

## SCIENTIFIC NOTE

### FIRST RECORD OF *Aedes (Stegomyia) albopictus* IN BELGIUM

FRANCIS SCHAFFNER,<sup>1</sup> WIM VAN BORTEL<sup>2</sup> AND MARC COOSEMANS<sup>2</sup>

**ABSTRACT.** The 1st record of *Aedes albopictus* in Belgium was made in a village in Oost-Vlaanderen Province. Two preimaginal stages were collected on October 31, 2000, in the used tire stock of a recycling company that imports tires from the USA and Japan. The species has reproduced on site, and local environmental conditions make its establishment possible. *Anopheles plumbeus* was a common companion species found in tires in high densities.

**KEY WORDS** *Aedes albopictus*, *Anopheles plumbeus*, larvae, used tires, Belgium

Native to Southeast Asia and the Indian Ocean, the tiger mosquito *Aedes (Stegomyia) albopictus* (Skuse, 1894), has been spreading throughout the world since the end of the 1970s (Mitchell 1995a). This species is an important vector of dengue and other arboviruses (Mitchell 1995b). The main means of dispersal of the species is as eggs in used tires (Knudsen 1995). When tires are stored outside, they collect rainwater and organic matter (e.g., dead leaves), and provide breeding sites for many mosquito species. Although tree holes in tropical forests are considered the original habitats of *Ae. albopictus*, this species also exploits artificial environments, such as tires, and has colonized temperate areas by overwintering in the egg stage (Hawley 1988). Diapause of the embryo is induced when the female experiences a short photoperiod (Hawley 1988). The ability to colonize used tires is the basis of the recent rapid establishment of this species in new geographic areas (Rodhain 1995). Eggs are laid on the inside surfaces of tires and transmitted globally through commerce. The species is now recorded in many countries of the Americas, Africa, and Oceania. In Europe it was recorded in Albania in 1979 (Adhami and Murati 1987) and Italy in 1990 (Dalla Pozza and Majori 1992), countries where it is now well established (Adhami and Reiter 1998, Romi et al. 1999) and, most recently, in France (Schaffner and Karch 2000).

Because of health risks (Rodhain 1995), a surveillance program for *Ae. albopictus* has been implemented and conducted in France since 1998 at the request of the French Ministry of Health. Surveillance is focused on French storage centers that import used tires from the USA, Japan, or Italy (countries known to be breeding areas). The discovery of *Ae. albopictus* in metropolitan France in

1999 (Schaffner and Karch 2000) and subsequently of *Ochlerotatus (Finlaya) japonicus japonicus* (Theobald, 1901) in 2000 (Schaffner et al. 2003) resulted in an extension of these surveillance activities. Contacts with French importers permitted the identification of suppliers from countries neighboring France also engaged in the importation of used tires. These suppliers are located in Belgium (3 suppliers), The Netherlands (7), Germany (2), and Switzerland (2).

For the present study we visited the storage center of a Belgian used tire recycling company located near Antwerp in the village of Vrasene (51°13'N, 4°12'E, altitude 15 m) in Oost-Vlaanderen Province. This company supplies French companies with tires originating from the USA and Japan. This center also deals with tires for trucks, heavy vehicles, and aircraft, originating from various countries (Canada, Japan, Russia, the USA, Italy, and other European countries). On October 31, 2000, we collected hundreds of immature stages from approximately 5,000 used tires piled up outdoors. Nearly all (95%) of the tires were exposed and contained rainwater. Mosquitoes were found breeding in 40% of these tires. The majority of the larvae that were collected were *Anopheles plumbeus* Stephens, 1828 (90%), *Ochlerotatus geniculatus* (Olivier, 1791) (9%), and *Culex pipiens* s.l. Linnaeus, 1758 (1%). Additionally, we found 1 larva and 1 pupa of *Ae. albopictus* in a batch of tires originating from The Netherlands that had been on the site for 4–5 months.

We don't know the origin of the infestation of *Ae. albopictus* in Belgium. However, the presence of immature stages suggests that this species is reproducing. Furthermore, the area surrounding the site favors the spread of *Ae. albopictus* in Belgium. Farm animals, artificial breeding sites, and resting sites such as thick hedges are abundant. These habitat characteristics and the large volume of tire commerce greatly increase the likelihood of establishment of *Ae. albopictus* in Belgium.

<sup>1</sup> Adege, EID Méditerranée, 165 Avenue Paul Rimbaud, 34184 Montpellier Cedex 4, France.

<sup>2</sup> Institute of Tropical Medicine, Department of Parasitology, Nationalestraat 155, 2000 Antwerpen, Belgium.

Although the site manager did not report mosquitoes as a local nuisance, we found large populations of *An. plumbeus* and *Oc. geniculatus*. These 2 woodland species that usually breed in flooded tree holes have successfully colonized tires containing dead leaves. *Anopheles plumbeus* is a potential vector of *Plasmodium falciparum* (Marchant et al. 1998) and although it has so far not been incriminated in malaria transmission in Belgium (Peleman et al. 2000), it is a suspected vector in the United Kingdom (Shute 1954).

This collection site in Belgium is the northernmost distribution record for *Ae. albopictus*. Distribution limits of the species are related to photoperiodicity, temperature, rainfall, and humidity (Mitchell 1995a). A 0°C cold-month isotherm probably could limit the distribution of *Ae. albopictus*. An annual rainfall of 500 mm is sufficient to supply the species with a variety of breeding habitats. Belgium is included within the possible European breeding area (Mitchell 1995a). However, finding this species in northern Belgium is not surprising, because this species has already been collected in Normandy (Schaffner et al. 2001). If, like the French populations of *Ae. albopictus*, the Oost-Vlaanderen population has an egg diapause, it can overwinter from November to May and overwintering adult *Ae. albopictus* may have emerged in Belgium at the end of May 2001.

*Aedes albopictus* is an important vector of dengue and other arboviruses, as well as filarial worms, in Asia. In Europe, in addition to the biting nuisance, the presence of this species increases the risk of transmission to humans and animals of *Dirofilaria* and arboviruses such as Sindbis, Tahyna, and West Nile viruses (Mitchell 1995a, Guillet and Nathan 1999). West Nile virus was detected in specimens of *Ae. albopictus* captured in the field in 2000 in the USA. A study on the oral susceptibility to dengue type 2 virus, made at the Institute Pasteur in Paris, showed that the French strain of *Ae. albopictus* is a potential dengue vector (Vazeille, unpublished data). Similar results were observed with the Albanian strain (Vazeille-Falcoz et al. 1999). The spread of this species combined with the increasing mobility of people between dengue-endemic and dengue-free areas increases the risk of disease transmission. A large dengue epidemic occurred in Greece in 1927–28, with more than a million cases and more than 1,500 deaths (Cardamatis 1929).

Vectorial capacity increases with temperature. If we take the 20°C warm-month isotherm as a separating line between greatest and lesser risk areas, then Benelux presents only a low risk for arbovirus outbreaks (Knudsen 1995, Mitchell 1995a). Occasional transmission may still occur north of that line, especially for viruses that can be maintained by vertical transmission.

Belgium is the 4th European country to report *Ae. albopictus*. Once again, tires seem to be the

means of transport. Other used tire importation centers will be inspected. Tires imported from Japan, the USA, and Italy present the highest risks for introduction of *Ae. albopictus*. But considering the international used tire trade, tires from Belgium, The Netherlands, and the United Kingdom must also now be considered as a potential source. Discovery of *Ae. albopictus* in Belgium confirms that surveys should not be limited to the warmer regions of Europe, and that international measures should be taken to limit the introduction of exotic mosquito species.

We thank the manager of the tire company who gave us the opportunity to make the survey in his storage center and we are very grateful to D. Fonseca for critical reading of the manuscript.

#### REFERENCES CITED

- Adhami J, Murati N. 1987. Prani e mushkonjës *Aedes albopictus* në Shqipëri. [Presence of the mosquito *Aedes albopictus* in Albania.] *Rev Mjekësore* 1:13–16. [In Albanian.]
- Adhami J, Reiter P. 1998. Introduction and establishment of *Aedes (Stegomyia) albopictus* Skuse (Diptera: Culicidae) in Albania. *J Am Mosq Control Assoc* 14:340–343.
- Cardamatis JP. 1929. La dengue en Grèce. *Bull Soc Pathol Exot* 22:272–292.
- Dalla Pozza G, Majori G. 1992. First record of *Aedes albopictus* establishment in Italy. *J Am Mosq Control Assoc* 8:318–320.
- Guillet P, Nathan M. 1999. *Aedes albopictus*, une menace pour la France? *Med Trop* 59(Suppl 2):49–52.
- Hawley WA. 1988. The biology of *Aedes albopictus*. *J Am Mosq Control Assoc* 4(Suppl):1–39.
- Knudsen AB. 1995. Geographic spread of *Aedes albopictus* in Europe and the concern among public health authorities. *Eur J Epidemiol* 11:345–348.
- Marchant P, Eling W, Van Gemert GJ, Leake CJ, Curtis CF. 1998. Could British mosquitoes transmit falciparum malaria? *Parasitol Today* 14:344–345.
- Mitchell CJ. 1995a. Geographic spread of *Aedes albopictus* and potential for involvement in arbovirus cycles in the Mediterranean basin. *J Vector Ecol* 20:44–58.
- Mitchell CJ. 1995b. The role of *Aedes albopictus* as an arbovirus vector. *Parassitologia* 37:109–113.
- Peleman R, Benoit D, Goosens L, Bouttens F, De Puydt H, Vogelaers D, Colardyn F, Van de Woude K. 2000. Indigenous malaria in a suburb of Ghent, Belgium. *J Travel Med* 7:48–49.
- Rodhain F. 1995. *Aedes albopictus*: a potential problem in France. *Parassitologia* 37:115–119.
- Romi R, Di Luca M, Majori G. 1999. Current status of *Aedes albopictus* and *Aedes atropalpus* in Italy. *J Am Mosq Control Assoc* 15:425–427.
- Schaffner F, Boulétreau B, Guillet B, Guilloteau J, Karch S. 2001. *Aedes albopictus* (Skuse, 1894) established in metropolitan France. *Eur Mosq Bull* 9:1–3.
- Schaffner F, Chouin S, Guilloteau J. 2003 First record of *Ochlerotatus (Finlaya) japonicus japonicus* (Theobald, 1901) in metropolitan France. *J Am Mosq Control Assoc* 19:1–5.
- Schaffner F, Karch S. 2000. Première observation d'*Aedes albopictus* (Skuse, 1894) en France métropolitaine. *C R Acad Sci Paris Sci Vie Life Sci* 323:373–375.

Shute PG. 1954. Indigenous *P. vivax* malaria in London believed to have been transmitted by *Anopheles plumbeus*. *Monthly Bull Minist Health Publ Lab Serv* 13:48-51.

Vazeille-Falcoz M, Adhami J, Mousson L, Rodhain F. 1999. *Aedes albopictus* from Albania: a potential vector of dengue viruses. *J Am Mosq Control Assoc* 15:475-478.