

**RESEARCHES REGARDING THE BIOLOGY OF THE PEST
PITYOGENES CHALCOGRAPHUS L. (COLEOPTERA, SCOLYTIDAE)
IN THE NĂDRAG - PADEȘ AREA (TIMIȘ COUNTY)**

**CERCETĂRI PRIVIND BIOLOGIA DĂUNĂTORULUI
PITYOGENES CHALCOGRAPHUS L. (COLEOPTERA, SCOLYTIDAE)
ÎN ZONA NĂDRAG - PADEȘ (JUDEȚUL TIMIȘ)**

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Abstract: To establish the flight phenology of the insect *Pityogenes chalcographus* L. and the development of descendance on the year 2005, were been delimited experimental points in representative forest stands with spruce from Nădrag-Padeș area. After recorded captures at pheromonal traps baited with aggregative synthetic pheromones we establish that the insect has two flights on year. The first flight is in April, May and June (76-94% from the flight on all growing season), and the second flight is in July and August (6-24% from the flight on all growing season). Has been established the length of each flight and the top of flight. Has been established the populations level. After periodically bark the trap stakes, as favourable place of oviposition, has been established the date of first entering of parents beetles, the date of appearance of first eggs, the length of egg, larval, pupal stadium, the date of appearance of first young adults and first mature adults, in forest stands at different altitude. Has been established that the insect have two generation on year.

Rezumat: Pentru a determina fenologia zborului insectei *Pityogenes chalcographus* L. și dezvoltarea progeniturii pe parcursul anului 2005, au fost delimitate puncte experimentale în arboretele reprezentative de molid din zona Nădrag-Padeș. În urma capturilor înregistrate la cursele feromonale amorțate cu feromoni sintetici agregativi s-a stabilit că insecta prezintă două zboruri pe an. Primul zbor este în aprilie, mai și iunie (76-94% din zborul de pe întreaga perioadă de vegetație), iar zborul al doilea este în iulie și august (6-24% din zborul de pe întreaga perioadă de vegetație). S-a determinat durata fiecărui zbor și vârful de zbor. S-a stabilit nivelul populațiilor. În urma cojirii periodice a parilor cursă, ca locuri favorabile de ovipoziție, s-a determinat data primelor intrări ale gândacilor părinți, data apariției primelor ouă, durata stadiilor de ou, larvă, pupă, data apariției primilor adulți tineri și a primilor adulți maturi, în arborete situate la altitudini diferite. S-a stabilit că insecta are două generații pe an.

Key words: *Pityogenes chalcographus*, biology, Nădrag-Padeș

Cuvinte cheie: *Pityogenes chalcographus*, biologie, Nădrag-Padeș

INTRODUCTION

The pest *Pityogenes chalcographus* L. made damages at the spruce trees, in age of 8-12 years, through biting the wood bast, thus hindered the circulation of the descendant sap. The pest made damages even older spruces through hindering at the level of treetop and branches, producing the perturbations. The attacks appear in conditions of physiological perturbations caused of different factors. After physiological deregulations, the host-plant cannot produce enough resin to flood the galleries made of adults and thus cannot repel the attack. True beetles entered in bark, the males emit the aggregation pheromone and attract other males, and after those other females, which contribute at population enlargement and contribute at supplementary destabilization of physiological functions of the tree. In field experience has

been follow the phenology of insect flight on all growing season with the appreciation of populations level and insect's descendance development in Nădrag-Padeș conditions.

MATERIAL AND METHOD

The experiment presented in this paper has been effectuated in representative forest stands with spruce from management unit III Padeș (forest district Ana Lugojana). The sites and typological characteristics of the research surfaces are presented in table 1.

Table 1

The site and typological characteristics of the research surfaces in Nădrag-Padeș area

Surface no.	Compartment	The sites type	The forest type	Surface (ha)	Height (m)	Exposition	Compozition	Mean age (years)
2.	15E	5.2.4.3. Hilly of <i>Fageta</i> (Ps), with <i>Asperula-Asarum</i>	421.1 <i>Fageta asperuleto</i> <i>submontana</i>	4.2	350-480	S E	4FA3M O 1BR1L A	110
3.	16A	5.2.4.3. Hilly of <i>Fageta</i> (Ps), with <i>Asperula-Asarum</i>	421.1 <i>Fageta asperuleto</i> <i>submontana</i>	12.9	370-550	S V	4BR3 MO 1FA1C A 1DT	100
4.	16E	5.2.4.3. Hilly of <i>Fageta</i> (Ps), with <i>Asperula-Asarum</i>	421.1 <i>Fageta asperuleto</i> <i>submontana</i>	1.4	440-480	S E	8MO2F A	100
9.	48B	4.4.3.0. Mountain-premountain of <i>Fageta</i> (Ps), with <i>Asperula-Dentaria</i>	411.1 <i>Fageta dentarietosa montana</i>	12.8	710-830	S V	6BR3 MO 1FA	90
12.	49B	4.4.3.0. Mountain-premountain of <i>Fageta</i> (Ps), with <i>Asperula-Dentaria</i>	411.1 <i>Fageta dentarietosa montana</i>	13.7	710-810	E	6BR2 MO 2DT	95
17.	61B	4.4.2.0. Mountain-premountain of <i>Fageta</i> (Pi), with <i>Asperula-Dentaria</i>	411.4 <i>Fageta dentarietosa montana</i>	4.8	820-930	S	6MO2 LA 2FA	105
19.	64B	4.4.2.0. Mountain-premountain of <i>Fageta</i> (Pi), with <i>Asperula-Dentaria</i>	411.4 <i>Fageta dentarietosa montana</i>	28.4	850-1180	N V	7MO2 LA 1FA	95
21.	67A	4.4.3.0. Mountain-premountain of <i>Fageta</i> (Ps), with <i>Asperula-Dentaria</i>	411.1 <i>Fageta dentarietosa montana</i>	14.8	960-1180	S E	8MO1F A 1BR	100
26.	82A	4.4.3.0. Mountain-premountain of <i>Fageta</i> (Ps), with <i>Asperula-Dentaria</i>	411.1 <i>Fageta dentarietosa montana</i>	35.5	480-1050	S	8FA2B R	90
29.	84B	4.4.3.0. Mountain-premountain of <i>Fageta</i> (Ps), with <i>Asperula-Dentaria</i>	221.1 <i>Abieto-Fageta asperuleto</i> <i>sa</i>	12.0	580-1100	S	6FA2M O 2BR	100
34.	112F	5.2.4.3. Hilly of <i>Fageta</i> (Ps), with <i>Asperula-Asarum</i>	421.1 <i>Fageta asperuleto</i> <i>submontana</i>	0.9	340	N E	8MO2F A	85
35.	113 A	5.2.4.2. Hilly of <i>Fageta</i> (Pm), with <i>Asperula-Asarum</i>	421.1 <i>Fageta asperuleto</i> <i>submontana</i>	13.0	340-440	V	2MO6F A 1PAM 1DT	25

Note: Pi- inferior quality; Pm- middle quality; Ps- superior quality; *Asperula odorata* (*Galium odorata*); *Asarum europaeum*; *Dentaria bulbifera* (*Cardamine bulbifera*), MO- spruce, BR- fir tree, LA- larch, FA- beech tree, CA- hornbeem, PAM- sycamore maple, DT- .

The flight phenology of the insect *Pityogenes chalcographus* L. on all growing season in the year 2005 has been established through the periodical sampling of biologic material captured from field with the pheromone traps. The traps were periodical verified, at 7-10 days. Though, in literature is recommended that at the flight beginning, the visiting of the traps to do at 3-4 days and than weekly, in our conditions, have not the captures which to outrun the collector capacity, the insects harvest has been made at 7 days in the flight periods and until 10 days in rainy periods or with reduced flight. The pheromone lure has been refreshed once at 30-40 days to increase the capacity of attraction of the traps, known the fact that the temperature and precipitations can contribute at pheromone dilution.

The utilized traps were traps type Theysohn baited with aggregative synthetic pheromones Chalcoprax Ampulle and Atrachalc.

The placement of the traps has been done at the edge of forest stands and in zones with thin forest area or in the glade. The distance between trees and traps was of 30-35 m. The height of the placement of the traps was of 1.3-1.4 m.

The obtained dates has been used to identify the moment of the flight unleashing on the year time, the length and the intensity of the flight on the period of insect activity, on the stock of height difference of the infested forest stands placement. The captures values have been utilized for the presentation of the insect flight dynamic in different types of forest with spruce from area.

In parallel, in two forest stands with spruce, placed at different height (300-400 m and 800-900 m), has been followed the descendants from insects flights on all growing season. Thus, has been installed the piles of trap stakes favourable for the insect oviposition and where the descendant have optimum condition of development. For monitoring of the descendant from the first flight has proceed at installed of the first series of stakes piles (15.04.2005), and for monitoring of the descendant from the second flight has proceed at installed of the second series of stakes piles (10.07.2005).

Has in view the first entering of adults, the period of infestation of trap stakes, marking with paint the entrances made of adult insects. Further researches were done through multi-barks of stakes and count of the insects. Thus, has been determinate the number of generations on year, the length of the development stages from marking of the first entrances to the appearance of first mature adults.

In each point of research have been installed four piles of stakes, stakes with middle diameter of 6-20 cm. The distance between the piles was of 50 m. The placement of trap stakes has made at the edge of the forest before the flight beginning. The distance between the piles and trees was of 20-35 m.

RESULTS AND DISCUSSIONS

In the year 2005, the trap installing has been done in the date of 10 respectively in 11 of April. The traps have been active until to the end of month October.

Begins with the date of 17 April, at the level of traps placed in *Fageta asperuleta submontana* forest type, at the height of 300-400 m, has been recorded the first captures of insects. At the level of *Fageta dentarietosa montana* and *Abieto-Fageta asperuleta* forest types, at the height of 600-1000 m, the first captures have been recorded in the date of 26 April. The moment of the flight beginning is conditioned of the values of temperatures. Thus, the medium temperature recorded in the period of flight beginning has been of 12.4-14.5°C and the maximum recorded value has been of 17.3-21.4°C. The last day with frost has been recorded in the date of 06 March. The sum of positive temperatures, recorded after the last negative value of temperature, at which is produced the flight beginning in the year 2005 have

the value of 363.9⁰C, and is comparable with the value from the year 2003 (343.0⁰C) and 2004 (350.4⁰C).

After the captures recorded at the level of pheromone traps in the conditions of the Nădrag-Padeș area in the year 2005, the bark beetle *Pityogenes chalcographus* L. presents two flights on year.

The first flight is in April, May, and June and represents 76-94% from the flight on all growing season. In this year the increasing of temperatures values has been made gradual, the warm periods alternating with cold and rainy periods. In these conditions, it was possible to observe the influence of environmental conditions about the insect flight. Thus, the length of the first flight is of 37 days at the traps placed in *Fageta dentarietosa montana* and *Abieto-Fageta asperuletos*a forest types at the height of 600-1000 m and of 46 days at the traps placed in *Fageta asperuletos*a *submontana* forest type, at the height of 300-400 m.

In *Fageta asperuletos*a *submontana* forest type (figure 1) the flight beginning has been done with high intensity comparative with the flight beginning from *Fageta dentarietosa montana* and *Abieto-Fageta asperuletos*a forest types, because of quick increasing of temperature values at the height of which are placed these forest types.

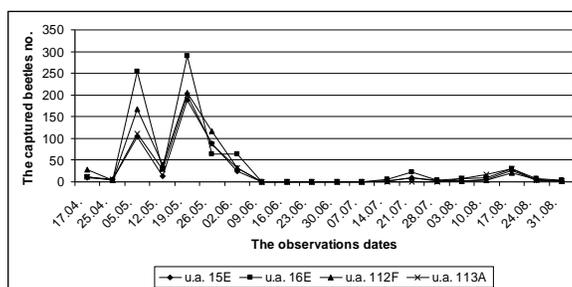


Figure 1. The flight dynamic at *Pityogenes chalcographus* L. in the *Fageta asperuletos*a *submontana* forest type

The beetle flight is concentrate in the month of May and presents a top of flight in the second decade of the month. The maximum flight was recorded after de 23-32 days from the flight beginning. The maximum captures has been recorded after a period, 16-18 May, favourable by the point of view of climatic conditions: the medium temperature between 19,0⁰C and 21,7⁰C, the maximum temperature between 25,4⁰C and 28,1⁰C, without the precipitations. In the month June, the general trend of insect flight has been of decreasing in intensity. The end of the first flight has produced at the majority of traps in 02 June. The biggest capture recorded at one reading was of 300 caught beetles in the compartment 49B (figure 2).

The lowest captures have been harvest from *Abieto-Fageta asperuletos*a forest types (figure 3), where the spruce presents a good vegetation situation, and where the pest cannot find the favourable conditions for multiplication.

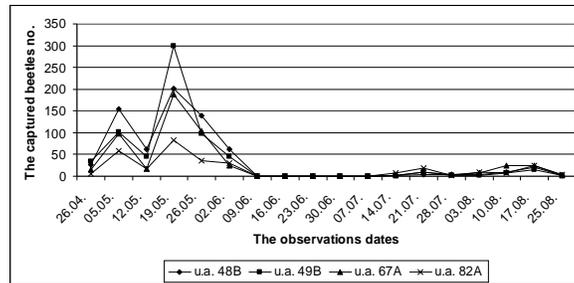


Figure 2. The flight dynamic at *Pityogenes chalcographus* L. in the *Fageta dentarietosa montana* forest type

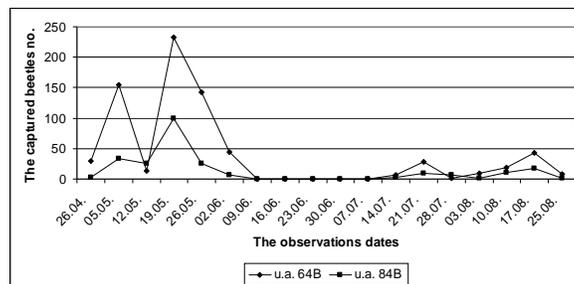


Figure 3. The flight dynamic at *Pityogenes chalcographus* L. in the *Fageta dentarietosa montana* (64B) and in *Abieto-Fageta asperuletos* (84B) forest types

The second flight is superposing upon the months July and August and represents 06-24% from the flight on all growing season. The length of this insect flight is of 42-48 days. The second flight is longer like first flight. With all of that even the second flight, present a top in the second decade of the month August at the level of all traps. The end of the second flight has been done at the level of traps placed in *Fageta dentarietosa montana* and *Abieto-Fageta asperuletos* forest types, at the height of 600-1000 m, with 6 days before like at the level of traps placed in *Fageta asperuletos submontana* forest type, at the height of 300-400 m.

The development of pest descendants on all growing season is presented in next few aspects.

At the level of trap stakes installed in *Fageta asperuletos submontana* forest type (at the height of 300-400 m) the first entrances of insects was identify at 6 days from stakes installing. The first eggs appears at 10 days from the first entrances marking. The egg stadium was of 14 days. The apparition of the first larva has been done at 18 days from the first entrances marking. The larval stadium has been of 23 days. The apparition of the first pupa has been done at 37 days from the first entrances marking. The pupal stadium has been of 18 days. The apparition of the first young adults has been done at 49 days from the first entrances marking. The young adults have been found in galleries time of 31 days. The first mature adults have been identifying at 62 days from the first adult's entrances marking. Thus, the period between the first adult's entrances marking and the first mature adults was of 8 weeks and 6 days. The resulted beetles produce the flight for pairing and oviposition in summertime.

In *Fageta dentarietosa montana* forest type (at the height of 800-900 m), the first entrances of insects was identify at 10 days from stakes installing. The first eggs appears at 12

days from the first entrances marking. The egg stadium was of 16 days. The apparition of the first larva has been done at 23 days from the first entrances marking. The larval stadium has been of 26 days. The apparition of the first pupa has been done at 36 days from the first entrances marking. The pupal stadium has been of 19 days. The apparition of the first young adults has been done at 52 days from the first entrances marking. The young adults have been found in galleries time of 42 days. The first mature adults have been identifying at 81 days from the first adult's entrances marking. Thus, the period between the first adult's entrances marking and the first mature adults was of 11 weeks and 4 days. The resulted beetles produce the flight for pairing and oviposition in summertime.

In the conditions of the year 2005, at the beginning of the month June a part from "mother" females which ending with oviposition, produce a supplementary feeding for sexual organs remaking, after that the female abandon the initial system of attack and after a new pairing they lay down the eggs again, giving life to the parallel descendant named "brood generation". A part from these descendants from this generation hibernates like larva or pupa.

Table 2

The development of the 1st generation of the bark beetle *Pityogenes chalcographus* L., 2005

No.	The observation period	Analyzed exemplars (eggs, larva, pupa, adults)		% from analyzed exemplars									
				eggs		larva		pupa		young adults		mature adults	
				16A	61B	16A	61B	16A	61B	16A	61B	16A	61B
	2	3	4	5	6	7	8	9	10	11	12	13	14
1	01.05.-05.05.	131	-	100	-	-	-	-	-	-	-	-	-
2	06.05.-10.05.	145	102	60	100	40	-	-	-	-	-	-	-
3	11.05.-15.05.	167	126	32	100	55	-	13	-	-	-	-	-
4	16.05.-20.05.	142	145	-	55	78	45	22	-	-	-	-	-
5	21.05.-25.05.	121	123	-	32	63	68	37	-	-	-	-	-
6	26.05.-31.05.	118	146	-	-	31	100	59	-	10	-	-	-
7	01.06.-05.06.	145	176	-	-	16	100	35	-	49	-	-	-
8	06.06.-10.06.	137	120	-	-	-	74	-	26	61	-	39	-
9	11.06.-15.06.	161	124	-	-	-	41	-	59	54	-	46	-
10	16.06.-20.06.	172	156	-	-	-	-	-	80	31	20	69	-
11	21.06.-25.06.	126	132	-	-	-	-	-	67	28	33	72	-
12	26.06.-30.06.	111	176	-	-	-	-	-	35	19	65	81	-
13	01.07.-05.07.	-	129	-	-	-	-	-	-	-	100	100	-
14	06.07.-10.07.	-	151	-	-	-	-	-	-	-	100	100	-
15	11.07.-15.07.	-	176	-	-	-	-	-	-	-	100	-	-
16	16.07.-20.07.	-	145	-	-	-	-	-	-	-	67	-	33
17	21.07.-25.07.	-	122	-	-	-	-	-	-	-	43	-	57
18	26.07.-31.07.	-	138	-	-	-	-	-	-	-	29	-	71
19	01.08.-05.08.	-	161	-	-	-	-	-	-	-	10	-	90
20	06.08.-10.08.	-	132	-	-	-	-	-	-	-	-	-	100
21	11.08.-15.08.	-	110	-	-	-	-	-	-	-	-	-	100

The first adult's entrance in the spruce bark of the second flight, in *Fageta asperuletoza submontana* forest type, has been identify at 7 days from trap stakes installing. The first eggs appears at 9 days from the first entrances marking. The egg stadium was of 11 days. The apparition of the first larva has been done at 16 days from the first entrances marking. The larval stadium has been of 24 days. The apparition of the first pupa has been done at 28 days from the first entrances marking. The pupal stadium has been of 13 days. The apparition of the first young adults has been done at 36 days from the first entrances marking. The young adults have been found in galleries time of 26 days. The first mature adults have been identifying at 51 days from the first adult's entrances marking. Thus, the period between

the first adult's entrances marking and the first mature adults was of 7 weeks and 2 days. At last control of traps the insect was in proportion of 31% in young adult stadium and 69% in mature adult stadium, and show us that all exemplars become mature and hibernate like mature adults. A part from adults can produce a new flight, but do not flight to new oviposition, they flight to find more favourable place for hibernate. These adults will produce the flight for pairing and oviposition in the next year. In *Fageta dentarietosa, montana* forest type, the first entrances of the second flight has been identifying at 10 days from trap stakes installing. The first eggs appears at 11 days from the first entrances marking. The egg stadium was of 13 days. The apparition of the first larva has been done at 21 days from the first entrances marking. The larval stadium has been of 25 days. The apparition of the first pupa has been done at 42 days from the first entrances marking. The pupal stadium has been of 14 days. The apparition of the first young adults has been done at 48 days from the first entrances marking. The young adults have been found in galleries time of 34 days. The first mature adults have been identifying at 62 days from the first adult's entrances marking. Thus, the period between the first adult's entrances marking and the first mature adults was of 8 weeks and 6 days. At last control of traps, the insect was in proportion of 47% in young adult stadium and 53% in mature adult stadium, and hibernate like mature adult in the place of attack. These adults will produce the flight for pairing and oviposition in the next year.

Table 3

The development of 2nd generation of the bark beetle *Pityogenes chalcographus* L., 2005

No.	The observation period	Analyzed exemplars (eggs, larva, pupa, adults)		% from analyzed exemplars									
				eggs		larva		pupa		young adults		mature adults	
				16A	61B	16A	61B	16A	61B	16A	61B	16A	61B
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	26.07.-31.07.	125	132	100	100	-	-	-	-	-	-	-	-
2	01.08.-05.08.	165	164	75	100	25	-	-	-	-	-	-	-
3	06.08.-10.08.	135	124	44	62	56	38	-	-	-	-	-	-
4	11.08.-15.08.	148	156	-	45	78	55	22	-	-	-	-	-
5	16.08.-20.08.	152	142	-	-	53	100	37	-	10	-	-	-
6	21.08.-25.08.	118	153	-	-	41	100	29	-	30	-	-	-
7	26.08.-31.08.	151	175	-	-	25	65	10	35	65	-	-	-
8	01.09.-05.09.	164	134	-	-	-	48	-	52	65	-	35	-
9	06.09.-10.09.	178	178	-	-	-	-	-	69	42	31	58	-
10	11.09.-15.09.	190	132	-	-	-	-	-	40	31	60	69	-
11	16.09.-20.09.	-	143	-	-	-	-	-	-	-	77	-	23
12	21.09.-25.09.	-	155	-	-	-	-	-	-	-	63	-	37
13	26.09.-30.09.	-	167	-	-	-	-	-	-	-	54	-	46
14	01.10.-05.10.	-	178	-	-	-	-	-	-	-	52	-	48
15	06.10.-10.10.	-	150	-	-	-	-	-	-	-	47	-	53

The succession of the development stages is quickly at low height, mainly caused of temperature but the other factors to, like the feeding conditions found of insect in the interior of tree bark. At low height, the vegetation situation of tree is precarious and the quantity of the resin secreted is low, and this situation caused favourable conditions for infestation and development of descendant.

CONCLUSIONS

The researches made in Nădrag-Padeş conditions, regarding the biology of the pest *Pityogenes chalcographus* L., through utilizing the traps type Theysohn baited with aggregative synthetic pheromones Chalcoprax Ampulle and Atrachalc, and of trap stakes as favourable places for oviposition, show us the next conclusion:

- the bark beetle present two flights on year;
- the first flight is in April, May and June, and represent 76-94% from flight on all growing season, the length is of 37 days in *Fageta dentarietosa montana* and *Abieto-Fageta asperuletos*a forest types, at the height of 600-1000 m, and of 46 days in *Fageta asperuletos*a *submontana* forest type, at the height of 300-400 m; the flight is concentrate in the month May and present a top in the second decade of the month;
- at the beginning of the month June a part of females, which ending with oviposition, produced a supplementary feeding for remaking the sexual organs, and after that female abandon the initial system of attack and after a new pairing they lay down the eggs again, giving life to the parallel descendant named "brood generation". A part from these descendants from this generation hibernates like larva or pupa;
- the descendant from first flight have next development: the length of the egg stadium of 14-16 days, the length of larval stadium of 23-26 days, the length of pupal stadium of 18-19 days, the appearance of the first young adults has been done at 49-52 days from first entering, and the appearance of the first mature adults at 62-81 days; the adults made the second flight;
- the second flight is in July and August and represent 6-24% from flight on all growing season; the length is of 42-48 days; the top of the flight is in the second decade of the month August; the ending of the flight has been done in *Fageta dentarietosa montana* and *Abieto-Fageta asperuletos*a forest types, at the height of 600-1000 m, with 6 days earlier like in *Fageta asperuletos*a *submontana* forest type, at the height of 300-400 m;
- the descendant from second flight have next development: the length of the egg stadium of 11-13 days, the length of larval stadium of 24-25 days, the length of pupal stadium of 13-14 days, the appearance of the first young adults has been done at 36-48 days from first entering, and the appearance of the first mature adults at 51-62 days;
- at 300-400 m height a part of mature adults resulted from the second flight can fly, but produce a new flight, but do not flight to new oviposition, they flight to find more favourable place for hibernate. These adults will produce the flight for pairing and oviposition in the next year;
- at 800-900 m height, the mature adults hibernate like mature adult in the place of attack and will produce the flight for pairing and oviposition in the next year.

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