

Study of A Culicidian Stand in The El Marsa Wetlands of the Skikda Region

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ABSTRACT

The Culicidae are Nematocera Diptera, they occupy place of choice, either by the role of vector of pathogenic organisms, or by their nuisance. In recent years, the mosquito has become widespread in all humid regions and can spread serious diseases.

In order to know the most widespread mosquito species, we conducted an inventory in the El Marsa wetland (Skikda Algeria) during a period running from January 2016 to December 2016.

The systematic inventory of Culicidae harvested at El Marsa in the sites surveyed revealed, after identification, the presence of 8 species belonging to 4 different genera: Anopheles, Culiseta, Culex, Uranotaenia whose genus is best represented particularly with the species Culex pipiens with close to 50%. We have also ecologically characterized this stand.

Keywords: Biodiversity, Culicidae, Ecological Parameters, Inventory, Wetlands.

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1. INTRODUCTION

In recent years, the expanded global distribution of vector-borne diseases, such as yellow fever, malaria and recently zika virus, has generated a renewed interest in the biology and control of these vectors. Among the insects so feared by humans, mosquitoes or Culicidae, these Diptera have more than 3,500 species distributed mainly in the three main genera Aedes, Anopheles and Culex (Resh & Carde, 2003).

Several surveys have been done in Algeria to list the mosquito species of this territory. More than 60 species have been collected since 1930 (Senevet & Andarelli 1960; Bruhnes et al. 1999; Merabti & Ouakid 2011; Bebbi & Berchi 2004; Rioux (1958); Bendali 2006).

Medically important species include An. sergentii, An. multicolor and An. hispaniola. An understanding of the environmental factors that affect the mosquitoes' larval abundance is a key factor for their control. Mediterranean wetlands present a particularly favorable context for the development of certain vector-borne diseases. In Algeria, particularly in the region of Skikda, known for the multitudes of wetlands, an environment conducive to the emergence of different mosquito species is offered.

The aim of this project was to carry out field surveys of possible mosquito breeding sites and to classify the mosquito species, and the characterization of stand structures using ecological parameters.

2. MATERIAL AND METHODS

2.1. Presentation of The Study Area:

The study was carried out in the wetlands of El Marsa 37 ° 01 '48 "north, 7 ° 15' 11" east and after conducting a preliminary survey in the wilaya of Skikda which is located in the fringe northeastern Algeria (36 ° 52 'north, 6 ° 54 east), the region is bordered on the north by the Mediterranean Sea, on the south by the wilaya of Mila, Constantine and Guelma, on the east by the wilaya of Annaba and to the west by the wilaya of Jijel (Figure 01).



Figure 1: Geographical location of El Marsa wetlands

2.2. Sampling of the Culicidal Population

During a year running from January 2014 to December 2014 with a fortnightly pace, samples were taken in different types of cottages in our study area.

The sampling technique, used for our different crops, consists of using a 500ml ladle that we have plunged a certain number of times into the wetlands.

The harvested larvae are then sorted by stage and the breeding is maintained in the laboratory (temperature 25° humidity 70% and 12 hours of scotophase) while waiting for a taxonomic identification.

2.3. Mosquito Identification and Ecological Parameters

The specimens were identified using the Mediterranean Africa software (Bruhnes et al. 1999).

Identifications were based on the external morphological characteristics of fourth instar larvae

and adults, i.e. the eggs, first to third instar larvae and pupae that were collected were reared to the fourth instar or adult stage for identification. Identifications were made using a microscope at ×10 magnification after following a special mounting protocol (Rioux 1958). The results obtained were confirmed by the dichotomous keys (Himi et al., 1995)

In order to characterize this Culicidan stand ecological parameters were calculated for relative abundance (FC) (Dajoz, 1971), frequency of occurrence (C%) (Dajoz,1982), and faunistic association of Culicidae (Marie and Aubin, 1980).

3. RESULTS

3.1. Composition of the Culicidan Fauna

The composition of the culicidan population sampled in the study unit reveals the existence of 8 species belonging to four different genera which are divided into two subfamilies: Anophelinae and Culicinae (Tab.1)

Table 1. Culicidae identified in El Marsa

Subfamily (Anophelinae)	Subfamily (Culicinae)		
Anopheles	Culex	Culiseta	Uranotaenia
Anopheles clavigier Anopheles labranchae	Culex pipiens Culex hortensis Culex impidicus	Culiseta annulata Culiseta longireolata	Uranotaenia unguiculata

3.2. Ecological Indices of Composition

Harvests in the region of El Marsa allowed the identification of 926 individuals divided into 8 species belonging to 4 different genera. Culex pipiens is the most representative species in our study area with 445 individuals (48.06%) followed by Culex impidicus with 271 individuals (29.26%).

The presence or occurrence of the sampled species differs depending on the harvest period. Culex pipiens (100%) and Anopheles clavigier (83.33%) are considered as constant species, Anopheles labranchae and Culex hortensis can be considered as regular species.

Culex impidicus with (33.33%) is the only accessory species, the remaining species with a low occurrence in the El Marsa region are therefore classified as accidental species.

Table 2. Ecological parameters of composition of the Culicidan populations in the El Marsa region

Species	N	FC%	occurrence	C%	category
Culex pipiens	445	48,06	6	100	Constant
Culex impidicus	271	29,26	2	33,33	Accessory
Anopheles labranchae	83	8,96	3	50	Regular
Culex hortensis	59	6,37	3	50	Regular
Anopheles clavigier	47	5,07	5	83,33	Constant
Culiseta longireolata	11	1,19	1	16,66	Accidental
Uranotaenia unguiculata	8	0,86	1	16,66	Accidental
Culiseta annulata	2	0,21	1	16,66	Accidental

FC%: relative abundance; Occurrence: the number of surveys containing the studied species; C%: the frequency of occurrence.

3.3. Faunistic Association of Culicidae

For a better exploitation of the results, we also studied associations of the Culicidan fauna which makes it possible to define the different groups of associated species according to the ecological requirements of their environments.

From Table 3, it appears that Culex pipiens is the only species present and associated with all species inventoried in our study area. The results also show that Culiseta longireolata, Culiseta annulata and Uranotaenia unguiculata are the species least associated with other species.

Table 3. Faunistic association of Culicidae

Species	Culex pipiens	Culex impidicus	Culex labranchae	Anopheles hortensis	Culex clavigier	Anopheles longireolata	Culiseta unguiculata	Uranotaenia unguiculata	Culiseta annulata
Culex pipiens	+	+	+	+	+	+	+	+	-
Culex impidicus	+	+	+	+	+	-	-	-	-
Anopheles labranchae	+	+	+	+	+	-	+	-	-
Culex hortensis	+	+	+	+	+	-	-	-	+
Anopheles clavigier	+	+	+	+	+	+	+	+	-
Culiseta longireolata	+	-	-	-	+	+	-	-	-
Uranotaenia unguiculata	+	-	+	-	+	-	+	-	-
Culiseta annulata	+	-	-	+	-	-	-	-	+

(Presence +, Absence-)

4. DISCUSSION

The classification of species and their nomenclature, often assimilated to the systematics designating a group of species belonging to any hierarchical level of the classification (species, branching genus), is devoted to the study, the description and the classification of living beings, according to criteria taking into account the evolutionary relations between species. From the keys presented by the works of Himmi et al. (1995), Rioux (1958) and the two identification programs, we have succeeded in identifying the most important taxonomic characters.

This year-long study showed that Culicidofauna in the Skikda region is rich and diverse. The composition of Culicidian populations sampled in several cottages reveals the existence of 8 species belonging to the two Culicidae subfamilies, Culicinae and Anophelinae.

Concerning the subfamily Anophelinae, we identified the genus *Anopheles* including two species: *Anopheles claviger* and *Anopheles labranchiae*. For the subfamily Culicinae, we collected 6 species divided into three genera: *Culex*, *Culiseta* and *Uranotaenia*.

The genus *Culex* is best represented in this subfamily, we identified 3 species *Culex pipiens*, *Culex impudicus*, *Culex hortensis*. The genus *Culiseta* is represented by 2 species: *Culiseta longiareolata* and *Culiseta annulata*. Finally, the genus *Uranotaenia* by a single species *Uranotaenia unguiculata*. In this study, we recorded some species of *Anopheles* mosquitoes that can transmit diseases to humans. The existence of this type of mosquito in the study area represents a major health risk.

Culex pipiens is a very common species in Algeria and North Africa. The larvae of this species are found in the most diverse cottages such as, permanent lodgings with fresh water poor or rich in vegetation, temporary lodgings with fresh water rich in vegetation. This species shows great plasticity reported by several authors where the water is fresh and pure, congested in vegetation or clear (Senevet & Andarelli, 1960, Berner, 1974, Cousserans et al, 1976, Brunhes et al, 1999).

The distribution of Culicidae extends almost in all the provinces of the Algerian territory which knew inventories of these Diptera that are the regions North, East, Center and the West. The various contributions indicated to us the presence of several species of different subfamilies of Culicinae, Aendenea or Anophelinae.

Brunhes et al. (2000), report that the Culicidian fauna of Algeria is rich with 48 species. This diversity reflects the climatic diversity and the diversity of biotopes offered to Culicidae development. Hassaine (2002) in the western region of Algeria (Tlemcen), noted 20 species of Culicidae, this number of species which is relatively important and spread over a period of two years. Berchi (2000b), noted the presence of 7 species of Culicidae belonging to 2 subfamilies, that of Anophelinae and that of Culicinae. These are *Culex pipiens*, *Culex mimeticus*, *Culex theileri*, *Culex hortensis*, *Culiseta longiareolata*, *Anopheles labranchiae* and *Uranotaenia unguiculata*.

Senevet and Andarelli (1960) reported on a total of thirty years of field work, a total of 27 Culicidae species in the Algiers region, belonging to two sub-families, Anophelinae and Culicinae. In the first subfamily, seven species of *Anopheles* have been inventoried belonging to the genus *Anopheles*. Among these

species, there is *Anopheles maculipennis* which, according to Senevet and Andarelli (1955a, b), constitutes a complex.

In the region of Collo (Skikda) in northeastern Algeria, Boudemagh et al. (2013) reported the presence of 13 Culicidae species belonging to 2 subfamilies, Anophelinae and Culicinae. These are *Culex pipiens*, *Culex laticinctus*, *Culex theileri*, *Culex hortensis*, *Culex impudicus*, *Culex pusillus*, *Culiseta longiareolata*, *Culiseta ochroptera*, *Culiseta glaphyroptera*, *Anopheles maculipennis sacharovi*, *Orthopodomyia pulqualpis* and *Uranotaenia unguiculata*.

Research on the biosystematics of Culicidae at four stations in the eastern region of Algiers, Réghaia marsh and Oued Sébaou in Tizi Ouzou has identified 13 species belonging to two sub-families. These are *Aedes caspius*, *Anopheles labranchiae*, *Culex mimeticus*, *Culex perexiguus*, *Culex pipiens*, *Culex theileri*, *Culex impudicus*, *Culex territans*, *Culex hortensis*, *Culex modestus*, *Culiseta longiareolata*, *Culiseta subochrea* and *Uranotaenia unguiculata* (Lounaci, 2003). Messai et al. (2010) showed the presence of 12 species in the Mila region, eight of the *Culex* genus (*Culex pipiens*, *Culex modestus*, *Culex antennatus*, *Culex hortensis*, *Culex deserticola*, *Culex theileri*, *Culex laticinctus* and *Culex* sp), two of the genus *Anopheles* (*Anopheles labranchiae* and *Anopheles pharoensis*), one of the genus *Culiseta* (*Culiseta longiareolata*) and one of the genus *Uranotaenia* (*Uranotaenia unguiculata*).

Works in the region of El-Kala (Aouati, 2009) report the presence of *Culex pipiens*, *Culex torrentium*, *Culex theileri*, *Culiseta annulata*, *Anopheles claviger*, *Anopheles maculipennis*. Hamaidai (2004) reports the presence of 15 Culicidae species in the Souk-Ahras region, including three belonging to the genus *Anopheles*, 3 to the genus *Culiseta* and 9 to the genus *Culex*. The same author reports the presence of 12 species in the Tebessa region, belonging to the genera *Culex*, *Culiseta* and *Aedes*.

Himmi et al. (1995), identified 47 species in Morocco. Thus, in the region of Rabat (Morocco), 9 Culicidae species were inventoried (*Culex pipiens*, *Culex theileri*, *Culex impudicus*, *Culiseta longiareolata*, *Culiseta subochrea*, *Uranotaenia unguiculata*, *Anopheles Labranchiae*, *Aedes caspius* and *Aedes detritus*). Research work that was done in Tunisia showed the presence of six genera, *Aedes* and *Anopheles* with 12 species for each one of them, the *Culex* with 9 species, *Culiseta* with 4 species and finally *Uranotaenia* and *Orthopodomyia* with one species each (Moussiegt, 1983).

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