EFFECTIVENESS OF DEFENSIVE MEASURES AGAINST THE LARGE LARCH BARK BEETLE (*IPS CEMBRAE* (HEER)) AND THEIR IMPACT ON NON-TARGET INVERTEBRATES

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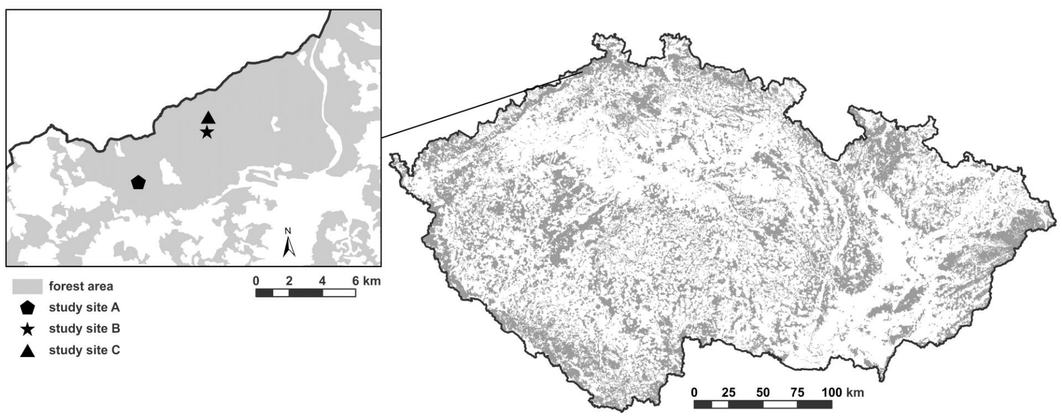
What is poisoned trap tree?

- Poisoned (p.) trap trees are cutted trap logs baited with pheromone lure and poisoned by insecticide.
- Their advantage lies in the unlimited capture ability of bark beetles attracted by pheromone lure.
- The main disadvantage of using poisoned trap trees is the negative impact on the non-target Arthropoda.

INTRODUCTION

Large larch beetle (*Ips cembrae* (Heer, 1836)) is a Euro-Siberian species of bark beetles (Scolytinae) [5], which is the facultative primary pest attacking larch stands (*Larix decidua* Mill.) in Europe. *I. cembrae* usually produces 2 generations depending on the weather [4] and altitude [2]. Between 2000 and 2020, an average of 467.850±66.405 m^3 of larch wood was harvested annually by salvage logging. Between 2005 and 2008, the share of logged timber infested by *I. cembrae* increased by 0.5 % and between 2015 and 2019, the most severe outbreak of *I. cembrae* occurred and the share of salvage logging increased up to 4.5 % [1]. Standing poisoned trap trees were successfully tested against the spruce bark beetle (*Ips typographus* L.) [3]. The aim of this study was to compare effectiveness of poisoned standing and laying trap trees in forest protection against *I. cembrae*.



METHODOLOGY

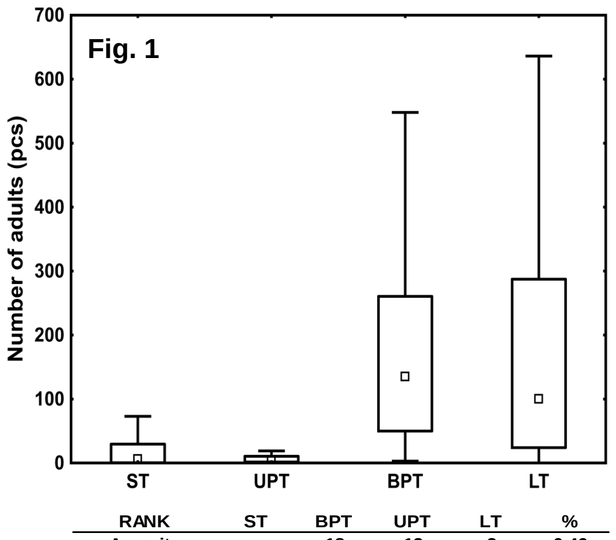
On 5 model localities (AI, AII, BI, BII, CI) in Děčínský Sněžník, 1 slot trap (Theysohn) (ST), 1 p. lying trap tree (LT) baited with pheromone were installed. Under the lying trap tree (lenght = 4 m) in the centre and on the edge, 2 catching devices (1 x 1 m) (centre, edge) were placed. The pheromone lure Cembräwit was placed in the centre of the p. trap tree. In a group of 11 standing trees, there were 6 control non-poisoned trees and 5 p. trees up to a height of 4 m. Two (UPT, BPT) from the 5 p. trees had 2 catching devices (0.8 x 0.8 m) in height 0.3 m and 2 m to collect dead bark beetles. One of the p. trees with devices was baited with pheromone lure (BPT). The samples from devices were collected every 2 weeks. Non-target Arthropoda in samples were divided into taxonomic ranks. The normality of data was analysed by Shapiro–Wilk (SW) test and differences were tested by Mann–Whitney U test and Kruskal-Wallis H test.

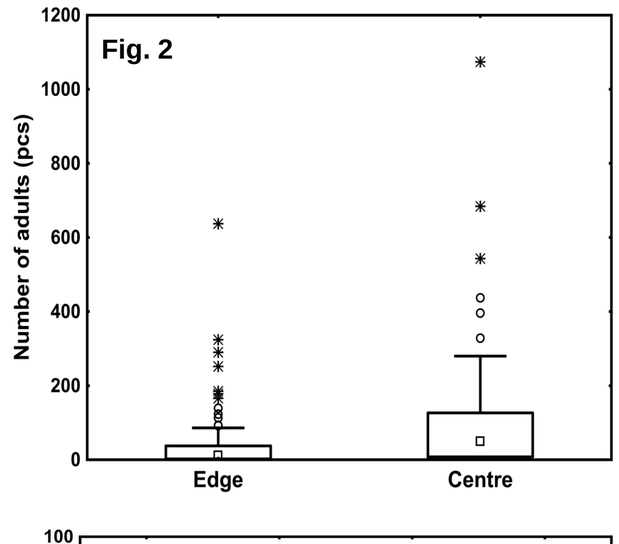
Poisoned lying trap tree (LT)

Baited (BPT) and unbaited p. tree (UPT)

RESULTS

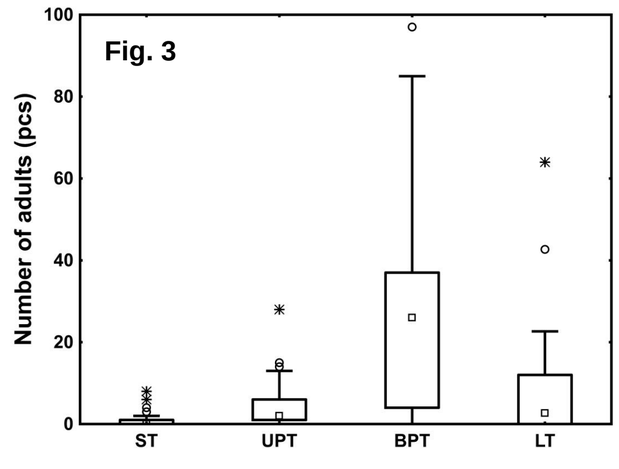
In total, 19 812 imagoes of *I. cembrae* were captured by defensive measures. The high effectiveness of lying (LT) and standing poisoned trap trees (BPT) was confirmed (SW: W = 0.595, p = 0.0000; KW: H (3, N = 180) = 74.541, p = 0.0000) (Fig. 1). A statistically significant difference was found between the catches of *I. cembrae* on the edge and in the centre of lying trap tree (LT) (SW: W = 0.689, p = 0.0000; MW: z = -2,311, p = 0.0207) (Fig. 1). No difference was found between the catches of bottom and upper part of the poisoned standing baited trap tree. Slot traps (ST) caught only 1180 imagoes and poisoned trees (UPT) without pheromone caught a low number of images (370 pcs).





Totally 7166 imagoes of Arthropoda were caught. BPT most negatively (SW: W = 0.608; p = 0.0000; KW: H (3, N = 181) = 62.339 p = 0.0000) affected *Thanasimus formicarius* L. (Cleridae) killing 1681 imagoes. *T. formicarius* is predator of bark beetles that was attracted by pheromone lure Cembräwit. Our results indicate that poisoned standing and lying trap trees with pheromone lure are usable in forest protection of larch stands against *I. cembrae*. Poisoned trap trees negatively affect populations of bark beetles predators (Cleridae) and soldier beetles (Cantharidae).

RANK	ST	BPT	UPT	LT	%
Apocrita		18	13	2	0.46
Araneae		328	271	13	8.54
Buprestidae		14	13	2	0.40
Cantharidae		749	626	17	19.43
Carabidae	1	92	92	4	2.64
Cerambycidae	9	69	43	38	2.22
Cleridae	52	1439	269	233	27.81
Coccinellidae	1	21	32	6	0.84
Curculionidae	1	283	321	9	8.57
Diptera	1	337	374	51	10.65
Ectobiidae		27	36	11	1.03
Elateridae	53	401	272	24	10.47
Ensifera		46	47	2	1.33
Formicidae	1	19	6	5	0.43
Heteroptera	1	28	30	5	0.89
Hydrophilidae	17	0	0	0	0.24
Chrysomelidae	3	4	12	1	0.28
Lepidoptera	2	13	22	4	0.57
Lymexylidae	4	3	0	0	0.10
Opilionida		14	5	2	0.29
Raphidioptera		4	7	0	0.15
Symphyta		64	68	5	1.91
Tenebrionidae	28	17	1	8	0.75
SUM	174	3990	2560	442	7166



ACKNOWLEDGEMENT

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