaller, more dwarf, the glumes and column shorter than in the type, the lower glume about 11—12 mm. long, the upper one 17—18 mm. long, the column only 15 mm. long. . . . . **var. arenarioides Henr.**

31. Column of awns about 4 cm. long; upper glume more than 2 cm. long.

Caespitose perennial, culms erect, simple, terete, glabrous, scaberulous, slightly striate, together with the panicle up to 50 cm. high, 1-noded, the node placed at about 1/8 of the length of the culm from the base of the plant; sheaths about as long as the internodes or slightly longer, tight, striate, scaberulous, ligule a ciliate rim, auricles long-bearded; blades linear, subulate, flat at the base, soon becoming convolute but not rigid, scarcely 1 mm. broad when expanded, greenish to glaucous, scaberulous beneath, densely hirtellous on the upper surface, up to 15 cm. long; panicle very narrow, elongate, strictly erect, interrupted below, together with the awns about 30 cm. long, the axis terete, striate, scaberulous and laterally grooved, the branches unequal, binate, the lower primary ones longer, exclusive of the awns 4—5 cm. long, 2-flowered, naked in lower 1/3 part, the secondary and upper branches shorter, 1-flowered, shortly pedicelled, the pedicels angulous and scabrous; spikelets pale-yellow, glumes firm, strictly erect, unequal, 1-nerved, the lower scabrous, scaberulous on the keel, 13—14 mm. long, chartaceous, slightly bidentate at the apex, shortly awned from the sinus, the upper one 22—24 mm. long, narrower, gradually acuminate and distinctly but shortly awned, the keel smooth; lemma tubulous, punctulate-scaberulous under a lens, mottled, about 9—10 mm. long, inclusive of the very acute, pungent, densely long-bearded about $2^1/_2$ mm. long callus; column firm, nearly smooth with scabrous margins, much twisted, awns scabrous, somewhat unequal, the central one up to 7 cm. long, the lateral ones about 6 cm. long. Australia: Central Australia to Queensland. . . . . **Aristida Muelleri Henr.**

Column of awns rather variable in length, but always much shorter than 4 cm., commonly 25—30 mm. long or not rarely shorter and about 22—23 mm. long; upper glume mostly shorter than 2 cm., mostly 15—18 mm. long, rarely slightly longer.

Slender caespitose, erect or geniculately ascending, elegant perennial, culms simple or slightly branched below, up to 40 cm. high, slightly compressed, striate and scaberulous; sheaths much shorter than the internodes, striate, scabrous like the internodes, ligule a ciliate rim, passing laterally into bearded auricles and a puberulous collar; blades

very narrow, convolute, up to 10 cm. long, acute, somewhat rigid, mostly erect, slightly scabrous beneath, scabrous and shortly pubescent on the upper surface; panicle exserted, 10–15 cm. long, very narrow, more or less interrupted at the base, more dense upwards, with a slender scabrous rhachis, the branches strictly erect and adpressed, 2—3-nate, somewhat distant, scabrous, the lower and longer ones mostly bearing 2 flowers, the upper ones and the shorter ones only 1-flowered, the upper branches solitary, the short erect pedicels scabrous, more or less compressed or angulous, subclavate; spikelets yellowish or brownish, glumes glabrous or minutely scaberulous or puberulous, acute, the lower 1-nerved or rarely with an additional side-nerve, 8—9 mm. long, sometimes up to 12½ mm. long, scarcely awned, the upper one rigid, convolute, 15—16 mm. long or not rarely 18–20 mm. long, and even slightly longer, very acute, not or scarcely awned; lemma chestnut, 7—8 mm. long inclusive of the callus, smooth below, somewhat scabrous at the summit, punctulate under a strong lens, the callus densely bearded especially on the margins, very acute, 2 mm. long with a prominent naked point; column strongly twisted, scabrous, the awns rather variable in length, subequal, 35—50 mm. long, sometimes up to 65 mm. long. Australia: From West Australia to Queensland, south to New South Wales. . . . . **Aristida Browniana Henr.**

(Is probably a hybrid between *Aristida Muelleri* and *Aristida arenaria*).

32. Glumes not awned, obtuse or acute to acuminate, the upper one if shortly awned the awn never from a bifid apex. . . . . 33.
Glumes awned, the upper one always more or less bifid at the apex, the lateral lobes well-developed, long and fine, rarely the summit of the upper glume shortly bifid, the lateral lobes less-developed and the awn from the sinus short. . . . . 35.

33. Lower glume at least 10 mm. long or longer . . . . . 34.
Lower glume only 6—7 mm. long.

Caespitose perennial, culms elegant, erect or ascending, glabrous and smooth, sheathed all along, somewhat branched, the branches panicle-bearing; sheaths glabrous, shorter than the internodes, the lower broader, with distinct hyaline margins, the upper ones narrower, ligule a minute ciliolate rim, auricles shortly pubescent; blades equally broad at the base, narrowly involute or setaceous, long-acuminate, scarcely ½ mm. broad when expanded, about 10 cm. long, glabrous beneath, scaberulous or shortly hairy on the upper surface; panicle about 10 cm.

long, linear-lanceolate, contracted but somewhat lax and subinterrupted, shortly exserted or not rarely sheathed at the base by the uppermost leaf, the axis glabrous, the branches rather thin, binate or subsolitary, erect, few-flowered; spikelets glabrous, shortly pedicelled, the pedicels angulous and puberulous, subclavate at the tips, glumes very unequal, linear-lanceolate, obtuse, the lower 6—7 mm. long, 1-nerved, very shortly and abruptly mucronate, keeled, the keel scabrous, upper one 1-nerved, 13—14 mm. long, smooth, not keeled, minutely bidentate at the apex; lemma smooth about 6 mm. long, inclusive of the very acute, densely hairy, $1^1/_2$ mm. long callus, column glabrous below, scabrous upwards, about 20 mm. long, strongly twisted; awns about equal or mostly somewhat unequal, the central one about $5^1/_2$ cm. long, the lateral ones $4^1/_2$ cm. long. North East Africa: Somaliland. . . . . **Aristida stenophylla Henr.**

34. Glumes very unequal, the lower 9—12 mm. long, the upper one 18—20 mm. long, lemma with callus 6 mm. long, awns mostly up to 6 cm. long, rarely shorter.

Densely caespitose, rather small, not more than 15 cm. high, with intravaginal innovations; culms nearly simple, strictly erect or slightly ascending, scabrous, subterete, slightly striate or grooved laterally; sheaths glabrous or scaberulous, striate, slightly compressed or subterete, shorter than the internodes or sometimes as long as or longer, ligule a short ciliolate rim, auricles long-bearded, collar glabrous; blades very fine, quite convolute, setaceous or almost filiform, more or less curved or flexuous, pointed, 5—8 cm. long, or rarely shorter, scabrous on both surfaces; panicle very narrow, linear-lanceolate, scarcely branched or not rarely reduced to a simple raceme, about 5—8 cm. long exclusive of the long awns, sometimes longer than half the length of the whole plant, the lower branches 2—3-nate, strictly erect or adpressed, the longer ones 2-flowered, the shorter ones bearing but a single spikelet, the pedicels scabrous, angulous; spikelets erect, purplish, glumes glabrous, scabrous on the keels, narrowly linear to lanceolate, finely pointed, 1-nerved, or the lower one sometimes with very minute additional nerves, the tips of the glumes sometimes minutely bidentulate; lemma finely punctulate under a lens, about 6 mm. long, inclusive of the densely hairy, sharp-pointed, 2 mm. long callus; column always less than 2 cm. long, mostly 10—15 mm. long or sometimes up to 17—18 mm. long, strongly twisted, the awns very fine, scabrous, nearly equal, up to 6 cm. long. Australia. . . . . **Aristida arenaria Gaudich.**

Sheaths with spreading long hairs, blades with long, weak, tubercle-based hairs. . . . . **var. hirsuta Henr.**

Glumes not so very unequal, the lower 15—17 mm. long, the upper one 17—19 mm. long, lemma with callus 8—9 mm. long, awns much shorter, abouth $3^1/_2$—4 cm. long.
Caespitose erect perennial, rather robust but very fragile, pale-glaucous, culms erect or somewhat ascending, about 30—40 cm. high inclusive of the panicles, much branched from nearly all the nodes, few-noded, culm-nodes swollen and protruding above the slightly annular sheath-nodes, the internodes terete, nearly smooth, slightly or scarcely striate; sheaths of the lowermost leaves pale or straw-coloured, glabrous and smooth with hyaline margins, the upper ones tight or not rarely slipping from the stems, subterete or subcompressed, slightly striate and nearly smooth, much shorter than the internodes, mostly only half the length of them, ligule a short ciliolate rim, auricles pubescent only, those of the few innovations more or less distinctly bearded; blades terete, subjunciform, rigid, erect, pale-greenish or glaucous, narrowed to a subpungent tip, up to 15 cm. long or those of the lateral branches much shorter and sometimes only 3 cm. long, about 1 mm. broad when expanded, glabrous beneath, densely hirtellous on the upper surface; panicles rather depauperate especially those of the lateral branches, exserted, contracted but lax and more or less interrupted, 10—15 cm. long, the lateral ones much shorter and narrower, axis of the panicle terete or subcompressed, slightly scaberulous, branches binate or solitary, erect and adpressed, the lower axils bearded or distinctly ciliate-pubescent, all the branches bearing but a single spikelet, the longer ones with a pedicel nearly as long as the glumes, the other ones nearly subsessile, the pedicels angulous or slightly compressed above, scaberulous and subclavate at the tips; spikelets pale or greenish, erect, glabrous, the glumes lanceolate, acuminate, keeled, 1-nerved, narrowed above but scarcely awned, more or less obtuse at the very tip, the upper glume smooth on the keel; lemma linear-lanceolate, nearly smooth, rounded at the base and rather suddenly contracted into the acute, densely, but shortly hairy, about 2 mm. long callus, the hairs not surpassing the very base of the lemma, which is about 8—9 mm. long inclusive of the callus, the body gradually narrowed above into the 10—13 mm. long, strongly twisted, firm column, awns filiform or capillary, more or less spreading, scaberulous, the central one $3^1/_2$—$4^1/_2$ cm. long, the lateral ones $^1/_2$ cm. shorter. Madagascar . . . . . **Aristida ambongensis Camus**

35. Upper glume very shortly bifid at the apex, with short lateral lobes and a short, only 1 mm. long awn from the sinus. . . . . 36.
Upper glume more or less, mostly deeply bifid at the apex, with long, narrow, lateral lobes and a long awn from the sinus. . . . . 37.

36. Culms stout and robust, 2—3 mm. thick, lower glume 3-nerved, about 7 mm. long, half as long as the upper one, the lemma with the densely hairy, acute callus, up to 7 mm. long, the slightly twisted scabrous column 12 mm. long.
Perennial, from a thick rootstock, much branched from the base and from the lower nodes, up to 1 meter high, inclusive of the long, drooping panicle; culms erect, many-noded, the branches panicle-bearing, internodes about equal, terete, striate, somewhat pruinose, the lowermost naked, subterete or flattened laterally; lower sheaths brown, shorter than the internodes, without blades, the upper ones longer than the internodes, the culm-nodes very tumid, protruding above the brown sheath-nodes, upper sheaths slightly compressed, striate, finely hirtellous between the nerves, ligule a short ciliolate rim, auricles rather long-bearded; blades narrow, convolute, flat at the very base, up to 30 cm. long, erect, gradually narrowed to the long setaceous point, scabrous on both surfaces, blades of the upper leaves much shorter; panicle very lax about 30 cm. long, branches at first erect, afterwards spreading and drooping, binate or semi-whorled, up to 15 cm. long, naked at the base, bearing at the summit erect branchlets with more or less adpressed spikelets, branches and pedicels scabrous, the latter shorter than the glumes or the terminal ones as long as or longer, subtriquetrous, tips slightly clavate; spikelets brownish, glabrous, glumes very unequal, scabrous on the keel, the upper narrower, 1-nerved, smooth on the keel, about 15 mm. long, slightly bifid at the summit, with a short awn from between the small lobes, callus about $1^1/_2$ mm. long with an acute naked point, lemma slightly swollen, narrowed upwards, scabrous especially in upper part, column very fine; awns about equal, the lateral ones about 6 cm. long, the central one somewhat longer, up to $6^1/_2$ cm. long North East Africa: Somaliland. . . . . .
. . . . . **Aristida Paoliana Henr.**

Culms elegant, about 1 mm. thick, many from a tuft; lower glume 1-nerved, about 10 mm. long, more than half as long as the upper one; lemma with the densely hairy, very acute callus, 10—11 mm. long, the strongly twisted scabrous column 16—20 mm. long.
Densely caespitose, up to 60 cm. high perennial, inclusive of the about 15 cm. long panicle, culms strictly erect, 3—5-noded, branched from

nearly all the nodes, the branches elongate and panicle-bearing, internodes about equal, terete, smooth, slightly striate, the lowermost naked, the sheaths delapsed, the upper ones longer than the sheaths, culm-nodes tumid, protruding above the annular dark sheath-nodes; sheaths somewhat compressed, striate, glabrous, ligule obsolete, a minute ciliolate rim, auricles puberulous or ciliolate; blades very narrow, filiform, convolute throughout, erect or somewhat spreading, glabrous beneath, scabrous on the upper surface, very acute, those of the innovations up to 20 cm. long, those of the upper leaves much shorter, 3—7 cm. long; panicles narrow, spiciform but not dense, more or less interrupted, with erect few-flowered branches, the branches 2—3-nate, bearing 2 or commonly but a single spikelet, branches and pedicels smooth or slightly scaberulous, the pedicels about 6 mm. long; spikelets pale or greenish, glabrous, glumes 1-nerved, acute or shortly awned, the upper one about 18 mm. long, lemma nearly glabrous with a $2^1/_2$ mm. long callus; awns capillary, about equal, 50 mm. long or the central one 55—60 mm. long. South Africa: Transvaal to Delagoa Bay.
. . . . . **Aristida graciliflora Pilger**

37. Glumes glabrous and smooth all over. . . . . 38.
Glumes scabrous, the upper one moreover with scattered long hairs on the back at the middle or only near the margins.
Culms simple below, branched from some of the lower and upper nodes, up to 60 cm. high, glaucous, dark-coloured or purplish; sheaths at the base broad, scale-like, papery, many-nerved, straw-coloured, with hyaline margins, those of the culm-leaves shorter than the slightly striate, minutely scaberulous or smooth internodes, slipping from the stems, ligule a minute ciliolate rim, auricles densely ciliate; blades convolute, filiform, glabrous beneath, scabrous on the upper surface and along the margins, 10—20 cm. long; panicles strictly erect, exserted, 10—15 cm. long, narrow, contracted, purplish, the lower branches subfascicled, the upper binate, the longer branches naked at the base, bearing 2—5 spikelets, the shorter branches 1—2-flowered, axis of panicle nearly smooth, axils not bearded, minutely puberulous, branchlets and pedicels scaberulous, the tips of the pedicels subclavate; glumes minutely pubescent or scabrous all over, 1-nerved, the nerves hispidulous, lower one not bifid, inclusive of the 2—$2^1/_2$ mm. long awn, up to 16 mm. long, the upper about as broad as the lower one, deeply bifid at the apex, inclusive of the 10 mm. long awn, up to 26 mm. long, the lateral lobes very fine, 3—4 mm. long, central part of the upper glume with adpressed white hairs near the margins, the hairs deciduous; lemma punctulate under a strong lens, about 12 mm. long

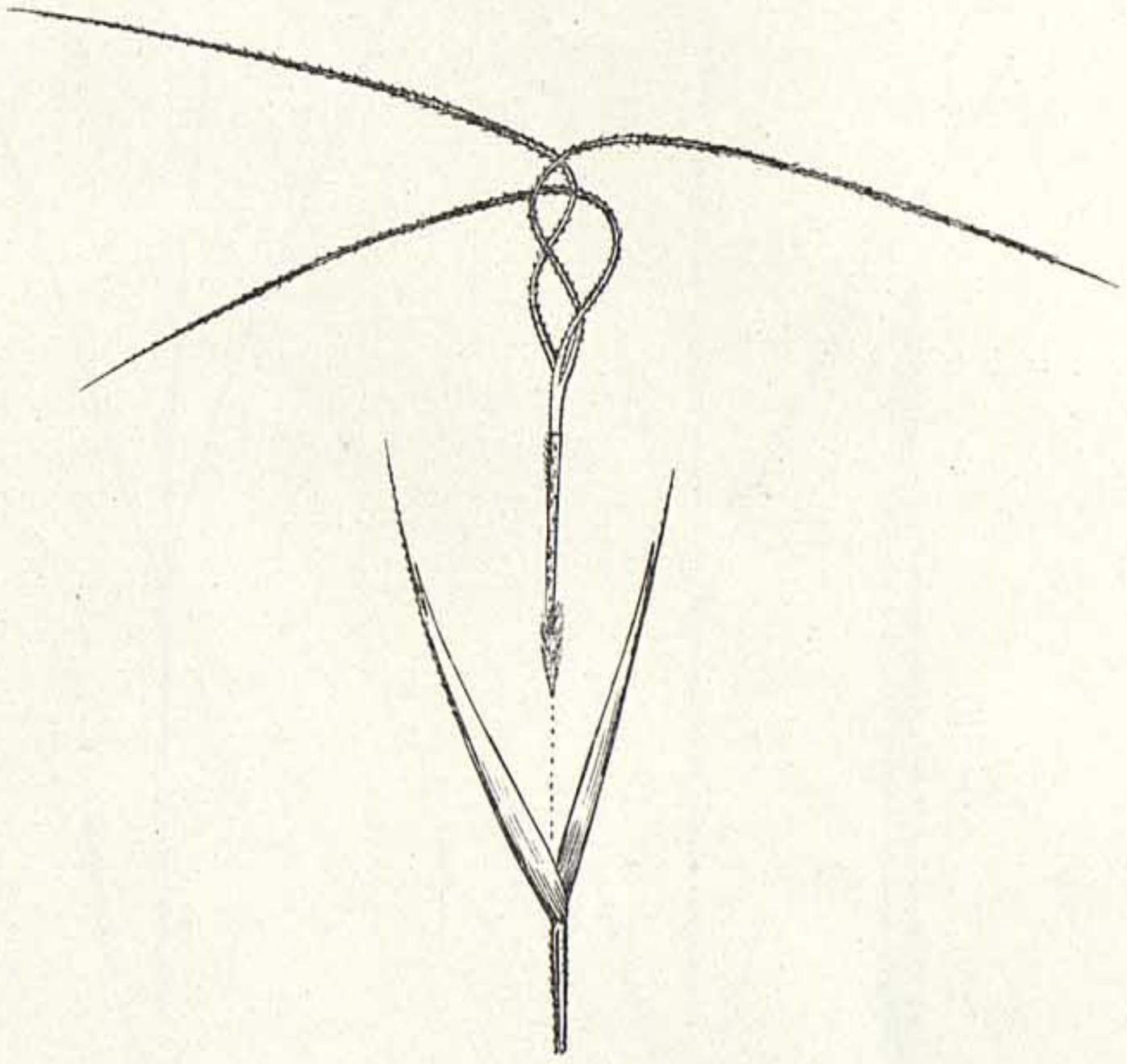
inclusive of the 2 mm. long, acute, hairy callus, the column strongly twisted, 18—20 mm. long; awns erect or slightly spreading, nearly equal, scabrous, about 60 mm. long. Southern Palestine. . . . . **Aristida Sieberiana Trin.**

38. Plants robust with stout culms, much longer than 50 cm. . . . . 39.
Plants not robust, elegant, with slender, thin culms, mostly not over 15 cm. high. . . . . See **A. tenuisetulosa var. arenarioides Henr.**

39. Lower glume rather broad, with the 4 mm. long awn up to 13 mm. long, upper glume with a deeply bifid apex, inclusive of the 4 mm. long awn up to 17 mm. long, the lateral lobes about $2^1/_2$ mm. long; lemma with the callus 10 mm. long, the awns more than 45 mm. long, mostly up to 50 mm. long or slightly longer.
Robust, loosely caespitose perennial, simple below, branched from the lower and upper nodes with old, glabrous, scale-like sheaths at the base; sheaths shorter than the glabrous, nearly smooth internodes, slipping from the stems, glabrous, striate, with hyaline margins, culm-nodes tumid, protruding, ligule a ciliate membrane, auricles long-bearded; innovations short, the sheaths with long hairs at the summit, the auricles and collar more densely hairy, blades of innovations shorter than those of the culm-leaves, the latter convolute and filiform or flat at the very base, acute, up to 20 cm. long, glabrous and smooth beneath, scabrous on the upper surface; panicle about 20 cm. long, erect, somewhat contracted but rather loose, the branches somewhat spreading, axis glabrous, nearly smooth, the axils of the branches without hairs; glabrous, branches binate or the uppermost ones solitary, naked at the base, the longer ones bearing 3—5 spikelets, the shorter ones with 1—2 flowers, branchlets and subclavate pedicels slightly scabrous; lemma smooth, the densely hairy acute callus about 2 mm. long, the column loosely twisted, scaberulous, awns scabrous, erect or somewhat spreading.
Africa: Southern Tunis and Senegambia to Gold Coast, Togo and Kamerun. . . . . **Aristida longiflora Schumacher**

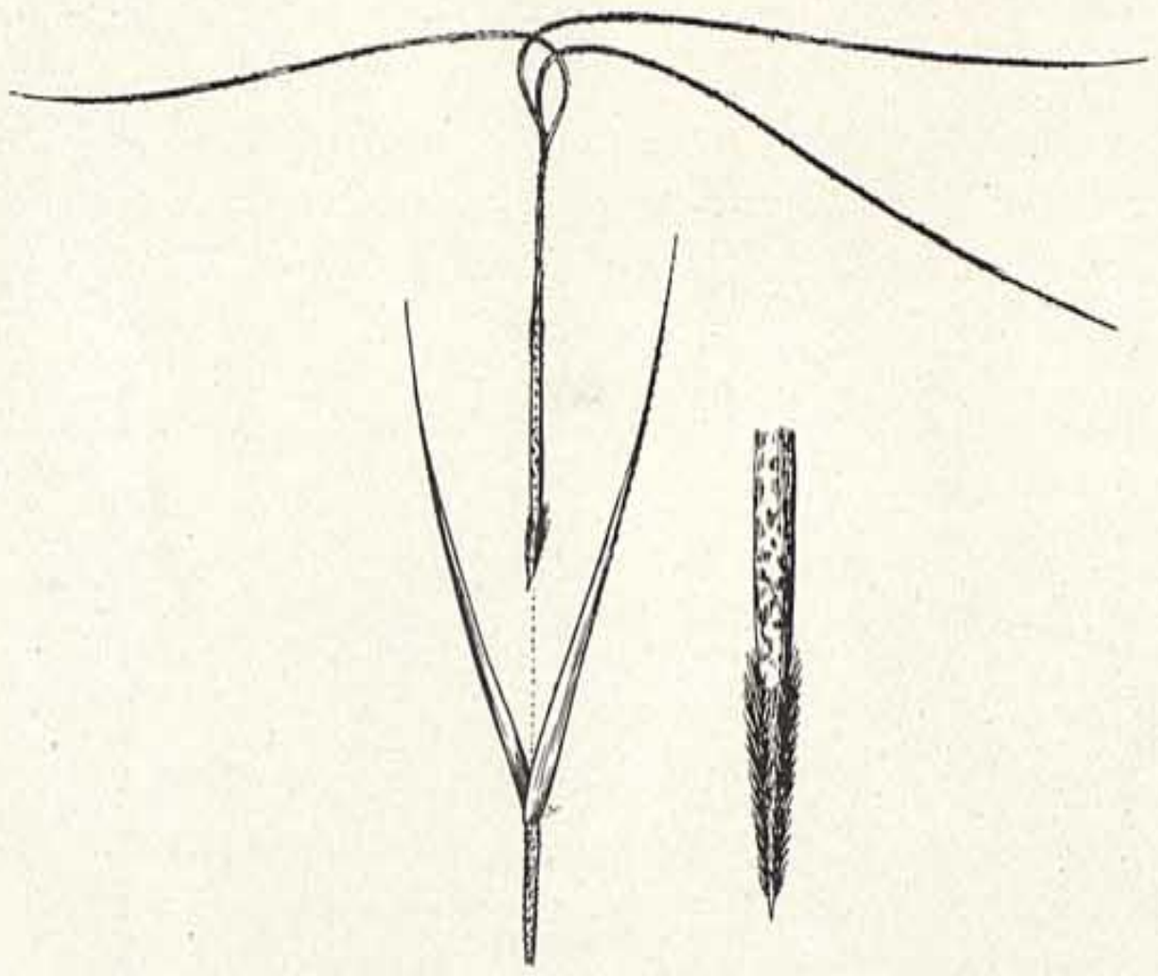
Lower glume narrower, inclusive of the 2 mm. long awn up to 9 mm. long, upper glume not so deeply bifid, the lateral lobes about 1 mm. long, inclusive of the 3 mm. long awn from the sinus, about 14 mm. long; lemma with the callus 7 mm. long, the awns less than 40 mm. long, mostly 35 mm. long or slightly longer.
Caespitose, 75—90 cm. high, strictly erect perennial, culms many in a tuft, branched nearly from all the nodes, terete or slightly compressed;

lower sheaths reduced to broad yellow scales, upper ones shorter than the glabrous, nearly equal internodes, slipping from the stems, glabrous and smooth, culm-nodes swollen, protruding, ligule a very short, scarcely ciliolate rim, auricles glabrous or minutely puberulous; blades involute, narrow, up to 30 cm. long, filiform, erect, acute, subpungent, glabrous beneath, scabrous on the upper surface and along the margins; panicles narrow, subspiciform, shortly exserted, 20—25 cm. long, with smooth axis and axils, branches filiform, erect, somewhat distant, the lower ones up to 5 cm. long, the upper ons gradually becoming shorter, 2—3-nate, the longer ones naked at the base and bearing 3—5 spikelets, the shorter ones few-flowered, the lateral flowers shortly pedicelled, the other ones with pedicels as long as the glumes, the branchlets and pedicels scabrous; glumes narrow, the lower scabrous on the keel; lemma smooth, punctulate under a strong lens, the densely but shortly hairy callus, about 2 mm. long, the strongly twisted scabrous column 10—12 mm. long, the awns scaberulous, erect or slightly spreading. South East Africa: Mozambique. . . . . **Aristida ramifera Pilger**



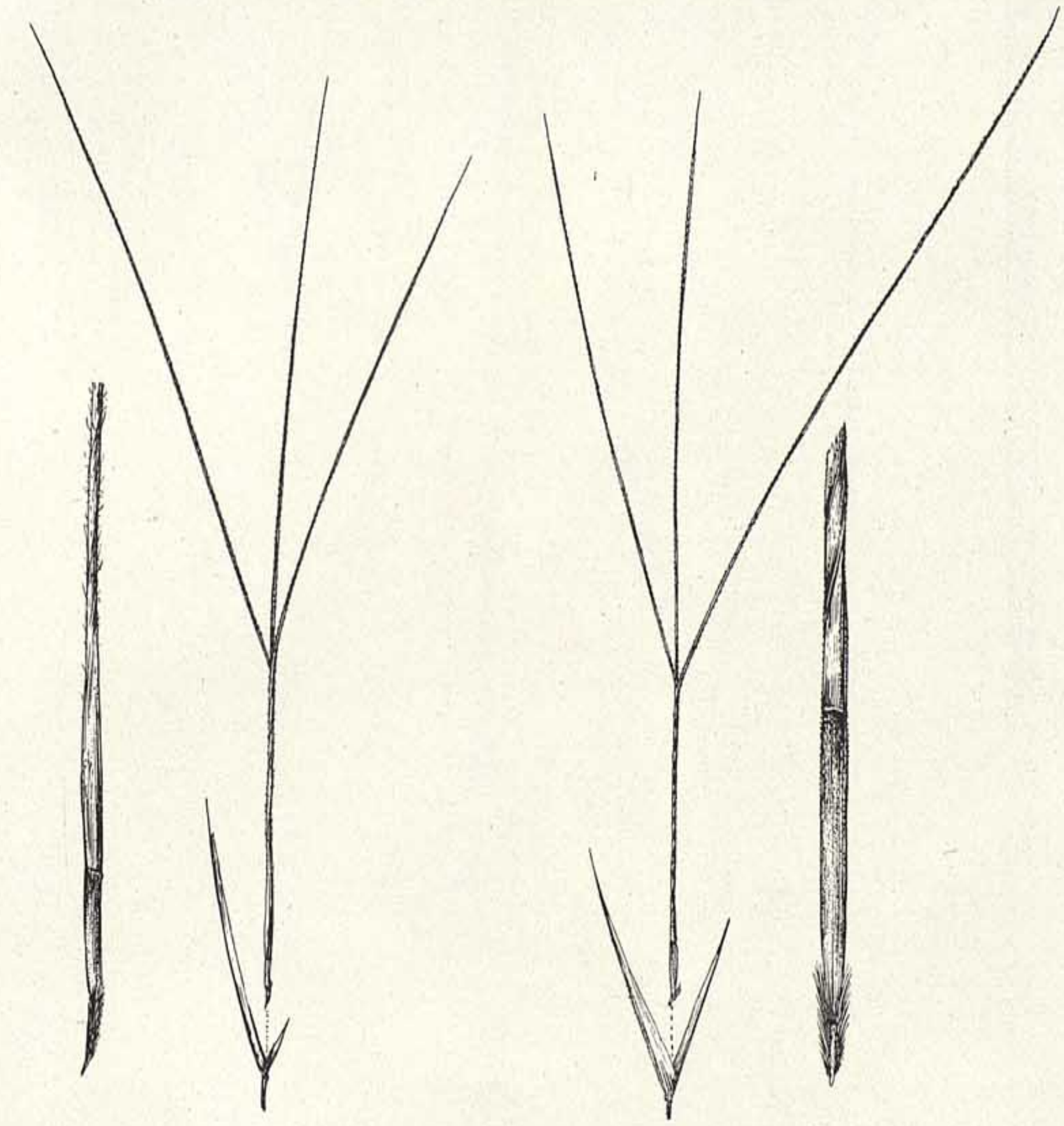
×2

ARISTIDA DESMANTHA Trinius et Ruprecht.



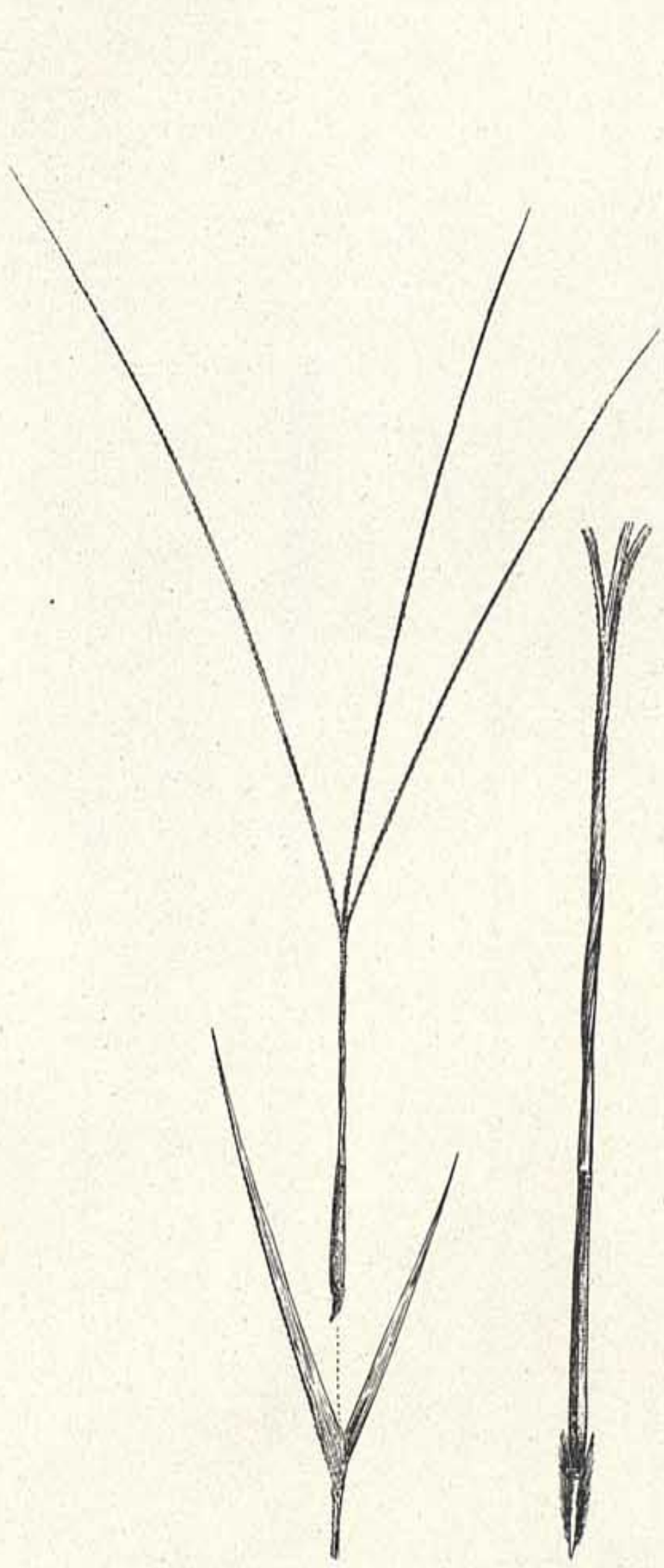
×1⅓ ×4

ARISTIDA TUBERCULOSA Nuttall.



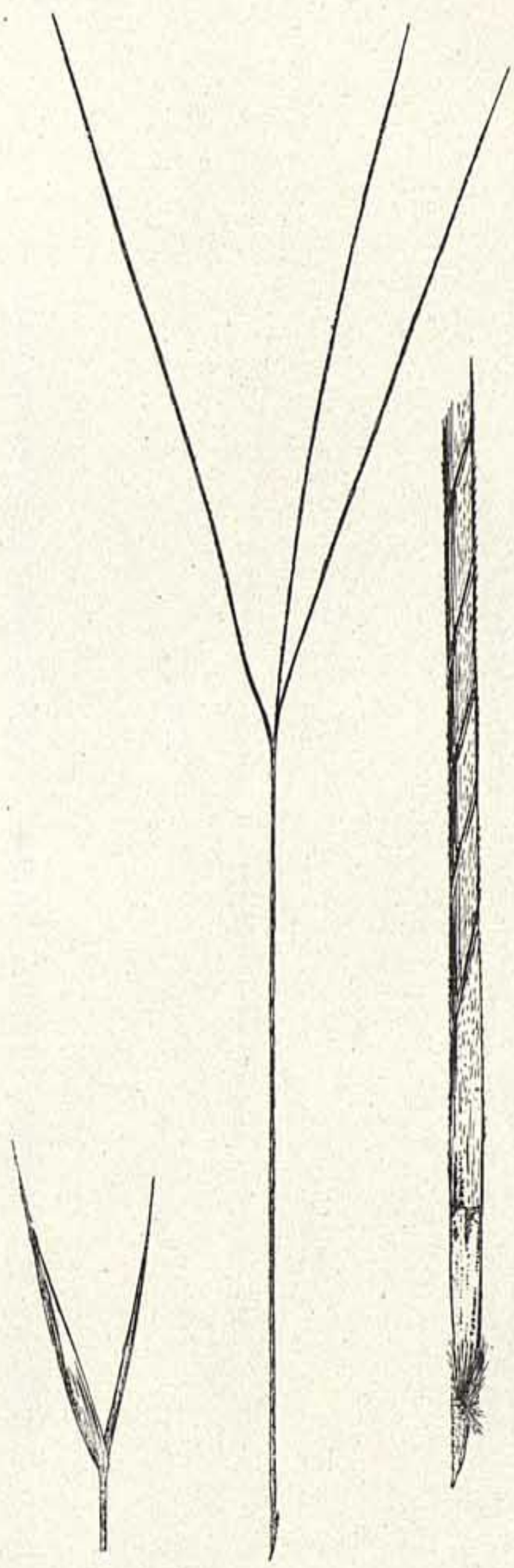
×4 ×1 ×1 ×6

ARISTIDA STOCKSII (Hook. f.) Domin. ARISTIDA POLYCLADOS Domin.



×2⅔ ×6⅔

ARISTIDA ROYLEANA Trinius et Ruprecht.



×1⅓ ×1⅓ ×4

ARISTIDA FUNICULATA
Trin. et Ruprecht.

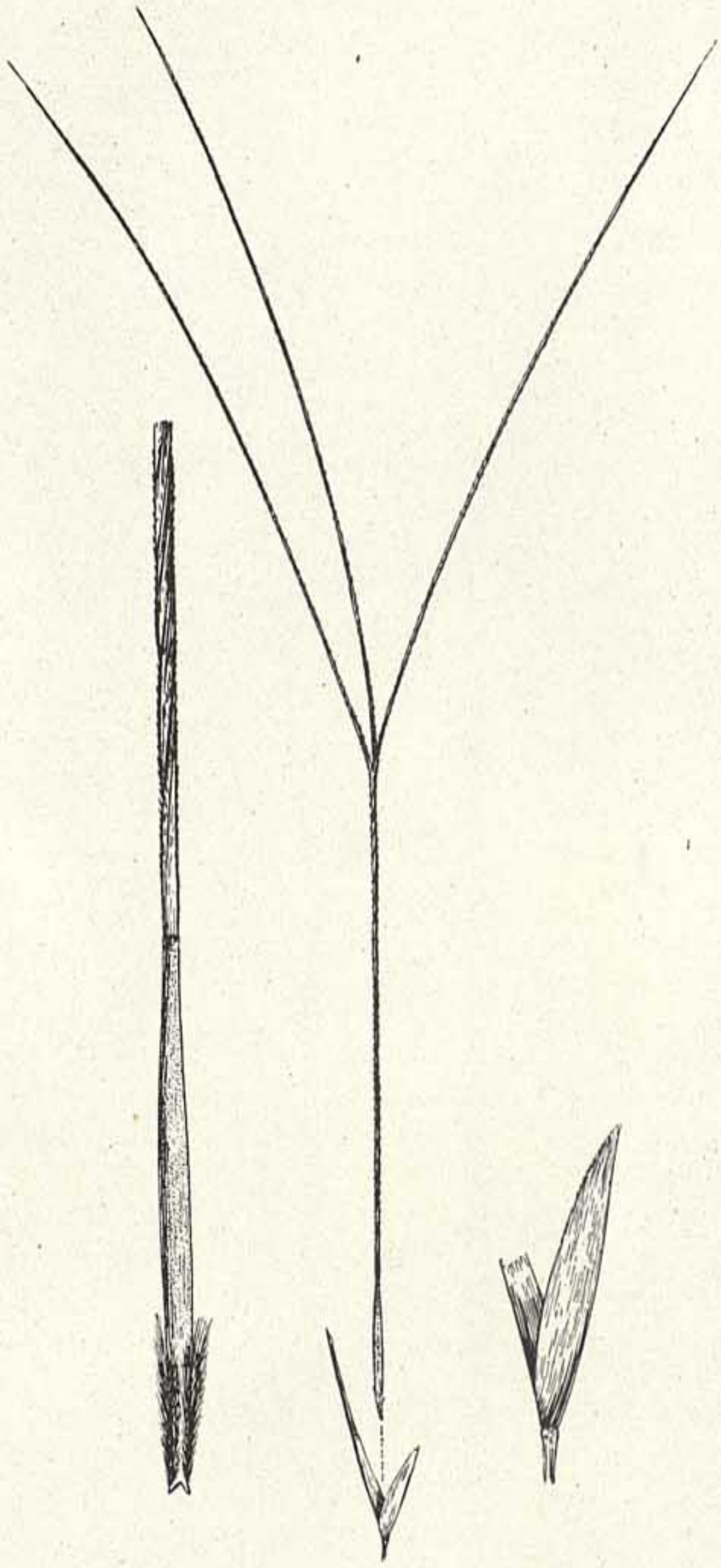


×⅔ ×7 ×2⅔ ×10 ×2½ ×5⅓

ARISTIDA KERSTINGII Pilger.

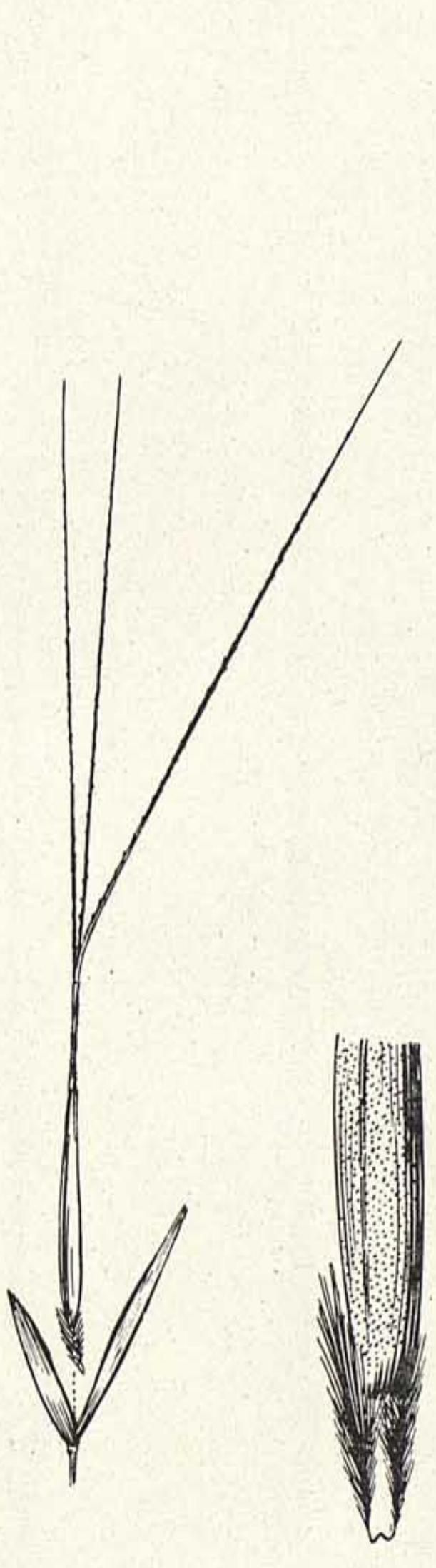
ARISTIDA HYSTRICULA Edgeworth.

ARISTIDA SPECTABILIS Hackel.



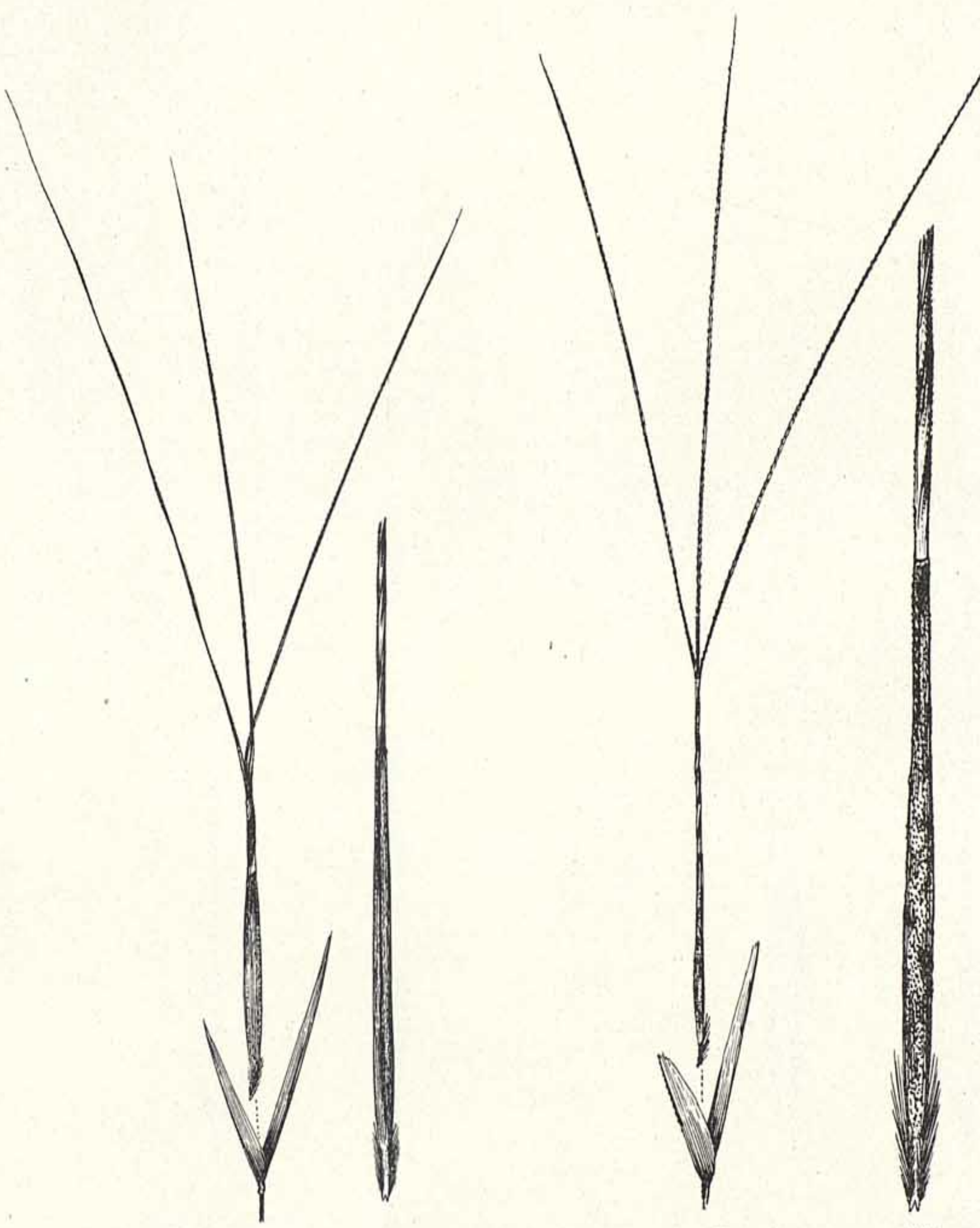
$\times 5\frac{1}{3}$ $\times 1\frac{1}{3}$ $\times 4$

ARISTIDA STIPOIDES Lamark.



$\times 3$ $\times 15$

ARISTIDA
DASYDESMIS (Pilger) Mez.

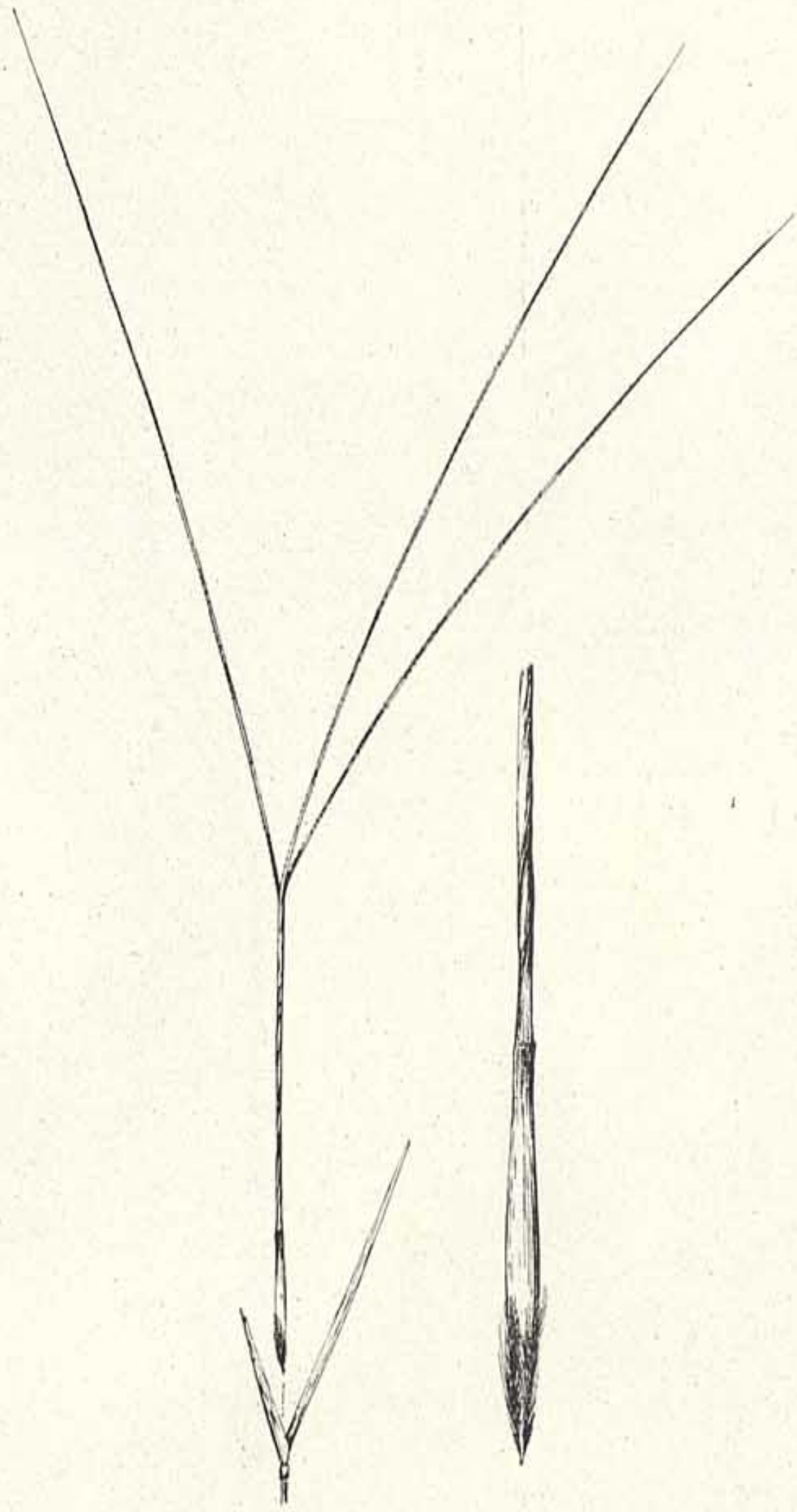


×2 ×4

ARISTIDA VESTITA Thunberg.

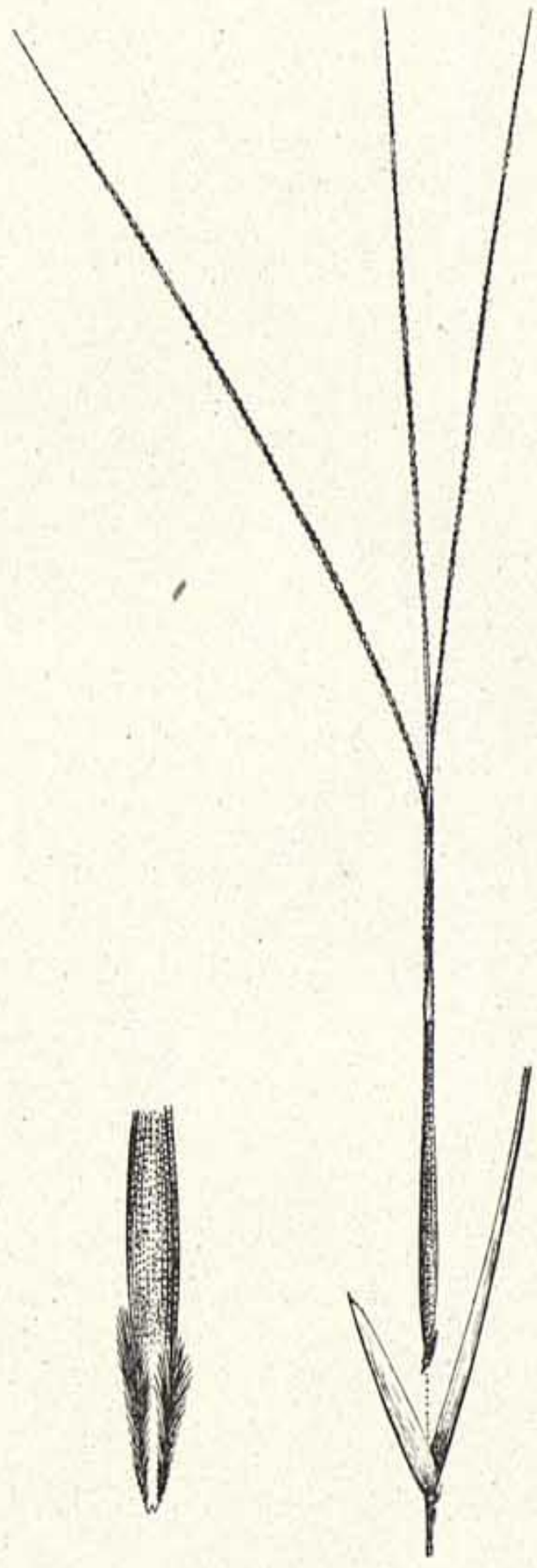
×3 ×9

ARISTIDA MERIDIONALIS Henrard.



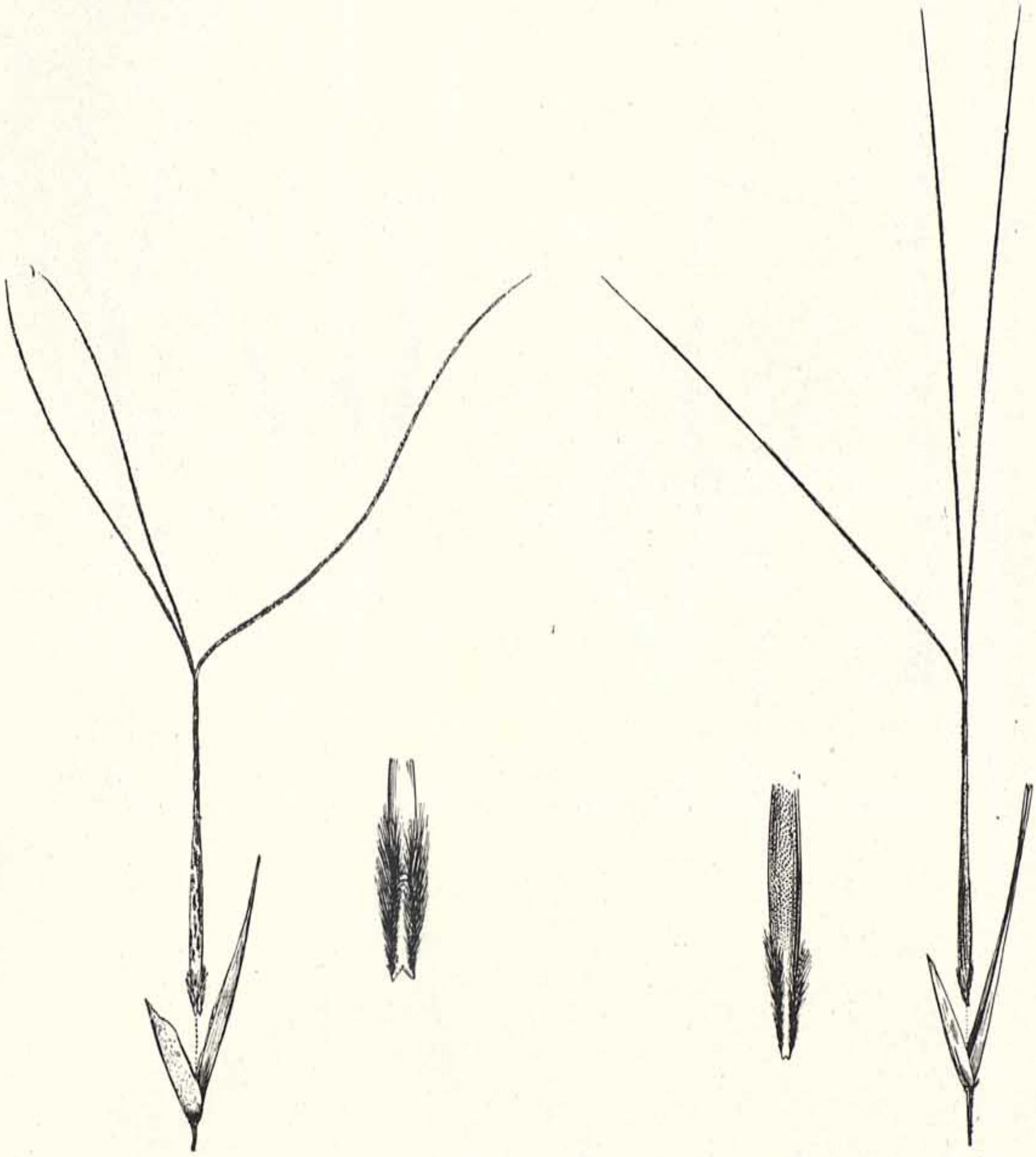
×2 ×6⅔

ARISTIDA PENINSULARIS Hitchcock.



×10 ×2

ARISTIDA DIFFUSA Trinius.



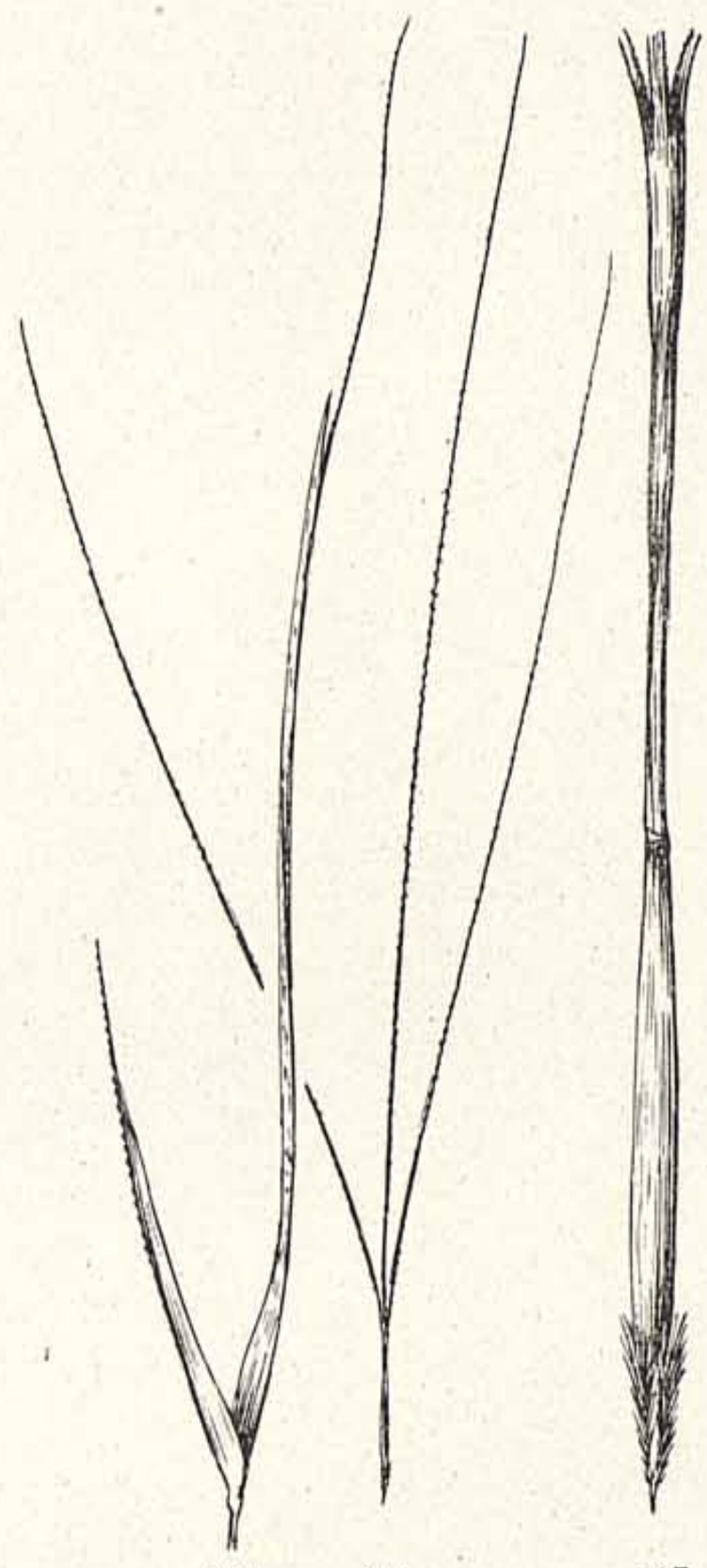
×3⅓ ×14
ARISTIDA ENGLERI Mez.

×5 ×2
ARISTIDA DIFFUSA Trin.
var. Eckloniana (Tr. et Rupr.) Henr.



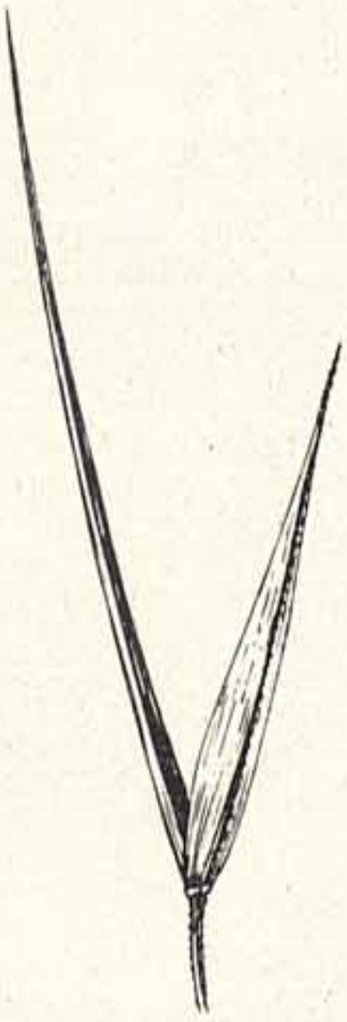
×1 ×5

ARISTIDA TRITICOIDES Henrard.



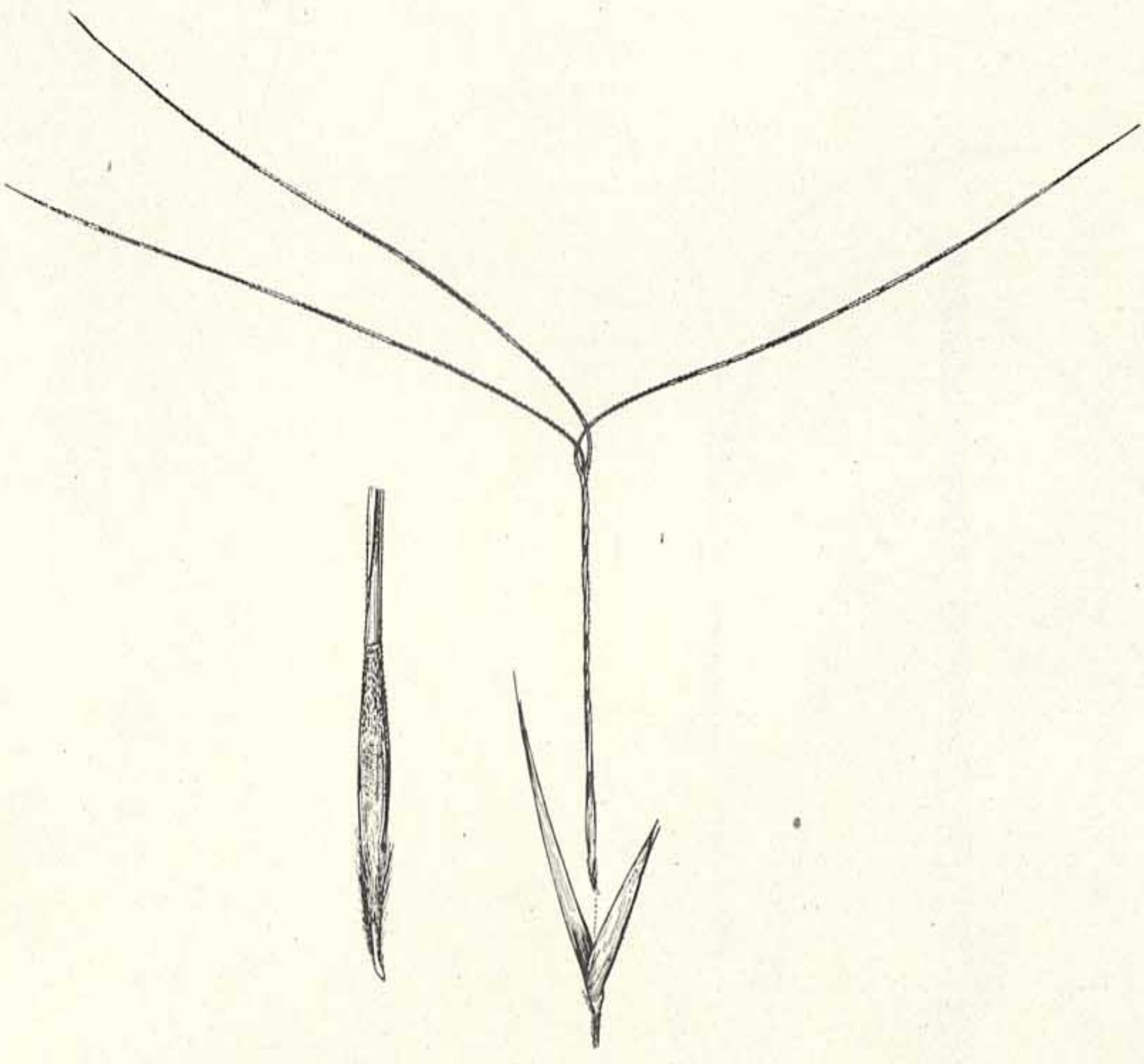
×3 ×1 ×7

ARISTIDA PROTENSA Henrard.



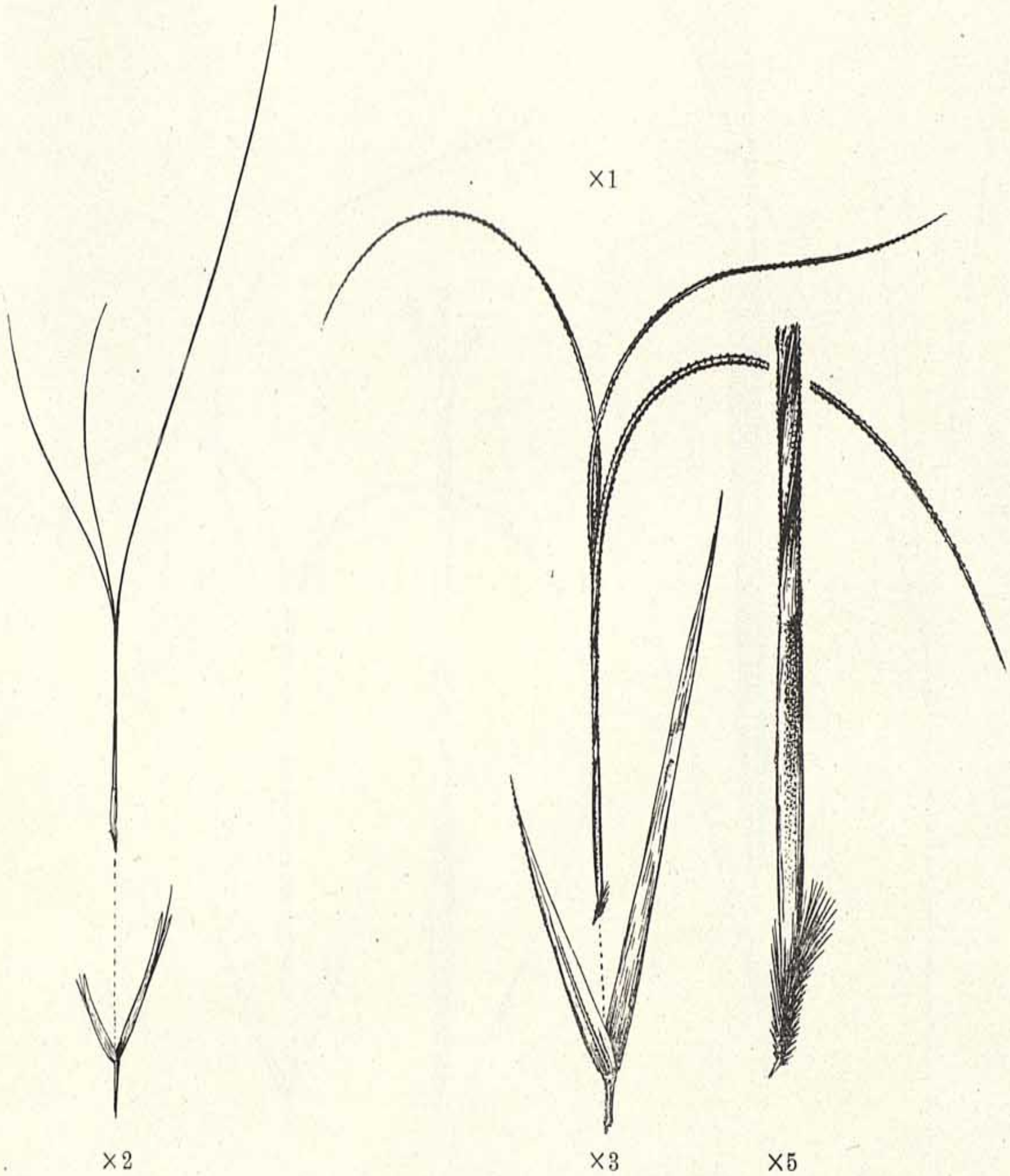
×3

ARISTIDA MOLLISSIMA Pilger.



×5 ×2

ARISTIDA CALIFORNICA Thurber.



ARISTIDA
KELLERI Hackel.

ARISTIDA SUPERPENDENS Domin.

Plate XXXIII.



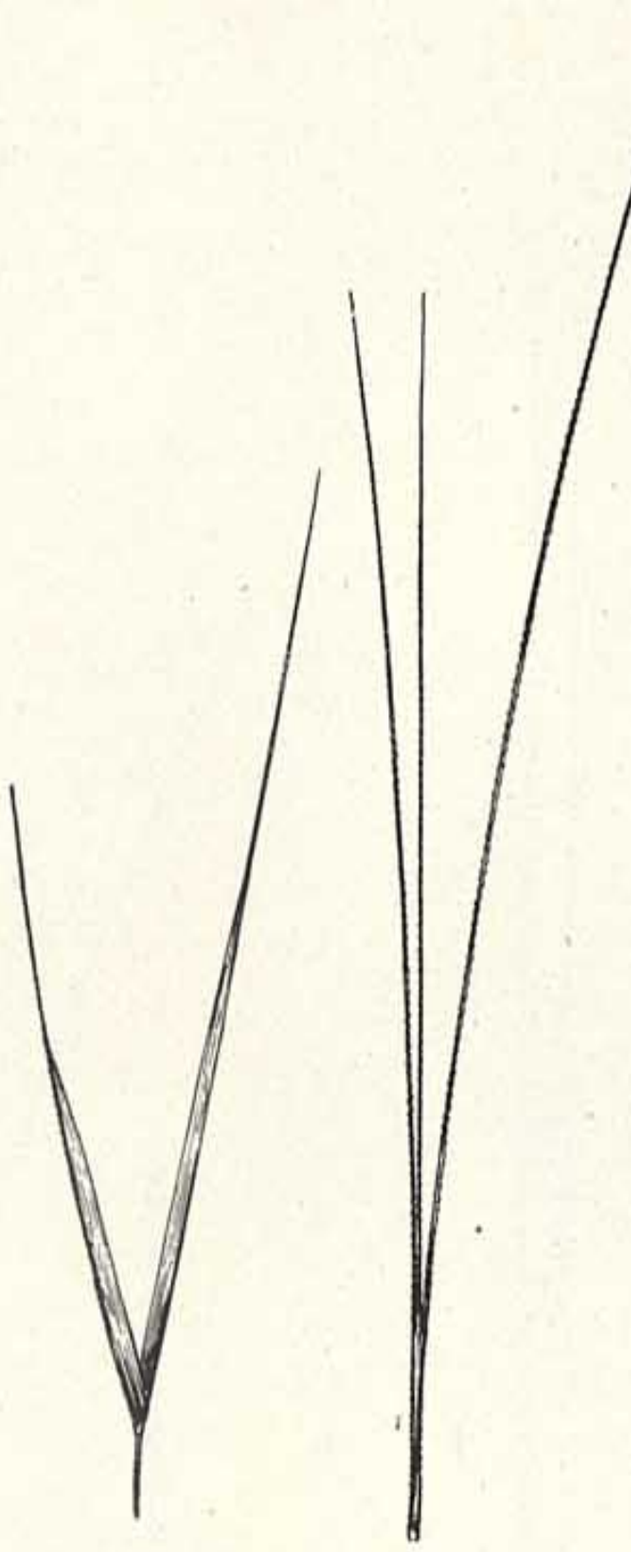
×2 ×4

ARISTIDA HIRTA Domin.

×5⅓

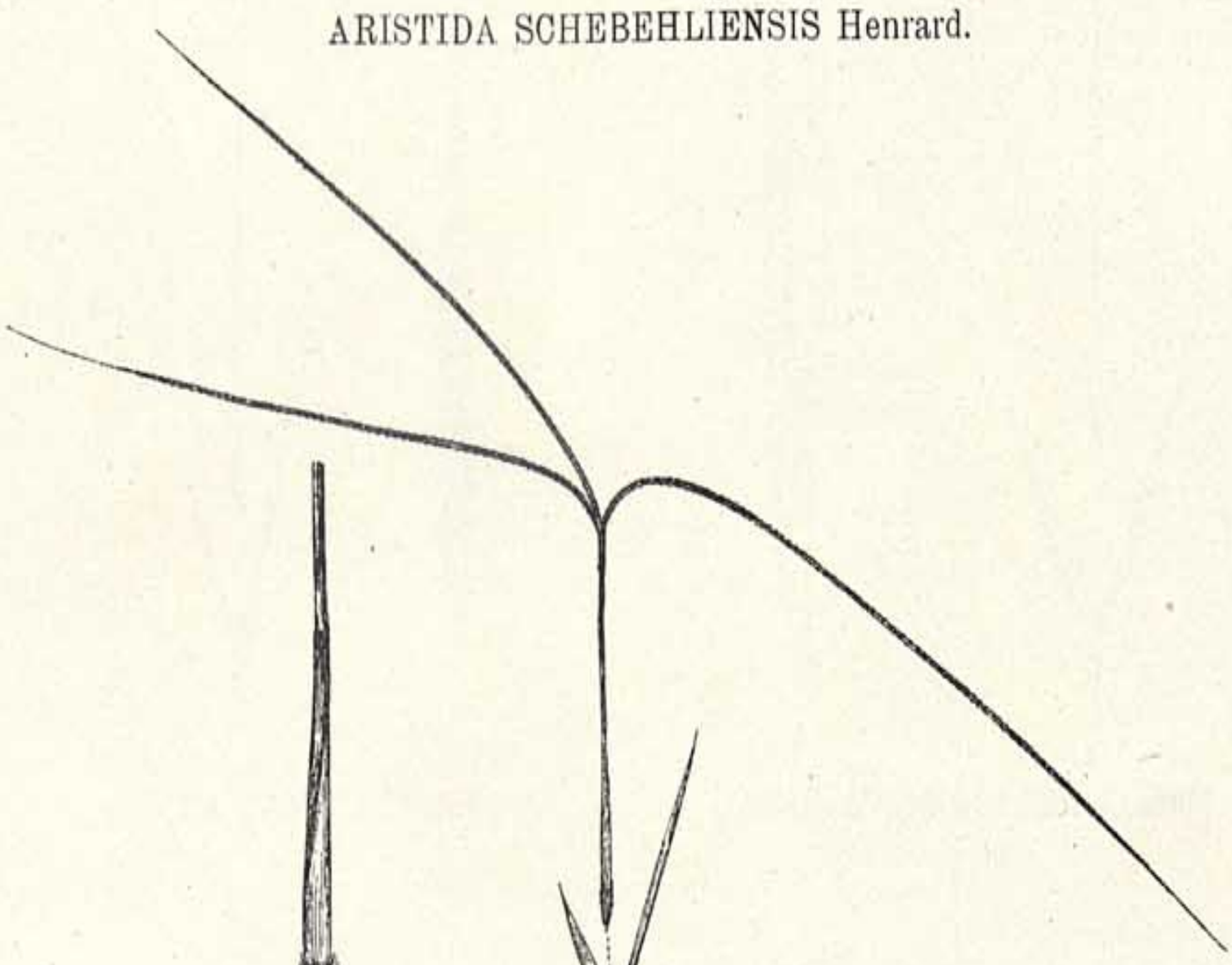
×1⅓ ×⅔

ARISTIDA HYGROMETRICA
Rob. Brown.



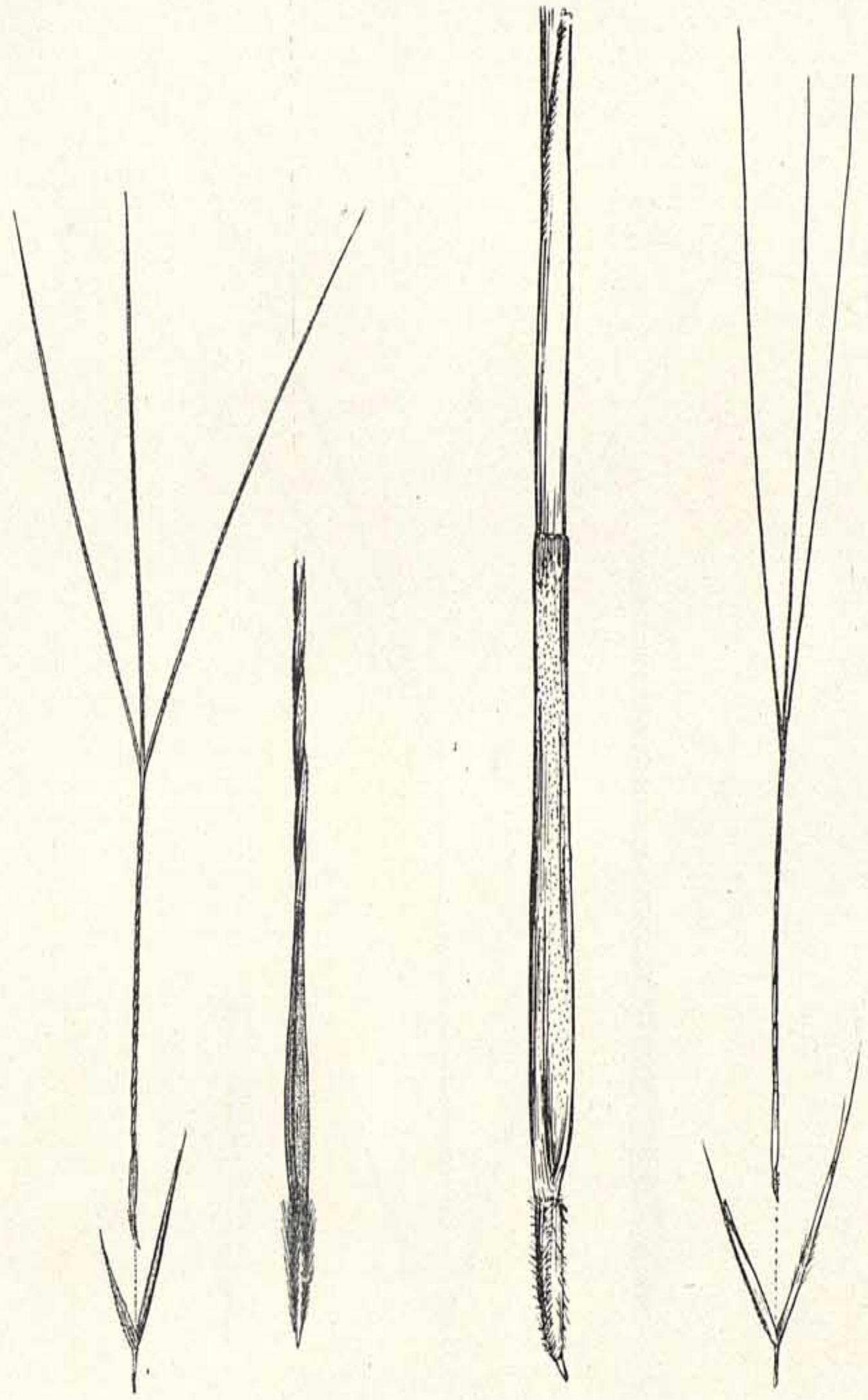
×2 ×1 1/3

ARISTIDA SCHEBEHLIENSIS Henrard.



×6 ×2

ARISTIDA GLABRATA (Vasey) Hitchcock.

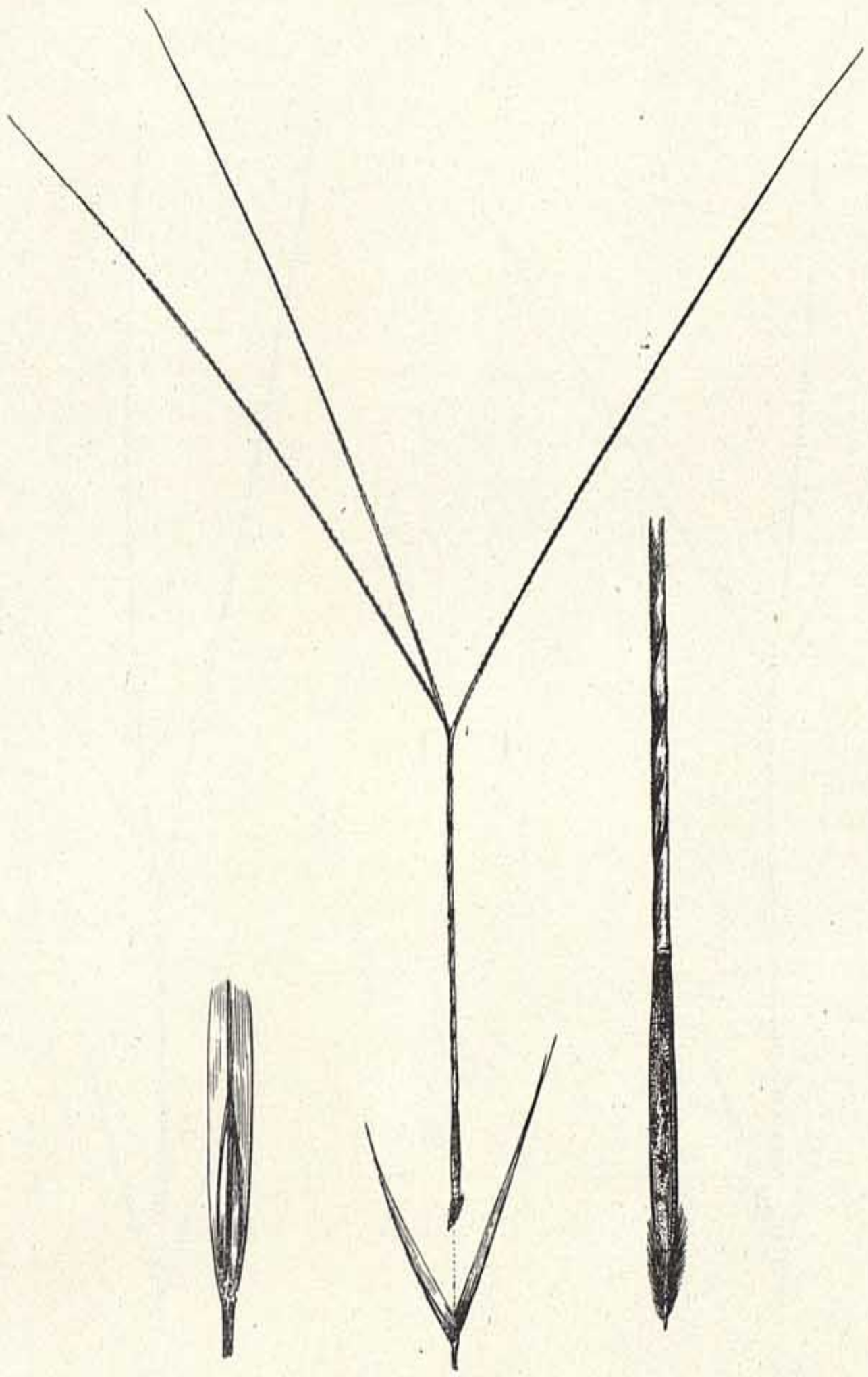


×1 ×4⅔

ARISTIDA STIPITATA Hackel.

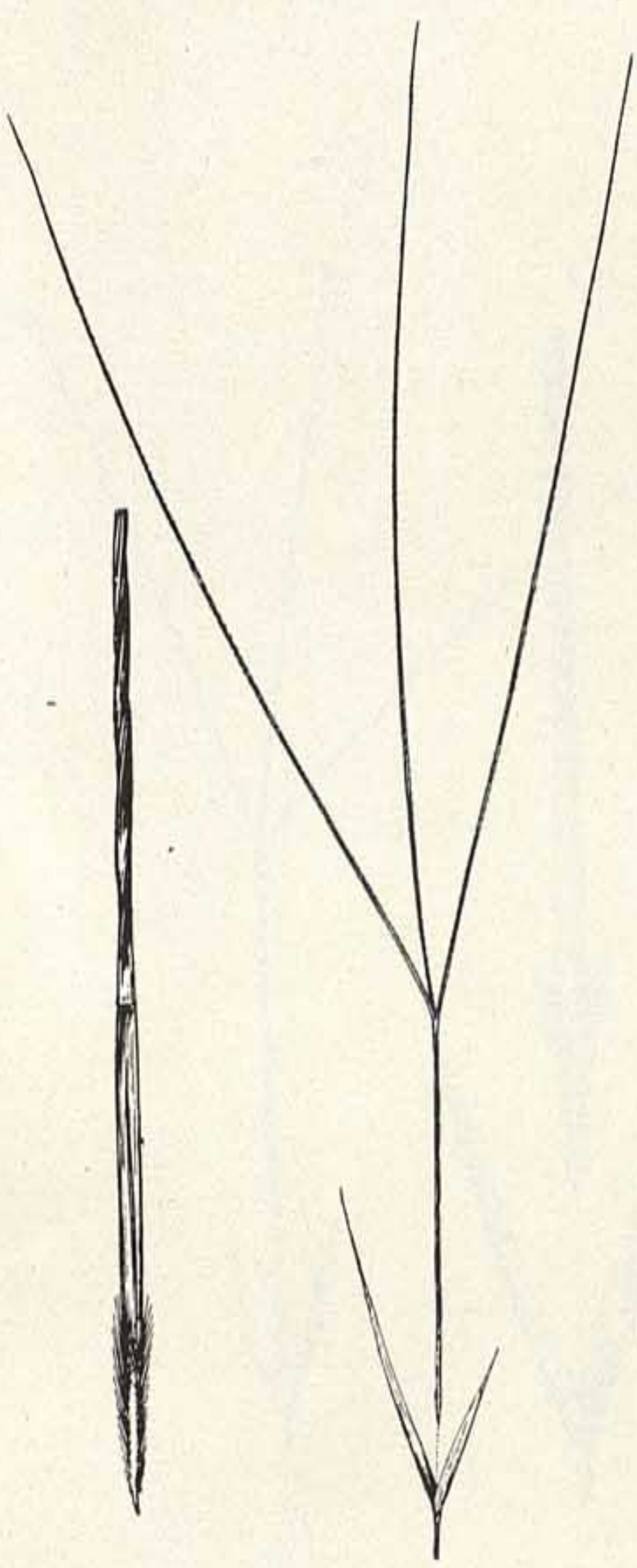
×8 ×1

ARISTIDA PALLIDA Steudel.



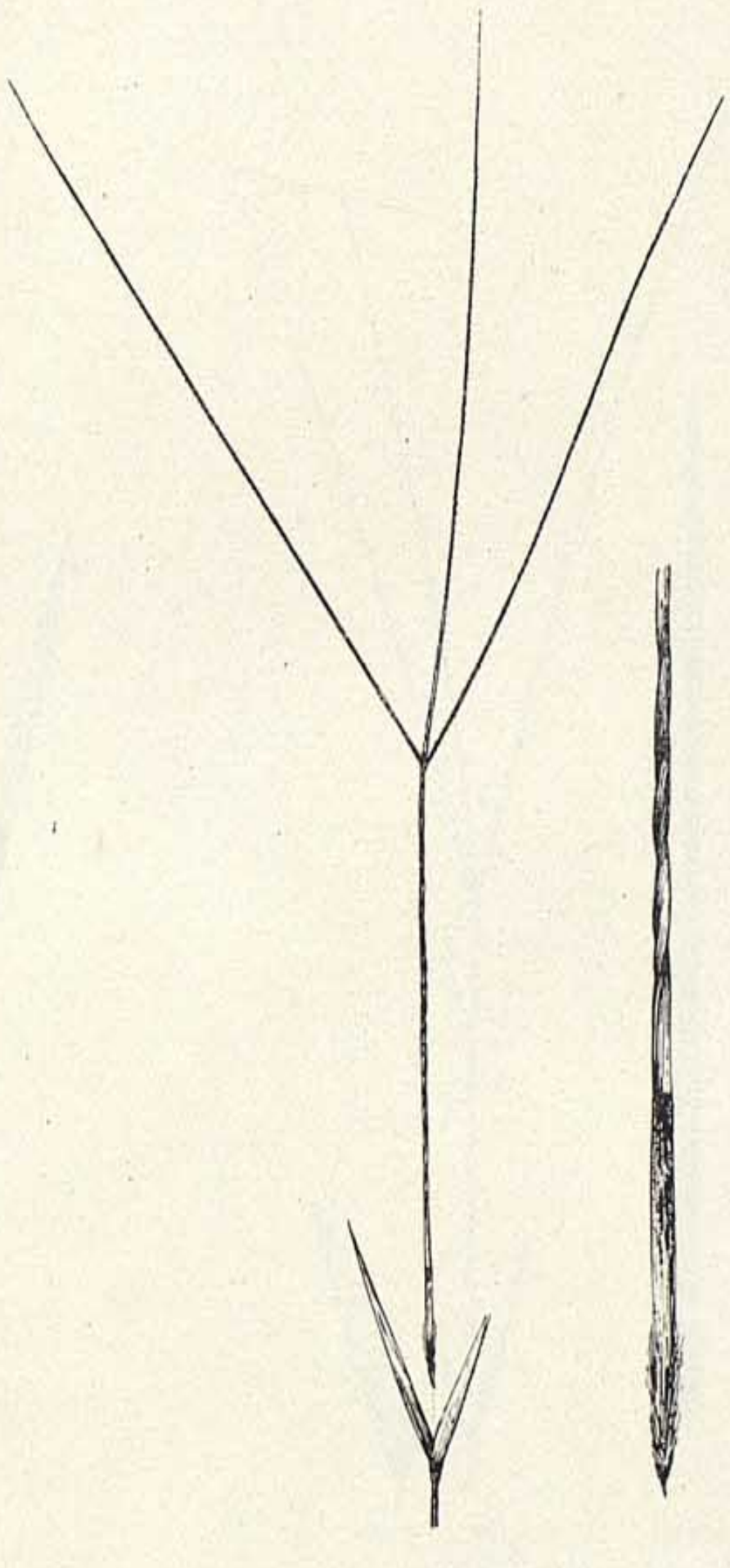
×4 ×1⅓ ×.4

ARISTIDA TENUISETULOSA (Pilger) Mez.



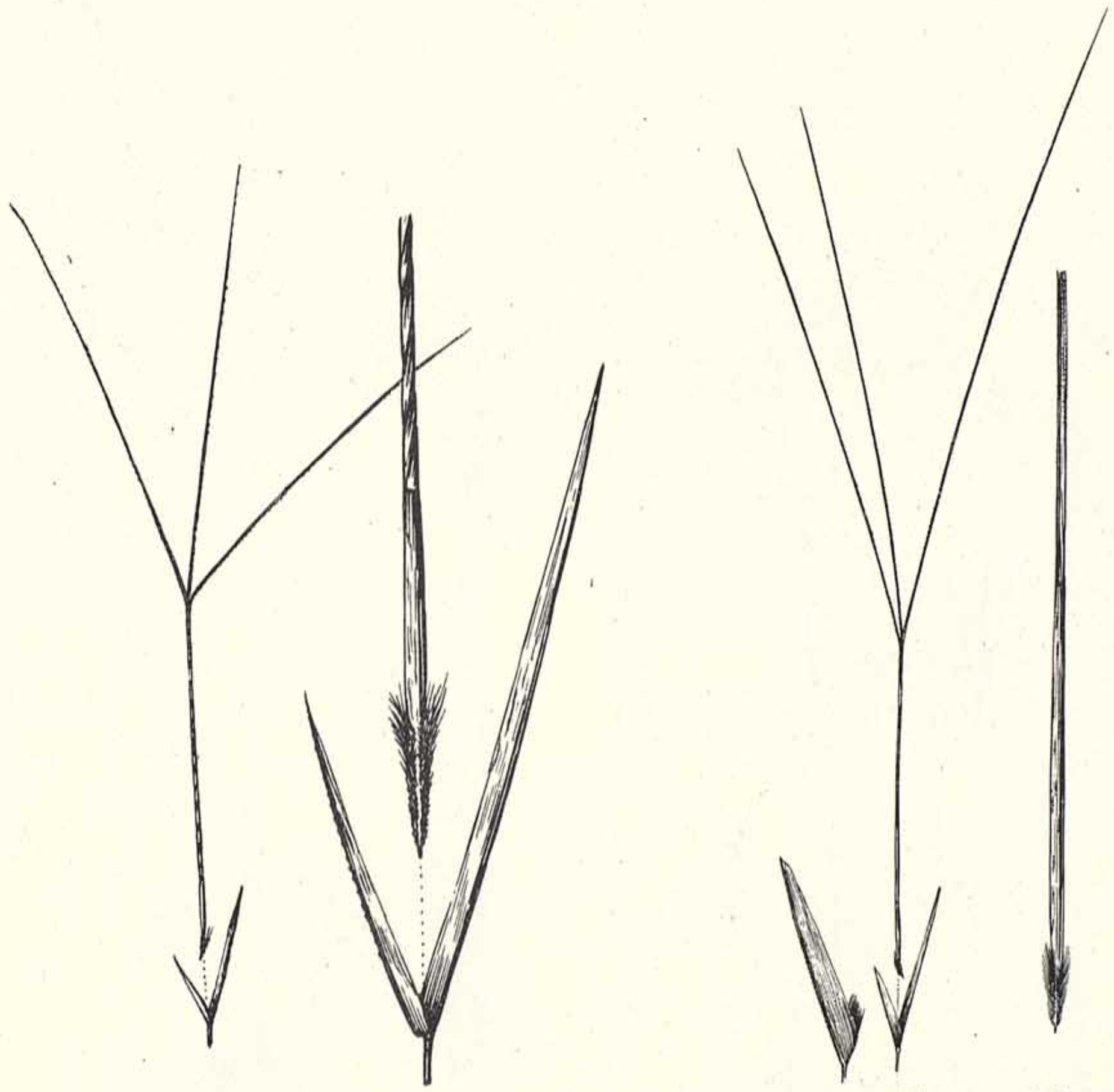
×6⅔ ×1⅓

ARISTIDA ARENARIA Gaudichaud.



×1 ×3⅓

ARISTIDA MUELLERI Henrard.



×1 ×5

ARISTIDA BROWNIANA Henrard.

×4 ×1⅓ ×8

ARISTIDA STENOPHYLLA Henrard.

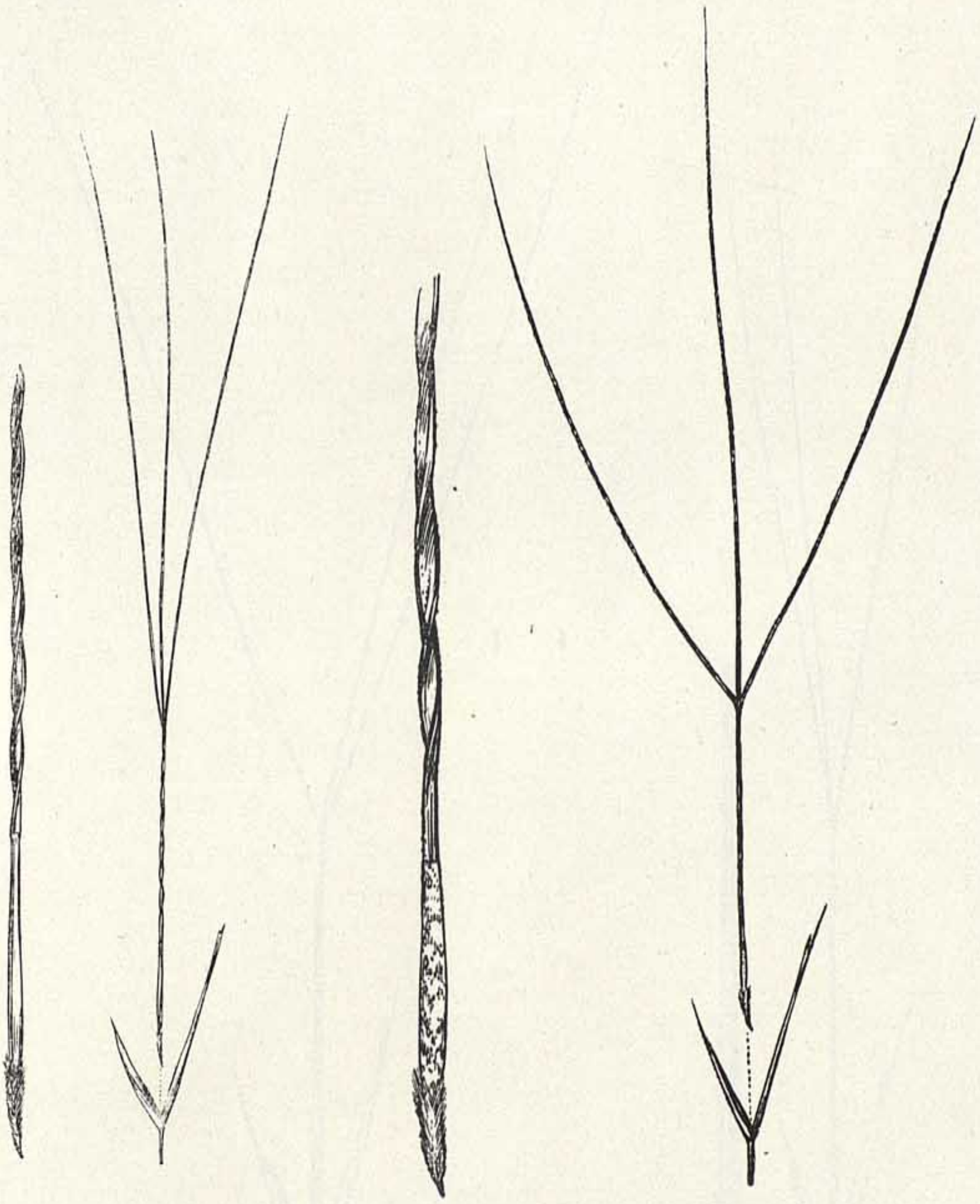


×2 ×8

ARISTIDA AMBONGENSIS Camus.

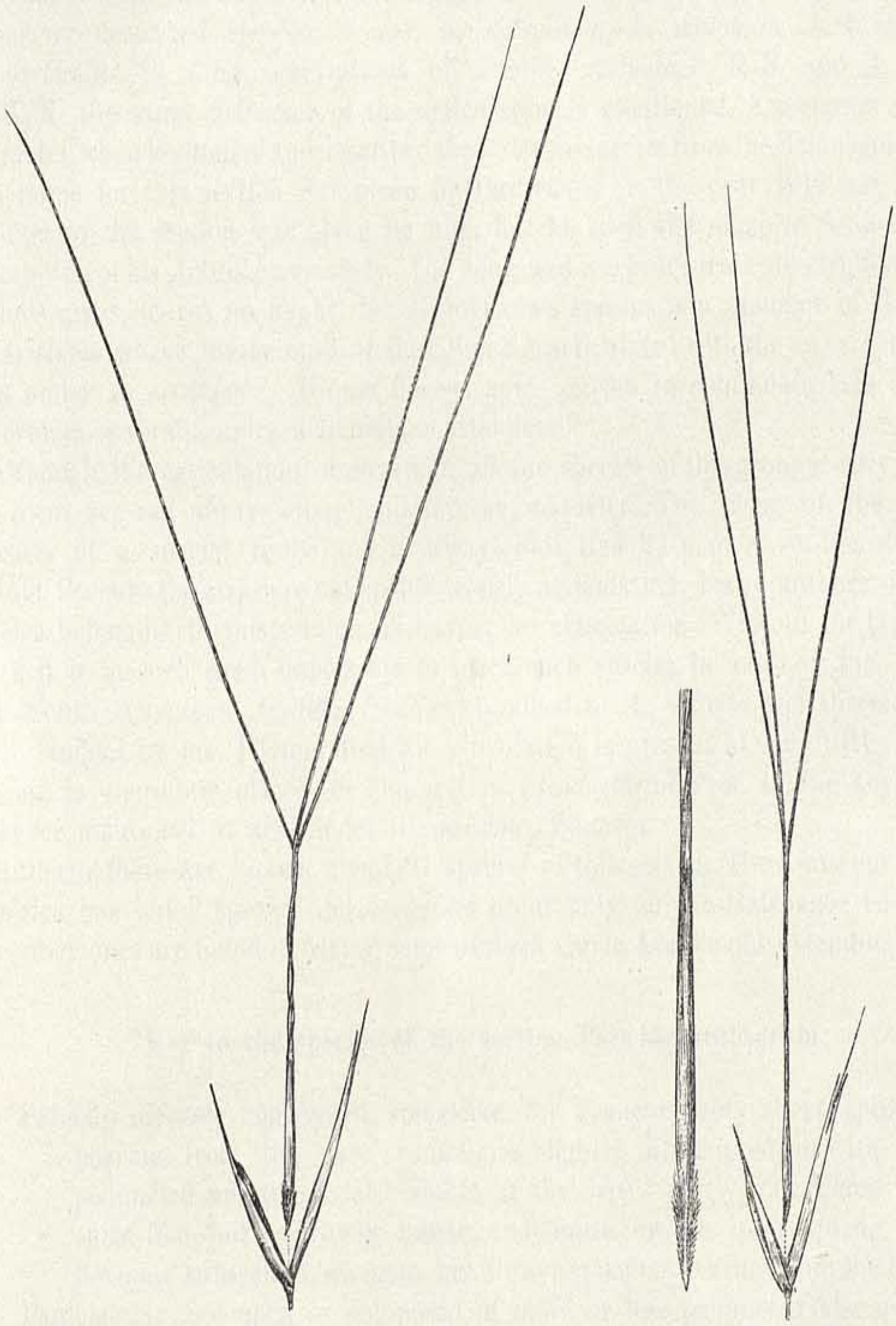
×1⅓ ×2⅔

ARISTIDA PAOLIANA (Chiovenda) Henrard.



×3⅓ ×1⅓ ×5 ×2

ARISTIDA GRACILIFLORA Pilger. ARISTIDA RAMIFERA Pilger.



×2

ARISTIDA LONGIFLORA Schumacher.

×6 ×1 1/3

ARISTIDA SIEBERIANA Trinius.

SECTION PSEUDARTHRATHERUM CHIOVENDA.

Many authors had already observed that there are *Aristidas* where the awns are articulated with the twisted column just below their branching-point. TRINIUS and RUPRECHT described *Aristida repens*, *A. subspicata*, *A. mutabilis*, *A. meccana* and *A. barbicollis*, in their descriptions of *Aristida congesta* R. & S. and *A. setifolia* H. B. K. the same character of the articulation is mentioned. ANDERSSON saw this character when he studied and described the *Aristida*-species from the Galapagos Islands.

A name for this section was given by CHIOVENDA in the year 1912 but no description of the section was given by him, but he used the name at the head of the description of his *Aristida astroclada*. The long and very accurate description of this curious grass, leaves no doubt that CHIOVENDA's species is a member of the group of *Aristidas* where the summit of the column is articulated with the awns. CHIOVENDA says under *A. astroclada*: „Gluma florens apice sensim in columnam laxe intortam filiformem scabram, apice articulatam attenuata."

Although the articulation observed in all the species of this group is very distinct, the awns are not always disarticulating at maturity. The place of the rupture consists of a special tissue and is always indicated by a more or less developed nodule. Because the awns are not spontaneously articulating, many authors described species belonging to this section as having no articulation. Without the type specimens it is in such cases impossible to placé such species in one of the sections The South American *Aristida Doelliana* is allied to *A. setifolia* and therefore once more studied by me, I found that an articulation is present at maturity and the species is therefore placed in the section *Pseudarthratherum*. In the keys I have however mentioned it also under the section *Chaetaria*.

Hitherto there are known about 21 species of this section. The continent of South America has but 2 species and 5 species occur only on the Galapagos Islands, all the other ones are found in Africa, some of them also in Arabia, one extending to India.

Key to the species of the section Pseudarthratherum.

1. Panicles densely contracted, spike-like, the branches very short spikelet-bearing from the base, sometimes slightly interrupted or with 1—2 peduncled additional false spikes at the base, rarely not dense and spike-like but narrowly linear and more or less interrupted, with flexuous subsecund branches, but always spikelets bearing from the base. 2.

   Panicles lax and open or composed of more or less peduncled false spikes, sometimes loosely contracted, the long branches erect and adpressed, but always naked below and never dense and spike-like. . . . . 12.

2. Sheaths glabrous or scabrous, sometimes with a very short pubescence, but never silky-villous. . . . . 3.

Sheaths conspicuously silky-villous with white, spreading hairs, except near the base, covered with more densely tufted hairs near the summit. Annual, with several slender, erect or ascending, 3–6-noded, simple or sparingly branched, slightly puberulous, terete culms, up to 35 cm. high; sheaths shorter than the internodes, compressed, striate, tight or more or less slipping from the stems, culm-nodes but slightly swollen, scarcely protruding above the glabrous annular sheath-nodes, ligule laciniately ciliate, auricles bearded, collar pubescent or smooth; blades glaucous, flat, thin, linear, 5—12 cm. long, $2^1/_2$–3 mm. broad, convolute at the summit, awn-pointed, finely pubescent and slightly scabrous or hispidulous on both surfaces; panicles exserted, 4—7 cm. long, scarcely 1 cm. in diameter, subspicate, interrupted at the base, axis pubescent, branches solitary, densely fascicled. sessile, scabrous; glumes slightly unequal, linear-lanceolate, attenuate, shortly awned, up to 8 mm long, the lower 3-nerved, puberulent on the back, or becoming glabrous, the nerves very scabrous, rather abruptly narrowed into the nearly 2 mm. long awn, somewhat rounded at the tip when expanded, without the awn about 4 mm. long, upper glume narrower, 1-nerved, slightly pubescent on the back and scabrous on the keel, deeply bifid at the apex, with acute lobes and a $1^1/_2$ mm long, scabrous awn from the sinus; lemma thick, ovate. glabrous below, scabrous upwards, rather suddenly narrowed into the very scabrous, scarcely twisted beak, together with the densely hairy, about $^1/_2$ mm. long, acute callus, up to 5 mm. long, the scabrous awns more or less spreading, equal or mostly unequal, the central one 9—15 mm, the lateral ones 5—6 mm. long. Galapagos Islands. . . . . **Aristida villosa Rob. et Greenm.**

3. Culms densely caespitose or but slightly ascending; panicles dense and spike-like; column always well-developed; glumes acute, long-awned, the awns from a bilid apex . . . . . 4.

Culms prostrate and rooting at the nodes, ascending upwards; panicles linear, interrupted, rather loose, not spike-like; column very short, scarcely developed, very slightly twisted; glumes shortly awned only.

Caespitose decumbent annual, much branched and prostrate and creeping at the base, stoloniferous, rooting at the lower nodes and sending up sterile tufs of leaves or erect floriferous branches, culms many-noded, terete, slightly striate, smooth or minutely scaberulous; sheaths slightly striate, glabrous, compressed, slipping from the stems, the upper ones tight, shorter than the internodes, ligule and auricles densely ciliate, the latter more or less bearded, collar glabrous; blades narrowly linear, flaccid, scarcely $1^1/_2$ mm. wide, 10–15 cm. long, or the lower ones

much shorter, flat or inrolled and convolute upwards, ending in a setaceous point, glabrous beneath, scabrous or hirtellous on the upper surface, the inrolled margins not thickened, bluish-green; panicles exserted, 10—15 cm. long, contracted, linear, with flexuous or subsecund, solitary, up to 3 cm. long, erect branches, spikelets bearing from the base, axis striate, angulous and scaberulous, spikelets nearly sessile or shortly pedicelled, the pedicels scabrous; glumes about equal, 1-nerved, narrowly linear, pale coloured or greenish, the lower scabrous on the keel, shortly awn-pointed, about 7 mm. long, the upper one scabrous only on the keel upwards, slightly and abruptly bifid with a mucro or short awn from the sinus; lemma tubulous, keeled, glabrous and punctulate below, scaberulous above, the keel very scabrous, slightly narrowed and beaked only, minutely twisted, the callus about $^1/_2$ mm. long, subobtuse, densely and long-bearded, the body of the lemma about 5 mm. long, articulation below the awns very distinct, awns slightly spreading or divaricate or suberect, scabrous, somewhat unequal, the central one 9—10 mm long, the lateral ones about 7 mm. long. Galapagos Islands. . . . . .
. . . . . **Aristida repens Trinius**

4. Lower glume mostly glabrous or scaberulous only, with an awn much shorter than the glume; lemma linear-cylindric, gradually passing into the twisted column, glabrous, scabrous or even tuberculate, but not with a densely pubescent striate summit. . . . . 5.

Lower glume hispidulous, with an awn nearly as long as the body of the glume; lemma oblong-cylindric, more abruptly narrowed into the column, smooth, densely punctulate under a lens, pubescent at the striate summit. Tufted, simple or scarcely branched, firm, rather robust, probably annual plant, erect or somewhat geniculate at the base, culms including the panicles about 35 cm. high, 2—3-noded, terete, slightly striate, scabrous, especially below the nodes, more or less pubescent; sheaths tight, striate, very scabrous, somewhat compressed, about half as long as the internodes, ligule a dense ciliolate rim, auricles long-bearded, collar glabrous; blades long, flat or the margins inrolled, acute, up to 3 mm. wide, up to 20 cm. long or those at the base of the plant commonly much shorter, prominently nerved, the midnerve keeled beneath, glabrous on the lower surface, very scabrous and hirtellous on the upper surface, ending in a setaceous point, the margins very scabrous and not thickened; panicles shortly exserted or not rarely sheathed at the base, 10—15 cm. long or shorter in less-developed culms, narrowed at the base, obtuse at the top, up to 2 cm. wide including the awns, very dense, not or scarcely interrupted below, the peduncle

hirsute or hirtellous, axis scabrous; spikelets pale greenish, densely congested on the short erect branches, with very short or nearly sessile hispidulous pedicels; glumes 1-nerved, unequal, the lower very scabrous on the keel and pubescent-hispid on the back, about 4 mm. long, lanceolate-ovate, acuminately narrowed into the scabrous awn, the upper one scabrous on the keel, the margins inrolled above, deeply bifid at the summit, the lateral setulae very acute and about 1 mm. long, awned from the sinus, the awn 2—3 mm. long, the total length of the glume about 9 mm.; lemma with a densely long-bearded, $^1/_2$ mm. long, subobtuse callus, the body fusiform, densely punctulate and striate at the summit, slightly keeled, about 3 mm. long, passing into a very scabrous, strongly twisted column, about as long as the body; awns slightly spreading and somewhat curved at the base, erect, very scabrous, subequal, about 10—15 mm. long. Galapagos Islands. . . . . .
. . . . . **Aristida caudata Andersson**

5. Lemmas smooth or scabrous only under a strong lens, never densely tubercled. 6.
Lemmas granular, densely tubercled in upper part, quite smooth only in lower 1/4 part.

Caespitose, robust, simple, erect, 80—90 cm. high perennial with few innovations, culms 3—4-noded, slightly compressed, glabrous, smooth, striate, culm-nodes protruding above the dark annular glabrous sheath-nodes; sheaths glabrous and smooth or slightly scaberulous, striate, compressed, tight, shorter than the internodes, ligule a densely ciliate rim, auricles pubescent and with some long hairs, collar with a dark triangular spot, pubescent and more or less bearded laterally, the hairs deciduous; blades linear, acuminate, up to 20 cm. long, 2—3 mm. broad at the flat base, convolute, glabrous and smooth beneath, hirtellous and scabrous on the upper surface and along the not thickened margins, ending in a very scabrous obtuse point; panicle exserted, with a glabrous or slightly scabrous peduncle, contracted, linear, elongate, erect, dense and spike-like, interrupted only at the very base, about 20 cm. long, together with the awns up to 3 cm. wide, axis terete and slightly scaberulous below, visible only at the base of the panicle, branches solitary, much divided nearly from the base or quite sessile, the branchlets and pedicels scabrous, very short and densely fascicled, the axils pubescent or smooth; spikelets erect, linear, slightly scaberulous, glumes 1-nerved, the lower very scabrous on the keel, including the awn, which is about as long as the glume, 9—10 mm. long, upper glume slightly scabrous only on the keel above, including the about 3 mm. long awn, 11—12 mm. long, the apex bifid, the acute lobes about 1 mm. long; lemma including the 1 mm. long, shortly but densely hairy, acute callus,

about 6 mm. long, narrowed above into a scabrous, twisted. 4—6 mm. long column; awns about equal, scabrous, erect or slightly spreading, 20—25 mm. long South West Africa: Ovamboland to Rhodesia. . . . . **Aristida alopecuroides Hackel**

6. Sheaths bearded at the junction with the blades, the auricles and collars with long erect or reflexed hairs. . . . . 7.
Sheaths naked at the junction with the blades, sometimes the collar and auricles with a very short minute pubescence. . . . . 10.

7. Perennial, more than 15 cm. high, up to 60 cm. long plants, with equal or subequal internodes, at least the two nodes below the panicle not approximate. 8.
Annual, scarcely 10 cm. high or mostly lower plants, with unequal internodes, the two nodes below the panicle approximate, the upper leaves enclosing the base of the panicle.
Densely caespitose, forming small bunches, culms erect or geniculately ascending, striate, glabrous, few-noded, nodes glabrous; lower sheaths very short, with short blades, pale, striate, compressed, glabrous and smooth with hyaline margins, upper ones as long as or longer than the internodes, broad above, glabrous or minutely scaberulous, striate, dark-green or tinged with purple, with broad margins, ligule a short ciliolate rim, auricles densely bearded, the collar sometimes laterally bearded with more or less reflexed hairs; blades 4—6 cm long, the upper ones somewhat shorter and overtopping the panicle, linear, narrow, up to 2 mm. broad when expanded, more or less spreading, plicate and involute, prominently sulcate-striate, scaberulous beneath, shortly hairy or hirtellous on the upper surface, ending in an obtuse rather thick point; panicle sheathed by the upper leaves, very shortly peduncled, ovate-oblong, very dense, 3—3½ cm. long, about 1½ cm. broad, with short, densely fascicled branchlets and spikelets, the branches and subclavate pedicels scaberulous; spikelets pale green, tinged sometimes with purple, dark yellow at maturity; glumes unequal, narrowly lanceolate, 1-nerved, shortly awned, hispidulous on the keels, the lower one 6—7 mm. long, gradually narrowed into the awn, the upper one 10 mm. long, bifid at the apex with acute lateral setae and a 2 mm. long awn from the sinus: lemma with a densely hairy, very acute, up to 1 mm. long callus, 4—5 mm. long, smooth or minutely scaberulous at the summit, narrowed into a 2½ mm. long, twisted column, awns very fine, minutely scabrous, subequal, somewhat divergent, about 20 mm. long. South West Africa: Great and Little Namaqualand, south to Prince Albert. . . . . **Aristida Rangei Pilger**

8. Glumes about equal or very slightly unequal, lower glume smooth or scabrous, the upper one with an awn from a very prominently bifid apex; lemma very rough or punctulate under a lens. . . . . 9.
Glumes unequal, glabrous, the lower about $6^1/_2$ mm. long, including the 2 mm. long awn, the upper about 9 mm. long, including the scarcely 3 mm. long awn from a minutely bifid or slightly bidentate apex; lemma nearly smooth.
Erect, simple, glabrous up to 60 cm. high perennial, culms sheathed all along, glabrous; sheaths glabrous, striate, shorter than the internodes, ligule a minutely ciliate rim, auricles bearded, the collar with more or less spreading hairs; blades convolute-filiform, acuminate, 10—20 cm. long, narrowly linear, glabrous beneath, scaberulous on the upper surface; panicle long-exserted, about 20 cm. long, contracted, dense and spike-like, linear-oblong, somewhat interrupted at the base with solitary scabrous branches, the lower ones naked at the base over a short distance, the upper ones sessile, much divided and spikelets bearing nearly from the base, all the branches erect and adpressed, the branchlets and pedicels very short, scabrous and densely fascicled; spikelets densely congested at the ends of the branchlets, subsessile or shortly pedicelled, linear or linear-lanceolate, greenish, tinged with purple, glumes 1-nerved, glabrous, the lower $4^1/_2$ mm. long, gradually narrowed into the 2 mm. long scabrous awn, scabrous on the keel, the upper one glabrous and smooth on the keel, not or scarcely bifid at the apex, gradually narrowed into the about 3 mm. long, scaberulous awn; lemma including the up to $1^1/_2$ mm. long, very acute shortly hairy callus, 5—6 mm long, linear-tubulous, quite smooth or very slightly scaberulous only at the summit just below the column, gradually passing into the elegant, twisted, about 4 mm. long column, awns very fine, somewhat spreading, scaberulous, nearly equal, up to $2^1/_2$ cm. long. South East Africa: Mozambique. . . . . .
. . . . . **Aristida longicauda Hackel**

9. Column of awns short, much shorter than the body of the lemma, a slightly twisted scaberulous beak only; lower glume scabrous above and along the nerves, 3-nerved, callus obtuse.
Caespitose rather robust perennial, culms erect with the panicles 10—12 dm. high, simple, glabrous, slightly striate, terete, 5—6-noded, nodes glabrous; sheaths shorter than the internodes, glabrous, bearded at the collar with long reflexed hairs, ligule obsolete, minutely ciliate, auricles pubescent and more or less reflexed-bearded; blades from a flat base gradually acuminate, laxly convolute above, the upper ones involute, up to 30 cm. long, rigidulous, glabrous beneath, scabrous on the upper

surface and along the margins, finely nerved, the nerves not very prominent; panicle dense more or less contracted, up to 25 cm. long, 2—3 cm. broad with a terete axis, branches solitary, 5 - 6 cm. long, much branched from the base with adpressed branchlets with densely imbricate spikelets, branchlets and short subclavate pedicels scabrous; spikelets very shortly pedicelled, pale, glumes somewhat unequal, the lower one about $7^1/_2$ mm. long, 3-nerved, scaberulous in upper half part, with scabrous nerves and keel, linear-lanceolate, rather abruptly narrowed into the scabrous about $1^1/_2$ mm. long awn, upper glume 1-nerved, narrower, keel smooth, distinctly bidentate at the apex with a 2 mm. long awn from the sinus, up to 10 mm. long; lemma 7 mm. long, linear or subfusiform, punctulate nearly all over and scaberulous at the summit with a subobtuse, long-bearded, about 1 mm. long callus and a scabrous about $1^1/_2$ mm. long, twisted column, articulation very distinct as a nodule below the branching-point of the erectly spreading nearly equal, scabrous, 16—20 mm. long awns. South West Africa: Damaraland and Great Namaqualand. . . . . .
. . . . . **Aristida Pilgeri Henr.**

Column of awns long, mostly as long as the body of the lemma, strongly twisted; lower glume 1-nerved, smooth except the keel, callus acute. Erect, caespitose perennial, culms 40—60 cm. high, many-noded, branched nearly from all the nodes; lower sheaths lax, pale, slightly striate, upper ones compressed, keeled, striate, scabrous, sometimes with a few long hairs above, shorter than the internodes, ligule very short, obsolete, densely ciliolate, auricles bearded with reflexed hairs, collar pilose; blades flat at the base and about 2 mm. broad, convolute upwards, narrowly linear, obtuse, 4—5 cm. or sometimes up to 10 cm. long, glabrous and smooth beneath, scabrous on the upper surface, finely nerved; panicle long-exserted, dense, spiciform, interrupted at the base, 7—9 cm. long, about 1 cm. wide with a glabrous rhachis, branches solitary, scarcely 1 cm. long, much divided from the base, sometimes the lower branches more or less peduncled, the upper ones always subsessile and spikelets bearing from the base with adpressed branchlets and densely fascicled spikelets; spikelets nearly sessile or very shortly pedicelled, glabrous with pubescent pedicels, glumes linear-lanceolate, subequal or slightly unequal, both 1-nerved, lower glume $8^1/_2$ mm. long, acute, awned, the awn scabrous, the keel very scabrous, upper glume about 10 mm long with a smooth keel, distinctly bifid at the apex, awned from the sinus; lemma glabrous below, very scabrous in upper half, the body including the acute densely hairy about 1 mm. long callus, about $4^1/_2$ mm. long, fusiform or ovate-

lanceolate, narrowed into the scabrous, twisted, about 4 mm. long column, the articulation distinct; awns subequal, erect or erectly-spreading, scabrous, about 20 mm. long. North East Afrika: Eritrea. . . . . **Aristida elytrophoroides Chiovenda**

10. Lemmas rough, very distinctly and densely scabrous-hispid or tuberculate in lines in upper half part, the lower part glabrous. African, perennial plants . . . . . 11.

Lemmas smooth, under a strong lens minutely and densely punctulate all over, never scabrous-hispidulous or tuberculate.

Densely or laxly caespitose perennial, not rarely flowering the first year and apparently annual, with rather few innovations, culms simple or sparingly branched from some of the nodes, erect or more or less geniculate at the nodes, 2–3-noded, up to 50 cm. long including the panicles, glabrous or more or less scabrous below the nodes, terete, slightly striate, the lower internodes more densely scaberulous or subpubescent; lower sheaths more or less flabellate, gaping at the summit, with overlapping lower margins, slightly striate, somewhat keeled, more or less scaberulous or puberulous above, upper sheaths tight, striate-sulcate, distinctly but slightly pubescent at the summit, with hyaline margins, half as long as the internodes, ligule a minute ciliolate rim, auricles bearded, especially those of the innovations, collar smooth; blades narrow, linear, scarcely 1 mm. broad, sometimes flat at the base, convolute-filiform, very acute but not pungent, erect, those of the innovations convolute throughout, up to 10 cm. long, mostly shorter, smooth or slightly scaberulous beneath, scabrous or shortly pilose on the upper surface; panicle more or less exserted or at first sheathed by the uppermost leaf, the peduncle scaberulous and distinctly pubescent at the summit below the inflorescence, interrupted at the base or over the whole length, spike-like, mostly 6—9 cm. long, oblong to linear-cylindric, thyrsiform, axis subterete or angulous, scabrid-pubescent, branches solitary, sessile, much divided and spikelet-bearing to the base, the branchlets and short pedicels scabrous-hirtellous; spikelets subsessile, glumes unequal, lanceolate to linear-lanceolate, the lower gradually passing into the scabrous up to 3 mm. long awn, about 7 mm. long, very scabrous on the keel and sometimes minutely pubescent on the margins, 1-nerved, commonly with one very distinct additional side-nerve, the upper glume narrower, 1-nerved, smooth on the keel below, scabrous on the keel upwards, bifid at the summit, including the 3 mm. long awn from the sinus, up to 9 mm. long; lemma smooth, including the long-hairy, subobtuse about $^1/_2$ mm. long callus and the twisted about 4 mm. long column, up to 8 mm.

long, ovate-oblong to oblong; awns scabrous, 12 mm. long, or the central one up to 15 mm. long, more or less spreading, slightly contorted and curved in a loose spiral at the base. South America: Galapagos Islands. . . . . **Aristida subspicata Trin. et Rupr.**

11. Upper glume deeply bifid at the apex with two long, very acute, about 2 mm. long lateral setae and a $2^1/_2$ mm. long awn from the sinus. Densely caespitose perennial with many short innovations, culms simple, erect or geniculate and ascending, 20—30 cm. high, striate, subcompressed, 2—3-noded, nodes glabrous; sheaths compressed, the lower ones with broad hyaline margins, striate, glabrous, much shorter than the internodes, ligule a shortly ciliolate rim, auricles densely pubescent, collar glabrous; blades very narrow, those of the culms 5—6 cm. long, erect or spreading, those of the innovations shorter and curved, all the blades involute-setaceous with an acute point, glaucous, glabrous beneath, densely shortly pubescent on the upper surface, many-nerved, the margins somewhat thickened; panicle spiciform, 6—7 cm. long, including the awns, 1—2 cm. broad at the summit, axis nearly smooth, branches solitary, divided nearly from the base, branchlets densely fascicled with scaberulous or puberulous pedicels; spikelets glabrous, greenish-purple, glumes narrowly linear-lanceolate, 1-nerved, slightly unequal, the lower scabrous on the keel, including the 1 mm. long scabrous awn, 6—7 mm. long, the upper one smooth on the keel, including the awn about 8 mm. long; lemma smooth below, scabrous above, together with the densely hairy, 1 mm. long, very acute callus and the 4 mm. long, scabrous twisted column, up to 8 mm. long, linear-tubulous, gradually narrowed above; awns about equal, 15 mm. long, erect or somewhat spreading, scabrous. North Africa: Tunis. . . . . **Aristida tunetana Cosson**

Upper glume not deeply bifid at the apex, the acute lateral setae scarcely 1 mm. long, mostly much shorter and sometimes not very distinct, with a scarcely 2 mm. long awn from the sinus.

Densely tufted glabrous perennial, with few innovations, culms simple or branched from some of the lower nodes, slender, rather wiry, terete, slightly striate, smooth, mostly erect or geniculately ascending, compressed below, up to 60 cm. high, mostly shorter and not rarely only about 15 cm. long, 3—4-noded, the nodes glabrous; sheaths compressed, the lower ones pale, the margins more or less overlapping at the base, gaping above, the upper ones tight, striate, smooth or scaberulous between the nerves, much shorter than the internodes, ligule a ciliolate short rim, auricles pubescent, collar glabrous; blades very

narrow, acute with a subobtuse tip, up to 15 cm. long or those at the base of the culms much shorter, sometimes much reduced and only a few cm. long, those of the innovations mostly about 10 cm. long, folded or convolute, rather rigid and more or less curved, sometimes flat at the very base, smooth beneath. scabrous-hispidulous on the upper surface, the margins not thickened, light green or glaucous; panicle dense, spike-like but commonly interrupted and sometimes with 1—2 shortly peduncled more or less spreading lateral false spikes, variable in length, mostly 5—10 cm. long and rarely up to 15 cm. long, at first shortly, at maturity long-exserted, axis subterete, slightly scaberulous, branches solitary, nearly sessile, much divided from the base, the branches and pedicels slightly scaberulous and somewhat compressed, very short, the spikelets densely fascicled, purplish; glumes unequal, glabrous, the lower lanceolate, somewhat abruptly passing into the scaberulous about 1 mm. long awn, slightly scaberulous on the keel, up to 8 mm. long, the upper one narrower, linear, quite smooth on the keel, including the awn up to 10 mm. long; lemma tubulous, including the very acute, hairy, about 1 mm. long callus and the twisted 3—4 mm. long column up to 9 mm. long; awns more or less divergent, fine, scabrous, slightly unequal, sometimes only 12 mm. long, mostly longer and 16—18 mm. long. South Africa: Natal to Great Namaqualand, south to the Coast Region. . . . . . **Aristida congesta Roem. et Schult.**

Very robust up to 80 cm. high, with a 20—25 cm. long panicle, which is interrupted at the base, blades of culms and innovations very long, up to 20 cm., spikelets longer than in the type, lower glume together with the 4 mm. long awn, 9 mm. long, upper one inclusive of the 4 mm. long awn about 12 mm. long, awns longer, up to 30 mm. long. Rhodesia. . . . . **var. megalostachya Henr.**

12. Column of awns twisted, scabrous or glabrous, mostly more than 2 mm. long; glumes unequal or very rarely about equal . . . . . 13.

Column of awns straight not twisted, scabrous, very short, scarcely 2 mm. long; glumes equal.

Culms erect, subgeniculate or ascending, branched from the lower nodes, culm-nodes slightly swollen and protruding above the sheath-nodes, with one to several, short, spreading, 1-noded branches, sheathed all along and panicle-bearing; sheaths glabrous, slipping from the stems, ligule a short ciliolate rim, auricles more or less ciliate, collar smooth; blades narrow, linear, very acute, convolute, 3—5 cm. long, scarcely

1 mm. broad, somewhat rigid, spreading, scabrous beneath, prominently nerved and puberulous on the upper surface; panicles of two kinds, very different in form and very unequal, those of the lateral branches short, with mostly erect or adpressed short branchlets, the panicle at the end of the culm long-exserted, effuse, very lax, pyramidal, with straight or flexuous rhachis, 10—15 cm. long, the scabrous branches solitary, distant, spreading, flexuous or straight, filiform, 5—6 cm. long, naked at the base over about 3 cm., bearing at the summit adpressed clusters of nearly sessile spikelets, the pedicels scabrous and slightly thickened; spikelets yellowish, glumes linear-lanceolate, both about 6 mm. long, the lower 1-nerved, sometimes with an additional sidenerve, very scabrous on the keel and scaberulous on the back, gradually acuminate, shortly awned, the upper one glabrous, 1-nerved, distinctly bifid at the apex with a short awn from the sinus, scaberulous on the keel; lemma fusiform, glabrous, minutely punctulate, scabrous at the summit, gradually passing into the very rough, perfectly straight column, including the pubescent, subacute, about 3/4 mm. long callus and the column, up to 6 mm. long; awns very fine, scabrous, suberect, subequal, 10—13 mm. long. West Africa: Upper Guinea, Nigeria. . . . . **Aristida nigritiana Hackel**

13. Lower glume much shorter than the upper one or sometimes nearly equal, but the lower always slightly shorter. . . . . 14.

Lower glume about 1 mm. longer than the upper one.

Densely caespitose strictly erect perennial, culms 3—4-noded with rather long internodes, simple or sparingly branched from the middle nodes, terete, glabrous or scabrous especially below the nodes, culm-nodes swollen and protruding above the annular sheath-nodes, up to 60 cm. high inclusive of the panicles; sheaths pale-coloured, prominently striate, glabrous or minutely scaberulous, shorter than the internodes, slipping from the stems or the upper ones tight, ligule a rim of long hairs, auricles ciliate, the margins of the sheaths ciliolate near the mouth, collar smooth; blades lax, erect or more or less spreading, flat at the base, convolute above, up to $2^1/_2$ mm. wide when expanded, filiform, the lower blades mostly shorter and about 10 cm. long, the upper ones not rarely up to 30 cm. long and sometimes flat over a long distance, glabrous beneath, densely and shortly pubescent on the upper surface with glabrous not thickened margins, those of the innovations convolute throughout and ending in a long setaceous point; panicle pale-greenish, yellowish at maturity, linear-oblong to ovate-oblong in outline, pyramidal, long-exserted or at first sheathed at the base by the uppermost leaf, axis terete, striate, scaberulous, branches solitary,

erectly spreading, distant, shortly peduncled, naked at the base for about 1 cm., the upper ones shorter peduncled to subsessile, much divided with very short branchlets, the clustered spikelets at the ends of the branches forming 4—5 cm. long false spikes, the upper ones gradually shorter, the branchlets strictly erect and scabrous, the pedicels subsessile and scaberulous; spikelets greenish-white, glumes hyaline, 1-nerved, hispid on the keels, the lower broadest, about 7 mm. long, gradually narrowed into a fine scabrous short awn, the upper one narrower, 6 mm. long, bifid at the apex with a short awn or mucro from the sinus; lemma minutely punctulate, distinctly scabrous above, gradually passing into the strongly twisted column, inclusive of the subacute, densely hairy, about 3/4 mm. long callus and the somewhat scabrous column up to 6 mm. long, mostly shorter and always shorter than the glumes; awns minutely scabrous, more or less spreading, about equal, 10 mm. long. South America: Galapagos Islands. . . . . **Aristida divulsa Andersson**

14. Upper glume acute, acuminate or shortly awned, not bifid at the apex. . 15.
Upper glume with a bifid apex and a mucro or short awn from the sinus. 16.

15. Robust up to 1 meter high caespitose perennial with a rather dense contracted panicle and densely flowered spike-like panicle-branches. Culms terete or slightly compressed, erect, 3—4-noded, branched from most of the lower nodes, culm-nodes slightly swollen and protruding above the dark-coloured sheath-nodes, internodes glabrous, striate, smooth, dark-green or somewhat purplish; sheaths much shorter than the internodes, slipping from the stems, subcompressed, striate, glabrous, ligule a short ciliolate rim, auricles long-bearded, the hairs often rufous and reflexed; blades linear, flat in lower part, convolute upwards, glaucous-green, 25—30 cm. long or longer, 2—2½ mm. wide at the base, narrowed into a long setaceous point, glabrous beneath, slightly scaberulous on the upper surface and with some long hairs especially at the mouth and near the base, the margins not conspicuously thickened, scabrous, innovations much shorter and convolute throughout; panicle up to 20 cm. long, contracted and more or less spike-like but somewhat loose, the axis visible, erect, interrupted at the base, rhachis terete, glabrous and smooth below, subcompressed and scaberulous above, branches erect, densely many-flowered, solitary, divided nearly from the base, the branchlets fascicled, the lower including the spikelets and awns 6—7 cm. long, the longer ones in each fascicle more or less peduncled, with shorter branchlets at the base, scaberulous, longer than the internodes of the rhachis, spikelets densely congested along

the branchlets, forming compact false spikes, pedicels very short; spikelets yellowish-brown to pale-purplish, erect, linear-lanceolate, glabrous, glumes 1-nerved, cuspidate-awned, lower scabrous on the keel, 9—10 mm. long, upper one with a smooth keel, 11 mm. long; lemma punctulate or slightly scaberulous under a lens, the callus subacute, up to 1 mm. long, densely long-hairy, including the scabrous, distinctly twisted, about 4 mm. long column, up to 9 mm. long, the nodule at the summit of the column very distinct, the awns breaking off at maturity; awns scabrous, erectly spreading or divergent, about 20 mm. long, or the lateral ones slightly shorter. South America: Brazil. . . . . **Aristida Doelliana Henr.**

Slender and delicate, up to 50 cm. high annual, mostly lower, with a thin very loose, lax, rather few-flowered panicle, flowering the first year and with a very faint root-system without innovations or sometimes caespitose with sterile innovations and more robust, apparently perennial, (such specimens belong probably to the hybrid between *Aristida Doelliana* and *A. setifolia* and are placed under the *var. arenaria* of *A. setifolia*.) Compare that variety.

Culms very thin, 2—3-noded, more or less branched from the lower nodes, erect, striate, glabrous throughout; sheaths striate, glabrous, shorter than the internodes, more or less slipping from the stems, ligule a long-ciliate rim, auricles ciliate and bearded with long hairs, collar glabrous; blades very thin and narrow, convolute-setaceous throughout, striate, glabrous with scabrous margins, bearing some scattered long hairs on the upper surface, 5 cm. long or less, sometimes up to 10 cm. long in robust specimens, scarcely 1 mm. wide when expanded; panicle exserted, very loose but more or less contracted, linear to lanceolate-ovate, subsecund, erect or sometimes nodding at the summit, branches distant, binate, naked in lower half part, spreading or more or less ascending, often secund, scaberulous, the rhachis of the panicle scabrous, angulous or subterete, the longer branches 4—8 cm. long, sparingly branched above with few erect and adpressed spikelets at the summit, the shorter branches with 2 spikelets or sometimes with but one long-pedicelled spikelet, pedicels as long as or longer than the glumes or those of the lateral flowers much shorter; spikelets yellowish or straw-coloured, glumes linear-subulate or lanceolate, mucronate or shortly awned, glabrous, very variable in length, the lower 6—12 mm. long, 1-nerved or with 1 or 2 short additional side-nerves, ciliate-scabrous on the keel, the upper one nearly glabrous on the keel, 1-nerved, $7^1/_2$—15 mm. long; lemma smooth, scaberulous at the summit, including the callus and the scabrous, more or less twisted

column, very variable in length, 5—11 mm., sometimes up to 15 mm. long or even slightly longer, the column exserted above the glumes or not, awns scabrous, somewhat curved and spreading, subequal or the central one somewhat longer, rather variable in length, mostly 12—20 mm. long or sometimes up to 30 mm. long. South America: Northern and eastern Brazil. . . . . **Aristida setifolia H. B. K.**

(*Observation*. This species is very variable as to the dimensions of the spikelets, but nearly all the varieties agree in the vegetative characters and are distinctly annual, only one variety is perennial, and belongs to the hybrid between *A. setifolia* and *A. Doelliana;* it is placed for the moment under *A. setifolia* because it was described as var. *arenaria* of *A. setifolia* and placed there, till the question is settled definitively.)

Varieties:

Delicate, slender, annual plants without innovations, panicles very loose, the branches naked at the base over a long distance, rather few-flowered, not forming dense false spikes.

Column of awns very short, about $1^1/_2$ mm. long, scarcely or but very slightly twisted, lower glume 8 – 10 mm. long, upper one 10—11 mm. long, lemma inclusive of the callus and column $7^1/_2$—8 mm. long, awns curved and reflexed, up to 20 mm. long. . . . . **var. intermedia Trin. et Rupr.**

Column of awns longer, more than 2 mm. long.

Spikelets small, lower glume about 6 mm. long, upper one about 7—8 mm. long, lemma inclusive of the callus and column 5—6 mm. long, awns 12—15 mm. long. . . . . **var. genuina Henr.**

Spikelets large, broader than in the var. *genuina*, lower glume 10—11 mm. long, the upper one up to 15 mm. long, sometimes the glumes still longer and the lower up to 15 mm., the upper sometimes up to 20 mm. long, lemma inclusive of the callus and column 15—$17^1/_2$ mm. long, the column mostly exserted above the glumes, awns longer, about 30 mm. long. . . . . **var. grandiflora Trin. et Rupr.**

More robust, perennial plants with numerous short innovations which are intravaginal and dense, branches of the panicle more or less sessile or naked at the base only over a short distance, rather densely flowered and forming more or less distinct false spikes; spikelets rather small, lower glume 7—8 mm. long, upper one about 10 mm. long, lemma inclusive of the callus and distinctly twisted column, 10–11 mm. long, the column about 4 mm. long, awns subequal and up to 20 mm. long. Hybrid between *Aristida setifolia* and *A Doelliana*. . . . . **var. arenaria Trin. et Rupr.**

16. Perennial, densely caespitose plants, with many short innovations. . . . 17.
Annual plants with a faint root-system and no innovations. . . . . 18.

17. Lower glume $5^1/_2$ mm. long, shortly awned, the awn about $^3/_4$ mm. long, upper glume about 8 mm. long, deeply bifid at the apex with a 1 mm. long awn from the sinus and well-developed, acute, lateral setae; lemma with callus and column about $6^1/_2$ mm. long; awns 11—12 mm. long. Densely caespitose light-green or glaucous perennial with many short innovations, culms erect or geniculately ascending, slender, rather wiry, distinctly compressed, especially below and grooved laterally, slightly scabrous or glabrous, simple or branched from the lower nodes, 3—4-noded, the glabrous culm-nodes slightly swollen and protruding above the sheath-nodes; sheaths compressed or keeled, distinctly scaberulous, tight or more or less slipping from the stems where the culms are branched, shorter than the internodes, mostly half as long, ligule a densely ciliolate rim, auricles densely bearded with long erect or spreading white hairs, the collar laterally bearded but glabrous on the back; blades narrow, linear, not acuminate, acutish, the tip rather obtuse and not setaceously pointed, up to 10 cm. long or somewhat longer, the lower ones mostly much shorter and 2—3 cm. long, canaliculate-folded or convolute, rather rigid, more or less curved, many-nerved, with 5 more prominent white nerves and somewhat thickened margins, glabrous and smooth beneath, scabrous and hispidulous on the upper surface; panicle composed of more or less peduncled, often nodding false spikes, ovate to oblong, mostly 10 cm. or sometimes up to 15 cm. long, in other specimens rather narrow and only 5 cm. long and at the same time with much shorter and shorter peduncled, more erect, false spikes, axis straight or flexuous, subterete, striate and scaberulous, branches solitary or binate, distant, filiform, spreading or suberect, flexuous or straight, scaberulous, naked at the base over a length of 3—4 cm., dense and spike-like at the summit, the scabrous

branchlets congested, erect and adpressed with scabrous short pedicels, sometimes the branches very shortly peduncled and naked at the base only for $^1/_2$ cm.; spikelets brownish to purplish, glumes keeled, glabrous, 1-nerved, the lower lanceolate with a scabrous or scaberulous keel, the upper one linear, smooth on the keel; lemma linear-lanceolate with a densely hairy subacute about 1 mm. long callus, the body mottled, glabrous and punctulate below, very scabrous in upper half part with white, hyaline, short tubercles at maturity, the lemma including the callus about $4^1/_2$ mm. long, gradually passing into the about $2^1/_2$ mm. long, strongly twisted column, awns scaberulous, fine, about equal, more or less spreading. South Africa: From the Coast Region north to Natal, Orange Free State and Transvaal. . . . . **Aristida barbicollis Trin. et Rupr.**

Plants less densely caespitose, shorter than the type, 15–20 cm. high, nearly simple, mouth of the sheaths and auricles very prominently bearded, the beards uniting into a ring at the junction of the blade and the sheath. the hairs more spreading; panicles strictly erect, slightly interrupted only at the base, shorter, 5–6 cm. long, more dense and spike-like, the branches solitary, 1–3 cm. long, strictly erect and adpressed, shorter peduncled or sometimes nearly sessile, forming a spiciform inflorescence, which is sometimes about 2 cm. broad. South Africa: Coast Region. . . . . **var. conglomerata Henr.**

Lower glume 5 mm. long, long-awned, the awn at least 2 mm. long, upper glume about $6^1/_2$ mm. long, slightly bifid at the apex with a 3/4 mm. long awn from the sinus, the lateral lobes very short, sometimes scarcely developed; lemma with callus and column about 8 mm. long; awns 25—27 mm. long, the central one mostly longer and up to 30 cm. long.

Elegant, many-noded, up to 80 cm. high perennial, scantily branched from some of the middle nodes, internodes nearly equal, 7—9 cm. long, glabrous, smooth, striate, terete or slightly compressed, uppermost internode very long and long-exserted, culm-nodes swollen and protruding above the glabrous sheath-nodes; sheaths striate, smooth, shorter than the internodes, slipping from the stems and rolled in at their summit, or tight, rather broad and keeled at the base with hyaline margins, upper sheaths slightly scaberulous, ligule a densely ciliate short rim passing into tufts of hairs at the mouth, the auricles and collar; blades up to 15 cm long, flat at the very base or mostly

narrowly convolute or plicate, keeled, striate, glabrous beneath or slightly scabrous only on the nerves, densely shortly pubescent on the upper surface especially near the base. acute or acuminate and ending in a fine subpungent tip; panicle very loose, up to 15 cm. long and nearly 10 cm. broad with solitary branches, lower branches bifurcate about 1 mm. above their base, the upper ones undivided, all the branches naked at their base for 2–4 cm, bearing at the summit loosely contracted 3–5 cm. long, false spikes, rhachis straight or somewhat curved, scabrous with many to numerous divaricate, sometimes suberect or flexuous, not rarely drooping branches, branches and branchlets very scabrous, axils shortly pubescent; spikelets densely congested with very scabrous pedicels, the latter shorter than the glumes; spikelets purplish, glumes 1-nerved, scabrous or smooth, narrowly linear, the lower but slightly scabrous on the keel, the upper one smooth; lemma glabrous and smooth at the base or punctulate only, very scabrous above, with the scarcely 1 mm. long, densely hairy, acute callus, up to 5 mm. long, graduâlly narrowed into an elegant densely twisted, about 3 mm. long column; awns very fine, spreading, scaberulous. East Africa: Kilimandjaro and Tanganika Territorium to Nyasaland and Rhodesia. . . . . **Aristida Lommelii Mez**

18. Ramifications of the culms solitary or binate from the nodes, never fascicled. . . . . 19.

Ramifications of the culms numerous, densely fascicled from the nodes, very different in form, those from the lower nodes abbreviate, iterately fasciculately branched, those from the upper nodes of two kinds, lower branches elongate, simple, 2—3-noded, sheathed, with a well-developed terminal panicle, upper branches reiterately fasciculately divided; panicles of the short branches linear, consisting only of 1—3 shortly pedicelled adpressed spikelets, terminal panicles with 4—7 solitary filiform branches, naked at the base for 2–3 cm., bearing at the summit 12—25 mm. long and 3—5 mm. broad spiciform fascicles of adpressed spikelets.

Pale green to yellowish plant with elegant culms, branched from the middle and upper nodes, internodes glabrous, smooth; lower sheaths broad, short, striate, glabrous, upper ones tight, striate, ligule a ciliate rim, auricles bearded, the collar smooth; blades setaceous, curved, striate, glabrous and smooth beneath, hirtellous on the upper surface, very short, scarcely 2 cm. long, mostly shorter; spikelets adpressed, on erect, triquetrous, scabrous, subclavate pedicels, glumes linear, narrow, very acute, shortly awned with denticulate-ciliate scabrous

keels, subequal, 1-nerved, up to 7 mm. long or the lower a little shorter, $1^1/_2$—2 mm. broad at the base; the lower commonly scabrous also on the back, the upper one mostly quite smooth, bifid at the apex with a short awn from the sinus; lemma narrowly linear, inlcusive of the subobtuse, $^1/_2$ mm. long, shortly pilose callus and the twisted, scabrous about 2 mm. long column, up to $7^1/_2$ mm long, minutely granular all over; awns very fine, nearly subequal, about 15 mm. long. North East Africa: Eritrea. . . . . .
. . . . . **Aristida astroclada Chiov.**

19. Panicles lax and very effuse, up to 15 cm. long, the branches suberect, soon becoming widely spreading or divaricate, naked from the base to the middle, densely floriferous at the summit. . . . . 20.

Panicles rather dense and congested, 5—7 cm. long or rarely longer, branches about 2 cm. long, erect or but slightly spreading, densely floriferous nearly to the very base.

Caespitose annual, forming small compact tufts, culms fascicled, erect or geniculately ascending, inclusive of the panicles up to 10 cm. long or sometimes up to 15 cm. long, very rarely in robust specimens up to 25 cm. long, sheathed all along, branched and bearing inflorescenses from some or most of the nodes, culms elegant, terete, striate, slightly scaberulous; sheaths shorter than the internodes, prominently striate, slightly scaberulous with hyaline margins, ligule a line of short hairs, auricles long-bearded with white hairs, the collar glabrous; blades narrowly linear, somewhat rigid, spreading, convolute, striate, glabrous beneath or scabrous towards the apex, scabrous-hirtellous on the upper surface, about 4 cm. long, scarcely 1 mm. wide, finely acute, subpungent; panicles linear to oblong, more or less flexuous, exserted, 5—8 cm. long, 1—2 cm. wide, axis subterete, striate, glabrous or scabrous above, branches solitary or sometimes binate, flexuous but erect and adpressed, rather short, 2—3 cm. long without the awns, floriferous nearly to the base or shortly peduncled, the peduncles very thin, scaberulous and 5—8 mm. long, branchlets and pedicels minutely scabrous, very short or the spikelets mostly subsessile; glumes pale or straw-coloured, lanceolate, cuspidate, 1-nerved, very unequal, the lower 5 mm. long, acute or shortly awned, scabrous on the keel, the upper one 7—8 mm. long, smooth on the keel, shortly awned or mucronate from a bifid apex; lemma linear-lanceolate or lanceolate-oblong, minutely punctulate all over, with a long and densely bearded, subacute, about 1 mm. long callus, the body of the lemma gradually passing into a very scabrous, strongly twisted, 2—3 mm. long column, total length of lemma, callus and column about 7 mm.; awns very

fine, scabrous, more or less spreading, slightly unequal, the central one somewhat longer, up to 25 mm. long. Africa: Eastern Egypt to Sinai and Western Arabia, also on the Cape Verd Islands, there probably introduced. . . . . **Aristida meccana Hochst.**

20. Column very long, mostly 2- 3-times as long as the body of the lemma. Caespitose erect annual, culms elegant, erect, simple or sometimes slightly branched from some of the middle nodes, up to 40 cm. high or longer, thin, terete, striate, minutely scabrous, 2—3-noded, the nodes placed in the lower half part of the culms, te nodes glabrous, those of the culms slightly swollen and protruding above the sheath-nodes; sheaths of the lower leaves short, more or less keeled, striate, glabrous, those of the culm-leaves tight, distinctly scaberulous especially above, shorter than the internodes, ligule a rim of short hairs, auricles densely bearded, the collar laterally bearded with long, spreading white hairs, the back of the collar glabrous; blades up to 10 cm. long or those of the lower leaves shorter, sometimes flat at the base, mostly convolute or folded, very narrow, scarcely 1 mm. wide when expanded, gradually narrowed into a scabrous point, glabrous or minutely scaberulous beneath, hirtellous or pubescent on the upper surface, mostly somewhat curved or flexuous; panicles mostly long-exserted, up to 15 cm. long, 5—6 cm. wide, very elegant, axis thin, subterete, striate, scaberulous above, branches distant, binate, with thickened axils, ascending or more or less spreading, about 5—6 cm. long without the awns, iterately branched, the branchlets and pedicels rather short, branches naked at the base over a long distance, bearing at the summit 6—8 or sometimes but 3—4 congested flowers, pedicels about as long as the glumes or those of the lateral spikelets about half as long as the glumes, scabrous and subclavate at the summit; glumes yellowish, very unequal, 1-nerved, the lower one lanceolate and rather broad, glabrous, very scabrous on the keel, $3^1/_2$ mm. long, rather abruptly narrowed into a very scabrous, $1^1/_2$ mm. long awn, upper glume narrower, quite smooth, about 8 mm. long, bifid at the summit with an awn from the sinus; lemma rather thick, lanceolate-ovate with a very acute, densely hairy about 3/4 mm. long callus, up to 3 mm. long, glabrous and smooth below, very distinctly scabrous in upper 1/4 part, rather suddenly passing into the more than 7 mm. long, scabrous, twisted column, rarely the column slightly shorter and sometimes up to 10 mm. long; awns very fine, more or less spreading, scabrous, nearly equal, about 25 mm. long. North East Africa: Abyssinia and Eritrea. . . . . **Aristida Cassanellii Terracciano**

Column much shorter or as long as the body of the lemma, sometimes slightly longer and up to $1^1/_2$ times its length.
Glaucous mostly 30—40 cm. high annual, sometimes up to 60 cm. high, agreeing in habit and vegetative characters with *A. Cassanellii*, culms erect or geniculately ascending, more or less branched, subterete or more or less compressed and grooved laterally, striate, slightly scabrous; sheaths shorter than the internodes, compressed-keeled, striate and scaberulous, ligule a ciliate rim, auricles with a tuft of hairs, collar bearded laterally; blades not rarely flat in lower half part, convolute above or all over, linear, subacute, up to 10 cm. long, more or less spreading, rather rigid, glabrous below, scabrous-hirtellous on the upper surface; panicles long-exserted with solitary branches, the latter 5—7 cm. long, the spikelets at the summit densely congested, forming curved, often nodding, false spikes; spikelets rather variable as to the dimensions of the different parts, the glumes always unequal, sometimes very prominently so, 1-nerved, the lower scabrous all over, asperulous by short hairs, which are sometimes wanting, the body 5—6 mm. long, gradually narrowed into an awn, sometimes the lower glume smooth with a scabrous keel only, upper glume glabrous throughout, slightly bifid at the apex with a mucro or short awn from the sinus, $6^1/_2$—$7^1/_2$ mm. long; lemma inclusive of the 3/4—1 mm. long, densely hairy, conical, subacute callus and the laxly twisted, scabrous column, up to 7 mm. long or sometimes up to 10 mm. long, the body of the lemma sometimes very scabrous at the summit; awns very fine, laxly spreading, subequal or unequal, the central one mostly about $2^1/_2$ mm. longer than the lateral ones. North Africa: From Senegal to Nubia, Abyssinia, Eritrea and Somaliland. . . . . **Aristida mutabilis Trin. et Rupr.**

Glumes somewhat unequal, the lower one however never half as long as the upper.
Glumes glabrous, with exception of the keel of the lower one.
Column of awns longer than the lemma, up to $1^1/_2$ times as long as the body, glumes and lemma as in var. longiflora. Abyssinia to Eritrea. . . . . **var. laeviglumis Henr.**

Column of awns shorter than the body of the lemma, only $1^1/_2$ mm. long, distinctly twisted, the lower glume with the $1^1/_2$ mm. long awn about 6 mm. long, the

upper one with the 1 mm. long awn about 8 mm. long, lemma with column $5^1/_2$ mm. long, awns somewhat unequal, 15 and 17 mm. long. . . . . **var. tangensis Henr.**

Glumes at least the lower one scabrous nearly all over, the upper one commonly glabrous, column as long as or shorter than the body of the lemma.

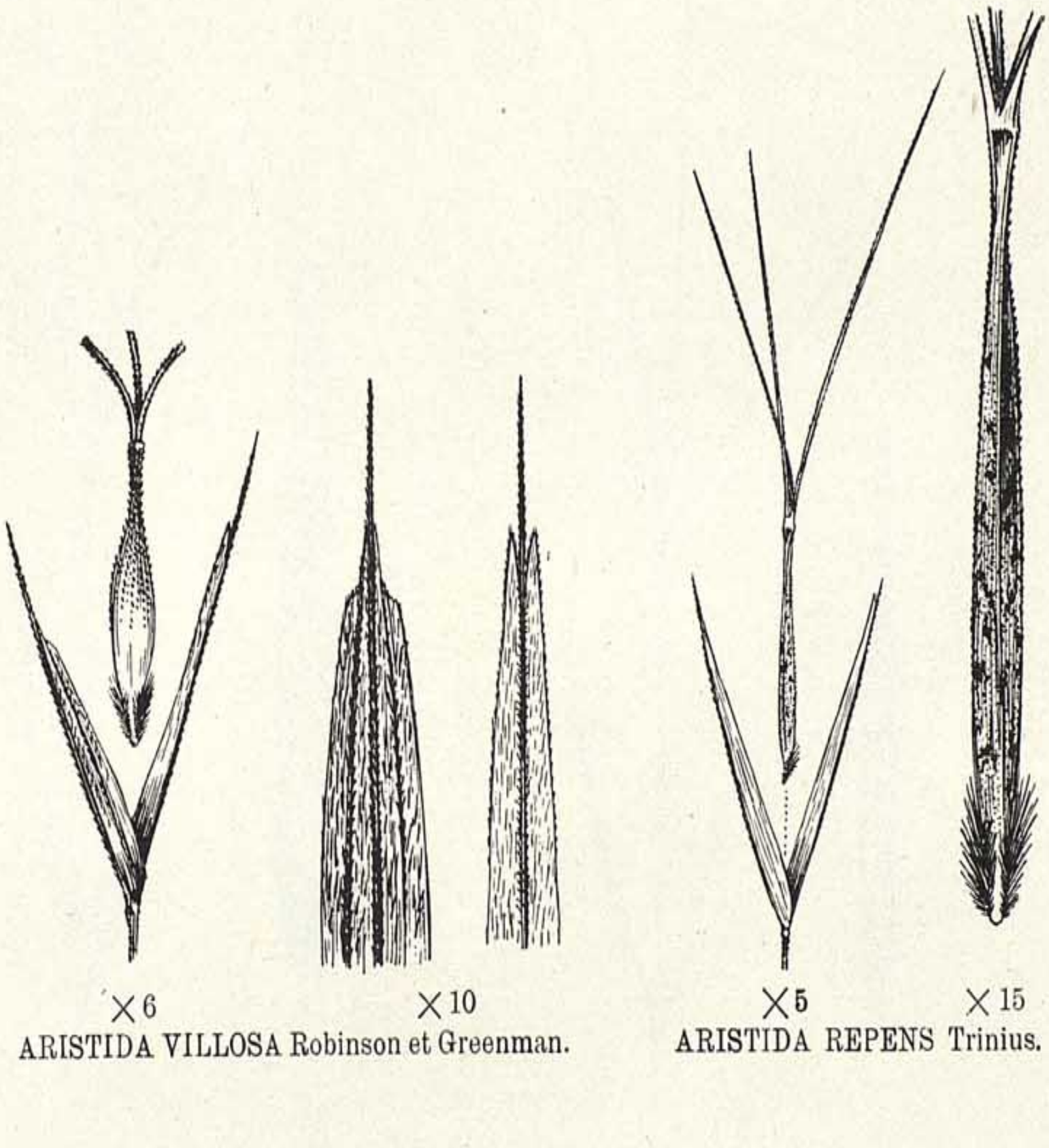
Culms more or less branched, rather robust, blades mostly rather short.

Blades mostly convolute, lower glume 5 mm. long, inclusive of the scarcely 1 mm. long awn, upper one $6^1/_2$ mm. long, lemma with callus and column up to 7 mm. long, lateral awns about 15 mm. long, the central one about $17^1/_2$ mm. long. . . . . **var. aequilonga Trin. et Rupr.**

Blades mostly flat in the lower half part, lower glume 6 mm. long, upper one 7—8 mm. long, lemma inclusive of the callus and column $8^1/_2$—9 mm. long, lateral awns about $22^1/_2$ mm., central one 25 mm. long. . . . . **var. longiflora Trin. et Rupr.**

Culms simple or nearly so, thin and elegant, blades elongate, up to 15 cm. long, lower glume scabrous, otherwise as in var. *longiflora*, but the panicle-branches commonly longer. . . . . **var. senegalensis Trin. et Rupr.**

Glumes very unequal, the upper twice as long as the lower one, both glabrous, the keel of the lower glume scabrous, column of awns about as long as the body of the lemma. Algerian Sahara. . . . . **var. hoggariensis Henr.**

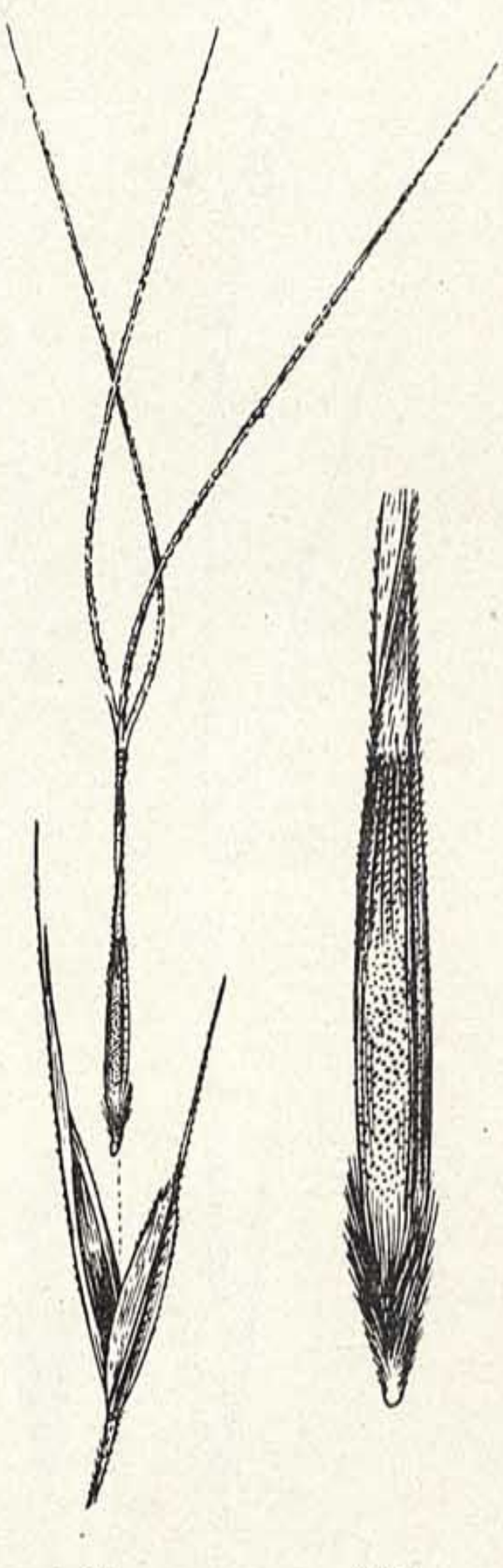


×6 ×10

ARISTIDA VILLOSA Robinson et Greenman.

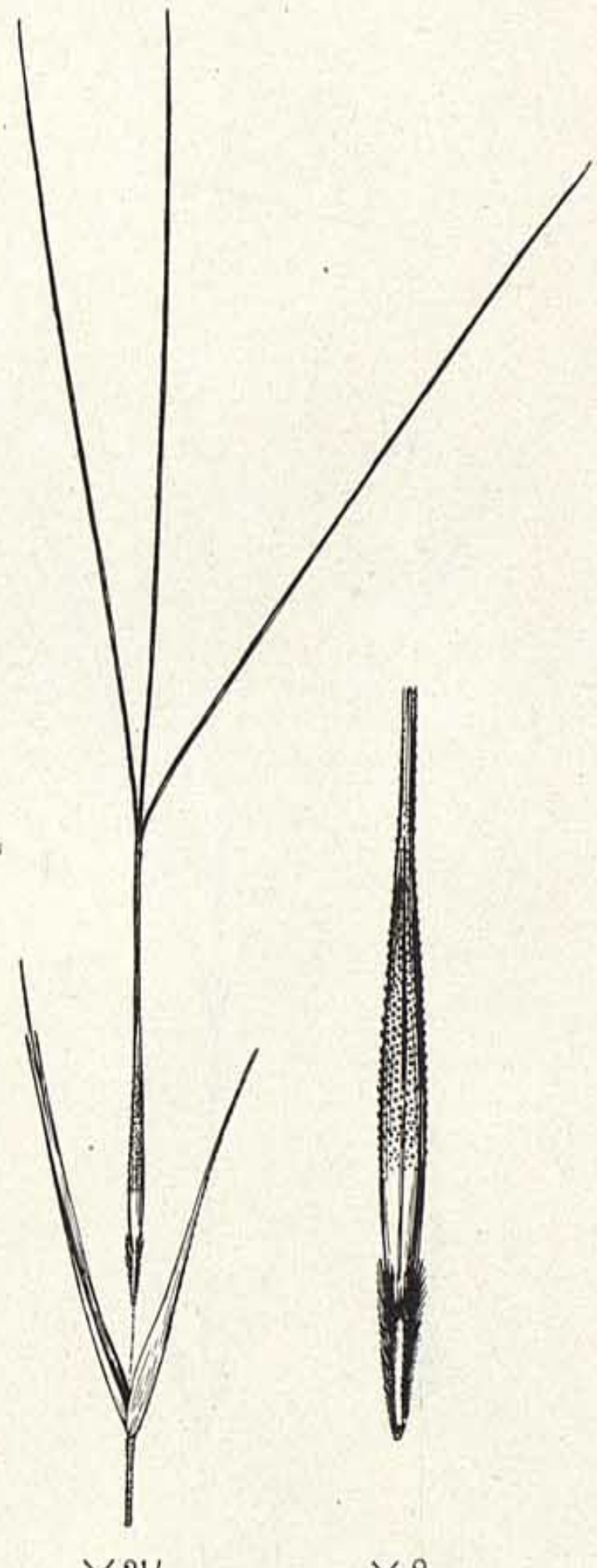
×5 ×15

ARISTIDA REPENS Trinius.



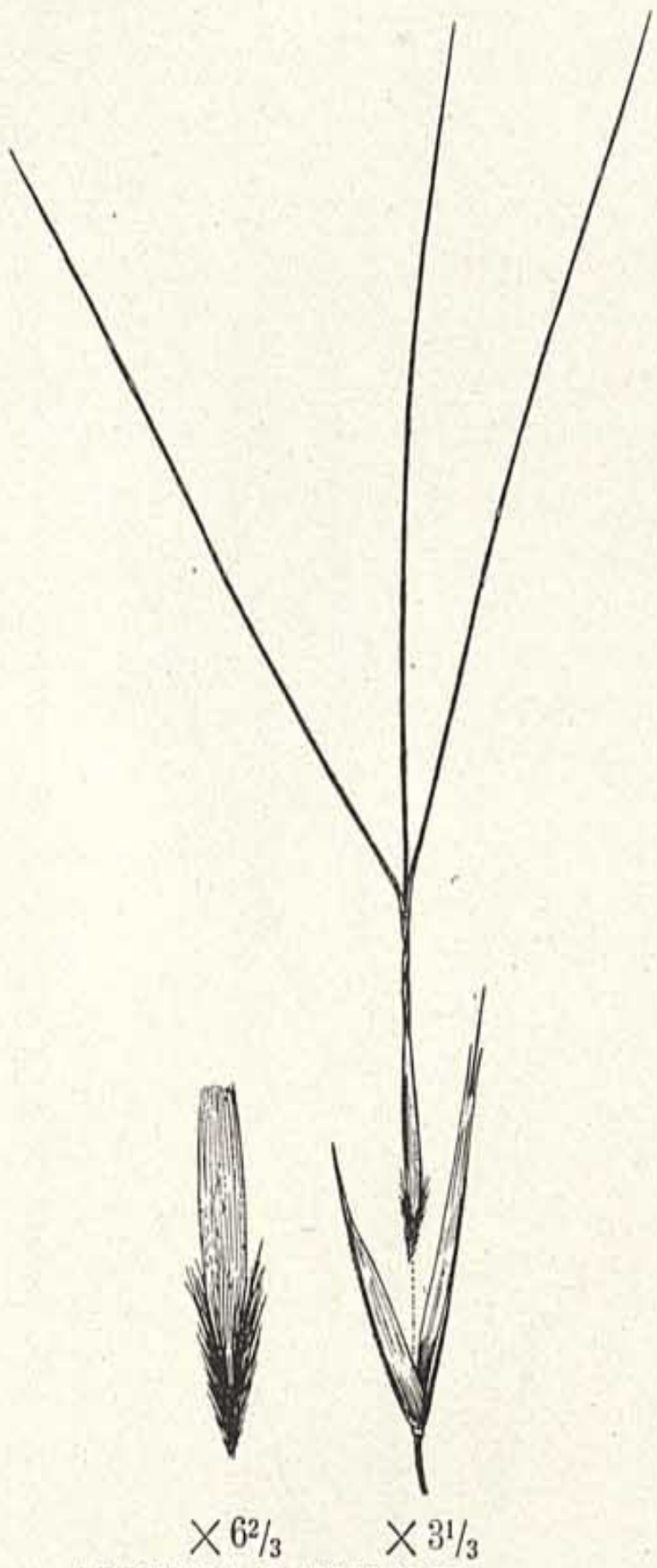
×5 ×15

ARISTIDA CAUDATA Andersson.

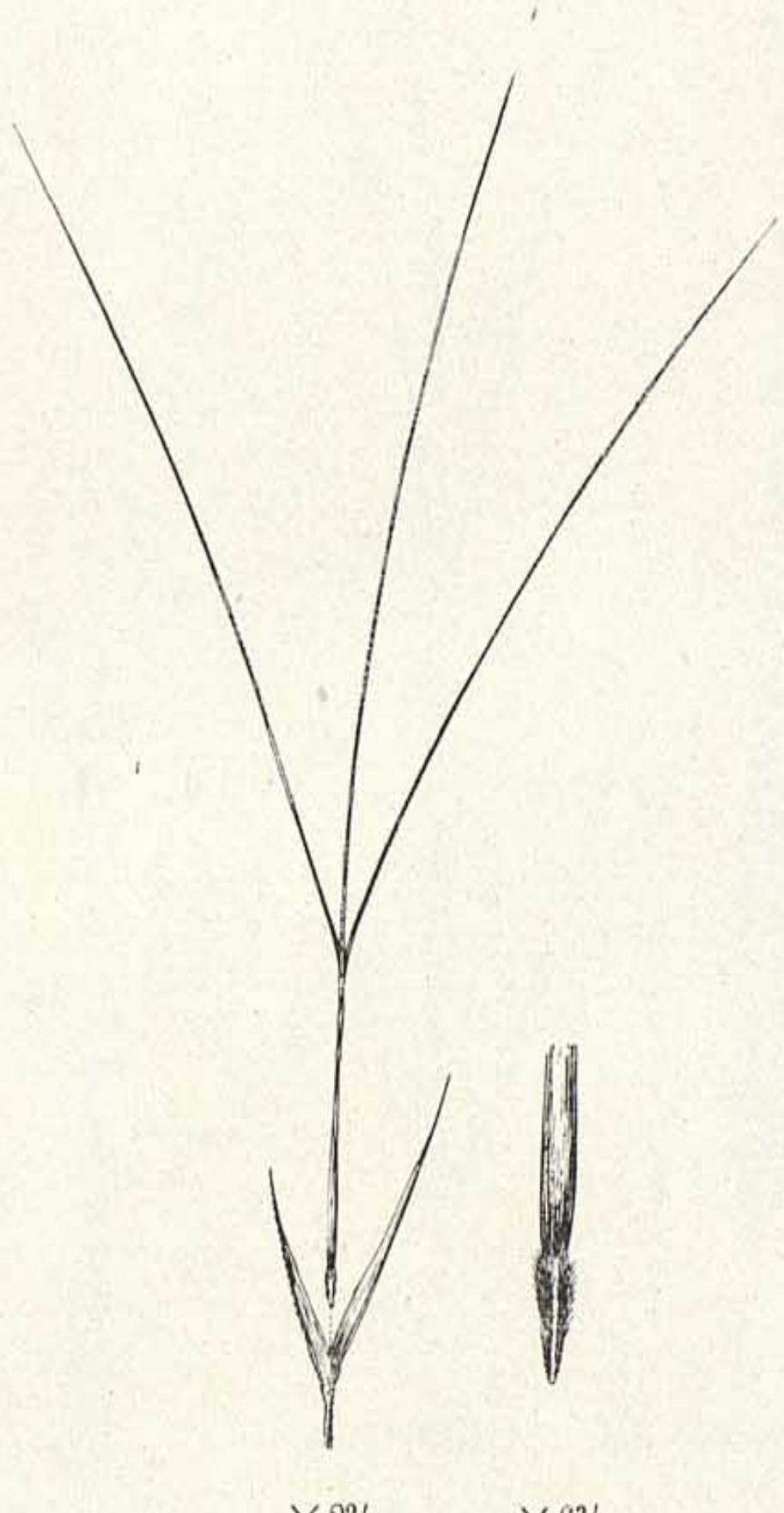


×3⅓ ×8

ARISTIDA ALOPECUROIDES Hackel.

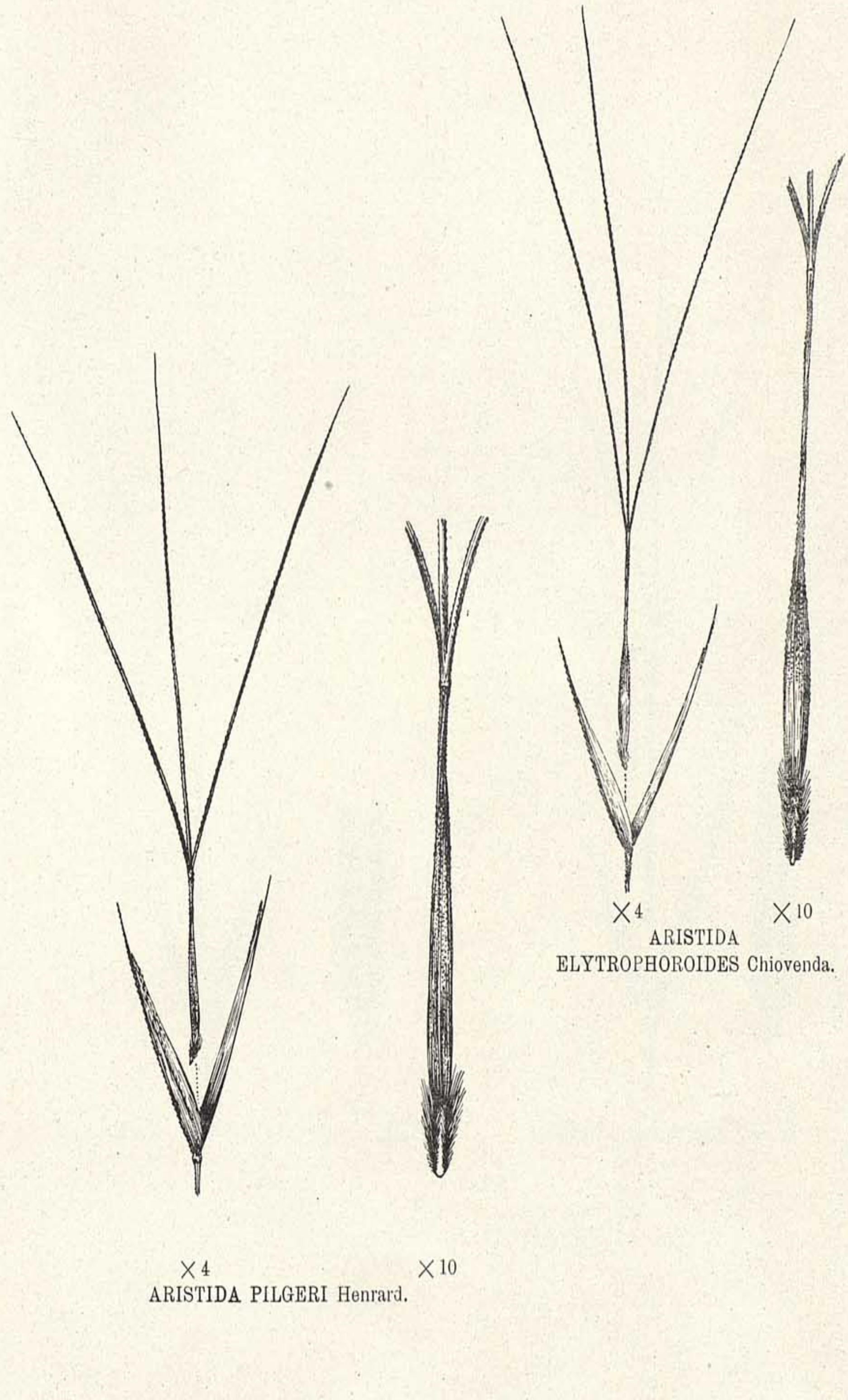


×6⅔ ×3⅓
ARISTIDA RANGEI Pilger.



×2⅔ ×6⅔
ARISTIDA LONGICAUDA Hackel.

Plate XLV.

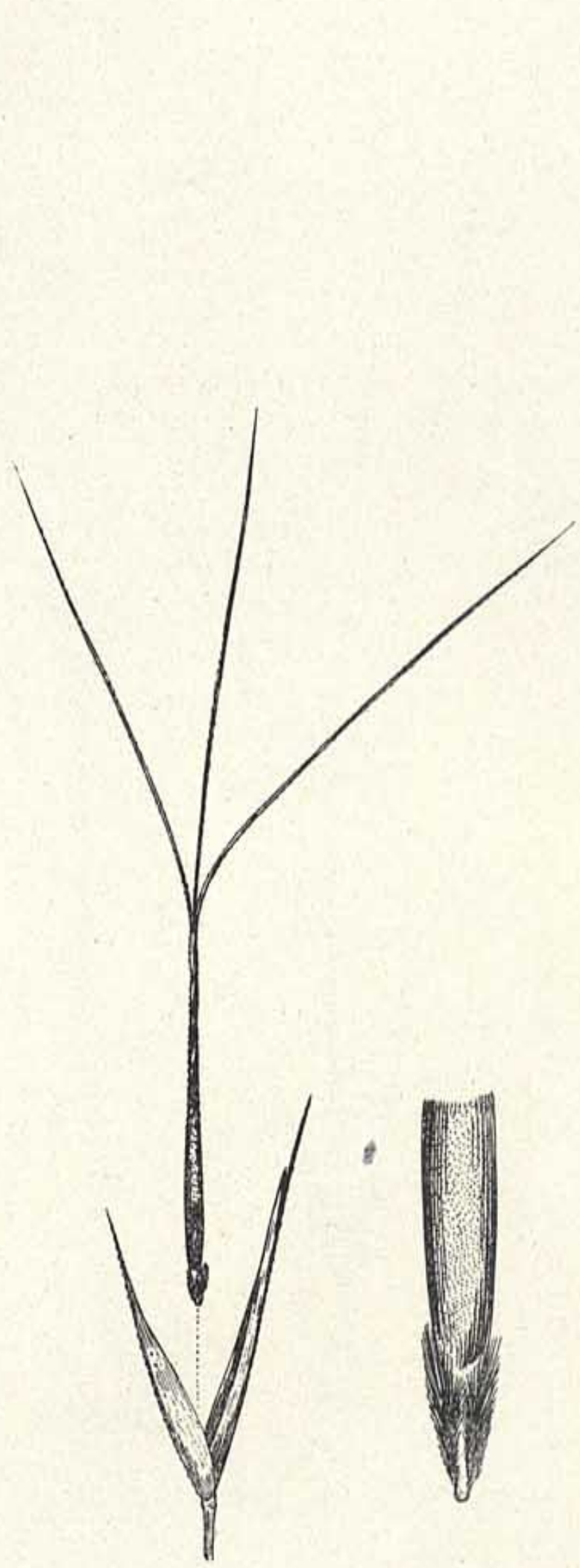


×4 ×10

ARISTIDA PILGERI Henrard.

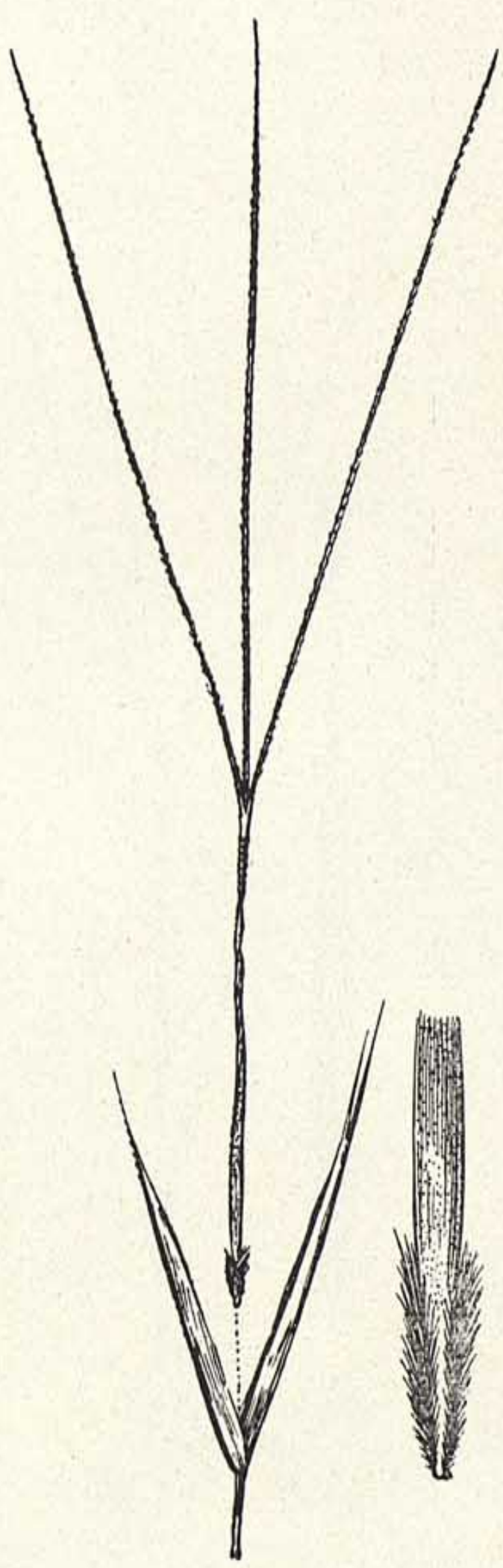
×4 ×10

ARISTIDA
ELYTROPHOROIDES Chiovenda.



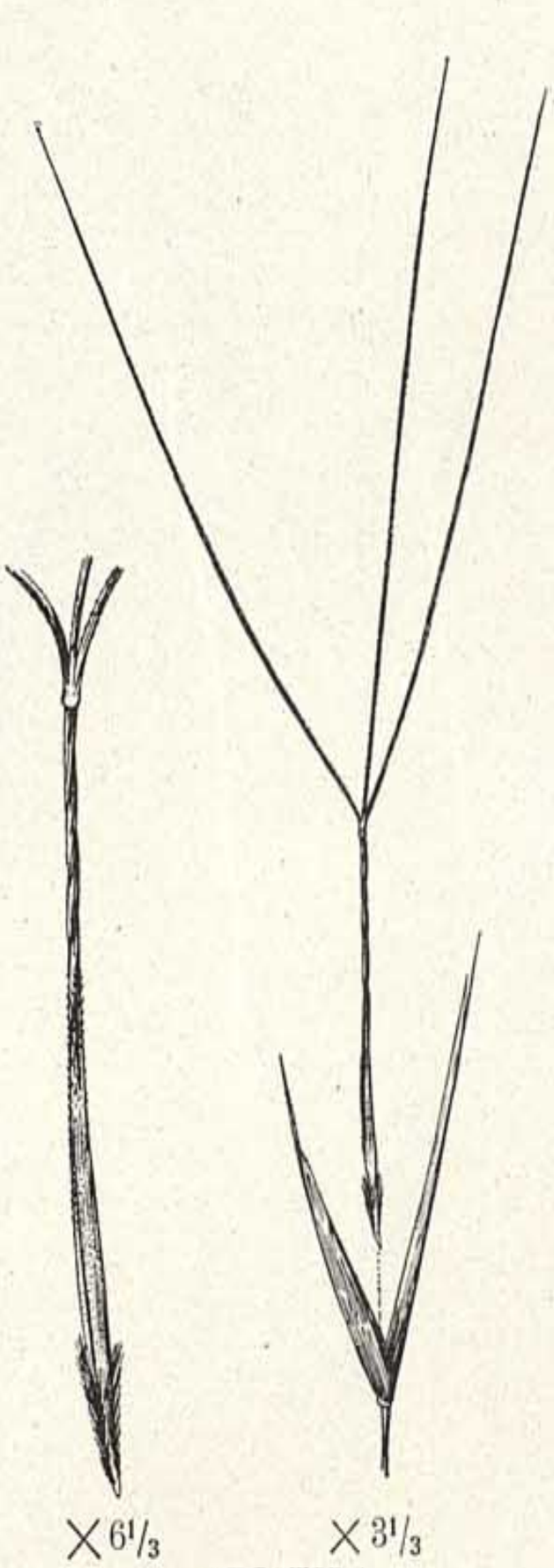
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ARISTIDA SUBSPICATA Trin. et Rupr.



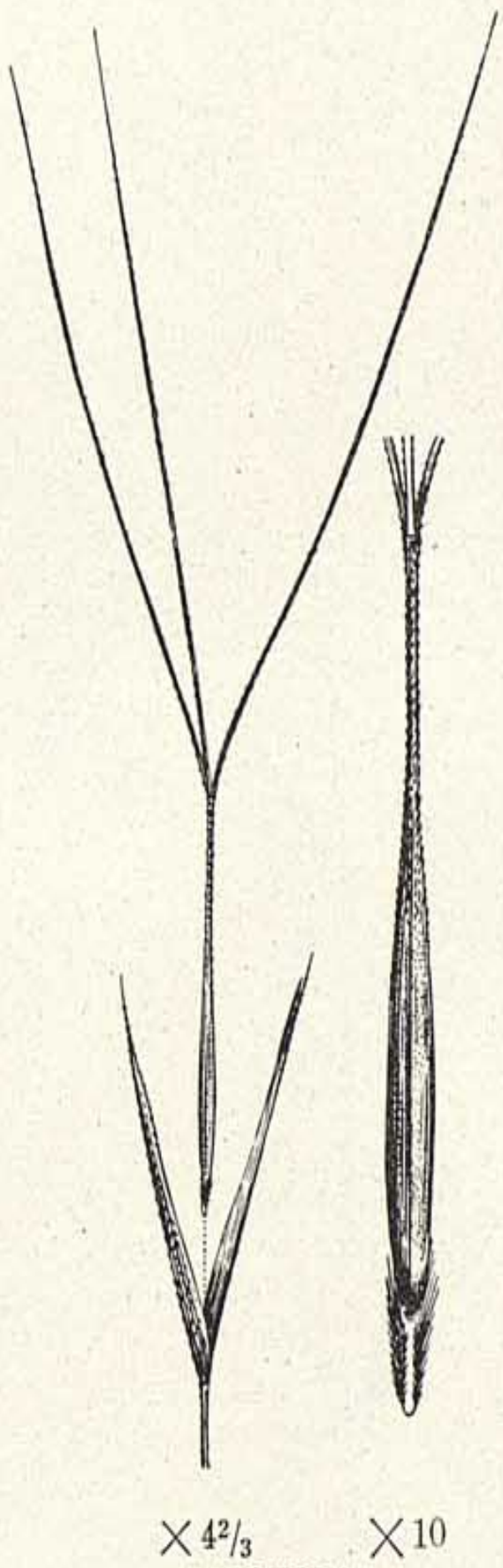
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ARISTIDA TUNETANA Cosson.



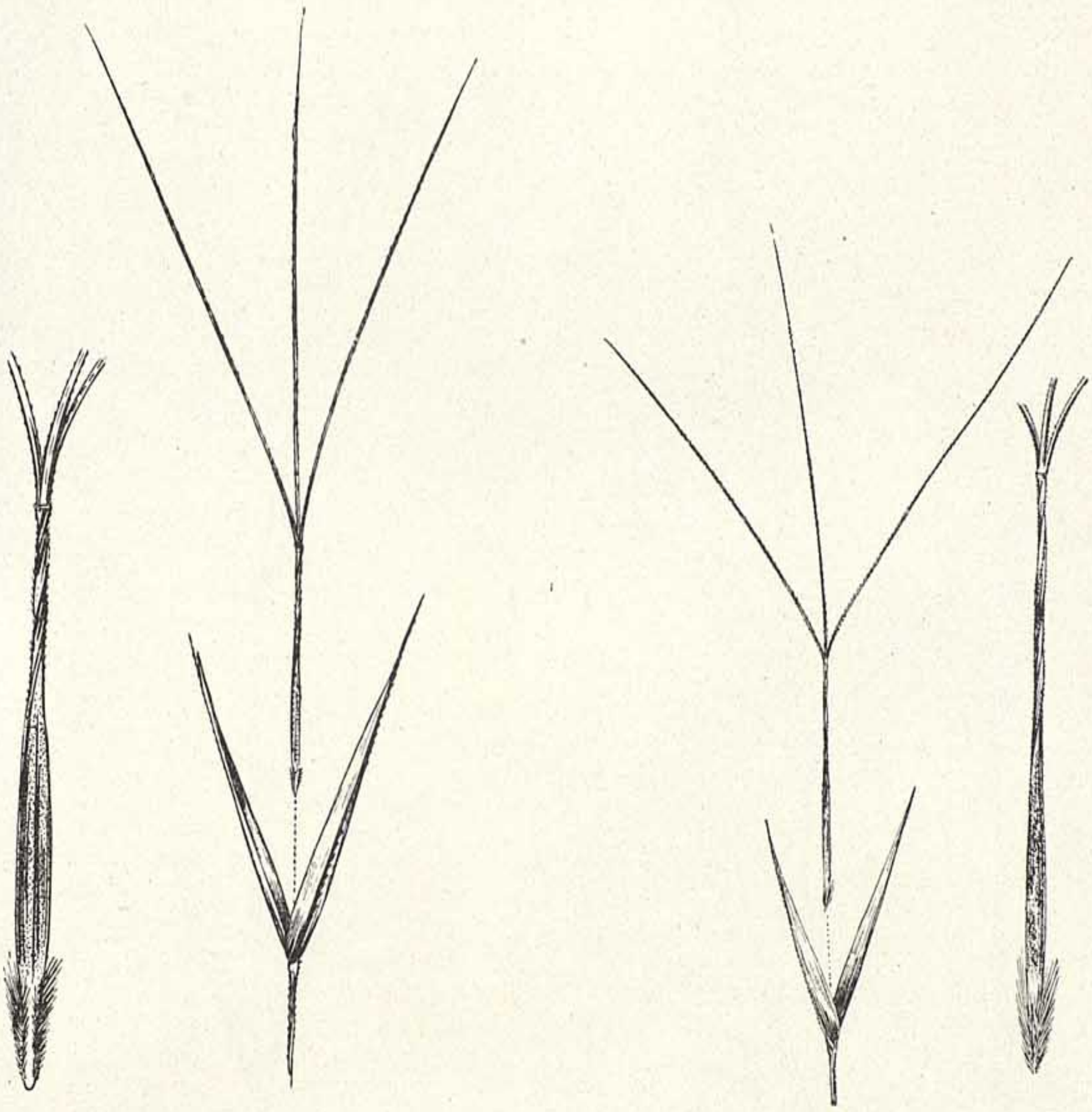
×6⅓ ×3⅓

ARISTIDA
CONGESTA Roem. et Schultes.



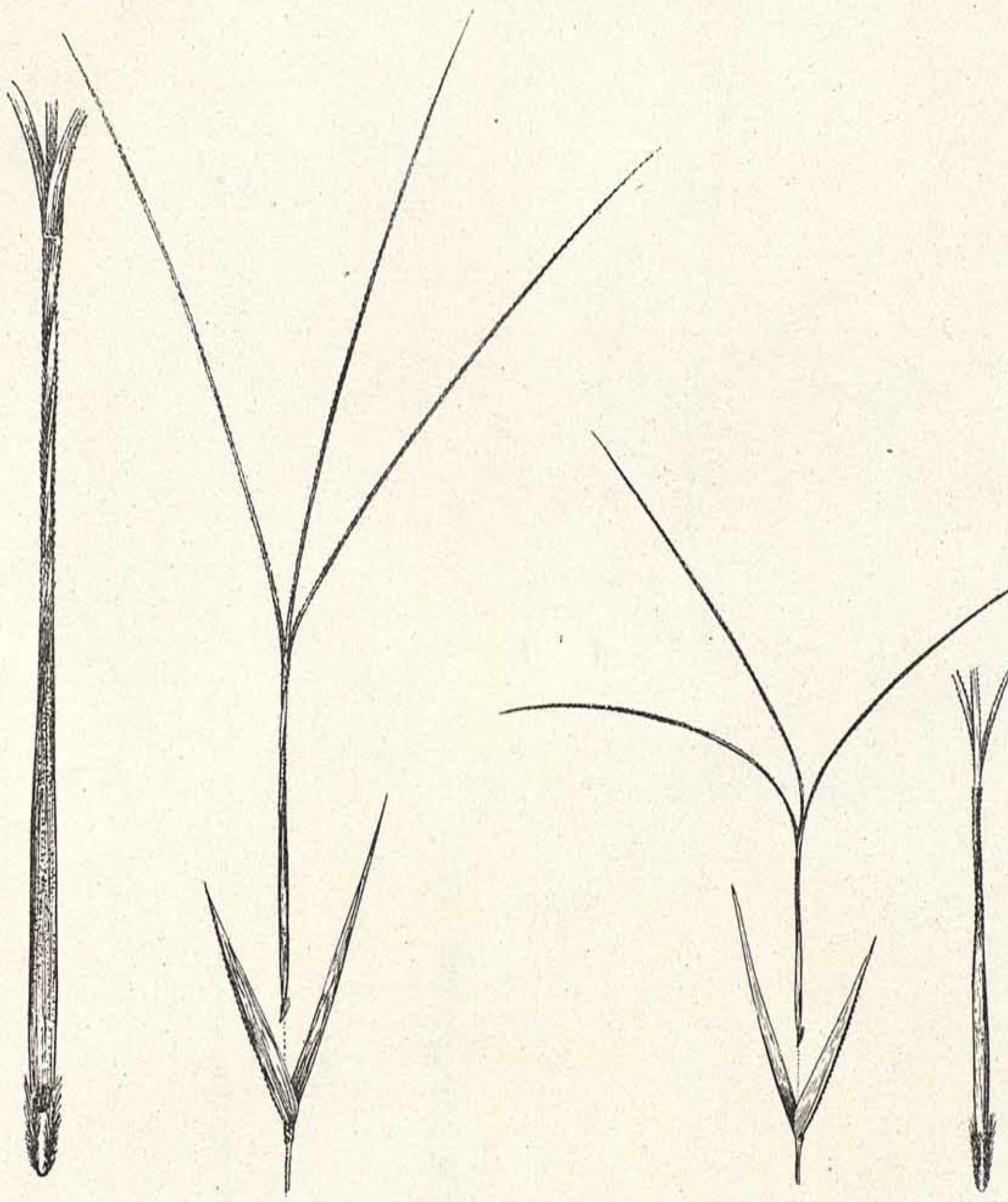
×4⅔ ×10

ARISTIDA
NIGRITIANA Hackel.



×14 ×6 ×2²/₃ ×7

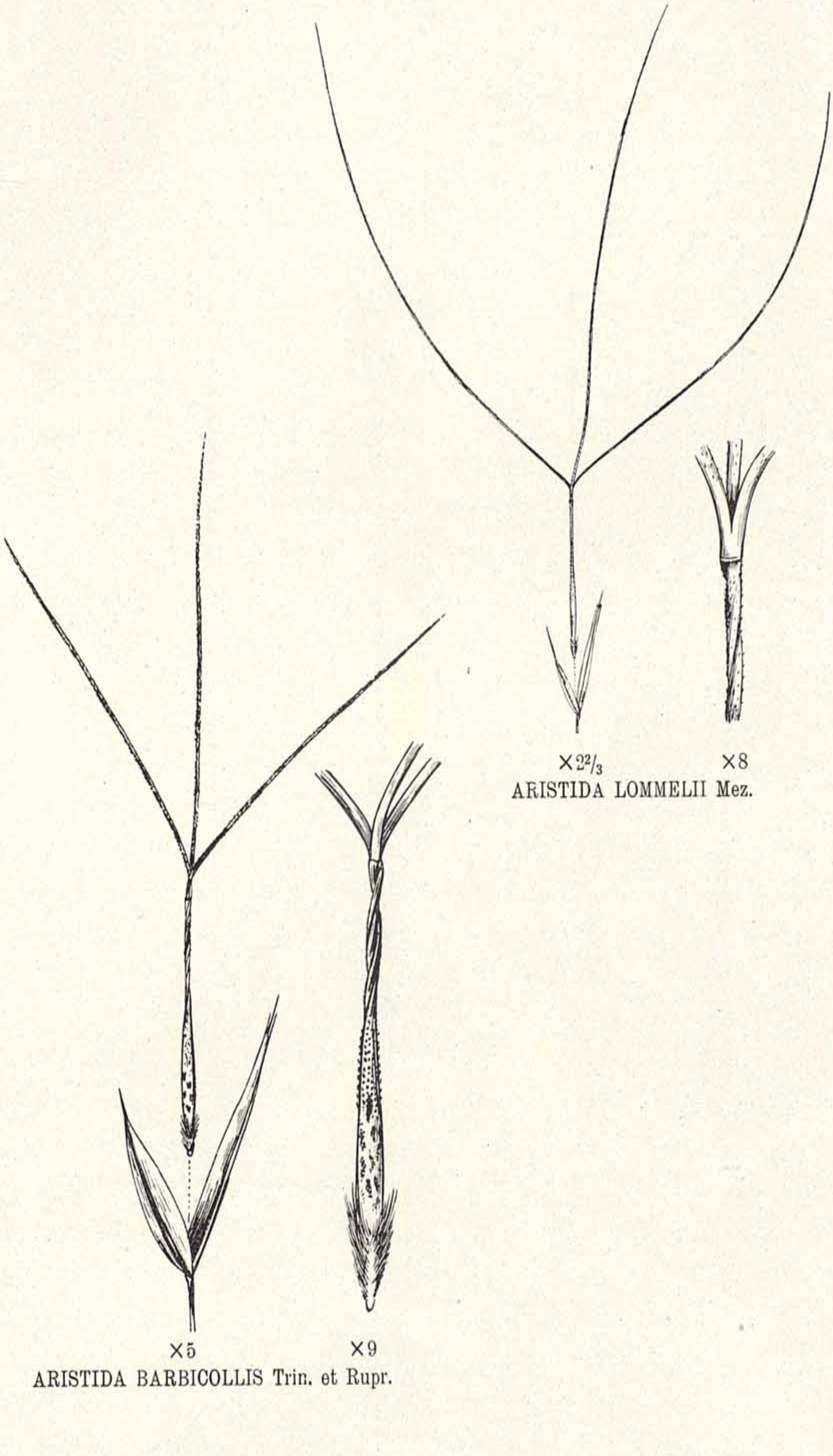
ARISTIDA DIVULSA Andersson. ARISTIDA DOELLIANA Henrard.



×10 ×4 ×4 ×8

ARISTIDA SETIFOLIA H. B. K.
var. arenaria Tr. et Rupr.

ARISTIDA SETIFOLIA H. B. K.

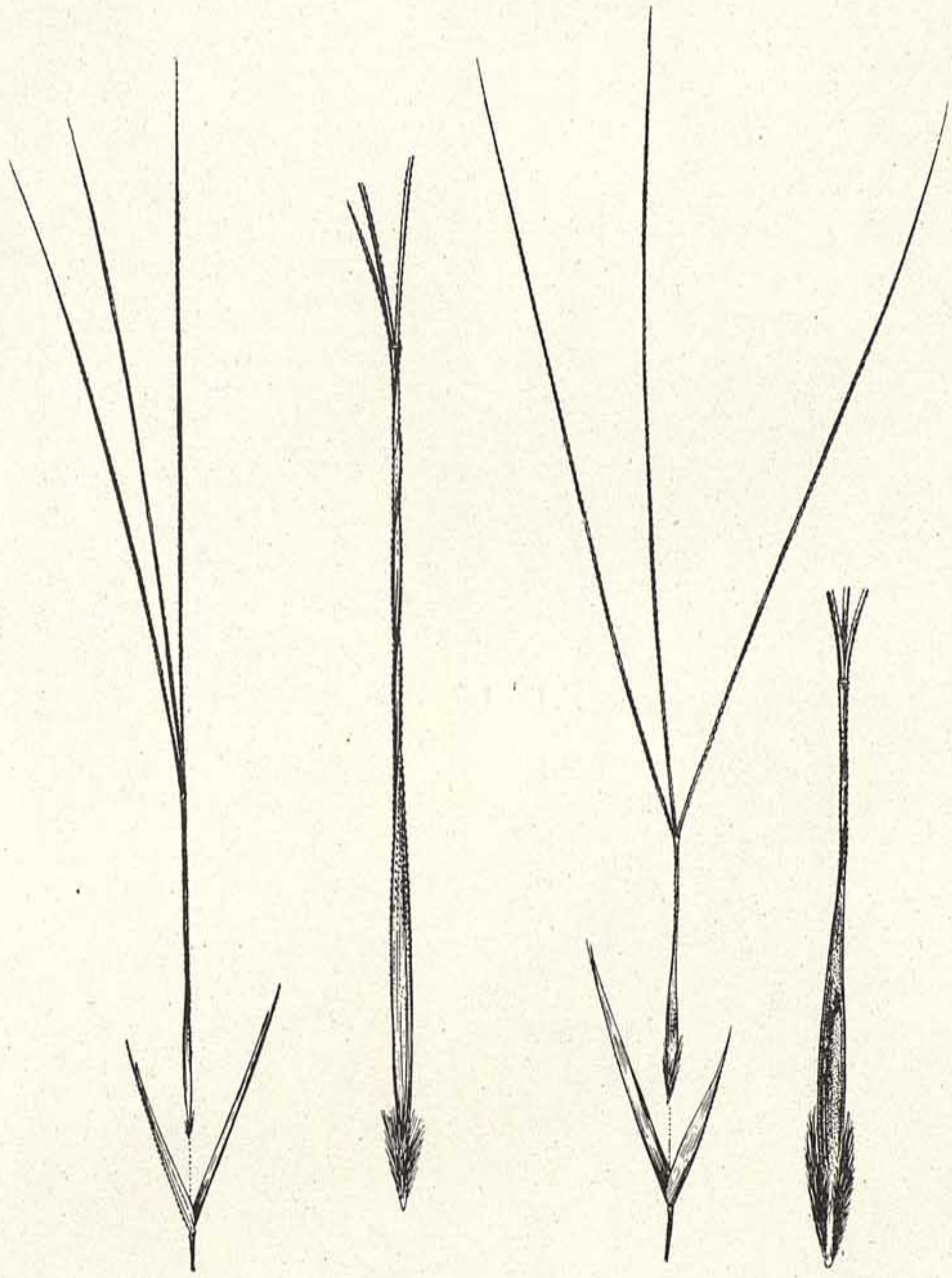


×2²/₃ ×8

ARISTIDA LOMMELII Mez.

×5 ×9

ARISTIDA BARBICOLLIS Trin. et Rupr.

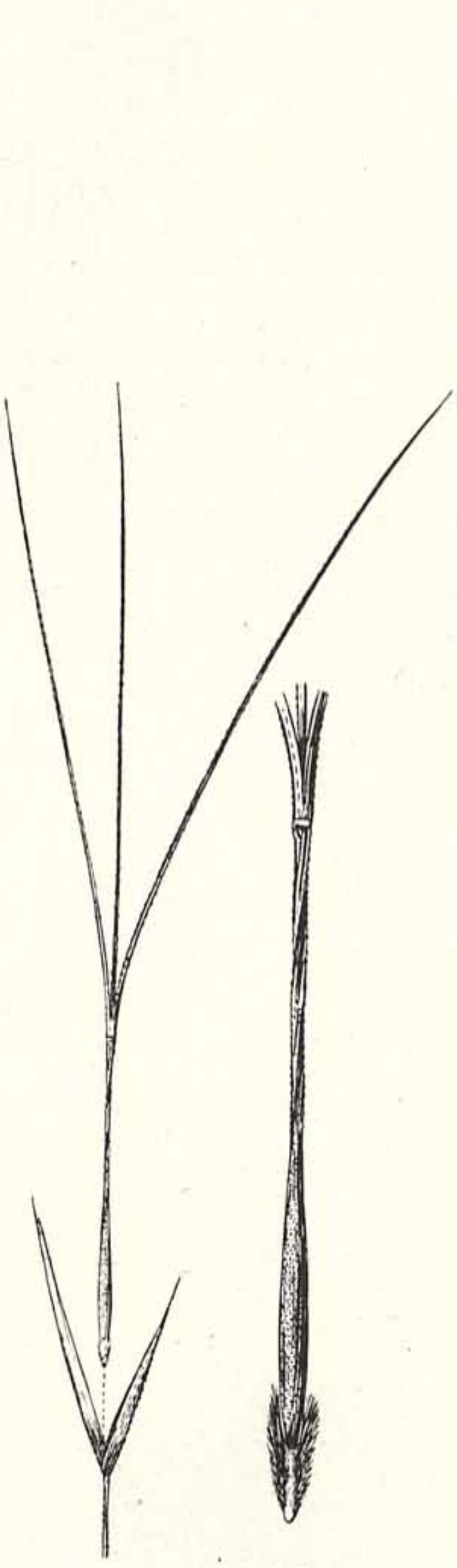


×4 ×10

ARISTIDA ASTROCLADA Chiovenda.

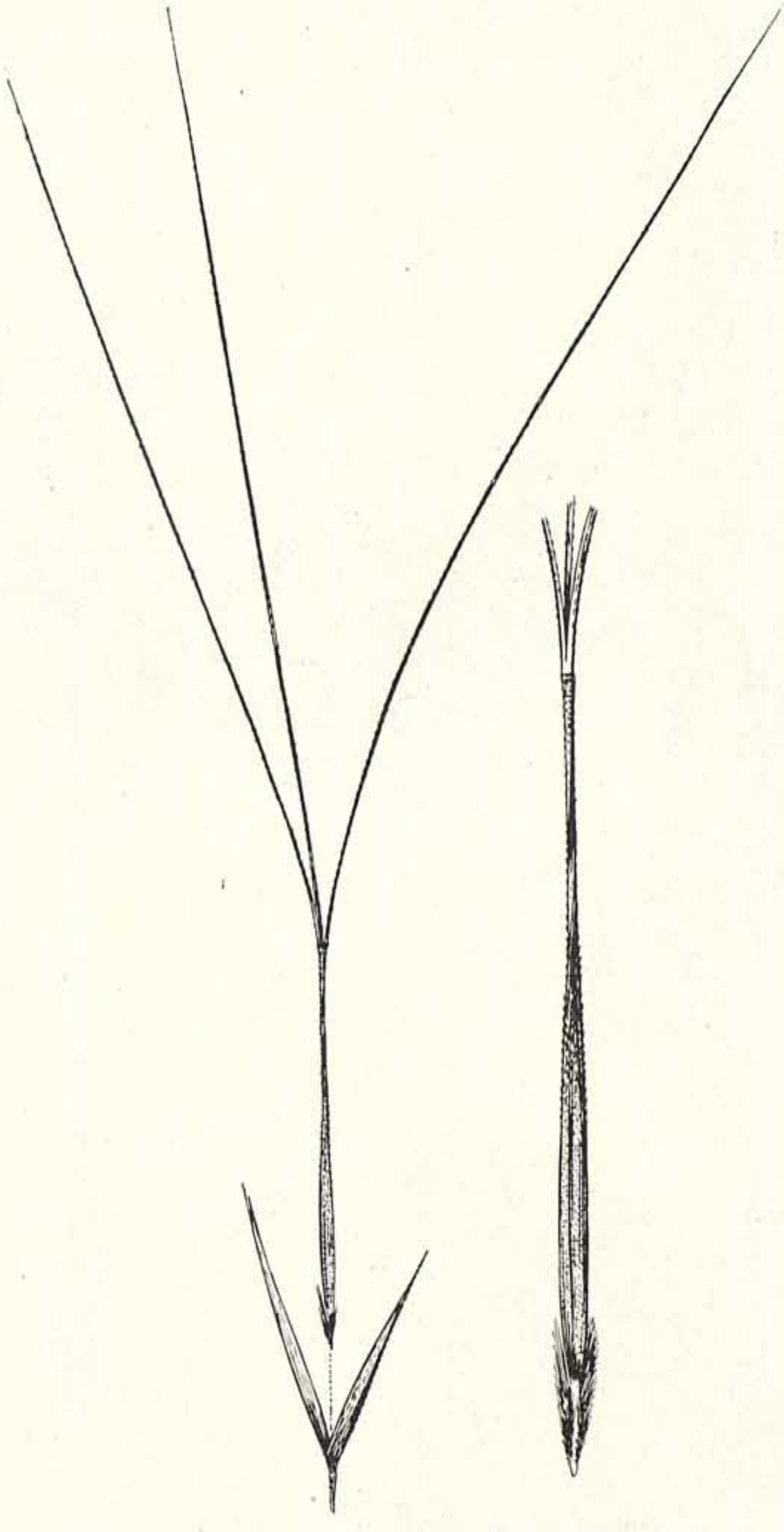
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ARISTIDA MECCANA Hochst. ap. Trin.



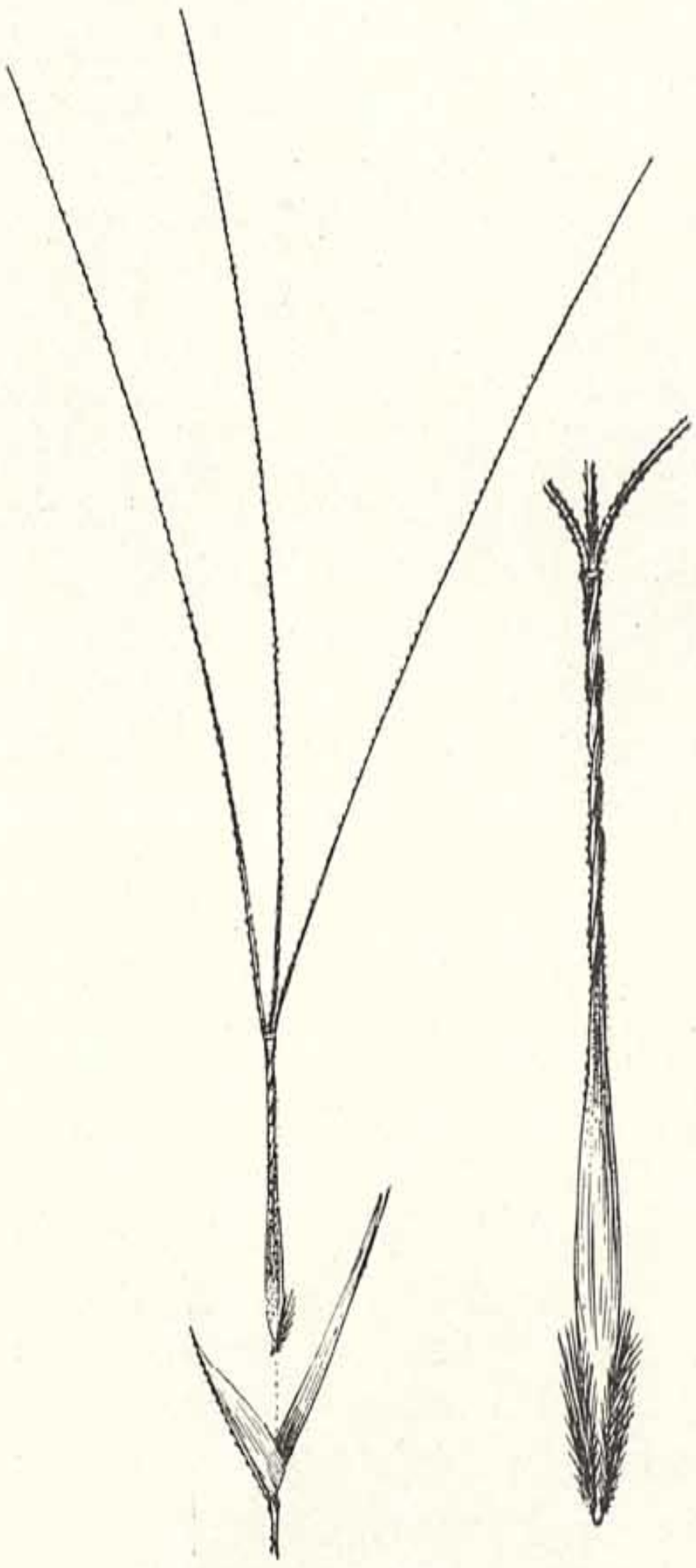
×4 ×8⅔

ARISTIDA MUTABILIS Trinius
et Ruprecht.
var. AEQUILONGA Tr. et Rupr.



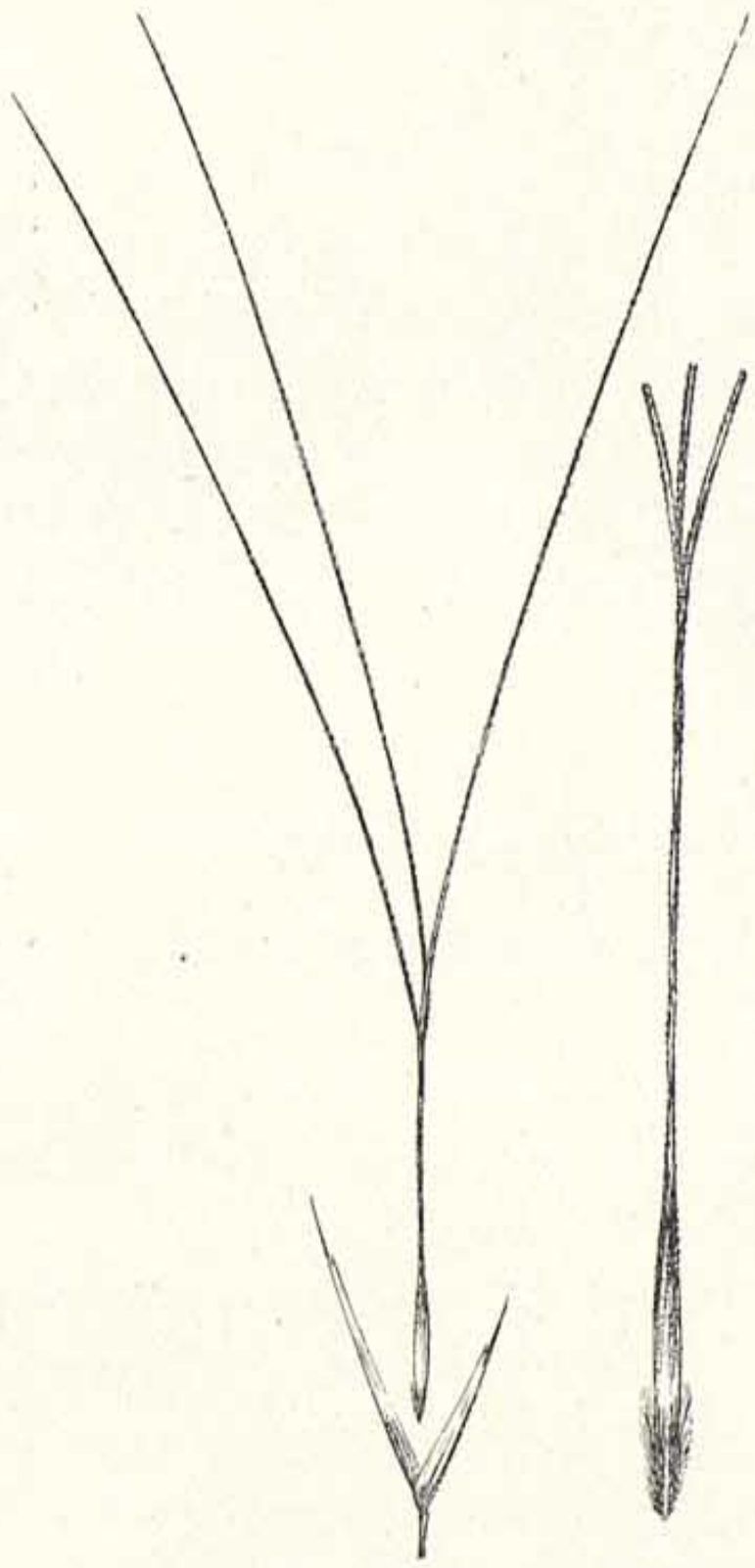
×4 ×8⅔

ARISTIDA MUTABILIS Trin. et Ruprecht.
var. LONGIFLORA Tr. et Rupr.



×3 ×9

ARISTIDA MUTABILIS Trin. et Rupr.
var. hoggariensis Henr.



×3⅓ ×6⅔

ARISTIDA CASSANELLII Terracciano.

SECTION PSEUDOCHAETARIA HENRARD.

In the year 1915, DOMIN proposed for a group of three Australian species, the name of *Arthrochaetaria* with the diagnosis: „Ut Chaetaria sed aristae a glumella conspicue articulatae". If we study these three species of DOMIN, we find however that an articulation between the lemma and the awns is not present at all, there is no special tissue and at maturity the awns do not break off. The three species accepted by DOMIN as belonging to a distinct section, are indeed true *Chaetarias* and the name *Arthrochaetaria* is thus a synonym of *Chaetaria*. I have therefore taken up the name *Pseudochaetaria* for a group of three African *Aristidas*, where there is a true articulation between the body of the lemma and the awns, these species have no column. The type of this section is *Aristida hordeacea*, described by KUNTH in the year 1830 as having an „arista tripartita articulata". In the year 1842, TRINIUS and RUPRECHT described *Aristida Steudeliana* and *Aristida Kunthiana* and although they had seen the articulation, — they give „flosculo cum basi aristae facile solubilis articulatim conjuncto" —, they placed these two species in their first section „aristae persistentes setis nudis", this proves that they have not given much importance to the absence or presence of an articulation in our genus. The section *Pseudochaetaria* is entirely limited to Africa.

Key to the species of the section Pseudochaetaria.

1. Panicles loose and open or but slightly contracted, never subspicate or spike-like, glumes shortly mucronate only. . . . . 2.

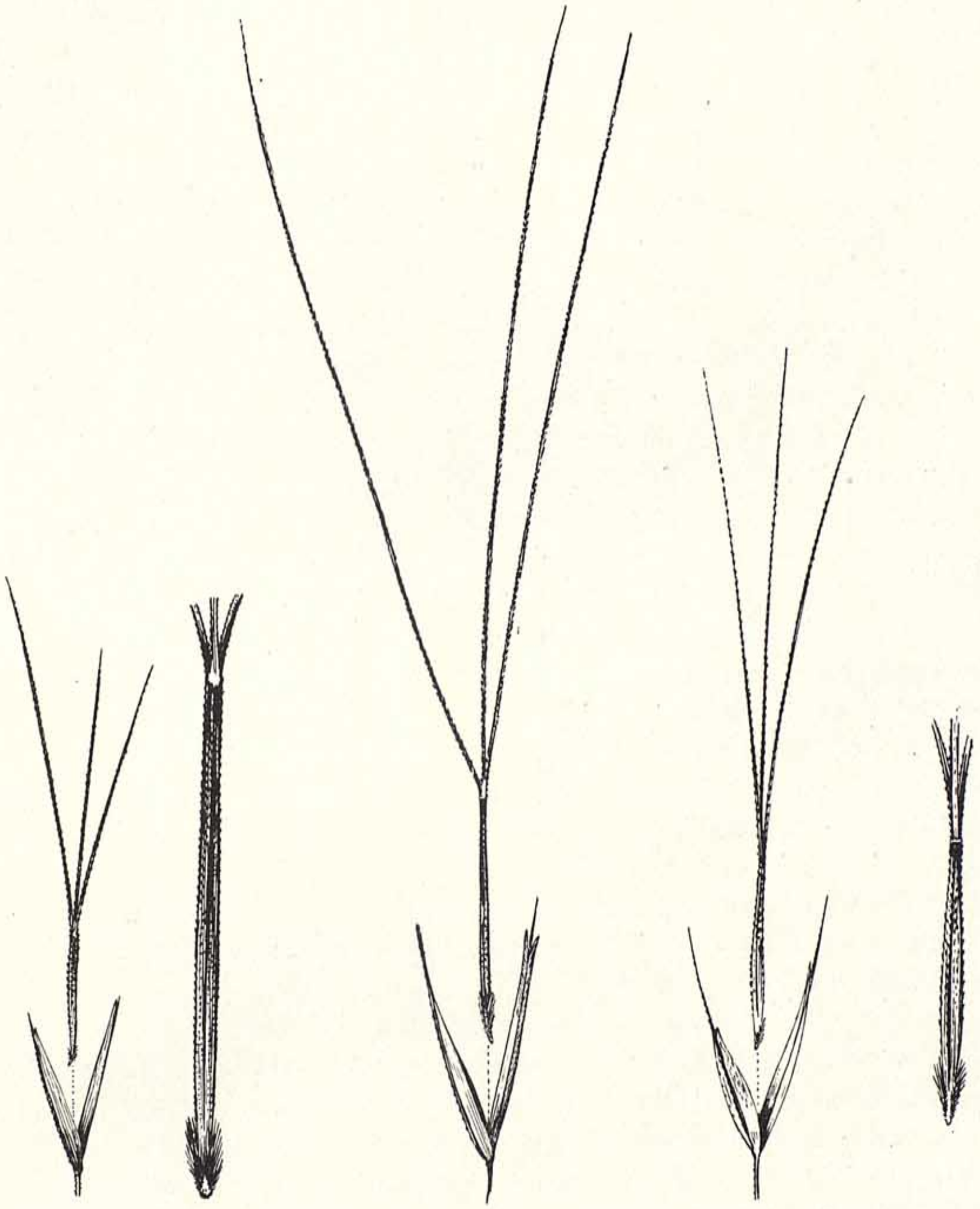
   Panicles densely contracted, compact and spike-like or interrupted only below, the branches and pedicels always very short and the spikelets fascicled; glumes manifestly long-awned.

   Annual, erect or ascending, much branched from the base and some of the lower nodes or simple in meagre specimens, up to 40 cm. high, or in small forms only 10 cm. high or shorter, robust forms commonly much longer; culms strict, few-noded, the internodes densely pubescent with reflexed or spreading, stiff, short hairs, striate, compressed or subterete in depauperate specimens, sometimes becoming nearly glabrous, nodes constricted and densely pubescent or becoming more or less glabrous; sheaths striate, keeled, pubescent, with narrow hyaline margins, shorter or sometimes as long as the internodes, meagre specimens have more terete, scabrous internodes only, ligules and auricles a shortly bearded rim, collar smooth; blades more or less glaucous, mostly flat or implicate and keeled or in depauperate specimens somewhat convolute, narrow, linear or commonly broad and flat, acute, up to 10 cm. long or in robust forms much longer and broader, scabrous on both surfaces or hirtellous above and becoming glabrous beneath; panicle linear-oblong

or subovate, exserted, the peduncle densely pubescent, the inflorescense commonly 6—7 cm. long and 1—3 cm. wide, in small forms much shorter and only a few cm. long and nearly as broad, or in robust forms much longer, axis densely pubescent, branches solitary, much divided from the base, the branchlets and flowers fascicled, the short pedicels pubescent; the panicle dense, not or slightly interrupted at the base only, in robust forms more interrupted and the axis visible in the lower part; spikelets congested, linear-lanceolate, glumes 1-nerved, the lower 4 mm. long, rather broad, scabrous on the keel and on the back, bifid at the apex with a scabrous, about 3 mm. long awn from the sinus, upper one smooth on the keel or scaberulous on the back, more deeply bifid at the apex, 5—6 mm. long, the awn about 2 mm. long; lemma narrowly linear, fusiform, the acute, densely hairy callus about $^1/_2$ mm. long, the body scabrous with very characteristic spiny hairs in lines from the base to the summit, ventral side furrowed, but the margins not quite inrolled, 5—6 mm. long, slightly narrowed but scarcely beaked, the place of the articulation well-marked, awns about equal, scabrous, strictly erect, about 15—20 mm. long or in robust specimens much longer. Africa: Widely distributed from Senegambia and the Sahara to Abyssinia, south to South West Africa and Rhodesia . . . . . **Aristida hordeacea Kunth**

Culms very robust, up to 1 meter high, blades up to 9 mm. wide, quite flat and many-nerved, panicles much longer with the awns more than 20 cm. long and about 5 cm. wide, much interrupted at the base, spikelets longer, the lemmas up to 9 mm. long and the awns 6—7 cm. long. Northern Nigeria to South West Africa . . . . . **var. longiaristata Henr.**

2. Panicle contracted but no very dense, the branches erect or ascending, spikelets bearing nearly from the base; blades flat, lemmas shorter than the unequal glumes which are obtuse and awn-pointed. Plant with the habit of Aristida adscensionis.
Annual, much branched from the base, often forming hemispheric tufts as much as 10 cm. in diameter, 10—40 cm. high, including the panicles, culms erect or geniculately ascending, fasciculate, branched from nearly all the nodes, terete, striate, scaberulous; sheaths about as long as the internodes or longer, striate, keeled, glabrous, slipping from the stems, ligules and auricles a minute ciliolate rim, collar



×3 ×12
ARISTIDA CARDOSOI
Coutinho.

×4
ARISTIDA KUNTHIANA
Trin. et Rupr.

×4 ×6
ARISTIDA HORDEACEA
Kunth.

glabrous and smooth; blades narrow, linear, flat, the tips only setaceously convolute and pointed, up to 2 mm. or sometimes only $^1/_2$ mm. wide, 8—10 cm. long, rather soft, not rigid, many-nerved, the margins not thickened, glabrous beneath, scabrous or hirtellous on the upper surface; nearly all the branches of the culms panicle-bearing, the panicles erect, strict, contracted but not dense and spike-like, up to 10 cm. long and about 1 cm. wide without the awns, axis striate, angulous, scaberulous, branches scabrous, binate, the longer ones shortly peduncled, the peduncle about 1 cm. long, the branches only a few cm. long, many-flowered, the shorter ones sessile, spikelet-bearing from the base, few-flowered, pedicels scabrous, shorter than the glumes, the lateral flowers subsessile; spikelets yellowish-green, sometimes tinged with purple, glumes about equal or the lower slightly shorter than the upper one, 6—7 mm. or sometimes up to 8 mm. long, linear-lanceolate, 1-nerved, the lower scabrous on the keel, acute, shortly awned, the apex slightly bifid, upper one bifid, with obtuse lobes and a mucro from the sinus, smooth on the keel; lemma compressed and keeled, very scabrous nearly all over, the keel more or less spiny, about 5 mm. long, the very short callus obtuse and densely hairy and long-bearded, the place of the articulation well-marked; awns rather variable in length, slightly unequal or equal, scabrous, erect or somewhat spreading, the central one about 15 mm., the lateral ones up to 10 mm. long or in robust specimens all the awns up to 25 mm. long. Africa: Cape Verd Islands. . . . . **Aristida Cardosoi Coutinho**

Panicle very effuse, the branches divaricately spreading, naked at the base over a long distance; blades convolute or flat only at the base; lemmas about as long as the glumes, the latter very acute and manifestly awned. Plant with the habit of Aristida mutabilis.

Annual, culms erect, glabrous, up to 30 cm. high or much longer, thin and elegant, filiform, simple or branched from the middle nodes; sheaths glabrous, striate, tight, shorter than the internodes, ligule a short ciliate rim, auricles bearded; blades narrow, involute or convolute upwards, flat only at the base, the lower up to 5 cm. long or shorter, the culm-blades up to 20 cm. long, ending in a setaceous point; panicle rather depauperate, up to 15 cm. long, exserted, very effuse, branches solitary, alternate, elongate, nearly simple, spikelets bearing at the ends, the spikelets congested and forming false spikes, lower branches up to 10 cm. long, the upper ones gradually shorter; glumes about equal, 5—8 mm., mostly about 7 mm. long, 1-nerved, the lower linear-lanceolate, gradually narrowed into the nearly 2 mm. long, scabrous

awn, the keel scabrous, the upper one but slightly longer than the lower, smooth on the keel, manifestly bifid at the apex, the lobes acute and very prominent, with a scabrous 1—1½ mm. long awn from the sinus; lemma with an acute about ¾ mm. long, densely hairy callus, tubulous, more or less scabrous, but slightly narrowed and not beaked, about as long as the glumes, the place of the articulation well-marked, at maturity the awns easy to break off, scabrous, equal or slightly unequal, 15—25 mm. long. West Africa: Senegambia. . . . . .
. . . . . **Aristida Kunthiana Trin. et Rupr.**

SECTION STREPTACHNE (R. BROWN) DOMIN.

Robert Brown described the genus *Streptachne* in the year 1810 and mentioned as the most important character that the terminal awn is not articulated with the valve. His specimens had no trace of lateral awns and there was thus no reason for him to bring his plants in connection with the genus *Aristida*. In the year 1799 Cavanilles had described a species as *Aristida ternipes* and here there are short lateral awns, in the type of Cavanilles they are scarcely 1 mm. long and in other specimens of *A. ternipes* the lateral awns are nearly wanting. Five years after the publication of the genus *Streptachne*, the authors of the Nova Genera et Species Plantarum used the name *Streptachne* for a group of 3 American species. One of them *Streptachne scabra* H. B. K. is the same species as *Aristida ternipes* Cavanilles, the *S. tenuis* H. B. K. is only an immature *A. ternipes*, the *Streptachne pilosa* which is *Aristida jorullensis* Kunth, is a very distinct annual species. If we compare these species with the genus, described by Brown, it is impossible to find differences in the spikelet-characters and we can find transitions between plants with short lateral awns and others where the lateral awns are quite obsolete and absent. If the central awn is the only developed one, we can find at the summit of the column, the place of insertion of the lateral awns as a well-marked spot.

Trinius and Ruprecht accepted in the year 1842 *Streptachne* as a genus, they added two other species, without having seen the type of R. Brown. These two species *Streptachne ramosissima* and *S. verticillata* are indeed *Stipeae*, they belong to the genus *Stipa* and the Russian authors overlooked the articulation. In the Revision of the Australian species of *Stipa* by D. K. Hughes in the Kew Bulletin (1921) no. 1., these two species are placed under the doubtful ones. They belong according to Miss Hughes to the genus *Dichelachne*, having 2, not 3 lodicules. I have studied these two species and my conclusion is, that they belong to the genus *Stipa;* they have an articulation at the summit of the valve, but on account of the coronula at the base of the awn this articulation is not so distinct as in other species of the genus *Stipa*, if we have quite mature spikelets we find that an articulation is present.

If we will take up *Streptachne* as a genus we must give generic rank to the different

other sections of the genus *Aristida*, which have better characters to distinguish them.

Aristida ramosissima, a species belonging to the section *Chaetaria*, is a good example to demonstrate the reduction of the lateral awns, they are well-developed in the var. *Chaseana* but commonly much shorter in the typical form, not rarely the lateral awns are obsolete or totally wanting in var. *uniaristata*, but we can find many intermediary forms and it is impossible to separate this variety *uniaristata* as a species.

Prof. HITCHCOCK has in his work on the North American species of Aristida, proposed the name *Uniseta* for our section, he follows Mss. HUGHES and accepts *Streptachne* as a different and distinct genus.

The section *Streptachne* is among all the other groups of the genus *Aristida* the less-characteristic one and scarcely to maintain and I have taken up this section only for practical reasons; most of the typical members of this section are very striking and easy to recognize.

If we place other species as *Aristida utilis*, *A. abnormis* and *A. redacta* in this section *Streptachne*, we must somewhat modify the characters of this group, because these species have lateral awns sometimes as much as 6 mm. long, but these lateral awns are merely bristles with a delicate texture, the central awn is a true awn. In some cases the lemma is very curious, it consists of a lower tightly inrolled fertile part which encloses the grain as in other species of the genus. The upper part of the lemma, the so-called sterile part, is much thinner and not tightly inrolled but more or less gaping. At maturity the lemma breaks off sometimes between the fertile and the sterile part as if there was an articulation. If we examine however the place of the rupture, we find that an articulation is not present and that the rupture is artificial. The section *Streptachne* is not a very natural one and it is impossible to limit it sharply It is probably better to unite *Streptachne* and *Chaetaria*, but for practical reasons I have separated them in this work.

The section as accepted here is rather heterogeneous and the distribution is also curious. Three species are natives of Australia, one of them also found in British New Guinea. One species occurs in British India and another in North East Africa, the latter is also found in Persia. All these Old World species are more allied and form a distinct group which agrees better with the old genus *Streptachne*. The 8 New World species, especially natives of Florida, Arizona, Mexico and the North Western part of South America, are more allied to the section *Chaetaria*.

Key to the species of the section Streptachne.

1. Internodes always glabrous or scabrous only, never with a woolly tomentum; sheaths glabrous. . . . . 2.

   Internodes, at least the lower ones, densely villous or woolly-pubescent with weak long hairs; sheaths sparingly hairy, the hairs long and flexuous.

   Densely tufted, erect perennial, 40 cm. to more than 1 meter high,

culms slender, simple, terete, few-noded, the nodes congested in lower part of the culm, lower internodes short, the uppermost one or peduncle very long, glabrous or minutely pubescent, the lower internodes woolly but the sheath-nodes nearly or quite glabrous; sheaths shorter than the internodes, tight, terete, the uppermost one nearly glabrous, ligule a short truncate ciliolate rim, auricles pubescent and more or less bearded especially the innovations with long-bearded auricles, collar quite smooth; blades narrow, flat only at the base, convolute, setaceous, somewhat rigid, curved, mostly 7—15 cm. long, acuminate, glabrous or scaberulous on the upper surface only, scarcely 1 mm wide when expanded; panicle slender, 25—35 cm. long, somewhat contracted but rather loose, rhachis terete, scabrous, smooth below, the lower branches distant, suberect or slightly spreading with capillary scabrous branchlets and pedicels, branches binate or nearly solitary, the longer ones naked at the base, the shorter ones subsessile, few-flowered, sometimes all the branches bearing but 1—2 spikelets; spikelets erect, the lateral ones longer than the pedicels, glabrous or scaberulous, glumes lanceolate, subequal, the lower mostly a little longer and prominently 3-nerved or sub-5-nerved, acute, awned, 9—11 mm. long, very scabrous on the keel, the upper one narrower, hyaline, 1-nerved, 7—9½ mm. long, slightly bifid at the apex with an awn from the sinus; lemma smooth or slightly scaberulous only upwards, punctulate, about 11 mm. long, tubulous, the subacute densely hairy callus about ¾ mm long, the body of the lemma gradually narrowed into a scabrous, twisted, somewhat spreading, 5 mm. long column, central awn spreading, quite straight, up to 10 mm. long, the lateral awns erect, shorter and much thinner and finer, about 4 mm. long, all the awns scabrous. Australia: Queensland and British New Guinea. . . . . .
. . . . . **Aristida utilis Bailey**

2. Axis of panicle, branchlets and pedicels glabrous or scabrous only, always without long hairs. . . . . 3.

Axis of panicle, branchlets and pedicels sparingly beset with long hairs.

Slender, tufted, mostly 20—40 cm. or sometimes up to 60 cm. high, much branched annual, culms striate, glabrous or minutely scaberulous, terete or subcompressed; sheaths glabrous, striate, slightly compressed or subterete, much shorter than the internodes, ligule a ciliolate rim, auricles pubescent or with a few deciduous hairs, collar smooth; blades narrow, 1—2 mm. wide, flat, soon becoming involute, tapering to a fine point, up to 10 cm. long, glabrous beneath, scabrous or hirtellous on the upper surface, mostly with scattered long hairs near the base and the mouth; panicles narrow, 10—20 cm. long, with somewhat

flexuous axis and short distant branches, spikelets bearing from the base; panicle and peduncle at maturity much elongated, axils of branches, branchlets and pedicels with long hairs, angulous and scabrous; spikelets glabrous or pubescent, not rarely with long hairs at the tip, of two kinds, the larger spikelets with very unequal glumes, lower one 9 mm., 1-nerved, or sub-3-nerved, acute or shortly awn-pointed, with very scabrous keel, broader than the up to 5 mm. long, 1-nerved upper one, with a smooth keel, tip obtusely obliquely awn-pointed, the smaller spikelets in the same panicle with nearly equal, shorter glumes and the lemmas with shorter awns; lemmas very scabrous, especially on the keel, gradually passing into a straight or somewhat curved, not twisted, scabrous somewhat compressed column, bearing a scabrous terete awn, lateral awns wanting, the callus short, scarcely $^1/_2$ mm. long, sparingly long-pilose; lemma including callus, column and awn very different in length, 20—35 mm. long, in the smaller spikelets up to 15 mm. long. Central America: Mexico to Panama. . . . . **Aristida jorullensis Kunth**

3. Body of the lemma consisting of a fertile lower part and a sterile mostly broader and thinner upper part, gradually passing into a straight or twisted column, which passes into the central awn, lateral awns nearly totally wanting or well-developed, but always very thin; annual plants. 4.

Body of the lemma gradually passing into a twisted or straight, sometimes wanting column, no broad sterile part between the column and the lemma; perennial, rarely annual plants. . . . . 5.

4. Fertile part of the lemma narrow, very scabrous and somewhat tuberculate in the upper part, sterile part together with the column and awns easily breaking off at maturity, but without an articulation, the rupture caused by the great difference in texture between the indurate lower and the papery or chartaceous sterile upper part of the lemma; mouth of the sheaths and auricles shortly pilose.

Culms simple or sparingly branched, slightly compressed, striate, glabrous, loosely sheathed, 30—60 cm. high; sheaths glabrous, striate, about as long as the internodes or somewhat longer or shorter, ligule shortly ciliate, collar glabrous; blades setaceous, convolute, the basal leaves short, smooth beneath, hirtellous on the upper surface, margins and lower part of the blades sparingly hairy; panicle contracted but very lax, sometimes broader and ovate in outline or nearly as long as broad with geminate, distant, flexuous, spreading branches and branchlets, pedicels unequal, shorter than the glumes, the branches naked at the base and scaberulous; glumes subequal, narrowly lanceolate, subulate,

acuminate, 1-nerved, glabrous, mostly 10—12 mm., sometimes 15—17 mm. long, the lower awned, slightly scaberulous on the keel, the upper one with a bifid apex and an awn from the sinus, lemma with a narrow base, gradually enlarged, the sterile part smooth, including the long-bearded acute callus, about 10 mm. long, the twisted column up to 13 mm. long; central awn divergent about 20 mm. long, the lateral awns wanting or very short, very thin, sometimes up to 6 mm. long. British India. . . . . **Aristida redacta Stapf**

Fertile part of the lemma slightly hairy only in the upper part, not tuberculate, sterile part not breaking off at maturity, no rupture between sterile and fertile part of the lemma; mouth of the sheaths and auricles long-bearded.

Culms caespitose, branched from the lower and most of the upper nodes, 15—40 cm. high, scaberulous or smooth, striate, terete or subcompressed; sheaths shorter than the internodes, glabrous, smooth, sulcate or striate, ligule a densely hairy rim, auricles prominently bearded, collar smooth; blades setaceous, up to 10 cm. long, somewhat rigidulous, very narrow, convolute, curved, striate, smooth, tips rough; panicle ovate, very lax and open, 5—10 cm. long, with short, solitary or geminate, erect or somewhat divergent branches, the latter naked at the base, scaberulous only or nearly smooth, pedicels short nearly smooth; spikelets somewhat clustered at the ends of the branchlets, pedicels shorter than the glumes, the latter subequal, 7—8 mm. long, sometimes up to 10 mm. long, linear-lanceolate, 1-nerved or sub-3-nerved, the upper slightly ciliate at the minutely bifid apex, with a mucro from the sinus, the lower one acuminate, awn-pointed, the nerves scaberulous; lemma 10 mm. long, 1-nerved, scabrous on the keel, shortly hairy at the summit and on the upper margins, abruptly narrowed into a divergent, strongly twisted, 8 mm. long column, callus acute, long-bearded, up to $1^1/_2$ mm. long; central awn 15—17 mm. long, lateral awns well-developed but very thin, up to 7 mm. long. Abyssinia, Eritrea and Somaliland to southern Persia. . . . . **Aristida abnormis Chiov.**

5. Lower glume 1-nerved or 3-nerved or sometimes sub-3-nerved and the lateral nerves short or obsolete, upper glume always 1-nerved . . . 6.

Lower glume 5-nerved, upper one 3-nerved. North American annual species, much branched from the base and all the nodes; central awn strongly curved and reflexed, lateral awns sometimes obsolete or nearly wanting or well-developed. See under the section *Chaetaria*. . . . . **Aristida ramosissima var. uniaristata A. Gray**

6. Prolongation of the lemma straight, curved or arcuate in a semicircle, never geniculate and never forming an obtuse angle, nor horizontally bowed; lateral awns totally wanting or scarcely indicated . . . . . 7.

Prolongation of the lemma always straight, geniculate, forming an obtuse angle, the awns sometimes horizontally bowed, lateral ones developed but very short . . . . . 11.

7. Column of awns more or less developed or sometimes wanting or a beak only, not or scarcely twisted or loosely twisted only in the lower part. New World species. . . . . 8.

Column of awns well-developed, twisted all over, passing into the awn without indication of lateral awns.

Panicle erect, the branches erect or ascending or slightly spreading, the pedicels mostly longer or those of the lateral spikelets shorter than the acute glumes, the latter awn-pointed, 11–13 mm. long, glabrous, nearly equal or the lower one slightly longer than the upper, the lower 3-nerved, the upper one 1-nerved; lemma terete, tubulous, narrowly linear, including the subobtuse, hairy about 1 mm. long callus, up to 14 mm. long, the strongly twisted straight column about 7 mm. long, the awn slightly curved and up to 16 mm. long. Australia: N. E. Queensland. Very imperfectly known species, described from the type specimen, lacking the base and the leaves. It was hitherto only collected near the Endeavour River by J. Banks. . . . . . **Aristida Streptachne Domin**

8. Panicle open, large and effuse, at first sometimes somewhat contracted but soon becoming diffuse, the branches spreading, long or short but always naked at the base. . . . . 9.

Panicle narrow, condensed, branches 3—5 cm. long, spikelets bearing nearly to the base; column of awns somewhat twisted and slightly curved in the lower part.

Caespitose perennial, culms about 60 cm. high, simple, slender, erect, sheaths bearded at the mouth; blades long, filiform, convolute, smooth; panicle half as long as the whole plant, erect, branches geminate, distant, scabrous, spikelets on short scabrous pedicels; glumes linear, 1-nerved, nearly equal, 8—8½ mm. long, or the lower up to 10 mm. long, the lower awn-pointed, hispidulous on the keel, the upper one smooth, truncate, mucronately awned from a bifid apex; callus bearded laterally, subobtuse, about 3/4 mm. long, lemma smooth, the body about as long as the glumes or shorter, linear-subulate, convolute, gradually passing into the long, laterally compressed, loosely curved and twisted column, the length of the lemma including column and

awn, about 30–35 mm, lateral awns totally wanting or minute points only. North America: Southern Florida, Key West. Only known from the type specimen, collected by BLODGETT. . . . . **Aristida floridana Vasey**

9. Column of awn well-developed as a laterally compressed, scabrous, somewhat falcate not twisted beak . . . . . 10.

Column of awn wanting or scarcely developed but never compressed or falcate. Lateral awns mostly well-developed and about 4—6 mm. long or sometimes in immature plants only 1—2 mm. long, the central awn is 15—16 mm. long, straight or slightly curved. See under the section *Chaetaria*. . . . . **Aristida gentilis var. breviaristata Henr.**

10. Panicle erect, more than half the length of the whole plant, the branches about 5 cm. long, usually stiffly spreading or reflexed, mostly bearing one or several short branches at the base with a pair of spikelets.

A rather small often prostrate or ascending plant, about 25 cm. high, rather slender, sometimes branched from the lower nodes; sheaths glabrous, or scabrous above, slightly hairy or glabrous near the mouth; blades involute, 15—30 cm. long, very scabrous on both surfaces or glabrous beneath,the auricles long-bearded but the collars smooth, flat below, soon becoming involute, narrowly linear; panicles effuse, branches capillary, at first erectly spreading, single, distant, scabrous, becoming divergent; lateral spikelets on very short scabrous pedicels, terminal spikelet of each branchlet with a pedicel up to 10 mm. long, glumes about equal or slightly unequal, 9–13 mm., mostly about 11 mm. long, if unequal one of them $^1/_2$—1 mm. longer or shorter than the other, glabrous and smooth, or the lower minutely scaberulous, both awn-pointed, the upper one somewhat laciniate-truncate at the summit; lemmas including the shortly hairy subobtuse callus and the awn, variable in length, 22—29 mm., but mostly 24—25 mm. long, glabrous, somewhat scabrous on the keel above; central awn scabrous, lateral ones minute or sometimes slightly developed and 1—3 mm. long. Southern United States: Texas and Arizona to Nicaragua. . . . . **Aristida divergens Vasey**

Panicle erect, nodding at the summit, 1/3—1/2 the entire length of the culms, branches few, very long, spreading and flexuous, solitary or fascicled, mostly naked at the base.

A rather large, erect perennial with erect firm glabrous culms, 50 cm. or up to 1 meter high; sheaths glabrous or scabrous above, ligule

minutely pubescent, auricles bearded, the collar sometimes slightly hairy; blades flat at the base, soon becoming involute, tapering into a fine convolute point, narrow, 2—3 mm. wide, up to 40 cm. long, glabrous beneath or scabrous on both surfaces, with long hairs near the base; panicles open, the scabrous branches rather long, the spikelets more or less adpressed at the end of the branches, pedicels short, scabrous; glumes mostly unequal, 1-nerved, the lower acute, broader than the upper one, up to 16 mm. long, awned, with very scabrous keel or scaberulous all over, the upper but slightly scabrous on the keel, smooth, truncate at the summit, shortly awned, up to 13 mm. long; lemma glabrous often mottled with purple, the long-hairy, subobtuse callus about 3/4 mm. long, the hairs exceeding the true base of the lemma which is gradually narrowed into a somewhat laterally compressed, very scabrous, nerved beak or column, extending into a scabrous nearly terete, straight or arcuate central awn, the total length of lemma and awn about 40 mm. long, but not rarely much shorter and only about 25 mm. long, at the same time the glumes much shorter and only 8—10 mm. long, lateral awns totally wanting or scarcely 1 mm. long. Southern United States from Arizona and New Mexico to Columbia, also on the Bahamas and Cuba . . . . . **Aristida ternipes Cav.**

11. Panicles rather robust, very loose and diffuse or somewhat contracted, if rather narrow always with very long branches, naked at the base over a long distance or with a shorter basal branch at the base. North American species . . . . . 12.

Panicles not robust, very narrow, contracted, somewhat interrupted, the branches very short and adpressed.

Caespitose elegant perennial, sometimes flowering in the first year and apparently annual, few-noded, culms strictly erect, about 20—35 cm. high including the panicle, terete, smooth; sheaths shorter than the internodes, tight, striate and glabrous, ligules and auricles shortly ciliolate, collar smooth; blades very narrow, convolute setaceous, somewhat glaucous, often curved, glabrous beneath, scabrous on the upper surface and on the margins, ending in a long setaceous point, up to 10 cm. long, scarcely 3/4 mm. wide when expanded; panicles rather small, up to 15 cm. long, scarcely 1/2 cm. broad, linear, interrupted, the axis totally visible, the branches short, few-flowered, scaberulous, binate or subsolitary, the longer ones about 3 cm. long with 1 or 2 sessile spikelets at the base or both branches but 1-flowered, rhachis smooth, the branches and pedicels scaberulous; spikelets yellowish, erect, mostly very shortly, or sometimes longer pedicelled and

the pedicels 3—4 mm. long; glumes linear-lanceolate, smooth, 6—8 mm. or not rarely up to 10 mm. long, equal, acuminate, the lower one 3-nerved or 5-nerved, slightly scabrous on the keel, the upper one 1-nerved, scabrous only at the tip; lemma narrowly linear, tubulous, quite smooth, with a densely hairy about $^1/_2$ mm. long, subacute callus, the body of the lemma 7—8 mm. long, the distinctly twisted scaberulous column about 4 mm. long, passing into a scaberulous 7—$9^1/_2$ mm. long awn, the lateral awns very thin, up to 2 mm. long, rarely obsolete and nearly wanting. Australia: Queensland. . . . . **Aristida spuria Domin**

12. Column of awns well-developed, strongly twisted. . . . . 13.
Column of awns wanting, there is only a very short not twisted beak . . 15.

13. Glumes without inverse position, subequal or the lower one distinctly shorter than the upper, spikelets pubescent at least the lower glume. . . . 14.
Glumes with inverse position, lower prominently longer than the upper one, glumes quite glabrous, scabrous only on the keel of the lower one.
Caespitose perennial forming small tufts with rather short intravaginal innovations, 60 cm. to more than 1 meter high; culms terete, slightly pubescent or scaberulous, 3—5-noded, erect; sheaths longer than the internodes, terete, striate, tight, pubescent or scaberulous, ligule a minute ciliolate rim, auricles pubescent, those of the innovations bearded, collar smooth; culm-blades up to 20 cm. long, flat or becoming involute, ending in a setaceous point, about 1 mm. wide, scaberulous or smooth beneath, hirtellous on the upper surface, the old leaves curved and flexuous, margins not conspicuously thickened; peduncle of the inflorescence very long, exserted; panicle very open and diffuse or more or less contracted, axis terete, striate, scabrous, or angulous and very rough upwards, the axils minutely ciliate or glabrous, branches binate or solitary, naked at the base over a long distance, long and spreading, not rarely the lower ones deflexed and drooping, spikelets adpressed and congested at the end of the branchlets; branches, branchlets and pedicels scabrous; in less-developed contracted panicles the branches are much shorter, erect or ascending, often only a few cm. long and few-flowered, bearing sometimes but 1 flower; spikelets yellowish or brown, lower glume $8^1/_2$—14 mm. long, sometimes still longer and up to 16 mm. long, 1-nerved or not rarely with shorter lateral nerves and prominently 3-nerved, scabrous on the keel, the upper one 7—10 mm. long, in robust specimens not rarely up to 14 mm. long, smooth on the keel, 1-nerved, both shortly mucronate from a more or less distinct bifid apex, glabrous and smooth or minutely scaberulous only;

lemma punctulate, the subacute, densely hairy callus about 1 mm. long, the body up to 10 mm. long, mostly purplish, the distinctly twisted scabrous column about as long as the body of the lemma; awn geniculate, 5—15 mm. long, scabrous, lateral ones minute. A species of more northern range. North America: Arizona to northern Mexico. . . . . **Aristida Orcuttiana Vasey**

14. Auricles densely pubescent and bearded, with a villous line across the collar; lateral awns of the column slightly developed and up to 3 mm. long. . . . . See **Aristida laxa var. Karwinskiana Henr.**

(OBSERVATION: *Aristida Karwinskiana* TRIN. et RUPR. is not so easily recognized. The specimens of the type are fragmentary and immature. The short lateral awns indicate *A. Schiedeana* but the villous line across the collar is a character of *A. laxa*. It may be that this *A. Karwinskiana* is a hybrid between the two species.)

Auricles shortly pubescent only, even those of the innovations not conspicuously bearded, no villous line across the collar, which is smooth or minutely puberulous only.

Densely caespitose perennial, 40—90 cm. or more than 1 meter high, agreeing in habit and vegetative characters with *Aristida Orcuttiana*. They have not rarely the same aspect and intermediary forms occur between them. There are moreover forms with more or less bearded auricles and a prominent villous line across the collar, such specimens are probably hybrids between *A. laxa* and *A. Schiedeana*.

Panicles exserted, culms erect, glabrous or somewhat scaberulous; sheaths glabrous or minutely pubescent; blades flat and involute upwards, glabrous beneath, scaberulous on the upper surface, as much as 3 mm. wide, tapering to a fine point; panicle long, open or somewhat contracted with few, long, binate, scabrous branches, naked below, ascending or spreading and drooping, sometimes as much as 10 cm. long, branched from the middle with adpressed branchlets and pedicels, the spikelets more or less crowded at the ends of the branches, pedicels angulous and scabrous, the lateral ones shorter than the glumes and up to 3 mm. long; glumes nearly equal, 9—10 mm. long, both or at least the lower one distinctly pubescent and 1-nerved or with a pair of lateral nerves, scabrous on the keel, the upper one smooth on the keel, both awned from a more or less bifid apex, the awn often more than 1 mm. long; lemma about 8 mm. long, including the column up to 15 mm. long,

smooth, callus rather obtuse, densely bearded, the column scabrous and strongly twisted, central awn up to 12 mm. long, lateral ones about 1 mm. long or minute. A species of more southern range. Southern Mexico to Guatamala and Ecuador . . . . . **Aristida Schiedeana Trin. et Rupr.**

15. Lower glume shorter than the upper; sheaths glabrous, pilose at the throat; lemma including the very short column about 10 mm. long, callus long-hairy.
Caespitose perennial, culms erect, slender, rather rigid, glabrous, 50—60 cm. high; sheaths tight, blades 5—10 cm. long and 1—2 mm. wide, flat at the base, becoming involute; panicles open, narrowly pyramidal, 15–25 cm. long, the branches few, few-flowered, stiffly ascending finally spreading or reflexed, the lower ones 5—6 cm. long, the branchlets and pedicels stiffly ascending; glumes 1-nerved, unequal, the lower about 6 mm. long, abruptly narrowed into the short awn, scabrous on the keel, the upper one 8 mm. long, smooth on the keel, notched or slightly bifid at the apex, scarcely mucronate; lemma tubulous, glabrous and smooth, minutely scaberulous only on the keel and on the very short beak, more or less mottled, the callus densely and long-bearded, subacute and nearly 1 mm. long or slightly shorter; central awn about 8 mm. long, straight, scabrous, recurved by a semicircular bend, the lateral ones scarcely 1 mm. long. North America: Lower California . . . . . **Aristida Purpusiana Hitchc.**

Lower glume longer than the upper one; sheaths scaberulous, not hairy at the throat; lemma including the straight, up to 6 mm. long column, about 14 mm. long, callus not so densely hairy.
Perennial, culms including the panicle at least 40—50 cm. high, erect, terete, striate, scaberulous; sheaths striate, tight, terete, distinctly scabrous in lines especially between the nerves, ligule a short ciliolate rim, auricles pubescent, collar smooth; blades 25—30 cm. long, flat at the very base, involute upwards, scaberulous or densely hirtellous on both surfaces or becoming glabrous beneath, strongly nerved but the margins not conspicuously thickened, 1—2 mm. wide when expanded; panicle strictly erect, 10—20 cm. long, loose but rather narrow, axis very scabrous, terete and striate below, angulous upwards, branches solitary stiffly ascending at an angle of about 45 degrees, distant, with a very short 1–2-flowered branchlet at the base, the lower ones about 3 cm. long, bearing 4—6 spikelets, the branches gradually becoming shorter, the uppermost ones bearing but 1—2 spikelets, axils minutely pubescent,

branches and pedicels scabrous, the pedicels of the lateral spikelets very short, the other ones half as long or sometimes nearly as long as the glumes; spikelets pale or brownish, glumes 1-nerved, glabrous or slightly scaberulous only on the keel of the lower one near the apex, the first 12 mm. long, gradually narrowed into the about 2 mm. long scabrous awn, the upper one 10 mm. long, rather abruptly narrowed into the 1 mm. long awn, or subbifid; body of the lemma 8 mm. long, punctulate, gradually narrowed into the scabrous up to 6 mm. long, slightly compressed column, callus obtuse, about 3/4 mm. long; central awn about 8 mm. long, scabrous, straight, geniculate, horizontal or reflexed, the lateral ones erect, minute, less than 1 mm. long. Mexico . . . . . **Aristida geminiflora Fourn**



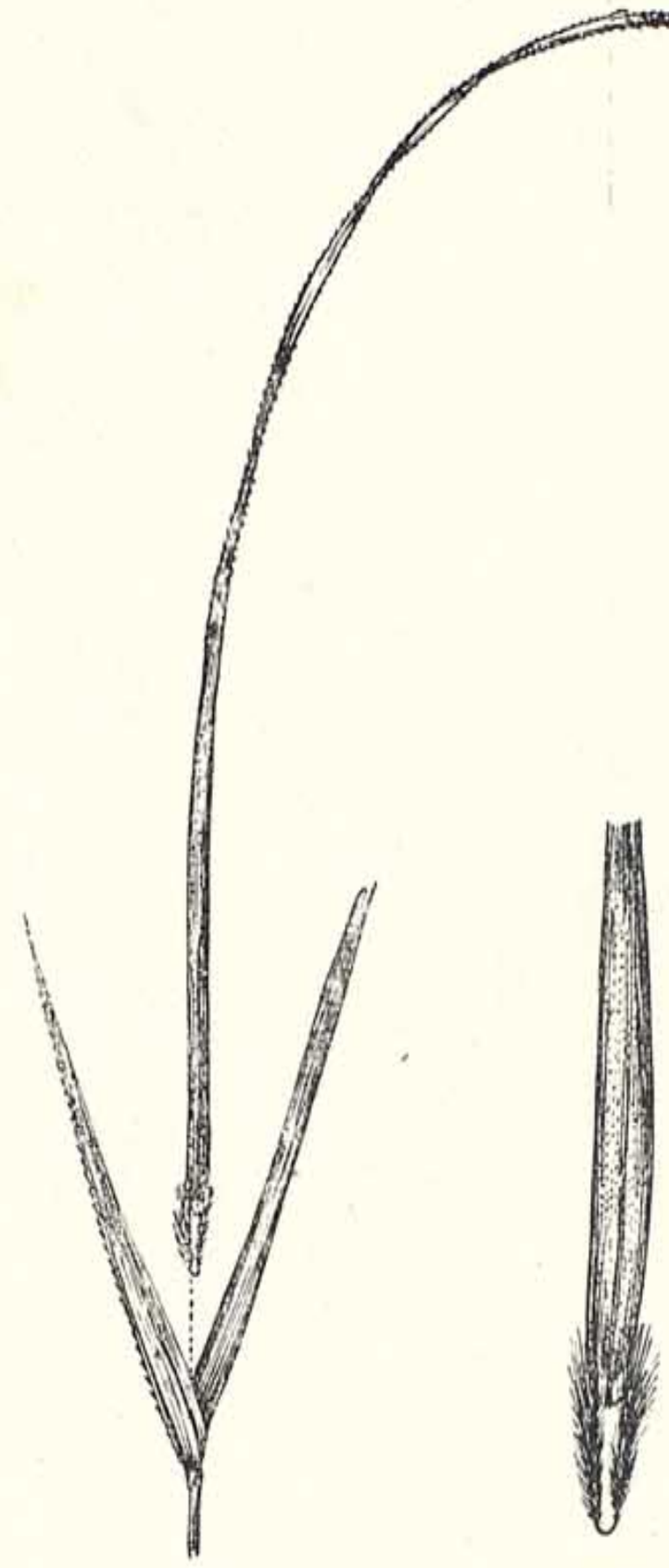
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ARISTIDA UTILIS Bailey. ARISTIDA JORULLENSIS Kunth.



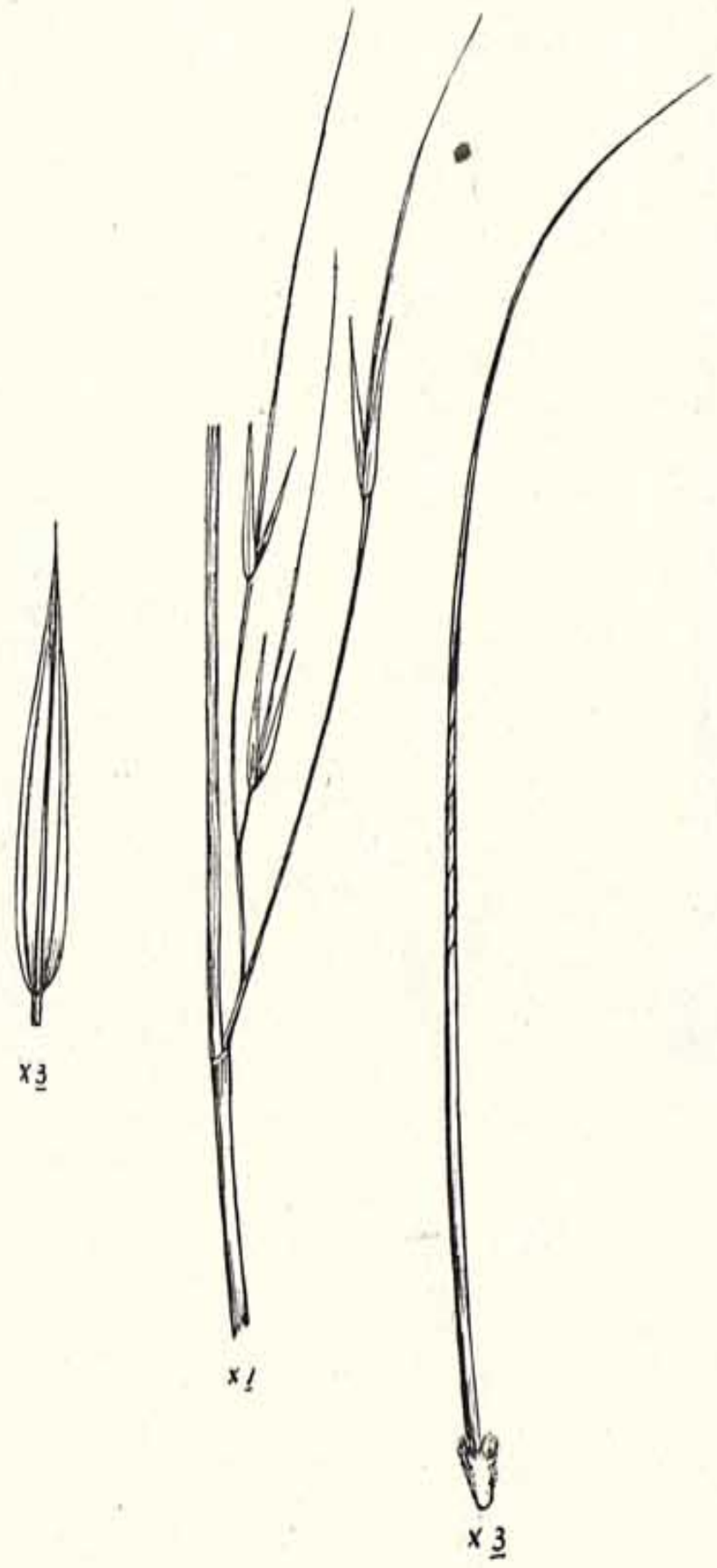
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ARISTIDA REDACTA Stapf. ARISTIDA ABNORMIS Chiovenda.



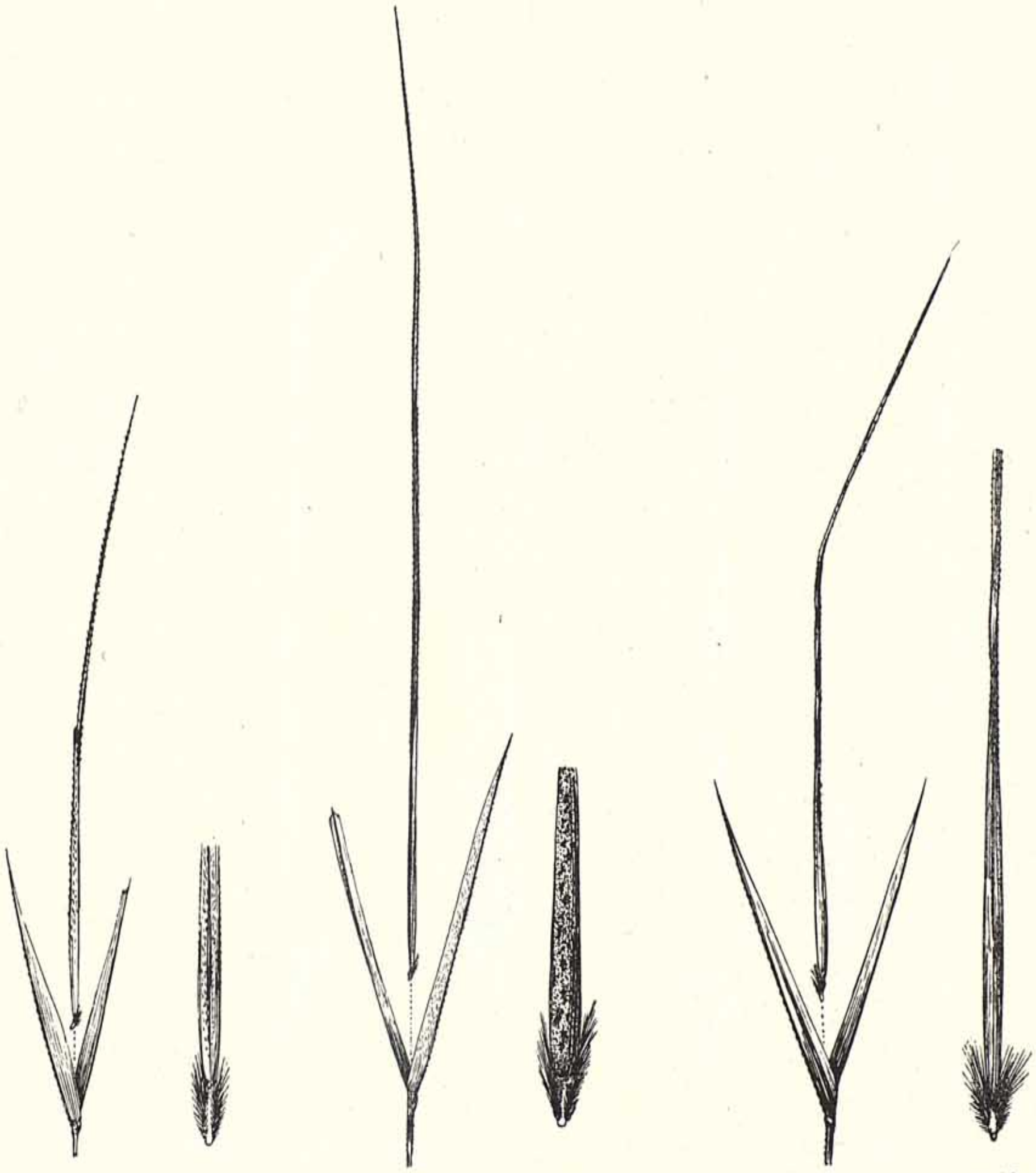
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ARISTIDA FLORIDANA (Chapman)
Vasey.



x3 x1 x3

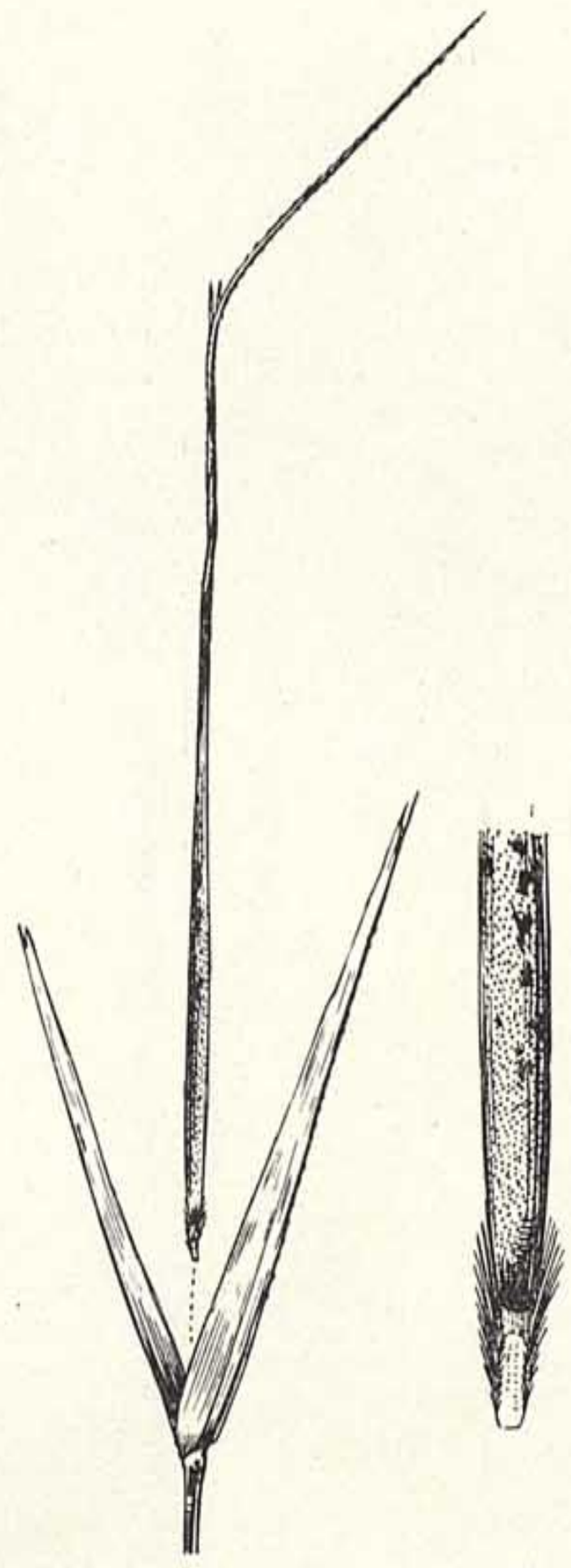
ARISTIDA STREPTACHNE (F. v. Muell.)
Domin.



×3 ×10
ARISTIDA
DIVERGENS Vasey.

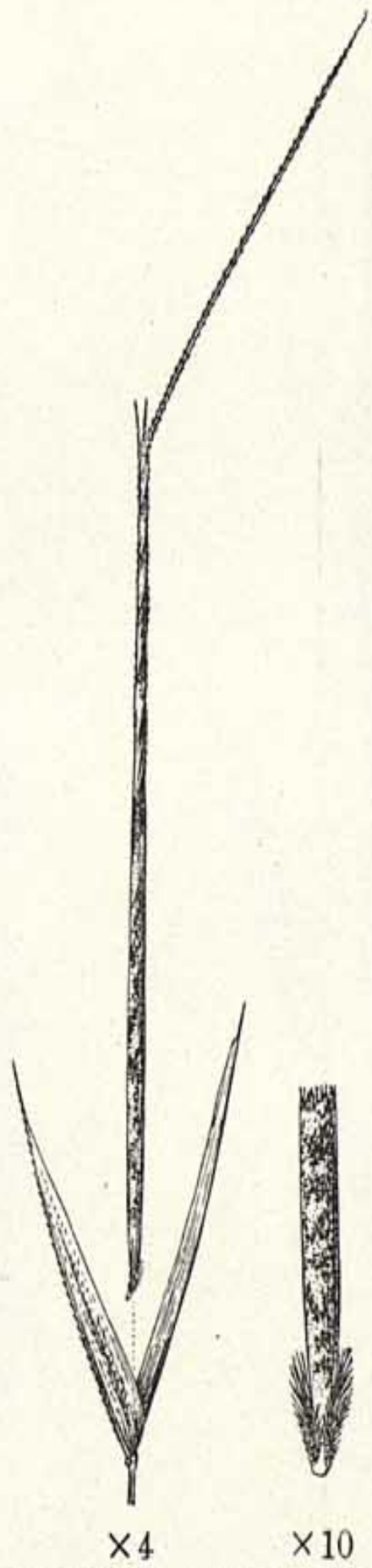
× 2⅔ × 6⅔
ARISTIDA TERNIPES
Cavanilles.

×4 ×10
ARISTIDA SPURIA Domin.



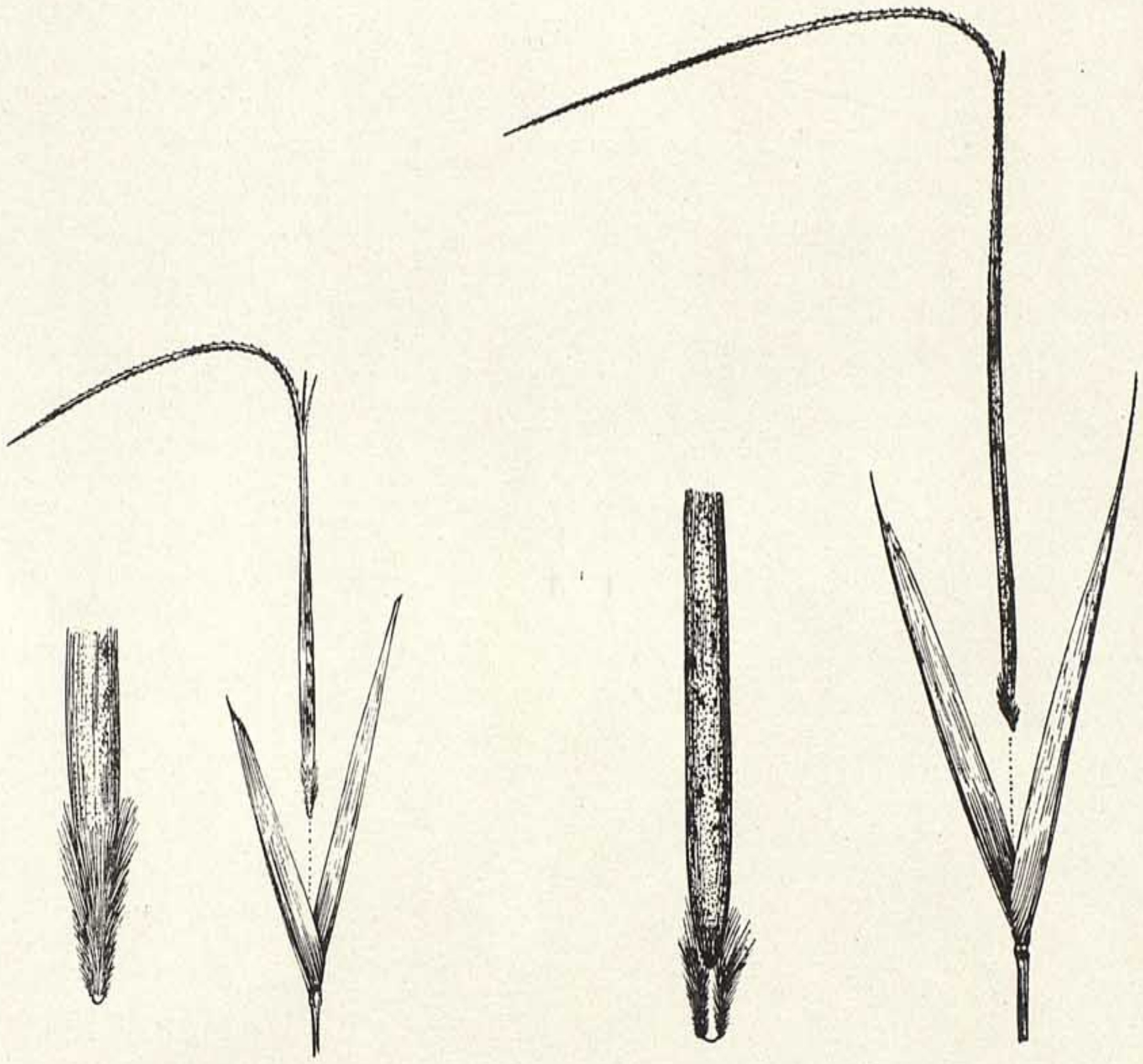
×6 ×15

ARISTIDA ORCUTTIANA Vasey.



×4 ×10

ARISTIDA SCHIEDEANA
Trin. et Rupr.



×10 ×5

ARISTIDA PURPUSIANA
Hitchcock.

×10 ×5

ARISTIDA GEMINIFLORA Fournier.