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Short Report

Dispersion of *Aedes albopictus* in the Spanish Mediterranean Area

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Emergence and re-emergence of arboviral disease in new areas of southern Europe is becoming a public health problem. Since *Aedes albopictus* was first detected in 2004 in Catalonia, it has spread along the Spanish Mediterranean coast. Results of an entomological surveillance carried out by the Spanish Ministry of Health to monitor the expansion of *Ae. albopictus* along the Spanish Mediterranean coast between 2009 and 2012 are presented. Besides the new locations in Valencia and Murcia regional communities, it was identified in five municipalities in the Balearic Islands in 2012. A comprehensive plan aiming the control of invasive vector-borne diseases including entomological surveillance should be considered.

Introduction

The emergence and re-emergence of arboviral diseases in new areas of southern Europe is becoming a public health problem.¹ One factor associated with this situation is the spread of invasive mosquitoes such as *Aedes albopictus*. The establishment of this mosquito represents a potential threat for the autochthonous transmission of viral diseases such as chikungunya and dengue.

In past years, autochthonous European outbreaks of chikungunya and dengue have been detected. Chikungunya outbreak in Italy in 2007, where the main competent vector was *Ae. albopictus*,² and dengue outbreak in the Island of Madeira (Portugal), transmitted by *Aedes aegypti*,³ were the most important. These events highlight the need to develop preparedness and response plans for emerging infectious threats in the era of globalization.

The *Ae. albopictus* mosquito was identified for the first time in Spain in August 2004 in San Cugat del Vallés, in Catalonia (north-east of the country).⁴ Since then this vector has widely spread across the Mediterranean area of Catalonia and currently affects almost all municipalities in this region.⁵ Additionally, *Ae. albopictus* was found in 2005 in an isolated area of Orihuela, a municipality of Alicante (Autonomous Community of Valencia), more than 400 km far from the affected area in Catalonia. Entomologists suggested that the mosquito could have been carried by car from Catalonia to Orihuela.⁶

The International Health Regulations 2005 require the provision of a programme for the surveillance and control of vectors in and around points of entry.⁷

In 2009, the Spanish Ministry of Health set up an entomological surveillance project with two objectives. First, to monitor the entry of (imported exotic) invasive mosquito vectors for infectious diseases in ports and airports. Second, to monitor the expansion of *Ae. albopictus* throughout the Spanish Mediterranean coast. This report focuses on the second objective.

Methods

Entomological surveillance activities were carried out in the area of interest between 2009 and 2012. The study areas were Valencia, Balears and Murcia autonomous regions in the Mediterranean coast. *Ae. albopictus* was widely established in Catalonia by 2009, at the beginning of the study; identifying the mosquito in this region did not add any value for the objectives of this study and therefore was excluded of the area of interest. Balearic Islands were included because of the intense maritime traffic with Catalonia, Valencia and Murcia. An intense monitoring around Orihuela was established during the first year of the study to assess whether focus previously identified was stable.

Oviposition traps with oviposition supports as a substrate for egg laying were progressively placed, in urban areas, following major roads communicating the study area with Catalonia and according to the abundance of suitable habitats. Traps were also placed around newly detected breeding sites where suitable habitats for expansion were identified. A special emphasis was placed on cemeteries (common breeding sites), petrol stations (in particular in the car park), residential complexes with gardens and tire stores. Traps were also placed following reports from the general public complaining about bites.

The number of traps in each location differed according to the abundance of suitable habitats. Oviposition traps are the most effective ones in detecting *Ae. albopictus* populations in environmental surveillance.⁸ Oviposition supports were refilled weekly and were operational from the beginning of August to the end of November.

Because the main aim of the study was to assess whether *Ae. albopictus* was present or not, a reduced number of BG Sentinel traps (4–10 traps/year) were placed only one night a week during short periods of time, where the use of ovitraps was impossible.

Substrates from ovitraps were sent to the entomological laboratory in University of Zaragoza. Substrates were introduced in water for larvae eclosion using the method described by Alarcón-Elbal et al. (2010). Larvae were classified for species identification using Schaffner method in 2001.

Results

A total of 2016 ovitraps were placed during the study period: 30 traps in 2009, 130 in 2010, 306 in 2011 and 1550 in 2012. Traps were placed in Alicante province in 2009, Alicante, Castellón and Mallorca in 2010 and 2011 and Valencia and Murcia were added up in 2012.

The figure 1 shows the area covered by the project and the expansion of *Ae. albopictus* along the study period. In this figure, it is represented the year of first detection by municipality affected.

The mosquito was found again in 2012 in the sites where they had previously found, noting it has been established.

Owing to the characteristics of the ovitraps and the habitats where they were placed, only *Ae. albopictus* layed eggs on the substrate.

The presence of *Ae. albopictus* in the municipality of Orihuela (Alicante) was consolidated after first detection in 2005, and the mosquito was found in abundance in 2009. *Ae. albopictus* was also detected in other municipalities of the same province (such as Torrevieja) in 2009 and in subsequent years. In 2011, *Ae. albopictus* was detected in two new towns on the coast of Alicante province: Guardamar del Segura and Pilar de Horadada. Furthermore, in 2012, it was also detected in Santa Pola and in three inland towns: Elche, Rojales and Benijofar.

Ae. albopictus was first identified in the province of Castellón, in the town of Benicassim in October 2010. The province of Castellón is between the previously known areas with established populations of *Ae. albopictus* in Southern Catalonia and Alicante province. Since 2010, the population of *Aedes* has spread in Castellón following the coast northward and southward where it has been detected in three coastal towns on the coast: Oropesa del Mar in 2011, and Torrelblanca and Castellón de la Plana, in 2012. A spread of the vector to inland villages (Vall d'Alba, Pobla de Tornesa and Borriol) was detected in 2012.

Ae. albopictus was first detected in the province of Murcia (further south Alicante province) by Collantes and Delgado⁹ in September 2011 in the peri-urban area of Era Alta. Our results of 2012 surveillance showed the presence of the mosquito in the town of San Pedro del Pinatar, in the north of the province of Murcia and close to Alicante province.

A significant amount of the new locations where *Ae. albopictus* was identified followed reports from the general public complaining of annoyance caused by mosquito bites. Most of identified breeding sites are located near the Mediterranean motorway.

In 2012, *Ae. albopictus* was identified in five municipalities in Majorca, Balearic Islands (Calvià and Palma de Mallorca on the coast and nearby inland towns of Bunyola, Esporles and Marratxi). The dispersal spread of the mosquito indicates that it may have been introduced at least two or three years ago.

The small number of BG traps used during the study period captured mainly *Ae. albopictus* but also small amounts of autochthonous mosquitos, in particular, *Culex pipiens* and *Culiseta longiareolata*.

Discussion

The monitoring of *Ae. albopictus* shows a rapid and wide expansion of this vector along Mediterranean coast of Spain. Every year this mosquito colonizes new areas and once a new location is colonized, populations are established.

The Mediterranean coast of Spain has high density of human populations, residential complexes and residential areas that together with Mediterranean climate become suitable habitats for *Ae. albopictus*. Once the mosquito was established in Catalonia its expansion along the Mediterranean coast was matter of time.

Ae. albopictus expanded along over 600 km of the Mediterranean coast in a period of 8 yr. This wide expansion was probably propitiated carriage of the mosquito by ground vehicles.

First *Aedes* colonies outside Catalonia could have been owing to transport of the mosquito in a private car from Sant Cugat del Vallés, in Barcelona, to Orihuela by a resident in Catalonia who had a holiday house in Orihuela.

The mosquito possibly arrived to Majorca from Barcelona where it is widely present via the intense air and maritime traffic with the Balearic Island. Nevertheless, the arrival of *Ae. albopictus* from another European country cannot be ruled out, as the island has heavy private maritime traffic especially from countries such as Italy.

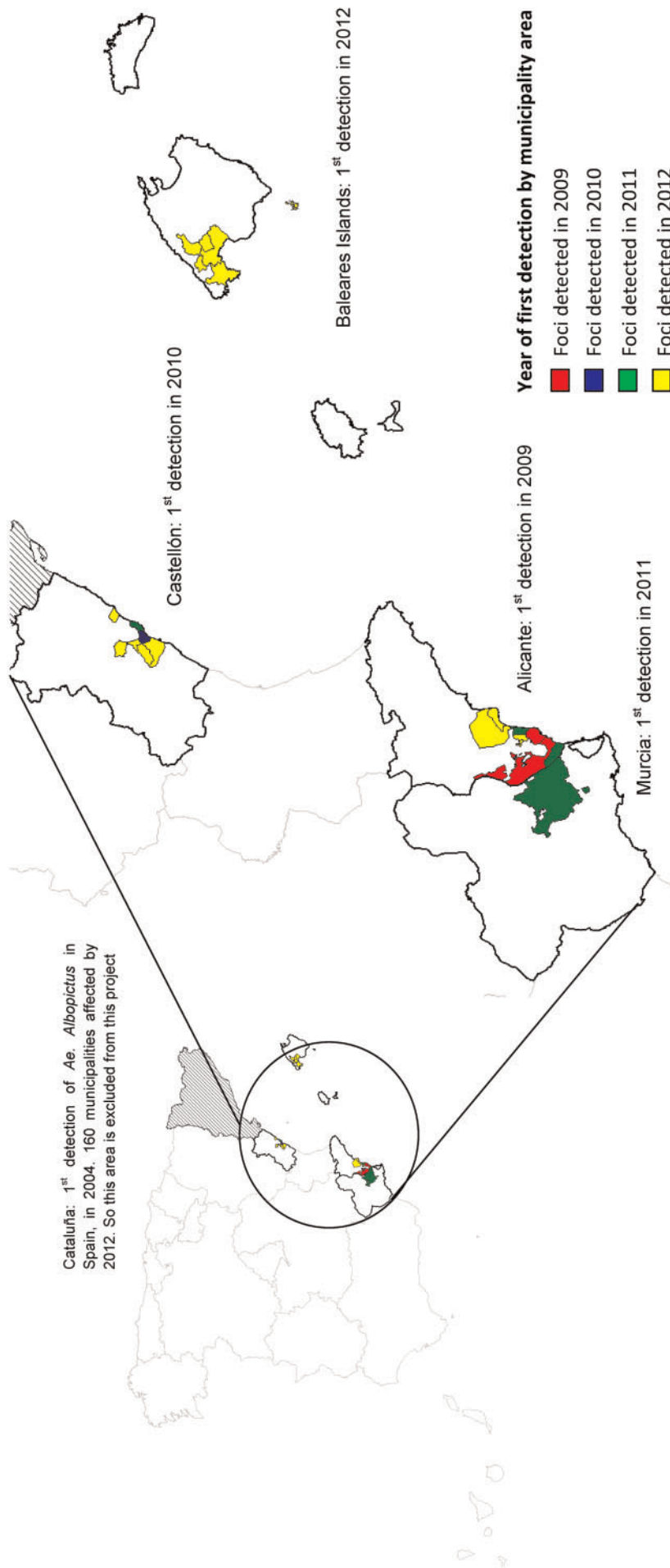


Figure 1 Dispersion of *Aedes albopictus* in the Spanish Mediterranean area by years (2009–2012).

Both the repeated detection and the rapid expansion of this mosquito species in the Spanish Mediterranean Area indicate that it is a very sensitive region for its establishment and that it is necessary to extend and intensify monitoring activities. The rapid detection of new foci is essential to allow for timely control measures to prevent or at least delay the settlement in new localities.¹⁰

Emergent vector-borne diseases represent a real risk for public health in Spain. The establishment and extension of this vector has led to the inclusion of dengue and chikungunya in the list for mandatory notifiable diseases.

A comprehensive plan against invasive vector-borne diseases that includes and enhances current entomological surveillance should be seriously considered.

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Conflicts of interest: None declared.

Key points

- During the past 4 yr (2009–2012), *Aedes albopictus* has spread along the Spanish Mediterranean coast and reached Balearic Islands, increasing its importance as a risk for public health.

- Once *Ae. albopictus* is introduced, enhanced entomological surveillance in and around the first foci is essential for identifying the spread and settlement of the mosquito.
- Vector detection in these new areas has been a cornerstone to enhance the vector-borne disease human surveillance in Spain, especially from May to November, aiming at controlling transmission.
- A comprehensive plan against invasive vector-borne diseases that includes and enhances current entomological surveillance and the monitoring of *Ae. albopictus* should be seriously considered.

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Short Report

Green space and changes in self-rated health among people with chronic illness

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This prospective study analyses change in self-rated health of chronically ill people in relation to green space in their living environment at baseline. Data on 1112 people in the Netherlands with one or more medically diagnosed chronic disease(s) were used. The percentage of green space was calculated for postal code area. Multilevel linear regression analysis was conducted. We found no relationship between green space and change in health; however, an unexpected relationship between social capital at baseline and health change was discovered.

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