Composition of Domestic Fly Populations in Delaware County, Indiana

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Abstract

Sampling of domestic fly populations, using the attached bait pan fly trap, was conducted in Delaware County, Indiana, during two spring seasons and two fall seasons. Approximately 20,000 flies were trapped. Although more than 32 species were obtained, 2 species, *Phaenicia sericata* (Meigen) and *Phormia regina* (Meigen), constituted over 70% of all flies collected. *Phormia regina* appears to be particularly well-adapted to Indiana conditions.

The house fly, *Musca domestica* L., was more abundant during fall than spring. Its association with food processing industries accounts for its abundance in certain Indiana communities during early autumn.

Introduction

Studies of domestic fly populations were conducted in Delaware County, Indiana, during the autumn of 1964 and 1966, and during spring of 1966 and 1967. The purposes of these studies were to determine: 1) the species composition of fly trap collections; 2) relative numbers, or densities of prevalent species; and 3) seasonal trends or successions. Insufficient data were obtained to realize the third objective, but preliminary information relating to the first two objectives was obtained. In this study, "domestic fly populations" is interpreted to mean those fly populations which frequent man's establishments, and which can be observed or trapped by conventional methods in those settings.

Materials and Methods

The attached bait pan fly trap as described by Schoof (4) was used exclusively in this study. Usually, traps were set out in late morning and were recovered the following morning. Adjustments were made for weather, and for the class schedule of students who operated the traps. During cool weather, traps were sometimes allowed to remain out for as long as 2 days. During warm weather, traps frequently filled with flies and could be recovered in a few hours.

Chicken entrails, obtained from a local produce house, were used for bait. Usually this material was obtained in quantities of a gallon or more, then transferred to waxed cartons, frozen, and kept in a freezer until needed. Half-gallon milk cartons, contributed by a local dairy, were convenient as bait containers. The top half of the carton was cut off and discarded. The lower half of the carton, containing the bait, was placed in the bait pan of the fly trap. Cartons and contents were discarded after each trapping.

Usually, two or more traps were used at each setting. Trap contents were combined to make up one collection. The number of collections varied from one to five per week.

In making trap collections, the upper screened component of the trap unit was disengaged from the bait pan, and placed in a metal can. A cotton pad soaked with chloroform also was placed inside the can and enclosed with a tight-fitting lid. The trap contents were anesthesized enroute to the site of temporary storage, at one of the university outdoor study areas nearby.

Flies were transferred to cylindrical pint-size paper cartons. Collection data (collection number, date, site, and trapping interval) were written on each carton. The cartons were then left uncovered inside a screened cabinet in a shelter house. After several days of airing, the fly collections usually were sufficiently deodorized to permit sorting and identification in the laboratory. Members of the Muscidae and Calliphoridae were identified to species using the terminology of Hall (1) and Dodge (H. Rodney Dodge, personal communication).

Description of Study Site

The study site was an open dump located approximately 1 mile west of the city boundary of Muncie. This was commonly known as the county dump. It also was used to some extent by residents and business firms from the city. A meat-packing industry used this site for drainage of washed hoofs, hair and other animal waste products temporarily stored in truck bodies. Some of the effluent was discharged into a nearby stream. Some of the effluent soaked into the ground. In addition to organically-impregnated soil from truck drippings, there were places at the periphery of the site where the actual waste products were dumped or spilled. Heavy production of blow flies occurred at these places.

The main body of the dump often contained waste grain, animal excrement, and waste vegetable products. Here, house flies and other members of the Muscidae were produced. All considered, the study site was a place of relatively high domestic fly production each year from March through September. In the late 1960's bulldozers leveled the site. The dump was covered with compacted earth and the land was reclaimed. A housing area has been developed on part of the land where the dump was located.

Results

Approximately 82% of the flies trapped were Calliphoridae (blow flies); 10% were Muscidae (house fly and relatives) and 3% were Sarcophagidae (flesh flies) (Table 1).

Two species constituted most of the Calliphoridae which were trapped—*Phaenicia sericata* (Meigen) and *Phormia regina* (Meigen). These 2 species also constituted more than 70% of all flies collected.

TABLE 1. *Numbers of species of domestic flies trapped in Delaware County, Indiana, during four seasons.*

Species	Spring, 1964		Fall, 1966		Spring, 1967		Fall, 1967		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Calliphoridae										
Calliphora vicina	166	2.73	57	<1	159	2.91	75	30.73	457	2.26
Cynomyopsis cadaverina	710	11.68	9	<1	67	1.22	11	4.50	797	3.94
Phaenicia sericata	566	9.31	5041	60.01	1951	35.73	102	41.80	7660	37.96
Phormia regina	3456	56.87	2004	23.85	1813	33.21	30	12.29	7303	36.19
Muscidae										
Fannia canicularis	—	—	31	<1	247	4.52	2	<1	280	1.38
Hydrotaea houghii	—	—	—	—	245	4.48	—	—	245	1.21
Musca domestica	—	—	663	7.89	294	5.38	2	<1	959	4.75
Muscina stabulans	389	6.40	69	<1	271	4.96	8	3.27	737	3.65
Ophyra leucostoma	438	7.20	120	1.42	11	<1	—	—	569	2.81
Sarcophagidae										
Sarcophaga spp.	106	1.74	14	<1	259	4.74	—	—	379	1.87
[1] Other	246	4.05	391	4.65	142	2.60	14	5.78	793	3.93
Total	6077		8399		5459		244		20,179	
No. collections	7		22		12		4		45	
Ave. per coll.	868		382		455		61		448	

[1] Includes: *Calliphora livida, C. terrae-novae, C. vomitoria, Callitroga macellaria, Lucilia illustris, Protophormia terrae-novae, Pollenia rudis, Fannia canicularis, Fucellia furcorum, Hydrotaea lata, H. houghii, Muscina assimilis, Ophyra aenescens, Pegomya varigata, Pyrellia cyanicolor, Scatophaga furcatum, S. stercorarium, Chrysomyza demandata, Euxesta notata, Notogramma stigma,* and *Meroplius stercorarius.*

It is not surprising that *Phaenicia sericata* was abundant. In the study reported by Schoof, Savage and Dodge, (5, 6), *P. sericata* constituted 35% or more of trap collections, either in 1949 or 1950, in 4 locations in the United States. In the same study, *P. sericata* made up approximately 70% of the flies trapped in the vicinity of Troy, New York. For these periods extending from June 23 to November 10, Thomas reported that *P. sericata* made up 21% of the flies trapped in the vicinity of Lafayette, Indiana (7). This species is commonly seen around homes, and larvae have been collected from garbage cans in Muncie. In Europe, the species is reported to be closely associated with man in the northern part of its range, but less dependent on man as its range extends southward (3).

The abundance of *Phormia regina* (black blow fly) is somewhat surprising. The highest incidence for *P. regina* reported by Schoof (5, 6) in the five areas where flies were trapped was in the vicinity of Muskegon, Michigan. There *P. regina* made up 25.7% of flies trapped in 1950.

However, Thomas (7) reported an incidence of 45.6% from June to November for *P. regina* in the vicinity of Lafayette, Indiana, with *P. regina* constituting 47.9% of the catch from June 23 to August 18.

There is no clear-cut explanation for the success of the black blow fly in Indiana. Preliminary results from an on-going study indicate that the adult stage is the mode of overwintering for *Phormia regina*. Presently, we are attempting to develop a cold hardy colony of *P. regina* at Ball State University from progeny of a few females which survived overwintering in an unheated outbuilding in Muncie in 1969-70.

Although *Phormia regina* can be reared at mean temperatures as high as 88°F, it characteristically is a cool-weather fly. In Phoenix, Arizona, it virtually disappeared in summer, and the frequency of its occurrence was greatest in spring and fall. According to Hall (1), its distribution is Holarctic, but it is commonly found during spring and fall throughout the United States.

Indiana evidently provides climatic conditions near optimum for the propagation of *Phormia regina*, since production may begin in early spring with eggs laid by overwintering females, and continue undiminished throughout spring, summer and fall.

Cynomyopsis cadaverina and *Calliphora vicina* are bluebottle flies, in the tribe Calliphorini. The relative numerical abundance of these species in this study is in agreement with data obtained by Thomas (8). These species characteristically are cool-weather flies, but they were observed in Delaware County throughout the summer.

Musca domestica L. (house fly) was absent from collections in 1964, and declined in incidence in 1967, as compared with 1966. Autumn appeared to be the peak season for house flies. The abundance of *M. domestica* often is related to certain local industries, such as food processing. Population pressure from such production foci as tomato processing plants may result in infiltration of house flies throughout entire residential areas of cities and towns. This was observed in Delaware County in the late 1950's, and more recently in other Indiana communities. The threat of enteric disease outbreaks in communities where mass production of house flies occurs should be recognized by public health officials. City and county health officers should instruct sanitarians under their direction to exercise strict authority, and to require environmental sanitation practices at vegetable processing plants during the canning season. Source reduction of production media at these sites should contribute substantially in stemming the threat of fly transmission of enteric diseases in the community.

With regard to other Muscidae, *Muscina stabulans* exceeded *M. assimilis* in numerical abundance; likewise *Ophyra leucostoma* was more abundant than *O. aenescens*. These findings are in agreement with those of Schoof *et al.* (4) for five sites in various parts of the United States.

All members of the Sarcophagidae trapped belonged to the genus Sarcophaga. None of these was identified to species. In addition to Calliphoridae, Muscidae and Sarcophagidae, the following families were represented: Otitidae, Sepsidae, and Anthomyiidae.

Average weekly temperatures for the spring of 1964 varied from a low of 36°F to a high of 60°F, with a mean for the period of 46.36°F. Precipitation for March totalled 7.27 inches; for April the measurable precipitation totalled 12.74 inches. For the fall of 1966, average weekly temperatures varied from a low of 36.5°F to a high of 60.6°F, with a mean for the period of 49.9°F. Precipitation for this fall period totalled 4.83 inches. Average weekly temperatures for the spring of 1967 varied from a low of 35.8°F to a high of 72.5°F, with an approximate mean for the period of 55.8°F. Rainfall for this spring period totalled 10.71 inches. Collections during the fall period of 1967 were limited to the week of November 12. During that week average temperatures ranged from a low of 32.5°F to a high of 42.5°F, with an approximate mean of 37.6°F. The comparatively low average of flies collected per trap collection (61) probably was due to low prevailing temperatures for that week.

Conclusions

Results of preliminary studies of domestic fly populations in Delaware County, Indiana, indicate that the numerical ratio of blow flies to house flies was approximately 8:1 during spring and fall of 1964, 1966 and 1967. Two species, *Phaenicia sericata* and *Phormia regina*, were the dominant blow flies.

In comparison with reported numerical abundance, based on a similar population sampling method, *Phormia regina* was more prevalent in the study area than in some other parts of the United States. This species appears to be quite well adapted to Indiana conditions.

House flies were more abundant during the fall than spring. This species is associated with food processing industries, and its prevalence often coincides with the peak of activity at tomato canning plants in Indiana. More data are needed in order to establish seasonal trends, or succession of species in relation to temperature and rainfall.

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