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SEASONAL ABUNDANCE OF THIRD INSTAR LARVAE OF FLIES (ORDER: DIPTERA) ON THE EXPOSED CARCASSES

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ABSTRACT

The study aims to identify the third instar larvae of fly species (Order : Diptera) feeding on carcasses (Fishes and Rabbits).

Two families (Calliphoridae and Sarcophagidae), were recorded with highest rate in Calliphoridae species. The following species had been registered in accordance with their prevalence respectively; *Calliphora vicina* Rob.-Desvoidy, *Chrysomya albiceps* (Wiedmann), *Chrysomy megacephala* (Fabricius), *Sarcophaga* sp. and *Lucilia sericata* (Meigen). The highest rate has been registered *Calliphora vicina* during February, November, December and January at rate 100%, the larvae of this fly have not been observed during July, August, September and October.

The highest rate of *Chrysomya albiceps* during October, whereas it didn't appear during February, March, July, November, December and January.

As for the appearance of *Ch.megacephala*, was highest registered during July, but there was no incidence of its appearance during February, March, April, November, December and January.

Sarcophaga sp. had been registered at high rate in summer, the highest rate in August, but there was no observation during cold month.

Third instar larvae of *Lucilia sericata* were registered in lowest rate compared with other species, was highest rate in March, whereas have not been registered during February, May, July, August, September, October, November, December and January.

This study was concluded the total number of the larvae of these species collected on carcasses was less in Months of Summer compared than other Months.

INTRODUCTION

Dipterous larvae are soft-bodied, generally with no clear distinction between thorax and abdomen often the mouthparts, with two pairs of spiracles (anterior and posterior). These are the only, practical means of identifying larvae, especially among the smooth maggots of the cyclorrhapha (Zumpt, 1965).

There are three larval instars in this group of Diptera, but the third one much longest; therefore it is the most useful tools for identification. The body is consist of eleven apparent segments, the integument is not sclerotized and appears as a white, tough and wrinkled skin, with some areas of small spines that give a roughened appearance, the spines are not always black and, if colourless, are difficult to see (Smith, 1973). Sometimes the form of the spiracles are the most useful single character for identifying maggots, in the mature larva (third instar) the hind spiracles normally has three slit-like openings, which are most commonly straight, or nearly so (Zumpt, 1965; FAO, 1991).

The larvae of flies should be regarded as being biologically independent of the a adults, if the fly lived two completely different lives, with different structures, physiology, senses and different powers of movement, all flies live in an environment totally different from that of their larvae (Smith, 1973).

Carrion, dead or decaying flesh, serves as a breeding and feeding habitat for carrion-feeding insect species; therefore, when an organism dies, it remains form an important habitat (John, 1975). Examples of carrion feeding insects are flies, the most common fly species is the blowfly (Putman, 1977). In addition to the blow fly, flesh flies (*Sarcophaga* sp.) also feed on carrion, and lay live larvae on decaying matter (Roback, 1956), and are found worldwide in various environments. Studies on carrion-breeding Diptera (Order of fly species) showed that species specialize along niche dimensions of season, carcass size, or state of decomposition (Kneidel, 1984).

In calliphoridae; the species: *Lucilia sericata* (Meig.), *Calliphora vicina* Rob.-Desvoidy , *Chrysomya albiceps* (Wied.) and *Pollenia* sp. (Derwesh, 1965), in addition to, *Ch. megacephala* (Fab.) (Spradbery, 1991). Mawlood (2001) studied of this family in Iraq.

Following sarcophgid species was recorded in Iraq by Khalaf (1957): *Sarcophaga argyrostoma* Rob.-Desv., *S. haemorrhoidalis* (= *S. africa*) Fall., *S. carnaria* Linn., *S. hirtipes* Wied. and *S. melanura* Meig.

As a result to the medical and veterinary importance of larvae, a seasonal prevalence on exposed carcasses in Baghdad city has been studied.

MATERIALS AND METHODS

A survey of larvae was undertaken during the period from February 2006 to January 2007. Seasonal field studies on rabbits and fishes carrion decomposition. Its associated diptera larvae fauna were conducted in the botanical garden of the Iraq Natural History Museum, University of Baghdad, Bab Al – Muadham. The rabbits were killed by strangulation (by Chloroform) to avoid external bleeding and to maintain their bodies intact. The carcasses (Rabbits and Fishes) were placed in the cage according to Denno & Cothran (1976) with some modification and exposed to direct sunlight.

Collection and sampling were performed randomly among the carcasses, according to Greenberg (1990), postfeeding larvae of sarcosaprophagous flies normally wander considerable distances from carcasses or burrow in the soil beneath carcasses, the larvae (third instar) were collected with forceps.

A portion of the collected larvae were killed by dropping them into warm water (40-50 C°) to avoid shrinking them by alcohol. (Smith, 1986). The remaining specimens were reared to obtain the adults for sure species identification.

Portion one of larvae cleared in 10% KOH for 10-15 minutes and stored in glycerin during identification for detailed study of cephalopharyngeal skeletons, spine bands and types, anterior and posterior spiracles (Greenberg and Szyska, 1984). Many keys to identify larvae such as: (Roback, 1951; Zumpt, 1965; Smith, 1973; Wells *et al.*, 1996; Mawlood, 2001).

RESULTS AND DISCUSSION

Two families of Diptera with larvae fed on carcasses (Calliphoridae and Sarcophagidae) were collected during this study. Among Calliphoridae : *Calliphora vicina* Robineau-Desvoidy, *Lucilia sericata* (Meigen), *Chrysomya megacephala* (Fabricius) and *Chrysomya albiceps* (Wiedemann), prevalence rates of them are: 45.52, 1.2, 18.47 and 23.28% respectively. Table (1), whereas in family Sarcophagidae, was 11.6% for *Sarcophaga* sp.

The results showed that Calliphorid species have highest rates compared with species of Sarcophagidae. In accordance with present results Leccese (2004) mentioned mentioned that insect that first colonize a dead body usually belong to the order Diptera and in particular to the families Calliphoridae and Sarcophagidae. Tantawi *et al.* (1996) found the third instar larvae of *Ch. albiceps, L. sericata* and *C. vicina* and also *Sarcophaga* sp. (Such as *S. argyrostoma*) but in lowest rate on exposed rabbit carrion. These results were in agreement with results in our study. Wolff *et al.* (2004) collected third instar larvae of *Ch. albiceps* and

Muscid species on rabbit carcass too, also Arnaldos *et al.* (2004) registered of *Sarcophaga africa* and *C. vicina*.

Table (1) Show that Calliphorid species were appeared in highest rate compared Sarcophagidae species, and this may be due to that, the ovoviviparous Sarcophagid females have much less fecundity than the oviparous Calliphorid female (Hanski, 1987 a). Unlike Calliphorid females, Sarcophagid females do not deposit all their larvae in one carcass but spread them evenly over many carcass as they fly between bouts of larviposition (Hanski, 1987 b), although the early use of carrion by Sarcophagid larvae. However, cannot be explained by an early adult arrival at the carcass, Sarcophagidae arrive shortly after the Calliphoridae species, but can exploit the resource immediately because they are ovoviviparous (Denno and Cothern, 1975).

Figure (1) showed the monthly appearance of third instar larvae of species were recorded during the course of time study. The minimum and maximum temperatures and relative humidity. The results find direct correlation between the appearance of flies with temperature and relative humidity. Amendt *et al.* (1999) stated the ambient temperature is one of the main factors influencing the developmental rate of necrophagous insects.

The results showed that *C. vicina had* the highest rate (100%) in February, November, December and January, the lowest rate (1.69) in May, whereas it was (91, 50, 36%) in March, April and June respectively, no larvae of this species were observed in July, August, September and October.

Greenberg and Povolny (1971) stated that *C. vicina* occurs in Winter in the subtropics and in the Spring and fall in temperate zone, So & Dudgeon (1989) assured that carrion decomposition rate and arthropod succession are influenced by many factors, the more important are temperature, humidity, rain fall and abundance of insects. Tantawi *et al.* (1996) concluded that *C. vicina* species was well represented in carrion in Winter only, indicative of a preference for cooler temperatures, whereas Greenberg (1991) noted that while higher temperature ~ 30Cº accelerate the development of feeding instars at *C. vicina*.

Leccese (2004) assumed that ovipostion of *C. vicina*, occurring in late April. These differences of results may be due to the difference of strain fly.

Like wise, *Lucilia sericata* was also influenced by temperate condition, the highest rate 9% in March (at temperature 11.5 ċ – 26.6 ċ max , 43% r.h.), the lowest rate 1.3% was in June (25.5 ċ min – 44.2 ċ max , 20% r.h.), while it was 3.13% in April, this species had no incidence in other months. Hanski (1987 a) found that maggots of the Calliphorid *Lucilia sericata* were the 1st to occupy the carcasses in Spring, this species was able to breed successfully in carrion in fall, Winter and Spring, also the species had only few third instar were observed on carcasses in Summer during July (Tantawi *et al.*, 1996), these notes were similar to Ullyett (1950) who found that species breeding in carrion occurred mainly in Winter .

In *Chrysomya albiceps*, the highest rate 80% in October (18.5 ċ min – 34.0 ċ max, 43% r.h.), the lowest rate 10.36 %, was in August (26.5 ċ min – 42.7 ċ max , 23 r. h.), whereas it was; 46.87, 40.67, 28.9, 72.6% in April, May, June and September respectively. The larvae of this species have not been observed during other months. This species common in summer, although in lower number than in Autumn (Arnolds *et al.* 2001). Results in our study were in accordance with Arnolds *et al.* (2004) who noted that *Ch. albiceps* was by far the most abundant species of Diptera found in Autumn, while in Winter its presence is extremely rare , also, Ullyett (1950) mentioned that *Chrysomya albiceps* is Summer carrion breeder.

Third instar larvae of *Ch. megacephala* had been registered in highest rate (73.52%) during July (27.0 ċ min – 45.3 ċ max , 22% r.h.), whereas its lowest rate was 1.4% in September (20.9 ċ min – 40.0 ċ max , 28% r.h.), but they were (35.59, 46.95, 57.75, 6.5%) in May, June, August and October, respectively, whereas they were abseint during February, March, April, November, December and January. This species prefered very warm conditions

(Das *et al*, 1978), while Al-Zubydi (2000) noted that optimal temperature for egg deposition of *Ch. megacephala* was 25 Cº.

In Sarcophagidae there was only one species recorded in this study, *Sarcophaga* sp. The highest rate 31.89% during August (26.5 ċ min – 42.7 ċ max – 23% r.h.), whereas it's lowest rate was 13.5% during October. In May, June, July and September the rate it was: 22.05, 19.25, 26.48 and 26.0% respectively. The results indicated that *Sarcophaga* sp. prefered warm conditions. Tantawi *et al.* (1996) were registered two species of *Sarcophaga* on rabbit carcasses, *S. argyrostoma* and S. *aegyptica*, actually bred in carrion, where they acted as primary flies in warmer temperate and tropical regions (Early and Goff,1986), whereas they are secondary species in cooler regions (Rodriguez and Bass, 1983), also Tantawi *et al.* (1996) assured that the species above bred successfully in carrion only in fall although a few maggots and puparia of the former species were observed in winter, also, as Sam (2006) stated, *Sarcophaga* sp. larvae were exposed to the outside environments cold temperature.

Finally, the total number of third instar larvae collected on carcasses (Fishes and Rabbits) was less in months of summer compared with other months.

Table (1): The total appearance (%) of species on exposed carcasses from Feb.-2006 to Jan.-2007

Order	Species	Total Percent
Calliphoridae	*L. sericata* (Meigen)	1.20
	C. vicina Rob.-Desvoidy	45.52
	Ch.megacephala (Fabricius)	18.47
	Ch. Albiceps (Wiedemann)	23.28
Sarcophagidae	*Sarcophaga spp.*	11.6

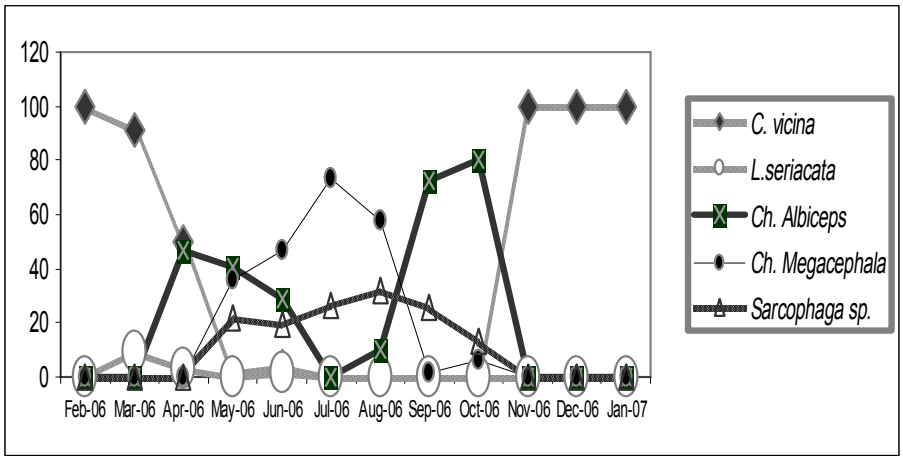

Figure (1): The monthly appearance (%) of third instar larvae of fly species on carcasses (Fishes and Rabbits) (Feb.2006-Jan.-2007)

Table(2): The temperature 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-2007	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

LITERATURE CITED

Al-Zubydi, R. SH. A. 2000. Comparative study of some biological and ecological Aspects between old world screw worm fly *Chrysomya bezziana* Vill. and big headed secondary myiasis fly *Ch. megacephala* (Fab.) (Diptera : Calliphoridae) in Baghdad, a thesis of M .Sc. in Biology, Baghdad University.

Amendt, J., Krettek, R. and Bratzke, H. 1999 Praxis der forensischen insektenlunde. Teil 1: Insektenaufsammlung am fundort einer Leiche. Arch. Kriminol. 204: 106-104 (cited by: Klotzbach, H.; Schroeder, H.; Augustin, C. and Pueschel, K. 2004. Information is everything-A case Report Demonstrating the Necessity of Entomological Knowledge at the Crime Scene. Aggrawals Internet J. of forensic Medicine and Toxicology, 5(1): 19-21.

Arnolds, M. I.; Romera, E.; Garcia, M. D. and Luna, A. 2001. An initial study on the succession of sarcosaprophagous (Diptera : Insecta) on carrion in the Southeastern Iberian peninsula, International J. of Legal Medicine, 114: 156-162.

Arnolds, M. I.; Sanchez, F.; Alvarez, P. and Garcia, M. D. 2004. A forensic entomology case from the south eastern Iberian Peninsula. Aggrawal ′○ ′s Internet J. of forensic Medicine and Toxicology, 5(1): 22-25.

Das, S. K.; Roy, P. and Dasgupta, B. 1978. The flying activity of *Chrysomya. megacephala* (Diptera : Calliphoridae) in Calcutta, India. Orient. Insects, 12:103-109.

Denno, R. F. and Cothran, W. R. 1975. Nich relationships of a guild of necrophagous flies. Ann. Entomol. Soc. America. 68(4): 741-758.

Denno, R. F. and Cothran, W. R. 1976. Competitive interactions and Ecological Strategies of Sarcophagid and Calliphorid flies Inhabiting Rabbit carrion. Ann. Entomol. Soc. Amer., 69(1): 109-113.

Early, M. and Goff, M. L. 1986. Arthropod succession patterns in exposed carrion on the Island of O ′○ahu, Hawaiian Islands, U.S.A. J. Med. Entomol. 23: 520-531.

FAO. 1991. Manul for the control of the screwworm fly.

Greenberg, B. 1990. Behavior of postfeeding larvae of some Calliphoridae and a muscid (Diptera). Ann. Entomol. Soc. Am. 83: 1210-1214.

Greenberg, B. 1991. Flies as forensic indicators. J. Med. Entomol. 28: 565-577.

Greenberg, B and Povolny, D. 1971. Bionomics of flies, pp. 57-83. In B. Greenberg, flies and disease vol.1. Princeton University prees, Princeton. N. J. .

Greenberg, B. and Szyska, M. L. 1984 Immature stages and Biology of fifteen species Peruvian Calliphoridae (Diptera). Ann.Entomol. Soc. Am. 77: 488-517.

Hanski, I. 1987 a. Nutritional ecology of dung and carrion feeding insects, pp. 837-884. In f. Slansky, Jr., and J. G. Rodriguez (eds.), Nutritional ecology of insects, Mites, Spiders and related invertebrates. Wiley, New York. (cited by Tantawi *et al.* 1996.

Hanski, I. 1987 b . Colonization of ephemeral habitats, pp. 155-185. In A. J. Gray, M. J. Crawley, and P. J. Edwards (eds.), colonization, succession, and stability. Blackwell. London (cited - by Tantawi *et al.* 1996).

Johnson, M. D. 1975. Seasonal and microseral variation in the insect populations on carrion. J. Amer. Midland Natural. 93: 79-90.

Kneidel, K. A. 1984. Influence of carcasses taxon and size on species composition of carrion breeding Diptera. J. American Midland Natural. 111: 57-63.

Leccese, A. 2004. Insects as forensic indicators: Methodological a speets. Aggrawa'd Internet J. of forensic Medicine and Toxicology, 5(1): 26-32.

Mawlood, N. A. 2001. Taxonomic study of the blow flies (Diptera : Calliphoridae) in middle of Iraq. A thesis of Ph.D., college of agriculture, university of Baghdad.

Putman, R. J. 1977. Dynamics of the Blowfly, *Calliphora erythrocephala* within carrion. J. Animal Ecology, 46: 853-866.

Roback, S. S. 1951. A classification of the Musscoid calyptrate, Diptera. Ann. Entomol. Soc. Am. 44: 327-361.

Roback, S. S. 1956. The Evolution and taxonomy of the Sarcophaginae (Diptera : Sarcophagidae). The Quarterly Review of Biology, 31: 309-310.

Rodriguez, W. C. and Bass, W. M. 1983. Insect activity and its relationship to decay rates of human cadavers in East Tennessee. J.

Sam, S. 2006. A study of the effect of temperature on the developmental rate of flesh flies, *Sarcophaga* sp. Saint Martin's University Biology J. 1: 233-243.

Smith, K. G. V. 1973. Insects and other arthropods of medical importance. British Museum (Natural History, London. 561 pp.).

So, P. M. and Dudgeon, D. 1989. Life history responses of larviparous *Boettcherisca formosensis* (Diptera : Sarcophagidae) to larval competition for food, including comparisons with oviparous *Hemipyrellia ligurriens* (Calliphoridae). Eco. Entomol. 14: 349-356.

Tantawi, T. I., EL-Kady, E. M.; Greenberg, B. and EL-Ghaffar, H. A. 1996. Arthropod succession on exposed Rabbit carrion in Alexandria, Egypt. J. Med. Entomol. 33(4): 566-580.

Ullyett, G. G. 1950. Competition for food and allied phenomena in sheep blow fly populations. Philos. Trans. R. Soc. Lond. (B)234: 77-174.

Wells, J. D.; Byrd, J. H. and Tantawi, T. I. 1996. Key to third-instar Chrysomyinae (Diptera : Calliphoridae) from carrion in the continental United States. J. Med. Entomol. 36(5): 638-641.

Wolff. M.; Builes, A.; Zapata, G.; Morales, G. and Benecke, M. 2004. Detection of Parathion (O, O – diethyl O – (4-nitrophenyl) phosphorothioate by HPLC Aggrawal's Internet J. of forensic Medicine and Toxicology, 5(1): 6-11.

Zumpt, F. 1965. Myiasis in Man and Animals in world, London; Butterworth.

Bull. Iraq nat. Hist. Mus.
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التواجد الموسمي ليرقات الطور الثالث للذبابيات على الجثث المكشوفة

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الخلاصة

دف الدراسة إلى معرفة يرقات الطور الثالث للذبابيات التي تعيش على جثث الأرانب والأسماك في مدينة بغداد للفترة من شباط ٢٠٠٦ – كانون الثاني ٢٠٠٧ حيث تم تسجيل عائلتين من رتبة ثنائية الأجنحة Diptera ، هما عائلة الذباب الأزرق Calliphoridae وعائلة ذباب اللحم Sarcophagidae وبنسبة مئوية للظهور كانت أعلى للعائلة الأولى خلال تلك الفترة . تم تشخيص الأنواع *Calliphora vicina* , *Chrysomya albiceps* ، *Ch.megacephala* *Sarcophaga* sp., و *Lucilia sericata* من الأعلى إلى الأقل نسبة خلال الفترة أعلاه. سجل النوع *C. vicina* بأعلى نسبة له في الأشهر شباط ، تشرين الثاني ،كانون الأول وكانون الثاني بنسبة ١٠٠% بينما لم يظهر خلال الأشهر تموز ، آب ، أيلول وتشرين الثاني. كانت أعلى نسبة لنوع ***Ch.albiceps*** خلال شهر تشرين الأول ، ولم يتم تسجيل هذا النوع للأشهر (شباط ، آذار ، تموز ، تشرين الثاني ،كانون الأول ،كانون الثاني) . أما النسبة المئوية لظهور النوع *Ch.megacephala* كانت أعلاها في تموز ولم يظهر النوع خلال الأشهر الباردة (شباط ، آذار ، نيسان ، تشرين الثاني ،كانون الأول ،كانون الثاني) . فيما سجل النوع *Sarcophaga* sp. بوفرة خلال أشهر الصيف وكانت أعلاها في آب ولم يسجل للأشهر الباردة (شباط، آذار، نيسان، تشرين الثاني،كانون الأول،كانون الثاني). فيما سجل النوع ***L.sericata*** بنسب واطئة كانت أعلاها في آذار ولم يسجل في الأشهر (شباط ، أيار ، تموز ، آب ، أيلول ، تشرين الأول، تشرين الثاني ،كانون الأول ،كانون الثاني) .

استنتجت الدراسة بأن أعداد اليرقات المسجلة للأنواع أعلاه كانت أقل خلال أشهر الصيف مقارنة بالأشهر الأخرى.