Bloodscale Sedge (*Cyperus sanguinolentus*), a new Weed in the United States

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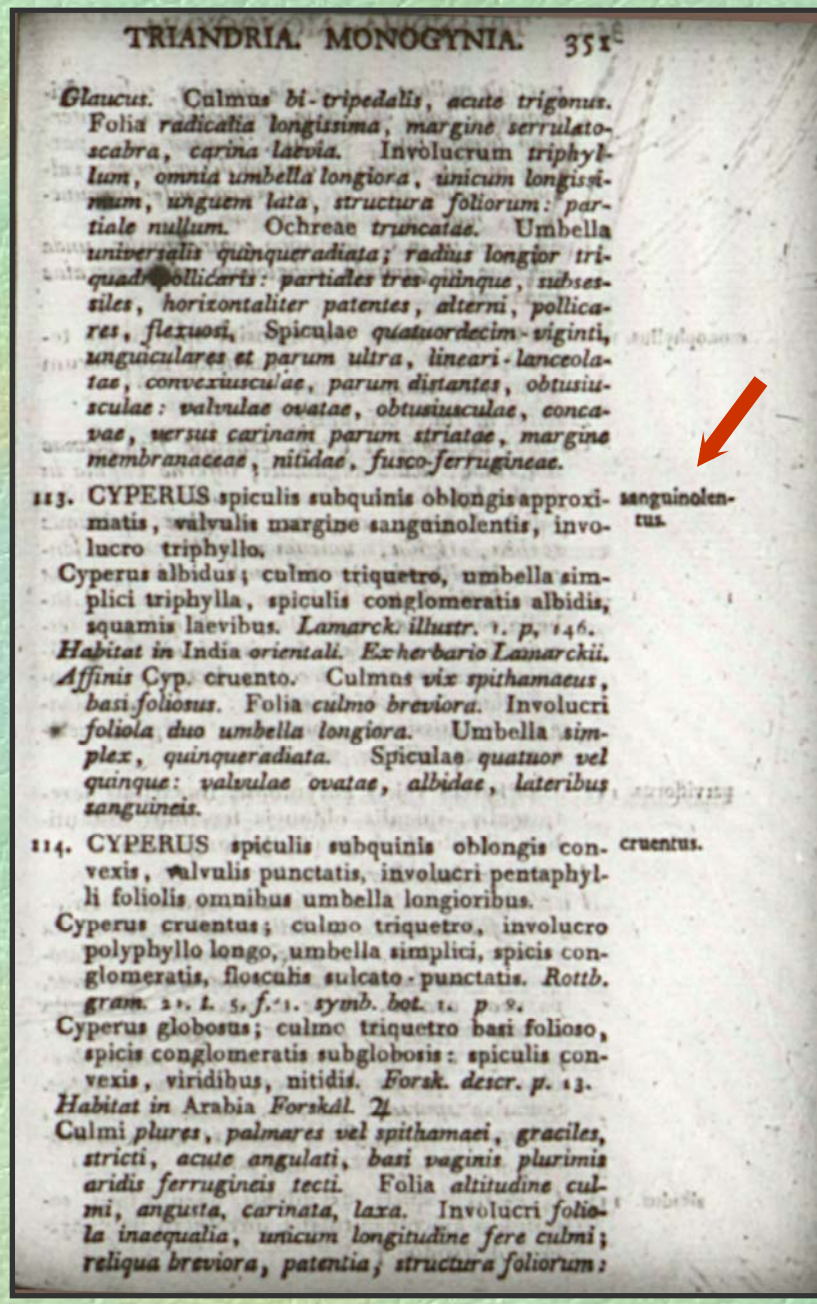
Nomenclatural History

- *Cyperus sanguinolentus* Vahl, Enumeratio Plantarum 2:351. 1805.
- *Pycreus sanguinolentus* (Vahl) Nees, Linnaea 9:283. 1835.
- Type: India. Uttar Pradesh. NW Himalaya, Distr. Tehri-Garhwál, 3000 ft, Oct 1894, *Gamble 15117* (L) [typ. cons. prop., Kukkonen 1995].



TRIANDRIA. MONOGYNIA. 351

Glaucus. Culmus *bi-tripedalis, acute trigonus.* Folia *radicalia longissima, margine serrulato-scabra, carina laevia.* Involucrum *triphyllum, omnia umbella longiora, unicum longissimum, unguem lata, structura foliorum: partiale nullum.* Ochreae *truncatae.* Umbella *universalis quinqueradiata; radius longior triquadripollicaris: partiales tres quinque, subsessiles, horizontaliter patentes, alterni, pollicares, flexuosi.* Spiculae *quatuordecim-viginti, unguiculares et parum ultra, lineari-lanceolatae, convexiusculae, parum distantes, obtusiusculae: valvulae ovatae, obtusiusculae, concavae, versus carinam parum striatae, margine membranaceae, nitidae, fusco-ferrugineae.*

113. CYPERUS spiculis subquinis oblongis approximatis, valvulis margine sanguinolentis, involucro triphyllo. sanguinolentus.

Cyperus albidus; culmo triquetro, umbella simplici triphylla, spiculis conglomeratis albidis, squamis laevibus. *Lamarck. illustr.* 1. *p.* 146.

Habitat in India *orientali. Ex herbario Lamarckii.*

Affinis Cyp. cruento. Culmus *vix spithamaeus, basi foliosus.* Folia *culmo breviora.* Involucri *foliola duo umbella longiora.* Umbella *simplex, quinqueradiata.* Spiculae *quatuor vel quinque: valvulae ovatae, albidae, lateribus sanguineis.*

114. CYPERUS spiculis subquinis oblongis convexis, valvulis punctatis, involucri pentaphylli foliolis omnibus umbella longioribus. cruentus.

Cyperus cruentus; culmo triquetro, involucro polyphyllo longo, umbella simplici, spicis conglomeratis, floseulis sulcato-punctatis. *Rottb. gram.* 21. *t.* 5. *f.* 1. *symb. bot.* 1. *p.* 9.

Cyperus globosus; culmo triquetro basi folioso, spicis conglomeratis subglobosis: spiculis convexis, viridibus, nitidis. *Forsk. descr. p.* 13.

Habitat in Arabia *Forskål.* ♃

Culmi *plures, palmares vel spithamaei, graciles, stricti, acute angulati, basi vaginis plurimis aridis ferrugineis tecti.* Folia *altitudine culmi, angusta, carinata, laxa.* Involucri *foliola inaequalia, unicum longitudine fere culmi; reliqua breviora, patentia; structura foliorum:*

Bloodscale Sedge (CYPSA)

Classification

Family Cyperaceae

Genus *Cyperus*

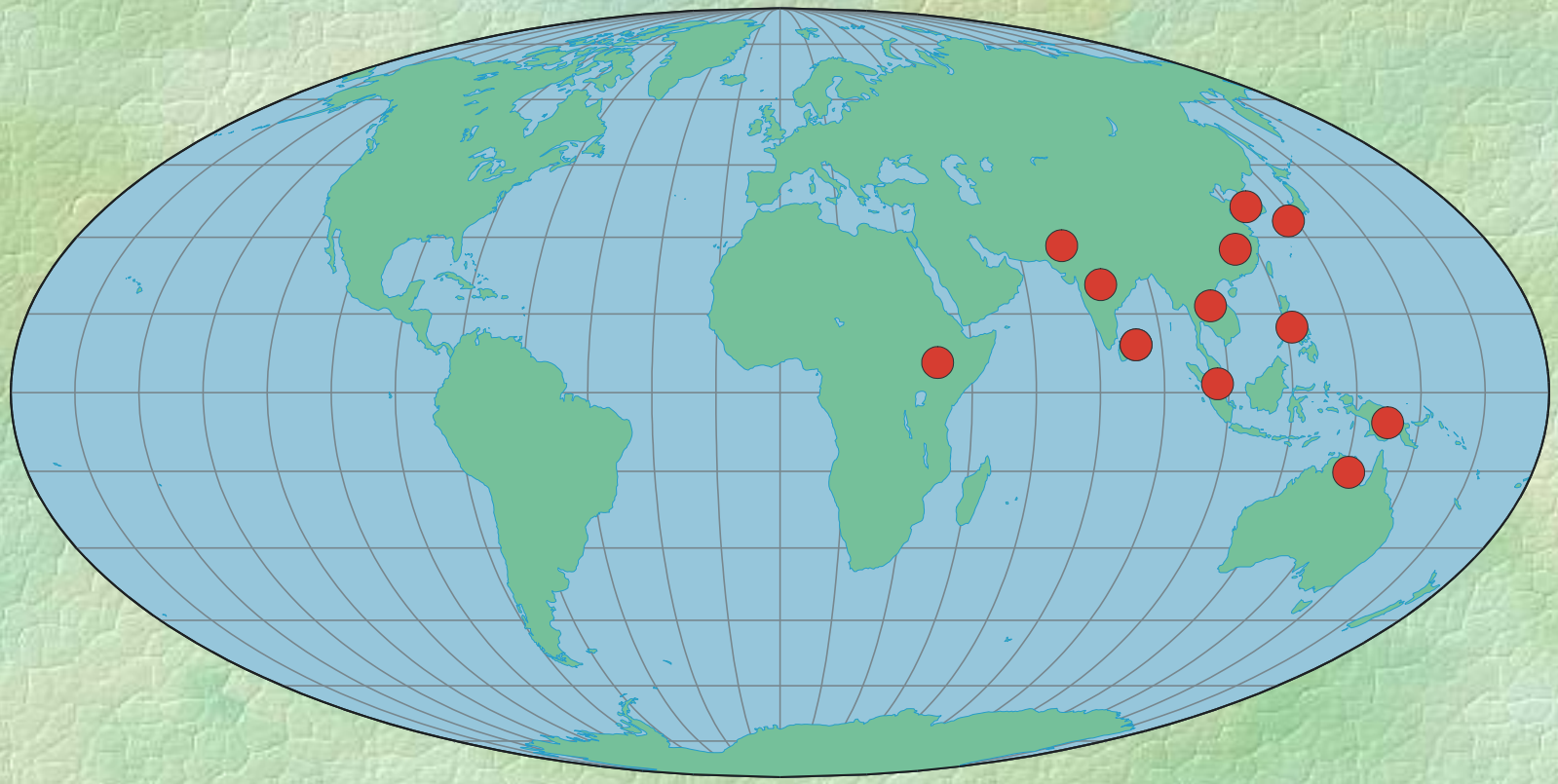
Subgenus *Pycreus*

- stigmas 2
- achene lenticular
- achene angle adjacent to rachilla
- scales and achenes disarticulating from rachilla

Section *Sulcati*

- scales laterally sulcate

Distribution of *Cyperus sanguinolentus*



Ecology

- *Cyperus sanguinolentus* cited as an agricultural weed in Eastern Hemisphere
  - Mingyuan & Dehu (1970) - China
  - Kern (1974)
  - Kühn (1982)
  - Holm et al. (1991)
- Reed (1977) listed it among foreign weeds posing "potential problems in the United States."

Cyperus sanguinolentus

- Highly variable
- Kükenthal (1936) segregated five varieties & named seven forms, including six under the typical variety.
- Kern (1974) treated four subspecies, including the typical one, from Malaysia.

Relationship with *Cyperus louisianensis*

- Described by Thieret in 1977
- Previously thought to be endemic to two sites in southeastern Louisiana
- Listed as *category 2* among endangered & threatened species by Department of Interior, U.S. Fish & Wildlife Service

Proc. Louisiana Acad. Sci. 40:23-26. 1977.

CYPERUS LOUISIANENSIS (CYPERACEAE), A NEW SPECIES FROM SOUTHERN LOUISIANA

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In 1970 and 1972 in Tangipahoa Parish, Louisiana, I collected a *Cyperus* that, in subsequent years, I have been unable to identify as any described species of this large and complex genus. Finally I have decided to describe it as a new species, as follows.

Cyperus louisianensis Thieret, sp. nov. *Annus* [?], caespitosus. *Radix* fibrosa. *Culmi* [6] 15-40 cm alti, [0.5] 1.0-1.3 mm crassi, laeves. *Folia* [1] 2-6, culmo breviora; laminae [0.6] 1.3-3.0 mm latae, [0.2] 3.0-15.0 cm longae, laeves. *Bracteae* 1-4 valde inaequales, 2.0-12.5 cm longae, 0.5-2.5 mm latae, saltem aliquot marginibus antrorse scabrae. *Anthelae* cum [6] 18-40 spiculae; rami primarii ad 1 cm longi, persaepe multo breves, anthelae plerumque glomerulus solitarius terminalis simulans; glomeruli [0.5] 1.5-3.5 cm lati. *Spiculae* ovatae ad anguste elliptico-ovatae, [3] 6-10 mm longae, [1.5] 2.3-2.8 mm latae, [6] 10-30 flora. *Rhachilla* 0.3-mm latae [plicatae], sulcatae, obtusae, plerumque marginibus sanguineae vel brunneae, color interdum praesens tantum distalis, interdum obscurus; carina 3-5 nervis obscuris, interdum virella. *Stamina* 3; antherae 0.5 mm longae, filamenta 2.0-2.5 mm longa persistens. *Stylus* 2.5 mm longus, 1/3 vel fere 1/2 ad basim bifidus; stigmata exserta. *Nux* lenticularis biconvexa, 1.1-1.4 mm longa, 0.7-0.8 mm lata, 0.3 mm crassa, elliptica vel elliptico-obovata, aliquantum asymmetrica, vix stipitata et apiculata; minute reticulata, reticulum argenteum vel crystallinum, sed pagina nucis chocolatina.

Annual [?] cespitose. *Roots* fibrous. *Culms* [6] 15-40 cm tall, [0.5] 1.0-1.3 mm thick, smooth, not septate-nodulose. *Leaves* [1] 2-6 on a culm, shorter than the culms; blades [0.6] 1.0-3.0 mm wide, [0.2] 3.0-15.0 cm long, smooth, not septate-nodulose, rarely absent on depauperate culms. *Bracts* 1-4, very unequal, 2.0-12.5 cm long, 0.5-2.5 mm wide, shorter than to much surpassing the inflorescence, at least some upwardly scabrous along the margin. *Inflorescences* with [6] 18-40 spikelets; primary branches to 1 cm long, almost always much shorter, most inflorescences, with their abbreviated primary branches, simulating a solitary, terminal glomerule; glomerules [0.5] 1.5-3.5 cm wide. *Spikelets* ovate to narrowly elliptic-ovate, [3] 6-10 mm long, [1.5] 2.3-2.8 mm wide, [6] 10-30 flowered. *Rachilla* 0.3 mm wide, wingless. *Scales* [1.5] 1.9-2.7 mm long, [0.5] 1.0-1.3 mm wide [folded], sulcate, obtuse, usually with a dull reddish to brownish marginal band to 0.3 mm wide, the color sometimes present only distally along the margin, sometimes obscure; keel with 3-5 obscure nerves, sometimes greenish. *Stamens* 3; anthers 0.5 mm long, filaments 2.0-

Holotype:
GH

Cyperus louisianensis Thieret, Proc. Louisiana Acad. Sci. 40:23-26. 1977.

Cyperus louisianensis holotype locality
Tangipahoa Parish, LA

Department of Interior, United States Fish & Wildlife Service, *category 2* listing among endangered & threatened species

Status		Lead Region	Scientific name	Family	Common name	Historic range
Category	Trend					
PE	U	R1	*Cyanea hamatiflora* ssp. *carlsonii*	Campanulaceae	Haha	HI.
2	U	R1	*Cyanea kunthiana*	Campanulaceae		HI.
2	U	R1	*Cyanea leptostegia*	Campanulaceae	Cyanea, giant koke'e	HI.
S	N	R1	*Cyanea lindseyana*	*** see ***	*Clermontia lindseyana*	
2*	E	R1	*Cyanea longissima*	Campanulaceae		HI.
2	U	R1	*Cyanea marksii*	Campanulaceae		HI.
S	N	R1	*Cyanea nelsonii*	*** see ***	*Cyanea stictophylla*	
PE	D	R1	*Cyanea shipmanii*	Campanulaceae	Haha	HI.
PE	U	R1	*Cyanea stictophylla*	Campanulaceae	Haha	HI.
S	N	R1	*Cyanea submuricata*	*** see ***	*Cyanea tritomantha*	
2	U	R1	*Cyanea tritomantha*	Campanulaceae	'Aku'aku	HI.
PE	U	R1	*Cyanea truncata*	Campanulaceae	Haha	HI.
S	N	R4	*Cyclodon alabamensis*	*** see ***	*Matelea alabamensis*	
2*	U	R4	*Cylindrocolea andersonii*	Cephaloziellaceae		NC.
2	D	R6	*Cymopterus acaulis* var. *higginsii*	Apiaceae	Biscuitroot, Higgins	UT.
2	U	R6	*Cymopterus beckii*	Apiaceae		UT.
2	D	R1	*Cymopterus davisii*	Apiaceae		ID.
1	U	R1	*Cymopterus deserticola*	Apiaceae	Cymopterus, desert	CA.
2	U	R1	*Cymopterus douglassii*	Apiaceae		ID.
3C	N	R6	*Cymopterus everetii*	Apiaceae		WY.
2	U	R1	*Cymopterus goodrichii*	Apiaceae		NV.
S	N	R6	*Cymopterus higginsii*	*** see ***	*Cymopterus acaulis* var. *higginsii*	
2	U	R2	*Cymopterus megacephalus*	Apiaceae		AZ.
2	U	R6	*Cymopterus minimus*	Apiaceae	Biscuitroot, Cedar Breaks	UT.
2	U	R1	*Cymopterus ripleyi* var. *saniculoides*	Apiaceae		NV.
S	N	R6	*Cymopterus* sp. nov. *fined.*	*** see ***	*Cymopterus everetii*	
S	N	R1	*Cymopterus* sp. nov. *fined.* (Custer, Lemhi Cos.).	*** see ***	*Cymopterus douglassii*	
2	U	R2	*Cynanchum wigginsii*	Asclepiadaceae		AZ, Mexico.
2	U	R4	*Cyperus cephalanthus*	Cyperaceae		LA, TX.
2	S	R3	*Cyperus grayoides (=grayioides)*	Cyperaceae	Sedge, umbrella,	IL, LA, MO, TX.
2	U	R4	*Cyperus louisianensis*	Cyperaceae	Sedge,	LA.
2	U	R2	*Cyperus onerosus*	Cyperaceae	Sedge, flat dune	TX.
S	N	R1	*Cyperus pennatiformis* var. *bryanii*	*** see ***	*Mariscus pennatiformis*	
2	U	R1	*Cyperus trachysanthos*	Cyperaceae		HI.
S	N	R4	*Cyperus urbanii*	*** see ***	*Mariscus urbanii*	
2	D	R1	*Cypripedium fasciculatum*	Orchidaceae	Lady's-slipper, clustered	CA, CO, ID, MT, OR, UT, WA, WY, Canada.

Relationship with *Cyperus louisianensis*

- Thieret (1977) commented on close relationship between *C. louisianensis* & *C. sanguinolentus*
- Distinguished between the species based upon differences in
  - achene shape
  - scale imbrication

Questions

- What are the range, distribution, frequency & habitat of *Cyperus louisianensis*?
- Is *C. louisianensis* a narrow endemic requiring legal protection?
- What is the taxonomic relationship between *C. louisianensis* & *C. sanguinolentus*?

Methods - Field

- *Cyperus louisianensis* type locality relocated
- Additional populations intensively sought in southeastern LA and southern MS
- Data recorded on population size, location, date of observation
- Voucher specimens prepared from each population

Methods - Greenhouse

- Seeds sewn Mar, Jun, Sep, Dec 1994, 1995,1996 on flats of 6 cm-deep mixture of Bosket silt loam (Mollic Hapludaf) & sphagnum (50% v/v)
- Seedlings (≥ 5 cm tall) transplanted to 15 cm-diam pots
- Flowering & fruiting plants transplanted from sites in Hancock Co., MS, & St. Tammany Pa., LA, to 15 cm-diam pots
- Pots watered from beneath & plants maintained at 30-35 C day, 25-30 C night, 60 to 75% relative humidity, without supplemental lighting
- Data taken - seedling emergence dates, flowering/fruiting dates, & plant longevity

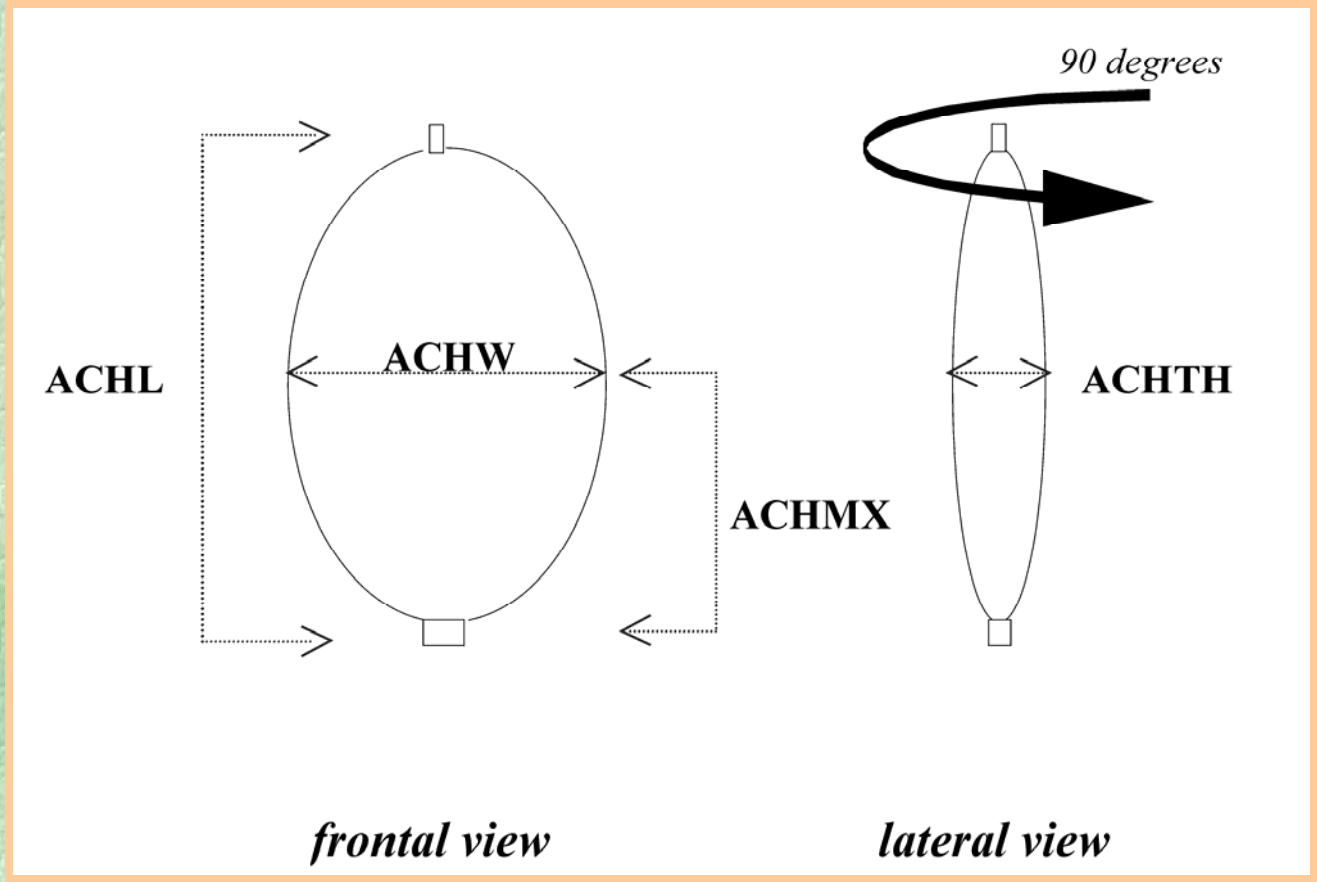
Methods - Herbarium

- Type specimens of *Cyperus louisianensis* borrowed for study
- Herbarium specimens of *C. sanguinolentus* borrowed for comparison & analysis
- Floral scales of CYPLA & CYPSA compared qualitatively
- Representative spikelets photographed using digital camera & microscope

Methods - Morphometric Analysis

- 5 achenes @ from 13 specimens of *C. louisianensis* & 20 specimens of *C. sanguinolentus* measured using stereomicroscope & ocular micrometer
- Characters examined: ACHL, ACHW, ACHTH, ACHMX
- Data analyzed & graphed using Minitab™

Achene Measurements



Quantitative achene characters & ratios used to compare specimens of *Cyperus sanguinolentus* & *C. louisianensis*

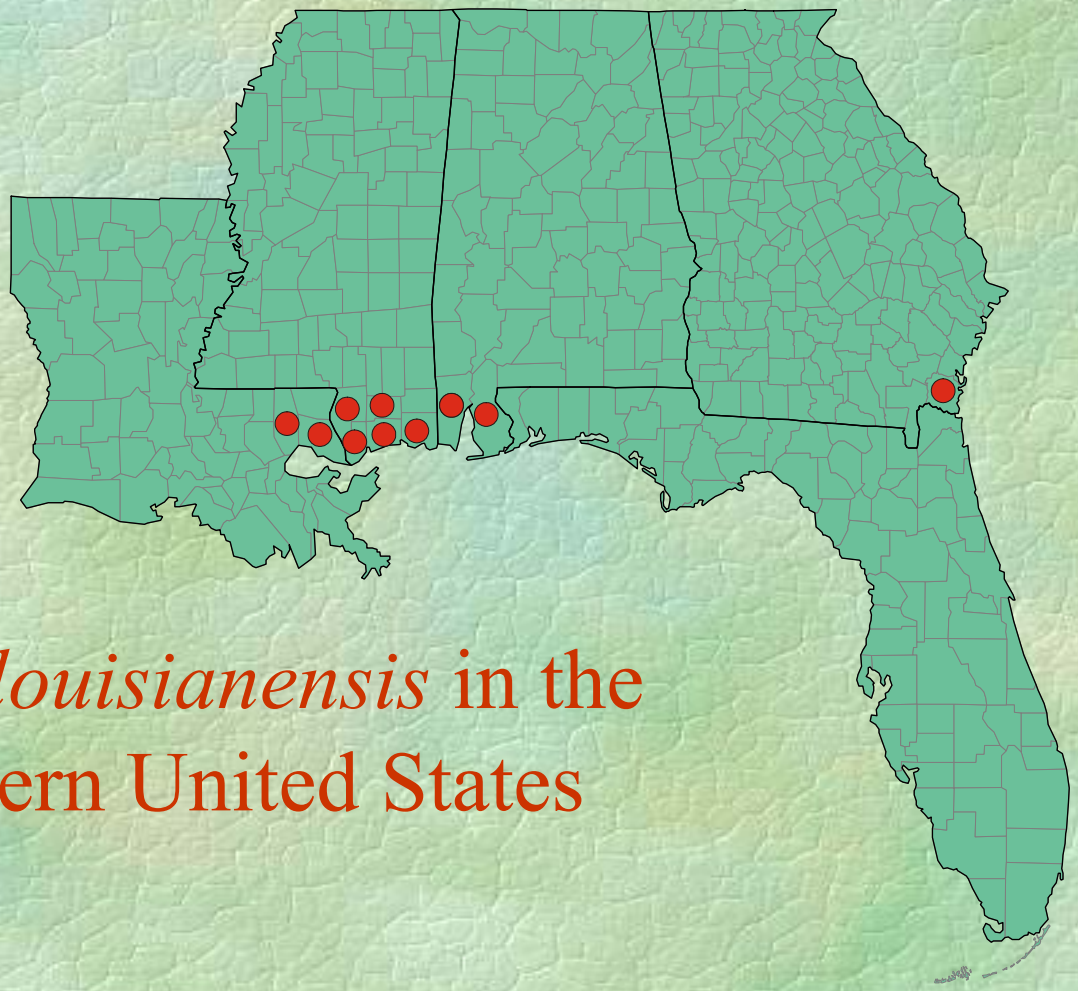
ACHL	**Achene length (mm)**
ACHW	**Achene width (mm)**
ACHMX	**Achene distance from base to widest point (mm)**
ACHTH	**Achene thickness (mm)**
ACHTH/ACHL	**Ratio used by Thieret (1977).**
ACHL/ACHW	**Ratio approximates achene outline, e.g. elliptic (2:1), ovate & obovate (3:2), orbicular (1:1).**
ACHL/ACHMX	**Ratio approximates achene outline, e.g., elliptic & orbicular (2:1), ovate (< 2:1), obovate (> 2:1)**

Results - Field

- In addition to Thieret's original sites in Tangipahoa Parish, LA, we have identified >40 sites concentrated in southeastern LA & southern MS.
- Isolated stations have been found in southern AL & southeastern GA.

Cyperus louisianensis site in Tangipahoa Parish, LA

Cyperus louisianensis
Camden County, GA



Cyperus louisianensis in the southeastern United States

Results - Greenhouse

- Plants emerged mid- & late May until mid-Sep
- Plants flowered from late Aug until mid-Dec, peaking early Sep through early Oct; plants subsequently fruited
- Late-emerging plants shorter at flower initiation, suggesting photoperiod effect
- All plants grown from seeds & transplanted into greenhouse from field died shortly after fruiting & showed no evidence of perennation

live plants

dead late-season plants

Results - Herbarium & Morphometric Analysis

Cyperus louisianensis versus *C. sanguinolentus*

- Achene shape
  - *C. louisianensis*: elliptic to elliptic-obovate, rather flattened (thickness-length ratio: 0.25--0.30
  - *C. sanguinolentus*: orbicular-obovate, turgid (thickness-length ratio: 0.40)
- Scales
  - *C. louisianensis*: well imbricated & flat along margin
  - *C. sanguinolentus*: often barely imbricate & frequently somewhat involute along margin

Spikelet variation in *Cyperus sanguinolentus*

China (*Boufford et al. 24675)*

Japan *(Okomoto NSM 584)*

Japan *(Furuse 10-11-1960)*

Nepal *(Stainton 9238)*

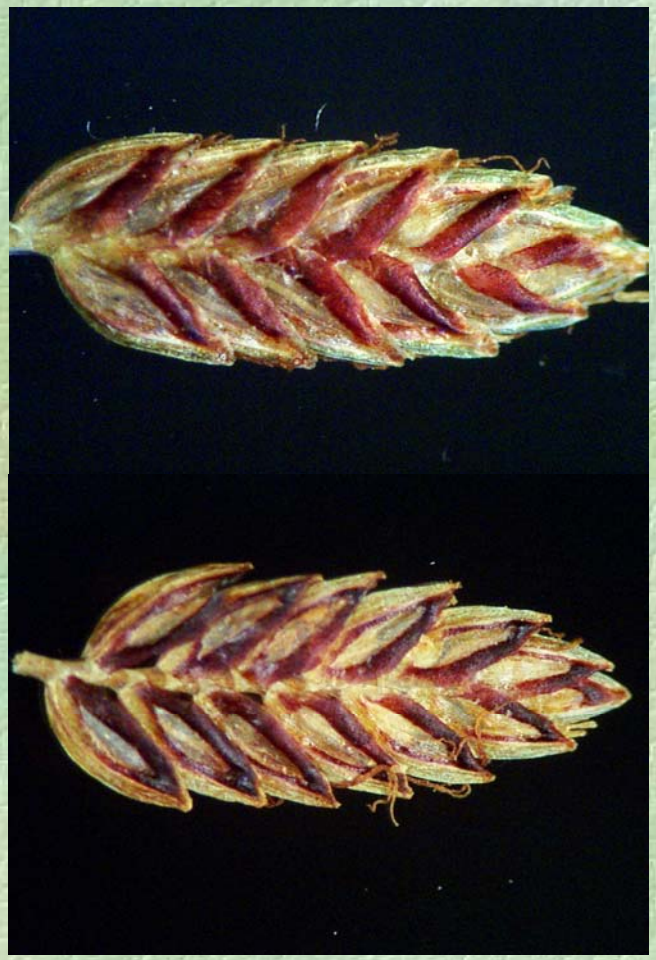
Japan *(Hutoh 11517)*

China *(Tsang 20665)*

Scale imbrication

- *C. louisianensis:* holotype--left
- *C. sanguinolentus:* Japan, *Furuse 09-30-1959*--right

Scale pigmentation

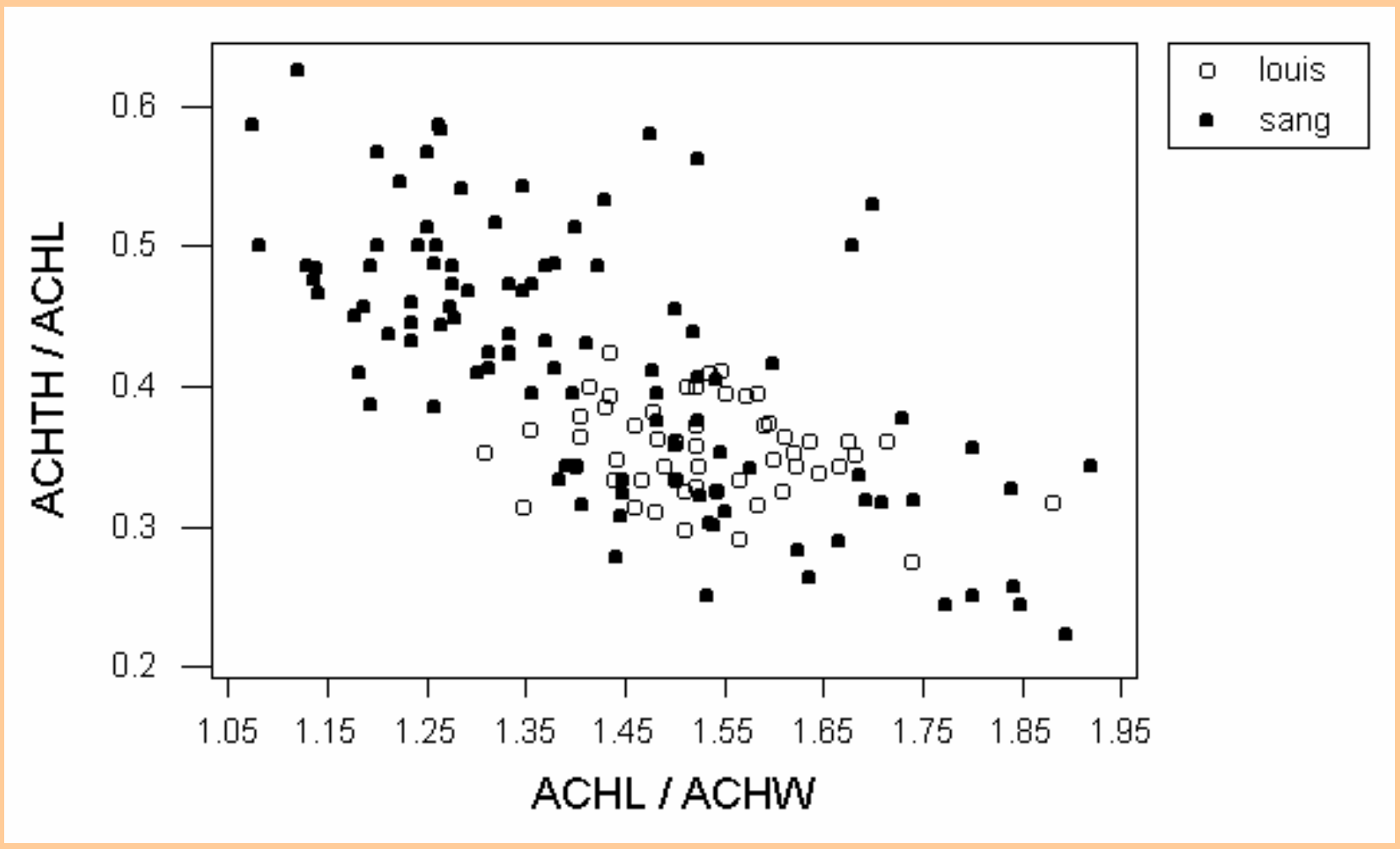


- *C. louisianensis:* Mississippi, U.S.A., *Carter 11562*
- *C. sanguinolentus:* Japan, *K. Okamoto NSM 584*

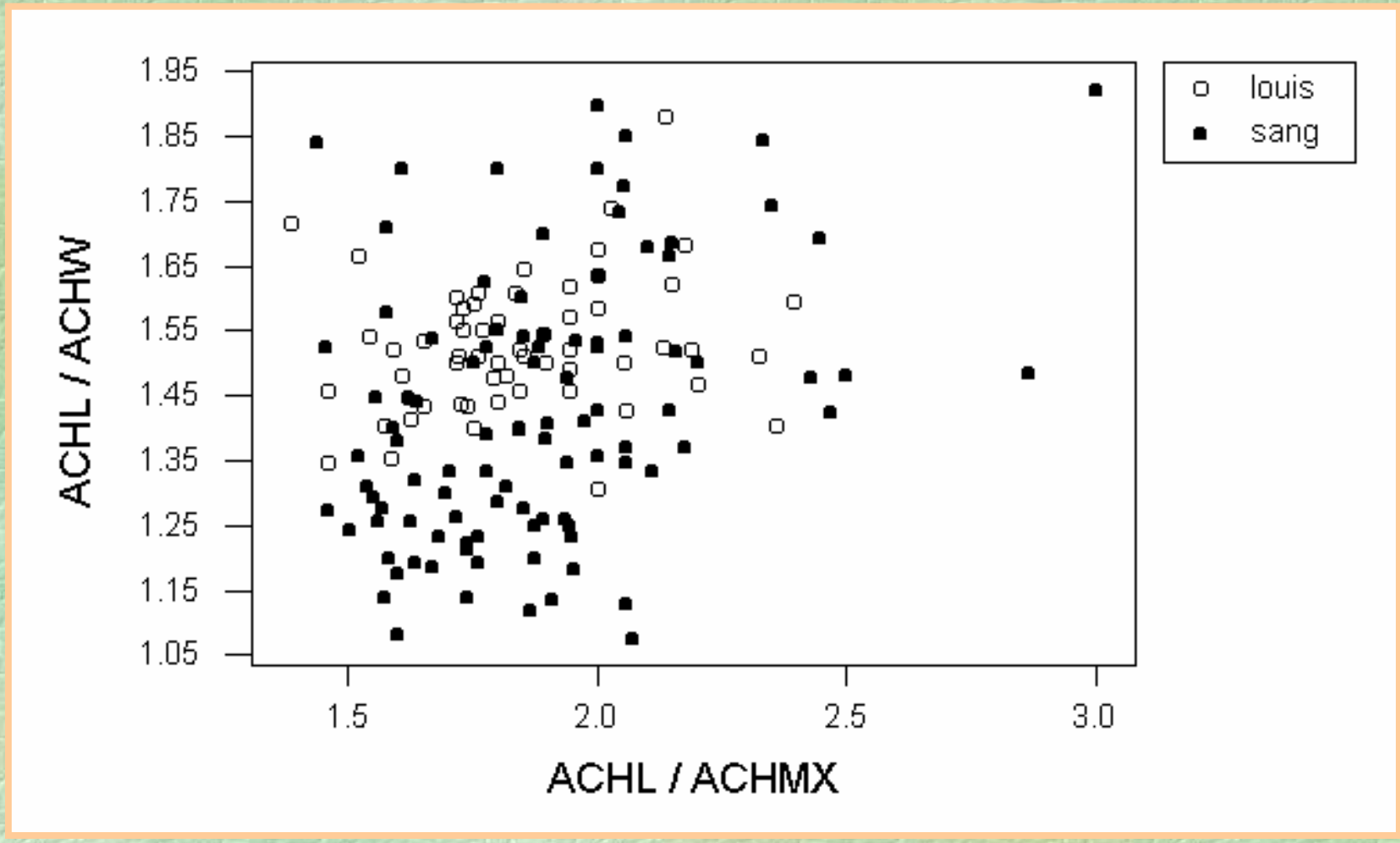
Achenes

- *C. sanguinolentus* - Japan
- *C. louisianensis* - U.S.A

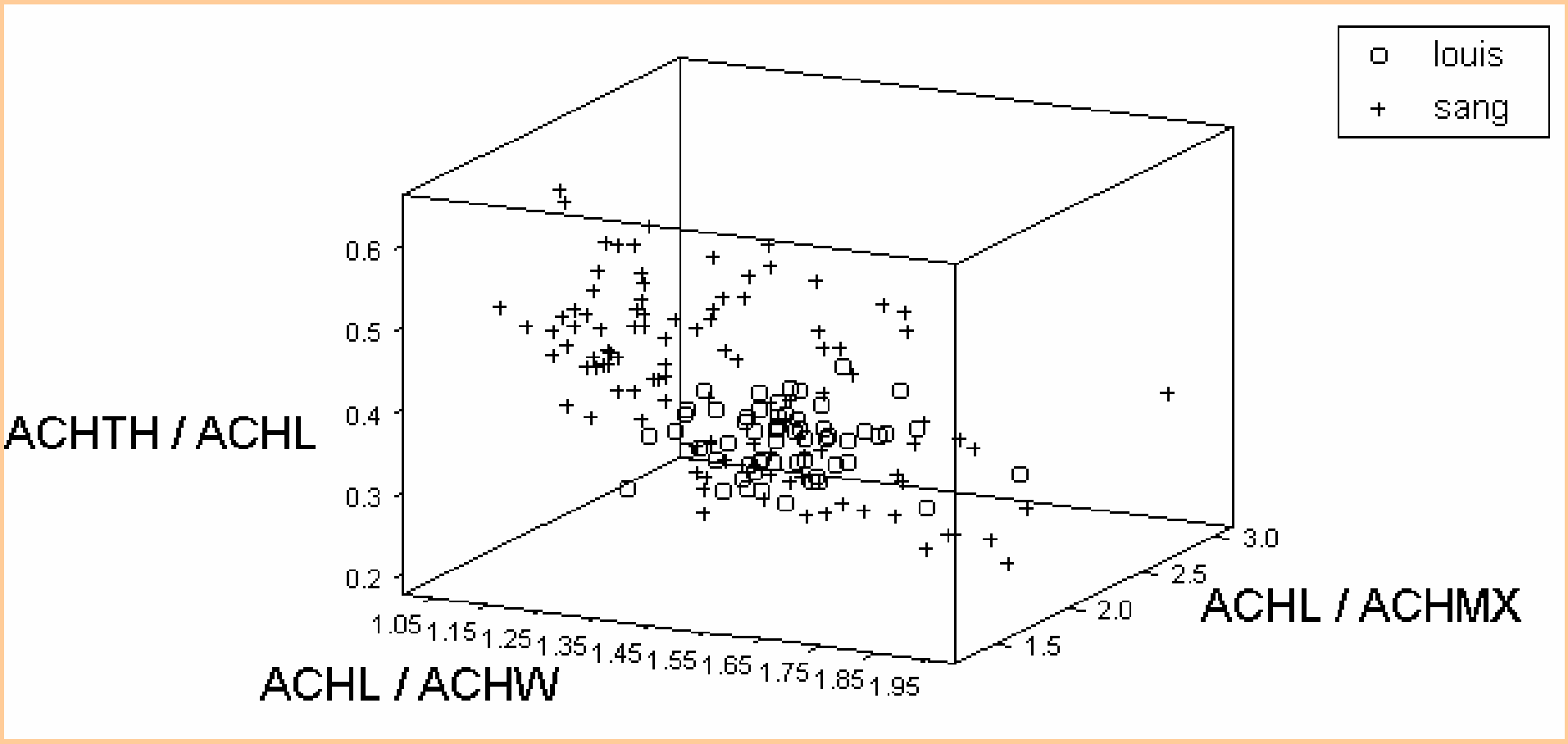
Achene length to width vs. achene thickness to length



Ratio of achene length to distance of maximum width from base vs. ratio of achene length to width



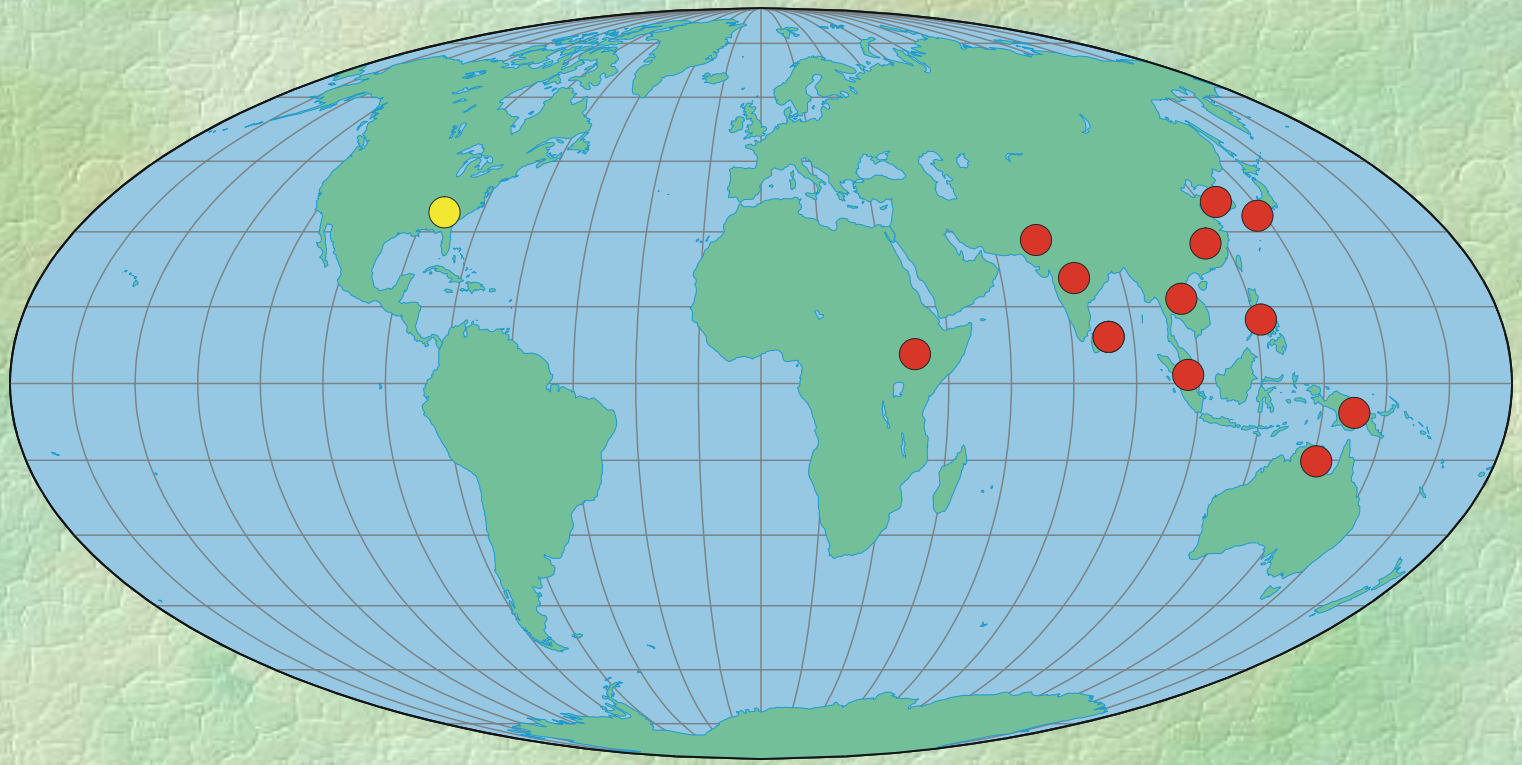
Ratio of achene length to width vs. ratio of achene length to distance of maximum width from base vs. ratio of achene thickness to length



Conclusions

- *Cyperus louisianensis* is not a narrow endemic species.
- *C. louisianensis* indistinguishable from certain *C. sanguinolentus* specimens
- *C. louisianensis* = *C. sanguinolentus*
- *C. sanguinolentus* Vahl (1805) is correct name for U.S. populations previously called *C. louisianensis* Thieret (1977).
- Range of *C. sanguinolentus* extended to the Western Hemisphere

Revised distribution of Bloodscale Sedge *(Cyperus sanguinolentus)*, including populations of *C. louisianensis*



Ecology & life history

- Widespread & weedy in SEUS
- Often locally abundant
- Invader of disturbed habitats
  - roadside ditches
  - margins of artificial ponds
- Range expanding in SEUS
- Phenology: flowers & fruits Sept. until frost
- Annual habit in SEUS