

Ips typographus (L.) (Coleoptera: Scolytidae) in Southeastern Alps: Results of a Six-Year-Long Monitoring Program

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Abstract

Beginning in 1996, populations of *Ips typographus* in the Friuli-Venezia Giulia region (NE Italy) have been monitored by using pheromone traps. Preliminary analysis of the data (1996-2001) reveals some interesting information:

- 1) the flight activity of *Ips typographus* is very extended and occurs over a period of four months (mid May until August)
- 2) the outbreak which began in 1996 has declined gradually over time as shown by lower levels of both insect captures and damage
- 3) there is a high correlation between spring captures (May-June) and total captures (May-August) and between spring captures and damage. The high correlation between spring captures and damage allows us to determine a reliable risk threshold (about 5,000 beetles/trap in spring), and at the same time reduce the period of monitoring. Pheromone traps are useful for studying both the biology and population dynamics of *Ips typographus* populations.

Key Words: *Ips typographus*, monitoring, pheromone traps, damage forecast

Most studies that involve the monitoring of populations of *Ips typographus* (L.) (Coleoptera Scolytidae) have been carried out in central and northern Europe where the winters are long and cold and flight activity begins quite late in the season (June-July); therefore the short summer allows completion of only one generation per year and damage to spruce stands is not always severe. However, in southern European countries, *I. typographus* attacks host trees early in the spring (April-May) and very often two generations are completed; consequently spruce trees which survive the attacks of the first generation can still be attacked and killed by emerging second generation adults. In this paper we summarize some data obtained from monitoring *I. typographus* over a period of six years and discuss how pheromone trap data might be used to forecast damage caused by this species.

Materials and Methods

Beginning in 1996, populations of *I. typographus* have been monitored permanently in the main spruce forests of the Friuli-Venezia Giulia (north-eastern Italy) by using ca 30 pheromone traps (Theysohn® slot-trap) baited with methyl-butenil, cis-verbenol and ips-dienol. The traps are installed and baited each year at the end of April and are checked weekly at which time all beetles captured are determined and counted. All pheromone dispensers are replaced after two months. The trials last until the first half of September and data are reported as mean captures per trap. At the same time, damage caused by *I. typographus* is recorded from field observations carried out over an area of 300 m around the traps beginning on the 1st of May (initiation of *I. typographus* flight) and continuing until April 30 of the following year.

Results

Captures observed in 1996 are higher than those of the following years (ANOVA, d.f.= 1; 5, F=8.43, P<0.001; Tukey's test, P<0.01) (Fig. 1). The volume of timber lost between 1996-2001 (Fig. 2) shows the same trend as the captures (Fig. 1). In addition, there is a significant correlation between the captures observed during the entire monitoring period (May-September) and those obtained in

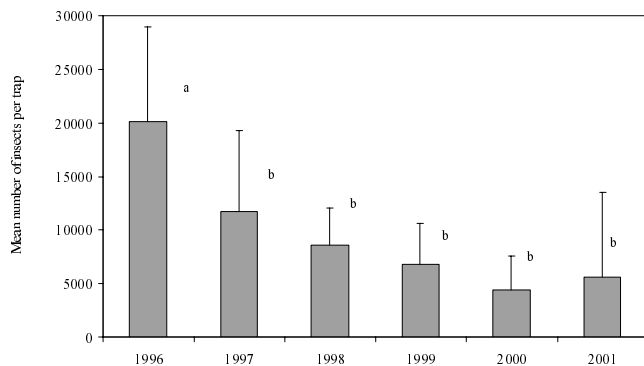


Figure 1.—Mean captures over the last six years. Different letters correspond to statistical differences ($P < 0.01$).

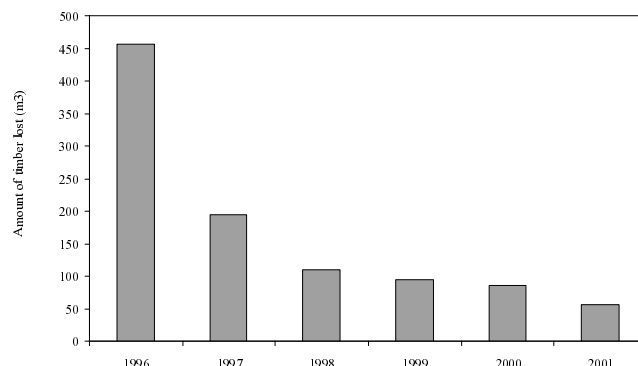


Figure 2.—Damage observed in the last six years.

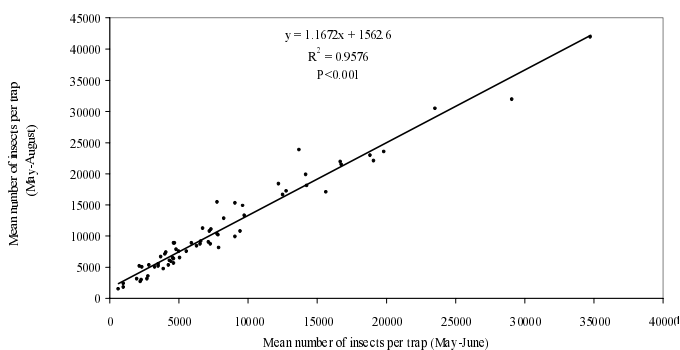


Figure 3.—Correlation between spring and total captures.

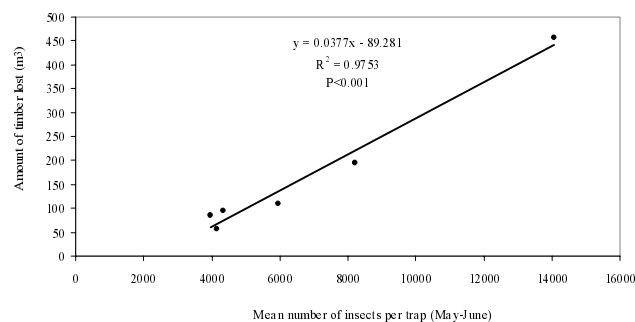


Figure 4.—Correlation between spring captures and damage.

spring (May-June) (d.f. = 1; 63, $F = 1400.95$, $P < 0.001$, $R^2 = 0.957$) (Fig. 3). Similarly, the spring catches are correlated with the total annual damage (d.f. = 1; 5, $F = 157.71$, $P < 0.001$, $R^2 = 0.975$) (Fig. 4).

Discussion

Both mean captures and damage declined considerably over time from 1996 to 2001 (Fig. 1 and 2). In northern Italy, *I. typographus* has a very long period of flight activity beginning early in May and ending at the beginning of September. Therefore, in order to follow the entire spring and summer activities of *I. typographus*, which covers more than 4 months, it was necessary to replace the pheromone dispensers at the middle of the spring monitoring period (the first week of July).

Unfortunately, monitoring data are available only at the end of summer by which time the flight period of the beetle has concluded and most of the damage has already occurred. Consequently, early forecasts about the volume of timber lost during the season are very important in determining the need for applying useful and prompt control strategies. The correlation found in the present work between spring captures (May-June) and total captures (May-August) (Fig. 3) and between spring captures and damage (Fig. 4), provide us with an opportunity to assess in advance the risk of future outbreaks and the time necessary to apply pest controls. Based on our results, monitoring could be terminated after two months (at the end of June), which would reduce the overall costs; and because of the good correlation between mean captures and the damage observed, it might also be possible to determine a “catch threshold” along with a relative “damage threshold”, which would help us to decide about the need for additional control measures. In Friuli – Venezia Giulia, by using a threshold of around 5,000 insects per trap during the spring monitoring period, we would expect that the damage in the monitored area would be lower than 100 m³ (Fig. 4). In northern and central European spruce plantations, the kind of silvicultural and the orographical features might tolerate higher densities of *I. typographus* populations, however in the Alps, control would have to be more intensive because the expansions of severe outbreaks is more difficult to confine on the accentuated slopes where there is a less extensive network of forest roads.