Semiochemical Diversity and Niche Partitioning among Scolytids and the Generalist Bark-Beetle Predator, *Thanasimus formicarius* (Coleoptera: Cleridae)

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Abstract In southwestern France, two conspecific scolytids, *Ips sexdentatus* (Boern.) and *Orthotomicus erosus* (Woll.), share several pheromone compounds, to which their common predator, *Thanasimus formicarius* (L.), responds. This raises questions regarding the role of pheromones in niche competition between the bark beetles and in prey recognition by the predator.

In spring 2003, in a pure stand of maritime pine (25 years old) located in the Forest Research Centre of INRA (Cestas, France), four attractants of bark beetles and *T. formicarius*, (i.e.: racemic ipsdienol (I);exo-brevicomin (E); Pheroprax® the commercial pheromone of *Ips typographus*, a blend of 2-methyl-3-buten-2-ol and cis-verbenol (P); and Stenoprax® the commercial pheromone of *Ips sexdentatus*, a blend of ipsdienol and 2-methyl-3-buten-2-ol (S)), were tested in six different combinations: S, I, PI, SE, IE and PIE. Each mixture was replicated five times and the control (no attractant) was repeated twice. The 32 small "bottle-traps" (30x15 cm) were randomly set-up on a 8x4 grid and were inspected weekly from 5 May to 12 June 2003. Traps were permutated at each inspection. Differences between mean relative catches/trap/day were tested with the GLM procedure and a post-hoc Scheffe's test.

Catches of I. sexdentatus were significantly ($P < 0.001$) higher in pheromone traps loaded with S and SE blends, whereas *Orthotomicus* spp. was significantly ($P < 0.001$) more attracted by pheromone traps loaded with S, SE, PI and PIE mixtures. All the six kairomone mixtures induced higher attraction of T. formicarius than the control, although S was the only blend that induced significantly ($p < 0.001$) higher catches than the control trap.

Orthotomicus spp. responds to all the pheromone blends attractive to *Ips sexdentatus* but the reciprocal is not true. These bark beetles share the same habitat of pine forest but they have different ecological niches. The small species *Orthotomicus* lives in thin bark of pine trees and the large species *I. sexdentatus* needs thick bark to develop. For *Orthotomicus* spp., it is therefore an advantage to be able to respond to the pheromone of *I. sexdentatus* because trees attacked by the large species are likely to provide the smaller species with suitable conditions of development. The reverse is not true as the presence of *Orthotomicus* spp. does not necessarily indicate the availability of thick bark : it is then also an advantage for I. sexdentatus not to respond to the pheromone of the small scolytid species. *T. formicarius* is able to recognize and respond to any combination of the semiochemicals that compose the active pheromone of the bark beetles (*Ips* and *Orthotomicus* spp.). As a generalist predator, it is probably in its interest to respond to the pheromone of different prey, thereby enhancing the probability of finding food, a sexual partner and eventually a suitable habitat for breeding.

The results have also practical implications. Fortunately, Stenoprax® lures can be used to monitor *Ips sexdentatus*, *Orthotomicus* spp. and *Thanasimus formicarius* populations with the same pheromone traps. Unfortunately, any pheromone mass trapping of the pests (bark beetles) may adversely affect the natural enemies (*Thanasimus*).