Distribution & Flight Periods of the California fivespined Ips (*Ips paraconfusus*) in the Willamette Valley of Western Oregon

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Abstract

This study represents a first attempt, using systematic pheromone-trapping, to examine the distribution & flight periods of the California fivespined Ips, *Ips paraconfusus*, in the Willamette Valley of western Oregon. Pheromone-baited Lindgren funnel traps were used to monitor populations at 11 sites along a latitudinal (north-south) gradient from May-October 2008. *Ips paraconfusus* were detected at all trap sites, suggesting that this species is present throughout the range of the Willamette Valley ponderosa pine ecotype. This distribution is consistent with anecdotal observations & the extent of existing range maps. Two peak flight periods were observed (early July & late September), indicating at least two generations per year. Abundance & flight periodicity did not appear to be correlated with latitudinal gradient, but were rather the result of localized site & stand conditions. Populations were highest in older stands where damage from winter storms was often left unmanaged. Additional research is needed to confirm initial findings, and will assist in refining management strategies for ponderosa pine in the Willamette Valley as well as provide baseline data for future studies.

Introduction

- *Ips paraconfusus* occurs west of the Cascade Mountain and Sierra Nevada crests from northern Oregon to southern California (Schultz & Bedard 1987), and has been recognized as a significant pest of several pine species since the mid-1940's (Fig. 1a).
- It is of concern in the Willamette Valley of Western Oregon due to its potential impacts upon "Valley" pine, an ecotype of ponderosa pine endemic to the area. While it was very common over a century ago, tree harvesting, agricultural conversions and urbanization have severely reduced its distribution (Fig. 1b).
- Due to concern this ecotype would be lost, a cooperative effort has preserved Willamette Valley ponderosa pine in a genetic conservancy & seed orchard in St. Paul, Oregon. Over the past decade, it has been increasingly utilized for reforestation & afforestation as it is well-adapted to westside soils and conditions, often thriving on sites that are poorly suited for Douglas-fir or other conifer species (Barsotti 2004). An estimated 1 million seedlings (3,000 acres) are being planted each year in western Oregon (Fig. 1c).
- These recently established, more intensely managed stands, are frequently located in close proximity to older, remnant stands, where damage from winter storms often goes unmanaged. As such, *Ips paraconfusus* in the Willamette Valley is a significant challenge for forest managers as preventative actions on their lands may be undone by negligence of adjacent properties.
- The first reported damage by *Ips paraconfusus* on newly established "Valley" ponderosa pine was in 1999 (Overhulser 2000b). Additional outbreaks have occurred each year since, leading to localized mortality at several sites (Fig. 1d). The future incidence of damage is expected to increase as populations respond to greater host availability; however, refining management strategies for the Willamette Valley has been hindered due to a lack of basic knowledge regarding the distribution & flight periods of this species.

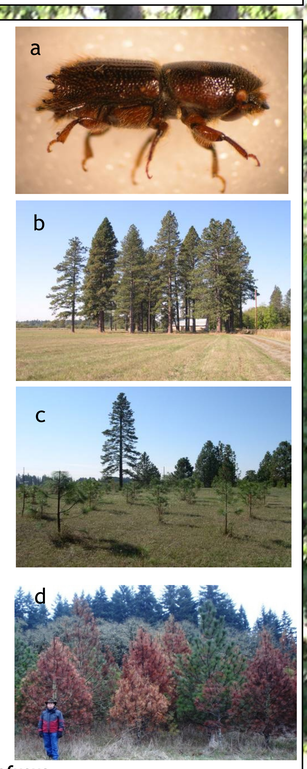

Figure 1. (a) Ips paraconfusus adult, (b) Remnant stand of Willamette Valley ponderosa pine, (c) Recently established "Valley" ponderosa pine plantation, (d) Localized damage due to outbreak of I. paraconfusus.

Materials & Methods

- Eleven sites along a latitudinal (north-south) gradient through the Willamette Valley were selected in the spring of 2008 (Fig 2a). Older, remnant stands were represented as well as early & more recent plantings. While sites had different stand structures, they were generally similar in terms of area & overall species diversity.
- Lindgren funnel traps baited with the *Ips paraconfusus* lure (ipsenol, ipsdienol, *cis*-verbenol) were placed at each site and monitored weekly or biweekly from May-October 2008 (Fig. 2b). Pheromone lures were changed every 45 days consistent with manufacturer recommendations (Contech, Inc., Vancouver, BC & Synergy Semiochemicals, Burnaby, BC).
- Trap captures of *I. paraconfusus* were sorted & counted for each collection date and summarized at 2 week intervals due to varying sampling frequencies. Total captures & average captures per week were examined by site & approximate stand age class.
- Statistical analyses have not yet been performed on this data set, but planned analyses include linear regression & ANOVA ($P = 0.05$).

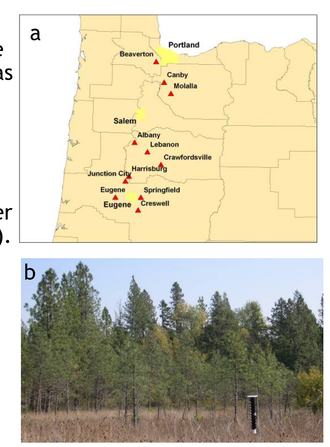

Figure 2. (a) Trap sites in the Willamette Valley, OR (b) Lindgren funnel trap with pheromone lure.

Results

- Over 15,000 *Ips paraconfusus* were captured in 2008. While individual sites showed high variability, this species was found at all 11 sites in the Willamette Valley. No substantial differences in abundance by latitudinal gradient (north-south) were evident (Fig 3a.)
- Total captures of *I. paraconfusus* indicated 2 major flights during the sample period, occurring in early July & late-September (Fig. 3b). However, the latter flight period was observed only at a single site. No substantial differences in flight periodicity were observed by latitudinal gradient (north-south), although the southern-most sites peaked slightly earlier than all others.
- Average trap captures per week were highest in older, often unmanaged stands, which also possessed greater winter storm damage (breakage & blowdown) than more actively managed, younger stands (Fig 3c).

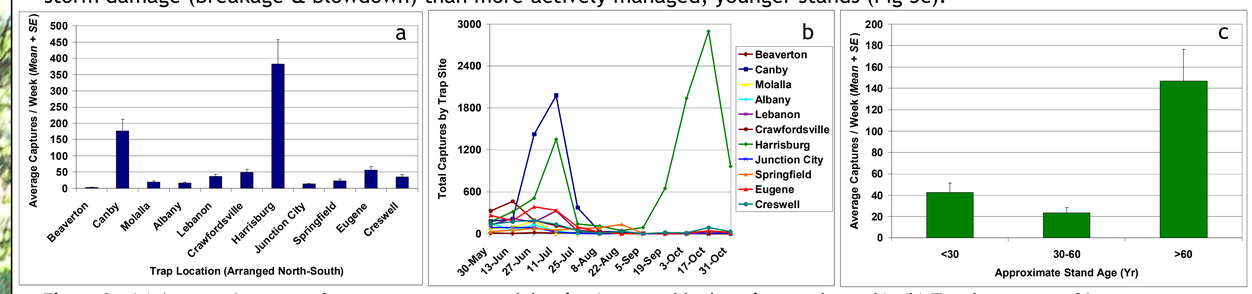

Figure 3. (a) Average I. paraconfusus captures per week by site (arranged by location north-south), (b) Total captures of I. paraconfusus by trap site & sample date, (c) Average I. paraconfusus captures per week relative to approximate stand age.

Discussion & Further Study

- *Ips paraconfusus* appears to be the greatest threat to newly established stands of the Willamette Valley ponderosa pine ecotype (Overhulser 2000a). Although flight periods of this species are well documented for California populations (Struble & Hall 1955; Fettig *et al.* 2005), there is limited information on this species in western Oregon.
- This study represents the first systematic, pheromone-based survey of *I. paraconfusus* in western Oregon. As the study & analyses are ongoing, all results should be viewed as preliminary, although some general trends were evident. To date, findings suggest that *I. paraconfusus* is distributed throughout the Willamette Valley, consistent with the extent depicted in historic range maps for Oregon (Struble & Hall 1955; Schultz & Bedard 1987). Initial data also suggests at least two & possibly three flight periods occur, consistent with anecdotal reports (Overhulser 2000a).
- Abundance & flight periodicity do not appear to be correlated with latitude, but are likely related to localized site & stand conditions. *Ips paraconfusus* populations were highest in older, remnant stands where breakage & blowdown from winter storms was abundant & often went unmanaged. As such, the risk to more susceptible stands nearby may be high.
- Due to a delay in the initiation of trapping & unusual weather in 2008, additional studies are planned in 2009 with funds provided by the USDA Forest Service, Region 6-FHM. This will allow for confirmation of initial trends, assessing the onset of initial flight for *I. paraconfusus*, and expansion of trapping efforts to include other species of interest.
- Additional understanding of *I. paraconfusus* will immediately assist in refining management strategies for ponderosa pine in the Willamette Valley as well as provide valuable baseline data for future studies examining the effects of climate change or other factors on bark beetle range expansion or increased levels of damage.

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