

FILTH INHABITING FLIES (DIPTERA) OF CALCUTTA CITY

A. N. T. JOSEPH AND P. PARUI

Zoological Survey of India, Calcutta

ABSTRACT

The study of filth inhabiting flies of Calcutta City was conducted for one year from September, 1977 to August, 1978. The filth of the city can be broadly grouped into the following eight categories : human excreta, cowdung or cattle droppings, garbage and kitchen refuses, decaying fish and meat, municipal sewage and other liquid waste, carrion, decaying coconut, and sweets. Detailed information about the attraction of 6 species of Muscidae, 3 species of Sarcophagidae, 2 species of Seysidae and 1 species each of Calliphoridae, Borboridae, Milichiidae, Drosophilidae, Phoridae, Syrphidae, Stratiomyidae and Psychodidae towards different types of filth has been provided. It is seen that cowdung or cattle droppings attract a maximum number of 16 species belonging to as many as 9 families followed by human excreta that attract 11 species of flies that fall under 5 families. The duration of life cycle from oviposition to emergence of 17 species of flies under 10 families in summer and winter has been recorded. Food preferences of larvae of *Musca domestica vicina*, *M. domestica nebulo*, *Chrysomya megacephala*, *Sarcophaga ruficornis* and *Megaselia scalaris* has been studied in detail. It is observed that they take less time for completion of life cycle and their mortality rate is much lesser in their favourite food medium, *i.e.*, meat. Seasonal changes in fly population have been discussed.

Communicable diseases like cholera, typhoid, dysentery, enteric fevers, etc. come in the way of economic progress of the tropical and subtropical countries. The rapid growth of population and influx of refugees are the main causes that considerably lowered the sanitary conditions so much that the city of Calcutta has provided ideal breeding grounds for such dreadful diseases. Though considerable attempts are afoot for the prevention of these diseases, enough emphasis has not been given to the study of its root cause, *i.e.*, their vectors, the filth inhabiting flies, which transmit the pathogens of these diseases. Normally these flies feed and breed in filth.

At the same time they also visit the food for human consumption thus transmitting the pathogens through contact with their body surfaces and sticky feet and through vomit drops and excreta. Hence the authors have taken up the present study which is of utmost importance to the public health and hygiene of Calcutta. It is for the first time such a study is conducted in Calcutta, though similar studies have been undertaken by Bohart and Gressit (1951) in Guam, Gill (1955) in Central Alaska, Webb and Graham (1956) in Canada, and Ameen and Huq (1973) in Dacca City. The present work was carried out for a year from September 1977 to August 1978 to find

out the seasonal abundance of the flies, their food preferences, habitats, duration of life histories in different media and in different seasons.

MATERIALS AND METHODS

This work includes the survey of different types of filth and the collection of the associated flies and their eggs, larvae and pupae. A brief account of the nature of the filth and flies associated with them, the survey procedure and the localities surveyed, the biology of the flies, the food preferences of their larvae, the seasonal changes in fly population and the diseases spread by them is given in order.

FILTH AND THE ASSOCIATED FLIES

The piled up garbage forms a permanent breeding ground for the flies and filth is quite common in vegetable and fish markets. Slaughter houses and meat shops in their unhygienic conditions perpetually attract the flies. Scattered cattle sheds with their manure heaps and slums with their open latrines form natural breeding grounds. In the present work the following breeding areas for the vector insect has been taken into consideration :

1. *Human excreta* : It is one of the best attractants of the filth visiting flies and one of their most important sources of breeding. The flies favour isolated deposits of excrements in shades or partly covered with leaves than those directly exposed to the sunlight or in large masses. 5 species of Muscidae, 3 species of Sarcophagidae, and 1 species each of Calliphoridae, Milichiidae and Borboridae have been recorded from it (Table 1).

2. *Cow dung or cattle droppings* : 5 species of Muscidae, 3 species of Sarcophagidae, 1 species each of Calliphoridae, Borboridae, Milichiidae, Ephydriidae, Syrphidae and Stratiomyidae, and 2 species of Sepsidae have been found associated with it (Table 1).

3. *Garbage and kitchen refuses (including vegetable and fruits)* : 5 species of Muscidae, 3 species of Sarcophagidae and 1 species each of Calliphoridae, Drosophilidae and Psychodidae have been recorded from this medium (Table 1). Of these, calliphorids (*Chrysomya megacephala*) and drosophilids (*Drosophila ananassae*) were the most abundant flies.

4. *Decaying fish and meat* : A total number of 8 species of flies belonging to the families of Muscidae (3 species), Sarcophagidae (3 species), Calliphoridae (1 species) and Phoridae (1 species) were recorded from the discarded parts of fish and meat (Table 1).

5. *Municipal sewage and other liquid waste* : Usually the stagnant water contains various waste and decomposed material and the scum of green algae. *Lispa orientalis* (Muscidae), *Brachydeutera longipes* (Ephydriidae) and *Psychoda alternata* (Psychodidae) were abundant. Rarely *Eristalis tenax* (Syrphidae) were also seen (Table 1).

6. *Carrion* : Its offensive odour attracts flies to it which forms food for adults as well as larvae. 3 species each of Muscidae and Sarcophagidae and 1 species each of Calliphoridae and Phoridae have been found to occur in this medium (Table 1).

7. *Decaying coconut* : Tender coconuts are discarded after consuming their contents. They are seen in heaps in various stages of

TABLE 1. List of flies associated with different types of filth in Calcutta City

Family	Species	Human excreta	Cow dung or cattle droppings	Garbage and kitchen refuses	Decaying fish and meat	Municipal sewage	Carrion	Decaying coconut	Sweets
1	2	3	4	5	6	7	8	9	10
Psychodidae	<i>Psychoda alternata</i> Say	—	—	**	—	***	—	—	—
Stratiomyidae	<i>Sargus metallinus</i> (F.)	—	*	—	—	—	—	—	—
Syrphidae	<i>Eristalis tenax</i> L.	—	*	—	—	*	—	—	—
Phoridae	<i>Megaselia scalaris</i> (Loew)	—	—	—	***	—	**	—	—
Sepsidae	<i>Sepsis rufa</i> Macquart	—	***	—	—	—	—	—	—
	<i>Sepsis pubipes</i> Brunetti	—	***	—	—	—	—	—	—
Ephydriidae	<i>Brachydeutera longipes</i> Hendel	—	*	—	—	***	—	—	—
Drosophilidae	<i>Drosophila (Sophophora)</i> <i>ananassae</i> Doleschall	—	—	***	—	—	—	—	—
Milichiidae	<i>Desmometopa m-nigrum</i> Zett.	**	***	—	—	—	—	—	—
Borboridae	<i>Leptocera</i> sp.	**	***	—	—	—	—	—	—
Calliphoridae	<i>Chrysomyia mega-</i> <i>cephala</i> (F.)	***	**	***	***	—	***	—	***
Sarcophagidae	<i>Sarcophaga ruficornis</i> (F.)	***	*	**	***	—	**	**	**
„	<i>Sarcophaga hirtipes</i> Wiedemann	***	*	**	***	—	***	**	**

TABLE 1 (continued)

1	2	3	4	5	6	7	8	9	10
Sarcophagidae	<i>Sarcophaga dur</i> Thomson	***	*	**	***	—	***	**	**
Muscidae	<i>Musca (Musca) domes-</i> <i>tica vicina</i> Macquart	***	*	**	***	—	—	**	**
„	<i>Musca (Musca) domes-</i> <i>tica nebulo</i> F.	**	*	**	***	—	—	—	—
„	<i>Musca (Byomyia)</i> <i>sorbens</i> Wiedemann	**	***	**	***	—	***	**	**
„	<i>Musca (Byomyia)</i> <i>pattoni</i> Austen	**	***	**	—	—	**	—	—
„	<i>Musca (Ptilolepis)</i> <i>inferior</i> Stein	**	**	**	—	—	*	—	—
„	<i>Lipsa orientalis</i> Wiedemann	—	—	—	—	***	—	—	—

*** Very common and abundant.

** Common.

* Rare.

— Not recorded.

decaying in several parts of the city. 5 species of flies belonging to Muscidae (2 species) and Sarcophagidae (3 species) were commonly seen in it (Table 1).

8. *Sweets* : Flies are attracted to the shops that sell sweetmeat and molasses. *Chrysomya magacephala* (Calliphoridae) have been found to occur in abundance. *Sarcophaga ruficornis*, *S. hirtipes* and *S. dux* (Sarcophagidae) and *Musca domestica vicina* and *M. sorbens* (Muscidae) were of common occurrence (Table 1).

SURVEY PROCEDURE AND LOCALITIES SURVEYED

For the collection of the flies surveys were undertaken in eight different localities of Calcutta City (Fig. 1) once in a fortnight. They were collected during day time between 10.00 a.m. and 5.00 p.m. The localities were selected from different parts of the city to give a fair idea of the distribution of the flies that are attracted to different kinds of filth. All these spots remained filthy throughout the year. The collection localities are included in the map provided. An account of the collection localities and the types of filth encountered there is as follows :

1. *Veterinary College, Belgachia* : In the campus there are cattle sheds, stables and kennels. Their droppings are deposited in one place while the dead animals are dumped in another. There are a number of stagnant drains also in the campus. All these spots attract a variety of flies.

2. *Belgachia Busty* : It (Busty No. 22) is situated on the side of the Belgachia Road, opposite to the Veterinary College. The

collections were made from Birpara side from the common dumping ground of the kitchen refuses and also from stagnant drains.

3. *College Street Market* : It is situated in the northern part of the city. There is a separate fish market with a few meat shops at the sides. The dumping ground for the rotten vegetables is adjacent to the fish market.

4. *Bagjola Canal, Dum Dum* : The sewage of the city after being treated falls to this canal. Always there remains a layer of scum on the surface of the water. Collections were made from the water surface as well as from the sides.

5. *Dapha* : It is the main municipal dumping ground for the refuses of the city. Because of the abundance of all kinds of decomposed material, it is an ideal locality for the filth inhabiting flies. There is a large cattle shed nearby where heaps of dung lay accumulated.

6. *Machua Bazar Market* : It is the main wholesale market for fruits in Calcutta. Collections were made from fresh as well as decaying fruits of various kinds.

7. *Kidderpur Market* : It is a very big market situated in the southern part of the city. From the fish and meat stalls and from the dumping ground collections were made.

8. *Medical College Hostel* : The hostel is located near the Calcutta Medical College and is intended for about one hundred boarders. The kitchen refuses are dumped outside the campus along the side of a Corporation drainage. For want of proper garbage removal,

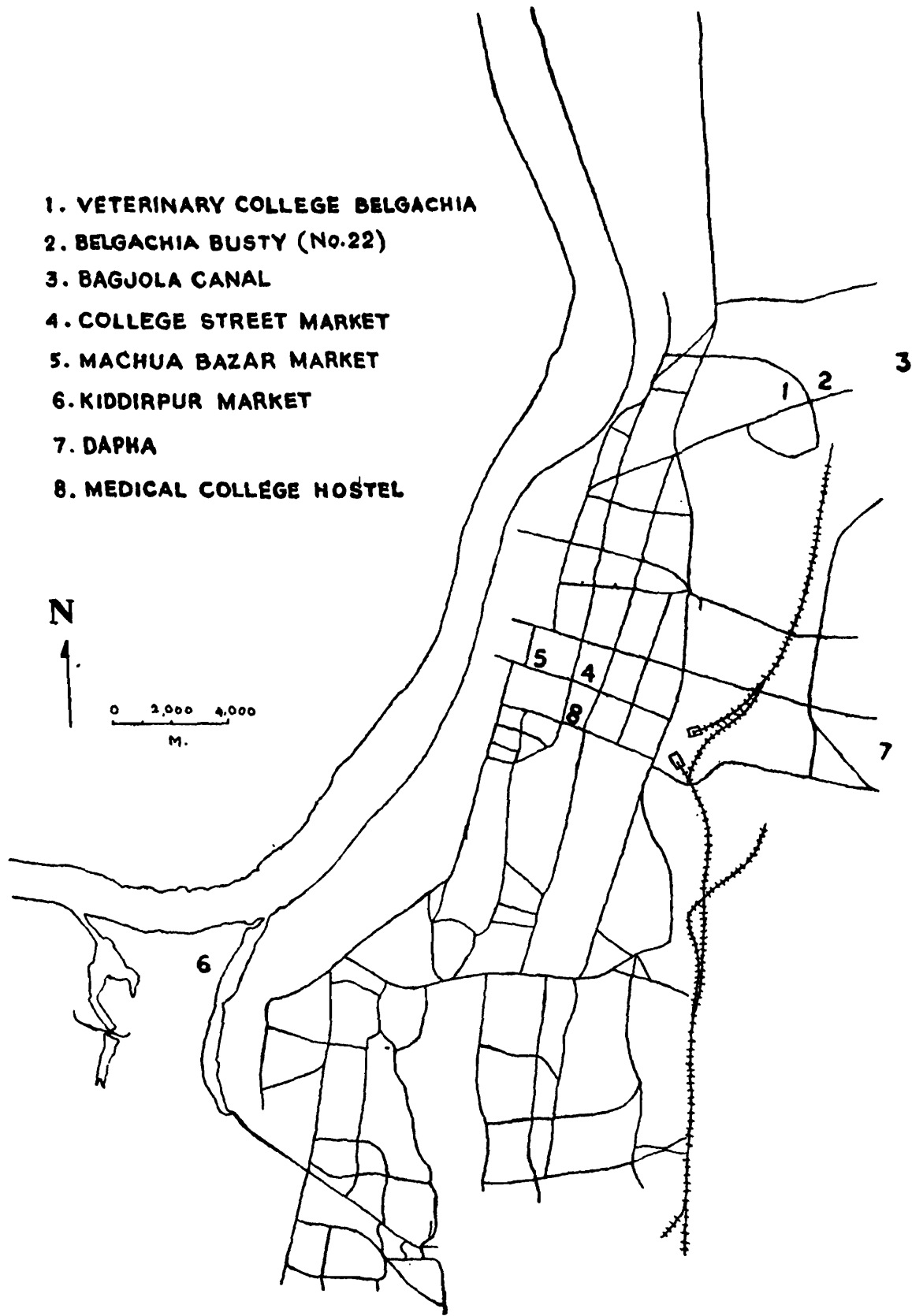


Fig. 1. Map of Calcutta showing the various collection localities.

TABLE 2. Duration of the various developmental stages of filth inhabiting flies in different media

Family	Species	Media	Season	Egg stage (In hours)	Larval stage (In days)	Pupal stage (In days)	Total time required (In days)
1	2	3	4	5	6	7	8
Psychodidae	<i>Psychoda alternata</i> Say	Sewage	Summer	15-17	4-5	3	7.6-8.7
		Mud and algae	Winter	18-20	7-8	5-6	12.8-14.8
Phoridae	<i>Megaselia scalaris</i> Loew	Fish and meat	Summer	18-20	4-5	6	10.8-11.8
		Fish and meat	Winter	20-22	5-6	13	18.8-19.9
Sepsidae	<i>Sepsis rufa</i> Macquort	Cow dung	Summer	12-14	4-5	5	9.5-10.6
		Cow dung	Winter	17-18	5	8-9	13.7-14.8
„	<i>Sepsis pubipes</i> Brunetti	Cow dung	Summer	12-14	5-6	5	10.5-11.5
		Cow dung	Winter	16-18	5	9-10	14.7-15.8
Ephydriidae	<i>Brachydeutera longipes</i> Hendel	Sewage	Summer	18-20	5	6	11.8-11.9
		Sewage	Winter	20-22	6-7	9-10	15.9-17.9
Drosophilidae	<i>Drosophila (Sophophora)</i> <i>ananassae</i> Doleschall	Lemon, mango, banana	Summer	10-12	3	3-4	6.4-7.5
		Tomato, apple	Winter	13-14	3-4	4-5	7.5-9.5
Milichiidae	<i>Desmometopa m-nigrum</i> Zett.	Cow dung	Summer	—	3-4	8-9	11-13
		Cow dung	Winter	—	—	—	—
Borboridae	<i>Leptocera</i> sp.	Cow dung	Summer	—	4	5-6	9-10
		Cow dung	Winter	—	—	—	—

TABLE 2 (continued)

1	2	3	4	5	6	7	8
Calliphoridae	<i>Chrysomya megacephala</i> (F.)	Fish and meat	Summer	11-12	7	4-5	11.4-12.5
		Fish and meat	Winter	14-16	7-9	5-6	12.6-15.6
Sarcophagidae	<i>Sarcophaga ruficornis</i> (F.)	Fish and meat	Summer	—	4-5	6-7	10-12
		Fish and meat	Winter	—	8-9	12-13	17-22
„	<i>Sarcophaga hirtipes</i> Wiedemann	Fish and meat	Summer	—	5	6-7	11-12
		Fish and meat	Winter	—	5-6	15	20-21
„	<i>Sarcophaga dux</i> Thomson	Fish and meat	Summer	—	5	9-10	14-15
		Fish and meat	Winter	—	5-6	18-19	23-25
Muscidae	<i>Musca (Musca) domestica</i> <i>vicina</i> Macquart	Fish and meat	Summer	8-10	3-4	4	7.3-8.4
		Fish and meat	Winter	14-15	5	5-6	10.6-11.5
„	<i>Musca (Musca) domestica</i> <i>nebulo</i> F.	Fish and meat	Summer	8-11	4	4	8.3-8.5
		Fish and meat	Winter	13-15	5-6	6	11.5-12.5
„	<i>Musca (Byomyia) sorbens</i> Wiedemann	Fish and meat	Summer	12-13	4	4	8.5-9.6
		Fish and meat	Winter	15-16	9	4	13.6-13.7
„	<i>Musca (Byomyia) pattoni</i> Austen	Fish and meat	Summer	10-12	5	4	9.4-9.5
		Fish and meat	Winter	15-16	9-10	5	14.6-15.6
„	<i>Musca (Ptilolepis) inferior</i> Stein	Fish and meat	Summer	12-14	5	5-6	10.5-11.5
		Fish and meat	Winter	16	9-10	4	13.6-14.6

this locality has decaying refuses which attracted the flies.

BIOLOGY

The dipteran flies have highly developed biology. The adults are free living and fliers, the larvae are aquatic or live in decaying vegetation, garbage, rotten fruits, carrion and free living tissues.

Most of the flies lay eggs but some such as sarcophagids being larviparous. The duration of the different stages of life vary from species to species and according to seasons. The present study shows, as can be seen from Table 2, that the larval period was considerably prolonged in winter season than in the summer as was earlier recorded by Ameen and Huq (1973).

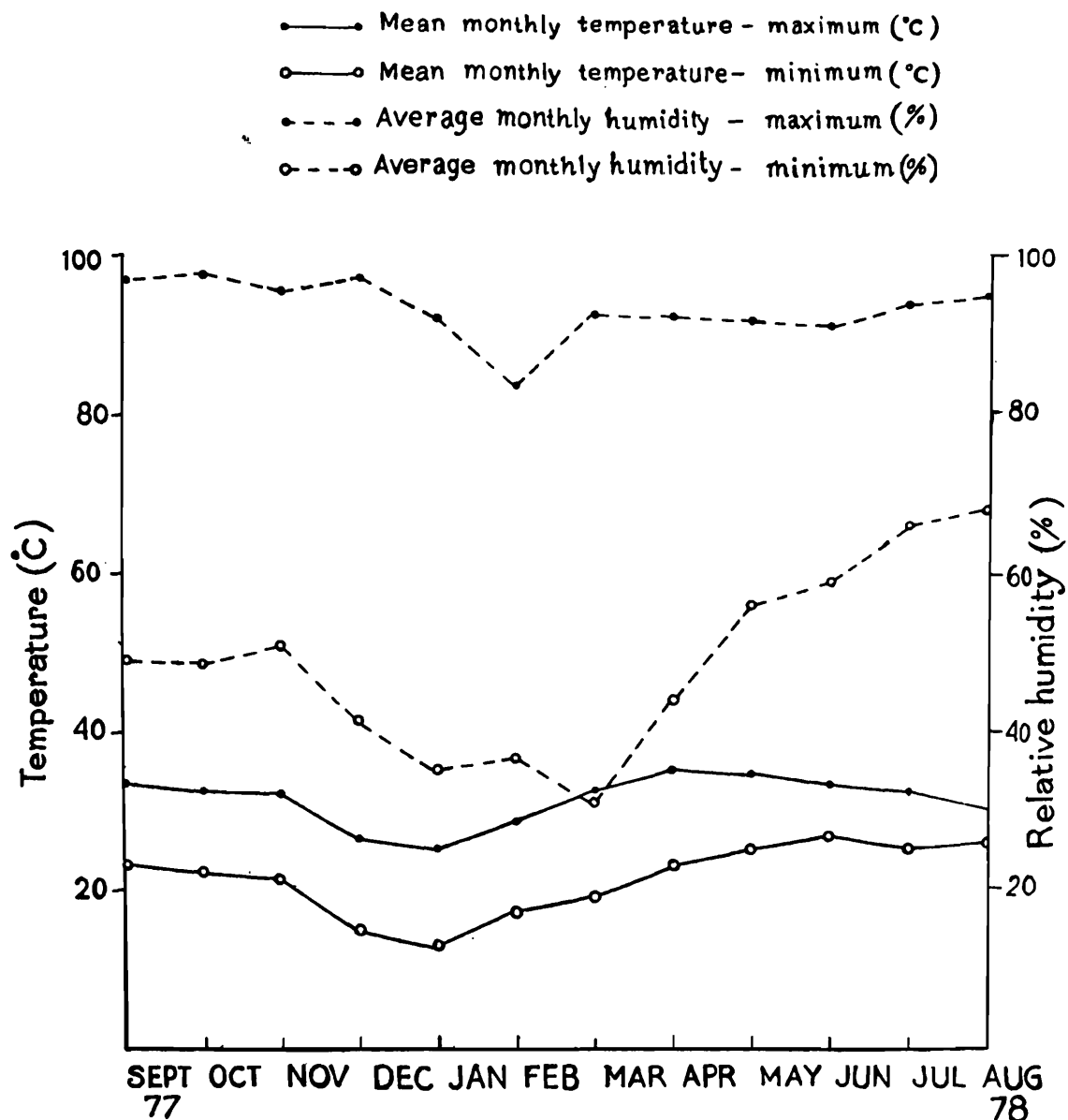


Fig. 2. Changes in temperature (maximum and minimum) and humidity (maximum and minimum) from September 1977 to August 1978.

FOOD PREFERENCES OF THE LARVAE

To know the food preferences of the larvae 2 species of Muscidae, 1 species each of Calliphoridae, Sarcophagidae and Phoridae were reared in more than one medium. It was observed that there are differences in the duration of the various developmental stages and that the favourable media help to develop more population in comparatively short duration.

Chrysomyia megacephala (Calliphoridae),

Sarcophaga ruficornis (Sarcophagidae) and *Megaselia scalaris* (Phoridae) were reared in meat and fish. It was seen that in meat they complete the life cycle faster than in fish (Table 3).

Musca domestica vicina and *M. domestica nebulosa* (Muscidae) were bred in fish, meat, and mixed bread, banana and sugar media. They completed the developmental stages faster in meat (Table 3).

TABLE 3. Duration of the various developmental stages of 5 species of flies in different food media

Family	Species	Media	Egg stage (in hours)	Larval stage (in days)	Pupal stage (in days)	Total time required (in days)
Muscidae	<i>Musca (Musca)</i>	Meat	8-9	3.5	4	7.3-9.3
	<i>domestica vicina</i> Macquart	Fish	8-10	4	4	8.3-8.4
		Bread, banana and sugar	10-12	4	5	9.4- 9.5
	„	<i>Musca (Musca)</i>	Meat	8-9	4	4
Sarcophagidae	<i>Sarcophaga ruficornis</i> (F.)	Fish	8-10	4	5	9.3-9.4
		Bread, banana and sugar	10-11	5	5	10.4-10.5
	<i>Chrysomyia megacephala</i> (F.)	Meat	11	7	4	11.4
Calliphoridae	<i>Chrysomyia megacephala</i> (F.)	Fish	11-12	7	5	12.4-12.6
		Meat	18-19	4	5.6	10-10.1
Phoridae	<i>Megaselia scalaris</i> (Loew)	Fish	18-20	4-5	6	10.7-11.8

SEASONAL CHANGES IN FLY POPULATION

The geographical location of an area, seasonal changes in temperature and humidity, etc. play a major role in the rate of growth and development of organisms and thus influence the abundance of animal population of that area. Graphs showing changes of temperature and humidity (Fig. 2) and rainfall (Fig. 3) are included to give an idea of the weather. Usually flies become abundant during summer. *Musca* population attain the highest in March-April, the next peak period being September. The flesh-flies, *Sarcophaga* species, reach their peak in May-June but are rare in winter. The blue-bottle flies, *Chrysomya megacephala*, attain their highest in June-July. The small

fruit-flies, *Drosophila ananassae*, are abundant in June-July but are rarely seen in winter. The *Megaselia scalaris* population attain their maximum in July-August.

FLIES AND DISEASES

Among the reared species, *Musca sorbens*, *M. domestica vicina*, *Chrysomya megacephala*, *Sarcophaga ruficornis*, *S. dux*, *S. hirtipes* and *Megaselia scalaris* play the important roll of transmission of the diseases like typhoid, paratyphoid, dysentery, cholera, amoebic, giardial and balantidial dysentery, taeniasis, ascariasis, enterobiasis, etc. because of their abundance, domestic habits, food preferences, size and hairiness.

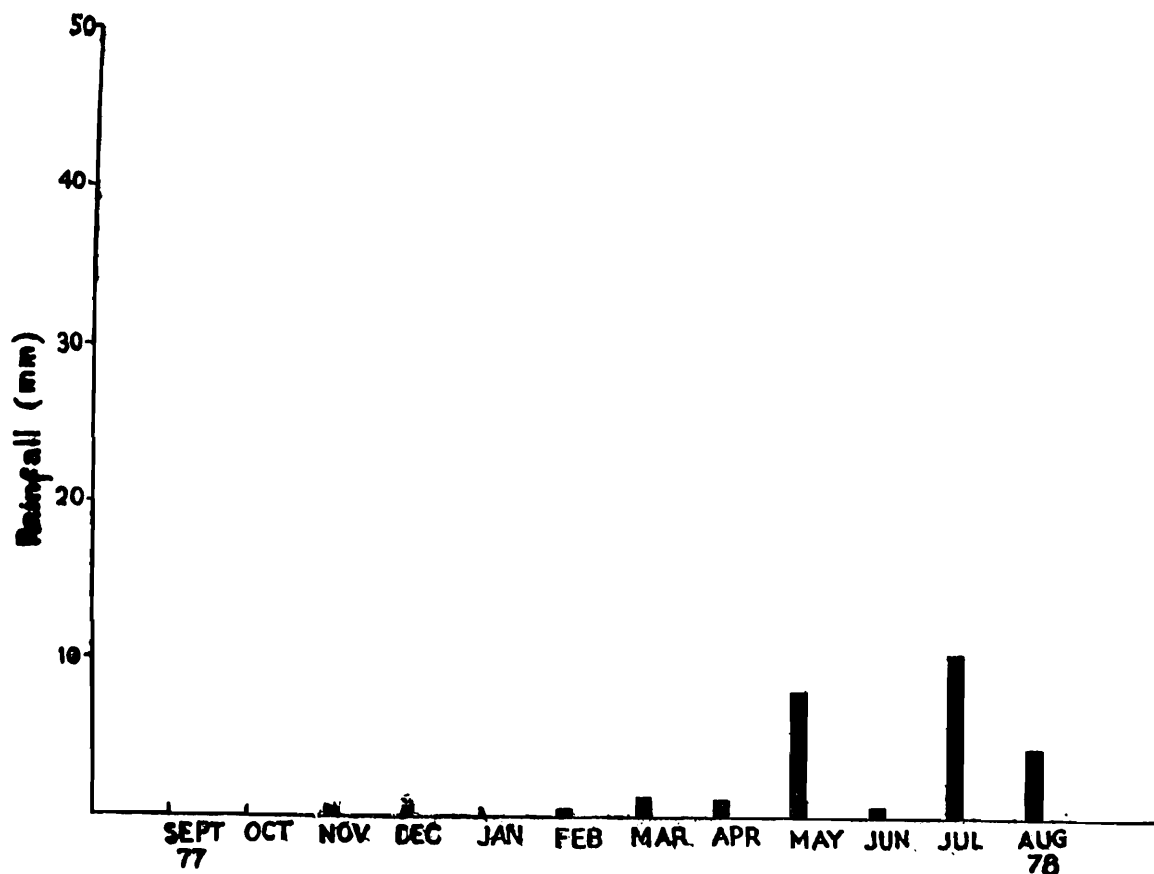


Fig. 3. Average monthly rainfall from September 1977 to August 1978.

ACKNOWLEDGEMENTS

We are indebted to the Director, Zoological Survey of India, Calcutta, for facilities of work and his keen interest in this problem.

REFERENCES

AMEEN MAHMUD-UL AND HUQ MOHAMMAD FAZUL 1973. Filth inhabiting flies of Dacca city. *J. nat. Hist.*, **7** : 633-652.

BOHART, G. E. AND GRESSITT, J. L. 1951. Filth-Inhabiting flies of Guam. *Prince P. Bishop Museum Bulletin* 204, Hawaii, vii+154 pp., 17 pls.

GILL, G. D. 1955. Filth flies of Central Alaska. *J. econ. Ent.*, **48**(6) : 648-653.

WEBB, J. E. AND GRAHAM, H. M. 1956. Observations on some filth flies in the vicinity of Fort Churchill, Manitoba, Canada 1953-54. *J. econ. Ent.*, **49**(5) : 595-600.