Seasonal Abundance of Adult Fly Species on the Exposed Carcasses in Baghdad City

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Abstract

Adult of dipterous flies were collected monthly from exposed animals carcasses during the period from February 2006 to January 2007 in Baghdad city. The results obtained showed that flies could be collected all over the year with variation of their population density in different seasons. The majority of the collected species were abundant during Spring and late Autumn (at lowest numbers) . In this investigation, nineteen species confined to four families were collected; these families are: Calliphoridae, Muscidae, Sarcophagidae and Fanniidae.

The species *Musca domestica* Linn .was the most abundant followed by *Chrysomya megacephala* (Fabricius) , while *Pollenia* sp . and *Fannia* sp . were the least abundant species.

Introduction

The dipterous flies can be distinguished from most other insects by the possession of only one pair of functional wings; immediately behind the wings arises a pair of club – shaped organs called halters which are derived from the posterior pair of wings [1] .The most important feature of the wings , for purpose of identification and classification ,is the wing – venation . This is quite astonishingly constant within one species , and often genera , tribes and families can be recognized immediately by some apparently insignificant detail [2] .

In suborder Cyclorrhapha , the antennae are composed of three segments an aristae or style carried dorsally on the last segment ; palpi with a single segment ; this group is large , consisting mainly of the insects normally called (flies) , many are closely similar to one another and their classification [2] .

The flies of the series schizophora are remarkable for the possession of an eversible sac or ptilinum, which protrudes from their heads and with which they push open the puparium and work their way through the soil beneath which they may have pupated [3] , the families Muscidae , Fanniidae , Calliphoridae and Sarcophagidae for examlie of this series above .

The families Muscidae , Fanniidae of older authors , may be defined as Calyptrate Diptera which lack a row of strong setae on the hypopleuron [1] . Adult of these families may be recognized by the 6^{th} (anal) vein (A1) , this vein is short , and does reach wing – margin in both families . Adult Fanniidae can be recognized by the extremely short 6^{th} (anal) vein , which does not extend half the distance from its base to the wing – margin , and by the curvature of the 7^{th} vein , an imaginary extension of which would intersect an imaginary extension of the 6^{th} vein well before the wing – margin ; and by the presence of a true dorsal sub median seta on hind tibia , which the adult of Muscidae recognized it , hind tibia without a strong median true dorsal seta , vein (A1) is longer than (A1) in Fanniidae , if extended does not meet an imaginary extension of vein (A2) before wing – margin [4] .

The Calliphoridae and Sarcophagidae are the well – known blue bottles and green bottles flies , also known as blow flies , and the grey flesh flies [5] , although bearing a superficial resemblance to flies of other families (e . g . Muscidae) the Calliphoridae are distinguished by having well – developed thoracic squamae and a row of bristles on the hypopleuron . In

Sarcophagidae (flesh flies), the adult large grayish – black chequered abdomen and black – striped thorax, a few species are brownish – yellow in colour but the thoracic stripes are always present [1, 2,3] .

The adult flies are attracted to carrion and faces at which they normally breed, and occur throughout the world and mostly breed in decaying animal matter [6].

Flies succession on carrion decomposition are influenced by many factors, most important of them are temperature, humidity, rain fall [7]. Many studies had been all the four seasons and attempted to describe the succession of insect on carrion exposed such as; [8 ,9 ,10] .

Flies have been implicated in the direct and indirect mechanical transmission of a number of pathogens responsible for human disease, especially those causing diarrheal illness; the common factor in the ecology of several species of flies is their utilization of decomposing organic materials as food sources for the adults and as developmental media for their larvae. Considering that these materials are often carrion, feces and food wastes (all with associated pathogens) [11], furthermore there are many species of flies can lay their eggs in an open wound on man and animals causing Myiasis disease [5] .

The aim of this study is to identify the fly species which are associated with exposed animal carcasses in Baghdad city.

Materials and Methods

The study was carried out in the garden of Iraqi Natural History Museum. A survey of adult flies was undertaken during the period from February 2006 to January 2007 on decomposed carcasses of rabbits and fishes decomposition.

The Rabbit were killed by strangulation using chloroform, and then placed with fishes in a metal cage according to the method of Denno and Cothran [12]. The cage was located in an open area and was exposed to direct sunlight and replicated monthly.

Collection and sampling were performed randomly among the carcasses. Flies were captured by aerial net, and then killed by freezing and mounted on entomological pins. The specimens were observed under dissecting microscope and identified to family and species using numerous keys [2, 3, 4, 13, 14, 15, 16]

Results

Adult of dipterous flies collected from the garden of Iraqi Natural History Museum, Baghdad city; using exposed carcasses (fishes and rabbits) during the period (from February 2006 to January 2007) of investigation were located in four families. Their seasonal abundance and the relative annual abundance were given in Table (1 ,2) and Table (3) showed the temperature and relative humidity which were recorded in Baghdad city during this period .

(1) Family: Calliphoridae: Five species were collected.

Calliphora vicina Rob – Desvoidy; it started with a high population during February. Its natural population then decreased during next months. In Jun, July, August, September, October and December, no flies were collected. During November the insect reappeared with a lowest numbers. Results showed that species appeared to one peak during Spring.

Chrysomya albiceps (Wiedemann): This species was abundant throughout the year, its population started with a lowest level in February, while it had a highest number in April. The abundance of this species was fluctuated in other months; no flies were collected during January. The population showed one peak during Spring.

Chrysomya megacephala (Fabricius) : This species was found all the year round , its highest population was reached during April and lowest during February and March , also ; September ,

October , December and January , while the flies reappear with a highest numbers in November . This species appeared to have two peaks; the first during Spring and the second during Autumn.

Lucilia sericata (Meigen): The population of this species was fluctuated during this period; it was highest during Spring, no flies were collected during July to January.

Pollenia sp.: This species was scare during this investigation; this species was recorded during February only, but in lowest number.

The results Table (2) showed that the relative annual abundance of these species; in family of Calliphoridae was 15.34, 33.93, 39.2, 11.45 and 0.08 % respectively. Accordingly, *Ch. megacephala* was the most abundant in this family, followed by *Ch albiceps* , *C . vicina* , *L sericata* and finally *Pollenia sp* .

(II) Family: Muscidae: There were five collected species.

Musca domestica Linn. : This species was the most abundant throughout the year except December. A high peak occurred during Spring reaching its maximum in April. The population then decreased gradually reaching the lowest level in January.

Musca sorbens Wied. : The population of this species was scare in this period, its seasonal abundance showed a high peak during Spring and late Summer. No flies were collected during March, May, Jun, July, September, October, December and January.

Musca biseta Hough: This species was recorded during August only, but in lowest numbers.

Musca sp.: Its population started with lowest numbers during February, it increased during Spring and reached its highest peak in April. One other peak occurred in November. No flies, however, were collected during June to October; also in December and January.

Muscina stabulans (Fallen): Flies were abundant during late Winter and Spring . The highest peak was reached in April. No fly was recorded in Summer, early Autumn and early Winter. These results showed that species in lowest numbers during November and January.

The relative annual abundance of the above mentioned species was 84.46, 2.73, 0.21, 6.4 and 6.2 % respectively. Accordingly, *M . domestica* comes first, followed by *Musca* sp . , *Muscina stabulans, Musca sorbens,* and finally *Musca biseta* .

(III) Family: Fanniidae: There were two species collected in this investigation.

Fannia canicularis (Linn.): The population of this species started with a high level in February forming its first peak. No flies could be collected for the next months from April to December.

Fannia sp.: This species was scare during the investigating period; it's recorded in lowest number in March only.

The relative annual abundance of these species was 97.3 and 2.7 %. Accordingly, *F. canicularis* was much more abundant than *Fannia* sp.

(IV) Family Sarcophagidae : Seven species were collected during the investigating period .

Sarcophaga africa (Wiedemann) : This was the most abundant species in this family ; flies were abundant during Spring , Summer , late Autumn and early Winter . The highest level occurred during Summer, especially in July.

Sarcophaga melanura Meig . : This was the least abundant of Sarcophagid species. Only two individuals were collected during March.

Sarcophaga sp.1 : This species was collected during March and June only; the highest number was in June.

Sarcophaga sp.2: No flies could be collected during February, its population started with high numbers during Spring.

The highest peak was reached in March. No flies collected from July till January.

Sarcophaga carnaria (Linn.): This species has a similar abundance of *S. melanura,* but it was collected during April only.

Sarcophaga argyrostoma (Rob – Desvoidy): Flies were collected during late Spring and late Autumn with highest number in reached April, There were no flies collected during other months.

Ravinia pernix (Harr .) : Flies were abundant during Spring ; the highest peak was reached in April . No flies could be collected during other months.

The relative annual abundance of these species was 60.23, 2.27, 5.68, 10.23, 2.27, 6.82 and 12.5 % respectively. Accordingly *S. africa* comes first; it was much more abundant than other species of this family; followed by *R. pernix*; *Sarcophaga* sp.2, *Sarcophaga argyrostoma, Sarcophaga* sp1 and lastly *S. melanura , S . carnaria* at similar appearance.

Discussion

A summary of the relative annual abundance of the collected species of adult dipterous flies from one locality in Baghdad city is given in Table (2), seasonal activity of flies species were fluctuating depending on season and environmental condition, temperature is most important factor affecting the growth and development of insects [17].

The adults of five families of diptera collected from the carcasses. Adults in the families Calliphoridae and Muscidae were the initial colonizers of the carcasses and then arriving adults in the family Sarcophagidae ; the species of Calliphoridae reported from carrion ; *Ch . albiceps , Ch . megacephala* and *Lucilia* sp . [18] ; the abundance of other group of flies in Diptera; it responds to the environmental conditions and that weather exerts a very powerful influence on their activities such as feeding and emerging [19]. Field observations supported by the data recorded in the present study, show that most, if not all, species of the collected Dipterous flies are more abundant during the moderate temperatures of Spring and Autumn seasons than during cold Winter and hot Summer seasons.

Most flies were highly abundant and reached their highest activity during the period from February to May except three species; *Ch. albiceps , Ch . megacephala* and *M . domestica* which present all the year for the first and the second species and occurred in eleven months for the third species; but their populations fluctuated during the season of the year influenced by temperature and relative humidity. It was rapid invasion of carcasses by adults Diptera (especially Calliphoridae and Sarcophagidae) , in Calliphorids ; they were collected *C . vicina , L . sericata* and *Ch . albiceps* , also assured that *L . sericata* was able to breed successfully in carrion in rain fall , Winter and Spring ; in Summer , it was surprising to find adult of this species in abundance on carrion from first day after the dead of the animals [10].

The flies associated with pig carrion and human corpses, these species; *Ch. albiceps, Ch. megacephala* and *Lucilia* sp. [18] , *Ch . albiceps* which is usually associated with warm weather was found as well [20] , also find that *Ch. albiceps* is by far the most abundant species of Diptera found in Autumn, while in Winter its presence is extremely rare [21] , this result in an agreement with the present study .On the other hand, *Ch. albiceps* is common in Summer , although in lower numbers than in Autumn ; this species is considered to be the principal taxon present of the primary diptera ; which suggests colonization of the carcass at the end of Summer or beginning of in Autumn , since this when *Ch . albiceps* is the most abundant species [21].

Adult specimens of, *Ch. megacephala,* was present on a man corpse when the temperature was 27 C^o max & 15 C^o minimum [22],while the temperature of 25 C^o and 70 % r.h. were best condition for adult flies survival and produced higher adult population , least adult production was at 37 C^o and 70 % r.h. [23] .

C. vicina occurs in winter in the subtropics and in Spring when rain fall occurs in the temperate zone [24]: on the other hand, *C . vicina* was well represented in carrion in Winter only [10].

The *C. vicina* was identified on meat exposed, and assured that oviposition of this species occurring in late April (28C° max, 13 C° min. and r.h. max. 91% & 31 % min.) [25], whereas that *C . vicina* occurred only on the unsheltered carcass in Winter (the most common species at this time of the year) [20] .

On the other hand, *C . vicina* was found the most dominant species in the coldest months [26], also this result is in an agreement with the present investigation .

The species of *Pollenia* sp. was rare in this study; this species was reported in Diyala Governorate [14].

In Muscidae ; the muscid adults found early arrival such as *M . domestica , Musca* sp . [18].

The flies of this family were found on Rabbit carrion exposed carcass; *Muscina stabulans , M . domestica , M . sorbens* ; and assured that *Muscina stabulans* was the dominant fly breeding in Winter [10] . On the other hand Fanniidae species were collected in small numbers in this study; it was represented by *F . cancularis* and *Fannia* sp . In the cold seasons; it was recorded in Winter and early Spring as assured by Tantawi et al [10].

S.argyrostoma bred successfully in carrion only in rain fall [10] ; while the other studies mentioned that the flesh flies are primary invaders of carrion in warmer temperate and tropical region [27 , 28] , whereas they are secondary species in cooler regions [29] .

S . Africa was identified on meat exposed and assured that larvipositing of this species occurring in late May as a dominant species [25], and the primary role of Sarcophagidae in carrion colonization [30], while the adult of *S. argyrostoma* was dominant fly in rain fall [10] .

Sarcophaga species cannot survive in a cold temperature climate [31], as referenced to Ward's Manual [32] ; the development rates of *Sarcophaga* species were temperature and light dependent , cooler temperatures and less light exposure will slow down the growth of development ; and the optimal temperature of development arrest is at 4 C° . In addition, the optimal culturing conditions were 25 C° and 24h. light exposure.

Generally from this investigation we can conclude that the numbers of species which were collected on exposed carcasses in lowest number during Summer as compared with other season; May cause that stages of decomposition were very quick in Summer or hot months [20].

Finally, the Calliphoridae species were the most abundant, followed by Muscidae , Sarcophagidae and finally Fanniidae species .

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Table (1):Seasonal abundance of fly adults in Baghdad governorate during the period from February 2006 to January 2007

	Number of flies in monthly collection Dipterous flies											
	Feb.2006ar.	Apr.	May	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan. 007		
Fam.:Calliphoridae												
Calliphora vicina	87	76	18	1	-	-	-	-	-	2	-	5
Chrysomya albiceps	2	31	264	23	20	5	20	4	14	34	1	-
Ch. megacephala	2	3	391	19	15	10	21	4	4	112	1	1
Lucilia sericata	4	92	39	5	1	-	-	-	-	-	-	-
Pollenia sp.	1	-	-	-	-	-	-	-	-	-	-	-
Fam.:Muscidae	2	64	386	75	44	40	39	36	82	35	-	1
Musca domestica	1	-	16	-	-	-	7	-	-	2	-	-
M.sorbens	-	-	-	-	-	-	2	-	-	-	-	-
M.biseta	2	12	35	4	-	-	-	-	-	8		
Musca sp.	6	22	27	2	-	-	-	-	-	1	-	1
Muscina stabulans	18	17	-	-	-	-	-	-	-	-	-	1
	-	1	-	-	-	-	-	-	-	-	-	-
Fam.:Fanniidae												
Fannia canicularis	-	-	-									
Fannia sp.	-	6	8	4	10	15	5	-	-	4	1	-
	-	2	-	-	-	-	-	-	-	-	-	-
	-	2	-	-	3	-	-	-	-	-	-	-
Fam.sarcophagidae	-	4	2	2	1	-	-	-	-	-	-	-
Sarcophaga africa	-	-	2	-	-	-	-	-	-	-	-	-
S. melanura	-	-	3	1	-	-	-	-	-	2	-	-
Sarcophaga.sp.1	-	1	9	1	-	-	-	-	-	-	-	-
Sarcophaga.sp.2												
S. carnaria												
S.argyrostoma												
Ravivia pernix												

Table (2):The relative annual abundance of the collected species of the fly adults on exposed carcass in Baghdad city during the period of investigation

Dipterous flies	Annual abundance%
Family : calliphoridae	
Calliphora vicina	15. 34
Chrysomya albiceps	33. 93
Ch. megacephala	39. 20
Lucilia serieata	11.45
Pollenia Sp.	0. 08
Family: Muscidae	
Musca domestica	84.46
M. sorbens	2.73
M. biseta	0.21
Musca sp.	6.4
Muscina stabulans	6. 20
Family : Fanniidae	
Fannia canicularis	97.30
Fannia sp.	2.70
Family: Sarcophagidae	
Sarcophaga africa	60.23
S. melanura	2.27
*Sarcophaga.sp.*1	5.68
*Sarcophaga.sp.*2	10.23
S.Carnaria	2.27
S. argyrostoma	6.82
Ravinia pernix	12.5

Table(3): The tempe ratuec and relative humidity through the study months

(According to Iraqi meteorological office)

Months	Feb-2006	March 2006	Apr-2006	May 2006	Jun 2006	Jul-2006	Aug-2006	Sep-2006	Oct-2006	Nov-2006	Dec-2006	Jan-2007
Min ċ	8.7	11.5	17.0	22.5	25.5	27.0	26.5	20.9	18.5	8.1	3.1	3.0
Max ċ	19.6	26.6	30.3	38.2	44.2	45.3	42.7	40.0	34.0	22.7	15.7	14.0
R.H%	63	43	49	33	20	22	23	28	43	49	62	67

مجلة ابن الهيثم للعلوم الصرفة والتطبيقية المجلد22 (4) 2009

التواجد الموسمي لانواع الذباب (الدور الكامل) على الجثث المكشوفة في مدينة بغداد

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الخلاصة

جمعت كاملات ذباب ثنائية الأجنحة للمدة (شباط 2006 – كانون الثاني 2007) في مدينة بغداد، أوضحت النتائج إنه بالإمكان جمع كاملات الذباب على مدار السنة لكن بكثافة متفاوتة لكل نوع . سجلت الدراسة أعداد كبيرة من الذباب خلال فصل الربيع ونهاية الخريف .

سجلت الدراسة تسعة عشر نوعاً تعود إلى أربعة عوائل هي : Calliphoridae، Muscidae، Sarcophagidae و Fannidae . النوع *Musca domestica* Linn . كان الأكثر وفرة تلاه النوع *Chrysomya megacephala* (Fab.) اعتماداً على أعداد وظهور تلك الأنواع خلال مدة الدراسة أعلاه ، بينما كانت الأنواع *Pollenia* sp . و *Fannia* sp . هي أقل وفرة من بين الأنواع التي سجلت .