

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 electrical mosquito'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 follows *Cx. (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 also no 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 alone caused 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 *Aedes aegypti* 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 Culicidae mosquitoes had been studied by many workers since 1920 ,⁽⁴⁾ wrote on some Culicidae of southern Iraq ; then in 1921 by Christopher and Shortt⁽⁵⁾; ^(6,7) have been recorded from Iraq genus *Anopheles* : *algeriensis*, *marteni*, *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 Culicine in the central region including Baghdad during August to November ,1954; ⁽⁹⁾ found *Aedes aegypti* in Baghdad; ⁽¹⁰⁾, ⁽¹¹⁾ and ⁽¹²⁾ worked on keys for Iraqi culicine larvae in general.

The previous authors believe that the culicine mosquitoes are still improperly studied; only 12 species (*Culex theileri* , *C. pusillus*, *C. tritaeniorhynchus* , *C. pipiens pipiens* , *C. pipiens fatigans* , *C. torrentium* , *Aedes caspius* , *A. dorsalis* , *Theobaldia longiareolata* , *Th. subochrea* , *Th. annulata* and *Urantaenia unguiculate*) 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 areas of 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. sacharovi* Favre and *An. superpictus* Grassi are proven to be vectors of malaria. *An. p-ulcherrimus* Theobald has been suspected of being a vector in Najaf Province⁽¹⁶⁾ .

Mosquitoes records in Iraq shows Variation of species number reported; In 12 Iraqi provinces were collected and speciated. Four *Anopheles* (*An. pulcherrimus*, *An. stephensi*, *An. superpictus*, and *An. sacharovi*) and one *Culex* (*Cx.*

pipiens) species were identified. *Anopheles pulcherrimus* was found in 11 provinces, *An. stephensi* in 7, *An. superpictus* in 2 and *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 species up to 37 species belong for 4 genera (*Anopheles*, *Culex*, *Aedes* and *Culiseta*) as shown in table (1),⁽¹⁸⁾.

Three species belong to three genera of Culicidae were identified, *Aedes caspius* (Pallas), *Culex pipiens* (Linnaeus) and *Culiseta longiareolata* (Macquart) in Al Kut city recorded by⁽¹⁹⁾.

⁽²⁰⁾Wrote about a parasitological survey carried in 2002 where they identified no malaria cases but an 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
<i>Aedes (Aedemorphus) vexans</i> (Meigen 1830)	R
<i>Ae. (Ochlerotatus) caspius</i> (Pallas 1771)	A1, K, X
<i>Ae. (Och.) dorsalis</i> (Meigen 1830)	I, K
<i>Anopheles (Anopheles) algeriensis</i> Theobald 1903	A2, G, P
<i>An. (Ano.) claviger</i> Meigen 1804	A2, G, P
<i>An. (Ano.) hyrcanus</i> (Pallas) 1771	A2, G, K, P
<i>An. (Ano.) maculipennis</i> Meigen 1818	A2, G, K, P
<i>An. (Ano.) marteri</i> Senevet and Prunelle 1927	A2, G, K, P
<i>An. (Ano.) melanoon</i> Hackett	G
<i>An. (Ano.) sacharovi</i> Favre 1903	A2, G, K, P
<i>An. (Cel.) apoci</i> Marsh	A2, G, K
<i>An. (Cel.) culicifacies</i> Giles	A2, G, K
<i>An. (Cel.) dthali</i> Patton 1905	A2, G, K, P
<i>An. (Cel.) fluviatilis</i> James 1902	A2, G, K, P
<i>An. (Cel.) multicolor</i> Cambouliu 1902	A2, G, K, P
<i>An. (Cel.) pulcherrimus</i> Theobald 1902	A2, G, K, P, X
<i>An. (Cel.) sergentii</i> (Theobald) 1907	A2, G, K, X
<i>An. (Cel.) stephensi</i> Liston 1901	A2, G, K, P, X
<i>An. (Cel.) superpictus</i> Grassi 1899	A2, G, K, P
<i>An. (Cel.) turkhudi</i> Liston	A2, G
<i>Culex (Barradius) modestus</i> Ficalbi	A1, K, X
<i>Cx. (Bar.) pusillus</i> Macquart	A1, I, K
<i>Cx. (Culex) mimeticus</i> Noe	A1, I, H1, H2
<i>Cx. (Cux.) perexiguus</i> Theobald	H2, X H1, H2
<i>Cx. (Cux.) pipiens</i> Linnaeus	A1, I, H1, H2, K, X
<i>Cx. (Cux.) pseudovishnui</i> Colless	H2
<i>Cx. (Cux.) quinquefasciatus</i> Say	H2, I, K, X
<i>Cx. (Cux.) theileri</i> Theobald	A1, H1, H2, I, K, X
<i>Cx. (Cux.) tritaeniorhynchus</i> Giles	A1, H1, H2, I, K, X
<i>Cx. (Mailloitia) deserticola</i> Kirkpatrick	H1, I
<i>Cx. (Mai.) hortensis</i> Ficalbi	A1, I
<i>Cx. (Neoculex) territans</i> Walker	A1
<i>Culiseta (Allotheobaldia) longiareolata</i> (Macquart)	AI, I, K, X
<i>Cs. (Culicella) fumipennis</i> (Stephens)	U
<i>Cs. (Culiseta) annulata</i> (Schrank)	I, K
<i>Cs. (Cus.) subochrea</i> (Edwards)	A1, I, K
<i>Uranotaenia (Pseudoficalbia) unguiculata</i> Edwards	A1, K
Total number of species	37

*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}).

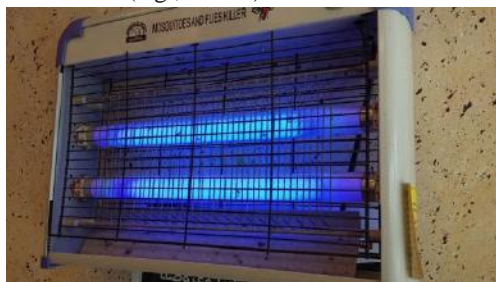


Fig.1: Electrical mosquitoes killer



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

III. RESULTS

Total of 553as 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

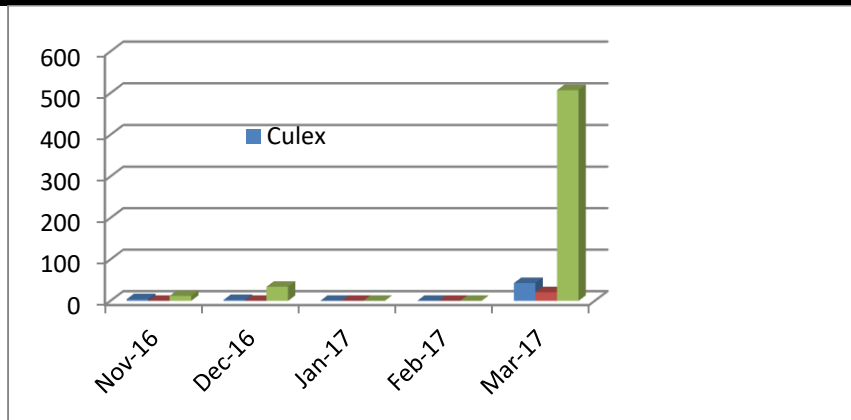


Fig.3: Monthly distribution of Mosq. and other insect

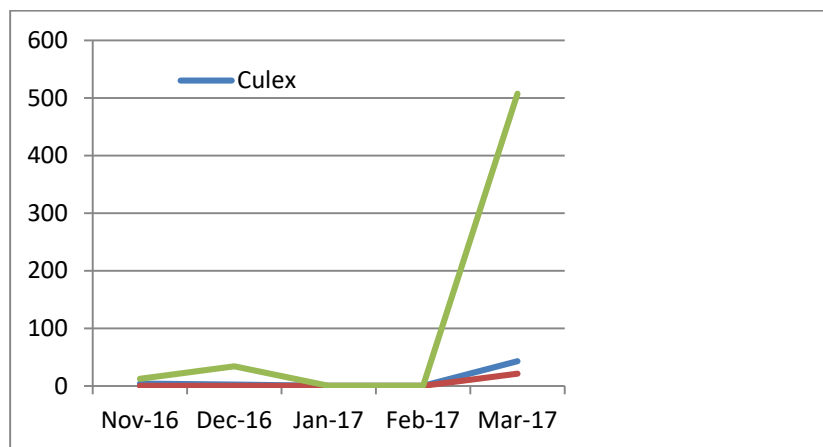


Fig.4: Monthly distribution of Mosq. and other insecta

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.) stephensi* Liston 1901.



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



Fig.8: *Anopheles An. (Ano.) sacharovi* Favre 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 outdoors; *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 *Culex pipiens* prevailing in November December and March both indoors and outdoors, this result agree with⁽³⁰⁾ in that, 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. sacharovi* 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* identification agree 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* 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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