

A BIOSYSTEMATIC STUDY OF THE  
POLYGONUM PENNSYLVANICUM  
COMPLEX (POLYGONACEAE)

By

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## PREFACE

This study was initiated in the fall of 1980. During the summer of 1981 field work began, but due to some difficulties only preliminary work could be done. In the following summer of 1982, the major part of my research began and I really began to observe the relationships in these species, despite technical difficulties which resulted in few numerical data. Sampling and measuring of herbarium specimens led to analyses that highly supported what I had observed both in the field and greenhouse. There is still considerable opportunity for research, as many facets of these species are still not fully understood; for example, reproduction. I suspect that further investigations will confirm the conclusions of this investigation.

I would like to express my appreciation to those who have served on my committee, Dr. James K. McPherson, Dr. Stanley Fox, and Dr. Arthur J. Pollard, for their advice and assistance during this study.

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## TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION . . . . .	1
II. LITERATURE REVIEW . . . . .	4
Classification and Nomenclature . . . . .	4
Descriptions of Taxa. . . . .	5
Recent Interpretations of This Complex. . . . .	12
Previous Biosystematic Studies. . . . .	12
III. MATERIAL AND METHODS . . . . .	14
Introduction. . . . .	14
Field Studies . . . . .	14
Greenhouse Studies. . . . .	18
Cytological Studies . . . . .	19
Studies of Herbarium Specimens. . . . .	19
IV. RESULTS AND DISCUSSION . . . . .	24
Distribution. . . . .	24
Field Observations. . . . .	24
Greenhouse Observations of Vegetative Morphology. . . . .	26
Reproductive Biology and Phenology. . . . .	28
Cytology. . . . .	34
Morphology and Statistical Analysis . . . . .	35
V. SUMMARY. . . . .	59
Key to Species. . . . .	59
BIBLIOGRAPHY . . . . .	64
APPENDIX . . . . .	68

## LIST OF TABLES

Table	Page
I. Taxonomic Treatments of the <u>P. pensylvanicum</u> Complex . . . . .	2
II. Study Sites of <u>P. bicorne</u> Raf. (B) and <u>P. pensylvanicum</u> L. (P) . . . . .	16
III. Morphological Characters Examined on Herbarium Specimens for Morphological Studies . . . . .	23
IV. Average Height of Greenhouse Populations of <u>P. bicorne</u> Raf. and <u>P. pensylvanicum</u> L. . . . .	27
V. Average Flower and Fruit Set of Greenhouse Populations of <u>P. bicorne</u> and <u>P. pensylvanicum</u> . . . . .	33
VI. Univariate Statistics and Duncan's Multiple Range Test Summary. . . . .	38
VII. Univariate Analysis by Physiographic Regions. . . . .	40
VIII. Stepwise Discriminant Analysis of the Eight Most Discriminating Variables Amongst the Groups . . . . .	46
IX. Classification of Groups Through Discriminant Analysis Using 23 Variables . . . . .	48
X. Classification of Groups Through Discriminant Analysis Using 21 Variables, Excluding Stamen and Style Lengths . . . . .	49
XI. Classification of Groups Through Discriminant Analysis Using the Eight Most Discriminating Variables, Including Stamen and Style Lengths . . . . .	50
XII. Classification of Groups Through Discriminant Analysis Using the Six Most Discriminating Variables, Excluding Stamen and Style Lengths . . . . .	51
XIII. Multivariate Analysis of Variance Between Groups ( <u>P. bicorne</u> and <u>P. pensylvanicum</u> ) . . . . .	52
XIV. Multivariate Analysis of Variance Between Regions (4C, 4G, 5, 6, 7) for <u>P. bicorne</u> and <u>P. pensylvanicum</u> . . . . .	53

LIST OF FIGURES

Figure	Page
1. Study Sites by County of <u>P. bicornе</u> Raf. (B) and <u>P. pensylvanicum</u> L. (P) . . . . .	15
2. States and Provinces From Which Herbarium Specimens Were Examined. Letter Indicates Initial Identification . . . . .	20
3. Collection Location (by state or county) of Each Herbarium Specimen Studied . . . . .	22
4. <u>P. bicornе</u> : Illustration of Achenes and Portions of Shoots.	29
5. Flowers of <u>P. pensylvanicum</u> (top) and <u>P. bicornе</u> (left, pin-flower; right, thrum-flower), Illustrating Differences in Floral Morphology . . . . .	31
6. Drawing of Meiotic Prophase I Chromosomes of <u>P. bicornе</u> (n=28) . . . . .	36
7. Plot of Principal Components 1 and 2 (23 characters) of Group 1 ( <u>P. bicornе</u> --long style), Group 2 ( <u>P. bicornе</u> --short style), and Group 3 ( <u>P. pensylvanicum</u> ) . . . . .	55
8. Plot of Principal Components 1 and 2 (8 most discriminating characters) of Group 1 ( <u>P. bicornе</u> --long style), Group 2 ( <u>P. bicornе</u> --short style), and Group 3 ( <u>P. pensylvanicum</u> ) . . . . .	56
9. Plot of Principal Components 1 and 2 (6 characters, excluding stamen and style lengths) of Group 1 ( <u>P. bicornе</u> --long style), Group 2 ( <u>P. bicornе</u> --short style), and Group 3 ( <u>P. pensylvanicum</u> ) . . . . .	57
10. Plot of Principal Components 1 and 2 (6 characters, excluding stamen and style lengths) of Group 1 ( <u>P. bicornе</u> --long style), Group 2 ( <u>P. bicornе</u> --short style), Group 3 ( <u>P. pensylvanicum</u> ), Group 4 ( <u>P. mexicanum</u> ), Group 5 ( <u>P. omissum</u> ), and Group 6 ( <u>P. mississippiense</u> ) . . . . .	58



## CHAPTER I

### INTRODUCTION

The common names smartweed and knotweed were appropriately coined for members of the genus Polygonum as one has to be intelligently aware of the minute separations between species within this genus that have caused many problems for taxonomists in classification and identification. Six closely related species of the section Persicaria--Polygonum pensylvanicum L., P. bicornes Raf., P. longistylum Small, P. omissum Greene, P. mexicanum Small, and P. mississippiense Stanford--constitute one complex within the genus. It is commonly referred to as the P. pensylvanicum complex. Depending on taxonomic interpretation, as many as six or as few as one species have been recognized. Table 1 illustrates these differences in taxonomic opinion. As can be seen, there is a difference in generic circumscription--Small and Correll and Johnston recognized the section Persicaria at the generic level. There is also a difference in the number of taxa recognized, varying from one to four. When an author recognizes bicornes, longistylum is not recognized and vice-versa. Also, it should be noted that P. pensylvanicum is always included in each treatment. Worthy of special note are Small's treatments. Small revised his 1913 treatment twenty years later in 1933 and omitted Persicaria mississippiense but included Persicaria mexicanum. He had described P. mexicanum in 1892, but did not include it in his 1913 treatment. In

TABLE I

TAXONOMIC TREATMENTS OF THE P. PENNSYLVANICUM  
COMPLEX

Variety	Small 1913	Rydberg 1923	Stanford 1925	Small 1933	Fernald 1950	Steyermark 1963	Correll and Johnston 1963	Waterfall 1972	Dalci 1972	Mitchell 1980
<u>Persicaria:</u>										
<u>bicorne</u> (Raf.) Small							X			
<u>longistyla</u> Small	X			X						
<u>mexicana</u> Small				X						
<u>mississippiense</u> (Stanford) Small	X									
<u>pennsylvanica</u> (L.) Small	X			X			X			
<u>Polygonum:</u>										
<u>bicorne</u> Raf.		X				X		X		
<u>longistylum</u> Small			X		X					
<u>mexicanum</u> Small			X							
<u>mississippiense</u>			X					X		
<u>omissum</u> Greene		X								
<u>pennsylvanicum</u> L.		X	X		X	X		X	X	X

recognizing only one species, Dalci (1972) based his decision on the results of his biosystematic study. Mitchell (1980) also classified all members of the complex in one species, Polygonum pensylvanicum. His treatment appeared in a checklist of names for North America; supporting evidence was not presented.

These problems in taxonomic interpretation are due to the tremendous overlap in morphological features among members of the complex as well as distributional and ecological overlaps. Found in moist or wet, disturbed habitats and in flower from late May to November, all taxa are herbaceous annuals or perennials with alternate simple leaves having ocrea. Usually pink flowers of five perianth segments are arranged in condensed racemes. Each flower has six to eight stamens, two styles, and produces a lenticular achene. Plants of the taxa differ most in overall size, style arrangement, stamen arrangement, and fruit characteristics. Moisture differences may be correlated with these morphological differences (Turesson, 1901; Massart, 1902; Nieuwland, 1911; Stanford, 1925; and Mitchell, 1968).

The objective of this research was to determine the relationships among the taxa of this complex by means of detailed morphological examinations and observations of habitat and distribution. It was hoped that through such detailed studies differences and similarities could be determined and a meaningful classification of these taxa developed. Additional limited studies of the cytology, reproductive biology, and pollination ecology of the taxa were made to complement the morphological and ecological investigations.

## CHAPTER II

### LITERATURE REVIEW

#### Classification and Nomenclature

Polygonum comprises approximately 200 species and is a member of the Polygonaceae, commonly referred to as the buckwheat, knotweed, or smartweed family. The genus was described by Linnaeus in Species Plantarum (1753).

The genus is often divided into sections. For example, in Gray's Manual of Botany (Fernald, 1950) there are six sections: Avicularia, Bistorta, Persicaria, Echinocaulon, Tiniaria, and Aconogonon. Other authors have elevated the sections to generic rank. Small (1913) and Rydberg (1932) treated the species of polygonums as representing several genera of which Persicaria is one. Correll and Johnston (1970) also split them into several genera. Small treated them both ways, positioning them within sections of Polygonum in his 1892 treatment and as several genera in his 1913 treatment.

The species investigated in this study are traditionally classified in the section Persicaria due to their close morphological similarities. Features of this section include: spike-like racemes, four to six perianth segments, six to eight stamens, two or three styles or cleft styles, and a lenticular or trigonous achene. Steyermark (1963), however, placed P. pennsylvanicum and P. bicornis in the section Avicularia. No explanation for this different interpretation was given.

The name Persicaria presents a nomenclatural problem in itself. It is uncertain who first used the name at the generic level. Linnaeus (1753) referred to the subdivisions of Polygonum and used Persicaria. According to Farr et al. (1979) Miller used Persicaria as a genus name in his 1754 Gardener's and Botanist's Dictionary. The 1754 edition was not available to determine whether Miller used Persicaria as a genus name. However, a review of the 1807 edition revealed that Miller was definitely using Persicaria as a sectional name. This confusion is indicated in several taxonomic works. In this work, Polygonum sensu lato is used. Persicaria is treated as a section of Polygonum.

#### Descriptions of Taxa

##### Polygonum pensylvanicum

Polygonum pensylvanicum was described by Linnaeus in 1753. Although the specific epithet appears to be misspelled, it is written as Linnaeus first wrote it, possessing one n rather than two as might be expected. As Fernald (1917) noted, Linnaeus and his contemporaries were following the accepted spelling of their day. Maps of the 18th century generally show the spelling "pennsylvania."

Linnaeus in Species Plantarum described P. pensylvanicum as having flowers arranged in spikes, each flower mounted on a pedicel and possessing eight stamens. The leaves were described as lanceolate, acuminate, and scabrous, and the ocrea as truncate. The peduncles were described as hispid. The habitat of the plant was given as Pennsylvania. One of the more detailed descriptions of this species was given by Britton and Brown in 1896. Their description included the same information given above and also mentioned the annual habit, the

presence of glands on the peduncles and pedicels, and plant heights to three feet. Plants were said to have dark pink to rose-colored, five-parted flowers with eight or fewer stamens and a two cleft style. A lenticular, smooth, shining achene was also described. Their treatment was the first to mention a stamen number of less than eight. Small (1913) in his Flora of Southeastern United States gave a similar description. In "Ferns and Flowering Plants of Nantucket," Bicknell (1909) compared an erect form similar to that of Britton and Brown to another form, a small prostrate plant with a dark mark on the leaves, dense spikes, and large fruits.

In other descriptions of P. pennsylvanicum, similar observations were made. Gray's Manual (Fernald, 1950) described the variation in leaf shape (lanceolate, elliptic, or oval), the variation in pubescence (slightly glandular and hispid to abundantly glandular and sparsely hispid), and the variation in habit (depressed to erect). Fernald specifically noted that the species is highly variable. He further stated that the stamens and styles are usually included, that the flowers are mostly cleistogamous, and that the stamens possess considerable inviable pollen. Correll and Johnston (1970) noted that plants usually had greenish stems and that the styles and stamens were of similar length and produced in white to pinkish flowers, 3.1-4.2 mm long.

Polygonum pennsylvanicum, the most broadly distributed species of those covered in this study, is found throughout the eastern two-thirds of the United States and Canada. Munz and Keck (1959) list P. pennsylvanicum as occurring in California and indicate that it is newly

introduced there. Correll and Johnston (1970) state that P. pensylvanicum is found throughout North America.

Infraspecific taxa of Polygonum pensylvanicum have been described. In 1917 Fernald recognized three varieties--var. genuinum, var. laevigatum, and var. nesophilum. Farwell in 1924 described another variety, viridialbum, and Stanford yet another variety, durum, in 1925. Myers (1942) introduced the variety eglandulosum, while Norton one year later (1943) described var. rosaeflorum. Also three forms of P. pensylvanicum have been used--var. laevigatum f. albineum by Farwell in 1923, var. laevigatum f. pallescens by Stanford in 1925, and f. albinum by Fernald in 1945 (a variety was not cited). Species also have been reduced to varietal status within P. pensylvanicum, e.g., P. Oneillii Brenckle which was reduced by Hulten in 1968. These varieties differ in their habit, amount of pubescence, coloration, and distribution. P. pensylvanicum var. genuinum, found from Mississippi eastward, is believed to have been the form considered by Linnaeus when he described P. pensylvanicum. The variety found from New Brunswick to Colorado is laevigatum and is considered the most common.

The varieties of P. pensylvanicum are based on many of the slight differences previously mentioned. Variety genuinum is described as having leaves that are copiously strigose beneath and often above, ocreae that are eciliate to ciliate, and achenes that are 2.2-2.8 mm wide (Fernald, 1917). Variety laevigatum has leaves which are glabrous, ocreae that are eciliate, and achenes of 2.5-3.5 mm wide (Fernald, 1917). The third variety, nesophilum, described by Fernald in 1917 has stems that are depressed, leaves that are elliptic to oval rather than lanceolate, and peduncles which are very short, unlike the other two

varieties. Variety eglandulosum, described by Myers in 1942, is similar to genuinum but lacks pubescence of any kind which is most atypical of the species. As the epithet implies, variety rosaeflorum is distinguished by the rose color of the flowers. This variety, described by Norton in 1942, also has strigose leaves and large achenes some 3.5-4.0 mm long. Also differing in floral color is variety viridialbum (Farwell, 1923). The flowers of this variety are greenish-white and the peduncles are densely glandular. All of these varieties are known from locations in the northeastern United States. Variety durum, type location in Florida, was described as having appressed hairs on the peduncles, lacking glands, and possessing six rather than eight stamens.

Two of the three forms of P. pennsylvanicum are of the variety laevigatum. Forma albineum Farwell (1923) of var. laevigatum has white flowers, as does forma albinum Fernald (1945). Fernald does not indicate a variety, but there appear to be no differences in descriptions between the two forms albineum and albinum. The third form, forma pallescens, is also within variety laevigatum and has glands that lack the usual red pigment found in the variety.

Polygonum bicornne Raf. and

Polygonum longistylum Small

Polygonum bicornne was described by Rafinesque in 1817. He described it as a species having plants from four to five feet in height with purplish stems and rose-colored flowers. Populations were said to be found growing in swamps, moist grounds, and along rivers, and are visited by bees as their "flowers smell like honey" (Rafinesque, 1817).



The styles were described as exserted and the stamens included with the plants flowering from August to December.

P. longistylum was described by Small in 1894 as an annual or perennial with erect stems 3-6 dm in height. The leaves were described as lanceolate (narrow to ovate-lanceolate). The stamen number was given as varying from six to eight and described as included while the styles, two in number, were described as being exserted. The achene, black in color and dull or shining, was said to be slightly gibbous. Small made no reference to Rafinesque's P. bicornis but stated that P. longistylum resembled both P. pensylvanicum and P. mexicanum in morphology and geography. Small noted that P. longistylum differed in the long style, small, dull achene, and long-petioled, lanceolate leaves.

As Nieuwland (1914) pointed out, the only difference between Rafinesque's description of P. bicornis and Small's description of P. longistylum is in the size of the plants. General distribution--the deep South--is the same for both taxa. Also noted was that these two taxa were the only American members of the section Persicaria to have exserted styles.

Other descriptions of P. bicornis and P. longistylum are similar. Characteristics mentioned for both include glandular abaxial leaf surfaces (Fernald, 1950) and pale pink flowers with the perianth measuring 2.0-2.5 mm in the long-styled form and 3.0 mm in the short-styled form (Stanford, 1925). The achene has been described as umbonate on one side (Waterfall, 1972) or convex on both sides (Steyermark, 1963). Fernald (1950), Steyermark (1963), and Correll and Johnston (1970) all noted the two forms of the flowers--exserted long styles and included short stamens, or included short styles and exserted

long stamens. Stanford (1925) reported that the first form was more fertile, while Fernald (1950) stated the opposite.

P. longistylum var. omisum has glands on the stems as well as on the peduncle. Only the long-styled form was described.

P. bicornis is distributed over a broad area in the central United States. Correll and Johnston (1970) cite it as occurring in California. P. longistylum is described from the central United States. Most descriptions give the distributions of these two species as midwestern and central United States, in particular the south central United States. P. longistylum var. omisum's distribution is given as more westward than other varieties of this species.

Nieuwland (1914) stated that P. longistylum must be considered a nomenclatural synonym of P. bicornis as "...the locality in both cases of publication is the same." Shinnars (1957) agreed with Nieuwland that the taxa were conspecific, a position followed by taxonomists today. Shinnars believed that early American botanists ignored Rafinesque's work because of prejudice and ignorance as they believed he did not look at specimens of the plants when writing his descriptions. Shinnars stated that this was not true. The name P. longistylum persists today due to its use in older manuals such as Gray's. Examination of specimens in this investigation indicates that the binomial P. longistylum is indeed a nomenclatural synonym of P. bicornis, hence P. bicornis will be used hereafter.

#### Polygonum omisum Greene

P. omisum was described by Greene in 1903 as a species with short, erect plants one to two feet tall having glabrous, short leaves. The

deep pink flowers have exserted styles and produce black, shiny achenes. The fruits are described as having one flat and one convex surface. Greene noted that plants of this species had previously been considered to be P. pensylvanicum. A few years later in 1925 Stanford reduced the species to a variety of P. longistylum. P. omissum is described as occurring from Colorado southward.

#### Polygonum mexicanum Small

In 1892, Small described P. mexicanum noting its similarity to P. pensylvanicum. He described a five-parted, light rose-colored calyx in which were found six to eight stamens and a long, two-parted style. The plants were described as three to four feet in height, having linear, lanceolate leaves, and possessing glands on the peduncles and pedicels. The achene was said to be dull, ovate, and lenticular. Stanford's description (1925) of the species included both included and exserted style forms. He noted that the short-styled forms were less fertile and the exserted forms more common.

The major distribution of P. mexicanum is in Mexico with possible occurrences in Louisiana and Texas. Munz and Keck (1959) also cite it in California, although they list it as a synonym of P. pensylvanicum.

#### Polygonum mississippiense Stanford

In 1925 Stanford described simultaneously P. mississippiense and a variety of it. He described P. mississippiense as a species with perennial erect plants having narrow, lanceolate leaves. The flowers were described as heterostylous containing six or seven stamens. The fruit is dull black and convex on both sides. The variety interius is

described as having glandular peduncles unlike peduncles of the type specimen which had appressed hairs lacking glands. Distributions, according to Stanford, are the same for both P. mexicanum and P. mississippiense--from Mississippi to Texas and south to Mexico. Stanford does note that many plants described north of Mexico as P. mexicanum are in fact P. mississippiense. Plants of the variety interius were collected in Oklahoma.

#### Recent Interpretations of This Complex

Recognizing only one species, Dalci (1972) in his biosystematic study reduced Polygonum bicorné to a subspecies of P. pensylvanicum. In his work "The Taxonomy of the Section Persicaria (Tourn.) L. in the Genus Polygonum in the United States East of the Rocky Mountains" he described two subspecies of P. pensylvanicum--subsp. pensylvanicum and subsp. bicorné. On the basis of field and greenhouse studies he positioned P. pensylvanicum var. durum within subspecies pensylvanicum. Within subspecies bicorné he placed P. longistylum, P. omissum, P. pensylvanicum var. laevigatum, and P. pensylvanicum forma albinum.

Mitchell, who has published several papers on Polygonum, grouped all of the members of the complex into one species in his 1980 treatment of the genus in A Synonymized Checklist of the Vascular Flora of the United States, Canada, Greenland, Vol. II: The Biota of North America. He presumably based his conclusions on Dalci's study.

#### Previous Biosystematic Studies

The descriptions presented above illustrate the close similarities in morphology of the members of the Polygonum pensylvanicum complex and

taxonomists have commented repeatedly on these similarities. Although comments are many, biosystematic research which might resolve the problems is limited.

Dalci (1972) conducted limited hybridization experiments and morphological studies on P. pensylvanicum and P. bicornis. Attributing differences in morphology between the two taxa to genetic variation and low levels of outcrossing, Dalci reduced P. bicornis to a subspecies of P. pensylvanicum.

Cytological information is also sparse: chromosome numbers of only one native and five introduced species of the section Persicaria had been reported by 1978 according to McDonald (1978). He obtained chromosome counts of  $2n=20$  or  $40$  for four additional species (P. setaceum, P. hirsutum, P. opelousanum, and P. hydropiperoides). Löve and Löve (1982) reported several new counts for members of the section, including the first count for P. pensylvanicum,  $2n=22$ . Prior to this study no count had been made of P. bicornis or other members of the complex. The base numbers of chromosomes for Polygonum are 10, 11, and 17 (Darlington and Wylie, 1955).

A few pollination studies or observations have been made on some species (Robertson, 1928; Dalci, 1972). Doida (1968) studied pollen in the genus and noted that the number of grains per pollen-sac varies from 4 to 8, 16, 32, 64, 128, or 256. Germination studies of the achenes of P. pensylvanicum have been conducted and problems in germination discovered (Ransom, 1935; Everson, 1949; Timson, 1965).

## CHAPTER III

### METHODS AND MATERIALS

#### Introduction

Initial field observations of plants identified as Polygonum bicorne in Payne County, Oklahoma, were made in the fall of 1980. Fruits were collected for germination studies. No preliminary field observations were made of P. pensylvanicum. The major divisions of the research embodied in this thesis include field studies, greenhouse studies, and an examination of herbarium specimens. The last was the most extensive part of this research.

#### Field Studies

Field studies were begun during the summer of 1981 and were conducted also during the summers of 1982 and 1983. Populations of Polygonum were located in Oklahoma, Texas, Kansas, and Arkansas via an examination of herbarium labels and many of the sites were then visited. Additional populations were also located. Major study sites are shown in Figure 1 and detailed descriptions given in Table II.

As populations were discovered, the plants were identified as either P. pensylvanicum or P. bicorne based on the distinguishing characters of style length and achene shape. Features of the habitat, habit of the plants, vegetative and floral morphology of the plants, and phenology were observed. Floral observations included the spatial



TABLE II  
 STUDY SITES OF P. BICORNE RAF. (B) AND  
P. PENNSYLVANICUM L. (P)

Population Number	County	State	Legal Description	Specific Location
82 (P)	Bryan	Oklahoma	R9E T5S Sec 21	1.4 mi. N. of Jct. OK 78 and OK 48 on OK 48 at Blue River, east side
87 (B)	Jefferson	Oklahoma	R4W T6S Sec 25	11.9 mi. S. of Jct. U.S. 70 and OK 89 on OK 89; Mud Creek, east side of Hwy
99 (B)	Payne	Oklahoma	R2E T19N Sec 16	Stillwater, 500 yds. east of Cow Creek and 0.5 mi. N. of OK 51; OSU Agronomy Farm, roadside ditch
101 (B)	Payne	Oklahoma	R2E T19N Sec 16	Stillwater, 200 yds. east of Cow Creek and 0.6 mi. N. of OK 51; OSU Agronomy Farm, edge of plowed field
108 (B)	Payne	Oklahoma	R2E T19N Sec 15	Stillwater, 0.2 mi. S. of McElroy Street on Western Avenue; west side of road in a field
109 (B)	Payne	Oklahoma	R3E T19N Sec 17	3.0 mi. E. of Jct. OK 51 and U.S. 177 on OK 51, just east of Brush Creek, north side in a field
110 (B)	Payne	Oklahoma	R1W T19N Sec 3	0.1 mi. N. of Stillwater Creek on OK 86; 2 mi. N. of Jct. OK 51 and OK 86, field
115 (B)	Payne	Oklahoma	R2E T18N Sec 36	Perkins, OSU Experimental Farm, 0.1 mi. E. of Jct. U.S. 177 and OK 33 on OK 33; twin lakes



TABLE II (CONTINUED)

Population Number	County	State	Legal Description	Specific Location
116 (B)	Cleveland	Oklahoma	R2W T9N Sec 19	Norman, S.W. of corner of OK 77 (Porter Ave.) and Rock Creek Road, crystal
133 (B)	LeFlore	Oklahoma	R24E T5N Sec 6	7.4 mi. S. and W. of Jct. of U.S. 270 and U.S. 271; 7 mi. S.W. of Wister; Victor Group Camp Area along back side of Lake Wister
136 (P)	Washington	Arkansas	R30W T15N Sec 16	0.4 mi. S.E. of Greenland on U.S. 71 at bridge of Westfork Creek, south side
143 (P)	Washington	Arkansas	R30W T17N Sec 33	Fayetteville, Univ. of AR Agronomy Stn., 0.2 mi. S. of U.S. 71 and AR 112 on AR 112, then 0.7 mi. E. of AR 112 at ponds
146 (P)	Benton	Arkansas	R31W T21N Sec 23	Bellevista, 0.4 mi. S.W. of U.S. 71 and AR 340 on AR 340; creek by golf course
147 (P)	Madison	Arkansas	R27W T18N Sec 28	War Eagle Creek, 3.0 mi. S. of Jct. AR 12 and AR 45 on AR 45 under bridge
148 (P)	Carroll	Arkansas	R23W T21N Sec 28	1.8 mi. N. of Oak Grove and Jct. of AR 21 and AR 103, then on dirt road 0.2 mi. N., in sandy ditch

relationship of the essential organs, perianth opening and closing times, time of anther dehiscence, floral color, and fruit set. Other observations included those of insect visitors and putative pollinators as well as associated species.

When available, fruit and floral buds were collected for later germination and cytological studies. Floral buds were fixed in the field in 95% ethyl alcohol and glacial acetic acid (3:1 ratio) and later preserved in 70% ethyl alcohol until use (McClintock, 1929). At three locations, bagging and pollen transfer techniques were employed in studies of the reproductive system.

At each study site three or four plants were dug and transplanted into pots for further study. In 1981 collected plants were taken to the University of Oklahoma Biological Station on Lake Texoma, while plants collected in 1982 were transported to greenhouses at Oklahoma State University. Also, at each site three or four flowering specimens were collected and field-pressed for later morphological study.

#### Greenhouse Studies

Plants collected at each study site were transported to the OSU greenhouses where the growth, habit, and reproductive characters of each could be examined closely.

Floral buds were collected at various times during the day from each plant and preserved for later pollen and cytological examinations.

Daily observations were made of the times of flower opening and closing as well as times of flower dehiscence. Leaf and plant size, numbers of flowers per inflorescence, floral color, and fruit set were also observed.

Crossing studies were conducted by collecting pollen with a fine bristled paint brush and transferring the grains to the stigma. Flowers receiving pollen were emasculated before anther dehiscence. Crosses were made between flowers of the same plant, between flowers of different floral forms of the same species, and between flowers of different species.

Root tips were collected from the potted plants for cytological study. Collection was facilitated by exposed root tips as the roots grew out of the pots. The roots were fixed in the same manner as the floral buds.

#### Cytological Studies

Root tips and floral buds, collected as described, were squashed and stained using the aceto-carmin technique (McClintock, 1929). Phase-contrast microscopy was used to examine the karyotypes and meiotic behavior. Observations of pollen grains were also made with phase-contrast microscopy.

#### Studies of Herbarium Specimens

As noted in the preceding chapter, the species of the P. pensylvanicum complex occur throughout most of the United States as well as parts of Canada and Mexico. Herbarium specimens of each species were examined. The specimens were selected to represent the total distributional range. The physiographic divisions of North America were used as a means of subdividing the area to insure adequate sampling (Hunt, 1967; Fig. 2). Using this method of study, specimens from a wide range of environmental conditions could be examined and the variation

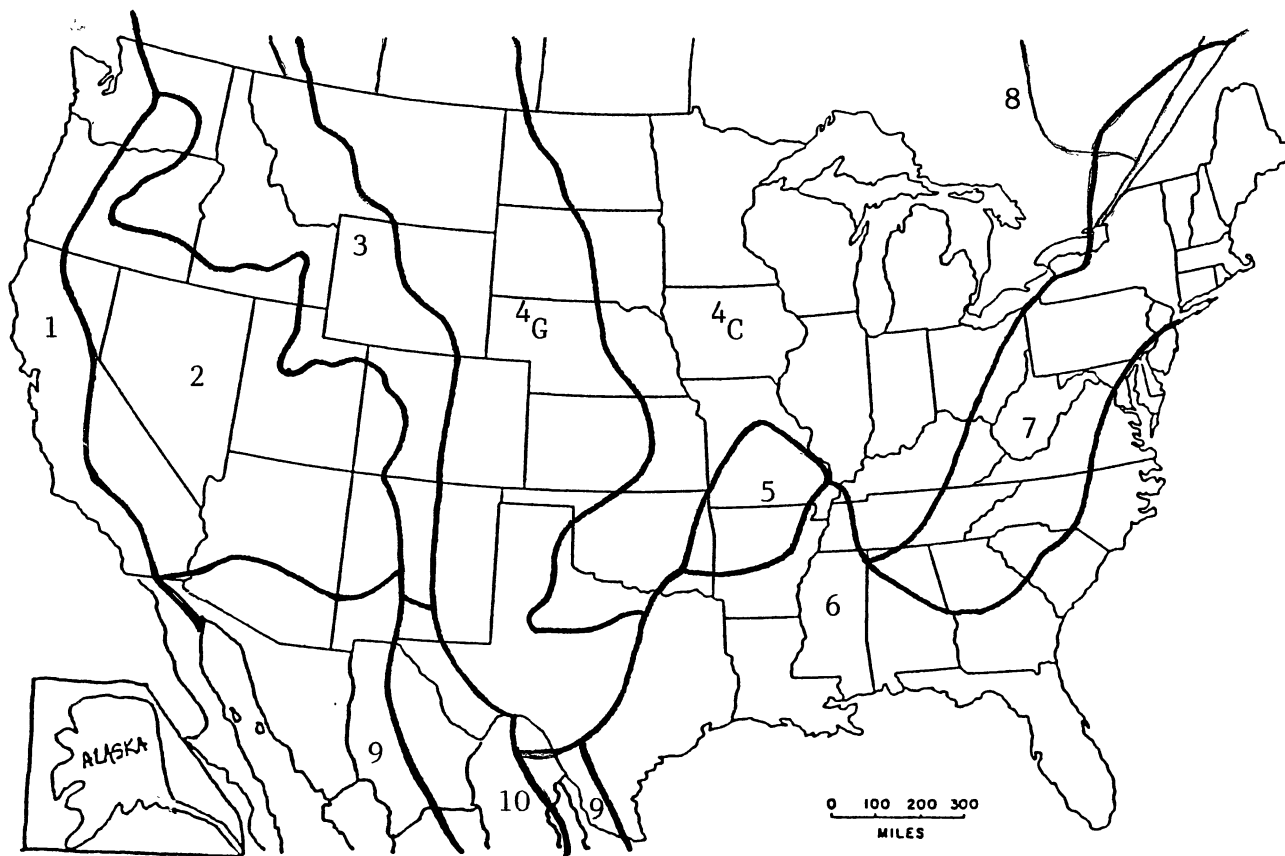


Figure 2. Physiographic Divisions (Hunt, 1967)\*

- |                                  |   |
|----------------------------------|---|
| 1. Pacific Mountain System (1)   | 6. Gulf-Atlantic Coastal Plains (83)          |
| 2. Intermontane Plateaus (5)     | 7. Appalachian Highlands (48)                 |
| 3. Rocky Mountain System (2)     | 8. Laurentian Upland (Canadian<br>Shield) (5) |
| 4. C-Central Plains (111)        | 9. Mexican Plateaus (10)                      |
| G-Great Plains (96)              | 10. Sierra Madre (8)                          |
| 5. Ozark-Ouachita Highlands (33) |   |

\*Number of specimens sampled from each region is indicated in parentheses

exhibited by each species described and understood. Two thousand, two hundred fifty-eight specimens were borrowed from the following herbaria: Missouri Botanical Garden (MO), U. S. Herbarium (US), Southern Methodist University (SMU), University of Nebraska (UN), Gray Herbarium (GRA), New York Botanical Garden (NY), University of Kansas (KU), and University of Oklahoma (OKL). In addition, specimens at Oklahoma State University (OKLA) were used.

The herbarium specimens were sorted according to physiographic regions. Samples were then drawn randomly. Care was taken to represent the entire distributional range within each. The number of specimens examined for each region are given in Figure 2. The longitude and latitude of each specimen were determined. The states and provinces from which herbarium specimens were examined are presented in Figure 3.

In the morphological studies, three hundred seventy-seven specimens were examined. Each specimen was measured or scored for 23 characters--sixteen quantitative and seven qualitative characters (Table III). Additionally, twenty-seven specimens which initially had been identified as P. mexicanum, P. mississippiense, and P. omissum were scored for six characters subsequently determined to be the most discriminating. Univariate and multivariate analyses were conducted on these data using an IBM computer and the Statistical Analysis System (SAS) of Helwig and Council (1979). The analyses included F statistics, Duncan's Multiple Range Test, MANOVA (Multivariate Analyses of Variance), Step-wise Discriminant Functions Analyses, and Principal Component Analyses.

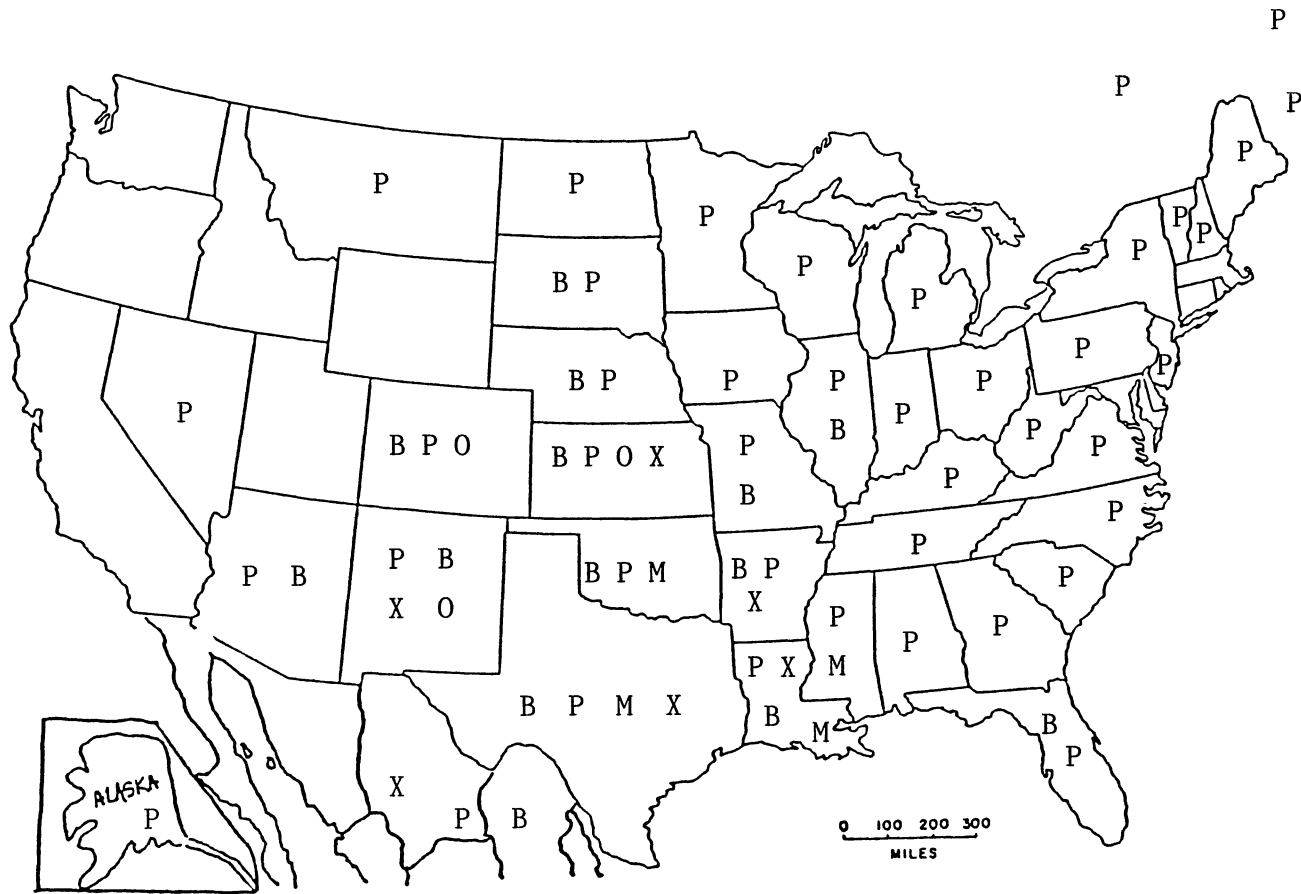


Figure 3. States and Provinces From Which Herbarium Specimens Were Examined. Letter Indicates Initial Identification

Legend: B = *P. bicornis*

P = *P. pensylvanicum*

M = *P. mississippiense*

O = *P. omissum*

X = *P. mexicanum*

TABLE III

MORPHOLOGICAL CHARACTERS EXAMINED ON HERBARIUM  
SPECIMENS FOR MORPHOLOGICAL STUDIES

Characteristics		
Quantitative Characteristics	Vegetative	Blade length Blade width Petiole Ocrea length Internode length
	Reproductive	Peduncle length Inflorescence length Inflorescence width Pedicel length Ocreolae length Perianth length Perianth width Stamen length Style length Achene length Achene width
Qualitative Characteristics	Vegetative	Leaf hairs (0-absent, 1-common, 2-abundant) Ocrea hairs (0-absent, 1-common, 2-abundant)
	Reproductive	Stamen number Peduncle pubescence (no./mm <sup>2</sup> ) Peduncle glands (absent-0; present-1) Achene shape (flat-0; convex-1; umbonate-2) Ocreolae hairs (absent-0; present-1)

## CHAPTER IV

### RESULTS AND DISCUSSION

#### Distribution

On the basis of the evidence presented in the following paragraphs, two species, Polygonum pensylvanicum L. and P. bicornе Raf., are recognized. The binomial P. longistylum Small is considered a nomenclatural synonym of P. bicornе. P. omisum, P. mississippiense, and P. mexicanum are considered conspecific with P. bicornе. To facilitate presentation and comprehension of the data, all comments will focus on P. pensylvanicum and P. bicornе unless specifically noted otherwise.

Initial field and greenhouse observations were crucial in understanding the patterns of morphological variation and thus will be presented first, followed by the analyses of morphology.

#### Field Observations

The habitat most often given for these species includes semi-aquatic conditions. They are found in waste places where the soil is not well drained. Rivers, ponds, creeks, roadside ditches, irrigation ditches, and low-lying agricultural fields are the major sites of population occurrence.

There are several factors that contribute to the difficulty in locating populations. Moisture availability often regulates the



abundance and period of growth of the plants. The species occur in low areas in disturbed habitats which are often flooded by heavy spring and early summer rains. If flooded, their growth begins much later. On the other hand, if temperatures are high and little or no rain has fallen, germination and growth are limited, if they occur at all.

While along creeks and rivers flooding is a problem, in the other major habitats--roadside ditches and edges of plowed fields--mowing and plowing are the most frequently encountered difficulties.

Another major factor that made populations difficult to locate is the appearance of aggressive weedy species which tend to take over areas once flourishing with Polygonum. Upon returning to several of the localities where populations of the P. pensylvanicum complex were studied initially, it was discovered that the plants were no longer there. The sites had been invaded by such plants as Helianthus annuus, Rhus glabra, Rumex crispus, and Lythrum lanceolatum.

There appear to be differences in the habitats of P. bicornne and P. pensylvanicum with the former occurring in open areas and the latter being located in rockier, less open sites. P. bicornne was found in areas with little canopy such as creek beds, ponds, and plowed fields. The soil usually had a high clay or high sand content. When present P. bicornne usually occurred in abundance, often dominating the area. Species associated with populations of P. bicornne included Solanum elaeagnifolium, Sorghum halepense, Echinochloa crus-galli, Chenopodium sp., and Bromus japonicus. In the field plants of P. bicornne were tall (20-120 cm) and erect.

P. pensylvanicum was found most often along creeks with some canopy. In open areas, it was found around ponds and in roadside

sites, plants did not appear to dominate the area and rarely occurred in abundance. The major species associated with P. pensylvanicum often were other polygonums--P. lapathifolium, P. persicaria, P. hydropiperoides. Other species included those previously mentioned for P. bicornis as well as Rhus radicans, Coreopsis tinctoria, Lythrum lanceolatum, and Sambucus canadensis. The growth form of P. pensylvanicum in the field was short (20-100 cm) and decumbent.

#### Greenhouse Observations of Vegetative Morphology

One of the purposes of bringing individual plants of each species into the greenhouse was to observe and compare their morphology and growth in the same environment. Differences in vegetative morphology noticed in the field were supported by the observations made in the greenhouse.

Differences in the heights of greenhouse populations are presented in Table IV. Plants of P. bicornis were tall and erect in the greenhouse. Plants of P. pensylvanicum were much shorter and more decumbent than those in the field. Most floras (Correll and Johnston, 1970; Fernald, 1950) give similar heights (1-20 dm) for both species.

Although pubescence has been used to separate varieties and even species (Small, 1892; Stanford, 1925), the pubescence of the leaves, stems, and peduncles was observed to vary. There appeared to be no consistency among plants of a population in the amount of pubescence. Kubetin and Schaal (1979) reported that plants of P. pensylvanicum further from water exhibited heavier pubescence and leaf spots. They

TABLE IV  
 AVERAGE HEIGHT OF GREENHOUSE POPULATIONS OF  
P. BICORNE RAF. AND P. PENNSYLVANICUM L.

Species	Population Number	Number of Plants	Average Height (m)
	99	5	1.50
	101	13	1.15
	108	8	1.78
<u>P. bicornne</u>	109	9	1.62
	110	11	1.37
	115	13	1.64
	133	17	0.93
	145	4	0.75
<u>P. pensylvanicum</u>	147	18	0.63
	148	13	0.58
	150	3	0.84

suggested that the individuals of the populations were genetically similar and that differences were due to phenotypic plasticity.

P. bicornis has narrow, lanceolate leaves (Fig. 4), while P. pensylvanicum has much broader, lanceolate leaves. This was observed in the field and also in the greenhouse. The differences in the size of leaves of these species indicated that leaf size might be a major vegetative character that could be used to separate the species. The leaf spots mentioned by Kubetin and Schaal (1979) were found on some plants.

Stem coloration has often been used to distinguish species of Polygonum. Plants of P. pensylvanicum usually exhibited green stems, while those of P. bicornis ranged from green to more often red.

Other vegetative characters were similar and of little use in separating the species when floral features were not available.

#### Reproductive Biology and Phenology

Floral features have been used most often to separate the species of the complex (Stanford, 1925b). The flowers of all individuals were typically polygonaceous. All had five, free perianth segments. Those of P. bicornis were almost always bright pink, while the flowers of P. pensylvanicum ranged from white to dark pink or reddish-pink. In one population of P. pensylvanicum all colors were seen; normally, plants of each population were very similar in color. Plants flowered from June through November. P. bicornis consistently had eight stamens, while P. pensylvanicum had six, seven, or eight. Both species possessed a two-cleft style and nectaries around the ovary at the base of the stamens.

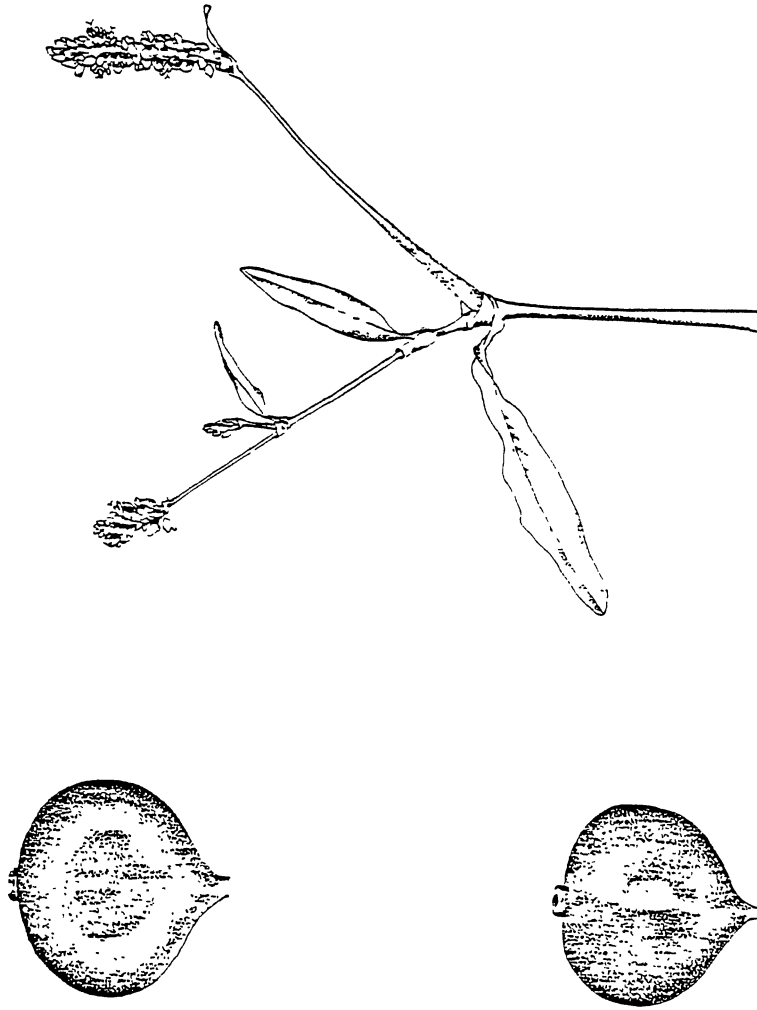


Figure 4. Polygonum bicorne: Illustration of Achenes and Portions of Shoots

Heterostyly<sup>1</sup>, a genetically controlled floral polymorphism in which a species produces flowers which differ in style and stamen lengths and are self-incompatible, is characteristic of P. bicorne. In all field observations of P. bicorne the long-styled and the short-styled morphs were present in each population. The ratio of forms was essentially 50:50 which is in agreement with Ornduff's observation (1971) that, in general, both forms are found in equal numbers in plants exhibiting heterostyly. The long-styled, or pin-form, had styles exerted beyond the perianth and possessed short, included stamens. The short-styled, or thrum-form, possessed long, exerted stamens and short, included styles. The flower forms of P. bicorne are illustrated in Figure 5.

In contrast to the heterostylous condition of P. bicorne, all individuals of P. pensylvanicum had styles and stamens that were of nearly equal length and not exerted beyond the perianth (Fig. 5). P. pensylvanicum is described as cleistogamous and self-compatible (Dalci, 1972; Stanford, 1925; Meehan, 1889); open flowers, however, were observed in this study.

In the field, fruit set appeared high for both species although percentages are not available because of problems in maintaining field populations; however, this was not the case in the greenhouse studies

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<sup>1</sup>An excellent explanation of heterostyly is given by Ganders (1979). He states that taxa have two forms only; rarely does an intermediate form exist. Also, rarely are heterostylous individuals self-compatible. Pin plants are homozygous recessive (ss) and thrums are heterozygous (Ss). This explains the equal numbers of the two forms in a population. According to Gander, the heterostyly mechanism "...increases disassortive pollination and results in assymmetric pollen flow in populations." Pollination, not just self-compatibility, must be considered in understanding the mechanism of heterostyly.



Figure 5. Flowers of P. pennsylvanicum (top) and P. bicorne (left, pin-flower; right, thrum-flower), Illustrating Differences in Floral Morphology

(Table V). Plants of P. pensylvanicum had high fruit set, while plants of P. bicorne had low fruit set. Such results are expected due to the self-compatibility of P. pensylvanicum and the self-incompatible flowers of P. bicorne. The formation of fruits by the plants of P. bicorne is likely due to the fact that insects were not completely excluded from the building. Fruit set may also be due to accidental cross-pollination that may have occurred as the plants were moved from one greenhouse to another and the close proximity of the plants to each other.

Observations of the pollination ecology of P. bicorne and P. pensylvanicum were made in the field; most were similar to those reported by Robinson (1928). Bumblebees (Bombus spp.) were frequent visitors, along with wasps, other bees, and flies. Monarch butterflies were observed on P. bicorne, and a few other moths and butterflies were also observed. Only the bees, wasps, and flies appeared to be gathering nectar. Flowers were visited in early to late morning by most insects. Robinson (1928) listed 98 insects visiting P. pensylvanicum. Insects observed by him and in this study included: Bombus separatus, Bombus americanorum, Halictus parallelus (Hymenoptera), Eristalis aenus and Eristalis tenax (Diptera), and Chrysophanus, Eurymus, and Vanessa atalanta (Lepidoptera). Robinson observed only one member of the order Coleoptera on P. pensylvanicum. The species observed was Chauliognathus pennsylvanica, the goldenrod soldier beetle. In the studies of this research two members of the Coleoptera were observed on plants of P. pensylvanicum. These observations included the goldenrod soldier beetle as well as the long snout beetle (Curculionidae). The larva of the long snout beetle was observed making its home in the stem of the plant. Neither of these beetles was observed on P. bicorne.



TABLE V

AVERAGE FLOWER AND FRUIT SET OF GREENHOUSE  
POPULATIONS OF P. BICORNE AND  
P. PENNSYLVANICUM

Species	Population Number	Number of Plants	Avg. Number of Inflorescences Per Plant	Avg. Number of Flowers per Inflorescence	Avg. Number of Fruits per Plant	Range Number of Fruits per Plant
	99	7	140	20	19	2-49
	101	14	73	--	8	0-37
	108	11	100	16	34	1-160
<u>P. bicorne</u>	109	15	89	--	45	1-223
	110	19	106	19	47	2-208
	115	16	85	15	13	0-51
	133	22	149	25	38	0-202
	145	3	130	25	1297	1854-3402
<u>P. Pennsylvanicum</u>	147	18	127	32	2461	994-3942
	148	9	70	25	1599	540-3864
	150	3	128	31	2663	2054-3456

Flowers of both species opened between 08:30 and 11:00 hours C.D.T. in the field as well as in the greenhouse. They closed between 16:30 and 18:00 hours C.D.T. Flowers of P. bicorne opened fully with the perianth tips extending outward from the center of the flower, while flowers of P. pensylvanicum opened only about three-fourths of the way with the perianth tips pointed inward toward the center of the flower. The flowers of both species remained opened one or two days. Flowers of P. bicorne typically remained opened longer. The degree and length of flower opening is correlated with the reproductive mode: cross-pollination versus self-pollination.

Determination of anther dehiscence was difficult. The anthers of P. pensylvanicum generally dehisced prior to flower opening; occasionally dehiscence occurred as the flower opened or after. This observation supports reports of cleistogamy in this species. P. bicorne was found to have anthers dehiscing at almost any time, but most often 30-90 minutes after flower opening. The number of pollen grains per locule differed between the two species. P. pensylvanicum has fewer than 19 per locule, while P. bicorne had more than 32 per locule. Attempts to determine the time of stigma receptivity were not successful.

Achene morphology was different in each species. The achene of P. bicorne was convex or umbonate (Fig. 4) while that of P. pensylvanicum was larger and flat.

#### Cytology

Mitotic chromosome counts from root tips of plants grown in the greenhouse or from germinating achenes could not be obtained. The small size of the roots prevented successful squashing and resolution of

cytological configurations. In future studies, it may be advantageous to grow the germinating seedlings in a liquid medium before maceration to increase the size of the roots.

Collecting material for meiotic chromosome studies was also difficult. The appropriate stage for collection is the very young floral bud that is still subtended by the ocreolae. The entire bud was squashed due to its tiny structure. Suguira (1936) also reported the same difficulty in obtaining counts for Polygonum.

P. bicorné was observed to have a chromosome number of  $2n=56$ . Counts were obtained from one bud. In the slide eleven pollen mother cells were observed. Three cells had 28 bivalents (Fig. 6), two cells had 26 bivalents, and one cell had 27 bivalents. In the other five cells counts were not obtained. This would indicate a somatic chromosome number of 56, 52, or 54. Meiotic configurations analysed were in diakinesis.

The chromosome number of P. pennsylvanicum is reported to be  $2n=22$  (Löve and Löve, 1982). Additional counts of P. pennsylvanicum were not obtained in this study. Base numbers for the genus are ten, eleven, and seventeen (Darlington and Wylie, 1955). The somatic chromosome number of 56 for P. bicorné suggests a base of seven or fourteen. Additional cytological work is needed.

### Morphology and Statistical

#### Analysis

In order to understand the morphological variability of the members of the complex, extensive studies of herbarium specimens from most of the United States, Canada, and Mexico were conducted. Many herbarium

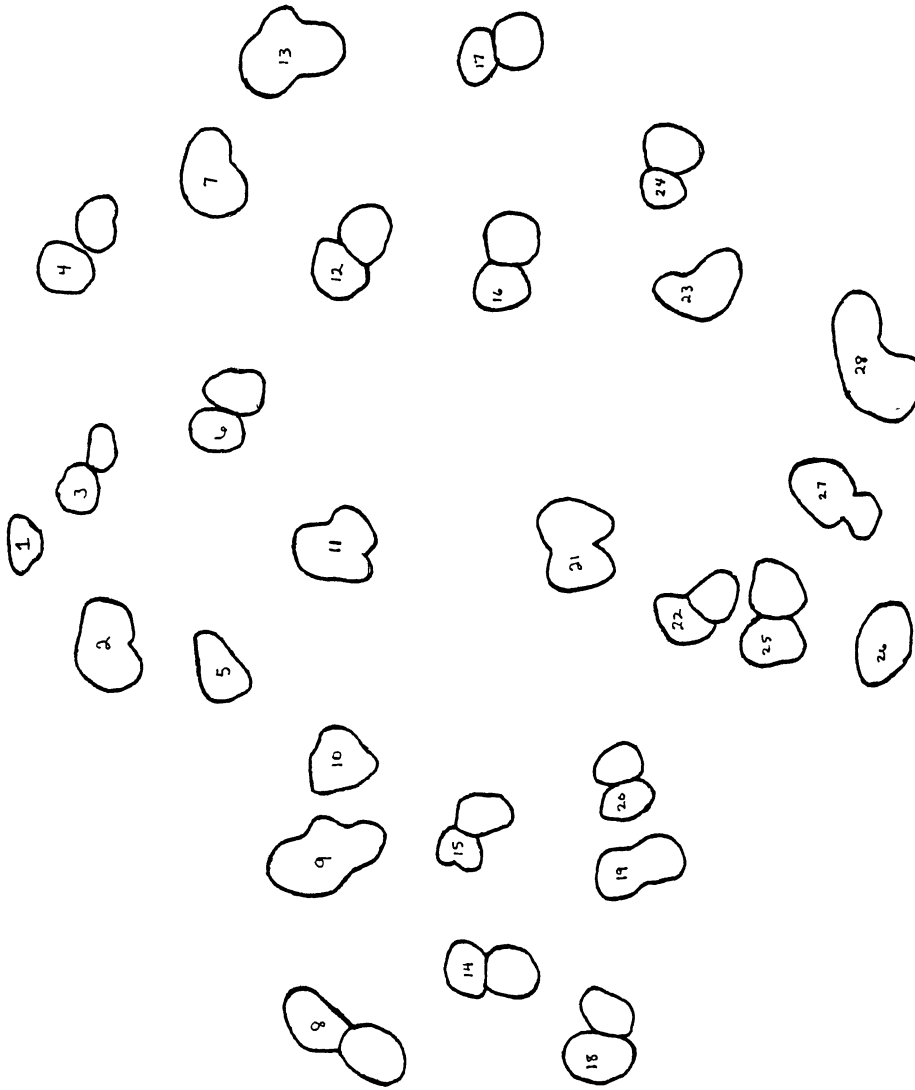


Figure 6. Drawing of Meiotic Prophase I Chromosomes of P. bicorne (n=28)

specimens of P. lapathifolium and P. persicaria were misidentified as members of this complex. It was noted that several specimens used in Dalci's 1972 study of the complex were misidentified which leads one to believe that his decision to recognize one species P. pensylvanicum had been made in haste.

Univariate analyses were conducted in order to ascertain the variability of each character throughout the range of the species. Variation for each character was large (Table VI). Intra-regional variation is presented in Table VII.

Duncan's Multiple Range Test is a mean separation procedure and was used to compare long and short-styled forms of P. bicorne and P. pensylvanicum (Table VI). Of the twenty-three characters, eleven separated the two species. Of these characters, blade width and length, stamen length, style length, and achene length, width, and shape had been used in separating these species in the field during this study. Pedicel length also separates the taxa. The pedicels are shorter in P. pensylvanicum. Pedicels have been shown to be of differing lengths depending on reproductive mechanisms (Hickmann, 1982).

Multivariate analyses were used to better understand an individual character's relationship to all other features. Stepwise Discriminant Analysis is a multivariate analysis technique to determine the most discriminating characters. It also permits a comparison of the positioning of individual plants by statistical means with that of the taxonomist. Table VIII lists the most discriminating characters for these species. Table IX shows that when using all characters only five specimens were repositioned. Plants initially identified as P. pensylvanicum were identified in the discriminant analysis as P. bicorne

TABLE VI  
UNIVARIATE STATISTICS AND DUNCAN'S MULTIPLE  
RANGE TEST SUMMARY

Character	Duncan Grouping	Mean (mm)	Range (mm)	Number in Group	Group*	Taxonomic Comments
Blade length	A	101.8	15.1-202.0	224	3	Separation into two species
	B	71.8	24.1-156.7	84	2	
	B	69.9	27.9-129.0	67	1	
Blade width	A	20.6	4.6- 48.2	224	3	Separation into two species
	B	13.4	5.4- 25.9	67	1	
	B	13.3	5.0- 26.7	84	2	
Petiole length	A	12.6	2.4- 36.3	224	3	Overlap
	AB	11.0	2.8- 20.9	67	1	
	B	10.4	3.0- 21.1	84	2	
Ocrea length	A	10.4	3.2- 24.0	224	3	Separation into two species
	B	7.0	2.5- 16.4	67	1	
	B	6.8	2.3- 18.5	84	2	
Internode length	A	54.1	14.6-102.5	67	1	No separation
	A	53.9	15.3-101.6	84	2	
	A	51.3	7.7-104.2	224	3	
Peduncle length	A	43.7	8.2- 86.3	67	1	Overlap
	AB	39.4	14.7- 95.8	84	2	
	B	34.5	7.4- 80.7	224	3	
Inflorescence length	A	36.4	12.8- 65.7	67	1	No separation
	A	33.8	13.5- 61.6	224	3	
	A	32.4	7.3- 61.6	84	2	
Inflorescence width	A	13.7	7.4- 28.7	67	1	Two forms separated
	B	12.0	6.5- 17.2	84	2	
	B	11.0	5.9- 18.3	224	3	
Pedicel length	A	3.1	1.8- 4.8	67	1	Separation into two species
	A	3.0	1.5- 6.2	84	2	
	B	2.3	1.2- 4.2	224	3	
Ocreolae length	A	3.1	2.0- 4.3	67	1	Overlap
	AB	3.0	1.8- 4.7	84	2	
	B	2.8	1.6- 4.6	224	3	
Perianth length	A	3.1	2.0- 4.6	84	2	Separation into two species
	A	3.1	2.0- 4.8	67	1	
	B	2.9	1.8- 4.4	224	3	
Perianth width	A	1.7	1.1- 2.6	67	1	No separation
	A	1.7	0.8- 2.6	84	2	
	A	1.6	0.7- 3.0	224	3	

TABLE VI (CONTINUED)

Character	Duncan Grouping	Mean (mm)	Range (mm)	Number in Group	Group*	Taxonomic Comments
Stamen length	A	2.7	1.7- 5.1	84	2	Separates all forms & species
	B	1.8	0.7- 3.3	224	3	
	C	1.2	0.6- 2.0	67	1	
Style length	A	2.6	1.5- 4.2	67	1	Separates all forms & species
	B	1.7	0.9- 2.8	224	3	
	C	1.1	0.6- 1.8	84	2	
Achene length	A	2.8	1.8- 3.6	224	3	Separates species
	B	2.5	1.6- 3.3	67	1	
	B	2.5	1.8- 3.3	84	2	
Achene width	A	2.5	1.0- 3.4	224	3	Separates species
	B	2.2	1.5- 2.8	67	1	
	B	2.2	1.7- 2.8	84	2	

Character	Duncan Grouping	Mean (#)	Range (#)	Number in Group	Group	Taxonomic Comments
Stamen number	A	8	7- 8	67	1	Separation of species
	A	8	6- 8	84	2	
	B	6	5- 8	224	3	
Peduncle pubescence	A	16	1-41	84	2	No separation
	A	14	0-28	67	1	
	A	13	0-42	224	3	
Peduncle glands	A	1	0- 1	67	1	No separation
	A	1	0- 1	84	2	
	A	1	0- 1	224	3	
Achene shape	A	2	0- 2	67	1	Separation of species
	A	2	0- 2	84	2	
	B	0	0- 2	224	3	
Leaf hair	A	1	1- 2	224	3	Overlap
	AB	1	0- 2	67	1	
	B	1	0- 2	84	2	
Ocrea hair	A	0	0- 1	67	1	Overlap
	AB	0	0- 1	84	2	
	B	0	0- 1	224	3	
Ocreolae hair	A	1	0- 1	224	3	No separation
	A	1	0- 1	67	1	
	A	1	0- 1	84	2	

\*1 = P. bicorne (long style); 2 = P. bicorne (short style); 3 = P. pensylvanicum.

TABLE VII  
UNIVARIATE ANALYSIS BY PHYSIOGRAPHIC REGIONS

LEAF BLADE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	69.262	23.7009	3.89641	24.1	125.0	34.2192
BICORNE	4G	70	70.014	20.8265	2.48925	28.7	129.0	29.7461
BICORNE	5	10	65.570	12.6447	3.99861	47.2	83.6	19.2843
BICORNE	6	27	75.056	28.4524	5.47566	27.9	156.7	37.9084
PENSYLVANICUM	4C	74	104.327	36.5270	4.24618	15.1	194.2	35.0120
PENSYLVANICUM	4G	21	87.381	33.1483	7.23355	19.5	157.6	37.9354
PENSYLVANICUM	5	22	94.241	30.7072	6.54679	31.7	150.9	32.5837
PENSYLVANICUM	6	49	110.127	34.5616	4.93737	40.7	202.0	31.3835
PENSYLVANICUM	7	48	104.542	38.4237	5.54598	35.8	185.0	36.7544

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LEAF BLADE WIDTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	13.8676	4.42380	0.72727	6.2	25.9	31.9004
BICORNE	4G	70	12.8171	4.20903	0.50308	5.0	23.1	32.8391
BICORNE	5	10	13.5600	4.00921	1.26782	8.3	20.7	29.5665
BICORNE	6	27	14.5889	6.08190	1.17046	5.4	26.7	41.6886
PENSYLVANICUM	4C	74	21.8446	8.86220	1.03021	7.4	48.2	40.5693
PENSYLVANICUM	4G	21	20.9190	6.78569	1.48076	4.6	36.4	32.4379
PENSYLVANICUM	5	22	19.0682	5.74252	1.22431	8.4	29.6	30.1157
PENSYLVANICUM	6	49	20.6571	8.18052	1.16865	6.3	47.3	39.6014
PENSYLVANICUM	7	48	20.9417	8.64766	1.24818	7.6	44.6	41.2940

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PETIOLE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	10.8216	4.22270	0.69421	0.3	17.7	39.0209
BICORNE	4G	70	11.0143	4.22169	0.50459	2.8	21.1	38.3292
BICORNE	5	10	8.7100	3.42749	1.08387	4.3	15.4	39.3512
BICORNE	6	27	10.3778	4.42139	0.85090	4.2	18.6	42.6044
PENSYLVANICUM	4C	74	13.2027	6.21721	0.72274	3.9	33.9	47.0904
PENSYLVANICUM	4G	21	11.4000	5.02573	1.09671	3.9	23.1	44.0854
PENSYLVANICUM	5	22	10.5273	4.34568	0.92650	2.4	19.1	41.2802
PENSYLVANICUM	6	49	13.3510	5.14365	0.73481	4.6	25.2	38.5263
PENSYLVANICUM	7	48	13.4604	6.80559	0.98230	3.3	36.3	50.5600

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OCREA LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	7.1595	3.00125	0.493402	3.7	17.3	41.9200
BICORNE	4G	70	6.7343	2.86472	0.342400	2.3	16.4	42.5394
BICORNE	5	10	6.9800	1.91822	0.606593	2.9	9.1	27.4816
BICORNE	6	27	5.8333	2.46358	0.474116	2.6	14.8	42.2328
PENSYLVANICUM	4C	74	10.9284	4.44034	0.516179	3.2	21.2	40.6312
PENSYLVANICUM	4G	21	9.0238	4.19510	0.915447	3.9	16.8	46.4893
PENSYLVANICUM	5	22	9.8000	4.18444	0.892125	3.2	18.1	42.6983
PENSYLVANICUM	6	49	10.9796	4.75074	0.678678	3.4	24.0	43.2689
PENSYLVANICUM	7	48	10.1125	4.31591	0.622948	3.9	20.6	42.6790



TABLE VII (CONTINUED)

INTERNODE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	48.4595	17.1981	2.82734	15.3	86.6	35.4896
BICORNE	4G	70	55.2500	18.6164	2.22509	14.6	101.6	33.6949
BICORNE	5	10	55.8100	23.7793	7.51967	21.0	96.0	42.6076
BICORNE	6	27	54.4148	22.8151	4.39076	20.5	102.5	41.9281
PENSYLVANICUM	4C	74	52.1014	16.2338	1.88714	11.7	92.7	31.1581
PENSYLVANICUM	4G	21	49.4095	14.7085	3.20966	26.0	82.5	29.7685
PENSYLVANICUM	5	22	46.7091	22.7708	4.85474	1.6	104.2	48.7502
PENSYLVANICUM	6	49	50.3020	16.6090	2.37272	16.4	101.0	33.0186
PENSYLVANICUM	7	48	52.2958	18.6235	2.68808	15.8	99.2	35.6119

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PEDUNCLE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	41.6865	16.7351	2.75123	19.5	82.3	40.1451
BICORNE	4G	70	42.0914	17.6592	2.11067	8.2	86.3	41.9543
BICORNE	5	10	51.1500	26.8641	8.49517	20.6	95.8	52.5202
BICORNE	6	27	39.6407	15.0091	2.88850	11.8	64.0	37.8628
PENSYLVANICUM	4C	74	35.9095	13.0114	1.51254	13.1	69.9	36.2339
PENSYLVANICUM	4G	21	33.3381	14.7641	3.22179	14.3	63.8	44.2860
PENSYLVANICUM	5	22	35.3682	15.3162	3.26542	10.5	71.6	43.3049
PENSYLVANICUM	6	49	37.2388	15.7726	2.25323	10.8	74.3	42.3554
PENSYLVANICUM	7	48	31.1083	15.2942	2.20753	7.4	80.7	49.1644

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INFLORESCENCE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	33.8081	9.5733	1.57384	15.7	57.9	28.3165
BICORNE	4G	70	31.7300	10.8672	1.29888	7.3	61.6	34.2491
BICORNE	5	10	41.5200	7.8848	2.49340	31.9	57.3	18.9905
BICORNE	6	27	38.5370	10.4750	2.01592	16.4	65.7	27.1817
PENSYLVANICUM	4C	74	35.8770	11.0517	1.28474	14.5	63.1	30.8045
PENSYLVANICUM	4G	21	31.9714	9.9041	2.16125	12.1	54.1	30.9780
PENSYLVANICUM	5	22	36.2091	10.6076	2.26154	16.2	54.0	29.2954
PENSYLVANICUM	6	49	33.4755	11.3133	1.61619	14.3	61.6	33.7958
PENSYLVANICUM	7	48	32.0062	9.3839	1.35445	13.9	57.4	29.3190

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INFLORESCENCE WIDTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	11.8541	2.0472	0.33655	7.4	15.5	17.2697
BICORNE	4G	70	13.2714	3.3533	0.40079	1.3	28.7	25.2668
BICORNE	5	10	12.5200	1.7974	0.56839	11.1	16.6	14.3563
BICORNE	6	27	13.5333	13.4684	2.59199	6.5	80.1	99.5200
PENSYLVANICUM	4C	74	11.2797	2.3196	0.26965	7.0	18.3	20.5643
PENSYLVANICUM	4G	21	12.0524	2.2905	0.49984	7.5	15.5	19.0050
PENSYLVANICUM	5	22	10.7955	2.2689	0.48374	7.9	14.8	21.0175
PENSYLVANICUM	6	49	10.7694	2.0893	0.29847	6.8	15.5	19.4002
PENSYLVANICUM	7	48	10.7667	1.9134	0.27617	5.9	15.2	17.7713

TABLE VII (CONTINUED)

PEDICEL LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	3.05676	0.674759	0.110930	1.8	4.2	22.0744
BICORNE	4G	70	3.14143	0.801175	0.095759	1.6	6.2	25.5035
BICORNE	5	10	2.93000	0.755792	0.239003	1.8	4.1	25.7950
BICORNE	6	27	2.98148	0.797610	0.153500	1.4	4.8	26.7521
PENSYLVANICUM	4C	74	2.36351	0.583700	0.067854	1.4	4.2	24.6963
PENSYLVANICUM	4G	21	2.45238	0.452348	0.098711	1.4	3.6	18.4453
PENSYLVANICUM	5	22	2.35909	0.609964	0.130045	1.3	3.6	25.8559
PENSYLVANICUM	6	49	2.25918	0.525166	0.075024	1.2	3.4	23.2458
PENSYLVANICUM	7	48	2.39375	0.553290	0.079861	1.4	3.7	23.1140

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OCREOLAE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	3.11081	0.638046	0.104894	1.8	4.3	20.5106
BICORNE	4G	70	3.01286	0.628299	0.075096	2.0	4.7	20.8539
BICORNE	5	10	3.19000	0.479467	0.151621	2.6	4.0	15.0303
BICORNE	6	27	2.91481	0.534001	0.102768	2.0	3.9	18.3202
PENSYLVANICUM	4C	74	2.98514	0.536524	0.062370	1.9	4.4	17.9732
PENSYLVANICUM	4G	21	2.94762	0.656216	0.143198	1.9	4.6	22.2626
PENSYLVANICUM	5	22	2.82273	0.477026	0.101702	2.2	3.7	16.8995
PENSYLVANICUM	6	49	2.52449	0.523422	0.074775	1.6	3.8	20.7338
PENSYLVANICUM	7	48	2.77708	0.518689	0.074866	1.8	4.1	18.6775

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PERIANTH LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	3.04595	0.545993	0.089761	2.2	4.8	17.9252
BICORNE	4G	70	3.14714	0.582031	0.069566	2.0	4.8	18.4939
BICORNE	5	10	3.51000	0.453260	0.143333	3.0	4.4	12.9134
BICORNE	6	27	3.14444	0.580672	0.111750	2.2	4.6	18.4666
PENSYLVANICUM	4C	74	2.92703	0.478667	0.055644	2.0	4.1	16.3534
PENSYLVANICUM	4G	21	2.93333	0.520897	0.113669	1.8	3.6	17.7578
PENSYLVANICUM	5	22	2.79091	0.410469	0.087512	2.2	3.9	14.7074
PENSYLVANICUM	6	49	2.85510	0.436397	0.062342	2.1	4.4	15.2848
PENSYLVANICUM	7	48	3.11250	0.526176	0.075947	2.0	4.1	16.9053

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PERIANTH WIDTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	1.67027	0.308999	0.050799	1.1	2.4	18.4999
BICORNE	4G	70	1.63143	0.379375	0.045344	0.8	2.9	23.2542
BICORNE	5	10	1.83000	0.442342	0.139881	1.0	2.6	24.1717
BICORNE	6	27	1.68148	0.444658	0.085574	1.1	2.7	26.4444
PENSYLVANICUM	4C	74	1.65541	0.343687	0.039953	0.9	2.5	20.7615
PENSYLVANICUM	4G	21	1.84286	0.474944	0.103641	0.7	3.0	25.7721
PENSYLVANICUM	5	22	1.73182	0.309202	0.065922	1.2	2.5	17.8542
PENSYLVANICUM	6	49	1.51837	0.289880	0.041411	1.1	2.5	19.0916
PENSYLVANICUM	7	48	1.56458	0.352794	0.050921	1.0	2.5	22.5488

TABLE VII (CONTINUED)

STAMEN LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	1.95405	0.75299	0.123791	0.7	3.6	38.5349
BICORNE	4G	70	1.96429	0.85296	0.101949	0.8	3.9	43.4236
BICORNE	5	10	2.68000	0.93666	0.296198	1.3	3.6	34.9500
BICORNE	6	27	2.33333	1.10732	0.213104	0.6	5.1	47.4565
PENSYLVANICUM	4C	74	1.69730	0.33103	0.038482	1.1	3.3	19.5034
PENSYLVANICUM	4G	21	1.66667	0.39285	0.085728	0.7	2.3	23.5712
PENSYLVANICUM	5	22	1.97273	0.36145	0.077062	1.1	2.6	18.3226
PENSYLVANICUM	6	49	1.90612	0.44036	0.062909	1.2	3.0	23.1026
PENSYLVANICUM	7	48	1.96458	0.34425	0.049688	1.3	2.9	17.5227

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STYLE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	1.73514	0.873122	0.143540	0.6	3.8	50.3201
BICORNE	4G	70	1.92429	0.934280	0.111668	0.8	4.2	48.5521
BICORNE	5	10	1.57000	0.598238	0.189180	0.7	2.4	38.1043
BICORNE	6	27	1.62222	0.704018	0.135488	0.6	2.7	43.3984
PENSYLVANICUM	4C	74	1.57703	0.311227	0.036179	0.9	2.7	19.7350
PENSYLVANICUM	4G	21	1.44762	0.348739	0.076101	1.0	2.4	24.0905
PENSYLVANICUM	5	22	1.84545	0.287398	0.061273	1.1	2.4	15.5733
PENSYLVANICUM	6	49	1.78367	0.353168	0.050453	1.0	2.8	19.8001
PENSYLVANICUM	7	48	1.73125	0.324959	0.046904	1.2	2.6	18.7702

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ACHENE LENGTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	2.46486	0.308415	0.0507032	1.9	3.3	12.5125
BICORNE	4G	70	2.55714	0.288711	0.0345076	1.6	3.2	11.2904
BICORNE	5	10	2.55000	0.275882	0.0872417	2.1	3.1	10.8189
BICORNE	6	27	2.43704	0.270538	0.0520651	2.0	3.2	11.1011
PENSYLVANICUM	4C	74	2.92568	0.298425	0.0346913	2.2	3.5	10.2002
PENSYLVANICUM	4G	21	2.93810	0.378783	0.0826571	2.2	3.6	12.8921
PENSYLVANICUM	5	22	2.78636	0.249372	0.0531662	2.4	3.4	8.9497
PENSYLVANICUM	6	49	2.60204	0.243661	0.0348087	2.2	3.2	9.3642
PENSYLVANICUM	7	47	2.83191	0.210699	0.0307336	2.4	3.3	7.4402

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ACHENE WIDTH								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	2.24324	0.273395	0.0449458	1.7	2.8	12.1875
BICORNE	4G	70	2.22429	0.253918	0.0303490	1.5	2.8	11.4157
BICORNE	5	10	2.31000	0.272641	0.0862168	1.7	2.6	11.8027
BICORNE	6	27	2.10741	0.220010	0.0423410	1.7	2.6	10.4399
PENSYLVANICUM	4C	74	2.59595	0.297680	0.0346046	1.9	3.4	11.4671
PENSYLVANICUM	4G	21	2.62857	0.373019	0.0813993	1.9	3.4	14.1909
PENSYLVANICUM	5	22	2.41364	0.436758	0.0931171	1.0	3.2	18.0954
PENSYLVANICUM	6	49	2.27959	0.287938	0.0411340	1.8	3.2	12.6311
PENSYLVANICUM	7	47	2.51489	0.279735	0.0408035	1.7	3.2	11.1231

TABLE VII (CONTINUED)

STAMEN NUMBER								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	7.94595	0.328798	0.054054	6	8	4.1379
BICORNE	4G	70	8.00000	0.000000	0.000000	8	8	0.0000
BICORNE	5	10	8.00000	0.000000	0.000000	8	8	0.0000
BICORNE	6	27	7.96296	0.192450	0.037037	7	8	2.4168
PENSYLVANICUM	4C	74	6.32432	0.599271	0.069664	6	8	9.4757
PENSYLVANICUM	4G	21	6.61905	0.864650	0.188682	6	8	13.0631
PENSYLVANICUM	5	22	6.04545	0.485727	0.103557	5	7	8.0346
PENSYLVANICUM	6	49	6.30612	0.584668	0.083524	5	8	9.2714
PENSYLVANICUM	7	48	6.39583	0.573885	0.082833	5	8	8.9728

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PEDUNCLE PUBESCENCE								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	14.2973	8.26258	1.35836	0	35	57.7912
BICORNE	4G	70	15.9714	7.41517	0.88628	4	35	46.4277
BICORNE	5	10	12.3000	4.08384	1.29142	5	17	33.2020
BICORNE	6	27	13.4074	9.07346	1.74619	0	41	67.6750
PENSYLVANICUM	4C	74	11.8108	6.60360	0.76765	0	28	55.9115
PENSYLVANICUM	4G	21	9.0000	6.39531	1.39557	0	28	71.0590
PENSYLVANICUM	5	22	11.5455	7.09612	1.51290	2	27	61.4625
PENSYLVANICUM	6	49	14.5714	7.45822	1.06546	2	29	51.1838
PENSYLVANICUM	7	48	14.9583	7.74036	1.11722	0	36	51.7461

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PEDUNCLE GLANDS								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	0.97297	0.164399	0.0270270	0	1	16.8966
BICORNE	4G	70	1.00000	0.000000	0.0000000	1	1	0.0000
BICORNE	5	10	1.00000	0.000000	0.0000000	1	1	0.0000
BICORNE	6	27	0.92593	0.266880	0.0513611	0	1	28.8231
PENSYLVANICUM	4C	74	1.00000	0.000000	0.0000000	1	1	0.0000
PENSYLVANICUM	4G	21	0.95238	0.218218	0.0476190	0	1	22.9129
PENSYLVANICUM	5	22	0.95455	0.213201	0.0454545	0	1	22.3353
PENSYLVANICUM	6	49	0.97959	0.142857	0.0204082	0	1	14.5833
PENSYLVANICUM	7	48	0.93750	0.244623	0.0353083	0	1	26.0931

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ACHENE SHAPE								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	1.67568	0.626013	0.102916	0	2	37.359
BICORNE	4G	70	1.75714	0.464250	0.055488	0	2	26.421
BICORNE	5	10	0.80000	0.421637	0.133333	0	1	52.705
BICORNE	6	27	1.29630	0.668800	0.128711	0	2	51.593
PENSYLVANICUM	4C	74	0.00000	0.000000	0.0000000	0	0	.
PENSYLVANICUM	4G	21	0.14286	0.358569	0.078246	0	1	250.998
PENSYLVANICUM	5	22	0.04545	0.213201	0.045455	0	1	469.042
PENSYLVANICUM	6	49	0.00000	0.000000	0.0000000	0	0	.
PENSYLVANICUM	7	47	0.04255	0.204030	0.029761	0	1	479.470

TABLE VII (CONTINUED)

LEAF HAIRS								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	1.29730	0.463373	0.076178	1	2	35.7184
BICORNE	4G	70	1.15714	0.438565	0.052419	0	2	37.9007
BICORNE	5	10	1.20000	0.421637	0.133333	1	2	35.1364
BICORNE	6	27	1.33333	0.480384	0.092450	1	2	36.0288
PENSYLVANICUM	4C	74	1.18919	0.394332	0.045840	1	2	33.1598
PENSYLVANICUM	4G	21	1.00000	0.000000	0.000000	1	1	0.0000
PENSYLVANICUM	5	22	1.54545	0.509647	0.108657	1	2	32.9772
PENSYLVANICUM	6	49	1.75510	0.434483	0.062069	1	2	24.7554
PENSYLVANICUM	7	48	1.37500	0.489246	0.070617	1	2	35.5815

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OCREA HAIRS								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	0.270270	0.450225	0.0740166	0	1	166.583
BICORNE	4G	70	0.357143	0.482617	0.0576838	0	1	135.133
BICORNE	5	10	0.000000	0.000000	0.0000000	0	0	.
BICORNE	6	27	0.370370	0.492103	0.0947052	0	1	132.868
PENSYLVANICUM	4C	74	0.067568	0.252716	0.0293776	0	1	374.019
PENSYLVANICUM	4G	21	0.095238	0.300793	0.0656383	0	1	315.832
PENSYLVANICUM	5	22	0.227273	0.428932	0.0914486	0	1	188.730
PENSYLVANICUM	6	49	0.326531	0.473804	0.0676862	0	1	145.102
PENSYLVANICUM	7	48	0.083333	0.279310	0.0403150	0	1	335.172

---

OCREOLAE HAIRS								
SPECIES	REGION	N	MEAN	STDEV	STDERR	MIN	MAX	CV
BICORNE	4C	37	0.621622	0.491672	0.080830	0	1	79.095
BICORNE	4G	70	0.628571	0.486675	0.058169	0	1	77.426
BICORNE	5	10	0.900000	0.316228	0.100000	0	1	35.136
BICORNE	6	27	0.814815	0.395847	0.076181	0	1	48.581
PENSYLVANICUM	4C	74	0.635135	0.484678	0.056343	0	1	76.311
PENSYLVANICUM	4G	21	0.428571	0.507093	0.110657	0	1	118.322
PENSYLVANICUM	5	22	0.727273	0.455842	0.097186	0	1	62.678
PENSYLVANICUM	6	49	0.918367	0.276642	0.039520	0	1	30.123
PENSYLVANICUM	7	48	0.791667	0.410414	0.059238	0	1	51.842

TABLE VIII  
STEPWISE DISCRIMINANT ANALYSIS OF THE EIGHT MOST  
DISCRIMINATING VARIABLES AMONGST THE GROUPS

Character	F Statistic	Probability
Achene shape	618.409	0.0001
Style length	256.201	0.0001
Stamen length	319.661	0.0001
Stamen number	85.086	0.0001
Achene width	10.981	0.0001
Pedicel length	4.032	0.0185
Blade width	4.459	0.0122
Inflorescence length	4.829	0.0085

(short style). Stamen and style lengths were then removed from the analysis as they are used as the major characters for identification. When this was done (Table X), the species still could be separated. Often all characters are not needed to identify a plant to species, so only the eight most discriminating characters were used in the analysis (Table XI). Again, P. bicorne and P. pensylvanicum were clearly separated. The last of the discriminant analyses was with the six most discriminating variables; stamen and style lengths were excluded (Table XII). The two species were separated, but the two forms of P. bicorne were not.

Other multivariate analyses conducted included four MANOVA Tests (Multivariate Analysis of Variance). These procedures use least squares means to determine differences between groups when all variables are considered together. All four MANOVA Tests showed significant differences between groups (Table XIII). Morphometric data for each species from physiographic regions 4C, 4G, 5, 6, and 7 were subjected to MANOVA Tests to determine whether differences among regions existed. There were significant differences among regions for P. pensylvanicum and for P. bicorne (Table XIV). This further indicates the wide range of variability for each species. It was determined from additional MANOVA Tests that, despite the high variability of each species, the difference between P. bicorne and P. pensylvanicum within a region was still significant, further supporting the separation of these taxa.

Principal components analysis is another multivariate analysis technique useful in understanding patterns of variation and taxon relationships. This procedure creates from the observed set of characters a new set of characters that are uncorrelated. The first

TABLE IX  
 CLASSIFICATION OF GROUPS THROUGH DISCRIMINANT  
 ANALYSIS USING 23 VARIABLES

Group	Number of Observations & % Classified into Group			
	1	2	3	Total
1 - <u>P. bicornes</u> (long style)	67 100%	0 0%	0 0%	67 100%
2 - <u>P. bicornes</u> (short style)	0 0%	84 100%	0 0%	84 100%
3 - <u>P. pensylvanicum</u>	0 0%	5 2.23%	219 97.77%	224 100%
Total	67 17.87%	89 23.73%	219 58.4%	375 100%



TABLE X  
 CLASSIFICATION OF GROUPS THROUGH DISCRIMINANT  
 ANALYSIS USING 21 VARIABLES, EXCLUDING  
 STAMEN AND STYLE LENGTHS

Group	Number of Observations & % Classified into Group			
	1	2	3	Total
1 - <u>P. bicorne</u> (long style)	62 92.54%	4 5.97%	1 1.49%	67 100%
2 - <u>P. bicorne</u> (short style)	11 13.10%	71 84.5%	2 2.38%	84 100%
3 - <u>P. pennsylvanicum</u>	1 0.45%	4 1.79%	219 97.77%	224 100%
Total	74 19.73%	79 21.07%	222 59.20%	375 100%

TABLE XI

CLASSIFICATION OF GROUPS THROUGH DISCRIMINANT  
ANALYSIS USING THE EIGHT MOST DISCRIMINATING  
VARIABLES, INCLUDING STAMEN AND STYLE  
LENGTHS

Group	Number of Observations & % Classified into Group			
	1	2	3	Total
1 - <u>P. bicorne</u> (long style)	66 98.51%	0 0%	1 1.49%	67 100%
2 - <u>P. bicorne</u> (short style)	0 0%	82 97.62%	2 2.38%	84 100%
3 - <u>P. pensylvanicum</u>	0 0%	5 2.23%	219 97.77%	224 100%
Total	66 17.60%	87 23.20%	222 59.20%	375 100%

TABLE XII  
 CLASSIFICATION OF GROUPS THROUGH DISCRIMINANT  
 ANALYSIS USING THE SIX MOST DISCRIMINATING  
 VARIABLES, EXCLUDING STAMEN AND STYLE  
 LENGTHS

Group	Number of Observations & % Classified into Group			
	1	2	3	Total
1 - <u>P. bicornes</u> (long style)	64 95.52%	1 1.49%	2 2.99%	67 100%
2 - <u>P. bicornes</u> (short style)	72 85.71%	9 10.71%	3 3.57%	84 100%
3 - <u>P. pennsylvanicum</u>	3 1.34%	6 2.68%	215 95.98%	224 100%
Total	139 37.07%	16 4.27%	220 58.67%	375 100%

TABLE XIII  
 MULTIVARIATE ANALYSIS OF VARIANCE BETWEEN  
 GROUPS, P. BICORNE AND P. PENNSYLVANICUM

Manova Tests	F	Probability	Trace
Hotelling-Lawley Trace	95.22	<0.001	12.5
Pillai's Trace	94.43	<0.001	1.7
Wilk's Criterion	94.82	<0.0001	0.002
Roy's Maximum	1315.54 (107.94)	Upper Bound 0	7.07

TABLE XIV  
 MULTIVARIATE ANALYSIS OF VARIANCE BETWEEN  
 REGIONS (4C, 4G, 5, 6, 7) FOR P. BICORNE  
 AND P. PENNSYLVANICUM

Manova Tests	Species	F	Probability	Trace
Hotelling-Lawley Trace	<u>P. bicorne</u>	3.00	<0.001	1.70
	<u>P. pensylvanicum</u>	2.77	<0.001	1.71
Pillai's Trace	<u>P. bicorne</u>	2.65	<0.001	0.84
	<u>P. pensylvanicum</u>	2.49	<0.001	0.99
Wilk's Criterion	<u>P. bicorne</u>	2.82	<0.001	0.31
	<u>P. pensylvanicum</u>	2.63	<0.001	0.27
Roy's Maximum	<u>P. bicorne</u>	4.76	Upper Bound	1.31
	<u>P. pensylvanicum</u>	5.41	Upper Bound	1.08

principal components account for most of the variation and are often the only ones used in comparisons. Figure 7 illustrates the plot of the first two principal components in the analysis based on 23 characters. There is separation although some overlap is apparent. Two distinct groups corresponding to P. pensylvanicum and P. bicorne are illustrated in the plot of principal components (Fig. 8) based on the analysis of only the eight most discriminating characters. When stamen and style lengths are included in the analysis, subgroups of P. bicorne are visible (Fig. 8), but when they are excluded from the analysis the subgroups are indistinguishable (Fig. 9).

Twenty-seven additional specimens initially identified as P. mexicanum, P. mississippiense, and P. omissum were added to the data set and analyses conducted. Figure 10 illustrates the plot of the first two principal components for the six most discriminating characters for all specimens scored. As is apparent, specimens initially identified as P. mexicanum, P. mississippiense, and P. omissum appear throughout the plot and are intermingled with specimens of both P. pensylvanicum and P. bicorne. These statistical analyses support the field and greenhouse observations. All observations and analyses indicate taxonomic recognition of two species, P. pensylvanicum and P. bicorne.

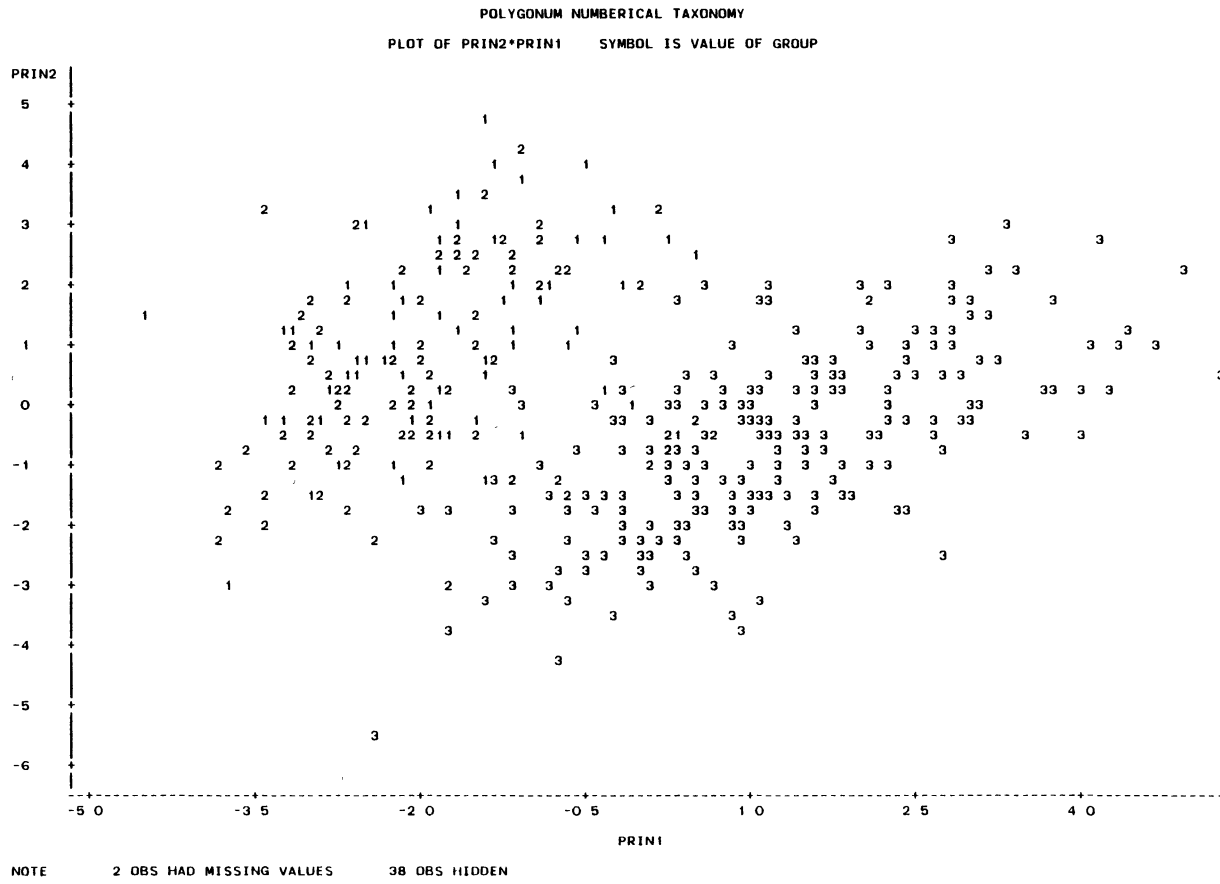


Figure 7. Plot of Principal Components 1 and 2 (23 characters) of Group 1 (P. bicornis--long style), Group 2 (P. bicornis--short style), and Group 3 (P. pennsylvanicum)

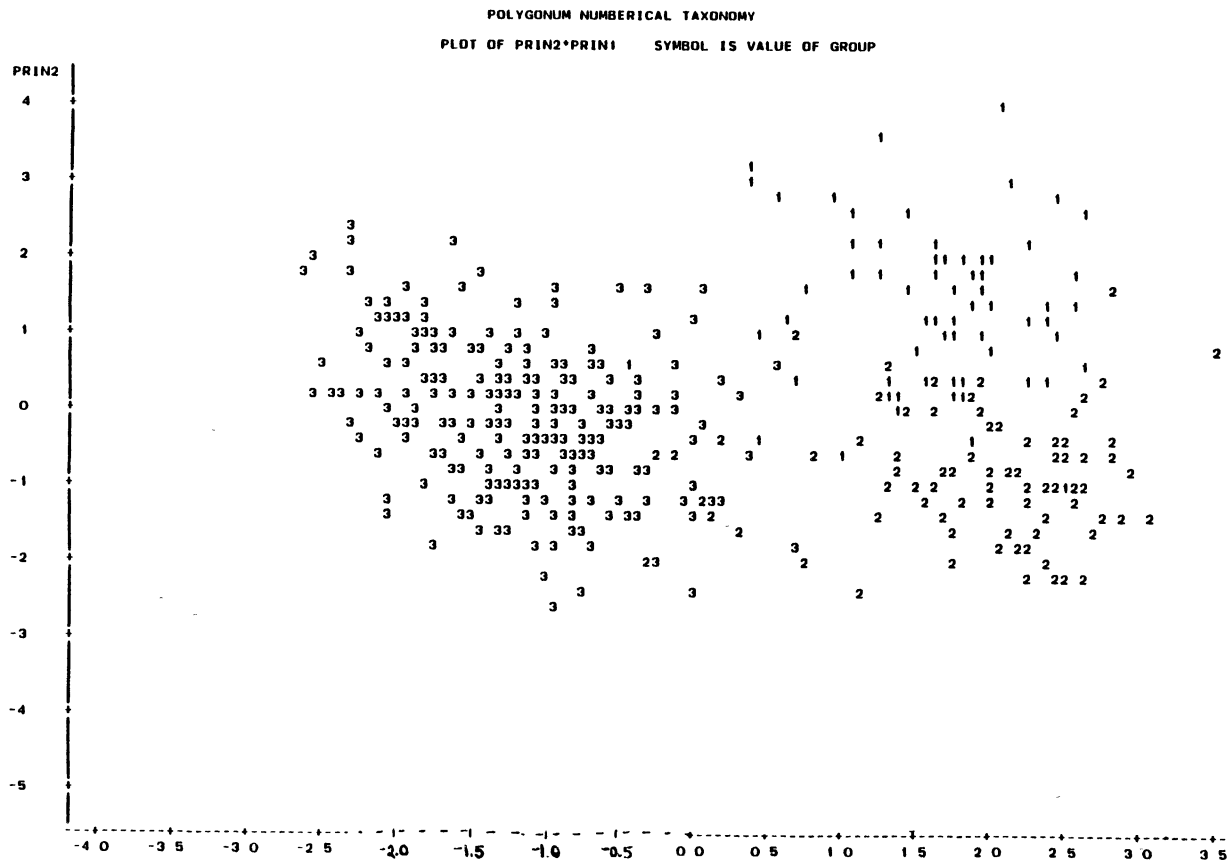


Figure 8. Plot of Principal Components 1 and 2 (8 most discriminating characters) of Group 1 (P. bicornis--long style), Group 2 (P. bicornis--short style), and Group 3 (P. pensylvanicum)



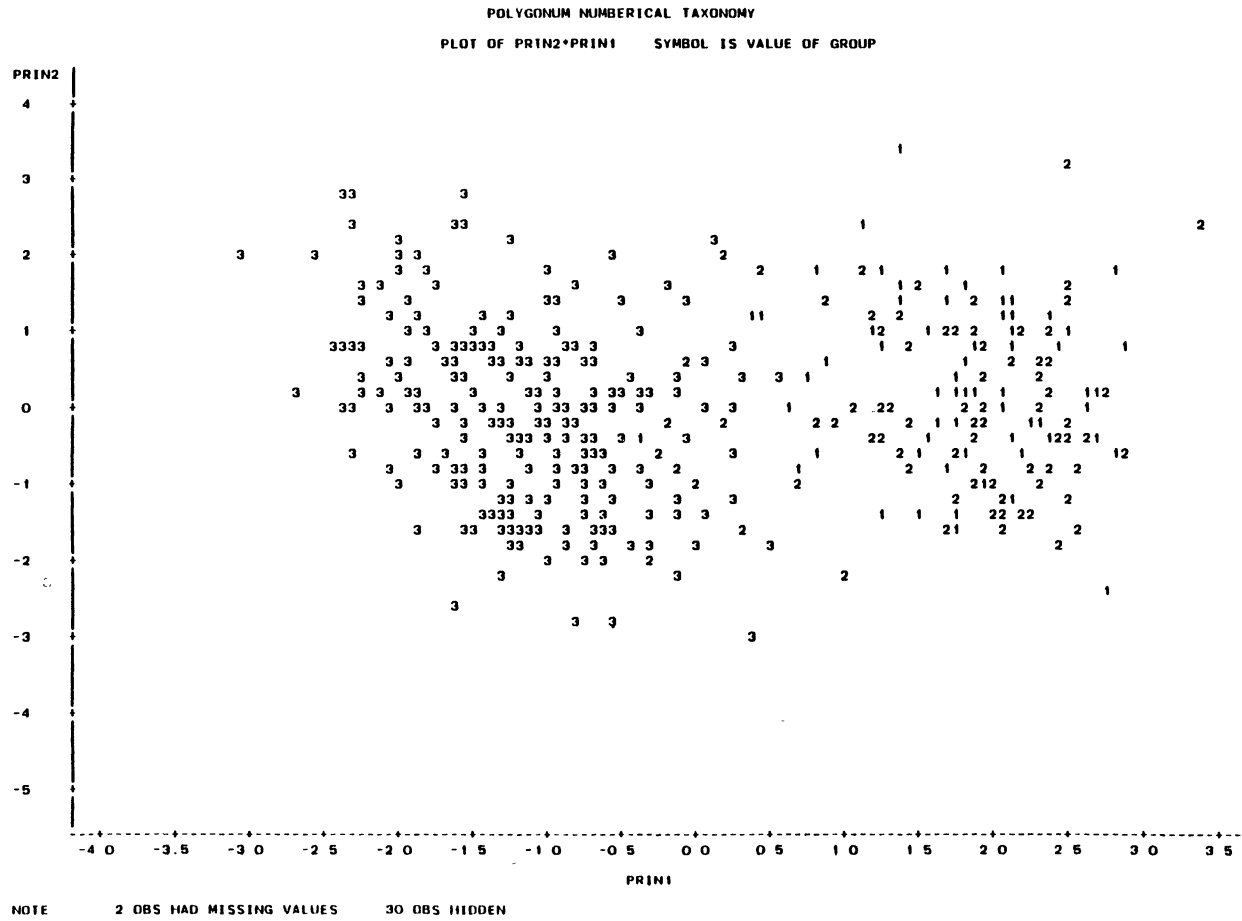


Figure 9. Plot of Principal Components 1 and 2 (6 characters, excluding stamen and style lengths) of Group 1 (P. bicorne--long style), Group 2 (P. bicorne--short style), and Group 3 (P. pennsylvanicum)

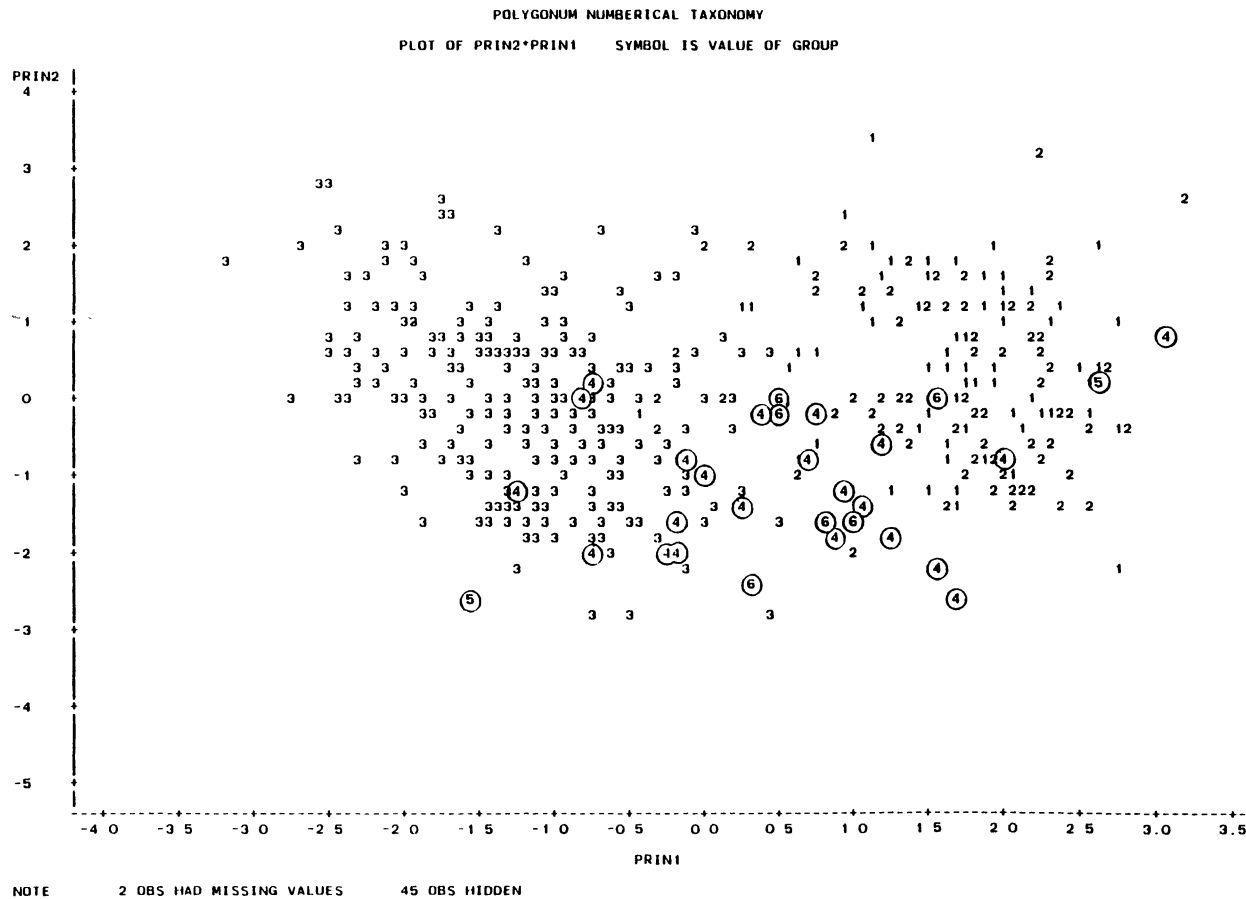


Figure 10. Plot of Principal Components 1 and 2 (6 characters, excluding stamen and style lengths) of Group 1 (*P. bicorné*--long style), Group 2 (*P. bicorné*--short style), Group 3 (*P. pennsylvanicum*), Group 4 (*P. mexicanum*), Group 5 (*P. omissum*), and Group 6 (*P. mississippiense*)

CHAPTER V

SUMMARY

On the basis of the data gathered in this study, it is believed that taxonomic recognition of two species, P. pensylvanicum and P. bicorne, is warranted. P. bicorne Raf. is maintained. P. longistylum Small is considered a nomenclatural synonym. P. omissum Greene, P. mexicanum Small, and P. mississippiense Stanford are also considered conspecific. P. mexicanum may possibly be recognized as a variety of P. bicorne because of its smaller, duller achenes and distribution in the south-central United States and Mexico; additional study is required before a taxonomic decision is made.

P. pensylvanicum L. is maintained as a separate species. It is distinct from P. bicorne in morphology and reproductive biology. The present study did not directly address varieties which have been proposed in P. pensylvanicum; however, based on subjective impressions, the investigator does not feel that these categories are warranted because of continuous variation and environmental effects. Keys and descriptions are given below.

Key to Species

Flowers homostylous, stamens and styles included; stamens usually 6  
(7 or 8); achenes broad, 1.7-3.4 mm in width,  
flat . . . . . Polygonum pensylvanicum

Flowers heterostylous; stamens or styles exerted; stamens 8; achenes convex, 1.5–2.8 mm in width . . . . . Polygonum bicorne

POLYGONUM PENNSYLVANICUM L.

Linnaeus. Species Plantarum. London. 1753.

P. pennsylvanicum var. genuinum Fernald. Rhodora 19:70–73. 1917.

P. pennsylvanicum var. laevigatum Fernald. Rhodora 19:70–73. 1917.

P. pennsylvanicum var. nesophilum Fernald. Rhodora 19:70–73. 1917.

P. pennsylvanicum var. laevigatum f. albineum Farwell. Papers Michigan Academy of Science 2:11–46. 1923.

P. pennsylvanicum var. viridialbum Farwell. Papers Michigan Academy of Science 3:93–95. 1924.

P. pennsylvanicum var. durum Stanford. Rhodora 27:173–184. 1925.

P. pennsylvanicum var. laevigatum f. pallescens Stanford. Rhodora 27:173–184. 1925.

P. pennsylvanicum var. eglandulosum Myers. Castanea 7:74–75. 1942.

P. pennsylvanicum var. rosaeflorum Norton. Castanea 7:74–75. 1943.

P. pennsylvanicum f. albinum Fernald. Rhodora 47:93–142. 1945.

P. pennsylvanicum var. Oneillii (Brenckle) Hulten. Flora of Alaska and Neighboring Territories: A Manual of the Vascular Plants. 1968.

Polygonum pennsylvanicum L. Annual; herbaceous; height 1–12 dm; stem decumbent to erect, usually green; pubescence variable, peduncles with or without glands, leaves broadly lanceolate, 15–202 mm long and 4 mm wide; petiole length variable, 2–36 mm long; ocrea papery and entire, 3–24 mm long; internode length variable, 8–105 mm long; peduncle length variable, 7–81 mm long; inflorescences terminal, 14–62 mm long and 6–18 mm wide; racemes spicate; flowers subtended by ocreolae 2–5 mm long; pedicels 1–4 mm long; flowers

subtended by ocreolae 2-5 mm long; pedicels 1-4 mm long; flowers cleistogamous and homostylous; perianth in one series, 5-parted, white to reddish-pink, 2-4 mm long and 1-3 mm wide, opening about three-quarters; stamens often 6 (sometimes 7 or 8), 1-5 mm long; style one, two-cleft, 1-3 mm long; achenes lenticular, broad, flat, dull to shiny, dark brown, 2-4 mm long and 1-3 mm wide.

Eastern United States and forested mountain regions of the western United States. Creek, river, and pond margins with sandy or rocky soils, occasionally roadside ditches. Flowering period May to December.

POLYGONUM BICORNE RAF.

Rafinesque. Flora Ludoviciana. 1817.

P. mexicanum Small. Bulletin Torrey Botanical Club 14:351-370.  
1892.

P. longistylum Small. Bulletin Torrey Botanical Club 21:168-173.  
1894.

P. omissum Greene. Pittonia 5:200. 1903.

P. longistylum var. omissum Stanford. Rhodora 27:173-184. 1925.

P. mississippiense Stanford. Rhodora 27:173-184. 1925.

P. mississippiense var. interius Stanford. Rhodora 27:173-184.  
1925.

P. pennsylvanicum subsp. bicorne Dalci. The Taxonomy of the  
Section Persicaria in the Genus Polygonum in the United  
States East of the Rocky Mountains. 1972.

Polygonum bicorne Raf.: Annual, herbaceous; height 1-18 dm; stem erect, often reddish-green; pubescence variable, peduncles often with reddish glands; leaves narrowly lanceolate, 24-129 mm long and 5-27 mm wide; petiole length variable, 3-21 mm long; ocrea short, papery, and entire, 2-19 mm long; internode length variable, 15-103 mm long; peduncle length variable, 8-96 mm long; inflorescences terminal, 7-66 mm long; racemes spicate; flowers subtended by ocreolae, 2-5 mm long; pedicels 2-6 mm long; flowers chasmogamous and heterostylous; perianth in one series, 5 parted, light to dark pink, 2-5 mm long and 1-3 mm wide, opening entirely during flowering; stamens usually 8: pin flowers 1-3 mm long, thrum flowers 2-5 mm long; one two-cleft style: pin flowers 2-4 mm long, thrum flowers 1-3 mm long; achenes lenticular and convexed (occasionally trigonous), dull to shiny, dark brown, 2-3 mm long and 2-3 mm wide.

Central Great Plains region of the United States as well as Mexico. Creek, river, and pond margins, roadside ditches, and plowed agricultural fields. Flowering period May to December.

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APPENDIX  
MORPHOLOGICAL DATA

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT		HERBARI	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA LN	INTERND	PEDUNCLE
	NO	NO									LN	WD				
1	MCATEE	3046	US	MO	4C	8	1	1919	89	38	98.7	25.0	14.7	11.2	37.6	47.3
2	STEPHEN	58531	KS	NE	4C	8	4	1972	97	41	99.2	14.4	15.6	8.2	54.0	53.4
3	BARTLET	S.N.	OKL	OK	4C	11	3	1962	98	35	42.0	12.9	12.1	5.3	35.5	37.5
4	SPENCE	36	OKL	TX	4G	6	19	1964	101	34	85.0	18.2	11.8	11.3	57.0	56.1
5	STEPHEN	50660	KS	KS	4G	8	7	1971	99	38	55.9	11.7	8.4	4.7	43.7	29.9
6	K. BRYAN		GRA	NM	4G	8	26	1942	103	35	36.7	5.4	13.2	4.7	48.7	8.2
7	RICHARD	857	SMU	KS	4G	7	18	1965	99	38	94.1	13.6	15.6	12.3	73.5	47.2
8	STEPHEN	51507	KS	SD	4G	8	23	1971	100	43	47.8	10.5	4.9	9.8	36.0	30.5

OBS	INFLO		PEDICEL	OCREOLA	PERI LN	PERI WD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREA HR	OCREA HR	SPECIES
	LN	WD																
1	41.5	12.9	2.7	2.7	4.1	2.0	1.4	3.7	2.8	2.4	8	3	1	1	2	1	1	BICORNE-LONG
2	40.7	13.5	3.8	4.3	4.8	2.0	1.9	3.8	2.5	2.2	8	14	1	2	2	0	1	BICORNE-LONG
3	21.5	14.1	3.0	2.8	3.6	2.2	1.5	3.7	2.8	2.6	8	25	1	2	1	0	1	BICORNE-LONG
4	49.8	13.3	2.9	2.9	2.2	1.6	1.1	1.8	2.7	2.2	8	5	1	2	1	0	1	BICORNE-LONG
5	36.1	15.3	3.8	2.6	2.3	2.6	1.1	2.9	2.7	2.3	8	24	1	2	1	0	1	BICORNE-LONG
6	29.9	9.2	2.3	2.8	2.9	1.6	1.4	2.5	2.8	2.4	8	5	1	2	1	0	0	BICORNE-LONG
7	41.4	15.7	3.2	4.5	3.4	1.7	1.4	3.3	3.0	2.8	8	16	1	2	1	0	1	BICORNE-LONG
8	25.7	11.4	3.5	2.9	2.2	1.2	0.9	2.3	2.1	2.7	8	21	1	2	1	0	1	BICORNE-LONG

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E - L N	B L A D E - W D	P E T I O L E	O C R E A - L N	I N T E R N D	P E D U N C L E
9	CRUTCHF	374	NY	TX	4G	7	15	1965	103	34	78.4	17.6	13.3	7.4	65.9	57.4
10	M DALCI	142-D	KS	KS	4G	7	27	1971	98	38	64.4	14.3	16.7	5.5	52.9	86.3
11	K. YOUNG	124	OKL	TX	4G	7	2	1964	102	34	65.8	15.8	6.9	5.7	69.8	40.1
12	WH. HARR	4036	KS	KS	4G	9	2	1951	100	37	60.5	8.4	5.9	2.5	64.7	47.8
13	ROWELL	10581	OSU	TX	4G	8	27	1964	102	36	103.2	8.9	10.9	9.8	75.7	52.7
14	ROWELL	10915	OSU	TX	4G	10	8	1965	100	36	31.6	5.5	2.8	3.3	40.3	36.8
15	DEMAREE	54549	NE	AR	5	9	21	1966	93	35	47.2	10.7	9.4	8.3	58.4	40.7
16	WALLIS	121	OSU	OK	5	8	16	1950	95	36	70.2	16.7	10.9	6.9	56.1	34.6

OBS	I N F L O R - L	I N F L O R - W	P E D I C E L	O C R E O L A E	P E R I - L E N	P E R I - W I D	S T A M E N - L	S T Y L E - L N	A C H E N E - L	A C H E N E - W	S T A M - N O	P E D - P U B	P E D - G L N	A C H E N E - S	L E A F H A I R	O C R E A - H R	O C R E L - H R	S P E C I E S
9	43.5	14.9	4.0	3.5	3.8	1.2	1.5	4.2	2.5	2.4	8	12	1	2	1	0	1	BICORNE-LONG
10	41.1	18.0	3.3	3.6	3.2	2.1	1.4	2.9	2.4	2.2	8	9	1	2	1	0	0	BICORNE-LONG
11	41.2	11.8	2.9	2.5	2.0	1.3	0.8	1.9	2.5	2.2	8	9	1	2	1	0	0	BICORNE-LONG
12	24.0	14.0	3.6	2.8	2.6	1.3	0.8	2.0	2.7	2.2	8	16	1	2	1	0	1	BICORNE-LONG
13	28.1	11.8	2.9	2.7	3.0	1.6	1.2	3.2	2.7	2.3	8	25	1	2	1	0	0	BICORNE-LONG
14	33.1	14.0	2.2	2.7	3.8	2.1	2.0	2.7	3.0	2.6	8	12	1	2	1	0	1	BICORNE-LONG
15	40.8	11.5	4.1	3.5	3.6	1.8	1.3	2.4	2.4	2.1	8	5	1	1	1	0	1	BICORNE-LONG
16	34.2	11.4	1.8	3.6	3.3	1.6	1.5	2.4	2.8	2.6	8	15	1	0	1	0	1	BICORNE-LONG

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERNOD	PEDUNCLE
17	FISHER	41193A	US	TX	6	8	10	1941	97	26	101.1	12.2	15.9	7.4	84.6	47.5
18	DEMAREE	24768	KS	AR	6	10	14	1943	92	34	90.0	18.7	11.8	5.6	93.5	61.9
19	DEMAREE	21656	NY	AR	6	9	22	1940	91	34	33.5	5.4	4.2	3.7	50.1	55.0
20	J. BAKER	83	US	TX	4G	8	14	1904	102	35	129.0	21.3	13.1	9.1	53.5	53.8
21	STEPHEN	73293	KS	TX	4G	9	10	1973	103	35	77.8	14.3	12.1	11.8	34.5	66.5
22	REUBEN	5	SMU	TX	4G	10	18	1965	99	32	52.9	8.3	4.3	2.6	50.3	57.5
23	MCGREGG	24007	KS	KS	4G	8	16	1971	100	39	80.0	12.6	15.5	7.0	71.4	58.0
24	STEPHEN	59244	KS	KS	4G	8	17	1972	99	40	54.1	13.4	10.9	9.6	37.4	51.0

OBS	INFLORE LN	INFLORE W	PEDICEL	OCREOLA E	PERRILEN	PERRIWD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE W	STAMEN LN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
17	42.8	9.6	3.3	2.7	2.2	1.4	2.0	2.6	2.2	1.9	8	23	1	1	1	0	1	BICORNE-LONG
18	65.7	12.0	4.1	3.5	3.1	1.6	1.2	2.4	2.7	2.3	8	0	1	1	2	1	1	BICORNE-LONG
19	44.7	9.6	2.8	2.8	3.0	1.7	1.1	2.7	2.5	2.2	8	7	0	1	1	1	0	BICORNE-LONG
20	57.8	13.1	3.3	2.4	3.6	1.4	1.2	2.4	2.4	2.1	8	8	1	1	1	1	1	BICORNE-LONG
21	39.1	14.1	4.1	4.0	3.6	1.3	1.5	2.8	2.5	2.0	8	10	1	1	1	1	0	BICORNE-LONG
22	36.1	13.9	2.7	2.5	3.3	2.0	1.3	3.3	2.4	2.1	8	11	1	1	1	1	1	BICORNE-LONG
23	31.2	17.0	3.1	3.1	3.8	2.0	1.4	3.4	2.6	2.5	8	10	1	2	1	1	1	BICORNE-LONG
24	48.5	18.2	2.5	2.7	3.6	1.9	1.3	2.7	3.1	2.8	8	18	1	2	2	0	1	BICORNE-LONG

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESSES	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
25	IKENBRY	11	OSU	KS	4G	8	8	1940	100	39	78.2	23.1	19.7	5.0	69.7	49.8
26	STEPHEN	29658	KS	KS	4G	10	11	1968	100	38	67.3	13.7	9.9	4.1	21.1	12.4
27	MCGREGR	28128	KS	KS	4G	9	13	1975	102	38	101.1	12.5	14.7	6.9	55.7	49.0
28	STEPHEN	63129	KS	KS	4G	10	4	1972	100	38	59.1	13.7	8.4	5.1	54.5	32.9
29	STEPHEN	45580	KS	NE	4G	9	22	1970	102	41	33.3	13.8	9.1	8.8	40.6	23.6
30	STEPHEN	28173	KS	NE	4G	8	27	1968	100	42	68.4	15.0	10.4	10.2	53.7	26.1
31	STEPHEN	51302	KS	NE	4G	8	21	1971	99	42	85.0	19.5	13.8	16.4	14.6	52.3
32	V. HARMS	1169	KS	KS	4G	8	14	1960	102	39	62.3	11.0	7.9	8.4	45.3	25.7

OBS	INFLORE LN	INFLORE WD	PEDICEL	OCREOLAE	PERILEN	PERIID	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAMINO PUB	PEDG LN	ACHENES	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES	
25	22.8	9.9	2.0	3.3	2.7	1.1	1.0	1.7	2.7	2.0	8	17	1	1	2	1	0	BICORNE-LONG
26	23.7	14.5	2.3	2.7	4.8	2.9	1.6	4.2	1.6	1.5	8	26	1	1	2	0	0	BICORNE-LONG
27	27.9	13.8	4.0	2.7	2.9	1.8	1.4	2.7	2.4	2.1	8	23	1	2	1	1	1	BICORNE-LONG
28	26.6	12.3	3.4	2.0	3.0	1.4	1.0	2.4	3.2	2.7	8	28	1	2	1	0	1	BICORNE-LONG
29	31.6	14.8	3.0	2.8	2.9	1.3	0.8	1.5	2.5	2.4	8	8	1	2	1	0	0	BICORNE-LONG
30	29.3	28.7	3.3	3.1	2.7	2.1	1.3	2.4	2.4	2.3	8	14	1	2	2	1	0	BICORNE-LONG
31	33.3	15.9	4.8	4.3	3.8	2.1	1.5	3.7	2.3	2.0	8	12	1	1	2	1	1	BICORNE-LONG
32	19.7	11.7	2.7	4.1	2.9	1.5	1.2	1.9	2.5	2.2	8	12	1	2	2	0	1	BICORNE-LONG



APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	CODLLECT	ACCESSES	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	CREA LN	INTERND	PEDUNCLE
33	M.DALCI	1	NE	NE	4G	9	20	1968	98	41	87.9	17.1	15.8	4.4	64.5	30.5
34	M.DALCI	128	NE	NE	4G	9	20	1970	100	43	104.6	18.5	20.9	9.4	80.5	51.9
35	RYDBERG	1274	NY	KS	4G	7	22	1929	99	39	68.1	7.0	11.1	5.6	72.5	81.0
36	PORTER		NY	CO	4G	8		1895	105	41	71.6	9.9	11.7	3.7	84.1	23.8
37	MAGRATH	3381	NY	KS	4G	9	27	1968	98	39	73.8	15.7	12.3	4.4	59.6	38.0
38	FORWOOD	327	SMU	SD	4G	6	19	1887	103	44	28.7	5.7	6.4	4.8	34.8	13.1
39	STEPHEN	72909	KS	TX	4G	9	7	1973	102	33	40.5	9.6	5.9	8.5	49.6	33.2
40	STEPHEN	72756	KS	TX	4G	9	4	1973	101	33	66.9	11.8	10.2	13.9	28.4	38.1

OBS	INFLLOR L	INFLLOR W	PEDICEL	OCREOLA E	PERRILEN	PERRIWD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMNO	PEDUB	PEDGLN	ACHENES	LEAFHAIR	OCREALR	OCREALR	SPECIES
33	38.9	11.1	4.2	2.6	3.4	1.6	1.2	2.0	2.8	2.6	8	8	1	1	1	0	0	BICORNE-LONG
34	52.4	15.6	2.9	3.4	3.1	1.5	1.0	2.5	3.2	2.6	8	17	1	2	1	0	0	BICORNE-LONG
35	34.7	11.7	2.7	4.0	2.5	1.3	0.9	1.6	2.5	2.3	8	10	1	2	1	1	1	BICORNE-LONG
36	14.7	9.6	2.7	2.3	3.4	1.7	1.0	1.8	3.0	2.5	8	16	1	1	0	0	0	BICORNE-LONG
37	37.0	17.2	4.5	3.5	3.3	1.9	1.3	2.3	2.4	2.4	8	15	1	1	1	0	1	BICORNE-LONG
38	12.8	9.4	2.4	2.0	2.0	1.4	1.2	2.2	2.2	1.7	8	9	1	2	1	0	1	BICORNE-LONG
39	24.3	11.1	3.5	2.1	3.0	1.7	1.1	2.5	2.4	1.9	8	18	1	2	1	1	0	BICORNE-LONG
40	26.0	12.9	3.3	3.7	3.1	2.0	1.6	3.1	2.6	2.2	8	9	1	2	2	1	1	BICORNE-LONG

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESSION	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LENGTH	BLADE WIDTH	PETIOLE	OCREA LENGTH	INTERNODE	PEDUNCLE
41	STEPHEN	82271	KS	TX	4G	8	5	1974	103	36	105.7	11.0	14.3	5.3	26.3	52.7
42	STEPHEN	80335	KS	TX	4G	7	20	1974	102	34	87.8	11.3	12.9	7.8	72.4	35.9
43	STEPHEN	73203	KS	TX	4G	9	10	1973	103	35	57.5	7.9	8.5	4.8	54.6	84.1
44	WALLIS	7860	OSU	TX	4G	9	19	1958	101	36	57.3	12.1	6.9	7.6	31.6	33.7
45	VL.CORY	24546	GRA	TX	4G	9	19	1937	99	30	75.7	20.7	13.4	4.5	80.1	44.6
46	WILSON	9723	OKL	KS	4C	9	24	1965	95	37	49.3	9.9	0.3	7.1	55.6	36.4
47	WH.HORR	E474	OKL	KS	4C	10	10	1943	95	39	55.5	13.2	10.2	4.0	27.6	22.3
48	M.DALCI	140	NE	NE	4C	9	27	1970	96	40	88.0	12.7	13.9	3.7	86.6	50.9

OBS	INFLORE	INFLORE	PEDICEL	OCREOLA	PERRILEN	PERRILEN	STAMEN	STYLE	ACHENE	ACHENE	STAMEN	PEDUNCLE	PEDUNCLE	ACHENE	LEAFHAI	OCREOLA	OCREOLA	SPECIES
41	33.0	13.7	3.5	3.3	2.6	1.4	1.2	2.3	2.3	2.0	8	32	1	2	1	0	0	BICORNE-LONG
42	38.5	11.2	2.2	3.2	3.3	1.7	1.2	3.4	2.8	2.2	8	7	1	2	1	1	1	BICORNE-LONG
43	43.4	10.5	4.1	3.9	3.7	2.1	1.5	2.3	2.6	1.8	8	4	1	1	1	0	0	BICORNE-LONG
44	17.8	14.2	2.2	2.9	3.9	1.9	1.9	3.2	2.7	2.3	8	22	1	2	2	1	1	BICORNE-LONG
45	54.5	12.1	1.9	3.7	4.5	1.5	1.5	3.9	2.6	2.2	8	15	1	1	1	0	0	BICORNE-LONG
46	38.1	11.7	3.0	2.4	3.4	2.0	1.4	3.2	2.4	2.7	8	19	1	2	1	0	1	BICORNE-LONG
47	25.8	11.6	3.6	2.4	3.6	1.7	1.1	2.3	3.3	2.7	8	8	1	0	1	1	1	BICORNE-LONG
48	42.6	13.7	3.6	3.7	3.3	2.0	1.1	1.9	2.6	2.4	8	20	1	2	2	0	1	BICORNE-LONG

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SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERNOD	PEDUNCLE
49	STEPHEN	34790	GRA	KS	4C	7	23	1969	98	38	84.6	14.6	11.0	5.6	41.2	39.1
50	CR. BALL	964	US	TX	4C	8	25	1906	100	34	56.8	15.5	9.4	8.6	62.6	74.3
51	HUSTON	179	MO	IL	4C	8	17	1968	89	37	95.8	15.6	13.9	7.9	52.0	31.2
52	THORNBR		GRA	SD	4C	8	15	1894	98	44	40.6	14.4	10.9	4.8	46.3	41.9
53	WEEDON	5090	KS	KS	4C	10	17	1968	97	39	83.5	13.7	9.5	10.2	54.1	69.8
54	MCGREGR	3151	KS	KS	4C	6	19	1949	91	38	74.2	22.7	16.5	8.9	59.1	70.3
55	WATERFL	1568	OKL	OK	4C	8	6	1939	97	36	71.5	11.6	12.2	5.7	51.4	62.0
56	M. CLARK	527	OSU	OK	4C	8	16	1957	96	36	99.3	12.7	9.8	6.4	64.5	34.9

OBS	INFLO L	INFLO W	PEDICEL	OCREOLAE	PERRI LN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN	PEDUB	PEDGLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
49	35.1	10.0	1.8	3.8	2.8	1.3	1.3	2.1	2.0	2.1	8	3	1	2	1	0	1	BICORNE-LONG
50	36.7	7.4	2.6	3.3	3.5	1.5	1.1	1.9	2.6	2.2	8	14	1	2	1	0	0	BICORNE-LONG
51	57.9	12.6	2.7	4.0	3.3	1.5	0.9	2.6	2.6	2.4	8	20	1	1	2	0	1	BICORNE-LONG
52	33.4	11.4	4.2	2.7	2.8	1.7	0.8	2.4	2.1	1.9	8	15	1	2	2	1	1	BICORNE-LONG
53	48.6	15.5	2.9	2.9	3.0	2.2	1.3	2.4	2.7	2.8	8	5	1	2	1	0	0	BICORNE-LONG
54	49.2	12.0	3.2	3.5	3.4	1.9	1.5	2.4	2.4	2.1	8	13	1	2	2	1	1	BICORNE-LONG
55	32.4	11.9	3.4	2.5	2.3	1.5	0.9	2.4	2.2	1.9	8	13	1	2	1	1	1	BICORNE-LONG
56	28.3	8.7	2.1	3.3	2.6	1.6	0.7	2.0	2.3	2.2	8	20	1	2	1	0	1	BICORNE-LONG

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SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTE RND	PEDUNCLE
57	D.MCCOY	814	OSU	OK	4C	6	29	1951	97	35	88.1	25.9	17.7	11.1	32.6	55.1
58	CLEMENS	11553	GRA	OK	4C	8	24	1916	98	35	67.9	10.3	14.6	5.8	70.1	19.5
59	J.EWAN	19608	SMU	LA	6	10	25	1958	92	32	31.5	6.1	4.5	5.8	33.9	29.7
60	W.REECE	1404	GRA	LA	6	10	13	1957	92	30	75.4	19.2	9.1	6.8	56.1	47.5
61	LANGLOS		US	LA	6	9	24	1890	92	30	43.2	10.5	5.0	5.3	20.5	32.3
62	AMERSON	756	SMU	TX	6	9	23	1971	95	33	81.5	11.8	10.3	3.1	102.5	40.2
63	SANDERS	119	NY	TX	6	6	5	1965	98	28	111.9	20.5	18.6	6.5	57.5	30.3
64	S.WOLFF	1280	US	TX	6				97	31	51.9	8.5	8.1	2.6	94.1	42.4

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRI LN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREA HR	OCRELR	SPECIES
57	30 1	10 9	4.2	3.8	2.6	1.2	1.1	2.1	2.4	2.2	8	18	1	2	1	1	1	BICORNE-LONG
58	32 6	11.2	2.8	2 5	2 9	1.5	1 4	2.2	2.5	1.9	8	22	1	2	2	0	1	BICORNE-LONG
59	34.7	11 5	2.9	3.4	2 9	1 6	1.0	2 3	2.5	2.3	8	17	1	2	2	1	0	BICORNE-LONG
60	42.4	10.9	2.4	2 4	3.0	1 8	1 4	2.7	2.5	2.1	8	19	1	1	2	1	1	BICORNE-LONG
61	37.7	80.1	2.7	2.4	2 5	1.1	0.6	1.6	2.0	1.9	8	5	1	1	2	1	1	MISSISSIPIENSE
62	53 4	9 8	3.9	2 5	3 0	1.3	1 1	2.7	2.0	1.8	8	25	1	2	1	0	1	BICORNE-LONG
63	41 6	14.1	3.0	2 9	2.9	1 9	1 0	2 5	2 2	1.9	8	13	1	1	1	0	0	BICORNE-LONG
64	47 8	10 1	2.0	3.1	2 5	1.5	1 3	2.3	2.5	2.1	8	8	1	2	1	0	1	BICORNE-LONG

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERNOD	PEDUNCLE
65	FLEETWD	10224	NE	TX	6	10	17	1972	95	29	27.9	7.2	4.3	5.1	35.4	11.8
66	KELLOGG		MO	MO	5	9	11	1937	90	37	53.7	15.1	4.3	7.3	21.0	77.1
67	Y MEXIA	2640	MO	MX	10	7	5	1929	99	19	71.4	7.3	19.6	16.0	60.8	20.7
68	LEVEGUE	19	OSU	OK	4C	10	7	1950	97	36	55.5	11.2	8.8	4.2	50.0	32.3
69	BARBER	1162	OSU	OK	4C	10	27	1975	100	34	24.1	8.2	5.0	3.7	35.7	37.1
70	STEPHEN	71147	KS	OK	4C	8	21	1973	97	37	125.0	14.2	15.5	9.8	72.7	29.1
71	VL. CORY	50116	US	TX	4C	10	12	1945	98	34	47.3	11.9	5.3	4.6	28.0	20.7
72	HOTCHKS	7579	US	KS	4G	10	7	1957	99	38	65.0	17.0	9.0	6.8	43.6	26.5

OBS	INFLORE LN	INFLORE W	PEDICEL	OCREOLAE	PERRILEN	PERRID	STAMEN LN	STYLE LN	ACHENE LN	ACHENE W	STAMEN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
65	25.5	9.5	2.3	2.7	3.0	1.4	1.3	2.6	2.5	2.1	8	3	1	1	1	1	1	BICORNE-LONG
66	41.4	11.1	2.5	2.8	3.1	1.5	1.4	2.3	2.7	2.5	8	15	1	1	2	0	1	BICORNE-LONG
67	39.1	8.2	2.2	3.0	2.9	1.5	1.4	2.3	3.0	2.1	7	28	1	1	1	0	0	BICORNE-LONG
68	25.0	14.7	4.1	3.5	3.7	1.7	2.8	1.1	2.6	2.2	8	16	1	2	1	0	0	BICORNE-SHORT
69	15.7	10.2	2.5	2.8	3.5	1.5	3.6	1.5	2.3	2.3	8	6	1	2	1	0	0	BICORNE-SHORT
70	46.6	14.4	3.0	3.4	2.9	1.8	2.6	1.2	2.3	2.0	8	15	1	1	2	1	1	BICORNE-SHORT
71	26.4	13.3	3.3	2.3	2.4	1.8	2.1	1.0	2.2	2.1	8	11	1	2	1	0	0	BICORNE-SHORT
72	32.8	12.6	6.2	2.3	3.3	2.3	2.7	0.8	2.4	2.3	8	25	1	2	1	0	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
73	STEPHEN	60320	KS	NE	4G	9	5	1972	98	41	42.3	11.6	5.2	5.2	43.2	36.3
74	DB.DUNN	6863	NY	NM	4G	8	12	1949	104	37	52.8	9.6	8.5	6.3	101.6	16.0
75	STEPHEN	62604	KS	CO	4G	9	27	1972	102	39	61.0	9.4	11.7	6.0	82.0	43.7
76	STEPHEN	36205	KS	CO	4G	8	19	1969	104	37	87.2	15.6	12.4	6.7	76.0	84.5
77	C SHEAR	210	GRA	KS	4G	8	13	1894	99	39	62.8	12.8	5.7	8.5	55.1	62.2
78	STEPHEN	79446	KS	OK	4G	7	9	1973	101	37	64.1	9.6	7.8	13.2	38.3	41.2
79	STEPHEN	81632	KS	TX	4G	7	30	1974	101	35	64.0	14.2	12.7	8.9	31.0	48.4
80	J.BARE	111	NY	KS	4G	9	3	1965	100	37	78.2	13.5	11.7	3.0	59.5	34.7

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRILE N	PERRI W ID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAF HAIR	OCREAL HR	OCREAL HR	SPECIES
73	34.8	14.9	3.7	2.7	2.8	1.6	2.6	1.4	2.4	2.1	8	24	1	1	1	0	0	BICORNE-SHORT
74	16.6	10.7	2.0	2.0	3.0	0.8	2.5	1.3	1.8	1.7	8	7	1	0	1	0	0	BICORNE-SHORT
75	18.2	15.0	2.6	2.3	2.8	1.8	2.7	1.3	2.9	2.3	8	12	1	2	1	0	0	BICORNE-SHORT
76	45.7	15.6	3.4	2.9	3.0	2.1	2.3	0.9	2.7	2.4	8	9	1	2	1	0	0	BICORNE-SHORT
77	23.9	6.8	2.8	3.4	2.9	1.4	2.6	1.0	2.4	2.0	8	29	1	2	1	0	1	BICORNE-SHORT
78	7.3	13.5	3.2	2.4	3.3	1.7	2.6	1.1	2.6	2.3	8	35	1	2	1	0	1	BICORNE-SHORT
79	61.6	17.0	4.5	2.9	3.6	1.2	3.3	1.3	2.4	2.3	8	10	1	2	1	1	1	BICORNE-SHORT
80	42.7	12.7	4.0	2.9	3.7	1.3	3.2	1.4	2.5	2.2	8	28	1	2	1	0	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTEARN	PEDUNCLE
81	DEMAREE	8610	NY	AR	5	10	18	1931	92	34	83.6	20.7	11.7	8.2	40.3	36.5
82	F. MEANS	4004	OSU	OK	5	8	27	1968	95	35	69.1	8.3	7.8	9.1	36.9	26.1
83	DEMAREE	59594	SMU	AR	5	10	23	1968	93	35	58.2	15.3	6.4	7.7	92.0	90.0
84	MAGRATH	4667	OKL	MO	5	8	27	1969	92	37	76.3	13.9	15.4	4.7	96.0	95.8
85	WALLIS	5843	KS	OK	5	9	28	1957	95	37	58.7	9.5	4.6	2.9	38.7	20.6
86	WALLIS	5391	OSU	OK	5	9	7	1957	95	36	82.7	16.2	9.7	8.5	63.2	38.5
87	VL. CORY	52313	GRA	TX	6	9	13	1946	96	32	67.2	21.0	12.4	5.4	71.3	17.7
88	RIEDEL		GRA	TX	6	7	25	1941	97	29	96.5	21.8	15.7	8.2	66.7	47.0

OBS	INFLORE L	INFLORE W	PEDICEL	OCREOLA E	PERRILEN	PERRID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCRELA HR	OCRELA HR	SPECIES
81	45.8	12.2	3.7	2.9	3.7	2.6	2.8	1.6	3.1	2.4	8	8	1	0	1	0	1	BICORNE-SHORT
82	32.9	11.2	2.4	2.6	3.4	2.1	3.4	0.7	2.4	2.1	8	13	1	1	2	0	1	BICORNE-SHORT
83	49.3	13.7	2.9	2.8	4.4	2.3	3.4	1.4	2.6	2.5	8	8	1	1	1	0	1	BICORNE-SHORT
84	57.3	14.3	2.5	3.7	4.1	1.7	3.3	1.2	2.4	2.3	8	11	1	1	1	0	1	BICORNE-SHORT
85	31.9	16.6	2.7	3.2	3.4	1.8	3.6	1.4	2.6	2.5	8	15	1	1	1	0	0	BICORNE-SHORT
86	43.0	11.7	4.0	2.8	3.0	1.9	3.5	1.2	2.4	2.4	8	16	1	1	1	0	1	BICORNE-SHORT
87	45.1	11.1	3.2	3.2	4.2	2.6	4.2	1.1	2.4	2.2	8	10	1	2	1	0	1	BICORNE-SHORT
88	28.9	13.2	4.8	3.3	3.3	2.4	5.1	1.4	2.6	2.0	8	8	1	0	1	0	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA	INTE	PEDUNCLE
											LN	WD				
89	FISHER	41193B	US	TX	6	8	10	1941	97	26	107.2	14.3	12.0	5.5	52.2	56.0
90	CLOVER	1514	NY	TX	6	12	10	1938	97	26	42.6	6.4	6.0	3.7	40.0	16.0
91	DEMAREE	34462	GRA	AR	6	10	8	1953	91	35	63.6	25.6	14.0	8.3	43.3	54.7
92	STEPHEN	71532	KS	OK	4G	8	24	1973	100	37	80.8	16.6	13.7	9.1	51.2	14.7
93	STEPHEN	72235	KS	TX	4G	8	30	1973	101	34	48.0	7.4	8.5	3.7	87.0	51.5
94	STEPHEN	59541	KS	KS	4G	8	23	1972	101	38	125.3	16.3	13.7	4.6	66.9	49.0
95	BROOKS	11340	KS	KS	4G	8	20	1975	101	40	63.8	16.4	15.6	4.7	51.0	44.5
96	J BARE	2130	KS	KS	4G	8	22	1969	99	38	76.3	16.0	14.8	4.0	38.0	48.7

OBS	INFLO		PEDICEL	OCREOLAE	PERI		STAMEN	STYLE		ACHENE		PED	ACHENE	LEAFHAI	OCREAL	OCREAL	SPECIES	
	L	W			LN	WD		L	LN	L	W							NO
89	37.0	10.3	3.5	2.5	3.2	2.0	3.2	1.0	2.3	2.1	8	17	1	2	1	0	1	BICORNE-SHORT
90	16.4	6.5	3.3	3.6	3.0	1.8	3.0	1.3	2.1	2.4	8	22	1	2	2	0	1	BICORNE-SHORT
91	42.1	12.5	3.8	3.9	3.7	2.7	3.8	1.5	3.2	2.5	8	3	1	0	1	0	1	BICORNE-SHORT
92	22.5	10.5	3.0	4.1	2.7	1.5	2.1	1.4	2.4	2.3	8	16	1	2	1	1	0	BICORNE-SHORT
93	39.2	12.8	3.9	4.7	3.8	1.7	3.7	1.6	2.3	1.9	8	17	1	1	1	1	1	BICORNE-SHORT
94	35.5	17.2	3.8	2.3	3.9	2.0	3.4	1.0	2.8	2.3	8	17	1	2	1	1	1	BICORNE-SHORT
95	28.2	14.3	3.8	3.2	2.5	1.5	2.8	1.0	2.6	2.2	8	13	1	2	2	0	0	BICORNE-SHORT
96	37.8	14.3	3.1	3.5	4.0	1.8	3.3	0.8	2.4	2.0	8	10	1	2	2	0	0	BICORNE-SHORT



APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
97	TOLSTED	411392	NE	NE	4G	7	28	1941	102	40	60.3	10.1	9.8	8.1	45.7	18.2
98	KIENER	15290	GRA	NE	4G	9	5	1943	102	41	62.7	11.5	13.5	5.6	47.9	27.6
99	STEPHEN	29460	KS	NE	4G	9	17	1968	98	40	71.8	14.2	7.1	4.3	77.0	44.1
100	V HARMS	1212	KS	KS	4G	8	15	1960	102	40	60.4	7.4	10.1	7.3	45.9	49.6
101	STEPHEN	87441	KS	KS	4G	8	13	1975	102	37	89.3	20.7	21.1	4.4	82.6	53.1
102	PALMER	11035	MO	TX	4G	10	14	1916	100	29	43.1	6.6	3.9	2.3	20.7	19.8
103	MAGRATH	6074	DKL	NE	4G	8	23	1970	99	40	114.0	17.9	15.5	9.2	74.1	48.0
104	RYDBERG	1591	NY	NE	4G	7	24	1893	101	42	84.4	12.4	13.4	10.7	45.8	43.6

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLAE	PERRI LEN	PERRI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAH R	OCREAL R	SPECIES
97	25.8	11.0	2.2	2.5	2.7	1.9	2.7	0.9	1.9	1.8	8	11	1	2	2	1	1	BICORNE-SHORT
98	23.3	13.2	3.4	2.8	2.9	1.3	2.5	1.3	2.5	2.1	8	6	1	2	1	0	1	BICORNE-SHORT
99	35.6	14.5	3.4	2.9	3.0	1.9	2.3	0.9	2.7	2.5	8	16	1	2	1	0	1	BICORNE-SHORT
100	23.8	13.5	3.6	3.5	3.3	1.4	2.8	1.1	2.6	2.0	8	15	1	2	1	0	1	BICORNE-SHORT
101	32.4	12.8	2.2	3.6	3.8	1.7	2.1	0.9	2.5	2.1	8	22	1	2	1	0	0	BICORNE-SHORT
102	19.8	11.6	3.6	3.1	3.0	1.3	2.2	1.0	2.7	2.4	8	23	1	2	1	0	0	BICORNE-SHORT
103	37.5	10.7	1.6	3.6	3.5	1.9	3.4	1.0	2.4	2.4	8	17	1	2	1	1	1	BICORNE-SHORT
104	17.3	8.2	3.3	3.1	2.0	1.0	1.7	0.9	2.3	2.2	8	11	1	2	2	1	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESSION	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LENGTH	BLADE WIDTH	PETIOLE	OCREA LENGTH	INTEARN	PEDUNCLE
105	KIENER	17843	KS	NE	4G	10	27	1944	98	41	86.5	17.5	10.3	4.3	50.5	17.6
106	KIENER	15022	NE	NE	4G	8	25	1943	98	41	62.3	13.1	12.3	5.7	66.9	30.5
107	RICHARD	814	NY	NE	4G	7	17	1965	100	40	55.7	9.1	5.7	5.7	47.3	31.4
108	NIGHSWO	748	SMU	OK	4G	9	27	1970	99	37	43.9	11.8	4.1	5.5	29.2	33.9
109	ROGERS	6929	US	CO	4G	8	2	1949	103	37	95.3	14.1	20.9	5.8	60.8	54.7
110	OSTERHT		NY	CO	4G	8	28	1897	105	41	69.6	9.4	13.0	5.5	98.5	24.1
111	STEPHEN	72175	KS	TX	4G	8	30	1973	101	34	53.5	7.4	6.0	4.7	63.5	48.5
112	STEPHEN	82482	KS	TX	4G	8	7	1974	101	36	85.7	19.3	17.1	7.4	65.3	79.8

OBS	INFLORE	INFLORE	PEDICEL	OCREOLA	PERRILEN	PERRID	STAMEN	STYLE	ACHENE	ACHENE	STAMEN	PED	PED	ACHENE	LEAF	OCRE	OCRE	SPECIES
	L	W	L	A	N	D	L	L	L	W	N	P	G	S	A	H	H	
105	35.3	16.4	2.0	2.8	3.0	1.5	2.3	1.4	2.7	2.5	8	10	1	2	0	0	1	BICORNE-SHORT
106	31.4	13.7	2.3	3.3	2.2	0.8	2.4	1.0	2.8	2.2	8	28	1	2	1	1	1	BICORNE-SHORT
107	19.9	10.2	2.6	3.6	2.7	1.2	2.1	1.1	2.3	2.2	8	33	1	2	1	0	1	BICORNE-SHORT
108	18.2	14.2	2.5	2.4	3.7	2.0	3.3	1.1	2.6	2.2	8	15	1	2	1	0	1	BICORNE-SHORT
109	26.8	13.7	3.2	3.6	3.8	1.5	2.4	1.3	2.7	2.1	8	16	1	1	1	1	1	BICORNE-SHORT
110	15.3	9.4	3.4	2.4	3.7	1.8	2.4	1.1	3.1	2.5	8	17	1	2	1	1	1	BICORNE-SHORT
111	29.7	1.3	2.1	2.3	3.5	1.4	3.0	1.1	2.5	2.1	8	19	1	2	1	0	0	BICORNE-SHORT
112	33.2	15.8	4.0	2.6	2.6	1.3	3.9	1.2	2.4	2.1	8	16	1	2	2	0	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERNOD	PEDUNCLE
113	STEPHEN	82095	KS	TX	4G	8	4	1974	102	36	73.7	13.1	9.1	5.4	40.2	33.5
114	STEPHEN	72828	KS	TX	4G	9	5	1973	102	33	57.5	5.0	7.8	6.4	56.0	22.1
115	STEPHEN	73722	KS	OK	4G	9	15	1973	103	37	61.7	10.2	8.8	5.7	55.7	52.2
116	PEARCE	919	SMU	OK	4C	7	4	1963	98	35	60.3	10.4	5.6	7.2	24.1	69.5
117	TOLSTED	411394	NE	NE	4C	7	15	1941	97	41	55.5	9.3	6.1	3.8	65.4	56.1
118	MUELLER		NE	NE	4C	9	21	1936	97	41	47.1	12.4	4.8	4.1	34.5	22.3
119	M.DALCI	100	NE	KS	4C	8	29	1970	96	40	75.1	19.4	11.6	7.6	77.0	47.8
120	KIENER	17837	SMU	NE	4C	10	27	1944	98	41	41.7	7.5	9.2	5.7	47.0	33.0

OBS	INFLORE LN	INFLORE WD	PEDICEL	OCREOLAE	PERRILEN	PERRIWD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAMEN	PEDUB	PEDGLN	ACHENES	LEAFHAIR	OCREALHR	OCREALHR	SPECIES
113	32.2	12.6	3.1	2.6	2.5	1.7	3.0	1.1	2.4	2.0	8	13	1	2	1	1	1	BICORNE-SHORT
114	38.8	15.8	2.7	2.2	3.3	1.7	3.3	1.0	2.7	2.0	8	15	1	2	1	1	1	BICORNE-SHORT
115	28.5	14.9	2.8	2.6	3.0	1.4	3.2	1.1	2.8	2.3	8	30	1	1	1	0	1	BICORNE-SHORT
116	31.0	9.6	3.6	3.9	2.6	1.4	2.3	0.9	2.3	2.3	6	2	1	2	1	0	1	BICORNE-SHORT
117	48.7	10.0	3.3	2.5	3.3	1.3	2.3	1.0	2.3	2.0	8	8	1	2	2	1	1	BICORNE-SHORT
118	27.4	11.2	3.0	3.0	2.9	1.3	2.8	1.4	2.9	2.4	8	12	1	2	1	0	1	BICORNE-SHORT
119	36.8	13.9	3.4	3.7	3.5	2.0	2.5	1.3	2.5	2.5	8	27	1	2	1	0	1	BICORNE-SHORT
120	20.7	11.0	2.9	2.2	2.8	2.4	2.1	1.2	3.3	2.6	8	5	1	2	1	0	0	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
121	DAVIDSN	662	US	IO	4C	9	3	1953	91	41	74.3	14.4	8.7	11.2	38.2	20.0
122	CHURCHL	1334	NE	IO	4C	9	11	1903	95	42	105.9	17.4	15.7	4.9	41.0	37.9
123	VL CORY	15900	GRA	TX	4C	9	25	1935	100	34	70.9	11.6	12.4	6.9	80.9	32.1
124	MAHLER	3700	SMU	TX	4C	9	11	1963	100	32	82.3	15.6	11.9	7.0	56.6	19.7
125	WHITEHS	10807	US	TX	4C	10	1	1945	99	34	75.3	18.1	14.8	3.9	53.7	42.2
126	F. GRAGG	77	OKL	TX	4C	9	25	1934	99	34	50.6	11.9	10.3	9.1	35.2	35.1
127	J DAVIS	14	SMU	TX	4C	10	17	1965	99	32	55.3	14.7	9.3	8.6	57.8	32.4
128	L LOCKE	55	US	OK	4C	9	2	1931	99	37	39.7	6.9	5.8	5.0	30.3	27.6

OBS	INFLOREL	INFLOREL	PEDICEL	OCREOLAE	PERRILEN	PERRIWD	STAMENL	STYLE	ACHENE	ACHENE	STAMEN	PEDPUB	PEDGLN	ACHENE	LEAFHAIR	OCREALH	OCREALH	SPECIES
121	29.3	11.7	2.1	3.8	2.8	1.2	2.6	1.8	2.9	2.8	8	11	1	0	2	0	1	BICORNE-SHORT
122	33.7	12.9	2.2	3.6	2.2	1.6	1.9	1.0	2.6	2.6	8	3	1	0	1	0	0	BICORNE-SHORT
123	31.5	9.4	3.3	2.8	2.4	1.5	1.8	0.9	2.2	2.0	8	18	1	1	1	0	0	BICORNE-SHORT
124	42.0	9.4	4.2	3.7	2.7	1.1	2.7	0.8	2.2	2.2	8	17	1	2	1	0	0	BICORNE-SHORT
125	40.5	9.7	1.8	3.1	3.1	1.9	2.4	1.2	2.5	2.1	8	10	1	2	1	0	0	BICORNE-SHORT
126	31.5	12.7	3.5	2.8	3.0	1.6	2.4	1.0	2.4	2.2	8	30	1	2	1	0	0	BICORNE-SHORT
127	24.9	15.1	3.0	2.8	3.3	1.9	2.5	1.2	2.2	2.1	8	24	1	2	1	0	0	BICORNE-SHORT
128	17.0	11.0	2.8	1.8	2.4	1.4	2.4	0.8	2.5	2.0	8	23	1	2	1	1	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
129	MUEHLEN	443	MO	MO	4C	9	19	1954	90	39	24.3	6.2	3.0	5.5	15.3	28.6
130	RJ. TYRL	806	OSU	OK	4C	7	12	1973	97	36	92.7	16.0	17.0	17.3	46.7	82.3
131	MCDONAL	53	OSU	OK	4C	8	17	1971	96	37	75.8	13.9	12.8	12.9	18.5	51.4
132	MAHLER	5036	SMU	OK	4C	10	6	1968	98	34	89.0	16.8	14.5	7.4	53.6	39.3
133	RICHARD	130	US	LA	6	5	26	1956	91	31	88.4	17.9	17.6	3.9	40.8	28.8
134	C. BROWN	8195	GRA	LA	6	9	30	1939	92	31	56.8	10.0	5.1	4.8	30.8	18.6
135	R KRAL	6042	GRA	FL	6	9	28	1957	87	30	100.5	14.9	6.5	8.1	69.8	23.0
136	E WEST		KS	FL	6	8	21	1942	82	30	156.7	15.4	15.6	14.8	81.4	64.0

OBS	INFLORE LN	INFLORE W	PEDICEL	OCREOLA E	PERI LN	PERI WD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE W	STAMEN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
129	22.6	8.4	2.3	3.3	2.6	1.7	2.4	1.2	2.2	2.0	8	12	1	1	1	0	1	BICORNE-SHORT
130	33.7	15.5	3.6	3.8	2.3	1.7	2.5	1.0	1.9	2.1	8	0	0	2	1	0	0	BICORNE-SHORT
131	41.8	12.4	3.7	3.8	3.3	1.8	3.2	0.6	2.3	2.1	8	12	1	1	2	1	1	BICORNE-SHORT
132	29.6	13.0	1.9	1.9	3.0	1.4	3.0	1.0	2.4	1.7	8	35	1	2	1	0	0	BICORNE-SHORT
133	30.7	7.5	1.4	2.3	2.8	1.3	2.5	0.7	2.3	1.9	8	7	1	1	2	0	1	BICORNE-SHORT
134	22.9	9.5	2.7	3.1	2.9	1.2	2.1	1.0	2.5	1.9	8	14	1	1	1	0	1	BICORNE-SHORT
135	38.3	12.2	4.0	3.8	4.4	2.1	2.4	1.1	2.6	2.1	8	41	1	1	2	1	1	BICORNE-SHORT
136	54.7	9.3	2.0	3.4	2.7	1.2	2.0	0.6	2.3	1.7	7	1	0	0	2	0	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

O B S	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E		P E T I O L E	O C R E A		I N T E R N D	P E D U N C L E
											L N	W D		L N	W D		
137	BF.BUSH	117-A	GRA	MO	6	9	14	1893	90	36	66.8	9.3	6.0	3.5	22.5	36.4	
138	S.BRAGG	75	OSU	OK	6	.	.	1935	96	34	58.1	9.9	11.1	3.1	52.6	25.4	
139	PALMER	8692	US	LA	6	9	27	1915	93	32	77.4	11.6	9.6	7.9	50.8	60.1	
140	CORRELL	32125	NY	TX	6	11	12	1965	96	32	72.0	22.2	12.2	6.4	53.0	38.7	
141	WHITEHS	17431	NY	TX	6	10	19	1946	97	34	67.9	15.0	7.1	4.3	68.2	53.5	
142	R.INNES	187	GRA	TX	6	10	29	1940	98	30	89.7	19.7	10.5	6.8	26.2	41.5	
143	VL.CORY	50016	GRA	TX	6	10	3	1945	94	30	84.7	12.1	10.4	4.3	40.2	51.1	
144	WHITEHS	16486	NY	TX	6	9	6	1946	96	33	82.5	26.7	16.6	6.6	31.2	39.2	

O B S	I N F L O R		P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N	S T Y L E	A C H E N E		S T A M E N	P E D P U B	P E D G L N	A C H E N E	L E A F H A I R	O C R E A	O C R E L	S P E C I E S
	L	W							L	W								
137	29.1	10.1	2.4	2.5	2.6	1.1	2.4	1.1	2.4	2.3	8	19	1	2	1	0	1	BICORNE-SHORT
138	36.7	9.7	1.8	2.2	3.3	1.6	2.9	1.3	2.8	2.6	8	23	1	2	1	1	1	BICORNE-SHORT
139	25.7	13.3	3.3	2.9	3.6	1.3	3.2	1.1	2.1	1.9	8	7	1	2	1	0	1	BICORNE-SHORT
140	37.3	16.4	3.3	2.7	3.0	1.6	2.6	1.2	2.4	2.0	8	14	1	1	1	0	1	BICORNE-SHORT
141	32.7	12.9	2.3	2.1	3.3	1.9	2.8	1.0	2.9	2.4	8	7	1	2	1	0	0	BICORNE-SHORT
142	42.1	13.1	3.3	3.5	4.6	2.2	3.6	1.8	2.6	2.2	8	18	1	1	1	0	0	BICORNE-SHORT
143	41.5	9.1	2.3	2.0	2.5	1.2	2.4	1.0	2.3	2.0	8	13	1	2	2	1	1	BICORNE-SHORT
144	43.0	11.5	3.7	3.3	3.7	1.9	2.8	1.2	2.4	2.1	8	18	1	1	1	1	1	BICORNE-SHORT

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
145	STANDLY	9035	US	MO	5	8	20	1912	93	27	56.0	9.2	6.9	6.2	55.5	51.6
146	CORRELL	39308	NY	AZ	2	8	15	1970	111	31	76.3	12.6	11.9	12.8	90.9	33.8
147	WHITING	1041	MO	MX	9	7		1934	101	23	112.5	6.0	5.0	5.5	48.5	28.4
148	ANGUAS	213	MO	MX	9	11	28	1976	99	20	41.5	6.4	3.4	3.7	39.8	21.0
149	PRINGLE	11699	US	MX	9	9	3	1903	100	20	91.5	13.8	13.4	15.5	90.5	19.8
150	ARSENE	2807	US	MX	10	7	25	1909	101	19	89.6	13.3	10.1	18.5	51.1	18.3
151	DRESSLR	278	MO	MX	10	8	21	1948	102	23	83.1	9.6	6.4	10.1	81.3	23.6
152	M DALCI	199-R	KS	OH	4C	8	19	1971	82	40	183.4	48.2	16.5	16.8	92.7	25.4

OBS	INF LOR	INF LOR	PEDICEL	OCREOLAE	PERI LEN	PERI WID	STAMEN	STYLE LN	ACHENE LN	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
145	38.6	11.5	2.7	4.0	3.1	1.0	2.6	1.1	2.1	1.7	8	17	1	1	1	0	1	BICORNE-SHORT
146	36.2	11.1	2.4	2.2	2.7	1.5	2.1	1.3	2.9	2.6	7	19	1	1	1	0	0	BICORNE-SHORT
147	31.8	8.4	1.5	2.3	3.4	2.0	2.2	1.2	2.9	2.4	7	10	1	1	1	0	0	MEXICANUM
148	18.9	9.3	1.9	2.3	2.8	2.1	2.1	1.4	2.5	2.7	6	19	1	1	1	0	0	MEXICANUM
149	34.6	9.6	1.5	2.3	2.9	2.1	2.6	1.5	2.9	2.4	7	30	1	1	1	1	1	MEXICANUM
150	26.1	9.1	2.0	2.5	3.8	2.3	2.4	1.3	3.1	2.6	7	18	1	1	1	0	1	MEXICANUM
151	42.4	10.7	2.3	2.3	2.6	1.3	2.2	1.3	2.5	2.0	7	39	1	1	1	0	0	MEXICANUM
152	29.5	8.8	3.8	4.1	3.8	1.9	1.8	1.6	3.1	2.7	7	7	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATER	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
153	M.DALCI	201-H	NE	OH	4C	8	20	1971	84	42	112.4	17.8	10.2	12.6	45.8	43.0
154	M.DALCI	85	NE	OH	4C	8	16	1970	82	42	95.0	11.9	9.8	18.6	38.7	42.9
155	M.DALCI	83	NE	OH	4C	8	15	1970	84	40	178.5	38.3	27.5	17.6	68.0	46.7
156	M.DALCI	88	NE	MI	4C	8	17	1970	87	42	162.8	32.8	26.0	20.6	49.1	29.2
157	H.DENKE	4928	GRA	IL	4C	9	13	1929	88	42	82.0	16.2	7.3	7.0	45.9	18.7
158	MCDONAL		GRA	IL	4C	8		1903	90	41	110.7	26.6	20.8	18.5	75.2	48.9
159	LANSING	3551	GRA	IL	4C	9	27	1912	88	40	46.3	9.6	3.9	6.5	51.0	19.5
160	V.CHASE	11603	US	IL	4C	9	16	1950	90	41	123.4	37.0	10.8	6.7	77.6	46.1

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRILE N	PERRI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN N	PED PUB	PED GLN	ACHENE S	LEAF HAIR	OCREALA R	OCREALA H R	SPECIES
153	29.8	13.0	2.4	2.8	2.9	2.0	1.9	1.9	3.2	2.4	7	14	1	0	1	0	1	PENNSYLVANICUM
154	41.9	14.6	2.6	2.7	2.2	1.9	1.9	1.8	2.9	2.3	7	0	1	0	1	0	1	PENNSYLVANICUM
155	48.5	9.4	2.1	2.7	2.6	1.2	1.7	1.2	2.8	2.4	7	11	1	0	1	0	1	PENNSYLVANICUM
156	32.7	7.0	2.1	3.6	3.6	1.9	1.7	1.5	3.1	2.7	7	6	1	0	1	0	0	PENNSYLVANICUM
157	23.7	11.1	1.7	3.5	2.9	1.7	1.6	1.3	3.3	2.7	7	14	1	0	1	0	1	PENNSYLVANICUM
158	34.8	9.9	2.5	3.8	3.0	1.8	1.7	1.6	3.2	2.6	7	6	1	0	1	0	1	PENNSYLVANICUM
159	39.6	10.4	2.0	3.4	2.8	0.9	2.0	1.9	3.0	2.9	7	6	1	0	1	0	1	PENNSYLVANICUM
160	43.7	9.6	2.4	3.0	3.5	2.4	3.3	2.7	3.3	3.4	6	18	1	0	1	0	1	PENNSYLVANICUM



APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E L N	B L A D E W D	P E T I O L E	O C R E A L N	I N T E R N D	P E D U N C L E
161	RIDGWAY		GRA	IL	4C	8	25	1914	88	39	43.7	10.5	4.9	7.9	31.8	39.1
162	WILSON	15304	OKL	OH	4C	8	23	1968	84	39	133.7	28.2	13.6	14.4	69.9	45.9
163	WILSON	15321	OKL	MI	4C	8	25	1968	84	42	53.1	7.4	4.3	14.3	35.9	36.0
164	CHANEY	217	US	MI	4C	9	.	1910	86	44	67.9	11.7	8.8	9.3	22.4	18.3
165	ENGLEMN		GRA	MO	4C	10	.	1868	90	39	118.5	17.8	11.3	7.1	54.3	33.7
166	HINTERT	838	MO	MO	4C	8	28	1973	91	40	102.0	18.0	15.2	11.6	90.5	47.5
167	BF.BUSH	513	NY	MO	4C	9	5	1895	89	39	125.1	21.5	15.0	6.5	54.3	29.0
168	M DALCI	210-P	KS	WI	4C	8	22	1971	90	44	73.1	15.0	9.2	11.6	65.1	33.3

OBS	I N F L O R L	I N F L O R W	P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N L	S T Y L E L N	A C H E N E L	A C H E N E W	S T A M N O	P E D P U B	P E D G L N	A C H E N E S	L E A F H A I R	O C R E A H R	O C R E L H R	S P E C I E S
161	25.2	18.3	1.6	2.4	2.5	1.4	1.8	1.5	2.6	2.5	6	4	1	0	2	0	1	PENNSYLVANICUM
162	36.9	7.5	1.8	3.0	2.2	1.4	1.3	1.3	2.7	2.3	6	10	1	0	1	0	1	PENNSYLVANICUM
163	26.6	11.5	2.5	3.1	2.3	1.1	1.7	1.4	2.3	2.2	7	27	1	0	1	0	1	PENNSYLVANICUM
164	15.2	9.3	1.7	2.4	2.5	2.0	1.9	1.3	2.8	3.0	7	10	1	0	1	0	1	PENNSYLVANICUM
165	42.3	10.0	2.2	2.5	2.9	1.3	2.0	1.0	2.7	2.2	6	11	1	0	1	0	0	PENNSYLVANICUM
166	52.3	12.4	4.0	2.7	2.9	1.3	2.1	1.8	2.6	2.5	6	13	1	0	2	1	1	PENNSYLVANICUM
167	29.9	9.4	2.4	2.8	3.8	1.4	2.2	1.9	2.7	2.3	6	7	1	0	1	0	0	PENNSYLVANICUM
168	22.8	12.6	2.0	2.4	2.8	2.0	1.7	1.5	2.8	2.7	6	7	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA	INTERN	PEDUNCLE
											LN	WD				
169	STEPHEN	44786	KS	SD	4C	9	7	1970	97	43	125.6	26.4	18.0	10.4	47.0	39.9
170	M. DALCI	125	NE	MN	4C	9	18	1970	96	45	60.7	16.4	5.0	19.7	28.7	27.4
171	MCGREGR	23554	KS	KS	4G	9	11	1970	98	40	157.6	36.4	23.1	12.3	49.5	26.9
172	STEPHEN	68003	KS	MT	4G	7	18	1973	106	49	43.1	13.5	6.5	9.3	32.3	15.3
173	STEPHEN	62507	KS	CO	4G	9	25	1972	103	41	78.1	22.9	10.9	6.9	39.4	20.1
174	STEPHEN	62566	KS	CO	4G	9	26	1972	102	40	71.4	24.2	7.6	8.5	41.0	29.6
175	STEPHEN	60319	KS	NE	4G	9	5	1972	98	41	90.5	15.5	5.9	8.1	47.6	23.7
176	C. SHEAR	170	GRA	KS	4G	7	20	1894	99	39	120.7	23.9	13.4	16.6	61.4	48.4

OBS	INFLO		PEDICEL	OCREOLAE	PERI		STAMEN	STYLE		ACHENE		STAM	PEDUB	PEDGLN	ACHENE	LEAFHAI	OCREAL	OCREAL	SPECIES
	LN	WD			LN	WD		LN	WD	LN	WD								
169	37	0	11.8	1.6	2.1	2.6	2.2	2.0	1.7	3.3	3.1	7	8	1	0	1	0	1	PENNSYLVANICUM
170	31	1	12.3	2.7	3.2	2.7	1.8	1.6	1.4	3.1	2.6	6	17	1	0	1	0	1	PENNSYLVANICUM
171	24	5	15.5	2.9	3.0	2.8	1.8	2.2	1.8	2.9	2.8	7	8	1	0	1	0	0	PENNSYLVANICUM
172	15	1	8.8	1.4	2.3	2.2	1.2	1.5	1.1	2.3	1.9	6	3	1	0	1	0	1	PENNSYLVANICUM
173	36	5	13.0	2.5	2.8	3.1	2.0	1.9	1.1	3.5	3.1	6	9	1	1	1	0	0	PENNSYLVANICUM
174	23	2	13.5	1.9	2.7	3.4	2.4	2.2	1.7	3.6	3.4	8	13	1	0	1	0	1	PENNSYLVANICUM
175	42	4	14.2	2.4	2.7	3.3	2.3	2.2	1.6	2.6	2.4	7	10	1	0	1	0	0	PENNSYLVANICUM
176	29	9	8.4	2.5	3.3	2.0	1.3	1.3	1.1	3.1	2.4	7	0	0	0	1	0	1	MEXICANUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
177	DEMAREE	38264	GRA	AR	5	8	28	1955	93	35	93.9	17.3	10.8	18.1	38.7	26.9
178	DEMAREE	9595	MO	AR	5	10	8	1932	94	34	69.9	16.5	17.2	4.0	74.3	22.5
179	DEMAREE	19877	NY	AR	5	8	12	1939	93	34	103.9	15.7	9.8	9.9	46.3	44.2
180	DEMAREE	23925	MO	AR	5	9	6	1942	93	35	100.0	17.1	6.7	12.4	49.7	39.1
181	DEMAREE	65868	MO	AR	5	10	12	1972	93	35	83.3	27.2	7.8	6.7	104.2	39.6
182	SCULLY	107	GRA	AR	5	9	16	1935	93	34	100.4	22.8	12.1	12.4	53.7	38.5
183	A HILL	67	SMU	AR	5	10	4	1974	93	35	107.5	24.9	11.1	6.0	69.6	50.6
184	SCULLY	105	GRA	AR	5	9	13	1935	93	34	72.1	13.0	8.9	12.8	36.9	51.7

OBS	INF LOR	INF LOR	PEDICEL	OCREOLAE	PERRI LN	PERRI WD	STAMEN	STYLE	ACHENE	ACHENE	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
177	39.0	9.5	2.4	2.5	2.7	1.6	2.2	1.6	2.9	2.1	6	22	1	0	2	0	1	PENNSYLVANICUM
178	39.1	11.0	1.5	2.5	2.2	1.8	2.0	1.9	2.7	2.6	5	19	1	0	2	1	1	PENNSYLVANICUM
179	16.2	8.0	2.6	3.2	2.6	1.6	1.1	1.1	2.4	2.1	6	8	1	0	1	0	1	PENNSYLVANICUM
180	30.5	8.5	2.2	2.4	3.5	1.8	2.2	2.0	2.5	2.4	6	19	0	0	2	0	1	PENNSYLVANICUM
181	29.7	11.1	3.0	3.6	2.7	1.8	2.6	2.0	3.1	2.7	6	6	1	0	2	0	1	PENNSYLVANICUM
182	35.5	7.9	2.0	2.6	2.5	1.6	2.2	1.9	2.7	2.2	6	7	1	0	2	0	1	PENNSYLVANICUM
183	51.9	12.6	1.9	2.2	2.3	1.9	2.4	2.0	2.6	2.4	6	7	1	0	2	0	1	PENNSYLVANICUM
184	32.7	10.2	2.6	2.3	2.8	1.4	2.0	1.8	2.7	2.3	6	11	1	0	2	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
185	SCULLY	106	MO	AR	5	9	26	1934	93	34	94.3	29.6	13.9	11.5	37.0	23.6
186	BLAKLEY	1454	GRA	OK	5	6	20	1914	95	35	74.7	23.4	9.4	6.4	49.0	10.5
187	DEMAREE	870	GRA	AR	5	8	28	1955	93	36	65.9	10.6	6.6	14.2	40.7	44.6
188	DEMAREE	34293	KS	AR	5	9	19	1953	94	35	142.4	22.4	17.1	13.3	79.1	44.8
189	F MEANS	4139	OSU	OK	5	9	22	1968	96	35	138.3	25.4	10.1	8.0	31.0	59.5
190	MAGRATH	4804	KS	MO	5	8	28	1969	92	38	142.6	20.7	18.0	17.4	57.7	71.6
191	BLAKLEY	3400	OKL	OK	5	8	27	1914	94	35	106.1	24.7	8.7	12.4	43.3	28.0
192	M.DALCI	103	NE	MO	5	8	29	1970	92	37	112.3	20.8	12.4	9.2	52.4	20.0

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRI LN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREA HR	OCREA HR	SPECIES
185	35.5	11.7	2.0	2.6	2.7	2.5	2.4	2.4	3.0	2.8	6	10	1	0	2	0	1	PENNSYLVANICUM
186	26.6	8.6	2.7	2.6	2.5	1.5	1.8	2.1	3.4	2.7	7	9	1	0	1	0	0	PENNSYLVANICUM
187	36.2	10.6	2.2	2.5	2.6	1.6	1.6	1.8	2.8	2.5	6	5	1	0	1	0	0	PENNSYLVANICUM
188	54.0	14.5	2.6	2.4	3.2	2.1	2.1	1.9	2.9	2.4	5	18	1	0	2	1	1	PENNSYLVANICUM
189	53.7	14.6	2.6	3.7	2.9	1.2	2.2	2.1	2.8	2.5	7	10	1	0	2	1	1	PENNSYLVANICUM
190	53.3	14.8	3.6	3.6	2.9	1.4	1.3	1.8	3.2	3.2	6	4	1	0	1	0	1	PENNSYLVANICUM
191	35.3	8.6	2.2	2.5	2.6	2.0	2.0	2.3	2.7	2.1	6	27	1	0	2	1	1	PENNSYLVANICUM
192	39.7	9.1	2.2	2.5	2.5	1.6	2.2	1.9	2.5	1.9	7	22	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATION	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
193	WALLIS	6050	OKL	OK	5	10	5	1957	95	36	55.6	13.5	9.8	5.9	20.2	16.0
194	WALLIS	5933	OSU	OK	5	9	28	1957	95	37	31.7	8.4	2.4	3.3	1.6	35.0
195	BICKNEL		NY	NY	6	10		1898	74	41	129.6	25.6	16.5	7.2	85.8	54.8
196	M.DALCI	195-V	KS	NJ	6	8	16	1971	75	40	135.0	24.5	22.5	24.0	63.9	18.5
197	MASSEY	3060	SMU	DE	6	9	30	1971	75	39	126.7	16.3	18.2	10.6	43.6	31.6
198	LIDESTM	7430	US	MD	6	9	20	1914	76	38	122.0	23.9	20.0	16.2	38.1	43.7
199	SVENSON	21087	MO	MA	6	9	11	1963	71	42	104.7	13.7	10.3	14.6	52.6	32.0
200	FAIRCLH	951	MO	GA	6	5	8	1964	84	31	67.0	15.0	11.9	13.9	45.1	36.5

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRI LN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN N	PEDUB	PEDGLN	ACHENE S	LEAFHAIR	OCREALH	OCREALH	SPECIES
193	23.0	14.6	3.0	3.5	3.9	2.3	2.2	1.8	2.7	2.7	6	8	1	0	1	0	0	PENNSYLVANICUM
194	34.5	12.3	3.6	3.0	2.5	1.6	1.8	1.8	2.4	2.9	6	8	1	0	1	0	1	PENNSYLVANICUM
195	46.6	13.6	3.0	3.0	3.0	2.5	1.7	1.6	3.2	3.2	6	18	1	0	1	0	1	PENNSYLVANICUM
196	23.3	11.0	2.8	3.0	2.7	1.3	1.4	1.0	2.7	2.3	5	13	1	0	2	1	1	PENNSYLVANICUM
197	33.4	12.4	2.6	2.2	2.9	1.6	2.4	2.4	2.7	2.6	7	20	1	0	2	1	1	PENNSYLVANICUM
198	38.6	15.0	2.8	3.4	2.8	2.0	1.6	1.9	2.9	2.7	7	14	1	0	2	0	0	PENNSYLVANICUM
199	29.4	10.5	2.5	3.6	3.1	1.7	2.1	1.6	2.8	2.4	6	16	1	0	2	1	1	PENNSYLVANICUM
200	22.8	12.3	2.3	3.5	2.2	1.1	1.7	1.6	2.5	2.2	6	11	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E L N	B L A D E W D	P E T I O L E	O C R E A L N	I N T E R N D	P E D U N C L E
201	E. WEST		KS	FL	6	4	7	1950	81	30	48.0	15.8	13.2	5.4	66.0	40.4
202	CORRELL	48325	NY	FL	6	4	9	1977	81	25	40.7	8.4	5.4	7.1	62.5	16.2
203	M. DALCI	177-0	KS	SC	6	8	8	1971	81	34	107.5	14.8	18.7	13.9	36.5	42.3
204	RUDOLPH		GRA	NC	6	9	2	1948	76	36	147.7	25.6	8.7	17.3	47.6	17.2
205	G. SHULL	221	GRA	VR	6	8	13	1902	77	39	115.6	20.4	11.8	11.5	57.1	68.0
206	DEMAREE	13920	GRA	AR	6	10	15	1936	92	34	98.9	24.8	10.6	8.8	35.1	29.5
207	M. DALCI	192-F	NE	NJ	6	8	15	1971	75	40	202.0	40.3	24.6	17.9	42.8	37.9
208	DEMAREE	37995	KS	AR	6	8	17	1955	92	35	143.8	31.4	16.8	10.0	62.1	42.3

OBS	I N F L O R L	I N F L O R W	P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N L	S T Y L E L N	A C H E N E L	A C H E N E W	S T A M N O	P E D P U B	P E D G L N	A C H E N E S	L E A F H A I R	O C R E A H R	O C R E L H R	S P E C I E S
201	17.9	10.6	1.7	2.7	3.7	2.0	3.0	2.1	2.9	2.6	7	3	1	0	1	0	1	PENNSYLVANICUM
202	14.3	9.6	2.9	3.0	2.9	1.5	2.8	1.8	2.4	2.2	7	23	1	0	1	0	1	PENNSYLVANICUM
203	29.3	10.0	2.3	2.4	2.8	1.7	2.3	1.8	2.6	2.3	8	6	1	0	2	0	1	PENNSYLVANICUM
204	32.0	11.6	2.9	3.2	3.3	2.0	2.4	2.2	3.0	2.5	7	24	1	0	2	1	1	PENNSYLVANICUM
205	43.7	11.6	2.5	2.7	2.6	1.4	2.3	1.8	2.7	2.5	6	5	1	0	1	0	1	PENNSYLVANICUM
206	22.5	14.0	2.0	2.2	3.4	2.1	2.7	2.8	2.7	2.2	7	11	1	0	2	1	1	PENNSYLVANICUM
207	23.2	9.7	1.9	3.0	2.3	1.6	1.8	1.4	2.5	2.5	7	6	1	0	1	0	1	PENNSYLVANICUM
208	61.6	9.4	3.0	2.1	2.8	1.6	2.4	1.7	2.6	2.3	6	12	1	0	2	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E L N	B L A D E W D	P E T I O L E	O C R E A L N	I N T E R N D	P E D U N C L E
209	DEMAREE	14045	MO	AR	6	10	24	1936	91	34	90.7	22.8	9.0	9.8	53.7	39.0
210	DEMAREE	14212	NY	AR	6	11	15	1936	91	34	58.3	15.4	10.9	3.4	31.7	26.6
211	ROGERS	8793	SMU	MS	6	10	7	1972	90	33	74.6	18.2	10.2	6.7	61.6	41.7
212	S. TRACY	8051	NY	AL	6	8	18	1904	88	31	119.2	24.0	16.1	14.6	53.5	35.6
213	M DALCI	80-C	NY	PA	7	8	14	1970	78	40	91.7	22.6	11.8	7.4	56.2	39.6
214	M DALCI	191-B	KS	PA	7	8	14	1971	77	40	117.1	19.4	10.5	7.0	42.9	32.5
215	LEONARD	2053	US	PA	7	9	2	1921	80	40	49.9	12.6	7.0	6.3	34.8	20.9
216	W L DIX	1839	NY	PA	7	8	23	1957	75	42	73.8	15.2	14.4	11.1	55.6	23.9

OBS	I N F L O R L	I N F L O R W	P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N L	S T Y L E L N	A C H E N E L	A C H E N E W	S T A M N O	P E D P U B	P E D G L N	A C H E N E S	L E A F H A I R	O C R E A H R	O C R E L H R	S P E C I E S
209	35.4	12.2	2.2	3.4	2.6	1.4	2.0	1.7	2.9	2.2	6	12	1	0	2	0	1	PENNSYLVANICUM
210	34.6	15.5	3.0	1.6	3.3	1.7	1.3	1.3	2.4	2.0	7	14	1	0	1	0	1	PENNSYLVANICUM
211	27.2	11.2	2.3	2.6	2.6	1.5	1.6	2.0	2.4	2.2	7	9	1	0	2	0	1	PENNSYLVANICUM
212	28.5	7.5	2.2	1.9	2.7	1.6	2.1	1.9	2.4	1.9	5	10	1	0	2	0	1	PENNSYLVANICUM
213	31.9	13.0	2.8	3.2	3.4	1.3	1.8	1.4	2.5	1.7	7	23	1	0	1	0	0	PENNSYLVANICUM
214	22.0	10.9	2.9	2.5	4.0	1.6	2.4	1.4			7	12	1		2	0	1	PENNSYLVANICUM
215	23.9	12.5	2.0	2.9	3.6	1.7	2.9	1.8	3.0	2.8	7	15	1	1	2	0	1	PENNSYLVANICUM
216	30.0	11.5	2.7	3.5	3.6	1.8	2.3	1.2	2.8	2.2	7	13	1	0	2	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
217	WINDBER	200	NY	PA	7	8	30	1955	79	40	174.2	31.3	22.0	7.8	77.3	23.2
218	M.DALCI	180-G	NE	GA	7	8	9	1971	84	34	156.9	21.5	26.4	14.0	47.5	43.4
219	GILBERT	937	OKL	WV	7	10	12	1940	82	38	119.0	32.2	12.9	8.9	67.0	27.9
220	B.GATES		MO	MA	7	9	16	1944	72	42	179.9	40.7	21.7	6.2	34.4	38.6
221	M.DALCI	77	NE	NY	7	8	13	1970	76	43	185.0	44.6	36.3	9.9	99.2	22.5
222	R.DAVIS	4442	SMU	TN	7	8	10	1967	83	36	131.8	26.1	13.4	7.7	78.8	80.7
223	R.KRAL	33471	SMU	AL	7	10	3	1968	87	35	67.3	14.9	5.7	4.7	72.0	44.6
224	KEARNEY	284	GRA	KY	7	8		1893	83	37	136.7	25.8	11.7	8.0	67.5	30.0

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRILE N	PERRI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
217	32.8	11.7	2.5	2.5	3.7	1.9	2.2	2.0	2.9	2.7	7	13	1	0	1	0	1	PENSYLVANICUM
218	50.9	9.4	3.2	2.3	2.7	1.8	2.4	1.9	2.6	2.1	7	8	0	0	2	0	1	PENSYLVANICUM
219	32.7	10.5	2.0	3.0	3.8	2.0	2.1	2.6	3.3	3.1	7	1	1	0	2	1	1	PENSYLVANICUM
220	45.6	11.3	3.1	4.1	3.0	2.5	2.0	1.5	2.9	2.2	7	21	1	0	1	0	1	PENSYLVANICUM
221	25.0	8.6	1.8	3.8	3.7	2.0	1.7	1.7	2.9	2.0	6	13	1	0	1	0	1	PENSYLVANICUM
222	32.8	8.7	2.8	3.5	2.6	1.6	1.4	1.6	2.9	2.2	6	10	1	0	2	0	1	PENSYLVANICUM
223	29.7	13.3	2.8	2.3	4.0	2.4	2.6	2.1	3.3	2.8	6	4	1	0	2	0	1	PENSYLVANICUM
224	29.0	10.3	2.5	2.7	3.1	2.1	2.7	2.4	2.8	2.6	6	8	1	0	1	0	1	PENSYLVANICUM



APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	CODLECT	ACCESSES	HERBAR	STATERE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
225	H GROH	1624	KS	QU	7	9	25	1941	76	45	35.8	7.6	3.3	3.9	15.8	22.5
226	SMALL	1366-A	GRA	NC	7	8	31	1897	83	36	104.2	26.3	11.3	7.4	52.9	14.6
227	M DALCI	184-D	KS	NC	7	8	11	1971	80	35	81.4	16.3	11.2	15.0	32.5	44.9
228	M DALCI	61	NE	NC	7	8	5	1970	82	35	49.3	9.1	4.9	12.3	28.7	34.7
229	M.DALCI	63	NE	NC	7	8	6	1970	80	35	105.7	15.8	10.8	7.5	58.0	61.0
230	M.DALCI	178-M	NY	SC	7	8	8	1971	81	34	101.4	17.6	13.9	16.3	48.1	54.1
231	M.DALCI	197-0	NE	NY	7	8	17	1971	74	42	137.0	20.9	21.5	6.7	75.4	28.4
232	SEYMOUR	71	GRA	MA	7	9	17	1913	73	42	105.1	31.7	17.9	11.8	35.0	44.4

OBS	INF LOR	INF LOR	PEDICEL	OCREOLA	PERRILEN	PERRIWD	STAMEN	STYLE	ACHENE	ACHENE	STAMNO	PED PUB	PED GLN	ACHENE	LEAFHAI	OCREAH	OCREAL	SPECIES
225	28.0	5.9	3.7	3.1	2.7	1.4	2.2	1.4	2.8	2.5	5	13	1	0	1	0	1	PENSYLVANICUM
226	30.7	10.6	2.8	2.2	3.0	1.8	2.2	2.0	3.0	2.9	7	11	1	0	1	0	1	PENSYLVANICUM
227	42.4	10.1	3.0	3.0	2.8	1.9	2.0	1.6	2.8	2.3	6	14	0	0	2	0	1	PENSYLVANICUM
228	22.6	9.4	2.4	2.6	2.0	1.5	1.3	1.3	2.6	2.5	7	15	1	0	1	0	1	PENSYLVANICUM
229	40.7	6.3	1.8	2.2	2.5	1.4	1.7	1.3	2.5	2.2	6	0	0	0	1	0	1	PENSYLVANICUM
230	24.5	7.7	2.4	3.0	3.1	1.4	1.5	1.4	2.5	2.3	6	6	1	0	2	0	1	PENSYLVANICUM
231	23.5	9.0	2.5	3.1	2.9	1.5	1.8	1.6	2.9	2.7	6	10	1	0	1	0	0	PENSYLVANICUM
232	36.4	13.9	2.9	3.0	2.8	1.1	2.1	1.7	3.0	2.7	6	14	1	0	1	0	1	PENSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
233	MOLDENK	1356	MO	NJ	7	8	8	1930	75	41	143.2	28.2	20.2	20.6	66.3	35.3
234	FERNALD	365	GRA	ME	7	7	29	1895	69	45	75.2	13.8	9.4	10.2	40.5	24.8
235	J. SMALL		US	PA	7	9	7	1892	76	40	84.1	21.7	10.7	4.6	57.0	23.2
236	GREEMAN	352	US	WV	7	9	23	1904	80	39	70.5	15.7	11.4	6.8	24.8	13.5
237	VICTORI	4257	US	QU	7	9		1917	74	46	85.8	12.8	14.3	12.9	59.1	25.4
238	BOUFORD	7668	SMU	NH	7	8	14	1972	72	43	57.3	11.4	10.1	9.5	42.0	30.4
239	EASTWOD	98	GRA	CO	4G	9	4	1910	105	40	95.0	19.2	9.6	4.0	34.9	16.3
240	M. DALCI	2	NE	NE	4G	9	21	1968	99	41	63.4	21.5	6.0	4.3	60.9	14.3

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLAE	PERI LEN	PERI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAH R	OCREEL H R	SPECIES
233	42.0	9.5	2.3	2.3	2.7	1.6	1.8	1.6	2.8	2.4	6	16	1	0	2	0	1	PENNSYLVANICUM
234	32.1	9.3	1.7	2.8	2.7	1.1	2.0	1.6	2.9	2.7	7	22	1	0	1	0	0	PENNSYLVANICUM
235	26.8	10.9	2.5	2.6	2.5	1.9	1.7	1.6	2.8	2.5	7	20	1	0	1	0	1	PENNSYLVANICUM
236	13.9	11.4	2.6	3.7	3.8	1.5	2.2	2.4	3.3	2.9	6	10	1	0	1	0	0	PENNSYLVANICUM
237	25.0	11.1	2.8	2.7	2.9	1.4	1.7	1.3	2.8	2.6	7	18	1	0	1	0	1	PENNSYLVANICUM
238	27.0	12.9	2.0	2.5	3.5	1.2	2.1	1.5	2.9	2.6	7	16	1	0	1	0	1	PENNSYLVANICUM
239	32.6	12.1	2.4	1.9	2.0	1.5	1.7	1.5	2.8	2.5	6	12	1	0	1	0	0	PENNSYLVANICUM
240	15.0	9.9	2.1	2.4	2.8	1.9	1.5	1.3	2.9	2.4	6	28	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
241	M.DALCI	121-E	NY	NE	4G	9	18	1970	98	41	66.9	19.3	5.2	8.7	49.0	38.3
242	M.DALCI	220-R	NY	NE	4G	9	11	1971	98	41	85.0	24.8	17.3	3.9	82.5	63.8
243	KIENER	15112	NE	NE	4G	8	28	1943	98	41	138.7	30.7	16.9	13.3	53.7	17.8
244	STEPHEN	44069	KS	CO	4G	8	18	1970	102	40	67.7	18.6	11.4	7.6	65.4	29.4
245	WEEDON	4906	NY	SD	4G	10	4	1968	99	43	67.5	19.1	13.5	4.8	59.4	25.2
246	DUEHOLM	4992	KS	WY	4G	7	26	1978	104	45	19.5	4.6	3.9	4.6	27.9	16.7
247	STEPHEN	61026	KS	SD	4G	9	10	1972	98	43	92.7	28.1	12.2	5.6	47.5	57.3
248	STEPHEN	50417	KS	KS	4G	8	4	1971	100	38	116.5	21.3	11.5	13.0	50.5	40.3

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLAE	PERRILEN	PERRIWD	STAMEN L	STYLE LN	ACHENNE L	ACHENNE W	STAM NO	PED PUB	PED GLN	ACHENNE S	LEAFHAIR	OCREA HR	OCREL HR	SPECIES
241	40.1	12.4	2.4	4.2	3.2	2.2	1.7	1.5	3.3	2.8	6	16	1	0	1	0	0	PENNSYLVANICUM
242	54.1	10.6	2.7	2.7	2.9	1.9	1.6	1.3	2.9	2.7	8	10	1	1	1	0	1	PENNSYLVANICUM
243	39.1	11.1	2.5	4.6	3.3	1.8	1.8	1.5	2.8	2.6	6	16	1	0	1	0	1	PENNSYLVANICUM
244	31.0	13.6	2.7	2.9	3.3	1.7	1.8	1.6	2.7	2.4	6	8	1	0	1	1	0	PENNSYLVANICUM
245	33.4	13.3	3.6	2.8	3.1	1.8	1.7	2.0	3.4	3.2	6	9	1	0	1	0	0	PENNSYLVANICUM
246	12.1	7.5	1.9	2.0	1.8	0.7	0.7	1.0	2.2	2.1	6	2	1	1	1	0	0	PENNSYLVANICUM
247	35.7	13.9	2.0	2.9	3.0	2.1	1.7	1.6	3.0	2.7	6	8	1	0	1	0	0	PENNSYLVANICUM
248	34.5	14.4	2.4	2.6	3.6	1.8	1.3	1.1	2.9	2.7	8	2	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATER	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
249	BROOKS	8575	KS	KS	4G	9	10	1974	102	38	62.0	15.3	7.7	6.3	26.0	40.0
250	STEPHEN	15514	KS	NE	4G	8	1	1967	99	43	85.3	24.6	14.4	16.1	51.7	38.3
251	STEPHEN	51188	KS	NE	4G	8	20	1971	98	40	138.3	17.3	19.9	8.8	75.6	48.7
252	WEEDON	4708	NY	NE	4G	9	24	1968	101	41	73.0	13.5	10.0	10.0	45.5	38.3
253	WILSON	8162	OKL	KS	4G	8	1	1964	101	40	102.1	25.0	12.5	16.8	35.9	51.4
254	BF.BUSH	7812	US	MO	4C	9	19	1916	94	39	101.3	16.5	11.6	7.0	42.8	41.7
255	M DALCI	205-K	NY	IN	4C	8	20	1971	86	41	155.0	28.3	33.9	21.2	58.0	50.1
256	FRIESNR	10130	NY	IN	4C	9	26	1936	87	41	72.8	16.9	13.6	5.6	71.0	37.5

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRILE N	PERRI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PEDUB	PEDGLN	ACHENE S	LEAFHAIR	OCREALH R	OCREALH R	SPECIES
249	28.0	13.6	2.5	3.5	3.4	3.0	2.3	2.4	2.8	2.7	6	2	1	0	1	1	1	PENNSYLVANICUM
250	36.5	9.7	2.6	3.8	3.0	1.7	1.3	1.0	2.5	2.1	8	14	1	0	1	0	0	PENNSYLVANICUM
251	38.6	13.1	3.0	2.7	3.4	2.2	1.7	1.5	2.8	2.5	8	7	1	0	1	0	0	PENNSYLVANICUM
252	33.1	14.6	2.4	3.1	3.3	1.9	1.8	1.4	3.4	3.1	6	9	1	0	1	0	1	PENNSYLVANICUM
253	36.0	9.9	2.7	3.0	2.7	1.5	1.1	1.3	3.3	2.7	6	3	1	0	1	0	1	PENNSYLVANICUM
254	46.0	14.9	2.5	2.4	3.4	2.0	1.7	1.4	3.3	2.8	7	8	1	0	1	0	1	PENNSYLVANICUM
255	42.6	13.0	1.9	2.9	2.2	1.5	1.3	1.0	3.2	2.8	6	9	1	0	1	0	0	PENNSYLVANICUM
256	48.6	7.7	3.6	2.5	2.3	1.1	1.3	0.9	2.7	2.3	6	5	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
257	M.DALCI	217-O	NY	NE	4C	9	5	1971	96	41	146.9	29.9	17.0	16.1	50.7	68.4
258	RG KOCH	4285	SMU	NE	4C	8	24	1967	97	41	98.7	26.9	6.7	7.3	65.9	55.5
259	M.DALCI	122-F	NY	NE	4C	9	18	1970	98	41	81.1	17.7	10.5	6.4	55.2	18.1
260	KIENER	17671	NE	NE	4C	9	17	1944	97	41	89.4	16.4	6.8	4.9	49.0	49.9
261	MORISON		MO	NE	4C	8	12	1934	96	41	94.1	25.3	11.2	8.5	49.6	45.4
262	M DALCI	216-B	NE	NE	4C	9	5	1971	96	41	68.2	14.4	7.7	10.5	21.0	40.2
263	SCHUETE		GRA	WI	4C	8	27	1882	88	45	60.8	10.4	4.7	5.5	27.5	23.7
264	J.MOORE	10290	NY	MN	4C	8	11	1938	93	44	104.4	25.1	20.4	9.4	45.4	21.0

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLA E	PERRILEN	PERRIWD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAF HAIR	OCREA HR	OCRELHR	SPECIES
257	40.5	15.5	3.2	3.5	2.4	1.8	1.5	1.5	2.9	2.8	6	7	1	0	1	0	1	PENNSYLVANICUM
258	60.0	13.7	2.0	2.3	3.3	1.8	1.7	2.0	3.5	3.1	6	14	1	0	1	0	0	PENNSYLVANICUM
259	28.1	12.4	2.0	3.6	2.9	1.8	1.7	1.4	3.1	2.7	6	4	1	0	1	0	0	PENNSYLVANICUM
260	43.2	10.1	2.8	2.8	3.6	1.6	1.3	1.5	3.3	2.9	6	8	1	0	1	0	1	PENNSYLVANICUM
261	29.4	11.4	2.7	2.9	3.1	1.5	1.9	1.5	2.9	2.5	6	5	1	0	2	0	1	PENNSYLVANICUM
262	20.9	11.4	1.9	3.3	2.3	1.4	1.4	1.6	3.0	2.5	6	18	1	0	1	0	1	PENNSYLVANICUM
263	37.8	9.6	2.1	2.9	3.3	1.5	1.9	2.2	2.8	2.9	7	23	1	0	2	0	1	PENNSYLVANICUM
264	27.4	9.9	1.6	4.4	3.0	1.5	1.6	1.3	2.6	2.1	6	21	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D D E L N	B L A D D E W D	P E T I O L E	O C R E A L N	I N T E R N D	P E D U N C L E
265	LANSING	2872	GRA	MI	4C	9	18	1910	86	42	69.5	8.5	8.3	9.0	43.3	56.7
266	M DALCI	82-B	NE	OH	4C	8	15	1970	83	40	176.9	26.9	22.6	13.4	47.4	37.8
267	FRIESNR	21829	KS	IN	4C	8	30	1947	87	40	122.0	18.6	14.5	9.7	80.5	40.1
268	C.DEAM	205	US	IN	4C	8	6	1905	85	40	137.9	20.6	14.1	14.5	61.4	26.4
269	KRIEBEL	2448	GRA	IN	4C	8	12	1934	86	39	85.5	12.9	7.8	6.8	52.8	15.3
270	M DALCI	203-H	NE	IN	4C	8	20	1971	85	42	194.2	37.8	24.8	14.3	57.5	44.7
271	WILSON	15326	OKL	IL	4C	8	31	1968	90	40	61.6	10.2	9.2	8.5	27.1	34.4
272	BENNETT		NY	IL	4C	8	31	1958	89	42	109.7	27.9	11.2	9.4	59.1	46.5

OBS	I N F L O R L	I N F L O R W	P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N L	S T Y L E L N	A C H E N E L	A C H E N E W	S T A M N O	P E D P U B	P E D G L N	A C H E N E S	L E A F H A I R	O C R E A H R	O C R E L H R	S P E C I E S
265	32.2	10.5	2.2	2.7	2.9	1.1	1.5	1.2	2.2	1.9	6	14	1	0	1	0	1	PENNSYLVANICUM
266	33.2	10.7	2.3	3.3	2.3	1.8	1.8	1.6	3.0	2.7	6	6	1	0	1	0	1	PENNSYLVANICUM
267	37.6	13.0	2.6	3.7	3.6	1.9	1.9	1.9	2.8	2.4	6	28	1	0	1	0	1	PENNSYLVANICUM
268	19.2	9.0	2.3	1.9	2.8	1.3	1.5	1.6	2.5	2.3	6	22	1	0	2	1	1	PENNSYLVANICUM
269	27.8	10.2	2.2	3.1	3.1	1.4	1.4	1.1	2.7	2.2	6	7	1	0	1	0	1	PENNSYLVANICUM
270	33.5	13.2	1.4	2.8	2.6	2.0	2.2	2.0	2.9	2.5	6	22	1	0	2	0	1	PENNSYLVANICUM
271	23.2	9.8	2.0	2.4	2.0	1.4	1.2	1.1	2.6	2.2	6	10	1	0	1	0	0	PENNSYLVANICUM
272	38.2	11.7	2.2	2.8	2.9	1.6	1.1	1.0	3.4	2.9	7	15	1	0	1	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBARIUM	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
273	RJ.WEBB	177	GRA	OH	4C	9	20	1896	81	41	92.3	32.3	17.9	7.9	70.5	37.9
274	BARTLEY	1453	US	OH	4C	9	30	1951	84	39	83.8	14.7	22.7	9.5	48.2	16.7
275	C DAVIS		KS	MI	4C	8	25	1890	85	43	51.9	9.0	9.9	4.7	45.0	13.1
276	PAMNEL	1114	MO	IO	4C	7		1925	94	42	87.4	20.4	9.4	3.2	48.7	49.8
277	BF.BUSH	327	NY	MO	4C	8	8	1893	94	39	133.0	24.1	14.2	14.3	71.6	37.7
278	M DALCI	207-I	NE	IN	4C	8	21	1971	87	41	125.6	20.7	20.8	18.0	62.4	42.0
279	C.DODGE		US	MI	4C	10	29	1909	83	43	175.1	36.0	29.0	9.3	52.4	29.6
280	HARTLEY	2688	NY	WI	4C	8	28	1956	91	44	95.8	17.2	12.7	8.8	36.4	35.4

OBS	INF LOR L	INF LOR W	PEDICEL	OCREOLAE	PERRI LEN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN NO	PED PUB	PED GLN	ACHENE S	LEAFH AIR	OCREAL HR	OCREAL HR	SPECIES
273	35.0	13.3	3.3	3.2	3.0	1.6	1.5	1.7	3.5	3.2	6	10	1	0	1	0	0	PENNSYLVANICUM
274	26.1	11.2	2.1	2.4	2.6	2.2	1.3	1.4	3.5	3.0	6	11	1	0	1	0	1	PENNSYLVANICUM
275	20.1	8.9	2.4	2.2	2.4	2.1	1.5	1.5	2.8	2.7	6	4	1	0	2	0	1	PENNSYLVANICUM
276	34.0	12.7	2.1	2.7	4.1	2.0	1.7	1.6	3.3	3.1	6	11	1	0	1	0	0	PENNSYLVANICUM
277	33.4	10.7	4.2	3.7	2.5	1.6	1.5	1.5	3.3	2.8	6	16	1	0	1	0	0	PENNSYLVANICUM
278	29.7	9.9	2.7	3.8	2.7	1.7	1.3	1.2	3.2	2.8	8	18	1	0	1	0	1	PENNSYLVANICUM
279	29.2	8.1	1.8	2.2	2.6	1.5	2.0	1.7	2.9	2.5	6	23	1	0	1	0	1	PENNSYLVANICUM
280	49.4	11.1	3.2	3.9	2.8	1.7	1.4	1.2	2.8	2.6	6	18	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA	INTERND	PEDUNCLE
											LN	WD				
281	FASSETT	2970	GRA	WI	4C	9	21	1926	89	43	105.8	22.9	9.3	13.2	49.8	20.8
282	CLINTON		NY	NY	4C	.	.	.	79	43	113.6	17.0	11.9	16.4	59.7	35.5
283	STEPHEN	36454	KS	SD	4C	9	6	1969	99	44	113.0	23.7	10.5	13.0	23.7	16.3
284	J. MOORE	22091	US	MN	4C	9	15	1954	94	45	60.2	13.8	12.2	6.2	33.0	13.5
285	J. MOORE	16168	GRA	MN	4C	10	3	1943	92	44	91.8	21.0	5.2	6.0	11.7	33.8
286	GENTRY	760	NY	KY	4C	9	8	1962	85	38	90.2	10.8	14.9	17.9	48.6	19.1
287	S PRICE		MO	KY	4C	8	.	1897	86	37	155.4	38.7	17.5	16.6	81.2	34.2
288	WHARTON	3381	NY	KY	4C	8	5	1938	84	37	106.4	20.9	13.5	8.9	57.3	69.9

OBS	INFLO		PEDICEL	OCREOLAE	PERILEN	PERIWD	STAMEN	STYLELN	ACHENE		STAMNO	PEDUB	PEDGLN	ACHENES	LEAFHAIR	OCREALH	OCREALH	SPECIES
	LN	W							LN	W								
281	33.0	13.4	2.4	3.0	2.9	1.4	1.8	1.5	3.3	2.7	6	21	1	0	1	0	0	PENNSYLVANICUM
282	43.0	8.1	1.6	2.6	3.5	1.3	1.5	1.7	2.5	2.1	6	14	1	0	2	0	0	PENNSYLVANICUM
283	31.2	9.9	2.0	2.8	2.7	1.4	2.2	2.1	3.0	2.4	6	23	1	0	1	0	1	PENNSYLVANICUM
284	25.3	10.2	2.0	3.0	3.9	2.4	1.9	1.6	3.4	2.7	6	4	1	0	1	0	1	PENNSYLVANICUM
285	19.8	9.5	1.5	2.1	2.4	1.5	1.4	1.3	3.0	2.7	6	7	1	0	1	0	0	PENNSYLVANICUM
286	32.5	8.3	2.4	3.4	3.1	1.5	2.0	1.9	3.1	2.4	6	24	1	0	2	1	1	PENNSYLVANICUM
287	41.4	8.4	2.3	2.5	2.6	1.3	1.6	1.7	2.7	2.4	6	14	1	0	2	0	1	PENNSYLVANICUM
288	49.1	10.5	3.5	3.6	3.5	1.4	1.5	1.7	2.5	2.4	6	8	1	0	2	0	1	PENNSYLVANICUM



APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	POLYGONUM DATA															
	COLLLECT	ACCESSES	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
289	R.KRAL	33527	SMU	TN	4C	10	3	1968	87	36	61.2	15.9	9.6	9.8	49.8	31.7
290	MCDUGL	1465	US	TN	4C	8	28	1947	88	35	76.5	17.5	8.9	14.7	67.8	43.1
291	M.DALCI	102	NE	MO	4C	8	29	1970	92	39	167.7	19.0	14.7	10.1	47.1	43.0
292	STEPHEN	60866	KS	NE	4C	9	9	1972	97	43	151.7	32.8	21.3	8.7	55.0	36.6
293	STEPHEN	29287	KS	SD	4C	9	16	1968	100	43	96.3	30.2	11.4	5.5	59.7	61.5
294	STEPHEN	44829	KS	SD	4C	9	8	1970	97	43	102.1	35.0	6.8	16.3	54.7	30.6
295	STEPHEN	28936	NY	ND	4C	9	8	1968	98	49	131.4	34.9	21.5	9.0	76.8	51.9
296	STEVENS	2970	KS	ND	4C	8	10	1966	97	46	85.6	22.2	12.9	16.7	72.2	21.7

OBS	POLYGONUM DATA																	
	INFLO L	INFLO W	PEDICEL	OCREOLA E	PERI LEN	PERI WID	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAMEN D	PED PUB	PED GLN	ACHENE S	LEAFH AIR	OCREAH R	OCREL HR	SPECIES
289	25.0	13.2	2.2	3.3	3.5	2.3	2.2	2.2	3.0	2.8	6	11	1	0	2	1	1	PENNSYLVANICUM
290	38.9	9.9	2.0	2.7	3.3	1.9	1.8	1.7	2.7	1.9	6	10	1	0	2	1	1	PENNSYLVANICUM
291	26.4	8.1	2.1	3.0	2.2	1.7	1.5	1.4	2.8	2.4	6	11	1	0	1	0	1	PENNSYLVANICUM
292	48.9	11.6	2.7	2.9	2.3	1.6	1.7	1.4	2.6	2.6	6	17	1	0	1	0	0	PENNSYLVANICUM
293	44.5	15.0	2.4	2.9	2.9	1.6	1.7	1.9	2.8	2.7	6	11	1	0	1	0	1	PENNSYLVANICUM
294	52.9	14.7	2.6	3.3	3.4	1.9	2.0	1.8	2.6	2.4	6	12	1	0	1	0	1	PENNSYLVANICUM
295	59.5	12.9	2.2	2.9	3.6	2.2	1.6	1.7	2.8	2.5	6	23	1	0	1	0	0	PENNSYLVANICUM
296	38.2	12.4	2.0	2.9	2.8	1.4	2.0	1.7	2.7	2.4	8	4	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P BICORNE SPECIMENS

OBS	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E _ L N	B L A D E _ W D	P E T I O L E	O C R E A _ L N	I N T E R N D	P E D U N C L E
297	GODFRED	4907	KS	ND	4C	8	16	1972	98	47	111.3	29.4	12.4	10.8	44.5	36.7
298	STEPHEN	61419	KS	ND	4C	9	13	1972	99	46	73.6	23.0	6.9	5.0	47.6	28.8
299	FITZPAT		GRA	IO	4C	8	17	1897	94	41	121.5	15.2	16.6	7.6	52.9	32.7
300	WALLIS		OSU	IO	4C	8	21	1950	93	43	111.7	24.5	18.0	13.6	40.4	60.1
301	PAMNEL		OSU	IO	4C	8	30	1927	92	42	111.6	13.6	12.2	7.4	68.3	21.9
302	CHURCHL	1325	NE	IO	4C	8	8	1904	94	42	94.7	21.8	13.7	13.4	45.4	40.6
303	M.DALCI	132	NE	IO	4C	9	25	1970	95	42	83.0	27.4	11.1	14.3	52.7	27.1
304	STEPHEN	9422	KS	KS	4C	9	18	1966	96	40	99.9	34.4	12.8	6.9	43.6	50.0

OBS	I N F L O R _ L	I N F L O R _ W	P E D I C E L	O C R E O L A E	P E R I _ L E N	P E R I _ W I D	S T A M E N _ L	S T Y L E _ L N	A C H E N E _ L	A C H E N E _ W	S T A M _ N O	P E D _ P U B	P E D _ G L N	A C H E N E _ S	L E A F H A I R	O C R E A _ H R	O C R E L _ H R	S P E C I E S
297	36.2	9.9	3.3	3.9	3.1	1.6	1.2	1.5	2.8	2.6	6	7	1	0	1	0	0	PENSYLVANICUM
298	51.1	11.8	1.9	2.8	2.9	1.5	1.6	1.9	2.6	2.4	6	3	1	0	1	0	0	PENSYLVANICUM
299	48.8	11.2	2.1	2.5	3.1	1.2	1.5	1.5	2.5	2.4	6	12	1	0	1	0	0	PENSYLVANICUM
300	63.1	14.0	2.2	2.9	3.4	2.1	2.0	1.6	3.1	2.7	6	7	1	0	1	0	0	PENSYLVANICUM
301	24.5	10.8	1.8	3.0	2.7	1.8	1.5	1.6	2.7	2.5	6	2	1	0	1	0	0	PENSYLVANICUM
302	40.1	11.4	3.3	4.1	2.8	1.3	1.1	1.3	3.1	2.7	8	3	1	0	1	0	0	PENSYLVANICUM
303	44.4	15.5	2.7	2.8	3.7	2.5	2.1	1.7	3.4	3.2	6	12	1	0	2	0	1	PENSYLVANICUM
304	58.1	14.9	2.9	3.8	3.3	1.9	1.6	1.7	3.0	2.9	6	9	1	0	1	0	1	PENSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA	INTERND	PEDUNCLE
											LN	WD				
305	STEPHEN	51870	KS	NE	4C	8	30	1971	96	42	78.7	21.0	14.1	11.0	53.7	32.2
306	MCDONAL	794	OSU	OK	4C	9	1	1972	96	37	146.8	30.7	13.9	12.7	23.5	36.2
307	HOPKINS	2019	OKL	OK	4C	9	26	1937	97	35	15.1	11.2	4.8	5.1	45.1	17.6
308	WILSON	15329	OKL	MO	4C	8	31	1968	93	39	90.6	11.1	7.1	10.5	45.4	24.1
309	J DAVIS		NE	SC	7	9	13	1919	83	35	104.6	15.9	9.4	11.7	45.1	37.4
310	CR.BELL	9734	NY	SC	7	9	16	1957	82	34	51.3	11.4	8.4	8.0	30.2	20.1
311	ROGERS	42324	SMU	NC	7	9	22	1968	84	35	69.4	11.1	6.7	9.2	32.3	21.9
312	GODFREY	2087	GRA	NC	7	8	20	1937	79	36	153.2	32.0	19.5	16.0	56.6	60.2

OBS	INF LOR	INF LOR	PEDICEL	OCREOLAE	PERI LN	PERI WD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAM NO	PED PUB	PED GLN	ACHENE S	LEAF HAIR	OCREAL HR	OCREAL HR	SPECIES
306	29.8	13.5	2.6	3.5	3.5	1.6	1.7	1.7	2.9	2.8	8	14	1	0	1	0	0	PENNSYLVANICUM
307	14.5	9.6	2.0	2.2	2.6	1.6	1.7	1.9	3.1	2.7	8	2	1	0	1	0	0	PENNSYLVANICUM
308	19.1	8.4	2.6	2.9	2.7	1.4	1.6	1.6	2.6	2.4	6	15	1	0	1	0	1	PENNSYLVANICUM
309	25.5	10.3	1.7	2.7	2.6	1.9	1.9	1.8	2.7	2.4	6	16	1	0	2	0	1	PENNSYLVANICUM
310	25.2	13.2	2.7	2.4	2.8	1.5	1.9	2.1	2.9	2.4	6	29	1	0	2	1	1	PENNSYLVANICUM
311	42.2	11.5	2.9	2.7	3.7	1.6	2.0	2.0	2.8	2.4	8	28	1	0	2	1	1	PENNSYLVANICUM
312	53.7	10.9	2.6	3.4	3.6	1.9	1.8	1.6	2.8	2.4	6	12	1	0	2	1	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESSES	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
313	SHINNER	32429	SMU	AL	7	9	11	1968	86	35	79.9	16.6	5.7	12.7	56.2	39.8
314	CHAPMAN		MO	GA	7	.			85	34	109.1	22.2	8.9	7.7	58.7	9.7
315	S. JONES	21154	SMU	GA	7	8	23	1971	85	33	138.9	26.2	29.7	17.5	53.5	34.8
316	A RUTH	1498	NY	TN	7	7	.	1894	84	36	160.0	39.3	12.2	16.1	74.3	64.5
317	BRITTAN	32	GRA	NB	7	8	20	1889	67	45	52.6	11.1	5.7	7.9	33.3	7.4
318	FOSBERG	15981	GRA	PA	7	9	5	1938	76	41	88.8	13.8	7.9	4.2	55.6	37.1
319	MORGAIN	3352	NY	PA	7	.	.	1927	78	41	91.4	18.4	15.2	7.0	42.6	7.4
320	EGGLEST	1558	GRA	VT	7	9	2	1899	73	44	96.6	28.8	15.9	5.2	42.2	26.6

OBS	INFLORE LN	INFLORE WD	PEDICEL	OCREOLA E	PERICLEN	PERIOD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAMEN	PEDUB	PEDGLN	ACHENE S	LEAFHAI R	OCREALH R	OCREALH R	SPECIES
313	41.4	10.9	2.9	3.4	3.1	1.4	1.9	1.9	2.4	2.3	6	18	1	1	2	0	1	PENNSYLVANICUM
314	29.2	9.3	1.8	2.3	2.5	1.7	1.7	1.7	2.9	2.7	6	33	1	0	1	0	1	PENNSYLVANICUM
315	40.8	11.5	1.5	2.1	4.0	1.1	2.6	2.3	2.5	2.2	6	16	1	0	2	0	1	PENNSYLVANICUM
316	57.4	12.4	2.7	2.2	2.7	1.6	1.9	1.7	2.8	2.6	6	28	1	0	2	0	1	PENNSYLVANICUM
317	21.7	11.2	1.7	2.3	3.7	1.3	2.4	2.1	2.7	2.6	6	12	1	0	1	0	1	PENNSYLVANICUM
318	34.0	10.3	2.1	2.7	2.9	1.1	1.4	1.2	2.7	2.6	7	14	1	0	1	0	1	PENNSYLVANICUM
319	20.6	12.0	1.6	2.0	2.4	1.3	1.9	1.6	2.9	2.5	6	7	1	0	1	0	0	PENNSYLVANICUM
320	39.5	12.4	2.7	2.5	3.9	1.5	2.0	1.9	2.9	2.7	7	9	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE		PETIOLE	OCREA	INTERND	PEDUNCLE
											LN	WD				
321	W.DEANE		US	NH	7	9	7	1915	71	45	136.8	20.9	17.6	13.7	67.3	42.8
322	SEYMOUR	24901	MO	CT	7	8	30	1966	73	41	73.0	10.2	10.4	6.9	38.0	26.3
323	PARLIN		GRA	ME	7				71	43	52.2	8.3	5.6	8.7	27.8	29.4
324	C BROWN	2755	NY	PA	7	8	25	1929	78	42	126.8	25.5	15.6	16.3	71.4	15.2
325	MATTHEW	2706	OKL	NY	7	10	2	1927	78	43	90.8	20.5	8.4	4.8	27.2	14.4
326	H.HOUSE	29108	OKL	NY	7	10	7	1942	74	44	139.8	27.5	18.8	15.8	60.0	23.5
327	A EAMES	11976	GRA	NY	7	8	4	1919	77	43	170.0	27.3	22.8	20.5	87.5	23.3
328	CURTISS		GRA	VR	7	9	20	1871	80	37	116.1	22.5	18.2	11.0	66.6	30.0

OBS	INFLORE	INFLORE	PEDICEL	OCREOLAE	PERILEN	PERIID	STAMEN	STYLE	ACHENE	ACHENE	STAMEN	PED	PED	ACHENE	LEAFHAI	OCREAL	OCREAL	SPECIES
321	43.9	15.2	1.5	3.0	3.1	1.2	1.8	1.6	3.1	2.9	6	8	1	0	1	0	0	PENSYLVANICUM
322	20.8	12.3	2.5	2.3	2.9	1.0	1.8	1.5	2.8	2.3	7	4	1	0	1	0	1	PENSYLVANICUM
323	21.4	10.1	2.0	2.8	2.3	1.2	1.9	1.8	2.6	2.4	6	22	1	0	1	0	1	PENSYLVANICUM
324	29.9	8.0	1.4	1.8	2.8	1.2	1.5	1.6	2.9	2.5	6	36	1	0	1	0	0	PENSYLVANICUM
325	24.2	11.1	2.6	3.5	4.1	2.2	2.0	2.0	3.3	3.2	7	12	1	0	1	0	0	PENSYLVANICUM
326	26.0	9.0	2.6	2.5	3.2	1.6	1.7	1.6	2.8	2.6	6	15	1	0	2	0	1	PENSYLVANICUM
327	38.2	9.4	2.3	3.6	2.9	1.6	2.1	2.1	2.8	2.7	6	22	1	0	1	0	1	PENSYLVANICUM
328	39.8	11.1	1.6	3.1	2.8	1.5	1.5	1.4	2.6	2.4	6	20	1	0	1	0	1	PENSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLLECT	ACCESSES	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
329	HUNNEWL	15782	GRA	VR	7	9	7	1938	78	39	113.4	21.4	11.0	13.2	33.8	23.9
330	JP. TASH	596	GRA	WV	7	8	24	1940	81	38	84.0	18.5	7.8	6.8	80.7	12.5
331	GODFREY	55831	GRA	FL	6	8	6	1957	84	30	85.7	10.6	8.7	15.6	56.7	47.1
332	R. KRAL	33248	SMU	AL	6	9	11	1968	85	32	135.4	23.8	19.5	12.3	51.4	67.5
333	DREHER	91	MO	LA	6	10	5	1971	93	33	72.5	18.5	9.8	13.6	22.2	19.6
334	AMERSON	983	SMU	TX	6	9	8	1971	95	33	89.4	19.6	9.5	6.1	63.2	59.1
335	HELLER	4278	NE	TX	6	9	22	1898	94	33	82.7	18.9	5.2	6.9	63.7	41.2
336	ST JOHN	20071	GRA	NY	6	9	21	1939	73	41	97.2	18.1	14.3	4.7	101.0	27.5

OBS	INFLORE	INFLORE	PEDICEL	OCREOLAE	PERILEN	PERILEN	STAMEN	STYLE	ACHENE	ACHENE	STAMEN	PED	PED	ACHENE	LEAF	OCRELA	OCRELA	SPECIES
329	26.0	14.7	3.4	2.4	3.4	1.1	1.8	1.9	2.7	2.6	6	10	1	0	1	0	1	PENNSYLVANICUM
330	33.0	10.3	1.6	2.5	2.9	1.2	2.0	1.8	3.0	2.6	6	21	1	0	1	0	0	PENNSYLVANICUM
331	54.8	9.7	1.8	2.4	2.2	1.4	1.3	1.7	2.3	1.9	6	2	1	0	2	1	1	PENNSYLVANICUM
332	49.0	12.7	2.3	2.3	3.0	1.1	1.7	1.8	2.4	2.0	6	13	1	0	2	0	1	PENNSYLVANICUM
333	37.5	10.7	1.5	2.1	2.4	1.3	1.5	1.5	2.3	2.1	7	16	1	0	2	0	1	PENNSYLVANICUM
334	53.9	12.1	2.0	2.4	3.5	1.6	2.2	2.0	3.0	2.4	6	18	1	0	2	1	1	PENNSYLVANICUM
335	42.5	8.6	2.0	2.1	3.1	1.4	1.8	1.7	2.6	2.5	6	17	1	0	2	0	1	PENNSYLVANICUM
336	49.0	13.6	2.8	1.6	2.7	1.1	1.8	1.8	2.5	2.0	6	26	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	CREA LN	INTERND	PEDUNCLE
337	TATNALL	4732	GRA	DE	6	10	11	1940	76	40	110.4	21.7	14.9	7.9	62.6	34.6
338	WINDLER	3252	KS	MD	6	8	24	1970	77	39	69.7	12.0	8.8	6.0	23.7	34.7
339	SPANCE		KS	KY	6	9	2	1932	88	37	100.4	24.1	9.9	16.9	43.2	72.6
340	D EYLES	8456	GRA	TN	6	7	5	1942	89	37	175.5	47.3	21.4	15.0	46.1	12.3
341	H. AHLES	35086	KS	SC	6	9	26	1957	81	34	80.0	12.3	9.4	7.0	36.9	35.6
342	ALEXAND	153	US	SC	6	8	23	1915	79	33	79.5	6.3	6.0	9.1	46.1	28.9
343	M DALCI	185-E	KS	NC	6	8	11	1971	77	36	137.1	17.5	8.6	5.0	50.3	58.1
344	SPERRY		US	NC	6	8	24	1925	78	34	73.3	7.7	5.2	5.5	32.7	74.3

OBS	INFLO L	INFLO W	PEDICEL	CREOLA E	PERRI LN	PERRI WD	STAMEN L	STYLE LN	ACHENE L	ACHENE W	STAM NO	PED PUB	PED GLN	ACHENE S	LEAFHAIR	CREA HR	CREA HR	SPECIES
337	36.0	11.0	2.6	3.0	3.5	1.7	2.1	1.8	2.2	2.1	6	8	1	0	1	0	1	PENNSYLVANICUM
338	20.5	10.5	2.2	2.9	2.8	1.1	1.9	1.9	2.7	2.7	6	6	1	0	1	0	1	PENNSYLVANICUM
339	46.5	12.6	2.3	2.2	2.9	1.7	1.5	1.4	2.5	2.0	6	3	1	0	1	0	0	PENNSYLVANICUM
340	33.3	8.6	1.8	3.8	2.9	1.8	1.8	1.5	2.4	1.9	6	24	0	0	2	0	1	PENNSYLVANICUM
341	35.9	8.2	1.5	2.3	2.7	1.1	1.8	1.9	2.6	2.2	6	19	1	0	1	1	1	PENNSYLVANICUM
342	17.3	11.0	1.3	2.3	2.1	1.2	1.3	1.6	2.4	2.2	6	29	1	0	2	1	1	PENNSYLVANICUM
343	40.3	11.1	1.9	2.4	2.5	1.6	1.8	2.0	2.2	2.0	6	11	1	0	2	1	1	PENNSYLVANICUM
344	39.9	13.0	3.4	1.7	3.2	1.4	2.0	1.6	2.7	2.5	7	4	1	0	2	0	1	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	CREA LN	INTERND	PEDUNCLE
345	E. SALLE	581	SMU	VR	6	8	30	1971	76	37	170.3	19.0	16.5	15.1	51.4	41.7
346	M. DALCI	190-M	NE	VR	6	8	13	1971	77	38	117.4	16.3	16.5	13.6	39.5	54.0
347	FERNALD	14703	GRA	VR	6	9	13	1944	78	37	131.5	22.8	18.2	9.3	42.7	30.9
348	FERNALD	8705	GRA	VR	6	7	20	1938	77	37	163.5	36.8	14.6	13.9	52.3	30.8
349	E. FAXON		GRA	MA	6	8	18	1878	70	41	138.1	24.5	14.5	11.2	41.2	10.8
350	F. EARLE		NY	AL	6	10	14	1900	85	33	78.7	18.3	12.8	5.9	51.4	16.8
351	DB. WARD	2129	US	FL	6	9	9	1960	82	30	137.1	12.7	10.1	9.2	53.9	45.2
352	BIELING		GRA	FL	6	8	3	1962	83	30	108.3	12.1	12.1	17.4	62.8	30.1

OBS	INFLORE LN	INFLORE WD	PEDICEL	OCREOLAE	PERRILEN	PERRIWD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE WD	STAMEN LN	PEDUB	PEDGN	ACHENE LN	LEAFHAI LN	OCREAL LN	OCREAL LN	SPECIES
345	43.2	8.6	2.8	2.6	4.4	1.5	2.8	2.5	2.8	2.3	6	29	1	0	2	1	1	PENNSYLVANICUM
346	37.1	8.3	2.5	2.1	2.9	1.1	1.4	1.6	2.5	2.2	6	10	1	0	2	0	1	PENNSYLVANICUM
347	18.9	13.2	2.3	2.3	3.3	1.4	2.0	1.9	2.7	2.4	7	25	1	0	2	0	1	PENNSYLVANICUM
348	27.0	8.7	2.5	2.0	3.0	1.7	2.0	1.9	2.9	2.4	7	5	1	0	2	0	1	PENNSYLVANICUM
349	29.1	7.6	2.9	2.8	2.5	1.6	1.7	1.3	2.8	2.5	7	16	1	0	2	0	1	PENNSYLVANICUM
350	19.8	10.5	2.0	2.1	3.0	1.4	2.8	2.3	2.6	2.6	6	17	1	0	2	0	1	PENNSYLVANICUM
351	52.3	13.9	3.2	3.1	3.0	1.7	2.2	2.7	2.4	2.2	6	20	1	0	2	1	1	PENNSYLVANICUM
352	22.7	10.0	1.7	2.5	2.2	1.6	1.5	1.7	2.2	1.9	6	13	1	0	2	0	1	PENNSYLVANICUM



APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	COLLECTOR	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
353	CRUTCHF	2182	NY	OK	6	9	12	1966	95	34	122.3	19.8	13.1	15.5	67.0	19.0
354	DEMAREE	70649	MO	AR	6	10	22	1975	93	34	119.0	30.2	8.5	5.2	92.6	40.2
355	DEMAREE	7195	US	AR	6	9	19	1929	90	36	97.9	13.9	11.9	7.4	23.3	22.1
356	EGGERT		MO	US	6	9	16	1896	90	34	67.3	18.7	4.6	4.0	54.1	36.1
357	DARWIN	751	MO	MS	6	8	4	1978	90	31	111.6	27.5	16.7	14.9	43.6	62.7
358	SCHUCHT		US	MS	6	10	11	1896	89	32	173.5	35.9	16.7	12.3	42.1	31.6
359	POLLARD	1301	US	MS	6	8	11	1896	89	33	119.7	24.2	14.9	11.4	16.4	41.5
360	GODFREY	55173	GRA	FL	6	9	23	1956	86	31	104.0	18.2	25.2	7.3	57.5	29.6

OBS	INFLORE	INFLORE	PEDICEL	OCREOLAE	PERILEN	PERIWD	STAMEN	STYLE LN	ACHENE LN	ACHENE WD	STAMEN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAL HR	OCREAL HR	SPECIES
353	31.4	8.6	2.0	2.4	2.8	1.3	1.9	1.8	2.6	2.1	6	28	1	0	2	0	1	PENSYLVANICUM
354	38.1	14.2	2.2	2.8	3.4	1.4	1.9	1.9	2.9	2.8	6	9	1	0	2	1	1	PENSYLVANICUM
355	25.5	9.6	1.4	2.0	2.6	1.3	1.8	1.7	2.3	1.9	7	27	1	0	2	0	1	PENSYLVANICUM
356	16.1	6.8	1.9	1.9	2.4	1.5	1.9	1.7	2.8	2.6	6	7	1	0	2	1	1	PENSYLVANICUM
357	39.1	8.5	2.5	2.5	2.9	1.6	1.8	1.7	2.4	1.8	6	14	1	0	2	0	1	PENSYLVANICUM
358	42.4	10.0	1.7	2.0	2.3	1.5	1.4	1.6	2.8	2.4	6	16	1	0	2	1	1	PENSYLVANICUM
359	28.5	8.9	1.2	2.8	2.7	1.2	1.7	1.4	3.0	2.4	6	13	1	0	2	0	1	PENSYLVANICUM
360	24.9	9.6	1.7	2.4	2.5	1.6	1.2	1.1	2.3	2.0	6	24	1	0	2	0	1	PENSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

OBS	CODLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	LONG	LATITUDE	BLADE LN	BLADE WD	PETIOLE	OCREA LN	INTERND	PEDUNCLE
361	HARPER		NY	GA	6	8		1897	84	32	115.2	22.0	20.7	19.9	33.9	14.7
362	M.DALCI	99-D	NE	WI	8	8	20	1970	92	45	70.9	12.7	8.6	7.8	83.1	28.8
363	MACOUN	54757	NY	ON	8	8	26	1901	82	46	65.4	12.1	4.1	5.4	46.6	28.7
364	VICTORN	8200	MO	QU	8	11	8	1918	79	47	43.0	6.7	5.5	6.0	64.2	15.2
365	LAKELA	4254	NY	MN	8	9	14	1940	92	47	75.5	19.0	9.6	9.4	20.3	33.0
366	ST. JOHN	90405	GRA	QU	8	9	18	1915	64	50	111.8	27.8	13.6	12.2	37.1	10.9
367	JC. DORT		US	AK	1			1922	130	55	85.5	16.7	6.7	14.5	34.1	21.5
368	THURBER	1097	GRA	AZ	2	9	9	1851	110	32	74.2	10.4	6.7	10.5	67.5	40.3

OBS	INFLORE LN	INFLORE W	PEDICEL	OCREOLA E	PERRILEN	PERRIWD	STAMEN LN	STYLE LN	ACHENE LN	ACHENE W	STAMEN	PED PUB	PED GLN	ACHENE S	LEAFHAIR	OCREAH	OCREELH	SPECIES
361	23.5	9.6	1.9	2.4	2.8	1.2	1.3	1.8	2.4	1.9	6	18	1	0	2	1	1	PENNSYLVANICUM
362	38.7	13.0	3.1	3.0	2.6	1.5	1.6	1.3	2.8	2.4	6	12	1	0	1	0	0	PENNSYLVANICUM
363	29.5	8.5	2.3	2.5	2.5	1.9	2.3	1.9	3.1	3.0	6	9	1	0	1	0	0	PENNSYLVANICUM
364	23.6	14.1	2.3	2.6	2.0	1.2	1.3	1.0	2.6	2.3	6	24	1	0	2	1	1	PENNSYLVANICUM
365	39.8	10.3	3.0	2.5	2.6	1.0	1.2	1.4	3.2	3.1	6	2	1	0	1	0	0	PENNSYLVANICUM
366	17.5	7.5	2.0	3.1	4.4	1.5	1.6	1.5	1.8	1.3	6	13	1	0	1	0	0	PENNSYLVANICUM
367	22.8	10.3	1.6	3.7	3.4	2.4	2.0	1.7			6	9	1		1	0	1	PENNSYLVANICUM
368	27.9	10.5	2.8	2.3	2.8	1.2	1.9	1.7	2.8	2.2	6	10	1	0	1	0	0	PENNSYLVANICUM

APPENDIX - LISTING OF POLYGONUM DATA  
 SPECIES IDENTIFICATION AS PER HERBARIUM LABEL  
 STYLE LENGTH NOTED FOR P. BICORNE SPECIMENS

O B S	C O L L E C T	A C C E S S	H E R B A R	S T A T E	R E G I O N	M O N T H	D A Y	Y E A R	L O N G	L A T I T U D E	B L A D E		P E T I O L E	O C R E A	I N T E R N D	P E D U N C L E
											L N	W D				
369	LINDSAY		US	NM	2	8	13	1944	108	35	110.7	16.1	9.7	14.5	80.1	32.7
370	CRUTCHF	695	NY	NM	2	8	14	1965	107	34	101.7	11.1	10.3	17.7	81.1	32.0
371	MISPAGL	13455	US	NV	2	7	21	1972	116	37	99.8	17.8	7.3	11.2	51.8	28.7
372	STANDLY	14664	US	NM	3	9	10	1916	105	37	81.5	5.4	8.7	7.8	49.7	17.8
373	MAINLND	14T7B4	NE	TX	3	10	1	1944	104	31	36.5	6.7	4.3	4.4	61.5	30.3
374	WALLIS	6141	OSU	OK	5	10	8	1957	95	36	74.2	13.9	5.4	3.2	56.2	21.1
375	DEMAREE	56870	SMU	AR	5	8	30	1967	94	36	150.9	22.6	19.1	9.1	42.3	42.9
376	STANDLY	8902	US	MO	5	8	19	1912	93	37	90.3	15.2	7.7	10.9	7.7	28.5

O B S	I N F L O R	I N F L O R	P E D I C E L	O C R E O L A E	P E R I L E N	P E R I W I D	S T A M E N	S T Y L E	A C H E N E	A C H E N E	S T A M E N	P E D P U B	P E D G L N	A C H E N E	L E A F H A I R	O C R E A	O C R E L	S P E C I E S
369	32 0	7.5	2.0	1 7	2.7	1.3	1.6	1.3	2.8	2.4	6	42	1	1	1	0	0	PENNSYLVANICUM
370	32.6	9.4	1.3	3 1	2.3	1.6	1.3	1.6	2.6	2.4	6	26	1	1	1	0	0	PENNSYLVANICUM
371	30.2	9 7	1.5	2 2	2 2	1 2	1.4	1.7	2.7	2.1	6	33	1	0	1	0	0	PENNSYLVANICUM
372	16 4	12 0	1 2	2 0	2 9	1 8	1.4	1.6	3.5	3.1	6	26	1	0	1	0	0	OMISSUM
373	13.5	6.9	1.8	1 6	2.7	1 4	1 3	1.2	2.3	2 2	6	13	1	0	1	1	0	PENNSYLVANICUM
374	29.5	10.3	1 3	2.7	3 1	1.4	1.7	1 6	2 7	1.0	6	20	1	0	2	1	1	PENNSYLVANICUM
375	39 8	10.3	2 4	2 9	2.8	1.9	1 6	1 4	3.0	2.7	6	7	1	1	1	0	0	PENNSYLVANICUM
376	42 5	10 4	1 9	3 5	2 5	1 6	1 8	1.5	2 8	2.5	6	5	1	0	1	0	0	PENNSYLVANICUM



DATA LISTING FOR ADDITIONAL SPECIMENS OF SMALLER SPECIES  
SPECIES IDENTIFICATION AS PER HERBARIUM SPECIMEN LABEL

SPECIES	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	BLADE_WD	INFLOL_L	PEDICEL	ACHENE_W	STAM_NO	ACHENE_S
MEXICANUM	MEXIA	2640	MO	MX	9	7	5	1929	8.3	23.0	1.8	2.4	5	1
MEXICANUM	BRYAN		GRA	NM	4G	8	26	1942	7.2	30.7	3.0	2.2	6	2
MEXICANUM	SCULLY	102	MO	AR	5	8	22	1934	12.6	36.5	3.2	2.6	6	0
MEXICANUM	RUNYON	4356	NY	TX	6	6	24	1949	7.4	14.1	2.6	1.8	6	2
MEXICANUM	DAVIS		GRA	TX	6	5		1942	14.6	7.8	1.4	1.9	8	2
MEXICANUM	ARMER	5525	US	TX	6	11	13	1928	11.4	26.3	1.7	1.7	6	2
MEXICANUM	WHITEHS	650	NY	TX	4G	8	26	1933	8.3	31.7	2.2	2.1	8	2
MEXICANUM	WALLER	1235	SMU	TX	4G	9	18	1966	5.7	31.4	4.5	2.2	8	2
MEXICANUM	DIAZ		US	MX	9	9	8	1969	13.3	32.8	2.7	2.6	6	2
MEXICANUM	ARSENE	44	US	MX	10	10	4	1906	8.0	31.0	2.2	2.1	8	0
MEXICANUM	PALMER	236	MO	MX	10			1896	10.6	20.3	2.2	1.8	6	0
MEXICANUM	FISHER	44203	MO	MX	10	7	23	1944	10.4	29.1	2.2	1.9	6	2
MEXICANUM	SALAZAR		US	MX	9	10	25	1913	9.4	19.2	1.5	2.6	8	2
MEXICANUM	ARSENE	293	US	MX	10	9	20	1906	7.8	20.0	2.8	2.6	8	2
MEXICANUM	ARSENE	418	US	MX	10	8	15	1906	8.8	21.9	2.2	2.6	6	1
MEXICANUM	LYONNET	1693	US	MX	9	10	9	1937	11.8	25.8	2.3	2.4	8	2
MEXICANUM	BALLS	5596	US	MX	9	4	10	1938	9.9	33.9	2.7	2.8	8	0
MEXICANUM	STANLEY	2579	MO	MX	9	9	3	1936	9.6	29.2	2.0	2.8	6	0
MEXICANUM	HINTON	1273	US	MX	9	6	8	1932	3.0	26.9	1.9	2.7	7	2
MEXICANUM	LANGLOIS		MO	LA	6		27	1893	10.6	24.3	3.6	2.0	7	2
OMISSUM	ROSE	17085	US	KS	4G	9	18	1912	3.7	36.0	4.3	2.2	6	2
OMISSUM	GREENE		GRA	CO	4G	9	10	1872	7.2	33.0	3.5	2.1	8	2
MISSISSIPIENSE	TRACY	7636	US	TX		9	14	1901	6.2	24.1	2.7	1.7	6	1
MISSISSIPIENSE	RUNYON	518	US	TX	6	8	16	1923	10.4	21.9	2.2	2.1	6	2
MISSISSIPIENSE	SCHULZ	773	US	TX	4G	6		1922	17.9	29.9	3.5	1.9	6	1
MISSISSIPIENSE	ARSENE	11427	US	LA	6	11		1919	6.1	21.9	1.6	1.9	6	1

DATA LISTING FOR ADDITIONAL SPECIMENS OF SMALLER SPECIES  
SPECIES IDENTIFICATION AS PER HERBARIUM SPECIMEN LABEL

SPECIES	COLLECT	ACCESS	HERBAR	STATE	REGION	MONTH	DAY	YEAR	BLADE_WD	INFLOR_L	PEDICEL	ACHENE_W	STAM_NO	ACHENE_S
MISSISSIPIENSE	TRACY	133	MO	MS	6	9	8	1900	10.7	43.4	2.6	1.7	6	1

2  
VITA

Irene Catherine Edin

Candidate for the Degree of

Master of Science

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COMPLEX (POLYGONACEAE)

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