

First detection of *Aedes albopictus* (Diptera: Culicidae) in the Balearic Islands (Spain) and assessment of its establishment according to the ECDC guidelines

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Abstract: The Asian tiger mosquito, *Aedes (Stegomyia) albopictus* is an invasive mosquito species of major concern to public health because of its vector role in transmission of several pathogens of human and animal health importance. This species was first detected in Europe (Albania) in 1979. Since then, at least eighteen additional European countries have reported its presence. In 2004, this mosquito was detected for the first time in Spain (Catalonia). Here we report, for the first time, the presence and establishment of *Ae. albopictus* on the island of Majorca (Balearic Islands, Spain). However, the introduction pathway of this species in Majorca has not yet been identified. The prompt surveillance programme implemented according to the guidelines of the European Centre for Disease Prevention and Control (ECDC) rapidly permitted a determination of the expansion of *Ae. albopictus* on the island. The information obtained from this study might be useful to plan mosquito control measures avoiding the spread of this vector species to the entire island. *Journal of the European Mosquito Control Association* 31: 8-11, 2013

Keywords: *Aedes albopictus*, ECDC guidelines, first detection, invasive mosquito, Majorca, Spain, tiger mosquito

Introduction

Aedes (Stegomyia) albopictus (Skuse, 1894) (Diptera; Culicidae) -commonly known as the Asian tiger mosquito- is an invasive exotic mosquito recognised as an important vector of dengue and chikungunya viruses in tropical and temperate regions worldwide (Mitchell, 1995; Gratz, 2004; Eritja *et al.*, 2005; Renault *et al.*, 2007; Kumar *et al.*, 2008; La Ruche *et al.*, 2010). Trading of goods (e.g. used tyres (Knudsen, 1995) and lucky bamboo (*Dracaena* spp.) (Madon *et al.*, 2002; Scholte *et al.*, 2008)) have facilitated the global spread of this species by the transport of its drought-resistant eggs (Reiter & Sprenger, 1987; ECDC, 2012). The abundance and variety of suitable oviposition sites (buckets, vases, drums, etc.) in urban and peri-urban areas facilitate the spread of this mosquito species and hampers control measures once it colonises a new area.

In Europe, *Ae. albopictus* has been established in 15 countries, including Italy, France and Spain. It has also been detected in several other countries such as Belgium, Germany, and the Netherlands (ECDC, 2012). The first detection of *Ae. albopictus* in Spain was reported in Catalonia in 2004 (Sant Cugat del Vallés) (Aranda *et al.*, 2006). Since then it has spread across the east coast of the Iberian Peninsula, being reported in Orihuela and Torreveja (Alicante) in 2006 and 2009 respectively (Roiz *et al.*, 2007; Delacour *et al.*, 2009; Bueno-Marí *et al.*, 2010); in Benicàssim (Castellón) in 2010 (Delacour *et al.*, 2010) and in Murcia in 2011 (Collantes & Delgado, 2011). This paper reports, for the first time, the presence and spread of *Ae. albopictus* in Majorca (Balearic Islands, Spain).

Methods and Results

On 19th September 2012, a resident of the municipality of Bunyola (Ca's Binissalemer, 39°39'28.89"N; 2°42'04.22"E) collected and sent to the Laboratory of Zoology at the University of the Balearic Islands (UIB) four mosquitoes that were identified as *Ae. albopictus* according to the identification key provided by Schaffner *et al.* (2001). Immediately after this

finding (September 20th), two CO₂-baited traps (Miniature CDC) and 20 oviposition traps (consisting of 250 ml black buckets half filled with chlorinated tap water and in which a 3 x 12 cm piece of carved wood was added) were placed in the same residential area of Ca's Binissalemer (Bunyola municipality) to enable rapid surveillance. The model of trap used, location and procedures for sampling was conducted according to the ECDC guidelines (ECDC, 2012). On September 21st, 20 new ovitraps were placed in three additional municipalities (Palma, Esporles and Marratxí) covering a radius of 4 km from the detected focus. During the first visit to the ovitraps (after one week: 28/09/2012) two municipalities (Bunyola and Esporles) were confirmed positive for the presence of eggs of *Ae. albopictus* (Figure 1). On September 28th, 70 additional ovitraps were employed, covering five municipalities (Calvià municipality was added to the network) with a total of 135 ovitraps. After two weeks (12/10/2012), all sampled municipalities were positive for the presence of *Ae. albopictus*. During the present study, the detected expansion of this mosquito species on the island of Majorca was close to 85 km². The municipality of Bunyola - where the first adults were found - had the highest ratio eggs/ovitraps (10.7), followed by the municipalities of Palma and Marratxí (9.4 and 4.6 respectively). The lowest ratio was found in the municipalities of Calvià and Esporles (1.8 and 1.2 respectively) (Figure 1). Thanks to the collaboration of 37 Biology students that placed ovitraps at their residences, on October 18th, the surveillance network was further enlarged to 21 municipalities with 294 ovitraps. Trap analysis until November 11th 2012 confirmed the presence of *Ae. albopictus* in only five out of the 21 municipalities sampled (Figure 2). Bunyola and Palma had the highest mosquito abundance according to the ratio eggs/ovitraps (5.2 and 3.1 respectively) followed by Marratxí, Calvià and Esporles (1.1, 0.4 and 0.3 respectively) (Table 1).

Despite the national sampling project implemented since 2009 at the maritime port and at the airport of Palma, *Ae.*

albopictus was first detected in Majorca more than 20 km away from these potential point of entries demonstrating the difficulty of the early detection of invasive mosquito species. Specifically, sampling was performed weekly from April to

July, as well as from September to October each year by using ovitraps and CO₂/odour-baited traps (BG-Sentinel and Miniature CDC traps). Results were negative during these years in all of the traps deployed. Consequently, the pathway(s) of introduction of this invasive mosquito on the island remains unknown.

Table 1. List of municipalities where ovitraps were deployed, indicating number of traps and samplings conducted and number of *Ae. albopictus* eggs detected between September and December 2012

Municipality	Number of Ovitrap	Number of Samplings	Analysed Samples	Number of Positive Traps	Cumulative Number of Eggs
Algaida	5	1	5	0	0
Andratx	10	3	18	0	0
Búger	5	3	14	0	0
Bunyola	60	7	268	57	1373
Calvià	13	6	47	1	18
Capdepera	10	3	19	0	0
Consell	8	3	14	0	0
Esporles	15	7	49	3	16
Lloret de Vistalegre	5	2	10	0	0
Lloseta	5	1	5	0	0
Manacor	5	3	15	0	0
Mancor de la Vall	5	2	10	0	0
Marratxí	35	7	122	6	130
Montuïri	5	3	15	0	0
Palma	74	7	210	31	656
Petra	5	1	3	0	0
Pollença	5	2	10	0	0
Puigpunyent	5	1	5	0	0
Sencelles	5	1	5	0	0
Son Servera	9	3	20	0	0
Valldemossa	5	1	5	0	0
Total	294	67	869	98	2193

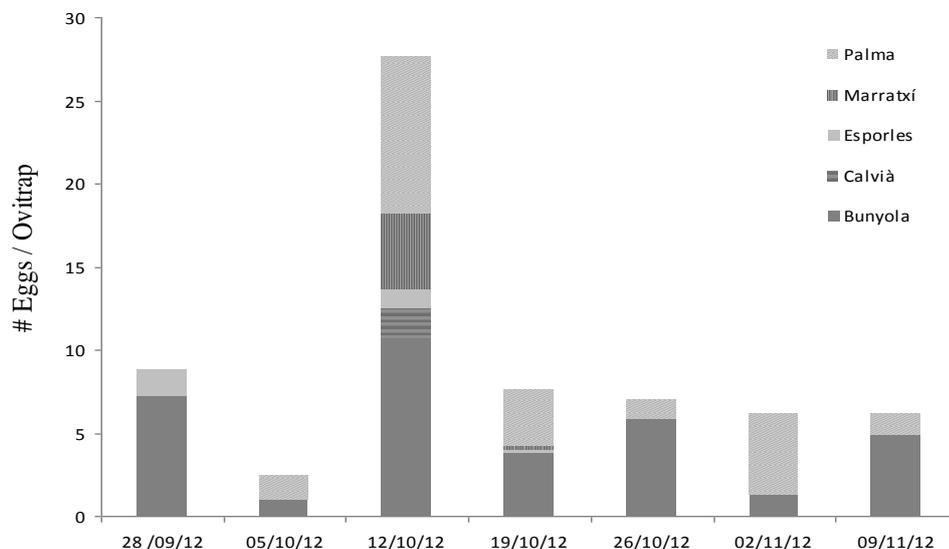


Figure 1. Egg/ovitrapping ratio. Cumulative number of eggs per ovitrapping and per municipality, found in five positive *Ae. albopictus* municipalities of Majorca during seven weeks in 2012.

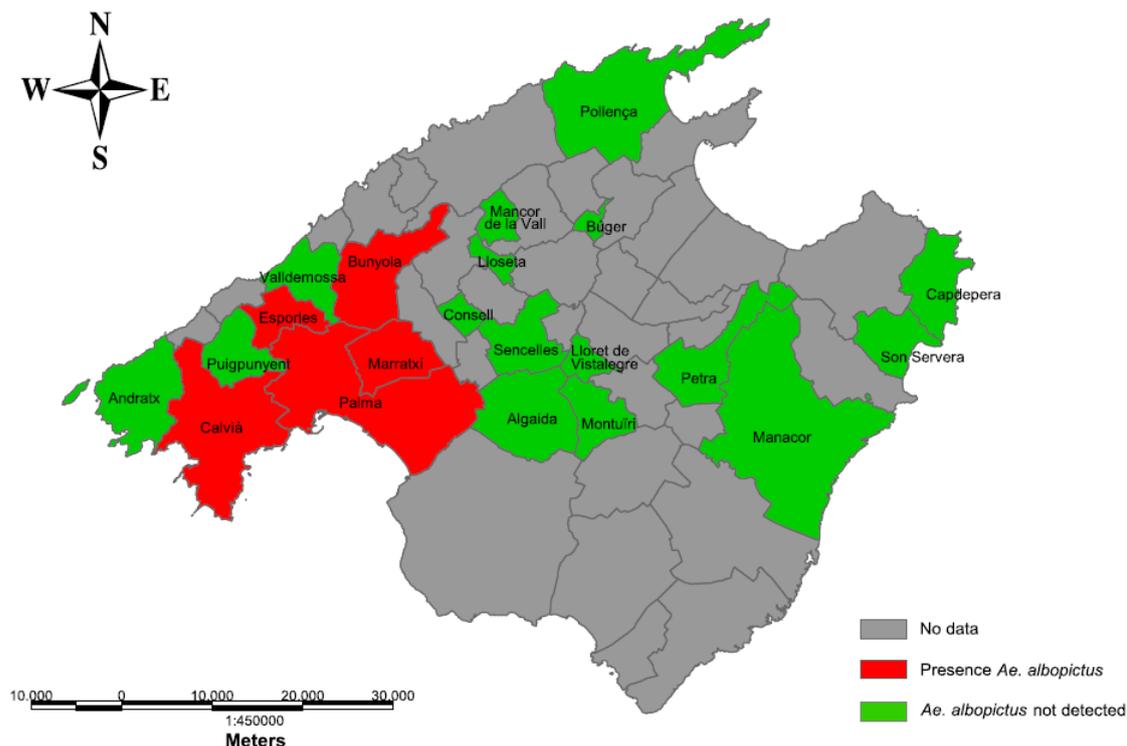


Figure 2. Distribution of *Aedes albopictus* in the island of Majorca. The map indicates the municipalities sampled and those that were found positive for eggs of *Aedes albopictus* between 28/09/12 and 09/11/12

Conclusion

Since *Ae. albopictus* has been detected in an area of more than the required 25 km² (as outlined in ECDC, 2012), it is therefore assumed that this species is well established on the island of Majorca but only locally. In order to avoid the spread to the entire island, the authors recommend the rapid implementation of effective control activities that could lead to the eradication of the tiger mosquito as demonstrated in other countries such as the Netherlands (Scholte *et al.*, 2012) or Italy (Sardinia) (Nuvoli & Pantaleoni, 2003).

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