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Mosquitos' species of Diyala province, Iraq

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Abstract— *In the present study; the electrical mosquito's killer collection method was used for adult mosquitoes. Two different stations for fixing electricalmosquito's killer were chosen in the study area of veterinary college of medicine of Diyala University,Baquba, Al-muradia. Total number of 553 insects collected ; total number of mosquitoes n = 70 ;Two genera Anopheles n=21 and Culex n= 49 adults were recorded with no significance difference P-Value = 0.565; Three spp. were identified and classified as followsCx. (Cux.) pipiens Linnaeus 1758 , An. (Cel.) stephensi Liston 1901 and An. (Ano.) sacharovi Favre 1903.*

There was significant difference p=0.010 between monthly distribution in favor of March 2017 , were the total number of the insects (n=507)and the number of mosquitoes(n=64) , and lowest number were in January and February (n=0)reported ; Results revealed alsono significant difference p=0.248 between the monthly total number of mosquitoes and other insects and monthly total number of mosquitoes; Mosquitoes were captured indoors more Anopheles than outdoors; Culex recorded in November, December and March, while anopheline reported in March only in time of study.

Our present study entomological data calls the health authority to conduct further survey for Mosquito species in the province to its great role as vector of malaria.

Keywords— Mosquito, Anopheles, Culex, Diyala, Iraq.

I. INTRODUCTION

There are 3,500 named species of mosquito, of which only a couple of hundred bite or bother humans.[1]. Mosquitoes are one of the deadliest animals in the world. Their ability to carry and spread disease to humans causes millions of deaths every year. In 2015 malaria alonecaused 438 000 deaths. The worldwide incidence of dengue has risen 30-fold in the past 30 years, and more countries are reporting their first outbreaks of the disease. Zika, dengue, chikungunya, and yellow fever are all transmitted to humans by the *Aedesaegypti* mosquito. More than half of the world's population lives in areas where this mosquito species is present [2].

Not only can mosquitoes carry diseases that afflict humans, they also transmit several diseases and parasites that dogs and horses are very susceptible to. These include dog heartworm, West Nile virus and Eastern equine encephalitis. In addition, mosquito bites can cause severe skin irritation through an allergic reaction to the mosquito's saliva - this is what causes the red bump and itching[3].

Iraqi Culicidaemosquitoes had been studied by many workers since 1920 ,[4]wrote on some Culicidaeof soutren Iraq ; then in 1921 by Christopher and Shortt[5]; [6,7] have been recorded from Iraq *genusAnopheles* : *algeriensis,marten, claviger, sacharovi, maculipennis* (typical form), *hyrcanus, dthali, fluviatilis, multicolor* (the inclusion of *multicolor* rests on the reputed capture of the an adult at Sedat-al-Hindiyeh in May 1943), *superpictus, stephensi, pulcherrimus*;[8]write an list of Culicinein the central region including Baghdad during August to November ,1954; [9] found *Aedesaegypti* in Baghdad; [10], [11]and [12]worked on keys for Iraqi culicine larvae in general.

The previous authors belive that the culicine mosquitoes are still improperly sutided; only 12 species (*Culex theileri ,C. pusillus, C. tritaeiniorhynchus ,C.pipinespipines , C. pipinesfatigans ,C. torrentium , Aedescaspius , A. dorsalis , Theobaldialongiareolata, Th.subochrea ,Th.annulata and Urantaeniaunguiculate*)have been reported from Iraq and half that number from Baghdad .

[13]Provided some notes on the bionomics of *An. Maculipennis*and *An. sacharovi*from Iran and Iraq and examined the distribution of the two species in central and northern areasof Iran. [14]Recorded 15 species of *Anopheles* from Iran and provided a key for the identification of these species in both Iran and Iraq.

Of the almost 16 anopheline species so far recorded in Iraq [5, 14, 7, 15] only 3, *Anopheles stephensi*Liston, *An. sacharoui*Favre and *An. superpictus*Grassi are proven to be vectors of malaria. *An. p-ulchcrrimus*Theobald has been suspected of being a vector in Najaf Province[16] .

Mosquitoes records in Iraq shows Variation of species number reported; In12 Iraqi provinces werecollected and speciated. Four *Anopheles* (*An. pulcherrimus, An. stephensi, An. superpictus,* and *An. sacharovi*) and one *Culex (Cx.*

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pipiens) species were identified. *Anopheles pulcherrimus* was found in 11 provinces, *An. stephensi*in7, *An. superpictus*in 2and *An. sacharovi*in one province, while *Cx. pipiens*was found in all the 12 provinces. Two peaks of mosquito density were found: the first from April–June and the other from September–October[17]; while 10 speciesup to37 species belong for 4 gerera (*Anopheles*,*Culelx*, *Aedes and Culiseta)* as shown in table (1),[18].

Three species belong to three genera of Culicidae were identified,*Aedescaspius*(Pallas),*Culex pipiens*(Linnaeus) and *Culisetalongiareolata* (Macquarrt) in Al Kut city recorded by[19].

[20]Wrote aboutA parasitological survey carried in 2002 were they identified no malaria cases butan entomological survey found both *Anopheles stephensi* and *A. pulcherrimus* in high densities.

Modified Table.1: Updated checklists of mosquito species from Afghanistan and Iraq (after Rueda et al.2008).

Species	Iraq
Aedes (Aedemorphus) vexans (Meigen 1830)	R
Ae. (Ochlerotatus) caspius (Pallas1771)	A1, K, X
Ae. (Och.) dorsalis (Meigen1830)	I, K
Anopheles (Anopheles) algeriensis Theobald1903	A2, G, P
An. (Ano.) clavigerMeigen1804	A2, G, P
An. (Ano.) hyrcanus (Pallas) 1771	A2, G, K, P
An. (Ano.) maculipennisMeigen1818	A2, G, K, P
An. (Ano.) marteriSenevet and Prunnelle1927	A2, G, K, P
An. (Ano.) melanoon Hackett	G
An. (Ano.) sacharoviFavre 1903	A2, G, K, P
An. (Cel.) apoci Marsh	A2, G, K
An. (Cel.) culicifacies Giles	A2, G, K
An. (Cel.) dthaliPatton 1905	A2, G, K, P
An. (Cel.) fluviatilisJames 1902	A2, G, K, P
An. (Cel.) multicolor Cambouliu1902	A2, G, K, P
An. (Cel.) pulcherrimusTheobald 1902	A2, G, K, P, X
An. (Cel.) sergentii (Theobald) 1907	A2, G, K, X
An. (Cel.) stephensi Liston 1901	A2, G, K, P, X
An. (Cel.) superpictusGrassi1899	A2, G, K, P
An. (Cel.) turkhudi Liston	A2, G
Culex (Barradius) modestusFicalbi	A1, K, X
Cx. (Bar.) pusillusMacquart	A1, I, K
Cx. (Culex) mimeticusNoe	A1, I, H1, H2
Cx. (Cux.) perexiguus Theobald	H2, X H1, H2
Cx. (Cux.) pipiens Linnaeus	A1, I, H1, H2, K, X
Cx. (Cux.) pseudovishnuiColless	H2
Cx. (Cux.) quinquefasciatus Say	H2, I, K, X
Cx. (Cux.) theileri Theobald	A1, H1, H2, I, K, X
Cx. (Cux.) tritaeniorhynchus Giles	A1, H1, H2, I, K, X
Cx.(Mailloitia) deserticola Kirkpatrick	H1, I
Cx. (Mai.) hortensisFicalbi	A1, I
Cx. (Neoculex) territans Walker	A1
Culiseta (Allotheobaldia) longiareolata (Macquart)	AI, I, K, X
Cs. (Culicella) fumipennis (Stephens)	U
Cs. (Culiseta) annulata (Schrank)	I, K
Cs. (Cus.) subochrea (Edwards)	A1, I, K
Uranotaenia (Pseudoficalbia) unguiculata Edwards	A1, K
Total number of species	37

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*References: A1 (Abul-hab 1968), A2 (Abul-hab and Al-Kassal 1986), G (Glick 1992) ,H1 (Harbach 1985), H2 (Harbach 1988), I (Ibrahim et al. 1983), K (Khalaf 1962), P (Pringle1954), R (Reinert 1973), U (WRBU 2001), X (Rueda et al.2008).

The aim of present study is to provide an up-to date list of mosquitoes collected from internal girl's residence and animal farm of veterinary college of medicine of Diyala University.

II. MATERIALS AND METHODS

In the present study; The electrical mosquitoes killer collection method was used for outdoor and semi-indoor resting mosquitoes. For the present entomological survey, 2 fixed stations of electrical mosquitoes killer were put in the internalgirl's residence and animal farm of veterinary college of medicine of Diyala universityarea, Al-muradia, and theywere visited weeklyto collect mosquitoesvector and other insects killed. The study time conducted from November 2016-March 2017.The vectors were monitored at adult stages from various habitats. Specimens were identified to species using keys and descriptions from pertinentliterature (e.g., [24, 22,28]).

Fig.1: Electrical mosquitoes killer

Fig.2 : Petri dish used for collection of insects killed.

III. RESULTS

Total of553as shown in table (2); Two genera Anopheles n=21 and Culex n= 49adult species of mosquitoes were recorded with no significance differencebetween total number of genraP-Value = 0.565 ,table (2) , fig.(2, ; their spp. were identified and classified as follows:

Table.2: Monthly distribution total adult mosquitoes.

Month	**Total number of genera**		**Total number of mosq.**	**Total number of insects**
	Cul. mosq.	Ano. mosq.		
November 2016	4	0	4	12
December 2016	2	0	2	34
January 2017	0	0	0	0
February 2017	0	0	0	0
March 2017	43	21	64	507
total	49	21	70	553

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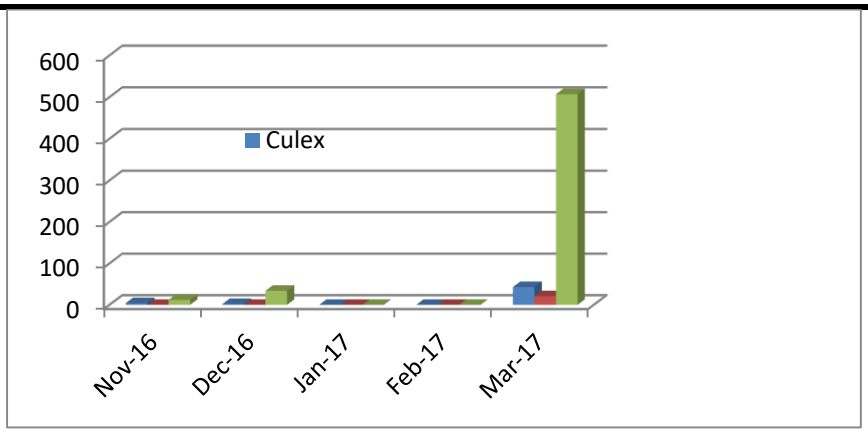

Fig.3: Monthly distribution of Mosq. and other insect

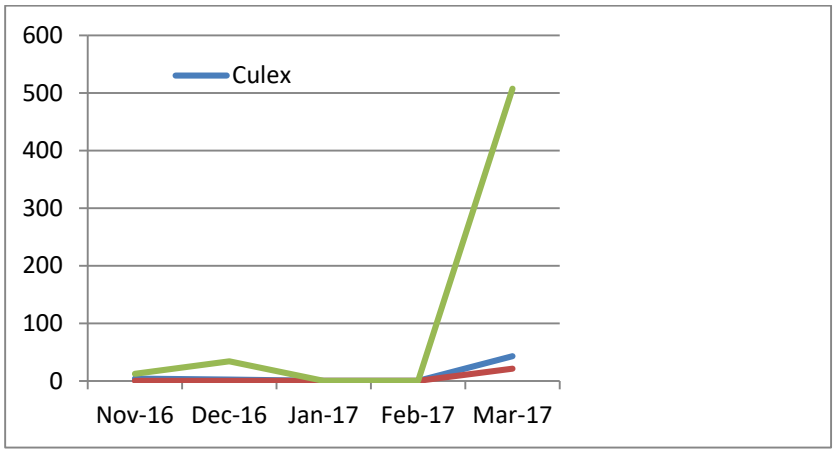

Fig.4: Monthly distribution of Mosq. and other insecta

Order Diptera
Family Culicidae

i. Sub family culicinae
Cx. (Cux.) pipiens Linnaeus 1758
ii. Sub family Anophelinae
An. (Cel.) stephensi Liston 1901
*An. (Ano.) sacharovi*Favre 1903

Fig.5: Cx. (Cux.) pipiens Linnaeus 1758 .

Fig.6: An. (Cel.) stephensiListon 1901.

Fig. 7: Anopheles An. (Ano.) sacharovi Favre 1903 .

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Fig.8: Anopheles An. (Ano.) sacharoviFavre 1903.

There was significant difference between monthly distribution in favor of March month p=0.010;Results revealed that the highest number of mosquitoes reported in March 2017 (n=70) and lowest in January and February (n=0) ; Results revealed also that the highest number of mosquitoes and other insect reported in March 2017 (n=507) and lowest in January and February (n=0) but with no significant difference p= 0.565 ; mosquitoes were captured indoors more Anopheles than indoors ; Culex recorded all over the time outdoors more than indoors resting places.

IV. DISCUSSION

There is growing evidence that the northern house mosquito, *Culex pipiens* (Diptera: Culicidae), is a major vector of avian malaria in the northern hemisphere. This mosquito, which can act as a vector of several other infectious diseases such as arboviruses[29].

Mosquitoes of*Culexpipiens* prevailing in November December and March both indoors and outdoors, this result agree with[30] inthat , it is a highly adapted to all the different types of environments; the adults of *C. pipiens* group are thought to appear throughout the year[31].

The study shows that 2 species Anopheles,*An. (Ano.) sacharovi* Favre 1903 ;*An. (Cel.) stephensi* Liston 1901 the proven vectors of malaria were encountered in Diyala area.

The findings revealed that A.*stephensi*and*A.saccharovi*only present during March 2017 in indoors resting disagrees with(20) who found that *A. stephensi* adults were present during all months of the year except January and also disagree with[17] who recorded the presence of *An. Pulcherrimus*and *An. Superpictus*only in Diyala province, but our finding of *C.pipiens*identificationagree with previously author.

Both the critical and normal thresholds were determined from the entomological data before, during and after the epidemic which is an important signal in malaria epidemiology and mosquitoes control.

In Iraq, increased *Anopheles* densities are not always associated with an epidemic disease but could be used as an indicator of epidemic risk. *A.stephensi*is the major malaria vector in the central and southern regions of Iraq. Indoor resting *A. stephensi* density was used as an indicator of epidemic risk when its density exceeded the critical level. [32].

V. CONCLUSION

Our present study entomological data calls the health authority to conduct further survey for Mosquito species in the province to its great role as vector of malaria.

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