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Mosquitoes collected on Weno Island, Romonum Island and Piis Island, Chuuk State, Federated States of Micronesia (Diptera: Culicidae)

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Abstract

Mosquito larval surveys were carried out on Weno Island, Romonum Island and Piis Island in August 2011. Larvae were collected from 133 natural and artificial habitats. A total of 1,761 larvae belonging to nine species including one unidentified species were collected. On Weno Island, eight species, *Aedes hensilli*, *Ae. albopictus*, *Ae. lamelliferus*, *Aedes* sp., *Culex quinquefasciatus*, *Cx. carolinensis*, *Cx. annulirostris* and *Lutzia vorax*, were collected. On Romonum Island, four species, *Ae. scutoscriptus*, *Ae. hensilli*, *Cx. quinquefasciatus* and *Cx. carolinensis* were collected. On Piis Island, six species, *Ae. scutoscriptus*, *Ae. hensilli*, *Aedes* sp., *Cx. quinquefasciatus*, *Cx. carolinensis* and *Cx. annulirostris*, were collected. Distributions of *Ae. hensilli* and *Ae. albopictus* were confirmed in this survey. To prevent the outbreak of dengue fever, environmental management should focus on the destruction, alternation, disposal or recycling of containers that produce the greater number of adult *Aedes* mosquitoes.

Key words: *Aedes hensilli*, *Aedes albopictus*, mosquito fauna, Chuuk State, Federated States of Micronesia

Introduction

It is a well-known fact that major vectors for dengue fever and dengue hemorrhagic fever are *Aedes aegypti* and *Ae. albopictus* in urban areas of Southeast Asia and in the Western Pacific Region (WHO, 1995). SAVAGE *et al.* (1998) reported a dengue fever outbreak in Yap State between June and July 1995 caused by dengue-type-4 virus. After this outbreak of dengue fever, it was also reported in 2004, 2007 and 2011 in Yap State. Entomological investigations implicated the native mosquito species, *Ae. hensilli*, as vector of dengue virus (SAVAGE *et al.*, 1998; NODA *et al.*, 2005). There is a possibility of outbreak of dengue fever in other states of Federated States of Micronesia. However, there is a little information for vector mosquito species. To know the geographical distribution of vector mosquitoes, entomological surveillance was carried out on Weno Island, Romonum Island and Piis Island, Chuuk State, Federated States of Micronesia. This report describes a survey of mosquito fauna and breeding sites of mosquitoes.

Materials and Methods

Mosquito larval surveys were carried out on Weno Island, Romonum Island and Piis Island in August 2011, Chuuk State, Federated States of Micronesia (Fig. 1). Weno

Island is the capital and commercial center of Chuuk. At just over 18km², it is the second largest island in the lagoon. Tropical forests make up much of the interior, with the highest point, the 370m Mt. Tonoken, nearly in the center. Romonum Island is also located in the lagoon, and it is less than 1 km². Piis island is located on the atoll ring reef, and it is also less than 1 km².

Larval collections were made at 133 habitats in Weno Island (86 habitats), Romonum Island (21 habitats) and Piis Island (26 habitats). The habitats are composed of coconut shells, rock pits, tree hole, banana stumps, wells, puddles, taro fields and artificial containers such as concrete puddles, plastic water barrels as well as discarded drink cans, glass containers, plastic containers, rubber containers, metal containers, buckets, plastic bags, pans, tires, freezer, washing machine and track loading platform, and the collections were made with a pipet and dipper. Collected larvae were preserved in 70% ethanol, and some larvae were reared to the adult stage.

Identification of the larvae and adults was made by using the keys and descriptions of BOHART (1957) and BOHART and INGRAM (1946). And, the classification of the species belonging to the genera *Lutzia* follows that of TANAKA (2003).

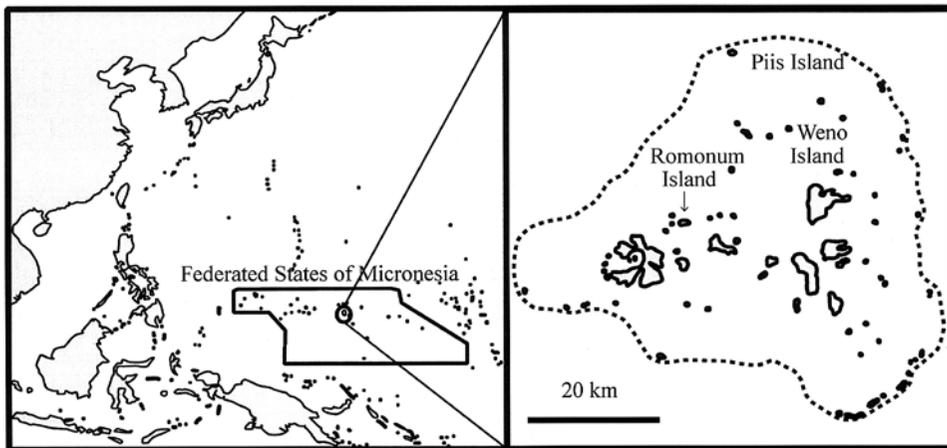


Fig. 1 Map of Chuuk Atoll. Mosquito larval surveys were carried out on Weno Island, Romonum Island and Piis Island.

Results

On Weno Island, a total of 1,180 larvae belonging to eight species including one unidentified species were collected at 86 natural and artificial habitats. They were identified as *Aedes hensilli*, *Ae. albopictus*, *Ae. lamelliferus*, *Aedes* sp., *Culex quinquefasciatus*, *Cx. carolinensis*, *Cx. annulirostris* and *Lutzia vorax* (Table 1). Among them, *Cx. carolinensis* was the most predominant species collected (656 larvae, 41 habitats) followed by *Ae. hensilli* (318 larvae, 44 habitats). *Ae. albopictus* was collected from discarded containers along the main road.

On Romonum Island, a total of 204 larvae belonging to four species were collected at 21 natural and artificial habitats. They were identified as *Ae. scutoscriptus*, *Ae. hensilli*, *Cx. quinquefasciatus* and *Cx. carolinensis* (Table 2). Among them, *Ae. scutoscriptus* was the most predominant species collected (99 larvae, 11 habitats).

Mosquitoes collected on Weno Island, Romonum Island and Piis Island, Chuuk State, Federated States of Micronesia (Diptera: Culicidae)

Table 1. Numbers of mosquitoes and their habitat types collected in Weno Island, Chuuk State, Federated States of Micronesia.

	Number collected	Number of habitat *	Habitato types (No. of habitat)
<i>Aedes hensilli</i>	318	44	Coconut shells (14), Drink cans (9), Glass containers (4) Plastic bag (1), Plastic containers (9), Metal container (1) Bucket (1), Tires (3), Freezer (1), Plastic water barrel (1)
<i>Aedes albopictus</i>	41	10	Coconut shells (2), Drink cans (5), Plastic container (1) Rubber container (1), Tire (1)
<i>Aedes lamelliferus</i>	11	1	Coconut shell (1)
<i>Aedes</i> sp.	1	1	Coconut shell (1)
<i>Culex quinquefasciatus</i>	72	6	Coconut shells (3), Pan (1), Tire (1), Washing machine (1)
<i>Culex carolinensis</i>	656	41	Coconut shells (18), Drink cans (7), Plastic containers (6) Rubber container (1), Bucket (1), Tires (8)
<i>Culex annulirostris</i>	80	6	Drink can (1), Glass container (1), Bucket (1) Concrete puddle (1), Track loading platform (1), Taro field (1)
<i>Lutzia vorax</i>	1	1	Drink can (1)

* Total number of habitat is 86.

Table 2. Numbers of mosquitoes and their habitat types collected in Romonum Island, Chuuk State, Federated States of Micronesia.

	Number collected	Number of habitat *	Habitato types (No. of habitat)
<i>Aedes hensilli</i>	23	4	Coconut shell (1), Drink can (1), Rock pits (2)
<i>Aedes scutoscriptus</i>	99	11	Coconut shells (2), Banana stumps (2), Drink can (1) Glass container (1), Rock pits (2), Plastic containers (3)
<i>Culex quinquefasciatus</i>	16	3	Coconut shell (1), Glass container (1), Well (1)
<i>Culex carolinensis</i>	66	4	Coconut shell (1), Glass container (1) Pan (1) Plastic water barrel (1)

* Total number of habitat is 21.

Table 3. Numbers of mosquitoes and their habitat types collected in Piis Island, Chuuk State, Federated States of Micronesia.

	Number collected	Number of habitat *	Habitato types (No. of habitat)
<i>Aedes hensilli</i>	82	8	Coconut shells (4), Drink cans (3), Pan (1)
<i>Aedes scutoscriptus</i>	65	10	Coconut shells (5), Drink can (1), Banana stump (1) Tree hole (1), Plastic containers (2)
<i>Aedes</i> sp.	17	2	Well (1), Taro field (1)
<i>Culex quinquefasciatus</i>	59	3	Tree hole (1), Concrete puddle (1), Puddle (1)
<i>Culex carolinensis</i>	105	7	Coconut shells (4), Drink can (1), Taro fields (2)
<i>Culex annulirostris</i>	49	3	Puddle (1), Taro fields (2)

* Total number of habitat is 26.

On Piis Island, a total of 377 larvae belonging to six species including one unidentified species were collected at 26 natural and artificial habitats. They were identified as *Ae. scutoscriptus*, *Ae. hensilli*, *Aedes* sp., *Cx. quinquefasciatus*, *Cx. carolinensis* and *Cx. annulirostris* (Table 3). Among them, *Cx. carolinensis* was the most predominant species collected (105 larvae, 7 habitats) followed by *Ae. hensilli* (82 larvae, 8 habitats).

Discussion

In this survey, a total of 1,761 larvae belonging to nine species including one unidentified species were collected at 133 natural and artificial habitats. Five *Aedes* species were collected and *Ae. hesilli* was most abundant *Aedes* species in Weno Island and Piis Island, and also distributed in Romanom Island. *Ae. hesilli* is a main vector of dengue fever in Yap State (SAVAGE *et al.*, 1998; NODA *et al.*, 2005). In Weno Island, *Ae. albopictus*, which is a one of the major vectors of dengue fever, was also collected. Therefore, these islands seem to be highly dengue-sensitive areas. The exact house index (No. of houses positive for vector species / No. of houses inspected x 100%) was not examined in this survey. The house index may be more than 50. Mosquito surveys were carried out only on three islands of Chuuk lagoon. The mosquito distribution and density seem to be the same situation in other islands of Chuuk lagoon.

Aedes species lay eggs in practically all types of man-made containers, and also in some natural containers. Fig. 2 shows typical habitats for *Ae. hensilli*. Generally, the *Aedes* adults will be found around 50 meters from the breeding sources with a maximum flight distance of around 200 meters. To prevent the outbreak of dengue fever, environmental management should focus on the destruction, alternation, disposal or recycling of containers that produce the greater number of adult *Aedes* mosquitoes.

Weno Island is the main island, and the district center, government offices and

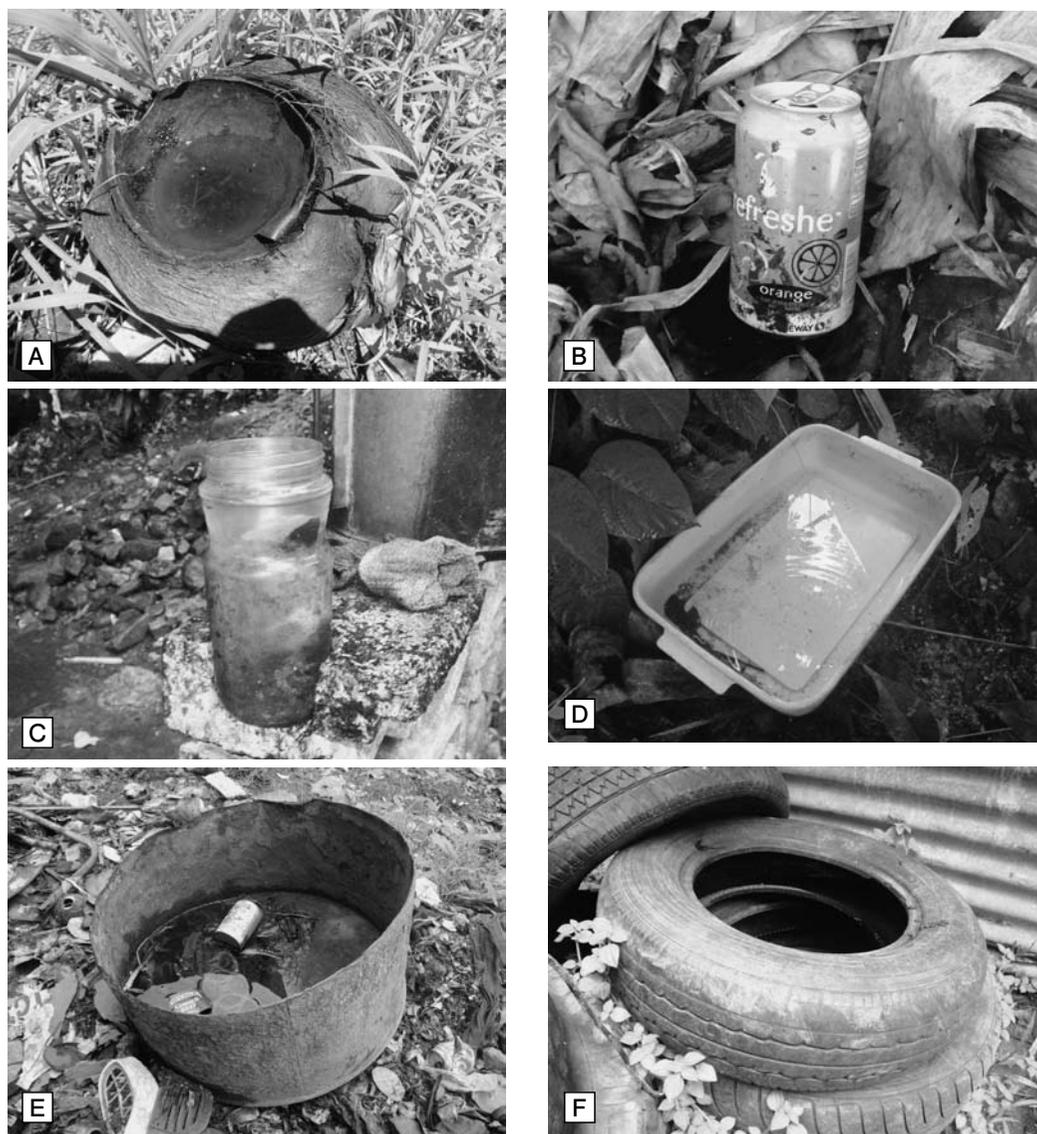


Fig. 2 Typical habitats for *Aedes hensilli* and *Aedes albopictus* (A: Coconut shell, B: Drink can, C: Glass container, D: Plastic container, E. Metal container, F: Tire).

airport are on the northwest side. Many people visit Weno Island from other islands for work, trade, shopping and other purposes. The northwest side of Weno Island is a very busy place. Fig. 3 shows the lump of the throw-away dust along the main street of Weno Island. *Aedes* larvae were often collected from artificial containers of throw-away dust. Unfortunately, the northwest area is highly dengue-sensitive. A patient infected with the dengue virus will arrive at this site from other states or countries, and may become the source of outbreak of dengue fever. As there was an outbreak of dengue fever in Palau, Yap and Majuro in 2011, an approach should be employed to reduce the potential for *Aedes* mosquitoes to breed in this area.



Fig. 3 The lump of the thrown-away dust along main street of Weno Island.

Acknowledgments

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