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PLANTHOPPER (HEMIPTERA: FULGOROIDEA) DIVERSITY OF WEEPING LOVEGRASS (*ERAGROSTIS CURVULA*), AN INTRODUCED HOST OF LITTLE-KNOWN, RARELY COLLECTED NATIVE SPECIES

Stephen W. Wilson[1,3] and A. G. Wheeler, Jr.[2,4]

[1]Department of Biology, University of Central Missouri, Warrensburg, Missouri 64093
[2]Department of Entomology, Soils, and Plant Sciences, Clemson University, Clemson, South Carolina 29634-0315

Abstract—Weeping lovegrass (*Eragrostis curvula* (Schrad.) Nees; Poaceae), an African species planted in the southern United States for erosion control and forage, has been colonized by a diversity of native planthoppers. Collecting data and previously recorded host plants are provided for 26 species of Fulgoroidea in 12 genera and 5 families; nymphs of 13 fulgoroid species were observed. New state records are given for 16 planthopper species; 15 planthopper species are considered little-known or rarely collected.

Key words: Caliscelidae, Cixiidae, Delphacidae, Dictyopharidae, Fulgoridae, host shifts.

Numerous species of plants have become established in new habitats throughout the world. The global movement of plants has been both inadvertent (e.g., as seeds via commerce) and intentional (e.g., for utilitarian or aesthetic purposes) (Mack and Lonsdale, 2001; Mack and Erneberg, 2002). Most plants used in agriculture, forestry, and horticulture in North America are not native (Reichard and White, 2001). Invasive non-native plants, whether purposefully or accidentally introduced, can threaten native biodiversity, alter ecosystem processes such as fire regimes and hydrology (D'Antonio and Vitousek, 1992; Gordon, 1998), and involve huge costs for their suppression (Pimentel et al., 2005). The use of relatively insect-free non-native plants in the landscape can reduce the insect biomass available to birds and other wildlife (Tallamy, 2007; Zuefle et al., 2008).

Numerous studies have explored ecological and evolutionary interactions between non-native plants and native insect herbivores (Strong et al., 1984; Thomas et al., 1987; Carroll et al., 1998; Graves and Shapiro, 2003; Cox, 2004). Adventive plants generally are colonized rapidly in ecological time, initially by native polyphagous species that tend to be common and well known, followed by specialist herbivores, or at least native species of more narrow diet breadth (Strong et al., 1984; Wheeler and Mengel, 1984; Auerbach and Simberloff, 1988). Generalist herbivores typically adopt novel host plants more rapidly than do specialists, with surface feeders (ectophages) colonizing more rapidly than internal feeders (endophages) (Strong et al., 1984). In some cases, endophages such as leafminers rapidly ($<$ 20 years) adopt novel hosts (Auerbach and Simberloff, 1988). Sugarcane (*Saccharum officinarum* L.), a member of the grass family Poaceae, is one of several crop plants whose native insect colonists have been documented in areas of plant introduction (Strong et al., 1977). A fulgoroid that has adapted to sugarcane is *Saccharosydne saccharivora* (Westwood), a New World delphacid associated with native grasses such as species of *Andropogon*. This planthopper colonized sugarcane after the plant was introduced from the Old World (Westwood, 1833; Metcalfe, 1969, 1971).

An introduced grass that has been colonized in the southern United States by a diversity of native planthopper species is weeping lovegrass (*Eragrostis curvula* (Schrad.) Nees). A warm-season perennial bunchgrass native to southern Africa, *E. curvula* was introduced into the southwestern United States in the 1930s to help reclaim rangelands after years of drought and overgrazing. Somewhat later, it was planted in southeastern states for erosion control along highways and also used in the East to revegetate mine spoils. It occasionally is grown as an ornamental (Fairbrothers, 1960; Wheeler, 1999; Wilson and Wheeler, 2005). *Eragrostis curvula* has become naturalized in parts of the United States (Fairbrothers, 1960), and although it and other African lovegrasses can reduce native biodiversity in the U.S. Southwest

[3,4] Email addresses for correspondence: swwilson@ucmo.edu; awhlr@clemson.edu

(Bock et al., 1986), weeping lovegrass in southeastern states has not become invasive, as it has in areas of Australia (Campbell, 1983; Scott and Delfosse, 1992; Milberg and Lamont, 1995).

In the southern United States, weeping lovegrass harbors a diverse hemipteran fauna, including rarely collected native species that develop or shelter in the dense crowns (Wheeler, 1999, 2003, 2005, 2006; Wilson and Wheeler, 2005). Rarely collected native planthoppers that develop on weeping lovegrass are the dictyopharid *Rhynchomitra microrhina* (Walker) and the fulgorids *Amycle vernalis* Manee, *Cyrpoptus belfragei* Stål, and *C. reineckei* Van Duzee (Wilson and Wheeler, 2005). Here we document the occurrence on *E. curvula* of 22 additional planthopper species in the fulgoroid families Caliscelidae, Cixiidae, Delphacidae, and Dictyopharidae.

Methods and Study Sites

Planthoppers were beaten from crowns of weeping lovegrass at numerous southern U.S. localities from North Carolina to Florida and west to Arkansas and New Mexico, as described by Wilson and Wheeler (2005). The following sources were used to identify planthoppers: Caliscelidae—Lawson (1933), Ball (1935), Doering (1939, 1941), Cixiidae—Kramer (1979); Delphacidae—Penner (1945), Beamer (1946a, b, 1947, 1948a, b), Scudder (1963), Wilson (1982), Bartlett & Deitz (2000), Gonzon & Bartlett (2007); Dictyopharidae—Metcalf (1923); Fulgoridae—Kramer (1978). Observations on seasonality of *Delphacodes parvula* (Ball) were made periodically at Glassy Mountain Heritage Preserve in South Carolina. The collection of nymphs of *D. parvula* and other planthopper species is listed when we were confident of associating them with adults of their respective species. When nymphal instars were determined, they are cited as Roman numerals; otherwise, they are listed as "early instars" (I–III), "late instars" (IV, V), or "nymphs." New state records are indicated by asterisks before state names. Specimens are housed in the S.W. Wilson collection at the University of Central Missouri, Warrensburg, and at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Results

Twenty-six planthopper species in 12 genera and 5 families were collected from weeping lovegrass. In addition to our collecting data, we summarize the previously recorded distributions and native host plants for the fulgoroid species associated with *E. curvula*.

Caliscelidae

Specific host plants for the six species of *Bruchomorpha* collected from weeping lovegrass have not previously been identified. Other species of the genus, however, are known from grasses: *B. decorata* Metcalf from *Setaria grisebachii* Fourn. (Poaceae) and *B. rugosa* Metcalf and *B. triunata* Ball from "range grasses" (Ball, 1935).

Bruchomorpha abrupta Ball: This species was considered common along the Gulf Coast of Florida and was reported from Texas and New Mexico by Doering (1939). *Collecting data:* Florida: Lake Co., Rt. 19, Altoona, 28°57.688′N, 81°39.064′W, 11 March 2008, 5 males, 4 females, 2-V; *Oklahoma: Canadian Co., Rt. 37, 17 km SE of Hinton, 29 May 2003, 1 male.

Bruchomorpha bunni Doering: Published records of this rarely collected species are limited to 15 specimens from Arizona and New Mexico (Doering, 1939). *Collecting data:* New Mexico: Curry Co., ca. 3 km W of Ranchvale, 24 May 2001, 1 female.

Bruchmorpha dorsata Fitch: Found from New York to Georgia and west to Colorado and Texas in the United States (Doering, 1939; this study), *B. dorsata* is known from Manitoba, Ontario, and Saskatchewan in Canada (Maw et al., 2000). It is common in native tall grass and mixed grass prairies; broomsedge (*Andropogon virginicus* L.) (Wilson, unpubl.) and *Schizachyrium* spp. (Bouchard et al., 2001) are probable hosts. *Collecting data*: *Georgia: Webster Co., Rt. 280, 1 mi. E of Preston, 25 September 1996, 1 male. *South Carolina: Abbeville Co., Rt. 185, 4 mi. W of Hodges, 7 September 1996, 1 male, nymphs.

Bruchomorpha jocosa Stål: This species is known from New Jersey to Florida and west to Wisconsin, Nebraska, and Texas in the United States (Doering, 1939) and Manitoba and Saskatchewan in Canada (Maw et al., 2000). It often is collected with *B. dorsata* in native prairies in Missouri; its native host probably is broomsedge (Wilson, unpubl.). The collection of specimens intermediate in color between *B. jocosa* and *B. dorsata* suggests that these species hybridize or one variable species exhibits a range of color patterns (Wilson, pers. obs.,). *Collecting data:*

*Oklahoma: Canadian Co., Rt. 37, 17 km SE of Hinton, 29 May 2003, 1 male; Carter Co., Rt. 199, 0.3 km E of Sandy Branch, E of Ardmore, 34°11.232′N, 97°01.622′W, 22 May 2009, 2 males.

Bruchomorpha nodosa Doering: Doering (1939) listed 21 specimens of this seldom-collected species from Kansas, Texas, and Louisiana. *Collecting data:* * Oklahoma: Atoka Co., Rt. 109A, 15 km N of Boswell, 34°09.86′N, 95°53.02′W, 11 May 2006, 1 male, 1 female, 1 nymph.

Bruchomorpha oculata Newman: This is the most frequently collected species of *Bruchomorpha*, having been recorded from Ontario, Prince Edward Island, and Quebec in Canada (Maw et al., 2000) and from Maine to Florida and west to Minnesota, Colorado, and New Mexico in the United States (Metcalf, 1958; this study). Immatures were reared in the laboratory on *Festuca pratensis* Hudson (Poaceae) (Wilson and McPherson, 1981). Its wide range, collection from *E. curvula*, and an ability to survive on *F. pratensis* suggests that it is polyphagous on Poaceae. *Collecting data:* *Arkansas: Ashley Co., Rt. 82, 13.5 km W of Crossett, 19 May 2001, 2 males. *Georgia: Burke Co., Rt. 23, 9 mi. NW of Girard, 24 September 1996, 1 male; Chattahoochee Co., Rt. 280, 1 mi. SE of Cusseta, 25 September 1996, 1 male; Screven Co., Rt. 301, 4 mi. SE of Hilton, 18 October 1998, 1 female. New Mexico: Eddy Co., Rt. 82, 4.5 km E of Artesia, 31 May 2003, 1 female; Roosevelt Co., Rt. 206, Pep, 24 May 2001, 1 female. North Carolina: Anson Co., Rt. 74, 4 mi. E of Lilesville, 21 September 1996, 1 male; Cumberland Co., Fayetteville, 25 August 1996, 1 male, 1 female; jct. Rt. 301 & Bus. I-95, S of Fayetteville, 25 August 1996, 1 female; Moore Co., Aberdeen, 25 August 1996, 1 female. Oklahoma: Carter Co., Rt. 70, ca. 8 km SSE of Ardmore, 20 May 2001, 1 female; Mary Niblack Rd., 2.5 km S of Rt. 199 E of Ardmore, 34°09.807′N, 97°04.387′W, 20 May 2001, 1 female and 22 May 2009, 1 male; Rt. 199, 0.3 km E of Sandy Branch, 6 km E of Ardmore, 34°11.232′N, 97°01.622′W, 20 May 2001, 1 male and 22 May 2009, 3 males, 3 females; Stephens Co., Rt. 89 exit, 3.3 km S jct. Rt.7, SE of Velma, 20 May 2001, 1 female. *South Carolina: Oconee Co., ca. 25 km N of Salem, 35°00.353′N, 83°01.539′W, 11 November 2006, 1 male, 1-V.

Bruchomorpha rosea Doering: Doering (1939) examined only 39 specimens from Texas, New Mexico, and Arizona of this apparently seldom-collected species. *Collecting data:* New Mexico: Eddy Co., Rt. 82, 4.5 km E Artesia, 28 April 2002, 5 males, 4 females; 31 May 2003, 3 males. Texas: Wilbarger Co., jct Rt. 283 & CR 106, ca. 20 km N of Vernon, 34°19.12′N, 99°18.22′W, 13 May 2006, 6 males, 2 females (including a mating pair).

Fitchiella rufipes Lawson: This little-known species has been collected in Arizona, California, Utah, and Texas (Doering, 1941). Its host plants apparently are unknown (Lawson, 1933; Doering, 1941). *Collecting data:* Texas: Callahan Co., I-20 access road, ca. 7 km E of Clyde, 32°24.57′N, 99°27.28′W, 13 May 2006, 1 male, 1 female, 1 late instar.

Cixiidae

Haplaxius crudus (Van Duzee): This planthopper has been reported from Florida and Texas in the United States as well as Mexico, Belize, Colombia, Venezuela, Trinidad, Jamaica, and the Cayman Islands (Howard and Wilson, 2001; S. W. Wilson, unpubl.). Nymphs feed underground on the roots of grasses, whereas adults feed on the foliage of palms and are considered a principal vector of the phytoplasma that causes lethal yellowing disease of coconut palms (*Cocos nucifera* L., Arecaceae) (Howard and Wilson, 2001). Collecting data: Florida: Lake Co., Rt. 192, E of jct Rt. 27, NNW of Kissimmee, 28°20.821′N, 81°40.217′W, 11 March 2008, 2 males, 2 females.

Delphacidae

Delphacodes campestris (Van Duzee): This commonly collected delphacid ranges from Newfoundland and Nova Scotia west to the Yukon and British Columbia in Canada and south to Florida and west to California in the United States (Wheeler and Bartlett, 2006). It has been recorded from the grasses *Achnatherum coronatum* (Thurb.) Barkworth, *Agropyron* sp., *Agropyron cristatum* (L.) Gaertn., *Agrostis* sp., *Calamovilfa longifolia* (Hook.) Scribn., *Deschampsia flexuosa* (L.) Trin., *Festuca ovina* L. [complex], and *Poa pratensis* L., and from the sedge *Carex scoparia* Schkuhr ex Willd. (Cyperaceae); it also has been reared on numerous species of grasses under laboratory conditions (Wilson et al., 1994; Wheeler and Bartlett, 2006). *Collecting data:* Oklahoma: Dewey Co., Rts. 207/281, 6.8 km SE of Oakwood, 29 May 2003, 2 males. *New Mexico: Otero Co., Rt. 82, Mountain Park, 8 May 2004, 1 male.

Delphacodes latidens Beamer: Beamer (1948a) listed only 15 specimens in describing *D. latidens*

from several localities in Texas, and no subsequent distribution records of this rarely collected planthopper have been published. It has been recorded from the grass *Setaria texana* W. H. P. Emery (Wilson et al., 1994). *Collecting data:* *New Mexico: Lea Co., Rt. 206, Tatum, 28 April 2002, 3 males, 6 females and 19 May 2004, 1 male, 3 females, early instars. *Oklahoma: Caddo Co., Rt. 9, 12.2 km E of Carnegie, 35°07.04′N, 98°28.12′W, 13 May 2006, 2 males.

Delphacodes lutea Beamer: Beamer (1946b, 1947) collected 138 specimens of this delphacid from one locality in Kansas. *Collecting data:* *Oklahoma: Atoka Co., Boehler, 34°09.845′N, 95°53.0322′W, 21 May 2009, 1 male, Carter Co., Rt. 7, 3 km NE of Ratliff City, 28 May 2003, 1 male.

Delphacodes parvula (Ball): This delphacid is known from Manitoba and Ontario in Canada (Maw et al., 2000) and from Illinois, Iowa, Kansas, and Missouri in the United States (Beamer, 1946a; Wilson, unpubl.). Records from Maryland and Florida (Metcalf, 1943) are suspect because they predate identifications based on structures of the male genitalia. *Delphacodes parvula* is relatively common in tall grass prairies (Wilson, pers. obs.,) and has been recorded from the grass *Schizachyrium scoparium* (Michx.) Nash (Wilson et al., 1994). *Collecting data:* *South Carolina: Pickens Co., Glassy Mountain Heritage Preserve, 4.2 km NE of Pickens, 22 June 2002, 7 males, 2 females; 9 March 2003, late instars; 23 March 2003, 2 males, 1 female, 17 late instars; 13 April 2003, >20 males, females, 1 early instar; 27 April 2003, males < females + early instars; 24 May 2003, 1 male, 2 females, 1 nymph; 15 June 2003, 1 male, females, 1 early & 4 late instars; 25 March 2005, 2 males, 4 females, 4 late instars; 4 July 2006, adults, late instars; 5 November 2006, instars I–III.

Delphacodes sucinea Beamer: The collection of large numbers at several localities in Mississippi and Florida (Beamer, 1948b) suggests that this delphacid may be abundant, but specific hosts have remained unrecorded. *Collecting data:* *Alabama: Tallapoosa Co., Alexander City, 25 September 1996, 1 male. Georgia: Emanuel Co., Rt. 80, Adrian, 24 September 1996, 1 male.

Delphacodes trimaculata Beamer: This planthopper has been reported, without host information, from Connecticut to Virginia and Illinois (Beamer, 1948a; Wilson and McPherson, 1980). *Collecting data:* *Florida: Levy Co., Manatee Springs State Park, 6 mi. W of Chiefland, 16 March 1999, 1 male, 1 female.

Laccocera vanduzeei Penner: This delphacid has been collected in British Columbia, Canada, and Arizona, California, and Colorado in the United States (Penner, 1945; Scudder, 1963). Its hosts have remained unknown. *Collecting data:* *New Mexico: Otero Co., Rt. 82, 14.5 km NNW of Mayhill, 28 April 2002, 4 males, 4 females, 2 nymphs.

Metadelphax propinqua (Fieber): A common pan-tropical species recently removed from the genus *Toya*, *M. propinqua* is the vector of *Cynodon* chlorotic streak virus of its host, bermudagrass (*Cynodon dactylon* (L.) Pers.) (Gonzon and Bartlett, 2007). Its occurrence in British Columbia, Canada (as *Delphacodes propinqua*), is considered adventive (Maw et al., 2000). This delphacid also has been recorded from the grasses *Chloris gayana* Kunth, *Paspalum* sp., *Pennisetum clandestinum* Hochst. ex Chiov., *Saccharum officinarum*, *Setaria sphacelata* (Schumach.) Stapf & C. E. Hubb. ex M. G. Moss, and *Zea mays* L. (Attie et al., 2008). *Collecting data:* *New Mexico: Lea Co., Rt. 206, Tatum, 19 May 2004, 1 male.

Pissonotus delicatus Van Duzee: This common widespread species is found from New Jersey to Florida and west to British Columbia, California, and Mexico (Bartlett and Deitz, 2000). Unlike the other delphacids collected from weeping lovegrass, *P. delicatus* uses dicots (Asteraceae) as hosts, including *Grindelia aphanactis* Rydb., *G. camporum* Greene, *G. squarrosa* (Pursh) Dunal., *Haplopappus ciliatus* Nutt. DC, and *Heterotheca subaxillaris* (Lam.) Britt. & Rusby (Wilson and Tsai, 1991; Bartlett and Deitz, 2000). Variation in genitalic structures and the known host range suggest that *P. delicatus* may represent a complex of sibling species. *Collecting data:* Florida: Okaloosa Co., Rt. 98, Destin, 30°23.3′N, 69°26.0′W, 8 April 2005, 1 male, 1 female; Polk Co., Rt. 27, 2.4 km N of jct. CR-54, NW of Loughman, 24 February 2002, 3 females; *South Carolina: Richland Co., Clemson Rd. nr jct. Rt. 20, 3.7 km S of Pontiac, 16 April 2000, 2 females.

Pissonotus dentatus Morgan and Beamer: This species previously has been recorded from Florida, Illinois, and North Carolina, as well as Cuba, with host plants remaining undocumented (Bartlett and Deitz, 2000). *Collecting data*: Alabama: Lee Co., Auburn, 25 Sept. 1996, 1 female. Georgia: Laurens Co., Rt. 80, 1 mi. E of Dudley, 24 Sept. 1996, 1 female; Talbot Co., Rt. 80., E of

Talbboton, 26 Sept. 1996, 1 male. South Carolina: Aiken Co., Rt. 270, SE of New Ellenton, 7 Sept. 1996, 5 females, nymphs; Richland Co., Rt. 1, nr Dentsville, 29 Mar. 1997, 1 female.

Prokelisa salina (Ball): Widely distributed in the western United States, *P. salina* has been recorded from the grasses *Buchloe dactyloides* (Nutt.) Engelm., *Calamovilfa longifolia*, and *Distichlis stricta* (L.) Greene (Wilson, 1982; Wilson et al., 1994) and *Sporobolus wrightii* Munro ex Scribn. (Wheeler, pers. obs.,). The Canadian distribution includes British Columbia, Manitoba, Ontario, and Saskatchewan (Maw et al., 2000). *Collecting data:* New Mexico: Eddy Co., Rt. 82, 4.5 km E of Artesia, 28 April 2002, 11 males, 19 females; Lea Co., Rt. 206, Tatum, 28 April 2002, 5 males, 32 females.

Syndelphax sp.: This delphacid, which might represent an undescribed species, is similar to *Syndelphax fallax* (Muir) from Texas. *Collecting data:* New Mexico: Eddy Co., Rt. 82, 4.5 km E of Artesia, 28 April 2002, 20 males, 14 females; Lea Co., Rt. 206, Tatum, 28 April 2002, 3 males, 4 females.

Dictyopharidae

Rhynchomitra microrhina (Walker): We previously reported the collection of 29 nymphs of the widely distributed *R. microrhina* from weeping lovegrass in Arkansas, Florida and North Carolina; two last instars (Arkansas and Florida) molted to adult males. Nymphs, adults, or both stages also were found on the composites *Ambrosia artemisiifolia* L. and *Heterotheca subaxillaris* and the grasses *Andropogon virginicus*, *A. glaucopsis* Ell., *Eragrostis* sp., *Paspalum urvillei* Steud., and *Urochloa mutica* (Forssk.) T. Q. Nguyen (Wilson and Wheeler, 2005).

Rhynchomitra recurva (Metcalf): This seldom-collected species, described from North Carolina by Metcalf (1923), was not included among dictyopharids of weeping lovegrass by Wilson & Wheeler (2005). Its host plants are unknown. *Collecting data:* *South Carolina: Marion Co., Rt. 30, 1 mi NE of Pee Dee, 14 September 1996, 1 female.

Fulgoridae

Amycle vernalis Manee: Wilson and Wheeler (2005) reported the collection from weeping lovegrass of 13 nymphs in *South Carolina, two of which molted to adult females. Nymphs and adults also were collected from little bluestem, *Schizachyrium scoparium*, and nymphs were collected from the grasses *Andropogon ternarius* Michx., *A. virginicus*, *Danthonia sericea* Nutt., and *Deschampsia flexuosa*.

Cyrpoptus belfragei Stål: Wilson and Wheeler (2005) reported this species from weeping lovegrass in *Oklahoma and South Carolina, including 14 nymphs, one of which molted to an adult male. Nymphs also were collected from the grasses *Muhlenbergia reverchonii* Vasey and Scribn. and *Piptochaetium avenaceum* (L.) Parodi. An adult recorded from *Pinus* sp. (Pinaceae) (Osborn, 1926) probably represents an incidental occurrence.

Cyrpoptus reineckei Van Duzee: From weeping lovegrass in Florida, Georgia, and South Carolina, Wilson and Wheeler (2005) recorded 9 adults and 142 nymphs, one of which molted to an adult male. Nymphs also were found on other grasses: *Andropogon glomeratus* var. *hirsutior* (Hack.) C. Mohr, *A. gyrans* Ashe, *A. virginicus*, *Deschampsia flexuosa*, *Muhlenbergia capillaris* var. *filipes* (M.A. Curtis) Chapman ex Beal., *Panicum repens* L., and *Spartina bakeri* Merr. Dozier (1926) reported an adult of this species from *Panicum repens*.

Discussion

Many planthoppers, especially delphacids, are monophagous on their native host plants, but host shifts have occurred, especially when planthoppers have colonized islands (Wilson et al., 1994). However, relatively little information is available on the incorporation of introduced plants into the diet of native monophagous planthoppers. Weeping lovegrass and other introduced plants do serve as alternative hosts of planthoppers. Novel plants might have lower levels of allelochemicals, lack feeding inhibitors, provide cues that stimulate feeding, have adequate amounts of nitrogen (Cook and Denno, 1994), and be available in greater densities than native hosts (McMahon and Bach, 2008). *Eragrostis curvula* probably has chemical attributes similar to those of the native hosts of planthopper species in the local pool. The large genus *Eragrostis* (ca. 350 spp.) is found worldwide in the tropics and subtropics and includes species native to the southern United States (Peterson, 2007). Taxonomic affinity or relatedness—that is, the availability of congeneric plants—can facilitate host shifts (Strong et al., 1984; Auerbach and Simberloff, 1988; Roques et al., 2006). Moreover, a host-plant architecture in which both the native hosts and weeping lovegrass have dense crowns and thick thatch would

provide similar physical habitats (Strong and Levin, 1979; Denno, 1994; Stiling, 1994).

We would have predicted that native, well-known grass feeders would colonize weeping lovegrass. Planthoppers and other insects that develop on families other than Poaceae would not have been predicted to adopt weeping lovegrass as a host, with the possible exception of Cyperaceae. Sedges can serve as alternative hosts for several grass-feeding delphacids (Wilson et al., 1994). Sedges and grasses, however, belong to different clades (cyperid and graminid, respectively) of the order Poales; sedges and rushes (Juncaceae), rather than sedges and grasses, are considered sister taxa (Chase, 2004). As expected, *E. curvula* has been colonized in the southern United States by numerous grass feeders, both generalist species that feed on grasses of several subfamilies and specialists of more restricted host range within Poaceae. Its accumulated insect fauna, however, contains an unexpectedly large number of rarely collected species whose host-plant relationships previously were unknown, in addition to several native species new to science (Henry, 2007; Wheeler, unpubl.). Certain native insects appear to be found in larger numbers in the extensive crowns of *E. curvula* than on their native grass hosts (Wheeler, 1999, 2005; Wilson and Wheeler, 2005). Insects presumed to be rare often can be collected in numbers when their habits and habitats become better known (Young, 1950; Wheeler, 2009). This is particularly true in the case of phytophages once their host plants are discovered (Nickel, 2003; Wagner, 2006; Bartlett and Wheeler, 2007).

Rarely collected or little-known planthoppers that develop on weeping lovegrass include the dictyopharid and three fulgorid species discussed elsewhere in more detail (Wilson and Wheeler, 2005). Only one of the four species (the fulgorid *Amycle vernalis*) qualifies as "rarely collected," but we consider the other three species "little known" because none of them had been documented as grass feeders previous to our fieldwork. Several species first reported herein from *E. curvula* also can be regarded as rarely collected, little known (e.g., specific hosts unknown), or both: the caliscelids *B. bunni*, *B. nodosa*, *B. rosea*, and *Fitchiella rufipes*; the delphacids *D. latidens*, *D. lutea*, *D. sucinea*, *Laccocera vanduzeei*, and *Syndelphax* sp. (possibly new); and the dictyopharid *Rhynchomitra recurva*. An apparent rarity or inadequate knowledge of the habits of 14 fulgoroid species associated with weeping lovegrass—the four we reported previously (Wilson and Wheeler, 2005) plus the ten recorded herein—might reflect applied entomologists' emphasis on planthoppers as important crop pests or vectors of phytopathogens (Wilson and O'Brien, 1987; Wilson, 2005) and field biologists' tendency to give only slight attention to grasses (Poaceae) and sedges (Cyperaceae (Nickel, 2003, p. 240).

Nymphs of 13 of the 26 fulgoroid species were found on weeping lovegrass in the southern United States, including four species of the caliscelid genus *Bruchomorpha* for which specific host associations previously had been unknown. The collection of a mating pair of *B. rosea*, as well as substantial numbers of adults of the delphacids *Prokelisia salina* and *Syndelphax* sp., suggests that these species also use *Eragrostis curvula* as a host. Our fieldwork does not allow weeping lovegrass to be termed a host plant for any of the planthopper species under a strict definition of the term (e.g., Oman, 1949; Roderick and Percy, 2008); the occurrence of some of the planthopper species on *E. curvula* might be incidental. Yet the delphacid *Delphacodes parvula* and the fulgorids *Amycle vernalis*, *Cyrpoptus belfragei*, and *C. reineckei* develop on this introduced African grass, and species whose nymphs were not observed during our limited surveys might still use weeping lovegrass as a host. *Pissonotus delicatus*, whose known hosts are composites, as well as several other delphacid species, might feed on this grass only as adults or use its dense crowns for overwintering or to minimize desiccation in hot, arid environments. In any case, weeping lovegrass serves as food and habitat for a hidden diversity of fulgoroid insects. Because *E. curvula* has shown little tendency to become invasive in the southern United States, this African grass might be considered an example of a non-native plant of ecological value in its area of introduction (*sensu* Williams, 1997)—that is, providing food resources and habitat for native insects.

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