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THE FORESTRY ECOSYSTEMS MANAGEMENT IN THE FOREST DISTRICT SIBIU, AGAINST THE DEFOLIATOR SPECIES *LYMANTRIA MONACHA* L., 1758 (LEPIDOPTERA: LYMANTRIIDAE) DURING THE PERIOD 2013-2017

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Abstract

In the present paper the investigations had as a purpose to knowledge of the Lymantria monacha L., 1758 *populations dynamic during the period 2013-2017 in the Forest Direction Sibiu, in order to use the results for a monitoring plan and control for the year 2018. The investigations made within the frame work of the Forest Districts: Arpaș, Avrig, Miercurea Sibiului, Sibiu and VI Cibin in the last five years studied the presence of this defoliator in a large number within Forest District Miercurea Sibiului (260 specimen), followed by the Forest District Arpaș (147 specimen), Sibiu (83 specimen), Forest District Cibin VI (55 specimen) and Forest District Avrig (52 specimen).*

***Key words*:** *Lymantria monacha L., 1758, Forest Direction Sibiu, pheromonal traps*

INTRODUCTION

The Forest Direction Sibiu manages a surface of 60,971 ha forest fond, in the state property.
From this surface, after the centralization of the data obtained during the years 2013-2017, it comes out that the pest damaged 3,183.5 ha, that represents 5.22% from the total surface.
Among the biological pests that made damages in the forest ecosystems of the Forest Direction Sibiu, we mention: the insects (*Hylobius abietis, Lymantria monacha, Pristiphora abietina, Ipidae*) vegetal parasites and mammals. From all of them we can affirm that *Lymantria monacha* L., 1758 is the most noxious defoliator of this forests, mostly of the coniferous forests ones [2-13].
The identification of the presence of this defoliator and the numeric increase in the forest ecosystem from the Forest Direction Sibiu, requires strict measures in order to limit its populations [14-18].
Based on the studies made during the years 2013-2017, it comes out that among the five monitored Forest Districts, the Forest District Miercurea Sibiului is the most affected by this defoliator attack [19]. The presence in the large number of the butterflies captures of *Lymantria monacha L., 1758* imposes a corresponding monitoring to control [1] this pest populations in the area of the Forest Direction Sibiu.

MATERIALS AND METHODS

The most efficient method to establish the presence and evolution of this pest populations is the pheromonal method.
The study of the population dynamic of the defoliator *Lymantria monacha* L., 1758 was made in accordance with the order nr. 42/13.03.1987 in the forests where the spruce fir and the fir trees were more than 30%, not matter the age of the arbores. Within the frame work of the Forest Direction Sibiu between the years 2013-2017 were installed a number of 150 points of control using the pheromonal traps Atralymon mounted [8-12, 20] on the plastic poster with caterpillar glue proceeded from the Chemistry Institute "Raluca Ripan" Cluj-Napoca.
The placement of the traps in the field during

the years of monitoring took place before the flight beginning of the adults [4-7,13]. This moment was different from a location to another, depending on the altitude and latitude of the Forest District monitorized (Arpaș, Avrig, Miercurea Sibiului, Sibiu and VI Cibin). In order to include all zones possible to become infested, the pheromonal traps were placed in the monitoring system (1:20.000) in the way that at about 200 ha should be "a control point".

RESULTS AND DISCUSSIONS

During the years 2013-2017, it was monitored the evolution of the population of the defoliator *Lymantria monacha L., 1758* in the five Forest Districts (Arpaș, Avrig, Miercurea Sibiului, Sibiu and VI Cibin) that belong to the Forest Direction Sibiu. Every year at the end of the flight period of the pest *Lymantria monacha L., 1758*, were centralized the results data in accordance with the Table 1-5. All these data constitute the necessary information about the evolution of the pest populations in the forest ecosystems within the frame work of Forest Direction Sibiu, and also the pest control measures.

Table 1. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 in 2013

	Forest District	Max. No.	U.P.	U.A.
1	Arpas	42	V	76A
2	Avrig	10	III	85A
3	Miercurea	58	III	145
4	Sibiu	16	I	74B
5	Vl Cibinului	11	II	109B
TOTAL		**137**		

Source: Field Survey, 2013.

Table 2. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 in 2014

	Forest District	Max. No.	U.P.	U.A.
1	Arpas	34	V	63B
2	Avrig	4	III	130A
3	Miercurea	35	III	145
4	Sibiu	13	II	151A
5	Vl Cibinului	16	II	120A
TOTAL		**102**		

Source: Field Survey, 2014.

Table 3. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 in 2015

	Forest District	Max. No.	U.P.	U.A.
1	Arpas	23	IV	121B
2	Avrig	3	II	73E
3	Miercurea	50	III	162B
4	Sibiu	20	I	36A
5	Vl Cibinului	0	0	0
TOTAL		**96**		

Source: Field Survey, 2015.

Table 4. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 in 2016

	Forest District	Max. No.	U.P.	U.A.
1	Arpas	36	IV	54B
2	Avrig	12	II	73E
3	Miercurea	33	III	162B
4	Sibiu	19	I	36A
5	Vl Cibinului	0	0	0
TOTAL		**100**		

Source: Field Survey, 2016.

Table 5. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 in 2017

	Forest District	Max. No.	U.P.	U.A.
1	Arpas	12	IV	33A
2	Avrig	23	II	81A
3	Miercurea	84	III	168B
4	Sibiu	15	I	36A
5	Vl Cibinului	29	II	131B
TOTAL		**163**		

Source: Field Survey, 2017.

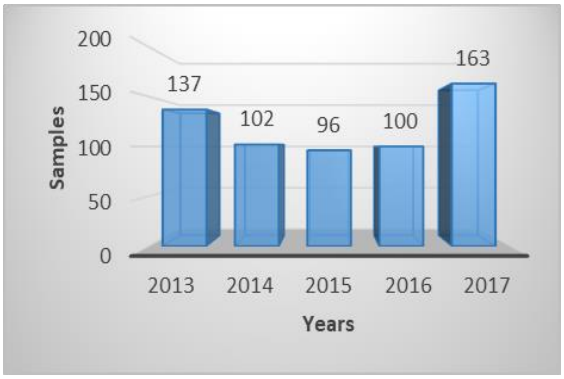

Fig. 1. The dinamics of the maximum captures of *Lymantria monacha* during the period 2013-2017

After the data centralizing from the five Forest Districts belonging to Forest Direction Sibiu, it comes out that the year with maximum attack were 2013 with 137 captures and 2017 with 163 captures. This was because

of the favourable meteorological conditions for development of this defoliator.

Table 6.The monitoring of infestation with *Lymantria monacha* L., 1758 in the coniferous forest and also the control measures proposed for the year 2018

Forest District	The surface with the presence identified (ha)		The surface after the nr of butterflies on one poster in the year 2017			The no. of pheromonal traps in the year 2018
	2016	2017	Over 100	Over 200	Over 400	
Arpas	5,130	5,130	0	0	0	25
Avrig	4,310	4,310	0	0	0	21
Miercurea	9,500	9,500	0	0	0	85
Sibiu	2,490	2,490	0	0	0	12
Vl Cibinului	1,600	1,600	0	0	0	7
Total	23,030	23,030	0	0	0	150

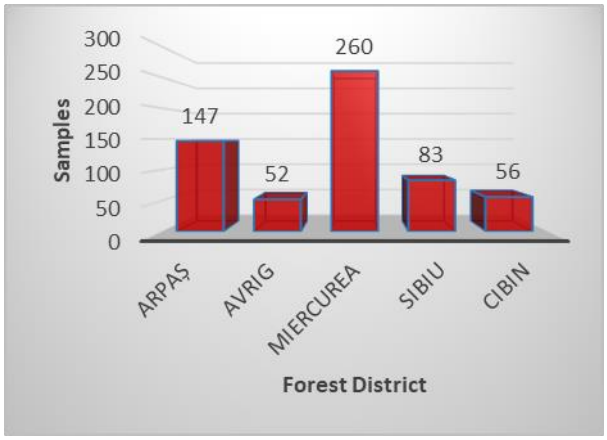

Fig.2. The dynamics of the maximum captures of *Lymantria monacha* L., 1758 within the frame work of forest Direction Sibiu
Sursa: Own design based on field survey.

The butterflies flight of *Lymantria monacha*, L., 1758 took place in the months July-September of the years 2013-2017, but the beginning and the end of the flight were offset depending on the place of the trap in the five Forest Districts: Arpaș, Avrig, Miercurea Sibiului, Sibiu and VI Cibin and the climatic evolutions specific to every year.

The highest number of 84 butterflies of *Lymantria monacha*, L., 1758 at a "control point" during all period of observations in the year 2017 were recorded at the Forest District Miercurea Sibiului [19].

After the analysis of the data about all five Forest Districts we established that the most affected is the Forest District Miercurea Sibiului with 260 specimen captured during the five years of study, followed by Forest District Arpaș, with 147 captured specimen, Forest District Sibiu with 83 specimen. The least affected were the Forest District VI Cibin and Avrig with more than 50 captured specimen.

CONCLUSIONS

The works to protect the forest within the framework of the Forest Direction Sibiu are effected for the maintaining an adequate phyto-sanitary situation in nurseries, solariums, young cultures and forest of deciduous and coniferous trees.

After the catalogue of the captured made by mean of 150 pheromonal traps in order to capture the species *Lymantria monacha*, L., 1758 during the years 2013-2017 on the surface of 23,030 ha of forest we could have the following conclusions: taking into consideration the correlation between the maximum density of insects during the larvae and adult stages it could be forecasted the pheromonal traps number necessary to protect the forestry ecosystem for the year 2018.

Another conclusion is that the density of populations is influenced by the variations of the maximum temperature in the month of May in every year of the study, by the rainfalls recorded during the flight period and by the yearly dryness during the period between 2013-2017.

Within the frame work of the Forest Direction Sibiu the pest *Lymantria monacha* L., 1758 continues to be in a latent stage because during the five years of study were not captured more than 200 butterflies on a point in the forests under 60 years old or more than 500 butterflies on a point in the forests older than 60 years, that require the additional measures to control this pest populations.

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