



Journal of
Entomology

ISSN 1812-5670



Academic
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Blowfly and Flesh Fly (Diptera: Cyclorrhpha) Fauna in Tehran, Iran

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Abstract: The blow fly (Calliphoridae) and flesh fly (Sarcophagidae) (Diptera: Cyclorrhpha) are flies of great ecological, medical and sanitary importance because they are decomposers of organic matter, mechanical vectors of pathogenic agents and causers of myiasis. This study was conducted to ascertain the fauna of Sarcophagidae and Calliphoridae in Tehran and suburb, over the period of three years during 1996-97 and 2000-2002, with ten monthly collections, continuously. Adult flies were netted and collected in different areas, indoors and outdoors and taken to the laboratory for identification. Twenty-two species of flies were identified. Thirteen species were medically important and four species consisting: *Calliphora vomitoria*, *Lucilia richardsi*, *Sarcophaga fertoni* and *Sarcophaga peregrina* were identified and reported for the first time in Iran.

Key words: Blowfly, flesh fly, fauna, myiasis, flies, Sarcophagidae, calliphoridae, Iran

INTRODUCTION

Flies are medically and sanitarily important because they are decomposers of organic matters, mechanical vectors of pathogenic agents and causers of myiasis (Service, 1996; Hall, 1995; Marinho *et al.*, 2006). House fly is the vector of about 65 human pathogens. Some of fly's maggots are also obligate or facultative parasite and cause myiasis in human and vertebrate animals (Service, 1996).

Myiasis has since been defined as the infestation of live vertebrate animals with dipterous larvae, which, at least for a certain period, feed on the host's dead or living tissue, liquid body substances, or ingested food (Zumpt, 1965). Most of myiasis-causing flies belong to Calliphoridae and Sarcophagidae families (James, 1947; Chan *et al.*, 2005; Marinho *et al.*, 2006). Family Sarcophagidae commonly called flesh flies, contains three subfamilies, the Miltogramminae, the Paramacronychiinae and the Sarcophaginae, containing between them 108 genera (Pape, 1996). In subfamily Sarcophaginae, the two genera of importance in myiasis are *Sarcophaga* and *Wohlfahrtia*. Calliphoridae family which commonly called blow flies is divided into three subfamilies, the Calliphorinae, the Phorminae and the Chrysomyinae, which between them contain about 23 genera. Three genera of Calliphoridae including *Lucilia*, *Chrysomya* and *Calliphora* are important myiasis-causing (Rognes, 1991). Flies in this family are often metallic in appearance. Blowflies are usually the first insect to come in contact with a dead animal (Monaghan, 2007). So far, the families of Calliphoridae and Sarcophagidae comprises about 1100 and 2000 known and described species worldwide, respectively (Larve, 2006). There are two main systems for categorizing myiasis: anatomically, in anatomically categories relation to the location of the infestation on the host and entomologically, Based on anatomical categorization, depending on invaded tissues by larvae, several types of myiasises occur, such as eye, ear, gastrointestinal, genito-urinary and dermal myiasis (Abdo *et al.*, 2006; Ogbalu *et al.*, 2006). In addition to loss of life and property which directly offend human by myiasis, it can be considered as a risk factor for prion

diseases in human, which are transmissible spongiform encephalopathies of human and animals (Lupi, 2006). Different species of insects have special behavior and biology, which distinguished them from other species. Therefore, identification and determination of flies in each region can be the first step to manage and control of this major nuisance insects. Also reports of fly species from each country may complete the distribution map of flies in the world (Monteiro and Prado, 2006; Hall, 1995). This study evaluated the fauna of medically important Calliphoridae and Sarcophagidae flies in Tehran province (capital of Iran) and has more emphasized on myiasis-causing species.

MATERIALS AND METHODS

This is a cross-sectional descriptive and taxonomic study. In this study, which was conducted in three years during 1996-97 (as a pilot study) and complementary study during 2000-2002 in Tehran and suburb, only adult flies which medically important and myiasis-causing were captured and identified. Tehran is the capital and largest city of Iran. The metropolitan city of Tehran on the slopes of the mountains of Shemiran and at the foot of the magnificent Mount Damavand is the world-famous capital of Iran and the province of Tehran (Fig. 1a). It has an altitude of 1200 m, above sea level. Tehran is a city of all four seasons with hot summers, freezing winters and brief springs and autumns (Statistical Center of Iran, 2006). To capture and collect flies, we referred to adult flies habitat, which are mostly in farms, gardens, stockbreeding, garbage and rotting debris, animal excrement, dead animal carcasses and etc in Tehran (capital of Iran) and suburb. Different 5 localities in north, south, east, west and center of Tehran and some villages were chosen in suburb (Fig. 1b).

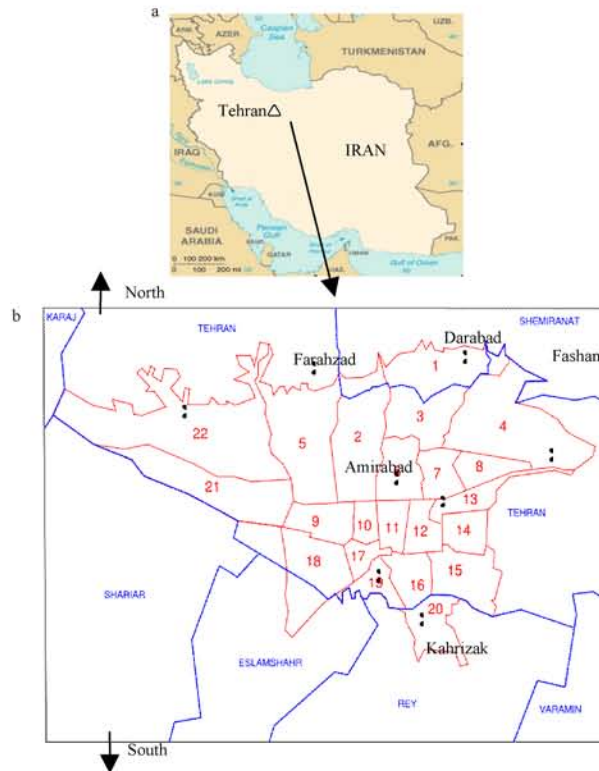


Fig.1: (a) Geographical situation of Tehran, Iran. (b) Sampling localities indicated by * in North, South, East, West and center of Tehran



Fig. 2: *Pittosporum tobira* Ait. (Genders, 1994)

Flies were mostly found on excrements, deteriorating organic materials, rubbish and also on some plants and shrubs which had aromatic flowers. According to the author's observations in Tehran north gardens, flies were mostly attracted to *Morus alba* and *Morus nigra* trees which had ripe fruits. Moreover, some of Scented plants such as *Pittosporum tobira* Ait (Pittosporaceae) shrubs are very attractive for *Cyclorhpha* flies, especially *Calliphora* (Fig. 2) (Genders, 1994). This shrub in florescence in the middle of spring is very fragrant and has white flowers. The shrub is not indigenous in Iran, but some kind of them can be found in Tehran gardens and parks.

A sweep-net was used to capture adult flies by suddenly moving it on flowers, plants, excrements and etc after observing them. Most of the Calliphoridae and Sarcophagidae were captured in June, July, September and October, coinciding with low rainfall and an average temperature of 24 to 34°C. Adult flies collected from various habitats were killed in a cyanide bottle (containing Potassium cyanide) and pinned. Five to ten minutes was enough for flies to make them lifeless. Each specimen was tagged with the information about host plants or habitat, locality and date. To protect the specimens from the insect pests, naphthalene tablets were added to collection boxes. The specimens identified in the Entomology Laboratory in department of Medical Entomology and Vector Control of TUMS (Tehran University of Medical Sciences) under stereomicroscope and identification keys and published literature (James, 1947; Emden, 1954; Zumpt, 1965; Oldroyd, 1970; McAlpine *et al.*, 1981, 1987; Smith, 1986; Lane and Crosskey, 1993). After determining sex and type of adult cases, the second label which contained type name and its sex (Hall, 1995), were added below the first one. The present study focused on blowfly and flesh fly only. Therefore all specimens except the two aforementioned groups were excluded.

To identify adult flies (Calliphoridae and Sarcophagidae) species following identification keys were used:

James (1947), Emden (1954), Zumpt (1965), Oldroyd (1970), McAlpine *et al.* (1981, 1987), Smith (1986) and Lane and Crosskey (1993).

RESULTS AND DISCUSSION

In this study, 856 flies in total were captured and identified. 643 belonged to the family Calliphoridae and 213 were from Sarcophagidae.

Six genera and 13 species of these two families which are medically important were identified. From these 6 genera, 848 adult flies included 13 species of myiasis-causing were identified, four species of them included *Sarcophaga fertoni*, *Sarcophaga peregrina*, *Calliphora vomitoria* and *Lucilia richardsi* are reported in Iran as a first time (Table 1). Eight samples from *Protocalliphora*, *Calliphora* and *Sarcophaga* genera were identified, but we can not identify them at the species level.

Table 1: Systematic categorization of the captured species from Calliphoridae and Sarcophagidae family (The species indicated by * are reported for the first time from Iran)

Family	Subfamily	Genus	Species
Calliphoridae	Calliphorinae	<i>Calliphora</i>	<i>Calliphora vicina</i> <i>Calliphora vomitoria</i> *
		<i>Lucilia</i>	<i>Lucilia caesar</i> <i>Lucilia richardsi</i> * <i>Lucilia sericata</i>
	Chrysominae	<i>Chrysomya</i>	<i>Chrysomya abieiceps</i>
	Phorminae	<i>Protocalliphora</i>	<i>Protocalliphora azure</i>
	Sarcophagidae	Sarcophaginae	<i>Sarcophaga</i>
<i>Wohlfahrtia</i>			<i>Wohlfahrtia magnifica</i>

Illustration of New Reports in Iran

Calliphora vomitoria (Linnaeus, 1758)

This species has reported from all geographic region of the world (James, 1947), but it has not reported from Iran and its neighbors yet.

During the study, at first, one of these species was captured in Darabad (a district in North of Tehran) (Fig. 1) with more precision, more cases were captured and finally 8 cases (6 male and 2 female) were collected. It was noticeable that this species is morphologically and biologically like *Calliphora vicina* and appear at the beginning of spring. Then they become more abundant with rising temperature until summer-especially July and August that they become less abundant in human habitat regions. At this study we observed that in warm months (July and August), these flies take refuge under bushes, grasses and creeping trees stems beside rivers to get rid of hot weather and rest there. However, for better perception of *Calliphora vomitoria* ecology, more precise studies should be done. There are some reports on attraction and oviposition of this fly on human wound in Europe. Their larva cause deep holes around the wounds (James, 1947).

Systematic Characteristics

The color of frontal spiral foramen is black or brown (light yellow in *Calliphora vicina*). Basicosta's color is dark, gena is hairy and black or dark gray (Fig. 3), the inferior part of the head has orange-godly hairs. Body length is 10-14 mm. Pab = 3.

Lucilia richardsi (Collin-Richards, 1926)

In this study, 21 species (8 females, 13 males) were collected from farms, gardens and trashes in Darabad and Farahzad districts (North of Tehran) (Fig. 1). Since this species is very similar to *Lucilia sericata*, it is difficult to distinguish between them and most of the time; this case was wrongly identified as *Lucilia sericata*. The only reliable characteristics are 2-3 large antrodorsal hairs on tibia of *Lucilia richardsi* mid leg, but *Lucilia sericata* just has one (Fig. 4). In *Lucilia richardsi*, the abdomen on the back side does not have the middle dark line and was not longitudinally divided either. The eyes distance in males is approximately equal to the third segment of antenna. In females the third segments of antenna is equal to forehead width (Lane and Crosskey, 1993).

Sarcophaga fertoni (Villeneuve, 1911)

This species distributed in Palaearctic region and was reported with myiasis wounds (James, 1947). During this study, 16 species (10 females and 6 males) of *Sarcophaga fertoni* species were collected from Farahzad, Kahrizak and Fasham, respectively north, south and northeast of Tehran (Fig. 1) and they were introduced as new species of Iran fauna insects.



Fig. 3: *Calliphora vomitoria* (Original)



Fig. 4: *Lucilia richardsi* (left) (original). Two large antrodorsal hairs on tibia of *L. richardsi* mid leg (right)



Fig. 5: *Sarcophaga fertoni* (original)

Systematic Characteristics

The Postsutural dorsocentral part has 3 bristles which are not grown. Frontal bristles are spread to antenna stem and branched to ocellus (Fig. 5). The body length is 7-11 mm.

Sarcophaga peregrina (Robineau-Desvoidy, 1830)

This species is widely distributed in oriental regions, Australia, Palaearctic east and Hawaii Island. During last summer, 6 cases (4 females, 2 males) were captured in Farahzad and Amirabad (a locality in center of Tehran) (Fig. 1). The females frequently oviposition their eggs on different decaying organic materials such as human excrement (Zumpt, 1965). Moreover, three myiasis wounds caused by this fly have been reported from India (Singh *et al.*, 1993).



Fig. 6: *Sarcophaga peregrina* (Original)

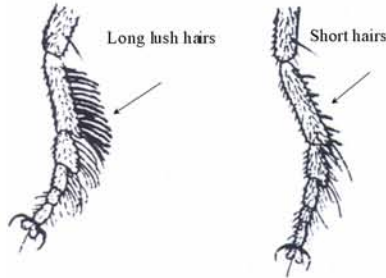


Fig. 7: The tibia of hind leg in *Sarcophaga peregrina* (right) and in other *Sarcophaga* (left) (original)

Systematic Characteristics

The postsutural dorsocentral part has 3 bristles (it is probable that frontal hairs do not grow completely). The tibia of hind leg does not have long lush hairs and mostly has short hairs. With this characteristic, *Sarcophaga peregrina* is distinguishable from other species of *Sarcophaga* such as *S. carnaria*, *S. crassipalpis* and *S. haemorrhoidalis* (Fig. 6, 7).

Frontal bristles below antenna branches out to eyes and genital segment color is red. The body length is 10-14 mm.

Fauna of myiasis- causing flies and their distribution in different regions of Iran are not specified completely. In previous studies, officially 9 species of Calliphoridae family have been reported from Iran, which 4 species of them are from Chrysomya including *Ch. regalis*, *Ch. bezziana*, *Ch. megacephala* and ? *Ch. albiceps* (Nateghpoor and Yaghoobi, 1987) and three species from *Lucilia* containing *L. cuprina*, *L. cericata* and *L. caesar* (Parchami Iraqi, 1994; Yaghoobi *et al.*, 2005; Ghasemi, 1989). *Calliphora vicina* and *Protocalliphora azurea* are two other species of the Calliphoridae family that have been reported in previous study. In this study we reported *Lucilia richardsi* and *Calliphora vomitoria* for the first time in Iran, which can be added to the species list. Therefore number of Calliphoridae species reported until now from Iran increased to 11.

In past studies only five species of Sarcophagidae flies including *S. carnaria*, *S. crassipalpis*, *S. haemorrhoidalis*, *Wohlfahrtia magnifica* and *W. nuba* were reported from Iran (James, 1947; Ghasemi, 1989). In the present study, two new species of this family containing *S. fertoni* and *S. peregrina* captured in Tehran, are reported for the first time in Iran. Therefore with this report total number of Sarcophagidae flies from Iran is now seven species.

ACKNOWLEDGMENTS

The authors would like to thank Professor S. Tirgari (Tehran University of Medical Sciences, Iran) for his kind cooperation in flies' identification and confirmation. We would like to thank Mr. H. Malekan for identifying herbal species. Also we would like to thank the referees for their constructive comments.

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