

SHORT COMMUNICATION

Presence of *Culex tritaeniorhynchus* (Diptera: Culicidae) in rice fields of Western Greece

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Summary The presence of the mosquito *Culex tritaeniorhynchus* was recorded in large numbers in rice in Western Greece for 6 consecutive years (2008-2013). As only few specimens were previously collected in Attica in 2003 and the mosquito is a potential vector of pathogens which cause human diseases, the importance of this species for the emergence of these diseases in Europe is discussed.

The mosquito species *Culex tritaeniorhynchus* Giles is part of the *Culex vishnui* subgroup, which also includes *Culex pseudovishnui* Collless and *Cx. vishnui* Theobald (Toma *et al.*, 2000). It is widely distributed throughout the Oriental region extending into the Middle East, the Mediterranean and Afrotropical region, China, Russia, Japan, Korea, Micronesia and Indonesia (Lee *et al.*, 1989). It has also been recorded in Angola, Cameroon, Central African Republic, Egypt, Gabon, Gambia, Ghana, India, Iran, Iraq, Israel, Jordan, Kenya, Lebanon, Maldives Islands, Mozambique, Nigeria, Saudi Arabia, Senegal, Sri Lanka, Syria, Tanzania, Togo, Turkey, Turkmenistan (Walter Reed Biosystematics Unit). In Europe, *Cx. tritaeniorhynchus* has been reported in Albania (Danielová and Adhami, 1960; Adhami, 1987; Samanidou and Harbach, 2003) and it was first recorded in Greece in 2003 from samples which were taken from a coastal marsh in the area of Marathon, Prefecture of Attica (Fig. 1) (Samanidou and Harbach, 2003).

This is the first record of *Cx. tritaeniorhynchus* in agricultural land in Greece and the second reference in the country. Moreover, it is the first time that large numbers of this mosquito species are recorded in

Greece for 6 consecutive years (2008-2013) as the previous report concerns only a few specimens (Samanidou and Harbach, 2003).

Specimens of *Cx. tritaeniorhynchus* were obtained through samplings which were conducted at an organic irrigated rice field for a research study on the mosquito fauna throughout the growing season. The size of the sampling field was approximately 8 ha. The rice field was located in a rural area close to the Delta of Acheloos river ($38^{\circ}20'20''N$, $21^{\circ}15'06''E$) in the Prefecture of Aitoloakarnania, Western Greece, where a total of 1,500 ha of rice fields exist (Fig. 1). The samplings were performed every 10 days during the rice cultivation period (between June and September) in the years 2009, 2010 and 2011, whereas they were conducted monthly during the same period in 2008, 2012 and 2013.

Twenty samples of larvae and pupae were taken using a standard larval dipper (350 ml, 13 cm diameter) with an elongated handle (BioQuip, Rancho Dominguez, CA). The samples were transferred to the laboratory in the Agricultural University of Athens, where mosquito larvae and pupae were counted and reared to adults in a rearing room at 25-26°C. Adults were collected every day, killed in killing boxes using ethyl acetate and pinned on paper points. The mosquitoes were then identified to species by the authors using taxonomic keys (DuBose

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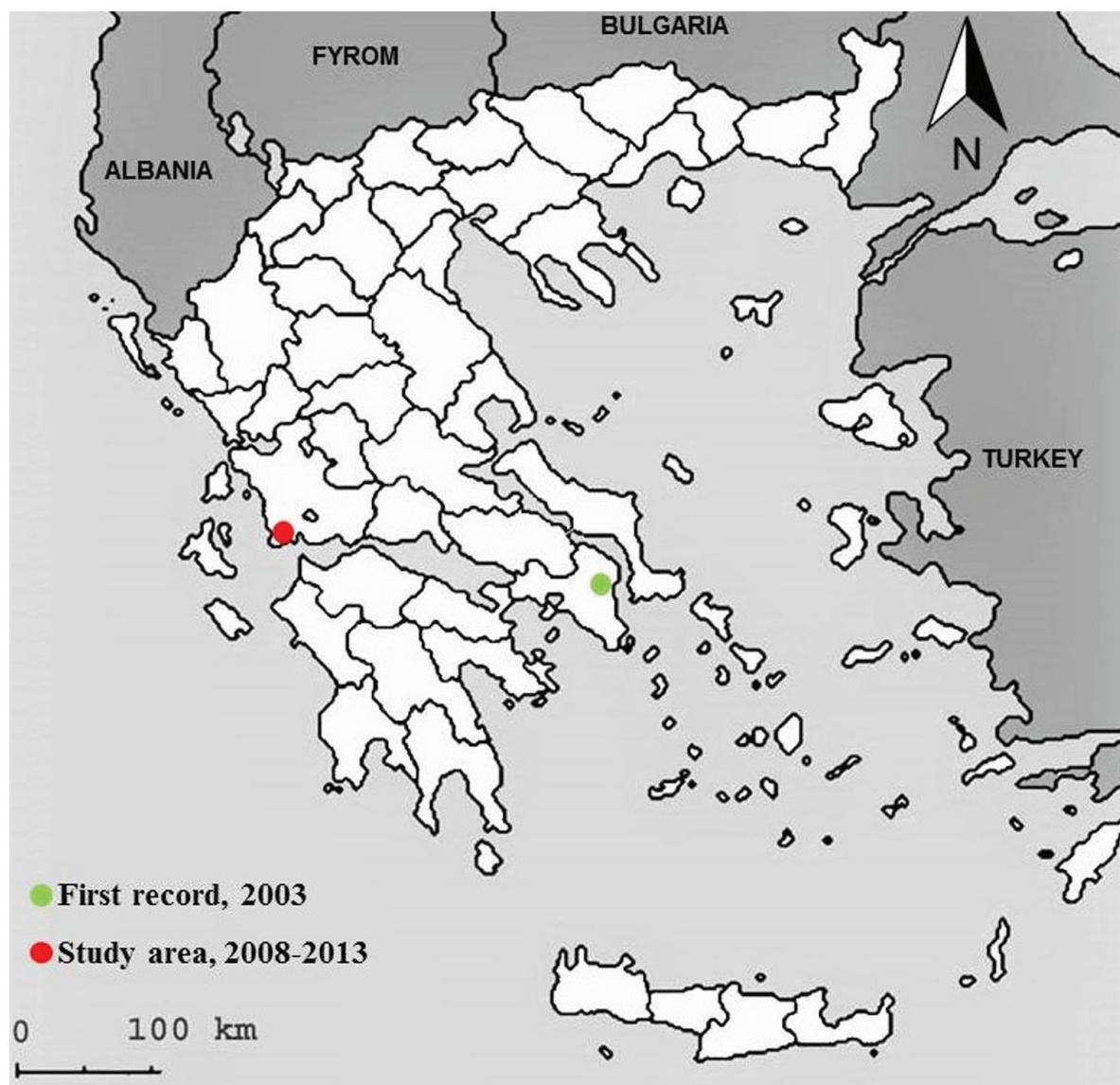


Figure 1. Areas where *Culex tritaeniorhynchus* has been recorded in Greece: Marathon, Prefecture of Attica in 2003 (first report); Delta of Acheloos River, Prefecture of Aitoloakarnania from 2008 to 2013.

and Curtin, 1965; Harbach, 1985; Samanidou and Harbach, 2003; Becker *et al.*, 2010).

Culex tritaeniorhynchus was permanently present in large numbers in the samples, ranging from 125 to 198 individuals per sampling (adults derived after the immature rearing). *Culex tritaeniorhynchus* is recorded for the first time in Aitoloakarnania, Western Greece. Although there is a severe nuisance from mosquitoes in this area, available data for the mosquito species that breed in these rice fields are lacking and no relevant control programs have been conducted for decades.

These findings are important because

Cx. tritaeniorhynchus is a potential vector of pathogens that cause human diseases. It is the primary vector of Japanese encephalitis (JE) in southern Asia and has also been found infected with Dengue, Rift Valley fever, Sindbis, Getah and Tembusu viruses, and microfilariae of both *Brugia malayi* and *Wuchereria bancrofti*, in many areas of eastern and southeastern Asia (Lacey and Lacey, 1990). The females of *Cx. tritaeniorhynchus* feed primarily on domestic animals such as cattle and pigs, but will bite man in their absence (Bram, 1967). They mainly bite outdoors between sunset and midnight, but may enter in cattle sheds and dwellings and

bite man during any time of the night (Gutsovich *et al.*, 1974; Sirivanakarn, 1976). The larvae of *Cx. tritaeniorhynchus* can be found in various temporary and permanent ground water habitats that are sunlit and contain vegetation such as ground pools, streams, swamps, shallow marshes, irrigation ditches, rice fields, and animal hoof prints (Bram, 1967; Harbach, 1988).

Taking these data into account, the rural area close to the Delta of Acheloos river with almost 7,000 residents, large surface area of rice fields and farms of cows and pigs could be under a potential threat of JE emergence. JE is the leading cause of viral encephalitis in South East Asia, being endemic in India, China, and Japan and all of South East Asia (Das, 2013). It is largely restricted to rural settings (Self *et al.*, 1973; Solomon *et al.*, 2000) and the incidence of pigs and marsh birds is crucial in the etiology of JE, as the virus is carried by birds and amplified by pigs (Broom *et al.*, 2003). The management of paddy water strongly influences the transmission of JE (Keiser *et al.*, 2005). The establishment of Japanese encephalitis virus (JEV) in new ecosystems outside of its current range is difficult (van den Hurk *et al.*, 2009). However, with the spread of JEV into the Indian sub-continent, other destinations served by frequent routes of commerce or passenger air travel (Africa and Europe) also could be at risk (Weaver and Reisen, 2010).

The present record indicates also the urgent need of further investigation about the presence of *Cx. tritaeniorhynchus* in other regions of Greece. The risk for the introduction and installation in Greece and Europe of the diseases that this species can transmit should be taken into consideration by the local authorities in order to establish effective control programs against mosquitoes.

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ΣΥΝΤΟΜΗ ΑΝΑΚΟΙΝΩΣΗ

Παρουσία του είδους *Culex tritaeniorhynchus* (Diptera: Culicidae) σε ορυζώνες της Ελλάδας

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Περίληψη Το είδος *Culex tritaeniorhynchus* καταγράφηκε σε υψηλές πληθυσμιακές πυκνότητες σε ορυζώνα στη δυτική Ελλάδα για 6 συνεχόμενα έτη (2008-2013). Δεδομένου ότι ελάχιστα άτομα του είδους αυτού είχαν στο παρελθόν συλλεγεί στην Αττική (2003) και ότι το κουνούπι αυτό αποτελεί δυνητικό φορέα παθογόνων για τον άνθρωπο, αξιολογείται η σημασία του είδους για την πιθανή εμφάνιση των ασθενειών αυτών στην Ευρώπη.

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