A REPORT OF FOUR EXOTIC *CYPERUS* (CYPERACEAE) SPECIES NEW TO FLORIDA, U.S.A.

Cyperus alopecuroides Rottb., *C. distans* L.f., *C. prolifer* Lam., and *C. sphacelatus* Rottb. are reported new to Florida. All four taxa are exotic weeds and appear to be naturalized. *Cyperus alopecuroides*, *C. distans*, *C. sphacelatus* are newly introduced, and *C. prolifer* is apparently recently naturalized. This report of *C. alopecuroides* is the second for the western hemisphere. General distributional data and pest potential are discussed. Each taxon is compared with similar species, and collection data are given.

In the past decade a number of *Cyperus* species have been reported new to Florida: *C. difformis* L., *C. echinatus* (L.) Wood, *C. entrerianus* Böckeler, *C. hystricinus* Fernald, *C. pilosus* Vahl, and *C. reflexus* Vahl (Burkhalter 1984, 1985; Carter 1988, 1990; Carter & Jones 1991; Anderson 1991). Recently, specimens from central and southern Florida have been identified as *Cyperus alopecuroides* Rottb., *C. distans* L.f., *C. prolifer* Lam., and *C. sphacelatus* Rottb. *Cyperus alopecuroides*, *C. distans*, and *C. sphacelatus* are apparently casual introductions, and *C. prolifer* is likely an escape from cultivation. All four species are weeds (Reed 1977; Häffliger et al. 1982) with potential to become pests in other subtropical areas of the southeastern United States, and all appear to be naturalized in Florida. None has previously been reported from Florida (Ward 1968; Long & Lakela 1971; Godfrey & Wooten 1979; Wunderlin 1982; Clewell 1985), and only *C. distans* (Small 1933; Kükenthal 1935; Radford, Ahles & Bell 1968; Beal 1977; Kartesz 1994) and *C. sphacelatus* (Mohr 1901; McGivney 1938) have previously been reported from the United States.

Cyperus alopecuroides Rottb., Descr. Pl. Rar. Progr. 20. 1772.

Cyperus alopecuroides is widely distributed in tropical and subtropical regions of the Old World, e.g., northern and tropical Africa, Madagascar, India, Ceylon, Indo-China, Malaysia and northern Australia; in the New World it is known only from Guadeloupe in the West Indies (Kükenthal 1936; Koyama 1985).

In habit and general inflorescence pattern, *C. alopecuorides* resembles the tropical species *C. imbricatus* Retz., and both taxa were placed in section *Exaltati* by Kükenthal (1935). Its foliage and stout reddish base somewhat resemble those of *C. erythrorhizos* Muhl. *Cyperus alopecuroides* is a robust aquatic to 1.5 m high. Its size in combination with other characters make it a striking plant in the field: broad bracts and leaf blades (to 15 mm wide) with contrasting surfaces (adaxial light-green, abaxial glaucous), and a branched inflorescence with spikes of densely clustered golden-brown spike-

lets. Although its affinities are clearly with subgenus *Cyperus* (Kükenthal 1935; Koyama 1985), it has characteristics that seem to defy placement there: namely, a bicarpellate gynoecium with two stigmas and a lenticular achene with face adjacent to rachilla. When taken alone, the gynoecium and fruit characteristics seem to indicate a relationship with subgenus *Juncellus* (Clarke 1908). However, Koyama (1985) has observed both bi- and trigynous pistils in the same inflorescence, and this, in combination with other characteristics, supports inclusion of *C. alopecuroides* in subgenus *Cyperus*. Illustrations of *C. alopecuroides* are in Häffliger et al. (1982, p. 46: as *Juncellus alopecuroides*) and Haines & Lye (1983, p. 181, Fig. 348).

In Florida, *C. alopecuroides* was growing as an emergent in a reclamation wetland in an abandoned phosphate pit, where it was locally abundant in floating mats and was less common in shallow water along the wetland edges. Associated taxa include *Eleocharis interstincta* (Vahl) R. & S., *Sagittaria* sp., and *Scirpus californicus* (Meyer) Steud. This exotic *Cyperus* may have been introduced as a contaminant in nursery stock used for revegetation and has probably been in place at least two years (Tom Nix, IHS Environmental Consultants, pers. comm. 1994). Several hundred plants were observed in an area of about six ha. The plant's ability to form extensive stands and floating mats here suggests invasive potential should it escape from the reclamation site. Close monitoring is called for in the area. The following data are for first collections from Florida and the United States.

Voucher specimens: U.S.A. **FLORIDA. Polk Co.:** ca. 3 mi W of Fort Meade, N from county road 630 on dirt road by Tiger Bay, reclamation wetland #SP-6 on U.S. Agrichem property, NW 1/4 Sec 30, T31S R25E, 15 Sep 1993, *T. Nix with M. Phillips s.n.* (FSU, fragment and photocopy at VSC); 11 Feb 1994, *Carter 11605 with Mears & Phillips* (FSU, SWSL, VSC, others to be distributed); 24 May 1995, *Burks 1018 with Nix, Phillips & Fiesler* (FSU, VSC).

Cyperus distans L.f., Suppl. pl. 103. 1781.

Cyperus distans is a pantropical weed inhabiting marshes, canal banks and ditches in Africa, India, Sri Lanka, southeastern Asia, Malaysia, southern China, the Philippines, the Caribbean islands, central America, Mexico, and tropical South America (Clarke 1900; Uittien 1932; Kükenthal 1935; Koyama 1985; Adams 1994; Tucker 1994). *Cyperus distans* is rare in southeastern United States, where it has been reported from coastal North Carolina (Kükenthal 1935; McGivney 1938; Radford, Ahles & Bell 1968; Beal 1977) and from Georgia (Small 1933; Kükenthal 1935; Beal 1977). The citations of *C. distans* from Georgia are doubtful; neither have we seen specimens nor was it reported by Jones & Coile (1988).

Cyperus distans has trifid styles and trigonous achenes and, in habit, re-

sembles *C. odoratus* L. or *C. stigosus* L., from which it can be distinguished by its looser spikes and more delicate spikelets. The following combination of characteristics distinguishes *C. distans* from all other North American *Cyperus*: scales ascending, remote, with 3-5 nerved greenish keels, sanguineus to reddish brown nerveless sides, and scarious emarginate tips. *Cyperus distans* is illustrated in Häffliger et al. (1982, p. 17) and in Beal (1977, p. 117). The following data provide the first documentation of *C. distans* from Florida.

Voucher specimens: U.S.A. **FLORIDA. St. Lucie Co.:** ca. 8 mi E of Okeechobee Co. line on FL 68, ca. 9 mi W of Ft. Pierce, T35S R38E Sec. 9, 26 Sep 1985, *Wunderlin, Hansen & van Hoek 10138* (TENN, pers. herb. C.T. Bryson, fragment and photocopy at VSC).

Cyperus prolifer Lam., Ill. I.147. 1791.

Cyperus prolifer inhabits marshes, marshy shores, and swampy stream banks in eastern Africa (Kükenthal 1935; Bailey & Bailey 1976; Haines & Lye 1983). *Cyperus prolifer* is commonly known as dwarf papyrus or miniature papyrus and is sold as an ornamental for use in water gardens (Bailey & Bailey 1976). It has been variously listed as *Cyperus haspan viviparus* (Watkins & Sheehan 1975; Graf 1985), *C. papyrus* cv. "*nanus*" (Bailey & Bailey 1976), and *C. isocladus* Kunth (Bailey & Bailey 1976; Everett 1981). Illustrations of *C. prolifer* are in Kükenthal (1935, p. 11, Fig. 2A) and Haines and Lye (1983, p. 171, Fig. 327).

In addition to the typical variety of *C. prolifer*, Kükenthal (1935) recognized *C. prolifer* var. *isocladus* (Kunth) Kükenthal (=*C. isocladus* Kunth). According to Kükenthal (1935), in var. *isocladus* the culm is trigonous and apically triquetrous and scabrid, while in the typical variety the culm is terete and apically obtusely trigonous and smooth. Our Floridian plants are consistent with Kükenthal's concept of *C. prolifer* var. *prolifer*. In habit *C. prolifer* superficially resembles *C. haspan* L., and Kükenthal (1936) classified both species in section *Haspani*. *Cyperus prolifer* can be readily distinguished from *C. haspan* by its thick rhizome and inflorescence of 50–100 rays, with the rays of more-or-less uniform length.

In central Florida *C. prolifer* has apparently escaped from cultivation and is found growing in floating mats and occasionally along margins of natural limesink lakes, where it is associated with *Oxycaryum cubense* (Poepp. & Kunth in Kunth) Lye {=*Scirpus cubensis* Poepp. & Kunth in Kunth}. The landowner of lakefront property adjacent to an infested area of Lake Huntley indicated "dwarf papyrus" had been cultivated there in a water garden for about eight years and that during that period it had spread into the lake where it had become an invasive pest (M. Hout, pers. comm. 1994). In

1991 the landowner sought and obtained a control permit from the Florida Department of Environmental Protection (FDEP), which allowed hand-removal or treatment with glyphosate (trademark Rodeo). After two years of growing-season treatment, the original Lake Huntley population was greatly reduced in size. However, several other colonies have been found on the lake (David Demmi, FDEP, pers. comm. 1994). This population and others found more recently in nearby Lake Francis and Lake Lotela and in Lake Howard should be monitored, and the species sought in systematic routine surveys in central Florida lakes. If *C. prolifer* continues to spread from cultivation, it should probably be placed on the state list of prohibited aquatic plants (Ramey 1990). The following data provide documentation for *C. prolifer* in Florida.

Voucher specimens: U.S.A. **FLORIDA. Highlands Co.:** city of Lake Placid, W and E sides of southernmost shore of Lake Huntley, just W of jct of Holmes Avenue and county road 29, SE 1/4 Sec. 8, T36S R29E, 6 Jul 1993, *D. Demmi s.n.* (FSU, VSC); 5 Oct 1993, *D. Demmi s.n.* (FSU, VSC); 13 Feb 1994, *Carter 11640 & Mears* (FSU, SWSL, VDB, VSC, others to be distributed); shore of Lake Francis, W of Hwy. US 27, ca. 3 mi N of city of Lake Placid, N 1/2 Sec 22, T36S R29E, 14 Sep 1993, *D. Demmi s.n.* (FSU, VSC); along NW shore of Lake Lotela near boat ramp near jct of hwys SR 17 and CR 17A, in city of Avon Park, NW 1/4 Sec. 28 T33S R28E, 2 Nov 1994, *D. Demmi s.n.* (FSU). **Polk Co.:** Winter Haven, N shore of Lake Howard between Lake Howard Drive NW and shore of lake, locally common between 8th St NW and Mirror Terrace, 24 May 1994, *Mears 94-30* (VSC).

Cyperus sphacelatus Rottb., Descr. Pl. Rar. Progr. 21. 1772.

Cyperus sphacelatus is a widely distributed tropical and subtropical taxon, known from eastern Africa, Ceylon, Malaysia, northern Australia (Queensland), Tahiti, South America, Central America, and the Caribbean (Clarke 1900; Britton 1907; Uittien 1932; Kükenthal 1936; Haines & Lye 1983; Tucker 1983; Koyama 1985). Mohr (1901) reported *C. sphacelatus* from ballast heaps in Mobile, Alabama, and McGivney (1938, p. 51) cited it among excluded taxa. Reed (1977) listed *C. sphacelatus* as an economically important foreign weed with potential for becoming a problem in the United States. Additional field work is needed to determine its total range in southern Florida and its pest potential there.

Although *C. sphacelatus* is a distinctive taxon, it might be confused with *C. esculentus* L., *C. filicinus* Vahl, or *C. rotundus* L., with which it bears a superficial similarity. The following combination of characteristics readily distinguishes *C. sphacelatus* from other North American *Cyperus* spp.: annual cespitose habit; triquetrous achene; diffuse inflorescence with flattened spikelets; and variegated floral scales pale, nearly white, each with two conspicuous reddish patches. Illustrations of *C. sphacelatus* are in Häffliger

TABLE 1. Geography and variation in scale length in *Cyperus sphacelatus*.

Location	Scale length	Specimen or reference citation
Florida, U.S.A.	2.0–2.8 mm (mean=2.48, N=50)	*Carter 11627 & Mears*
Dominican Republic	2.25–2.6 mm (mean=2.43, N=25)	*Carter 5190 & Garcia*
Cameroon	2.4–2.8 mm	*Goetghebeur 4908*
Tanzania	2.4–2.8 mm	Haines & Lye (1983)
Ceylon	2.0–2.8 mm	Koyama (1985)
Costa Rica and Panama	(2.2–)3.0–4.0(–4.4) mm	Tucker (1983)
Central America	2.5–4.0 mm	Adams (1994)

et al. (1982, p. 25), Haines & Lye (1983, p. 195, Fig. 383), and Reed (1977, p. 180).

The floral scales are longer in Central American specimens than in West Indian ones (Tucker 1983). Scale length in our Floridian specimens ranges from 2.0 to 2.8 mm, well within the range seen in West Indian specimens and mostly shorter than reported from Central America (see Table 1). Thus, *C. sphacelatus* was likely introduced into Florida from the West Indies.

The habitat of *C. sphacelatus* was described by Reed (1977) as "disturbed ground, in damp, grassy places" and by Tucker (1983) as "beaches, shores of rivers, moist thickets, fields, and disturbed sunny sites." In southern Florida, *C. sphacelatus* is a locally common heliophyte in moderately well drained soil along an open, sloping road berm adjacent to a swamp, where it is associated with *Amaranthus spinosa* L., *Ambrosia artemisiifolia* L., *Argemone mexicana* L., *Bidens alba* (L.) DC., *Catharanthus roseus* (L.) G. Don, *Chamaesyce hyssopifolia* (L.) Small, *Chromolaena odorata* (L.) King & Robins., *Conoclinium coelestinum* (L.) DC., *Cyperus filicinus* Vahl, *C. polystachyos* Rottb., *C. surinamensis* Rottb., *Dactyloctenium aegyptium* (L.) Beauv., *Eclipta alba* (L.) Hassk., *Emilia fosbergii* Nicols., *Erechtites hieracifolia* (L.) Raf., *Kyllinga brevifolia* L., *Macroptilium lathyroides* (L.) Urban, *Parthenium hysterophorus* L., *Pennisetum* sp., *Physalis* sp., *Pluchea odorata* (L.) Cass, *Poinsettia cyathophora* (Murr.) Kl. & Gke., *P. heterophylla* (L.) Kl. & Gke., *Ricinus communis* L., *Scoparia dulcis* L., *Sida acuta* Burm. f., *Sorghum halepense* (L.) Pers., *Stachytarpheta jamaicensis* (L.) Vahl, *Trema micrantha* (L.) Blume, *Tridens flavus* (L.) Hitchc., and *Urena lobata* L. The following data provide documentation for *C. sphacelatus* in Florida.

Voucher specimens: U.S.A. **FLORIDA. Dade Co.:** 0.58 mi S of jct hwys US 41 and FL 997, shoulder of hwy FL 997, edge of swamp, locally common, 12 Feb 1994, *Carter 11627 & Mears* (FSU, SWSL, VSC, others to be distributed); 1.58 mi S of jct hwys US 41 and FL 997, shoulder of hwy FL 997, edge of swamp, locally common, 25 Dec 1993, *R.L. Mears s.n.* (VSC); 12 Feb 1994, *Carter 11634 & Mears* (FSU, SWSL, VSC, others to be distributed). **Hillsborough Co.:** E of jct Dale Mabry Drive and Lakeview Drive, 0.35 mi

N jct Lakeview Drive and Lake Heather Drive by Lake Heather Drive, along E side of Lake Heather Drive, 10 Dec 1994, *K. Holland & R.L. Mears s.n.* (VSC).

Other specimens examined: **DOMINICAN REPUBLIC. Distrito Santo Domingo:** a orilla del Rio Manoguayabo, en el poblado de Manoguayabo, 12 Dec 1986, *Carter 5190 & Garcia* (VSC). **CAMEROON. Litt. Prov.:** Loum Chantiers, Moungo River beds, near large bridge, 5 km NW of Ebonji, 27 Mar 1983, *Goetghebeur 4908* (VSC).

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CYPHOMERIS GYPSOPHILOIDES VAR. *STEWARTII* A SYNONYM OF A VARIABLE *C. GYPSOPHILOIDES* (NYCTAGINACEAE)

In a recent paper, Mahrt and Spellenberg (1995) reported upon multivariate analyses of the small genus *Cyphomeris*, and provided a taxonomy that recognized only two variable species, *C. crassifolia* (Standl.) Standl. and *C. gypsophiloides* (Mart. & Gal.) Standl. One of the goals of that study was to search for geographically coherent series of populations that might be worthy of taxonomic recognition. Overall, such structure in the genus was determined to be weak at best. In that paper they noted that both taxa were variable, particularly the latter, and that *C. gypsophiloides* var. *stewartii* I.M. Johnston was statistically somewhat peripheral to groups of populations or individuals produced by cluster analyses or principal components analysis, but was not clearly distinct nor any more distinct in these analyses than other isolated and moderately differentiated populations. By innuendo it is apparent that they believed that *C. gypsophiloides* var. *stewartii* was not worthy of infraspecific recognition, but unfortunately in the taxonomy provided, this name was omitted from synonymy. Although cumbersome by doing now, I wish to explicitly indicate to future workers that we do not recognize this variety to be distinct from *C. gypsophiloides* when recognized as a variable taxon composed of numerous semi-isolated populations differentiated from one another to varying degrees. The holotype, *R.M. Stewart 1943*, Chihuahua, large canyon near northeast end of Sierra Diablo, 29 Jul 1941, GH! (J. Arnold Arbor. 25:173. 1944) was used in the analyses.—*Richard Spellenberg, Department of Biology, New Mexico State University, Las Cruces, NM 88003-8001, U.S.A.*

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