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FLIES (DIPTERA) DEVELOPING IN SHEEP DROPPINGS IN HUNGARY

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Thirty-one dipterous species (the majority for the first time) have been reared from droppings of grazing sheep in pastures of North and Central Hungary including some species of veterinary importance. The sheep droppings in Hungary have no autochtonous dipterous community but other populations of all reared species develop in cattle droppings (the dominance of the species is different). Data were also collected on population interactions of flies, beetles and mites. With four tables.

The flies developing in the droppings of grazing sheep on pastures were poorly known before, even with respect to species composition. After the pioneer work of WHITE (1960) on the distribution and disappearance of sheep droppings, OLECHOWICZ (1974) published a paper on sheep dung and the "fauna" colonizing it in the Pieniny Mts, later (OLECHOWICZ, 1976) a longer paper on the role of coprophagous dipterans in that mountain pasture ecosystem, biomass and production of coprophagous dipterous larvae in the pasture, a study of coprophagous Paregle aestiva larvae under laboratory conditions, data on the contribution of coprophagous fly larvae to the decomposition of dung in the pasture, the energy flow through that pasture ecosystem and the factors modifying it. Unfortunately, her findings are hardly interpretable for other areas and for other considerations due to the lack of proper taxonomic data of these flies. OLECHOWICZ (1976) grouped the fly larvae developing in sheep droppings in three groups: (1) "proper coprophages with a short life history, found in newly dropped dung"; (2) "secondary coprophages with a longer life history, occurring in older dung"; (3) "predominantly predaceous larvae, migratory, found in various-aged dung". No wonder that this grouping is improper: one can group anything properly on the base of certain knowledge on each of the entities grouped (e.g. scatopsid larvae are actually coprophagous; it is more than an exaggeration to designate muscid larvae as a whole as predaceous, etc.).

As regards the cattle droppings, interactions of dipteran and coleopteran populations have been studied, papers of a high level are published first of all for beetle enemies of the bush fly (*Musca vetustissima*) in Australia (TYNDALE-BISCOE, WALLACE and MORTON, 1981, WALLACE and TYNDALE-BISCOE, 1983), etc. but interactions of larvae of face fly and those of beetles (MOON, LOOMIS

and ANDERSON, 1980) have also been investigated, similarly the effect of coleopteran species on the survival of horn flies (*Haematobia irritans*) and on the influence of predaceous mites on dipterous pests have been studied (for literature see WALLACE and TYNDALE-BISCOE, 1983 and several other papers in the Bull. ent. Res.). Population interactions of flies, beetles and mites in sheep droppings are almost unknown, one can find some qualitative data in OLECHOWICZ (1976).

The present dipterological studies were performed within the framework of a team-approach to a larger programme aiming to study the population interaction of flies, beetles and mites living in sheep droppings in Hungary (investigations on mites were carried out by Dr. S. MAHUNKA, on beetles by L. ÁDÁM, Zoological Dept., Hungarian Natural History Museum, Budapest).

My first aim was to collect data on the specific composition of the dipterous communities developing in sheep dung, some data for further studies on the population interactions and to find the constant-dominant species of the dipterous communities in the sheep dung in Hungary.

Material and methods. During the first period of our studies (one year from the 17 Sep. 1982 to the 23 Sep. 1983) 71 samples of sheep droppings were collected from 13 pastures in Hungary (see the head of Tables 1—3); the majority of the samples was collected on three sampling areas in North and Central Hungary, as follows:

1. Dömsöd, Apajpuszta: Central Hungary, Great Hungarian Plain; vegetation: Lepidio crassifolio-Festucetum pseudovinae; the only area of "solonchak" salty soil in Hungary. Here 250 sheep of mixed-aged were pastured on an area of c. 200 hectares.

2. Bogács: North Hungary, dry hilly area in the vicinity of the Bükk Mts; vegetation: Cynodonto-Festucetum pseudovinae, in spring with numerous Adonis vernalis. Samples were taken on the margins of a pasture for c. 500 sheep, not far from sheep stables.

3. Pusztamonostor: Central Hungary, on the north edge of the Great Hungarian Plain; vegetation: Achilleo-Festucetum pseudovinae (with small areas of Cynodonto-Poetum angustifoliae). Here two flocks of 600 ewes and young breeding animals each were pastured on 120 hectares which is also mown parallel with grazing (but sheep were also pastured on the nearby alfalfa fields).

On the sampling areas 10×10 m^2 square plots were staked out in the form of two right-angled isosceles with perpendicular sides of 10 m. The sheep droppings utilizable for the beetles and flies were counted in these plots, and, also the droppings were counted which had been destroyed by the beetle imagos to such an extent that they had become improper for the development of flies. This kind of counting was usually performed five times in each place, in some cases all the droppings were collected or even carried home in linen-sacks in order to obtain the beetle populations.

The air temperature on soil level and the temperature of soil in the depth of 5 cm were always measured.

1983	Dömsöd, Apajpuszta	Bugács	Pusztamonostor
24, 25 March	—	A: 17.5 S: 10.5	A: 20 S: 13.5
11 April	A: 15 S: 11	—	—
4 June	A: 34 S: 27	—	A: 27.5 S: 25
23 September	A: 21.5 S: 18	—	A: 21 S: 18
6 October	—	A: 18 S: 15	—

Random sampling of 1—3-day old sheep droppings with the underneath soil of $10 \times 10 \times 5$ cm was performed for sampling mites (five samples each per pasture and date); these samples were put into sacks and mites were extracted with the aid of Berlese—Balogh funnels in the laboratory.

For rearing flies three to four days old (in the autumn possibly five days old) sheep droppings were collected into glass jars (those droppings are no more attractive for oviposition of flies but dipterous larvae have surely not left them). Each sample comprised four to five pieces of sheep droppings (as a mean 250 g with 70 per cent water content). Rearing was made after the method of PAPP (1971) at air temperature of 24 ± 1 °C. In addition, flies were also collected on fresh droppings by covering the droppings with a sweeping net.

A more detailed description of our methods will be published in a subsequent paper by ÁDÁM, MAHUNKA and PAPP.

Results. Data of the flies reared are summarized in Tables 1—3 and the results of collecting flies on dropping in Table 4, respectively. The species marked by an asterisk are of veterinary importance.

The dipterous specimens (2250 ex.) reared belong to 31 species; the majority of these species has never been reared from sheep droppings (cf. HENNIG, 1964, 1976, etc.).

We managed to specify the constant-dominant species developing in sheep droppings in Hungary (the species which were obtained from more than 25% of the positive samples in a given period are regarded here as constant species). They are namely: *Cecidomyiidae sp.* indet. (from June to the end of September), *Sphaerocera curvipes* LATREILLE, 1805 [March—May to (?)June], *Coproica lugubris* (HALIDAY, 1836) (March to September), *Scathophaga stercoraria* LINNAEUS, 1758 (March to April and from September to October), *Paregle cinerella* (FALLÉN, 1825) (from April to October), *Myospila meditabunda* (FABRICIUS, 1781) (from April to September), *Musca tempestiva* FALLÉN, 1817 (from May—August to ?), *Ravinia striata* (FABRICIUS, 1794) (from May to September).

The group which is richest in species among the 31 species is the family Sphaeroceridae with 13 species. The number of the species of veterinary importance is low (only five) and their dominance (combined) is not more than 15.69%.

It is the summer period when most of the species are developing and also the amount of the specimens is the highest, as shown below:

	Spring	Summer	Autumn
Dömsöd, Apajpuszta			
Species	3	8	2
Ex./sample	28.6 (0.1)*	12.6	3.8
Bogács			
Species	3	11	5
Ex./sample	2.0	75.8	17.8 (0.1)**
Pusztamonostor			
Species	3	12	6
Ex./sample	0.8	16.5	5.3

* without *Scathophaga* and *Paregle*
** without cecidomyiids

In the spring two species, *Scathophaga stercoraria* and *Paregle cinerella* develop in higher numbers in some droppings, in the autumn cecidomyiids and *Scathophaga stercoraria* are dominant.

In some cases (samples from the Hortobágy National Park, HNP) we were able to make an estimate of the production of dipterous larvae compared to the weight of the sheep dung (counted in dry weight). The highest value is 4.5% (HNP No. 1), another sample (from summer) from the Hortobágy (HNP No. 3) resulted in 0.65%. An estimation has been made for the rate of the final weight of the dipterous larvae to the fresh dung (dry weights) for all the samples: this is 0.23% for the positive samples and 0.18% if we include also the negative samples.

Specimens of 40 dipterous species were netted on sheep dropping (Table 4), including species which develop in all probability there, though they have not been reared here. This indicates the necessity of further collecting and rearing in order to better understand the species composition of the dipterous community of sheep droppings.

Discussion. It was found that sheep droppings in Hungary form no autochtonous dipterous community, but other populations of all the species reared develop in cattle droppings (cf. PAPP 1971, 1976, PAPP and GARZÓ, 1985); the dominance of the species is, however, different.

ROHÁČEK (1984) collected 37 sphaerocerid species on red-deer droppings in North Moravian peat-bogs; among them 21 species (marked by a letter

"D" in the list below) have been collected in Slovakia on sheep droppings (ROHÁČEK, personal communication). His collectings (15 samples, several hundred specimens) resulted 35 sphaerocerid species from sheep droppings, as follows: *Sphaerocera curvipes* LATR. (D), *Ischiolepta nitida* DUDA (D), *I. pusilla* FALL. (D), *I. vaporariorum* HALID., *Lotobia pallidiventris* MEIG., *Lotophila atra* MEIG. (D), *Crumomyia nigra* MEIG. (D), *Copromyza equina* FALL. (D), *C. similis* COLL. (D), *Trachyopella leucoptera* HALID., *T. kuntzei* DUDA, *Elachisoma bajzae* L. PAPP, *E. aterrimum* HALID. (D), *E. pilosum* DUDA, *Halidayina spinipennis* HALID. (D), *Coproica acutangula* ZETT., *C. ferruginata* STENH. (D), *C. hirticula* COLL. (D), *C. hirtula* ROND., *C. lugubris* HALID. (D), *C. vagans* HALID. (D), *Chaetopodella scutellaris* HALID. (D), *Opalimosina mirabilis* COLL. (D), *O. calcarifera* ROH. (D), *O. collini* RICH. (D), *O. simplex* RICH. (D), *Telomerina pseudoleucoptera* DUDA (D), *Paralimosina fucata* ROND., *Spelobia clunipes* MEIG. (D), *S. faeroensis* DEEM., *S. nana* ROND., *S. simplicipes* DUDA, *S. ochripes* MEIG., *Rudolfia rozkosnyi* ROH. (D), *Pteremis fenestralis* FALL. This may indicate a closer relationship of the sheep-dropping fly community with that of the wild hoofers also in our country. An intensive collecting programme is necessary towards the clarification of this relationship.

The production rate of the fly larvae developing in sheep droppings is rather close to the maximum measured in cattle droppings (see PAPP, 1971, 1976), though the crust of sheep droppings embodies a much higher proportion than that of the cattle droppings, and, sheep dropping dries out more quickly than cattle dropping does; all these may reflect the comparatively high caloric value of the sheep droppings. The mean production of fly larvae compared to the dry weight of the dung is in the same order as the value of OLECHOWICZ (1976) in the Pieniny Mts pastures (0.18% vs. 0.40% of OLECHOWICZ); it is a matter of course that this rate is higher in the more wet conditions of mountain pastures.

Further research into the quantitative relations of the secretophagous species of veterinary importance is needed before we can judge whether the abundance of the latter species is higher than dangerous levels in the given pastures or not, and, consequently, whether it is necessary to control them and in which ways. The data involved in the Tables 1—3 do not justify such a control measure.

According to our experience hitherto, more or less contrarily to the decomposition of cattle droppings in Hungary, in the sheep droppings of the coprophagous coleopteran species (first of all those of the genus *Aphodius*) are antagonistic to the fly larvae in spring and autumn: the beetles scatter the sheep droppings which then desiccate and consequently they become unsuitable for the development of dipterous larvae (cf. WALLACE and TYNDALE-BISCOE, 1983). This is why the period in which large-bodied dipterous larvae (muscid species, etc.) can develop in sheep droppings becomes shorter by c. a

Table 1

Flies reared from sheep

Locality:	Bogács				Pusztamonostor		
Negative sample:	1				2		
No.:	1	2	3	4	1	2	3
Date:	24 March				25 March		
Species							
Cecidomyiidae sp. indet.	—	—	—	—	—	—	—
Chloromyia formosa	—	—	—	—	—	—	—
Phoridae sp. indet.	—	—	—	—	—	—	—
Sepsis fulgens	—	—	—	—	—	—	—
Sepsis orthocnemis	—	—	—	—	—	—	—
Sepsis punctum	—	—	—	—	—	—	—
Sepsis thoracica	—	—	—	—	—	—	—
Sphaerocera curvipes	—	—	—	1	1	1	4
Ischiolepta pusilla	—	—	—	—	—	—	—
Ischiolepta vaporariorum	—	—	—	—	—	—	—
Lotobia pallidiventris	—	—	—	—	—	—	—
Coprοica ferruginata	—	—	—	—	—	—	—
Coprοica hirticula	—	—	—	—	—	—	—
Coprοica lugubris	1	1	—	—	—	1	2
Coprοica vagans	—	—	—	—	—	—	—
Elachisoma aterrimum	—	—	—	—	—	—	—
Elachisoma bajzae	—	—	—	—	—	—	—
Halidayina spinipennis	—	—	—	—	—	—	1
Chaetopodella scutellaris	—	—	1	—	—	—	—
Spelobia ochripes	—	—	—	—	—	—	—
Scathophaga stercoraria	—	—	—	—	—	—	—
Calythea albicincta	—	—	—	—	—	—	—
Paregle cinerella	—	—	—	—	—	—	—
Hylemya strenua	—	—	—	—	—	—	—
Hylemya variata	—	—	—	—	—	—	—
*Myospila meditabunda**	—	—	—	—	—	—	—
Dasyphora cyanicolor	—	—	—	—	—	—	—
*Musca autumnalis**	—	—	—	—	—	—	—
*Musca osiris**	—	—	—	—	—	—	—
*Musca tempestiva**	—	—	—	—	—	—	—
*Ravinia striata**	—	—	—	—	—	—	—
Diptera total	1	1	1	1	1	2	7
Hymenoptera							
Leptopilina sp.	—	—	—	—	—	—	—
Braconidae indet.	—	—	—	—	—	—	—

droppings (spring)

		Apajpuszta			Hortobágy N. P.		Kerteskő	Bugyi—Vány		
1	2	3 11 April	4	5	1 22 April	2 24 April	27 April	1	2 28 April	3
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	1	1	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	3	—	—	—	—	—
—	—	—	—	—	1	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	1	2	6	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	1	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	1	—	—	—
—	—	—	—	—	—	—	—	—	—	—
42	25	1	8	23	554	108	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
185	—	—	1	—	—	58	—	10	—	49
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	3	3	15	—	—	—
—	—	—	—	—	—	—	4	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	17
227	25	1	9	24	563	175	22	11	1	66
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—

Table 2

Flies reared from sheep

Locality:	Kunszentmiklós		Apajpuszta				
Negative sample:	—		—				
No.:	1	2	1	2	3	4	5
Date:	24 May				4 June		
Species							
Cecidomyiidae sp. indet.		—	—	—	—	—	3
Chloromyia formosa	—	—	—	—	—	—	—
Phoridae sp. indet.	—	—	—	—	—	—	—
Sepsis fulgens	—	—	—	—	—	—	—
Sepsis orthocnemis	—	—	—	—	—	—	—
Sepsis punctum	—	—	—	—	—	—	—
Sepsis thoracica	—	—	—	—	—	—	—
Sphaerocera curvipes	—	—	—	—	—	—	—
Ischiolepta pusilla	—	—	—	—	—	—	—
Ischiolepta vaporarium	—	2	6	—	—	—	—
Lotobia pallidiventris	—	1	—	—	—	—	—
Coproica ferruginata	—	—	—	—	—	—	—
Coproica hirticula	—	—	—	—	—	—	—
Coproica lugubris	—	1	1	—	—	—	1
Coproica vagans	7	—	—	—	—	—	—
Elachisoma aterrimum	—	—	—	—	—	—	—
Elachisoma bajzae	—	—	—	—	—	—	—
Halidayina spinipennis	—	—	—	—	—	—	—
Chaetopodella scutellaris	—	—	—	—	—	—	—
Spelobia ochripes	—	—	—	—	—	—	—
Scathophaga stercoraria	—	—	—	—	—	—	—
Calythea albicincta	—	—	—	—	—	—	—
Paregle cinerella	—	—	—	—	—	1	—
Hylemya strenua	—	—	—	—	—	—	—
Hylemya variata	—	—	—	—	—	—	—
*Myospila meditabunda**	—	—	—	—	—	—	—
Dasyphora cyanicolor	—	—	—	—	—	—	—
*Musca autumnalis**	—	—	—	—	—	—	—
*Musca osiris**	—	—	—	—	—	3	—
*Musca tempestiva**	—	1	1	2	—	—	—
*Ravinia striata**	—	—	—	—	25	20	—
Diptera total	7	5	8	2	25	24	4
Hymenoptera							
Leptopilina sp.	—	—	—	—	—	—	—
Braconidae indet.	—	—	—	—	—	—	—

droppings (summer)

Pusztamonostor				Hortobágy N. P.		Cserépfalu				Bogács						Fót
1	2	3	4	5	3	1	2	3	4	1	2	3	4	5	6	
		4 June			27 Aug		17 September					17 September				17 Sep
11	6	5	2	2	174	—	—	2	—	—	—	3	—	—	—	9
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
—	—	45	1	10	—	—	—	—	—	—	—	—	—	—	—	—
—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	9	—	2	—	—	—	—	—	—	—
—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	7	—	2	4	1	—	—	4	6	—	—	3	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	20	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
—	—	—	—	—	—	—	—	—	—	—	3	2	—	—	—	—
8	60	18	1	13	43	2	1	2	3	19	1	1	3	7	3	6
—	—	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	8	4	1	—	—	1	—
2	2	2	5	1	9	1	1	1	1	—	1	1	3	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
—	—	—	—	14	—	—	—	—	—	—	—	—	—	—	—	—
—	—	48	—	8	1	—	—	—	—	—	—	—	—	—	—	—
2	10	5	35	9	12	46	10	10	9	2	—	2	—	—	—	1
56	85	133	45	59	244	53	21	14	19	35	31	11	9	9	4	16
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—

Table 3

Flies reared from sheep

Locality:	Apaj	Pusztamonostor							Bogács
Negative sample:	4	1							2
No.:	23 Sep-	1	2	3	4	1	2	3	4
Date:	tember	23 September					6 October		
Species									
Cecidomyiidae sp. indet.	8	1	5	66	2	—	—	—	—
Chloromyia formosa	—		—	—	—	—	—	—	—
Phoridae sp. indet.	—	—	—	—	—	—	—	—	—
Sepsis fulgens	—	—	—	—	—	—	—	—	—
Sepsis orthocnemis	—	—	—	—	—	—	—	—	—
Sepsis punctum	—	—	—	—	—	—	—	—	—
Sepsis thoracica	—	—	—	—	—	—	—	—	—
Sphaerocera curvipes	—	—	—	—	—	—	—	—	—
Ischiolepta pusilla	—	—	—	—	1	—	—	—	—
Ischiolepta vaporariorum	—	—	—	—	—	—	—	—	—
Lotobia pallidiventris	—	—	—	—	—	—	—	—	—
Coproica ferruginata	—	—	—	—	—	—	—	—	—
Coproica hirticula	—	—	—	—	—	—	—	—	—
Coproica lugubris	—	—	—	—	—	—	—	—	—
Coproica vagans	—	—	—	—	—	—	—	—	—
Elachisoma aterrimum	—	—	—	—	—	16	—	—	—
Elachisoma bajzae	—	—	—	—	—	—	—	—	—
Halidayina spinipennis	—	—	—	—	—	—	—	—	—
Chaetopodella scutellaris	—	—	—	—	—	—	—	—	—
Spelobia ochripes	—	—	—	—	—	—	—	—	—
Scathophaga stercoraria	—	—	—	—	—	—	3	2	4
Calythea albicincta	—	—	—	—	—	—	—	—	—
Paregle cinerella	11	—	4	—	1	—	—	—	—
Hylemya strenua	—	—	—	—	—	2	—	1	—
Hylemya variata	—	—	—	—	—	—	—	—	—
*Myospila meditabunda**	—	1	—	—	2	—	—	—	—
Dasyphora cyanicolor	—	—	—	—	—	—	—	—	—
*Musca autumnalis**	—	—	—	—	—	—	—	—	—
*Musca osiris**	—	—	—	—	—	—	—	—	—
*Musca tempestiva**	—	—	—	—	—	—	—	—	—
*Ravinia striata**	—	4	1	—	—	—	—	—	—
Diptera total	19	6	10	66	6	18	3	3	4
Hymenoptera									
Leptopilina sp.	—	1	—	—	—	—	—	7	—
Braconidae indet.	—	—	—	—	—	—	—	—	—

droppings (autumn)

5	6 6 October	7	8	Hortobágy N. P. — 30 October	Total specimens	Positive samples (n)	
—	—	—	—	—	299	15	June—end of September
—	—	—	—	—	2	2	
—	—	—	—	—	1	1	
—	—	—	—	—	56	3	
—	—	—	—	—	6	3	
—	—	—	—	—	1	1	
—	—	—	—	—	21	2	
—	—	—	—	—	16	7	March—May
—	—	—	—	—	12	3	
—	—	—	—	—	13	3	
—	—	—	—	—	1	1	
—	—	—	—	—	1	1	
1	—	1	—	—	2	2	
—	—	—	—	—	50	15	March—September
—	—	—	—	—	8	2	
—	—	—	—	—	36	2	
—	1	—	—	—	1	1	
—	—	—	—	—	1	1	
—	—	—	—	—	2	2	
—	—	—	—	—	1	1	
—	3	—	—	49	824	13	Mar—Apr, Sep—Oct
—	—	—	—	—	5	2	
—	1	—	—	—	512	27	April—October
—	—	—	—	—	6	4	?—September—October
—	2	—	—	—	16	5	?—September—October
—	—	—	—	—	54	18	April—September
—	—	—	—	—	4	1	
—	—	—	—	—	1	1	
—	—	—	—	—	17	2	
—	—	—	—	—	61	6	May—August—?
—	—	—	—	—	220	18	May—September
1	7	1	1	49	2250		
—	8	—	1	—	17	4	
—	—	—	—	—	3	3	

Table 4

Flies collected from sheep droppings, 1983

Species	Bogárs 24 March No. 1	Bogárs 24 March No. 2	Cserépfalu 24 March	Apajpuszta 4 June	Pusztamonostor 4 June	Remark
Cecidomyiidae sp. indet.	—	—	—	1	—	*
Smittia sp.	2	—	1	—	—	(*)
Oxycera pantherinus	—	—	—	—	1	—
Haematopota pluvialis	—	—	—	—	2	—
Crossopalpus sp.	1	—	—	—	—	(*)
Dolichopodidae indet.	—	—	—	11	—	—
Conopidae indet.	—	—	—	1	—	—
Saltella nigripes	—	—	—	4	—	(*)
Sepsis biflexuosa	—	—	—	2	—	(*)
Sepsis fulgens	—	—	1	—	—	*
Sepsis thoracica	—	—	—	12	1	*
Psilopa nigripes	—	—	—	—	2	—
Psilopa polita	—	—	—	12	12	—
Nostima picta	—	—	—	1	—	—
Sphaerocera curvipes	11	19	1	—	—	*
Ischiolepta pusilla	—	1	—	—	—	*
Crumomyia nigra	2	2	—	—	—	(*)
Copromyza equina	—	1	—	—	—	(*)
Coproica acutangula	—	—	—	2	1	(*)
Coproica ferruginata	65	57	1	—	—	*
Coproica lugubris	3	4	—	1	1	*
Coproica vagans	18	14	—	—	—	*
Philocoprella italica	—	—	—	1	—	(*)
Halidayina spinipennis	4	3	—	—	—	*
Chaetopodella scutellaris	1	—	—	—	1	*
Spelobia clunipes	—	—	1	—	—	(*)
Leptometopa niveipennis	—	—	—	3	—	?
Meoneura flavifacies	—	—	—	—	1	?
Meoneura neglecta	—	—	—	1	2	?
Ophiomyia sp.	—	—	—	1	—	—
Pseudonapomyza atra	—	—	—	1	—	—
Chloropidae indet.	—	—	—	522	410	—
Paregle cinerella	—	—	—	2	6	*
Musca osiris	—	—	—	5	3	*
Musca tempestiva	—	—	—	1	—	*
Coenosia sp.	—	—	—	1	—	—
	107	101	5	585	443	1241

— = Species not developing in sheep droppings
* = Species reared from sheep droppings
(*) = Most probably develops in sheep droppings but it has not been reared
? = Its development in sheep droppings is questionable

month in the spring and by one or two weeks in the autumn (depending on the weather). We will continue our work to get more precise data of these interactions.

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