Purdue University
Department of Entomology
Undergraduate Capstone
Project Summary

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Project Title:

Non-target Coleoptera attracted to Emerald Ash Borer style Purple Traps

Project Summary:

Emerald ash borer is an invasive buprestid beetle that was introduced into Michigan from China. It attacks ash trees, which are used extensively in urban development and are important forest trees, and has a 100% mortality. The larvae, like those of other Buprestidae, feed under the bark; in large numbers they cut off the nutrient flow of the tree, starving it until the tree is killed.

The beetle has been spread, mostly through human means, through Indiana and also has disjunct populations in Ohio, Pennsylvania, and Maryland. All 48 continental states have established monitoring programs to varying degrees – states where EAB has not been found are watching campgrounds (where it is transported through infested firewood) while states with known populations (Indiana, Ohio, and Pennsylvania being examples) have monitoring traps on a 2 km grid statewide.

I was interested to know if the purple monitoring traps that were being used were attracting any other families of beetles, if these families were beneficial, and if they might be detrimentally affected by such a large scale program. In order to test these hypotheses I constructed traps similar to those used for monitoring – mine were purple corrugated plastic cut into 6x48" pieces – as well as control traps – which were 1/8" Plexiglas cut into the same dimensions. Nine arrays were set up with one purple and one clear trap at each location. Because of restricted funding I could not set the arrays up over a large area, so arrays 1-5 were around one location and arrays 6-9 were at another a few miles away. I didn't want any array affecting the catch rate of another array, so I set each one a minimum of 500 meters from the next closest array. The environment was all secondary growth forest of varying ages; traps were placed in a variety of habitats, including edge and non-edge, closer to streams and valley bottoms or up higher on hillsides, etc. I thought that with a 2 km grid, the monitoring programs will be covering most or all available environments and I wanted to reflect that.

The traps were set in early May and collected for the last time in the middle of August. They were hung between 20' and 30' in the lower canopy. The traps were covered with a plastic film, which was then covered with Tanglefoot trap glue. Approximately every two weeks the film was changed and new trap glue was applied. The used film was tagged with the appropriate label and stored in a freezer until I could process it. Processing a sample required it be submerged in a xylene bath, usually overnight or over the course of the day, in order to strip the captured insects off. The bath was in a series of two buckets, the smaller of the two having the bottom cut out and a fine mesh screen installed. The smaller bucket could then be lifted out of the xylene, straining out the insects. After straining, the sample was washed to remove excess xylene and stored in alcohol.

Once all of the samples were processed and stored in alcohol, they were course sorted to order – Coleoptera in one vial, Diptera in a second, and everything else in a third. After course sorting was completed, the beetles were identified to the family level. This data was then entered into an Access database from which data could be mined.

Charts were then generated in Excel that showed the number of individuals caught per trap, the mean number caught per trap type, standard deviation, and standard error for each family. Excel was also used to conduct a 2-tailed, equal variance t-test for each family; two families were checked by hand to ensure the Excel algorithm was working properly.

1	Family	Trap Number/Stati	Clear	Purple
109				
110	**Buprestidae**	1	6	14
111		2	6	20
112		3	3	5
113		4	9	36
114		5	2	11
115		6	11	29
116		7	2	7
117		8	1	1
118		9	7	7
119		n	9	9
120		sum	47	130
121		y bar	5.222222	14.44444
122		s	3.456074	11.72722
123		SE	1.152025	3.909075
124		SE(y1-y2)	4.075294	
125		ts	-2.26296	
126		P Value (pooled, e	0.015781	0.037901
127				

An alpha value of .05 was used and four families were shown to have significant p-values. As these families had higher overall catches on purple traps, I took this to mean that they were caught more significantly by purple traps and were therefore attracted to them. These families and there corresponding p-values are:

Buprestidae - 0.037901
Cerambycidae - 0.012311
Haliplidae - 0.028863
Histeridae - 0.031085

Originally pooled t-tests were conducted, which showed an additional three families having significant p-values: Cucujidae, Melyridae, and Carabidae. It was hypothesized that the predator families were being attracted by the same cues as the xylophagus Buprestidae and Cerambycidae. Upon revising the t-test to be non-pooled, this idea is called into question as three of the four families of predators were found not to be significantly attracted.

Overall, nearly 8000 beetles in 46 families were caught and identified in this project. Ten families had more than 100 individuals caught on both purple and clear traps, but only the Buprestids were found to be significant. This shows that sticky traps, regardless of color, are efficient at capturing insects. They are easy to set up and maintain and catch families that are often otherwise overlooked or not caught – between the 18 traps in this project almost 1000 Eucnemidae were caught. Depending on trap placement other uncommonly collected families may be found.

The traps probably aren’t affecting beneficial beetles to a substantial degree, even on a grid of 2 km. Future work will include identifying all non-dipterous insects to determine if there are any other families of insects that are attracted to purple traps. A similar project could be conducted with more arrays to reduce the high standard error and to incorporate different environment types. Arrays could also be set up in edge and non-edge habitat to see if there is any differences.