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ABUNDANCE AND POPULATION DYNAMICS OF ADULT *SPHENOPHORUS INAEQUALIS* (COLEOPTERA: CURCULIONIDAE) IN FLORIDA

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Billbugs are common turfgrass pests whose damage is often misdiagnosed (Potter 1998). The uneven billbug, *Sphenophorus inaequalis* Say (Coleoptera: Curculionidae), occurs in the eastern United States and can develop on Kentucky bluegrass (*Poa pratensis* L.), perennial ryegrass (*Lolium perenne* L.), tall fescue (*Festuca arundinacea* Schreb.), and bermudagrass [*Cynodon dactylon* (L.) Pers.] (Satterthwait 1931; Johnson-Cicalese et al. 1990). It was expected to cause considerable turfgrass damage in New Jersey (Johnson-Cicalese & Funk 1990). Although 25 species of billbugs occur in Florida (Peck & Thomas 1998), only *S. venatus vestitus* Chittenden was considered the most abundant and damaging species. Huang & Buss (2009) reported that > 80% of all billbug adults collected from pitfall traps located on 4 golf courses in Florida were *S. venatus vestitus* and 18% were *S. inaequalis*. The seasonal activity of *S. venatus vestitus* has been described in Florida (Huang & Buss 2009) and North Carolina (Dokocil & Brandenburg 2012). However, the biology and pest status of *S. inaequalis* in bermudagrass is poorly known. Thus, we sought to determine adult *S. inaequalis* activity patterns in golf courses in northcentral and southern Florida.

The abundance and population dynamics of adult *S. inaequalis* were monitored on 4 golf courses in Florida weekly from Jan 2006 to Dec 2007. The golf courses included Gainesville Country Club and West End Country Club in Gainesville, LaGorce Country Club in Miami Beach, and Card Sound Country Club in Key Largo. Four linear pitfall traps (similar to Lawrence 1982) were placed in 'Tifway' bermudagrass roughs on each course in Jan 2006. Each trap had four 3-m long PVC "arms" (7.6 cm diam.), with a straight 2.5 cm slit along each arm. The far pipe end was capped and the inner pipe end extended through a hole on the side of a 19-liter bucket. A removable plastic tube extended the arm over a removable 4-liter bucket. To initiate sampling, traps were cleaned in the morning, sand was added to the 4-liter bucket, and any adults caught during the following 24 h were collected, frozen, preserved in 70% ethanol, and species and gender were determined. Weekly data were summarized by month and analyzed using a one-way ANOVA (PROC GLIMMIX, SAS Software 2008) to detect

the effect of month on *S. inaequalis* population dynamics. The response variable, total number of *S. inaequalis* collected on each sampling date, was subjected to a logarithmic transformation (Zar 1999) before analysis, but actual numbers of billbugs collected each month are presented in Fig. 1. Treatment means were separated using LSMEANS test ($P < 0.05$). Correlations between number of *S. inaequalis* collected and temperature or precipitation were quantified using Spearman's rank correlation analysis (PROC CORR) to detect the effect of environmental conditions on *S. inaequalis* adult activity.

A total of 3,345 adult *S. inaequalis* were collected at 3 of the 4 golf courses. Numbers were greatest at West End Country Club (99.6% of specimens), followed by Gainesville Country Club (0.38% of specimens). Only one adult was collected at the Card Sound Country Club and none were collected at the LaGorce Country Club, which suggests that *S. inaequalis* was not abundant in those locations, possibly due to environmental conditions or maintenance practices.

The following results are therefore only from collections at West End in Gainesville. Nearly twice as many males were collected compared to females: the sex ratio of all samples combined was 1.9 : 1 (male : female). Peak activity of adult *S. inaequalis* at West End Country Club occurred from Jun to Aug in both years (Fig. 1). The mean number of *S. inaequalis* adults collected by month was significantly greater in Jul (108.5 ± 12.7) and lower in Feb (6.8 ± 4.3) in 2006 ($F = 13.55$; $df = 11, 36$; $P < 0.0001$), and was significantly greater in Jul (73.3 ± 8.5) and lower in Dec (7.3 ± 2.3) in 2007 ($F = 12.17$; $df = 11, 36$; $P < 0.0001$). Numbers of adult *S. inaequalis* fluctuated throughout the year, but mostly corresponded to the ambient temperature. Temperature and number of adult *S. inaequalis* collected in both 2006 (Spearman correlation coefficient = 0.836) and 2007 (Spearman correlation coefficient = 0.814) were positively correlated, but precipitation was not correlated with the number of adult *S. inaequalis* collected. These field data suggest that *S. inaequalis* may be univoltine in northcentral Florida, but developmental time needs to be confirmed by rearing studies. Despite having nearly equal pest status with 3 other *Sphenophorus* spp. in New Jersey

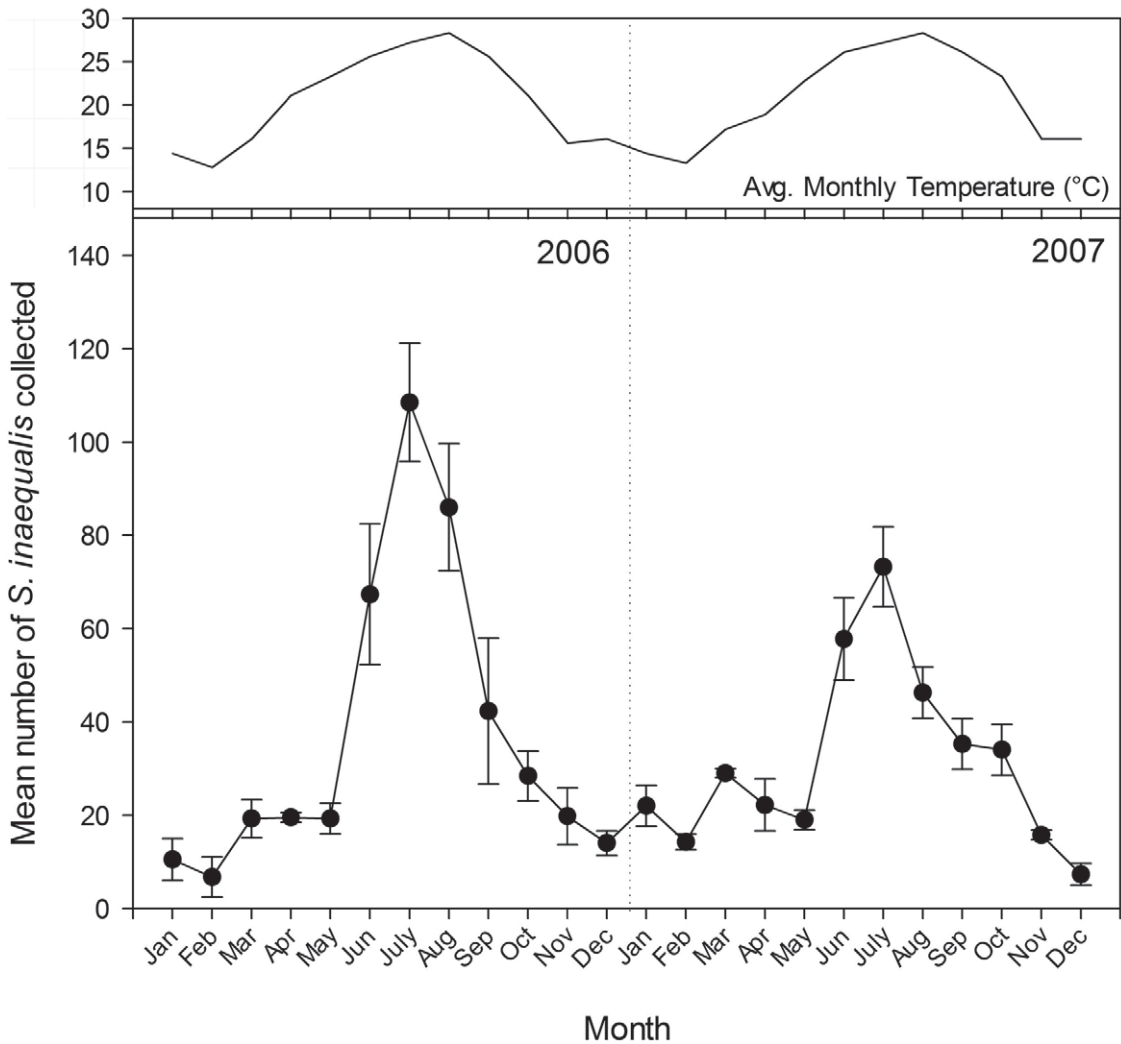


Fig. 1. Total number of adult *Sphenophorus inaequalis* collected within 24 h from 4 linear pitfall traps each wk at West End Country Club in Gainesville, Florida (2006 and 2007).

(Johnson-Cicalese et al. 1990), Daskocil & Brandenburg (2012) reported that only 19 *S. inaequalis* adults were collected from 2 of the 5 locations sampled in North Carolina. This confirms that *S. inaequalis* populations may be localized, rather than widely abundant in Florida. However, no noticeable damage occurred near the pitfall traps at West End Country Club.

SUMMARY

Abundance and population dynamics of adult *Sphenophorus inaequalis* were monitored at 4 bermudagrass golf courses in Florida. *Sphenophorus inaequalis* was present at 3 of the courses, but was the dominant billbug species at one pub-

lic golf course in Gainesville, FL. Peak activity occurred from Jun to Aug in both 2006 and 2007 in Gainesville. *Sphenophorus inaequalis* appears to be univoltine and populations are localized within Florida.

Key Words: uneven billbug, peak activity, pitfall trap, turfgrass, univoltine

RESUMEN

La abundancia y dinámica de la población de adultos de *Sphenophorus inaequalis* fueron monitoreadas en 4 campos de golf del pasto Bermuda en la Florida. *Sphenophorus inaequalis* estuvo presente en 3 de los campos, pero fue la especie picudo dominante únicamente en un campo de

golf público en Gainesville, Florida. La actividad máxima sucedió a partir de junio a septiembre en 2006 y 2007 en Gainesville. El *Sphenophorus inaequalis* parece ser univoltino y sus poblaciones se localizan dentro de la Florida.

Palabras Clave: picudo desigual, actividad máxima, trampa de caída, césped, univoltino

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