

STUDY UPON THE SPECIES *IPS TYPOGRAPHUS* L. (COLEOPTERA, CURCULIONIDAE) IN THE RAȘINARI FORESTRY ECOSYSTEM, SIBIU COUNTY

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Abstract

The disturbance of the equilibrium between the endogenous and exogenous command factors of human origin leads to massive perturbations in the forestry ecosystems affecting all the living beings within the biocenosis and especially the forestry entomologic fauna. Under some circumstances the pest insects from the forestry ecosystem can produce big damages to the trees in the case of maintaining high effectiveness of these and for many years, too. Our study aimed the monitoring the species Ips typographus L., a forestry pest, which by its action produces important damages to the spruce fir. The research work ran for two years, during 2012-2013, in the area of Rașinari Forestry District, Sibiu County. The work method was to install at the skirt of the forest the traps with pheromones bait in the researched area. There were collected a number of 4,146 samples of which in 2012 were captured 1,973 individuals and in 2013 were captured 2,173 individuals. There was established a growth of the pest population in the studied biotope, this being the same as at the national level. As a consequence there are imposed further studies in order to find the most proper solutions regarding stopping the dissemination of the insect into new territories and maintaining the density of the population of the pest beyond the economic level of damage.

Key words: Coleoptera, forestry ecosystem, Ips typographus

INTRODUCTION

A high attention upon the evolution of the Romanian forestry ecosystem was firstly drawn by Berca in 2006.

Romania is among the countries with a medium degree of covering, namely 26.77% of the total forest surface, being on the 10th place in Europe. As a result of reducing the forestry surface in the last decades, with almost 5 million hectares, today the forestry patrimony of Romania is estimated at a surface of 6,341 thousands hectares from which the forests hold 6,339 thousand hectares [3].

The forest is considered a conglomeration of ecosystems with specific characteristics made up of trees, bushes, herbaceous plants and fauna. The trees that are the main factor of the trophic and dynamic forestry ecosystem are continuously under the action of the endogen factors (such as physical and chemical elements of the system, biotic components) and exogenous command factors of atropic

origin [1]. The atropic factors are as follows: the weather changes (high or low temperatures, diminution of the ozone stratum due to pollution); the modification of the ecosystem through excessive clearing, intensive agriculture, urbanizing, fires, excessive use of pesticides, especially insecticides against the forestry pests and last but not least the apparition of “new pest species” and the “secondary pests” [5,17].

The deregulation of the equilibriums among these factors leads to massive perturbations in the forestry ecosystems having strong influences upon the living beings within the biocenosis and mostly upon the forestry entomologic fauna. This, under certain circumstances, can produce major prejudices upon the trees, in case of maintaining high effectiveness of pests and for many years, too. The forestry entomologic fauna can attack diverse parts of the trees: leaves, fruits, roots, bark, the wood and seeds. The insects attacking leaves belong to the orders *Lepidoptera* [6, 10, 14, 16], *Coleoptera* [1, 2]

and *Hymenoptera* [9]. There are numerous insects that attack both the resinous and leafy trees. The main category of pests in the leafy forests in Romania is represented by the species belonging to the order *Lepidoptera* with the classical example of the species *Limantria dispar* L. (the hairy caterpillar of the oak) [11,15]. The insects that attack the wood (xylophages) produce galleries in the wood or between the bark and the wood. They belong to the orders *Coleoptera*, *Lepidoptera* and *Diptera*. Among the insects attacking the wood and the bark of the trees is included also the species *Cerambyx cerdo* L. [4] and *Ips typographus* L., species with a stressed secondary character and which make the object of our study.

During the last years the deregulations among the endogen and exogenous command factors from the forestry ecosystems determined that the pest *Ips typographus* L. named also “European spruce bark beetle” to produce major attacks in the spruce fir forests in our country. The insect is considered “a secondary pest” which attacks the trees in a weakly condition. By mass multiplying this can transform into a primary pest and can attack healthy trees producing great damages to the forestry ecosystems. In 2014 in the spruce fir forests in Bistra Valley basin the trap trees presented intensification of the attack, from weak to middle (between 8.6 and 39.8 entries/m² on analyzed bark) [8]. In the Brasov area there were also collected with the help of the pheromones traps a big number of samples of *Ips typographus*: in 2009-14,632 samples, in 2010-32,921 samples and in 2011-54,179 samples which affected the wooden part in the quoted ecosystem [7]. In the Retezat National Park the attack of the pest took proportions in 2010. This attacked the spruce fir trees on an area of 1,500 hectares, the infestation comprising 2,000 cubic meters [8]. Important damages have been noticed in the Semenic-Caraș Keys National Park where were eliminated 8,000 cubic meters of wood, the damage being estimated at 3 million lei [9]. In the last two years in the Vișeu area also were cut 100,000 cubic meters of wood presenting attacks of *Ips typographus* [18]. A correct economic management imposes an

advantageous equilibrium between the necessary expenses and the expected benefits in the forestry ecosystem [12]. The uncertainty or the risk bound to the forestry economic management must come into discussion regarding a durable and sustainable development of the ecosystem [13].

MATERIALS AND METHODS

The researched species in the forestry ecosystem *Ips typographus* (Linnaeus, 1758), which is commonly named “European spruce bark beetle”. Systematically the species belongs to Class: *Insecta*, Order: *Coleoptera*, Suprafamily: *Curculionoidea*, Family: *Curculionidae*, Subfamily: *Scolytinae*.

The adult can have sizes from 3.5 to 5.5 mm, having a brownish black color with yellow hairs. The elytrons have a dark brown color with rows of dots. On the posterior part these present a bevel cant which has four teeth on each part. The third one is bigger and thicker toward the top (Photo 2). The antennae are slightly in a right angle (Photo 1). These together with the legs are yellow. The larvae are white and apodal.



Photo 1.
Ips typographus L.
Antenna slightly in right angle. (original photo)



Photo 2 *Ips typographus* L. Elytron's teeth. (original photo)

The research was done in a spruce fir arboretum round 80 years old in Șanta area, Rașinari Forestry District, Sibiu County, at 1,420 m. altitude.

The forestry fond of the Rașinari Forestry District has 9,962 hectares from which the area occupied by woods 9,891 hectares (7,174 hectares resinous trees, 2,717 hectares leafy trees). The forestry formations were built on the structure of the five basic species (spruce fir, fir tree, beech, evergreen oak and oak), the greatest part being covered by the spruce fir 58%, showing that the spruce fir is at large. The other basic formations are consisting of

beech and evergreen oak. The oak has a symbolic presence (Table 1).

Table 1. The forestry formations of the Raşinari Forestry District

Kinds of wood	Surface (Ha)	(%)
Pure spruce fir areas	4,293.1	56
Mixed spruce fir-fir-beech	281.3	4
Spruce fir-beech	163,0	2
Pure mountain beech	1,799.3	23
Pure hill beech	224.8	3
Pure evergreen oak	673.9	9
Evergreen-beech	184.9	2
Evergreen-oak	69.8	1

Source: <http://www.osrasinarira.ro>

The time during the investigation took place was 2012-2013.

The collecting method of the biologic material was done using the wing type of pheromones traps. The trap is made by two rectangular panels put perpendicularly one over the other. On it there is a lid in a pyramid shape, as a protection against the wind and the sun. In the middle of the joining of the two plastic follies there is made a hole in which is placed the pheromones bait, using Atratyp pheromone. In the inferior part the trap continues with a funnel in a pyramid shape for collecting and conducting the insects in a plastic recipient. This has a lid with a wire net for leaking the water (Photo 3).



Photo 3. Pheromones trap of wing type (original photo)

The pheromones traps were put at the skirts of the forest, the distance among them being of 100 m. There were three traps. Their installing was done at the end of April 2012, 2013. The checking up of the pheromones traps and the collecting of the insects was done one in a three days or weekly function of the weather. The insects shouldn't be left too long in the traps, because they decompose and emanate a bad smell diminishing the one of the

pheromone.

During this period there were collected a number of 4146 adults and they were preserved in alcohol of 60% till they were sorted and identified.

RESULTS AND DISCUSSIONS

Ips typographus is known as the main pest of the spruce fir tree, having a share of 80% from the total of *Scolytinae*, identified in the attack. It attacks trees of 40 years old but mainly those round 60 to 100. In 2012 were captured a total of 1973 samples from 3 pheromones traps (Table 2).

From the data in the table 2 can be noticed that during 2012 the flight of *Ips typographus* began at the beginning of May. The attack of the pest registered maximum values within June for the traps 2 and 3, and regarding the trap 1 the maximum value of the captures was registered in July.

Table 2. The numerical abundance of the species *Ips typographus* L. during 2012

Nr. Trap	Date of installin g the trap	Date of checking the trap/ nr. sample on trap												Total adults/ trap
		May			June			July			August			
		4	7	31	4	7	30	4	7	31	4	18	31	
1	29.04	29	-	87	99	43	98	89	35	98	5	38	21	642
2	29.04	25	-	91	98	59	87	98	49	69	9	41	28	654
3	29.04	63	-	83	99	51	99	99	38	74	4	32	35	677
Total month/year		378			733			649			213			1,973

The collecting in June was bigger because it corresponds to the first flight of the insects, which is considered to be the most active and dangerous. At the beginning of August there was registered a reduction of the number of captures, and at the end of this month the number of coleopterons was reduced significantly. With the help of the trap 1 were collected 642 adults, the trap 2 -654 adults and from trap 3 -677 adults.

In 2013 were captured a number of 2182 adult with 3 pheromones traps placed in the same place like in 2012, respecting the same program of collecting as in the previous year (Table 3).

During the year 2013, with the help of the traps 1 and 2, it was collected a number of 704 sample for each trap and in trap 3 a number of 764 adults.

Table 3. The numerical abundance of the species *Ips typographus* L. during 2013

Nr. Trap	Date of installin g the trap	Date of checking the trap/ nr. sample on trap												Total adults/ trap
		May			June			July			August			
		4	7	31	4	7	30	4	7	31	4	18	31	
1	29.04	31	40	90	98	47	99	91	37	97	9	40	25	704
2	29.04	29	35	87	99	61	90	99	51	70	7	45	31	704
3	29.04	65	71	88	99	56	98	98	40	76	6	38	30	765
Total month/year		536			747			659			231			2,173

The same as during 2012 the biggest values of the captures were in June, respectively in July. The number of captures decreases beginning from August and coincides with the second flight of the insects that is considered a reduced flight.

By a comparison between 2012 and 2013 there can be established a raise of the population of *Ips typographus* in the researched forestry ecosystem.

As a result of the researches done in the field we established the intensification of the attack of this pest species against the spruce fir trees, these being vulnerable due to their age, the arboretum reaching 80 years old. Initially, the attack was headed against the enabled, broken, hurt trees. There was noticed how the attack came down to the tree stem till almost to their base. The growth of the pest in the area can have as an effect into transforming it from a secondary species in a primary one. We can prevent the multiplying of the coleopteron by hygiene, by taking out the attacked wooden materials and by applying a corresponding integrated material against the pest, preventing the attack against the healthy trees.

CONCLUSIONS

The attack produced by *Ips typographus* L. against the spruce fir trees extended in the last years in more areas of the country.

During the period 2012-2013 the study was done in the Raşinari forestry ecosystem, area were the spruce fir tree wood is preponderant.

Noticing and finding out the “European spruce bark beetle ” trees was done during the two years by using the pheromones baits. There were used every time 3 wing type traps placed at the skirts of the wood having 100 m. distance one from each other.

There were captured a number of 4,146 adults

of *Ips typographus* of which 2,173 samples in 2013 and 1,973 samples in 2012.

Because the pest is in extension there should be make more studies permitting to lead to the most proper solutions in order to stop the dissemination of the insect in new territories, maintaining the density of the pest population under the economic damage limit.

Giving the information to the forestry personnel regarding knowing this pest should be a permanent preoccupation using all the means at hand.

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