HYLASTES POPULATION DYNAMICS AND FOREST HEALTH EVALUATION IN ASSOCIATION WITH THINNING AND FERTILIZATION

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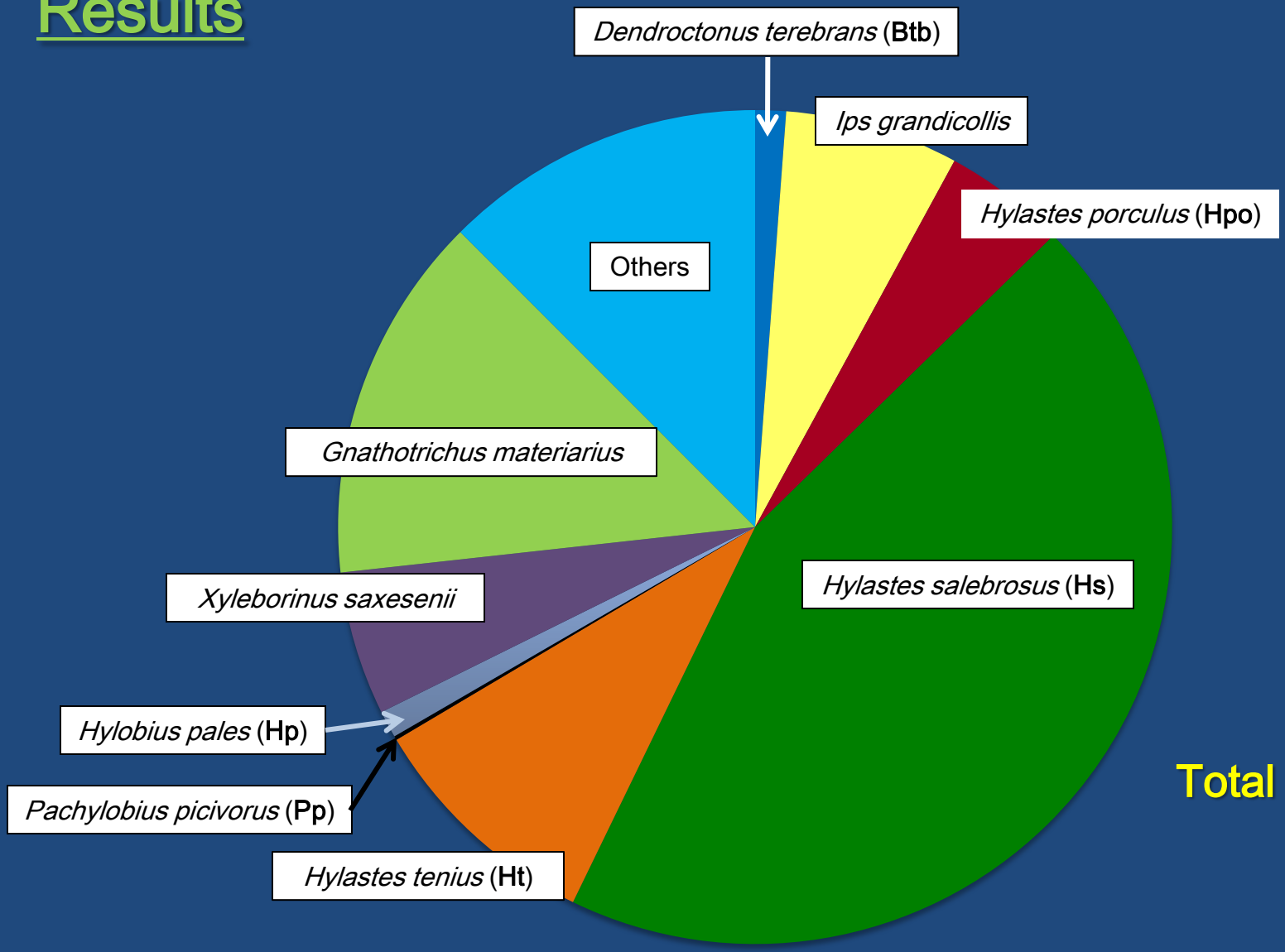
Study Objectives

- **Objectives:**
  - Quantify the populations of root and lower stem colonizing beetles (*Hylastes* spp.) and other pine bark beetles, in stressed and healthy pine stands through three different seasonal periods spring, summer and fall.
  - Compare populations among stands under various management regimes (thinning and fertilization) during the three seasonal periods.
  - Determine tree vigor under various management regimes during the three seasonal periods.
  - Relate all management and site characteristics to changes in populations of root and lower stem colonizing insects while monitoring for changes in forest health condition.

- **Progress:**
  - **Insects collections from March 2008 to March 2010.**
  - **Crown rating**
  - **Resin sampling**
  - **Root sampling**
  - **Data Analysis - *In Progress***

Results



Total = 97,878

Results

Table 1. P-values from ANOVA for treatment effects.

		Root-feeding Species					
	d.f.	Btb	Hpo	Hs	Ht	Pp	Hp
Fertilizer (F)	1	0.8231	0.0143	0.0029	0.0122	0.0420	0.1255
Thinning (T)	3	0.0024	0.2432	0.0053	0.0064	0.0627	0.6214
F*T	3	0.9431	0.8681	0.7872	0.5870	0.2900	0.3313

* Highlighted values indicate significant treatment effect on a species at α = 0.05.

Btb = *Dendroctonus terebrans*, Hpo = *Hylastes porculus*, Hs = *Hylastes salebrosus*, Ht = *Hylastes tenuis*, Pp = *Pachylobius picivorus*, Hp = *Hylobius pales*

Results

Table 2. Comparison of the mean number of root-feeders caught in each treatment.

	Root-feeding Species					
	Btb	Hpo	Hs	Ht	Pp	Hp
Fertilization						
Fertilizer	37a	167a	1552a	314a	6a	35a
No Fertilizer	36a	123b	1171b	253b	4b	29a
Thinning						
100tpa	42a	127a	1472a	316a	6a	36a
200tpa	39a	144a	1527a	314a	5ab	32a
300tpa	47a	173a	1485a	299a	5ab	28a
500tpa	18b	137a	960b	207b	3b	32a

* Different letters among treatment for each insect indicates difference was significant at $\alpha = 0.05$.

Btb = *Dendroctonus terebrans*, Hpo = *Hylastes porculus*, Hs = *Hylastes salebrosus*, Ht = *Hylastes tenuis*, Pp = *Pachylobius picivorus*, Hp = *Hylobius pales*

Beetle Trapping Result Summary

Expected Results

- More beetles in the fertilized plots
- More beetles captured in the 500 spa
  - High density, more stress
  - Less fertilizer per tree
- Less beetles captured in the 100 spa
  - Low density, less stress
  - More fertilizer per tree

Actual Results

- More beetles in fertilized plots
- More beetles captured in the 100 spa
- Less beetles captured in the 500 spa

**Except for 1 species (Hpo)*

Results

Table 3. Comparison of resin weight (gm) and percent volatiles by treatment.

Tree Vigor

	Resin (gm)	Alpha %	Beta %	4AA %
Fertilization				
Fertilizer	3.64a	81.76a	41.40a	3.39a
No Fertilizer	6.02b	30.30b	16.71b	6.07b
Thinning				
100tpa	5.05a	53.05a	24.14a	5.29a
200tpa	4.99a	55.76a	27.12ab	4.22a
300tpa	4.55a	57.28a	35.42b	4.91a
500tpa	4.72a	58.04a	29.53ab	4.50b

* Different letters among treatment for each insect indicates difference was significant at $\alpha = 0.05$.

Results

- Crown Ratings
  - Fertilized stands had higher crown density an lower foliage transparency than did non-fertilized stands.

- Root Sampling
  - Fertilized stands thinned to 100tpa and 200tpa had a 40% greater fungal isolation rate than the other treatments.
  - Extent of root health is unknown as samples were taken using an increment hammer in a nondestructive manner.

Conclusion

- Fertilization may lower tree defenses and therefore attract more insects especially when coupled with an additional stress such as thinning.
  - Fertilized stands produced less resin, had higher percentages of alpha- and beta-pinene, and lower percentages of 4-allyanisole than non-fertilized stands.
  - Fertilized stands had greater numbers of beetles.
  - Stands thinned to 100, 200 and 300tpa had greater numbers of beetles.
  - Stands with greater numbers of beetles had higher inoculation rates.

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Questions