



First Report of the Invasive Crane Fly, *Tipula oleracea*, Associated with Turfgrass in Utah

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Abstract

This is the first report of *Tipula oleracea* L. (the common crane fly, also marsh crane fly) in Utah. Tipulid larvae were collected from a putting green in Tooele County in fall 2012. Pupal exuvia and adult crane flies were seen flying on golf courses in Salt Lake, Davis, and Utah counties in 2013, but adults were not captured or identified as the exotic species until fall 2014. The detection of *T. oleracea* in Utah is somewhat surprising, given the species' association with moist environments. A statewide survey is needed to better understand the spread and potential impact of *T. oleracea* on the turfgrass industry in Utah and the surrounding Intermountain West region.

THIS IS THE FIRST report of *Tipula oleracea* L. (the common crane fly, also marsh crane fly) in Utah. The Tipulidae, commonly referred to as “crane flies,” represent one of the largest families of dipterans. There are estimated to be >15,000 species distributed worldwide, yet only two species are known to cause damage to horticultural crops (de Jong et al., 2008). The European crane fly, *Tipula paludosa* Meigen, and *Tipula oleracea* L. are native to northwestern and central-southern Europe, respectively (Young et al., 1999). Both species can become pests of cereal crops and pasture grasses and have established in North America through multiple, separate introductions into regions with similar climatic conditions (Fox, 1957; Wilkinson and McCarthy, 1967; Costello, 1998; Gelhaus, 2006). However, recent ecological models predicted both species could occupy regions with dissimilar conditions to their native ranges (Petersen, 2012).

Tipula oleracea is a recent pest in North America, though its current distribution is similar to that of *T. paludosa* (La Gasa and Antonelli, 2000). *Tipula oleracea* was first detected in 1998 in Vancouver, BC (Costello, 1998), and has dispersed into Washington, Oregon, and California in the western United States (La Gasa and Antonelli, 2000; Umble and Rao, 2004). Confirmed finds in New York (Peck et al., 2006) and Michigan

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Abbreviations: OHGC, Oquirrh Hills Golf Course; RGC, The Ridge Golf Course.

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Table A. Useful conversions.

To convert Column 1 to Column 2, multiply by	Column 1 Suggested Unit	Column 2 SI Unit
1.609	mile, mi	kilometer, km (10 ⁻³ m)
2.96 × 10 ⁻²	ounce (liquid), oz	liter, L (10 ⁻³ m ³)
3.78	gallon, gal	liter, L (10 ⁻³ m ³)
2.54	inch	centimeter, cm (10 ⁻² m)

(Gelhaus, 2006) in the northeastern United States have also been reported, but the complete range of *T. oleracea* has not been documented.

On 4 Aug. 2012, tipulid larvae were collected from a putting green at Oquirrh Hills Golf Course (OHGC) in Tooele, Tooele County, Utah. The course sits in the foothills of the Oquirrh Mountains, approximately 10 km south of the Great Salt Lake and 25 km southwest of Salt Lake City. The soils at OHGC are clay loam, with push-up-style putting greens modified with sand top-dressing. Turfgrasses consist of mixed Kentucky bluegrass (*Poa pratensis* L.)–perennial ryegrass (*Lolium perenne* L.)–annual bluegrass (*Poa annua* L.) fairways, roughs, and tees. Putting greens are mixed creeping bentgrass (*Agrostis stolonifera* L.)–annual bluegrass. Extensive foliar damage was noticed on multiple greens in research trial areas managed by the senior author, and was initially believed to be caused by black cutworm larvae [*Agrotis ipsilon* (Hufnagel)]. A disclosing solution of 30 mL of Joy Ultra liquid dishwashing soap (Proctor and Gamble, Cincinnati, OH) in 7.6 L of water was applied to damaged areas, yet failed to expose any larvae. Damaged areas were then destructively sampled with a 2-cm soil probe, and tipulid larvae were discovered in the rootzone. The larvae were placed into vials of ethanol and shipped to EntomoTech Fundamentals (Geneva, NY) for identification. Samples were confirmed only as being tipulid larvae but were not identified to species.

The next year in September 2013, golf course superintendents in Salt Lake, Davis, and Utah counties reported crane fly pupal exuvia sticking out of putting greens. Crane fly infestations are often detected by the presence of pupal exuvia protruding from the short-mown turf or lying on the turfgrass canopy on higher heights-of-cut. Before adult eclosion, the pupa wriggles to the soil surface in preparation for adult emergence, typically in a short period before sunset (Potter, 1998). Although large, slender adult crane flies were observed flying in the areas reporting the presence of pupal exuvia, none were captured.

Tipulid adults were collected from The Ridge Golf Course (RGC) in West Valley City, Salt Lake County, Utah, on 15 Sep. 2014. West Valley City is a suburban area, southwest of Salt Lake City, located approximately 15 km in a direct line from OHGC, though separated by the Oquirrh mountain range. The landscape and site-level characteristics are similar to OHGC. The RGC borders a residential area to the east and native scrub land to the west. The RGC also has similar turfgrass mixtures

by area to OHGC but also has fine fescue (*Festuca* spp.) native areas. Native soils at RGC are predominately silt loam, and putting greens are sand. Adult crane flies were observed by the senior author flying low across turf and captured in plastic containers, then shipped to the Turfgrass Entomology Lab at the Pennsylvania State University in University Park, PA. The adults were identified by the third author as *T. oleracea* based on characteristics described by Peck et al. (2006). The two exotic species, *T. oleracea* and *T. paludosa*, can be distinguished from native species by a small patch of squamal hairs and the coloration of the leading edge of the forewing. *Tipula oleracea* is distinguished from *T. paludosa* by the spacing between the compound eyes (ventral surface), differences in the male genitalia, and wing:abdomen ratio. *Tipula oleracea* adults possess wings that extend beyond the length of the abdomen, and are capable fliers. *Tipula paludosa* females are incapable of flying long distances given their relatively short wings. *Tipula paludosa* gravid females are often observed flying just above the turf, seemingly struggling to take flight. Damage can be more severe with *T. paludosa* populations because populations tend to build up locally. It could be expected that *T. oleracea* would exhibit a more rapid expansion of its geographic distribution and even divided ranges within its distribution (Peck and Olmstead, 2009).

The detection of *T. oleracea* in Utah is somewhat surprising, given the species' association with moist environments. European crane flies are most prevalent in areas with cool summers and average annual rainfall of 60 cm or more (Niemczyk and Shetlar, 2001). Additionally, exposure to drying conditions can cause *T. oleracea* eggs to desiccate within 2 to 4 minutes (Jackson and Campbell, 1975). It is not clear whether *T. oleracea* will be capable of persisting in turf areas in the surrounding urban landscapes and beyond, where very little annual precipitation is observed. Golf course site characteristics may provide ideal conditions for *T. oleracea* to persist in isolated patches. The RGC has numerous ponds for irrigation, and is within 10 to 15 km of a body of water (Jordan River, Great Salt Lake). The high amounts of fines in the soils, thatch levels, and almost daily irrigation replacement may provide immature crane fly life stages with adequate moisture levels to survive. Cultural practices, in particular good soil drainage, along with chemical control strategies are recommended to reduce pressure from tipulid larvae.

A statewide survey is needed to determine the distribution of *T. oleracea* in Utah and potential impact on the

turfgrass industry in the Intermountain West. Crane flies may go undetected for several years, as large densities of tipulid larvae may not cause visible damage in healthy turf (Peck et al., 2010). Future studies should examine methods to reduce populations locally and limit the potential spread to uninvaded areas.

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