

**International Journal of TROPICAL DISEASE
& Health**
2(4): 301-310, 2012



SCIENCEDOMAIN *international*
www.sciencedomain.org

Presence of *Aedes albopictus* in Palestine – West Bank

Shadi Hilmi Abd Allah Adawi^{1*}

¹Ministry of Health, Salfit Primary Health Care, Environmental Health Department,
Palestinian Territory.

Author's contribution

This work was carried out by SHAAA as a cross-sectional survey. Author SHAAA read and approved the final manuscript.

Research Article

Received 27th November 2012
Accepted 25th January 2013
Published 19th February 2013

ABSTRACT

Aim: This study confirmed the establishment of *Aedes (Stegomyia) albopictus* (Skuse, 1894) and provided information about its distribution during the period of July to October 2012 in Salfit district (Northwestern West Bank).

Study Design: A cross-sectional study.

Methods: A cross-sectional survey was conducted in West Bank - Salfit district to collect larvae and adults of the *Aedes albopictus* from two localities in Salfit district during the period of July to October 2012.

Results: Adult *Aedes albopictus* were collected from outdoor sites of different habitats in two localities in Salfit district (Mas-ha and AZ-Zawia locality) and different immature stages (larvae and pupae) were found in Salfit district (Mas-ha locality).

Limitations of Study: The study discussed the presence of *Ae. albopictus* in two localities in Salfit district and data about other species of mosquito were neglected in the study.

Conclusion: The results show that adults and larvae were found confirming the establishment of the species in the area. More studies are needed to understand the ecology and biology of *Aedes albopictus* and its distribution in Salfit district and its possibility of transmitting viral diseases.

*Corresponding author: Email: shd_adawi@yahoo.com;

Keywords: *Aedes albopictus*; Salfit district; presence; distribution.

1. INTRODUCTION

The mosquito *Aedes* (*Stegomyia*) *albopictus* (Skuse, 1894), known notoriously as the Asian Tiger Mosquito, has been spreading worldwide during the past two decades and has been reported in more than 25 countries on the five continents outside its natural region since the end of 1970 [1,2]. It was originally widespread in South Asia and on the Islands of the Western Pacific and Indian oceans [3]. In recent decades it has also spread to North and South America, Australia, Africa and European countries such as France, Italy and Spain [4-7]. It can also be found in Mediterranean region countries such as Lebanon, Syria and Israel, which is within few kilometers distance of the West Bank [8,9].

Ae. albopictus are easily recognized by the bold black shiny scales and distinct silver white scales on the palpus and tarsi [10]. The scutum (back) is black with a distinguishing white stripe down the center beginning at the dorsal surface of the head and continuing along the thorax [10]. It is a highly invasive mosquito species and difficult to control, an aggressive day-time biter, and considered a container breeder preferring to oviposition in small quantities of water such as drums, tires, buckets, flower saucers, tarpaulins and manholes, earthen jug, broken jars, animal feed containers, broken glass bottles, metal drums, discarded plastic containers and tree holes [4,5,11].

In addition to the nuisance of biting, *Ae. albopictus* poses a potential threat to human health, because it has been experimentally infected with more than 20 arboviruses [12,13]. It is known to be a vector of several arboviruses in Africa, Asia and Europe. Many studies have discussed that the *Ae. albopictus* is the possible vector for dengue, chikungunya (CHIK) and Encephalitis viruses [1,12,13], and was recently found naturally infected with West Nile virus in the U.S.A [14].

In the Middle East region the presence of *Ae. albopictus* in different countries such as Lebanon, Syria, and Israel, including studies in its ecology, biology and its medical importance in transmitting diseases has been documented [8,9,15]. Recently Palestine-West Bank Ministry of Health reported that a new species of mosquito (*Ae. albopictus*) was found in a few sporadic foci in different districts of the West Bank. However details and studies concerning the presence of *Ae. albopictus*, including its biology, ecology, distribution and its medical importance of this species in Palestine – West Bank have never been recorded [16]. This is the first report provides information of the presence, establishment, distribution and breeding sites of *Ae. albopictus* mosquito in West Bank.

2. MATERIALS AND METHODS

2.1 Study Area

Salfit district located at 32° 7' 5.5" N, 35° 5' 25" E (Fig. 1) with atotal area of almost 202 sq km, is one of 17 districts of the Palestinian National Authority. It is located in the northwestern West Bank, bordered by the district of Ramallah and Al-Bireh to the South, Nablus to the East, and Qalqilya to the North as well as Israel to the West. According to the Palestinian Central Bureau of Statistics (PCBS), 2007 the governorate has a population of 59,570 inhabitants. Mas-ha and AZ-Zawia localities located in the Western part of Salfit district and have atotal population of 5,200 inhabitants, most of whom work in agriculture and

trade. Economic activity depends on agriculture, where olives, almonds, figs, grapes, and apples are the main crops. Climate is hot with dry summers and rainy winters, with an average maximum and minimum temperatures of 29 and 6°C, respectively. The average humidity in the region is 62% that may rise up to 67%. Rainfall is concentrated in the winter and the average rainfall is 660 mm per year.

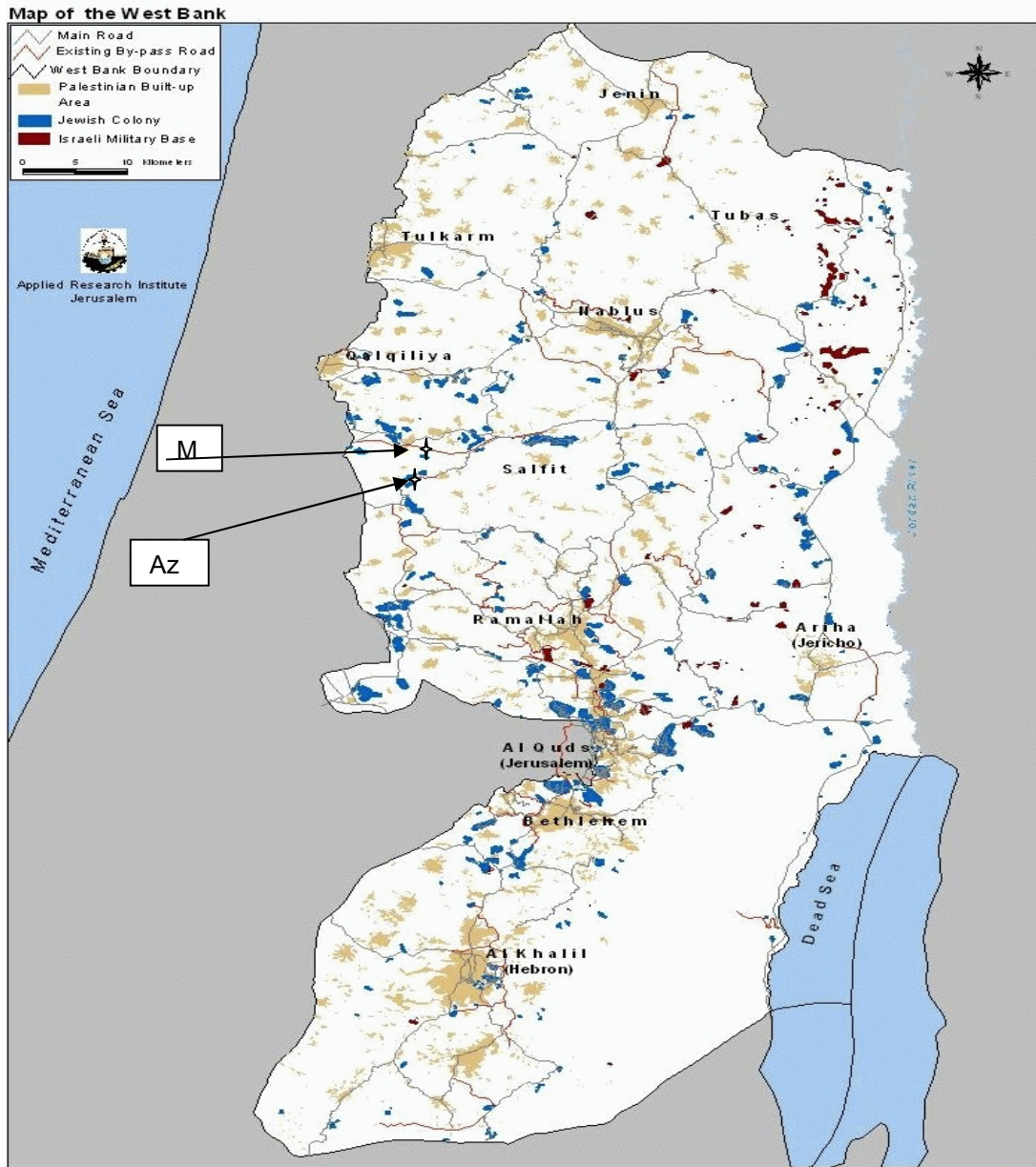


Fig. 1. Shows the localities of Mas-ha (M) and Az-Zawia (Az) in Salfit district in the West Bank (Palestine Central Bureau of statistic, 2007)

2.2 Study Design

This study was conducted as a cross sectional survey to collect larvae and adults of suspected *Ae. albopictus* mosquito from two localities Mas-ha and Az-Zawia localities in Salfit District from July to October 2012. The two sites were selected based on the continuous complaints from the residents who suffer from an aggressive biting during the day by a mosquito with black and white colors that were not noticed before this year. Every study site at first was divided into four sectors (North, South, West and East) and each sector divided into three of different habitats (vegetation area, animal area and waterside areas), then larvae and adult mosquitoes were collected from outdoor sites using different collection methods: Dipping technique was used in the collection of larvae and landing catches during the day using aspirator tool for adults [17].

2.2.1 Larva and adult collection and identification

2.2.1.1 Larva collection

Mosquito larvae were collected from all available potential breeding sites. (tin cans, discarded tires, plastic and metal container waters, etc). Dipping technique was used in the collection of larvae from large containers and small pipet used to collect larvae from small tin containers [17]. Larvae were transported to the laboratory, washed, killed with hot water and kept in 70% alcohol then mounted on slides using Euparal [17].

2.2.1.2 Adults collection

Adult mosquitoes were collected by using landing catches on volunteers during the day for three hours using an aspirator apparatus tool and conserved with funnel test tube until identification in the laboratory. Other species of mosquito were neglected.

2.2.1.3 Adults and larvae identification

Collected adult and larvae mosquitoes were sent to the lab at Salfit Primary healthcare center for identification and identified by using morphological keys [18-20].

2.3 Distribution of *Ae. albopictus* Adults and Larvae in Different Habitats

To investigate the presence of *Ae. albopictus* adults and larvae in different habitats, each study site is divided into three sectors, where each sector represents a different habitat (1- animal and poultry farm, or any areas using for rearing animal, 2- vegetation cover such as house gardens, plant farms and nurseries, etc. 3- waterside such as outside artificial wells irrigation canals, artificial pools, springs and any other source of water), then *Ae. albopictus* adults and larvae were collected from these habitats during the study period and numbers of *Ae. albopictus* adults and larvae collected from each sector of the sites were recorded and analyzed.

2.4 Data Management and Analysis

Data were entered in SPSS software 16 and analyzed using simple descriptive statistics.

3. RESULTS

3.1 Collecting Adults and Larvae of *Ae. albopictus* from Outdoor Sites in Mas-ha and Az-Zawia Localities During the Year 2012

After identified all collected adults mosquito, 200 adult *Ae. albopictus* were collected from outdoor sites in two localities in the Salfit district (150 adults from Mas-ha locality and 50 adults from Az-Zawia locality) (Table 1) and other mosquitos species were neglected. The result shows that 590 different immature stages (550 larvae and 40 pupae) of mosquitos were collected. Only larvae were identified. The results show that 60% of larvae were *Ae. Albopictus* and found in one locality in the Salfit district (Mas-ha locality) (Table 1).

3.2 Distribution of *Ae. albopictus* Adults and Larvae in Different Habitats in Mas-ha and Az-Zawia Localities in Salfit District During the Year 2012

During the period of entomological survey, (163;82%) of adults *Ae. albopictus* were collected from vegetation area and (37;18%) were collected from the water area in the two localities, also the results show that 300 larvae of *Aa. albopictus* were collected from a container in vegetation area in Mas-ha locality. No larva and adult *Ae. albopictus* was found in the animal area in two localities as shown in Table 2.

Table 1. Number of adults and larvae of *Ae. albopictus* collected outdoor sites from Mas-ha and AZ-Zawia localities in Salfit district for the year 2012

Localities	No. of adults <i>Ae. albopictus</i> collected	No. of Larvae collected	No. of positive Larvae <i>Ae. albopictus</i> collected	% of positive Larvae <i>Ae. albopictus</i> collected	No. of pupae collected
Mas-ha	150	500	300	60	27
AZ-Zawia	50	50	0	0	13
Total	200	550	300	55	40

Table 2. Numbers and percentages adults and larvae of *Ae. albopictus* collected from different habitats in Mas-ha and AZ-Zawia localities in Salfit district for the year 2012

Habitats	No. of adults collected from Mas-ha locality	No. of adults collected from AZ-Zawia locality	Total No. of adults	% of adults	No. of larvae collected from Mas-ha locality	No. of larvae collected from AZ-Zawia locality	Total No of larvae	% of larvae
Vegetation area	113	50	163	82	300	0	300	100
Animal area	0	0	0	0	0	0	0	0
Water area	37	0	37	18	0	0	0	0
Total	150	50	200		300	0	300	

4. DISCUSSION

Ae. albopictus is adapted to live and establish in different environmental conditions and breeding in different habitats and different forms of containers [10]. In general *Ae. albopictus* has been found abundant during rainy season when appropriate temperature and humidity are suitable for breeding and surviving conditions. *Ae. albopictus* was found less abundant during the hot and dry seasons [10,25-28]. Breeding habitat of *Ae. albopictus* has been found in the natural water containers and prefers to lay eggs outdoors along the plant leaves such as cavity in a tree, coconut husks, bamboo containing water and also in discarded tires, earthen jug, animal feed containers, broken jars, debris and coconut shell, broken glass bottles, metal drums, discarded plastic containers and in artificial wells [29]. For that collected adults of *Ae. albopictus* from vegetation and water areas and larvae from a plastic container in Salfit district agree with the previous studies which collected adults and larvae from this habitat and during the hot seasons.

Ae. albopictus is a widespread mosquito and many studies discussed the presence, distribution, biology, ecology and medical importance of this species in different countries [1,6,8,9,10,15] also in Israel that is a country close to Palestine which shares borders in all districts there are some studies discussed the presence and the medical importance of this species [8,15], so the transmission of *Ae. Albopictus* to Palestine - West Bank is possible by different ways. It can be transported in vehicles, trading ornamental plants, trees or other methods. These means are suitable habitat for breeding and resting of *Ae. albopictus*. This hypothesis agrees with different studies like [8,20], which suggests that the *Ae. albopictus* was transmitted by vehicle transportation. Madon et al. [22,23] found that the immature stages of mosquito were introduced by ornamental plant sent to California.

In Salfit district especially in Mas-ha and Az-Zawi localities it is expected that the presence of *Ae. Albopictus* is due to the previous methods, but the transporting or trading of ornamental plants is thought to be the more likely way. Through the entomological survey the results showed that all places having positive *Ae. albopictus* adult mosquitoes have ornamental plants (flowers) brought from the nurseries located in the neighboring country (Israel) which is endemic with *Ae. albopictus*. The results also showed the presence of immature stages of mosquito in one place (nursery) in Mas-ha locality from Salfit district, through the investigations with the owner of this nursery, the results showed that all plants (ornamental plants, trees plant) were coming from endemic areas in Israel. This result agrees with other studies as [22-24], which proved that immature stages of mosquito transmitted through the trading of ornamental plants coming from an endemic country with *Ae. Albopictus*.

5. CONCLUSION

The results show that adults and larvae were found confirming the establishment of the species in the area. More studies are needed to understand the ecology and biology of *Aedes albopictus* and its distribution in Salfit district and its possibility of transmitting viral diseases.

CONSENT

No consent was needed because this research was done by the author himself.

ETHICAL APPROVAL

The approval was taken from the Salfit primary health care center for the use of the laboratory and all materials needed for the research. Another approval was taken from the volunteer who is in charge of catching the adults mosquito. Finally an approval was taken from the targeted households, gardens and nurseries owners to collect adults and larvae.

ACKNOWLEDGEMENTS

I am grateful to the Director of primary healthcare center in Salfit district Dr. Jamil Draghmah for his support, comments and encouragement during this work. I also gratefully thank the head of environmental health department Mr. Abed Al –Kareem Bolad and his staff for their efforts. Finally, I am also grateful to Dr. Yasser Buzzia for his encouragement.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Gratz NG. Critical review of the vector status of *Aedes albopictus*. *Med Vet Entomol*. 2004;18(3):215-27.
2. Benedict MQ, Levine RS, Hawley WA, Lounibos LP. Spread of the tiger: global risk of invasion by the mosquito *Aedes albopictus*. *Vector Borne Zoonotic Dis*. 2007;7(1):76-85.
3. Belkin JN. The mosquitoes of the South Pacific (Diptera: *Culicidae*). Volumes 1 and 2. University of California Press. 1962; Berkeley and Los Angeles, CA.
4. Aranda C, Eritja R, Roiz D. First record and establishment of *Aedes albopictus* in Spain. *Med. Vet. Entomol*. 2006;20(1):150-52.
5. Toto JC, Abaga S, Carnevale P, Simard F. First report of the oriental mosquito *Aedes albopictus* on the West African island of Bioko, Equatorial Guinea. *Med Vet Entomol*. 2003;17(3):343-6.
6. Schaffner F, Karch S. First report of *Aedes albopictus* (Skuse, 1984) in metropolitan France. *C R Acad Sci III*. 2000;323(4):373-5.
7. Ritchie SA, Moore P, Carruthers M, Williams C, Montgomery B, Foley P, Ahboo S, van den Hurk AF, Lindsay MD, Cooper B, Beebe N, Russell RC. Discovery of a widespread infestation of *Aedes albopictus* in the Torres Strait, Australia. *J Am Mosq Control Assoc*. 2006;22(3):358-65.
8. Pener H, Wilamowski A, Schnur H, Orshan L, Shalom U, Bear A. *Aedes albopictus* in Israel. *European Mosquito Bulletin*. 2003;14:32.
9. Haddad, N, Harbach E, Chamat S, Bouharoun H. Presence of *Aedes albopictus* in Lebanon and Syria. *J Am Mosq Control Assoc*. 2007;23(2):226-28.
10. Hawley WA. The biology of *Aedes albopictus*. *J. Am. Mosq. Control Assoc*. 1988;4(Suppl.):1-40.
11. Costanzo KS, Muturi EJ, Lampman RL, Alto BW. The effects of resource type and ratio on competition occurring between *Aedes albopictus* and *Culex pipiens* (Diptera: *Culicidae*) in Italy. *J Med Entomol*. 2011;48(1):29-38.

12. Mitchell CJ. The role of *Aedes albopictus* as an arbovirus vector. *Parassitologia*. 1995;37(2-3):109-13.
13. Shroyer DA. *Aedes albopictus* and arboviruses: a concise review of the literature. *J. Am. Mosq. Control Assoc.* 1986;2(4):424-8.
14. Holick J, Kyle A, Ferraro W, Delaney RR, Iwaseczk M. Discovery of *Aedes albopictus* infected with West Nile virus in southeastern Pennsylvania. *J. Am. Mosq. Control Assoc.* 2002;18(2):131.
15. Müller GC, Xue RD, Schlein Y. Seed pods of the carob tree *Ceratonia siliqua* are a favored sugar source for the mosquito *Aedes albopictus* in coastal Israel. *Acta Trop.* 2010;116(3):235-9.
16. MOH, Palestinian Health Information Center, Dengue not recorded in Palestine. 24/08/2012. Website, WWW.MOH.PS.
17. Richard F, A C de Silveira Ramos, 2d ed. *Manual of malarial entomology: a handbook of laboratory and field training exercises*, Manila, Malaria Eradication Training Center; 1969.
18. Leopoldo MP ictorial Keys f or the Identification of Mosquitoes (Diptera: *Culicidae*) Associated with Dengue Virus Transmission. Ph.D. Magnolia Press. *Zootaxa*. 2004;589:1–60.
19. Darsie RF Jr, Samanidou-Voyadjoglou A. Keys for the identification of the mosquitoes of Greece. *J Am Mosq Control Assoc.* 1997;13(3):247-54.
20. Shahyad, AH, Ralef H. Keys to the adult females and fourth-instar larvae of the mosquitoes of Iran (Diptera: *Culicidae*). Magnolia Press. *Zootaxa*. 2009; 2078:1–33
21. Klobucar A, Merdic E, Benic N, Baklaic Z, Krcmar S. First record of *Aedes albopictus* in Croatia. *J. Am. Mosq. Control Assoc.* 2006;22(1):147- 48.
22. Madon M, Mulla MS, Shaw MW, Kluh S, Hazelrigg JE. Introduction of *Aedes albopictus* (Skuse) in Southern California and potential for its establishment. *J Vector Ecol.* 2002;27(1):149-54
23. Madon MB, Hazelrigg JE, Shaw MW, Kluh S, Mulla MS. Has *Aedes albopictus* established in California? *J. Am. Mosq. Control Assoc.* 2004;19(4):298.
24. Müller GC, Xue RD, Schlein Y. Differential attraction of *Aedes albopictus* in the field to Flowers, Fruits and Honeydew. 2011;118(1):45-9.
25. Gould DJ, Mount GA, Scanlon JE, Ford HR, Sullivan MF. Ecology and Control of denguevectors on an Island in the gulf of Thailand. *J Med Entomol.* 1970;25;7(4):499-8.
26. Sulaiman S, Jeffery J. The ecology of *Aedes albopictus* (skuse) (Diptera: *Culicidae*) in a rubber estate in Malaysia. *Bull. Entomol. Res.* 1986;76:553-57.
27. Mogi M, Khamboonruang C, Choochote W, Suwanpanit P. Ovitrap surveys of dengue vector mosquitoes in Chiang Mai, northern Thailand: seasonal shifts in relative abundance of *Aedes albopictus* and *Ae. aegypti*. *Med Vet Entomol.* 1988;2(4):319-24.
28. Thavara U, Tawatsin A, Chansang C, Kong-ngamsuk W, Paosriwong S, Boon-Long J, Rongsriyam Y, Komalamisra N. Larval occurrence, oviposition behavior and biting activity of potential mosquito vectors of dengue on Sumui Island, Thailand. *J Vec Ecol.* 2001;26(2):172-80.

29. Ogata K, Lopez Samayoa A. Discovery of *Ae. albopictus* in Guanemala. J Am Mosq Control Assoc. 1996;12(3):503-6.

© 2012 Adawi; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=164&id=19&aid=923>