Abundance and Seasonal Activity of Arthropod Predators in St. Augustinegrass Lawns in Florida[1]

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J. Entomol. Sci. 41(2): 165-169 (April 2006)

Abstract St. Augustinegrass (*Stenotaphrum secundatum* (Walt.) Kuntze) lawns in southern Florida were surveyed for arthropod predators. Three sampling methods (vacuum, irritant, visual) were used to obtain a more complete assessment of predators present in the lawns. Seasonal activity of predators also was measured using pitfall traps. Ants were the most abundant predators recovered with 91% of all predators in the survey. The second most abundant group was spiders. The red imported fire ant, *Solenopsis invicta* Buren, was found more frequently and in greater abundance than any other predator. Predators were active the entire year with total predator catches in traps highest in the summer, intermediate during fall and spring, and lowest in the winter.

Key words St. Augustinegrass, lawns, predators

Turfgrass is inhabited by a diverse fauna of invertebrates including herbivores, predators, and decomposers. Many of these organisms help to regulate pest populations, improve soil physical properties, and aid in the decomposition of thatch and clippings (Arnold and Potter 1987). Numerous studies have been reported on beneficial arthropods in turf. However, studies characterizing the beneficial arthropod community and assessing effects of management practices on those invertebrates are especially lacking for warm-season turfgrass species (Braman and Pendley 1993).

St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze, is a warm season turfgrass used throughout the southern United States in public and private lawns. The total turfgrass area used and maintained in Florida in 1992 was 1619,433 ha, and St. Augustinegrass was 72% of all grasses grown in Florida (Haydu et al. 1998). Previous studies, such as Reinert (1978) and Cherry (2001), have noted various predators associated with southern chinch bugs, *Blissus insularis* Barber, found in St. Augustinegrass in Florida. However, a detailed survey of arthropod predators found in St. Augustinegrass in Florida or elsewhere has not been conducted. The objective of this study was to determine the abundance and seasonal activity of arthropod predators in St. Augustinegrass in southern Florida.

[1]Received 19 September 2005; accepted for publication 20 December 2005.
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Materials and Methods

Thirty St. Augustinegrass lawns were sampled for arthropod predators during 2003. Ten lawns were sampled in each of three contiguous counties (Miami-Dade, Broward, Palm Beach) located on the heavily urbanized southeastern coast of Florida. Lawns were randomly selected with no prior knowledge of treatment history, i.e., insecticide use, watering, etc. Also, lawns were sampled throughout the year to reduce possible bias due to seasonal differences between predator populations. A 1 × 1 m area was randomly selected at each lawn to be sampled for predators. The area was first vacuumed for 5 min using a modified gas-powered blower/vacuum (Poulan/Weedeater, Shreveport, LA). Thereafter, an irritant solution of 50 ml of liquid dishwashing soap in 7.6 L of water was poured over the 1 m^2 to cause additional arthropods to surface from the grass (Baxendale and Grant 1995). After the solution was poured, the area was observed for 10 min, and arthropod predators surfacing were collected. Lastly, the grass was pulled apart for 5 min using a pronged hand rake, and predators observed were quickly hand-collected. The use of the three sampling methods (vacuum, irritant, visual) was conducted to obtain a more complete sample of arthropod predators in the 1-m^2 area. After collection, samples were frozen for later taxonomic identification and enumeration in a laboratory. In this paper, I consider arthropods to be predaceous if they belong to a taxonomic group in which most members are predaceous. The relative abundance and frequency of the arthropod predators in the lawns were determined.

The previous sampling methods were useful for measuring predator abundance in a given area. However, pitfall traps were used to measure seasonal activity of predators because these traps also measure predator mobility. Pitfall trap sampling was conducted using 10 pitfall traps located in St. Augustinegrass at the Everglades Research and Education Center (EREC) at Belle Glade, FL. The traps were located in different areas of the center where the grass is mowed, but receives no additional treatment such as watering, fertilization, etc. Each pitfall trap consisted of a 9-cm diam plastic cup containing 100 ml of ethylene glycol. A small metal roof also was placed above each trap to prevent rainfall from filling traps. Pitfall trap sampling was conducted from March 2003 to March 2004. Traps were used for 2 wks each month. After each 2-wk period, traps were transported to a laboratory where samples were drained through paper towels and frozen.

The previous 3-county survey showed that arthropod predators in St. Augustinegrass fell into three main groups of ants, spiders, and other predators. Hence, arthropods in the pitfall traps were identified only into these groups because the objective was to determine seasonal activity of predators and not specific predators at the EREC. To determine possible seasonal differences in activity, samples from 3-month periods were pooled. For the purposes of this paper, winter is defined as December, January, and February, spring is March, April, and May, summer is June, July, and August, and fall is September, October, and November. These definitions correspond to seasonal definitions for the North Temperate Zone (Guralnik 1982). Mean differences in predators caught in traps among seasons was determined by using a Least Significant Difference (LSD) test (SAS 1996).

Results and Discussion

The relative abundance of arthropod ground predators in St. Augustinegrass lawns is shown in Table 1. Ants were the most abundant predators representing 91% of all

Table 1. Relative abundance of arthropod ground predators in St. Augustinegrass lawns in Florida

Predator	Frequency*	Abundance**	
		Total	% Relative
Ants			
Brachymyrmex obscurior Forel	57	462	5.9
Paratrechina bourbonica Forel	17	883	11.3
Pheidole moerens Wheeler	73	1809	23.2
Solenopsis invicta Buren	77	3242	41.6
Wasmannia auropunctata Roger	7	626	8.0
Other ants	67	73	0.9
Spiders			
Linyphidae	60	166	2.1
Lycosidae	67	204	2.6
Theridae	67	201	2.6
Other spiders	37	37	0.5
Other Predators			
Assassin bugs	3	1	<0.1
Big eyed bugs	3	1	<0.1
Centipedes	10	6	0.1
Damsul bugs	3	1	<0.1
Earwigs	27	53	0.7
Ground beetles	20	9	0.1
Hister beetles	7	2	<.1
Rove beetles	10	9	0.1

* Frequency = percentage of samples in which the predator was found.

** Total abundance = predators found in all samples. % Relative abundance = (total number of predators divided by total number of all predators) X 100.

predators collected. Spiders were the second most abundant with a relative abundance of 8%. All other predators were far less numerous being only about 1% of the total predators. The sequence of ants being the most abundant predators followed by spiders also has been observed in other turf ecosystems. Cockfield and Potter (1984) reported that ants were the most abundant predators followed by spiders caught in pitfall traps in Kentucky bluegrass (*Poa pratensis* L.) and tall fescue (*Festuca arundinacea* Screb) lawns in Kentucky. And, ants followed by spiders were the most abundant predators in pitfall traps in centipedegrass (*Eremochloa ophiuroides* (Munro) Hack) in Georgia (Braman and Pendley 1993). These preceding data emphasize the importance of ants and spiders in turf ecosystems.

Table 2. Seasonal catches of arthropod predators in pitfall traps in St. Augustinegrass lawns in Florida

Season	Predators*			
	Ants	Spiders	Others	Total
Summer	23.9 ± 3.3 A	11.9 ± 3.4 A	4.1 ± 3.2 A	40.0 ± 6.5 A
Fall	13.5 ± 3.6 B	4.2 ± 2.5 C	2.2 ± 1.8 B	19.8 ± 5.0 B
Spring	10.0 ± 3.9 C	7.5 ± 3.2 B	2.1 ± 1.6 BC	19.6 ± 5.0 B
Winter	5.8 ± 2.5 D	3.2 ± 2.8 C	1.1 ± 1.1 C	10.1 ± 3.7 C

* Mean ± SD. Means in a column followed by the same letter are not significantly different (alpha = 0.05) using the LSD test (SAS 1996).

The red imported fire ant, *Solenopsis invicta* Buren, was found more frequently and in greater abundance than any other predator. This important ant species is not native to Florida and was first reported in Palm Beach Co. in southern Florida in 1973 (Adams et al. 1981). Reinert (1978) reported that *S. geminata* was the most frequently encountered ant species at southern chinch bug infestations in St. Augustinegrass in southern Florida, but did not note *S. invicta*. In a later study, Cherry (2001) reported that *S. invicta* was the most abundant ant species found at these infestations in southern Florida showing how quickly *S. invicta* had spread. Potter and Braman (1991) have noted that the fact that insect outbreaks are relatively uncommon in low-maintenance turfgrass suggests that many pests are normally held in check by indigenous natural enemies. In contrast, my data show that an exotic species, *S. invicta*, is now the most common predator in St. Augustinegrass lawns in southern Florida.

Seasonal catches of predators in pitfall traps are given in Table 2. Similar to the general survey (Table 1), ants and spiders were the predominant predators. Predators were active year round with total predator catches highest in the summer, intermediate during the fall and spring, and lowest in the winter. Besides increased predator populations, greater predator catches in the summer may also be related to warmer temperatures resulting in higher mobility and frequency of encountering the traps. This temperature effect also would explain lowered winter catches due to decreased temperatures. Braman and Pendley (1993) used pitfall traps to measure seasonal abundance of beneficial arthropods in centipedegrass in Georgia. Their data showed predator activity the entire year which supports the observation of year-round activity in this study, especially with southern Florida having warmer winters than Georgia. They also showed that ants were the most abundant predators and were most active during summer months but were captured the entire year, consistent with data in this study.

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