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Research Article

Faunistic analysis of mosquitoes (Diptera, Culicidae) in Teruel Province (Northeastern Spain)

Abstract

Intensive samplings for mosquito larvae were conducted between June and October 2014 in the main representative wetlands of the Teruel province (Northeastern Spain). All water bodies listed in the Inventory of Protected Wetlands from Aragón belonging to the study area, as well as also other fluvial environments, fountains, ponds, streams and reservoirs that had optimal conditions for the development of these dipterans were visited. A total of 2.329 mosquito larval exemplars belonging to 18 species were collected. It is important to note that 4 of these species (*Anopheles plumbeus, Ochlerotatus geniculatus, Culex laticinctus* and *Culex mimeticus*) are first recorded in the study area. The main bio ecological aspects of recorded species and the epidemiological interest of those mosquitoes are briefly discussed in the text.

Introduction

Mosquitoes are considered the most important disease vectors of the world, being necessary their haematophagic participation in natural transmission cycle of parasitoses like malaria or arboviruses like dengue. In current framework of global changes (climatic change, globalization, biodiversity loss, habitat degradation, deforestation, etc.), the analysis of vector presence and distribution is essential to infer about potential local scenarios of diseases transmissions. After malaria eradication at the beginnings of 60's, faunistical, phenological and bio ecological studies about mosquitos have been dramatically decreased.

From the 64 mosquitoes species detected in Spain, 23 have been cited in Teruel Province; namely: *Anopheles algeriensis* Theobald, 1903, *Anopheles atroparvus* Van Thiel 1927, *Anopheles claviger* (Meigen, 1804), *Anopheles hyrcanus* (Pallas, 1771), *Anopheles maculipennis* Meigen, 1818, *Anopheles petragnani* Del Vecchio, 1939, *Aedes vexans* (Meigen, 1830), *Ochlerotatus echinus* Edwards, 1920, *Ochlerotatus caspius* (Pallas, 1771), *Ochlerotatus flavescens* (Muller, 1764), *Ochlerotatus punctor* (Kirby 1837), *Culex modestus* Ficalbi 1889, *Culex pipiens* (Linnaeus, 1758), *Culex theileri* Theobald, 1903, *Culex hortensis* Ficalbi, 1889, *Culex impudicus* Ficalbi, 1890, *Culex territans* Walker, 1856, *Culiseta longiareolata* (Macquart, 1838), *Culiseta fumipennis* (Stephens, 1825), *Culiseta annulata* (Schrank, 1776), *Culiseta subochrea* (Edwards, 1921), *Coquilletidia richiardii* (Ficalbi, 1899) and *Uranotaenia unguiculata* Edwards, 1913 [1], and date back more than 60 years. Consequently an update of the information linked to the culicid fauna in Teruel Province is very appropriate nowadays.

Materials and Methods

A planning of sampling visits was designed in representative water bodies of Teruel Province to collect mosquito's larvae between June and October 2014. Margin rivers and streams, lagoons, reservoirs, ponds and irrigation channels were prospected in the whole study area. Specifically, the mosquitoes search was enhanced in 24 protected wetlands declared by the Regional Government of the Region. Additionally, due to the potential impact of the study for human health other urban and periurban mosquitoes breeding sites like ornamental fountains or domestic containers were sampled.

In general terms we sampled suitable larval sites using the standard dipping method [2]. For small larval habitats such as tree holes or small containers, the sampling was done by emptying or pipetting the contents for immature stages. The sampling effort was fixed at 10 min, which included the active search for larvae in each biotope visited [3]. Mosquitoes were identified according to taxonomic criteria of Schaffner et al. [4].

Results and discussion

A total of 2.379 larval exemplars belonging to 18 species (Table 1) were collected and identified. Sampling points were widely distributed in urban, rural, and wild environments of the study area (Figure 1).

Citation: Bueno-Marí R (2017) Faunistic analysis of mosquitoes (Diptera, Culicidae) in Teruel Province (Northeastern Spain). Glob J Zool 2(1): 021-023.

According to our data and the information from a sampling campaign of 5 months, we can indicate that Teruel Province still show a high diversity of mosquitoes species. This is not surprising and one of the explanations can be associated with the low degree of anthropization in the region, since is one of the peninsular territories where landscapes have been best preserved. With some exceptions, most of the wetlands display similar characteristics that decades ago so the impact on mosquitoes fauna could be lower than other coastal regions of Spain [5].

Table 1: Species identified and exemplars collected.

Species	Exemplars
Anopheles atroparvus Van Thiel 1927	339
Anopheles claviger (Meigen, 1804)	43
Anopheles maculipennis Meigen, 1818	112
Anopheles petragnani Del Vecchio, 1939	122
Anopheles plumbeus Stephens, 1828	15
Ochlerotatus caspius (Pallas, 1771)	66
Ochlerotatus echinus Edwards, 1920	38
Ochlerotatus geniculatus (Olivier, 1781)	21
Culex theileri Theobald, 1903	65
Culex mimeticus Noè, 1899	46
Culex pipiens (Linnaeus, 1758)	447
Culex laticinctus Edwards, 1913	13
Culex hortensis Ficalbi, 1889	381
Culex impudicus Ficalbi, 1890	49
Culex territans Walker, 1856	181
Culiseta longiareolata (Macquart, 1838)	285
Culiseta annulata (Schrank, 1776)	75
Culiseta subochrea (Edwards, 1921)	31

In epidemiological terms, the finding of 5 anophelines species is remarkable from the point of view of hypothetical malaria transmission. Among these potential malaria vectors, we can highlight the records of *An. atroparvus*. This species was considered the most important vector of the disease in the past, not only in Spain but also in numerous areas of Europe. It is important to note that *An. atroparvus* is suspected of being the vector of an autochthonous case of *Plamodium vivax*, which occurred in Northern Spain (Aragon Region, close to study area of this research) in 2010 [6,7]. At the end of the XIX Century, An. atroparvus was probably involved in the epidemic episodes of malaria that occurred in towns surrounding wetlands surveyed in our study, like Gallocanta or Cañizar lagoons.

Regarding to *An. claviger*, *An. maculipennis* and *An. petragnani*, these species have a minor role in malaria dissemination, since are zoophylic species that tend to proliferate in wild environments far from human settlements. Nevertheless, *An. claviger* and *An. maculipennis* have been also incriminated in isolated cases of malaria transmission in Eastern Mediterranean countries [8,9]. Finally *An. plumbeus* is also a notable malaria vector mainly in association to forest areas where the species can breed in tree holes or cavities water filled [10].

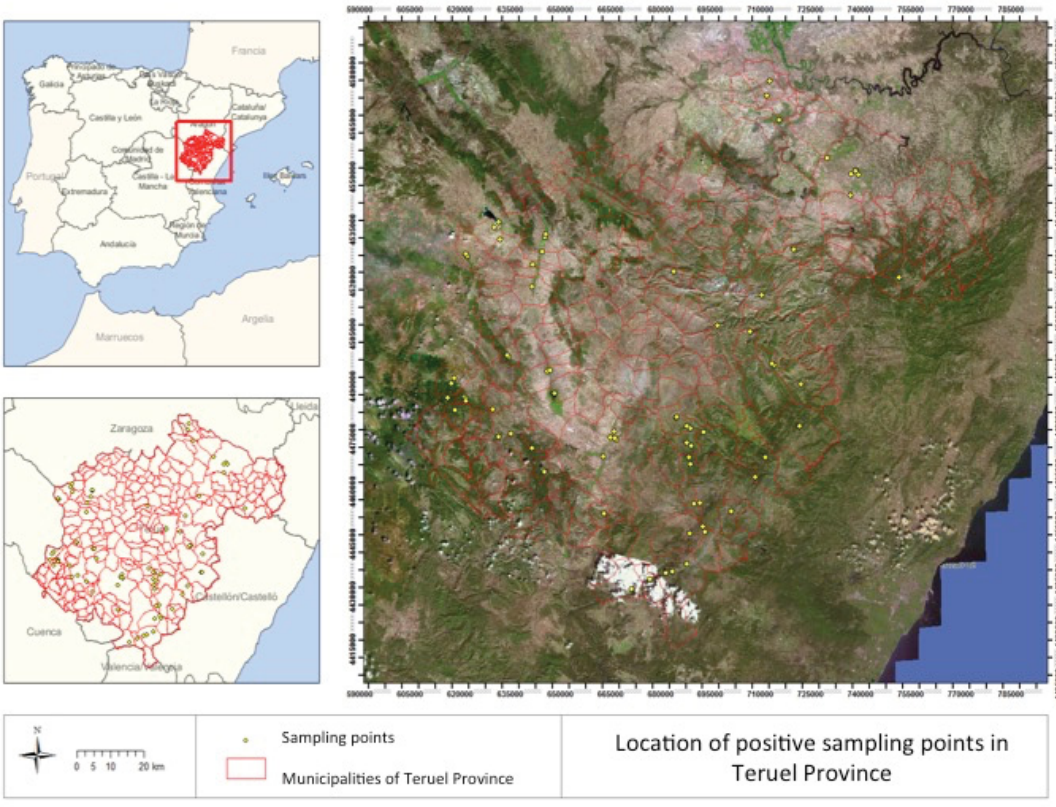

Figure 1: Situation of the study area and geolocalization of breeding sites sampled.

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In reference to potential mosquito problems in urban environments, only *Cx. pipiens* can protagonize occasional and low impact episodes of citizen complaints. Is the unique species found at urban level with enough degree of anthropophily to cause incidences linked to bites on humans. Other common species in these anthropized environments is *Cs. longiareolata*. However Cs. longiareolata is not considered as a target species in mosquito control programmes due to its ornitophilic tendency. We must emphasize that the Asian tiger mosquito, *Aedes albopictus* (Skuse, 1894), was not found in our study. This urban, exotic and invasive mosquito has been recently detected for first time in Teruel Province, specifically in a couple in municipalities in the northeast of the region [11]. Moreover, some attention should be paid for confirmed breeding sites of *Oc. caspius* in lagoon systems and other flooding areas placed in the vicinity of human settlements. This species show a strong anthropophily, being an aggressive mosquito during daylight hours and can migrate big distances (even more than 10 kilometers) in search of optimal hosts for blood feeding. Consequently *Oc. caspius* is well known as a focal species in mosquito control programmes conducted in all Mediterranean countries.

In conclusion, the entomological surveillance of native and exotic mosquitoes should be a priority for the study area in next years. Four species (*Anopheles plumbeus*, *Ochlerotatus geniculatus*, *Culex laticinctus* and *Culex mimeticus*) that are potential vectors of several parasites and virus have been first recorded in the Province. Moreover the recent detection of *Ae. albopictus* and current global context of worlwide increasing incidence of urban arboviruses like dengue, zika or chikungunya must sensitize to Public Administration about the convenience of the implementation of an entomological surveillance network that can act as an early warning system for mosquito borne diseases.

(Appendix 1)

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