

NOTES ON THE *CYPERUS RETROFLEXUS* COMPLEX
(CYPERACEAE) WITH THREE NOMENCLATORIAL
PROPOSALS

RICHARD CARTER

Herbarium, Biology Department,
Valdosta State University, Valdosta, GA 31698-0015

STANLEY D. JONES

Herbarium, Botanical Research Center,
P.O. Box 6717, Bryan, TX 77805-6717

ABSTRACT. This poorly understood and confusing group is centered around *Cyperus retroflexus*, until recently known as *C. uniflorus*. Typification of *C. uniflorus* var. *pumilus* is discussed, and the following new combination is made: *C. retroflexus* var. *pumilus*. Two varieties of *C. uniflorus* are discussed and elevated to species: *C. floribundus* and *C. pseudothyrsiflorus*. Included is a dichotomous key treating the aforementioned taxa and putative allies of *C. pseudothyrsiflorus*: *C. hermaphroditus*, *C. lentiginosus*, *C. tenuis*, and *C. thyrsiflorus*.

Key Words: Cyperaceae, *Cyperus* section *Umbellati*, *C. floribundus*, *C. pseudothyrsiflorus*, *C. retroflexus* var. *retroflexus*, *C. retroflexus* var. *pumilus*, *C. uniflorus*

Revisional studies in *Cyperus* section *Umbellati* (Carter 1984; Carter, in prep.) and preparation of treatments of the genus for *Flora of North America* and *Vascular Plants of Texas* by Jones, Wipff, and Montgomery (1997) have brought to light several taxonomic and nomenclatural problems bearing heavily on the Texas flora. These problems involve the species formerly known as *C. uniflorus* Torr. & Hook., now properly known as *C. retroflexus* Buckley (Tucker 1987, 1994). Fernald and Griscom (1935) wrote that the “supposed new species” *C. uniflorus* was based on an immature specimen of *C. strigosus* L., evidence that the taxon has long been problematic. Although we concur with Fernald and Griscom that type material (*Drummond 287*) of *C. uniflorus* is immature, we disagree, as did Kükenthal (1936) and others (Horvat 1941; O’Neill 1942), that the type belongs in *C. strigosus*. Kükenthal, in a comprehensive monograph of the genus, treated this complex as five taxa shown in Table 1. Horvat subsequently placed all of these names into synonymy under *C. uniflorus*, a

view essentially upheld by O'Neill. Tucker (1994) followed Horvat and O'Neill in recognizing but a single taxon, albeit under *C. retroflexus*. Table 1 compares these various taxonomies and ours.

RESULTS AND DISCUSSION

Our field and herbarium studies support Kükenthal's contention that multiple taxa are involved; however, as shown in Table 1, in departure from Kükenthal, we recognize three species and one variety. Our revised taxonomy is based upon combinations of vegetative, spike, spikelet, scale, and achene characters, some previously unused, which are summarized in key form and in Tables 2, 3, and 4. Moreover, discovery that *Cyperus uniflorus* Torr. & Hook. is illegitimate (Tucker 1987, 1994) complicates the problem somewhat, especially since we have determined, as did Horvat (1941), that the type of *C. uniflorus* Torr. & Hook. is not the same as *C. retroflexus*, but instead is an immature specimen of *C. uniflorus* var. *floribundus*, which we treat as a distinct species. All of this necessitates revision of the taxonomy and nomenclature of this complex. Thus, we propose: *C. retroflexus* var. *pumilus* (Britton) R. Carter & S. D. Jones, *comb. nov.*; *C. floribundus* (Kük.) R. Carter & S. D. Jones, *stat. nov.*; and *C. pseudothyrsiflorus* (Kük.) R. Carter & S. D. Jones, *stat. nov.*

Typification of *Cyperus uniflorus* var. *pumilus* Britton. Britton (1884) described *Cyperus uniflorus* var. *pumilus*, based primarily upon an S. B. Buckley collection from the "Valley of the Lower Rio Grande, in Texas and Northern Mexico." Subsequently, Small (1903) elevated this taxon to species rank and, crediting Britton with authorship, called it "*Cyperus subuniflorus* Britton," citing in synonymy "*C. uniformis* [sic] var. *pumilus* Britton, not *C. pumilus* L." Kükenthal (1936), like Small, treated *C. subuniflorus* as a distinct species allied with *C. uniflorus*. Apparently unaware of Britton's 1884 publication of var. *pumilus*, Horvat (1941) and O'Neill (1942) mistook an entry in a list published by Britton two years later (1886) as a *nomen nudum*. In fact, Britton in 1884 had provided a description with the name and thus had validly published it under Articles 32 & 36 of the ICBN (Greuter et al. 1994).

As was usually the case then, Britton (1884) did not explicitly designate in publication a holotype for *Cyperus uniflorus* var.

Table 1. Comparison of taxonomic treatments of the *Cyperus retroflexus* complex.

Present Treatment 4 Taxa	Kükenthal (1936) 5 Taxa	Horvat (1941) O'Neill (1942) 1 Taxon	Tucker (1994) 1 Taxon
<i>C. floribundus</i>	<i>C. uniflorus</i> var. <i>uniflorus</i>	<i>C. uniflorus</i>	<i>C. retroflexus</i>
	<i>C. uniflorus</i> var. <i>floribundus</i>		
<i>C. pseudothyrsiflorus</i>	<i>C. uniflorus</i> var. <i>pseudothyrsiflorus</i>		
<i>C. retroflexus</i> var. <i>retroflexus</i>	<i>C. uniflorus</i> var. <i>retroflexus</i>		
<i>C. retroflexus</i> var. <i>pumilus</i>	<i>C. subuniflorus</i>		

pumilus. However, the title of his article "A list of Cyperaceae collected by the late Mr. S. B. Buckley from 1878 to 1883 in the valley of the lower Rio Grande, in Texas and northern Mexico" obviously indicated that a Buckley collection was the basis for *C. uniflorus* var. *pumilus*. At NY, there are two sheets of Buckley collections from the valley of the Lower Rio Grande, dated 1878–1883. On virtually identical labels, handwritten by N. L. Britton, these specimens are identified as "Cyperus uniflorus, Torr.; var. *pumilus*, Britton." The only substantive difference between the two labels is that one bears the additional designation "type."

It would seem that the NY specimen marked "type" should be recognized as holotype. However, in addition to his obvious reference to Buckley's collections, Britton (1884) cited another collection as follows: "I refer here also No. 350, Palmer, Indian Territory." Specimens of *Palmer 350* are at NY and US. Although no Buckley collections were cited beyond the title, the new taxa described by Britton, including *Cyperus uniflorus* var. *pumilus*, were obviously based upon collections of S. B. Buckley, and only secondarily were other specimens such as *Palmer 350* cited. Unfortunately, Horvat (1941) and O'Neill (1942) stated "*Palmer 350* from the Indian Territory and Buckley's specimen from the valley of the Lower Rio Grande (1879–1883) are respectively the

Table 2. A comparison of *Cyperus retroflexus* var. *retroflexus* and *C. retroflexus* var. *pumilus*.

	<i>C. retroflexus</i> var. <i>retroflexus</i>	<i>C. retroflexus</i> var. <i>pumilus</i>
Plant height	Except for depauperate specimens, plants usually greater than 25 cm tall	Plants diminutive, 3-35 (-45) cm tall
Length longest peduncle	Longest peduncle (0.5-) 2.4-6.8 cm long	Longest peduncle less than 2.7 (-3.9) cm long
Fertile floral scale length	Fertile floral scales (2.8-) 3.0-3.9 mm long	Fertile floral scales 1.9-3.0 (-3.3) mm long
Terminal floral scale	Terminal sterile floral scale usually not greatly reduced, $\frac{2}{3}$ or more the length of fertile scales	Terminal sterile floral scale of spikelet often much reduced, then less than $\frac{2}{3}$ the length of fertile scales
Rachilla nerves	Rachilla usually with two conspicuous nerves, one on either side of median	Rachilla usually without conspicuous nerves
Rachilla wing texture	Rachilla wing usually chartaceous beyond clasped achene angle, border membranaceous (rarely wing almost entirely membranous)	Rachilla wing membranaceous throughout (rarely medially chartaceous)
Spikelet length	Longest spikelets 4.9-9.0 (-11.3) mm long	Longest spikelets 2.8-5.8 (-8.0) mm long

Table 3. Comparison of *Cyperus floribundus* and *C. retroflexus* var. *retroflexus*.

	<i>C. floribundus</i>	<i>C. retroflexus</i> var. <i>retroflexus</i>
Spikelet length	Longest spikelets (9.0-) 9.8-21.25 mm long	Longest spikelets 2.8-9.0 mm long
Spikelet outline	Spikelets strongly flexuous-contorted	Spikelets not strongly contorted, at most flexuous with curved tips
Spikelet base	Spikelet base strongly stipitate, 0.4-1.0 mm long	Spikelet estipitate or only weakly stipitate and stipe 0.1-0.3 (-0.5) mm long (2.8-) 3.0-3.9 mm
Length longest floral scale	(3.5-) 3.7-4.8 mm	Pale whitish or reddish brown, less commonly sanguineous, usually reddish brown maculate
Floral scale color	Sanguineous to reddish brown, rarely brownish or pale whitish	Distal fertile floral scales obtuse to acute or with short mucro 0.1-0.3 (-0.5) mm long
Floral scale apex	Distal fertile floral scales with prominent mucro 0.6-1.9 mm long	Keel of distal fertile floral scales smooth (30× magnification), excluding cluster of small teeth at mucro tip
Floral scale keel	Keel of distal fertile floral scales usually scabrid (30× magnification)	0.3-0.5 (-0.6) mm
Anther length	0.5-1.3 mm	Achenes 2-3 (-3.3) times as long as wide
Achene length : width ratio	Achenes more than 3 times as long as wide	Plants more widely distributed, throughout northern Mexico and Texas westward into New Mexico, northward into Oklahoma and southern Missouri, and eastward through Arkansas and northern Louisiana with outliers in western Kentucky, Mississippi, and eastern Alabama
Distribution	Plants restricted to lower Rio Grande valley and adjacent areas of southern Texas and northeastern Mexico, with outlier in Travis County, Texas	

Table 4. Comparison of *Cyperus pseudothyrsiflorus*, *C. thyrsiflorus*, *C. tenuis*, *C. lentiginosus* and *C. hermaphroditus*.

	<i>C. pseudothyrsiflorus</i>	<i>C. thyrsiflorus</i>	<i>C. tenuis</i>	<i>C. lentiginosus</i>	<i>C. hermaphroditus</i>
Mid-culm diameter	2.0-2.6 mm	0.5-1.1 mm	1.2-2.2 mm	(0.8-) 1.1-3.0 mm	(1.3-) 2.0-3.6 mm
Mid-peduncle diameter	0.4-0.7 mm	0.2-0.5 (-0.55) mm	0.4-0.8 mm	(0.4) 0.5-0.9 mm	(0.5-) 0.7-1.4 mm
Leaf/bract width	(3.0-) 4.0-5.8 mm	0.8-2.8 (-3.0) mm	1.8-3.1 mm	(2.6-) 3.0-8.0 mm	(3.5-) 5.0-10 mm
Inflorescence	4-12 rays; peduncles usually conspicuous, longest mostly 1-4× as long as spike axis	(2-) 3-6 rays; peduncles conspicuous, longest mostly at least 3× as long as spike axis	Spikes mostly sessile to subsessile, peduncles obscure to 3× (-3.3) as long as spike axis	5-11 rays; peduncles conspicuous, longest mostly at least 3× as long as spike axis	7-12 rays; peduncles conspicuous
Spike shape	Oblong to elliptical (rarely subglobose)	Oblong to subglobose	Oblong to subglobose	Oblong to broadly oblong	Narrowly oblong to oblong
Spike density	Tight; (11-) 14-21 spikelets per 5 mm span upper rachis	Loose; 7-9 spikelets per 5 mm span upper rachis	Tight; 22-45 spikelets per 5 mm span upper rachis	Loose to tight; 8-12 spikelets per 5 mm span upper rachis	Tight; 18-26 spikelets per 5 mm span upper rachis
Lower bracteoles of pedunculate spikes	Narrowly triangular to setaceous, mostly longer than associated prophyll	Triangular to narrowly triangular, mostly no longer than associated prophyll	Narrowly triangular to setaceous, usually longer than associated prophylls	Narrowly triangular to linear-triangular and setaceous, exceeding associated prophylls	Linear triangular to setaceous, exceeding associated prophylls
Spikelet posture	divaricate (to ascending)	Mostly divaricate	Ascending to divaricate	Mostly divaricate	Mostly divaricate

Table 4. Continued.

	<i>C. pseudothyrsiflorus</i>	<i>C. thyrsiflorus</i>	<i>C. tenuis</i>	<i>C. lentiginosus</i>	<i>C. hermaphroditus</i>
Spikelet length	(4.0-) 4.8-11.5 mm	3.4-7.4 (-17.0) mm	5.3-8.7 (-14) mm	8.9-11 mm	(2.5-) 4.0-7.2 mm
Spikelet stipe length	Absent or 0.1-0.2 mm	Absent to 0.1 mm	Absent or 0.1-0.2 mm	0.3-0.5 mm	Absent to 0.1 mm
Spikelet, prophyll, bracteole, rachis pigmentation	Usually conspicuously reddish brown maculate or striate	Usually reddish brown striate	If present, then reddish brown specks or streaks tiny and inconspicuous	Conspicuously reddish brown maculate	Pigmented spots or streaks absent, or at least inconspicuous
Scale length	2.4-3.4 mm	2.0-3.0 mm	2.4-2.8 mm	3.3-4.0 mm	2.3-3.0 mm
Apex of distal fertile scales	Short mucronate, mucro 0.1-0.3 mm	Obtuse to acute, or with short mucro to 0.1 mm long	Obtuse to acute, or with short mucro to 0.1 mm long	Mucronate, mucro 0.3-0.5 mm long	Obtuse
Scale color	Usually bilaterally variable, whitish to sanguineous or reddish brown sometimes tinted ferruginous or yellowish	Whitish nerves and margins, with chocolate to liver brown undercolor	Pale olivaceous to brown, usually with chocolate to liver brown undercolor	Chestnut to cinnamon brown, sometimes yellow tinted	Scales golden yellow to stramineous (to reddish brown)
Achene shape; width	Elliptic to narrowly elliptic to narrowly obovate; 0.5-0.75 mm	Narrowly elliptic to oblong; 0.5-0.65 mm	Narrowly oblong; 0.4-0.45 mm	Oblong to elliptic; 0.55-0.6 mm	Elliptic to oblong to narrowly obovate; 0.6-0.8 mm
Scale length: achene length ratio	ca. 1.5 [1.35-1.74 (-1.81)]	ca. 1.5 [1.31-1.75 (-1.88)]	ca. 1.5 [1.53-1.67]	ca. 2 [(1.61-1.72-2.55)]	(1.3-) 1.5-3.5
Achene color	Light brown, base and apex darker	Dark brown	Brown	Light brown, base and apex darker	Brown

type and cotype . . .” Furthermore, O’Neill annotated as “TYPE” a duplicate of *Palmer 350* (US). Although *Palmer 350* (US) was annotated by Britton as *C. uniflorus* var. *pumilus*, we think it is significant that Britton in no way indicated it was a type. Duplicates of *Palmer 350* (NY, US) examined by us are very immature, and although the plants are diminutive, as would be expected with *C. uniflorus* var. *pumilus*, their yet immature fertile scales are already 2.9–3.2 mm long, which is at the taxon’s upper limit as understood by us. In contrast, the Buckley specimens (NY) are more mature, have shorter [2.4–2.5 (–2.8) mm long] scales, and are generally more representative of the taxon. Thus, we reject the Horvat (1941) and O’Neill (1942) designations of *Palmer 350* as “type” and the Buckley specimen as “co-type” and think the Buckley specimen at NY, annotated by Britton as “type,” should stand as holotype.

Cyperus retroflexus var. *pumilus*, *comb. nov.* [= *C. uniflorus* var. *pumilus*; *C. subuniflorus*]. Fernald and Griscom (1935) asserted that this taxon “is merely small individuals of *C. globulosus*.” However, we think this taxon is a distinct variety and find no evidence that it is related to *C. globulosus* auct. non Aubl., now properly known as *C. croceus* Vahl (Carter and Kral 1990). Small (1903) and Kükenthal (1936) recognized this taxon as a distinct species (*C. subuniflorus*) allied with *C. uniflorus*. Horvat (1941) and O’Neill (1942) treated it as a synonym of *C. uniflorus*, commenting that “it is impossible to draw any kind of dividing line between [*C. uniflorus* and *C. subuniflorus*] . . . when a large number of specimens are studied” and further that “[*C. uniflorus* and *C. subuniflorus*] appear to stand at opposite ends of a long series of intergrading forms.” We concur with Horvat and O’Neill that these taxa do not merit species rank. As shown in Table 2, there is overlap in virtually every characteristic we examined in *C. retroflexus* var. *retroflexus* [= *C. uniflorus*, *sensu* Horvat and *sensu* O’Neill] and *C. retroflexus* var. *pumilus* [= *C. subuniflorus*]. Despite this, we find that most specimens may be reliably placed in var. *retroflexus* or var. *pumilus* when combinations of characteristics are used, and given the disparate nature between specimens at opposite extremes of this continuum, we think infraspecific rank is both logical and useful. In the absence of evidence of geographical or habitat isolation, we maintain *C. uniflorus* var. *pumilus* at varietal rank but transfer it to *C. retroflexus*. Differ-

ences between *C. retroflexus* var. *retroflexus* and *C. retroflexus* var. *pumilus* are summarized in Table 2 and in the accompanying key.

***Cyperus floribundus*, stat. nov. [=C. uniflorus var. floribundus].** Kükenthal (1936) described *Cyperus uniflorus* var. *floribundus* based upon its relatively loose spikes, longer 3–5 fruited spikelets, and distal scales with long recurved mucros. Subsequently, the taxon was placed in synonymy under *C. uniflorus* (Horvat 1941; O'Neill 1942) and *C. retroflexus* (Tucker 1994). We concur with Horvat and with O'Neill that *C. uniflorus* var. *floribundus* is the same as *C. uniflorus* Torr. & Hook. and with Tucker (1987, 1994) that *C. uniflorus* Torr. & Hook. 1836 is illegitimate (non *C. uniflorus* Thunb. 1825), requiring use of *C. retroflexus*, the next available name.

We also concur with Horvat and with O'Neill that Kükenthal's brief diagnosis of *Cyperus uniflorus* var. *retroflexus* as having culms 45–75 cm high and terete, reflexed spikelets is insufficient to allow its separation from the rest of the complex. However, we find numerous characteristics to distinguish *C. floribundus* from *C. retroflexus* (summarized in Table 3) and do not agree with Horvat (1941), O'Neill (1942), and Tucker (1994), who have placed *C. uniflorus* var. *floribundus* into synonymy under *C. uniflorus* and *C. retroflexus*. Both *C. floribundus* and *C. retroflexus* var. *retroflexus* exhibit bewildering variation in habit from low slender plants to more robust ones of moderate stature; therefore, in our circumscription we use spikelet, scale, and achene characters almost exclusively. Moreover, although *C. retroflexus* and *C. floribundus* are sympatric, the distribution of *C. floribundus* appears to have integrity as a rather tight cluster of populations in southeastern Texas and adjacent northeastern Mexico, nested entirely within the range of *C. retroflexus*. Thus, we propose recognition of *C. floribundus* as a distinct species.

***Cyperus pseudothyrsiflorus*, stat. nov. [=C. uniflorus var. pseudothyrsiflorus].** *Cyperus uniflorus* var. *pseudothyrsiflorus* Kük. was treated as a synonym of *C. retroflexus* by Tucker (1994). Horvat (1941) wrote “[o]f doubtful status is *C. uniflorus pseudothyrsiflorus* Kükenth. [= *Mariscus dissitiflorus* C. B. Clarke]” and she further speculated “[t]hese plants may possibly be hybrids of *C. uniflorus* and *C. setigerus*.” These views were

echoed by O'Neill (1942). We can find no morphological evidence that *C. pseudothyrsiflorus* is a hybrid between *C. uniflorus* and *C. setigerus* Torr. & Hook., and we think such a hybrid is unlikely given the genetic disparity between the putative parents; *C. setigerus* is a member of section *Rotundi* (with *C. rotundus* L.) and is not even remotely related to *C. uniflorus*. Curiously, despite erroneous speculation with regard to hybrid origin, Horvat (1941) and O'Neill (1942) did observe a relationship between *C. uniflorus* var. *pseudothyrsiflorus* and *Mariscus dissitiflorus* [= *C. thyrsiflorus* Jungh.], with which we concur. Also, in choosing the epithet *pseudothyrsiflorus*, Kükenthal (1936) obviously saw some resemblance, although to him presumably superficial, with *C. thyrsiflorus*.

Although *Cyperus* sections are ill-defined and poorly understood and its sectional taxonomy is sorely in need of revision, we think *C. pseudothyrsiflorus* is more closely allied with *C. thyrsiflorus* [= *Mariscus dissitiflorus*], *C. tenuis* Sw., *C. lentiginosus* Millsp. & Chase, and *C. hermaphroditus* (Jacq.) Standl. than with *C. retroflexus* (*C. uniflorus* as previously treated). Also, Correll and Johnston (1970, p. 298) suggested a relationship between var. *pseudothyrsiflorus* and *C. hermaphroditus*. However, this putative alliance contains members of three sections (see Table 5) as understood by Kükenthal (1936), and additional study is needed before a formal proposal to realign the sections can be made. Herein, we propose species rank for *C. uniflorus* var. *pseudothyrsiflorus* and provide a dichotomous key to allow its separation from *C. retroflexus* and *C. floribundus* and from its putative allies: *C. thyrsiflorus*, *C. tenuis*, *C. lentiginosus*, and *C. hermaphroditus*. Species in this putative alliance are further compared in Table 4.

REVISED TAXONOMY

1. ***Cyperus retroflexus*** Buckley, Proc. Acad. Nat. Sci. Philadelphia. 1862: 9. 1863.

Cyperus uniflorus var. *retroflexus* (Buckley) Kük., Pflanzenreich IV. 20 (101): 521. 1936. TYPE: U.S.A. Texas: northern Texas, *S. B. Buckley s. n.* (LECTOTYPE designated here: PH!).

- a. ***Cyperus retroflexus* var. *retroflexus***
- b. ***Cyperus retroflexus* var. *pumilus*** (Britton) R. Carter & S. D. Jones, *comb. nov.*

Table 5. Sectional classification (fide Kükenthal 1936) of *Cyperus retroflexus* and "allies."

Section <i>Umbellati</i>	Section <i>Tetragoni</i>	Section <i>Strigosi</i>
<i>C. retroflexus</i> var. <i>retroflexus</i>	<i>C. thyrsiflorus</i>	<i>C. tenuis</i>
(as <i>C. uniflorus</i> var. <i>uniflorus</i>)	<i>C. hermaphroditus</i>	<i>C. lentiginosus</i>
<i>C. retroflexus</i> var. <i>pumilus</i>		(as <i>C. tenuis</i> var. <i>lentiginosus</i>)
(as <i>C. subuniflorus</i>)		
<i>C. floribundus</i>		
(as <i>C. uniflorus</i> var. <i>floribundus</i>)		
<i>C. pseudothyrsiflorus</i>		
(as <i>C. uniflorus</i> var. <i>pseudothyrsiflorus</i>)		

Cyperus uniflorus var. *pumilus* Britton, Bull. Torrey Bot. Club 11: 87. 1884. *Cyperus subuniflorus* Britton in Small, Fl. S.E.U.S. 173, 1327. 1903. *Mariscus subuniflorus* (Britton) T. Koyama, Phytologia 29: 74. 1974. TYPE: "valley of the Lower Rio Grande, in Texas and Northern Mexico, 1879–1883," S. B. Buckley s. n. (HOLOTYPE: NY!; ISOTYPE: NY!).

PARATYPE: U.S.A. Indian Territory, chiefly on the False Washita, between Fort Cobb and Fort Arbuckle, 1868, *Palmer 350* (NY!, US!).

2. ***Cyperus floribundus* (Kük.) R. Carter & S. D. Jones, stat. nov.**

Cyperus uniflorus var. *floribundus* Kük., Pflanzenreich IV. 20 (Heft 101): 521. 1936. TYPE: MEXICO. Tamaulipas: vic. Victoria, 1 May–13 Jun 1907, *Palmer 287* (LECTOTYPE designated by Tucker [1994]: B; ISOLECTOTYPE: NY!). *Cyperus uniflorus* Torr. & Hook., Ann. Lyceum Nat. Hist. New York 3: 431. 1836, non Thunb. 1825. *Mariscus uniflorus* (Torr. & Hook.) Steud., Synops. Cyper. 64. 1855. U.S.A. Texas: without locality, *Drummond 287* (HOLOTYPE: NY!; ISOTYPES: GH!, K!, OXF!).

3. ***Cyperus pseudothyrsiflorus* (Kük.) R. Carter & S. D. Jones, stat. nov.**

Cyperus uniflorus var. *pseudothyrsiflorus* Kük., Pflanzenreich IV. 20 (Heft 101): 521. 1936. TYPE: MEXICO. Nuevo Leon: Sierra Madre near Monterey, 30 Jun 1888, *Pringle 1966* (HOLOTYPE: B!; ISOTYPE: US!).

KEY TO *CYPERUS RETROFLEXUS* AND ALLIES

1. Floral scales on same side of spikelet not overlapping or spikelets with only 2 floral scales (best observed in mature spikelets); achenes (1.7–) 1.9–2.6 mm long; less than $\frac{1}{7}$ (rarely as much as $\frac{1}{4}$ in *C. retroflexus*) of ventral achene edge extending beyond rachilla wing (free portion of achene measured from intersection of rachilla edge and achene ventral edge to achene apex); lower bracteoles in pedunculate spikes mostly triangular to narrowly triangular, equal to or shorter than associated secondary prophyll (2)
2. Longest spikelets 9.8–21.25 mm long, strongly flexuous-contorted; spikelet with strongly stipitate base 0.4–1.0 mm long; achenes more than 3 times as long as wide; distal fertile floral scales with prominent mucro 0.6–1.9 mm long; longest floral scale of spikelet (3.5–) 3.7–4.8

mm long; keel of distal fertile floral scales usually scabrid (30× magnification); anthers 0.5–1.3 mm long; plants restricted to lower Rio Grande valley and adjacent areas of southern Texas and northeastern Mexico, with outlier in Travis County, Texas *C. floribundus*

2. Longest spikelets 2.8–9.0 mm long, or if longer then at most flexuous with curved tips, but not strongly contorted; spikelet estipitate, or only weakly stipitate and stipe 0.1–0.3 (–0.5) mm long; achenes 2–3 (–3.3) times as long as wide; distal fertile floral scales obtuse to acute or with short mucro 0.1–0.3 (–0.5) mm long; longest fertile floral scale of spikelet (2.1–) 2.5–3.5 (–4.0) mm long; keel of distal fertile floral scales smooth (30× magnification), excluding cluster of small teeth at mucro tip; anthers 0.3–0.5 (–0.6) mm long; plants more widely distributed (3)

3. Fertile floral scales (2.8–) 3.0–3.9 mm long; rachilla wing usually chartaceous beyond clasped achene angle, border membranaceous; rachilla usually with two lateral nerves, one along each side of median; longest spikelets 4.9–9.0 (–11.3) mm long; terminal sterile floral scale usually not greatly reduced, $\frac{2}{3}$ or more the length of fertile floral scales; longest peduncle (0.5–) 2.4–6.8 cm long; except for depauperate specimens, plants usually greater than 25 (–57) cm tall *C. retroflexus* var. *retroflexus*

3. Fertile floral scales 1.9–3.0 (–3.3) mm long; rachilla wing usually membranaceous throughout; rachilla usually lacking lateral nerves; longest spikelets 2.8–5.8 (–8.0) mm long; terminal sterile floral scale of spikelet often much reduced, less than $\frac{2}{3}$ the length of fertile floral scales; longest peduncle less than 2.7 (–3.9) cm long; plants diminutive, 3–35 (–45) cm tall *C. retroflexus* var. *pumilus*

1. Floral scales on same side of spikelet mostly overlapping or at least reaching base of next floral scale (best observed in mature spikelets); achenes 1.4–1.9 (–2.1) mm long; at least $\frac{1}{5}$ of ventral achene edge extending beyond rachilla wing (free portion of achene measured from intersection of rachilla edge and achene ventral edge to achene apex); lower bracteoles in pedunculate spikes mostly narrowly

- triangular to linear-triangular and setaceous, longer than associated secondary prophylls (except in *C. thyrsiflorus*).
 (4)
4. Spikelets remote, 6–10 (–15) per 5 mm rachis span in proximal half of rachis (5)
5. Distal floral scales mucronate, mucros 0.2–0.5 mm long; scales (2.9–) 3.3–4.0 mm long; spikelets stipitate, stipes 0.3–0.5 mm long; scales mostly about 2× [(1.61–) 1.72–2.55] as long as achenes; spikelets 8.9–11 mm long; lower bracteoles in pedunculate spikes mostly narrowly triangular to linear-triangular and setaceous, longer than associated secondary prophylls; largest leaves and primary inflorescence bracts usually more than 3.0 mm wide; largest peduncles usually more than (0.4–) 0.5 mm wide; mature achene light brown with distinctly darker base and apex; floral scales chestnut to cinnamon brown sometimes yellow tinted *C. lentiginosus*
5. Distal floral scales without mucros or mucros 0.1 mm or less long; floral scales 2.0–2.8 (–3.0) mm long; spikelets estipitate or stipes no more than 0.2 mm long; floral scales mostly about 1.5× [1.31–1.75 (–1.88)] as long as achenes; spikelets 3.4–7.4 (–17) mm long; lower bracteoles in pedunculate spikes mostly triangular to narrowly triangular and no longer than associated secondary prophylls; largest leaves and primary inflorescence bracts 1.0–2.8 (–3.0) mm wide; largest peduncles 0.2–0.5 (–0.55) mm wide; mature achene dark brown throughout; floral scales whitish along nerves and margins, with chocolate to liver brown undercolor mostly between nerves *C. thyrsiflorus*
4. Spikelets more congested, (9–) 11–45 per 5 mm span in distal half of rachis (6)
6. Distal floral scales mucronate, mucros 0.2–0.5 mm long; floral scales predominately reddish, brownish, or whitish; rachis, spikelets, bracteoles, and prophylls usually conspicuously reddish brown maculate or striate (10× magnification) (7)
7. Spikes loose, 8–12 spikelets per 5 mm span of upper half of rachis; floral scales (2.9–) 3.3–4.0 mm

- long; spikelets stipitate, stipes 0.3–0.5 mm long; floral scales mostly twice [(1.61–) 1.72–2.5] as long as achenes; upper half of floral scale (excluding mucro) appressed and clasping spikelet (best observed in mature spikelets); spikelets and floral scales chestnut to cinnamon brown sometimes yellowish, color not bilaterally variable; spikelets mostly divaricate; spikes broadly oblong to oblong *C. lentiginosus*
7. Spikes tighter, 11–21 spikelets per 5 mm span of upper half of rachis; floral scales 2.4–3.4 mm long; spikelets estipitate, or stipes 0.1–0.2 mm long; floral scales mostly about 1.5× [1.33–1.74 (–1.81)] as long as achenes; upper half of lowest floral scale ascending, not tightly clasping spikelet (best observed in mature spikelets); spikelet and floral scale color usually bilaterally variable, from whitish to sanguineous or reddish brown sometimes tinted ferruginous or yellowish; spikelets divaricate to ascending; spikes oblong to elliptical (rarely subglobose) *C. pseudothyrsiflorus*
6. Floral scale mucro absent or if present then less than 0.1 mm long; floral scales golden yellow to stramineous (to red-brown) or pale olivaceous with chocolate to liver brown undercolor; rachis, spikelets, bracteoles, and prophylls not conspicuously maculate or striate (10× magnification) (8)
8. Floral scales golden yellow to stramineous (to red-brown); inflorescence with 7–12 conspicuously pedunculate rays; achenes elliptic to oblong to narrowly obovate, 0.6–0.8 mm wide; spikes narrowly oblong to oblong; spikelets mostly divaricate *C. hermaphroditus*
8. Floral scales pale olivaceous with chocolate to liver brown undercolor; inflorescence of mostly sessile to subsessile spikes or at least peduncles obscure and no more than 3× (–3.3) as long as spike axis; achenes narrowly oblong, 0.4–0.45 mm wide; spikes oblong to subglobose; spikelets ascending to divaricate *C. tenuis*

LITERATURE CITED

- BRITTON, N. L. 1884. A list of Cyperaceae collected by the late Mr. S. B. Buckley from 1878 to 1883 in the valley of the lower Rio Grande, in Texas and northern Mexico. *Bull. Torrey Bot. Club* 11: 85–87.
- . 1886. A preliminary list of North American species of *Cyperus*, with descriptions of new forms. *Bull. Torrey Bot. Club* 13: 205–216.
- CARTER, R. 1984. A systematic study of *Cyperus* section *Umbellati* in North America. Ph.D. dissertation, Department of General Biology, Vanderbilt Univ., Nashville, TN.
- AND R. KRAL. 1990. *Cyperus echinatus* and *Cyperus croceus*, the correct names for North American *Cyperus ovularis* and *Cyperus globulosus* (Cyperaceae). *Taxon* 39: 322–327.
- CORRELL, D. S. AND M. C. JOHNSTON. 1970. *Manual of the Vascular Plants of Texas*. Texas Research Foundation, Renner, TX.
- FERNALD, M. L. AND L. GRISCOM. 1935. Three days of botanizing in south-eastern Virginia. *Rhodora* 37: 129–157.
- GREUTER, W., F. R. BARRIE, H. M. BURDET, W. G. CHALONER, V. DEMOULIN, D. L. HAWKSWORTH, P. M. JØRGENSEN, D. H. NICOLSON, P. C. SILVA, P. TREHANE, AND J. MCNEILL. 1994. *International Code of Botanical Nomenclature (Tokyo Code)*. Koeltz Scientific Books, Königstein, Germany.
- HORVAT, M. L. 1941. A revision of the subgenus *Mariscus* found in the United States. *Catholic Univ. Amer. Biol. Ser.* 33: 1–147.
- JONES, S. D., J. K. WIPFF, AND P. M. MONTGOMERY. 1997. *Vascular Plants of Texas: A Comprehensive Checklist including Synonymy, Bibliography, and Index*. Univ. Texas Press, Austin, TX.
- KÜKENTHAL, G. 1935–36. Cyperaceae-Scirpoideae-Cypereae [*Cyperus*], pp. 1–671. *In*: A. Engler and L. Diels, eds., *Das Pflanzenreich IV*. 20 (Heft 101).
- O'NEILL, H. T. 1942. The status and distribution of some Cyperaceae in North and South America. *Rhodora* 44: 43–64.
- SMALL, J. K. 1903. *Flora of the Southeastern United States*. Published by the author, New York.
- TUCKER, G. C. 1987. The genera of Cyperaceae in the southeastern United States. *J. Arnold Arbor.* 68: 361–445.
- . 1994. Revision of the Mexican species of *Cyperus* (Cyperaceae). *Syst. Bot. Monogr.* 43: 1–213.