

## CHIRONOMIDAE (DIPTERA: INSECTA) OF TEMPORARY SALT LAKES IN THE EASTERN HAUTS PLATEAUX OF ALGERIA

### ABSTRACT

From November 2010 to June 2012 chironomid fauna was collected from 11 wetlands in the eastern Hauts plateaux of Algeria. These wetlands, called chotts or sebkhas or saltlakes, are characterised by their high conductivity, except Garâet Timerganine which is characterized by its freshwater. A total number of 30 Chironomid taxa, mainly identified to specific level, have been recorded. In these waterbodies, the Chironomidae fauna is represented by three subfamilies. The Chironominae with 14 taxa, Orthoclaadiinae with 9 taxa and Tanypodinae with 7 taxa. The numerically dominant species were *Cricotopus ornatus*, *Cricotopus sylvestris*, *Chironomus plumosus* and *Microchironomus tener*. The low values of chironomid species number compared with other investigated standing waters in Algeria is probably due to limiting factors such as: food depletion, unfavourable sediment conditions and predation by damselflies and waterbirds.

**Key words:** Chironomidae, eastern Hauts plateaux , salinity, Algeria.

### 1. INTRODUCTION

Chironomidae (Insecta :Diptera) is the most ubiquitous and abundant group of macroinvertebrates in number of species and individuals, in addition they exist in most habitats. In fact, the number of species of Chironomidae worldwide is estimated at 15,000<sup>1</sup>. However, this number is debatable. Indeed, species are still being discovered and newly described<sup>2,3,4</sup>.

Chironomidae invade the sea, nestling on the shores and 30 m living on the seabed<sup>5</sup>. In addition, Chironomidae larvae are found in all types of waterbodies: freshwater, brackish or saline environments and even terrestrial<sup>6</sup>.

Ecological studies have shown that under certain conditions, such as extremely low dissolved oxygen, chironomid larvae are the only ones present in the bottom sediments. Extreme variations in temperature, pH, salinity, depth, current and productivity are exploited by larvae and imagines of some species of Chironomidae<sup>7</sup>.

Chironomid research in the Mediterranean region has been very active in the last years, the number of species known to occur in the Mediterranean countries has gone up steeply. North African Chironomidae are still poorly known. Concerning Algeria, preliminary results were provided by Moubayed et al.<sup>8</sup>, Lounaci et al.<sup>9</sup> and Moubayed & Lounaci<sup>10</sup>. The chironomid fauna study remained very fragmentary. In fact, these studies concerned inventories of species of Chironomidae in wetlands<sup>11,12</sup>.

Saline water bodies are wetlands with salinity equal or higher than 3 g/l<sup>13</sup>. They are especially distributed in arid and semi arid regions throughout the world<sup>14</sup>. In plus, they are highly influenced by a multitude of factors which cause loss in their biodiversity<sup>15,16</sup>.

The wetland complex of Constantinois situated in the North east of Algeria is scattered between: wilaya of Oum El Bouagui, Khenchela, and Batna at a length of 300 km, and covers an area of 55000 ha. It includes a chain of natural and artificial sites of standing or running water of an undeniable importance, of which 10 sites are already classified or proposed for Ramsar classification<sup>17</sup>.

These water bodies are particularly difficult to study because of their huge size and their inaccessibility and, indeed, very little scientific literature described these wetlands<sup>18</sup>. In addition, most of these environments dry in summer.

In this study, new samplings in the eastern hauts plateaux, which are semi arid areas of Algeria, are intended to complete our knowledge concerning entomological fauna and to provide a more global inventory of chironomid family of Algeria.

## **2. MATERIAL AND METHODS**

### **2.1 Sampling sites**

The Hauts Plateaux are located in the east of Algeria and dominate the coastal plains of the north. These Hauts Plateaux extend over a surface of 55000 ha, from Setif to Oum El- Bouaghi wilayas, and characterised by a semi arid climate. Waterbodies in this zone are mainly garâets, sebkhetts or salt lakes (Figure 1). These water bodies are not very deep and their depth does not exceed 50 cm in general. The vegetation is very poor, there are only a species supporting a high salt content such as *Atriplex* and *Tamarix*.

Eleven wetlands from the eastern Hauts plateaux were sampled between november 2010 and June 2012. Sampling in the summer periods were not possible because of the drought of the waterbodies.

Characteristics of the eleven sites studied are summarised in table 1.

The average values of conductivity are relatively high and reflected a strong mineralization of waters of these sites. Indeed higher values are noted, respectively, at Garâet Tarf (183 mS/cm), G. Ank Djemel (180 mS/cm) and Garâet Gemot (178 mS/cm). This latter is a 57 ha body of water and is a satellite sebkha of Garâet Tarf. The smallest values of conductivity were registred in Chott Timerganine (1.04 mS/cm), this waterbody is the only freshwater wetland of the eastern Hauts plateaux. This is due to its limestone constitution and its significant power of storage of the rainwater and runoff.

Respective pH values of the eastern Hauts plateaux wetlands are limited between 7 and 8.6 and demonstrated a tendency to alcalinity of these waterbodies.

The biological material used in this study consists of Chironomidae collected in the stage of adults or pharates, pupae and their exuviae and larvae. Samples were obtained using entomological nets for adults, and a standard surber net (mesh size 250 µm) for the benthos.

### **2.2 Methods**

Chironomidae individuals were mounted in Euparal and identified in the Research Laboratory: Biology, Eau et Environment (University 8 Mai 1945, Guelma, Algeria) on the basis of keys of morphological identification of Wiederholm<sup>19, 20, 21</sup>, the key to Italian species<sup>22</sup>, the key to Palaearctic pupae<sup>23</sup> and the key to male adults<sup>24</sup>.

## **3. RESULTS AND DISCUSSION**

Chironomid fauna was collected from 11 wetlands in the eastern Haut plateaux of Algeria. These wetlands, called chotts or sebkhas or saltlakes, are characterised by their high conductivity, except Garâet Timerganine which is characterized by its freshwater (conductivity: 1.04 mS/cm). Check list of chironomid species is recapitulated in table 2 with their corresponding frequencies.

A total number of 30 Chironomid taxa, mainly identified to specific level, has been recorded from eastern wetlands of algerian Hauts plateaux.

Compared to other thoroughly investigated standing waters in Algeria such as ponds located in Numidia in the northeastern Algeria<sup>11</sup>, the number of chironomids recorded from the eastern Hauts Plateaux is not very high. This is mainly due to the extreme chemical and physical conditions. In addition, these water bodies are particularly difficult to sample because of their huge size and the difficulty of access to these sites<sup>18</sup> and the majority of these environments dries very early in summer. Other works on salty waterbodies found similar results and explained this low chironomids species number to physiological stress due to the water chemistry<sup>25,26</sup>.

In these waterbodies, the Chironomidae fauna is represented by three subfamilies. The Chironominae dominate with 14 taxa (11 species, 47 %) divided between the tribes of Chironomini with (8 species, 30%) and Tanytarsini with 5 taxa (3 species, 17%). Chironominae are followed by the Orthocladiinae with 9 taxa (8 species, 30 %). The latter subfamily is restricted to the periphyton and submerged macrophytes. Tanypodinae contribute with 7 taxa (6 species, 23% only).

In the wetlands of the eastern Hauts plateaux four species of chironomids are new records to Algeria. These species are : *Ablabesmyia longistyla*, *Chironomus anthracinus*, *Microchironomus tener* and *Hydrobaenus olfa*.

*Microchironomus tener* was known to be the most abundant species in saline and alkaline waters<sup>26</sup>. This species represents in the eastern Haut plateaux wetlands 4.89% and appear to be perfectly tolerant to severe conditions inhabiting the sediment of oligotrophic and brackish to saline water.

*Hydrobaenus olfa* is a new species for science. It was described for the first time in this area on the basis of larval, pupa and adult specimens<sup>4</sup>. Indeed, the species is easily separated from all the other known species of the genus *Hydrobaenus* (Fries, 1830) because of the high number of anal macrosetae on anal lobe of pupa. This character state is actually unknown within all the known species of the *Hydrobaenus* group<sup>4</sup>. 86% of species were recorded to occur in Algeria, most of these species are palearctic elements<sup>27</sup>. *Cricotopus sylvestris* is much expanded species in Algeria and in this area is very abundant with a frequency of 15.57% of chironomids sampled. This species inhabit brackish water and occurred in most stagnant habitats living on submerged vegetation<sup>20, 28, 29</sup>.

*Cricotopus ornatus*, is the most abundant species in the eastern Hauts plateaux of Algeria with a frequency of 23.05%. It is also noted that this species is present in all sites sampled. This species have been registered in many studies as the only species in salty waters<sup>30</sup>.

The major factors limiting production of chironomids in the eastern Hauts plateaux appear to be depletion in food supplement especially for species feeding on macrophytes. It can be explained also by unfavourable sediment conditions due to physiological stress due to the water chemistry. Another ineligible action is predation by damselflies or waterbirds that nested in these waterbodies<sup>31, 32</sup>.

The most spacious wetlands are: Garâet Tarf, Garâet Guelif, Garâet Ank Djemel and Garâet Zemoul. Most of them remain hard to have access to due to lack of road infrastructure, surrounding mud of water bodies and their huge surface<sup>33</sup>.

Garaet Timerganine is a freshwater temporary waterbody, limited by a shallow meadow based on a halophilic vegetation. It is a freshwater lake (conductivity = 1.07 ms / cm), covered on a part of a dense palustre vegetation. This site located in the wetland complex of Oum El Bouaghi is the nesting site for several waterbirds of scientific importance: *Oxyura leucocephala*, *Aythya nyroca* and *Marmaronetta angustirostris*. Indeed, it has been designed Ramsar site. Concerning the chironomid fauna of this waterbody, it has been noted that species of chironomids are very close of those sampled and identified in the seasonal ponds of Numidia, a freshwater complex situated in the northeastern Algeria<sup>11</sup>. In fact, the same species have been found: *Xenopelopia falcigera*, *Chironomus plumosus*, *Procladius choreus*, *Cricotopus sylvestris*, *C. trifasciatus* and *Paratanytarsus mediterraneus*.

#### 4. CONCLUSION

Studies on Hauts plateaux wetlands remain few and knowledge on these sites are still highly insufficient due to the rarity of multi-disciplinary studies (ecology, climatology, Hydrology, geology, sociology, etc) <sup>33</sup>. Most of them are focused especially on ecology and behavior of waterbirds <sup>34,17</sup>. In fact, investigation on all biological resources in these areas exceptionally fragile is particularly important for the conservation of wetlands in Algeria.

#### 5. FIGURES AND TABLES

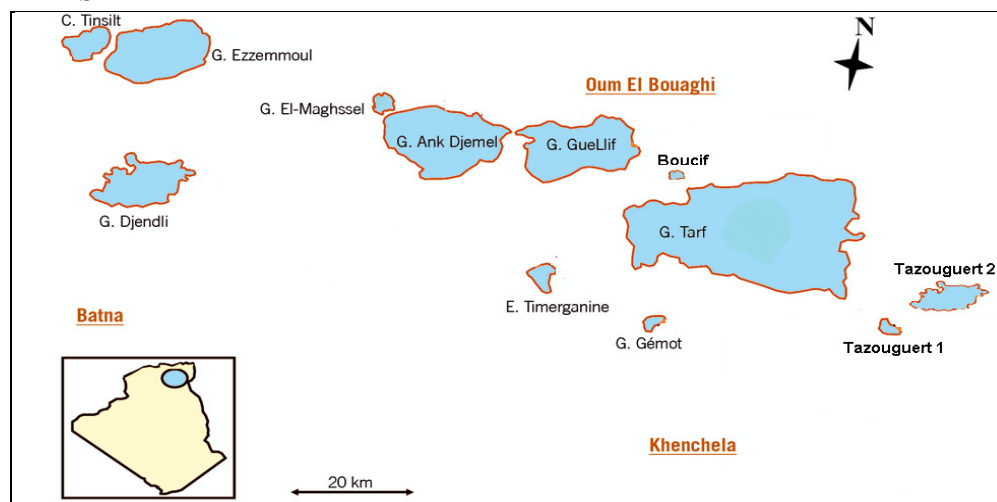


Figure 1: Wetland complex of the Hauts Plateaux of East Algeria.

	Wetlands	Geographic coordinates	Surface (ha)	Conductivity (mS/cm)	pH
01	Tazougert 1	35° 21' 04" N 7° 16' 04" E	164	109	7.8
02	Tazougert 2	35° 23' 77" N 7° 19' 92" E	1300	99	8
03	Garâet Guellif	35° 46' 31" N 6° 59' 10" E	24 000	160	8.1
04	Garâet Ank Djemel	35° 46' 28" N 6° 52' 00" E	18140	170.3	8.29
05	Chott Tinsilt	35° 53' 61" N 6° 28' 44" E	2154	38	7.49
06	Chott Timerganine	35° 39' 56" N 6° 57' 38" E	1460	1.04	7
07	Garâet Gemot	35° 38' 30" N 7° 00' 50" E	57	178.5	8.1
08	Garâet Boucif	35° 47' 21" N 7° 04' 99" E	175	59	8

09	Garâet Taref	35° 41' 11" N 7° 08' 00" E	33 000	183	8.4
10	Garâet El Maghsel	35° 49' 40" N 6° 46' 06" E	1000	158	7
11	Sebkhet Djendli	35° 42' 00" N 6° 31' 55" E	3700	29	8.6

**Table 1:** Characteristics of principle eastern Hauts plateaux wetlands sampled.

Species	Stations											%	
	1	2	3	4	5	6	7	8	9	10	11		
<b>Tanypodinae</b>													
Ablabesmyia longistyla * (Fittkau, 1962)	+	+					+						0.29
Ablabesmyia phatta (Egger, 1863)													1.17
Procladius choreus (Meigen, 1804)	+	+	+	+			+	+					9.20
Tanypus kraatzi (Kieffer, 1912)	+							+					0.58
Tanypus punctipennis (Meigen, 1818)	+												0.19
Xenopelopia sp.	+						+						0.29
Xenopelopia falcigera (Kieffer, 1911)	+						+						0.39
<b>Orthocladiinae</b>													
Cricotopus ornatus	+	+	+	+	+	+	+	+	+	+	+	+	23.05
Cricotopus sylvestris (Fabricius, 1794)	+	+	+				+	+	+				15.57
Cricotopus trifasciatus (Meigen, 1810)		+								+			0.58
Hydrobaenus olfa * *(Zerguine, 2010)					+								0.88
Limnophyes sp.		+								+			0.29
Psectrocladius limbatellus (Holmgren, 1869)	+	+											0.19
Psectrocladius obvius								+	+				0.19
Psectrocladius platypus (Edwards, 1929)	+							+					0.78
Psectrocladius sordidellus	+	+	+									+	6.95
<b>Chironominae</b>													
<b>Chironomini</b>													
Chironomus anthracinus *(Zetterstedt, 1860)	+								+				1.76
Chironomus plumosus (Linnaeus, 1758)	+	+	+	+			+	+		+	+		18.80
Chironomus riparius (Meigen, 1804)	+	+		+								+	2.05
Chironomus thumni (	+		+			+		+					2.05
Dicotendipes nervosus (Staeger, 1839)	+	+										+	0.78
Glyptotendipes barbipes (Staeger, 1839)	+	+									+		0.29
Glyptotendipes gripekoveni (Kieffer, 1913)	+	+									+		0.49
Microchironomus tener * (Kieffer, 1918)	+	+						+	+				4.89
Parachironomus sp.							+						0.20

Tanytarsini		
Cladotanytarsus mancus (Walker, 1856)		0.19
Paratanytarsus mediterraneus (Reiss & Sawedal, 1981)	+	0.29
Paratanytarsus sp	+	0.88
Tanytarsus fimbriatus	+	0.39
Tanytarsus sp.	+ + +	0.78

**Table 2:** Check list and frequencies of chironomids in the 11 stations sampled in the eastern Hauts plateaux of Algeria (1-11: numbering of stations in table 1, \*: species new to Algeria; \*\*: species new to science)

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