SHORT COMMUNICATION

Records of Aedes albopictus and Aedes cretinus (Diptera: Culicidae) in Greece from 2009 to 2011

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Summary Aedes (Stegomyia) albopictus, an invasive mosquito species of great medical importance, was first recorded in Athens, Greece, in 2008. Its presence raised awareness among people and as a consequence numerous “tiger-like” mosquito specimens were sent to Benaki Phytopathological Institute for identification and relevant information. The results of the adult mosquito specimens, collected for three years (2009-2011), revealed that Aedes albopictus occurs in many municipalities around Athens, in Attica Prefecture, and in many parts of the country. The mosquito samples confirmed also the presence of the native species Aedes (Stegomyia) cretinus. Our data, based on people awareness and annoyance, suggest the need to implement appropriate surveillance programs for monitoring the presence and population densities of Stegomyia mosquitoes in the frame of an integrated mosquito control program.

Additional key words: Aedes albopictus, Aedes cretinus, Attica, Greece, Stegomyia

The Asian tiger mosquito Aedes (Stegomyia) albopictus (Skuse 1894) is a species native to tropical and subtropical regions of South-East Asia, which has undergone an astonishing expansion of its range within the last few decades (3, 9). The international trade of used tires has primarily facilitated Ae. albopictus spread around the world via transportation of its eggs (14).

In Europe, it was recorded for the first time in Albania in 1979 (1). Ever since the species has been reported in 11 other countries, including Italy (1990), France (2000), Switzerland (2003), Spain (2004), Croatia (2004) and the Netherlands (2005) (24), with Italy to be considered the most heavily infested European country nowadays (8).

The geographic position and climatic conditions of Greece have been considered highly suitable for a potential invasion and establishment of Asian tiger mosquito (15, 18). Hence, Aedes albopictus was first detected in Greece in the North-western part of the country near Albania and Italy in the Prefectures of Thesprotia and Corfu in 2003 (22). Subsequently, it was found in northern Greece in the Prefecture of Serres in 2007 (25) and the following year in central-west Greece in Aitolokarnania Prefecture (16).

Aedes albopictus is an anthropophilic species that causes serious nuisance problems and can play an important role in the transmission of a wide range of human pathogens. This mosquito is a laboratory-competent vector of at least 22 arboviruses, notably Dengue virus, the most important arboviral disease in humans (13). The recent cases of autochthonous transmission of
Dengue in France (2010) and Croatia (2010) and Chikungunya virus in Italy (2007) and France (2010) justify the awareness of *Ae. albopictus* related potential risk for introduction and spread of serious diseases in continental Europe (11, 12, 17, 19).

The presence of *Ae. albopictus* in the capital of Greece, Athens, was confirmed for the first time in 2008 from mosquito specimens originated from the Rizoupoli area in Municipality of Athens (16). After the media announcement on finding this invasive mosquito in Athens, and the description of its medical importance, the public awareness in Greece was raised resulting in more than 100 specimens of “tiger-like” adult mosquitoes, which have been sent to Benaki Phytopathological Institute (BPI) for identification within the following three years (2009-2011). Most of these specimens were sent to BPI by civilians, pest control companies or official authorities with the note for “aggressive day-time biting mosquitoes”.

The majority of the specimens were mosquitoes of subgenus *Stegomyia* (Diptera: Culicidae) although other mosquito species or mosquito resembling dipterous insects (e.g. Tipulidae, Chironomidae) were also recorded. Mosquito species identification was performed using appropriate dichotomous keys (6, 20). Most mosquito samples were identified as *Ae. albopictus*, whereas some of them belonged to the indigenous *Aedes* (*Stegomyia*) *cretinus*. This species is closely related to *Ae. albopictus* and has a limited distribution across the world (Greece, Cyprus, Georgia and Turkey) (2, 7). In Greece, it has been reported to exist in Crete, Macedonia and some parts of Attica (21). *Aedes cretinus* is described as an aggressive day-time biting mosquito causing considerable irritation to humans (7, 21). It is a container-breeding mosquito but little appears to be known about its biology (2).

For all the specimens an official answer was produced by the BPI experts or advisory services via telephone communication were provided, including a synopsis of the biology of the identified species, medical importance and appropriate protection measures especially for *Ae. albopictus*.

Herein, we review the results of records of *Ae. albopictus* and *Ae. cretinus* in Greece based on samples sent to BPI during a 3-year period (2009-2011). The results were recorded on maps referring to the specimen incidence and the origin sites for both *Stegomyia* species in chronological order for Attica Prefecture and in the rest Prefectures of Greece, indicating the first records. The administrative units, either municipalities of Attica or Prefectures of Greece, where samples came from, were color marked in the aforementioned maps, even in case of single mosquito specimens. We consider that information about the presence of *Stegomyia*, especially for *Ae. albopictus*, although limited, is very important for the committees of Municipalities and Prefectures, which are mainly responsible for the regional mosquito management programs in Greece. In Figure 1 the first specimen of *Ae. albopictus* in 2008 is also presented and mentioned as “first point”.

In a total of 76 *Stegomyia* specimens, 71 were in good condition for identification and had been sent from 35 Municipalities of the Attica Prefecture (including Municipality of Athens). During the 3-years period, *Ae. albopictus* was found in 24 Municipalities, which are located mainly in central and south-east part of Attica. *Aedes cretinus* adults were collected from 15 Municipalities located primarily in central and northern areas of Attica, while in 4 cases (localities) both *Stegomyia* species were present. Overall, *Ae. albopictus* was recorded from 7 Municipalities in 2009, 11 in 2010 and 13 in 2011. According to Figure 1, its presence was recorded for the first time in 6, 8 and 9 different Municipalities in the years 2009, 2010 and 2011, respectively. Accordingly, *Ae. cretinus* specimens were sent in a total of 12 Municipalities in 2009, 8 in 2010 and only 2 in 2011, while first reports of this species were declining (11 in 2009, 3 in 2010 and only 1 in 2011) (Figure 2).

With regards to the rest of Greece, a total of 35 *Stegomyia* specimens were collected from 15 out of 52 Prefectures, during the 3-years period, mostly from southern Greece (Peloponnese and Crete) and the northern parts of the country (Macedonia). Overall,
Figure 1. Municipalities* of Attica where *Ae. albopictus* was first reported over a 3-year period (2009-2011). The first specimen of *Ae. albopictus* in 2008 is also presented and mentioned as “first point”.

*Municipalities are displayed according to the Greek administrative unit system until 2010.

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Figure 2. Municipalities* of Attica where *Ae. retinus* was first reported over a 3-year period (2009-2011).

*Municipalities are displayed according to the Greek administrative unit system until 2010.
Ae. albopictus and Ae. cretinus adults were recorded from 8 Prefectures each. *Aedes albopictus* specimens were sent from 5 Prefectures in 2009 and 2010 and 2 in 2011. *Aedes cretinus* was detected in 6 Prefectures in 2009, 2 in 2010 and 2 in 2011. Figures 3 and 4 show that *Ae. albopictus* was first found in 4 and 3 Prefectures, while *Ae. cretinus* was first found in 5 and 1 Prefectures for the years 2009 and 2010, respectively. In 2011, there was no first record of *Ae. albopictus*, whereas *Ae. cretinus* was recorded for the first time in

![Map of Greece showing the distribution of Ae. albopictus](image)

**Figure 3.** Prefectures* of Greece where *Ae. albopictus* was first reported over a 3-year period (2009-2011). Previous literature reports, concerning *Ae. albopictus* presence, are also presented for 2003, 2007 and 2008.

*Prefectures are displayed according to the Greek administrative unit system until 2010.

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Prefecture. In Figure 3, except the records for the 3-year period, previous literature reports concerning *Ae. albopictus* presence are also presented (2003, 2007 and 2008).

Our results revealed that 8 years after the first detection of *Ae. albopictus* in northwestern Greece, this species is present in many parts of the country and in many suburbs in and around Athens, where almost half of the population of Greece live. The current review of *Ae. albopictus* and *Ae. cretinus* samples in Greece, based on people awareness and annoyance, indicates the presence of these two *Stegomyia* species and com-

**Figure 4.** Prefectures* of Greece where *Ae. cretinus* was first reported over a 3-year period (2009-2011).

*Prefectures are displayed according to the Greek administrative unit system until 2010.*
prises useful information while organizing mosquito surveys. Although it is generally believed that the public awareness may result in exaggeration, fear and unreasonable reactions and behavior, we also have to take into account that members of the public can also be a great source of information by reporting new invasions, recording phenomenological changes associated with invasions or disease outbreaks, and finally can participate in management efforts (5).

A recent mosquito surveillance in Athens, using ovitraps, verified the presence of both Stegomyia species and revealed that Aedes albopictus has currently developed considerably high populations, displaying a trend of increase over time, in the urban environment of the Greek capital city (10). Moreover, the co-occurrence of Aedes albopictus and Aedes cretinus, mainly in some Municipalities of Attica, arises the need for a better study on the biology of Aedes cretinus and suggests the implementation of surveillance programmes using ovitraps and other surveillance methods in order to investigate the population dynamics of each species and the possible interspecific competitive interactions.

Surveillance programs will be also useful to prevent the introduction and establishment of other invasive container-breeding Aedes species with medical importance such as Aedes aegypti, Aedes japonicus, Aedes atropalpus, Aedes koreicus and Aedes triseriatus. These species have been reported the recent years as introduced into various European countries (4, 23).

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ΣΥΝΤΟΜΗ ΑΝΑΚΟΙΝΩΣΗ

Στοιχεία της παρουσίας των *Aedes albopictus* και *Aedes cretinus* (Diptera: Culicidae) στην Ελλάδα για την τριετία 2009-2011

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Περιλήψη Το *Aedes (Stegomyia) albopictus* είναι ένα επεκτατικό είδος κουνουπιού με μεγάλη υγειονομική σημασία, του οποίου η παρουσία καταγράφηκε για πρώτη φορά στην Αθήνα το 2008. Τα επόμενα 3 έτη (2009-2011) πολυάριθμα δείγματα κουνουπιών από την Αττική και την Ελλάδα γενικότερα εστάλησαν στο Μπενάκειο Φυτοπαθολογικό Ινστιτούτο προς αναγνώριση και παροχή σχετικών πληροφοριών, ως αποτέλεσμα της όχλησης των κατοίκων ορισμένων περιοχών καθώς και της ανησυχίας που προκλήθηκε από την παρουσία και υγειονομική σημασία του συγκεκριμένου είδους κουνουπιού. Από την εργαστηριακή εξέταση των δειγμάτων προέκυψε ότι το *Ae. albopictus* δραστηριοποιείται σε αρκετούς Νομούς της χώρας και Δήμους της Αττικής. Επιπλέον, επιβεβαιώθηκε η παρουσία και του συγγενούς είδους κουνουπιού *Aedes cretinus*. Αν και τα δεδομένα βασίζονται κυρίως σε δείγματα πολιτών, καταδεικνύουν την ανάγκη εφαρμογής κατάλληλων μεθόδων μελέτης της παρουσίας των συγκεκριμένων ειδών στα πλαίσια της ολοκληρωμένης αντιμετώπισης του γενικότερου προβλήματος των κουνουπιών.