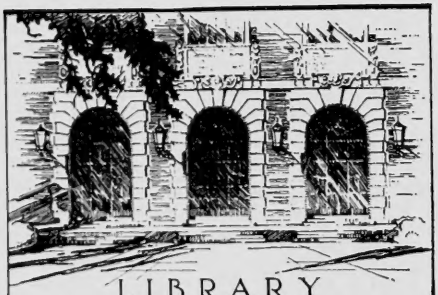

Taxonomy of *Setaria* (Gramineae) in North America

JAMES M. ROMINGER

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I. INTRODUCTION

The species of *Setaria* merit continuing surveillance because of their world-wide economic importance. Included in this genus are cultivated grains, perennial forage grasses, and noxious weeds. Since prehistoric times man has cultivated several varieties of *Setaria italica,* known as millet, foxtail millet, or Hungarian grass. Contributing to the range cover and forage of the semi-arid lands of the southwestern United States and northern Mexico are several species of *Setaria* which are native to North America. Not without its "black sheep," this genus includes some of the most noxious weeds in North America. Cosmopolitan weeds of the temperate zones of the world, the green foxtail (*S. viridis*) and its several allies represent an increasingly serious control problem in clean-tilled crops.

Setaria is a genus belonging to the tribe Paniceae of the family Gramineae (Poacae) and including approximately 125 species distributed throughout the temperate, subtropical, and tropical regions of the world. It is represented in North America by forty-three species and four varieties segregated into three subgenera as follows: *Ptychophyllum* (6 spp.), *Paurochaetium* (10 spp.), and *Setaria* (27 spp. and 4 var.). Twenty-five species are native to North America, ten have their centers of origin in South America, and eight species are adventives from the Old World.

The species of *Setaria* in North America were described by Scribner and Merrill (1900) and later revised by Hitchcock (1920). The accumulation of literature during the past forty years relating to the taxonomy, morphology, cytology, anatomy, geographical distribution, and economics of *Setaria* points to the need for a new synthesis. This is the first systematic treatment of *Setaria* to include an extensive bibliography of useful references for each binomial, detailed maps of geographical distribution, a compilation of cytological data, and a proposed phylogeny of the genus.

During this study, approximately 6,000 herbarium specimens have been critically examined to define the limits of morphological variation and geographical distribution within each specific entity. Direct field collections and observations have been made of the species of the midwestern United States.

Sincere acknowledgments are due Dr. G. Neville Jones, Professor of Botany and Curator of the Herbarium, University of Illinois, under whose direction this investigation has been completed; Dr. Donald P. Rogers,

Professor of Botany, University of Illinois, for assistance in preparation of the bibliography; Dr. Fred W. Slife, Associate Professor of Agronomy, University of Illinois; Dr. Lawrence R. Heckard, of the Jepson Herbarium of the University of California; and Dr. Kevin Guinagh, Eastern Illinois University, for the Latin diagnosis.

For the loan of specimens and other courtesies extended to me, I wish to express my appreciation to the curators of the following herbaria (abbreviations adopted from Lanjouw, 1956):

ARIZ —University of Arizona
GH —Gray Herbarium
F —Chicago Natural History Museum
ILL —University of Illinois
ILLS —Illinois State Natural History Survey
INJ —Institute of Jamaica (abbreviation not from Lanjouw)
MO —Missouri Botanical Garden
NY —New York Botanical Garden
SMU —Southern Methodist University
TAES —Tracy Herbarium of Texas A. & M.
TEX —University of Texas
UNM —University of New Mexico
US —United States National Herbarium

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II. NOMENCLATURAL HISTORY OF THE GENUS

The foxtail grasses (*Setaria* Beauvois) were originally included by Linnaeus in the genus *Panicum* (1753). The name *Panicum* as applied prior to 1753 was based mainly on the plant known as foxtail millet, *Setaria italica* (L.) Beauvois, which was commonly cultivated as a cereal. Tournefort (1700) established *Panicum* as a genus and described fifteen species which included the following grasses: *Setaria italica*, *Setaria viridis* (L.) Beauvois, *Setaria verticillata* (L.) Beauvois, *Pennisetum americanum* (L.) Schumann, *Echinochloa crusgalli* (L.) Beauvois, *Polypogon monspeliensis* (L.) Desfontaines, and *Gastridium lendigerum* (L.) Gaudin. He included one figure which represents a form of *Setaria italica*, which is therefore taken as the type of *Panicum* as proposed by Tournefort.

Linnaeus (1737), in his *Genera Plantarum*, states in the description of *Panicum* that the involucre is many-leaved and capillary, which refer to *Setaria*. An interpretation of his concepts of the genus *Panicum*, as set forth in the fifth edition of *Genera Plantarum* (1754), points to the conclusion that he did not consider those species that were awned or invo-

lucrate as typical. Therefore, the economically important true millet, *Panicum miliaceum* L., has been selected as the type of *Panicum.*

Palisot de Beauvois in 1812 (p. 51) described the genus *Setaria* in his *Essai d' une Nouvelle Agrostographie ou Nouveaux Genres des Graminées.* Included in this description is the distinguishing phrase, "*Locustae setis 2 aut pluribus subinvolucratae . . .*" referring to the two or more bristles below each spikelet. During the nineteenth century the various species of foxtail grasses were placed in the genus *Setaria* or quite often retained as species of *Panicum.* However, species of foxtail grasses were included under other genera upon occasion. Robert Brown (1810) included two species of *Setaria* under the genus *Pennisetum* L. Richard. In 1891 Kuntze added several species of *Setaria* to the genus *Chamaeraphis* R. Brown. Nash (1895) included four species under *Ixophorus* Schlechtendal. The efforts of Kuntze and Nash were in response to the realization that *Setaria* Beauvois was invalid because of lack of priority.

The name *Setaria* had been applied previously to a group of lichens by Acharius (1798). However, Acharius used the name as a subdivision of the genus *Lichen.* Michaux (1803) validly published the name *Setaria* Acharius as a genus of lichens. Therefore, Scribner (1897) proposed the name *Chaetochloa* to replace *Setaria,* pointing out that both *Chamaeraphis* and *Ixophorus* are distinct genera separate from *Setaria. Chamaeraphis* is a genus of Australian and southern Asiatic grasses in which the spikelet and bristle fall attached, while in the species of *Setaria* the point of disarticulation is above the bristles. *Ixophorus* possesses well-marked characters of generic value, such as a winged sterile palea and a multinerved second glume which exceeds the fertile lemma.

Otto Stapf (1920) rejected *Setaria* Acharius on the basis that it had not come into general use by lichenologists and he therefore considered *Setaria* Beauvois as valid. Hitchcock (1927), although recognizing *Setaria* Acharius as validly published by Michaux (1803), suggested that *Setaria* Beauvois be added to the list of proposed conserved generic names in view of the infrequent use of *Setaria* Acharius and the economic importance of certain members of *Setaria* Beauvois. The International Botanical Congress at Cambridge (1930) included *Setaria* Beauvois in the list of *nomina generica conservanda,* and *Chaetochloa* Scribner was treated as a *nomen rejiciendum.*

Setaria, in the tribe Paniceae, is one of several satellite genera near the genus *Panicum.* An artificial key has been drawn up to facilitate the separation of *Setaria* from other closely related genera (chap. VI, p. 11).

The first monographic treatment of *Setaria* in North America was by Scribner and Merrill (1900). Before this the most comprehensive treatments of *Setaria* were compilations of binomials. Among these were Kunth's *Enumeratio Plantarum* (1833), which listed fifty-six species of *Setaria,* and Steudel's *Synopsis Plantarum Glumacearum* (1854), which

included eighty-eight species of *Setaria* as section VII of *Panicum*. Scribner and Merrill's monograph, which described twenty-eight species and ten varieties in North America, was revised by Hitchcock (1920) to include only twenty-six species. Hitchcock incorporated four species of the subgenus *Ptychophyllum* A. Braun (1855) which Scribner and Merrill had retained under *Panicum*. Scribner and Merrill and also Hitchcock applied the generic name *Chaetochloa* in their treatments of the foxtail grasses.

As a result of anatomical studies of transverse sections of the leaf blades of *Setaria* species, Wolfgang Herrmann (1910) devised a taxonomic key to seventy-three species. In this work Herrmann described twenty-three new species, most of them from Africa or South America.

III. MORPHOLOGY

Inflorescence

The inflorescenses of *Setaria* are panicles representing varying degrees of branching and reduction. Within the subgenus *Ptychophyllum*, the panicles may produce branches as long as 25 cm. In contrast to these open panicles, members of the subgenus *Setaria* may produce very dense, cylindrical, spicate panicles with very short branches only a few millimeters in length. The basic unit of the inflorescence of *Setaria* is the spikelet, but an association of spikelets and bristles forms a secondary unit, the fascicle. A fascicle is a single spikelet or cluster of spikelets with the accompanying bristles.

Various investigators have interpreted the origin and structure of the bristles of the panicles of *Setaria*. Hofmeister (1868), Goebel (1884), and Schumann (1895) arrived at the same general conclusion that the bristles of *Setaria* represent the stalks of abortive spikelets. On the basis of the examination of serial sections through the fascicles of *S. glauca* (*S. lutescens*), Arber (1931) concluded that each ultimate bristle-shoot (not each individual bristle) is equivalent to a spikelet. Sohns (1954) examined the inflorescences of four species of *Setaria*, including *S. lutescens*, and concluded that each bristle is to be considered as potentially spikelet bearing. In *S. palmifolia*, the single bristle that usually extends beyond each spikelet represents the fascicle axis.

Chase (1937, p. 74) expresses an opinion as to the origin of the bristles of *Setaria*. In a diagrammatic representation (figs. 67, 68) she shows that the removal of all the terminal spikelets from a hypothetical panicle produces a condition potentially similar to that of the panicle of *S. grisebachii*. The panicle branches, from which the terminal spikelets were removed, correspond to the bristles of the panicle of *Setaria*. Sohns

(1954) reaches the conclusion that species with complex fascicles of many spikelets and bristles, such as S. *viridis* and S. *italica*, are more primitive than species such as S. *lutescens*, whose fascicles have lateral branches suppressed and usually a single spikelet which terminates the fascicle axis.

Most native North American species of *Setaria* possess panicles that bear rather simple fascicles which consist of a single spikelet or a cluster of spikelets, each spikelet subtended by a single bristle.

Spikelet

The single, most unifying character of the tribe Paniceae is the dorsally compressed, two-flowered spikelet normally disarticulating below the glumes. The spikelets of *Setaria* follow this pattern. Possessing a pair of unequal glumes, the spikelet includes a sterile or staminate floret below, and a perfect floret above. The lower floret possesses a sterile lemma of similar texture to the glumes, and is called the third glume by most agrostologists preceding Hitchcock. This sterile lemma usually encloses a broad, hyaline, two-nerved palea nearly its own size, e.g., in S. *lutescens* and S. *setosa*. In certain species the sterile palea is completely missing, e.g., in S. *liebmanni* and S. *tenacissima*. In others it is only a rudimentary scale, e.g., in S. *grisebachii;* and in a few species the sterile palea consistently reaches lengths of ½ to ⅘ the length of the palea of the fertile floret. The perfect or fertile floret, often referred to as the fruit or the grain, includes an indurate, usually transversely wrinkled, lemma and a palea of similar texture and marking, which at maturity tightly enclose the caryopsis. The degree of rugosity of the fertile lemma is a valuable diagnostic character. Occasionally the fertile lemma is smooth and shiny without any visible transverse ridges, e.g., in S. *italica* and S. *magna*. Those with very fine ridges include S. *grisebachii* and S. *viridis*. The very coarsely rugose "fruits" are found in S. *corrugata*, S. *liebmanni*, and S. *arizonica*, among others. Most species in the S. *macrostachya* complex possess fertile lemmas of somewhat intermediate degrees of rugosity.

A pair of lodicules is present in the fertile floret of most species of *Setaria*. They are found in both florets of the spikelets of S. *lutescens* (Arber, 1931, Sohns, 1954).

The rachilla or axis of the spikelet is extremely reduced so that the glumes and lemmas are borne one immediately above the other. The rachilla never extends beyond the base of the fertile floret.

Leaf Blade

Herrmann (1910) presented the results of an anatomical study of the vascular system of *Setaria*. This work includes many drawings of the

cross sections of both leaf blades and stems. In conjunction with this study Herrmann described twenty-three new species, mostly from Africa and South America.

The epidermis of the leaf blades of *Setaria* is of the general panicoid type with minute two-celled hairs and complex siliceous cells over the nerves.

The blades of *Setaria* do not show an unusual or conspicuous array of vesture types. However, in many instances the indumentum of the leaf blades is diagnostically useful in separating two closely related species. A few examples, with the conspicuously pubescent species listed first in each pair, are: *S. faberii* and *S. viridis* var. *major; S. arizonica* and *S. liebmanni; S. adhaerans* and *S. verticillata; S. villosissima* and *S. macrosperma.*

In the subgenus *Setaria,* the leaf blades rarely exceed 3 cm. in width and may be as narrow as 2 mm., e.g., in *S. rariflora* and *S. texana.* However, in the subgenus *Ptychophyllum* the leaf blades may reach a width of 10 cm. and a length of 60 cm., e.g., in *S. paniculifera.* These blades are often conspicuously plaited or folded longitudinally. This plaited or plicate condition of the leaves is found in all members of the subgenus *Ptychophyllum.* The North American species of this subgenus are restricted to tropical or subtropical regions. Another conspicuous feature of the leaf blades of these robust, tropical species is the petiolate leaf base, that may extend several centimeters in length with only a midrib and very narrow lateral extension of the mesophyll.

The leaf blades of *S. vulpiseta,* a species common in Panama and tropical South America, possess certain characters which are intermediate between the subgenus *Ptychophyllum* and the subgenus *Setaria.* The blades of *S. vulpiseta* occasionally are mildly plicate and tapered below to a petiolate base. The very large, bristly panicle might easily be interpreted as a compressed and reduced panicle of some member of *Ptychophyllum.* However, it does possess one or two bristles below each spikelet and the blades are usually plicate only in their early development. *Setaria vulpiseta* has certain affinities which place it in close proximity with members of the *S. macrostachya* complex of the subgenus *Setaria.*

IV. GEOGRAPHICAL DISTRIBUTION

The tribe Paniceae is apparently a natural assemblage of genera of pantropical distribution. *Setaria,* a genus of this tribe, is known from every major land mass of the world, excepting the polar regions. It is particularly well represented in Africa, Asia, and South America. Probably the greatest concentration of *Setaria,* in numbers of species, is in trop-

ical Africa, where Stapf and Hubbard (1930) report seventy-four species.

In the Western Hemisphere, *Setaria* has its center of distribution in Brazil, and radiation occurs poleward in both directions. In cultivated areas, both temperate and tropical, the rapid spread of species introduced from the Old World tends to mask or distort the original distribution pattern of native species. An analysis of the species in North America reveals three distinct categories based on geographical origin. In one category can be placed those species which are native to North America. A second category includes species whose center of origin is in northern South America and whose range extends into southern North America or have been introduced there by human agency. The third category embraces a group of weedy annuals introduced from the Old World. These three categories and the species and varieties belonging to each are listed below for comparative purposes.

1. Native to North America

1. S. *corrugata*
2. S. *magna*
3. S. *macrosperma*
4. S. *macrostachya*
5. S. *leucopila*
6. S. *scheelei*
7. S. *texana*
8. S. *villosissima*
9. S. *palmeri*
10. S. *grisebachii*
11. S. *liebmanni*
12. S. *latifolia*
13. S. *longipila*
14. S. *arizonica*
15. S. *geniculata*
16. S. *chapmani*
17. S. *ramiseta*
18. S. *reverchoni*
19. S. *firmula*
20. S. *subtransiens*
21. S. *distantiflora*
22. S. *utowanaea*
23. S. *pradana*
24. S. *ophiticola*
25. S. *leonis*

2. Center of origin in South America

1. S. *vulpiseta*
2. S. *scandens*
3. S. *tenacissima*
4. S. *tenax*
5. S. *tenax* var. *antrorsa*
6. S. *paniculifera*
7. S. *poiretiana*
8. S. *setosa*
9. S. *setosa* var. *leiophylla*
10. S. *rariflora*
11. S. *crus-ardeae*
12. S. *speciosa*

3. Introduced from Old World

1. S. *viridis*
2. S. *viridis* var. *major*
3. S. *verticillata*
4. S. *verticillata* var. *ambigua*
5. S. *italica*
6. S. *faberii*
7. S. *lutescens*
8. S. *adhaerans*
9. S. *palmifolia*
10. S. *barbata*

A closer appraisal of the distribution of the species within each of these categories follows.

Within the first category, four species have their center of distribution

in the peninsula of Florida and radiate northward and westward along the coastal regions. These four, *S. chapmani, S. corrugata, S. magna,* and *S. macrosperma,* are rarely known in Mexico, Central America, or South America. *Setaria chapmani, S. corrugata,* and *S. magna* are found in Cuba, probably introduced from Florida.

Six species of the subgenus *Paurochaetium* (category 1, nos. 20-25) are native of Cuba, some occurring in adjacent Hispaniola and Puerto Rico.

The most impressive array of native North American species of *Setaria* is that group known as plains bristle grasses, which belong to the *S. macrostachya* complex (*sensu* Emery, 1957a). This complex includes six perennial species which are wide spread over the southwestern United States and highland plateaus of Mexico. Sympatric with this complex are three species of the subgenus *Paurochaetium, S. ramiseta, S. reverchoni,* and *S. firmula.*

The only native annual species of significant distribution in the southwestern United States and Mexico are *S. grisebachii* and *S. liebmanni.* The former is relatively abundant at elevations from 900 to 2,500 meters in southern Texas, New Mexico, Arizona, and as far south as British Honduras, though only sporadically south of San Luis Potosi. The range of these two annuals overlaps in northwestern Mexico and southern Arizona, which represents the northernmost penetration of *S. liebmanni.* This species is found most abundantly along the Pacific slopes of Mexico and northern Central America, usually at elevations below 600 meters.

The most widespread species indigenous to the Western Hemisphere is *S. geniculata.* A highly polymorphic taxon that merits further cytological and ecological investigation, *S. geniculata* ranges from Argentina northward to Massachusetts in northeastern United States. It probably has its origin in Central America or northern South America and has spread poleward in both directions.

Those species in the second category have entered North America by two possible routes. They have migrated overland via the Isthmus of Panama or have been introduced to Tobago or Trinidad from the northeastern tip of Venezuela. Subsequent spread through the islands of the West Indies has taken place. Those species which have a continuous distribution from South America to Central America include *S. vulpiseta, S. scandens, S. tenacissima, S. tenax, S. paniculifera,* and *S. poiretiana.* The remaining species listed in category 2 have probably been introduced into Trinidad and have spread or been introduced to other islands of the West Indies. One of these species, *S. setosa,* is very common throughout the West Indies and is only rarely known from South America. Its origin is somewhat doubtful but it is probably indigenous to South America.

Category 3 includes species introduced to North America from the Old

World. Most of these are cosmopolitan weeds that have spread rapidly throughout the temperate regions of North America. *Setaria* in Canada and the northern half of the United States is almost exclusively European or Asian in origin. The majority of these introduced annual species are rare in southeastern United States and are absent from most of Mexico, Central America, and the West Indies. Three introductions that are subtropical in their distribution are *S. adhaerans*, *S. palmifolia*, and *S. barbata*. The first is a common garden weed throughout the southern United States, Mexico, Central America, and the West Indies. *Setaria palmifolia*, introduced into Jamaica from India, has apparently not spread to adjacent islands. *Setaria barbata*, an adventive from Africa, has spread to most of the islands of the West Indies, and has been collected on ballast in Panama and Florida.

V. PHYLOGENETIC RELATIONSHIPS

Generic Relationships

The arrangement of tribes and genera of the Gramineae as proposed by Häckel (1887) has been subjected to challenges and amendments by Prat (1936), Pilger (1954), and Stebbins (1956). However, the tribe Paniceae has remained stable as originally defined, and represents a natural grouping of several closely related genera. Of pantropical distribution, this tribe represents a rather highly evolved group within the Gramineae according to Bessey (1917). The tribe Paniceae is characterized by its two-flowered, dorsally compressed spikelets, bearing unequal membranaceous glumes, a lower sterile or staminate floret, and an upper fertile floret with indurate lemma and palea. Disarticulation usually occurs below the glumes, the spikelet falling entire.

The genus *Panicum* includes the greatest number of species and produces the most primitive type of inflorescence within the tribe and the least-modified type of spikelet. Generic separation is usually based upon spikelet irregularities, disposition of the spikelets in the inflorescence, or the presence of bristles below the spikelets.

The genus *Setaria* is segregated from the genus *Panicum* technically by the presence of a bristle or bristles below some or all of the spikelets. Although the basic structure of the spikelets is the same, those of *Setaria* are usually recognizably distinct from those of *Panicum*. The spikelets of *Panicum* are typically obtuse, the second glume and sterile lemma pilose, or if glabrous, typically longer than the enclosed fertile lemma (pl. V, figs. 1, 2). The spikelets of *Setaria* are typically lanceolate-elliptic, glabrous, with the second glume seldom equaling and never exceeding

the fertile lemma, the sterile lemma seldom exceeding the fertile lemma, and the glumes and sterile lemma tightly enclosing the often turgid fruit (pl. V, fig. 3). The inflorescence of *Setaria* is usually a compact, cylindrical, densely flowered, spicate panicle, which contrasts with the more open, diffuse, highly branched panicle of *Panicum*. In the subgenus *Ptychophyllum*, more extensive branching occurs, but even in these species the panicles are more strict and the branches more appressed than in the panicles of most species of *Panicum*.

There are other genera in the Paniceae that produce bristles below the spikelets. These and other genera closely related to *Setaria* are treated in a taxonomic key (chap. VI, p. 11).

Interspecific Relationships

Any attempts at reconstruction of the phylogeny of a group whose fossil remains are so fragmentary as to be of little or no significance must necessarily be advanced with extreme caution. Such is the case with *Setaria*. Having recently examined a very generous sample of the extant species of *Setaria* in North America, I feel obligated to express some opinion as to relationships within the genus. A rather limited knowledge of *Setaria* in South America prevents me from reaching more decisive conclusions.

The subgenus *Ptychophyllum* is represented in North America by a homogeneous group of species whose center of dispersal is in South America. A possible connecting link between the two subgenera *Ptychophyllum* and *Setaria* is *S. vulpiseta*. This species possesses large leaves which occasionally are plicate, as is characteristic of the leaves of the species of the subgenus *Ptychophyllum*. The panicle is intermediate in size but produces spikelets which closely resemble those of *S. tenax* and *S. macrostachya* in the subgenus *Setaria*.

The ten species of subgenus *Paurochaetium* do not comprise a truly natural group. The six species native to Cuba form one natural unit and the three Texan species fall into a second group. *Setaria chapmani*, of the Florida Keys, is structurally more similar to the Texan species than to the Cuban species, but it is probably of separate origin. Specimens of *S. ramiseta* from Texas and northern Mexico sometimes approach *S. leucopila* or *S. texana* in their general appearance.

The species of subgenus *Setaria* in North America can be separated into several complexes of closely related species. These include (1) the *S. macrostachya* complex, (2) the *S. liebmanni* complex, (3) the *S. geniculata* complex, (4) the *S. scandens* complex, and (5) the *S. viridis* complex of Old World origin. *Setaria corrugata* and *S. magna* possess certain affinities with the *S. liebmanni* and *S. viridis* complexes respectively, but are probably of separate origin.

Setaria geniculata, abundant in warm regions of both North and South America, is the most highly specialized species of *Setaria* native to the New World. It has a high degree of reduction and sterilization of the panicle branches to produce a very compact, densely flowered, and profusely bristled inflorescence. No other species native to North America exhibits such a high degree of sterilization in the fascicle as *S. geniculata*. *Setaria lutescens*, an annual weed of European origin, very closely resembles *S. geniculata*. Also, numerous species from tropical Africa appear to be closely related to *S. geniculata*. The place of origin and the phylogenetic relationship of *S. geniculata* to other species of the New World presents an interesting enigma, the elucidation of which should result from a study of the South American and African species of *Setaria*.

I have drawn a diagram (pl. VI) which integrates judgments of relationship based on structural similarity and geographical proximity. In the center of the diagram are included only species native to the New World. Species introduced from the Old World are treated separately. The directional arrows connecting species do not indicate direct lines of descent, but indicate structural similarity, which I interpret as indicating relationship.

Morphological criteria which have been interpreted as significant in postulating a phylogeny of *Setaria* in North America are listed as follows:

PRIMITIVE	ADVANCED
1. open, branching panicle	1. narrow, spicate panicle
2. branches of panicle long, spreading	2. branches of panicle short, appressed
3. perennial with rhizomes	3. annuals
4. leaf sheaths not conspicuously compressed	4. leaf sheaths compressed-keeled
5. leaf blades broad, plicate	5. leaf blades narrow, not plicate
6. leaf blades petiolate	6. leaf blades not petiolate
7. a single bristle below only the terminal spikelet of each branchlet	7. several bristles subtending each spikelet
8. glumes and sterile lemma many-nerved	8. glumes and sterile lemma few-nerved

Number 4 of the above list applies particularly within the subgenus *Paurochaetium* and numbers 5 and 6 apply to the subgenera *Ptychophyllum* and *Setaria*. The other criteria are applicable to the genus as a whole.

VI. SYSTEMATIC TREATMENT, WITH KEYS

Key to *Setaria* and Allied Genera

1. Spikelets subtended or surrounded by one to many bristles or spines

(sterile branchlets); these distinct or more or less connate at the base, forming a false involucre.

2. Bristles persistent, not falling with the spikelets.
   3. Sterile palea at maturity becoming cartilaginous and winged, much exceeding the spikelet in width; spikelets arranged along one side of the branches of a simple panicle.....IXOPHORUS
   3. Sterile palea not winged or enlarged at maturity.
      4. Second glume and sterile lemma of spikelet highly modified; second glume cordate or auriculate near the base; sterile lemma variously swollen and distorted in shape.....SETARIOPSIS
      4. Second glume and sterile lemma not modified as in *Setariopsis* ..... SETARIA
2. Bristles falling with the spikelets at maturity.
   5. Bristles solitary.
      6. A single bristle subtending each spikelet.....PARATHERIA
      6. Axis of branchlet extended beyond the upper or only spikelet as a bristle.....CHAMAERAPHIS
   5. Bristles numerous below each spikelet or cluster of spikelets.
      7. Bristles not united at base, usually slender, often plumose ..... PENNISETUM
      7. Bristles more or less united at the base, forming a bur ..... CENCHRUS

1. Spikelets not subtended or surrounded by bristles.
   8. Spikelets awned or awn-pointed.
      9. Base of spikelet elongate, forming a sharp-pointed bearded callus; both glumes long-awned.....CHAETIUM
      9. Base of spikelet blunt, not bearded.
         10. First glume long-awned, the body nearly as long as the spikelet ..... OPLISMENUS
         10. First glume awnless, less than half as long as the spikelet ..... ECHINOCHLOA
   8. Spikelets awnless.
      11. Inflorescence densely spicate; fruit scarcely indurate, open at summit ..... HYMENACHNE
      11. Inflorescence usually open, loosely flowered; fruit indurate, closed at summit, the lemma tightly enclosing the palea ..... PANICUM

SETARIA Beauvois

Bibliography of the Genus

Setaria Beauvois, Ess. Agrost. 51, pl. 13, fig. 3. 1812; *non Setaria* Acharius 1798; *non Setaria* Michaux 1803. Humboldt, Bonpland, & Kunth

(1815) 109; Roemer & Schultes (1817) 488; Beauvois (1818) 110; Sprengel (1821) 78; Raddi (1823) 50; Schultes in Roemer & Schultes (1824) 275; Sprengel (1825) 304; Torrey (1826) 72; Kunth (1829) 46; Kunth (1830) xi; Presl (1830) 313; Kunth (1833) 149; Meissner (1836) 319; A. Gray (1856) 581; Chapman (1860) 578; Grisebach (1864) 554; Bentham & Hooker (1883) 1105; Häckel in Engler & Prantl (1887) 36; Chapman (1897) 587; K. Schumann (1902) 417; Dalla Torre & Harms (1907) 14; Robinson & Fernald in A. Gray (1908) 118; Herrmann (1910) 42; Henry (1915) 26; Hubbard (1915) 169; Standley (1928) 83; Deam (1929) 307; Hitchcock (1930) 673; Stapf & Hubbard in Prain (1930) 768; Hitchcock (1931) 316; Rydberg (1932) 76; Silveus (1933) 670; Swallen (1934) 351; Hitchcock (1935) 695; Munz (1935) 33; Swallen (1936) 181; Hitchcock (1936) 335; Deam (1940) 176; Pilger in Engler & Prantl (1940) 70; Peck (1941) 131; Swallen (1943) 243; Leon (1946) 162; Marie-Victorin (1947) 815; Blomquist (1948) 187; Booth (1950) 125; Fernald in A. Gray (1950) 226; Jones (1950) 69; Kearney & Peebles (1951) 138; Gould (1951) 266; A. Chase in Hitchcock (1951) 718; Fassett (1951) 90; Davis (1952) 125; Gleason in Britton & Brown (1952) 235; Strausbaugh & Core (1952) 98; Weber (1953) 66; Weintraub (1953) 52; Harrington (1954) 111; Jones & Fuller (1955) 79; Swallen (1955) 331.

Chaetochloa Scribner (1897) 38; Scribner & Merrill (1900) 1; Heller (1900) 21; Nash in Britton (1901) 89; Small (1903) 105; Hitchcock (1909) 230; Hitchcock (1913) 259; Nash in Britton & Brown (1913) 164; Piper & Beattie (1915) 35; Wooton & Standley (1915) 60; Hitchcock & Chase (1916) 346; Schaffner (1917) 320; Mosher (1918) 324; Hitchcock & Standley (1919) 80; Hitchcock (1920) 155; Rydberg (1922) 38; House (1924) 84; Jepson (1925) 141; Small (1933) 84; Abrams (1940) 118; Conzatti (1943) 46.

Description of the Genus

Annual or perennial grasses with erect or geniculate culms, often branching from the base; leaf blades flat, rarely twisted, folded, or involute, plicate and petiolate in the subgenus *Ptychophyllum;* inflorescence a narrow, terminal panicle, usually dense and spicate, rarely loose and open; spikelets lanceolate or elliptic, rarely globose, usually turgid, subsessile, or short-pediceled, in clusters (fascicles) on short branches or borne singly from a central axis, some or all subtended by one to several bristles (sterile branchlets); disarticulation normally below the glumes, the spikelets falling entire, the bristles persistent; first glume less than ½ the length of the spikelet; second glume ½ to nearly equaling the fertile lemma in length; sterile lemma equaling or rarely exceeding the fertile lemma, sometimes staminate; sterile palea a reduced scale to as

long as the lemma, rarely absent; fertile lemma and palea indurate, transversely rugose, rarely smooth; spikelets 1.0–4.5 mm. long, usually 2–3 mm.

Basic chromosome number: n = 9.

Setaria includes 125 species, the greater number in tropical Africa. It is represented also in Europe, Asia, Australia, North America, and South America.

TYPE SPECIES: *Setaria viridis* (Linnaeus) Beauvois.

KEY TO SUBGENERA OF *Setaria* REPRESENTED IN NORTH AMERICA

1. Bristles one to many below each spikelet, or if missing below some, then the blades plicate.
   2. Blades plicate; bristles below only a part of the spikelets ..... Subgenus PTYCHOPHYLLUM
   2. Blades not plicate; bristles below all the spikelets normally ..... Subgenus SETARIA
1. Bristles usually below only the uppermost spikelet of each branchlet as an extension of the axis of the branchlet; the blades not plicate ..... Subgenus PAUROCHAETIUM

SUBGENUS PTYCHOPHYLLUM (A. Braun) Hitchcock

BIBLIOGRAPHY

Ptychophyllum, A. Braun, Ind. Sem. Hort. Berol. App. 18. 1855, as a section of *Panicum;* Hitchcock (1920) 158, as a subgenus of *Chaetochloa;* Hitchcock (1931) 316, as a subgenus of *Setaria;* Hitchcock (1936) 334, as a subgenus of *Setaria;* Pilger in Engler & Prantl (1940) 71, as a section of *Setaria.*

DESCRIPTION

Mostly robust perennials with broad, plicate leaf blades; the panicles usually loose, open, bearing slender, often acuminate spikelets; a single bristle subtending the terminal spikelet of each ultimate branchlet and occasionally a bristle below some of the lower spikelets; in tropical and subtropical regions of both hemispheres.

Six species in tropical North America, one native of India, one from Africa, the others from South America.

TYPE SPECIES: *Setaria plicata* (Lamarck) T. Cooke.

KEY TO SPECIES OF SUBGENUS *Ptychophyllum*

1. Primary branches of panicle axis usually 6–25 cm. long.
   2. Involute tip of sterile lemma exceeding the fertile lemma by as much as 1 mm.; branches of panicle seldom exceeding 10 cm. in length; leaf blades as much as 6 cm. wide and 50 cm. long ..... 1. *S. palmifolia*

2. Sterile lemma and fertile lemma nearly equal; branches of panicle as long as 25 cm.; leaf blades often very large, up to 10 cm. wide and 60 cm. long.....3. *S. paniculifera*

1. Primary branches of panicle axis usually less than 6 cm. long.
   3. Axis of panicle villous; plants annual.....2. *S. barbata*
   3. Axis of panicle scabrous-puberulent; plants perennial.
      4. Sterile palea broad, equaling the coriaceous-indurate sterile lemma.
         5. Spikelets 3 mm. long, blunt, "open-mouthed" due to the extreme curving of the indurate sterile lemma; first glume three-nerved; sterile lemma equaling the fertile lemma.....4. *S. crus-ardeae*
         5. Spikelets elliptic-lanceolate, often 4–5 mm. long; first glume five-nerved; sterile lemma exceeding the fertile lemma.....5. *S. speciosa*
      4. Sterile palea absent or only a minute scale, the sterile lemma membranous, not indurate.....6. *S. poiretiana*

TAXONOMIC TREATMENT OF SPECIES OF SUBGENUS *Ptychophyllum*

1. SETARIA PALMIFOLIA (Koenig) Stapf

Panicum palmaefolium Koenig, Naturforscher 23:208. 1788.

Panicum plicatum Willdenow, Enum. Pl. 1033. 1809. *Non P. plicatum* Lamarck 1791.

Panicum palmifolium Willdenow *ex* Poiret in Lamarck, Tabl. Encycl. Meth. Bot. Sup. 4:282. 1816.

Panicum nervosum Roxburgh, Fl. Ind. 1:314. 1820. *Non P. nervosum* Lamarck.

Panicum neurodes Schultes in Roemer & Schultes Syst. Veg. Mant. 2:228. 1824.

Panicum plicatum haitiense Kunth in Grisebach, Fl. Brit. W. Ind. 547, *pro. syn.* 1864.

Chamaeraphis palmifolia (Willdenow) Kuntze, Rev. Gen. Pl. 2:771. 1891.

Setaria palmifolia (Koenig) Stapf in Jour. Linn. Soc. Bot. 42:186. 1914; Bailey (1924) 111; Hitchcock (1931) 318; Hitchcock (1935) 704. fig. 1581; Hitchcock (1936) 337. fig. 307; A. Chase in Hitchcock (1951) 726. fig. 1108; Weintraub (1953) 53.

Chaetochloa palmifolia (Willdenow) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:348. 1917; Hitchcock (1920) 161. fig. 38.

Perennial; stems 1–2 m. tall, glabrous or sparsely villous, the nodes puberulent; leaf sheaths strigose with a fringe of stiff hairs along the margins, hispid on the collar; ligule densely ciliate, about 2 mm. long; leaf blades strongly plicate, flat, tapering at both ends, pubescent with many short, straight hairs on lower surface, and a few longer hairs sparsely scattered over upper surface, 2–6 cm. wide, as much as 50 cm. long; panicles loosely open, green, as much as 40 cm. long, with lower branches compound, up to 10 cm. long, the panicle axis and branches

both scabrous; spikelets lanceolate, acute, 3–4 mm. long, closely arranged on short pedicels along branchlets appressed along the main branches, only a part of the spikelets subtended by slender, inconspicuous bristles, about 5 mm. long, or sometimes shorter and imperfectly developed; first glume ½ the length of the spikelet, obtuse, three- to five-nerved; second glume nearly equaling the fertile lemma, acute, seven-nerved; sterile lemma 3–4 mm. long, five-nerved, with involute tip extending nearly 1 mm. beyond the fertile lemma, enclosing a broad, well-developed palea nearly equal to the fertile palea in length; fertile lemma shorter than the sterile lemma, lanceolate, acute, apiculate, obscurely transversely rugose.

TYPE LOCALITY: Type of Koenig is not known. Fragment from type of Willdenow has been examined (US). Native of India.

DISTRIBUTION: Jamaica; introduced and spread through eastern Jamaica: in rocky woods and shaded banks often at elevations above 1,000 meters.

Jamaica. New Castle, PATRICK 215 (INJ). Content Gap, PATRICK 170 (INJ). Above Mt. Airy, PATRICK 162 (INJ). Castleton, HARRIS 11286 (F, MO, NY, US). In shady places, Mt. Hybla, HARRIS 11535 (F, MO, NY, US). Hardware Gap, HARRIS 10911 (F, NY, US). Moist, shaded soil, Morces Gap, NICHOLS 37 (F, MO, NY, US). Gordontown, HITCHCOCK, Amer. Gr. Nat. Herb. 605 (F, ILL, NY, US). St. Helen's Gap, MAXON & KILLIP 586 (F, ILL, US). Between Clydesdale and Morces Gap, BENGRY (INJ). Catherine's Peak, HITCHCOCK 9727 (US). Buff Bay, HITCHCOCK 9762 (US). Buff River, ORCUTT 3786 (US).

This species came from India to Jamaica, where it occupies the eastern half of the island. No collections are known to the author from any of the West Indian islands other than Jamaica. This species is called "palmgrass" and usually occurs on shaded mountain banks at altitudes up to 1,500 meters.

Distinguishing characters are the very short, inconspicuous bristles and the presence of a sterile lemma which extends conspicuously beyond the tip of the fertile lemma.

2. SETARIA BARBATA (Lamarck) Kunth

Panicum barbatum Lamarck, Tabl. Encycl. Meth. Bot. 1:171. 1791.

Panicum costatum Roxburgh, Fl. Ind. 1:314. 1820.

Setaria barbata (Lamarck) Kunth, Rev. Gram. 1:47. 1829; Standley (1928) 83; Hitchcock (1930) 674; Hitchcock (1931) 317; Hitchcock (1935) 704; Hitchcock (1936) 335. fig. 305; Swallen (1943) 244; Chase in Hitchcock (1951) 726; Weintraub (1953) 52.

Panicum flavescens sensu Grisebach, Fl. Brit. W. Ind. 547. 1864. *Non P. flavescens* Swartz 1788.

Panicum viaticum Salzm. *ex* Doell in Mart. Fl. Bras. 2(2):155. 1877.
Chamaeraphis viatica (Salzmann) Kuntze, Rev. Gen. Pl. 2:770. 1891.
Chamaeraphis costata Kuntze, *op. cit.* 771.
Chaetochloa barbata (Lamarck) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:348. 1917; Hitchcock (1920) 158. fig. 36; Small (1933) 85.

Annual; stems geniculate, 0.5–2 m. tall, often rooting at the lower nodes, branching, glabrous, nodes pubescent; leaf sheaths glabrous or sparsely pubescent with ciliate fringe along the margins above, the collar puberulent; ligule densely ciliate, about 1 mm. long; leaf blades narrowly elliptic, plicate, flat, thin, strongly scabrous on both surfaces, as much as 30 cm. long and 2.5 cm. wide; panicle long exserted, as much as 20 cm. long, open, the lower branches 2–4 cm. long, scabrous and villous on both branch and panicle axes; spikelets 2.5 mm. long, clustered on very short pedicels, all but a few spikelets subtended by single, flexuous bristles, 5–8 mm. long; first glume 1 mm. long, orbicular, three-nerved; second glume 2 mm. long, ovate, acute, seven-nerved; sterile lemma 2.5 mm. long, acute, seven-nerved, slightly coriaceous, enclosing a broad, well-developed palea of equal length, staminate occasionally; fertile lemma elliptic, acute about 2.3 mm. long, strongly transversely rugose, the palea enclosed to the tip.

Type Locality: MAURITIUS: Type specimen in Lamarck Herbarium in Paris. Fragment of type examined (US).

Distribution: Jamaica, Dominican Republic, Puerto Rico, West Indian Islands to Trinidad; introduced and on ballast in Florida and Panama Canal Zone; introduced from tropical Asia.

Jamaica. Open banks, Linstead, PROCTOR 8147 (INJ). Cooperage, PATRICK 137 (INJ, NY, US). Banks of Ferry River, HARRIS 11782 (MO). Open slope of stony hill, Castleton Gardens, Amer. Gr. Nat. Herb. 603 (ILL, US). Ipswich, HITCHCOCK 9604 (US).

Dominican Republic. Rio San Juan, MILLER 1143 (US). Santo Domingo, EKMAN H 14989 (US).

Puerto Rico. Rio Piedras, ALBERTS 259 (US). Laver, SARGENT 3242 (US).

Antigua, ROSE 3391 (US).

Guadeloupe. QUESTEL 4578 (INJ). QUESTEL 5090 (US).

Dominica. JONES 43 (US).

Martinique. HITCHCOCK 16463 (US).

St. Lucia. Castries, KUUP 39 (US).

St. Vincent. MORTON 5242 (US).

Barbados. EGGERS 7128 (US). HITCHCOCK 16498 (US).

Grenada. Grenville, HITCHCOCK 17680 (US). St. Georges, BROADWAY (US).

Trinidad. Banks along cacao fields, Palmiste, BROADWAY 7950 (MO).

Port of Spain, HITCHCOCK 9965 (US). St. Ann, BRITTON & HAZEN 1690 (US).

Tobago. King's Bay, BROADWAY 4335 (MO). Weed in cacao plantation, Scarboro, HITCHCOCK 10225 (US). Damp places, Government House grounds, BROADWAY 4737 (MO, US).

Panama. Canal Zone: damp thicket, near Culebra, STANDLEY 25954 (US).

Florida. On ballast, Franklin: Apalachicola, CHAPMAN 30 (MO), BILTMORE 8374 (US).

Setaria barbata is the only annual species in North America belonging to the subgenus *Ptychophyllum*. It is distinguished from other members of the subgenus by its narrower blades (less than 2.5 cm. wide usually) and smaller spikelets (2.5 mm.). Characteristics which aid in recognition are the five-nerved first glume which is nearly circular in shape. Also the slightly sulcate sterile lemma is distinctly seven-nerved. The lower floret usually encloses three well-developed stamens.

Called "Mary grass" in Tobago and Trinidad and "corn grass" in Jamaica, this species is a common pest in the cacao plantations. *Setaria barbata* has spread rapidly and can be found on nearly all of the major islands of the Greater and Lesser Antilles of the West Indies. Introduced from tropical Asia, it is apparently native to Africa (Bor, 1954, p. 553).

3. SETARIA PANICULIFERA (Steudel) Fournier

Panicum sulcatum Aublet, Pl. Guian. 1:50. 1775; Steudel, Syn. Pl. Glum. 1:49. 1854.

Panicum paniculiferum Steudel, *op. cit.* 54.

Setaria paniculifera (Steudel) Fournier, Mex. Pl. 2:42. 1886; Standley (1928) 83; Hitchcock (1930) 674; Hitchcock (1931) 319; Swallen (1936) 182; Hitchcock (1936) 338. fig. 308; Swallen (1943) 244. fig. 27; Swallen (1955) 333. fig. 95.

Setaria effusa Fournier, Mex. Pl. 2:42. 1886; Herrmann (1910) 42.

Chamaeraphis effusa (Fournier) Kuntze, Rev. Gen. Pl. 2:770. 1891.

Chamaeraphis paniculifera (Steudel) Kuntze, *loc. cit.*

Chamaeraphis sulcata (Aublet) Kuntze, *loc. cit.*; Beal, Grasses N. Am. 2:158. 1896.

Panicum mexicanum Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:40. 1900.

Chaetochloa sulcata (Aublet) Hitchcock in Contr. U.S. Nat. Herb. 17:260. 1913; Hitchcock & Chase (1917) 348; Hitchcock (1920) 162. fig. 39; Conzatti (1943) 47.

Chaetochloa effusa (Fournier) Hitchcock in Contr. U.S. Nat. Herb. 17:261. 1913; Conzatti (1943) 47.

Setaria sulcata (Aublet) A. Camus in Bull. Mus. Hist. Nat. 30:108. 1924.

Perennial; stems robust, up to 4 m. tall, glabrous, the nodes glabrous; leaf sheaths glabrous or scabrous, occasionally sparsely strigose with long papillose hairs along the margins, the collar hispid; ligule a ciliate

membrane 1–2 mm. long; leaf blades flat, broad, strongly plicate, as much as 10 cm. wide and 60 cm. long, tapering toward both ends, the basal end becoming petiolate, the upper surface scaberulous, with a sparse scattering of long papillose hairs, the lower surface very strongly scabrous, sometimes densely hispid with occasional long papillose hairs; panicles green or sometimes purple, often very large, as much as 70 cm. long, open, spreading, with compound branches as much as 25 cm. long, the rachis scabrous, the branches scabrous-pubescent; spikelets narrow, slender, pointed 3–3.8 mm. long, loosely arranged along the lax panicle branches, the pedicels 0.5–2 mm. long, scabrous-pubescent, the flexuous bristles 10–15 mm. long, subtending only a part of the spikelets; first glume ⅓ the length of spikelet, acute, three–five-nerved; second glume ¾ the length of spikelet, apiculate, five–eight-nerved; sterile lemma nearly equaling the fertile lemma, five-nerved, enclosing a palea which varies from a minute scale to ½ the length of its lemma, occasionally longer; fertile lemma is linear-lanceolate, usually about 3.5 mm. long, tapering to an indurate point, nearly smooth or very finely transversely rugose.

Type Locality: FRENCH GUIANA: the type of *P. sulcata* Aublet has not been examined. The type of *P. paniculiferum* Steudel is based on a collection (GALLEOTTI 5858) from Oaxaca, Mexico. This type is in the Museum National d' Histoire Naturelle in Paris. A photo and fragment of this type have been examined (US).

Distribution: southern Mexico, Central America to Panama; introduced into Guadeloupe and several of the Windward Islands.

Mexico.

Veracruz: Mirador, LIEBMANN 456 (MO, US), MOHR in 1857 (US). Shady forests, Zacuapan, PURPUS 2907 (F, US). PURPUS 2907, 7811 (US). Orizaba, HITCHCOCK 6380 (US), BOURGEAU 2599 (GH, US). Cordoba, VERA SANTOS 2482 (US), BOURGEAU 1457 (US), HITCHCOCK 6395 (US), and KERBER 110 (US).

Oaxaca: Tonguia, LIEBMANN 454 (US).

Tabasco: near El Carmen, GILLY & HERNANDEZ X, 364 (TEX).

Chiapas: Mt. Tacana, MATUDA 2465 (F, US). Ocuilpa, NELSON 3059 (US).

Guatemala. San Marcos: Finca El Porvenir, STEYERMARK 37546 (F). Alta Vera Paz: Cuiliquitz, TURCKHEIM II 1450 (F, MO), TURCKHEIM 8030 (US). Near Coban, STANDLEY 71463 & 90033 (F), POPENOE 908 (US). Chiquimula: pine forest, along Rio Taco, STEYERMARK 30634 (F). Peten: La Libertad, AGUILAR H. 153 (MO, US). Huehuetenango: near Jacaltenango, STEYERMARK 51844 (F). Santa Rosa: Platanares, STANDLEY 79064 (F). Izabal: near Cerro San Gil, STEYERMARK 41652 (F). Quezaltenango: damp thickets, near Colomba, STANDLEY 67992 (F).

British Honduras. El Cayo, BARTLETT 12952 (US). Stann Creek district, GENTLE 3064 (MO).

Honduras. Atlantida: near Tela, STANDLEY 52852 (F, US). Morazan: in pine-oak forest, above El Zamorano, STANDLEY 5101 (F). Santa Barbara: San Pedro Sula, THIEME 5589 (US).

El Salvador. San Salvador, CALDERON 2063 (US).

Nicaragua. Mombacho volcano, MAXON 7793 (US).

Costa Rica. San Jose, JIMINEZ 133 (US). Port Limon, HITCHCOCK 8412 (US). Villa Quesada, ANDERSON 1383 (US). Turrialba, ROWLEE & STARK 829 (US).

Panama. Canal Zone: Culebra, Amer. Gr. Nat. Herb. 713 (F, MO, US). Gamboa, PITTIER 6800 (US). Ancon, KILLIP 4025 (US). Barro Colorado Isl., SHATTUCK 324, 579, & 629 (F). Darien: ALLEN 859 (F, MO). Bocas del Toro: Water Valley, WEDEL 727 (MO). San Jose Isl., JOHNSTON 376 (US). Changuinola Valley, DUNLAP 245 (F, US).

Guadeloupe. DUSS 3185 (NY, US).

Dominica. JONES 3 (US).

Martinique. DUSS 4656 (NY, US), 1292 (NY). Tivoli, STABLE 5364 & 5387 (US).

St. Vincents. SMITH 226 (NY).

Grenada. Black Forest, BROADWAY 123 (F, ILL, MO, US). Petit Etang, BEARD 1307 (MO, US).

This is the most widespread member of the subgenus *Ptychophyllum* in North America. It is the most robust, growing nearly to a height of 4 m., bearing strongly plicate blades as much as 60 cm. long and 10 cm. wide and producing a diffusely branching panicle as much as 70 cm. long. *Setaria paniculifera* is recognizably distinct from *S. palmifolia* by the more conspicuous bristles and the nearly equal length of the sterile and fertile lemmas. It differs from *S. poiretiana, S. crus-ardeae,* and *S. speciosa* by the presence of secondary panicle branches as much as 25 cm. long. *Setaria paniculifera* lacks a well-developed sterile palea which is typical of *S. crus-ardeae, S. speciosa,* and *S. palmifolia.*

This species was originally described by Aublet as *Panicum sulcatum,* and this specific epithet was combined with *Setaria* by Camus in 1924, but previously Raddi had proposed *S. sulcata* for another entity, thus invalidating *S. sulcata* A. Camus.

In British Honduras, this grass bears the vernacular name "maisillo"; in Guatemala, "camolote"; and in Panama "cola de gato."

4. SETARIA CRUS-ARDEAE (Willdenow) Kunth

Panicum sulcatum Bertolini, Excerpta 14. 1820. *Non Panicum sulcatum* Aublet 1775.

Setaria sulcata (Bertolini) Raddi, Agrost. Bras. 50. 1823. Based on *Panicum sulcatum* Bertolini.

Panicum crus-ardeae Willdenow *ex* Nees, Agrost. Bras. 253. 1829; Steudel (1854) 54.

Setaria crus-ardeae (Willdenow) Kunth, Rev. Gram. 1:Suppl. xxii. 1830; Kunth (1833) 155.

Chamaeraphis crus-ardeae (Willdenow) Kuntze, Rev. Gen. Pl. 2:770. 1891.

Chaetochloa cruz-ardeae (Willdenow) Kuhlmann in Comm. Linh. Telegr. Matto Grosso Amaz. Annexo 5. Bot. 11:69. 1922.

Perennial; stems erect 1–1.5 m. tall, glabrous, the nodes glabrous; leaf sheaths sparsely papillose-hispid or glabrous; ligule ciliate; leaf blades strongly plicate, as much as 10 cm. wide and 1 m. long, tapering toward each end, the basal end petiolate, scabrous on both surfaces, minutely hispid on lower surface; panicle erect, yellowish-green, rather densely flowered, 25–50 cm. long, about 6 cm. wide, the axis puberulent, the branches ascending, irregularly clustered, approximate, usually 2–5 cm. long, the lowermost occasionally much longer; spikelets secund on the branches, ellipsoidal, pale, about 3 mm. long, blunt, "open-mouthed" due to the extreme curving of the indurate sterile lemma, the pedicels scabrous, very short, the terminal and sometimes lower spikelets subtended by slender, flexuous bristles, 5–10 mm. long; first glume 1.2 mm. long, oval, three-nerved; second glume 1.8 mm. long, ovate, slightly coriaceous, seven-nerved; sterile lemma equaling the fertile lemma, oblong-ovate, indurate-coriaceous, five-nerved, inflated and enclosing a broad, well-developed sterile palea; fertile lemma 2.8 mm. long, smooth, shiny, obscurely transversely rugose below, ellipsoidal, with a stubby involute tip, enclosing a palea of similar texture and marking.

Type Locality: "Habitat in America meridionali." The type of *P. crus-ardeae* is in the Willdenow Herbarium at Berlin. A fragment of this type has been examined (US).

Distribution: Trinidad; in shade of cacao trees.

Trinidad. Heavily wooded area, Port of Spain, POTTER 5200 (GH). Near Port of Spain, HITCHCOCK, 9978, 10171 (US). Under trees, St. Ann's, BROADWAY 8957 (MO). San Juan, BROADWAY 6376 (MO). In shade of cacao trees, River Estate, Amer. Gr. Nat. Herb. 604 (F, GH, US).

This species, which was included under *S. poiretiana* in Hitchcock's treatment (1920), is recognizably distinct in several features of the spikelet. The pale spikelets, about 3 mm. long, are inflated at maturity due to the curving and hardening of the sterile lemma. The very indurate and sulcate sterile lemma, tightly and nearly completely, encloses the fertile floret. At maturation every part of the spikelet is coria-

ceous, and the spikelets have an "open-mouthed" appearance due to the pressure of the inflated sterile lemma. The fertile lemma is very obscurely transversely rugose, nearly smooth, and very shiny. This species is conspicuously distinct from *S. poiretiana* by the presence of a broad and well-developed sterile palea, which is usually lacking in the latter.

According to labels on specimens collected in Trinidad, this grass is known locally as "gamalotte."

5. SETARIA SPECIOSA (Nees) Kuhlmann

Panicum speciosum Nees *ex* Trinius, Gram. Pan. 169. 1826. *Non P. speciosum* Walter Fl. Carol. 73. 1788.

Chamaeraphis speciosa (Nees) Kuntze, Rev. Gen. Pl. 2:770. 1891.

Chaetochloa speciosa (Nees) Kuhlmann in Comm. Linh. Telegr. Matto Grosso Amaz. Annexo 5. Bot. 11:88, 1922.

Setaria speciosa (Nees) Kuhlmann in Comm. Linh. Telegr. Matto Grosso Amaz. ed. 2 Annexo 5. Bot. 11:100. 1948.

Perennial; stems 1–2 m. tall, usually glabrous, nodes glabrous; leaf sheaths sparsely papillose-strigose, with ciliate margin above; collar densely hispid; ligule ciliate; leaf blades flat, strongly plicate, scabrous along the nerves on the lower surface, sparsely papillose-strigose on upper surface, tapering toward each end; panicle green or purple, large, open, 40–60 cm. long, the branches spreading to a near 90° angle, occasionally reflexed, 2–5 cm. long, the axis scabrous-hispid; spikelets elliptic-lanceolate, 4.3–5.0 mm. long, mostly 4.5 mm. long, the pedicels scabrous-hispid, 1 mm. or less long, the terminal spikelets of each branch and some of the lower spikelets subtended by a slender, flexuous bristle, antrorsely scabrous, 1.5–2 cm. long; first glume ⅓ the length of the spikelet, obtuse, five-nerved; second glume ⅔ the length of the spikelet, similar to the first in shape, five–seven-nerved; sterile lemma 4.5 mm. long, coriaceous, five-nerved, acuminate and involute at the tip, enclosing a well-developed palea nearly equaling its own length; fertile lemma lanceolate-acuminate, 4 mm. long, the tip involute and curved, nearly smooth, having a fine, cellular appearance, enclosing a palea of similar texture and marking.

TYPE LOCALITY: BRAZIL. PARA. The type, collected by Martius, is in the Munich Herbarium. Fragment of panicle has been examined (US).

DISTRIBUTION: Trinidad.

Trinidad. Manacas, BROADWAY 7232 (MO).

The only collection known from North America (BROADWAY 7232) matches the fragment of the type specimen of *P. speciosum* Nees. The very long spikelets (4.3–5.0 mm.) separate this Brazilian species from other members of the subgenus *Ptychophyllum* in North America.

6. SETARIA POIRETIANA (Schultes) Kunth

Panicum elongatum Poiret in Lamarck, Encycl. Suppl. 4:278. 1816. *Non P. elongatum* Salisbury. 1796; *non P. elongatum* Pursh. 1814.

Panicum poiretianum Schultes in Roemer & Schultes, Syst. Veg. Mant. 2:229. 1824; Steudel (1854) 50.

Setaria elongata (Poiret) Sprengel *ex* Schultes in *op. cit.* 280; Kunth (1833) 155.

Setaria poiretiana (Schultes) Kunth, Rev. Gram. 47. 1829; Kunth (1833) 155; Hitchcock (1931) 318; Hitchcock (1935) 704; Hitchcock (1936) 336. fig. 306; A. Chase in Hitchcock (1951) 726; Weintraub (1953) 53.

Panicum flabellatum Steudel, Syn. Pl. Glum. 1:53. 1854. *Non P. flabellatum* Fournier. 1880.

Agrostis flabellata Salzmann in Steudel, *loc. cit., pro. syn.*

Setaria jurgensenii Fournier Mex. Pl. Gram. 2:42. 1886.

Chamaeraphis "Juergensii" (Jurgensenii) (Fournier) Kuntze, Rev. Gen. 770. 1891.

Panicum Jurgensenii (Fournier) Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:40. 1900.

Chaetochloa poiretiana (Schultes) Hitchcock in Contr. U.S. Nat. Herb. 22:159. fig. 37. 1920; Conzatti (1943) 47.

Perennial; stems erect, 1–2 m. tall, villous in the vicinity of the nodes; leaf sheaths copiously papillose-hispid with coarse, glassy trichomes, the margins glabrous; ligule ciliate, about 2 mm. long; leaf blades strongly plicate, papillose-hispid with coarse hairs along the mid-vein on lower surface, scabrous along nerves with a few scattered papillose hairs on both surfaces, 4–10 cm. wide, as much as 60 cm. long, tapering at both ends, the base petiolate; panicles erect, commonly purple, long exserted, often 60–80 cm. long, branches clustered at rather regular intervals from apex to base, the axis puberulent, branches ascending, 2–4 cm. long or the lowest as much as 8 cm. long; spikelets secund on the branches, slender, 3 mm. long; the pedicels puberulent, less than 1 mm. long usually, some but not all of the spikelets subtended by single, flexuous bristle 1–1.5 cm. long; bristles usually purple; first glume 1.5 mm. long, obtuse, three-nerved; second glume 2 mm. long, obtuse, five-nerved; sterile lemma membranous, 3 mm. long, acutish, five-nerved, enclosing only the edges of the fertile lemma, the sterile palea wanting or rarely a minute scale; fertile lemma 3 mm. long, nearly smooth, shiny, slender, enclosing a palea of similar texture.

Type Locality: BRAZIL: the type is in the Desfontaines Herbarium at Florence. Photo and fragment of panicle have been examined (US).

Distribution: Mexico: San Luis Potosi to Chiapas; low woods, wet soil.

Mexico.

San Luis Potosi: by streams, Las Canoas, PRINGLE 3921 (F, MO, US). Tamasopa Canyon, PRINGLE 3452 (US).

Veracruz: low woods, between Coatepec and Jalapa, HITCHCOCK, Amer. Gr. Nat. Herb. 712 (F, US). Mirador, LIEBMANN 459 (MO, US).

Hidalgo: Atexca, H. E. MOORE, JR. 3475 (US).

Oaxaca: near La Laguna, CONZATTI 3755 (US).

Chiapas: Turubula, NELSON 3359 (US). Near El Pozo, SHARP X-604 (US).

In North America, this species is known only from the southern states of Mexico. It probably occurs in Central America, but I know of no collections from this area. The leaf blades and leaf sheaths of S. *poiretiana* are more conspicuously pubescent than those of S. *crus-ardeae*. The sterile palea is completely lacking or only a minute scale in S. *poiretiana*, rarely equaling ½ the length of the fertile palea. This very robust grass seems to prefer moist habitats such as low woods or stream margins. It differs from S. *paniculifera* by the presence of short panicle branches rarely exceeding 6 cm. in length.

SUBGENUS PAUROCHAETIUM (Hitchcock & Chase) Rominger, *grad. nov.*

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Paurochaetium Hitchcock & Chase in Contr. U.S. Nat. Herb. 15:22. 1910, as a subgenus of *Panicum*; Hitchcock & Chase (1915) 463; Hitchcock & Chase (1917) 327; Silveus (1933) 554; Hitchcock (1935) 611; Hitchcock (1936) 242; Silveus (1942) 126. Chase in Hitchcock (1951) 636.

Distantiflora Hitchcock in N. Am. Fl. 17(3):202. 1915, as a subgeneric taxon of *Panicum*; Small (1933) 60.

Paurochaetium (Hitchcock & Chase) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940, as a section of *Setaria;* Amshoff (1942) 46.

DESCRIPTION

Perennials; culms tufted, erect, leaf blades not over 7 mm. wide, not plicate; inflorescence narrow, more or less interrupted, the branches short and appressed, the ultimate branchlets bearing one to several spikelets, the uppermost spikelet subtended by a bristle 1–6 mm. long; spikelets 1.5–3.8 mm. long, swollen on the face, glabrous; fruit finely transversely rugose.

DISCUSSION OF TAXONOMIC POSITION

The species of the subgenus *Paurochaetium* originally described under the genus *Panicum* are included here under the genus *Setaria*. Hitchcock and Chase, when initially describing this subgeneric taxon under *Panicum*, added that "This group approaches *Chaetochloa* in having branch-

lets produced into bristles, and in the shape of the spikelets and rugose fruits" (Hitchcock & Chase 1910, p. 22). *Chaetochloa* mentioned above is a synonym of *Setaria*.

The extension of the axis of the branchlets beyond the base of the terminal spikelet as a bristle, which characterizes the subgenus *Paurochaetium*, also occurs, but with less uniformity, in the subgenus *Ptychophyllum*. This same condition has been observed in a few species of the subgenus *Setaria*, but is restricted to the terminal axis of the panicle. In some specimens of *S. texana*, *S. leucopila*, and *S. grisebachii* from southern Texas, the central axis of the panicle bears a series of subsessile spikelets for a short distance from the apex. All lack bristles, but the apical one appears to have a bristle since the central axis of the panicle extends beyond it. The panicles of these specimens closely resemble certain panicles of *S. ramiseta*, which are more densely flowered than normal. Chromosome determinations of *S. reverchoni* by Gould (1958) show a basic number of nine, as in *Setaria*.

Six species of *Paurochaetium* known to occur in the West Indies produce slender spikelets, with the second glume conspicuously shorter than the fertile lemma, which more closely resemble the spikelets typical of *Setaria* than those of *Panicum*.

Erik L. Ekman, collector of Cuban plants and author of three of the six West Indian species in the subgenus *Paurochaetium*, supports the author's disposition of *Paurochaetium* when he said, "That this belongs with *Setaria* and not with *Panicum* is evident to anyone who has not grown accustomed to place it with *Panicum*. The characters of the inflorescence, spikelets, glumae and lemma are all those of *Setaria*, to say nothing of the bristles. Furthermore there are species uniting this with *Setaria* proper." Ekman's statement was attached to an herbarium label of a specimen (EKMAN 13102, US) of *S. pradana*.

It is very improbable that the species placed under *Paurochaetium* constitute a truly natural group. The three species from Texas are quite distinct from the six species of Cuba and adjacent islands of the West Indies. The elongation of the branchlet axis beyond the terminal spikelet of each branchlet has probably evolved independently in these two groups. *Setaria chapmani* from the coral sand of the Florida Keys bears spikelets similar to those of the Texas species, but its panicle has longer, more remote branches.

The species of *Paurochaetium* were first placed under the genus *Setaria* by Pilger (1940). Leon, author of *Panicum pradanum*, later transferred this and other species of *Paurochaetium* to *Setaria* in his Flora de Cuba (1946).

Type Species: *Setaria distantiflora* (Michaux) Pilger.

KEY TO SPECIES OF SUBGENUS *Paurochaetium*

1. Second glume conspicuously shorter than the fertile lemma; spikelets slender, acuminate.
   2. Panicles strict, 15–35 cm. long.....8. *S. pradana*
   2. Panicles not strict, mostly subflexuous, not more than 15 cm. long.
      3. Leaf blades 4–7 mm. wide, flat, thick.....9. *S. leonis*
      3. Leaf blades 1–3 mm. wide, flat or involute.
         4. Spikelets 1.5 mm. long.....7. *S. distantiflora*
         4. Spikelets 1.8–2.8 mm. long.
            5. Only the terminal spikelet of each branchlet sutbended by a bristle; second glume covering ¾ of the fertile lemma; the bristles 1–3 mm. long.
               6. Bristles shorter than the spikelets, inconspicuous; leaf blades flat or folded toward the apex, mostly 3–8 cm. long, the basal ones crowded in a tuft.....10. *S. ophiticola*
               6. Bristles equal to or exceeding the spikelets; upper leaf blades involute, 10–20 cm. long, the basal ones not in a dense tuft.....11. *S. utowanaea*
            5. A bristle present below most of the spikelets; second glume covering only ½ of the fertile lemma; the bristles about 5 mm. long.....12. *S. subtransiens*
1. Second glume equal or subequal to the fertile lemma; spikelets ovate, broad.
   7. Leaf blades usually more than 15 cm. long, narrowed toward the base.
      8. Spikelets about 2 mm. long.....13. *S. chapmani*
      8. Spikelets about 3.5 mm. long.....16. *S. reverchoni*
   7. Leaf blades usually less than 15 cm. long, not narrowed toward the base.
      9. Leaf blades tapering, 2–4 mm. wide; the bristles rarely exceeding the spikelets; spikelets about 2.5 mm. long.....14. *S. ramiseta*
      9. Leaf blades abruptly acuminate, 4–7 mm. wide; the bristles one to two times as long as the spikelets; spikelets about 3 mm. long .....12. *S. firmula*

TAXONOMIC TREATMENT OF SPECIES OF SUBGENUS *Paurochaetium*

7. SETARIA DISTANTIFLORA (A. Richard) Pilger

Panicum distantiflorum A. Richard in Sagra, Hist. Cuba 11:304. 1850; Hitchcock & Chase (1910) 23. fig. 1; Hitchcock & Chase (1915) 463; Hitchcock (1915a) 210; Hitchcock & Chase (1917) 327; Hitchcock (1936) 298. fig. 283.

Setaria distantiflora (A. Richard) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940; Leon (1946) 163.

Perennial, 30–80 cm. tall; culms cespitose, slender, wiry, sometimes geniculate below, often producing slender, occasionally fascicled branches from the glabrous nodes; leaf sheath narrow, glabrous or scaberulous; ligule a ring of very short hairs; leaf blades flat to involute, 1–3 mm. wide, usually less than 15 cm. long, glabrous on lower surface, minutely hispid above; panicles numerous, 2–8 cm. long, very narrow, the branches appressed; panicle axis scaberulous, very finely ridged, the branchlets bearing one to three spikelets on short pedicels; the spikelets lanceolate-elliptic, 1.5 mm. long, the terminal one of each branchlet subtended by a slender bristle about 1 mm. long; first glume about ½ as long as the spikelet, broad, acute, three–five-nerved; second glume covering about ⅔ of the fertile lemma, five–seven-nerved; sterile lemma equaling the fertile lemma, five–seven-nerved, enclosing a narrow palea nearly its own length; fertile lemma very finely transversely rugose.

Type Locality: CUBA: the type in the Museum National d'Histoire Naturelle in Paris is labeled "in montosis insulae Cubae." It was received from Sagra. Type not examined.

Distribution: open, rocky soil, Cuba and the Bahamas.

Bahamas. Inagua, HITCHCOCK in 1890 (F), NASH & TAYLOR 893 (F).

Cuba. Santa Clara: Gavilan, HOWARD 6355 (US), Milpa, HOWARD 6375 (US). Each collection from Cuba cited by Hitchcock (1936) has been examined and verified (US). These are omitted from citation here.

Setaria distantiflora is separated from other species of the subgenus *Paurochaetium* by its shorter spikelets. Judging from collections in the United States National Herbarium, this is the most common species of this subgenus in Cuba.

8. SETARIA PRADANA (Leon) Leon

Panicum pradanum Leon *ex* Hitchcock in U.S. Dept. Agr. Misc. Publ. 243: 294. fig. 284. 1936.

Setaria pradana (Leon) Leon, Fl. Cuba 164. 1946.

Following is a transcription of the original description by Leon in Hitchcock (1936, p. 294).

Culms cespitose, ascending, 50–90 cm. long, slender, wiry; sheaths shorter than the internodes, ciliate at the auriculate summit; ligule a ring of short hairs; blades flexuous to curled, strongly involute from base to apex, much narrower at base than the summit of the sheath, finally often becoming flat from the middle toward the apex, 15–20 cm. long, not more than 2 mm. wide, often sparsely pubescent with short hairs on

the upper surface, slightly scabrous on the margin; panicles 15–35 cm. long, the branches remote, appressed, the lower not more than 2 cm. long, bearing a few to several spikelets, the bristle from nearly obsolete to as long as the spikelet or longer; spikelet spreading, 1.8–2 mm. long, somewhat beaked; first glume about ⅖ the length of the spikelet, acute, three-nerved; second glume about ⅔ the length of the spikelet, five-nerved, rarely seven-nerved; sterile lemma five-nerved, pointed; fruit 1.8 mm. long, minutely rugose, slightly beaked at the acute apex.

TYPE LOCALITY: CUBA: Oriente: Mesa de Prada, Lower Jauco Valley, Jauco, LEON 11710 (1924). Holotype examined (US).

DISTRIBUTION: open thickets and rocky slopes, eastern Cuba, Hispaniola, and Puerto Rico.

The collections cited by Hitchcock (1936) have been examined and verified (US).

Setaria pradana has long, narrow panicles (15–35 cm.) and long, usually involute leaf blades. These characters distinguish it from closely related species.

9. SETARIA LEONIS (Ekman) Leon

Panicum leonis Ekman *ex* Hitchcock in U.S. Dept. Agr. Misc. Publ. 243: 295. fig. 286. 1936.

Setaria leonis (Ekman) Leon, Fl. Cuba 163. 1946.

Following is a transcription of the original description from Hitchcock (1936, p. 295).

Loosely cespitose, the slender rhizome better developed than in the other species, the culms slender, erect, or spreading, freely branching, 30–60 cm. tall, the nodes, at least the lowermost, pubescent, sometimes obscurely so; sheaths somewhat compressed, the lower rarely pubescent, a pubescent line across the collar, short pilose along the margin at summit; ligule a dense line of short hairs; blades 5–15 cm. long, 4–7 mm. wide (rarely only 3 mm. wide), flat, narrower than the sheath at base; panicles from all the upper nodes, usually 2–5 cm. long, relatively dense; spikelets 1.7–2 mm. long, the bristles from minute to longer than the spikelet.

TYPE LOCALITY: CUBA: Cojimar, near Havana, EKMAN 13155 (1921). Holotype examined (US).

DISTRIBUTION: rocky slopes and clearings, Cuba and Hispaniola.

The collections cited by Hitchcock (1936) have been examined and verified (US).

Setaria leonis is most easily separated from closely related species by its broad leaf blades 4–7 mm. wide which are narrower than the sheath at the base.

10. SETARIA OPHITICOLA (Hitchcock & Ekman) Leon

Panicum ophiticola Hitchcock & Ekman *ex* Hitchcock in U.S. Dept. Agr. Misc. Publ. 243:293. fig. 282. 1936.

Setaria ophiticola (Hitchcock & Ekman) Leon, Fl. Cuba 163. 1946.

Following is a transcription of the original description from Hitchcock (1936, p. 293).

Culms densely cespitose, very slender, erect or spreading, 30–50 cm. tall, the nodes mostly glabrous; sheaths scarcely compressed, villous around the summit; ligule a dense line of short hairs; blades flat or usually folded, especially those of the dense basal tuft, often pilose on the upper surface, mostly less than 10 cm. long, commonly much shorter, 1–2 mm. wide, rarely to 3.5 mm. wide, several culm blades, commonly flat; panicles terminal and axillary from the upper sheaths, slender, 2–7 cm. long, few-flowered, the branches short and appressed; spikelets 2–2.8 mm. long, the bristle minute.

Type Locality: CUBA: Pinar del Rio: Loma Cajalbana, EKMAN 12712 (1921). Holotype examined (US).

Distribution: rocky slopes, mostly on serpentine, Cuba.

The collections cited by Hitchcock (1936) have been examined and verified (US).

This species has flat, narrow blades 2 mm. wide and extremely minute bristles beneath the terminal spikelets.

11. SETARIA UTOWANAEA (Scribner) Pilger

Panicum utowanaeum Scribner *ex* Millspaugh in Field. Columb. Mus. Publ. Bot. 2:25. 1900; Hitchcock & Chase (1910) 24. fig. 2; Hitchcock & Chase (1915) 464; Hitchcock (1915a) 210; Hitchcock & Chase (1917) 327; Hitchcock (1936) 295. fig. 285.

Panicum sintenisii Nash in Bull. Torr. Club 30:382. 1903.

Setaria utowanaea (Scribner) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940; Leon (1946) 163.

Following is a transcription of the original description by Scribner *ex* Millspaugh (1900, p. 25).

A slender, glabrous and stoloniferous perennial, 2.5–5 dm. high, with narrow, elongated leaves and simple, contracted panicles 6–12 cm. long, sheaths compressed, those at the base strongly so, ligule a short ring of stiff hairs, leaves erect or spreading, 10–20 cm. long, 1–3 mm. wide, scabrous above and on the margins, very acute tapering, and becoming nearly involute toward the base, much narrower than the sheath; branchlets of the panicle more or less remote, 1–3 cm. long, appressed, spikelets glabrous, broadly lanceolate or oblong, subacute, 2 mm. long, subtended by an awnlike bristle (a continuation of the branchlet) which is minutely scabrous, somewhat flexuous and about 4 mm. long; first glume three-

nerved, obtuse, ⅓ to nearly ½ as long as the second, clasping at the base; second glume obtuse, ⅔ as long as the spikelet, five-nerved; third glume oblong-obtuse, five-nerved, equaling or slightly exceeding the fourth glume and furnished with a hyaline palea about ½ its own length; fourth glume smooth and slightly beaked or curved at the acute apex.

TYPE LOCALITY: PUERTO RICO: Guanica, Millspaugh Pl. Utow. 702 (1899). Holotype examined (F).

DISTRIBUTION: open rocky soil, mostly near the coast, Cuba and Puerto Rico to Guadeloupe.

The collections cited by Hitchcock (1936) have been examined and verified (US).

The type collection was made by C. F. Millspaugh during the voyage of the yacht, *Utowana,* Mr. Allison V. Armour the owner and master. Scribner, who first described the species, commented that *Panicum utowanaeum* was "related to *Panicum reverchoni* Vasey, but much more slender and at once distinguished by its smaller spikelets and stoloniferous habit" (Millspaugh 1900, p. 25).

12. SETARIA SUBTRANSIENS Hitchcock & Ekman

Setaria subtransiens Hitchcock & Ekman *ex* Hitchcock in U.S. Dept. Agr. Misc. Publ. 243:351. fig. 323. 1936; Leon (1946) 164.

Following is a transcription of the original description from Hitchcock (1936, p. 351).

Perennial; culms tufted, erect, slender, glabrous, 60–100 cm. tall, the nodes glabrous, or the lower pubescent; sheaths glabrous, keeled, somewhat auricled at summit (the auricle on one side sometimes conspicuous); ligule less than 1 mm. long, membranaceous below, densely ciliate above; blades mostly erect, flat or involute, scabrous or puberulent on the upper surface, glabrous beneath, 10–20 cm. long, 1–3 mm. wide, gradually narrowed toward the base; panicles slender, interrupted, especially below, attenuate at summit, 5–15 cm. long, the branches appressed, short, the lower sometimes as much as 2 cm. long, the axis scabrous; bristles mostly single below each spikelet, sometimes wanting below some of the spikelets, appressed, about 5 mm. long or some of them shorter; spikelets 2–2.5 mm. long, somewhat oblique upon the short pedicel, lanceolate, acute, glabrous; first glume three-nerved, about ⅓ as long as the spikelet; second glume five-nerved, about ½ as long as the spikelet; sterile lemma five–seven-nerved, about as long as the fertile lemma; fertile floret acuminate, not strongly turgid on the convex side, obscurely crosslined.

TYPE LOCALITY: CUBA: Santa Clara: Motembo, EKMAN 16828 (1923). Holotype (US) and isotype (MO) examined.

DISTRIBUTION: on serpentine, Cuba.

Collections cited by Hitchcock (1936) have been examined and verified (US).

This species, originally excluded from the subgenus *Paurochaetium*, shows a closer affinity with the other West Indian species of that group than it does with the members of the subgenus *Setaria*. However, the panicle of *S. subtransiens* does produce bristles below many spikelets other than the terminal one of each axis, thus providing a connecting link between the subgenus *Paurochaetium* and the subgenus *Setaria*.

13. SETARIA CHAPMANI (Vasey) Pilger

Panicum tenuiculmum sensu Chapman, Fl. S. U.S. 572. 1860. *Non P. tenuiculmum* Meyer.

Panicum chapmani Vasey in Bull. Torr. Club 11:61. 1884; Chapman (1897) 581; Small (1903) 91; Hitchcock & Chase (1910) 24. fig. 3; Hitchcock & Chase (1915) 464; Hitchcock (1915a) 210; Hitchcock & Chase (1917) 327; Small (1933) 68; Hitchcock (1935) 611. fig. 1270; Hitchcock (1936) 293. fig. 281; Silveus (1942) 129; Chase in Hitchcock (1951) 636. fig. 910.

Setaria chapmani (Vasey) Pilger in Die Nat. Pflanzenf. 14e:72. 1940; Leon (1946) 163.

Perennial, 40–100 cm. tall; culms tufted, erect, slender, glabrous, rarely branching; nodes glabrous; leaf sheaths glabrous, loosely compressed, ciliate along the upper margins, conspicuously wider than the base of the blade; ligule an inconspicuous ring of very short stiff hairs; leaf blades flat or with inrolling margins, the basal leaves becoming involute, stiff, erect, tapering at both ends, 2–5 mm. wide, 15–40 cm. long, scabrous on both surfaces, sparsely pilose on the upper surface near the base; panicle slender elongate-interrupted, up to 35 cm. long, bearing remote, appressed, racemose branches, the lower up to 3.5 cm. long bearing as many as fifteen subsessile spikelets, two ranked along an undulating axis, the upper branches shorter, bearing progressively fewer spikelets, the axis of each raceme projecting beyond the terminal spikelet as a bristle, 3–6 mm. long; the axis of the panicle and the racemose branches are flattened and scaberulous, the central axis nearly glabrous below; spikelets obovate, abruptly pointed, turgid, yellowish-green, 1.8–2.2 mm. long; first glume about ⅓ as long as the spikelet, broad, obtuse, three-nerved; second glume subequal to the fertile lemma, distinctly five–seven-nerved, reticulate above; sterile lemma equaling the fertile lemma, broad, five–seven-nerved, the palea absent; fertile lemma indurate, elliptic, finely transversely rugose, the margins inrolled only at the base, enclosing a palea of similar texture and marking.

TYPE LOCALITY: FLORIDA. A specimen in the National Herbarium from the Chapman Herbarium labeled "*Panicum tenuiculmum* S. Fl. S.

Florida" in Chapman's hand, and "*Panicum chapmani* Vasey" in Vasey's hand, has been chosen as the type. Type examined (US).

DISTRIBUTION: coral sand and shell mounds, southern Florida, Bahamas, Cuba, Yucatan.

Florida. Lee: Shell mounds, Marco, HITCHCOCK 487 (MO, US); Monroe: Planter, Key Largo, A. CHASE 3926 (ILL, US); Key Largo, CURTISS 5457 (ILL, MO, US); Ramrod Key, SILVEUS 6631 (US); Big Pine Key, KILLIP 32047, 40645, 44441, 44480 (US), SWALLEN 10671 (US); Flamingo, EATON 1354 (US), SWALLEN 5247 (US); Boca Chica Key, SMALL 3942 (US); Sugar Loaf Key, SWALLEN 5158 (US).

Mexico.

Yucatan: Progreso, SWALLEN 2920, 2979 (US), LUNDELL & LUNDELL 8008 (US); GAUMER 24360 (US).

Bahamas. New Providence, BRITTON & BRACE 401 (F); Rose Island, BRITTON & MILLSPAUGH 2137 (F); Great Exuma, BRITTON & MILLSPAUGH 3076 (F).

Cuba. Camaguey: sandy beach, Batabano, EKMAN 12615 (US); Havana: low forest, Cayo Sabinal, EKMAN 15521 (US).

Setaria chapmani has its center of distribution in the Florida Keys, restricted to soil of coral or shell origin.

14. SETARIA RAMISETA (Scribner) Pilger

Panicum subspicatum Vasey in Bull. U.S. Dept. Bot. 8:25. 1889. *Non P. subspicatum* Desvaux. 1831.

Panicum ramisetum Scribner in Circ. U.S. Dept. Agr. Agrost. 27:9. 1900; Small (1903) 91; Hitchcock & Chase (1910) 24. fig. 5; Hitchcock & Chase (1915) 464; Hitchcock (1915a) 211; Silveus (1933) 554; Hitchcock (1935) 611. fig. 1271; Silveus (1942) 127; Chase in Hitchcock (1951) 636. fig. 911.

Setaria ramiseta (Scribner) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940.

Perennial, 30–90 cm. tall; culms tufted from short rootstocks, branching at the base; upper nodes glabrous, the lower appressed-pubescent; leaf sheaths rounded, not compressed, sparsely papillose-pubescent, the upper margins densely ciliate; ligule a ring of dense hairs 1–2 mm. long; leaf blades grayish-green, rather stiff, erect, flat, tapering to an involute tip, not narrowed below, 2–4 mm. wide, 5–15 mm. long, conspicuously papillose-pilose on the upper surface, scaberulous or sparsely pubescent on lower surface; panicles narrow, 5–20 cm. long, the branches appressed, the axis scabro-hispid, bearing a few scattered strigose hairs of unequal lengths; the ultimate branchlets bearing one to four subsessile spikelets, the terminal one of each branchlet subtended by a bristle 2–4 mm. long; the spikelets obovate, strongly turgid, about 2.5 mm. long; first glume clasping, ½ the length of the spikelet, acute, five-nerved; second glume

equaling the fertile lemma, broad, strongly seven–nine-nerved; the sterile lemma equaling the fertile lemma five–seven-nerved, the sterile palea absent; second glume and sterile lemma becoming coriaceous; fertile lemma indurate, strongly turgid, finely transversely rugose, enclosing a palea of similar texture and marking.

Type Locality: TEXAS: G. C. Nealley in 1887. The holotype has been examined (US).

Distribution: sandy plains and prairies, southern Texas and northern Mexico.

Texas. Bee: Skidmore, SILVEUS 506 (US); Bexar: Lake Mitchell, near San Antonio, Amer. Gr. Nat. Herb. no. 1 (MO, US); HITCHCOCK 5189 (US); near San Antonio, BEBB 2332 (ILL); Duval: San Diego, NEALLEY 62 (US); Hidalgo: near Mission, LUNDELL 12687 (US); Howard: Big Spring, TRACY 7948a (MO); Jim Wells: between Alice and San Diego, THARP 43138 (MO); Kleberg: Kingsville, TRACY 8879 (ILL, MO, US), Amer. Gr. Nat. Herb. 1600 (US); La Salle: Encinal, GRIFFITHS 6380 (US); Pecos: Sheffield, HANSON 573 (MO); Tom Green: San Angelo, REVERCHON 4148 (MO); Ward: sandhills, EGGERT in 1901 (MO); Webb: Laredo, PRINGLE 2377 (MO), HITCHCOCK 5498 (ILL), MACKENZIE 117 (MO); Zapata: near Zapata, SHINNERS 17697 (ILL).

Mexico.

Coahuila: near Diaz, PRINGLE 8323 (ILL, US).

Nuevo Leon: Mamulique Pass, LEAVENWORTH 752 (ILL, US).

Closely resembling *S. reverchoni* and *S. firmula*, this species is recognized by its smaller spikelets and usually shorter bristles. Specimens of the *S. leucopila* complex and *S. grisebachii* have been observed which resemble *S. ramiseta* because they lack bristles below the spikelets of the terminal axis, excepting the terminal spikelet.

15. SETARIA FIRMULA (Hitchcock & Chase) Pilger

Panicum firmulum Hitchcock & Chase in Contr. U.S. Nat. Herb. 15:27. fig. 9. 1910; Hitchcock (1915a) 211; Silveus (1933) 556; Hitchcock (1935) 612. fig. 1273; Silveus (1942) 128; Chase in Hitchcock (1951) 637. fig. 913.

Setaria firmula (Hitchcock & Chase) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940.

Following is a transcription of the original description from Hitchcock & Chase (1910, p. 27).

Plants light olive green, rather losely tufted, ascending or decumbent at base, from creeping knotted rootstocks as much as 5 cm. long; culms 30–40 cm. high, simple or with a few appressed branches, glabrous, the nodes glabrous or strigose; sheaths overlapping, striate, papillose-pubescent, papillose only, or near glabrous, a tuft of stiff hairs 3 mm. long on

the sides at the sumit; ligule dense, about 1.5 mm. long; blades ascending or spreading, firm, 4–10 cm. long, the lower shorter and more spreading, 4–7 mm. wide, abruptly acuminate, rounded at the base and wider than the sheath, sparsely papillose-ciliate, at least toward the base, scabrous on the upper surface; panicles slender, interrupted, their branches erect, the branchlets bearing one to three short-pediceled spikelets, the setiform prolongation of the axis usually about as long as the spikelets, sometimes twice as long; spikelets 3–3.2 mm. long, 1.7–1.8 mm. wide, obovate, subacute, turgid, strongly nerved; first glume clasping, ½ the length of the spikelet, pointed, five- to seven-nerved; second glume and sterile lemma subequal, scarcely covering the fruit, five- to seven-nerved, the glume obscurely reticulated toward the summit; fruit 2.7–2.8 mm. long, 1.6–1.7 mm. wide, obovate-elliptic, abruptly acute, very turgid.

TYPE LOCALITY: TEXAS: Zapata Co.: Elsordo, D. GRIFFITHS 6446 (1904). Holotype examined (US).

DISTRIBUTION: sandy prairies, southern Texas.

Texas. Atascosa: Pleasanton, SILVEUS 907 (US); Bexar: west of Thelma, JOHNSON & WEBSTER 581 (US); Duval: San Diego, NEALLEY 62, in part (MO); Jim Hogg: south of Hebbronville, THARP 5257 (US); Kenedy: Yturria, LUNDELL 8727 (US); Kleberg: Riviera, BOGUSCH S-206 (US); Willacy: Sarita, Amer. Gr. Nat. Herb. no. 3 (MO, US); between Raymondville and Yturria, LUNDELL 14955 (US); Zapata: Elsordo, GRIFFITHS 6446 (US).

Closely resembling *S. ramiseta*, this species is recognized by its broad (4–7 mm.), abruptly acuminate leaf blades and its larger spikelets (3.0–3.2 mm. long).

16. SETARIA REVERCHONI (Vasey) Pilger

Panicum reverchoni Vasey in Bull. U.S. Dept. Agr. Div. Bot. 8:25. 1889; Small (1903) 91; Hitchcock & Chase (1910) 26. fig. 7; Hitchcock (1915a) 211; Silveus (1933) 556; Hitchcock (1935) 612. fig. 1272; Silveus (1942) 128; Chase in Hitchcock (1951) 637. fig. 912.

Setaria reverchoni (Vasey) Pilger in Engler & Prantl, Die Nat. Pflanzenf. 14e:72. 1940.

Perennial, 30–70 cm. tall; culms tufted from short rootstocks, branching at the base; nodes glabrous or appressed-pubescent; leaf sheaths glabrous or scaberulous, mostly longer than the internodes, not compressed, very narrow, ciliate along the upper margins, bearing long hairs at the margins of the collar; the ligule a ring of short, stiff hairs; leaf blades erect, stiff, strongly involute at the tip, 1–3 mm. wide, 15–30 cm. long, narrowed at the base, scaberulous on both surfaces; panicles narrow, few-flowered, interrupted, the axis scabrous; the branchlets bearing one or two spikelets on short pedicels, the single or terminal spikelet of each

branchlet subtended by a bristle, 5–8 mm. long; the spikelets elliptic, 3.5–4.0 mm. long; first glume ½ the length of the spikelet, obtuse, five- to seven-nerved; second glume, broad, equaling the fertile lemma, seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, the sterile palea absent; fertile lemma broad, slightly turgid, finely transversely rugose, enclosing a palea of similar marking.

Type Locality: TEXAS: Dallas Co.: near Dallas, J. Reverchon. The type has been examined (US).

Distribution: rocky or sandy prairies and limestone hills, Texas.

Texas. Bexar: Lake Mitchell, near San Antonio, Amer. Gr. Nat. Herb. no. 2 (MO, US); Comal: New Braunfels, LINDHEIMER 1267 (MO), 162 (ILL); Comanche: EGGERT in 1900 (MO); Dallas: Dallas, REVERCHON 1096 (US), BUSH 674 (MO, US); Gillespie: JERMY 39 (MO, US); Howard: west of Sterling, HITCHCOCK 13407 (US); Kendall: limestone hillside, near Kendalia, JOHNSON & WEBSTER 517 (US); Kerr: Kerrville, HELLER 1603, HITCHCOCK 5283 (US); Lampasas: THARP 43054 (MO); McLennan: SMITH 498 (US); Mitchell: Colorado, TRACY 7939 (US); Nueces: Corpus Christi, PALMER 11217 (MO); Parker: Weatherford, TRACY 7948 (MO, US); San Patricio: northwest of St. Paul, HARVEY 863 (US); Tarrant: RUTH 1500 (US); Taylor: Abilene, TRACY 7940 (US); Travis: Austin, PALMER 9338 (MO); Val Verde: Devil's River, ORCUTT 6104 (US).

This species differs from *S. ramiseta* by its larger spikelets (3.5–3.8 mm. long), its longer, narrower leaf blades, and its more conspicuous bristles.

Chromosome number: n=18, Gould (1958); n=36, Gould (1958).

Subgenus SETARIA (Beauvois) Rominger, *grad. nov.*

BIBLIOGRAPHY

Setaria Beauvois, Steudel, Syn. Pl. Glum. 1:49. 1854, as a section of *Panicum*.

Eusetaria Stapf in Fl. Cap. 7:420. 1899 as a section of *Setaria*; Herrmann (1910) 42, as a subgenus; Pilger in Engler & Prantl (1940) 72, as a section; Amshoff (1942) 46.

DESCRIPTION

Annuals or perennials with flat or loosely twisted leaf blades, seldom exceeding 2 cm. in width (exceptions *S. magna, S. vulpiseta*); one or more bristles usually present below each spikelet; panicles usually contracted, spicate, bearing very short branches which seldom exceed 2 cm. in length (except in *S. setosa*); spikelets obtuse or acutish, the fertile lemma transversely rugose or rarely smooth.

Subtropical and temperate regions of both hemispheres. Twenty-seven species in North America, seven of which are introduced from the eastern hemisphere, one introduced from South America.

TYPE SPECIES: *Setaria viridis* (Linnaeus) Beauvois.

KEY TO SPECIES OF SUBGENUS *Setaria*

1. Bristles four to twelve below each spikelet; the panicles spicate, uniformly thick, not interrupted; margin of sheath glabrous; lower floret often staminate.
   2. Culms arising singly or in small tufts from short, knotty rhizomes; plants perennial; spikelets 2.0–2.8 mm. long, less turgid, distinctly transversely rugose; leaf blades flat, not twisted..42. *S. geniculata*
   2. Culms in large tufts from fibrous root system; plants annual; spikelets 3 mm. long or longer, very turgid, coarsely transversely rugose; leaf blades loosely twisted.....43. *S. lutescens*
1. Bristles usually single, or two to three below each spikelet; the panicles spicate to loosely spicate, often interrupted below, usually tapering above; margins of upper sheath ciliate (except *S. adhaerans*, *S. palmeri*); lower floret seldom staminate (except *S. magna*).
   3. Bristles partially or completely retrorsely scabrous.
      4. Bristles retrorsely scabrous only; panicle branches verticillate.
         5. Margins of upper sheath hyaline, glabrous; leaf blades conspicuously strigose on both surfaces; subtropical and tropical .....40. *S. adhaerans*
         5. Margins of upper sheath ciliate; leaf blades scabrous or occasionally bearing scattered hairs on the upper surface; temperate.....41. *S. verticillata*
      4. Bristles both retrorsely and antrorsely barbed; panicle branches not verticillate.
         6. Spikelets 2.0–2.5 mm. long; sterile palea broad, equaling its lemma in length; plants perennial; antrorsely and retrorsely directed barblets intermixed on the bristle axis...18. *S. tenax*
         6. Spikelets very small, 1.0–1.5 mm. long; sterile palea absent or rather small; plants annual; bristles retrorsely scabrous above, antrorsely scabrous below.
            7. Sterile palea absent; panicles to 20 cm. in length, the bristles 1.0–1.5 cm. long; spikelets and bristles becoming dark purple at maturity; bristles retrorsely scabrous on terminal half, antrorsely scabrous on basal half....24. *S. tenacissima*
            7. Sterile palea small, equaling ½ the length of the spikelet; panicles seldom exceeding 10 cm. in length, the bristles very short, 3–5 mm. long; spikelets and bristles green; bristles retrorsely scabrous at apex only....35. *S. scandens*

3. Bristles antrorsely scabrous only.
   8. Fertile lemma very coarsely undulate-wrinkled; plants annual.
      9. Panicle spicate, densely flowered; sterile palea lanceolate, ¾ the length of its lemma; a weedy annual of southeastern United States and West Indies.....33. *S. corrugata*
      9. Panicle loosely flowered; sterile palea broad, equaling its lemma in length or absent; annuals of southwestern United States and Mexico.
         10. Leaf blades scabrous on both surfaces, lacking any pubescence.
            11. Sterile palea absent; panicle axis scabrous only.....29. *S. liebmanni*
            11. Sterile palea broad, equaling its lemma; panicle axis bearing coarse, stiff hairs, 2–3 mm. long..32. *S. longipila*
         10. Leaf blades papillose-pubescent on both surfaces.
            12. Leaf blades linear-lanceolate, 5–8 mm. wide, 7–15 cm. long; panicle axis scabrous only.....30. *S. arizonica*
            12. Leaf blades broadly lanceolate, cordate-clasping at the base, 1.0–1.5 cm. wide, 6–8 cm. long; panicle axis villous.....31. *S. latifolia*
   8. Fertile lemma smooth, finely or strongly transversely rugose, not coarsely undulate-wrinkled; annual or perennial.
      13. Panicle densely flowered, spicate, the primary panicle axis usually not readily visible, except below.
         14. Fertile lemma smooth, shiny; fruit disarticulating above the glumes and sterile lemma.
            15. Spikelet small, 2 mm. long; sterile palea broad, equaling its lemma; saline marshes of southeastern United States .....36. *S. magna*
            15. Spikelet larger, 3 mm. long; sterile palea narrow, equaling ½ of the length of its lemma; cultivated.....38. *S. italica*
         14. Fertile lemma finely or strongly rugose, not smooth; disarticulation below the glumes.
            16. Branches of panicle verticillate, the panicle axis scabrohispid only.....41a. *S. verticillata* var. *ambigua*
            16. Branches of panicle not verticillate; the panicle axis pubescent.
               17. Panicle as much as 30 cm. long, the axis bearing yellowish-green hairs; sterile palea broad, equaling its lemma in length; tropical.....17. *S. vulpiseta*
               17. Panicle seldom exceeding 15 cm. in length; sterile

palea narrow, ½ to ⅔ the length of the sterile lemma; temperate.

18. Upper surface of leaf blades pilose or strigose; spikelets 2.5–3.0 mm.; panicles at maturity nodding from near the base.....39. *S. faberii*
18. Leaf blades scabrous only; spikelets 1.8–2.2 mm.; panicles at maturity nodding from near the apex.
19. Panicles usually less than 8 cm. long; leaf blades seldom exceeding 12 mm. wide or 20 cm. long; culm height less than 1 m.....37. *S. viridis*
19. Panicle to 20 cm. in length; leaf blades up to 2.5 cm. wide, 20 cm. long; culm height up to 2 m.....37a. *S. viridis* var. *major*

13. Panicle loosely flowered, the primary panicle axis readily visible the entire length of the panicle, or at least intermittently.
20. Spikelets 3 mm. long.
21. Leaf blades pubescent on both surfaces; panicle axis copiously villous; on soil of igneous origin, southwestern United States.....24. *S. villosissima*
21. Leaf blades scabrous only; panicle axis very sparsely villous; on coral rock and shell mounds in Florida; rare elsewhere.....25. *S. macrosperma*
20. Spikelets less than 3 mm. long.
22. Leaf blades narrow, usually less than 5 mm. wide.
23. Leaf blades conspicuously pubescent on both surfaces; sterile palea broad, equaling its lemma in length; West Indies.....27. *S. rariflora*
23. Leaf blades scabrous or rarely pilose on the upper surface only; sterile palea rudimentary to ⅔ the length of its lemma; southwestern United States, Mexico.
24. Panicles usually less than 6 cm. long, the axis scabrous-puberulent, but not villous; spikelets 1.9–2.1 mm. long.....20. *S. texana*
24. Panicles 6–15 cm. long, the axis scabrous or villous; spikelets 2.2–2.5 mm. long.....21. *S. leucopila*
22. Leaf blades more than 5 mm. wide.
25. Margins of sheath hyaline, glabrous; panicles strict, straw-colored.....22. *S. palmeri*
25. Margins of sheath ciliate-pubescent, at least above.
26. Leaf blades up to 50 cm. long, occasionally plicate and petiolate below; panicles large, rather densely

flowered, up to 30 cm. long, the axis copiously villous with greenish-yellow hairs.....17. *S. vulpiseta*

26. Leaf blades shorter, never plicate or petiolate; panicles smaller, more loosely flowered, the axis sparsely villous.
    27. Second glume equal or subequal to the fertile lemma; sterile palea rudimentary to ⅓ the length of its lemma; plants annual.....28. *S. grisebachii*
    27. Second glume shorter than the fertile lemma; sterile palea ½ to equaling its lemma in length; plants perennial.
        28. Second glume very broad, seven–nine-nerved; the spikelets globose; fertile lemma smooth at apex, strongly rugose below.....18a. *S. tenax* var. *antrorsa*
        28. Second glume narrower, five–seven-nerved; the spikelets not globose; fertile lemma rugose to the apex.
            29. Spikelets gibbous; leaf blades scabrous, often bearing a tuft of long white hairs at the throat; panicles of nearly uniform thickness from base to apex.....19. *S. macrostachya*
            29. Spikelets not gibbous; panicle branches longer below, panicle tapering above.
                30. Bristles 1.0–3.5 cm. long; the sterile palea ½ the length of its lemma; spikelets apiculate, incurved at the apex.....23. *S. scheelei*
                30. Bristles 0.5–1.0 cm. long; sterile palea broad, equaling its lemma in length; spikelets not conspicuously curved at the apex.
                    31. Leaf blades pubescent, seldom exceeding 1 cm. in width.....26. *S. setosa*
                    31. Leaf blades glabrous or scaberulous, up to 2.5 cm. wide, rounded abruptly at the base.....26a. *S. setosa* var. *leiophylla*

TAXONOMIC TREATMENT OF SPECIES OF SUBGENUS *Setaria*

17. SETARIA VULPISETA (Lamarck) Roemer & Schultes

Panicum vulpisetum Lamarck, Encycl. Meth. 4:735 (*err. typ.* 745). 1798; Steudel (1854) 50.

Setaria composita HBK. Nov. Gen. & Sp. 1:111. 1815; Sprengel (1825) 304; Kunth (1833) 154; Kunth (1835) 108.

Setaria vulpiseta (Lamarck) Roemer & Schultes, Syst. Veg. 2:495. 1817; Kunth (1833) 153; Grisebach (1864) 555; Standley (1928) 83; Hitchcock (1930) 677; Hitchcock (1931) 329; Swallen (1934) 351; Swallen (1936) 183; Hitchcock (1936) 350. fig. 322; Swallen (1943) 247; Swallen (1955) 336. fig. 97.

Setaria polystachya Schrader *ex* Schultes in Roemer & Schultes Syst. Veg. Mant. 2:277. 1824.

Panicum compositum (HBK.) Nees, Agrost. Bras. 244. 1829. *Non P. compositum* L. 1753.

Panicum macrourum Trinius in Mem. Acad. St. Petersb. VI. 3(2):227. 1834; Steudel (1854) 53.

Setaria alopecurus "Hort. Gor.," Trinius in Steudel, *loc. cit., pro. syn.*

Panicum amplifolium Steudel, *loc. cit.*

Panicum subsphaerocarpum Salzmann *ex* Schlechtendal in Linnaea 31:483. 1862.

Chamaeraphis setosa var. *vulpiseta* (Lamarck) Kuntze, Rev. Gen. Pl. 2:769. 1891.

Chamaeraphis composita (HBK.) Kuntze, *loc. cit.*; Beal (1896) 154.

Chaetochloa vulpiseta (Lamarck) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:350. 1917; Hitchcock (1920) 202. fig. 59.

Perennial, branching at the base, often in large tufts, as much as 2 m. tall; culms glabrous or scabrous below the panicle, stout, often decumbent; leaf sheaths keeled, glabrous or scabrous and hispidulous above, the collar bearing a ring of stiff hairs, 2–4 mm. long; ligule densely hispid, about 2 mm. long; blades flat or folded, rarely plicate, tapering toward both ends, acuminate above and petiolate at the base, scabrous on both sides, as much as 50 cm. long and 3 cm. wide; panicles rather densely flowered, cylindrical, tapering toward both ends, as much as 30 cm. long and 4–5 cm. wide, the branches stiffly ascending, as much as 3 cm. long, the axis angled, scabrous, and densely villous with yellowish-green hairs about 1 mm. long; bristles one or two at base of each spikelet, flexuous, yellowish-green or brownish, 2–3 cm. long, antrorsely scabrous; spikelets ovate, turgid on the convex side, about 2.5 mm. long; first glume ⅓ to ½ as long as the spikelet, three–five-nerved; second glume ¾ as long as the fertile lemma, seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a broadly ovate palea equaling the fertile palea; fertile lemma, yellowish, turgid on convex side, about 2.5 mm. long, nearly smooth near the acute tip, very strongly transversely rugose below.

TYPE LOCALITY: DOMINICAN REPUBLIC: Santa Domingo (Ciudad Trujillo) by Dutrone. The type is in the Desfontaines Herbarium in Florence.

DISTRIBUTION: Isthmus of Tehuantepec, Mexico, to Isthmus of Panama; Puerto Rico, St. Thomas Isl., Tobago, Trinidad.

Mexico.

Veracruz: Cordoba, KERBER 55A (US).

Oaxaca: in llanos, Chiltipec, MARTINEZ-CALDERON 178 (GH, US). El Cerro de Nacimiento, SANTOS 2429 (US). Tabasco: San Antonio de Cardenas, ROVIROSA 254 (NY).

Chiapas: in sandy field near beach, Mojarra, near Tonala, MATUDA 17210 (F).

Yucatan: GAUMER 24292 (F, MO, US).

British Honduras. El Cayo, BARTLETT 12953 (US). Corozal, GENTLE 507 (US). Orange Walk, O'NEILL 8503 (NY, US). Open forest, near Stann Creek Railway, SCHIPP 373 (F, MO).

Guatemala. Huehuetenango: Nenton, SELER 2716 (US). Along Rio Nenton, STEYERMARK 51450 (F).

Honduras. Cortes: Rio Piedras. MOLINA R. 3532 (US). San Pedro Sula, THIEME 5582 & 5582B (US). Without locality, THIEME 5574.

El Salvador. Near San Salvador, RENSON 296 (ILL, US). San Salvador, CALDERON 1168 (US).

Nicaragua. Managua: near Sierra de Managua, GARNIER (F). Jintepe, HITCHCOCK 8683 (US).

Costa Rica. Las Delicias del Reventazon, PITTIER 16171 (MO, US). El General, SKUTCH 3946 (MO, US). Colonia Carmona, JIMINEZ 368 (US). San Luis de Currubales, VALERIO 661 (F).

Panama. Lincoln Creek, Changuinola Valley, DUNLAP 200 (F). Balboa, STANDLEY 29310 (US). Colon, ALLEN 3584 (US). Corozol, KILLIP 4023 (US). Chiva-chiva trail, PIPER 5228 (US). Summit, STANDLEY 26958 (US). Panama City, MENDEZ 111 (US). Rio Pequeni, WOODSON, ALLEN & SEIBERT 1627 (MO). Rio Chagres, near Madden Dam, SEIBERT 548 (MO). Gatun, STEVENS 1200 (ILL). Ft. Sherman, STEVENS 271 (ILL). Gamboa, STEVENS 1078 (ILL). In open ground, Culebra, Amer. Gr. Nat. Herb. 728 (F, MO, US). Obispo, STANDLEY 31734 (US). Gorgona, MAXON 4734 (US). Barro Colorado Island: Fairchild Point, AVILES 884 & 962 (F). Edge of Lake, STARRY 65 (F). STANDLEY 41172 (US). BAILEY & BAILEY 330 (US). Bocas del Toro: Ciriqui Lagoon, WEDEL 1615 (MO). Toro Point, HITCHCOCK 8046 (US). Taboga Island: HITCHCOCK 8093 (US).

Puerto Rico. Humacao, SARGENT 3015 (US). Jayuya, SINTENSIS 6335 (US). San Juan, CHASE 6371 (US). Rio Piedras, STEVENSON 3024 (US).

St. Thomas Island. NELTHROPP 2 (NY).

Trinidad. Bot. Gard. Herb. 3304.

Tobago. BROADWAY 4898.

Apparently South America is the center of distribution of *S. vulpiseta*. It extends only as far north as the Isthmus of Tehuantepec in southern

Mexico. Closely resembling S. *tenax* in its general appearance, it lacks the retrorse barblets so typical of S. *tenax*. The panicle is as much as 30 cm. long, greenish-yellow, and the panicle branches are stiffly ascending, uniformly 2–3 cm. long. The panicle resembles that of S. *magna* in size but is not so densely flowered. The spikelets of S. *vulpiseta* differ markedly from those of S. *magna*, being larger and rather strongly transversely rugose.

The panicle axis is copiously villous with short, stiff, yellowish-green hairs. This species may grow to a height of 2 m. in open, but moist areas. It has been collected most intensively from Panama. It is known in Central America as "cola-de-venado."

18. SETARIA TENAX (Richard) Desvaux

Panicum tenax Richard in Act. Soc. Hist. Nat. Paris 1:106. 1792; Lamarck (1798)735 (*typ. err.* 745).

Panicum impressum Nees, Agrost. Bras. 247. 1829; Steudel (1854) 53.

Setaria impressa (Nees) Kunth, Rev. Gram. Suppl. xii. 1830; Herrmann (1910) 57.

Setaria tenax (Richard) Desvaux, Opusc. 78. 1831; Standley (1928) 83; Hitchcock (1930) 675; Hitchcock (1931) 321; Swallen (1934) 351; Hitchcock (1936) 341. fig. 311; Swallen (1943) 245; Swallen (1955) 334.

Panicum sphaerocarpum Salzm. in Steudel, Syn. Pl. Glum. 1:51. 1854. *Non P. sphaerocarpum* Ell. 1816.

Panicum amphibolum Steudel, *loc. cit.*

Panicum intermedium Salzmann in Steudel, *loc. cit., pro. syn. Non P. intermedium* Vahl. 1813.

Setaria biconvexa Grisebach in Fl. Brit. W. Ind. 555. 1864.

Chaetochloa salzmanniana Hitchcock in Contr. U.S. Nat. Herb. 17:265. 1913; Conzatti (1943) 47.

Chaetochloa impressa (Nees) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:350. 1917.

Chaetochloa tenax (Richard) Hitchcock in Contr. U.S. Nat. Herb. 22:176. 1920.

Perennial, 1–2 m. tall; culms erect or geniculate at the base, glabrous, scabrous below the panicle; nodes very narrow, glabrous; leaf sheaths glabrous, rarely pubescent and scaberulous on upper part, densely papillose-ciliate along the margins, the collar densely villous; ligule densely hispid 1–2 mm. long; blades flat, rounded abruptly at the base, acuminate at the apex, minutely scabrous, rarely softly pubescent, 15–30 cm. long, 10–20 mm. wide; panicle loosely spicate, tapering above, 10–35 cm. long, the axis angled, scabrous, densely villous with white, papillose hairs; panicle branches usually very short, the lower ones as much as 3 cm. long; bristles single below each spikelet, 1–2 cm. long, bearing antrorse and retrorse barblets intermixed along their axes, sometimes the antrorse barblets restricted to the basal half of the bristle and the retrorse barblets on the upper half; spikelets subspheric, 2.0–2.5 mm.

long, very turgid on one side and slightly swollen on the other; first glume ⅓ the length of the spikelet, broad, triangular, five-nerved; second glume covering about ½ of the fertile lemma, broadly ovate, seven–nine-nerved; sterile lemma equaling the fertile lemma, broad, faintly five–seven-nerved, enclosing a broad palea nearly its own length; fertile lemma nearly globose, yellowish-brown at maturity, smooth at the apex, coarsely transversely rugose below, the palea slightly convex and of similar texture.

Type Locality: FRENCH GUIANA: Cayenne. The type is in the Florence Herbarium.

Distribution: southern Mexico to El Salvador; Cuba, Jamaica, Barbados, Trinidad; most frequent habitat is in shade on rocky slopes in pine and oak woods.

Mexico.

San Luis Potosi: Tamazunchole, EDWARDS 945 (MO, US, TEX).

Veracruz: Cordoba, HITCHCOCK 6424 (US). San Martins near Tacobepei, VON ROZYNSKI 583 (F). Fortuno on Coatzacoalcos River, WILLIAMS 8866 (F). El Palomar near Zongolica, SANTOS 3292 (NY).

Guerrero: in llano, Vallecitos near Montes de Oca, HINTON 10566 (ILL, US, TEX).

Oaxaca: Cerro de Nacimiento, east of Cosolapa, SANTOS 2447 (F).

Chiapas: Agvacate Palenque, MATUDA 3806 (F, NY, US). Sand dunes near ocean, MORLEY 718 (US).

Yucatan: Tizimin, SWALLEN 2505 (US).

British Honduras. El Cayo: San Augustin, LUNDELL 6731 (NY, US).

Guatemala. Ivirique, JOHNSTON 1259 (F). Jutiapa: brushy, rocky slope, near Jutiapa, STANDLEY 75134 (F, US). Izabal: hilly pine forest, near Quirigua, STANDLEY 72457 (F).

Honduras. Morazan: pine-oak region, above El Zamorano, STANDLEY 12239 (F); near El Jicarito, STANDLEY 12588a (F, NY); rocky hillside, near Santa Clara, STANDLEY 23415 (F); along Rio Capa Rosa, near Zamorano, WILLIAMS & MOLINA R. 13239 (F). Cortes, MOLINA R. 3444 (US). Santa Barbara, MOLINA R. 3794 (US). El Paraiso: Mt. Yuscaran, MOLINA R. 604 (F).

Panama. San Jose Island, Perlas Archipelago, ERLANSON 454 (GH, US), ERLANSON 74 (NY). JOHNSTON 674 (GH). Taboga Island, HITCHCOCK 8085, BRO. CELESTINE 87 (US).

Cuba. Santa Clara: serpentine barrens, near Santa Clara, HOWARD 5040 (NY); Soledad, HOWARD 6262 (US); Cienquito, COMBS 264 (MO). Oriente: Sierra de Nipe, EKMAN 9959 (NY) and MORTON & ACUNA 2920 (US); Havana: Havana, EKMAN 13127 (NY); Triscornia, TRACY 9090 (MO, TEX).

Jamaica. Rocky banks, Watsons Hill, near S. Manchester, Amer. Gr.

Nat. Herb. 608 (F, ILL, MO, US). Inverness, HARRIS 12167 (MO). In shade on savanna, Lititz, HARRIS 11657 (MO, NY). Damp, shady places, Two-Mile Wood Pen, HARRIS 12065 (MO).

Haiti. La Tortue, EKMAN H 4136 (INJ, US).

Trinidad. Dry hills, near Port of Spain, Amer. Gr. Nat. Herb. 609 (F, MO, US). St. Ann's, BROADWAY 7368 (F, US).

Barbados. St. Andrew, DASH 603 (NY).

This taxon resembles both *S. vulpiseta* and *S. macrostachya* but is immediately separated from these by the presence of retrorsely scabrous barblets on the bristles. These bristles usually possess both upwardly and downwardly pointed barblets intermixed along their axes. Sometimes the retrorsely scabrous barblets are found on the terminal half of the bristle axis, while the antrorse ones are basal. Regardless of the arrangement, the panicles are conspicuously rough to the touch and may adhere to clothing. This species is further characterized by its swollen, subspheric spikelets and its rather sparsely flowered panicle.

Growing from sea level to about 1,000 meters elevation, *S. tenax* prefers shaded, rocky slopes in pine and oak forests. However, it has been collected from coastal sand dunes and serpentine barrens, indicative of its wide range of ecological adaptation. In Veracruz this species is a common weed in corn fields.

18a. SETARIA TENAX var. ANTRORSA *var. nov.*

TYPE LOCALITY: MEXICO: YUCATAN: Chichen Itza, SWALLEN 2439 (1932).

DISTRIBUTION: rare; known only from Yucatan and Veracruz.

Mexico.

Veracruz: Cordoba, FISHER 68 (F, US).

Yucatan: dense clump in open place in brush, Chichen Itza, SWALLEN 2439 (MO, US).

This variety represents *S. tenax* with antrorsely barbed bristles. Easily confused with the antrorsely barbed *S. macrostachya*, it differs from it by the less densely flowered panicle and the slightly larger sterile palea. Also the second glume is seven–nine-nerved and broader, more obtuse than the second glume of *S. macrostachya*. This variety differs from *S. tenax* only in the absence of retrorsely directed barblets on its bristles.

A var. tenaci differt setis antrorse scabris.

19. SETARIA MACROSTACHYA HBK.

Setaria macrostachya HBK. Nov. Gen. & Sp. 1:110. 1815; Presl (1830) 315; Kunth (1833) 154; Kunth (1835) 108; Herrmann (1910) 58; Hitchcock (1931) 330; Silveus (1933) 674; Hitchcock (1935) 700. fig. 1570; Hitchcock (1936) 346. fig. 317; Kearney & Peebles (1941) 149; Johnston

(1943) 417; A. Chase in Hitchcock (1951) 721. fig. 1099; Gould (1951) 270. fig. 75; Kearney & Peebles (1951) 139; Emery (1957a) 99.

Panicum macrostachyum (HBK.) Nees, Agrost. Bras. 245. 1829.

Panicum onurus Willdenow *ex* Nees, *op. cit.* 251. *pro. syn.*

Chamaeraphis setosa var. *macrostachya* (HBK.) Kuntze, Rev. Gen. Pl. 2:769. 1891.

Chaetochloa gibbosa Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:24. 1900.

Chaetochloa macrostachya (HBK.) Scribner & Merrill in *op. cit.* 29. fig. 16; Small (1903) 107; Hitchcock (1913) 262. Hitchcock (1920) 204. figs. 60, 61; Conzatti (1943) 50.

Chamaeraphis macrostachya (HBK.) Kuntze *ex* Stuckheim in Anal. Mus. Nac. Buenos Aires III. 4:76. 1904.

Setaria berlandieri Herrmann in Beitr. Biol. Pflanzenf. 10:56. 1910.

Setaria caudata var. *pauciflora* Jones, Contr. West. Bot. 16:13. 1930.

Perennial, 60–120 cm. tall, stems robust, erect or geniculate, compressed, rarely branched above, scabrous below the panicle and nodes; leaf sheaths compressed, keeled, glabrous, the collar glabrate; ligule densely ciliate, 2–4 mm. long; leaf blades mostly flat, 15–20 cm. long, 7–15 mm. wide, strongly scabrous above, scaberulous below, generally with a few white hairs at the throat; panicle densely flowered, 10–30 cm. long, 1–2 cm. in diameter, strict, cylindrical, of nearly uniform thickness from base to apex, occasionally interrupted or lobed below, the axis angled, scabrous, sparingly villous and puberulent, hairs as much as 3 mm. long, branches short; bristles usually solitary below each spikelet, 10–20 mm. long, soft, antrorsely scabrous; spikelets 2.0–2.3 mm. long, ovate, gibbous; first glume about ⅓ to ½ as long as the spikelet, three–five-nerved; second glume ⅔ to ¾ as long as the spikelet, five–seven-nerved; sterile lemma five-nerved, as long as the strongly cross-wrinkled fertile lemma; sterile palea nearly as long as the convex, ovate, fertile palea. Chromosome number $2n = 54$.

Type Locality: MEXICO: GUANAJUATO: Salamanca, BONPLAND 4202. Photo of isotype examined (US). Isotype deposited in the Museum National d'Histoire Naturelle in Paris.

Distribution: abundant over southern Texas and southern Arizona; scattered throughout highlands of central Mexico; rare in West Indies.

Texas. Bexar: San Antonio, HITCHCOCK 5162 (ILL); Brooks: near Falfurrias, EMERY 567 (TEX); Cameron: near Harlingen, JOHNSTON 5319.150 (TEX); Dimmit: A. & M. College Substation no. 19, McCULLEY 10 (ILL); Duval: Benavides, HARVEY 894 (GH); Hidalgo: near Linn, JOHNSTON 541392 (TEX); Jim Hogg: Hebbronville, THARP & JOHNSTON 541832 (TEX); Jim Wells; west of Kingsville, EMERY in 1954 (TEX); Kleberg: Kingsville, SWALLEN 10252 (US); Travis: Austin, LETTERMAN 5467 (NY); Webb: Laredo, MACKENZIE 107

(NY); Willacy: Yturria, JOHNSTON 541087 (TEX); Wilson: Poth, HARVEY 894 (US); Zapata: Zapata, FISHER 41167 (GH).

Arizona. Cochise: Pearce, GRIFFITHS 1944 (NY); Pima: Baboquivari Mts., M. JONES 24696 (GH, MO), 24698 (NY), KEARNEY & PEEBLES 10376 (US), GOULD 4466 (GH); Santa Cruz: Patagonia, HITCHCOCK 3660 (US).

Mexico.

Sonora: Magdalena, DROUET & RICHARDS 3805 (F).

Chihuahua: near Cruces, SHREVE 8909 (US).

Coahuila: near La Rosa, EMERY 136 (TEX).

Nuevo Leon: Monterrey, LEAVENWORTH 771 (MO).

Tamaulipas: Santander to Victoria, BERLANDIER 2248 (MO).

San Luis Potosi: Cardenas, Amer. Gr. Nat. Herb. 732 (MO, US).

Durango: Durango, PALMER 872 (F, MO).

Nayarit: Maria Madre, Tres Marias Isl., FERRIS 5755 (MO, US).

Queretaro: Queretaro, HITCHCOCK 5808 (ILL, US).

Veracruz: Carranca de Panoaya, PURPUS 8557 (MO, NY, US).

Hidalgo: Ixmiquilpan, MOORE & WOOD 3742 (US).

Puebla: Tehuacan, ROSE 10116 (F).

Oaxaca: Oaxaca, CONZATTI 3986 (US).

Chiapas: sand dunes near ocean, MORELEY 718 (GH).

Haiti. Gonzives, Holdridge 1747 (US); St. Marc, LEONARD 2889 (US); Port-de-Paix, EKMAN H 3939 (US); Fond Parisien, LEONARD 4155, 4155a (US).

Dominican Republic. Santo Domingo, EKMAN H 14161 (US); Jarabacoa, EKMAN H 14124 (US); Barahona: Valley of Neiba, HOWARD 8350 (US).

Cuba. Guantanamo, HIORAM 14056 (US); Isla de Pinos, EKMAN 11728 (US).

This binomial was originally described by Humboldt, Bonpland, and Kunth (1815) from a collection gathered in the highlands of central Mexico in Guanajuato. Scribner and Merrill (1900) recognized *S. macrostachya* HBK. (*sensu stricto*) and also described six other closely related species. Hitchcock (1920, 1931, 1935) retained *S. villosissima* and *S. scheelei* as distinct species but broadened the concept of *S. macrostachya* to include the remaining four species as treated by Scribner and Merrill. An intensive cytotaxonomic study of *Setaria macrostachya* and its relatives (Emery 1957a, b) has served to elucidate this complex considerably, though not completely. Emery retains *S. villosissima* and *S. scheelei* as distinct entities. *Setaria macrostachya* (*sensu* Hitchcock) was separated, on the basis of chromosome number, populational studies, and re-evaluation of morphological characters, into three distinct species: *S. texana* Emery; *S. macrostachya* HBK. (*sensu stricto*), and *S. leucopila*

(Scribner & Merrill) K. Schum. The last one of these is highly polymorphic and, as indicated by Emery, is undoubtedly capable of further segregation, pending data that will correlate chromosome differences with morphological differences.

Setaria macrostachya HBK. can be readily separated from its relatives in the southwestern U.S. by its short, swollen spikelets, its broad, scabrous blades, and its well-developed sterile palea. Also, the densely flowered, rather broad and seldom interrupted panicle is recognizably distinct. A few long white hairs at the throat of the leaf blades further characterize this species.

Chromosome number: 2n = 54, Emery, 1957a.

20. SETARIA TEXANA Emery

Setaria texana Emery in Bull. Torr. Club 84:97. 1957.

Following is a transcription of the original description from Emery (1957a).

Perennial 30–70 (90) cm. tall. Stems wiry, erect or geniculate, compressed, much-branched above, scabrous below panicle and usually below the glabrous nodes; leaf sheaths compressed-keeled, glabrous or slightly scabrous on keel, ciliate on upper margin, the collar glabrate; ligule densely ciliate, 1 mm. or less long; blades mostly flat, 5–15 (20) cm. long, 2–4 (5) mm. wide, scabrous above, smooth or slightly scabrous beneath; panicle spikelike, 2–6 (8) cm. long, somewhat tapering above but not attenuate, occasionally interrupted or lobed below, the axis angled, scabrous, puberulent; the branches less than 3 mm. long; bristles usually solitary below each spikelet, 3–10 mm. long, soft, antrorsely scabrous; spikelets 1.9–2.1 mm. long; first glume about ½ as long as the spikelet, three-nerved; second glume about ¾ as long as the spikelet, five-nerved; sterile lemma five-nerved, about equaling the finely but distinctly cross-wrinkled fertile lemma; sterile palea rudimentary or up to ½ as long as the narrowly ovate fertile palea. Chromosome number 2n = 36.

Type Locality: TEXAS: Kleberg Co.: 8 miles west of Kingsville, Nov. 11, 1955. EMERY 515. Holotype examined (TEX).

Distribution: in shaded habitats on sandy loam soils of the Rio Grande Plain of south Texas.

Texas. Bee: Beeville, EMERY 496 (TEX); Cameron: Olmito, TRACY 8907 (F, ILL, US); Dimmit: A. & M. Substation no. 19, McCULLEY 9 (SMU); Dubal: south of Benavides, EMERY 525, 526 (TEX); Hidalgo: west of Mission, THARP & YORK 51-68 (TEX); Jim Wells: west of Kingsville, EMERY 576 (TEX); Kenedy: King Ranch, SWALLEN 10609 (US); Kleberg: Baffin Bay, SWALLEN 10066 (US); La Salle:

south of Cotulla, BROWN (TEX); Nueces: north of Banqueta, JOHNSTON 542325 (TEX); Starr: southwest of Santa Elena, JOHNSTON 541436 (TEX); Tom Green: San Angelo, SMITH 171 (TEX); Uvalde: east of Uvalde, EMERY 579 (TEX); Val Verde: WRIGHT 627, 695 (GH); Webb: Laredo, ROSE 18051 (NY, US); Willacy: Sauz Ranch, JOHNSTON 5319.147 (TEX); Wilson: south of Seguin, EMERY 491 (TEX); Zapata: New Zapata, THARP & JOHNSTON 541947 (TEX); Zabala: south of Uvalde, EMERY 581 (TEX).

Mexico. Tamaulipas: south of Rio Tigre, LE SUEUR 685 (TEX). San Fernando, ROSE 24333a (US).

This recently described species (Emery 1957a) has a rather limited distribution, being restricted to the Rio Grande Plain of south Texas. Its narrow glabrous blades 2–5 mm. wide, short, slender panicle 2–8 cm. long, consistently short spikelets 1.9–2.1 mm. high, and wiry, highly branched culms readily separate this species from other perennial species in southern Texas. It has definite ecological preferences, growing abundantly in shaded, sandy, loam soils while often absent from adjacent open, clay soils. Its limited distribution and ecological preferences probably eliminate this grass as a potential forage grass.

Setaria texana has a distinctive somatic chromosome number, $2n = 36$, the lowest number known in the *S. macrostachya* complex. It may represent a basic species from which higher polyploid individuals have evolved.

The earliest known collections of this taxon, WRIGHT 627, 695 (GH) Val Verde Co., Texas, 1849, were designated as *S. setosa* (Sw.) Beauvois by Scribner.

Chromosome number: $2n = 36$, Emery 1957a.

21. SETARIA LEUCOPILA (Scribner & Merrill) K. Schumann

Chaetochloa leucopila Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:26. fig. 14. 1900.

Chaetochloa composita sensu Scribner & Merrill in *op. cit.* 27. fig. 15; Hitchcock (1913) 263; Wooton & Standley (1915) 60; Rydberg (1922) 39; Conzatti (1943) 49.

Setaria leucopila (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28:417. 1902; Emery (1957a) 101.

Setaria commutata Hackel *ex* Stuck. in Anal. Hist. Nat. Buenos Aires 13: 439. 1906.

Perennial, 20–100 cm. tall, usually pale or glaucous; stems compressed, erect or geniculate from a cespitose base, rarely branched above, scabrous below the panicle and nodes, often more or less pubescent below the nodes; leaf sheaths compressed-keeled, glabrous, often scabrous toward the summit and on the keel, villous along the upper margin, collar glabrate to hispid; ligule densely ciliate, 1.0–2.5 mm. long; leaf

blades flat or folded, 8–25 cm. long, 2–5 mm. wide, scabrous on both surfaces or nearly smooth beneath, rarely pubescent, acuminate at the apex; panicles densely flowered, 6–15 cm. long, 1.0–1.5 cm. in diameter, pale green, columnar, often interrupted or lobed below, tapering at the apex but not attenuate, axis angled, scabrous or villous, branches short; bristles usually solitary below each spikelet, 4–15 mm. long, pale; first glume about ½ as long as the spikelet, three-nerved; second glume ¾ to nearly as long as the spikelet, five-nerved; sterile lemma five-nerved, as long as the acute, short, apiculate, finely cross-wrinkled fertile lemma; sterile palea lanceolate, ½ to ¾ the length of the ovate-lanceolate, plane or slightly convex fertile palea.

Type Locality: MEXICO: COAHUILA: Parras, PALMER, 1363 (1880). Holotype examined (US).

Distribution: common over southwestern United States and northern Mexico; occurring from Texas to Arizona and southern Colorado to Guanajuato, Mexico.

Texas. Andrews: Shafter Lake, THARP 43005 (SMU); Bexar: Castroville, EMERY 597 (TEX); Brewster: Alpine, TURNER 2964 (SMU); Calhoun: Farewell Isl., THARP (TEX). Cameron: Brownsville, LUNDELL 10659 (SMU); Crane: MULLER 8536 (SMU); Crockett: Juneo, WARNOCK & McBRYDE 15286 (TEX); Culberson: Van Horn, WARNOCK 9431 (SMU); Donley: Memphis, BENNETT 31 (TEX); Ector: Odessa, SCHALLERT 14761 (ILL); El Paso: Bow Wow Canyon, THARP 46293 (ILL); Garza: Post, THARP & GIMBRADE 51-1544 (TEX); Hidalgo: Edinburg, GOULD 7468 (TAES); Howard: Big Spring, HITCHCOCK 13376 (US); Hudspeth: Salt Flat, WHITEHOUSE 17015 (SMU); Jeff Davis: Valentine, EMERY 543 (TEX); Jim Hogg: Hebbronville, THARP 5254 (TEX); Karnes: Karnes City, JOHNSON 814 (TEX); Kenedy: El Toro Isl., THARP 49045 (TEX, US); Kleberg: Kingsville, SWALLEN 10246 (US); La Salle: Canada Verde, SWALLEN 10004 (US); Liveoak: THARP 5249 (TEX); Llano: near Llano, GOULD 7534 (TAES); Loving: Mentone, WARNOCK (SMU); McMullen: Tilden, SWALLEN 10017 (US); Maverick: near Eagle Pass, EMERY 554, 596 (TEX); Medine: Hondo, EMERY 555 (TEX); Midland: Midland, CORY 42016 (TEX); Mitchell: near Colorado City, POHL 5008 (SMU); Nueces: Driscoll, GOULD & HYCKA 8068 (TAES, TES); Pecos: Ft. Stockton, CORY 51938 (SMU); Potter: East Amarillo Creek, CORRELL 13093 (SMU); Presidio: Van Horn Creek, HINCKLEY 1639 (TEX); Randall: Palo Duro Canyon, ANDERSON & HALL (TEX); Reeves: Red Bluff Lake, WHITEHOUSE 16850 (SMU); San Patricio: Sinton, EMERY 560 (TEX); Scurry: RUTH 1260 (SMU); Taylor: near Abilene, TOLSTEAD 7381 (SMU); Terrell: near Sanderson, WARNOCK & McBRYDE 14784 (TEX); Travis:

Austin, BROWN 3240 (TEX); Upton: McCamey, EMERY 563 (TEX); Val Verde: Del Rio, GOULD 5989 (TEX); Webb: Laredo, HITCHCOCK 5508 (US); Wilbarger: near Vernon, WHITEHOUSE 10921 (SMU); Willacy: Willamar, GOULD 8140 (TAES).

Oklahoma. Cimarron: Mesa de Maya, ROGERS 4785 (US); Payne: Stillwater, MUNCRIEF 84 (TEX).

Colorado. Baca: Corrizo Canyon, PORTER 4296 (NY, TEX, US); Fremont: Canyon City, SHEAR 979, M. JONES 780, EASTWOOD 4 (US); BRANDEGEE 614, CLEMENTS 283 (NY); Las Animas: Troy, ROGERS 4852 (US).

New Mexico. Bernalillo: Albuquerque, TRACY 85 (US); Chaves: Roswell, GRIFFITHS 5738 (US); DeBaca: Fort Sumner, NISBET 8280 (UNM); Dona Ana: Mesilla, WOOTON 60 (ILL, US); Eddy: Carlsbad Caverns, SPRINGFIELD 3168 (UNM); Grant: Mangas Springs near Silver City, METCALFE 154 (ILL, US); Guadalupe: Santa Rosa, SPRINGFIELD 3165 (UNM); Hidalgo: Animas Creek, METCALFE 1147 (UNM); Lea: Jal, CASTETTER (UNM); Lincoln: Carrizozo, THOMPSON 121 (UNM); Luna: Deming, HITCHCOCK 3757 (US); Quay: Tucumcari, SHINNERS 21044 (UNM); San Miguel, Las Vegas, VASEY 81 (GH); Socorro: Socorro, ROLLER 3169 (UNM).

Arizona. Cochise: Benson, GRIFFITHS 2003 (US); Coconino: Phantom Ranch, Grand Canyon, CLOVER 4082 (US); Pima: Tucson Mts., TOUMEY 77 (US); Santa Cruz: near Patagonia, EMERY 535 (TEX).

Mexico.

Sonora: San Rafael, SANTOS 1777 (GH).

Chihuahua: near Camargo, EMERY 391, 402 (TEX).

Coahuila: Saltillo, HITCHCOCK 5589 (ILL).

Nuevo Leon: Galeana, V. H. CHASE 7658 (GH, ILL).

Tamaulipas: Chamal, SWALLEN 1699 (US).

San Luis Potosi: San Luis Potosi, HITCHCOCK 5665 (US).

Durango: west of Torreon, EMERY 145 (TEX).

Zacatecas: Concepcion del Oro, PALMER 261 (GH, US).

Guanajuato: Rincon, SOHNS 470 (US).

Puebla: Tejuacan, HITCHCOCK 6047 (US).

This highly polymorphic taxon was originally described by Scribner and Merrill (1900). Hitchcock (1920, 1931, 1935) placed this under *S. macrostachya*, but at the same time he stated that, "The commoner form of Texas and northern Mexico is less robust, the blades narrower, 3–4 mm. wide, often folded, the panicles more compactly flowered and spikelike" (Hitchcock 1931, p. 330). This commoner form, which Hitchcock recognized as differing from *S. macrostachya* HBK. (*sensu stricto*), is reinstated with specific rank by Emery (1957a).

Emery recognizes that *S. leucopila* embraces at least three different somatic chromosome numbers (2n = 54, 68, 72) and suggests that further study may make it possible to correlate these chromosome differences with observable morphological differences. Emery (1957a and b) also has observed aposporous embryo-sac development and a 5n endosperm in the 2n = 54 form, strongly indicating that apomixis plays a major role in the reproduction of this species. The 68- and 72-chromosome forms are restricted to the counties of central southern Texas. The 54-chromosome form is found in western Texas, New Mexico, Colorado, Arizona, and northern Mexico. The latter form is characterized by a villous panicle axis, while the 68- and 72-chromosome forms usually have the axis scabro-hispid. There are other observable morphological differences within this species, but extensive examination of herbarium specimens has failed to reveal consistent differences which could be interpreted as of specific value.

Setaria leucopila is the most abundant and most widely dispersed of the perennial bristle grasses of the plains. It, therefore, is of greater economic importance as forage and cover than any of the other perennial species of *Setaria* in the southwestern United States and northern Mexico. Emery's separation of *S. macrostachya* HBK. (*sensu stricto*) from *S. leucopila* helps to reduce the confusion within this complex, but attention must now be focused on the remaining forms within the *S. leucopila* complex.

Chromosome number: 2n = 54, Emery (1957e); 2n = 68, Emery (1957a); 2n = 72, Emery (1957a).

22. SETARIA PALMERI Henrard

Chaetochloa rigida Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:30. 1900.

Setaria rigida (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28:417. 1902. *Non S. rigida* Stapf, 1899.

Setaria palmeri Henrard in Blumea 3:415. 1940.

Following is a transcription of the original description of *Chaetochloa rigida* Scribner & Merrill (1900, p. 30).

An erect, rigid, perennial, 3–6 dm. high, with loose, narrow, interrupted panicles, few short setae, and rigid lanceolate leaves 1–2.5 dm. long. Culms cylindrical, somewhat branching below, striate, smooth, scabro-pubescent below the panicles and sometimes below the glabrous nodes; sheaths mostly close, equaling or exceeding the nodes, glabrous, the lower ones imbricate and scarcely striate, margins very smooth, not ciliate; ligule very short, sparingly ciliate, not exceeding 1 mm. in length; leaf blades rigid, 6–12 mm. wide, minutely scabrous on both sides or nearly smooth, often minutely pubescent at the throat, serrulate-

scabrous on the margins, narrowed at the base, acuminate, sometimes somewhat involute-setaceous above, midnerve very prominent on the lower side of the leaf for ⅔ its length, glabrous. Panicle 0.5–2 dm. long, strict, often scarcely exserted from the upper sheath, pale or straw-colored; rachis angular, short pubescent or somewhat villous, undulate; branches very short or nearly obsolete, the lower not exceeding 1 cm., erect; setae solitary, often nearly obsolete, stout, flexuous, 3–10 mm. long. Spikelets 2–2.5 mm. long, ovate, acute; first glume about ½ as long as the spikelet, acute, three-nerved, the midnerve excurrent, the lateral ones anastomosing with it; second glume ½ to ⅔ as long as the spikelet, five- to seven-nerved, broadly ovate, acute, apiculate; third glume equaling the flowering glume and slightly enclosing it with its infolded margins, five-nerved, sulcate, subtending a lanceolate, hyaline palea ⅔ its own length; flowering glume ovate, acute, apiculate, obscurely keeled, striate, transversely undulate-rugose below, nearly smooth and glossy at the apex, the inclosed palea similar in markings and texture, nearly plane.

TYPE LOCALITY: MEXICO: BAJA CALIFORNIA DEL SUR: La Paz, PALMER 125 (1890). Holotype examined (US).

DISTRIBUTION: reported only from Baja California del Sur and adjacent Carmen Island.

Mexico.

Baja California. La Paz, PALMER 125 (TYPE, US); San Jose del Cabo, BRANDEGEE 28 (US); Carmen Island, PALMER 857 (US).

Examination of the type specimen makes it difficult to confine it to a synonym of either *S. leucopila* or *S. macrostachya* with which it is closely related. The glabrous sheath margin, the stiff, erect culms, and the straw-colored panicles with very short bristles separate this from its nearest allies.

Originally described as *Chaetochloa rigida* Scribner & Merrill (1900), this entity was renamed *S. palmeri* Henrard (1940) because of a previously published *S. rigida* Stapf (1899).

23. SETARIA SCHEELEI (Steudel) Hitchcock

Setaria polystachya Scheele in Linnaea 22:339. 1849. *Non S. polystachya* Schrader 1824; Herrm. (1910) 55.

Panicum scheelii Steudel, Syn. Pl. Glum. 1:51. 1854.

Chaetochloa polystachya (Scheele) Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:37. fig. 22. 1900; Small (1903) 108; Conzatti (1943) 48.

Chaetochloa scheelei (Steudel) Hitchcock in Contr. U.S. Nat. Herb. 22:207. fig. 62. 1920.

Setaria scheelei (Steudel) Hitchcock in Proc. Biol. Soc. Wash. 41:163. 1928; Hitchcock (1931) 331; Silveus (1933) 675; Hitchcock (1935) 700. fig. 1572; Johnston (1943) 417; A. Chase in Hitchcock (1951) 722. fig. 1100; Gould (1951) 271; Emery (1957a) 103.

Perennial, 60–120 (30) cm. tall; stems robust, usually geniculate, compressed below, occasionally branched above, scabrous below the panicle and nodes, often appressed-pilose at the nodes; leaf sheaths compressed-keeled, glabrous, or scabrous toward the summit and on the keel, sometimes hispid on the surface, the collar hispid; ligule densely hispid, 1–2 mm. long; leaf blades flat or occasionally loosely folded, 15–30 (50) cm. long, scabrous, commonly pubescent, 5–12 mm. wide; panicle 15–25 (10) cm. long, pale green, loose, tapering from near the base, occasionally columnar, axis angled, scabrous-pubescent and sparsely villous; branches short to as much as 3 cm. long; bristles usually solitary below each spikelet, 1.0–3.5 cm. long, occasionally two or more by abortion, soft, antrorsely scabrous, spreading; spikelets 2.2–2.5 mm. long, pale; first glume about ½ the length of the spikelet, three-nerved; second glume ¾ to nearly as long as the spikelet, five-nerved; sterile lemma, five-nerved, as long as the acute, short-apiculate, incurved, finely cross-wrinkled fertile lemma; sterile palea lanceolate, about ½ the length of the ovate-lanceolate or lanceolate, plane, fertile palea. Chromosome number: $2n = 54$.

Type Locality: TEXAS: Comal Co.: New Braunfels, LINDHEIMER 564, 1847. Isotype examined (US, MO).

Distribution: common throughout central Texas and southward to northeastern Mexico; prefers shaded habitats on alluvial soils of canyons and river bottoms; abundant in limestone canyons of the Edwards Plateau in central southern Texas.

Texas. Aransas: Wildlife Refuge, CORY 45688 (TEX); Bee: near Beeville, EMERY 494 (TEX); Bell: near Little River, WOLFF 1013 (US); Bexar: near Bracken, GROTH 123 (NY, US); Burnet: Granite Mt., EMERY 490 (TEX); Cameron: Brownsville, CORY 51410 (SMU); Comal: New Braunfels, LINDHEIMER 564 (ISOTYPE, MO, US); Duval: Benavides, EMERY 527 (TEX); Gillespie: Bear Mt., JERMY 783 (US); Gonzales: Palmetto State Park, CORY 45178 (TEX); Hays: San Marcos, York, JOHNSON and THARP 43021 (NY, TEX); Hidalgo: near Mission, UZZELL 58 (TEX); Jackson: Lavaca River, THARP (TEX); Jeff Davis: Mt. Gomez, THARP 3922 (TEX); Karnes: Karnes City, JOHNSON 873 (TEX); Liveoak: George West, SHINNERS 17005 (SMU); Llano: Fredericksburg, EMERY 482 (TEX); Matagorda: Gulf, CORY 11516 (GH); McLennan: Waco, SHINNERS 16686 (SMU). Medina: Devine, CORY 11665 (GH); Mills: Goldthwaite, CORY 58214 (SMU); Nueces: Corpus Christi, CORY 20453 (GH). Reagan: Big Lake, SCHALLERT 14761 (SMU); San Patricio: near Sinton, GOULD 8530 (SMU); San Saba: near San Saba, CORY 58300 (SMU); Starr: Rio Grande City, JOHNSTON 2775 (TEX); Travis: Austin, GOULD

7620 (SMU, TAES, TEX); Uvalde: Garner State Park, GOULD 7673 (SMU, TAES, TEX); Val Verde: San Felipe Springs, CORY 16744 (GH); Wilson: Floresville, SHINNERS 24097 (SMU).

Mexico.

Coahuila: Cuatro Cienegas, MARSH 2027 (F, US); Sabinas, NELSON 6820 (US).

Neuvo Leon: Sierra Madre Mts., Monterrey, MUELLER 400 (GH, ILL, TEX).

Tamaulipas: San Miguel, BARTLETT 10685 (GH, US).

San Luis Potosi: Cardenas, Amer. Gr. Nat. Herb. 732 (GH, NY, US).

Durango: near Torreon, PALMER 505 (GH, NY).

Veracruz: Orizaba, MULLER 2051 (NY).

Hidalgo: Jacala, V. H. CHASE 7220 (US).

Michoacan: Morelia, BRO. NICOLAS 6 (F).

Setaria scheelei is highly variable and is recognized by a combination of characters. The panicle is usually rather open, tapering, with the lower branches 2–3 cm. long, the bristles conspicuous and spreading. Occasionally the panicle is more spikelike. The blades are usually flat and nearly 1 cm. wide, but occasionally loosely folded and as narrow as 5 mm., nearly always pubescent. The "short-apiculate, incurved, finely cross-wrinkled fertile lemma . . ." (Emery 1957a, p. 104) is also a good supporting morphological character.

Chromosome number: 2n = 54, Emery (1957a).

24. SETARIA VILLOSISSIMA (Scribner & Merrill) K. Schumann

Chaetochloa villosissima Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:34. fig. 19. 1900; Small (1903) 108; Hitchcock (1920) 197. fig. 55.

Setaria villosissima (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28:417. 1902; Hitchcock (1931) 328; Silveus (1933) 675; Hitchcock (1935) 700. fig. 1569; A. Chase in Hitchcock (1951) 721. fig. 1098; Gould (1951) 271; Emery (1957) 95.

Following is a transcription of the original description by Scribner and Merrill (1900, p. 34).

An erect, somewhat cespitose more or less densely villous-pubescent perennial, 4–10 cm. high, with broad-linear or linear-lanceolate leaves and loose, lanceolate panicles about 2 dm. in length. Culms branching and usually somewhat geniculate at the base, compressed, striate, glabrous; nodes smooth or sparingly bearded with appressed hairs; sheaths loose, striate, compressed, equaling or exceeding the internodes, scabrous above, especially on the keel, nearly smooth below, more or less densely villous-pubescent above, bearded at the apex and ciliate-pubescent on the margins; ligule brown, about 1 mm. long, densely ciliate-fringed with long white hairs; leaf blades broad-linear, 1.5–3 dm.

long, 6–8 mm. wide, tapering toward the base, long-acuminate at the apex, more or less densely villous-pubescent on both sides, with spreading white hairs, serrulate-scabrous on the cartilaginous margins, midvein prominent on the lower surface for its entire length. Panicle about 2 dm. long, 2–3 cm. in diameter below, tapering to the apex, loose; rachis angular striate, scabrous, villous; branches slender, spreading-erect, the lower 2–3 cm. long, few-flowered, much exceeding their internodes; setae solitary, green, slender, somewhat flexuous, antrorsely scabrous, 1.5–2.5 cm. in length. Spikelets lanceolate-ovate, acute, 2.5–3 mm. long, pale green; first glume ⅓ as long as the spikelet, broadly ovate, acute, three-nerved, somewhat enclosing the base of the spikelet; second glume nearly equaling the flowering glume, ovate, acute, short apiculate, five- to seven-nerved, the mid-nerve excurrent, the lateral ones abruptly vanishing in the hyaline margins or anastomosing; third glume, equaling the flowering glume, five-nerved, apiculate, slightly sulcate and enclosing the flowering glume with its infolded margins subtending a very short lanceolate, hyaline palea about ⅕ its own length; flowering glume lanceolate-ovate, acute, abruptly short-apiculate at the incurved tip, rather finely transversely undulate-rugose below, striate and punctate above, the enclosed palea narrow, plane, similar in texture and markings.

Type Locality: TEXAS: Duval Co.: San Diego, May, 1897. J. G. Smith. Holotype examined. (US).

Distribution: rare; found only on soils derived from igneous rocks; sparsely scattered over southwestern Texas and on either side of the Arizona-Sonora border.

Texas. Burnet: Granite Mt., REED (US); Gillespie: Bear Mt., CORY 24523 (US); SILVEUS 7337 (US); EMERY 434-467 (TEX); Jeff Davis: north of Alpine, WARNOCK 11829 (SMU); Llano: Balanced Rock, EMERY 591 (TEX); Presidio: Limpia Canyon, NEALLEY 115 (NY, US).

Arizona. EMERSLEY 19, 21 (US).

Mexico.

Sonora: Sierra de la Caballero, SANTOS 2098 (GH, US).

Coahuila: west of Hacienda de la Encantada, STEWART 1707 (GH, US).

This taxon is morphologically distinct from other perennial species of the southwestern United States by its large, pale green spikelets 3 mm. long. It also possesses conspicuously villous leaf blades and leaf sheaths. *Setaria villosissima* is known only from a few isolated areas in southern Texas and near the Arizona-Sonora border. It is apparently highly specific in its ecological requirements, as it occurs only on granitic outcrops or other soil types of igneous origin.

Emery (1957a and b) has observed the development of aposporous embryo-sac initials from cells of the nucellus, therefore apomixis may play a significant role in the reproduction of this species.

Chromosome number: 2n = 54, Emery (1957a).

25. SETARIA MACROSPERMA (Scribner & Merrill) K. Schumann

Setaria composita sensu Chapman, Fl. S. U.S. 578. 1860; ed. 3. 588. 1897. *Non S. composita* HBK.

Chaetochloa composita sensu Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner (1898) 85. fig. 67; Small (1903) 107. *Non S. composita* HBK.

Chaetochloa macrosperma Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:33. fig. 18. 1900; Small (1903) 107; Hitchcock (1920) 195. fig. 54; Small (1933) 85.

Setaria macrosperma (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28:417. 1902; Hitchcock (1931) 327; Hitchcock (1935) 699. fig. 1568; Hitchcock (1936) 350. fig. 321; A. Chase in Hitchcock (1951) 721. fig. 1097.

Perennial, 1–1.5 m. tall, often in large tufts; culms robust, glabrous, sometimes geniculate below, often rooting at the lower nodes; the nodes glabrous; leaf sheaths rather prominently keeled, glabrous, the margins villous, the collar hispidulous; ligule a ciliate membrane 1–3 mm. long; leaf blades flat or folded below, tapering at both ends, very scabrous on upper surface, scaberulous on lower surface, as much as 50 cm. long, 1–2 cm. wide; panicle loosely flowered, tapering above, as much as 25 cm. long, the axis easily visible, scabrous and very sparsely villous; branches erect, spreading, 1.5–3 cm. long, bearing spikelets on short pedicels; bristles single below each spikelet, often in pairs due to the abortion of spikelets, somewhat flexuous, antrorsely scabrous, 1.5–3 cm. long; spikelets about 3–3.2 mm. long, lanceolate-ovate; first glume about ⅓ as long as the spikelet, apiculate, three-nerved; second glume ¾ as long as the spikelet, ovate, apiculate, three–seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a narrow, hyaline palea ½ its own length; fertile lemma narrowly ovate, 3 mm. long, very finely transversely rugose, its palea similar in texture and markings, slightly convex at the base.

TYPE LOCALITY: FLORIDA: Duval Co.: shell islands at mouth of St. Johns River near Jacksonville, CURTISS 3617. Type examined (US).

DISTRIBUTION: Chiefly in Florida; isolated collections from Bahamas and Georgia. Restricted to shell islands, keys, coral, occasionally in old fields or hammocks.

Florida. Brevard: Eau Gallie, McFARLIN 3788 (US); Broward: bordering canal, Ft. Lauderdale, EATON 337 (F); Citrus: shelly and

rocky islands, Homosassa, COMBS 977 (US); Dade: in coral, Miami, Am. Gr. Nat. Herb. 727 (F, MO, US). Dixie: hammock, Suwanee, GODFREY 56044 (SMU); Duval: shell islands at mouth of St. Johns River, CURTISS 3617 (F, US); Lake: border of cypress swamp, Eldorado, CHASE 4123 (ILL); Lee: shell mounds, Marco, HITCHCOCK 519 (MO); Monroe: old pineapple field, Key Largo, CURTISS 5502 (ILL, MO); Orange: Rooney Hammock, BAKER 29 (US); Palm Beach: near Lake Okeechobee, SEIBERT 1208 (MO).

Georgia. McIntosh: edge of salt marsh, Sapelo Island, DUNCAN 20555 (SMU).

Bahamas. Berry Island: Frozen Cay, BRITTON & MILLSPAUGH 2203 (NY).

Setaria macrosperma is separated from most other closely related species by its large spikelets, 3 mm. It differs from *Setaria villosissima*, which has equally large spikelets, by its scabrous, but not pubescent, blades and its longer sterile palea which is ½ the length of the fertile palea.

Setaria macrosperma is found in Florida, usually on shell islands or other soil of coral origin. It also has been collected in the Bahamas.

26. SETARIA SETOSA (Swartz) Beauvois

Panicum setosum Swartz, Prodr. Veg. Ind. Occ. 22. 1788; *Trinius* (1828) 95; Steudel (1854) 53.

Panicum caudatum Lamarck, Tabl. Encycl. 1:171. 1791; Lamarck (1798) 736 (*err. type.* 746); Trinius *op. cit.* 96; Steudel *loc. cit.*

Setaria setosa (Swartz) Beauvois, Ess. Agrost. 51, 171, 178. 1812; Grisebach (1864) 555; Herrmann (1910) 57; Hitchcock (1931) 328; Hitchcock (1935) 700; Hitchcock (1936) 347. figs. 318, 319; A. Chase in Hitchcock (1951) 722; Weintraub (1953) 53.

Panicum brachiatum Poiret in Lamarck, Encycl. Suppl. 4:282. 1816.

Setaria caudata (Lamarck) Roemer & Schultes, Syst. Veg. 2:49. 1817; Herrmann *loc. cit.*

Setaria elongata Sprengel *ex* Schultes in Roemer & Schultes, Syst. Veg. Mant. 2:280. 1824; Kunth (1833) 154.

Setaria brachiata (Poiret) Kunth, Rev. Gram. 47. 1829; Kunth, Enum. Pl. 1:154. 1833.

Panicum parachtaenoides Trinius in Mem. Acad. St. Petersb. VI. 3:219. 1834.

Panicum dumetorum A. Richard in Steudel, Syn. Pl. Glum. 1:49. 1854.

Panicum restitutum Steudel *op. cit.* 53.

Setaria setosa var. *caudata* (Lamarck) Grisebach, Fl. Brit. W. Ind. 555. 1864.

Pennisetum swartzii F. Mueller, Fragm. 8:110. 1873.

Chamaeraphis setosa (Swartz) Kuntze, Rev. Gen. Pl. 2:768. 1891.

Chamaeraphis setosa var. *caudata* (Lamarck) Kuntze, *op. cit.* 769.

Chamaeraphis caudata (Lamarck) Britton in Ann. N.Y. Acad. 7:264. 1893; Beal (1896) 157.

Chaetochloa setosa (Swallen) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner & Merrill (1900) 39. fig. 24; Hitchcock (1909) 231; Hitchcock (1913) 263; Hitchcock & Chase (1917) 348; Hitchcock (1920) 198. figs. 56, 57; Conzatti (1943) 50.

Chaetochloa caudata (Lamarck) Scribner in Rep. Missouri Bot. Gard. 10:52. 1899.

Setaria paractaenoides (Trinius) Urban in Repert. Sp. Nov. 15:98. 1917.

Perennial, 50–100 cm. tall; culms erect or decumbent at the base, sometimes woody, shiny brown, smooth; nodes usually glabrous; leaf sheaths glabrous or finely pubescent, ciliate along the margin above, the collar glabrous or hispidulous; ligule densely ciliate about 1 mm. long; leaf blades flat or folded, 15–20 cm. long, 6–12 mm. wide, occasionally wider, scabrous on upper surface, often finely pubescent on both surfaces; panicle rather loosely flowered, 15–20 cm. long, interrupted, lax, attenuate, the axis scabrous and often sparsely villous; panicle branches ascending, approximate, the lower ones 2.5 cm. long, usually much shorter, occasionally very remote and nearly reflexed; bristles single below each spikelet, slender, antrorsely scabrous, usually less than 1 cm. long; spikelets 2.0–2.5 mm. long; first glume ½ as long as the spikelet, acute, three-nerved; second glume ⅔ as long as the spikelet, obtuse, five–seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a broad, well-developed sterile palea as long as the fertile palea; fertile lemma ovate-lanceolate, moderately turgid on the convex side, finely but distinctly transversely rugose, slightly apiculate at the tip.

TYPE LOCALITY: JAMAICA. The type specimen is in the Swartz Herbarium at Stockholm.

DISTRIBUTION: West Indies; on ballast in New Jersey and Florida.

New Jersey. On ballast, Camden, PARKER in 1879 (US).

Cuba. Oriente: Santiago de Cuba, CLEMENT 118 (US); Guantanamo, EKMAN 10233 (US); Pinar del Rio: Mendoza, EKMAN 11484 (US).

Jamaica. Kingston, Amer. Gr. Nat. Herb. 606 (ILL, MO, US); Musgrave Road, HARRIS 11479 (MO, US); Long Mt. Road, HARRIS 11303 (MO, US).

Puerto Rico. Guanica Bay, Amer. Gr. Nat. Herb. 607 (ILL, MO, US); Cabo Rojo, SINTENSIS 853 (US).

Haiti. Gonaive Island, LEONARD 3136 (US); Port-au-Prince, BUCH 1486 (INJ); Tortue Island, LEONARD 11325 (MO, US).

Dominican Republic. Guayubin, ABBOTT 939, 951, 954, 1023 (US); Santiago, EGGERS 2378 (US); Rincon, FUERTES 1378 (US).

Virgin Islands. St. Croix, RICKSECKER 407 (MO); Virgin Gorda, FISHLOCK 57 (US); St. John, BRITTON & SHAFER 631 (US).

Guadeloupe. DUSS 2698, 3188 (US).

Dominica. JONES 34 (US).

Trinidad. Chacachacare, HITCHCOCK 10059 (US).

Setaria setosa is closely related to the species of the *S. macrostachya* complex of southwestern United States and Mexico. However, its distribution is throughout the islands of the West Indies, occurring rarely in northern South America.

This species prefers rather dry, wooded or rocky hillsides of the West Indian Islands. The usual form has a loosely interrupted, cylindrical panicle, with short, ascending branches rarely exceeding 1 cm. in length. An extreme form occurs, usually on dry hillsides, which has an elongated, interrupted panicle, the branches remote and sometimes reflexed, the lower ones as much as 5 cm. in length. Many intermediates connect the usual with the extreme form.

26a. SETARIA SETOSA var. LEIOPHYLLA (Nees) Arechavaleta

Panicum leiophyllum Nees, Agrost. Bras. 249. 1829. Steudel (1854) 53. *Non P. leiophyllum* Fournier.

Setaria leiophylla (Nees) Kunth, Rev. Gram. 1:sup. xii. 1830; Kunth (1833) 154; Hitchcock (1936) 349.

Setaria setosa var. *leiophylla* (Nees) Arechavaleta in Anal. Mus. Nac. Montevideo 1:171. 1894.

This variety differs from *Setaria setosa* (Swartz) Beauvois as it possesses very broad blades which lack pubescence. The blades are usually 1.5–2.5 mm. wide, acuminate at the tip, rounded abruptly at the base, scaberulous above, glabrous below. The panicle, as much as 30 cm. long, is usually open, attenuate above, the branches remote, ascending, 1.5–2.5 cm. long. In other morphological characters it closely resembles *S. setosa*, but generally it is more robust and the leaf blades are of a much richer, deeper green.

Type Locality: BRAZIL: BAHIA: the type has not been examined.

Distribution: rare; known only from Antigua in the British West Indies.

Antigua. Vernon's Estate, BOX 16, 88 (US); Fig Tree Hill, BOX 83 (US).

Hitchcock (1937) included var. *leiophylla* as a species separate from *S. setosa* because of differences of blade width and pubescence. Close examination of the specimens cited by Hitchcock (1937) under *S. leiophylla* showed occasional pubescence on the leaf blades of certain ones.

The only specimens examined that appear distinct are from Antigua. These plants possess leaf blades scaberulous above, usually over 2 cm. wide, abruptly narrowed at the base, nearly cordate, and very deep green. The panicle and spikelets are not distinct from *S. setosa*.

27. SETARIA RARIFLORA Mikan

Setaria rariflora Mikan *ex* Trinius in Sprengel, Neue Entdeck. 2:78. 1821; Trinius (1828) 96. fig. C; Hitchcock (1931) 329; Hitchcock (1935) 700; Hitchcock (1936) 349. fig. 320; A. Chase in Hitchcock (1951) 722; Weintraub (1953) 53.

Setaria vaginata Sprengel, Syst. Veg. 4:33. 1827.

Panicum triquetrum Willdenow *ex* Doell in Mart. Fl. Bras. 2(2):161, *pro. syn.* 1877.

Chaetochloa rariflora (Mikan) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:349. 1917; Hitchcock (1920) 200. fig. 58; Small (1933) 85.

Perennial, 30–70 cm. tall; culms erect or occasionally decumbent, branching profusely at the base, glabrous; nodes glabrous or sparsely hispid; leaf sheaths keeled, sparsely pubescent, ciliate along the margins above, the collar very narrow, nearly glabrous; ligule densely ciliate, less than 1 mm. long; leaf blades flat, narrowed at the base, densely pubescent on both surfaces, 15–30 cm. long, usually less than 5 mm. wide; panicles very slender, attenuate, interrupted and sparsely flowered, 5–15 cm. long, the axis loosely villous, the hairs usually less than 1 mm. long; panicle branches very short, or occasionally the lowermost 5–10 mm. long, also villous; bristles usually one below each spikelet, occasionally lacking, flexuous, antrorsely scabrous, 4–7 mm. long; spikelets about 2 mm. long, slightly turgid on convex side, ovate-lanceolate; first glume ⅓ the length of the spikelet, three-nerved; second glume about ½ the length of the spikelets, five–seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a broad, well-developed palea, equal in length to the fertile palea; fertile lemma acute, finely and sharply transversely rugose.

TYPE LOCALITY: BRAZIL. The type is in the Trinius Herbarium.

DISTRIBUTION: West Indies; adventive in Alabama, Florida, and Tamaulipas, Mexico.

Florida. Key West, BLODGETT (GH, NY).

Alabama. On ballast, Mobile, MOHR (US).

Mexico. Tamaulipas: Chamal, SWALLEN 1701 (US).

Cuba. Isla de Pinos, EKMAN 11728 (US).

Dominican Republic. San Jose de las Matas, JIMINEZ 896 (US).

Puerto Rico. Boqueron, CHASE 6502 (US).

Virgin Islands. St. Croix, RICKSECKER 67 (GH, US); Virgin Gorda, VELEZ 3143 (US); San Thomas, ORSTED (US).

Guadeloupe. QUESTEL 2161 (INJ).

Closely allied to S. *setosa*, this slender grass has its center of distribution in South America and is probably only a recent adventive to the islands of the West Indies. *Setaria setosa*, however, is only rarely known from South America. This disjunct distribution supports the separation

of the Brazilian *S. rariflora* as a species distinct from *S. setosa* of the West Indies.

Setaria rariflora is characterized by a slender panicle, rarely exceeding 10 cm. in length, and narrow, conspicuously pubescent blades, usually less than 5 mm. wide.

28. SETARIA GRISEBACHII Fournier

Setaria pseudo-verticillata Fournier, Mex. Pl. 2:43. 1886.

Setaria grisebachii Fournier, Mex. Pl. 2:45. 1886; Herrmann (1910) 53; Hitchcock (1931) 323; Silveus (1933) 672; Hitchcock (1935) 701. fig. 1576; Johnston (1943) 416; Gould (1951) 269; Chase in Hitchcock (1951) 724. fig. 1103.

Setaria laevis Fournier, Mex. Pl. 2:45. 1886.

Chaetochloa grisebachii (Fournier) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Small (1903) 108; Hitchcock (1913) 262; Hitchcock (1920) 183. fig. 46; Conzatti (1943) 48.

Chaetochloa grisebachii var. *ampla* Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:36. fig. 21. 1900; Hitchcock (1913) 262; Wooton & Standley (1915) 60; Conzatti (1943) 48.

Chaetochloa grisebachii var. *mexicana* Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:37. 1900.

Setaria mexicana Schaffner *ex* Scribner & Merrill in *loc. cit., pro. syn.*

Setaria yucatana W. Herrmann in Beitr. Biol. Pflanz. 10:51. 1910; Swallen (1934) 351; Swallen (1936) 182; Swallen (1955) 338.

Annual, as much as 1 m. tall, usually much less; culms slender, branching at the base, smooth or scaberulous below the nodes and below the panicle; the nodes covered with short appressed hairs, leaf sheaths shorter than the internodes, scabrous and sparingly hispidulous above, glabrous below, margins ciliate, the collar hispid; ligule short, densely ciliate, leaf blades flat, lanceolate, tapering below, acuminate above, mostly less than 12 cm. long and 1 cm. wide, occasionally as much as 25 cm. long, 1.5 cm. wide, scabrous and hispidulous on both surfaces; panicle slender, 3–18 cm. long, cylindrical, interrupted, occasionally lobate, often purple, the axis scabro-pubescent and, except the lower part, bearing very slender white hairs less than 1 mm. long; spikelets nearly sessile, clustered along the main axis or borne on short pedicels along ascending branches as much as 2.5 cm. long; bristles single below each spikelet, flexuous, antrorsely scabrous, the axis angled, often loosely twisting, 5–15 mm. long; spikelets ovate, acute, 1.5–2.2 mm. long; first glume ⅓ as long as the spikelet, broad, enclosing the spikelet at the base, three-nerved; second glume very obtuse, entire, nearly equaling the fertile lemma, five-nerved; sterile lemma equaling the fertile lemma, slightly sulcate, five-nerved, enclosing a narrow hyaline palea about ⅓ its own length; fertile lemma about 2 mm. long, very finely transversely rugose.

TYPE LOCALITY: MEXICO: VERACRUZ: Orizaba, SCHAFFNER 36 (1876). Type specimen in Grisebach Herbarium; Fournier also cited BOURGEAU 441 in the original description as one of the type specimens: BOURGEAU 441, Federal District, Mexico, 1863-66; isotype examined (GH).

DISTRIBUTION: southeastern Arizona, southwestern New Mexico, and south to Big Bed region of Texas; along the Central Highlands of Mexico to Oaxaca; usually at elevations between 750 and 2500 meters.

Maryland. Baltimore: chrome-ore piles, Canton, REED 32731 (US).

Oklahoma. Murray: Arbuckle Mts., GOODMAN 5421 (TEX).

Texas. Brewster: Chisos Mts., CORRELL 13729 (SMU); Comal: New Braunfels, BILTMORE 14922 (US); Hudspeth: Eagle Mts., WATERFALL 6680 (MO, NY, SMU); Kerr: Kerrville, WELLER 1897 (US); Kimble: west of Junction, SILVEUS 779 (US); Pecos: near Ft. Stockton, HINCKLEY 46 (US); Presidio: Limpia Canyon, NEALLEY 130 (MO, US); San Saba: southeast of San Saba, CORY 58289 (SMU); Terrell: Sheffield, WEBSTER 299 (TEX).

New Mexico. Dona Ana: Organ Mts., WOOTON 438 (NY, US). Grant: west of Silver City, GOODDING 4729 (ARIZ); Hidalgo: Alamo Hueco Mts., CASTETTER 10373 (UNM); Otero: Guadalupe Mts., Amer. Gr. Nat. Herb. 723 (F, MO, US); San Miguel: Las Vegas, ARSÈNE 19079 (F, US); Sierra: Hillsboro, METCALFE 1262 (F, MO, US).

Arizona. Cochise: Chiracahua Natl. Mon., CLARK 8645 (ARIZ); east of Douglas, GOULD & HASKELL 4512 (ARIZ); juniper-oak forest, Huachuca Mts., GOULD 2417 (ARIZ, US); Coconino: Havasupai Canyon, CLOVER 7212 (ARIZ, US); Graham: Lower Tripp Canyon, ANDERSON & RHINEHART 1331 (ARIZ); Navajo: juniper woodland, north of Snowflake, DARROW 3328 (ARIZ); Pima: Santa Catalina Mts., GRIFFITHS 706 (MO); Santa Rita Mts., GOULD 2891 (US); Pinal: Oracle, THORNBER 2012 (ARIZ); Santa Cruz: Patagonia Mts., KURTZ & HASKELL 287 (ARIZ).

Mexico.

Baja California del Sur: CARTER, ALEXANDER & KELLOG 2029 (US).

Sonora: El Tigre, SANTOS 1948 (US); Ranchos Carretas, HARVEY 1596 (MO, US).

Chihuahua: near Chihuahua, PRINGLE 381 (NY, F); near Camargo, EMERY 394 (TEX); Majalca, LE SUEUR Mex-04 (TEX).

Coahuila: near Saltillo, PALMER 336, 337, 385, 397 (F).

Nuevo Leon: Galeana, TAYLOR 149 (F, TEX); west of Monterrey, EMERY 116 (TEX).

Tamaulipas: San Fernando, ROSE & RUSSELL 24333 (US).

San Luis Potosi: Manantiales, SOHNS 1334 (US); Carcas, WHITING 1003 (ARIZ). SCHAFFNER 1044 (US).

Durango: Durango, PALMER 716, 728 (F, MO): north of Rodeo, EMERY 356 (TEX).

Zacatecas: near Ojo Caliente, EMERY 286 (TEX).

Aguascalientes: north of Aguascalientes, EMERY 265 (TEX).

Nayarit: Rincon de Mateo, MEXIA 781 (US).

Jalisco: Guadalajara, HITCHCOCK 7338 (ILL, US); LEAVENWORTH 1872 (MO).

Guanajuato: San Felipe, SOHNS 453 (US); Apaseo el Alto, EMERY 237, 246, 247 (TEX).

Queretaro: San Juan del Rio, EMERY 228, 229 (TEX).

Hidalgo: Jacala, H. E. MOORE, JR. 1830 (US).

Michoacan: Morelia, ARSÈNE 2998 (ILL); Lake Cuitzeo, SOHNS 745 (US).

Federal District: Mixcoac, ARSÈNE 8282 (F, ILL, US); Fedrigal lava beds, PRINGLE 6470 (F, MO).

Mexico: Tenancingo, MATUDA 28984 (US).

Tlaxcala: Texmelucan, SOHNS 661 (US).

Puebla: near Puebla, ARSÈNE 1262 (ILL); Tehuacan, Amer. Gr. Nat. Herb. 724 (F, US).

Oaxaca: El Parian, PRINGLE 4937 (F, MO, US); Monte Alban, SMITH 939 (MO).

Campeche: Tuxpena, LUNDELL 1359 (F, NY, US).

Yucatan: Izamal, GAUMER 2478 (F); in brush at roadside, Chichen Itza, SWALLEN 2423, 2449 (MO, US); edge of corn field, Progreso, SWALLEN 2948 (MO, US); weed in corn field, Uxmal, SWALLEN 2593 (US).

British Honduras. Corozal: San Andres, GENTLE 65 & LUNDELL 4853 (F, MO, NY, US); Santa Rita, GENTLE 115 & LUNDELL 4939 (F, US).

This is the most widespread and abundant native annual species of *Setaria* in southwestern United States and Mexico. It is found in open ground usually above 750 meters altitude. Although superficially resembling *S. liebmanni* in general habit, it exhibits marked morphological differences. *Setaria grisebachii* is easily distinguished from *S. liebmanni* by its very finely transversely rugose fertile lemma, its sterile palea about ⅓ the length of the fertile lemma, and its sparsely pubescent blades. *Setaria grisebachii* is found at higher elevations in more open, rocky terrain than *S. liebmanni*. In Mexico and Central America, the latter is found only along the Pacific slope at elevations below 750 meters, but *S. grisebachii* is found at elevations up to 2,500 meters along the central highlands.

The most common form of S. *grisebachii* produces a rather narrow, loosely spikelike panicle, with the panicle branches only a few millimeters long. Occasionally, in arroyos and other periodically damp places, specimens of S. *grisebachii* will grow much taller with a longer panicle which produces lower branches as much as 3½ cm. long. This robust form is not distinct however, as intermediates between the narrow and the lobate-panicled forms occur. The spikelet size does not vary between the robust and normal forms. Spikelets of this species often become purple at maturity. A few specimens have been observed (SCHAFFNER 1044) with rather short, broad leaves, but they are otherwise comparable with the normal form.

Specimens of S. *grisebachii* collected from British Honduras, Campeche, and Yucatan bear spikelets about 1.5 mm. long as compared to the spikelets of typical S. *grisebachii,* which measure 2–2.2 mm. These plants have been called S. *yucatana* by Herrmann (1910). However, an extensive examination of the spikelet size of many specimens of wide distribution reveals some intermediate sizes. Specimens have been observed from Arizona (GOULD & HASKELL 4512), Nuevo Leon (EMERY 116), and Puebla (Amer. Gr. Nat. Herb. 724) with spikelets 1.5–1.9 mm. long. In view of the sporadic occurrence of plants bearing spikelets of intermediate size, and of the lack of other morphological variation, the plants described as S. *yucatana* Herrmann are here included under S. *grisebachii.*

29. SETARIA LIEBMANNI Fournier

Setaria rariflora Presl, Rel. Haenk. 1:313. 1830; Kunth (1833) 150; Herrmann (1910) 49. *Non S. rariflora* Mikan, 1821.

Panicum rariflorum Presl *ex* Steudel, Syn. Pl. Glum. 1:51. 1854. *Non P. rariflorum* Lamarck 1798.

Panicum dissitiflorum Steudel, *loc. cit., pro. syn.*

Setaria liebmanni Fournier, Mex. Pl. 2:44. 1886; Hitchcock (1930) 677. Hitchcock (1931) 327; Hitchcock (1935) 701. fig. 1575; A. Chase in Hitchcock (1951) 723. fig. 1102; Gould (1951) 269; Swallen (1955) 332.

Chamaeraphis caudata var. *pauciflora* Vasey *ex* Beal, Grasses N. Am. 2:158. 1896.

Chaetochloa liebmanni (Fournier) Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:31. 1900; Hitchcock (1913) 261; Hitchcock (1920) 193. fig. 52; Conzatti (1943) 49.

Chaetochloa liebmanni var. *pauciflora* Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:33. 1900.

Annual, 30–90 cm. tall, usually less than 50 cm.; culms erect, glabrous, scabrous below the panicle; the nodes glabrous or the lower ones occasionally pubescent; leaf sheaths glabrous, the margin ciliate, the collar inconspicuous, hispid; ligule a short, densely ciliate membrane; blades flat, thin, lanceolate-acuminate, yellowish-green, as much as 20 cm. long

and 2 cm. wide, usually about 1 cm. wide, strongly scabrous on both surfaces and along the cartilaginous margins; panicles loosely flowered, cylindric, tapering at both ends, often nodding, 10–25 cm. long, the axis angled, scabrous along the ridges; branches ascending, loosely arranged 5–25 mm. long, usually about 10 mm. long, bearing spikelets on short pedicels, each spikelet subtended by a single bristle; bristles 7–15 mm. long, antrorsely scabrous, very slender, flexuous; spikelets ovate, slightly turgid, about 2 mm. long, the nerves conspicuous; first glume ⅓ as long as the spikelet, three-nerved; second glume nearly equaling the fertile lemma, five-nerved, with an additional accessory pair to the outside; sterile lemma equaling the fertile lemma, five-nerved, with an accessory pair of lateral nerves as in the second glume, the palea wanting; fertile lemma slightly gibbous, inflated below on either side, very strongly and coarsely transversely rugose, enclosing a palea of similar texture and marking.

Type Locality: MEXICO: VERACRUZ: Manantial. LIEBMANN 389 (1841). Type specimen is in the Copenhagen Herbarium.

Distribution: southern Arizona; Pacific slope of Mexico and Central America to Costa Rica, usually at elevations below 750 meters.

Arizona. Pima: hill above Desert Lab, Tucson, HITCHCOCK 3514 (US); Alamo Canyon, Ajo Mts., GOODDING & REEDER (ARIZ, US); Mesas, near Tucson, GRIFFITHS 7315 (MO); between Fresnal and Toro Canyons, Baboquivari Mts., GILMAN 32 (ARIZ, NY); Tucson Mts., THORNBER 2430 (ARIZ).

Mexico.

Chihuahua: Batopilas, PALMER 52, 110a (US).

Sonora: south of Magdalena, WIGGINS 7192 (ARIZ); open, grassy plains and low, rocky hills, west of Hermosillo, WIGGINS & ROLLINS 104 (ARIZ, MO); New Year's Mine, Hermosillo, M. JONES 22807 (MO); Guaymas, PALMER 191 (US); forest slope, Chorijoa, GENTRY 1600 (ARIZ, F, MO); Croz, PENNELL 20224 (US); south Baviacora, DROUET, RICHARDS, & LOCKHART 3736 (F).

Baja California: San Jose del Cabo, BRANDEGEE 12 (US); Loreto, M. JONES 97634 (MO).

Sinaloa: in dense underbrush, Mazatlan, EYERDAM & BEETLE 8653 (ARIZ); Topolobampo, PALMER 233 (ARIZ, ILL); San Ignacio, ORTEGA 4469 (US); Culiacan, BRANDEGEE 9 (US).

Colima: Colima, PALMER 142 (ARIZ, GH); Manzanilla, HITCHCOCK 7026 (US).

Nayarit: near Ixtlan, MEXIA 781 (F); penal colony, Maria Madre, Tres Marias Island, FERRIS 5574 (MO).

Michoacan: common in moist soil, near Apatzingan, LEAVENWORTH & HOOGSTRAAL 1332 (ILL, MO).

Guerrero: Rio Balsas, ORCUTT 4194 (MO); Acapulco, MacDANIELS 171 (F); Cutzamala in Coyuca, HINTON 6308 (ARIZ); Mina, Placeres Bejuco, HINTON 9071 (ARIZ, ILL); sandy alluvium, Tierra Colorado, GRIFFITHS & ROWLEE 2471 (SMU).

Mexico: Temascaltepec: Acatitlan, HINTON 4344 (ARIZ); Vegas, HINTON 1214 (NY).

Oaxaca: Tehuantepec, MATUDA 323 (MO); Extepec, FISHER 35257 (ARIZ, F, MO, SMU); Tomellin, HITCHCOCK 6191 (ILL, US).

Veracruz: Banos del Carrizol, PURPUS 6211 (MO, US).

Guatemala. Zacapa: moist thicket, Zacapa, STANDLEY 73595 (F); Chiquimula; damp thicket, Quebrado Shusho, STANDLEY 74306 (F); Champerico, SEMPLE 144 (US).

Honduras. Valle: San Lorenzo, RODRIGUEZ 3497 (F, US).

Nicaragua. Managua, BRO. GARNIER 813 (US); near sea level, San Juan del Sur, HITCHCOCK 8599 (US).

Manantial, the locality cited on the type specimen (LIEBMANN 389), is thought to be in Veracruz on the basis of reasoning that Liebmann supposedly did not leave that state during the year 1841 (Hitchcock 1920, p. 193). However, Liebmann's collection represents one of two collections of *S. liebmanni* reported from the Atlantic slopes of Mexico. The type specimen of *S. rariflora* Presl, a homonym of *S. liebmanni,* was collected in Acapulco, Mexico, and described in 1830. This is a more representative locality for this species.

Setaria liebmanni is characterized by its broad, thin, scabrous, lanceolate leaves, yellowish-green, loosely flowered panicle, and its coarsely transversely rugose fertile lemma. It also has conspicuous lateral accessory nerves on both the second glume and the sterile lemma. The sterile palea is lacking. This species is the most abundant and wide spread of a group of four closely related annuals. Closely related to it are *S. latifolia, S. longipila,* and *S. arizonica,* each of which has a very limited distribution.

Setaria liebmanni thrives at elevations below 600 meters on the Pacific slope of Mexico and Central America. It flourishes on moist soils, such as may be found in shaded draws, dense thickets, and on rocky hillsides of forest slopes. In northern Mexico and southern Arizona it seems to survive in shaded rocky canyons. At the southern extreme of its distribution, it thrives in moist thickets at or near sea level in Guatemala, Nicaragua, and Costa Rica.

In Mexico this species is called "Para grass," and is collected as fodder for stock.

30. SETARIA ARIZONICA *sp. nov.*

Annual, 25–50 cm. tall; culms erect or slightly geniculate below, branching at the base, scabrous below the panicle, otherwise glabrous;

the nodes villous with short appressed hairs; leaf sheaths glabrous with a ciliate margin above; ligule a densely ciliate membrane 1–2 mm. long; leaf blades flat, tapering at both ends, 7–15 cm. long, 5–8 mm. wide, upper surface scabrous and conspicuously papillose-hispid along the nerves; panicle loosely flowered, cylindric, tapering above, 5–12 cm. long, the axis angled, scabrous; branches as much as 1.5 cm. long, usually much shorter, scabrous, bearing spikelets on very short pedicels, each spikelet subtended by a single bristle, 5–15 mm. long, antrorsely scabrous, flexuous, rarely lacking; spikelets ovate, 1.8–2.0 mm. long; first glume ⅓ as long as the spikelet, three-nerved, the two lateral nerves anastomosing with the mid-nerve prior to reaching the apex; second glume obtuse, covering about ⅔ of the fertile lemma, five-nerved; the sterile lemma equaling the fertile lemma, five-nerved, enclosing a broadly ovate palea equal in length to the fertile palea; fertile lemma strongly turgid on the convex side, very coarsely and strongly transversely rugose, enclosing a palea of similar texture, which is turgid on its upper half and concave below.

Annua, 25–50 cm. alta; culmis erectis vel infra leviter geniculatis, infra ramosis, sub panicula scabris, aliter glabris; nodi cum villis brevibus adpressis; foliorum vaginae glabrae in margine supra ciliatae; ligula membrana dense ciliate 1–2 mm. longa; laminae planae, supra et infra paulum attenuatae, 7–15 cm. longae, 5–8 mm. latae, supra scabrae, sparsim papilloso-hispidae, infra scabrae et secundum nervos notabiliter papilloso-hispidae; panicula aperta, cylindracea, supra attenuata 5–12 cm. longa, axe angulato scabro; ramuli scabri usque ad 1.5 cm., generaliter breviores cum apiculis in pedicellis exiguis; una seta, 5–15 mm. longa, sub omni spicula antrorse scabra flexilis; spiculae ovatae 1.8–2.0 mm. longae; gluma prima trinervata tertiam partem spiculae aequans, duobus nervis lateralibus conjungentibus sub apice per anastomosem cum medio nervo; gluma secunda obtusa, quinquenervata, duabus partibus (⅔) lemmatis fertilis aequans; lemma sterile quinquenervatum, includens paleam late ovatam fertili paleae longitudine aequalem; lemma fertile in latere convexo turgidius, crasse fortiterque rugosum ex aspectu transverso includens paleam similis texturae, in superiore dimidio turgidam, in inferiore concavam.

Type Locality: ARIZONA: Pima Co.: western slopes of Baboquivari Mts., L. N. GOODDING 3754. This collection is chosen as the type. Holotype at the University of Arizona; isotype at the U.S. Herbarium.

Distribution: rocky hillsides, often in shade of mesquite; south of Nogales, Sonora, to Tucson, and west to Topawa on the Papago Indian Reservation; rare.

Arizona. Pima: Univeristy of Arizona campus, Tucson, THORNBER 171 (MO, NY, ARIZ); western slope of Baboquivari Mts., L. N. GOOD-

DING 3754 (US, ARIZ); under mesquite, Vamori School, west of Topawa, L. N. GOODDING 187-45 (NY, ARIZ); Santa Cruz: Nogales, THORNBER (ARIZ); Gil Ranch 5, Sasabe, GRINER (ARIZ).

Closely resembling S. *liebmanni* in habit and with its very coarsely transversely rugose fertile lemma, it differs from that species in three distinct morphological characters:

(1) Leaf blades bear papillose-hispid hairs on both surfaces, particularly conspicuous along the nerves on the lower surface; no pubescence on blades of S. *liebmanni.*

(2) Sterile palea is broad, well developed, as long as the fertile palea; palea completely lacking in S. *liebmanni.*

(3) Second glume and sterile lemma are each five-nerved, having no lateral accessory nerves, which are so typical and readily conspicuous in S. *liebmanni.*

Setaria liebmanni reaches the northern limit of its distribution in southern Arizona, where it is found in association with S. *arizonica.* The latter is known only from a few collections, all within a 100-mile radius of Nogales. This suggests that S. *arizonica* may be closely related to S. *liebmanni.*

31. SETARIA LATIFOLIA (Scribner) W. Herrmann

Chaetochloa latifolia Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 11:44. 1898; Scribner & Merrill (1900) 31. fig. 17; Hitchcock (1913) 261; Hitchcock (1920) 194. fig. 53; Conzatti (1943) 48.

Chaetochloa latifolia var. *breviseta* Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:31. 1900.

Setaria latifolia (Scribner) W. Herrmann in Beitr. Biol. Pflanz. 10:55. 1910; Hitchcock (1931) 327.

Annual, 30–40 cm. tall; culms erect or geniculate-spreading, branching at the base, scabrous, appressed-pilose at the nodes; leaf sheaths compressed, papillose-hispid, the hairs 1 mm. long, the margins densely ciliate-pilose, the collar nearly glabrous; ligule a short, densely ciliate membrane; leaf blades flat, broadly lanceolate, tapering abruptly to an acute tip, cordate-clasping at the base, mostly 6–8 cm. long and 1.0–1.5 cm. wide, scabrous and sparsely papillose-strigose on both surfaces, the cartilaginous margins scabrous and often undulate-wrinkled; panicles loosely cylindrical, tapering above, 5–10 cm. long, the axis scabrous and beset with slender white hairs as much as 2 mm. long; branches scabrous only, usually less than 5 mm. long, bearing nearly sessile spikelets, each subtended by a single bristle; bristles flexuous, antrorsely scabrous, 5–18 mm. long; spikelets obovate, about 2 mm. long, moderately turgid on the convex side; first glume ovate covering about $\frac{4}{5}$ of the fertile lemma, five-nerved; sterile lemma equaling the fertile lemma, five-nerved; the palea well developed, equaling the fertile palea; the fertile

lemma 2 mm. long, very turgid on the convex side, very strongly and coarsely transversely undulate-wrinkled, except at the slightly apiculate tip, enclosing a palea of similar texture and markings.

TYPE LOCALITY: MEXICO: DURANGO, PALMER 879 (1896), "growing under bushes in deep ravines." Holotype examined (US); isotypes (MO, F).

DISTRIBUTION: known only from Durango and Oaxaca; reported from Brazil; rocky hills and shady places.

Mexico.

Durango: Durango, PALMER 879 (US, F, MO), PALMER 7643 (US); Santiago Papasquiaro, PALMER 470 (F, MO, US).

Oaxaca: CONZATTI & GONZALEZ 347 (US); CONZATTI 3591 (US); HITCHCOCK 6105 (US).

This annual species described by Scribner (1898) is morphologically distinct in its short, broad, blunt leaf blades which are cordate-clasping at the base. Its spikelets resemble those of *S. arizonica*. The length of the conspicuously spreading bristles varies from 5–15 mm. The sterile palea is of maximum size, as in *S. longipila* and *S. arizonica*.

32. SETARIA LONGIPILA Fournier

Setaria longipila Fournier, Mex. Pl. 2:47. 1886; Hitchcock (1930) 677; Hitchcock (1931) 326; Swallen (1955) 333.

Chaetochloa longipila (Fournier) Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:22. 1900; Hitchcock (1913) 261; Hitchcock (1920) 191. fig. 50; Conzatti (1943) 49.

Annual, 30–50 cm. tall, cespitose; culms erect, glabrous, or scabrous just below the panicle, the nodes bearing appressed, stiff hairs; leaf sheaths compressed, much shorter than the internodes, scaberulous above, nearly glabrous below, ciliate along margin above; ligule a dense line of stiff white hairs 2–3 mm. long; leaf blades flat, 5–20 cm. long, as much as 12 mm. wide, tapering rather abruptly to a short-acuminate apex and a narrowed base, strongly scabrous on upper side, scaberulous on lower surface; panicles subspiciform, cylindric, 4–12 cm. long, tapering, rather densely flowered, the axis thickly clothed with coarse, rather stiff, glassy hairs 2–3 mm. long, extending a short distance below the panicle; branches short, few-flowered, scabrous, and bearing hairs similar to those of the main axis; bristles mostly single, occasionally paired, below each spikelet, antrorsely barbed, green, stout, flexuous, 5–10 mm. long; spikelets 2 mm. long, extremely turgid on the convex side; first glume about ⅓ as long as the spikelet, three-nerved; second glume nearly equaling the fertile lemma, five-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a broad, well-developed palea equaling the fertile palea; fertile lemma about 2 mm. long, extremely

turgid, very coarsely transversely rugose, enclosing a palea much more finely rugose.

TYPE LOCALITY: MEXICO.

DISTRIBUTION: Pacific slope, Nayarit to El Salvador; rare.

Mexico. Nayarit: foothills of Sierra Madre, Territorio de Tepic, between Aguacate and Dolores, ROSE 2017 (US, GH).

Guatemala. Maxatenango, BERNOULLI & CARIO 916 (US).

Honduras. Morazan: Matorrales humedos de Quebrada Suyapa, MOLINA R. 3204 (US).

El Salvador. San Vicente: in cafetal, Volcan de San Vicente, STANDLEY 21479 (US, GH); Finca San Nicolas, CALDERON 1769 (NY, US).

Of very limited distribution, this species represents either a recently derived species or an isolated relic. It is morphologically similar to *S. liebmanni*, but differs from it in several distinct features. The specific epithet alludes to the very coarse, glassy hairs which clothe the panicle axis and which often exceed the spikelets in length. This copious vesture gives a gray, myceliate appearance to the cylindrical, tapering, rather short panicle. The spikelets are more turgid than in *S. liebmanni* and also possess a broad well-developed sterile palea. The panicle seldom exceeds 10 cm. in length.

The description of *S. longipila* by Hitchcock (1920, 1931) states that the "fertile lemma is sharply transversely rugose," which probably refers to *S. scandens* Schrader and not to *S. longipila*, which has a very coarsely transversely rugose fertile lemma. Other minor discrepancies strongly indicate that these two entities were confused by Hitchcock in his description.

33. SETARIA CORRUGATA (Elliott) Schultes

Panicum corrugatum Elliott, Sketch Bot. S. Car. & Ga. 1:113. 1816.

Pennisetum corrugatum (Elliott) Nuttall, Gen. N. Am. Pl. 1:55. 1818.

Setaria corrugata (Elliott) Schultes in Roemer & Schultes Syst. Veg. Mant. 2:276. 1824; Kunth (1833) 153; Chapman (1860) 578; Herrmann (1910) 55; Hitchcock (1931) 326; Hitchcock (1935) 701. fig. 1573; Hitchcock (1936) 345. fig. 316; Blomquist (1948) 188; A. Chase in Hitchcock (1951) 722. fig. 1101.

Setaria glauca var. *corrugata* (Elliott) Schrader in Linnaea 12:429. 1838.

Chamaeraphis corrugata (Elliott) Kuntze, Rev. Gen. Pl. 2:770. 1891; Beal (1896) 156.

Chaetochloa corrugata (Elliott) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner (1898) 84. fig. 66; Scribner & Merrill (1900) 22. fig. 11; Scribner (1900) 72. fig. 66; Small (1903) 107; Hitchcock (1920) 191. fig. 51; Small (1933) 85.

Chaetochloa hispida Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:25 fig. 13. 1900; Hitchcock (1909) 230; Hitchcock & Chase (1917) 351; Small (1933) 85.

Setaria hispida (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28:417. 1902.

Annual, as much as 1 m. tall; culms erect or geniculate spreading, profusely branching at the base, scabrous below the nodes and panicle, the nodes appressed-hispid; leaf sheaths usually glabrous, sometimes scabrous at the summit and rarely appressed-pilose all over, the margins finely ciliate above; ligule a densely ciliate membrane about 1 mm. long; leaf blades flat, linear-acuminate, tapering to the base, 15–30 cm. long, 4–7 mm. wide, strongly scabrous on the upper surface, scaberulous on lower surface, occasionally pubescent on both surfaces; panicle densely flowered, spicate, 3–15 cm. long, the axis scabro-hispid and sparsely villous, the hairs about 1 mm. long; branches very short, bearing clusters of spikelets, each subtended by one to three bristles (usually two); the bristles antrorsely scabrous, flexuous, 5–15 mm. long, green, purple, or tawny; spikelets about 2 mm. long, turgid on the convex side, nerves green and distinct; first glume ⅓ to ½ as long as the spikelet, three–five-nerved; second glume covering ¾ of the fertile lemma, five–seven-nerved; sterile lemma equaling the fertile lemma, five-nerved, enclosing a lanceolate, hyaline palea ¾ its own length; fertile lemma about 2 mm. long, turgid, very coarsely transversely rugose.

Type Locality: GEORGIA: Savannah, Baldwin. Holotype in the Elliott Herbarium. Phototypes deposited in GH, NY, US. Authentic material from near the locality of the type has been examined.

Distribution: sandy woods and waste places along Atlantic coast, Florida to North Carolina, along Gulf coast to Louisiana; Cuba; Dominican Republic.

Florida. Alachua: Gainesville, GOULD 6673 (TEX); Broward: Ft. Lauderdale, SMALL & CARTER 1126 (F); Citrus: Homosassa, COMBS 944 (US); Columbia: cultivated fields, Lake City, ROLFS 760 (MO); Dade: Opalocka Hammock, MOLDENKE 495 (MO, ILL); Duval: cultivated ground, Jacksonville, CURTISS 3616 (F, MO, US); Franklin: cultivated field, Apalachicola, KEARNEY 108 (US); Hillsborough: waste ground, FREDHOLM 6401 (MO); Lake: clay soil, Eustis, NASH 640 (F, MO); Lee: Ft. Myers, HITCHCOCK 518 (MO, GH); Levy: 2.7 miles northwest of Williston, PERDUE 1709 (ILL); Marion: recently burned scrub, Salt Spring, TOWNSWEND (ILL); Pinellas: pinelands, Tarpon Springs, O'NEILL 875 (MO).

Georgia. Clinch: Okefenokee Swamp, EYLES 115 (US); Decatur: near open pond, Bainbridge, THORNE 6569 (US); McIntosh: Sapelo Island, DUNCAN 20469 (SMU, TEX); Earley: banks of Chattahoochee, west of Saffold, THORNE & MUENSCHER 8561 (GH).

South Carolina. Beaufort: Daufuskie Island, EYLES 781 (US); Orangeburg: Orangeburg, HITCHCOCK 717 (GH).

North Carolina. Craven: New Bern, KEARNEY 2221 (US); New Hanover: sandy woods, Wilmington, HITCHCOCK 726 (F, MO, US).

Alabama. Crenshaw: Dozier, REED (TEX); Mobile: Mobile, HITCHCOCK (US).

Mississippi. Cat Island, TRACY 436 (MO, NY, US).

Tennessee: Knox: cultivated, Knoxville, RUTH (ILL).

Texas. Harris: Humble, THARP 4247 (TEX).

West Indies. Cuba. Sandy pine woods, C. WRIGHT (GH). Pinar del Rio: pinelands, EKMAN 18118 (US); Isle de Pinos, San Pedro, BRITTON & WILSON 14817 (NY, US); near San Francisco, EKMAN 11893 (NY).

Hispaniola. Santo Domingo. Cordillera Central, EKMAN 14124 (GH).

Some specimens of *S. corrugata* resemble very closely those of *S. viridis* in general appearance. The two species are morphologically distinct and probably not even closely related. *Setaria corrugata* is recognizably distinct by the presence of a very coarsely transversely rugose fertile lemma. The bristles of this species are highly variable in length and color. Ranging from 5–20 mm., they may be green, tawny, or purple. *Setaria corrugata* is common in the sandy soil of pinelands, but is also a weed in cultivated fields and waste places. *Setaria viridis* is infrequent in Florida and its ecological niche is filled there by *S. corrugata.*

34. SETARIA TENACISSIMA Schrader

Setaria tenacissima Schrader *ex* Schultes in Roemer & Schultes, Syst. Veg. Mant. 2:279. 1824; Kunth (1833) 152; Herrmann (1910) 52; Hitchcock (1930) 676; Hitchcock (1931) 323; Swallen (1936) 182; Hitchcock (1936) 344. fig. 314; Swallen (1943) 246; Swallen (1955) 334. fig. 96.

Panicum tenacissimum (Schrader) Nees, Agrost. Bras. 238. 1929.

Chaetochloa tenacissima (Schrader) Hitchcock & Chase in Contr. U.S. Nat. Herb. 18:352. 1917; Hitchcock (1920) 182. fig. 45.

Setaria scandens f. *longiseta* Häckel in Buchtien, Contr. Fl. Bolivia 1:66. 1910.

Annual, 1–2 m. tall, occasionally branching and/or rooting from the lower nodes; stems erect, slender, glabrous, scabrous just below the panicle; nodes glabrous; leaf sheaths glabrous below, strongly scabrous above, short-hispid on the margins and the back above, hispid on the collar; ligule very short, densely ciliate; leaf blades flat or loosely folded, strongly scabrous and soft pubescent on both surfaces, 10–20 cm. long, 4–10 mm. wide; panicle loosely spicate, narrow, often deep purple, slightly nodding, as much as 20 cm. long, the axis densely hispid with sparsely scattered slender white hairs; branches pubescent, 2–5 mm. long, bearing clusters of spikelets, each one subtended by a rather stiff

bristle; bristles 1.0–1.5 mm. long, often dark-purple; first glume nearly ½ as long as the spikelet, three-nerved; second glume nearly covering the fertile lemma, five-nerved; sterile lemma equaling the fertile lemma, five-nerved, the sterile palea wanting; fertile lemma transversely rugose with numerous fine ridges.

Type Locality: BRAZIL: authentic material from Brazil has been examined (US).

Distribution: brushy hillsides, Guatemala to Panama; Cuba, Haiti, Dominican Republic, Puerto Rico, Trinidad.

Guatemala. Alta Verapaz: Saquija, STANDLEY 70212 (F); Jalapa: north of Jalapa, STEYERMARK 32298 (F); Santa Rosa: Buena Vista, HAYDE & LUX 4295 (US).

British Honduras. El Cayo District, BARTLETT 11585 (US).

Honduras. Santa Barbara: San Pedro Sula, THIEME 842 (US).

El Salvador. Cerro del Guayabal, CALDERON 2014 (US).

Costa Rica. Canas Gordas, PITTIER 11006 (ILL, US); Cuesta del Toro, BRENES 16879 (F); Alajuela: La Guacima, LEON 2880 (US).

Panama. Chiriqui: Boquete, MAURICE 656 (US), *Hitchcock* 8291 (US), KILLIP 4564 (US).

Cuba. Oriente: Sierra de Nipe, EKMAN 9954, 10128 (NY).

Haiti. St. Michel de l'Atalaye, LEONARD 8053 (F, MO, NY, US).

Dominican Republic. Lagunas de Cenobi, VALEUR 12 (US); Bonao, EKMAN H 11481 (US); La Vega: Piedra Blanca, ALLARD 16061 (INJ, US).

Puerto Rico. Utuado, SINTENSIS 6498 (MO, NY, US).

Trinidad. Near Port of Spain, Amer. Gr. Nat. Herb. 610 (GH, F, MO, US).

Setaria tenacissima was included under *S. scandens* by Scribner and Merrill, but Hitchcock segregated it from *S. scandens* (1920). Schrader described the blades of *S. scandens* as subpilose and those of *S. tenacissima* as scabrous. Extensive examination of the blades of many specimens of these two entities failed to reveal any constant differences of significant importance. The blades of *S. tenacissima* are often softly pubescent as well as scabrous. As so often is the case, separation of these two species is based on the observance of a combination of morphological characters. Below is a list of the most significant characters that aid in recognition of these two species.

Setaria scandens Schrader	*Setaria tenacissima* Schrader
Sterile palea present, ½ the length of the spikelet.	Sterile palea wanting.
Bristles short, 3–5 mm. long.	Bristles longer, 10–15 mm.
Panicle short, 3–10 cm. long.	Panicle 9–20 cm. long.
Spikelets green.	Spikelets often purplish-black.

Setaria tenacissima, like *S. scandens,* seems to be native to South America. It is not found as far north as *S. scandens,* since it is absent from Mexico. However, it is found in Central America and the West Indies, usually preferring a slightly more xeric habitat than *S. scandens.*

In Salvador this grass is called "cola de mico."

35. SETARIA SCANDENS Schrader

Setaria scandens Schrader *ex* Schultes in Roemer & Schultes, Syst. Veg. Mant. 2:279. 1824; Sprengel (1825) 304; Kunth (1833) 151; Herrmann (1910) 52; Standley (1928) 83; Hitchcock (1930) 676; Hitchcock (1931) 322; Swallen (1934) 351; Hitchcock (1936) 343. fig. 313; Swallen (1943) 245; Swallen (1955) 334.

Panicum scandens (Schrader) Trinius, Gram. Pan. 166. 1826; Trinius (1829) 201; Steudel (1854) 52.

Setaria trinii Kunth, Enum. Pl. 1:151. 1833.

Panicum scandens var. *vulgare* Doell in Mart. Fl. Bras. 2(2):171. 1877.

Chaetochloa scandens (Schrader) Scribner in Donn. Smith, Pl. Guat. 5:91. 1899; Scribner & Merrill (1900) 17; Hitchcock & Chase (1917) 352; Hitchcock (1920) 180. fig. 44.

Annual, 40–80 cm. tall; culms slender, branching at base, geniculate, scabrous below the panicle, otherwise glabrous; nodes glabrous or bearing a tuft of hair below the margins of the sheath; leaf sheaths glabrous, with cilate margins, the collar bearing stiff hairs; ligule densely ciliate, less than 1 mm. long; leaf blades flat, linear-lanceolate, acuminate, abruptly narrowed at the base, 5–15 cm. long, 4–10 mm. wide, scabrous and strigose on both surfaces, strongly scabrous on upper surface; panicles slender, erect, densely spicate, 3–10 cm. long, about 5 mm. wide, the axis short-pubescent and bearing slender hairs 2.0–2.5 mm. long; branches very short, bearing clusters of spikelets, each subtended by one to three bristles; the bristles 3–5 mm. long, green, antrorsely barbed except at the tip which is retrorsely barbed; spikelets about 1.5 mm. long, green, ovoid, turgid on the convex side; first glume about ½ as long as the spikelet, broad, ovate, enveloping the base of the spikelet, three-nerved; second glume nearly equaling the fertile lemma, five-nerved; sterile lemma barely exceeding the fertile lemma, five-nerved, enclosing a palea about ½ its own length; fertile lemma about 1.5 mm. long, turgid on the convex side, finely transversely rugose.

TYPE LOCALITY: unknown. In the Trinius Herbarium is a specimen of "*Setaria scandens* Schrad. H. Gotting.," which may be part of the type material.

DISTRIBUTION: southern Mexico, Central America to Panama; Cuba, Jamaica, Haiti, Dominican Republic; moist ground, often a weed in cultivated areas.

Mexico.

Mexico: Temascaltapec, HINTON 2726, 5365 (ILL, MO, NY, US).

Veracruz: Cordoba, SANTOS 2480 (US), MATUDA 343 (US).

Oaxaca: Villa Alta, SANTOS 3554 (US).

Guatemala. Alta Verapaz: Carcha, STANDLEY 70039 (F, US); Huehuetenango: Cerro Negro, STEYERMARK 51717 (F, US).

Honduras. Morazan: El Zamorano, STANDLEY 22856, RODRIGUEZ 544 (F); Cueste Grande, WILLIAMS 13268 (F, US).

Costa Rica. Banks of Rio Virilla near Heredia, ALLEN 582 (F).

Panama. Panama: Savana de Alajuela, PITTIER 3463 (US).

Cuba. Oriente, Sierra de Nipe, EKMAN 9798 (GH, US), LEON 19886 (US).

Jamaica. Killits, PROCTOR 16759 (INJ); Trelawny: Ramgoat Cave, PATRICK 264 (INJ); Mt. Hybla, HARRIS 11380 (GH, MO, NY, US); Arntully, ORCUTT 2732, 3063 (MO, US).

Haiti. Port-au-Prince, PROCTOR 10666 (INJ), EKMAN H 6633 (US), BUCH 1682; 1738 (INJ, US); Mission, LEONARD 3705 (GH, INJ, US).

Dominican Republic. Lagunas de Cenobi, VALEUR 10 (US); Santiago: Igua, JIMINEZ 1212 (US).

Pennisetum scandens Jacquin in Cat. Sem. Hort. Vindb. (1801) refers to a seed catalogue of the Vienna Garden. This reference has not been verified, but the binomial is probably a *nomen nudum*. Therefore, *S. scandens* Schrader is taken as the first validly published combination.

This species seems to have its center of distribution in South America. It occurs frequently in Central America and on the major islands of the West Indies. It occurs rarely in a few southern states of Mexico. *Setaria scandens* prefers moist habitats such as thickets, river banks, and cultivated fields. It most closely resembles *S. tenacissima*. In the discussion of the latter species, a résumé is given to aid in separating these two entities.

Setaria scandens is notable for its ability to cling tenaciously to a passerby's clothing. This is because of the barblets directed downward at the tip of the bristles of the panicle. The bristles are antrorsely scabrous except for a few terminal retrorse barblets.

36. SETARIA MAGNA Grisebach

Setaria magna Grisebach, Fl. Brit. W. Ind. 554. 1864; Chapman (1897) 588; Herrmann (1910) 50; Hitchcock (1930) 676; Hitchcock (1931) 324; Silveus (1933) 673; Hitchcock (1935) 702. fig. 1577; Hitchcock (1936) 344. fig. 315; Blomquist (1948) 188; Fernald in A. Gray (1950) 226; A. Chase in Hitchcock (1951) 724. fig. 1104; Gleason (1952) 236.

Chamaeraphis magna (Grisebach) Beal, Grasses N. Am. 2:152. 1896.

Chaetochloa magna (Grisebach) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner (1900) 106. fig. 402; Nash in Britton (1901)

90; Small (1903) 107; Nash in Britton & Brown (1913) 166; Hitchcock (1920) 185. fig. 47; Small (1933) 85.

Annual, as much as 4 m. tall and 2 cm. thick at the base; culms stout, scabrous just below the panicle and scaberulous below the smooth nodes, otherwise glabrous; leaf sheaths glabrous or scabrous near summit, villous along the margins above; ligule a densely ciliate membrane 1–2 mm. long; leaf blades flat, scabrous, especially on the upper surface and along the cartilaginous margins, as much as 60 cm. long and 3.5 cm. wide; panicles densely flowered, cylindrical, virgate, as much as 45 cm. long and 3 cm. thick, the axis scabrous and densely villous; branches as much as 1.5 cm. long, bearing many short-pedicelled spikelets, each subtended by one or two bristles; the bristles flexuous, antrorsely scabrous, 1–2 cm. long; spikelets elliptical, bluntish, about 2 mm. long or slightly less; first glume about ⅓ as long as the spikelet, acute, three-nerved; second glume equaling the fertile lemma, seven-nerved; sterile lemma slightly exceeding the fertile lemma, five–seven-nerved, enclosing an ovate, hyaline palea equal to its own length, the sterile palea minutely pubescent along its two lateral nerves and often enclosing well-developed stamens; fertile lemma about 1.8 mm. long, smooth, shiny, brownish, enclosing a palea of similar texture, the fruit disarticulating above the glumes and sterile lemma. Chromosome number, $2n = 36$.

TYPE LOCALITY: JAMAICA: "Pd. (Purdie), along the lagoons behind the ferry." The type is probably at Kew. A collection from near the type locality has been examined (US).

DISTRIBUTION: in saline marshes, Florida to New Jersey, along Gulf Coast to Texas; introduced in Yucatan, Costa Rica, Jamaica, Puerto Rico, Guadeloupe, and Bermuda.

Florida. Alachua: Gainesville, COMBS 748 (US); Brevard; margins of ponds, Merritt's Island, CURTISS 3618 (MO, US); Broward: Dania, EATON 828 (F); Citrus: Homosassa, COMBS 964 (US); Collier: Everglades, O'NEILL (MO); Franklin: St. Vincent Island, McATEE 1713A & 1720B (UF); Highlands: south of Lake Istokpoga, BRASS 15310 (US); Lake: in swamp (8–20′ tall), Eustis, NASH 1279 (F, MO); Levy: Manatee, RUGEL 365 (US); Monroe: sandy soil, edge of canal, Key Largo, MOLDENKE 414 (ILL, MO); Orange: Apopka, BAKER 21 (US); Palm Beach: border of marsh, Palm Beach, CURTISS 5410 (ILL, MO); Polk: wet ditches, COMBS 1219 (US).

Georgia. Spalding: Experiment, REDDING (US); Chatham: Savannah, WIEGAND & MANNING 297 (GH).

South Carolina. Charleston: brackish meadow, west of Charleston, GODFREY & TRYON 1577 (MO); Georgetown: South Island, GODFREY & TRYON 1564 (US).

North Carolina. Brunswick: west of Southport, FULTS 1831 (NY, US); Southport, BROWN 2699 (TEX); edge of lagoon, Long Beach, BOYCE 1284 (SMU); Carteret: wet, marshy place east of Beaufort, CANOSO (ILL); New Hanover: Wilmington, HITCHCOCK (US).

Virginia. Norfolk: in Dismal Swamp, near Deep Creek, GRIMES 4539 (US); Princess Anne: swamp, Pleasant Ridge, MacKENZIE 1795 (MO, NY); Virginia Beach, BRADFORD 3 (US).

Maryland. Millstone, HITCHCOCK 7890 (GH, NY, US).

Delaware : marsh behind Augustine Beach, Delaware Bay, CHURCHILL (MO); tidal river banks and salt marsh, Collins Beach, COMMONS 148 (US); Kent: Little Duck Creek, east of Leipsic, LARSEN 846 (MO); Smyrna, BARTRAM & VAN PELT (US); Woodland Beach, LARSEN 1012 (US).

New Jersey. Cape May: Cape May City, STONE (GH); Cold Spring, KILLIP 144 (US); Salem: Canton, FOGG 6073 (GH).

Alabama. Buckley Island, VASEY 4 (MO); Mobile: Mobile, MOHR (US).

Louisiana. Calcasieu: Lake Charles, ALLISON 110 (NY, US); Orleans: New Orleans, FISHER 133 & 2337 (MO, NY, US); Plaquemines: Point-a-la-Hache, LANGLOIS (NY, US); Breton Island, TRACY & LLOYD 463 (F, NY, US); Terrebonne: Houma, WURZLOW 26 (US).

Arkansas. Bradley: swamp, Warren, DEMAREE 21823A (MO); Drew: soft bog, Wilmar, west of Monticello, DEMAREE 13704 (MO, NY).

Texas. Galveston: Galveston Island, TRACY 7747 (F, MO, NY); Jefferson: Port Arthur-Orange Road, SILVEUS 662 (US); Matagorda: Palacios, MOORE (US); Val Verde: banks of Rio Grande, EGGERT (MO).

Mexico.

Yucatan: brackish marsh, south of Cienega, near Progreso, LUNDELL & LUNDELL 8183 (GH, F, US).

Costa Rica. Littoral on Pacific coast, Punta Mula, PITTIER 6825 (US).

Bermuda. MUNRO (US).

Jamaica. Black River, HITCHCOCK 9646 (US).

Puerto Rico. Humacao, EGGERS (US); Campo Alegro, CHASE 6800 (US).

Guadeloupe. PERE DUSS 3918 (US).

The tallest, most robust species of *Setaria* in North America, *S. magna* is deservedly named. Its special affinity for saline marshes restricts it to coastal areas except in Florida, where brackish marshes abound inland, and in Arkansas, where marshes along the Salt River provide suitable habitats. Label data indicate specimens as much as 6 m. tall.

The culm, nearly 3 cm. thick at the base, may become very tough and woody. The densely flowered panicles may be as long as 40 cm., bushy and truly resembling a fox's tail, nearly life-size. In smaller specimens the panicles resemble those of *S. vulpiseta* and *S. macrosperma,* although *S. magna* is more compactly and densely flowered. The spikelet of *S. magna* is its most distinctive morphological character. It is about 2 mm. long, ovate-elliptic, bearing a smooth, brownish, shining fertile lemma. The sterile palea is broad and well developed, equaling the fertile palea.

Chromosome number: $2n = 36$, Brown (1948), no. 2699 (TEX); voucher examined.

37. SETARIA VIRIDIS (Linnaeus) Beauvois

Panicum viride L. Syst. Nat. ed. 10. 870. 1759; Lamarck (1791) 169; Lamarck (1798) 727 (*typ. err.* 737); Muhlenberg (1813); Trinius (1829) 203; Steudel (1854) 51.

Pennisetum viride (L.) R. Braun, Prodr. Fl. Nov. Holl. 1:195. 1810; Nuttall (1818) 55; Eaton & Wright (1840) 346.

Setaria viridis (L.) Beauvois Ess. Agrost. 51, 171, 178. pl. 13. fig. 3. 1812; Sprengel (1825) 304; Torrey (1826) 72; Kunth (1833) 151; Gray (1856) 581; Chapman (1860) 578; Grisebach (1864) 554; Robinson & Fernald in A. Gray (1908) 118. fig. 71; Herrmann (1910) 54; Hubbard (1915) 175; Henry (1915) 26; Deam (1929) 308. pl. 82; Hitchcock (1930) 677; Hitchcock (1931) 325; Rydberg (1932) 77; Silveus (1933) 673; Hitchcock (1935) 702. fig. 1579; Hitchcock (1936) 345; Peck (1941) 131; Marie-Victorin (1947) 816; Pohl (1947) 592; Blomquist (1948) 189; Fernald in A. Gray (1950) 226; Pohl (1951) 502. fig. 4; Fassett (1951) 90; A. Chase in Hitchcock (1951) 724. fig. 1105; Gould (1951) 268; Strausbaugh & Core (1952) 98. pl. 97; Davis (1952) 125; Gleason in Britton & Brown (1952) 236; Weintraub (1953) 53; Harrington (1954) 112; Jones & Fuller (1955) 79; Breitung (1957) 14.

Setaria weinmanni Roemer & Schultes, Syst. Veg. 2:490. 1817.

Panicum viride var. *brevisetum* Doell, Rhein. Fl. 128. 1843.

Setaria viridis var. *weinmanni* (Roemer & Schultes) Borbas, Math. Termesz. Koslem 15:310. 1878; Brande in Kock (1905) 2690; Fernald & Wiegand (1910) 133.

Panicum italicum var. *viride* (L.) Koernicke in Koernicke & Werner, Handb. Getreid. 1:277. 1885.

Chamaeraphis italica var. *viridis* (L.) Kuntze, Rev. Gen. Pl. 2:767. 1891.

Chamaeraphis viridis (L.) Millspaugh in W. Va. Agr. Expt. Sta. Bull. 2:466. 1892; Porter (1893) 196; Beal (1896) 157.

Ixophorus viridis (L.) Nash in Bull. Torr. Club 22: 423. 1895; Nash in Britton & Brown (1896) 126. fig. 282.

Chaetochloa viridis (L.) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner & Merrill (1900) 19. fig. 8; Nash in Britton (1901) 90; Small (1903) 107; Nash in Britton & Brown (1913) 165. fig. 393; Piper & Beattie (1915) 35; Hitchcock & Chase (1917) 352; Schaffner (1917) 321; Mosher (1918) 326; Hitchcock & Standley (1919) 80; Hitchcock (1920) 187; fig. 48; Rydberg (1922) 39; House (1924) 85; Gress (1924) 47. fig. 20; Jepson

(1925) 141; Small (1933) 85; Abrams (1940) 118. fig. 248. Conzatti (1943) 48.

Setaria viridis var. *breviseta* (Doell) Hitchcock in Rhodora 8:210. 1906.

Setaria italica subsp. *viridis* (L.) Thellung in Mem. Soc. Sci. Nat. Cherbourg 38:85. 1912.

Chaetochloa viridis var. *breviseta* (Doell) Farwell in Mich. Acad. Sci. Papers 1:86. 1921.

Chaetochloa viridis var. *minor* (Koch) Farwell, *loc. cit.*

Chaetochloa viridis var. *weinmanni* (Roemer & Schultes) House in Bull. N.Y. State Mus. 243-244:39. 1923.

Annual, 20–100 cm. tall, branching at the base, erect or geniculate; nodes glabrous; leaf sheaths glabrous or scaberulous above, ciliate along the upper margins; ligule densely ciliate 1–2 mm. long; leaf blades flat, linear-lanceolate up to 20 cm. long and 12 mm. wide, usually shorter and narrower, scabrous on upper surface, scaberulous or glabrous on lower surface; panicle densely flowered, cylindrical, uninterrupted, erect or slightly nodding from near the apex, 2–15 cm. long, usually 3–8 cm. long, the axis hispid and villous; branches of panicle very short, bearing a cluster of spikelets, each subtended by one to three bristles; the bristles green or rarely purple, antrorsely scabrous, 5–10 mm. long; spikelets 1.8–2.2 mm. long, elliptic, flattened; first glume ⅓ the length of the spikelet, triangular-ovate, three-nerved; second glume nearly equaling the fertile lemma, elliptical, five–six-nerved; sterile lemma slightly exceeding the fertile lemma, five-nerved, enclosing a narrow, hyaline palea about ⅓ its own length; the fertile lemma very pale green and very finely transversely rugose.

Type Locality: no locality is given. In the original description (Linnaeus 1759), a reference is made to "Spe. pl. n. 2 β." Panicum number 2 in the Species Plantarum (1753) is *P. glaucum* and below it is variety β which is based on a citation from Scheuchzer (1719, p. 46) describing a plant from Europe.

Distribution: a cosmopolitan weed of the temperate regions of the world; found throughout the United States and Canada in cultivated soil and waste places; rare in Florida and southern states; occasional in Mexico, Central America, and the West Indies.

Setaria viridis is undoubtedly an inhabitant of every province of Canada and state of the United States. Herbarium collections which I have examined give credence to its having been present at some time in all regions of Canada and the United States, excepting Manitoba, Alaska, and Georgia. Hulten (1942) reports *S. viridis* was introduced at Juneau, but apparently failed to survive the winter. At the other climatic extreme, *S. viridis* in Florida is known from a single atypical collection (SMALL 8208 NY). An extremely common weed of culti-

vated fields and waste places of temperate North America, S. *viridis* is rare in the southeastern states. In Florida, its role as a weed in gardens is assumed by S. *corrugata*.

Specimens of S. *viridis* collected from sub-tropical and tropical regions of North America are cited below.

Mexico.

San Luis Potosi: San Luis Potosi, HITCHCOCK 5664 (US).

Veracruz: Cordoba, HITCHCOCK 6450 (US).

Costa Rica. San Rafael de Cartago, PITTIER 9037 (US).

Panama. San Jose Isl., JOHNSTON 1155 (US).

Bermuda. Mt. Langton, COLLINS 159 (F, US); Smith's Parish, MOORE 2856 (F); BRITTON & BROWN 829 (NY).

This has been selected as the type species of the genus *Setaria*. It is the most common weedy species in lawns, gardens, cultivated fields, and waste places in temperate North America. For this species many varietal names have been proposed, indicative of the latitude of its morphological limits. The bristles of the panicle may be green or purple and the size and habit of the individual plants vary considerably depending on the environment. Plants collected in Canada and northeastern United States, have been designated as var. *weinmanni* but are not distinct, except for being in general smaller and often geniculate at the base.

Setaria viridis is closely related to the cultivated foxtail millet S. *italica*, yet attempts to cross these two species (Li, Li, & Pao 1945) revealed nearly complete sterility between them. The differences between these two entities are mostly quantitative; and the best single qualitative criterion for separating them is the point of disarticulation of the fruit. In S. *viridis*, disarticulation occurs below the glumes, the spikelet falling entire; in S. *italica*, the disarticulation occurs above the glumes, the fertile floret shelling out and leaving the glumes and sterile floret behind. Also the fertile lemma of S. *italica* is smooth and shiny, but that of S. *viridis* is finely, but distinctly, transversely rugose.

Setaria viridis appears to be the ancestral stock from which several specific or variant entities may have developed. It is thought by some to be the stock from which S. *italica* has been derived. Li, Pao, and Li (1942) have suggested that the tetraploid, S. *faberii* Herrmann, originated from an ancient cross of S. *viridis* with an unknown diploid species.

An extensive synonymy of this species is given by F. T. Hubbard (1915, pp. 175-178).

Chromosome number: $2n = 18$, Avdulov (1931); S. *viridis* var. *weinmanni*, Kishimoto (1938); Tateoka (1954); $n = 9$, Li, Meng, Liu (1935);

Li, Li, Pao (1945); Fairbrothers (1959); Gould no. 7655 (TAES, voucher examined).

37a. SETARIA VIRIDIS var. MAJOR (Gaudin) Pospichal

Panicum viride maius Gaudin, Agrost. Helvetica 1:18. 1811. Gaudin (1828) 152.

Setaria viridis var. *major* (Gaudin) Posp., Fl. Oesterr. Kustenl. 1:51. 1897.

Chaetochloa viridis var. *major* (Gaudin) Farwell in Papers Mich. Acad. Sci. 1:86. 1921.

Annual; culms 1.5–2.5 m. tall; leaf blades flat, linear-lanceolate up to 40 cm. long, as much as 2.5 cm. wide, scabrous on upper surface, glabrous on lower surface; panicle densely flowered, cylindrical, erect or slightly nodding from near the apex, as long as 20 cm., the axis hispid and villous; lower branches of panicle about 3 cm. long, giving a lobed appearance to the panicle; spikelets 1.8–2.2 mm. long, morphologically indistinct from those of var. *viridis*.

Type Locality: SWITZERLAND. Type is not known.

Distribution: in rich soil of cultivated fields of temperate Europe and temperate North America, in association with *S. viridis*.

Pennsylvania. Centre: near Martha's Furnace, WAHL 1337 (ILL).

Michigan. Oxford, FARWELL 5607a (US); Belle Isle, FARWELL 593e.

Illinois. Champaign: north of Champaign, AHLES 7478 (ILL, MO, US); ROMINGER 27 (ILL); La Salle: edge of corn field, near Ottawa, SCOTT (ILL).

South Dakota. Spink: Redfield, RICKSECKER 194 (ILL).

Iowa. Pohl (1951) reports this variety from several counties in Iowa.

Nebraska. Collections from near Lincoln have been received and verified by Dr. Fred W. Slife of the Agronomy Department, University of Illinois.

Many varietal combinations have been proposed in several parts of the world to describe this giant form of *S. viridis*, the first being that of Gaudin (1811) when describing the grasses of Switzerland. This robust variety has become quite abundant in many corn fields and soybean fields of Illinois and Iowa, and grows in association with *S. viridis*, *S. faberii*, and *S. lutescens*.

Additional evidence of the degree of quantitative discontinuity between var. *major* and *S. viridis* proper comes from nodal and seed counts. Nodal counts of several hundred specimens reveal an average of six to seven nodes per plant of *S. viridis* and seven to twelve nodes per plant of the var. *major*. Seed counts of mature panicles revealed an average of 600 to 800 grains for each primary panicle in *S. viridis* and 4,000 to 6,000 grains for each primary panicle of var. *major*. Chromo-

some determinations showed that both *S. viridis* and *S. viridis* var. *major* are diploids with a somatic number of eighteen.

Setaria viridis var. *major*, 2n = 18, Ellen Dempsey, University of Illinois, unpublished; no voucher specimens prepared.

38. SETARIA ITALICA (Linnaeus) Beauvois

Panicum italicum L., Sp. Pl. 56. 1753; Walter (1788) 72; Lamarck (1791) 169; Muhlenberg (1813) 9; Muhlenberg (1817) 103; Elliott (1821) 113; Trinius (1829) 198; Eaton & Wright (1840) 346; Steudel (1854) 51.

Panicum germanicum Miller, Gard. Dict. ed. 8. Panicum no. 1. 1768; Muhlenberg (1817) 104; Trinius (1829) 199; Eaton & Wright *loc. cit.*

Panicum italicum var. *germanicum* (Miller) Koeler, Descr. Gram. 17. 1802.

Pennisetum italicum (L.) R. Brown, Prodr. Fl. Nov. Holl. 1:195. 1810; Nuttall (1818) 55.

Setaria germanica (Miller) Beauvois, Ess. Agrost. 51, 169, 178. 1812; Scribner (1896) 83. fig. 76.

Setaria italica (L.) Beauvois, Ess. Agrost. 51, 170, 178. 1812; Sprengel (1825) 304; Torrey (1826) 72; Kunth (1835) 108; Gray (1856) 581; Chapman (1860) 578; Grisebach (1864) 554; Scribner (1896) 84. fig. 78; Robinson & Fernald in A. Gray (1908) 119; Herrmann (1910) 50; F. T. Hubbard (1915) 183; Henry (1915) 26; Bailey (1924) 111; Deam (1929) 309; Hitchcock (1931) 325; Rydberg (1932) 77; Silveus (1933) 674; Hitchcock (1935) 704. fig. 1580; Marie-Victorin (1947) 816; Pohl (1947) 592; Blomquist (1948) 189; Fernald in A. Gray (1950) 226; Fassett (1951) 90; Pohl (1951) 505. fig. 5; A. Chase in Hitchcock (1951) 725. fig. 1107; Gould (1951) 268; Strausbaugh & Core (1952) 98; Gleason in Britton & Brown (1952) 236; Weintraub (1953) 52; Harrington (1954) 112; Jones & Fuller (1955) 79.

Pennisetum germanicum (Miller) Baumgarten, Enum. Stirp. Transsilv. 3: 277. 1816.

Setaria italica var. *germanica* (Miller) Schrader in Linnaea 12:430. 1838.

Panicum italicum var. *californicum* (Kellog) Koernicke & Werner, Handb. Getreid. 1:272. 1885.

Chamaeraphis italica (L.) Kuntze, Rev. Gen. Pl. 2:767. 1891; Porter (1893) 196; Beal (1896) 174. fig. 79; Beal (1896) 154.

Chamaeraphis italica var. *germanica* (Miller) Kuntze, Rev. Gen. Pl. 2:768. 1891.

Ixophorus italicus (L.) Nash in Bull. Torr. Club. 22:423. 1895; Nash in Britton & Brown (1896) 127. fig. 283.

Chaetochloa italica (L.) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner (1898) 86. fig. 68; Scribner (1900) 74. fig. 68; Scribner & Merrill (1900) 20. fig. 9; Nash in Britton (1901) 90; Small (1903) 107; Nash in Britton & Brown (1913) 166. fig. 394; Hitchcock & Chase (1917) 352; Schaffner (1917) 321; Mosher (1918) 324; Hitchcock & Standley (1919) 80; Hitchcock (1920) 189. fig. 49; Rydberg (1922) 39; Gress (1924) 48. fig. 21; House (1924) 85; Small (1933) 85.

Chaetochloa italica var. *germanica* (Miller) Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 6:32. 1897; Scribner (1897) 32; Scribner (1900) 74; Scribner & Merrill (1900) 21.

Setaria viridis subsp. *italica* (L.) Briquet, Prodr. Pl. Corse 1:68. 1910.

Chaetochloa germanica (Miller) Smyth in Trans. Kans. Acad. 25:89. 1913.

For a more extensive synonmy see F. T. Hubbard in Amer. Jour. Bot. 2:183. 1915.

Setaria italica differs from *S. viridis* in having more robust culms, wider blades, and larger, lobate panicles. It can also be separated from both *S. viridis* and *S. viridis* var. *major* by the larger spikelets, 3 mm., which enclose a smooth, shiny fruit which disarticulates above the glumes and sterile floret. The sterile palea is narrow and equals half the length of its lemma. Many of the cultivated varieties and forms of this species are discussed by F. T. Hubbard (1915).

Type Locality: INDIA.

Distribution: cultivated throughout the warmer parts of both hemispheres, especially in the Great Plains region.

Setaria italica, commonly called foxtail millet, German millet, or Hungarian grass, is cultivated for hay, pasture, and green fodder, primarily in the Great Plains, from Texas to Nebraska, and eastward into Indiana. It has been grown locally in New England, New York, and other eastern states. Formerly grown in the midwestern United States, often as a source of poultry feed, it is now found only rarely.

This species is highly variable, apparently because of its long record of domestication. It was under cultivation in China as early as 2700 B.C. In Europe, grains of *S. italica* have been found in the debris of the lake dwellings of the Stone Age in Switzerland. Occasionally referred to as Italian millet, it is not native to Italy nor is it cultivated extensively there. It has been commonly grown for food in North China, where rice is too dear for poorer classes. (Arber, 1934, p. 18).

The original wild form of the foxtail millet is thought to be *S. viridis*, from which it differs in size. The more robust *S. italica* is characterized by possessing larger, lobate panicles, which produce smooth, shiny seeds that disarticulate above the glumes and sterile floret. Disarticulation occurs below the glumes in *S. viridis*, and the fertile lemma is finely transversely rugose. Attempts to hybridize these two entities by Li, Li, and Pao in 1945 revealed a high degree of sterility in the offspring. *Setaria italica* and *S. viridis* each have nine pairs of chromosomes and in the F_1 hybrid meiotic pairing was normal. However, about 70 per cent of the pollen produced was shrunken and devoid of starch. The F_1 resembled the *S. viridis* parent in seven of eight characters studied. Li and his co-workers (1945) demonstrated that the site of disarticulation of the spikelet was controlled by two pairs of complementary factors, with disarticulation below the glumes dominant. Pohl (1951) suggests a possible origin of the robust *S. viridis* var. *major* plants by the introduction of the "viridis-type" disarticulation into *S. italica* and their subsequent segregation. Therefore, plants with the size and vigor of millet would retain the "viridis-type" disarticulation.

Li, *et al.* (1942) succeeded in obtaining a true hybrid by crossing *S. italica* (2n = 18) with *S. faberii* (2n = 36). The F_1 triploid produced a long, slender panicle which surpasses the panicle of either parent in length. This hybrid produced anthers which failed to dehisce. Sterility in this hybrid was extremely high.

Chromosome number: 2n = 18, Avdulov (1928); Kishimoto (1938); Li, Pao, Li (1942).

39. SETARIA FABERII Herrmann

Setaria faberii Herrmann in Beitrage Biol. Pflanz. 10:51. 1910; Allard (1941) 119; Fernald (1944) 57; Wood (1946) 391; Pohl (1947) 592; Gates (1948) 201; Blomquist (1948) 188; Evers (1949) 391; Fernald in A. Gray (1950) 226; A. Chase in Hitchcock (1951) 725. fig. 1106; Pohl (1951) 505. fig. 6; Strausbaugh & Core (1952) 98; Weintraub (1953) 52; Jones & Fuller (1955) 79.

Annual; stems erect 0.5–2 m. tall, glabrous, nodes glabrous; leaf sheaths glabrous, except for a fringe of white hairs along the margins, the collar minutely hispid; ligule of stiff hairs, 2 mm. long; leaf blades linear-acuminate, 1–2 cm. wide, 15–30 cm. long, scabrous on both surfaces, bearing long, soft, papillose hairs on the upper surface; panicles cylindrical, densely flowered, spicate, arching and drooping from a point near the base of the panicle, 6–20 cm. long, usually about 10 cm. long and 1 cm. wide, branches short, 1–2 mm. long, the panicle axis densely villous; spikelets 2.5–3.0 mm. long, subtended by one to six (usually three) bristles each about 1 cm. long; first glume 1 mm. long, acute, three-nerved; second glume 2.2 mm. long, obtuse, five–nine-nerved; sterile lemma about 2.8 mm. long, obtuse, five-nerved plus two incomplete nerves at tip, enclosing a palea ⅔ its own length; fertile lemma 2.8 mm. long, pale, rather strongly transversely rugose, enclosing a palea much more finely rugose.

TYPE LOCALITY: CHINA: Szechwan. The type is Faber 582 = 1182 . . . Herb. Wien.

DISTRIBUTION: cultivated and waste ground, New York to Nebraska, North Carolina to Arkansas; introduced from China.

Connecticut. Bridgeport, EAMES, Aug., 1932 (CONN).

New York. Plattsdale, L.I., FERGUSON 4606, Sept., 1925 (NY).

New Jersey. Fairbrothers (1959, p. 47) shows *S. faberii* to be present in every county.

Delaware. New Castle: Red Lion, ROMINGER 31 (ILL).

Maryland. Worcester: Willards, MOLDENKE 13842 (US).

District of Columbia. Washington, CHASE 12704 (US).

Virginia. Arlington: Arlington Farm, ALLARD 2246, Sept., 1936 (MO, US).

North Carolina. Craven: Cherry Point, BLOMQUIST 13722 (US).

Pennsylvania. Philadelphia, LONG 35540, Sept. 1931.

West Virginia. Eagle Rock, WOOD 6659 (NY).

Ohio. Champaign: LEONARD 20470 (US).

Indiana. White: Monticello, FRIESNER 21869 (TEX).

Kentucky. Omstead, FLEETWOOD, July 1936 (US).

Tennessee. Unicoi: Chestoa, WHERRY (US).

Illinois. Union: State Forest, FULLER 777, Aug. 1941 (ILL, ILLS); Evers (1949) reports on *S. faberii* in Illinois; Jones & Fuller (1955, p. 79), say that it is probably present in every county.

Wisconsin. Iowa: FOSBERG 34924 (US).

Iowa. Tama: Traer, ROHRBAUGH 82 (TEX); Pohl (1951, p. 507) shows *S. faberii* to be present in nearly every county of the southern half of the state of Iowa.

Missouri. St. Charles: along Wabash R. R., St. Charles, STEYERMARK 9256, Aug. 1932 (MO, US); Boone: Columbia, JORDAN (MO).

Kansas. Cloud: Concordia, FRASER 927, Sept. 1945 (US).

Nebraska. Lancaster: Lincoln, FULTS 1809, June 1936 (US).

Within the past decade, this exotic plant has become a serious weed in bean and clover fields of midwestern United States. Its rapid spread has stimulated considerable research to determine its origin, spread, distribution, ecology, genetics, and most of all, its control. Commonly called giant foxtail, Chinese foxtail, or nodding foxtail, this species was introduced into the United States from China, probably in the early 1920's. Seeds of *S. faberii* were first observed by a seed analyst in millet imported from China (Chase 1948, p. 14). This did not represent its initial arrival as it was previously collected on Long Island, N.Y. (FERGUSON 4606) on September 19, 1925, and near Philadelphia (LONG 35540) on September 9, 1931. Also collections in 1932 at St. Charles, Missouri (STEYERMARK 9256) and Columbia, Missouri (JORDAN) indicate its early spread to the midwestern area. Its westward migration to Missouri was apparently via rail as both early Missouri collections are from locations along the Wabash railroad.

The giant foxtail does not compete well with established vegetation but thrives in recently broken ground or clean-tilled row crops in the midwestern states. The extensive 2, 4-D spraying programs of the late 1940's and early 1950's, coupled with the removal of fences, altered the ecology of the field margins. The nearly complete elimination of the rank growth of broad-leaved herbs along the fence rows and the plowing of fields to the extreme edges opened the way for the rapid spread of *S. faberii* along these field margins. The spread of giant foxtail since the late 1940's has been little short of phenomenal, considering its annual habit. Seed production is prolific, averaging about 1,200 seeds in each

primary panicle. These seeds are carried by farm machinery, water courses, as impurities in seed lots, and by birds. Within a few years, the giant foxtail has spread throughout most of the corn-soybean states, and infestations in bean and clover fields are sometimes so heavy that the nodding panicles completely mask the shorter legumes. Reports of the arrival and spread of S. *faberii* in this country are to be found in Fernald (1944), Pohl (1951), and King (1952). Some other papers report the initial observation of its arrival in a particular state. King (1952) reports on chemical controls effective in inhibiting germination and seedling development of S. *faberii*. An excellent bibliography accompanies his work. A recent investigation of S. *faberii* and S. *viridis* in New Jersey (Fairbrothers 1959) presents chromosome data and statistical comparisons of morphological characters which aid considerably in the separation of these two species. *Setaria autumnalis* Ohwi (1938) may be conspecific with S. *faberii*, but I have not seen the type of the former for comparative study.

Giant foxtail is quickly recognized by the pubescence on the upper surface of the leaf blades and the nodding panicles which droop or arch from near the base at maturity. These characters serve to separate this species from S. *viridis* var. *major*, which rivals, or even surpasses, the giant foxtail in height. Both plants may exceed 2 m. in height.

Chromosome number: n = 18, Kishimoto (1938); Fairbrothers (1959). 2n = 36, Kishimoto (1938); Li, Li, & Pao (1942).

40. SETARIA ADHAERANS (Forsskål) Chiovenda

Panicum adhaerans Forsskål in Fl. Aegypt.-Arab. 20. 1775; A. Braun (1871) 5.

Setaria rottleri Sprengel, Syst. 1:304. 1825; Kunth (1833) 152.

Panicum rottleri (Sprengel) Nees, Fl. Afr. Austr. 53. 1841; Steudel (1855) 52.

Setaria respiciens Walpers, Ann. Bot. Syst. 3:721. 1852.

Panicum respiciens (Walpers) Hochstetter *ex* Steudel, Syn. Pl. Glum. 52. 1855.

Panicum aparine Steudel, *loc. cit.*

Panicum verticillatum parviflorum Doell in Mart. Fl. Bras. 2(2):172. 1877.

Setaria verticillata subsp. *aparine* (Steudel) Durand & Schinz, Consp. Fl. Afr. 5:775. 1895.

Setaria verticillata var. *respiciens* (Walpers) K. Schumann in Engler, Pflanzenwelt Ost.-Afrikas 105. 1895.

Setaria verticillata var. *aparine* (Steudel) Ascherson & Schweinfurth, Illustr. Fl. Egypte 161. 1889.

Chaetochloa brevispica Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:15. fig. 5. 1900.

Setaria brevispica (Scribner & Merrill) K. Schumann in Just's Bot. Jahresb. 28(1):417. 1902.

Setaria aparine (Steudel) Chiovenda in Nuov. Giorn. Bot. Ital. 19:419. 1912.

Setaria adhaerans (Forsskål) Chiovenda in Nuov. Giorn. Bot. Ital. 26:77. 1919.

Annual, 25–60 cm. tall, branching profusely at the base, the culms often geniculate below; the nodes glabrous, brownish-black; leaf sheaths glabrous, the hyaline margins glabrous to the summit; ligule a ring of stiff, white hairs, 1–2 mm. long; leaf blades flat, 5–10 mm. wide, usually less than 10 cm. long, occasionally 15 cm. long, strigose on both surfaces, bearing papillose hairs 1 mm. long, particularly conspicuous on the lower surface, tapering abruptly to a very narrow apex, broad below, joining a broad, compressed sheath; panicle strongly verticillate, yellowish-green or purplish, tapering above, 2–6 (8) cm. long, the axis retrorsely scabrous-hispid on the angles; branches of the panicle similar to the main axis, usually less than 5 mm. long; spikelets clustered on short branchlets, a single bristle usually subtending each spikelet, occasionally missing; bristles about 5 mm. long, retrorsely scabrous to the base; spikelets 1.5–2 mm. long, oblong-elliptic; first glume about ½ as long as the spikelet, obtuse, with a distinct midnerve and two faint or missing lateral nerves; second glume nearly as long as the spikelet, five–seven-nerved; sterile lemma five-nerved, which equals or slightly exceeds the fertile lemma, enclosing a reduced scale-like palea, which is less than ½ the length of the spikelet; fertile lemma very finely transversely rugose, enclosing a palea of similar texture.

Type Locality: NORTHEAST AFRICA. The type is apparently not known, but the collection on which the original description is based is most likely to be in the Herbarium Forsskålii in the Botanical Museum of the University of Copenhagen.

Distribution: pantropical; in North America it is known in the southern United States, Mexico, Guatemala, Cuba, and Bermuda.

United States.

Pennsylvania. On ballast, Girard Point, Philadelphia, PARKER 10962 (MO), BURKE 5 (US).

Alabama. Mobile: on ballast, Mobile, MOHR 19 (US).

Louisiana. On ballast, Port Eads, LANGLOIS 55 (US).

Texas. Bexar: near San Antonio, FREEBORN 109 (TEX). Brewster: igneous soil, Alpine, WARNOCK 9120 (SMU, TEX). Presidio: Shafter, THARP (MO, TEX); Travis: Waller creek near Austin, THARP 5 (TEX); Val Verde: Qualia vineyard, Del Rio, CORY 15209 & 44410 (TEX).

Mexico.

Chihuahua: Presa de Chihuahua, LE SUEUR 0137 (GH, MO, TEX).

Coahuila: Parras, PALMER 453 (F, MO, US); ARCHER 3994 (US); Saltillo, HITCHCOCK 5640 (ILL, US).

Jalisco: Tequila, near Guadelajara, PALMER 484 (MO, US).

Guanajuato: Irapuato, HITCHCOCK 7438 (US).

Queretaro: Queretaro, Amer. Gr. Nat. Herb. 721 (F, ILL, MO, US), HITCHCOCK 5807 (US); ARSÈNE 10381 (F, MO, US); BASILE 49, 50 (US).

Puebla: Tehuacan, Amer. Gr. Nat. Herb. 722 (F, MO, US); HITCHCOCK 6054, 6084½ (US).

Oaxaca: Valley of Oaxaca, PRINGLE 4920 (F, MO, US).

Guatemala. Sacatepequez: near Antigua, STANDLEY 58571 (F, US); STANDLEY 63629 (F); STANDLEY 64620 (US); KELLERMAN 4814 (US); Escuintla: near San Jose, STANDLEY 64149 (F); Quiche: AGUILAR 874 (F); Ciudad Vieja, TEJADA 311 (US).

Bermuda. Paget, BRITTON & BROWN 116 (F, US); Warwick Marsh, BRITTON & BROWN 302 (F, US); Grassmere, COLLINS 161 (F, US); Harrington House, BROWN 676 (US); Flatts Village, HARSHBERGER in 1905 (US); Walsingham, MILLSPAUGH 99 (US).

Cuba. Havana: Vadado, EKMAN 110, 13120 (US); LEON 555 (US); Havana Botanical Garden, CURTISS 693 (F, US); HITCHCOCK 491 (US).

Martinique. PERE DUSS 789 (NY).

As indicated by the synonymy associated with this taxon, there have been repeated recognitions by various authors of a tropical entity which is distinct and separate from the temperate species *S. verticillata*. Henrard (1940) summarizes the nomenclatural history of this taxon and concludes that *S. adhaerans* (Forsskål) Chiovenda is the proper name of this tropical grass. *Setaria adhaerans* is readily separated from the temperate *S. verticillata* by a series of morphological differences. The former has a hyaline, glabrous sheath margin, is conspicuously papillose-strigose on either or both surfaces of the leaf blade, and bears spikelets usually 1.5–2 mm. long. *Setaria adhaerans* also has a shorter panicle, shorter leaves, and a shorter culm height than *S. verticillata*.

41. SETARIA VERTICILLATA (Linnaeus) Beauvois

Panicum verticillatum L., Sp. Pl. ed. 2.82. 1762; Lamarck (1791) 169; Lamarck (1798) 728 (*typ. err.* 738); Muhlenberg (1813) 9; Bigelow (1814) 18; Trinius (1829) 202; Steudel (1854) 52.

Pennisetum verticillatum (L.) R. Brown, Prodr. Fl. Nov. Holl. 1:195. 1810; R. Brown (1817) 488, *pro. syn.*; Nuttall (1818) 55; Eaton & Wright (1840) 346.

Setaria verticillata (L.) Beauvois, Ess. Agrost. 51. 178. 1812; Roemer & Schultes (1817) 488; Sprengel (1825) 304; Torrey (1826) 72; Kunth (1833) 152; Gray (1856) 581; Chapman (1860) 578; Chapman (1897) 587; Robinson & Fernald in A. Gray (1908) 118. fig. 70; Herrmann (1910) 53; Deam (1929) 310. fig. 82; Hitchcock (1931) 322; Rydberg (1932) 77; Silveus (1933) 672; Hitchcock (1935) 699. fig. 1566; Hitchcock (1936) 342. fig.

312; Johnston (1943) 416; Pohl (1947) 592; Marie-Victorin (1947) 815; Stevens (1950) 81; Fernald in A. Gray (1950) 226; Pohl (1951) 502. fig. 3; Chase in Hitchcock (1951) 720. fig. 1096; Fassett (1951) 90; Gould (1951) 269; Davis (1952) 125; Strausbaugh & Core (1952) 98; Gleason in Britton & Brown (1952) 236; Weintraub (1953) 53; Harrington (1954) 111; Jones & Fuller (1955) 79; Swallen (1955) 336.

Chamaeraphis italica var. *verticillata* Kuntze, Rev. Gen. Pl. 2:768. 1891.

Chamaeraphis verticillata Porter in Bull. Torr. Club 20:196. 1893; Beal (1896) 151.

Ixophorus verticillatus Nash in Bull. Torr. Club 22:422. 1895; Nash in Britton & Brown (1896) 126. fig. 280.

Chaetochloa verticillata Scribner in Bull. U.S. Dept. Agr. Div. Agrost. 4:39. 1897; Scribner (1900) 107. fig. 403; Scribner & Merrill (1900) 16. fig. 6; Nash in Britton (1901) 89; Small (1903) 107; Hitchcock (1909) 231; Nash in Britton & Brown (1913) 164. fig. 390; Hitchcock (1913) 265; Schaffner (1917) 321; Hitchcock & Chase (1917) 352; Mosher (1918) 325; Hitchcock & Standley (1919) 80; Hitchcock (1920) 178. fig. 43; House (1924) 84; Jepson (1925) 141. fig. 125; Small (1933) 84; Conzatti (1943) 47.

Annual, 30–100 cm. tall; culms geniculate, glabrous, scabrous just below the panicle; the nodes glabrous, brownish-black; leaf sheaths glabrous, the margins ciliate above; ligule very short, densely ciliate; leaf blades flat, acuminate, 10–25 cm. long, 5–15 mm. wide, scabrous on both surfaces, serrulate-scabrous along the margins, occasionally with scattered hairs on upper surface; panicles erect, yellowish-green or purplish, cylindric, tapering above, occasionally interrupted below, 5–15 cm. long, the axis deeply angled, retrorsely scabrous-hispid on the angles; branches of panicle angled, scabrous-hispid, 2–10 mm. long, usually about 5 mm. long; spikelets clustered on short branchlets, a bristle below each spikelet; bristles retrorsely scabrous to the base, 4–7 mm. long; spikelets about 2.0–2.2 mm. long, oblong-elliptic; first glume about ⅓ as long as the spikelet, obtuse, one-nerved, occasionally with two faint lateral nerves; second glume nearly as long as the spikelet, rounded at tip, five-nerved, enclosing a rather broad palea about ½ its own length; fertile lemma finely transversely rugose, enclosing a palea of similar texture.

Type Locality: SOUTHERN EUROPE.

Distribution: introduced into the Western Hemisphere; a weed in greenhouses and gardens from Massachusetts to British Columbia, southward to California, eastward to Virginia. Absent from the southern United States, Mexico, Central America, and the West Indies.

Vermont. Chittenden: Burlington, L. R. JONES (F).

Massachusetts. Dorchester, CHURCHILL 118 (MO).

Connecticut. Hartford: Hartford, BISSELL (US).

New York. Monroe: Pittsford, KILLIP 12238 (US).

New Jersey. Middlesex: New Brunswick, "Halsted's American Weeds 194" (ILL).

Delaware. New Castle: Wilmington, CANBY in 1862 (US).

Maryland. Baltimore. Chrome ore piles, Canton, REED 32674 (US).

District of Columbia. Washington, VASEY in 1876 (US).

Pennsylvania. Northhampton: Lafayette College, Easton, PORTER in 1868 (US).

Virginia. Rockbridge: Lexington, CHURCHILL (GH, MO).

Ontario. Willington: Guelph, DORE (US).

Michigan. Washtenaw: University of Michigan Botanical Garden, Ann Arbor, HERRMANN 9264 (F, MO).

Ohio. Schaffner (1917) reports this species from Ohio.

Indiana. Tippecanoe: Lafayette, DORNER 75 (US).

Kentucky. Fayette: Lexington, McFARLAND 12 (GH, MO, NY).

Minnesota. Fillmore: Chatfield, J. W. MOORE 15939 (ILL).

Wisconsin. Walworth: Delavan, WADMOND (ILL).

Illinois. Tazewell: near East Peoria, V. H. CHASE 10052 (ILL).

Iowa. Clayton: Marquette, FASSETT 16377 (MO).

Missouri. St. Louis: St. Louis, BAUER 76 (F).

North Dakota. Barnes: Valley City, STEVENS 229 (F).

South Dakota. Clay: Vermillion, OVER 5093 (US).

Nebraska. Douglas: Omaha, LAWTON 82 (F).

British Columbia. Kamloops, COPLEY in 1933 (US).

Idaho. Bonneville: Idaho Falls, ANDERSON (NY).

Montana. Rosebud: Brewster Arnold Ranch, BENNETT (US).

Utah. Cache: Logan, TILLETT 417 (NY, US).

Colorado. Pueblo: Pueblo, HITCHCOCK 23028 (US).

Oklahoma. Muskogee: Muskogee, BEBB 6081 (US).

New Mexico. Dona Ana: Mesilla Valley, WOOTON & STANDLEY in 1907 (US).

Arizona. Coconino: Havasupai Canyon, CLOVER 5184 (US).

California. Riverside: Riverside, ROOS 5660 (NY).

This species is a common weed in North America as well as southern Europe. *Setaria verticillata* usually is not found with *S. viridis, S. faberii,* or *S. lutescens* in the cultivated grain and bean fields. Rather, it thrives in greenhouses, gardens, and banks of city streams. In the United States, *S. verticillata* has slowly migrated from east to west. Upon arrival in the vineyard country around Fresno, California, it rapidly spread along the irrigating ditches and soon became a notorious pest among the grapevines. A specimen from Fresno County, California, identified as *Setaria carnei* Hitchcock by Agnes Chase (1951) is a specimen of *S. verticillata.*

Setaria verticillata is at once distinguished from most closely related species by the retrorsely barbed bristles. These downward directed barb-

lets cause the panicles to adhere readily to any passing object which might brush against them. Also the panicles become entangled one with another which gives this grass a scraggly, untidy appearance. Due to the tenacious qualities of the panicle, this weed represents a potential menace in any cultivated ground, but thus far it has reached epidemic proportions only in the vineyards of California.

The binomial *S. verticillata* has often been applied to a closely related tropical species, *S. adhaerans*. *Setaria verticillata* is generally larger, more robust, and can be easily recognized by the ciliate fringe of hair along the margins of the summit of the leaf sheath which is always glabrous in the smaller tropical species.

The chromosome number of *S. verticillata* collected in Illinois has been verified as $2n = 36$. It is quite possible that the specimen from which de Wet (1954b) made his determinations may have actually been *S. adhaerans*.

Chromosome number: $2n = 36$, Avdulov (1931); Rominger (no. 6, Voucher ILL). $2n = 18$, de Wet (1954b).

41a. SETARIA VERTICILLATA var. AMBIGUA (Gussone) Parlatore

Panicum verticillatum var. *ambiguum* Gussone, Fl. Sic. Prodr. 80. 1827.

Setaria ambigua Gussone, Fl. Sic. Syn. 1:114. 1842; Hitchcock (1931) 324. *Non S. ambigua* Schrader (1838).

Setaria verticillata var. *ambigua* (Gussone) Parl. Fl. Palerm. 1:36. 1845; Fernald in A. Gray (1950) 226; A. Chase in Hitchcock (1951) 721; Weintraub (1953) 53.

Setaria viridis var. *ambigua* (Gussone) Cosson & Durand in Expl. Sci. Alger. 2:36. 1854; F. T. Hubbard (1915) 179; Gleason in Britton & Brown (1952) 236.

Panicum ambiguum (Gussone) Haussknecht, Oestrr. Bot. Zeitschr. 25:345. 1875.

Setaria viridis var. *purpurascens* Peck *ex* Dudley, Bull. Cornell Univ. 2:122. 1886.

Chamaeraphis italica var. *ambigua* (Gussone) Kuntze, Rev. Gen. Pl. 2:768. 1891.

Chaetochloa ambigua (Gussone) Scribner & Merrill in Bull. U.S. Dept. Agr. Div. Agrost. 21:18. fig. 7. 1900; Hitchcock (1920) 186; House (1924) 84.

This variety differs most conspicuously from *S. verticillata* by the presence of antrorsely barbed bristles. The ligule is somewhat longer and consists of a fringe of stiff hair 1–2 mm. long. The blades are scabrous and the upper surface is sparsely villous. The panicle branches are verticillately arranged and the panicle axis is antrorsely scabro-hispid without any villous hairs. These two latter characteristics immediately separate this variety from *S. viridis*.

Type Locality: SICILY. The type has not been examined.

DISTRIBUTION: central and southern Europe; introduced into the United States and Canada.

New York. Albany: Albany, HOUSE 8534 (US), 26884 (NY); Rensselaer: Troy, HOUSE 24036 (NY); Queens: Long Island, Flushing, MONACHINO 96 (TEX, ILL).

New Jersey. Somerset: Plainfield, MOLDENKE 6587 (US); Burlington: ballast ground, Camden, SCRIBNER (US).

District of Columbia. Washington, MERRILL 175 (NY).

Alabama. Mobile: Mobile, MOHR (US).

Canada. British Columbia: Canadian-Pacific Railway, Kamloops, EASTHAM 16109 (US).

Closely resembling *S. verticillata,* this variety lacks the retrorsely barbed bristles. It is found in only a few isolated locations where it has undoubtedly been introduced. It has failed to spread extensively or possibly has been overlooked by collectors because of a resemblance to the cosmopolitan weed, *S. viridis.* It can be separated from this latter species by the verticillate arrangement of its branches and the lack of villous hairs on the panicle axis.

F. T. Hubbard (1915, pp. 179-180) has an extensive synonymy for this variety.

42. SETARIA GENICULATA (Lamarck) Beauvois

Panicum geniculatum Lamarck, Encycl. 4:727 (*err. typ.* 737). 1798.
Cenchrus parviflorus Poiret in Lamarck, Encycl. 6:52, 1804.
Setaria geniculata (Lamarck) Beauvois, Ess. Agrost. 51, 178. 1812.
Setaria gracilis HBK. Nov. Gen. & Sp. 1:109. 1815.
Setaria purpurascens HBK. *op. cit.* 110.
Panicum imberbe Poiret in Lamarck, Encycl. Suppl. 4:272, 1816.
Panicum laevigatum Muhlenberg *ex* Elliott Sketch Bot. S. Car. & Ga. 1:112. 1816.

For a more extensive synonomy see Hitchcock (1920, pp. 168-171, or 1931, pp. 320-321).

Perennial, 30–120 cm. tall, with short, knotty rhizomes, erect or geniculate, tufted or solitary; the nodes glabrous; leaf sheaths glabrous, keeled, glabrous along the margins; ligule a ring of stiff hair less than 1 mm. long; leaf blades flat, 2–8 mm. wide, up to 25 cm. long, scabrous on upper surface, glabrous on lower surface, sometimes bearing long hair at the throat; panicle densely flowered, cylindrical, 3–8 cm. long, rarely longer, green or tawny, sometimes purple tipped, the axis scabrous-hispid; branches of the panicle axis very short, bearing clusters of short branchlets which divide abruptly into bristles and spikelet bearing pedicels; four to twelve bristles below each spikelet, antrorsely barbed, 2–12 mm. long; spikelets 2.0–2.8 mm. long, elliptical, slightly turgid on convex side; first glume ⅓ as long as the spikelet, three-nerved; second glume

½ to ⅔ as long as the spikelet, five-nerved; sterile lemma five–seven-nerved, which equals the fertile lemma, enclosing a broad palea of equal length, often enclosing three well-developed stamens; fertile lemma distinctly transversely rugose.

TYPE LOCALITY: GUADELOUPE: authentic collections from Guadeloupe.

DISTRIBUTION: Atlantic coast, Massachusetts to Florida; Gulf coast, Florida to Texas; Carolinas westward to Kansas; California; Mexico; Central America to Panama; all major islands of the West Indies; South America.

Massachusetts. Barnstable: Dennis, FERNALD & LONG 16181 (US).
Connecticut. Graton, JANNSON (TEX).
New York. Nassau: Merrick, FERGUSON 3340 (US).
New Jersey. Califon, FISHER in 1901 (US).
Pennsylvania. Philadelphia, SMITH 64 (US).
Maryland. Owings, HITCHCOCK 1620 (ILL).
District of Columbia. Eckington, MERRILL (ILL).
Delaware. New Castle: near Red Lion, ROMINGER 32 (ILL).
Virginia. York: Williamsburg, GRIMES 3796 (US).
West Virginia. Preston: Aurora, STEELE (NY).
North Carolina. Carteret: Pivers Isl., CANOSO (ILL).
South Carolina. Orangeburg: Orangeburg, Amer. Gr. Nat. Herb. 717 (US).
Georgia. Clarke: Athens, COMBY 60 (US).
Florida. Clay: northwest of Green Cove Springs, PERDUE 1668 (ILL); specimens from twenty-one counties in U.S. Herbarium.
Alabama. Crenshaw: Dosier, REED in 1941 (TEX).
Mississippi. George: Agricola, DEMAREE 35231 (US).
Illinois. Marion: Kinmundy, EVERS 34136 (ILLS).
Kentucky. Marshall: Aurora, AHLES 8125 (ILL).
Tennessee. Coffee: Tullahoma, SVENSON 9682 (US).
Iowa. Jones: bottoms of Wapsipinicon River, POHL 6607 (Iowa State).
Missouri. Jasper: Alba, PALMER 3050 (ILL).
Arkansas. Garland: near Hot Springs, V. H. CHASE 9919 (ILL).
Louisiana. Coillon Isl., THARP 6760 (TEX).
Kansas. Meade: XI Ranch, HORR & FRANKLIN E 274 (ILL, TEX, US).
Oklahoma. Payne: Stillwater, JAMISON 31 (TEX).
Texas. Brewster: Pena Blanca, WARNOCK 10864 (SMU); known from at least forty-five counties.
New Mexico. Sierra: Kingston, METCALFE 1195 (ILL, US).
Arizona. Santa Cruz: near Ruby, GOODDING A 9851 (US).

California. Kern: Arvin, FRAZIER 44 (US).

Oregon. On ballast, Linnton, NELSON 977 (US).

Mexico and Central America. In the United States National Herbarium are collections of *S. geniculata* from every state of Mexico except Tabasco and Campeche. This species is also found in each country of Central America from Guatemala to Panama, and extends southward to Argentina.

West Indies. Collections of *S. geniculata* have been observed on every major island of the West Indies from Cuba to Tobago.

This perennial species, commonly called knotroot bristle grass, is apparently a native of the Western Hemisphere. It is probably the most widespread species of *Setaria* in North America. In the United States it is common in the moist ground of both the Atlantic and Gulf coastal states. It has migrated northward via the Mississippi embayment and has been reported from several midwestern states along the Mississippi valley. It occurs frequently in much of eastern Texas, eastern Oklahoma, and southern Kansas. On the Pacific coast it is known only from California. This species is extremely abundant in the moist areas of Mexico, Central America, and the West Indies.

The extensive list of synonyms accompanying *S. geniculata* is indicative of the extreme variability in the morphology of this species. Bristle length and color are highly variable, and apparently depend upon the age and enviroment of the plant. The bristles are longer when the plant is young or is in cultivated soil. Bristle color varies from yellow to purple. The exposed tip of the fertile lemma may become dark purple at maturity.

By Scribner and Merrill (1900) this was separated into three species, one of which was further divided into four varieties. Hitchcock (1920) lumped all of these in *S. geniculata,* stating that "it is impossible to segregate coherent groups." Although morphological variations are apparent within the present concept of *S. geniculata,* these differences are not of sufficient magnitude to merit segregation without supporting evidences from cytology. Examination of spikelet characters fails to reveal constant differences that can be correlated with other morphological distinctions. Spikelet size varies from 2–2.8 mm., but many intermediate sizes are known. The sterile lemma is five- to seven-nerved, occasionally indurate and vaguely transversely rugose. The blades may be villous at the throat, but more often are glabrous.

I have examined voucher specimens from which chromosome number determinations have been made by Dr. Frank Gould. These chromosome studies reveal a polyploid complex in specimens from Texas. The voucher specimens having a haploid number of 18 exhibit shorter culms, shorter bristles, narrower leaf blades, and shorter spikelets than those specimens

having a haploid number of 36. However, subsequent examination of much material from North America fails to reveal two distinct entities based on these vouchers. For fear that the proposal of a single varietal entity might encourage a deluge of others, I still include these narrow-bladed, short-bristled forms under S. *geniculata*. I believe no subdivision of this species should be proposed without examination of the cytology and ecology of a large amount of material from the many diverse geographic localities in which it occurs.

43. SETARIA LUTESCENS (Weigel) F. T. Hubbard

Panicum lutescens Weigel, Obs. Bot. 20. 1772.

Panicum glaucum var. *flavescens* Elliott, Sketch S. Car. & Ga. 1:113. 1816.

Panicum compressum Balb. *ex* Steudel Nom. Bot. ed. 2. 2:254. *pro. syn.* 1841.

Chaetochloa lutescens (Weigel) Stuntz in U.S. Dept. Agr. Bur. Pl. Ind. Inv. Seeds 31:83. 1912; Hitchcock (1915b) 299; Hitchcock & Chase (1917) 351; Mosher (1918) 325; Hitchcock (1920) 167. fig. 40; Jepson (1925) 141. fig. 126; Tidestrom (1925) 69; Small (1933) 84; Abrams (1940) 118. fig. 247.

Setaria lutescens (Weigel) F. T. Hubbard in Rhodora 18:232. 1916; Deam (1929) 307. fig. 82; Hitchcock (1931) 319; Rydberg (1932) 77; Silveus (1933) 671; Hitchcock (1935) 697. fig. 1562; Hitchcock (1936) 339. fig. 309; Chase (1937) fig. 69. Deam (1940) 176; Peck (1941) 131; Marie-Victorin (1947) 815; Blomquist (1948) 187; Stevens (1950) 80; Fassett (1951) 90. fig. 334-336; Chase in Hitchcock (1951) 718. fig. 1094; Gould (1951) 267; Kearney & Peebles (1951) 139; Weintraub (1953) 52; Harrington (1954) 112; Jones & Fuller (1955) 79.

Annual, 30–130 cm. tall; culms in large tufts from fibrous root system, erect, branching at the base, sometimes geniculate below; the nodes dark, glabrous; leaf sheaths glabrous, strongly compressed, with a glabrous, hyaline margin; ligule ciliate, very short; leaf blades 4–10 mm. wide, as much as 30 cm. long, loosely twisted, scabrous on upper surface, bearing long papillose hairs near the throat, glabrous on the lower surface; panicle densely flowered, cylindrical, not tapering, 3–15 cm. long, rarely longer, usually 5–8 cm. long, the axis hispid; branches of the panicle very short, bearing one fertile spikelet and often an abortive spikelet with a cluster of sterile branchlets or bristles below each; the bristles antrorsely scabrous, yellow at maturity, 3–8 mm. long, usually four to twelve below each spikelet; spikelets 3.0–3.4 mm. long, ovate, extremely turgid on the convex side; first glume ⅓ as long as the spikelet, acute, three-nerved; second glume about ½ as long as the spikelet, broadly ovate, five-nerved; sterile lemma five-nerved, equaling the fertile lemma, enclosing broad hyaline palea of equal length, sometimes staminate; fertile lemma very strongly transversely rugose.

Type Locality: GERMANY: Pomerania. Type not known.

DISTRIBUTION: introduced from Europe; Canada; common in United States, except Florida and Alaska; rare in Mexico, Central America, and the West Indies.

Canada.
Nova Scotia. Halifax Harbor, HOWE & LANG 465 (NY).
Quebec. Pontiac: Norway Bay, ZINCK 745 (NY).
Ontario. Windsor, MACOUN 26418 (NY).
New Brunswick. Shediac Cape, F. T. HUBBARD 759 (GH).
British Columbia. Sicamous, MACOUN 7 (US).
United States.
Maine. Hancock: Bangor, KNIGHT 22 (US).
New Hampshire. Cheshire: Jaffrey, ROBINSON 284 (US).
Vermont. Rutland: Rutland, KIRK 1026 (US).
Massachusetts. Houghton, BLAKE (US).
Connecticut. Hartford: Glastonbury, WILSON 1263 (US).
New York. Genesee: Pavilion, HILL in 1855 (ILL).
New Jersey. Union: Fanwood, MOLDENKE 6199 (US).
Delaware. New Castle: Stanton, COMMONS 146 (US).
Maryland. Prince George: Hyattsville, SCRIBNER in 1888 (US).
District of Columbia. Deanwood, Amer. Gr. Nat. Herb. 714 (US).
Virginia. York: Williamsburg, GRIMES 4235 (US).
North Carolina. Mitchell: Magnetic City, WETHERBY 8 (US).
South Carolina. McCormick: Parksville, DUNCAN 10410 (US).
Georgia. Clarke: Athens, CRONQUIST 4138 (NY, US).
Florida. Gadsden: Quincy, COMBS 396 (US).
Pennsylvania. Lancaster: Lancaster, SMALL in 1888 (US).
West Virginia. Calhoun: Walnut, HARRIS (US).
Tennessee. Shelby: Memphis, DEMAREE 19665 (NY).
Alabama. Barbour: Eufaula, McCARTHY in 1888 (NY).
Mississippi. Jackson: Ocean Springs, SKEHAN 25554 (ILL).
Michigan. Keweenaw: FARWELL 3614 (ILL).
Ohio. Hamilton: Cincinnati, LLOYD 3614 (US).
Indiana. Tippecanoe: Lafayette, DORNER 73 (US).
Illinois. Ford: Roberts, AHLES 3123 (ILL).
Wisconsin. Dodge: Mayville, ALLEN & FASSETT 17677 (GH).
Minnesota. Lake: Duluth, HITCHCOCK 5090 (US).
Iowa. Fayette: FINK 274 (US).
Missouri. St. Louis: St. Louis, EGGERT 266 (US).
Arkansas. Garland: Hot Springs, MOORE 321211 (US).
Louisiana. East Baton Rouge: Scotland, McCOY (NY).
Texas. Travis: southwest of Austin, GOULD 7622 (SMU, TEX).
North Dakota. Cass: Fargo, STEVENS 35 (US).
South Dakota. Yankton: Janesville, BRUCE 11 (US).

Nebraska. Douglas: Omaha, EASTMAN (ILL).
Kansas. Riley: NORTON 575 (US).
Oklahoma. Payne: Stillwater, McAFEE (US).
Montana. Beaverhead: Wisdom, BOOTH 1091 (US).
Idaho. Canyon: Nampa, BAKER 8405 (US).
Washington. Klickitat: Bengen, SUKSDORF 11507 (US).
Oregon. Multnomah: Linnton (Portland), SUKSDORF 1684 (US). This specimen has been misidentified as *Setaria nigrirostris* (Nees) Dur. and Schinz, a native of South Africa and not known to occur in North America.
California. Bard, REEDER 145 (US).
Arizona. Maricopa: Scottsdale, PEEBLES 14421 (TEX).
New Mexico. Grant: near Silver City, BARKLEY 14649 (TEX).
Mexico.
Chihuahua: Camargo, HARVEY 1413 (GH, MO, US).
Coahuila: Saltillo, ARSÈNE 6374 (ILL).
Durango: Durango, PALMER 381 (ILL).
Nayarit: near La Labor, PENNELL 19876 (US).
Jalisco: west of Zamora, BARKLEY, PAXSON, & ROWELL 7665 (F).
Federal District: Mixcoac, ARSÈNE 8505 (ILL).
Michoacan: Morelia, ARSÈNE 2680a (ILL).
West Indies.
Jamaica. Cinchona, HARRIS 11272, 11457 (US).
Haiti. Furcy, LEONARD 4424 (INJ, NY, US); Port-au-Prince, BUCH 1452 (INJ, US).

A common weed of cultivated ground in temperate North America, this species is called yellow foxtail, yellow bristle grass, or pigeon grass. It most closely resembles *S. geniculata* but can be distinguished from it by its annual habit, its larger and more turgid spikelets, and its usually longer and thicker panicle. With a distribution similar to that of *S. viridis*, *S. lutescens* can be separated from the former by its larger spikelets which have the upper half of the fertile lemma exposed, its erect stiff panicles, and its loosely twisted blades which are villous at the throats.

This species is widely known under the binomial *S. glauca* Beauvois, based on *Panicum glaucum* L. 1753. However, Trimen (1887, p. 136) points out that Linnaeus' description of *Panicum glaucum* was based on a specimen of pearl millet, *Pennisetum glaucum* (L.) R. Brown. The most nearly complete single reference summarizing data pertinent to the status of *Panicum glaucum* L. is found in Chase (1921). This exhaustive investigation by Mrs. Chase reveals that the pearl millet of agronomic importance is the basis for *Panicum glaucum* L. (1753). The specific epithet alludes to the bluish head of pearl millet and the descriptive phrase "bristles the length of the flowers" coincides with the

bristles of pearl millet, but not with those of the yellow foxtail. Pearl millet, thus, becomes *Pennisetum glaucum* (L.) R. Brown and the yellow foxtail is to be known as *S. lutescens* (Weigel) F. T. Hubbard. The following binomials are based on *Panicum glaucum* L. as to name, but refer to *Setaria lutescens* (Weigel) F. T. Hubbard as to plant:

Setaria glauca (L.) Beauvois, Ess. Agrost. 51, 178. 1812.

Chamaeraphis glauca (L.) Kuntze, Rev. Gen. Pl. 2:767. 1891.

Ixophorus glaucus (L.) Nash, Bull. Torr. Club 22:423. 1895.

Chaetochloa glauca (L.) Scribner, Bull. U.S. Dept. Agr. Agrost. 4:39. 1897.

The strongest argument for retention of *S. glauca* (L.) Beauvois for the yellow foxtail is presented by Stapf (1928) and supported by Reeder (1951).

The following chromosome determinations have been made for *S. lutescens*: 2n = 36, Avdulov (1931); Kishimoto (1938). 2n = 72, Brown (1948). n = 18, Krishniswami & Rangaswami Ayyangar (1935). n = 36, Gould no. 7622 (TAES), voucher examined.

VII. SUMMARY

The genus *Setaria*, belonging to the tribe Paniceae of the family Gramineae (Poaceae), is represented in North America by forty-three species and four varieties. These taxa are separated into three subgenera as follows: *Ptychophyllum* (6 spp.), *Paurochaetium* (10 spp.), and *Setaria* (27 spp. and 4 var.).

Representing a group of plants commonly known as foxtail grasses or bristle grasses, *Setaria* is best known through a few weedy, annual species of Old World origin. The green foxtail (*S. viridis*) is the most common of these and has become a noxious weed in cultivated ground throughout the temperate regions of the world.

Species of *Setaria* native to North America are best represented by the *S. macrostachya* complex, commonly called the plains bristle grasses, whose members range from southwestern United States through the highland plateaus of northern Mexico. Some of these have excellent forage value.

Several species belonging to the subgenera *Paurochaetium* and *Ptychophyllum* are found abundantly in the islands of the West Indies. These subtropical grasses have a close affinity with certain species of the genus *Panicum*.

A miscellanea of other species of *Setaria* are scattered throughout the southern United States, Mexico, and Central America.

A summary of significant taxonomic and phylogenetic interpretations incorporated in the body of this work follows:

(1) *Setaria vulpiseta* appears to be a connecting link between subgenera *Ptychophyllum* and *Setaria.*

(2) The subgenus *Paurochaetium* is closely linked with subgenus *Setaria* by S. *subtransiens* at one extreme and S. *ramiseta* at the other.

(3) *Setaria arizonica* is the name proposed for a previously undescribed species from southern Arizona.

(4) *Setaria adhaerans* is the correct name of the tropical counterpart of the temperate S. *verticillata.*

(5) *Setaria crus-ardeae* and S. *speciosa* are distinct from S. *poiretiana.*

(6) Specimens of S. *tenax* with antrorsely scabrous bristles have been called *antrorsa* var. nov.

(7) Giant specimens of S. *viridis,* appearing sporadically throughout the cultivated fields of eastern and midwestern United States, are called var. *major* Gaudin.

(8) *Setaria palmeri* from southern Baja California is recognized as a distinct species within the S. *macrostachya* complex.

(9) *Setaria leucopila* merits further study to correlate morphological and chromosomal variation.

(10) *Setaria geniculata* represents the most highly specialized and widespread species of *Setaria* in the Western Hemisphere. Latitude of morphological variation, coupled with polyploidy, marks this species for further investigation.

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IX. INDEX TO NUMBERED EXSICCATAE

Explanation of citations below: name of the collector, collection number, (number of the species as it appears in this work);

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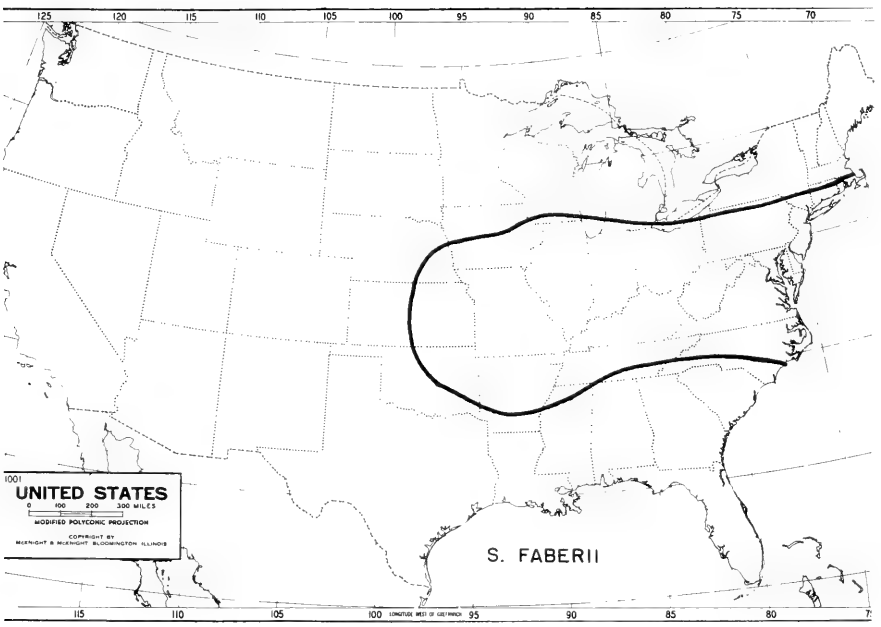
X. MAPS OF GEOGRAPHICAL DISTRIBUTION AND PLATES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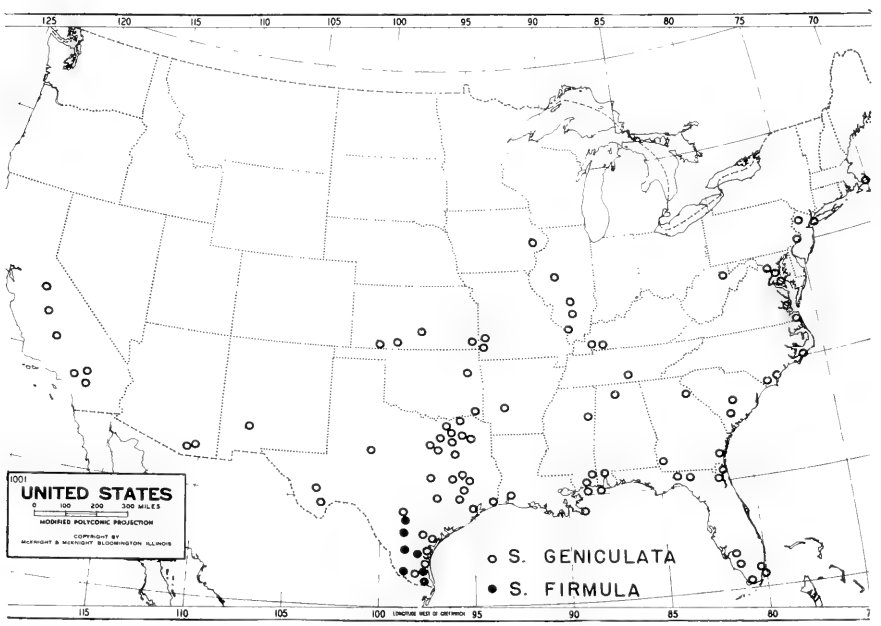
115 110 105 100 LONGITUDE WEST OF GREENWICH 95 90 85 80

MAP 1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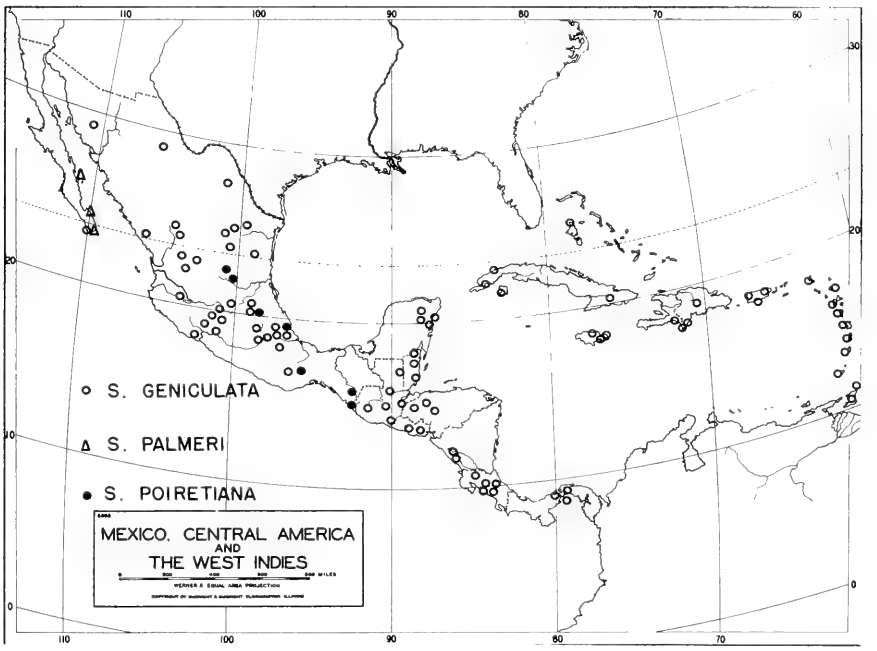
MAP 2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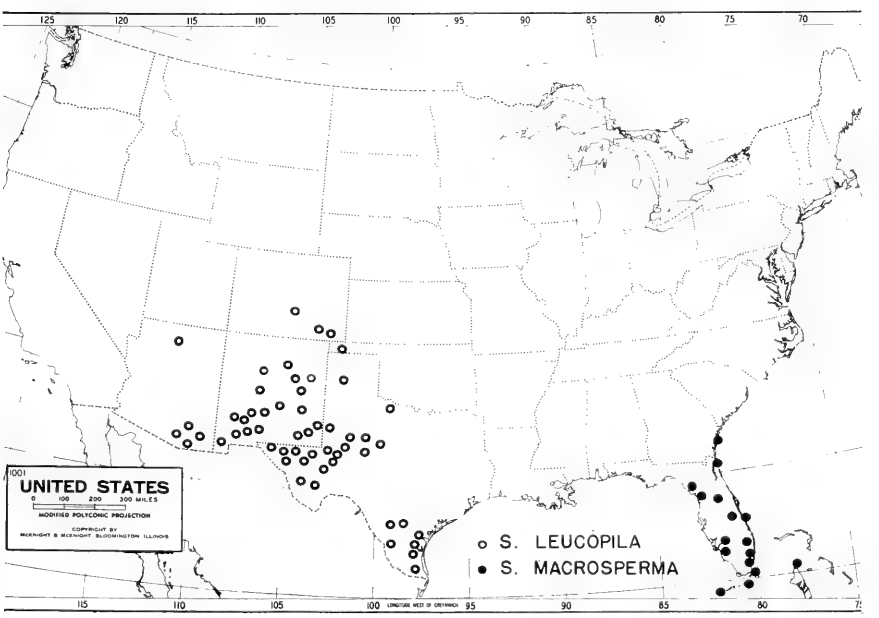
AND
THE WEST INDIES

Map 3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S. MACROSPERMA

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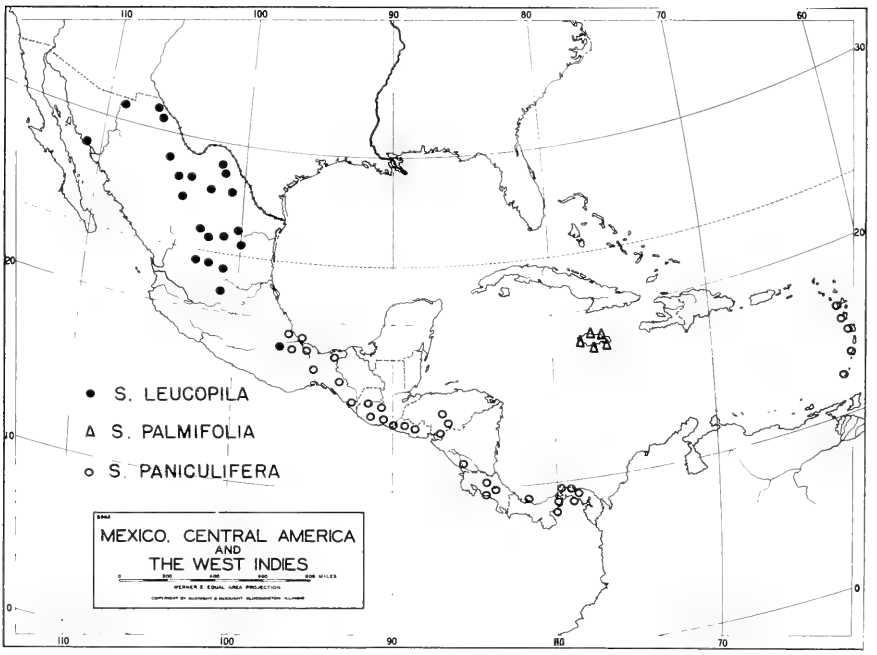
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MEXICO, CENTRAL AMERICA
AND
THE WEST INDIES

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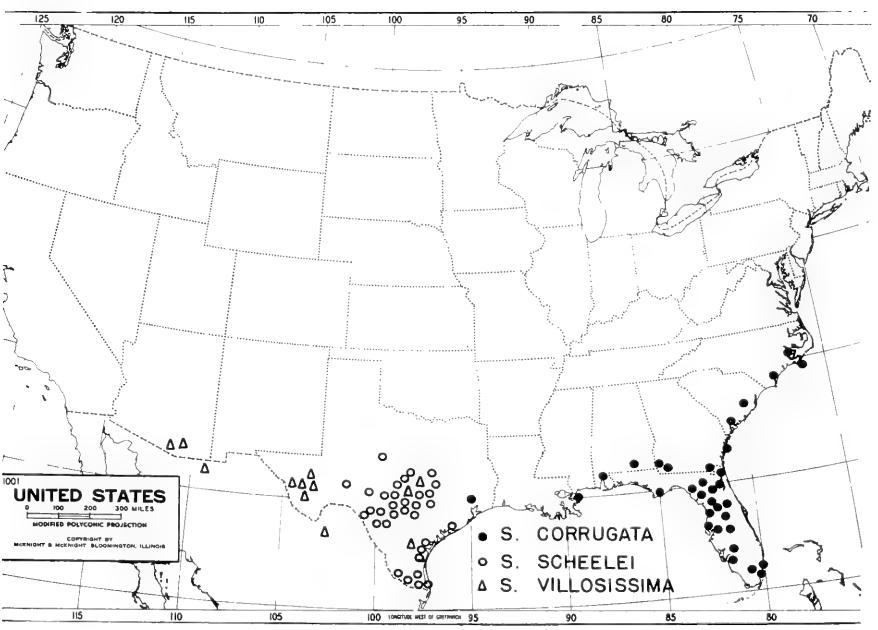
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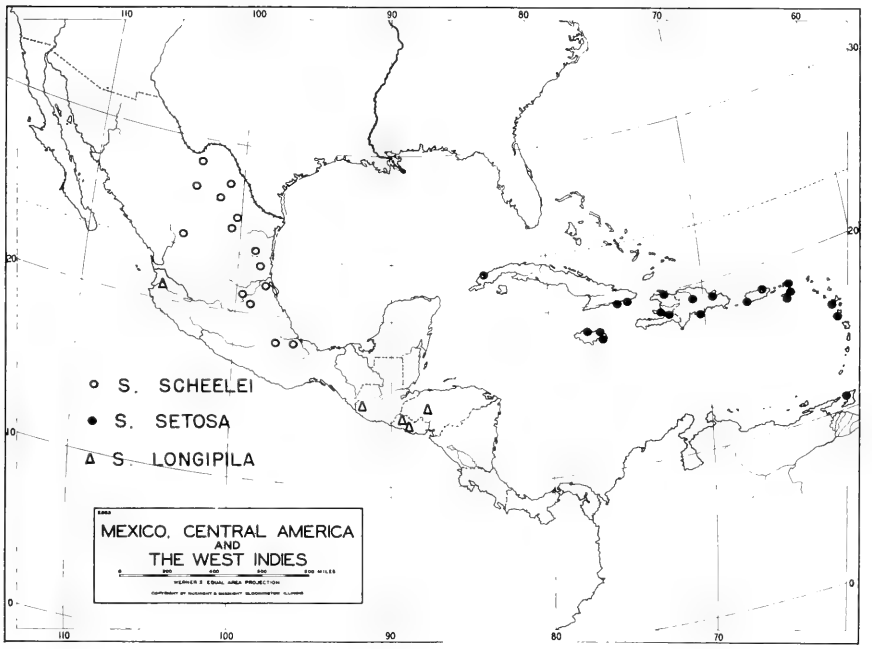
S. SCHEELEI
S. VILLOSISSIMA

Map 6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S. LONGIPILA
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AND
THE WEST INDIES

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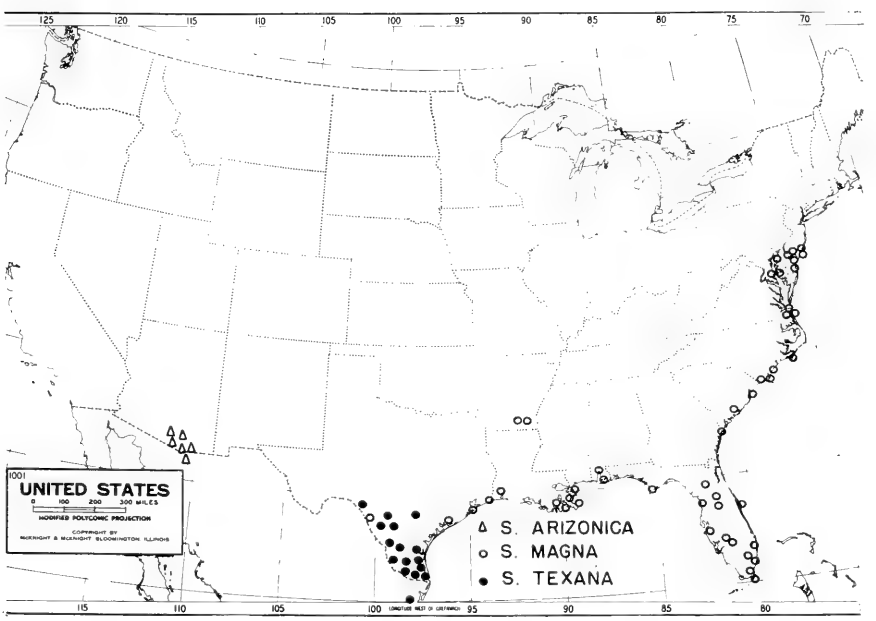
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S. MAGNA
S. TEXANA

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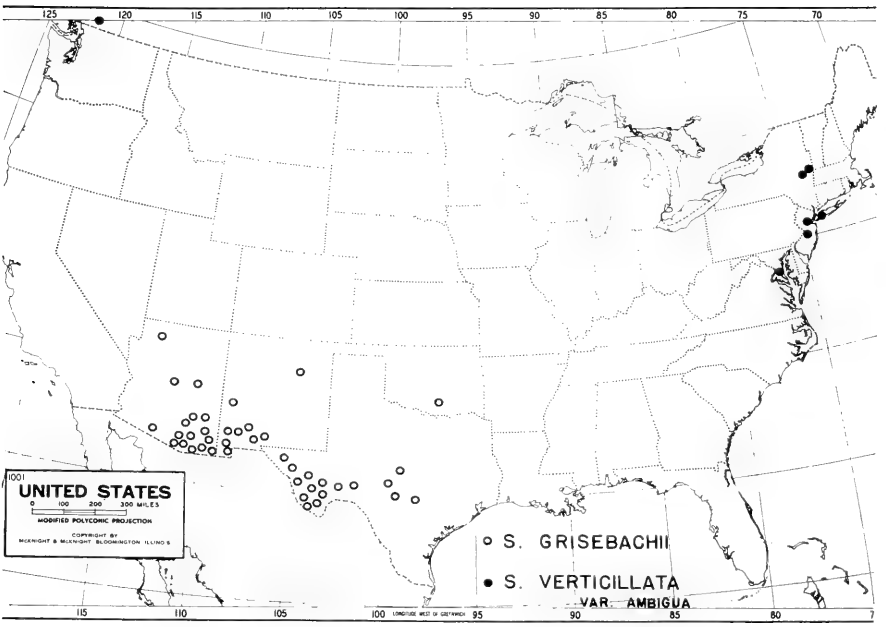
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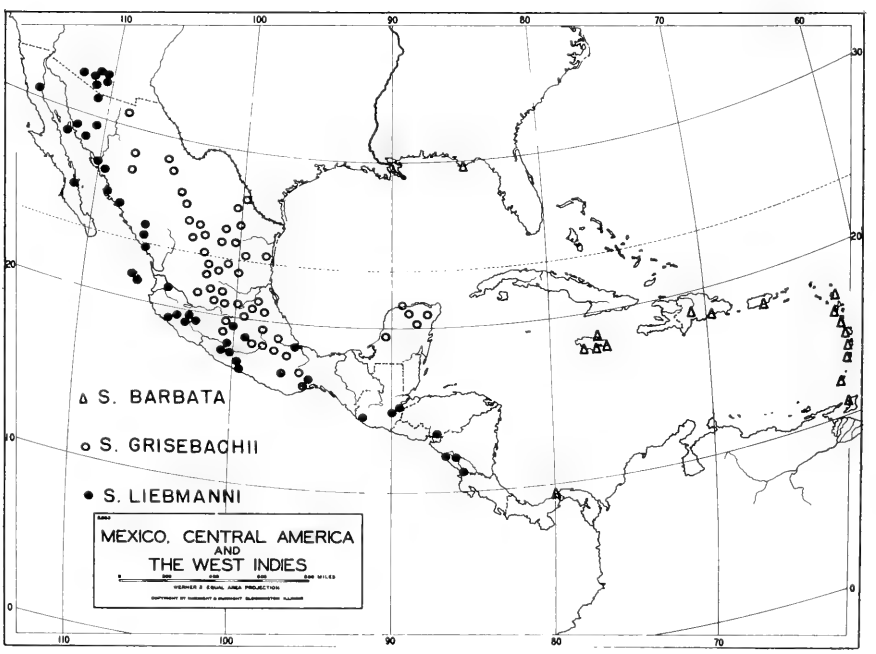
S. VERTICILLATA
VAR. AMBIGUA

Map 9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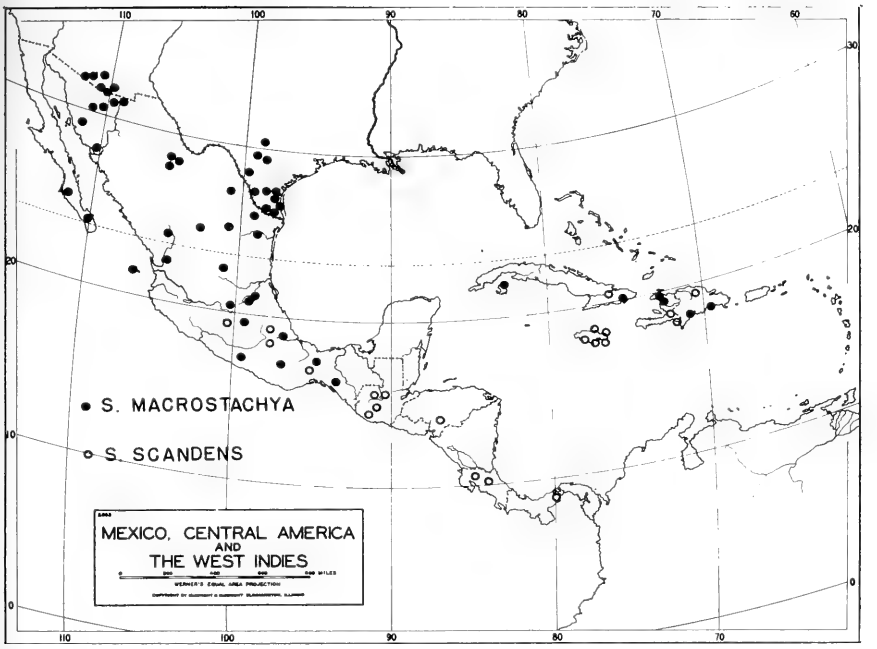
MEXICO, CENTRAL AMERICA
AND
THE WEST INDIES

Map 10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AND
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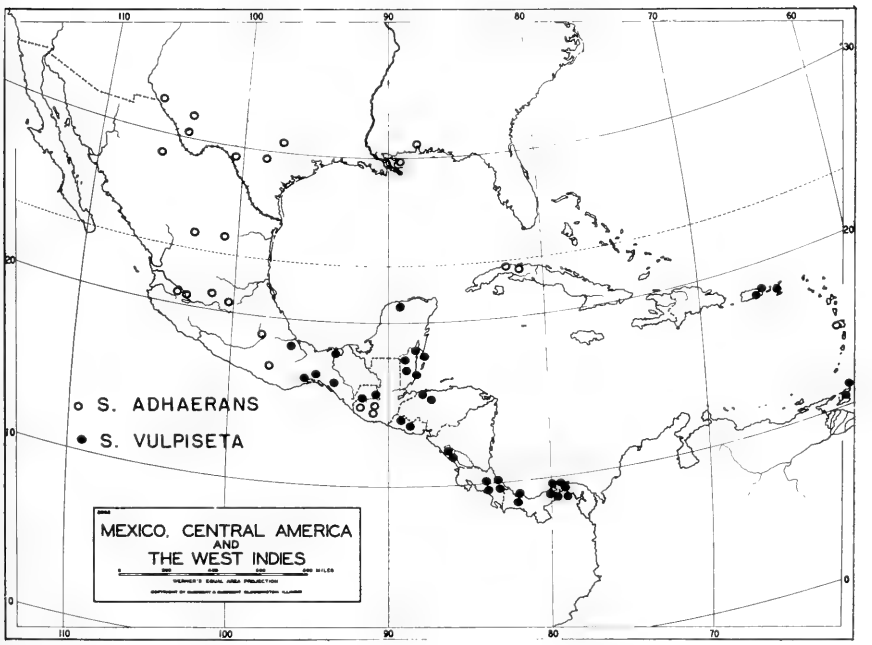
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AND
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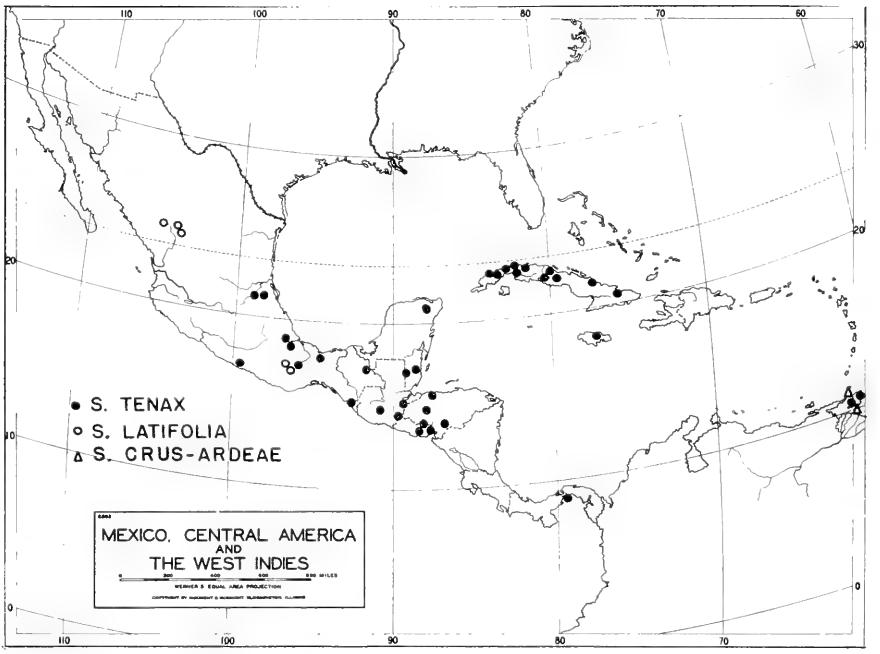
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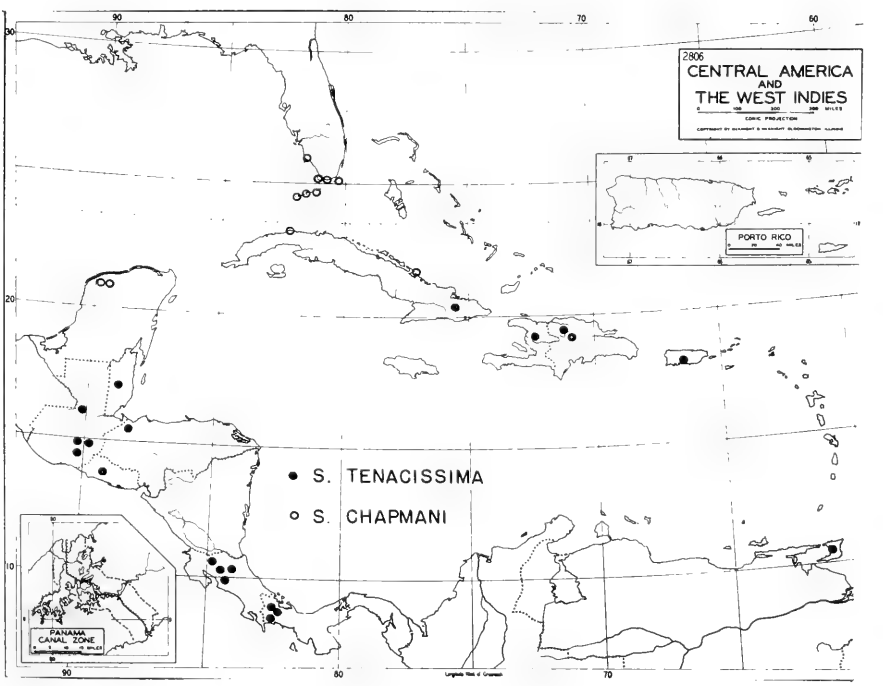
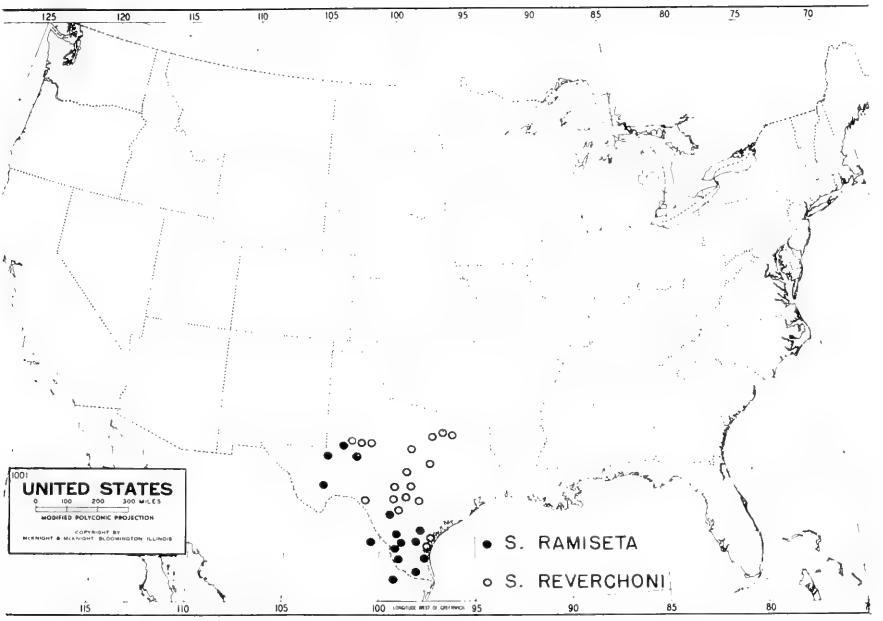
S. CRUS-ARDEAE
MEXICO, CENTRAL AMERICA
AND
THE WEST INDIES

MAP 13


2806
CENTRAL AMERICA
AND
THE WEST INDIES
PORTO RICO
S. TENACISSIMA
S. CHAPMANI
PANAMA
CANAL ZONE

MAP 14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S. RAMISETA
S. REVERCHONI
115
110
105
100
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90
85
80

Map 15

PLATE I. Photograph of *Setaria crus-ardeae* in the Gray Herbarium. Label inscription: "Path through a heavily wooded area at margin of the Trinidad Botanical Gardens, Port of Spain, Trinidad, August 22, 1935, David Potter 5200."

PLATE II. Photograph of paratype of *Setaria arizonica* in the herbarium of the University of Arizona. Label inscription: "Nogales, Arizona, September 10-12, 1930, J. J. Thornber."

PLATE III. Photograph of *Setaria viridis* var. *major* in the herbarium of the University of Illinois. Label inscription: "abundant weed in soy bean field, 2½ miles north of Champaign, Champaign County, Illinois, August 17, 1953, Harry E. Ahles 7478, with G. N. Jones & F. B. Buser."

PLATE IV. Photograph of *Setaria adhaerans* in the herbarium of the University of Illinois. Label inscription: "weed in park, Saltillo, Coahuila, Mexico, July 10-14, 1910, A. S. Hitchcock 5640."

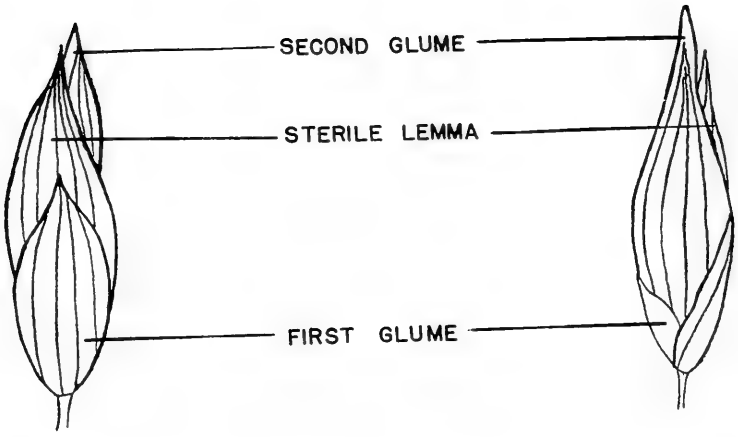


FIG. 1. PANICUM VIRGATUM X 15

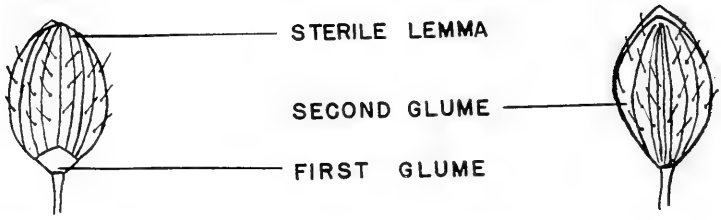


FIG. 2. PANICUM HUACHUCAE X 15

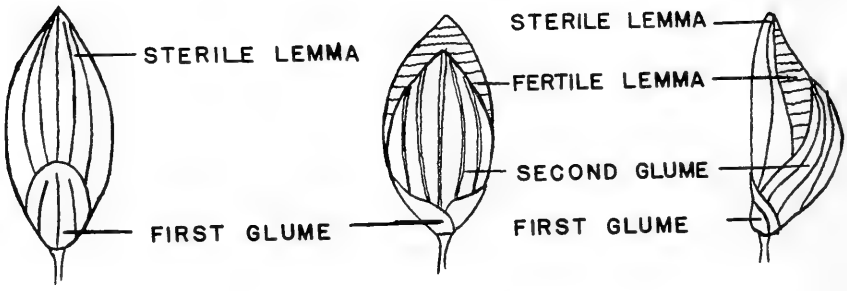
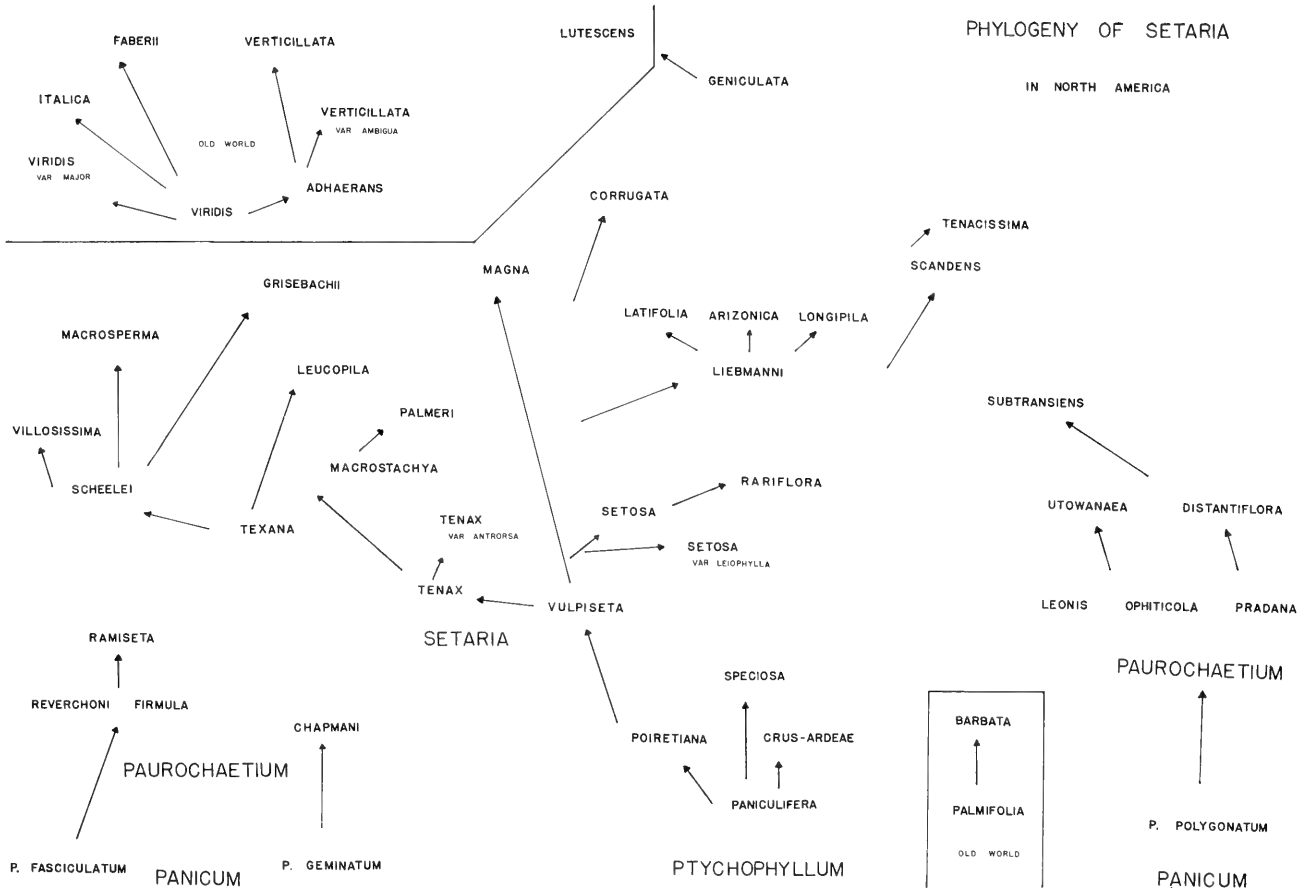


FIG. 3. SETARIA CORRUGATA X 15

PLATE V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GENICULATA
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VERTICILLATA
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VIRIDIS
VAR MAJOR
ADHAERANS
VIRIDIS
CORRUGATA
TENACISSIMA
SCANDENS
MAGNA
GRISEBACHII
LATIFOLIA
ARIZONICA
LONGIPILA
MACROSPERMA
LIEBMANNI
LEUCOPILA
SUBTRANSIENS
PALMERI
VILLOSISSIMA
MACROSTACHYA
SCHEELEI
RARIFLORA
SETOSA
UTOWANAEA
DISTANTIFLORA
TENAX
VAR ANTRORSA
SETOSA
VAR LEIOPHYLLA
TEXANA
TENAX
VULPISETA
LEONIS
OPHITICOLA
PRADANA
SETARIA
PAUROCHAETIUM
RAMISETA
SPECIOSA
REVERCHONI
FIRMULA
BARBATA
CHAPMANI
POIRETIANA
CRUS-ARDEAE
PAUROCHAETIUM
PALMIFOLIA
OLD WORLD
PANICULIFERA
P. POLYGONATUM
P. FASCICULATUM
PANICUM
P. GEMINATUM
PTYCHOPHYLLUM
PANICUM

PLATE VI

INDEX

Accepted scientific names are in roman type; synonyms in italic type; new combinations in capital letters; principal page entry in italic type.

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