Trop. Med., 33 (3), 55−60, September, 1991

Distribution of Mosquitoes on a Hill of Nagasaki City, with Emphasis to the Distance from Human Dwellings

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Abstract: Mosquito larvae were examined by using an ovitrap and adults by human bait catch from May to August in 1989 at 27 sites from the foot to the top of Konpira Hill of Nagasaki City, ranging from 120 to 320 m in altitude. Dominant mosquito species of both larvae and adults were *Aedes japonicus, Ae. albopictus* and *Tripteroides bambusa,* but remarkable differences were recognized in distribution among species. *Ae. albopictus* was abundant near the foot of the hill where human dwellings were located, while *Ae. japonicus* was rather evenly distributed from the foot to the top and *Tr. bambusa* was abundant near the top. More abundant *Ae. albopictus* near the foothill is probably due to a marked feeding preference for man.

Key words: Mosquito, *Aedes japonicus, Aedes albopictus, Tripteroides bambusa,* Spatial distribution

INTRODUCTION

Types of larval breeding places are fairly well known in Japanese mosquitoes (Kamimura, 1968; Tanaka *et al.*, 1979), but the relation between the abundance of mosquitoes and the distance from human dwellings has scarcely been studied. To clarify this relation the present study was carried out on a hill of Nagasaki City.

PLACE AND METHODS

Konpira Hill of Nagasaki City (Fig. 1), where this study was made, is covered by the secondary forest, and several human dwellings are located only at the foothill. A cylindrical metal ovitrap (350 ml in volume) was set on April 25, 1989 each at 27 sites, which were distributed along paths in the forest from the foot to the top, ranging from 120 to 320 m in altitude, as shown in Fig. 1. The water in the ovitrap was renewed and examined for larvae and pupae 4 times from May 25 to August 15. Adult mosquitoes attracted to a man were also collected 8 times from May 9 to August 15 by a hand net for 5 minutes in the day time each at the same 27 sites.

Received for Publication, September 4, 1991.
Contribution No. 2535 from the Institute of Tropical Medicine, Nagasaki University.

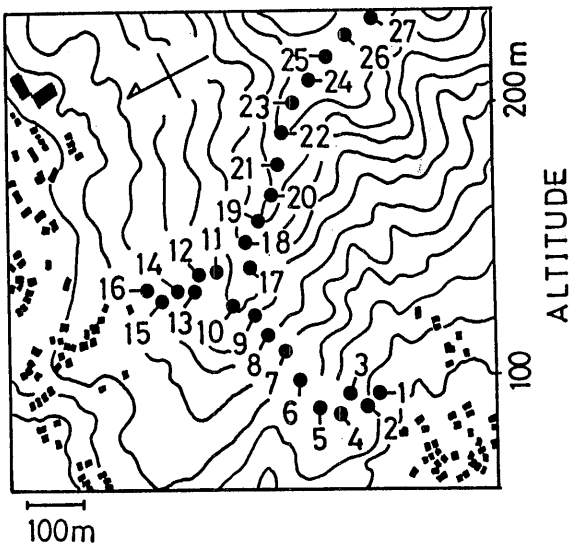

Fig. 1. Map of Konpira Hill showing 27 sites for mosquito survery. Squares indicate dwelling houses.

Results and Discussions

Table 1 shows total numbers of larvae (pupae inclusive) of mosquitoes collected from the 27 ovitraps. Five species were encountered, and dominant were *Aedes japonicus, Ae. albopictus* and *Tripteroides bambusa.* Smaller numbers of mosquitoes in earlier collections may be, besides the seasonal trend, due to the short period from the time of trap setting (April 25) to the start of collection (May 25).

Total numbers of adult mosquitoes by human bait cattch at the 27 sites are given in Table 2. Six species of mosquitoes were collected and again *Ae. japonicus, Ae. albopictus* and *Tr. bambusa* were abundant. It is interesting that seven *Culex tritaeniorhynchus* were obtained

Table 1. Total numbers of larvae (pupae inclusive) of mosquitoes collected from 27 ovitraps on each day, 1989

Species*	May 25	Jun. 20	Jul. 18	Aug. 15	Total
Ae. japonicus	91	55	111	23	280
Ae. albopictus	0	0	0	384	384
Tr. bambusa	0	237	639	3,172	4,048
Ar. subalbatus	0	0	0	73	73
Or. anopheloides	0	0	0	3	3
Total	91	292	750	3,655	4,788

**Ae.*: *Aedes*; *Tr.*: *Tripteroides*; *Ar.*: *Armigeres*; *Or*: *Orthopodomyia.*

Table 2. Total numbers of adult mosquitoes obtained by human bait catch at 27 sites on each day, 1989

Species*	May		Jun.		Jul.		Aug.		Total
	9	25	8	20	4	18	2	15	
Ae. japonicus	13	17	14	7	114	59	19	1	244
Ae. albopictus	0	1	10	3	24	51	23	46	158
Tr. bambusa	6	56	23	15	21	16	24	6	167
Ar. subalbatus	0	2	0	0	0	6	0	5	13
Cx. tritaeniorhynchus	0	0	0	0	1	0	6	0	7
Cx. pipiens pallens	1	1	0	0	4	0	1	0	7
Total	20	77	47	25	164	132	73	58	596

*Cx.: *Culex*; see Table 1 for other generic abbreviation.

in the day time on the hill. This seems to indicate that quite a large number of *Cx. tritaeniorhynchus* were invading the dwelling quarters of Nagasaki City from surrounding areas, because there were most probably no breeding places of this mosquito in the dwelling quarters and on the hill.

Distributions of larvae and adults of three dominant mosquitoes on the hill are illustrated by the total numbers collected during the survey period in Figs. 2 and 3, respectively. These figures clearly demonstrated remarkable differences in distribution among mosquito species. *Ae. albopictus* was abundant near the foot of the hill where human dwellings were located, while *Ae. japonicus* was rather evenly distributed from the foot to the top and *Tr. bambusa* was abundant near the top.

The distribution of mosquitoes related to the distance from human dwellings is important, for example, in assessing the frequency of mosquito bites, but little attention has been paid not only in Japan but also in other countries. Though extensive studies in Kenya by Lounibos (1981) showed distinct habitat preferences by the larvae of some aedine mosquitoes, the reason was not discussed. Hanson *et al.* (1988) reported the ubiquitous distribution throughout the urban area of *Ae. triseriatus,* which is primarily a tree hole mosquito, but the comparison with the distribution in the rural area was not made.

The present study demonstrated the distribution of the mosquitoes on a hill as related to the distance from human dwellings. Different distributions in mosquito species are influenced by various factors, among which the availability of hosts for blood feeding and the difference in microenvironment for the resting of adults seem to be important. More abundant *Ae. albopictus* near the foothill where dwelling houses were located is probably due to a marked feeding preference for man.

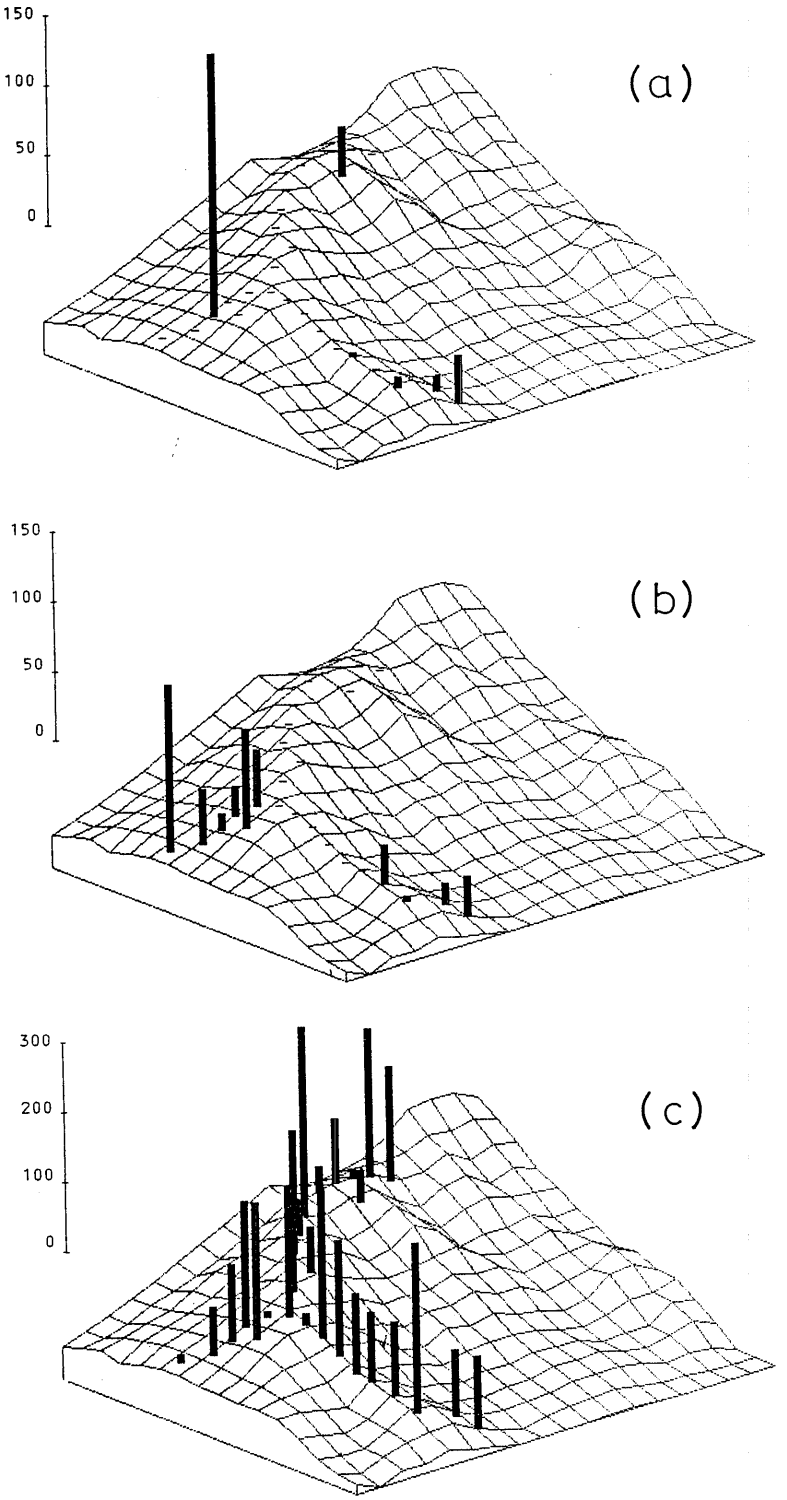

Fig. 2. Distribution of larvae (pupae inclusive) of three dominant mosquitoes on Konpira Hill. A bar indicates the total number of larvae collected during the survey period at each site. (a) *Ae. japonicus,* (b) *Ae. albopictus* and (c) *Tr. bambusa.*

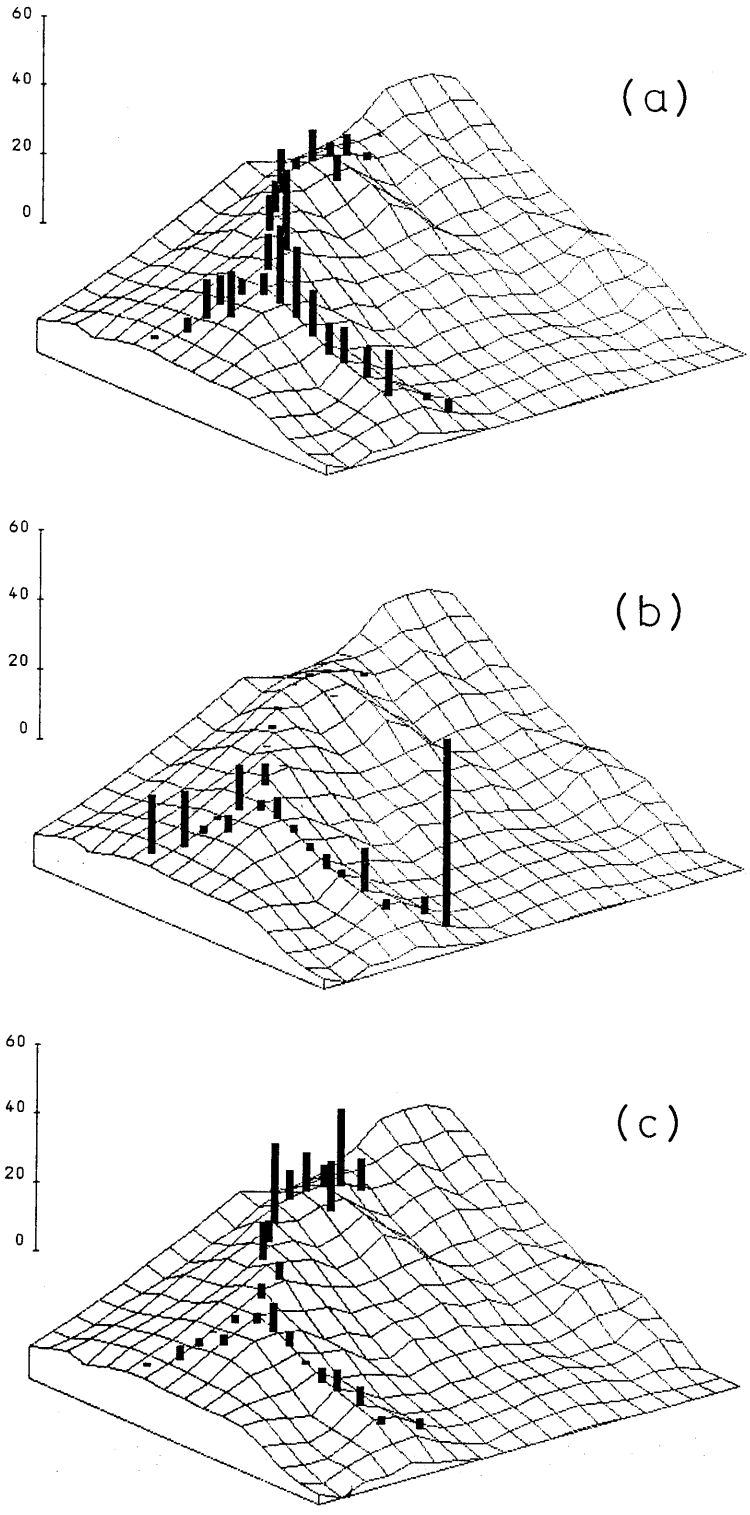

Fig. 3. Distribution of adults of three dominant mosquitoes on Konpira Hill. A bar indicates the total number of adults collected during the survey period at each site. (a) *Ae. japonicus,* (b) *Ae. albopictus* and (c) *Tr. bambusa.*

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