

An Approach to the Study of grasses, the "Tribal Triangle"

FRANK W. GOULD

Associate Professor, Department of Range and Forestry, A. & M. College of Texas, College Station, Texas

AGROSTOLOGY, the science of grass classification, is an essential prerequisite to the study and practice of range management. Of prime importance to the range manager is a basic understanding of the kinds, characteristics and qualities of important range grasses. For proper assimilation and retention of information about grasses, it is advisable that the range manager undertake more of a study of agrostology than the mere memorization of names and recognition of specimens. He should become well acquainted with the basic framework of grass classification and should obtain satisfactory concepts of tribes, genera and species, and the interrelationships of these groups.

The Gramineae not only is one of the largest of the families of flowering plants, but it also is one of the most highly specialized in floral characteristics. The familiar grass spikelet is a greatly reduced and contracted flowering branch bearing minute, reduced flowers protected by scale-like floral bracts. The nature of the spikelet and of its parts, and the arrangement of the spikelets in the inflorescence are the principal bases for classification of grasses.

As a systematic science, the study of range agrostology includes three phases: (1) the recognition of vegetative and reproductive structural units; (2) the learning of names and characteristics of the important taxa

(tribes, genera, and species); and (3) the knowledge of the distribution, habitat preference and economic importance of the major range grasses.

This paper is concerned primarily with the second phase, specifically, the taxonomic relationships of the subfamilies and tribes. According to the system of the great American agrostologist, Dr. A. S. Hitchcock, the genera of grasses are grouped into 14 tribes. Ten of these tribes are placed in the subfamily Festucoideae and four in the subfamily Panicoideae. The tribes are comprised of morphologically similar and supposedly closely related genera. Due to lack of knowledge of actual relationships, and because continuous evolutionary processes have produced grasses that do not fit nicely into any taxonomic niche, the placement of some genera in one or another tribe is controversial. Dr. Hitchcock realized that his system was not entirely natural nor com-

pletely satisfactory. In the publication "Genera of Grasses of the United States", Hitchcock (1935) noted,

"Most of the genera of grasses fall naturally into one of the two series of subfamilies. The remaining few are rather arbitrarily assigned to one or the other series. In the same manner, most of the genera may assemble into distinct and well-marked tribes, but several are not closely allied to the other genera in the tribe to which they are assigned but are so placed for convenience in classification."

The "Tribal Triangle" (Figure 1) has been developed to show relationships between the grass tribes of Hitchcock, and to minimize the memorization of series of characters in learning the tribes. Two sides of the Tribal Triangle, the lines separating Area 1 from Area 3 and Area 3 from Areas 2a, 2b and 4b, are based on the major lines of evolution in the grass family:

- (1) the reduction in the spikelet from several perfect florets to one.
- (2) the modification of the inflorescence from a panicle to a spike or a series of spicate branches.

The third side of the triangle represents the principal difference between the subfamilies: the reduction in the spikelet of the Panicoideae to a single perfect floret with a single reduced (staminate or sterile) floret below it. The placement of tribes on the division lines between areas indicates the occurrence of grasses in these tribes with the characteristics of both areas.

Needless to say, although the majority of our range grasses fit well into this scheme, there are exceptions such as tall oatgrass (*Arrhenatherum elatius*), in which the spikelets are 2-flowered with a perfect floret above and a staminate floret below.

In Area 1 of the Tribal Triangle are grouped the most unspecialized and thus hypothetically the most

"primitive" tribes, namely the Bambuseae, Festuceae, and Aveneae. The distinguishing features of these tribes are:

Bamboo tribe, BAMBUSEAE. Culms woody; plants not flowering and fruiting annually.

Oat tribe, AVENEAE. Culms not woody; plants flowering annually; glumes exceeding the lowermost floret; lemmas awned dorsally.

Fescue tribe, FESTUCEAE. Culms not woody; plants flowering

tain groups of the tribe Festuceae. The Zoysieae is a highly "artificial" tribe of tropical and subtropical grasses whose affinities are mainly with the Chlorideae and the Festuceae. The concept of the Zoysieae as herein treated is based on the genus *Hilaria*. The distinguishing features of the three tribes of Areas 2a and 2b are:

Curlymesquite tribe, ZOYSIEAE.

Inflorescence a terminal bilateral spike or spicate raceme; spikelets disarticulating in clusters

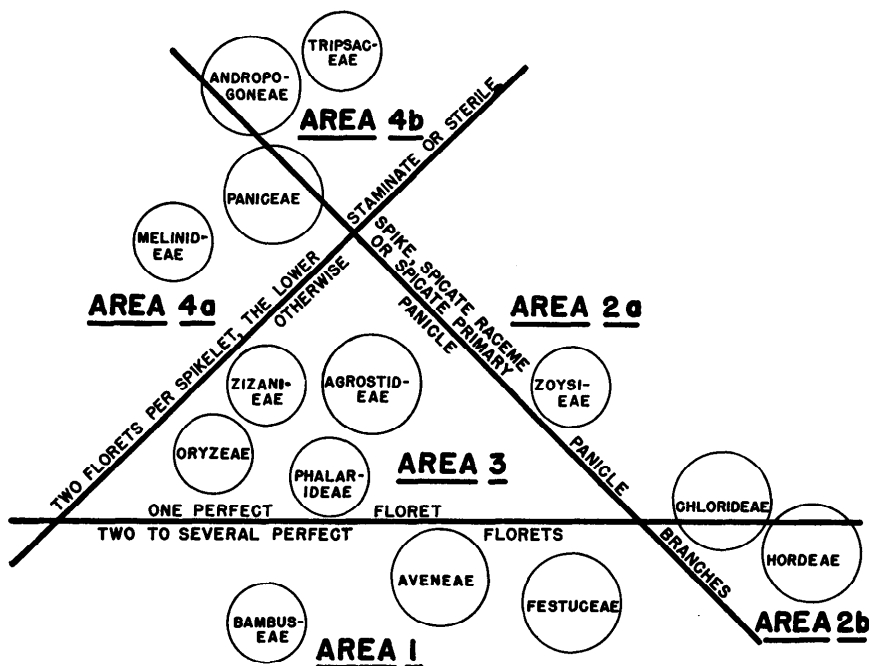


FIG. 1. The Tribal Triangle.

annually; glumes not exceeding the lowermost floret or if so the lemmas not awned dorsally.

In Areas 2a and 2b are those grasses of the Subfamily Festucoideae in which the inflorescence has been reduced to spike, spicate raceme or a series of spicate branches. As this type of evolutionary reduction apparently has taken place independently in a number of relatively unrelated groups, the tribes in this area are not altogether natural, that is, they probably are comprised of both closely related and distantly related genera. Grasses of the tribes Chlorideae and Hordeae are interrelated with cer-

from the continuous inflorescence axis.

Barley tribe, HORDEAE. Inflorescence a terminal bilateral spike or spicate raceme; spikelets falling separately or with joints of a disarticulating inflorescence axis.

Grama tribe, CHLORIDEAE. Inflorescence of two or more (occasionally one) lateral, unilateral spicate branches.

In Area 3 are those grasses of the subfamily Festucoideae with paniculate inflorescences and with a single fertile floret per spikelet. With the exception of the small tribe Phalarideae, the spikelets of these

grasses do not have reduced florets above or below the fertile one. The four tribes of Area 3 may be distinguished as follows:

Canarygrass tribe, PHALARIDEAE.

Reduced florets (staminate or sterile) present below the perfect one.

Timothy tribe, AGROSTIDEAE. Reduced florets not present below the perfect one; spikelets bisexual; glume well developed.

Rice tribe, ORYZEAE. Reduced florets not present below the perfect one; spikelets bisexual; glumes reduced.

Indian rice tribe, ZIZANIEAE.

Reduced florets not present below the perfect one; spikelets unisexual; glumes absent.

The two principal tribes of Areas 4a and 4b, the Paniceae and the Andropogoneae, are relatively "good" tribes, both in respect to morphological characteristics and genetical relationships. The small tribe Tripsaceae, well known for its cultivated maize or corn, *Zea mays*,

has close affinities with the Andropogoneae. Grasses of the subfamily Panicoideae are remarkably uniform in the principal spikelet character—that of the single perfect floret with a single sterile or staminate floret below. The distinguishing features of the tribes in Areas 4a and 4b are:

Millet tribe, PANICEAE. Glumes thinner and less firm than the fertile lemma.

Bluestem tribe, ANDROPOGONEAE. Glumes thicker and firmer than the fertile lemma; spikelets usually in pairs of one perfect and one staminate or sterile.

Corn tribe, TRIPSACEAE. Glumes thicker and firmer than the fertile lemma; male and female spikelets on separate parts of the inflorescence or plant.

Molassesgrass tribe, MELINIDEAE. Glumes and fertile lemma about equal in thickness and firmness.

The Tribal Triangle is presented as an aid to the learning of critical subfamily and tribal characters. No

attempt is made to completely summarize the characteristics of these groups as they are treated thoroughly and adequately by Agnes Chase in her excellent introductory grass study "First Book of Grasses" (1922), and by A. S. Hitchcock in the Manual of Grasses of the United States (1951). The Tribal Triangle follows Hitchcock's classification system and is based on morphological characteristics and lines of morphological evolution. Structural characters, although not always reliable indicators of genetical relationships, provide the best practical basis for grass classification.

LITERATURE CITED

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FIRST KODACHROME SLIDE CONTEST

Eighth Annual Meeting of the American Society of Range Management
San Jose, California, January 25-28, 1955

Society members are invited to enter Kodachrome slides that they have taken in two classes:

1. Range condition class
2. Wildlife of the range

Kodachrome slides may be 2 x 2, or larger, mounted or unmounted. Contestants may enter one slide in each class. Slides will be projected at an evening session. Thereafter,

they will be displayed for competition, with awards for the three slides placed highest in each class and the top slide of the display.

Rules of the photograph contest shall prevail with regard to typed description, contestant's name and address, and his responsibility to take the slides to and from the display booth.

—Les Albee, Chairman, Slide Contest