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Yellow sticky boards: a possible way of monitoring little spruce sawfly (*Pristiphora abietina*) (Hymenoptera: Tenthredinidae)

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ABSTRACT: Several methods of *Pristiphora abietina* adults catching were compared (Malaise trap, white and yellow sticky boards, sweeping). The yellow sticky boards are handy in the field, and under the high population density appear to be a reliable method of detecting sawfly populations: 1. There was a statistically significant coincidence between the samples of Malaise traps and yellow sticky boards. 2. There was a highly significant linear correlation between the number of caught adults on five sticky boards and the degree of defoliation in seven localities. 3. We did not observe any statistically significant differences between the samples on yellow sticky boards taken in different intervals. To estimate the abundance of adults, it is sufficient to install yellow sticky boards before swarming and check them after the swarming. 4. No statistically significant differences were found between the catch means per board in line with different number of boards, it means with different distance, in both male and females.

Keywords: *Pristiphora abietina*; ways of monitoring; yellow sticky boards; sweeping; Malaise trap; evaluation of feeding; Czech Republic

Several outbreak areas of the little spruce sawfly (*Pristiphora abietina* [Christ 1791]), including thousands of hectares of spruce forests, have occurred in Europe. Every year the spraying of parts of these areas is necessary (e.g. Pschorn-Walcher 1982; Liška et al. 1991); nevertheless, integrated pest management (IPM) has not been developed yet. *Pristiphora abietina* is usually monitored by estimating the density of cocoons in the soil (Bogenschütz 1986; Pschorn-Walcher 1982). However, this procedure is time consuming and not feasible at a large scale and is very unreliable (Janásek 1964). The method needs other evaluating study (Bogenschütz 1986). Therefore the first step to develop IPM is to find a reliable monitoring method.

Adults of the sawflies are generally attracted to yellow traps (Murhead-Thompson 1991). For the monitoring of spruce web-spinning sawflies (*Cephalcia* spp.) some authors used yellow sticky boards (Jensen 1988; Cescatti, Battisti 1992) and correlated trap samples with the density of prepupae in soil (Battisti, Rodeghiero 1998). Berger (1992) found out that *Pristiphora abietina* adults could also be attracted to yellow traps. These samples correlated with density of cocoons in soil.

To confirm the possibility of using the method of sticky boards as a predictor of damage and consequently to support the decision of applying the standard control methods, we have studied this method. The method of sticky boards was compared with other methods of adult as well as other aspects of the method of yellow sticky boards were investigated. Finally, the relation with a more representative

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Table 1. Study localities

Locality	Nearest village	Longitude; latitude	Altitude (m a.s.l.)	Year of investigation
Čaplovec wood	Trnávka	18°11´; 49°41´	290	1999
Kabátice hill	Chlebovice	18°16´; 49°39´	550	1998
Lipina wood	Oprechtice	18°16´; 49°44´	260	1998
Loucký les wood	Albrechtice	18°35´; 49°47´	230	1998
Palesek wood	Stará Bělá	18°14´; 49°45´	260	1998
Paskovský les wood	Paskov	18°17´; 49°43´	275	1998–1999
Stolařka Mt.	Lhotka	18°19´; 49°36´	700	1998
Václavovický les wood	Sedliště	18°21´; 49°44´	310	1998
Zámrklí wood	Fryčovice	18°15´; 49°40´	315	1998

indicator of the population size, which is the feeding of larvae, was searched.

MATERIALS AND METHODS

Study sites

Experiments were carried out in young Norway spruce (*Picea abies* [L.] Karst.) stands in the eastern part of the Czech Republic in 1998 and 1999 (Table 1). Sawfly (*Pikonema* sp., *Pristiphora* sp.) larvae caused great damage there during the last 50 years (Kolubajiv 1958; Liška et al. 1991). Trees were 2–4 m high. The places were situated at 230–700 m above sea level throughout the whole area (Table 1).

Traps and trapping periods

In 1998, Malaise traps of Townes (1972) type (one per site), five white and five yellow sticky boards (at the distance of 5 m) were exposed on each of the eight studied plots. The traps consisted of yellow or white plastic boards 14.8 × 21 cm in size, coated on both sides with entomological glue (Chemstop®), and they were suspended from the top or from a branch at about 2 m above the ground. They were exposed on the southeastern side of trees.

Malaise traps were exposed in the interior of forest stand at least 30 m from the edge. We also used the method of sweeping on each plot, 100 sweeps per stationary 25 m long transect (each sweep per each step). The sweep net was 40 cm in diameter and the length of the stick was 50 cm, it means that the lower branches of the sunny woodland borders from the ground to the approximately 2.5 m were swept very well. All methods were used approximately at the distance of 20 m from each other. Every locality was visited every 3 days from April 18th to June 6th 1998, always at the same daytime.

In 1999, three methods (Malaise trap, 18 yellow sticky boards, sweeping) were used only in the locality Paskovský les. In this locality four parallel lines of 50 yellow sticky boards per line were placed, visited at different periods (3, 6, 9, 12 days). The boards were placed on every other tree. There were two free lines of trees between the board lines.

In two localities (Paskovský les and Čaplovec), we studied the influence of different distance of traps on the numbers of caught sawflies in 1999. The length of lines was the same (60 and 36 trees). In the first line, boards were placed on every tree. In the second line, boards were placed on every other tree. The distance between the first and the second line was one tree. Alike, in the third line, the distance between boards

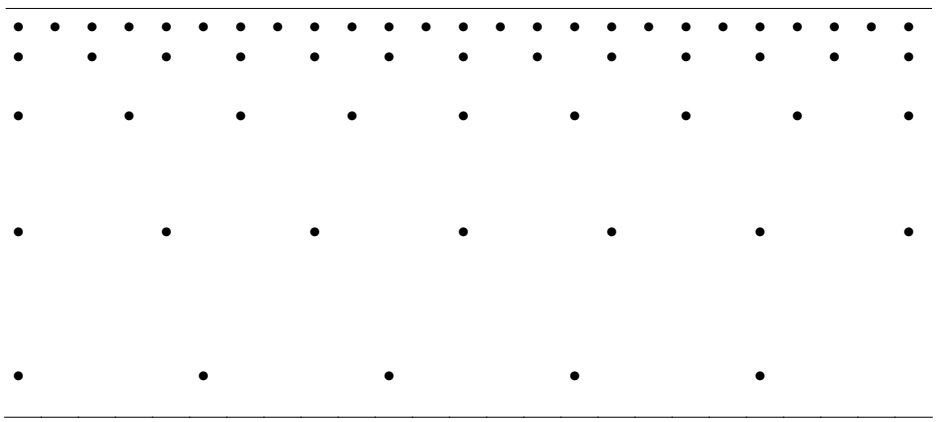


Fig. 1. Scheme of board arrangement in the test with a decreasing number of boards in the line

Table 2. Average *Pristiphora abietina* catch in different traps and comparison of means using Dunn test (q_{crit} = 2.40; n.s. – non-significant, $^+$ – significant)

Method	Sex	Average catch ± SD		Comparison of methods			
		1998	1999	Yellow sticky boards		Malaise trap	
				1998	1999	1998	1999
Sweeping	male	0.60 ± 1.58	0.08 ± 0.29	4.18*	2.59*	4.01*	2.21*
	female	1.68 ± 3.29	0.33 ± 0.49	2.91*	0.15 n.s.	3.46*	3.02*
Yellow sticky boards	male	12.95 ± 44.79	5.37 ± 5.29			0.19 n.s.	0.39 n.s.
	female	5.60 ± 11.16	0.67 ± 0.67			0.53 n.s.	2.88*
Malaise trap	male	7.91 ± 21.98	3.92 ± 4.54				
	female	7.00 ± 14.05	9.25 ± 17.41				

were two trees as well the distance between the second and the third line was two trees. The number of free trees between boards in the next line increased by one tree as well the distance between next lines was still larger. It means that boards were placed in the grid with increasing size of gaps (Fig. 1).

All traps were installed or used from mid-April to mid-June, it means long before adult emergence and long after the end of swarming.

The material is preserved in 70% alcohol (leg. J. Holuša, coll. FGMRI Jíloviště-Strnady).

Determination of sawflies

For the identification of adults the works by Beneš and Křístek (1979) and Zhelokchovsev (1988) were consulted. Sawflies were determined by J. Holuša (genitalia of all specimens were checked). Some specimens were revised by L. Roller (Institute of Zoology, Slovak Academy of Sciences, Bratislava). *Pristiphora abietina* was a predominant species in the studied localities. The species composition of spruce tenthredinids studied by Malaise traps is presented and discussed in another paper (Holuša 2002).

Evaluation of feeding of larvae

The scale of damage to spruce was created to make the evaluation of insects feeding objective. On each of the 8 plots 100 trees were investigated to assess the percentage of defoliation of current year shoots of each whorl beginning from the top of the tree using 4 degrees:

– very light defoliation – below 10% (value 0.1),
– light defoliation 10–50% (value 1),
– heavy defoliation 50–90% (value 2),
– total defoliation over 90% (value 3).

A damaged leader of the tree was evaluated by 1 (no feeding by 0). The values of defoliation of all whorls were accumulated per tree.

Statistical analyses

Data from all eight localities were arranged together as a rank (separately for males and females and methods). The homogeneity of trapping series variance was tested with the Bartlett's χ^2. Because of heavy inequality of variance and non-normality of the sets (Box-Cox transformation on normality was not successful), non-parametric Kruskal-Wallis method was used for comparisons of means, followed by Dunn multiple comparison test (Unistat 5.1) (H_0 – we assume that catch means are equal). In all cases $\alpha = 0.05$. The influence of the visit period's variability on the number of adults was tested in four lines with 50 traps in the same way.

Statistical analyses including correlation and regression analyses were performed with Statistica 6.0 ($\alpha = 0.05$). To find a linear correlation the natural logarithm of adult number was used.

RESULTS

In 1998 the total of 2,866 adults of *Pristiphora abietina* and in 1999 the total of 219 adults of the same

Table 3. Average *Pristiphora abietina* catch per trap (four lines with 50 yellow sticky boards checked in different periods) and comparison of means using Dunn test (q_{crit} = 2.64)

Days of observation	Average catch ± SD	Comparison of checked periods		
		six	nine	twelve
Three	1.16 ± 2.90	0.90 n.s.	2.28 n.s.	2.23 n.s.
Six	1.08 ± 1.58		1.38 n.s.	1.34 n.s.
Nine	1.74 ± 2.39			0.04 n.s.
Twelve	3.65 ± 9.04			

Table 4. Average *Pristiphora abietina* catch per trap (lines with decreasing number of boards; line number represents the number of trees without board) and comparison of means using Dunn test (Paskovský les locality) (q_{crit} = 3.12)

Line	Sex	Number of boards	Average catch ± SD	Comparison of lines					
				1	2	3	4	5	10
0	male	33	0.15 ± 1.86	2.31 n.s.	0.59 n.s.	0.28 n.s.	1.91 n.s.	0.21 n.s.	1.42 n.s.
	female		0.61 ± 1.12	0.52 n.s.	1.09 n.s.	0.82 n.s.	1.87 n.s.	0.43 n.s.	0.14 n.s.
1	male	17	2.18 ± 1.98		2.36 n.s.	1.48 n.s.	3.36*	0.16 n.s.	0.27 n.s.
	female		0.59 ± 0.80		1.39 n.s.	1.13 n.s.	2.08 n.s.	0.71 n.s.	0.39 n.s.
2	male	12	0.75 ± 1.14			0.70 n.s.	1.21 n.s.	0.56 n.s.	1.64 n.s.
	female		0.25 ± 0.62			0.17 n.s.	0.80 n.s.	0.31 n.s.	0.44 n.s.
3	male	10	0.60 ± 2.76				1.80 n.s.	0.00 n.s.	1.15 n.s.
	female		0.30 ± 0.67				0.93 n.s.	0.16 n.s.	0.32 n.s.
4	male	8	0.13 ± 0.35					1.50 n.s.	2.38 n.s.
	female		0.00 ± 0.00					0.93 n.s.	0.96 n.s.
5	male	5	1.20 ± 1.64						1.04 n.s.
	female		0.60 ± 1.34						0.16 n.s.
10	male	3	3.33 ± 4.04						
	female		0.33 ± 0.58						

species were caught using Malaise traps, sweeping and yellow sticky boards. In 1998, no specimens were caught before 27 April and after 2 June, and in 1999, no specimens were caught before 27 April and after 30 May. In both years the differences in the variance of ranks (Table 2) are statistically significant. Only 28 adults were entrapped by white sticky boards in 1998.

In 1998, the statistically significant difference was rejected only in the equalities of means of Malaise trap samples and yellow sticky board samples, for both males (according to Dunn test results q = 0.19, in all cases q_{crit} = 2.40) and females (q = 0.53). In 1999, we do not reject H_0 in means of Malaise trap male samples and yellow sticky board samples (q = 0.39) and female sweeping samples and yellow sticky board samples (q = 0.15) (Table 2).

In the test with four parallel lines with 50 yellow sticky boards the differences in the variance of ranks were statistically significant, but the difference between means was not statistically significant (we do not reject H_0) (Table 3; q_{crit} = 2.64).

In the experiment with the decreasing number of boards the difference between of means was not statistically significant (we do not reject H_0) in either males or females in both localities (Tables 4 and 5; q_{crit} = 3.12) except one comparison in males (Table 4).

In 1998, all defoliation data sets were non-normal because they were positively skewed and leptokurtic or platykurtic (Table 6). Box-Cox transformation on normality was not successful, therefore the defoliation distribution is shown by non-transformed means (Fig. 2), but the medians were used as a di-

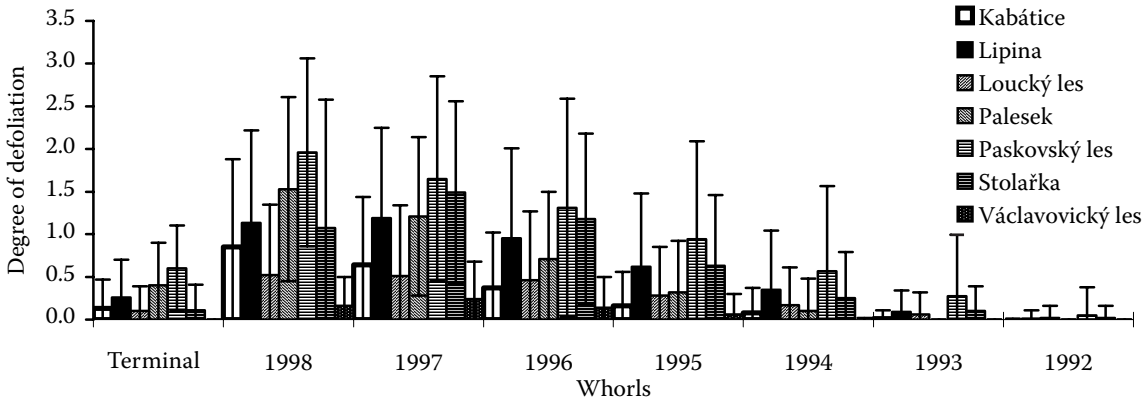


Fig. 2. Defoliation distribution (mean ± SD) of leaders and whorls characterised as years of growth in localities

Table 5. Average *Pristiphora abietina* catch per trap (lines with decreasing number of boards; line number represents the number of trees without board) and comparison of means using Dunn test (Čaplovec locality)

Line	Sex	Number of boards	Average catch ± SD	Comparison of lines						
				1	2	3	4	5	7	10
0	male	50	0.94 ± 1.15	2.78 n.s.	2.18 n.s.	2.40 n.s.	2.94 n.s.	2.33 n.s.	2.93 n.s.	1.39 n.s.
	female		0.30 ± 0.81	0.16 n.s.	1.29 n.s.	1.29 n.s.	1.57 n.s.	1.57 n.s.	1.39 n.s.	1.28 n.s.
1	male	26	0.50 ± 1.21		0.04 n.s.	0.16 n.s.	1.10 n.s.	0.53 n.s.	0.98 n.s.	0.04 n.s.
	female		0.19 ± 0.40		1.06 n.s.	1.06 n.s.	1.39 n.s.	1.38 n.s.	1.24 n.s.	1.15 n.s.
2	male	14	0.50 ± 1.34			0.17 n.s.	1.03 n.s.	0.51 n.s.	0.94 n.s.	0.01 n.s.
	female		0.07 ± 0.27			0.00 n.s.	0.47 n.s.	0.47 n.s.	0.43 n.s.	0.40 n.s.
3	male	14	0.21 ± 0.43				0.86 n.s.	0.37 n.s.	0.80 n.s.	0.14 n.s.
	female		0.07 ± 0.27				0.47 n.s.	0.47 n.s.	0.43 n.s.	0.40 n.s.
4	male	8	0.00 ± 0.00					0.46 n.s.	0.00 n.s.	0.81 n.s.
	female		0.00 ± 0.00					0.00 n.s.	0.00 n.s.	0.00 n.s.
5	male	8	0.13 ± 0.35						0.42 n.s.	0.41 n.s.
	female		0.00 ± 0.00						0.00 n.s.	0.00 n.s.
7	male	6	0.00 ± 0.00							0.77 n.s.
	female		0.00 ± 0.00							0.00 n.s.
10	male	5	0.40 ± 0.89							
	female		0.00 ± 0.00							

Table 6. Statistical analysis of defoliation data sets

	Locality						
	Kabátice	Lipina	Loucký les	Palesek	Paskovský les	Václavovický les	Stolařka
Valid *n*	100	100	100	100	100	100	100
Median	1.10	3.15	1.00	4.00	6.10	0.00	4.00
Skewness	1.38	0.85	1.82	0.88	0.53	1.98	0.66
Kurtosis	1.81	– 0.43	2.41	0.94	– 0.77	3.95	– 0.53
Shapiro-Wilk test	0.82	0.88	0.70	0.93	0.93	0.65	0.92
p-level	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

mension characterising the defoliation degree (Table 6). There was a highly significant relationship between the number of entrapped adults on five sticky boards and the degree of defoliation in seven localities (the locality Zámrklí was eliminated because the control measures were taken in the forests after the swarming) (Fig. 3; $r = 0.95^{**}$ (ln)). The significant relationships were found for Malaise traps ($r = 0.69^{*}$) and no relationships for sweeping ($r = 0.26$ n.s.; $r_{0.05}(6) = 0.67$; $r_{0.01}(6) = 0.83$).

Table 7. Coefficients of linear regression between the number of caught adults and the degree of defoliation ($r_{0.05}(6) = 0.67$; $r_{0.01}(6) = 0.83$)

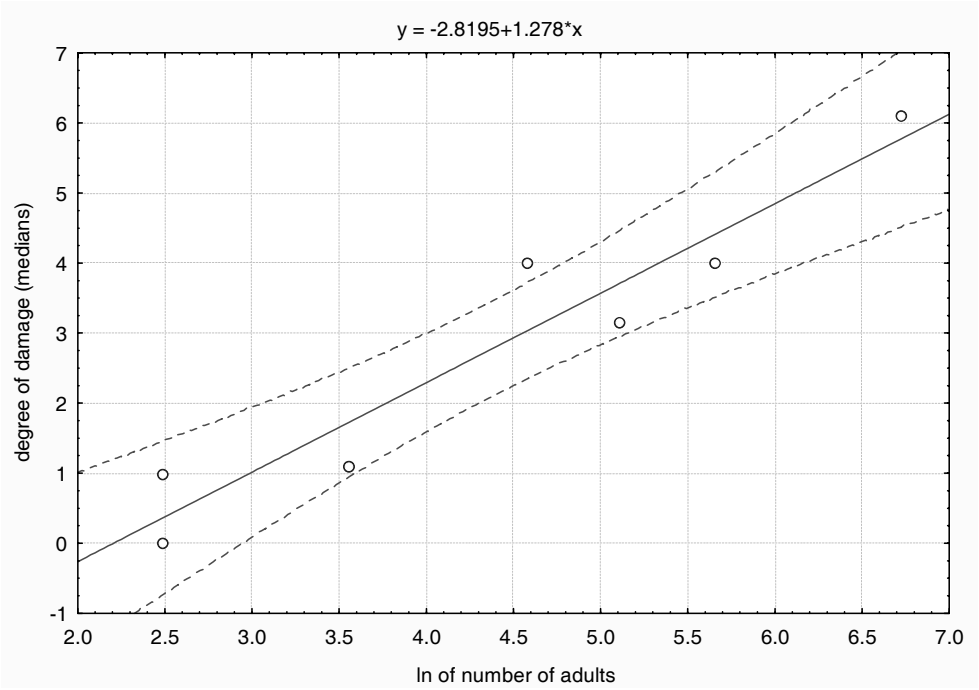
	Malaise traps	Sweeping	Yellow sticky boards
R	0.69*	0.26 n.s.	0.98** (ln)

In the method of yellow sticky boards, natural logarithm of adults was used

DISCUSSION

The sweeping method is very time-consuming, depending on the moment sun-light and is restricted to the number of caught insects due to high vagility of adults, mainly males. On the other hand, Malaise traps are very effective for experimental purposes; however, they are useless in practise because sorting out the insects is time-consuming.

Malaise trap is a very effective method for catching smaller and more active sawflies (Taeger, Taeger 1997; Liston 1995). Therefore it is very suitable for the study of *Pristiphora abietina* flight activity (period of flight activity based on these data is discussed by Holuša 1999). Liston (1984) and Roller (1998) showed that sawfly males in samples were often more abundant. In our material the sex ratio varied among localities, which was probably a result of trap



ln of number of adults: degree of damage (medians): $r^2 = 0.9119$; $r = 0.9549$, $p = 0.0008$

Fig. 3. Relationship between the defoliation of seven forest stands and the total number of captured *Pristiphora abietina* specimens using 5 yellow sticky boards ($y = -2.8195 + 1.278x$; – confidence interval of model)

position and of the effect of microclimate (Holuša 2002).

White sticky boards are not attractive to *Pristiphora abietina* adults. All 28 caught specimens were found in the period of peak swarming. Their presence was probably a coincidence. On the other hand, yellow sticky boards are very effective even for swarming observations because a highly significant relationship was observed between samples of yellow sticky boards and Malaise traps (in 1998 in both sexes, in 1999 in males). The relationship between sweeping and yellow sticky boards in female samples is the result of a very low number of caught specimens.

The defoliation of trees in all localities varied considerably. The parts of trees that bud before or after swarming escaped defoliation because females lay eggs only during bud break. In all evaluated lines, several tree clusters of damaged and undamaged trees alternated, but the majority of trees were damaged slightly, which is a reason for the left-side distribution of sets. Upper whorls were more intensively defoliated and the degree of defoliation decreased towards the tree foot. The defoliation of older whorls was lower in all localities. It was a result of the behaviour of adults that fly mainly around the upper part of crowns.

There is a high significant relationship between the number of caught adults on sticky boards and the degree of defoliation in localities. This suggests that yellow sticky boards method could be used in integrated pest management. In contrast to Malaise trap, yellow sticky boards were placed directly in the space of sawfly swarming and their higher number eliminates the positional effect. It is probably a reason of lesser significant relationship in relation to the degree of defoliation.

We did not observe any statistically significant differences between samples taken in different intervals. To estimate the abundance of adults it is sufficient to install yellow sticky boards before swarming and check them after the end of swarming. The relationship between the number of specimens and the length of visit interval could exist because of the possible sex pheromone presence in *Pristiphora abietina*. If a newly emerged female is caught on a trap and remains alive, it may attract a large number of males (see Battisti, Rodeghiero 1998). The presence of sex pheromone was observed in harmful sawflies in Northern America (see Anderbrant 1993). Recently its presence was also confirmed in *Cephalcia abietis* (Linné, 1758), too (Gruppe, Nisslein 1996). In some species the presence of sex pheromone was observed in both laboratory and field tests (Coppel et al. 1960; Jewett et al. 1976; Löfqvist 1986; Olaifa et al. 1987, 1988). There is a possibility of sex pheromone existence in other sawflies.

There is an important problem to solve. What number of traps is necessary to ascertain the signifi-

cant abundance of sawflies? In 1998, the numbers of specimens caught on five sticky boards were high but the variance was so high that it was impossible to find the necessary rank of boards. In 1999, the population density and consequently the number of caught adults were low in other thirteen non-mentioned localities (due to the control measures in the previous year – see Holuša and Švestka [2000] – as well as poor quality of the glue). But probably under the condition of the high population density, yellow sticky boards appear to be a reliable method of detecting sawfly populations.

It is not important how many boards are used to monitor the sawfly in the line of the same length because no significant equality of catch means was found almost in all cases. Several dozens boards will probably be necessary to ascertain the sawfly abundance. The installation of a board on every other or third tree could be perfect. In this case, the monitored line is able to catch almost the whole young spruce stands in the studied area.

This monitoring tool appears to be more useful than the traditional methods, such as soil sampling and emergence traps.

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Žluté lepové desky: možný způsob monitoringu pilatky smrkové (*Pristiphora abietina*) (Hymenoptera: Tenthredinidae)

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ABSTRAKT: Bylo porovnáváno několik metod pro odchyt dospělců pilatky smrkové (*Pristiphora abietina*): Malaiseho lapače, bílé a žluté lepové desky, smýkání. Žluté lepové desky jsou praktickou, lehce použitelnou metodou a za vysokých populačních hustot se zdají být vhodnou metodou pro stanovení populace pilatek: 1. Byla zjištěna statisticky signifikantní shoda mezi počty odchytaných jedinců Malaiseho lapači a lepovými deskami. 2. Byla zjištěna statisticky signifikantní lineární korelace mezi průměrnými počty odchytaných jedinců na pěti žlutých lepových deskách a stupněm poškození porostu na sedmi lokalitách. 3. Nebyl zjištěn rozdíl mezi počty odchytaných jedinců na souborech padesáti žlutých lepových desek odebíraných v různých intervalech. Ke stanovení početnosti populace je dostačující instalovat desky před počátkem rojení a kontrolovat je po ukončení letové aktivity. 4. Nebyl zjištěn statisticky signifikantní rozdíl mezi průměrnými počty dospělců odchytaných v liniích s různým počtem lepových desek.

Klíčová slova: *Pristiphora abietina*; možnosti monitorování; žluté lepové desky; smýkání; Malaiseho lapače; hodnocení žíru; Česká republika

I když smrkové pilatky (především *Pristiphora abietina*) poškozují každoročně ve střední Evropě několik tisíc hektarů smrkových porostů, nebyla doposud vypracována integrovaná ochrana lesa proti pilatce smrkové. Neexistuje doposud ani spolehlivá metoda na monitorování jejich populací.

Kontrola výskytu a populačních hustot smrkových pilatek, spočívající ve zjišťování počtu zámotků v půdě na podzim po ukončení žíru housenic, je značně nespolehlivá. Janásek (1964) kriticky prověřil metodu pokusných plošek a zjistil, že přesnost je z hlediska potřeb ochrany nedostatečná. Také Bogenschütz (1986) považuje za nezbytné podrobit metodu půdních sond dalšímu studiu.

Metoda půdních sond je navíc velice pracná a v případě pilatky smrkové, která se vyskytuje převážně v mladých porostech s travním pokryvem nebo se starými drny trav, neproveditelná. Metodu rozboru zámotků komplikuje také možnost přeléhání housenic, kořeny stromů a větší kameny sni-

žující absolutní plochu plošky, a to neuvažujeme o chybě vzniklé přehlédnutím zámotků při rozboru materiálu z plošek.

Aby bylo možné uvažovat o vypracování integrované ochrany lesa proti pilatkám, je nutné hledat dobrou monitorovací metodu. Dospělci širopasého hmyzu jsou obecně lákáni do žlutých pastí (Murhead-Thompson 1991). Pro monitorování ploskohřbetek použili někteří autoři žluté lepové desky (Jensen 1988; Cescatti, Battisti 1992; Battisti, Rodeghiero 1998). Berger (1992) zjistil, že dospělci *Pristiphora abietina* jsou velmi dobře lákáni na žluté pasti a že počty dospělců korelují s výsledky půdních sond.

V roce 1998 byly srovnávány různé druhy pastí, Malaiseho lapač (Townesův typ), bílé a žluté lepové desky (5 a 5 kusů) a smýkání na transektu (50 smyků). Kontroly se prováděly ve třídenních intervalech na osmi lokalitách (tab. 1). Homogenity rozptylů byly testovány Bartlettovým χ^2 testem. Shoda aritmetických průměrů byla nejdříve testována pro všechny metody dohromady Kruskal-Wallisovou jednofaktorovou analýzou rozptylu a posléze pro jednotlivé dvojice metod metodou Dunn (ve všech případech $\alpha = 0{,}05$). Na bílých lepových deskách bylo zjištěno jen několik kusů dospělců pilatek. Mnohonásobná porovnání prokázala statisticky významnou shodu průměrů mezi soubory hodnot, získané Malaiseho lapačem a žlutými lepovými deskami, u obou pohlaví (tab. 2).

V roce 1999 byl studován vliv délky intervalů odběrů ve vztahu k množství zjištěných jedinců a vlivu hustoty lepových desek na velikost odchytu. Čtyři rovnoběžné řady s 50 lepovými deskami byly kontrolovány v různých intervalech (3, 6, 9, 12 dnů) pro zjištění vlivu délky intervalu kontrol na velikost úlovku. Délka intervalu mezi jednotlivými odběry ze žlutých lepových desek nemá vliv na odchycení celkového počtu dospělců, protože rozdíly aritmetických průměrů jednotlivých souborů jsou statisticky nevýznamné (tab. 3). Dále byl proveden pokus, kdy na dvou lokalitách v řadách stromů s lepovými deskami byl snižován počet desek a zároveň bylo mezi řadami tolik řad stromů jako počet neobsazených stromů mezi stromy s deskami (obr. 1). Podobně průměrné počty odchytaných dospělců v liniích se snižujícím se počtem desek byly vyrovnané (tab. 4 a 5).

Mezi počty dospělců (bez rozlišení pohlaví), zjištěnými na pěti lepových deskách v roce 1998 (protože na lokalitách byly soubory odchytaných dospělců velmi levostranně nesouměrné a špičaté, tzn. že populace je výrazně shlukovitá – tab. 6, obr. 3), bylo nutné tyto hodnoty transformovat (Box-Coxova transformace) a byla zjištěna statisticky vysoce signifikantní lineární korelace s výsledným poškozením porostu (obr. 3, $r = 0.95^{**}$ (ln)). Hodnocení poškození je ve skutečnosti jediná metoda, která zachycuje skutečný stav populace na daném místě. Hodnocení je prováděno na linii 100 stromů, kdy u každého jedince je hodnocena míra poškození přeslenů od vrcholu třemi stupni a poškození terminálu. Bylo určeno průměrné poškození jednoho stromu a hodnoty byly sečteny (obr. 2).

Závěrem lze konstatovat, že metoda žlutých lepových desek může být pro pilatku smrkovou vhodnou monitorovací metodou.

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