Ann Ig 2017; 29: 86-90 doi:10.7416/ai.2017.2135

SHORT PAPER

Preliminary considerations about the presence of *Aedes albopictus* (Skuse 1897) (Diptera: Culicidae) during winter in the Northwestern Italy

M. Dutto[1], A. Mosca[2]

Key words: Aedes albopictus, buildings, wintertime, mosquito-borne diseases
Parole chiave: Aedes albopictus, abitazioni, stagione invernale, malattie trasmesse da zanzare

Abstract

Aedes albopictus, the Asian tiger mosquito, was unintentionally introduced in Italy at the beginning of the 1990s. In few decades it spread almost in the whole Country. In Piedmont, the first report dates back to 1994. Usually, temperate populations are affected by seasonal temperature and photoperiodicity and can overwinter by producing eggs that undergo a winter diapause. In Rome females of the species extended their trophic activity to the coldest months of the year, but there is no notice about a similar behaviour for northern areas of the Country.

In our routine work, we often inspect residential and public buildings according to people requests due to the presence of annoying mosquitoes. During these inspections, we try to identify and solve the problem looking for adults and breeding sites of annoying species. Samples are conveniently collected and identified in the field or returning in the labs.

We report seven cases of Ae. albopictus female trophic activity in both residential and public buildings, from November to March, in urban and rural areas in Piedmont, ranging between 44°33'11" N and 45°05'09" N. In one case, some larval breeding sites with a large number of larvae and pupae of this species were identified.

Ae. albopictus can show trophic and reproductive activity during the winter in the northwestern Italy under favourable conditions. This evidence is of particular concern because of seasonality of Aedes mosquito-borne disease in returned travellers. Dengue, for example, has its higher morbidity in returned travellers from Caribbean and Central America typically during the winter period.

Introduction

Aedes (Stegomya) albopictus (Skuse 1894), the Asian tiger mosquito, is considered to be the most invasive mosquito species in the world (1). During the last thirty years it has spread from South-East Asia to many parts of the world (2) primarily disseminated by transportation of dormant eggs in tyres (3). In Italy it was found for the first time in 1990 in Genoa and its presence was immediately related with the trades of the harbour (4). In few decades it spread almost in the whole Country, especially at the lowest

[1] *Former Consultant of Medical and Urban Entomology and Zoology, Department of Prevention, Local Health Unit CN1, Saluzzo (CN), Italy*
[2] *Project Manager and Senior Entomologist, Ipla SpA, Torino Mosquito Abatement District, Torino, Italy*

altitudes. In Piedmont, the first report dates back to 1994, in San Mauro Torinese; after 20 years it has colonized the entire regional area with a limit, at the moment, being set around 600 meters a.s.l. (5).

Aedes albopictus is not only an annoying mosquito, since it was demonstrated to be a competent vector for *Aedes*-borne diseases (1). It is the main vector of Chikungunya (6) and a competent vector for a number of other arboviruses, included Dengue (7) and Zika virus (8). The presence of these viruses is not stable in Europe, but they are periodically introduced by returned travellers infected in endemic countries. Their morbidity depends on various factors, like the period of the travel, the country visited and the magnitude of the local outbreaks. The number of Dengue cases in travellers, for example, is higher from August to December in the Caribbean, in January in Central America, in March in South America, in June and from September to December in Southeast Asia and from September to December in South Central Asia (9). In 2015, eighteen cases of Dengue were notified in Piedmont, half of which in autumn or winter (10). Therefore, in many cases travellers return in periods of the year considered of low presence of the vector. In fact, while tropical population of *Ae. albopictus* can not survive during winter in temperate regions (11), populations from temperate areas are affected by seasonal temperature and photoperiod and can overwinter by producing eggs that undergo a winter diapause (12). In wintertime usually only overwintering eggs can survive. For this reason, surveillance activities on this species usually begin in spring and end in autumn (13, 14).

Materials and Methods

We investigated some cases related to the winter presence of mosquitoes in Piedmont. We became aware about them thanks to the complaints of some people annoyed by mosquito bites. A field inspection followed each complaint according to standard protocols. Each case was analyzed in its context and an interview with people had reported the case helped us to better understand the situation. The latitude of each site was obtained by a portable GPS or searching the exact point on Google Earth®. Particular care was taken in looking for breeding sites and adult mosquitoes. When a potential breeding site was found, samples of water were collected using a dipper or a pipette in order to verify the presence of preimaginal stages of mosquitoes. Resting sites were inspected and resting mosquitoes sucked by hand hold aspirators.

Each specimen was identified either directly in the field or in the laboratory using morphological identification keys (15-17) and a stereo microscope (SMZ-168 Motic®). Data were recorded on a spreadsheet (Microsoft Excel®).

Results

The field inspections considered here were completed between the months of December and March, during a period of five years, from 2009 to 2016.

The northernmost site was at a latitude of 45°05’09” N. It is situated in the town of Torino, where the mean temperature of January (Torino Caselle, 1971-2000) is 2.1° (18). Both mosquito females and evidences of trophic activity on humans were found during every inspection. Males were identified only on two occasions. In most cases, the analysis of the collected specimens (females, males and larvae) confirmed the presence of *Ae. albopictus*. Females belonging to another species, the northern house mosquito (*Culex pipiens*), were identified only in two cases.

According to the resident people, the presence of *Cx. pipiens* was always related with overnight annoyance, while trophic activity of *Ae. albopictus* was noted during

the day, the night or both. It largely depends on the human presence in the building: where people generally stayed far away during daytime, it was reported mosquito bites only in the night and vice versa.

Some typical breeding sites (plant buckets and rooting vases) full of *Ae. albopictus* larvae and pupae were identified during an inspection in the middle of November.

Discussion and conclusions

For the moment our observations have been limited to the inspections arising from the requests of few annoyed citizens. Nevertheless, such inspections can help us to draw some preliminary conclusions. First of all, every feeding or reproductive activities observed are related to indoor events. Therefore, these observations indicate that the winter activity of *Ae. albopictus* in the considered areas is restricted and bound up with particularly favourable conditions. These conditions were so far found only inside the buildings, where the availability of breeding sites, blood meals and the microclimatic conditions allow the development of stable populations of *Ae. albopictus*, despite the photoperiod and external conditions.

In other temperate areas some Authors recorded winter reproductive and trophic activities even outdoors. It is the case of Rome (19), Athens (20) and the Southern Spain (21), but all these areas are finally southerner and warmer than Piedmont. In Rome, for example, the average latitude is 41°53′30″ N and the mean temperature of January (Roma Urbe, 1971-2000) is 7.4° (18), five degrees less than Turin.

The current situation in northern Italy could be exceeded by a significant climate change or by a further adaptation of the Asian tiger mosquito population. Different projections of seasonal changes in mean temperature estimate for the southern Europe a growth of the winter temperature (December-February) from 2° up to 6° degrees within the end of this century (22). It is possible, and mainly desirable, that the most extreme event does not occur. In any case, a couple of degrees more could be enough to help the adaptation of the local strains to the new winter conditions. On the other hand, the same projections indicate a reduction of the winter precipitations in the region (22). Then, water availability could become more relevant than temperature as limiting factor for the development of the species in wintertime.

Finally, even if the number of surveyed sites in not yet sufficient to allow us to define the real entity of winter presence of the species in the area and the associated risk of vector-transmitted diseases, the mere presence and activity of a competent vector in wintertime bring us to suggest more alertness when a viremic traveller returns from areas endemic for *Aedes*-borne diseases.

Acknowledgments

This survey was possible thanks to the worthwhile collaboration of the Authors with the ASL Cuneo 1 and Ipla SpA, with the support of the Piedmont Region Government.

Riassunto

Considerazioni preliminari sulla presenza invernale di* Aedes albopictus *(Skuse 1897) (Diptera: Culicidae) nell'Italia nordoccidentale

Aedes albopictus, la cosiddetta zanzara tigre, fu introdotta accidentalmente in Italia agli inizi degli anni '90. In pochi decenni si è diffusa in quasi tutto il Paese. In Piemonte, la prima segnalazione risale al 1994. Di solito, le popolazioni delle aree temperate risentono della temperatura e del fotoperiodo stagionali e sono in grado di svernare producendo uova invernali diapausanti. A Roma le femmine della specie hanno esteso la loro attività trofica ai mesi più freddi dell'anno, ma non ci sono evidenze su di un simile comportamento per le aree settentrionali del Paese.

Nel nostro lavoro, ci capita spesso di dover ispezionare edifici pubblici e residenze abitative in seguito a segnalazioni di presenza di zanzare moleste. Durante

questi sopralluoghi, si tenta di identificare e risolvere il problema cercando adulti e focolai larvali di zanzare moleste. Alcuni campioni sono idoneamente raccolti e identificati in campo o in laboratorio.

Riportiamo sette casi di attività trofica da parte di femmine di *Ae. albopictus* in edifici residenziali e pubblici tra novembre e marzo, in zone urbane e rurali del Piemonte, comprese tra 44°33'11" N e 45°05'09" N. In un caso sono anche stati identificati alcuni focolai con molte larve e pupe di questa specie.

In condizioni favorevoli, *Ae. albopictus* può mostrare attività trofica e riproduttiva invernale anche nell'Italia nordoccidentale. Ciò desta particolare preoccupazione a causa della stagionalità con cui si presentano nei viaggiatori le malattie veicolate dalle zanzare di questo genere. Per esempio, la Dengue ha la sua maggior morbilità nei viaggiatori di ritorno da Caraibi e America Centrale proprio nel periodo invernale.

References

1. Gratz, NG. Critical review of the vector status of *Aedes albopictus*. Med Vet Entomol 2004; **18**: 215-7.
2. Mitchell CJ. Geographic spread of *Aedes albopictus* and potential for involvement in arbovirus cycles in the Mediterranean basin. J Vector Ecol 1995; **20**: 44-58.
3. Reiter P. *Aedes albopictus* and the world trade in used tires, 19881995: the shape of things to come. J Am Mosq Control Assoc 1998; **14**: 83-94.
4. Sabatini A, Raineri V, Trovato G, Coluzzi M. *Aedes albopictus* in Italia e possibile diffusione della specie nell'area mediterranea. Parassitologia 1990; **32**: 301-4.
5. Mosca A, Ferrara AM, Grieco C et al. Diffusione di *Aedes* (Stegomyia) *albopictus* (Skuse, 1895) (Diptera, Culicidae) in Piemonte e prima segnalazione per la Valle d'Aosta. Riv Piemont di St Nat 2016; **37**: 127-36.
6. Reiter P, Fontenille D, Paupy C. *Aedes albopictus* as an epidemic vector of chikungunya virus: another emerging problem? Lancet Infect Dis 2006; **6**: 463-4.
7. Lambrechts L, Scott TW, Gubler DJ. Consequences of the Expanding Global Distribution of Aedes albopictus for Dengue Virus Transmission. PLoS Negl Trop Dis 2010; **4**(5): e646.
8. Grard G, Caron M, Mombo IM et al. Zika virus in Gabon (Central Africa). 2007: a new threat from *Aedes albopictus*? PLoS Negl Trop Dis. 2014; **8**: e2681.
9. Schwartz E, Weld LH, Wilder-Smith A et al. Seasonality, annual trends, and characteristics of dengue among ill returned travelers, 1997–2006. Emerg Infect Dis 2008; **14**: 1081-8.
10. IZS-PLV, IPLA, ASL TO2, SeREMI-ASL AL, Struttura Regionale di Coordinamento per le attività trasfusionali. Il sistema di sorveglianza sulle malattie trasmesse da zanzare in Piemonte. Torino: IZS-PLV, 2015: 24.
11. Hawley WA. The biology of *Aedes albopictus*. J Am Mosq Control Assoc 1988; **4**(Suppl 1): 40.
12. Lounibos LP, Escher RL, Lourenco-de-Oliveira R. Asymmetric evolution of photoperiodic diapause in temperate and tropical invasive populations of *Aedes albopictus* (Diptera: Culicidae). Ann Entomol Soc Am 2003; **96**: 512-8.
13. Regione Emilia Romagna. Linee guida per la sorveglianza e la lotta alla zanzara tigre (*Aedes albopictus*). Bologna: Centro Stampa Regione Emilia Romagna, 2005.
14. Regione del Veneto. Linee operative per la lotta alla zanzara. Venezia: Centro Stampa Giunta - Regione del Veneto, 2009.
15. Stojanovich CJ, Scott HG. Mosquitoes of Italy: Mosquitoes of the Italian Biogeographic Area Which Includes the Republic of Malta, the French Island of Corsica and All of Italy except the Far-Northern Provinces. USA: Stojanovich CJ & Scott HG, 1997.
16. Severini F, Toma L, De Luca M, Romi R. Identification of the adult stages of the Italian mosquitoes (Diptera, Culicidae). Fragmenta Entomol 2009; **41**: 213-372.
17. Romi R, Pontuale G, Sabatinelli G. Le zanzare italiane: generalità e identificazione degli stadi preimmaginali (Diptera, Culicidae). Fragmenta Entomol 1997; **29**: 1-141.
18. Aeronautica Militare Italiana. Tabelle climatiche 1971-2000 dall'Atlante Climatico 1971-2000 del Servizio Meteorologico dell'Aeronautica Militare, 2008.
19. Romi R., Severini F, Toma L. Cold acclimation and overwintering of female *Aedes albopictus* in Roma. J Am Mosq Control Assoc 2006; **22**(1): 149-51.
20. Giatropoulos A, Emmanouel N, Koliopoulos G, Michaelakis A. A study on distribution and seasonal abundance of *Aedes albopictus* (Diptera: Culicidae) population in Athens, Greece. J Med Entomol 2012; **49**(2): 262-9.
21. Collantes F, Delgado JA, Alarcón-Elbal PM, Delacour S, Lucientes J. First confirmed out-

door winter reproductive activity of Asian tiger mosquito (*Aedes albopictus*) in Europe. An Biol 2014; **36**: 71-6.
22. Parry M, Canziani O, Palutikof J, van der Linden P, Hanson C, Eds. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of IPCC Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press, 2007.

Corresponding Author: Andrea Mosca, Via E. Bava 37, I-10124 Torino, Italy
e-mail: moscandrea@gmail.com