IPS PINI IN BAJA MEXICO

Final Report to International Activity Team
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(slight update from Dec. 2004 semi-final report)

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Purpose:

Meet with CONAFOR (Comisión Nacional Forestal) entomologists in Mexico to develop a cooperative program of work to assess populations of pine engraver (*Ips pini*) in the Baja peninsula. Goals of the project are:

1. to determine the flight seasonality of pine engraver
2. assess pheromone preference to determine the most effective pheromone combination for survey and management, and
3. determine if pheromone preference changes over the season

Background:

The forest health program in Mexico is relatively new with a limited number of experienced professionals to service the country's large area. Similar to many areas of the United States, Mexico is experiencing drought-related outbreaks of bark beetles that have previously received little attention. Thus, Dr. Jaime Villa Castillo, Chief of Forest Health, Comisión Nacional Forestal (CONAFOR) approached me in 2003 with a request to assist his group in evaluating pine engraver (*Ips pini*) activity on a part of the Baja peninsula particularly hard hit. My background with ips activity in Montana, Arizona, and Wyoming were of interest to him.

Our original intent was to evaluate both pine engraver and the piñon ips (*I. confusus*), but time and funding required us to limit our final work to the pine engraver. Dr. Villa was particularly interested in determining the flight periodicity and pheromone preference of the pine engraver attacking Jeffrey pine (*Pinus jeffreyi*) in Baja California, Mexico around Parque Nacional Constitución; an area being hard hit. This information would be used in management plans for the area. CONAFOR committed a number of people to conduct the field and lab work but requested expertise in planning and evaluating the project.

This project has been a good opportunity for the USDA Forest Service to provide needed assistance and expertise to Mexico, and to strengthen ties between the forest health programs of the two countries. In addition, information gathered on insects common to both countries benefits development of future management strategies. Opportunities for collaboration and experience may be particularly important as we look

at the potential of inheriting forest health problems (including changed behaviors of native pests) due to shifts in global climate patterns.

Project Description:
Pheromone production and selection of the pine engraver is known to vary geographically in both the use of ipsdienol enantiomers and in the synergistic effect of lanierone. California populations tend to prefer the negative enantiomer and experience little synergistic effect by lanierone (Birch et al. 1980, Seybold et al. 1995, Miller et al. 1997), whereas in Arizona, the negative enantiomer tends to be preferred but lanierone is nearly obligatory for attraction (Steed 2003). In addition to geographic variation, the attraction of enantiomeric ratios varies seasonally (Steed 2003). Thus, monitoring population levels over time with a poor pheromone combination may lead to erroneous conclusions. Effectiveness of mass trapping, both in attraction of the bark beetle and in the removal of beneficial predators, is affected by the pheromone combination used as well as the season of deployment (Aukema et al. 2000, Dahlsten et al. 2003).

Specifically, this project compares the attraction of five different enantiomeric ratios of ipsdienol (+75/-25, +50/-50, +35/-65, +13/-87, +3/-97) with and without the synergist lanierone, and two controls (empty trap and trap w/ lanierone only) during the initial spring flight and the second flight in the summer. Between these two flights and after the second flight, monitoring traps with +50/-50 and +16/-84 ipsdienol with lanierone were used to monitor seasonal flight patterns. Test of pheromone preference and seasonal flight were replicated at three sites.

By the first of April, 2004 we had deployed pheromone traps at the three sites in Parque Nacional Constitución approximately one mile distant from each other (Figures 1-4).

Figure 1: Laguna Hanson and surrounding Jeffrey pine areas of Parque Nacional Constitución

Figure 2: trap site 1 (San Luis)

Figure 3: trap site 2 (Tres Venados)

Figure 4: trap site 3 (Campamento)

Traps were successfully deployed from April 1 through the end of July (2004) with insects collected weekly (Figures 5-7).

Figure 5: the crew hanging traps

Figure 6: Lindgren-funnel trap hung

Figure 7: setting traps with pheromone

As of January 2005, insect collections have been identified and counted, and the data entered and verified. As of November 2005, the data has been statistically analyzed and a poster presentation made for the XIII Simposio Nacional de Parasicología Forestal in Morelia, Mexico (Figure 8). The shorter English summary is given as an Appendix. If details of there results are of interest, please contact Brytten for more specifics.

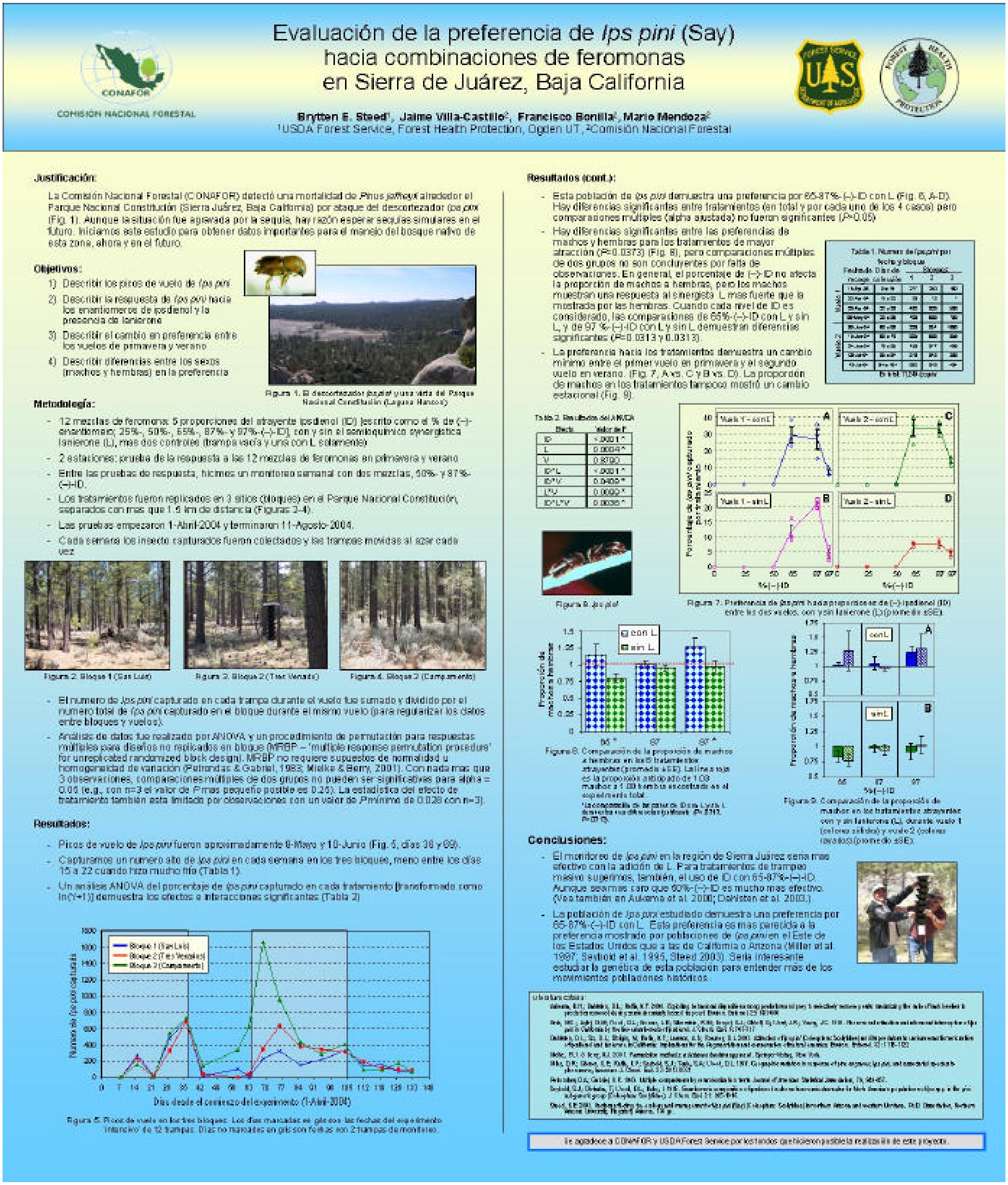

Figure 8: Poster (in Spanish) presented November 2005 in Morelia, Mexico for the XIII Simposio Nacional de Parasicología Forestal

References Cited:

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Seybold, S.J.; Ohtsuka, T.; Wood, D.L.; Kubo, I. 1995. Enantiomeric composition of ipsdienol: a chemotaxonomic character for North American populations of *Ips* spp. in the *pini* subgeneric group (Coleoptera: Scolytidae). J. Chem. Ecol. 21: 995-1016.

Steed, B. E. 2003. Factors affecting the ecology and management of *Ips pini* (Say) (Coleoptera: Scolytidae) in northern Arizona and western Montana. Ph.D. Dissertation, Northern Arizona University, Flagstaff, Arizona. 130 pp.

Travel Dates and Costs FY2004-2005:

- March 26-April 4, FY2004: one week+ on-site visit to chose trapping locations, set traps and pheromone, trained field personnel in the collection of samples and re-randomization of traps

TOTAL TRAVEL VOUCHER: $1,249

- April 30-May 3, FY2004: weekend visit to CONAFOR office in Mexicali to identify and count the 1st month's intensive sampling trap catches, train assisting CONAFOR technicians, and prepare all materials (field and lab) for the upcoming months of monitoring and intensive trapping

TOTAL TRAVEL VOUCHER: $ 537

- January 11-15, FY2005: four days of perdiem added to a personal trip to Mexico. Purpose was to verify insect identifications, review dates and check data entry, and discuss the implications of these results for management planning.

TOTAL TRAVEL VOUCHER: $ 578

Appendix

Pheromone response of Ips pini in Sierra de Juárez, Baja California

Evaluación de la preferencia de *Ips pini* hacia combinaciones de fermonas en Sierra de Juárez, Baja California

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English Summary:

- OBJECTIVES: Goals of the project were to determine the flight seasonality of pine engraver, assess pheromone response to determine the most effective pheromone combination for survey and management, determine if pheromone response changes over the season, and assess potential differences between male and female response.

- BACKGROUND: Pheromone production and selection of *Ips pini* (Say) is known to vary geographically in both the use of ipsdienol (ID) enantiomers [(*R*)-(–) and (*S*)-(+)] and in the synergistic effect of lanierone (L). California populations tend to prefer the (–)-enantiomer of ID and experience little synergistic effect by L, whereas in Arizona, the (–)-enantiomer tends to be preferred but L is obligatory for attraction. Eastern populations ('New York') prefer intermediate levels of (–)-ipsdienol. In addition to geographic variation, the attraction of ID enantiomeric ratios and L can vary seasonally.

- METHODS: We compared the attraction of five different enantiomeric ratios of ID [3%(–), 25%-(–), 50%-(–), 87%-(–), 97%-(–)] with and without L, and deployed two controls (empty trap and trap with L only). These 12 pheromone blend treatments were tested during both the initial spring flight and the second flight in the summer of 2004. Between these two flights and after the summer flight, monitoring traps with 50%-(–)-ID and 87%-(–)-ID with lanierone were used to monitor seasonal flight patterns. Tests of pheromone preference and of seasonal flight were replicated at three sites. Trap catches were collected weekly with traps re-randomized after collection. All beetles caught in each trap were summed over the 4-5 week flight period before being subjected to ANOVA and Multiple Response Permutation Procedure for unreplicated randomized block design (MRBP). Multiple comparisons to determine the separation of treatments at were not conducted due to the small sample size (e.g. the smallest exact *P*-value possible for the two-group multiple comparisons with n=3 is 0.25). However, statistics for group-wide comparisons and occasional specific comparisons were made.

- RESULTS: Results suggest that peak flight periods for this area are around May 6 and June 8 (Fig. 5; approximately days 36 and 69). Pheromone response more closely resembles that of the more eastern populations of *Ips pini* with an overall preference of 65-87%-(–)-ID and a synergistic effect of L (Fig. 6 A-D). Within this population, males tend to be more strongly synergized by L than are females, although differences were generally not statistically different (Fig. 7). Minimal shift in pheromone response was found between the spring and summer flights (Fig. 6, A vs. C and B vs. D), with no significant change in sex ratios between season (Fig. 8).