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Flies (Diptera) visiting human faeces in mountain creek valleys in Hungary*

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Abstract: In 1988-1990 trappings with human faeces were made in four localities of low mountain creek valleys in N and NE Hungary (250 to 400 m a.s.l.) which are affected by tourism to a different extent. The dipterous assemblages were found to be rich in species (9,191 specimens of 175 to 180 species in 29 samples). The impact of tourism is hardly detectable in the results of trapping: no or very few specimens of the true synanthropic species were caught. It was found that the impact of human activity is not much more far reaching in these forests than the place it affects directly, as judged from these dipterous assemblages. On the other hand, dipterous assemblages visiting human faeces in forests seem to be unsuitable for indicating unfavourable changes in the environment. The maintenance of the "hemisynanthropic" category does not seem reasonable.

Key words: Diptera, synanthropic flies, forest flies, human impact, Hungary

INTRODUCTION

"Synanthropic flies" is an ill-defined term for denoting flies in the environment of humans which may spread infectious germs by their life-habits through the consumption of, egg-laying on and development in infected materials.**

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** The term "synanthropic" is applied particularly to flies and certain rodents coexisting with man over an extended period (Povolny in Greenberg 1971)

The original aim of this study was to test a well-known and very simple principle: any disturbance in an ecosystem is likely to be indicated earlier and more efficiently by changes in the structure of communities than by abundance changes or presence/absence relations of individual species.

We selected two test groups of flies: the so-called synanthropic flies (collections made with Gregor-Povolny's traps baited with human faeces) *and* the drosophilids (results published elsewhere, see Papp 1992).

Originally we intended to assess the deformation caused in the community structure of the dipterous assemblages by human activity (we thought that assemblages of species visiting human faeces were proper test groups). In the course of studies other aspects also arose: how the populations of rare species (discussed elsewhere) should be dealt with, and how wide the meaning of the term "synanthropic fly" should be.

The term "synanthropic fly" has an obscure origin; I found the earliest use in the works of some Soviet dipterists from the early 40's (for a short review of the early literature see Stackelberg 1956). Most studies of this kind in Europe were done by F. Gregor and D. Povolny, who not only made invaluable, extensive and interesting collectings (also in Hungary, see Gregor and Povolny 1960) but also proposed a terminology for their grouping (Gregor and Povolny 1958).

Our original plan and later work were much influenced by the results of Ferenc Mihályi, who collected synanthropic flies in all parts of Hungary in the late 'fifties and early 'sixties. He used the same traps as we did in the present study; he baited his traps with human faeces, decaying meat and fresh ripe fruits. Mihályi (1965, 1967) published several interesting papers and made a comprehensive summary of results in his theses (Mihályi 1966). In accordance with his aims, he stressed connections with public health, human epidemiology etc. For us the species composition, abundance relations etc. are more important aspects. Nevertheless, we found his data very useful for comparison also in the latter respects.

All the voucher specimens are preserved in the collection of the Zoological Department, HNHM, Budapest (pinned, or minutia-pinned and double-mounted, also those specimens which were originally kept in alcohol).

MATERIALS AND METHODS

In 1988-1990 collections were made in four localities of low mountain creek valleys in N and NE Hungary at an altitude range from 250 to 400 m a.s.l.. These four valleys are affected by tourism to a varying extent: least at Aggtelek, most strongly at Magyarkút. All the four sites are comparatively well-known as regards the faunistics of dipterous flies, e.g. they are characterized by a peculiar black brachypterous fly, the only pleciid species of Hungary, namely *Penthetria funebris* Meigen, 1804 (= *holosericea*) (see more in Papp 1992). The four sites are:

Aggtelek National Park: Aggtelek, Ménes-völgy [=valley], Medvés-kert (below coded with A): below Ménes-forrás [source];

Bükk National Park: Miskolc, Garadna-patak völgye (below coded with B): 200-300 m upstream the Hámori lake;

Börzsöny Landscape Protection Area: Verőcemaros (changed to Verőce during the period of collectings), Magyarkút, Keskenybükki-patak völgye (below coded with M): just outside the settlement;

Pilis Landscape Protection Area: Visegrád, Apátkúti-völgy (below coded with V): 150 m upstream of the hunters'-seat.

When coding the samples, a letter for the site and five numbers for day (2), month (2) and year (1) were used, e.g. **A11090** is for the Aggtelek site on the 11th of September, 1990.

Human faeces was put under Gregor-Povolny's traps. Fresh or one to two hour old human faeces was used. Exposure time was mostly four hours in 1988, three hours in 1989-1990. The soil temperature at a depth of 5 cm, the air temperature on the ground and the wind speed were always measured. (Not with the purpose of finding any correlation between capture results and the meteorological data but in cases when we captured less than expected, in that way we had a slight chance to find the reasons.) Trapping sites were shady (mostly grassy) places at a short distance from a creek; we placed traps to the same spot/site for three years.

In 1988 9 samples were collected, in 1989 11 samples, in 1990 9 samples (two samples from 1990 were left unidentified for lack of time). Nine A samples, eight B samples, seven M samples and five V samples were collected. These dipterous materials served as sources to judge the species richness at the given site and the composition of the dipterous assemblages. A total of 9,191 dipterous specimens of 29 samples were identified.

The specimens were identified by the identification books of Mihályi (1975), Papp (1973) and others. For the families Fanniidae and Muscidae the taxonomical sequence and nomenclature follows the catalogue of Pont (1986).

When analysing the samples, the Shannon-Wiener index (polynomial entropy), or evenness index were not used (as in studies on drosophilids), as we thought that the samples taken were not representative enough to support an opportunity for comparison. For some groups the Jaccard index (species identity index) was calculated. Only the number of specimens, the number of species represented, and the number of species per collecting site were summarized in the tables.

RESULTS

The results are summarized in Tables 1 and 2. To avoid even larger tables, only the commoner species and all the species of the families of calyptrate flies (Scathophagidae, Anthomyiidae, Fanniidae, Muscidae, Calliphoridae, Sarcophagidae) are included in the tables.

We collected comparatively numerous materials of assemblages rich in species. There are dozens of species among them which do not develop in human faeces, particularly so for the materials from 1988. That was a very dry year and we think that

Table 1

Flies collected by Gregor-Povolny traps with faeces in 1988

Species	Localities	Aggtelek Medvéskert				Bükk Garadna		Verőce M.kút		Viseg-rád
	Date of samples	10. 05.	19. 07.	14. 09.	12. 10.	21. 07.	14. 10.	21. 08.	15. 10.	20. 08.
Sciaridae indet.		2	4	1	3	1	1	1	3	1
Psychodidae indet.		-	11	-	-	-	1	5	1	1
Neuroctena anilis		-	-	-	1	4	3	-	2	-
Dryomyza flaveola		-	-	-	-	-	6	8	7	-
Nemopoda nitidula		-	4	-	-	2	-	1	-	7
Sepsis punctum		-	7	-	-	3	-	15	-	11
Sphaerocera curvipes		1	-	-	-	-	-	-	-	-
Copromyza equina		2	-	-	-	-	-	-	-	-
Crumomyia fimetaria		1	-	-	-	-	-	-	-	-
Crumomyia nigra		9	-	-	-	-	-	-	-	-
Coproica ferruginata		5	-	-	-	-	-	-	-	-
Coproica vagans		1	-	-	-	-	-	-	-	-
Spelobia manicata		11	45	-	1	1	1	3	1	2
Spelobia palmata		3	-	-	-	-	-	-	1	-
Piophila latipes		-	3	-	-	-	-	1	-	-
Piophila varipes		16	1	-	-	-	-	3	-	-
Scathophaga furcata		-	-	-	1	-	2	-	-	-
Scathophaga inquinata		1	-	-	-	-	-	-	-	-
Scathophaga stercoraria		10	-	-	-	-	-	-	1	-
Fannia armata		-	1	21	-	-	-	-	-	2+
Fannia ?carbonella		-	-	-	-	-	-	-	1	-
Fannia ornata		-	-	-	2	-	3	1	1	-
Fannia parva		3	2+	-	-	-	1	11	2	-
Fannia rondanii		-	1	-	-	-	-	-	-	-
Alloestylus diaphanus		-	-	-	1	-	-	-	-	-
Alloestylus simplex		-	-	1	4	-	-	2	-	-
Azelia cilipes		7	-	6	16	54	9	10	20	4
Azelia macquarti		5	-	2	2	-	5	2	9	-
Azelia triquetra		-	-	-	-	2	1	-	1	-
Dasyphora albofasciata		-	-	-	-	-	-	2	-	-
Dasyphora cyanicolor		1	15	-	-	2	1	36	2	6
Dasyphora pratorum		9	-	-	-	-	-	-	-	-
Graphomyia maculata		-	-	-	-	-	-	1	-	-
Hebecnema umbratica		-	-	-	-	2	-	1	-	-
Morellia hortorum		-	5	-	-	-	-	-	-	-
Mydaea ancilla		1	-	-	-	-	-	-	-	-
Mydaea nebulosa		-	-	-	-	13	-	-	-	4
Mydaea urbana		-	-	-	-	2	-	6	-	5
Mydaea scutellaris		-	-	-	5	-	-	-	-	-
Myospila meditabunda		-	-	-	-	-	-	-	1	-
Phaonia pallida		-	10	2	1	16	-	28	9	6
Phaonia populi		-	-	-	1	-	-	-	1	-
Phaonia valida		-	-	-	-	-	-	-	-	1
Musca larvipara		-	5	-	-	-	-	-	-	-
Hydrotaea cyrtoneurina		9	-	-	-	-	-	-	-	-
Hydrotaea dentipes		203	-	-	-	-	1	-	11	-
Hydrotaea glabricula		-	-	-	-	1	-	-	-	-
Hydrotaea irritans		-	-	-	-	1	-	-	-	-
Hydrotaea pellucens		-	-	-	-	1	-	-	-	-
Hydrotaea similis		1	-	-	8	-	-	-	1	-
Thricops ?cunctans		-	-	-	-	-	-	5	-	-
Haematobosca stimulans		-	6	-	-	-	-	-	-	1
Pollenia similis		-	-	-	-	4	-	-	-	-
Pollenia sp.		-	1	-	-	-	-	-	-	-
Lucilia ampullacea		-	-	-	-	1	-	7	-	1
Lucilia caesar		18	79	-	1	5	-	57	9	10
Lucilia silvarum		-	1	-	-	-	-	-	-	-
Calliphora vicina		-	-	-	-	1	-	1	-	-
Calliphora vomitoria		73	1	-	2	1	-	1	2	-
Protophormia terranovae		-	-	-	-	-	-	-	1	-
Bercaea haemorrhoidalis		-	-	-	-	-	-	-	1	-
Specimens(total)		431	1001	43	175	204	200	419	113	268
Remarks		I	II	III	IV	V	VI	VII	VIII	IX

the representatives of numerous species were attracted by the higher humidity in the close proximity of traps rather than smells from faeces. After all, to trap representatives of 81 species in 1,001 specimens (**A19078**) with such a small trap is a remarkable fact.

Results from 1989 and 1990 summarized in Table 2 seem to be suitable for comparing the species richness of the four sites. Five **A**, six **B**, five **M** and four **V** samples were collected, where the number of species represented are 73, 73, 67 and 69, respectively. That is, the four sites were not found different in their species richness. Otherwise the results do not seem to be suitable for statistical analysis.

Our results are compared with those obtained by Mihályi about three decades before. We must only admit here that the number of species and specimens is strikingly lower for the sarcophagid species than was in Mihályi's series. He exposed traps always on sunny places; this fact alone is enough to account for the differences experienced in this respect.

Remarks for species omitted from Table 1

I: Cecidomyiidae sp. 1, Simuliidae sp. 1, Chironomidae sp. 3, Empididae sp. 1, *Megaselia* sp. 1, *Neoleria ruficauda* 9, *Fannia* spp. 24 females ; **II:** *Sylvicola fenestralis* 1, *Anopheles maculipennis* 1 male, Cecidomyiidae sp.1-2. 3+3, Chironomidae sp.1-3. 10+2+1, Ceratopogonidae sp.1-3. 1+1+2, Mycetophilidae sp.1-2. 1+1, Empididae sp. 1, Syrphidae sp.1-2. 1+1, Dolichopodidae 1, *Lonchoptera strobli* 1 male, Phoridae sp.1-7. 4+5+5+1+1+7+42, *Platystoma gemmationis* 20, *Opomyza florum* 4, *Geomyza tripunctata* 1, *Anthomyza gracilis* 1, *Acartophthalmus bicolor* 3, *Sapromyza basalis* 1, *Minettia longipennis* 1, *Peplomyza litura* 2, *Tricholauxania praeusta* 1, *Diastata vagans* 2, *Ditrichophora fuscella* 3, *Parascaptomyza pallida* 45, *Lordiphosa fenestrarum* 2, *Drosophila obscura* 4, *Leptocera fontinalis* 3, *Spelobia rufilabris* 2, *Chaetopodella scutellaris* 4, *Pullimosina moesta* 63, *Terrilimosina schmitzi* 2, *Opacifrons moravica* 5, *Minilimosina fungicola* 6, *Minilimosina v-atrum* 10, *Meoneura carpathica* 25, *Meoneura flavifacies* 21, *Melanagromyza* sp. 3, *Poemyza* sp. 2, *Oscinella frit* 1, *Chlorops* sp. 1, *Pegohylemyia fugax* 2, *Hydrophoria annulata* 8, *Hydrophoria* sp.1. 22, *Hydrophoria* sp.2. 2, *Hydrophoria* sp.3. 2, *Hydrophoria* sp.4. 1, *Pegomya* sp. 1, *Hylemya* sp. 6, several 1st instar larvae of a sarcophagid species, *Oplisa tergestina* 6. 81 species; **III:** *Lonchoptera tristis* 7, *Drosophila phalerata* 1, *Hydrophoria* sp. 1; **IV:** *Apiloscatopse scutellata* 1, Chironomidae sp. 1, Megaselia sp.1. 1, sp.2. 3, *Suillia affinis* 1, Anthomyiidae sp.1-3. 12+30+1, *Fannia* sp. 3; **V:** Phoridae sp.1-5. 5+2+1+1+1, *Tricholauxania praeusta* 1, *Chaetopodella scutellaris* 2, *Minilimosina fungicola* 2, *Ditrichophora fuscella* 5, *Hirtodrosophila confusa* 1, *Drosophila phalerata* 15, *Drosophila testacea* 1, *Fannia fuscula* 1, *Fannia* sp. 20, *Hydrophoria* sp. 13, Anthomyiidae sp. 12, Muscidae sp. 1, Tachinidae sp. 1; **VI:** *Lonchoptera tristis* 1, *Megaselia* sp.1. 1, sp.2. 2, *Suillia vaginata* 1, *Spelobia clunipes* 1, *Drosophila busckii* 1, *Drosophila melanogaster* 1, *Drosophila phalerata* 1, *Hydrophoria* sp. 2, Anthomyiidae sp. 1, *Fannia* spp. 153 females; **VII:** Cecidomyiidae sp.1-3. 1+1+1, Chironomidae 1, Ceratopogonidae 1, *Holoplagia albitarsis* 1, Empididae sp. 2, Dolichopodidae sp.1-2. 3+1, Platypezidae 1, *Megaselia* sp.1. 6, *Megaselia* sp.2. 5, Phoridae sp.1-4. 1+1+1+2, *Homoneura notata* 1, *Peplomyza litura* 1, *Cal-*

liopum aeneum 1, *Calliopum simillimum* 3, *Tricholauxania praeusta* 3, *Lyciella rorida* 11, *Palloptera ustulata* 2, *Suillia affinis* 3, *Suillia bicolor* 1, *Suillia pallida* 2, *Suillia variegata* 1, *Anthomyza albimana* 1, *Chaetopodella scutellaris* 6, *Paralimosina fucata* 4, *Spelobia clunipes* 1, *Minilimosina fungicola* 1, *Minilimosina splendens* 1, *Leiomyza dudai* 1, *Drosophila phalerata* 5, *Drosophila testacea* 1, *S.(Parascaptomyza) pallida* 3, *Meoneura triangularis* 1, *Chlorops* sp. 1, Chloropidae 1, Anthomyiidae sp.1-4. 1+1+2+2, *Fannia* spp. 45 females, Coenosiinae sp.1-4. 1+1+2+11, *Hydrophoria* sp. 57. 78 species; **VIII:** *Fannia* spp. 27 females; **IX:** Cecidomyiidae sp.1-2. 1+1, Chironomidae sp.1-2. 1+2, Ceratopogonidae 1, Hybotidae 1, Dolichopodidae sp.1-2. 1+1, *Megaselia* sp. 1. 1, *Megaselia* sp. 2. 1, *Megaselia* sp. 3. 1, *Megaselia* sp. 4. 3, *Megaselia* sp. 5. 15, *Anthomyza gracilis* 1, *Leiomyza dudai* 1, *Homoneura notata* 1, *Peplomyza litura* 1, *Lyciella decempunctata* 1, *Lyciella rorida* 1, *Opomyza florum* 1, *S.(Parascaptomyza) pallida* 14, *Lordiphosa fenestrarum* 1, *Hirtodrosophila confusa* 1, *Drosophila phalerata* 1, *Spelobia parapusio* 1, *Paralimosina fucata* 1, *Pullimosina moesta* 2, *Opacifrons coxata* 2, *Minilimosina fungicola* 1, *Hydrophoria* sp. 30, Anthomyiidae sp.1-5. 8+2+4+2+1, *Fannia* spp. 104 females. 51 species.

Table 2

Flies collected by Gregor-Povolny traps with faeces in 1989-90 (specimens/species in a family)

Species \ Localities	Aggtelek Medvéskert					Bükk Garadna valley						Verőce Magyarkút					Visegrád Apátkúti v.			
Code of samples	A02 089	A07 099	A10 109	A15 080	A11 090	B03 089	B08 099	B11 109	B16 080	B13 090	B27 090	M28 079	M01 109	M01 079	M19 080	M22 090	V14 079	V27 079	V08 099	V07 090
Sciaridae indet.	7/2	3/2	1	3	1	-	-	-	-	1	-	-	3/3	5/3	-	-	-	1	34/3	-
Psychodidae indet.	-	-	-	-	-	-	1	3	-	-	-	-	3/2	-	-	-	1	-	1	-
Neuroctena anilis	-	1	-	-	3	3	9	1	3	7	5	-	-	-	-	-	-	-	6	-
Sepsis fulgens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Sepsis punctum	-	-	-	-	-	-	-	-	-	-	-	45	-	21	3	-	7	4	-	-
Nemopoda nitidula	-	-	-	-	-	12	9	-	7	-	-	-	-	2	2	-	-	-	-	-
Piophila casei	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Piophila latipes	-	-	-	-	-	-	-	-	-	-	-	6	-	1	-	-	-	3	-	-
Oldenbergiella seticerca	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suillia oxyphora	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Lotophila atra	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Crumomyia fimetaria	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coproica ferruginata	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Paralimosina fucata	-	-	-	-	-	-	1	-	3	-	-	2	1	2	-	-	2	58	-	-
Paralimosina macedonica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
Spelobia manicata	7	48	-	6	2	3	34	-	1	-		-	2	14	1	-	-	1	7	2
Spelobia palmata	-	1	-	-	-	3	3	1	-	-	-	-	-	-	-	-	-	9	-	-
Spelobia parapusio	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
S.(Bifronsina) bifrons	-	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	1	-	-	-
Pullimosina moesta	7	-	-	9	-	1	1	-	1	-	-	1	1	4	-	-	1	3	2	-
Chaetopodella scutellaris	-	-	-	-	-	-	-	-	2	-	-	7	-	4	-	-	3	4	-	-
Opacifrons coxata	8	-	-	-	-	-	-	-	8	-	1	-	-	-	-	-	-	-	-	-
Leptocera caenosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Leptocera fontinalis	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L.(Rachispoda) limosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Madiza glabra	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scathophaga stercoraria	-	-	-	3	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-
Paregle audacula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Paregle cinerella	-	-	-	3	-	-	-	-	-	-	-	3	-	2	-	-	-	-	-	-
Hydrophoria sp.	1	3	-	3	7	2	3	-	23	1	1	3	3	-	1	7	-	3	-	9
Anthomyiidae indet.	2/2	3/2	-	15/6	-	-	3/2	-	3/2	-	-	1	1	2	1	2/2	-	-	1	-

Table 2 (continued)

Flies collected by Gregor-Povolny traps with faeces in 1989-90 (specimens/species in a family)

Species \ Localities	Aggtelek Medvéskert					Bükk Garadna valley						Verőce Magyarkút						Visegrád Apátkúti v.			
Code of samples	A02 089	A07 099	A10 109	A15 080	A11 090	B03 089	B08 099	B11 109	B16 080	B13 090	B27 090	M28 079	M01 109	M01 079	M19 080	M22 090	V14 079	V27 079	V08 099	V07 090
Fannia armata	12	22	-	30	-	23	47	1	20	2	4	9	2	16	5	-	2	9	24	2
Fannia barbata	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	16	-	3
Fannia canicularis	-	-	-	1	-	1	1	-	-	-	-	2	-	2	2	-	-	-	-	-
Fannia difficilis	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fannia lepida	-	-	-	-	1	-	6	-	1	3	-	-	-	-	-	-	-	-	-	-
Fannia ornata	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Fannia parva	254	542	-	430	211	118	1080	146	28	980	176	-	109	-	8	-	-	4	131	23
Fannia pruinosa	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Fannia rondanii	1	-	-	7	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fannia scalaris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
Fannia serena	-	-	-	19	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Fannia umbrosa	1	2	-	6	-	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-
Muscina levida	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Azelia cilipes	12	6	5	-	18	4	10	-	13	-	-	2	-	3	1	2	-	7	1	1
Azelia nebulosa	2	10	-	-	12	-	2	-	1	3	-	-	1	-	-	1	-	5	-	-
Azelia triquetra	-	2	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Thricops diaphanus	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Thricops simplex	-	-	-	1	-	1	5	-	-	3	-	-	-	-	-	-	-	-	2	-
Hydrotaea cyrtoneurina	-	-	-	-	10	-	6	-	-	4	-	3	1	-	2	-	-	-	-	-
Hydrotaea dentipes	4	2	-	9	-	12	16	-	6	-	-	-	-	1	3	-	1	13	-	1
Hydrotaea ignava	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Hydrotaea irritans	-	-	-	4	1	-	1	-	1	1	-	-	-	-	-	-	-	1	-	-
Hydrotaea meridionalis	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Hydrotaea palaestrica	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Hydrotaea similis	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Polietes lardaria	-	-	-	-	1	-	4	-	-	8	-	5	-	2	-	-	-	-	-	-
Musca autumnalis	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Musca tempestiva	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Morellia hortorum	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Neomyia cornicina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Eudasyphora cyanella	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	2	3	-	-
Eudasyphora cyanicolor	-	1	-	-	-	-	12	-	-	-	-	6	-	4	-	-	-	-	-	-
Eudasyphora pratorum	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phaonia pallida	-	-	-	1	-	2	-	-	8	-	-	-	-	-	-	-	-	-	-	-
Phaonia rufiventris	-	-	-	7	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Phaonia subventa	-	-	-	6	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Phaonia valida	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Helina deleta	-	4	-	-	-	-	-	-	4	-	-	-	-	-	1	-	-	-	2	-
Mydaea corni	2	-	-	-	5	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-
Mydaea nebulosa	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mydaea urbana	-	-	-	-	-	1	-	-	5	-	-	-	-	1	2	-	-	1	-	-
Hebecnema umbratica	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-
Graphomyia maculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Calliphora vicina	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	1	-	-
Calliphora vomitoria	1	7	-	1	-	9	5	-	-	1	-	1	1	7	-	-	-	8	2	-
Lucilia ampullacea	-	-	-	-	-	1	1	-	1	-	-	2	-	1	2	-	1	-	-	-
Lucilia caesar	56	27	-	56	7	23	7	-	15	-	-	29	11	23	18	-	22	63	12	-
Lucilia illustris	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Lucilia silvarum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Phormia regina	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Pollenia sp.	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2+5	-	-	-
Thyrsocnema incisilobata	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Parasarcophaga albiceps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Specimens (total)	398	692	12	658	291	264	1275	160	188	1018	193	146	149	145	67	14	79	257	283	48
Number of species	29	24	6	45	22	34	33	12	41	16	10	10	23	36	36	7	24	38	39	12
Species per locality	53 + ca. 20					50 + ca. 23						47 + ca. 20					39 + ca. 30			

Remarks for species omitted from Table 2

A02089: Cecidomyiidae sp.1-2. 2+2, Phoridae sp.1-4. 10+5+1+1, *Fannia ringdahlana* Collin, 1939: 1 male, *species new for the fauna of Hungary*; **A07099**: Phoridae sp.1-3. 2+1+1, *Coenosini* sp. 3, *Hydrotaea pilipes* 1; **A15080**: Cecidomyiidae sp. 3, *Microchrysa flavicornis* 1, Syrphidae sp. 1, Phoridae sp.1-2. 7+4, *Nowakia* sp. 2 males (*a genus new to Hungary*), *Scaptomyza pallida* 6, *Poemyza lateralis* 2, *Oscinella frit* 1, Chloropidae sp. 1, *Coenosini* sp. 1; **A11090**: *Lonchoptera lutea* 1, Phoridae sp.1-2. 2+1; **B03089**: Chironomidae sp. 1, Dolichopodidae sp. 2, Phoridae sp.1-2. 3+1, *Terrilimosina schmitzi* 1, *Opacifrons humida* 1, *Ditrichophora* sp. 1, *Drosophila obscura* 2, *Drosophila phalerata* 1, *Drosophila testacea* 1, *Fannia* sp. 1 female, *Hydrotaea armipes* (= *occulta*) 1; **B08099**: Mycetophilidae sp. 1, Phoridae sp.1-3. 1+1+1, *Ditrichophora* sp. 1, *Scaptomyza pallida* 1; **B11109**: Cecidomyiidae sp. 1, Phoridae sp.1-2. 1+1, *Dryomyza flaveola* 1, *Crumomyia nigra* 1; **B16080**: Empididae sp. 1, Dolichopodidae sp.1-2. 2+3, Syrphidae sp. 1, Phoridae sp.1-2. 1+1, *Ditrichophora* sp. 3, *Drosophila testacea* 1; **B13090**: Phoridae sp.1-2. 1+1; **B27090**: Phoridae sp. 2, *Acatophthalmus nigrinus* 1; **M28079**: Phoridae sp.1-3. 3+2+1, Hybotidae sp. 1, *Drosophila phalerata* 1, *Hydrotaea* sp. 1 female; **M01109**: Cecidomyiidae sp. 1, Phoridae sp.1-2. 4+1, *Drosophila melanogaster* 1; **M01079**: Cecidomyiidae sp. 1, Phoridae sp.1-4. 5+5+3+1, *Ditrichophora* sp. 1, *Opacifrons humida* 1, *Drosophila melanogaster* 2, *Fannia* sp. 2 females; **M19080**: Cecidomyiidae sp. 1, Phoridae sp.1-3. 2+1+1, *Drosophila testacea* 1, *Athyroglossa glabra* 3; **M22090**: - ; **V14079**: Phoridae sp.1-2. 3+3, *Eumerus* sp. 1, Platypezidae sp. 1, Tachinidae sp. 1; **bV27079**: Mycetophilidae sp. 1., *Aedes* sp. 1, Ceratopogonidae sp.1-4. 3+1+1+1, Dolichopodidae sp. 1, Phoridae sp.1-7. 7+6+3+2+1+1+1, *Drosophila obscura* 1, *Drosophila subobscura* 1, *Fannia* sp. 1 female; **V03099**: Cecidomyiidae sp.1-2. 1+1, Mycetophilidae sp.1-3. 2+1+1, *Culicoides* sp. 1, *Sylvicola fenestralis* 1, Empididae sp.1-2. 1+1, Dolichopodidae sp.1-2. 2+1, *Lonchoptera lutea* 22, Phoridae sp.1-7. 5+4+3+2+1+1+1, *Ditrichophora* sp. 1, *Clusioides albimana* 1, *Suillia fuscicornis* 1, *Suillia laevifrons* 2, *Lipoptena cervi* 1; **V07090**: Chironomidae sp. 1, *Lonchoptera lutea* 1, *Megaselia* sp.1. 3, *Megaselia* sp.2. 1.

DISCUSSION

The impact of tourism is hardly detectable in the results of our trapping. No specimen of the true synanthropic species, like *Musca domestica*, and *Lucilia sericata*, was caught during those 3 years, in spite of the fact that e.g. the trapping site at Verőce, Magyarkút was just outside the village, next to the worst - dirtiest - tourist lay-by of Hungary. The 9 specimens of *Fannia canicularis* and 2 specimens of *F. scalaris* are just indicating human intrusion to the life of forests. The other important synathropic species, *Calliphora vicina* was found in three times one specimen from Magyarkút and Visegrád only. It is comforting to know that the impact of human activity is not much more far reaching in our forests than the place it affects directly, at least as judged from the dipterous assemblages visiting human faeces.

Mihályi (1966) made his collectings with human faeces in or in the surroundings of 42 localities in Hungary, collecting 9,779 dipterous specimens in 149 samples. Our 29 samples from 4 localities in 3 years contain 9,191 specimens. Mihályi's exposition time was 1 hour, less frequently 2 hours, ours was 3 hours (and mostly 4 hours in 1988). It is obvious that this is the main reason for his smaller samples. However, traps baited with human faeces do not catch twice as many flies during twice as much time (see e.g. Mihályi 1966). His trap hours cannot be determined precisely (the numbers in his table with 180 trapping hours with faeces (Mihályi 1967) are surely erroneous, when one makes a counting in his theses; that number is higher for sure). In any case, it is quite certain that we collected much more flies per time unit during our about 90 trapping hours than Mihályi did three decades ago. He collected representatives of cca 200 to 225 dipterous species (incl. the "indet." species), our samples contain about 175 to 180 species, i.e. about 80% of the former value. This is again comparatively higher. We are not unaware that the legitimacy of such a comparison is limited or even questionable. Mihályi exposed his traps also in yards of villages, on meadows etc. Traps exposed in settlements are likely to collect less specimens and species than those in forests but meadows offer a richer fauna and more abundant populations than do forests. So our general conclusion is limited to an assertion that loud and repeated statements on the loss in the diversity of insects in the last decades cannot be proved for the forest flies visiting faeces (quite the same applies to forest drosophilids).

Considering that our data are not fully comparable to Mihályi's, we selected three groups of flies to make comparison in the number of species, namely family Sphaeroceridae ("lesser dung flies"), family Fanniidae, and family Muscidae.

The sphaerocerid materials from Mihályi's collectings were identified and published by Aradi (1965). Since all those specimens are still preserved in the collection of the Hungarian Natural History Museum, all the identifications are controllable even today. He reported 31 species but all the specimens of 2 species (*Opalimosina pullula* and *Coproica pseudolugubris*) were misidentified so we can count on 29 species. We collected representatives of 28 sphaerocerid species. Mihályi's material included 12 species which were not collected now, among them 6 species of dung heaps, barns and stables and of village yards, however, since these 6 species also occur in the wild nature, they are not left out of our consideration. We collected representatives of 11 species, which were not caught by Mihályi. The full combined list contains 40 species. Thus the Jaccard index of the two series of collectings is $17/40 = 0.425$. Our final conclusion is that none of the two series produced representative results for the species of Sphaeroceridae visiting human faeces in Hungary. As for our series, we probably must not expect such a representativeness. But if we take into consideration that his 149 samples collected in various habitats are not enough to be representative, we must probably revaluate former statements on the level and quality of knowledge on faunas based on specimens from collectings of a few years. As for the number of specimens, our samples are smaller; this is no surprise for reasons easily accounted for: sphaerocerid populations are bigger, their abundance is much higher near dung heaps, village yards and on wet meadows than those of the species in mountain creek valleys.

As regards the species of Fanniidae, specimens of 14 species were caught during our three year period. There are five among them which were missing from Mihályi's series, among them *Fannia ringdahlana* Collin, 1939, a species new to the fauna of Hungary

We may admit here that the first known male (i.e. the first true voucher specimen) in Hungary of *Coenomyia* [now *Fannia*] *mollissima* Haliday, 1840 was also caught during our collecting period (cf. Mihályi 1975)

Mihályi published 6 species which were not caught now. Thus the species identity (Jaccard index) of the two series of collectings is 9/20 = 0.45. As for the number of specimens, Mihályi reported 741 specimens, we collected nearly 5,000 specimens. As for the species representativeness of the Fanniidae, our conclusion is quite the same as with the sphaerocerids. Our very high number of specimens is attributed to the fact that we exposed traps always in shady places in forests, where species of *Fannia* are swarming.

The dipterous group which was probably best represented in Mihályi's material is the family Muscidae. Those materials served as one of the bases for the collection of Muscidae now in the Hungarian Natural History Museum. Mihályi's materials are definitely richer (again, possibly due to the more various habitats he collected from). He found 22 species, which were not represented in our materials; we collected only 8 species which were missing from Mihályi's lists. No specimens of *Musca domestica* were trapped by us. Contrarily to our long list of muscid species (nearly 50 species), we must not state that the species compositions found would indicate representatively the human impact on the sites sampled. In other words, muscid assemblages in forests, sampled by our methods or by similar ones, are also unsuitable to indicate unfavourable changes in the environment.

I can corroborate Mihályi's opinion on the "hemisynanthropic" species as regards their role in the transmission of infections (or on the reason for maintaining such a term). The probability of such a forest fly flying from a human faeces to humans is low. A certain time after its contact with faeces it may contact humans without causing any harm since bacteria or other infectious germs perish in/on its body. So the "hemisynanthropic" category of Gregor and Povolny (1958) may be even regarded as a misleading term.

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Papp, L.: Emberi székletet látogató legyek hazai középhegységi patakvölgyekben (Diptera)

1988-tól 1990-ig 4 hazai középhegységi patakvölgyben (Aggteleki N.P.: Ménes-völgy, Medvés-kert, Bükki N.P.: Garadna-patak völgye, Börzsönyi Tájvédelmi Körzet: Verőce, Magyarkút, Keskenybükki-patak völgye, Pilisi Tájvédelmi Körzet: Visegrád, Apátkúti-völgy) friss emberi széklettel használt Gregor-Povolny-féle csapdákkal gyűjtöttünk legyeket. A közölt táblázatokban 29 mintából 9191 légyegyed adatai szerepelnek, amelyek 175-180 fajhoz tartoznak. Az eredmények azt mutatják, hogy még lakott helyek közvetlen közelében, szemetes túristapihenők mellett is az erdei légyegyüttesek a meghatározóak: a környezetrontás hatása - ezeken a légyközösségeken lemérve - alig nyúlik túl azon a területen, amelyet közvetlenül érint. Kultúrakövető fajokat nagyon alacsony egyedszámben fogtunk. A székletcsapdás gyűjtések meglepően sok fajképviseletet mutattak ki, de olyan kevés fajra tekinthető reprezentatívnak a gyűjtött anyag, hogy matematikai elemzésre alkalmatlannak ítéltük. Mihályi Ferencnek 3 évtizeddel ezelőtti azonos módszerű gyűjtéseivel összehasonlítva kiderült, hogy e légyközösségekre vonatkozóan sem az akkori, sem a mostani gyűjtéssor nem elég reprezentatív. Mihályihoz hasonlóan elvetjük a "hemiszinantróp" kategória használatát (az erdei fajoknak nincs közegészségügyi jelentősége). Eredeti hipotézisünk nem igazolódott: az emberi székletet látogató légyfajok együtteseinek szerkezete erdőkben, erdei patakvölgyekben nem jelzi jól az emberi behatolás mértékét.

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