

## On the Incidence of Larvae of Hypodermatidae in the Games and Wild Rodents of Hungary

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ABSTRACT. 172 wild ruminants were examined for infection with warble fly larvae in Hungary. Larvae of *Hypoderma diana* Brauer, 1858 were found to occur in 97.8% of roe deer and 64.7% of red deer examined, while larvae of *H. actaeon* Brauer, 1858 showed 92.9% incidence in red deer. Among Hypodermatid imagoes from the collection of the National History Museum in Budapest a further species *Oestromyia leporina* (Pallas, 1778) Brauer, 1863 was also identified in Hungary. Data related to the life cycle and seasonal dynamics of these parasites are discussed. Finally, control measures are suggested including early chemotherapy to be carried out in October-November.

Since 1973 the examination of the incidence, frequency and pathological significance of the *Hypoderma* infection of Cervidae in Hungary as well as the elaboration of appropriate control measures has been belonging to the scope of tasks of the Research Station of Game Biology. Though some results of these studies have already been published (SUGÁR, 1975), no species identification of the collected larvae has been carried out by us as yet, thus no faunistic data have been reported. We wish to fill up these gaps in the present paper. Besides, some conclusions will be drawn concerning the seasonal dynamics of the *Hypoderma* infection and measures of prevention.

Prior to our examinations we did not find any data on the *Hypoderma* infection of wild animals in Hungary. In the report of KERTÉSZ (1897) a brief description of the morphology and biology of the *Hypoderma*-larvae of roe deer and red deer was given on the basis of foreign data of literature. More recently, however, some reports have been published concerning the morphology, biology and geographic distribution of the species of Hypodermatidae (mainly ZUMPT, 1965 and GRUNIN, 1966).

### Material and Methods

#### Animals examined:

Central-European red deer  
*Cervus elaphus hippelaphus* Erxleben, 1777

Between 5th November 1973 and 15th April 1976 we examined 61 red deer of which 43 were shot on hunting, 14 perished, 3 died on account of running over and 1 was killed by electric shock. 51 were collected from the environs of Budakeszi, the rest originated from 4 diverse hunting regions. 53 animals were examined after skinning, and from 8 animals larvae were collected through the breathing holes of the skin.

European roe deer  
*Capreolus capreolus capreolus* Linné, 1758

Between 21st May 1973 and 15th April 1976 we examined 102 roe deer of which 84 were shot on hunting, whereas 17 died due to a variety of reasons. 48 originated from the neighbourhood of Békéscsaba, 10 from that of Budakeszi, 17 from the environs of Pölöske (County Zala) and the rest was collected from various hunting areas. 95 animals were examined for infection after skinning, while from 6 animals larvae were collected through the breathing hole of the skin.

Fallow deer  
*Dama dama dama* Linné, 1758

3 animals of the examined 5 were killed in the environs of Gyulaj, 1 was shot on hunting in the region of Budakeszi, 1 died in the game reserve Tata-Remeteszég. All were examined after skinning.

Mouflon  
*Ovis ammon musimon* Pallas, 1811

Of the 4 animals we examined between 11th November 1975 and 9th February 1976 3 were collected from the environs of Budakeszi and 1 from the region of Lovasberény (County Veszprém). All were examined after skinning.

Collection and preservation of larvae. In most instances free 1st stage (L1) and encapsulated 2nd and 3rd stage larvae (L2, L3) were collected with the help of fine forceps, scalpel and scissors from the subcutaneous connective tissue after skinning. Living and dead but as yet not disintegrated larvae were preserved in the following manner: L2, L3 and a part of L1 were kept in hot water for a few minutes then transferred to 70-75% spirit (ZUMPT, 1965), the rest of L1 were fixed in hot Barbagallo solution.

Cultivation of imagoes from mature larvae. Mature larvae discharged either spontaneously, or by pressure through the breathing holes of the skin of dead animals, or released after skinning, were placed on wood shavings in wide-mouth bottles of 100-200 ml, and kept at room temperature till the hatching of the flies, or for about 6 weeks.

Examination of imagoes. This was done as described by ZUMPT (1965) and GRUNIN (1966).

The imagoes of the Diptera collection of the Natural History Museum in Budapest captured in Hungary and belonging to the family of Hypodermatidae were kindly set at our disposal extending the material of our own collectings.

Systematics

As a result of identification of larvae and imagoes the incidence of 3 species was established. Data of collectings related to the larvae of the two frequently occurring species are presented in Tables 1 and 3. As to the third species, we have been able to find only its imagoes so far.

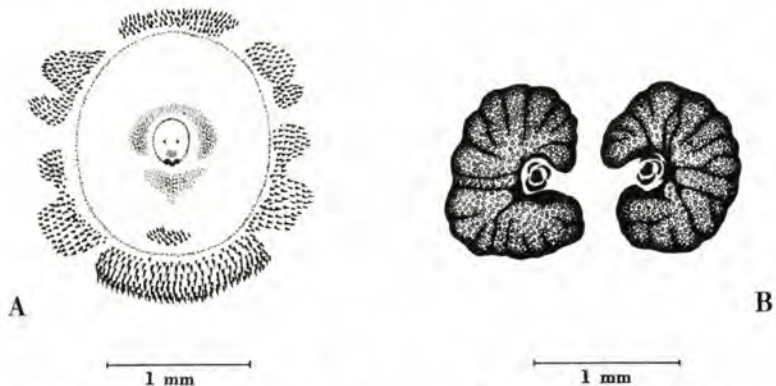


Fig. 1: *Hypoderma diana* Brauer. A: armature of pseudocephalon of L2; B: posterior peritremes of L3.

HYPODERMA Latreille, 1818

Hypoderma diana Brauer, 1858 (Fig. 1)

Likely to have a country-wide occurrence in regions with roe deer (Fig. 3).

Hosts: preferentially *Capreolus capreolus capreolus*, often *Cervus elaphus hippelaphus*, sometimes *Dama dama dama* and *Ovis ammon musimon*.

Localization: subcutaneous tissue, usually at the scapular, spinal, lumbal and caudal region. Extensity: in roe deer 97.8% (excluding those 14 non-infected specimens which were less than 15 months old), in 21 der deer - thoroughly examined - 64.7%, in fallow deer 1/5, in moufflons 4/4. Intensity: in roe deer 1-506, in red deer 1-152, in fallow deer 85, in moufflons 1-9 larvae.

Hypoderma actaeon Brauer, 1858 (Fig. 2)

Likely to have a country-wide incidence in areas with red deer (Fig. 3).

Host: *Cervus elaphus hippelaphus*.

Localization: subcutaneous tissue, preferentially at the scapular, spinal, lumbal and caudal region. Extensity: 92.9% (11 red deer under 15 months of age were all infected). Intensity: 1-990 (mean 108) larvae.

OESTROMYIA Brauer, 1860

Oestromyia leporina (Pallas, 1778) Brauer, 1863

So far recorded solely from the Bükk Mts. (see Faunistics). Hosts in Europe (according to ZUMPT, 1965): *Microtus arvalis*, *M. agrestis*, *Pitymys subterraneus*, *Arvicola terrestris*, *Ondatra zibethica*.

Faunistics

Collectings were made by Mrs. FEKETS, dr. M. HÖNICH, Mrs. SOMFALVI and dr. L. SUGÁR. Collectors' names will not be indicated at individual collectings except at imagoes.

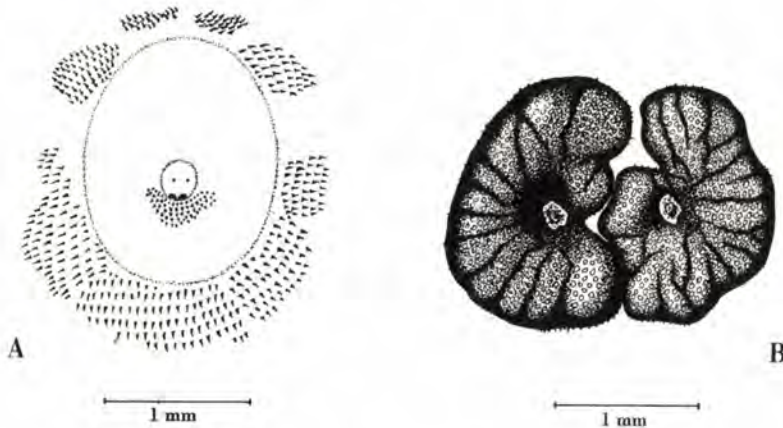


Fig. 2: *Hypoderma actaeon* Brauer. A: armature of pseudocephalon of L2;  
B: posterior peritremes of L3.

Table 1

Details of collectings related to larvae of *H. diana* recovered from roe deer, fallow deer and moufflons

Locality and date of collection I	Species and age in years of the host		Number of subcutaneously situated larvae					
	II	III	total living	L 1	L 2	L 3	mature	dead
			IV	V	VI	VII	VIII	IX
Budakeszi 21/05/1973	Cap.	5	0	0	0	0	0	1
Gyarmatpuszta 21/05/1973	"	3	0	0	0	0	0	4
16/07/1973	"	7	0	0	0	0	0	2
12/10/1973	"	2	0	0	0	0	0	1
Budakeszi 26/11/1973	"	2	178	174	4	0	0	0
Tata 30/11/1973	Dama	3	85	62	23	0	0	0
Hollád 09/12/1973	Cap.	6	30	22	8	0	0	18
09/12/1973	"	1	506	182	324	0	0	0
Isaszeg 16/12/1973	"	4	118	31	84	3	0	32
Agárd 12/02/1974	"	5	19	0	14	4	1	26
Gyulaj 19/02/1974	"	5	? <sup>x</sup>	?	?	2	9	?
Isaszeg 06/03/1974	"	7	?	?	?	2	0	?
Szalkszentmárton 08/03/1974	"	4	8	1	0	3	4	6
Nagyhegyes 13/03/1974	"	3	0	0	0	0	0	85
Budakeszi 03/04/1974	"	6	0	0	0	0	0	35
03/04/1974	"	2	0	0	0	0	0	6
Szekszárd 12/04/1974	"	2	0	0	0	0	0	67
Békéscsaba 27/06/1974	"	2-12 <sup>xx</sup>	0	0	0	0	0	2-88
Budakeszi 02/07/1974	"	2	0	0	0	0	0	24

x) Not all but L3 and mature larvae were counted.

xx) Age ranges of 40 roe deer specimens.

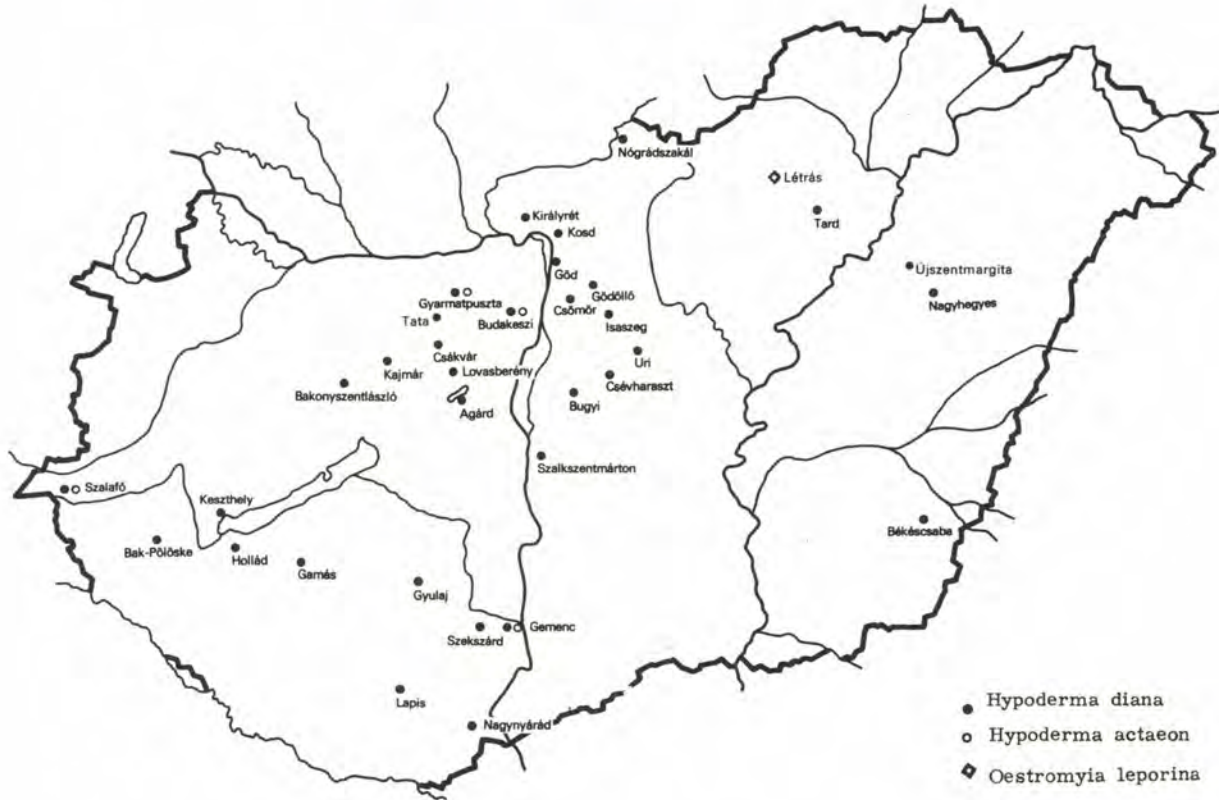
Cap. = roe deer  
Dama = fallow deer  
Ovis = moufflon

(Table 1 - continued)

I	II	III	IV	V	VI	VII	VIII	IX
Pölsöke								
31/07/1974	Cap.	4	0	0	0	0	0	28
31/07/1974	"	8	0	0	0	0	0	37
Uri								
23/01/1975	"	5	11	9	2	0	0	14
Királyrét								
10/02/1975	"	14	131	0	12	118	1	77
Isaszeg								
12/02/1975	"	2	48	0	0	48	0	3
28/02/1975	"	3	?	?	?	1	0	?
12/03/1975	"	12	19	0	0	18	1	12
Tata								
27/03/1975	"	5	1	1	0	0	0	38
Királyrét								
06/04/1975	"	11	9	0	0	9	0	42
Kosd								
08/04/1975	"	2	0	0	0	0	0	56
Gödöllő								
28/04/1975	"	14	0	0	0	0	0	23
Pölsöke								
10/05/1975	"	7	0	0	0	0	0	28
Keszthely								
13/05/1975	"	8	0	0	0	0	0	21
Bugyi								
28/05/1975	"	6	0	0	0	0	0	44
Budakeszi								
29/10/1975	"	5	2	2	0	0	0	3
Lovasberény								
11/11/1975	Ovis	2	1	1	0	0	0	0
Nagynyárád								
13/11/1975	Cap.	7	10	10	0	0	0	0
Pölsöke								
27/11/1975	"	4	56	50	6	0	0	18
Budakeszi								
28/11/1975	Ovis	7	7	7	0 <sup>+</sup>	0	0	0
08/12/1975	"	4	0	0	0	0	0	10
Gamás								
16/01/1976	Cap.	8	55	11	32	12	0	32
Szekszárd								
02/02/1976	"	6	62	2	9	51	0	38
Budakeszi								
09/02/1976	Ovis	10	3	3	0	0	0	3
Szekszárd								
16/02/1976	Cap.	7	49	0	3	46	0	25
16/02/1976	"	4	30	0	0	29	1	18
Göd								
03/03/1976	"	14	9	0	0	8	1	33
Budakeszi								
04/03/1976	"	2	2	0	0	2	0	27
15/03/1976	"	10	0	0	0	0	0	14
Csömör								
13/04/1976	"	5	0	0	0	0	0	36

Fig. 3

Collecting localities of Hypodermatidae species



### Hypoderma diana

Data of collectings related to larvae are presented in Tables 1 and 3.

Data of collectings related to imagoes:

1. Mecsek-Lapis	5/04/1957	leg.: GEBHARDT - det.: J. MINÁR
2. Tard	27/04/1957	leg.: S. TÓTH - det.: "
3. Nógrádszakál	25/04/1958	leg.: B. LIPTHAY - det.: "
4. Bakonyszent- lászló	18/05/1960	leg.: ZSIRKÓ - det.: "
5. Csákvár	11/04/1961	leg.: F. MIHÁLYI - det.: "
6. Csákvár	11/04/1961	leg.: ZSIRKÓ - det.: "
7. Csévharaszt	8/04/1972	leg.: F. MIHÁLYI - det.: F. MIHÁLYI
8. Újszentmargita	21/04/1975	leg.: L. PAPP - det.: L. PAPP

Data related to H. diana imagoes cultivated from pupae are presented in Table 2.

Table 2

Data related to Hypoderma diana imagoes cultivated from pupae

Locality and date of collection of larvae	Start of pupation	Hatching	No. and sex of imagoes	Pupation period in days
Gyulaj 19/02/1974	19/02	4/03	4 ♂ 4 ♀	13
Gyulaj 19/02/1974	20/02	9/03	1 ♀	18
Szalkszentmárton 8/03/1974	8/03	25/03	1 ♀	17

### Hypoderma actaeon

Data of collectings related to larvae are presented in Table 3.

Data of collectings related to imagoes:

Budakeszi 18/05/1974 - 2 o specimens, leg. and det.: L. SUGÁR

Data related to H. actaeon imagoes cultivated from pupae are presented in Table 4.

### Oestromyia leporina

Data of imagoes collected:

Létrás (Bükk Mts.) 27/09/1962 9 specimens leg.: S. TÓTH - det. F. MIHÁLYI.  
Létrás 4/10/1962. 4 specimens leg.: S. TÓTH - det.: F. MIHÁLYI.

Table 4

Data related to Hypoderma actaeon imagoes cultivated from pupae

Locality and date of collection of larvae	Start of pupation	Hatching	No. and sex of imagoes	Pupation period in days
Gyarmatpuszta 16/04/1974	17/04	7/05	2 ♂	21
Gyarmatpuszta 16/04/1974	18/04	7/05	1 ♂	20

Table 3

Details of collectings related to larvae of *H. diana* and *H. actaeon* recovered from red deer

Locality and date of collection	Age of the host in years	Number of <i>H. diana</i> larvae						Number of <i>H. actaeon</i> larvae						
		total living	L 1	L 2	L 3	mature	dead	total living	L 1	L 2	L 3	mature	dead	
Budakeszi														
05/11/1973	2	8	6	2	0	0	0	28	2	26	0	0	0	0
21/11/1973	12	0	0	0	0	0	0	1	0	1	0	0	0	0
23/11/1973	2	10	9	1	0	0	0	13	12	2	0	0	0	0
27/12/1973	5	0	0	0	0	0	0	4	1	3	0	0	0	0
27/12/1973	3	0	0	0	0	0	0	12	1	11	0	0	0	0
Szalafo														
03/01/1974	8	26	2	24	0	0	0	44	5	39	0	0	0	0
Budakeszi														
03/01/1974	10	0	0	0	0	0	0	39	5	34	0	0	0	0
05/01/1974	1	10	0	10	0	0	0	41	6	35	0	0	0	0
Gemenc														
06/01/1974	9	64	3	54	7	0	50	16	1	15	0	0	0	30
Budakeszi														
12/01/1974	1	152	0	59	93	0	?	156	10	146	0	0	0	?
14/01/1974	3	0	0	0	0	0	0	20	2	18	0	0	0	0
01/02/1974	1	11	0	10	1	0	0	6	0	6	0	0	0	0
11/02/1974	1	87	0	0	87	0	30	116	2	114	0	0	0	10
15/02/1974	13	17	0	0	17	0	20	94	2	92	0	0	0	45
09/03/1974	2	0	0	0	0	0	6	72	0	48	24	0	0	35
13/03/1974	4	0	0	0	0	0	?	?	?	?	3	1	?	?
16/03/1974	3	0	0	0	0	0	?	?	?	?	1	0	?	?
18/03/1974	1	0	0	0	0	0	1	27	0	4	23	0	0	30
08/04/1974	3	0	0	0	0	0	?	?	?	?	2	2	?	?
08/04/1974	2	0	0	0	0	0	?	?	?	?	2	1	?	?
Gyarmatpuszta														
12/04/1974	4	0	0	0	0	0	?	?	?	?	2	27	?	?
Budakeszi														
19/04/1974	7	0	0	0	0	0	?	?	?	?	3	0	?	?
19/04/1974	5	0	0	0	0	0	?	?	?	?	8	1	?	?
Gemenc														
30/04/1974	1	0	0	0	0	0	?	0	0	0	0	0	0	2+?
30/04/1974	1	0	0	0	0	0	?	0	0	0	0	0	0	4+?
Tata														
13/12/1974	5	35	14	21	0	0	0	0	0	0	0	0	0	0
Gyarmatpuszta														
21/03/1975	4	0	0	0	0	0	?	67	0	0	67	0	0	30
Budakeszi														
24/03/1975	7	0	0	0	0	0	?	?	?	?	2	0	?	?
24/03/1975	2	0	0	0	0	0	?	?	?	?	2	0	?	?
24/03/1975	15	0	0	0	0	0	15	990	2	292	696	0	0	140
25/03/1975	6	0	0	0	0	0	?	?	?	?	3	0	?	?
27/03/1975	1	0	0	0	0	0	?	?	?	?	2	0	?	?
07/04/1975	5	0	0	0	0	0	?	?	?	?	11	0	?	?
15/04/1975	1	0	0	0	0	0	?	3	0	0	3	0	?	25
10/11/1975	4	0	0	0	0	0	0	17	14	3	0	0	0	0
04/02/1976	1	117	0	0	116	1	0	30	0	30	0	0	0	0
08/03/1976	10	0	0	0	0	0	?	24	0	6	18	0	0	20
07/04/1976	1	0	0	0	0	0	?	?	?	?	2	3	?	?
14/04/1976	3	0	0	0	0	0	?	?	?	?	2	2	?	?
14/04/1976	3	0	0	0	0	0	?	?	?	?	2	0	?	?

? = Not all but L3 and mature larvae were counted.



Data relating to the development and the seasonal incidence of individual larval stages of *H. diana* and *H. actaeon* are presented in Table 5.

Table 5

Seasonal incidence of individual larval stages of *H. diana* and *H. actaeon* in roe deer and red deer

Incidence		Larval forms found							
		in roe deer				in red deer			
		L1	L2	L3	mature	L1	L2	L3	mature
<i>H. diana</i>	from	29/10	26/11	16/01	02/02	05/11	05/11	06/01	04/02
	peak	01/11- 31/01 in 8 of 9	26/11- 14/02 in 9 of 10	16/01- 15/03 in 22 of 22	10/02- 12/03 in 7 of 11	- -	23/11- 01/02 in 7 of 11	06/01- 15/02 in 6 of 7	- -
	till	27/03	13/03	15/03	06/04	06/01	01/02	15/02	-
<i>H. actaeon</i>	from					05/11	05/11	08/03	13/03
	peak					05/11- 15/02 in 14 of 18	05/11- 18/03 in 19 of 20	07/03- 19/04 in 21 of 21	13/03- 19/04 in 7 of 19
	till					24/03	18/03	19/04	19/04

## Discussion

**Occurrence.** The present paper reports for the first time the occurrence in Hungary of *H. diana*, *H. actaeon* and *Oe. leporina* on ground of home collectings. The development of *H. diana* in roe deer and of *H. actaeon* in red deer as well as the morphology of the larvae of these *Hypoderma* species have already been briefly described by KERTÉSZ (1897), however, based on results of experiments conducted abroad.

As shown by our results, the Hypodermatid-fauna of games in Hungary fits well in the fauna picture of Hypodermatids in Europe (ZUMPT, 1965; GRUNIN, 1966).

**Life cycle of *H. diana*.** We were able to detect larvae of *H. diana* from each of the 22 regions from where roe deer older than 15 months were examined. This parasite was found to be very common in roe deer, common in red deer, and occasional in fallow deer and moufflon. In roe deer and red deer (presumably in fallow deer, too) larvae can develop to maturation, however, in the moufflon they usually die before reaching the 2nd larval stage.

Among the examined 3 species the imagoes of *H. diana* are most likely to start the wing at the earliest; the bulk in April, considering that mature larvae can be found predominantly from mid-February till mid-March and the pupation period can hardly exceed 20-25 days (at 20 °C it lasts 13-18 days). This conclusion is also supported by the collecting time of the free imagoes, moreover, by the fact that kids usually do not become infected during the year of their birth,<sup>+</sup> while in red deer calves, the birth

<sup>+</sup> The main period of the birth of kids was claimed by von RAESFELD (1970) on the basis of several thousand data of observation to fall between 15th May and 15th June in the Federative Republic of Germany. This is confirmed also by the observations of professional hunters in Hungary.

of which is likely to run earlier, the infection occur fairly frequently (6 of 11 carefully examined animals were infected). ++)

Life cycle of *H. actaeon*. Larvae of *H. actaeon* have been found in 4 regions so far (from other places red deer were not examined). This is a rather common parasite of red deer. We could not find it in other wild ruminant species. Our observations confirm the statement of GRUNIN (1966), according to which *H. actaeon* is a strictly specific parasite for the European red deer.

The peak of its wing takes place in May, i. e. one month later than that of *H. diana*, as most the mature *H. actaeon*-larvae were found from mid-March till mid-April and the pupation period is supposed to last for 3-4 weeks (at 20 °C it last 20-21 days). This is confirmed by the collecting time of the 2 captured imagoes as well as by the high extensity of infection of the calves in the year of their birth (18 of 19 calves were infected). ++)

Control measures. In the present observations it was evidenced that larvae of both *H. diana* and *H. actaeon* may reach their final localization site by early November, and the period of their intensive development (2nd and 3rd stages) mostly falls on the winter season. On the basis of these observations and of peak larval incidences the following measures are recommended in order to prevent losses in roe deer and red deer stocks due to warble fly larvae:

- supplementary feeding of the animals during the winter months with game-feed of good quality and adequate composition, containing sufficient vitamin A and carotin;
- an anti *Hypoderma* treatment with medicated feed at the earliest possible time (in October-November, in December the very latest); Ditrifon or other organic phosphates are recommended;
- at the end of the winter feeding period a thorough cleaning of the ground around the feeders and careful destruction (e. g. by ploughing in) of the wastes and dungs which likely contain warble-fly pupae;
- at heavily infected areas stock-reducing and eliminating shootings to be carried out preferentially during the autumn when the animals are still well fed and their skin is less damaged than later.

Concluding remarks. The present observations extend or modify our knowledge on the species in question in the following respects:

*H. diana*: most 1st-stage larvae occur from early November till the end of January (related data in the literature not available), 2nd-stage larvae from the end of November till mid-February (BRAUER: January-February), 3rd stage larvae from mid-January till mid-March (BRAUER: February-April). Mature larvae occur in the subcutaneous tissue from early February till the end of March (BRAUER: March-April); pupation period is unlikely longer than 20-25 days (ZUMPT: 26-33 days); most imagoes hatch in April

++) With the calves of red deer the main period of birth lasts from the end of April till the end of May as indicated in our observations. So far we have succeeded in stating the accurate time of births of a total of 23 calves of them 21 were born within the above period (17 in closed region, 4 in open region), and the remaining two on 5th and 16th June (both in closed region). In the literature, however, data referring to later periods are available: end of May-early June (WHITEHEAD, 1972; SZEDERJEI, 1965), May-June (GRZIMEK, 1968), from mid-May onwards (von RAESFELD, 1970). Nevertheless no exact dates are given. According to the estimation of many experienced Hungarian hunters red deer calves are born slightly later, i. e. from the end of May till early June. We believe that references to this later calving period can be explained by the fact that red deer cows normally hide their calves far better and longer (perhaps up to 2-3 weeks) from the human eye, than roe does do their kids (for about 2 days). However, they cannot hide them from the egg-laying *H. diana* and *H. actaeon* imagoes.

(BRAUER: May-June). This latter may explain why roe deer kids remain usually non-infected in the year of their birth;

H. actaeon: most 1st-stage larvae occur from mid-November till early February (no related data in the literature); 2nd-stage larvae from the end of November till early March (BRAUER: January), 3rd stage larvae from early March till mid-April (BRAUER: March-April), mature larvae from mid-March till mid-April (BRAUER: April); pupation period is about 3-4 weeks (ZUMPT: 26 days), most imagoes probably hatch in May (no other data), thus the calves become infected in the year of their birth as a rule;

Oe. leporina: hatching period extending up to early October (ZUMPT: from the end of August till mid- or late September).

As judged by the occurrence of H. diana larvae in materials collected from 25 regions of 11 counties and of H. diana imagoes from 6 other areas (6 counties), this species seems to have a country-wide distribution.

Though the infection with H. actaeon was investigated only in 4 regions, its high extensity suggests a wide distribution of this species too.

As Oe. leporina is concerned, we plan to carry out an investigation in the coming years on the incidence of larval forms and on its life cycle by capturing its wild rodent hosts, specially in the areas where imagoes have been found.

Our studies to develop chemotherapeutic measures applicable in field conditions are under way.

#### SUGÁR, L.: Adatok a vadon élő kérődzőkben és rágcsálókban élősködő Hypodermatidae-fajok magyarországi előfordulásához

A szerző az ATE Vadbiológiai Kutató Állomásán 1973-1976 között négy kérődző vadfaj 172 egyedében vizsgálta a Hypodermatida-lárvák előfordulását. Az ország 25 területéről gyűjtött anyagban 2 faj - a Hypoderma diana Brauer, 1858 és a H. actaeon Brauer, 1858 - lárváinak igen gyakori előfordulását tapasztalta.

H. diana lárvákat talált a 15 hónapnál idősebb őzek 97,8%-ában (1-506, átlag 94 lárva), a gímszarvasok 64,7%-ában (1-152, átlag 60,5 lárva), ezenkívül 1 dímavadban és 4 mufolonban. A Természettudományi Múzeum gyűjteményében őrzött imágók adatait is figyelembe véve e fajt eddig az ország 31 területéről (14 megyéből) lehetett kimutatni. H. actaeon lárvákat a vizsgált gímszarvasok 92,9%-ában talált (1-990, átlag 108 lárva). A fertőzött állatok 4 megye 1-1 területéről származtak.

A múzeumi gyűjtemény Hypodermatida-imágói között még a rágcsáló vargalégy, az Oestromyia leporina (Pallas, 1778) Brauer, 1863 imágóit is megtalálta, amelyeket a Bükk-hegységben gyűjtöttek 1962-ben.

A faunisztikai részben közli a Magyarországon gyűjtött és meghatározott összes lárva, valamint imágó adatait.

Tapasztalata szerint a H. diana élő lárvái október vége és március közepe között tartózkodnak az állatok bőr alatti kötőszövetében. Fő érési idejük február közepétől március közepéig tart, a rajzás fő ideje április. E korai rajzás az oka annak, hogy a születés évében az őzgidák zöme nem fertőződik, az átlagosan 2-3 héttel később születő gímszarvasborjak legtöbbször viszont fertőződik H. diana-val.

A H. actaeon élő lárvái november eleje és április vége között tartózkodnak a gímszarvasok bőr alatti kötőszövetében. Fő érési idejük március közepétől április közepéig tart, a rajzás főideje valószínűleg május. A borjak rendszerint már születésük évében fertőződnék.

A szerző, figyelembe véve a fertőzöttség nagy fokú hazai elterjedését, továbbá azt, hogy vizsgálatai szerint a *H. diana* és a *H. actaeon* lárvák bőr alatt való fejlődésének fő ideje a téli hónapokra esik, a bőrbagócs lárvák kártételének a csökkentésére javasolja az egyes állományok megfelelő téli takarmányozását, a szerves foszforsavészterrel történő gyógykezelés korai, vagyis október-november hónapokban való elvégzését, az etetők és a szókörnyékének tél-vegi "nagytakarítását", továbbá az állományapasztó és selejtezõ lelõvések zömének az őszi hónapokban való elvégzését.

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