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DAMAGE IN CENTIPEDE SOD ASSOCIATED WITH CRANE FLY AND MARCH FLY LARVAE (DIPTERA: TIPULIDAE, BIBIONIDAE) IN MISSISSIPPI

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Crane flies (Diptera: Tipulidae) are distributed worldwide, ranging from fresh and marine aquatic habitats to drier terrestrial environments (Alexander & Byers 1981). Tipulidae is the largest family in the Diptera; however, larvae have been described for less than 10% of the named North American species (Thompson 1990). Larvae of a few *Tipula* species have been implicated in damage to crops and grasslands in North America (Hartman & Hynes 1977; Alexander & Byers 1981; Alexander 1920). Larvae of the range crane fly, *T. (Triplicitipula) simplex* Doane, a native species, consume roots causing damage to un-irrigated pastureland in the San Joaquin Valley, California (Hartman & Hynes 1977). Larvae of other native *Tipula* (*Serratipula*) species have been implicated in pasture damage (Alexander 1967; Gelhaus 1986). Two exotic species, the common and the European crane fly (*T. oleracea* L. and *T. paludosa* Meigen, respectively) are destructive pests of cool-season turfgrass in the Pacific Northwest, western New York (D. Peck, Cornell University, personal communication), and maritime provinces of Canada (Jackson & Campbell 1975; Vittum et al. 1999; LaGasa & Antonelli 2000).

Larvae of march flies (Diptera: Bibionidae) are herbivores and scavengers (Hardy 1981). Larvae of several species have been reported to damage agronomic crops, vegetables, and grasses (Hardy 1981; Darvas et al. 2000). In the southeastern United States, swarms of adult *Plecia nearctica* Hardy, or lovebugs, are abundant in the spring and fall. Larvae of *P. nearctica*, however, are not a known pest of turfgrass.

On 13-I-2004, three larvae of the subgenus *Tipula* (*Triplicitipula*) were collected from a group of about 30 larvae crossing pavement adjacent to a bermudagrass home lawn in Saucier, Harrison County, MS. No damage to the adjacent grass was noted. At that same site on 31-I-2004, adult *T. (Triplicitipula) umbrosa* Loew were collected at dusk and presumed to be conspecific with the larvae collected earlier. Females were typically collected while at rest on a vertical surface such as a building. Males were collected most often while copulating with females. This marks the first record of this species in Mississippi; the

species is known previously from Louisiana and Florida (Oosterbroek 2003).

On 27-II-2004, live larvae and pupae (Tipulidae and Bibionidae) were collected by Wayne Wells from under centipede grass (*Eremochloa ophiuroides* [Munro] Hack.) sod which was severely weakened from extensive root herbivory and poor nutrition. The infested turf, growing on a sod farm in Picayune, Pearl River County, MS, was breaking apart during harvesting, indicating damage to the roots. That same day, specimens were submitted to the senior author for identification. Most of the live immatures were placed into a mixture of moistened field soil and sand in the laboratory for rearing. A few representative larvae and pupae were preserved in alcohol.

On 4-III-2004, the previously mentioned sod farm was surveyed by the senior author. This site contained three separate fields of centipede grass where the root damage was such that they were deemed unharvestable by the sod producer. Because larvae of Tipulidae and Bibionidae are not commonly associated with damage to warm season grasses, the site was first surveyed for damage from more common pests such as mole crickets (Orthoptera: Gryllotalpidae, *Scapteriscus* spp.), white grubs (Coleoptera: Scarabaeidae), or billbug larvae (Coleoptera: Curculionidae). In each field, three 1-m² areas of damaged turf were sampled with a soap solution for disclosing mole crickets and adult billbug (Vittum et al. 1999). Three soil samples, consisting of 0.1-m² plots, were excavated on each of three infested fields and the soil, grass, and thatch examined for larvae.

Disclosing samples yielded no mole crickets or billbugs, and only immature flies were recovered from excavated samples. Spiny brown larvae (Bibionidae) formed aggregations (about 5-10 larvae) in, or just below, the thatch. Larvae in some aggregations appeared white, not light brown, and appeared likely infected with an entomopathogen. Larger larvae and pupae (Tipulidae) also were located in the thatch, but solitary. None of these larger larvae appeared infected. Both types of larvae and the *Tipula* pupae were collected for rearing. About half of the immatures that were collected that day were packaged into loose, moist soil and shipped overnight to the lab-

oratory of JKG, The Academy of Natural Sciences, Philadelphia for rearing. The remaining immatures were confined with a core of grass in a sealed plastic container and reared in the laboratory at the Coastal Research & Extension Center, Biloxi. Several crane flies emerged in early March from pupae at both laboratory locations and were confirmed by JKG to be *Tipula umbrosa*.

All bibionid larvae at both locations died before eclosion. Cadavers were firm but within a few days became enveloped in a white fungal growth, presumably the same pathogen noted in the field. A fungus from these cadavers was isolated by Dr. Charlotte Nielsen (Cornell University) and identified by Dr. Richard Humber (USDA, ARS, Ithaca, NY), as *Evlachovaea* sp. Species identification of these larvae was not possible without an adult specimen. However, JKG could identify them as members of the genus *Plecia*, likely larvae of the lovebug, *P. nearctica*, which is abundant in Mississippi in the spring and fall.

This is the first record of *T. umbrosa* in Mississippi and the first habitat record for larvae of this species. Closely related adults and larvae (*Triplictipula*) in the eastern United States may also develop in grassy areas, particularly at edges of woodlands; the more distantly related species in the western United States include those that are the pest "range crane flies" (Gelhaus 1986). Although not previously recorded as pests of turfgrass, we document that larvae of both *T. umbrosa* and *Plecia* sp. can be associated with damage to warm season grasses, especially those with already weakened root systems or under nutrient stress.

We thank Billy Joe Lee, Paul Jeaufreau, and Wayne Wells (Mississippi State University, Department of Plant and Soil Sciences) for collecting specimens and assistance with the site survey. Identifications of all larvae and adults were made by JKG. We thank Ann Hajek, Cornell University, for arranging for the identification of the fungal pathogen, and George Byers, University of Kansas, for comparing specimens of *T. umbrosa* with those he identified from Louisiana. JKG also consulted an unpublished manuscript by Steven Teale reviewing the eastern Nearctic species of *Tipula* (*Triplictipula*) for help in identifying *T. umbrosa*. Voucher specimens of *T. umbrosa* and *Plecia* sp. are on deposit in the collection of The Academy of Natural Sciences and in the Mississippi Entomology Museum, Starkville. Richard Brown, Mark Woodrey (Mississippi State University), and David Boyd (USDA-ARS) provided helpful comments on an earlier draft of this manuscript. This paper is No. J-10723 of the Mississippi State Agricultural Experiment Station.

SUMMARY

Larvae of march and crane flies (Bibionidae, *Plecia* sp. and Tipulidae, *Tipula* (*Triplictipula*) *umbrosa* Loew) were collected from beneath damaged, low maintenance centipede grass sod in Picayune, Mississippi. Larvae of both species have not been associated previously with turf damage. Larvae and adult *T. umbrosa* also were found associated with turf in a residential landscape in Saucier, MS. This is the first record of *T. umbrosa* for Mississippi and a new record of larval habitat.

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