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Acoustic Evaluation of Trees for *Coptotermes formosanus* Shiraki (Isoptera: Rhinotermitidae) Treated with Imidacloprid and Noviflumuron in Historic Jackson Square, New Orleans, Louisiana

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Abstract

Nine years of periodic acoustical monitoring of 93 trees active with Formosan subterranean termite, *Coptotermes formosanus* Shiraki, were evaluated for imidacloprid tree foam and noviflumuron bait to reduce termite activity in trees. Long term, imidacloprid suppressed but did not eliminate termite activity in treated trees. Noviflumuron bait did not significantly reduce the proportion of trees with high termite activity but significantly increased the number of trees with no termite activity. Noviflumuron changed termite distribution by possibly eliminating only some fraction of numerous colonies whereby surviving colonies avoided trees containing dead termites.

Introduction

The formosan subterranean termite, *Coptotermes formosanus* Shiraki (FST), is native to Asia (Bouillon, 1970), but was introduced into the southern United States where they have become devastating pests (Su & Tamashiro, 1987). In addition to structural infestations, *C. formosanus* infestations of living trees are common in the New Orleans, LA area (Osbrink et al., 1999; Osbrink & Lax, 2003; Osbrink et al., 2011). Total economic loss due to termites in the United States was estimated at $11 billion per year (Su, 2002). Control of termites is important to prevent the destruction of materials where it is undesirable.

Following implementation of an area wide termite control strategy, a definitive question is what happens to the termite populations (Osbrink et al., 2011). In addition to reducing termite pressure in areas where structure and tree damage is undesirable, termite population elimination also increases the area available for the establishment and growth of new or suppressed termite populations (Su, 2002; Lax & Osbrink, 2003; Su & Lees, 2009; Guillot et al., 2010; Osbrink et al., 2011; Mullins et al., 2011). Because of the affinity of the Formosan termite for living trees, they cannot be ignored in area wide population suppression efforts as they may be a primary source of termites (Osbrink et al., 1999; Osbrink & Lax, 2002b; Osbrink & Lax, 2003).

Non-invasive monitoring of termite activity is ideal for evaluation of the efficacy of control efforts because monitoring has no effect on population dynamics. Invasive monitoring techniques can push termites away from the monitor creating an artifact of apparent control because of relocation of the termites. Efforts to develop techniques for detecting hidden termite infestations have produced only a few successful alternatives to traditional visual inspection methods (Lewis, 1997). Alternatives include ground-based monitoring devices with sensors that detect acoustic emissions of termites in wood (Fujii et al., 1990; Lewis & Lemaster, 1991; Noguchi et al., 1991; Robbins et al., 1991). Acoustic emission sensors are successful because they are nondestructive and operate at high frequencies (ca. 40 kHz) where there is

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negligible background noise to interfere with detection and interpretation of insect sounds (Lewis & Lemaster, 1991; Robbins et al., 1991). Acoustic emission systems have been applied as research tools to estimate termite population levels (Fujii et al., 1990; Lewis & Lemaster, 1991; Scheffrahn et al., 1993; Osbrink et al., 2011). Acoustic emission systems are ideal for detection of termites in trees (Osbrink et al., 1999; Kramer, 2001; Mankin et al., 2002; Osbrink et al., 2011).

Understanding pest population dynamics in space and time post-treatment integrates into an effective pest management strategy. The objective of this research was to monitor Formosan termites treated with imidacloprid and noviflumuron in an area wide termite control effort. To meet this objective, trees were monitored for *C. formosanus* with an acoustical emissions detector to quantify activity. These studies provide insight into the dynamics of an area wide termite management approach.

Materials and Methods

Jackson Square

Historic Jackson Square (JS) is a ≈ 0.9-ha (92 x 96 m) green space in the French Quarter, New Orleans, LA. A total of 93 JS trees, comprised of ten different species, were periodically monitored for termite activity with an acoustical emission device (AED) for 9 years. JS was divided into 5 topographic regions: Q1 south-east quarter with trees 1-15; Q2 north-east quarter with trees 16-29; Q3 north-west quarter with trees 30-42; Q4 south-west quarter with trees 42-62; and center (Cent) with trees 63-94 (Fig. 1). Trees are identified in Table 1, years and months sampled in Table 2.

Acoustical Emission Detector (AED)

An AED-2000 acoustical emissions detector (Acoustical Emissions Consulting, Inc Fair Oaks, CA) was used to quantify termite activity within 93 live trees in JS. Lag bolt wave guides (150 x 9 mm) were screwed horizontally into pre-drilled pilot holes in the north-west trunk of test trees ≈20 cm from the ground. Acoustical emissions were detected with a Model SP-1L probe with Model DMH-30 high force magnetic accessory attachment (Acoustic Emission Consulting, Inc., Fair Oaks, CA). For each tree, AED counts were acquired for 60 s with accompanying software which converts termite sounds to counts per second saved in Excel (Microsoft, Redmond, WA). Only the numbers of counts in the first 10 s of the 60 s recording were used to represent each unique individual recording. If the first 10 s of recording was contaminated with interference noise (elevated spiked counts), the first 10 s of recording following the cessation of interference noise were used to represent the unique individual recording. Previous research has determined that AED counts measure termite activity in trees (Mankin et al., 2002; Osbrink et al., 2011).

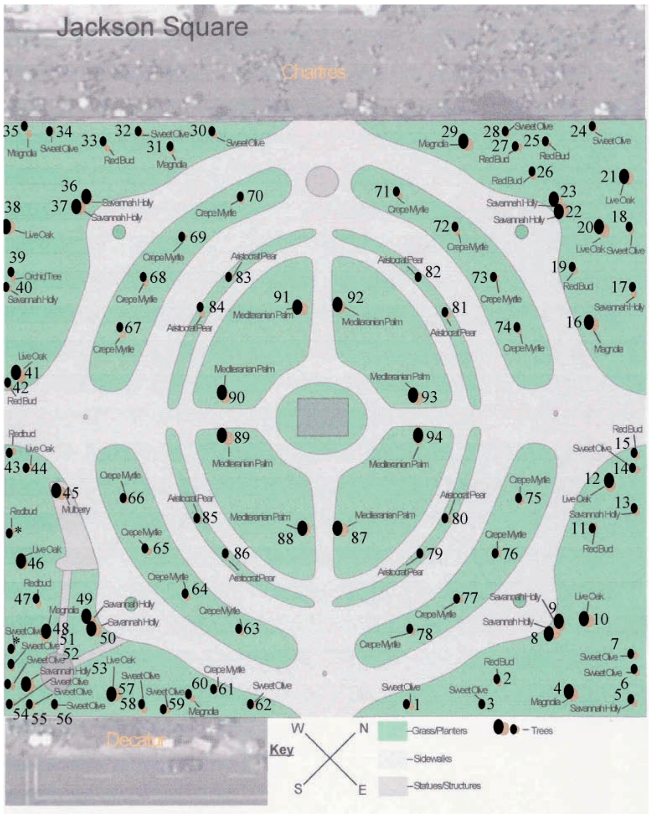

Figure 1. Map of Jackson Square, New Orleans indicating locations of trees.

Noviflumuron bait

By 2006, pest management professionals (PMP) installed 84 commercial in-ground Sentricon™ monitoring stations (Dow Agro Sciences LLC, Indianapolis, IN) with untreated wood every ≈5 m around the JS perimeter (22 west, 22 north, 21 east, and 19 south). PMP also initiated and maintained baiting with 0.5% noviflumuron bait tubes in monitors becoming positive with FST. The baiting program was terminated June 2011.

Imidacloprid tree foaming

In 2000, 7 trees (T7, T10, T20, T21, T38, T49, and T57) with *C. formosanus* activity were drilled and foamed with 0.5% imidacloprid (Premise™ sc, Bayer, Kansas City, MO) by PMP.

FST Mud tube survey

On May, 2011, JS trees were visually inspected for fresh FST mud tubes created for spring distribution flights.

Data Analysis

Ten consecutive count values (10 s) were used to calculate mean (±SE) counts per second to represent termite activity associated with each unique AED tree attachment. Acoustical data were analyzed using one way ANOVA with means separated with protected Tukey test, *P* < 0.05 (Systat, 2008). Proportions were arcsine square root transformed before analysis and actual proportion reported in tables. Tree readings were defined as high (H) termite activity when significantly > 0, which was qualitatively confirmed with earphones, connected to the AED. Low (L) tree readings were defined by readings of 0 or an event which only occurred only once (1 s) in 10 s, also confirmed qualitatively as above. Readings were defined as medium (M) when between H and L. M was qualitatively verified and indicates the presence of termites.

Results

Jackson Square

All 93 trees had termite activity, and a total of 25 (≈26.9%) trees were lost or removed. Only 4 trees (4.3%), tree # 1 (T1), T11, T19, and T58, had combined H activity > M or L activity (Table 1). Tree T58 was removed (lost) after 2006. Over the study, 17 (≈18.3%) trees had 0 H, 8 of which were lost (Table 1). Trees with M activity > H or L occurred in 84 trees (90.3%). Only 5 trees had L > M, and 3 trees had overall 0 L activity (Table 1).

Noviflumuron bait

Two monitors (2.4%) adjacent to T14 and T34 had FST on January 2010 (Fig. 1), initiating noviflumuron baiting. All trees had significantly high termite activity at some time, but few trees had consistently high termite activity (Table 2 and 3). Three trees (T1, T11, and T19) had repeated significantly high termite activity (Tables 2 and 4)

No significant reduction in trees with H termite activity occurred in the post-treatment years of 2010 and 2011 (Table 5). Post-treatment 2010 M show significant decrease in M trees in March, April, May, July (except 2008), September (except 2009), and October (except 2005). Post-treatment 2011 M show significant decrease in trees occurred March (except 2008), April, May, July (except 2008, 2009), September (except 2009), and October (except 2003, 2005). M 2011 were consistently greater than in 2010 and significantly higher for the months of July and October (Table 5).

Post-treatment 2010 L show significant increase for March, April, May, July (except 2008), September (except 2009), and October (except 2005, 2009). Post-treatment 2011 L show significant increase in April, May, July (except 2008, 2009), September (except 2009), and October (except 2003, 2005, 2009) (Table 5).

Imidacloprid tree foaming

The seven imidacloprid foamed trees had a lower but non-significant H readings than un-foamed trees with a mean percent (± SE) of 2.8 ± 0.9 and 11.3 ± 1.2, respectively (F = 3.666; df = 1, 92; P = 0.059). H events occurred twice in 2003, once in 2006, 1x in 2007, 2x in 2008, and 2x in 2011 (Table 6). There was no difference in M levels of termite activity in foamed and un-foamed trees with mean (± SE) percent of 62.2 ± 3.0 and 61.2 ± 1.3, respectively (F = 0.0433; df = 1, 92; P = 0.836). There was no difference between mean percent L activity between foamed and un-foamed trees (mean ± SE) 35.3 ± 3.5 and 28.3 ± 1.4, respectively (F = 1.952; df = 1, 92; P = 0.166).

Mud tube survey

In May 2011, six trees (T4, T10, T21, T29, T38, and T46) were found with active FST mud tubing (Table 6). All mud tube trees had 0% H in 2011. Five of six trees (83.3%) with FST mud tubing had been drilled and treated with imidacloprid.

Discussion

Certain events can interfere with successful recording of termite activity including wind noise, trucks with squeaking breaks, generators, crowd noise, leaf flutter, etc. AED recordings do not distinguish termite events from unrelated sound events. AED termite activity has a unique sound resembling rain on a tin roof. AED recordings are qualitatively monitored with earphones and a log maintained allowing data spikes of non-termite origin to be excluded from data analysis.

Jackson Square

FST Infestation of 100% of trees with termite activity is unprecedented though not unreasonable. Guillot et al. (2010) reported FST in 1.5% of 3000 trees visually inspected in the French Quarter neighborhood surrounding JS and noted this level was surprisingly low. Messenger and Su (2005) reported ≈ 32% infested trees in Armstrong Park, New Orleans. Osbrink et al. (1999) used visual inspection and staking to determine tree infestation in a portion of New Orleans City Park with results varying from 0 to 30.6% depending on tree species. Inspection of hurricane damaged trees in City Park revealed 75% of 21 trees were infested with FST (Osbrink et al., 1999). The number of trees infested with Formosan termite is much higher than indicated by current established monitoring techniques as revealed following incidents of heavy wind. This is confirmed by the number of living and externally healthy trees which break or fall revealing FST infestations. Successful treatment of termite populations in trees will require the development of improved, nondestructive, monitoring techniques. JS has had increasing FST populations for > 60 years resulting in a high probability contact with 100% of available trees. The proportion of L infestations under such circumstance reflects the limitation of detection capabilities not the foraging ability of FST.

Noviflumuron bait

Of 84 in-ground monitors 2.4% became infested. This is consistent with the 4.8% and 6.7% of wooden stakes found infested with by FST in City Park and Armstrong Park, New Orleans, respectively (Osbrink et al., 1999, Messenger & Su, 2005). Noviflumuron has been shown to eliminate those termite colonies that take the bait (Smith et al., 2002; Karr et al., 2004; Getty et al., 2007; Husseneder et al., 2007; Austin et al., 2008; Thoms et al., 2009; Eger et al., 2012; Lee et al., 2012). Termites adjacent to JS have had control pressure for years in historic structures such as the St. Louise Cathedral and Cabildo (site of Louisiana Purchase), followed by a decade of federal termite control pressure with Operation Full Stop (Su et al., 2000; Guillot et al., 2010). Control pressure changes the FST population demography away from a few large alpha colonies controlling most of the space and resource (Aluko &Husseneder, 2007). Alpha-colonies are surrounded by suppressed FST colonies surviving like the bonsai-tree with reduced resources. Alpha-colony elimination allows bonsai-colony expansion into vacated territory (Aluko &Husseneder, 2007). Expanding bonsai-colonies avoid baited areas initially because they avoid dead termites (Su & Tamashiro, 1987) and because they are excluded by competing bonsai-colonies. Dense colony FST populations become functionally resistant to the bait because colony elimination removes only a fraction of resident termites (Husseneder et al., 2007). Consistent with this are the results of Messenger et al. (2005) who used hexaflumuron to eliminate Formosan termite colonies in Armstrong Park, New Orleans, in three mo, but observed reinvasion almost immediately.

Three trees (T1, T11, and T19) had repeated significantly high termite activity (Table 4) and may indicate FST carton nest locations (Table 4; Fig. 1). These putative FST colonies are well spaced by > 35 m (T1 to T11 ≈36 m and T11 to T19 ≈ 37 m). Coptotermes frenchi Hill locates their colony in a tree and forage to neighboring trees from the colony tree (Hill, 1942), which provides a plausible explanation for the changes in H trees overtime. FST regularly changes areas of high activity (Tables 2, 3, and 4).

While studies indicate rapid (months) population suppression or colony elimination with CSI as reviewed by Su (2003) and Su and Scheffrahn (1998) there are often problems with continued, long term reinvasions. Su (2003) summarized hexaflumuron performance as 98.5% successful colony elimination from 1,3691 sites, with 199 sites experiencing control problems. However, Glenn and Gold (2002) baited *C. formosanus* with hexaflumuron for two yr in Beaumont, TX and found termites remained active in or around two of five structures. Using hexaflumuron, Su et al. (2002) continued to detect *C. formosanus* populations for about two yr after initiating an area wide community test. Guillot et al. (2010) reported hexaflumuron treated areas in the French Quarter, LA, with 3-4% of independent monitors that remaining active for ca. five yr. Thus, colonies can be eliminated rapidly in area-wide management, but termite populations may remain because they may not come into contact with treatments.

Imidacloprid tree foaming

The lower (non-significant) mean percent H activity in the foamed trees may be an indication that imidacloprid reduced suitability of central tree lumen as a habitat for FST. Recorded M termite activity may be due to termites occupying the untreated wood surrounding the foamed hollow. Osbrink and Lax (2003) found that independent monitors up to 46 m from treated trees showed imidacloprid intoxication resulting from the direct application of toxicant to the termites occupying the hollow of the tree. After six to 15 mo, there was complete recovery of FST populations in the independent monitors. This effect was not seen with imidacloprid soil applications which require the termites to dose themselves by moving through the treated substrate dispelling theories that imidacloprid acted like liquid bait (Osbrink et al., 2005). Imidacloprid has been shown to have a relatively short half life in soil and trees when compared to other termiticides (Ring et al., 2002; Mulrooney et al., 2006; Saran & Kambel, 2008). Though not eliminating termites from trees, the putative extended suppression of activity may be attributed to increased residual activity when bound to the substrate inside the protected tree hollow.

Mud tube survey

Presence of mud tubes provides visual confirmation of survival of functional FST colonies. FST may prefer placement of their swarm tubes in areas with the least amount of termite activity which is a possible mechanism to avoid antagonistic interactions at a vulnerable time in FST life cycle.

The *C. formosanus* populations appeared to be primarily centered in trees (Ehrhorn, 1934; Osbrink et al., 1999; Osbrink & Lax, 2002a). Hill (1942) determined that all large *Coptotermes frenchi* Hill colonies are centered inside living trees and that colony developments in alternate locations do not achieve the size or the longevity of colonies nesting in trees.

Though *C. formosanus* has flexible nesting habits, available hardwood trees may be their definitive host as it provides ideal harborage, mechanical protection, moisture for survival of small young colonies, flood protection, antibiotic benefits, and food (Osbrink et al., 1999; Fromm et al., 2001; Cornelius et al., 2007; Osbrink et al., 2008; Cornelius & Osbrink, 2010, Osbrink et al., 2011), with mutualistic tree benefits with de novo antibiotic production and nitrogen fixation, soil aeration, and relocation of micronutrients (Janzen, 1976; Burris, 1988; Ohkuma et al., 1999; Osbrink & Lax, 2003; Apolinario & Martius, 2004; Jayasimha & Henderson, 2007, Chouvenc et al., 2009).

Because of the affinity of the Formosan termite for living trees, they cannot be ignored in area-wide population suppression efforts as they may be a primary source of termites (Osbrink et al., 1999, Osbrink &Lax 2002b; Osbrink & Lax, 2003).

Annual reinvasion of suppressed areas with alates establishing new colonies and the expansion of bonsai-colonies eventually will lead to a resurgence of termite pressure. The resulting new populations will be independent of one another, different from the larger suppressed populations, potentially altering the performance of continuing bait treatments (Husseneder et al., 2007). Such a dynamic promotes the establishment of many separate populations, similar to disturbed landscapes studied by Aluko and Husseneder (2007), reducing the impact of baits over time. Termite baits are more effective against a few larger mature populations as opposed to with numerous independent populations. Thus, large numbers of independent termite populations established upon reinvasion provide a mechanism of demographic resistance to lessen the effects of baits on overall termite populations possibly responsible for control plateaus reported in other area wide control studies (Guillot et al., 2010). Similarities may exist in the proliferation of polygyne over mongyne fire ants Solenopsis invicta Buren accompanying area wide baiting with hydramethylnon (Glancy et al., 1987).

In conclusion, after about two yr of area-wide treatment, there were as many trees with high termite activity post-treatment. The reinvasion and establishment of new independent termite populations provides a mechanism over time to decrease the effectiveness of baits protecting the structures. Thus, continuous reevaluation of changing circumstance becomes critical for implementation of the best control strategies, including tree evaluations, to protect structures from reinvading colonies.

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Table 1. Trees of Jackson Square with cumulative % H, M, and L Formosan termite activity

Tree	Common name	Scientific name	H	M	L
1	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	39.2 ± 14.1	38.6 ± 12.8	22.2 ± 9.6
2	redbud	*Cercis canadensis* L., Leguminales	19.4 ± 10.0	52.8 ± 12.1	27.8 ± 14.7
3	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	10.6 ± 5.3	68.0 ± 7.1	21.4 ± 8.9
4 IM	magnolia	*Magnolia grandiflora* L., Magnoliaceae	4.8 ± 3.4	71.7 ± 9.3	23.5 ± 9.9
5	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	7.1 ± 5.6	49.9 ± 8.8	43.0 ± 11.
6	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	25.1 ± 9.4	51.8 ± 10.9	23.0 ± 8.0
7	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	10.3 ± 6.9	47.9 ± 9.4	41.8 ± 5.4
8	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	0.0 ± 0.0	64.6 ± 11.9	35.4 ± 11.9
9	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	3.2 ± 3.2	60.8 ± 12.4	36.0 ± 12.2
10 IM	live oak	*Quercus virginiana* Miller, Fagaceae	5.6 ± 5.6	63.2 ± 9.3	31.2 ± 9.9
11 X	redbud	*Cercis canadensis* L., Leguminales	49.4 ± 13.6	43.3 ± 12.0	19.8 ± 12.4
11 X	redbud	*Cercis canadensis* L., Leguminales	49.4 ± 13.6	43.3 ± 12.0	19.8 ± 12.4
12	live oak	*Quercus virginiana* Miller, Fagaceae	1.6 ± 1.6	52.5 ± 6.9	45.9 ± 7.2
13	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	3.7 ± 3.7	57.5 ± 10.5	38.7 ± 10.1
14 N	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	6.4 ± 4.8	54.9 ± 8.0	49.9 ± 9.8
15	redbud	*Cercis canadensis* L., Leguminales	6.9 ± 3.9	65.7 ± 6.1	27.4 ± 6.8
16 X	magnolia	*Magnolia grandiflora* L., Magnoliaceae	0.0 ± 0.0	88.9 ± 11.1	11.1 ± 11.1
17	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	0.0 ± 0.0	62.2 ± 11.2	37.8 ± 11.2
18	ND	ND	ND	ND	ND
19	redbud	*Cercis canadensis* L., Leguminales	52.6 ± 9.8	42.6 ± 10.6	3.2 ± 2.1
20 I	live oak	*Quercus virginiana* Miller, Fagaceae	1.6 ± 1.6	69.2 ± 11.9	29.2± 12.3
21 IM	magnolia	*Magnolia grandiflora* L., Magnoliaceae	0.0 ± 0.0	61.0 ± 10.8	40.6 ± 11.7
22	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	7.1 ± 5.6	45.8 ± 12.2	55.0 ± 11.4
23	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	11.6 ± 8.3	67.6 ± 8.5	28.7 ± 9.2
24	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	4.4 ± 3.0	62.3 ± 9.3	33.3 ± 10.1
25	redbud	*Cercis canadensis* L., Leguminales	14.9 ± 4.5	56.0 ± 9.5	29.1 ± 10.4
26 X	redbud	*Cercis canadensis* L., Leguminales	8.3 ± 8.3	70.9 ± 10.5	20.8 ± 12.5
27	redbud	*Cercis canadensis* L., Leguminales	7.9 ± 4.8	64.5 ± 11.4	27.5 ± 11.6
28	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	13.4 ± 7.3	63.1 ± 10.8	14.0 ± 7.2
29 M	magnolia	*Magnolia grandiflora* L., Magnoliaceae	7.1 ± 5.6	60.3 ± 8.8	32.5 ± 9.9
30	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	15.9 ± 10.8	53.7 ± 11.6	30.4 ± 8.5
31 X	magnolia	*Magnolia grandiflora* L., Magnoliaceae	16.7 ± 16.7	55.6 ± 5.6	27.8 ± 14.7
32	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	19.0 ± 9.2	64.6 ± 13.0	16.4 ± 6.2
33 X	redbud	*Cercis canadensis* L., Leguminales	0.0 ± 0.0	100.0 ± 0.0	0.0± 0.0
34 N	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	28.6 ± 12.1	61.4 ± 11.1	10.1 ± 4.5
35 X	magnolia	*Magnolia grandiflora* L., Magnoliaceae	11.7 ± 7.3	76.7 ± 14.5	11.7 ± 7.3
36 X	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	14.6 ± 8.6	85.4 ± 8.6	0.0 ± 0.0
37	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	4.8 ± 4.8	60.1 ± 9.8	35.2 ± 9.9
38 IM	live oak	*Quercus virginiana* Miller, Fagaceae	4.8 ± 4.8	56.1 ± 5.9	39.1 ± 6.5
39	orchid tree	*Bauhinia purpurea* L., Fabaceae	6.9 ± 4.6	64.8 ± 9.0	28.3 ± 10.4
40	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	3.2 ± 3.2	67.6 ± 8.9	29.2 ± 9.6
41	live oak	*Quercus virginiana* Miller, Fagaceae	3.7 ± 3.7	56.1 ± 11.7	32.8 ± 11.5
42 X	redbud	*Cercis canadensis* L., Leguminales	10.0 ± 10.0	76.7 ± 14.5	13.3 ± 13.3
43	redbud	*Cercis canadensis* L., Leguminales	24.9 ± 8.7	57.7 ± 14.1	17.5 ± 9.8
44	live oak	*Quercus virginiana* Miller, Fagaceae	1.6 ± 1.6	53.4 ± 12.2	45.0 ± 12.1

(table continues)

Table 1. Trees of Jackson Square with cumulative % H, M, and L Formosan termite activity

Tree #	Common name	Scientific name	H	M	L
45	mulberry	*Morus* spp. , Moraceae	11.9 ± 5.8	55.3 ± 9.7	32.8 ± 9.7
46 M	live oak	*Quercus virginiana* Miller, Fagaceae	0.0 ± 0.0	57.3 ± 9.8	42.7 ± 9.8
47	redbud	*Cercis canadensis* L., Leguminales	24.9 ± 6.9	58.9 ± 9.2	16.3 ± 6.6
48	magnolia	*Magnolia grandiflora* L., Magnoliaceae	1.6 ± 1.6	70.4 ± 10.5	28.1 ± 10.4
49 I	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	2.8 ± 2.8	65.9 ± 10.5	31.4 ± 10.4
50	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	1.9 ± 1.9	57.5 ± 11.8	40.6 ± 12.4
51	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	4.8 ± 3.4	69.3 ± 11.5	25.9 ± 11.4
52	sweet olive	Osmanthus fragrans Lour., Oleaceae	1.6 ± 1.6	54.8 ± 12.3	43.7 ± 12.4
53	savannah holly	*Ilex x attenuata* L.'savannah', Aquifoliaceae	0.0 ± 0.0	49.3 ± 9.7	50.7 ± 9.7
54	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	4.8 ± 2.4	65.3 ± 12.5	31.5 ± 11.9
55	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	6.4 ± 4.8	51.9 ± 12.5	41.8 ± 11.2
56	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	3.2 ± 2.1	72.1 ± 6.4	24.7 ± 6.7
57 I	live oak	*Quercus virginiana* Miller, Fagaceae	0.0 ± 0.0	48.3 ± 10.9	51.7 ± 10.9
58 X	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	52.1 ± 22.2	35.4 ± 14.6	12.5 ± 12.5
59	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	23.5 ± 11.2	47.6 ± 10.3	28.9 ± 11.5
60	magnolia	*Magnolia grandiflora* L., Magnoliaceae	17.5 ± 8.8	54.9 ± 11.8	27.6 ± 12.2
61 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	21.4 ± 11.1	78.6 ± 11.1	0.0 ± 0.0
62 X	sweet olive	*Osmanthus fragrans* Lour., Oleaceae	8.3 ± 8.3	66.7 ± 23.6	8.3 ± 8.3
63	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	7.1 ± 5.6	62.2 ± 9.6	30.7 ± 10.0
64 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	0.0 ± 0.0	93.3 ± 6.7	6.7 ± 6.7
65	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	0.0 ± 0.0	60.3 ± 13.5	39.7 ± 13.5
66 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	0.0 ± 0.0	62.5 ± 23.9	37.5 ± 23.9
67 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	12.5 ± 12.5	79.2 ± 12.5	8.3 ± 8.3
68 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	25.0 ± 19.4	61.7 ± 19.7	13.3 ± 13.3
69	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	13.8 ± 8.2	49.5 ± 9.3	34.0 ± 10.8
70	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	8.7 ± 5.6	54.1 ± 11.7	37.2 ± 10.4
71 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	16.7 ± 16.7	58.3 ± 22.1	25.0 ± 25.0
72 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	0.0 ± 0.0	93.8 ± 6.3	6.3 ± 6.3
73 X	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	33.3 ± 16.7	58.3 ± 8.3	8.3 ± 8.3
74	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	13.1 ± 5.5	53.8 ± 11.9	33.1 ± 10.7
75	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	5.3 ± 3.8	62.8 ± 7.9	27.4 ± 7.7
76	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	3.2 ± 2.1	68.8 ± 9.9	28.0 ± 9.4
77	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	1.6 ± 1.6	77.3 ± 9.9	21.2 ± 9.0
78	crepe myrtle	*Lagerstroemia indica* L., Lythraceae	7.1 ± 5.6	58.9 ± 13.5	45.1 ± 14.4
79 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	0.0 ± 0.0	68.8 ± 23.7	31.3 ± 23.7
80 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	20.8 ± 12.5	41.7 ± 4.8	37.5 ± 14.2
81 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	0.0 ± 0.0	80.6 ± 10.0	19.4 ± 10.0
82 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	16.7 ± 16.7	58.3 ± 22.1	25.0 ± 25.0
83 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	8.3 ± 8.3	62.5 ± 14.2	29.2 ± 10.5
84 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	11.1 ± 11.1	58.3 ± 12.7	30.6 ± 19.5
85 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	0.0 ± 0.0	75.0 ± 25.0	25.0 ± 25.0
86 X	aristocrat pear	*Pyrus calleryana* Decne, Rosaceae	27.1 ± 10.4	39.6 ± 16.5	33.3 ± 11.8
87	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	18.5 ± 11.1	53.3 ± 12.8	39.3 ± 11.2
88	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	14.3 ± 10.9	70.9 ± 10.9	25.9 ± 10.1
89	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	0.0 ± 0.0	58.1 ± 10.4	41.9 ± 10.4
90	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	4.4 ± 3.0	68.1 ± 9.8	27.5 ± 10.5

(table continues)

Table 1. Trees of Jackson Square with cumulative % H, M, and L Formosan termite activity

Tree #	Common name	Scientific name	H	M	L
91	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	0.0 ± 0.0	48.3 ± 10.5	51.7 ± 10.5
92	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	6.0 ± 3.2	50.7 ± 11.2	51.7 ± 10.5
93	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	7.9 ± 6.4	56.1 ± 12.7	47.1 ± 14.1
94	Mediterranean palm	*Chamaerops humilis* L., Arecaceae	20.1 ± 12.4	47.5 ± 12.6	43.5 ± 11.8

X tree removed before end of study. I imidacloprid treatment in 2000. M mud tubing May 2011. N tree adjacent to noviflumuron station.

Table 2. Mean number (± SE) Jackson Square tree acoustical counts

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
(Q1) 2003							
4 PoIM	ND	14.1 ± 4.1	ND	ND	ND	ND	0.0 ± 0.0
5	ND	140.5 ± 14.5*	ND	ND	ND	ND	1.1 ± 1.0
6	ND	83.8 ± 12.1*	ND	ND	ND	ND	0.4 ± 0.3
7	ND	101.2 ± 44.9*	ND	ND	ND	ND	0.0 ± 0.0
10 PoIM	ND	11.6 ± 8.0	ND	ND	ND	ND	4.2 ± 1.9*
14 PrN	ND	29.4 ± 15.2	ND	ND	ND	ND	0.0 ± 0.0
	ND	F= 6.758	ND	ND	ND	ND	F = 2.269
	ND	df = 14, 149	ND	ND	ND	ND	df = 13, 139
	ND	P < 0.001	ND	ND	ND	ND	P = 0.010
(Q2) 2003							
20 PoI	ND	1.3 ± 0.7	ND	ND	ND	ND	0.9 ± 0.5
21 PoIM	ND	9.7 ± 2.3	ND	ND	ND	ND	1.8 ± 1.0
22	ND	127.1 ± 21.1*	ND	ND	ND	ND	0.0 ± 0.0
29 M	ND	142.6 ± 45.2*	ND	ND	ND	ND	11.0 ± 7.2
	ND	F = 6.687	ND	ND	ND	ND	F = 2.432
	ND	df = 13, 139	ND	ND	ND	ND	df = 12, 129
	ND	P < 0.001	ND	ND	ND	ND	P = 0.007
(Q3) 2003							
31 X	ND	66.3 ± 16.2*	ND	ND	ND	ND	6.1 ± 2.8
34 PrN	ND	71.9 ± 20.3*	ND	ND	ND	ND	13.5 ± 4.8*
38 PoIM	ND	9.0 ± 7.7	ND	ND	ND	ND	0.0 ± 0.0
42 X	ND	11.1 ± 4.6	ND	ND	ND	ND	**18.3 ±5.3***
	ND	F = 3.055	ND	ND	ND	ND	F = 5.206
	ND	df = 11, 119	ND	ND	ND	ND	df = 12, 129
	ND	P < 0.001	ND	ND	ND	ND	P < 0.001
(Q4) 2003							
45	ND	16.1 ± 10.9	ND	ND	ND	ND	34.1 ± 10.3*
46 M	ND	4.5 ± 2.4	ND	ND	ND	ND	1.1 ± 0.6
49 PoI	ND	5.7 ± 2.2	ND	ND	ND	ND	0.0 ± 0.0
57 PoI	ND	2.9 ± 1.4	ND	ND	ND	ND	0.0 ± 0.0
59	ND	126.2 ± 25.4*	ND	ND	ND	ND	36.8 ± 8.6*
60	ND	4.3 ± 1.4	ND	ND	ND	ND	22.1 ± 10.8*
62	ND	88.9 ± 34.1*	ND	ND	ND	ND	24.8 ± 5.4*
	ND	F = 7.459	ND	ND	ND	ND	F = 7.928
	ND	df = 18, 189	ND	ND	ND	ND	df = 19, 199

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
	ND	P < 0.001	ND	ND	ND	ND	P < 0.001
(Q1) 2004							
2 X	ND	59.2 ± 8.5*	ND	196.4 ± 20.3*	ND	729.2 ± 322.8*	66.4 ± 15.6*
4 PoIM	ND	16.5 ± 4.1*	ND	1.1 ± 0.6	ND	17.1 ± 1.5	6.4 ± 1.8
10 PoIM	ND	10.9 ± 3.5	ND	0.2 ± 0.1	ND	0.9 ± 0.6	2.1 ± 1.0
10 PoIM	ND	1.6 ± 0.9	ND	0.9 ± 0.4	ND	0.6 ± 0.5	0.7 ± 0.5
14 PrN	ND	9.3 ± 3.9	ND	0.2 ± 0.2	ND	1.3 ± 0.8	1.3 ± 0.8
	ND	P < 0.001	ND	P < 0.001	ND	P < 0.001	P < 0.001
(Q2) 2004							
19	ND	44.2 ± 26.7*	ND	3.5 ± 1.5	ND	17.2 ± 5.4*	17.3 ± 10.7
20 Pol	ND	3.1 ± 2.	ND	0.3 ± 0.3	ND	1.5 ± 1.2	1.2 ± 1.0
21 PoIM	ND	0.6 ± 0.6	ND	3.4 ± 1.9	ND	0.1 ± 0.1	0.0 ± 0.0
24	ND	4.0 ± 2.3	ND	0.8 ± 0.5	ND	12.6 ± 5.5*	5.4 ± 2.9
28	ND	6.0 ± 1.6	ND	1.9 ± 0.7	ND	2.1 ± 2.9	22.2 ± 10.5*
29 M	ND	0.9 ± 0.6	ND	0.3 ± 0.3	ND	0.3 ± 0.3	2.9 ± 1.8
	ND	F = 2.616	ND	F = 4.025	ND	F = 5.376	F = 2.592
	ND	df = 12, 129	ND	df = 12, 129	ND	df = 12, 129	df = 12, 129
	ND	P = 0.004	ND	P < 0.001	ND	P < 0.001	P = 0.004
(Q3) 2004							
34 PrN	ND	15.6 ± 5.6	ND	5.2 ± 1.3	ND	1.3 ± 1.1	ND
35 X	ND	1.6 ± 0.9	ND	31.2 ± 9.1*	ND	0.9 ± 0.8	0.0 ± 0.0
35 X	ND	64.2 ± 30.0*	ND	0.5 ± 0.5	ND	1.6 ± 1.0	2.9 ± 1.4
38 PoIM	ND	2.1 ± 1.0	ND	1.0 ± 1.0	ND	0.6 ± 0.6	1.1 ± 0.7
	ND	F = 3.676	ND	F = 7.092	ND	F = 0.643	F = 2.614
	ND	df = 12, 129	ND	df = 12, 129	ND	df = 12, 129	df = 10, 109
	ND	P < 0.001	ND	P < 0.001	ND	P < 0.802	P < 0.007
(Q4) 2004							
46 M	ND	0.7 ± 0.7	ND	0.4 ± 0.3	ND	3.9 ± 1.9	3.2 ± 1.2
49 Pol	ND	13.9 ± 17.6	ND	24.3 ± 11.7*	ND	3.6 ± 3.5	0.0 ± 0.0
57 Pol	ND	19.2 ± 12.6	ND	0.0 ± 0.0	ND	0.5 ± 0.3	1.8 ± 0.9
58 X	ND	1.0 ± 0.9	ND	48.6 ± 15.7*	ND	188.8 ± 44.7*	100.1 ± 20.6*
60	ND	20.9 ± 4.1*	ND	1.1 ± 1.0	ND	1.8 ± 1.0	44.0 ± 14.4*
	ND	F = 3.004	ND	F = 5.999	ND	F = 16.331	F = 37.6
	ND	df = 19, 199	ND	df = 19, 199	ND	df = 19. 199	df = 19, 199
	ND	P < 0.001	ND	P < 0.001	ND	P < 0.001	P < 0.001
(Q1) 2005							
1	6.7 ± 2.9	ND	ND	51.4 ± 6.1*	ND	ND	2.9 ± 1.1*
2 X	2.0 ± 1.0	ND	ND	22.2 ± 5.4*	ND	ND	0.1 ± 0.1
3	1.3 ± 0.7	ND	ND	27.4 ± 6.7*	ND	ND	1.2 ± 0.6
4 PoIM	9.4 ± 6.3	ND	ND	6.3 ± 5.2	ND	ND	0.0 ± 0.0
6	14.2 ± 5.2*	ND	ND	21.8 ± 4.7*	ND	ND	0.2 ± 0.2
10 PoIM	0.3 ± 0.2	ND	ND	3.4 ± 2.7	ND	ND	0.0 ± 0.0
11	9.3 ± 2.1	ND	ND	19.8 ± 2.8*	ND	ND	0.8 ± 0.3
14 PrN	0.0 ± 0.0	ND	ND	5.7 ± 2.9	ND	ND	0.2 ± 0.2
	F = 9.295	ND	ND	F = 13.427	ND	ND	F = 4.001
	df = 14, 149	ND	ND	df = 14, 149	ND	ND	df = 14, 149

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
	P < 0.001	ND	ND	P < 0.001	ND	ND	P < 0.001
(Q2) 2005							
19	2.5 ± 1.2	ND	ND	**35.1 ± 14.4***	ND	ND	2.2 ± 1.1
20 Pol	0.6 ± 0.6	ND	ND	0.8 ± 0.6	ND	ND	0.1 ± 0.1
21 PolM	3.2 ± 1.8	ND	ND	25.5 ± 12.0	ND	ND	0.1 ± 0.1
25	5.6 ± 1.7	ND	ND	**56.9 ± 11.2***	ND	ND	0.1 ± 0.1
29 M	1.8 ± 1.8	ND	ND	1.5 ± 1.0	ND	ND	1.0 ± 1.0
	F = 2.170	ND	ND	*F* = 7.645	ND	ND	*F* = 1.096
	df = 12, 129	ND	ND	df = 12, 129	ND	ND	df = 12, 129
	P = 0.017	ND	ND	*P* < 0.001	ND	ND	*P* = 0.370
(Q3) 2005							
34 PrN	10.2 ± 3.3	ND	ND	4.3 ± 1.5	ND	ND	0.1 ± 0.1
35 X	**48.5 ± 11.3***	ND	ND	7.2 ± 5.6	ND	ND	0.0 ± 0.0
38 Pol	3.6 ± 2.2	ND	ND	0.3 ± 0.2	ND	ND	0.1 ± 0.1
	F = 10.805	ND	ND	*F* = 0.784	ND	ND	*F* = 0.613
	df = 10, 109	ND	ND	df = 11, 119	ND	ND	df = 9, 99
	P < 0.001	ND	ND	P = 0.656	ND	ND	P = 0.613
(Q4) 2005							
43	0.8 ± 0.6	ND	ND	53.9 ± 11.1*	ND	ND	0.6 ± 0.3
49 Pol	13.9 ± 5.2	ND	ND	4.7 ± 1.6	ND	ND	0.0 ± 0.0
57 Pol	1.7 ± 0.8	ND	ND	1.3 ± 0.6	ND	ND	0.1 ± 0.1
58 X	58.6 ± 30.4*	ND	ND	25.8 ± 6.8	ND	ND	1.9 ± 0.6
59	33.1 ± 16.4	ND	ND	46.2 ± 18.3*	ND	ND	0.8 ± 0.7
	F = 3.264	ND	ND	F = 7.646	ND	ND	F = 37.6
	df = 19, 199	ND	ND	df = 19, 199	ND	ND	df = 19, 199
	P < 0.001	ND	ND	P < 0.001	ND	ND	P = 0.078
(Q1) 2006							
1	ND	107.8 ± 14.2*	ND	147.9 ± 7.7*	ND	63.4 ± 9.3*	ND
3	ND	43.9 ± 12.2*	ND	18.6 ± 11.9	ND	23.9 ± 4.1	ND
4 Pol	ND	2.9 ± 2.3	ND	1.2 ± 1.1	ND	3.5 ± 2.3	ND
10 PolM	ND	0.9 ± 0.6	ND	0.1 ± 0.1	ND	3.4 ± 1.5	ND
11	ND	72.0 ± 8.8*	ND	227.7 ± 14.3*	ND	58.7 ± 20.9*	ND
14 PrN	ND	13.2 ± 4.0	ND	4.0 ± 3.4	ND	4.8 ± 2.1	ND
15	ND	50.8 ± 20.4*	ND	2.0 ± 1.2	ND	0.7 ± 0.5	ND
	ND	F = 17.648	ND	F = 24.5	ND	F = 10.519	ND
	ND	df = 13, 139	ND	df = 13, 139	ND	df = 13, 139	ND
	ND	P < 0.001	ND	P < 0.001	ND	P < 0.001	ND
(Q2) 2006							
19	ND	1.7 ± 0.7	ND	74.5 ± 16.2*	ND	21.0 ± 8.5	ND
20 Pol	ND	13.3 ± 6.3	ND	7.2 ± 42.4	ND	7.2 ± 3.1	ND
21 PolM	ND	1.8 ± 1.3	ND	19.1 ± 7.3	ND	6.8 ± 3.8	ND
23	ND	18.0 ± 6.0*	ND	1.8 ± 0.9	ND	1.9 ± 1.3	ND
25	ND	0.3 ± 0.2	ND	5.2 ± 2.9	ND	69.8 ± 13.0*	ND
26 X	ND	14.1 ± 1.9	ND	9.0 ± 3.0	ND	74.1 ± 13.0*	ND
29 M	ND	0.1 ± 0.1	ND	2.8 ± 1.4	ND	3.6 ± 1.8	ND
	ND	F = 4.287	ND	F = 12.436	ND	F = 28.9	ND

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
	ND	df = 11, 119	ND	df = 11, 119	ND	df = 11, 19	ND
	ND	P < 0.001	ND	P < 0.001	ND	P < 0.001	ND
(Q3) 2006							
34 PrN	ND	2.6 ± 1.0	ND	0.6 ± 0.5	ND	7.9 ± 2.3	5.2±4.6
36 X	ND	1.8 ± 0.8	ND	48.5 ± 12.8*	ND	7.3 ± 2.9	ND
38 PolM	ND	0.0 ± 0.0	ND	5.7 ± 3.0	ND	2.3 ± 1.5	ND
39	ND	32.0 ± 7.7*	ND	17.9 ± 5.6	ND	7.4 ± 5.0	ND
41	ND	0.9 ± 0.6	ND	5.6 ± 3.0	ND	40.3 ± 25.8*	ND
	ND	*F* = 11.210	ND	*F* = 5.445	ND	*F*= 28.9	ND
	ND	df = 10, 109	ND	df = 10, 109	ND	df = 10, 109	ND
	ND	*P* < 0.001	ND	*P* < 0.001	ND	*P* = 0.037	ND
(Q4) 2006							
43	ND	15.2 ±3.9	ND	**175.8 ± 12.7***	ND	17.0 ± 5.6	ND
46 M	ND	8.7± 1.4	ND	ND	ND	1.7 ± 1.2	ND
47	ND	**153.5 ± 40.8***	ND	23.8 ± 7.5	ND	22.1 ± 10.0	ND
49 Pol	ND	0.7 ± 0.5	ND	12.4 ± 5.5	ND	21.3 ± 13.6	ND
57 Pol	ND	10.4±6.2	ND	2.3 1.3	ND	3.6 2.1	ND
58 X	ND	207.4±24.1	ND	394.2 74.5*	ND	ND	ND
59	ND	F=18.348	ND	41.6 21.8	ND	ND	ND
	ND	df=19.199	ND	df = 18, 189	ND	df = 16, 169	ND
	ND	P<0.001	ND	P < 0.001	ND	P = 0.048	ND
(Q1) 2007							
1	17.4 ±6.6*	2.8 ± 2.3	22.5 ± 5.6	5.5 ± 4.5	6.7±2.4	2.8 ± 2.3	6.1 ± 3.0
3	19.5 ±6.9*	4.7 ± 3.0	17.8 ± 11.3	3.2 ± 2.0	4.1±1.7	34.7 ± 5.8*	8.2 ± 5.1
4 PolM	4.1 ±3.2	5.3 ± 73.8	20.9 ± 7.7	32.1 ± 12.6*	2.2±1.7	31.5 ± 8.9*	11.2 ± 3.6
5	0.6 ± 0.5	**33.6 ± 14.1***	18.2 ± 9.5	13.3 ± 4.1	3.0 ± 2.8	6.0 ± 3.2	18.1 ± 4.8
6	0.0 ± 0.0	4.0 ± 1.1	9.5 ± 5.3	5.2 ± 2.5	6.1 ± 2.8	2.1 ± 1.4	**33.5 ± 19.3***
10 PolM	2.5 ± 0.9	16.7 ± 8.6	8.2 ± 3.2	4.5 ± 2.3	10.5 ± 12.9	1.7 ± 1.7	2.8 ± 2.0
11	11.9 ± 1.7	**41.9 ± 4.2***	**36.7 ± 4.5***	**46.6 ± 7.4***	**86.9 ± 16.9***	**37.5 ± 4.6***	28.8 ± 3.9
12	0.6 ± 0.6	0.7 ± 0.6	**36.4 ± 4.4***	1.4 ± 1.0	10.5 ± 2.8	0.0 ± 0.0	3.6 ± 2.1
14 PrN	0.0 ± 0.0	1.3 ± 1.0	1.6 ± 0.8	0.1 ± 0.1	2.9 ± 1.5	3.1 ± 1.0	22.5 ± 7.5
	F = 3.776	*F* = 4.990	*F* = 2.729	*F* = 8.748	*F* = 19.999	*F* = 17.827	*F* = 2.527
	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139
	P < 0.001	*P* < 0.001	*P* = 0.002	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.004
(Q2) 2007							
19	**82.6 ± 27.7***	18.8 ± 9.4	**34.4 ± 9.9***	**63.9 ± 17.5***	**43.6 ± 12.4***	54.3 ± 12.1	**100.6 ± 20.7***
20 Pol	6.1 ± 1.8	1.2 ± 1.1	2.5 ± 1.8	11.4 ± 5.1	25.5 ± 7.2	ND	18.7 ± 6.0
21 PolM	0.7 ± 0.7	13.2 ± 7.4	0.8 ± 0.5	18.6 ± 9.9	30.3 ± 16.6	8.6 ± 4.3	5.8 ± 3.9
25	16.2 ± 5.8	9.8 ± 5.0	1.9 ± 1.5	**63.9 ± 17.5***	2.8 ± 2.3	5.9 ± 2.6	7.4 ± 3.9
27	6.5 ± 4.9	6.2 ± 2.1	6.3 ± 2.7	8.1 ± 2.5	**236.1 ± 13.2***	**95.0 ± 6.0***	**71.1 ± 6.3***
28	4.5 ± 2.1	7.4 ± 5.2	6.4 ± 2.7	15.1 ± 5.1	4.6 ± 1.5	15.1 ± 6.8	**93.2 ± 5.9***
29 M	6.9 ± 3.2	4.3 ± 2.5	9.2 ± 4.4	6.0 ± 5.1	2.7 ± 1.7	15.6 ± 7.6	7.5 ± 4.4
	F = 24.6	*F* = 1.314	*F* = 32.4	*F* = 7.768	*F* = 77.567	*F* = 20.832	*F* = 20.238
	df = 10, 109	df = 10, 104	df = 10, 109	df = 10, 109	df = 10, 109	df = 9, 99	df = 10, 109
	P < 0.001	*P* = 0.234	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q3) 2007							
34 PrN	**12.0 ± 4.5***	18.4 ± 8.7	**28.2 ± 5.0***	9.2 ± 5.7	11.5 ± 5.3	**75.9 ± 9.9***	5.2 ± 4.6

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
38 PolM	4.7 ± 1.5	1.1 ± 0.8	6.7 ± 2.3	5.2 ± 3.2	1.9 ± 0.9	1.1 ± 1.1	0.0 ± 0.0
39	**13.1 ± 3.4***	27.3 ± 9.5	**26.5 ± 10.2***	21.4 ± 7.6	14.0 ± 4.7	50.9 ± 16.8	7.8 ± 3.6
	F = 4.327	*F* = 24.6	*F* = 5.092	*F* = 2.289	*F* = 2.440	*F* = 10.214	*F* = 0.629
	df = 8, 89	df = 7, 79	df = 7, 29	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79
	P < 0.001	*P* = 0.138	*P* < 0.001	*P* = 0.037	*P* = 0.027	*P* < 0.001	*P* = 0.731
(Q4) 2007							
45	0.8 ± 0.6	3.2 ± 2.2	4.5 ± 2.3	27.2 ± 13.7	2.4 ± 1.7	1.2 ± 0.9	**44.1 ± 18.6***
46 M	1.8 ± 1.4	0.4 ± 0.4	1.1 ± 1.1	2.2 ± 2.2	9.5 ± 5.7	3.3 ± 2.2	8.4 ± 5.4
47	**30.6 ± 14.7***	**33.6 ± 14.1***	15.4 ± 10.8	4.3 ± 2.7	11.0 ± 4.4	13.0 ± 8.6	29.9 ± 12.8
49 Pol	ND	2.1 ± 2.0	3.9 ± 3.2	2.4 ± 2.1	1.9 ± 1.1	3.5 ± 1.4	1.7 ± 1.7
50	ND	18.6 ± 9.2	0.4 ± 0.3	4.6 ± 2.9	2.7 ± 1.0	**29.0 ± 13.0***	1.0 ± 0.9
51	6.5 ± 2.8	2.9 ± 1.0	9.9 ± 3.7	**49.5 ± 16.0***	2.3 ± 1.3	3.9 ± 1.2	2.0 ± 1.4
54	1.0 ± 0.8	9.7 ± 5.0	2.1 ± 1.1	**65.6 ± 16.9***	28.0 ± 19.0	2.9 ± 1.3	8.6 ± 4.1
55	**46.4 ± 12.1***	15.3 ± 14.2	5.6 ± 2.9	0.5 ± 0.5	1.0 ± 0.6	1.5 ± 0.7	5.4 ± 2.9
56	2.3 ± 0.8	10.7 ± 2.4	3.0 ± 2.3	14.1 ± 6.8	**52.0 ± 10.8***	21.2 ± 11.1	1.7 ± 0.8
57 Pol	3.2 ± 1.4	0.4 ± 0.4	2.3 ± 1.7	3.2 ± 2.0	4.9 ± 2.9	1.5 ± 1.5	0.1 ± 0.1
59	**36.9 ± 6.4***	4.9 ± 2.1	11.1 ± 3.8	2.4 ± 1.5	32.4 ± 9.8	0.1 ± 0.1	5.9 ± 4.2
61	8.5 ± 2.6	**37.3 ± 13.1***	**32.0 ± 9.6***	8.7 ± 3.5	**42.4 ± 5.4***	**66.1 ± 8.3***	**152.9 ± 11.1***
	F = 6.597	*F* = 2.885	*F* = 2.439	*F* = 5.042	*F* = 23.992	*F* = 8.440	*F* = 19.854
	df = 15, 159	df = 17, 179	df = 17, 179	df = 17, 179	df = 17, 179	df = 17, 179	df = 17, 179
	P < 0.001	*P* < 0.001	*P* = 0.002	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q1) 2008							
	30.8 ± 11.4	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0	2.7 ± 1.8	**29.0 ± 8.8***
4 PolM	1.6 ± 0.9	**30.7 ± 13.0***	2.5 ± 1.2	9.7 ± 4.4	3.7 ± 2.0	4.3 ± 5.2	0.0 ± 0.0
10 PolM	6.5 ± 4.4	2.2 ± 1.8	2.8 ± 1.3	1.7 ± 1.3	1.8 ± 1.7	4.7 ± 2.5	5.7 ± 5.7
11	**60.2 ± 28.2***	**25.9 ± 6.7***	**33.2 ± 3.9***	13.8 ± 9.2	**51.4 ± 9.4***	**52.0 ± 21.1***	**52.2 ± 18.1***
14 PrN	0.0 ± 0.0	2.4 ± 1.3	20.0 ± 12.4	0.0 ± 0.0	1.0 ± 0.7	ND	0.2 ± 0.2
	F = 4.087	*F* = 5.043	*F* = 4.493	*F* = 1.624	*F* = 7.594	*F* = 4.696	*F* = 5.544
	df = 12, 129	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 11, 119	df = 13, 139
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.087	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q2) 2008							
19	**27.7 ± 4.7***	17.2 ± 4.8	**108.1 ± 13.0***	**49.3 ± 19.2***	**242.1 ± 10.6***	**84.2 ± 11.4***	41.7 ± 16.0
20 Pol	1.3 ± 0.8	1.2 ± 0.6	0.7 ± 0.5	0.2 ± 0.2	6.3 ± 5.1	3.0 ± 1.2	7.6 ± 5.7
21 PolM	2.8 ± 1.9	5.7 ± 3.9	21.1 ± 13.8	0.0 ± 0.0	0.0 ± 0.0	2.2 ± 1.0	7.3 ± 3.7
25	**19.4 ± 6.1***	0.0 ± 0.0	7.4 ± 6.7	0.2 ± 0.2	22.5 ± 15.8	1.9 ± 1.1	17.6 ± 7.2
28	**50.5 ± 9.0***	ND	**56.0 ± 14.1***	**58.5 ± 12.8***	**154.9 ± 19.0***	9.2 ± 2.2	19.5 ± 3.9
29 M	2.7 ± 1.5	**91.3 ± 17.7***	2.2 ± 1.1	0.2 ± 0.2	67.3 ± 127.3	4.2 ± 1.8	1.2 ± 1.1
	F = 15.581	*F* = 13.893	*F* = 20.604	*F* = 9.607	*F* = 26.301	*F* = 36.590	*F* = 1.851
	df = 10, 109	df = 9, 99	df = 10, 109	df = 10, 109	df = 10, 109	df = 9, 99	df = 10, 109
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.061
(Q3) 2008							
32	1.9 ± 0.9	11.0 ± 3.0	17.9 ± 6.4	0.0 ± 0.0	3.3 ± 1.8	**41.4 ± 7.9***	**41.9 ± 13.7***
34 PrN	15.4 ± 7.1	13.5 ± 3.4	31.0 ± 9.0	0.1 ± 0.1	5.0 ± 2.9	8.9 ± 4.5	30.2 ± 17.6
37	2.0 ± 1.7	4.5 ± 2.2	**52.1 ± 19.4***	**0.9 ± 0.5***	**41.2 ± 16.9***	9.4 ± 7.2	0.0 ± 0.0
38 PoiM	2.9 ± 1.0	5.1 ± 4.6	6.9 ± 4.6	0.0 ± 0.0	7.1 ± 5.3	4.6 ± 2.1	1.4 ± 0.5
	F = 2.219	*F* = 1.453	*F* = 2.576	*F* = 2.615	*F* = 3.716	*F* = 4.827	*F* = 4.297

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79
	P = 0.042	*P* = 0.198	*P* = 0.020	*P* = 0.018	*P* = 0.002	*P* < 0.001	*P* < 0.001
(Q4) 2008							
43	**46.1 ± 15.8***	7.9 ± 4.6	6.3 ± 4.3	8.9 ± 5.4	9.9 ± 5.2	4.3 ± 2.9	7.5 ± 4.3
45	3.8 ± 3.1	1.1 ± 1.1	0.0 ± 0.0	4.2 ± 2.5	**56.1 ± 8.5***	8.8 ± 3.0	0.0 ± 0.0
46 M	0.0 ± 0.0	0.3 ± 0.3	5.6 ± 2.7	0.6 ± 0.5	0.0 ± 0.0	0.7 ± 0.7	24.2 ± 8.5
47	0.0 ± 0.0	14.2 ± 5.6	**23.9 ± 14.0***	14.0 ± 5.6	11.2 ± 3.0	23.8 ± 6.6	**39.7 ± 17.8***
49 Pol	2.0 ± 1.0	6.2 ± 5.3	9.2 ± 5.9	1.2 ± 0.6	17.5 ± 8.3	20.7 ± 8.7	24.7 ± 8.4
57 Pol	24.3 ± 6.5	1.0 ± 0.7	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	7.3 ± 2.1	0.0 ± 0.0
59	4.2 ± 2.3	17.8 ± 9.2	0.0 ± 0.0	1.9 ± 1.1	2.0 ± 1.3	**45.0 ± 8.7***	3.9 ± 1.3
61	13.3 ± 7.9	18.1 ± 6.6	8.8 ± 3.2	**52.3 ± 12.2***	**48.7 ± 9.5***	24.4 ± 9.1	9.5 ± 4.7
	F = 3.729	*F* = 1.841	*F* = 1.866	*F* = 8.719	*F* = 14.077	*F* = 5.262	*F* = 3.596
	df = 17, 179	df = 17, 179	df = 17, 179	df = 16, 169	df = 16, 169	df = 17, 179	df = 17, 179
	P < 0.001	*P* = 0.027	*P* = 0.024	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q1) 2009							
4 PolM	3.8 ± 1.2	1.5 ± 01.4	0.0 ± 0.0	2.4 ± 1.6	3.9 ± 2.2	0.0 ± 0.0	0.6 ± 0.5
9	**18.6 ± 5.8***	**25.1 ± 10.7***	4.0 ± 2.1	1.1 ± 0.7	12.9 ± 5.4	0.8 ± 0.8	0.0 ± 0.0
10 PolM	0.1 ± 0.1	0.2 ± 0.2	0.6 ± 0.6	3.0 ± 2.4	0.7 ± 0.7	0.4 ± 0.4	0.4 ± 0.4
11	**23.6 ± 6.5***	13.1 ± 3.2	**62.2 ± 22.2***	15.4 ± 6.3	**138.6 ± 8.6***	**268.8 ± 54.4***	**75.3 ± 18.2***
14 PrN	1.9 ± 1.1	0.7 ± 0.4	0.3 ± 0.2	**79.5 ± 9.9***	**56.5 ± 21.2***	7.6 ± 6.5	**26.7 ± 6.3***
15	4.1 ± 1.9	1.6 ± 0.6	1.1 ± 0.5	12.6 ± 4.8	**72.1 ± 17.4***	0.3 ± 0.3	0.1 ± 0.1
	F= 6.618	*F*= 5.206	*F*= 7.215	*F*= 35.891	*F*= 22.590	*F*= 23.800	*F*= 15.376
	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139	df = 13, 139
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q2) 2009							
19	**106.8 ± 30.5***	**123.5 ± 30.5***	**108.6 ± 29.5***	**33.1 ± 5.1***	**151.9 ± 16.9***	**24.3 ± 10.1***	**26.8 ± 17.8***
20 Pol	16.1 ± 4.8	32.1 ± 17.2	1.4 ± 1.2	14.9 ± 5.3	9.8 ± 3.4	**27.9 ± 12.9***	0.6 ± 0.5
21 PolM	0.1 ± 0.1	1.9 ± 1.3	1.6 ± 1.1	1.9 ± 0.8	0.2 ± 0.2	0.0 ± 0.0	0.8 ± 0.5
29 M	0.0 ± 0.0	2.1 ± 1.6	5.4 ± 1.8	0.8 ± 0.6	1.5 ± 1.4	0.0 ± 0.0	0.6 ± 0.3
	F = 10.979	*F* = 12.247	*F* = 11.490	*F* = 6.681	*F* = 64.455	*F* = 4.298	*F* = 2.150
	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 9, 99
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.033
(Q3) 2009							
32	4.1 ± 1.1	**25.6 ± 12.0***	2.7 ± 1.2	0.2 ± 0.2	0.0 ± 0.0	1.0 ± 0.9	0.5 ± 0.5
34 PrN	1.6 ± 1.1	5.1 ± 1.4	0.5 ± 0.3	5.9 ± 2.3	0.4 ± 0.4	**17.6 ± 9.5***	10.1 ± 6.5
38 PolM	9.7 ± 6.3	16.1 ± 3.2	4.4 ± 2.6	0.8 ± 0.8	**20.2 ± 4.6***	**22.5 ± 2.3***	**60.5 ± 14.1***
40	1.0 ± 0.6	15.7 ± 4.6	7.4 ± 5.1	**14.8 ± 3.6***	**17.9 ± 7.5***	1.3 ± 0.7	0.3 ± 0.2
	F = 2.095	*F* = 2.665	*F* = 1.419	*F* = 9.686	*F* = 7.052	*F* = 5.448	*F* = 14.725
	df = 7, 79	df = 6, 69	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79
	P = 0.055	*P* = 0.023	*P* = 0.211	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q4) 2009							
43	4.0 ± 1.6	0.6 ± 0.5	1.1 ± 0.8	2.7 ± 2.7	5.4 ± 3.6	**31.7 ± 10.1***	0.5 ± 0.2
44	1.1 ± 0.8	3.1 ± 2.1	1.7 ± 1.2	**14.7 ± 5.5***	0.0 ± 0.0	1.5 ± 1.5	0.0 ± 0.0
46 M	ND	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	1.8 ± 1.8	1.2 ± 0.8	0.1 ± 0.1
47	5.1 ± 2.0	**13.8 ± 8.1***	ND	6.9 ± 3.8	**10.9 ± 5.1***	3.4 ± 1.8	0.6 ± 0.6
48	0.0 ± 0.0	1.4 ± 1.0	2.5 ± 1.4	0.5 ± 0.4	**14.8 ± 4.3***	8.5 ± 2.7	0.1 ± 0.1

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
49 Pol	0.6 ± 0.6	2.4 ± 0.9	4.3 ± 2.6	1.4 ± 0.7	1.2 ± 1.0	0.8 ± 0.6	1.3 ± 1.1
54	1.9 ± 1.3	1.9 ± 0.7	**11.0 ± 3.6***	0.5 ± 0.4	0.8 ± 0.5	0.0 ± 0.0	0.6 ± 0.6
57 Pol	0.2 ± 0.1	0.9 ± 0.9	0.0 ± 0.0	0.4 ± 0.3	2.9 ± 2.2	0.0 ± 0.0	0.3 ± 0.3
61	**25.2 ± 5.5***	3.8 ± 1.8	ND	ND	ND	ND	ND
	F = 14.125	*F* = 2.264	*F* = 3.780	*F* = 3.682	*F* = 4.340	*F* = 7.566	*F* = 0.506
	df = 16, 169	df = 17, 179	df = 15, 159	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169
	P < 0.001	*P* = 0.004	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.941
(Q1) 2010							
1	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0	**87.6 ± 6.3***	**89.2 ± 2.9***	**14.4 ± 1.8***	**47.5 ± 8.3***
4 PolM	0.3 ± 0.3	0.3 ± 0.3	0.0 ± 0.0	0.0 ± 0.0	3.9 ± 2.4	0.0 ± 0.0	0.0 ± 0.0
6	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.2	1.9 ± 1.1	**111.8 ± 7.4***	1.2 ± 1.0	0.0 ± 0.0
7	0.0 ± 0.0	0.0 ± 0.0	**7.8 ± 2.6***	**23.9 ± 3.9***	**26.3 ± 4.8***	0.6 ± 0.4	0.0 ± 0.0
10 PolM	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.5 ± 0.3	0.2 ± 0.1	0.0 ± 0.0
11	2.6 ± 1.9	0.2 ± 0.2	**19.0 ± 3.3***	ND	ND	ND	ND
12	0.1 ± 0.1	0.3 ± 0.3	1.5 ± 0.9	2.0 ± 1.0	0.2 ± 0.2	0.0 ± 0.0	0.0 ± 0.0
13	0.8 ± 0.7	0.0 ± 0.0	0.6 ± 0.6	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
14 N	0.8 ± 0.8	0.0 ± 0.0	3.8 ± 1.3	**16.2 ± 3.7***	10.7 ± 1.8	0.5 ± 0.5	0.0 ± 0.0
15	**31.0 ± 15.5***	0.5 ± 0.4	0.4 ± 0.3	0.4 ± 0.4	0.7 ± 0.3	0.5 ± 0.3	0.0 ± 0.0
	F = 3.814	*F* = 0.801	*F* = 18.781	*F* = 109.855	*F* = 184.080	*F* = 35.529	*F* = 32.665
	df = 13, 139	df = 13, 139	df = 13, 139	df = 12, 129	df = 12, 129	df = 12, 129	df = 12, 129
	P < 0.001	*P* = 0.695	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q2) 2010							
19	0.3 ± 0.3	0.4 ± 0.3	**3.1 ± 1.9***	**20.8 ± 10.4***	**14.3 ± 4.0***	**14.7 ± 2.6***	**14.4 ± 6.2***
20 Pol	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
21 PolM	0.0 ± 0.0	1.1 ± 0.7	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
29	0.0 ± 0.0	0.8 ± 0.8	1.1 ± 0.9	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
	F = 0.750	*F* = 1.255	*F* = 2.390	*F* = 3.876	*F* = 12.770	*F* = 31.982	*F* = 5.519
	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109
	P = 0.676	*P* = 0.267	*P* = 0.014	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q3) 2010							
30	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0	**193.0 ± 15.6***	**234.2 ± 4.7***	**376.7 ± 14.9***	**229.0 ± 15.8***
32	0.0 ± 0.0	0.4 ± 0.4	0.0 ± 0.0	**54.8 ± 4.7***	**92.1 ± 2.9***	**179.9 ± 18.8***	**94.7 ± 8.8***
34 N	0.0 ± 0.0	0.2 ± 0.2	3.9 ± 3.2	**26.5 ± 4.8***	**20.6 ± 2.6***	15.3 ± 5.3	18.0 ± 3.0
37	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.5 ± 0.5	1.2 ± 0.8	0.0 ± 0.0
38 PolM	0.1 ± 0.1	0.0 ± 0.0	1.2 ±1.1	0.1 ±0.1	1.5 ±1.0	3.7 ±2.1	0.0 ±0.0
39	0.1 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.3	0.0 ± 0.0	0.0 ± 0.0
40	0.4 ± 0.4	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	3.8 ± 3.1	0.0 ± 0.0	0.0 ± 0.0
	F=0.857	*F* = 0.905	F=1.456	F=125.154	F=1139.984	F=249.817	*F* = 160.770
	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79
	P=0.544	*P* = 0.507	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q4)							
43	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	25.5 ± 5.4*	17.4 ± 3.9*	88.6 ± 8.0*	3.8 ± 1.5*
46 M	0.9 ± 0.9	0.0 ± 0.0	0.3 ± 0.2	0.0 ± 0.0	0.4 ± 0.3	0.0 ± 0.0	ND
47	0.1 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	12.9 ± 2.4*	20.4 ± 2.9*	2.6 ± 1.5*
49 Pol	0.1 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
54	0.0 ± 0.0	0.3 ± 0.3	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	24.0 ± 9.2	0.0 ± 0.0

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
57 Pol	0.3 ± 0.3	0.1 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
	F = 0.645	*F* = 0.673	*F* = 2.002	*F* = 21.858	*F* = 20.275	*F* = 45.598	*F* = 4.496
	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 15, 159
	P = 0.843	*P* = 0.817	*P* = 0.016	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001
(Q1) 2011							
4MPol	0.4 ± 0.3	2.0 ± 1.3	1.0 ± 0.8 **M**	0.4 ± 0.2	1.3 ± 0.8	5.0 ± 3.9	0.3 ± 0.2
6	0.7 ± 0.5	0.3 ± 0.3	0.0 ± 0.0	0.3 ± 0.3	**4.2 ± 1.7***	0.8 ± 0.8	0.0 ± 0.0
10 MPol	0.2 ± 0.1	0.0 ± 0.0	0.3 ± 0.2 **M**	3.3 ± 2.3	0.0 ± 0.0	0.6 ± 0.6	0.5 ± 0.5
12	0.9 ± 0.6	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.1	0.7 ± 0.7	0.0 ± 0.0	0.1 ± 0.1
13	0.0 ± 0.0	1.7 ± 1.4	1.2 ± 0.9	0.2 ± 0.2	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0
14 N	0.2 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.3 ± 0.3	0.3 ± 0.3	1.9 ± 1.2	0.2 ± 0.2
15	0.1 ± 0.1	0.2 ± 0.2	2.0 ± 1.8	0.2 ± 0.2	1.8 ± 1.6	1.9 ± 1.3	1.5 ± 1.4
	F = 1.798	*F* = 1.164	*F* = 0.932	*F* = 1.504	*F* = 2.626	*F* = 1.258	*F* = 0.895
	df = 12, 129	df = 12, 129	df = 12, 129	df = 12, 129	df = 12, 129	df = 12, 129	df = 12, 129
	P = 0.056	*P* = 0.317	*P* = 0.518	*P* = 0.132	*P* = 0.004	*P* = 0.253	*P* = 0.554
(Q2) 2011							
17	0.1 ± 0.1	0.6 ± 0.6	3.0 ± 2.1	0.1 ± 0.1	0.0 ± 0.0	0.0 ± 0.0	0.4 ± 0.4
19	**14.9 ± 3.5***	**10.8 ± 5.8***	0.0 ± 0.0	**10.8 ± 2.5***	4.7 ± 2.1	6.4 ± 1.9	5.0 ± 2.2
20 Pol	0.6 ± 0.4	0.0 ± 0.0	0.5 ± 0.5	1.4 ± 1.2	0.1 ± 0.1	2.8 ± 1.7	0.5 ± 0.5
21 MPol	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.1 **M**	1.8 ± 1.7	0.7 ± 0.7	5.7 ± 3.1	1.2 ± 1.2
22	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.9 ± 0.5	**13.7 ± 4.9***	1.1 ± 1.1	0.0 ± 0.0
24	0.2 ± 0.2	0.8 ± 0.8	0.9 ± 0.6	0.9 ± 0.6	9.6 ± 3.4	**13.6 ± 4.9***	7.8 ± 5.5
25	0.3 ± 0.3	2.2 ± 1.3	0.0 ± 0.	0.0 ± 0.0	**12.6 ± 3.8***	0.0 ± 0.0	0.5 ± 0.5
27	0.0 ± 0.0	0.0 ± 0.0	1.1 ± 0.5	**16.8 ± 2.5***	6.1 ± 1.4	0.2 ± 0.2	0.1 ± 0.1
28	0.0 ± 0.0	0.5 ± 0.4	3.3 ± 1.5	0.6 ± 0.3	**11.8 ± 3.1***	0.0 ± 0.0	0.2 ± 0.1
29 M	0.0 ± 0.0	2.4 ± 1.1	1.5 ± 0.8 **M**	4.8 ± 2.6	0.4 ± 0.2	3.2 ± 2.2	2.0 ± 1.1
	F = 17.039	*F* = 2.942	*F* = 2.029	*F* = 12.361	*F* = 5.224	*F* = 3.276	*F* = 1.780
	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109	df = 10, 109
	P < 0.001	*P* = 0.003	*P* = 0.038	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.074
(Q3) 2011							
30	**55.3±5.2***	**226.4±18.8***	**27.1±3.8***	**349.1±20.9***	**585.8±16.8***	**66.2±10.5***	1.5±1.3
32	**59.4 ± 4.7***	**203.3 ± 16.2***	**20.7 ± 2.9***	**474.4 ± 19.3***	**60.7 ± 67.6***	0.2 ± 0.2	3.2 ± 2.6
34 N	2.5 ± 1.2	**51.1 ± 9.9***	**18.7 ± 3.1***	**24.7 ± 3.9***	**75.7 ± 8.3***	**29.0 ± 5.7***	2.8 ± 5.8
38 MPol	0.9 ± 0.7	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2	0.0 ± 0.0	1.1 ± 1.1	1.5 ± 0.9
39	0.1 ± 0.1	0.0 ± 0.0	1.0 ± 0.7 **M**	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.3	0.0 ± 0.0
40	4.2 ± 1.6	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	1.4 ± 0.9	0.2 ± 0.6	0.2 ± 0.2
	1.0 ± 0.8	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.1	1.4 ± 0.9	0.1 ± 0.3
	F = 98.312	*F* = 105.701	*F* = 32.291	*F* = 356.160	*F* = 802.957	*F* = 32.263	*F* = 0.941
	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79	df = 7, 79
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* = 0.481
(Q4) 2011							
43	**8.3 ± 1.8***	2.5 ± 0.9	**18.8 ± 2.2***	**20.0 ± 3.5***	**66.4 ± 6.7***	**37.3 ± 12.7***	0.1 ± 0.1
45	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.8 ± 0.4	**34.1 ± 5.5***	**76.8 ± 10.7***	0.0 ± 0.0
46 M	0.3 ± 0.2	0.0 ± 0.0	0.3 ± 0.2 **M**	0.3 ± 0.2	0.0 ± 0.0	3.1 ± 2.9	0.3 ± 0.3
47	**6.1 ± 2.8***	**10.4 ± 3.7***	**7.4 ± 2.0***	5.2 ± 1.9	6.3 ± 2.8	**47.8 ± 9.5***	8.3 ± 3.3
49 Pol	4.0 ± 1.0	0.0 ± 0.0	1.2 ± 0.9	2.4 ± 0.9	0.2 ± 0.2	3.4 ± 1.7	0.2 ± 0.2

(Table continues)

Table 2. Mean number (± SE) Jackson Square tree acoustical counts.

Tree	Mar.	April	May	July	Aug.	Sept.	Oct.
47	**6.1 ± 2.8***	**10.4 ± 3.7***	**7.4 ± 2.0***	5.2 ± 1.9	6.3 ± 2.8	**47.8 ± 9.5***	8.3 ± 3.3
49 Pol	4.0 ± 1.0	0.0 ± 0.0	1.2 ± 0.9	2.4 ± 0.9	0.2 ± 0.2	3.4 ± 1.7	0.2 ± 0.2
51	**12.2 ± 0.9***	0.0 ± 0.0	2.5 ± 1.7	0.0 ± 0.0	0.7 ± 0.4	3.8 ± 2.4	**87.2 ± 18.6***
52	0.0 ± 0.0	1.2 ± 0.9	0.4 ± 0.3	30.5 ± 4.1	**16.5 ± 3.9***	0.7 ± 0.4	0.0 ± 0.0
55	**11.7 ± 3.2***	0.0 ± 0.0	0.1 ± 0.1	**10.4 ± 2.9***	**12.7 ± 1.8***	0.1 ± 0.1	0.5 ± 0.5
56	1.0 ± 1.0	0.0 ± 0.0	1.0 ± 0.9	7.1 ± 2.4	1.3 ± 3.0	**33.5 ± 12.9***	4.0 ± 1.78
57 Pol	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.3 ± 0.3	0.2 ± 0.2	0.0 ± 0.0
	F = 11.561	*F* = 7.136	*F* = 24.224	*F* = 26.148	*F* = 50.062	*F* = 15.512	*F* = 19.783
	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169	df = 16, 169
	P < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001	*P* < 0.001

* Means significantly > 0; protected Tukey Test ($P < 0.05$). PoI post imidacloprid treatment.
M mud tube present in May 2011. N tree adjacent to active noviflumuron bait station. ND no data.