Native and Exotic Ambrosia Beetles (Coleoptera: Scolytidae) Captured from an Intensively Managed Forest Plantation

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ABSTRACT

In the spring of 2002, a large ambrosia beetle (Coleoptera: Scolytidae) infestation occurred on an intensively managed plantation near Aiken, SC. The 22 ha plantation contained four tree species and received fertilization and irrigation treatments. Cottonwood was the species most affected, with over 40% of the trees sustaining some ambrosia beetle damage. A monitoring program was immediately initiated, and continual trapping has occurred since June 2002. To date 3,159 scolytids have been trapped using ethanol lures. Nearly 90% of these captures are exotic species. South Carolina is particularly vulnerable to exotic species introductions due to its proximity to major shipping ports. This survey demonstrates the necessity for intensive monitoring programs to determine the arrival of new exotic species and to increase our knowledge about their phenology and flight patterns.

INTRODUCTION

Ambrosia beetles generally attack weakened or stressed trees. Damage can be particularly bad near logging operations, where felled logs attract ambrosia beetles. Ambrosia beetles may also attack living trees (Fig. 1). Furthermore, the threat of exotic species entering the US from South Carolina ports is a major concern, as exotic species are often unknowingly transported from other countries in ballast or other wood products.

In the spring of 2002 a large infestation occurred on a plantation of healthy trees in South Carolina. This provided an opportunity to monitor ambrosia beetle species composition, populations, and flight periods. We hypothesized that the majority of trap captures would be indigenous species, and that flight patterns would peak in spring and late summer.

Figure 1. Damage to Christmas tree plantation by *Xylosandrus compactus*. Photo courtesy of Bugwood Resources.

MATERIALS AND METHODS

The study location consisted of an intensively managed tree plantation containing five tree genotypes: eastern cottonwood (*Populus deltoides*) clones ST66 and S7C15, sycamore (*Planatus occidentalis*), sweetgum (*Liquidambar styraciflua*), and loblolly pine (*Pinus taeda*). Trees received various irrigation and fertilization amendments, as the primary focus of the study was to examine tree growth and biomass and nutrient partitioning in response to varying resource levels (Coleman et al. 2004). Four Lindgren funnel traps were installed on the plantation perimenter (Fig.2). Traps were baited with ethanol and checked weekly during the summer or bi-weekly during the winter. With the exception of two genera, all Scolytidae were identified to species.

Figure 2. Location of study area: USA, SC, Aiken Co. Red dots on right indicate trap placement.

	Tribe	Species	2002	2003	Grand total	% of total
Exotic	Xyleborini	*Xyleborinus saxeseni* (Ratzburg)	674	1426	2100	66.48%
Exotic	Xyleborini	*Xylosandrus crassiusculus* (Motschulsky)	35	348	383	12.12%
	Cryphalini	*Hypothenemus* spp.	72	146	218	6.90%
Exotic	Dryocoetini	*Dryoxylon onoharaensum* (Murayama)	42	145	187	5.92%
Exotic	Xyleborini	*Ambrosiodmus rubricollis* (Eichhoff)	23	33	56	1.77%
	Xyleborini	*Xyleborus impressus* Eichhoff	18	36	54	1.71%
Exotic	Xyleborini	*Xyleborus californicus* Wood	0	51	51	1.61%
Exotic	Xyleborini	*Xyleborus atratus* Eichhoff	0	21	21	0.66%
	Xyleborini	*Xyleborus ferrugineus* (Fabricius)	7	10	17	0.54%
	Corthylini	*Pityophthorus* spp.	4	9	13	0.41%
	Xyleborini	*Xyleborus pubescens* Zimmermann	1	9	10	0.32%
	Corthylini	*Monarthrum fasciatum* (Say)	0	10	10	0.32%
	Xyleborini	*Xyleborinus affinis* Eichhoff	1	6	7	0.22%
	Ipini	*Ips avulsus* (Eichhoff)	3	2	5	0.16%
	Xyleborini	*Ambrosiodmus tachygraphus* Zimmermann	0	5	5	0.16%
	Corthylini	*Monarthrum mali* (Fitch)	0	5	5	0.16%
	Hylesinini	*Hylastes tenuis* Eichhoff	1	2	3	0.09%
	Corthylini	*Pseudopityophthorus pruinosus* Eichhoff	0	3	3	0.09%
	Corthylini	*Pseudopityophthorus minutissimus* (Zimmermann)	2	0	2	0.06%
	Micracini	*Micracisella nanula* (LeConte)	0	2	2	0.06%
Exotic	Xyleborini	*Xylosandrus compactus* (Eichhoff)	0	2	2	0.06%
	Ipini	*Orthotomicus caelatus* (Eichhoff)	1	0	1	0.03%
Exotic	Xyleborini	*Euwallacea validus* (Eichhoff)	0	1	1	0.03%
	Corthylini	*Gnathotrichus materiarius* (Fitch)	0	1	1	0.03%
	Ipini	*Ips calligraphus* (Germar)	0	1	1	0.03%
	Ipini	*Pityogenes hopkinsi* Swaine	0	1	1	0.03%
		Total	884	2275	3159	

RESULTS

A total of 3,159 Scolytidae were trapped between 18 June 2002 and 18 December 2003 (Table 1). Trap captures represented 26 species, of which 12 species were captured in both years. Eight exotic species were captured, comprising nearly 89% of the total specimens collected. The number of exotic species captured is surprising, and contradicts our first hypothesis. The exotic beetle *Xyleborinus saxesini* accounted for over 66% of total trap captures alone (Table 1). Twelve species trapped in 2003 were not trapped in 2002, whereas only two species trapped in 2002 were not trapped in 2003.

Temporal patterns showed a pulse in beetle flight activity in late summer 2002 and early spring 2003 (Fig. 3). In contrast to 2002, there was no obvious increase in insect activity in late summer 2003. Our second hypothesis agrees with these flight patterns.

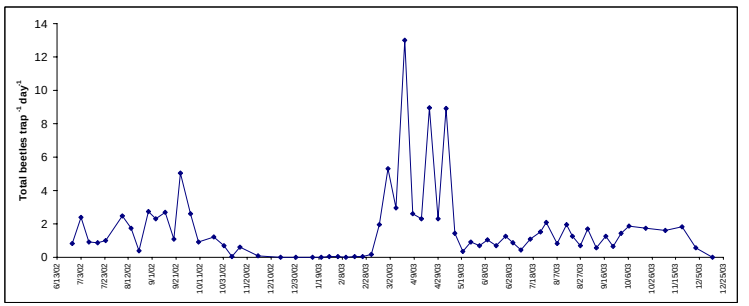

Figure 3. Temporal variation in ambrosia beetle flight activity for the period 18 June 2002 through 18 December 2003.

Xylosandrus crassiusculus. Photo courtesy of the Canadian Forest Service.

Hypothenemus species. Photo courtesy of Bugwood Resources.

SUMMARY AND FUTURE PLANS

- A small number of species comprised the majority of trap captures, and six of the eight most common species were exotic to North America (Table 1).
- Beetle flight followed expected patterns: high peak in early spring, and a smaller peak in autumn.
- Interestingly, plantation trees have received only sporadic attacks since the initial 2002 infestation.
- Traps will be monitored at least through June 2004, and beyond if additional resources can be procured. This will allow us to compare spring 2003 and 2004 flight patterns.
- All species trapped in this study will be cross-referenced with the state records collection housed in the Clemson University Insect Museum, and voucher specimens of any new state records will be housed in the Museum collection. This data will be published at the conclusion of the study. Trap capture rates will be correlated with air temperature, relative humidity, and rainfall in the hopes of identifying abiotic mechanisms driving Scolytidae flight patterns.

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