Beetle Fauna Captured in Traps Baited with *Tomicus piniperda* Pheromone Blends in a Pine Stand in Central Croatia

Milan Pernek[1], Boris Hrašovec[2] and Miljenko Županič[1]

[1]Forest Research Institute, Jastrebarsko, Croatia
[2]Faculty of Forestry, University of Zagreb, Croatia

Abstract

During field evaluations of pheromone blends used for monitoring *Tomicus piniperda* beetles, many non-target beetles were captured and identified. Five pheromone blends, plus commercially available TOMODOR were used in two different traps: the IPM Tech Intercept PTBB and the THEYSOHN intercept barrier trap. In addition to *Tomicus* bark beetles we trapped 3,469 other Coleoptera in three of the 10 replications that represented 53 species distributed among 27 families. Most numerous were representatives of Staphyllinidae, Elateridae, Cleridae and Rhizophagidae. Temporal distribution of the most important predatory species as well as their responsiveness to pheromone blends is presented. The results are discussed in terms of interspecies chemical communication and few practical aspects relevant for the potential use in *Tomicus* monitoring or suppression activities.

Introduction

Recent developments in research on *Tomicus piniperda* pheromone communication (Csokajlo 1998, Kolk 2000) and small scale outbreaks of this pest in some parts of Croatia, served as a basis for a three-country (USA, Poland, Croatia) collaborative field test of new trap designs and pheromone blends. In Croatia, a mixed *Pinus sylvestris* and *P. nigra* forest culture of 16 ha was chosen in the continental part of the country (44º 44' N, 15º 39' E of Greenich). During the last three years a heavy attack of several bark beetle species occurred in this area. The most important pests were: *T. piniperda*, *T. minor*, *Ips sexdentatus* and *I. acuminatus*.

The research was initiated in 2001 but due to a late deployment of traps, the number of beetles (target as well as non target) recovered was too low for us to make reasonable comparisons; the data presented were recorded in 2002.

Materials and Methods

Six candidate semiochemicals, with or without the addition of ETOH, were tested in a completely randomized block design with 10 repetitions. Each block consisted of 6 IPM Tech Intercept PTBB traps and one THEYSOHN type intercept barrier trap equipped with odour blends with the following characteristics and combinations:

Semiochemicals

α-pinene (AP), nonanal (N), (-)-trans-verbenol (TV), (-)-myrtenol (MOL), (-)-myrtenal (MAL), (±)- α-pinene oxide (APOX), Ethanol (ETOH) and TOMODOR released at rates of 300, 6.0, 5.0, 5.0, 5.0, 2.5, and 20 mg/24 h at 24 ºC, respectively (release rate and blend of TOMODOR was not known).

Blends

1. Blend #1 (AP) with IPM Tech Intercept PTBB
2. Blend #2 (AP + N + TV + MOL) with IPM Tech Intercept PTBB
3. Blend #3 (AP + N + TV + MOL + MAL) with IPM Tech Intercept PTBB
4. Blend #4 (AP + N + TV + MOL + MAL + APOX) with IPM Tech Intercept PTBB
5. Blend #4 (AP + N + TV + MOL + MAL + APOX) with THEYSOHN trap
6. Blend #5 (AP + N + TV + MOL + MAL + APOX + ETOH) with IPM Tech Intercept PTBB
7. Tomodor with IPM Tech Intercept PTBB

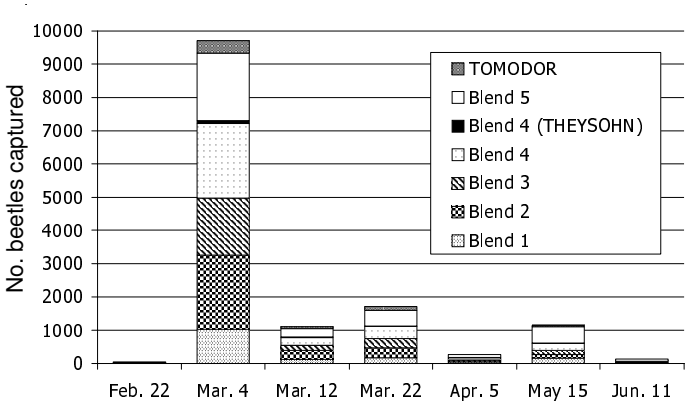

Figure 1.—Response of *T. piniperda* to offered blends.

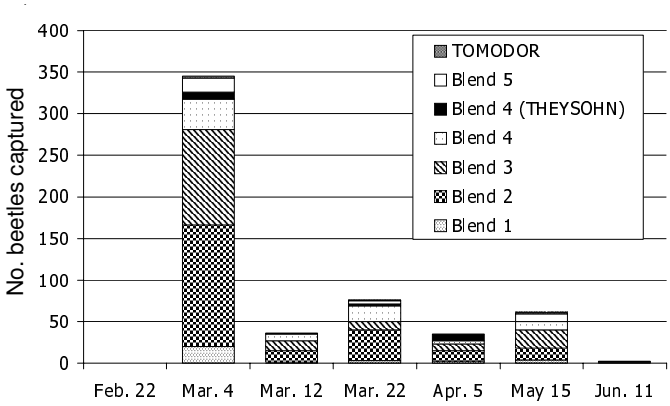

Figure 2.—Response of *T. minor* to offered blends.

Traps were positioned in each block 15 meters apart and close to the ground so both THEYSOHN and IPM Tech Intercept PTBB collecting cups were about 20 cm above ground. Trapped beetles were collected weekly or biweekly (later in the season), dried in the laboratory and identified.

Results

During the trapping period in 2002 (February – June), a total of 34,735 *Tomicus* beetles were trapped: 33,488 *T. piniperda* and 1,241 *T. minor*. These numbers refer to a total number of 60 IPM Tech Intercept PTBB traps and 10 THEYSOHN traps set up in the field trial. Blends #4 and #5 performed best based upon response by *T. piniperda* and the IPM Tech Intercept PTBB trap outperformed by far the THEYSOHN trap in the capture of *Tomicus* and the predatory beetles. (Figs. 1-3). An obvious time lag between the maximum flight period of the *Tomicus* and *Thanasimus* offers the possibility to reduce the predatory catches by removing the traps (attractants) after the initial flight of pine shoot beetles. Gradual decline of the *Thanasimus* catches later in the season might be related to the appearance and boring activity of other bark beetle populations in the area (*I. sexdentatus*, *I. acuminatus*)). It is unclear whether the clerid beetles could differentiate between their scolytid prey on the basis of some specific compounds released during the initial phase of bark beetle attack.

Non-target beetles that responded to the offered compounds belong to several guilds of wood inhabiting insects, whether as xylophages, saproxyllic or predators. The most common were: *Paromalus parallelepipedus*, *Necrophorus humator*, *N. vespilloides*, *Agathidium* sp., *Anisotoma* sp., *Liodopria* sp., *Scaphisoma* sp., *Melolontha melolontha*, *Aphodius* sp., *Athous* sp., *Ampedus ferrugineus*, *Melanotus* sp., *Megatoma undata*, *Thanasimus formicarius*, *Pityophagus ferrugineus*, *Ipidia quadrimaculata*, *Rhizophagus ferrugineus*, *R. depresus*, *Uleiota planata*, *Cerylon evanescens*, *Lathridius* sp., *Corticarina* sp., *Corticaria* sp., *Enicmus* sp., *Ditoma crenata*, *Mycetophagus quadripustulatus*, *Ptinus* sp., *Vincenzellus ruficollis*, *Acanthocinus aedilis*, *Asemum striatum*, *Rhagium inquisitor*, *Anastrangalia sanguinolenta*, *Cortodera* sp., *Pogonocherus* sp., *Anthribus albinus*, *Rhyncolus* sp., *Hylobius abietis*, *Pissodes nottatus*, *Hylastes* sp., *Hylurgus ligniperda*, *Hylastes cunicularius*, *Xyloterus lineatus*, *Ips sexdentatus*, *Orthotomicus* sp.

Different responses of four non-target beetles depicted in Figure 4 may illustrate various colonizing strategies regarding the state and physical condition of the attacked pine trees (reflected by different amounts of chemical compounds released in time).

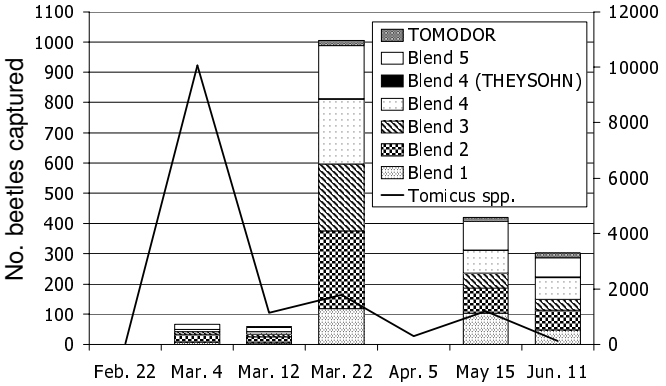

Figure 3.—*T. formicarius* response on tested blends and comparison with the total *Tomicus* catches (left axis *Thanasimus*, right axis *Tomicus* beetles.

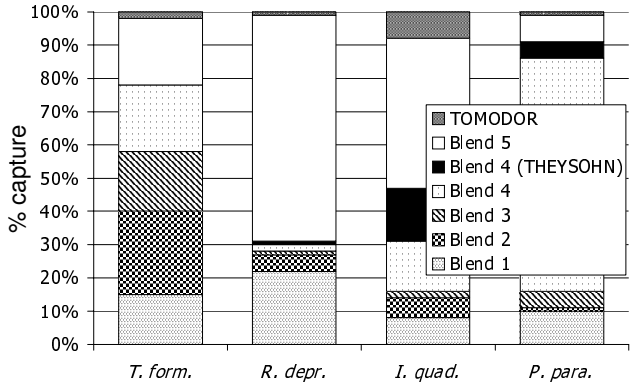

Figure 4.—Different response types for four non-target species: *T. formicarius*, *R. depressus*, *I. quadrimaculata* and *P. parallelepipedus*.

References Cited

Czokajlo, D. 1998. Semiochemicals for the Larger Pine Shoot Beetle (*Tomicus piniperda* L.) and its Clerid Predators. Dissertation, State University of New York, College of Environmental Science and Forestry, Syracuse, New York, 165 pp.

Kolk, A. 2000. Feromony i kairomony wybranych owadów fitofagicznych sosny pospolitej (*Pinus sylvestris* L.) oraz możliwości ich wykorzystania w ochronie lasu. Instytut Badawczy Leśnictwa, Warszawa, 129 pp.

Puchegger, F. 1987. Entwicklung einer Zuchttechnik für den Ameisenbundkäfer *Thanasimus formicarius*. Diploma thesis, Institut für Forstschutz und Forstentomologie, Universität für Bodenkultur, Wien.

Yüksel, B., G. Tozlu and M. Şentürk. 1999. The Serious Harmful Bark Beetles at Sarıkamış Scotch Pine Forests and Their Precautions, Doğu Anadolu Ormancılık Araşıtrma Müdürlüğü, Teknik Bulten Yayını No: 3, Erzurum, 71pp.