

A SURVEY OF LARVAL MOSQUITOES ON KUME ISLAND, RYUKYU ARCHIPELAGO, JAPAN

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ABSTRACT. Mosquito collections were carried out during May 1991 in Kume Island, Ryukyu Archipelago. Eighteen species of mosquitoes in 8 genera were collected; 11 species were new records for Kume Island. Characteristics of the larval habitats of these species are also described.

Kume Island (59 km²), is at 26° N latitude and 126° E longitude (Fig. 1), about 100 km west of Okinawa Island, Ryukyu Archipelago. The population of about 10,000, mostly in the villages of Gushikawa and Nakazato, has been declining yearly. The climate is subtropical; the mean daily minimum temperature for January and February (the coolest months of 1990) was 16.6°C, while the mean daily maximum for July and August of 1990 was 29.0°C. The total rainfall for 1990 was 2,409 mm. There are hills in the north (Uegusukudake, 310 m above sea level, Husakinayama, 220 m, Odake, 230 m and Darumayama, 203 m), and in the south (Aradake, 287 m). The area of the hilly terrain covered by trees is 23.6 km². Agriculture is extensive. Although there are very few rice fields (0.03 km²), sugar cane fields (14.8 km²) are common in the flatland.

The mosquitoes of Kume Island have been documented by the Okinawa Prefectural Health Section (1931) and Sasa et al. (1977), who recorded only 9 species in 4 genera. To better understand the mosquito fauna of the island in relation to the kinds of larval habitats available, larval collections were made from May 21 to 25, 1991. This was undertaken in conjunction with a parasitological study of canine dirofilariasis.

More than 1,000 mosquito larvae were collected with dipper, pipette, siphon or pump and small nets at approximately 50 sites throughout the island. Habitats sampled included: tree holes, rice fields, ponds, rock pools, crab holes, as well as artificial containers such as tin cans, earthen jars, used tires, plastic containers and glass bottles. Species difficult to identify in the larval stage were reared to the adults in the laboratory.

The mosquitoes collected are shown in Table 1. Eighteen species in 8 genera were collected. Eleven species preceded by an asterisk(*) rep-

resent new records for Kume. *Culex mimeticus* Noe (Sasa et al. 1977, Okinawa Pref. Health Section 1931) and *Aedes aegypti* (Linn.) (Okinawa Pref. Health Section 1931) were recorded previously from this island, but were not found in our survey. The addition of the 11 species brings the mosquito list of Kume Island to 20 with 8 genera.

Species predominating in open water habitats in cultivated areas, paddy fields and other flatland areas including swamps, ponds and ground pools were: *Anopheles sinensis*, *Cx. bitaeniorhynchus*, *Cx. pseudovishnui* and *Cx. tritaeniorhynchus*. *Aedes albopictus*, *Armigeres subalbatus* and *Cx. quinquefasciatus* were the predominant species in artificial containers around human dwellings. In tree holes and artificial containers in foothill areas, we collected *Uranotaenia novobscura ryukyuana*, *Orthopodomyia anopheloides*, *Ae. aureostriatus okinawanus*, *Ae. flavopictus downsi* and *Ae. riversi*. The larvae of *Topomyia yanbarensis* were collected exclusively from newly cut bamboo stumps and in erect bamboo internodes, and the predominant species in old bamboo were *Ur. n. ryukyuana*, *Ae. f. downsi* and *Ae. riversi* in the foothills.

The mosquito fauna of Kume Island is basically similar to those of Okinawa Island (1,220 km²) and Iheya Island (21 km²) situated 26 km northeast of Okinawa. Forty-eight species in 12 genera have been recorded from Okinawa, and 21 species in 7 genera in Iheya (Toma and Miyagi 1986). *Uranotaenia jacksoni*, collected from fresh water crab holes in the foothills, has been recorded from only 3 islands in the Ryukyu Archipelago, Okinawa, Kume, and Iheya. *Topomyia yanbarensis*, *Or. anopheloides*, *Ae. a. okinawanus* and *Ae. f. downsi*, which occur on Kume and Okinawa, have not been found on Iheya. *Mimomyia elegans*, *Mansonia uniformis*, *Ae. vexans nipponii*, *Cx. rubithoracis* and *Cx. vagans*, which breed in open areas, have not been found during this brief survey on Kume. Toma and Miyagi (1986) reported a high correlation between the size of an island in the Ryukyu Archipelago and the number of mosquito

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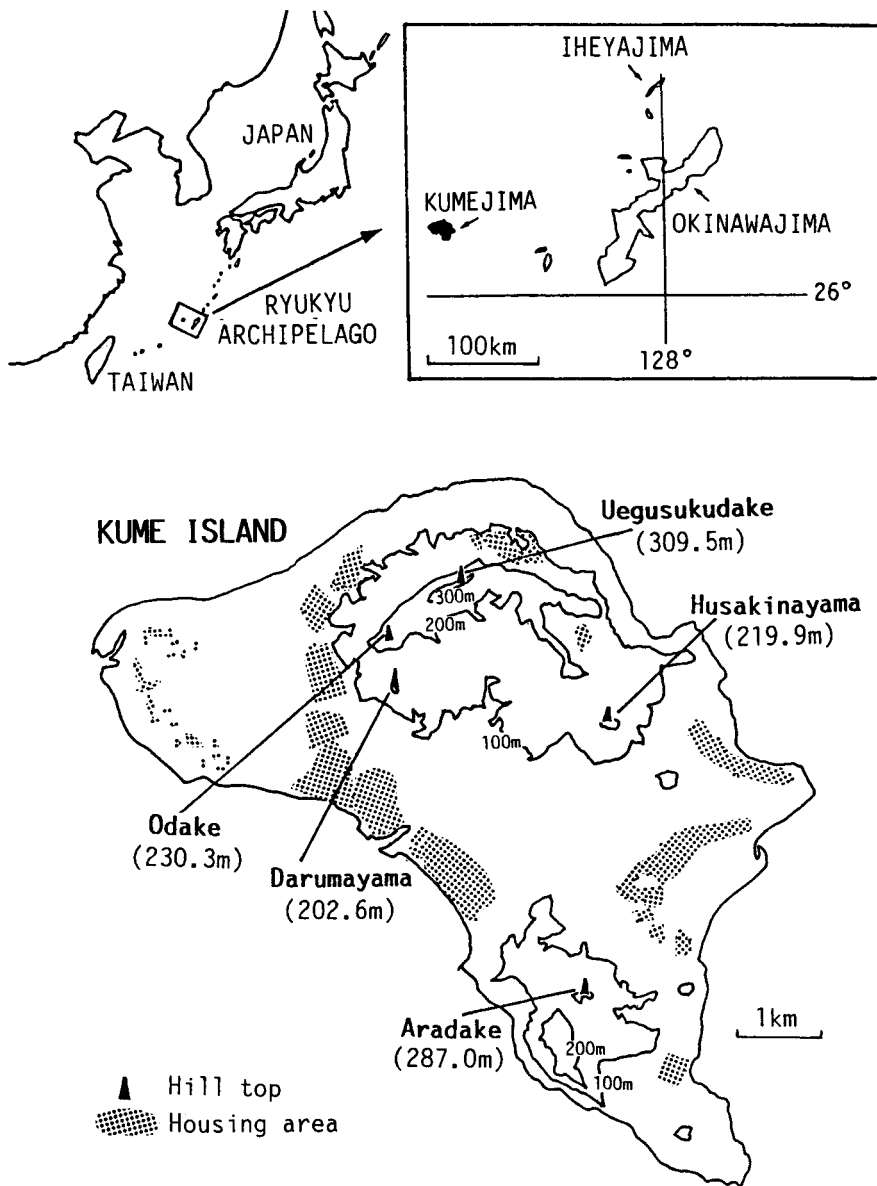


Fig. 1. Map of Japan and the Ryukyu Archipelago showing Kume Island.

Table 1. Mosquito larvae collected from different habitats in Kume Island, Ryukyu Archipelago, May 1991. *Culex mimeticus* and *Aedes aegypti* were recorded previously (Okinawa Pref. Health Section 1931)].

Species	Foothill area							Open area				
	Tree hole	Leaf axil (Taro)	Bamboo	Crab hole (fresh water)	Artificial con- tainer	Rock pool (brackish water)	Paddy field	Pond, swamp	Ground pool	Ditch	Artificial con- tainer	
<i>Anopheles sinensis</i> Wiede- mann							++++*	+	+++			
<i>Topomyia yarbarensis</i> Mi- yagi*			+									
<i>Mimomyia luzonensis</i> (Lud- low)*												
<i>Uranotaenia n. ryukyuna</i> Tanaka et al.*	+++		++		+++					++		
<i>Ur. jacksoni</i> Edwards* <i>Orthopodomyia anopheloides</i> (Giles)*	+++			++	+							
<i>Aedes a. okinawanus</i> Bohart* <i>Ae. togoi</i> (Theobald)	+++				+	+++				+		
<i>Ae. albopictus</i> (Skuse) <i>Ae. f. downsi</i> Bohart and In- gram	++	+	++		+					+++		
<i>Ae. rivarsi</i> Bohart and In- gram*	++		++		+							
<i>Armigeres subalbatus</i> (Co- quillet)							+			+++		
<i>Culex halifaxi</i> Theobald* <i>Cx. tubertis</i> Bohart*				++						+		
<i>Cx. bitaeniorhynchus</i> Giles <i>Cx. pseudovishnui</i> Colless* <i>Cx. quinquefasciatus</i> Say <i>Cx. tritaeniorhynchus</i> Giles*							++		++	++		
							+++		++	+++		
							+++	++	++	+++		
Total no. species	5	1	4	2	5	1	5	4	4	1		

* New record for Kume.

** Abundance was recorded as scarce (+), common (++) or very common (+++).

species present. The relationship between the size X and the number Y is represented by the equation $Y = 5.6X^{0.3}$. The number of species which can breed in Kume (59 km²) is estimated at 18.6 from the equation. Although Kume is 100 km distant from Okinawa, in analyzing the availability of mosquito habitats on Kume, it appears that the total number of mosquito species for the island will be increased slightly in the future by further study.

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REFERENCES CITED

- Okinawa Prefectural Health Section. 1931. Report on the dengue fever prevailing in Okinawa Prefecture in 1931, with a special reference to its relation with the distribution of mosquitoes, and number of mosquitoes and water tanks used by the inhabitant. *J. Public Health Assoc. Jap.* 7:511-523 (in Japanese).
- Sasa M., K. Kamimura and I. Miyagi. 1977. Mosquito. pp. 137-175. *In: M. Sasa, R. Takahasi and H. Tanaka (eds.). Animals of medical importance in the Nansei Islands in Japan.* Shinjuku Shobo, Ltd., Tokyo.
- Toma T. and I. Miyagi. 1986. The mosquito fauna of the Ryukyu Archipelago with identification keys, pupal descriptions and notes on biology, medical importance and distribution. *Mosq. Syst.* 18:1-109.