

Mosquitoes of the Ryukyu Archipelago
(Diptera: Culicidae)¹

Kazuo Tanaka, Edward S. Saugstad² and Kiyoyuki Mizusawa
Department of Entomology, U. S. Army Medical Laboratory, Pacific
Kamitsuruma 4054, Sagamihara City, Kanagawa Pref., Japan 228

ABSTRACT. Mosquito species occurring in the Ryukyu Archipelago are enumerated. *Anopheles ohamai* is provisionally treated as a subspecies of *An. sapersoi*. *An. nigerrimus* is deleted from the fauna of the Archipelago.

INTRODUCTION

The senior author of this paper presented a short speech on the mosquito fauna of the Ryukyu Archipelago at the 23rd Annual Meeting of the Japan Society of Sanitary Zoology, publishing "A List of the Family Culicidae of the Ryukyu Islands" (Tanaka, 1971a, 1971b). In preparation of this list, he largely utilized Hara's mimeographed paper, "A List of Mosquito Fauna of Japan" (1966). However, Hara's list has been found inaccurate, especially in distribution of species within the Ryukyus, thus causing several erroneous distribution records in Tanaka's list. This paper is a replacement and enlargement of the speech of 1971, being essentially a list of species occurring in the Archipelago, including corrections of and additions to the list of 1971, synonyms from this region, brief accounts of larval habitats and geographical distributions. The first record of each species from the Ryukyu Archipelago is also shown as far as we could trace it; there may well exist earlier records than those we found for some of the commonest species such as *C. tritaeniorhynchus*, *Aedes albopictus*, *Ae. vexans nipponi*, etc.

The Ryukyu Archipelago is here defined as a series of more than 100 islands situated between Kyushu and Taiwan, extending about 1000 km from 24° to 30° N, and 123° to 130° E. Tokara Guntô, composed of more than 10 very small islands scattered between Yakushima and Amami Ōshima, may be a part of the Ryukyu Archipelago. However, mosquitoes have not been surveyed in this Guntô, and it is not considered in this paper. Daitô Shotô³, about 400 km east of Okinawa Is., consisting of 3 small islands of upheaved coral-reef, may belong to a different geographical category, thus, it is not included in the Ryukyu Archipelago. Ōsumi Shotô, including Yakushima (Is.) and

¹Supported in part by U. S. Army Medical Research and Development Command, Office of the Surgeon General, Washington, D. C. 20314, Project No. 3A062110A831.

²Present address: Officer Student Battalion, Academy of Health Science, Class #6-8-C-22, Ft. Sam Houston, Texas 78234.

³K. Mizusawa personally attempted a survey during 4-6 Sept. 1967 on Minami Daitô Is., the largest island (31 km²) of the three, obtaining 4 species: *Mansonia uniformis*, *Culex pipiens quinquefasciatus*, *Aedes albopictus* and *Armigeres subalbatus*.

Tanegashima (Is.) off southern Kyushu, is also not included, because it appears geographically more closely related to the mainland of Kyushu.

The Ryukyu Archipelago is divided into 4 groups of islands from the north to south: Amami Guntô, Okinawa Guntô, Miyako Guntô and Yaeyama Guntô; the last 2 occasionally combined as Sakishima Guntô. The area of and the number of species recorded from the total Ryukyu Archipelago, together with those of these 4 groups and Palaeartic Japan (from Hokkaido to Kyushu) are shown in Table 1. Species composition of the total Ryukyu Archipelago is demonstrated in a diagram (Fig. 1).

While zoogeography of the Ryukyu Archipelago may well be one of the more fascinating subjects in this field, detailed discussions on the zoogeography of mosquitoes will be done elsewhere. Here we will give only a rough and partial sketch of it. Endemic species are *Anopheles saperoi*, *Uranotaenia ohamai*, *U. yaeyamana*, *Heizmannia* sp., *Culex tuberis*, *C. ryukyensis*, *Aedes atrisimilis*, *Ae. iriomotensis* and *Toxorhynchites yamadai*. Semiendemic species are *Aedes watasei*, *Ae. riversi* and *Ae. nobukonis*; the distributions of these 3 species outside the Archipelago are limited to only one to a few localities of the southern and western coastal regions of the Kyushu District. A rather high percentage of endemic species is thought to be one of the characteristics of the Ryukyuan fauna. However, future discoveries seem likely to decrease rather than increase this percentage. Mosquito fauna of the eastern coastal region of East Asia including the Ryukyus may be characterized by richness of species and strong northwards invasion of southern species, bringing a high percentage of species common to the Oriental and Palaeartic Regions to both the Ryukyus and Palaeartic Japan. For an explanation of it, approaches from geological history should primarily be considered; however, aerial currents may be one of the important additional factors. Overseas migration of mosquitoes has recently been confirmed; for instance, 3 females of *Culex tritaeniorhynchus* were captured on a weather-ship located on the Pacific Ocean at 29°N, 135°E, 560 km east of Amami Ôshima, or 780 km from Okinawa Is. (Asahina & Turuoka, 1969, 1970; Asahina 1970). The aerial currents prevailing in this region must have allowed northwards migration of southern species, and relatively high temperature and rich rain fall brought by the warm Japan oceanic current may have enabled them to have established there, contributing to the enrichment of the mosquito fauna of this region. The general character of the mosquito fauna of the Ryukyu Archipelago is Oriental as clearly seen in Fig. 1. Apparent richness of tropical elements in temperate Japan and its vicinity makes the boundary between the Oriental and Palaeartic Regions in this area rather obscure. But, closer examination of the mosquito faunae of Amami Guntô and Ôsumi Shotô will give some light to this problem. Two tropical genera (*Mimomyia* and *Malaya*) and 5 Oriental species recorded from Amami Guntô do not reach Ôsumi Shotô; *Heizmannia*, an Oriental genus (Mattingly, 1962), though occurring in Korea, was found on Amami Ôshima, but not in Ôsumi Shotô; on the other hand, 7 Palaeartic species of Ôsumi Shotô do not reach Amami Guntô. Essentially palaeartic elements in Amami Guntô are only 3; the Amami population of one of them (*Aedes nipponicus*) appears morphologically distinct from the populations of Palaeartic Japan and Korea, and the remaining 2 species are distributed

further south. Ryukyuan subspecies *downsi* of *Ae. flavopictus* is spread throughout the Archipelago including Amami Guntô while the nominate subspecies occurs in Korea and temperate Japan including Ôsumi Shotô. "Percentages of affinity" (Masamune, 1931) of mosquito faunae between the neighbouring groups of islands are shown beneath.

Kyushu mainland-Ôsumi	Ôsumi-Amami	Amami-Okinawa	Okinawa-Yaeyama
82.08	55.30	79.61	84.57

The above examples appear to show that a greater faunal discontinuity exists between Ôsumi Shotô and Amami Guntô than between other areas of this region, suggesting that it is the boundary separating the Oriental and Palaeartic Regions. This coincides with the Watase Line (Okada, 1924, after Tokuda, 1941) which has been substantiated by the distributions of mammals, birds, reptiles, amphibians, terrestrial snails and several groups of insects (after Tokuda, 1941).

Table 1. The numbers of mosquito genera, subgenera and species.

	Area (km ²)	Genera	Subgenera	Species	% of total species
Total Ryukyu Arch.	3,436	13	24	63	100.0
Amami Guntô	1,237	12	18	37	58.7
Okinawa Guntô	1,334	11	19	44	69.8
Miyako Guntô	227	4	8	13	20.6
Yaeyama Guntô	638	12	23	57	90.5
Palaeartic Japan	368,425	10	24	63	----

LIST OF SPECIES

1. *Anopheles (Cellia) minimus* Theobald, 1901, Mon. Cul. I: 186 (F);
Pokfulam, Hong Kong.
Anopheles formosaensis I Tsuzuki, 1902; ---Miyasaki, 1903; Yaeyama
(after Tsuzuki, 1907, Zool. Jahrb., Abt. Syst. Geogr. Biol.
Tiere 25: 542).

During 5 years of surveys on the Ryukyu Archipelago starting in 1970, we found this species only in November and December, 1971, and obtained more than 100 larvae from a streamlet between Mt. Banna and Mt. Maeshi, Ishigaki Is. This species was the primary vector of malaria on Miyako and Yaeyama, but appears to have been successfully controlled.

Distr. Ryukyu Arch. (Miyako and Yaeyama Guntô). Throughout the Oriental Region including Taiwan, excepting most parts of Malaya and Borneo.

2. *Anopheles (Cellia) tessellatus* Theobald, 1901, Mon. Cul. I: 175 (F);
Taipan, Straits Settlements. ---Miyagi, Iha & Kishimoto, 1969,
Trop. Med., Nagasaki 11: 33 (F); Haneji and Ishikawa, Okinawa
Is.; Ôtomi and Sonae, Iriomote Is.

The species seems to be very rare in the Ryukyu Arch., no record exists other than that of Miyagi *et al.* (1969).

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Throughout the Oriental Region including Taiwan. Moluccas.

3. *Anopheles (Anopheles) bengalensis* Puri, 1930, Ind. J. Med. Res. 17: 955
(M, L) (*aitkeni* var.); Marianbarie, Bengal Terai. ---Kanda & Kami-
mura, 1967, Japan. J. Sanit. Zool. 18: 108 (M, F, P. L); Amami
Ôshima and Tokunoshima, Amami Guntô.

Amami Guntô is the northern limit of the range of this species. It has not been found in Okinawa and Yaeyama Guntô.

Distr. Ryukyu Arch. (Amami Guntô). Taiwan. Philippines. Borneo. Java. South China. Hong Kong. Indochina. Malaya. Thailand. Burma. East India (Bengal and Assam).

4. *Anopheles (Anopheles) saperoi* Bohart *et* Ingram, 1946
Subsp. *saperoi* Bohart *et* Ingram, 1946, J. Wash. Acad. Sci. 36: 46
(F, L. E); Chizuka (= Kijoka), Okinawa Is.
Subsp. *ohamai* Ohama, 1947, Rec. Publ. Hlth. Dep. Yaeyama Prov. Gov.
No. 4: 9 (M, F, L) (as species) (mimeographed); Ishigaki Is.

Endemic species. Reid (1968) placed this species in the "*albotaeniatus* group," but resemblance in the male genitalia and especially larvae suggests that *saperoi* will be more closely allied to *koreicus*.

Anopheles ohamai was treated as a synonym of *saperoi* by Teller and Gentry (1955); it was regarded as a distinct species by Ohama (1955) and Bohart (1959); Sasa and Kamimura (1971) suggested the necessity of restudying its status. The differentiating characteristics indicated by Ohama (*l.c.*) and Bohart (*l.c.*) are: 1) the pale subcostal spot on vein *c* is shorter than the pale apical mark in *saperoi*, as long as it in *ohamai*; 2) larval seta 3-C 4-7 branched in *saperoi*, 3-5 in *ohamai*; 3) 4-C is longer in *saperoi* than in *ohamai*. We examined 2 males, 5 females and 6 larvae of *saperoi* from Okinawa Is., and 2 males and 3 larvae of *ohamai*; the 2 males of *ohamai* from Ishigaki Is. and the 3 larvae of *ohamai* from Iriomote Is. All the 4 males of these 2 species have the subcostal spot

of the same length as the apical mark; 1 female of *saperoi* also has the spot as long as the apical mark; the subcostal spot is definitely shorter in 3 females and intermediate in 1 female. The male of *saperoi* has more developed pale spots or marks on the wing as often seen in species of this genus. Ohama and Bohart's discussion did not include the male of *saperoi* and our material lacks the female of *ohamai*. But the above facts suggest that difference in the size of the subcostal spot will be due to sexual dimorphism and also individual variation to some extent. The larval seta 3-C is 4-7 branched in *saperoi* and 3-6 branched in *ohamai* in the specimens we studied. This cannot be considered as a specific difference. We also could not find any significant difference between seta 4-C of *saperoi* and *ohamai*. Thus, *saperoi* and *ohamai* cannot be discriminated by these 3 characters. As to the male genitalia, we examined 2 specimens of *saperoi* and 1 of *ohamai* (genitalia of another male were missing). They agree quite well with each other; including the characteristic lobes of tergum IX. Thus, *saperoi* and *ohamai* are considered as conspecific. However, we found some minor differences which were not mentioned by previous authors, viz., male hind tarsomere I is 1.19-1.21 times length of tibia in *saperoi*, 1.12-1.16 in *ohamai*; larval seta 3-VIII is 11-13 branched in 11 cases of *saperoi*; 8-10 branched in 2 cases of *ohamai*. Here we provisionally treat *ohamai* as a subspecies of *saperoi* until further material allows us to revise this status along with reevaluation of the above 2 differences.

Subsp. *saperoi* appears to be restricted to the northern mountain region of Okinawa Is. We obtained it at Mt. Onishi and Yona, 2 larvae were found on a rapid streamlet in the dark woods of Mt. Onishi. Subsp. *ohamai*, according to Ohama (1947a), was fairly common in that time; the larvae breed exclusively on mountain streamlets but have never been found associated with *minimus*. At present, *ohamai* appears very rare, the latest specimen we examined is a larvae, Iriomote Is., 17 XI 1965, M. Sasa leg., which Dr. Kamimura, Toyama Prefectural Hlth. Inst., kindly permitted us to study. Reisen *et al.* (1971) recorded *saperoi* from Misawa and Yokota AB, Honshu, Itazuke AB, northern Kyushu, and Osan and Kwang-Ju AB in Korea. It may be a misidentification or mislabeling.

Distr. Subsp. *saperoi*: Ryukyu Arch. (Okinawa Guntô). Subsp. *ohamai*: Ryukyu Arch. (Yaeyama Guntô).

5. *Anopheles (Anopheles) sinensis* Wiedemann, 1828, Aussereurop. Zweifl.

Ins. 1: 547 (M, F); Canton, China. ---Matsumura, 1905, Thous. Ins. Japan 2: 123; Ryukyu.

Anopheles nigerrimus: Hara, 1961 (*nec* Giles, 1900), Japan. J. Sanit.

Zool. 12: 161. ---Hara, 1966, List, Mosq. Fauna Japan (mimeographed); Amami Ôshima; Okinawa (Misidentification).

Common throughout the Archipelago.

Hara (1961) listed *nigerrimus* in an enumeration of additional mosquito species to the Japanese fauna without giving any collection data; then in "A List of Mosquito Fauna of Japan" (1966), he gave Amami Ôshima and Okinawa as its distribution. Through the courtesy of Dr. Okada, Juntendo University, we were permitted to study 3 females from Ariya, Amami Ôshima, in Hara's collection preserved in Juntendo University. These 3 are all the specimens of *Anopheles* from the Ryukyu Archipelago occurring in this collection, and

2 of them are labeled as "*Anoph. nigerr.*" and "*Anoph. nige.*", respectively, apparently by Hara's handwriting; the 3rd specimen has no label. There were no specimens of *Anopheles* from Okinawa. We identified these 3 specimens as *sinensis*. Excluding Hara, no one has found *nigerrimus* from the Archipelago. According to Harrison (1972), there are no confirmed records of the "*nigerrimus* subgroup" north or northeast of Vietnam. Thus, we feel it reasonable to delete *nigerrimus* from the Ryukyuan fauna.

Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô), Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea. North and south China. Taiwan. Hong Kong. Indochina. Thailand. Malaya. Sumatra. Assam. ?Siberia.

6. *Anopheles (Anopheles) lesteri* Baisas and Hu, 1936

Subsp. *lesteri* Baisas and Hu, 1936, Month. Bull. Bur. Hlth. Philipp., Manila 16: 229 (F, P, L, E) (*hyrcanus* var.); Santa Mesa of Manila. ---Tanaka, 1971, Japan. J. Sanit. Zool. 22: 80; Okinawa Is.

Harrison (1973) recorded this species from Iriomote Is. We examined the following specimens from Amami, Okinawa, Ishigaki, Iriomote and Yonaguni Is.

Amami Oshima: 1 F with associated Le⁴ and Pe,⁵ Nishinakama, 10 VII 1970, rice field, Mizusawa & Nishikawa leg.; 1 M with associated Le and Pe, Yuwan, 26 VII 1974, ground pool, Saugstad leg. Okinawa Is.: 1 M with associated Le and Pe, Ojana, Ginowan, 6 XI 1970, Ent., US Army Med. Cent. Ryukyu Is. leg.; 1 M, 2 FF with 3 associated LLe and PPe, Mashiki, Ginowan, 7 XI 1970, Ent., US Army Med. Cent. Ryukyu Is. leg. Ishigaki Is.: 1 M, 1 Pe, Miyara Riv., 25 IV 1971, grassy stream, Mizusawa & Nishikawa leg.; 2 FF, Mt. Banna, 19 XI 1971, marsh, Tanaka & Mizusawa leg.; 1 M, 1 F, 2 PPe, Mt. Omoto, 14 XII 1972, ground pool, Mizusawa & Imamura leg. Iriomote Is.: 1 F, Uehara, 29 X 1971, net, Mizusawa, Shinonaga & Kikuchi leg.: 1 F, Yashi-gawa, 18 XI 1971, net, Mizusawa leg. Yonaguni Is.: 2 FF nr. Sonai, 23 XI 1971, net, Mizusawa leg.; 1 M, *l.c.*, stream, Mizusawa leg.

The characteristic serrate margin of the pupal trumpet is constant in specimens from Utôma, Okayama Pref., Western Honshu and the Ryukyu Archipelago. In the Hokkaido population, it is not distinctly serrate and apparently similar to that of *sineroides*. These 2 species are, however, easily separated by the shape of abdominal setae 9-II-VII. Paired dark spots near the trumpet bases indicated by Ohmori (1959) as a specific character, were constantly found in the specimens we examined from Hokkaido, Honshu and Okinawa Is., and 1 female from Amami Ôshima; they are lacking in specimens from Yaeyama and 1 male from Amami Ôshima.

An. sinensis has been thought to be a malaria vector in Japan, but more attention should be paid to *An. lesteri* as suggested by Otsuru (1949) and Kamimura (1968), though malaria is no longer a serious problem in this region.

⁴Larval exuviae (sing. - Le; pl. - LLe)

⁵Pupal exuviae (sing. - Pe; pl. - PPe)

Distr. Subsp. *lesteri*: Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Hokkaido, Honshu, Kyushu). South China. Hong Kong. Philippines.
Subsp. *paraliae*: Borneo. Thailand. Malaya. Singapore.

7. *Uranotaenia (Pseudoficalbia) jacksoni* Edwards, 1935, Bull. Ent. Res. 26: 130 (M); Hong Kong.
Uranotaenia stonei Bohart, 1946, J. Wash. Acad. Sci. 36: 47 (M, F, L); Chizuka, Okinawa Is.
A fresh water crab-hole species. Bohart (1946) obtained this species from a rock hole. The records of this species from Ishigaki and Iriomote Is. by Bohart (1959) seem to be erroneous. They may be either *U. ohamai* or *yaeyamana*. This will be clarified by Mr. E. L. Peyton.
Distr. Ryukyu Arch. (Okinawa Guntô). Hong Kong.
8. *Uranotaenia (Pseudoficalbia) ohamai* Tanaka, Mizusawa et Saugstad, 1975, Mosq. Syst. 7: 27 (M, F, L); Ishigaki and Iriomote Is.
A fresh water crab-hole species. Common.
Distr. Ryukyu Arch. (Yaeyama Guntô).
9. *Uranotaenia (Pseudoficalbia) yaeyamana* Tanaka, Mizusawa et Saugstad, 1975, Mosq. Syst. 7: 31 (M, F, L); Ishigaki and Iriomote Is.
A fresh water crab-hole species. Less common than *ohamai*.
Distr. Ryukyu Arch. (Yaeyama Guntô).
10. *Uranotaenia (Pseudoficalbia) bimaculata* Leicester, 1908, Cul. Malaya: 226 (M, F); The Gap, Selangor, Malaya. ---Yamada, 1932, In Icon. Ins. Japon.: 229 (F); Ryukyu.

Common throughout the Archipelago except for Miyako Guntô. Larvae occur chiefly in tree holes, occasionally in small artificial containers. The population of the Ryukyu Arch. is characterized by the pale pleura. Contrarily, specimens from Palaearctic Japan appear identical in the pleural colour with Malayan specimens, which Mr. E. L. Peyton, Principal Investigator, Medical Entomology Project, Smithsonian Institution, kindly sent us for comparison.

Distr. Ryukyu Arch. (Amami, Okinawa & Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Taiwan. South China. Thailand. Malaya. India.

11. *Uranotaenia (Pseudoficalbia) nivipleura* Leicester, 1908, Cul. Malaya: 219 (M, F); Selangor, Malaya; Singapore. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 57 (M); Chizuka, Okinawa Is.
Very rare in the Archipelago. We obtained only 2 females: 1 F, Yona, Okinawa Is., 11 IX 1970, Tanaka & Mizusawa leg.; 1 F, Mt. Banna, Ishigaki Is., 12 V 1970, net, Mizusawa & Nishikawa leg. The female of Yona, Okinawa Is., was captured on a naked knee of a man in a room in the evening, but it is unlikely that it feeds on man.
Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Taiwan. Malaya. Singapore. Java. India. Ceylon.

12. *Uranotaenia (Uranotaenia) annandalei* Barraud, 1926, Ind. J. Med. Res. 14: 343 (M, F); Golaghat, Assam.
Uranotaenia nanseica Bohart et Ingram, 1946, U. S. Navmed 1055: 56 (M); Chizuka and Hedo, Okinawa Is.

Common in Yaeyama, less so in Okinawa Is.; the larvae are found in shaded shallow stream pools, and are characterized by *Aedes*-type sinuous actions and greatly modified antennal setae.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Taiwan. South China. Burma. Nepal. India.

13. *Uranotaenia (Uranotaenia) macfarlanei* Edwards, 1914, Bull. Ent. Res. 5: 127 (F); Hong Kong. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 55 (M, F, L); Chizuka, Okinawa Is.

Very common in Yaeyama, less so in Okinawa Is. The most favorite larval habitat is a leafy shaded stream pool or a blocked stream. Their actions are *Anopheles*-like. We found that the male lacked the posterior smaller claw on the mid tarsus; this character appears not to have been reported by any previous author. Mr. Peyton, Medical Entomology Project, kindly informed me that topotypical specimens of this species also did not have the posterior claw on the mid tarsus.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Taiwan. South China. Malaya. Java. Sumatra. India.

14. *Mimomyia (Etorleptiomyia) elegans* (Taylor, 1914) (*sensu* Mattingly, 1957, Cul. Mosq. Indomal. Area I: 46). ---Tanaka, Saugstad & Mizusawa, 1973, Japan. J. Sanit. Zool. 23: 284 (M, F); Itokawarindô, Iriomote Is.; Mt. Maeshi and Nosoko, Ishigaki Is.

Rare in the Archipelago. We also examined 1 female specimen from Okinawa (Nago, 19 II 74, light trap) through the courtesy of Dr. Kishimoto, Okinawa Inst. Poll. Hlth.

Belkin (1962) stated that the typical *elegans* from Queensland, Australia, was markedly different from specimens of all the other areas including South-east Asia, and erected 2 species from the *elegans* complex of the South Pacific. Species of Southeast Asia may be different from typical *elegans* and also species of the South Pacific, however, there is no other available name for the species of this area. Here then, we follow Mattingly (1957). Ryukyuan specimens appear to have the patterns of pale scales on the scutum and abdomen more developed than in those of the other areas.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Philippines. Malaya. Thailand. Sumatra. New Guinea. Bismark Arch. Solomon Is. Australia.

15. *Mimomyia (Etorleptiomyia) luzonensis* (Ludlow, 1905), Canad. Ent. 37: 101 (F) (*O'Reillia*); Bayambang, Luzon. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 60 (M, F, L); Chizuka and Hedo, Okinawa Is.

Apparently rare.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Throughout the Oriental Region including Taiwan.

16. *Mansonia (Mansonioides) uniformis* (Theobald, 1901), Mon. Cul. 2: 180 (F) (*Panoplites*); Quilon, Travancore, S. India; Taiping, Perak. ---Mochizuki, 1913, Fukuoka Ikadaigaku Zasshi 7: 32 (F); Naha, Okinawa Is.

Apparently not rare. Adult females are easily obtained by human bait.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Korea. Oriental (including Taiwan), Australasian and Ethiopian Regions.

17. *Coquillettidia (Coquillettidia) crassipes* (Van der Wulp, 1881), Bijdr. Fauna Mid.-Sumatra, Dipt.: 9 (F) (*Culex*); Soeroelangoen, Sumatra. ---Bohart, 1959, Mosq. News 19: 196; Shirahama to Hoshitate, Iriomote Is.
Common in Iriomote Is., rather rare in other parts of the Archipelago.
Specimens examined. 1 F, Yuwan, Amami Oshima, 11 VII 1970, net, Mizusawa & Nishikawa leg.; 5 MM, 5 FF, Chibana, Okinawa Is., 1969, light trap, Ent., U. S. Army Med. Cent. Ryukyu Is. leg.; 39 MM, 24 FF, Yaeyama Guntô.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Taiwan. South China. Philippines. Malaya. Indonesia. Thailand. Burma. India. Ceylon. Australasian Region.
18. *Coquillettidia (Coquillettidia) ochracea* (Theobald, 1903), Mon. Cul. 3: 263 (F) (*Taeniorhynchus*); Kuala Lumpur. ---Gentry, 1957, Mosq. News 17: 82 (*Mansonia*); 1/4 mile southwest of Oyama, Okinawa Is.
Not common; adults are captured by light trap.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu). South China. Indochina. Malaya. Indonesia. Philippines. Thailand. India. New Guinea.
19. *Orthopodomyia anopheloides* (Giles, 1903), In Wyville Thomson, J. Trop. Med. 6: 315 (M, F, L) (*Mansonia*); Dehra Dun, India. ---Gentry, 1957, Mosq. News 17: 82; 7 km west of Ada Vill., Okinawa Is.
Common throughout the Archipelago except for Miyako Guntô; the larvae occur chiefly in tree holes and occasionally in artificial containers.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Throughout the Oriental Region including Taiwan, excluding Celebes.
20. *Heizmannia* sp. Tanaka, 1971, Abstracts of speeches 23rd Ann. Meet. Japan Soc. Sanit. Zool.: 4; Amami Guntô.
This is a unique species of this genus in the Ryukyu Arch. Detailed description and discussions will be given in a later paper.
Distr. Ryukyu Arch. (Amami Guntô).
21. *Culex (Lutzia) fuscans* Wiedemann, 1820, Dipt. Exot.: 9 (M, F); India. ---Intermill, 1970, Distr. Abund. Mosq. Okinawa:2; Okinawa Is.
Apparently rare in the Archipelago.
Specimens examined. 2 MM, 5 FF, Okinawa Is., VIII 1970, light trap, Ent., U. S. Army Med. Cent. Ryukyu Is. leg.; 1 M, Kishaba, Okinawa Is., 1 III 1971, light trap, T. Higa leg.; 1 F, Kishaba, Okinawa Is., 16 III 1971, light trap, B. Higa leg.; 1 F with associated Pe and Le, Yona, Okinawa Is., 24 X 1971, blocked stream, Mizusawa, Shinonaga & Kikuchi leg.; 1 F, Mt. Banna, Ishigaki Is., 2 XI 1971, net, Mizusawa, Shinonaga & Kikuchi leg.
There is no confirmed record of this species from Palaeartic Japan.
Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). South Prymorye. Korea. Taiwan. South China. Philippines. Borneo. Java. Sumatra. Indochina. Malaya. Thailand. Burma. India. Ceylon. Andaman Is. Caroline and Palau Is.

22. *Culex (Lutzia) halifaxii* Theobald, 1903, Mon. Cul. 3: 231 (F); Dindings, Straits Settlements.
Culex vorax (Edwards, 1921); ---Bohart & Ingram, 1946, U. S. Navmed 1055: 70 (M, F, L); Okinawa Is. and Iheya Is., Okinawa Guntô.
 Common throughout the Archipelago.
 Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). South Prymorye. Korea. North and south China. Oriental (including Taiwan) and Australian Regions. Ogasawara Is. Mariana Is.

23. *Culex (Eumelanomyia) brevivalpis* (Giles, 1902), Handb. 2nd ed.: 384 (M, F) (*Stegomyia*); Shahjahanpur, India. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 72 (M, F, L); Shanawan and Nakasoni, Okinawa Is.

Apparently rare in Okinawa Is., more common in Iriomote Is., Yaeyama Guntô.

Specimens examined. 3 MM, 1 F, with 2 (M & F) associated PPe and LLe, 4 LL (K-0684), Itokawa-rindô, Iriomote Is., 14 IV 1971, tree hole, Mizusawa & Nishikawa leg; 1 M, 2 FF, with 3 associated PPe and LLe, 57 LL (K-0698 and K-0699), near Sonai, Iriomote Is., 20 V 1971, tree hole, Mizusawa & Nishikawa leg., 1 L (K-1236), Ôhara, Iriomote Is., 22 IX 1972, tree hole, Mizusawa leg., 1 L (K-1238), Itokawa-rindô, Iriomote Is., 24 IX 1972, tree hole, Mizusawa leg.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Taiwan. Philippines. Borneo. Java. South China. Hainan Is. Indochina. Malaya. Thailand. Burma. India. Ceylon. Morotai. New Guinea. Bismark Arch.

24. *Culex (Eumelanomyia) hayashii* Yamada, 1917, Zool. Mag. Tokyo 29: 67 (M, F, P, L, E); Tokyo, Koyama, Nagaoka, Fukui, Kyoto, Kobe, Hiroshima and Ogori, Honshu; Fukuoka, Kyushu. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 71 (M, F, L); Kochiya, Nago, Genka, Hentona and Hedô, Okinawa Is.

Common throughout the Archipelago except for Miyako Guntô. Larvae are found most frequently in rock pools and blocked streams, occasionally in ground pools. The adults are known as amphibian biters.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). South Prymorye. Korea. North and south (Kiukiang; Chekiang) China. Taiwan.

25. *Culex (Eumelanomyia) okinawae* Bohart, 1953, Proc. Ent. Soc. Wash. 55: 187 (M, F, P, L); East Taira, Okinawa Is.

Apparently rare throughout the Archipelago. Sirivanakarn (1972) recorded this species from Iriomote Is.; we also obtained 4 larvae from this island (Itokawa-rindô, 6 XII 1972, ground pool, Saugstad, Mizusawa & Imamura leg.). Prof. Y. Wada, Department of Medical Zoology, Nagasaki University School of Medicine, kindly informed us that he obtained this species on Amami Island. The larvae are found in shaded blocked streams, and rock or ground pools along streams.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Taiwan. Philippines.

26. *Culex (Lophoceraomyia) cinctellus* Edwards, 1922, Ind. J. Med. Res. 10: 228 (nom. nov. for *Lophoceratomyia taeniata* Leicester, 1908, Cul. Malaya: 127 (M, F); Kuala Lumpur and Klang, Malaya). ---Bohart, 1959, Mosq. News 19: 197; Yaeyama.

Common in both Iriomote and Ishigaki Islands, Yaeyama Guntô.

Distr. Ryukyu Arch. (Yaeyama Guntô). Hainan. Philippines. Borneo. Indonesia. Malaya. Thailand. India.

27. *Culex (Lophoceraomyia) infantulus* Edwards, 1922, Ind. J. Med. Res. 10: 287 (M); Hong Kong. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 73 (M, F, L, E); Nago, Nahasoni, Chizuka and Hedo, Okinawa Is.

Very common throughout the Archipelago except for Miyako Guntô. The larvae are found most frequently in blocked streams, rock pools, ground pools, and occasionally in crab holes.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). South China. Hong Kong. Indochina. Thailand. Philippines. Java. India. Nepal. Ceylon. Maldive Is.

28. *Culex (Lophoceraomyia) minor* (Leicester, 1908). Cul. Malaya: 126 (M, F) (*Lophoceratomyia*); Kuala Lumpur and Selangor, Malaya. ---Bohart, 1959, Mosq. News 19: 197, Yaeyama.

Very common in Ishigaki and Iriomote Islands. The larvae are found usually in tree holes, occasionally in rock holes or ground pools.

Reisen *et al.* (1971) recorded this species from Yokota AB, Honshu, Japan. This is undoubtedly a misidentification or mislabeling.

Distr. Ryukyu Arch. (Yaeyama Guntô). Philippines. Malaya. Thailand. Burma. India.

29. *Culex (Lophoceraomyia) rubithoracis* (Leicester, 1908), Cul. Malaya: 119 (M, F) (*Lophoceratomyia*); Kuala Lumpur, Malaya. ---Intermill, 1967, Dist. Abund. Mosq. Okinawa: 2; Okinawa Is.

This species was also recorded from Amami Guntô by Kamimura (1968), but has not been found on Yaeyama Guntô.

Distr. Ryukyu Arch. (Amami and Okinawa Guntô). Japan (Honshu, Shikoku, Kyushu). Taiwan. Philippines. Borneo. Indonesia. South China. Malaya. Singapore. Thailand. Burma. India. Ceylon.

30. *Culex (Lophoceraomyia) tuberis* Bohart, 1946, Proc. Biol. Soc. Wash. 69: 42 (M, L); Chizuka, Okinawa Is.

Endemic species. Bohart obtained this species from a rock hole in Okinawa Is. We collected many larvae from fresh water crab holes on Ishigaki and Iriomote Islands, together with *Uranotaenia ohamai* and *U. yaeyamana*. The larvae and reared adults are identical with Bohart's description. It may be the same situation as the case with *Uranotaenia jacksoni* (= *stonei*) which Bohart obtained from a very deep, narrow rock hole, whereas we found it only in crab holes.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô).

31. *Culex (Culiciomyia) nigropunctatus* Edwards, 1926, Bull. Ent. Res. 17: 121 (nom. nov. for *Culiciomyia annulata* Theobald, 1907, Mon. Cul. 4: 230 (M, F); Sarawak at Kuching, Borneo). ---Bohart, 1959, Mosq. News 19: 197; Mt. Banna, Ishigaki Is.; Nakara River, Iriomote Is.
Restricted to Yaeyama Guntô in the Archipelago. Apparently not common. We found larvae from a blocked stream on Ishigaki Is., and from an apparently abandoned crab hole on Iriomote Is. We also examined larval specimens obtained from rice paddies near Arakawa, Ishigaki Is. (9 II 1968, A. B. Silagan leg.) through the courtesy of the Entomology Branch, U. S. Army Medical Center, Ryukyu Islands.
Distr. Ryukyu Arch. (Yaeyama Guntô). Oriental Region including Taiwan, excluding Indochina. Palau and Caroline Islands.
32. *Culex (Culiciomyia) pallidothorax* Theobald, 1905, J. Econ. Biol. 1: 32 (M, F); India. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 75 (M, F, L, E); Nago, Taira, Chizuka, Hentona, Nakaoshi and Kochiya, Okinawa Is.; Ie Is.; Heanza Is.; Takabanare Is.; Hamahika Is.
Yamamoto (1962) recorded this species from Amami Ôshima, and Tanaka (1971) from Iriomote Is. Apparently not very common through the Archipelago.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Taiwan. Philippines. South China. Indochina. Malaya. Thailand. Burma. India. Nepal. Ceylon.
33. *Culex (Culiciomyia) ryukyensis* Bohart, 1946, Proc. Biol. Soc. Wash. 59: 41 (M, F, L); Chizuka, Kochiya, Hedo and Yaba (Motobu Peninsula), Okinawa Is.
Endemic species. Common throughout the Archipelago except for Miyako Guntô. The larvae are found in a wide variety of breeding places, such as ground pools, blocked streams, tree holes, crab holes and artificial containers; frequently in turbid water.
Reisen *et al.* (1971) recorded this species from Itazuke, northern Kyushu; this record needs substantiation.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô).
34. *Culex (Culex) sitiens* Wiedemann, 1828, Aussereurop. Zweifl. Ins. 1:542 (F); Sumatra. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 81; Okinawa Is. and Ie Is., Okinawa Guntô.
Common in brackish water ground pools in Yaeyama Guntô. The male has 25-31 modified setae on the 3rd segment of the palpus, the setae are blunt-tipped and different in shape from usually pointed ones of *Culiciomyia*.
Distr. Ryukyu Arch. (Okinawa, Miyako and Yaeyama Guntô). Korea. Coastal regions throughout the Oriental Region, and of east Africa, Madagascar, northern Australia and Pacific islands.
35. *Culex (Culex) pseudovishnui* Colless, 1957, Ann. Trop. Med. Parasit. 51: 88 (M, F, L); Singapore.
Culex vishnui: Bohart & Ingram, 1946 (*nec* Theobald, 1901), U. S. Navmed 1055: 83 (M, F, L); Kochiya and Chizuka, Okinawa Is.; Iheya Is.
As to the identification of this species, we here follow Sirivanakarn (1975).
Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Korea. Oriental Region including Taiwan.

36. *Culex (Culex) tritaeniorhynchus* Giles, 1901, J. Bombay Nat. Hist. Soc. 13: 606 (A); Travancore, India. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 82; Okinawa Is., Kerama Is., Takabanare Is. and Theya Is., Okinawa Guntô.

Very common throughout the Archipelago. The primary vector of Japanese B encephalitis. Sagiya virus was isolated from this species in Okinawa (Hurlbut & Nibley, 1964). Larvae are found most frequently in rice fields and in association with *Anopheles sinensis*. McDonald & Savage (1972) reported the remarkable drop of the population of this species as well as that of *Anopheles sinensis* through changes in agriculture in Okinawa Is.

Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). South Prymorye. Korea. Manchuria. North and south China. Taiwan. Philippines. Indonesia. Indochina. Malaya. Thailand. Burma. India. Ceylon. Maldive Is. Uzbek. Turkmen. South Azerbaijan. Southwest Asia. Africa.

37. *Culex (Culex) whitmorei* (Giles, 1904), J. Trop. Med. 7: 367 (F) (*Taenio-rhynchus*); Camp Stotsenburg, Angeles; Pampanga, Luzon. ---Bohart, 1959, Mosq. News 19: 197; Sonai, Iriomote Is.

Apparently rare in the Archipelago. Kamimura (1968) recorded this species from Amami Guntô, and Intermill (1968) from Okinawa Is.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Prymorye. Korea. South China. Oriental Region including Taiwan. New Guinea.

38. *Culex (Culex) fuscocephala* Theobald, 1907, Mon. Cul. 4: 420 (F); Peradeniya, Ceylon. ---Miyagi and Omori, 1968, Abstracts 18th Ann. Meet. South Japan Br., Japan Soc. Sanit. Zool.: 5; Yaeyama Guntô.

Not rare in Yaeyama Guntô, but not found in other parts of the Archipelago. The larvae are found in ponds or rice fields.

Distr. Ryukyu Arch. (Yaeyama Guntô). Taiwan. Philippines. Indonesia. South China. Indochina. Malaya. Thailand. Burma. Andaman Is. India. Nepal. Ceylon.

39. *Culex (Culex) pipiens* Linne, 1758

Subsp. *quinquefasciatus* Say, 1823, J. Acad. Nat. Sci. Philad. 3: 10 (A) (as species); Mississippi River.

Culex fatigans Wiedemann, 1828; ---Hatori, 1919, J. Med. Ass. Formosa No. 205: 1057; Shika, Ishigaki Is. (misprinted as *Culex fatigavi*).

Very common throughout the Archipelago; a primary vector of Bancroftian filariasis. The Okinawa strain of Japanese B encephalitis was experimentally transmitted to mice by this subspecies (Hode, 1946).

Reisen *et al.* (1971) recorded *quinquefasciatus* from Misawa, Tachikawa and Yokota AB, Honshu, and Itazuke, Kyushu. These records should be restudied.

Distr. Subsp. *quinquefasciatus*: Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Cosmotropical. Species *pipiens*: Cosmopolitan.

40. *Culex (Culex) vagans* Wiedemann, 1828, Aussereurop. Zweifl. Ins. 1: 545 (M, F); Foochow, China. ---Intermill, 1967, Distr. Abund. Mosq. Okinawa: 2; Okinawa.

Kamimura (1968) recorded this species from Amami Guntô.

Distr. Ryukyu Arch. (Amami and Okinawa Guntô). Japan (Hokkaido, Honshu, Kyushu). East Siberia. Korea. Manchuria. North and south China. Hong Kong. North India.

41. *Culex (Culex) bitaeniorhynchus* Giles, 1901, J. Bombay Nat. Hist. Soc. 13: 607 (A); Travancore, India. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 77 (M, F, L); Okinawa Is. and Takabanare Is., Okinawa Guntô.
Common throughout the Archipelago.
Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). South Prymorye. Korea. North and south China. Oriental (including Taiwan), Australian and Ethiopian Regions.
42. *Culex (Culex) sinensis* Theobald, 1903, Mon. Cul. 3: 180 (*gelidus* var.) (F); Shaohyling, China. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 80 (M, F, L); Nago, Chizuka and Hentona, Okinawa Is.
Sasa *et al.* (1968) recorded this species from Amami Guntô, and Bohart (1959) obtained 1 adult from Ishigaki Is. Apparently not common through the Archipelago.
Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). South Prymorye. Korea. South China. Taiwan. Philippines. Indonesia. Indochina. Malaya. Thailand. Burma. India. Ceylon.
43. *Culex (Culex) mimeticus* Noe, 1899, Boll. Soc. Ent. Ital. 31: 240 (F); Grassano in Basilicata, Italy. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 80 (M, F, L); Nago, Okinawa Is.
Health Section, Okinawa Pref. (1931) reported the occurrence of this species in Okinawa, Tokashiki & Aguni Is., Okinawa Guntô; Miyako Is. & Yaeyama Guntô (Taketomi Vill.), but they did not give a full scientific name. Except in Amami Ôshima, this species appears not very common in the Ryukyu Arch.
Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea. Throughout the southern Palaearctic Region and the Oriental Region including Taiwan.
44. *Aedes (Ochlerotatus) vigilax* (Skuse, 1889), Proc. Linn. Soc. N. S. W. 3: 1731 (F), (*Culex*); New South Wales and Queensland. ---Tanaka, Nagano, Kishimoto and Miyagi, 1975, Japan. J. Sanit. Zool. 25: 298; Kuroshima (Is.), Yaeyama Guntô.
Up to now, this species has been found only on Kuroshima, a small flat heart-shaped island, 4.1 km wide, 3.2 km long, situated between Ishigaki and Iriomote Is., the 2 major islands of the Yaeyama Guntô. The larvae were found in ground pools. Iyengar (1954) showed that this species was the principal vector of *Wuchereria bancrofti* in New Caledonia (after Belkin, 1962).
Distr. Ryukyu Arch. (Yaeyama Guntô). Taiwan. Philippines. Indonesia. Indochina. ?Malaya. Thailand. Seychelles. New Guinea. Australia. Solomon Is. New Hebrides. New Caledonia. Loyalty Is. Fiji.
45. *Aedes (Finlaya) japonicus* (Theobald, 1901), Mon. Cul. 1: 385 (F) (*Culex*); Tokyo. ---Teller & Gentry, 1955, Proc. 42nd Ann. Meet., New Jersey Mosq. Ext. Ass.: 45; Iriomote Is.
The species common in Amami Ôshima, Amami Guntô, and also Ishigaki and Iriomote Is., Yaeyama Guntô, but very curiously it has not been found from Okinawa Guntô. A similar distribution pattern is seen also in *Tripteroides bambusa*. Larvae are found most frequently in rock holes, and often in tree holes and various types of relatively small artificial containers. Knight (1968) assigned the Ryukyuan population to subsp. *shintienensis* Tsai and

Lien, 1950. Miyagi (1971) synonymized *shintienensis* with *japonicus*. The situation, however, appears more complicated. The southern population has some different characteristics from the northern population, and the populations of Amami, Yaeyama and Taiwan are not always consistent in both adult and larval characters. Here we treat provisionally all of them as *japonicus*. Detailed discussions will be published later.

Distr. Ryukyu Arch. (Amami and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea. South China. Taiwan. Hong Kong.

46. *Aedes (Finlaya) togoi* (Theobald, 1907), Mon. Cul. 4: 379 (F) (*Culicelsa*); Osaka. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 66; Naha, Shimabaru, Bolo Point and Kin, Okinawa Is.

Common throughout the Archipelago. Larvae are found chiefly in brackish water. Health Section, Okinawa Prefecture (1931) reported the occurrence of this species in Okinawa, Ie and Tokashiki Is., Okinawa Guntô; Irabu Is., Miyako Guntô; and Yaeyama Guntô (Ishigaki, Ohama, Taketomi and Yonaguni Villages), but they did not give a full scientific name for this species. This species has been known as a natural vector of *Brugia malayi* (not occurring in this Archipelago), and also a good experimental vector of *Wuchereria bancrofti*, *Dirofilaria immitis*, etc.

Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Southern Kurile Islands. Sakhalin. South Prymorye. Korea. North and south China. Taiwan. Marcus Is. Ogasawara Is. Recently recorded from Thailand (Koh Samui Is.) (Gould *et al.*, 1968). Malaya (Ramalingam, 1969) and British Columbia (Sollers-Riedel, 1972).

47. *Aedes (Finlaya) aureostriatus* (Dcoleschall, 1857)

Subsp. *okinawanus* Bohart, 1946, Proc. Biol. Soc. Wash. 59: 39 (M, F, L) (as species); Okuma, Chizuka and Nago, Okinawa Is.

Subsp. *taiwanus* Lien, 1968, Trop. Med., Nagasaki 10: 223 (M, F, P, L); Mashihshih, Taiwu, Pingtung Hsien, Taiwan. ---Tanaka, Saugstad & Mizusawa, 1973, Japan. J. Sanit. Zool. 23: 284 (M, F, L); Ishigaki and Iriomote Is.

Common in Amami and Okinawa Is., rather rare in Yaeyama Guntô; larvae are found in tree holes and fern stumps.

Ae. aureostriatus aureostriatus was described from Amboina. We have not seen any typical or topotypical specimens, but examined 5 males, 3 females and 3 larval exuviae from Philippines. Adults of subsp. *okinawanus* differ from these Philippine specimens in that the scutal golden stripes are markedly narrower and paler, the mesepimeron bears 3-9 bristles on its mid anterior portion and also often 1-2 additional bristles on its lower posterior part, and the pale basal bands of the abdominal terga and the pale articular bands of the hind tarsus are less developed. Subsp. *taiwanus* is identical with *okinawanus* in scaling, but it has no mid and lower mesepimeral bristles as in specimens from Philippines. All the specimens of *aureostriatus* we obtained from Yaeyama Guntô agree with *taiwanus*. Though Bohart (1959) recorded *okinawanus* from Yaeyama Guntô, it will be *taiwanus*. Larvae also show some differences in their chaetotaxy among these 3 subspecies.

Distr. Subsp. *okinawanus*: Ryukyu Arch. (Amami and Okinawa Guntô). Japan (Yakushima). Subsp. *taiwanus*: Ryukyu Arch. (Yaeyama Guntô). Taiwan. Other subspecies: Oriental Region. New Guinea.

48. *Aedes (Finlaya) nipponicus* LaCasse et Yamaguti, 1948, Mosq. F. Japan Korea, part II: 79 (M, F, L) (*niveus* ssp.); Maizuru, Yodo and Wakayama, Honshu; Fukuoka, Nagasaki and Kagoshima, Kyushu. ---Kamimura, 1968, Japan. J. Sanit. Zool. 19: 28; Tokunoshima, Amami Guntô.

This may be essentially a palaeartic species, and in the Archipelago, has been recorded only from Amami Guntô, the northernmost islands in the Ryukyus. Specimens of Amami Ôshima, however, appear morphologically distinct from those from Palaeartic Japan and Korea. Detailed discussions will be published later. Larvae occur in tree holes. In the original description, the localities (should be type localities) of this species were shown by dots on a map. The names of these localities should be interpreted from another map. Stone *et al.* (1959: 167) appear to have partly misread in this procedure; Sasabo (correctly Sasebo) should be replaced by Nagasaki and Nara must be deleted.

Distr. Ryukyu Arch. (Amami Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea.

49. *Aedes (Finlaya) watasei* Yamada, 1921, Annot. Zool. Japon. 10: 64 (F); Ômura, Kyushu. ---Kamimura, 1968, Japan. J. Snait. Zool. 19: 19; Amami Guntô.

We have found this species throughout the Archipelago except for Miyako Guntô. Bohart (1953) recorded *Ae. (F.) feegradei* from Okinawa and Ishigaki Is. The original description of *Ae. (F.) feegradei* Barraud, 1934, is identical with specimens of *watasei*. At present, we consider Bohart's *feegradei* as *watasei*. Synonymity between Burmese *feegradei* and Japanese *watasei* will be studied later.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Kyushu).

50. *Aedes (Finlaya) albocinctus* Barraud, 1924, Ind. J. Med. Res. 11: 1002 (M, F) (*Finlaya albocincta*); Solon, Western Himalayas. ---Bohart, 1959, Mosq. News 19: 196 (F); Iriomote Is.

Since Bohart (1959), no one has obtained this species from the Ryukyu Archipelago. Larvae have been found in tree holes in the Himalayas (Barraud, 1934) and Yunnan (Chow and Mattingly, 1951).

Distr. Ryukyu Arch. (Yaeyama Guntô). China (Yunnan). India (Western Himalayas).

51. *Aedes (Geoskusea) baisasi* Knight and Hull, 1951, Pac. Sci. 5: 197 (M, F); Palawan, Samar, and Mindanao Is., Philippines. ---Tanaka, Saugstad & Mizusawa, 1974, Japan. J. Sanit. Zool. 24: 308 (M, F, P, L); Iriomote Is.

Immature stages of this Philippine species had not been previously known. We obtained all stages at Komi and along the River Maira, Iriomote Is. The larvae are found in brackish water crab holes.

Distr. Ryukyu Arch. (Yaeyama Guntô). Philippines.

52. *Aedes (Stegomyia) aegypti* (Linne, 1762), in Hasselquist's Reise nach Palästina: 470 (A) (*Culex*); Egypt.
Stegomyia fasciata (Fabricius, 1805); ---Mochizuki, 1913, Fukuoka Ika-daigaku Zasshi 7: 60; Naha, Okinawa Is.

According to Yamada (1916), the species appeared common in Okinawa Is. at that time; it also has been said as common in Okinawa, Miyako and Yaeyama

at or before World War II (Hatori, 1919; Miyao, 1931; Saigo, 1940; Iwata, 1943). According to Dr. Kishimoto, Okinawa Inst. Poll. Hlth. (personal communication), the species has not been found in the Ryukyus since 1958. Reisen (1970a, b) and Reisen & Basio (1972) reported that this species had been obtained by ovitraps at Kadena AB and Naha AB, Okinawa Is. on 1-11 Sept. 1970. This material needs a restudy. Tanaka (1971b) recorded 11 males and 13 females from Kabira, Ishigaki Is. collected by Dr. M. Nishikawa, former member of our project, on April 30, 1970. These may be the latest record in the Archipelago. This species as well as *Ae. albopictus* has been believed to be a vector of dengue fever in this area.

Distr. Ryukyu Arch. (Okinawa and Yaeyama Guntô). Cosmotropical.

53. *Aedes (Stegomyia) albopictus* (Skuse, 1895), Ind. Mus. Notes 3: 20 (1894) (F) (*Culex*), Calcutta. ---Miyao, 1931, Bull. Nav. Med. Ass. Japan 20: 566; Naha, etc., Okinawa Is.

Very common throughout the Archipelago. The larvae occur in natural containers including tree holes, bamboo and fern stumps, leaf-axils, etc., and various types of small artificial containers in human dwelling areas. It has been known as a vector of dengue fever. Hatori (1919) recorded *Stegomyia scutellaris* from Fukai, Ishigaki Is., but it is uncertain whether his species is *albopictus* or *riversi*.

Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Korea. North and South China. Oriental Region. Australian Region. Mariana Is. Hawaiian Is. French Somaliland. Malagasy.

54. *Aedes (Stegomyia) flavopictus* Yamada, 1921

Subsp. *downsi* Bohart et Ingram, 1946, J. Wash. Acad. Sci. 36: 51 (M, F, L) (as species); Chizuka, Shana Wan, Hentona and Hedo, Okinawa Is.

Bohart (1953) treated *downsi* as a subspecies of *flavopictus*. Huan (1972) erected it again to a species. Some of the characteristics considered as specific by her, however, appear to be due to local or individual variation. At present, we have checked only a part of our collection. Until further study is accomplished, we retain here subspecies status for *downsi*.

Distr. Subsp. *downsi*: Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Subsp. *flavopictus*: Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea. South Prymorye.

55. *Aedes (Stegomyia) riversi* Bohart et Ingram, 1946, J. Wash. Acad. Sci. 36: 50 (M, F, L); Chizuka, Hentona, and Shana Wan, Okinawa Is.

Very common throughout the Archipelago excepting Miyako Guntô. Habits of this species are similar to those of *Ae. albopictus* and *flavopictus downsi*. We obtained this species from Cape Sata, southern extremity of the mainland of Kyushu. This may be the first record of this species from the main islands of Japan. Specimens examined: 2 FF, 30 VIII 1969, biting, Mizusawa & Yoshii; 14 MM, 29 FF, 1 c., reared from larvae, tree hole, Mizusawa & Yoshii.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Japan (Kyushu: Cape Sata, Tsushima and Yakushima).

56. *Aedes (Aedimorphus) vexans* (Meigen, 1830)

Subsp. *nipponii* (Theobald, 1907), Mon. Cul. 4: 337 (F) (*Culicada nipponii*); Karuizawa (misprinted as *Karnizana*), Honshu, Japan. ---Bohart & Ingram, 1946, U. S. Navmed 1055: 69 (Adult, L); Miyazato, Haba, Kadena and China, Okinawa Is.

Common throughout the Archipelago. Larvae are found usually in unshaded ground pools or rice fields. The Okinawan strain of Japanese B encephalitis virus was experimentally transmitted to mice by this species (*vexans vexans?*) (Hodes, 1946), and Sagiya virus was isolated from this species in Okinawa (Hurlbut & Nibley, 1964).

Distr. Subsp. *nipponii*: Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Prymorye. Kharbarovsk area. Korea. Manchuria. North and south China. Transbaikalia. Mongolia. Subsp. *vexans*: Palaearctic (excepting the range of subsp. *nipponii*), Oriental, Australasian, Ethiopian and Nearctic Regions.

57. *Aedes (Verrallina) atrisimilis* Tanaka et Mizusawa, 1973, Bull. Natn. Sci. Mus. Tokyo 16: 625 (M, F, L); Iriomote Is.

Found only on Iriomote Is., Yaeyama Guntô. The larvae were found in ground pools ("Swamp" in the original description is erroneous). Adults bite man, being found in jungles but not common.

Distr. Ryukyu Arch. (Yaeyama Guntô).

58. *Aedes (Verrallina) iriomotensis* Tanaka et Mizusawa, 1973, Bull. Natn. Sci. Mus. Tokyo 16: 633 (F); Iriomote Is.

It is very curious that this species was found abundant only during October to November, 1971, in an area at the upper limit of a mangrove forest of Iriomote Is., Yaeyama Guntô. A hundred females were easily obtained by human bait, but all efforts made in 3 succeeding years have been unsuccessful in obtaining not only the male and immature stages, but also additional female specimens.

Distr. Ryukyu Arch. (Yaeyama Guntô).

59. *Aedes (Verrallina) nobukonis* Yamada, 1932, In Icon. Ins. Japon.: 228 (F); Ômura, Kyushu, Japan.

Aedes ishigakiensis Bohart, 1956, Bull. Brookly Ent. Soc. 51: 32 (M, F, P, L); Ishigaki Is.

Since Bohart (1956), this species has not been found in the Archipelago. Nagahana and Toyama (1954) recorded their specimens from Okinoshima (Is.), off western Honshu, as "*Aedes nobukonis?*"

Distr. Ryukyu Arch. (Yaeyama Guntô). Japan (Kyushu, ?Okinoshima).

60. *Armigeres (Armigeres) subalbatus* (Coquillett, 1898), Proc. U. S. Nat. Mus. 21: 302 (F) (*Culex*); Japan.

Desvoidea obturbans: Hatori, 1919, J. Med. Ass. Formosa No. 205: 1057; Fukai, Ishigaki Is. (misprinted as *Desvoidea of turbans*).

Common throughout the Archipelago.

Distr. Ryukyu Arch. (Amami, Okinawa, Miyako and Yaeyama Guntô). Japan (Honshu, Shikoku, Kyushu). Korea. South China. Taiwan. Indochina. Thailand. Burma. India. Ceylon.

61. *Tripteroides (Tripteroides) bambusa* (Yamada, 1917), Zool. Mag. Tokyo 29: 61 (M, F, P, L, E); Tokyo; Higashiyama Spa, Fukushima Pref.; Kyoto; Hiroshima; Omura, Nagasaki Pref.; Kumamoto; Kagoshima. ---Yamada, 1927, Sci. Rep. Gov. Inst. Inf. Dis. 6: 569

(*Rachionotomyia*); Ryukyu Isls.

Kamimura (1968) recorded this from Amami Guntô; we made mosquito surveys twice on Amami Ôshima but failed to obtain this species. In Yaeyama

Guntô this is fairly common; the coloration of the adult from this area is different from specimens from palaeartic Japan; the population of Yaeyama may deserve to be treated as a distinct subspecies. This species has not been collected in Okinawa Is., this curious distribution pattern is shared with *Aedes (Finlaya) japonicus*.

Distr. Ryukyu Arch. (Amami and Yaeyama Guntô). Japan (Hokkaido, Honshu, Shikoku, Kyushu). Korea. Taiwan. South China.

62. *Malaya genurostris* Leicester, 1908, Cul. Malaya: 258 (M); Malaya.

---Bohart & Ingram, 1946, U. S. Navmed, 1055: 54 (*Harpagomyia*)

(M, F, L); Nago, Shana Wan, Chizuka and Hedon, Okinawa Is.

Common; larvae are found in leaf axils of *Alocasia macrorrhiza*.

Distr. Ryukyu Arch. (Amami, Okinawa and Yaeyama Guntô). Taiwan.

Philippines. Indonesia. South China. Malaya. Singapore. Thailand. Burma. India. Ceylon. Maldive Is. New Guinea. Australia.

63. *Toxorhynchites (Toxorhynchites) yamadai* (Ouchi, 1939)

Subsp. *yamadai* (Ouchi, 1939), J. Shanghai Sci. Inst. Sect. III, 4:

223 (M) (*Megarhinus*); Mt. Yuwan, Amami Ôshima.

Subsp. *yaeyamae* Bohart, 1956, Bull. Brooklyn Ent. Soc. 51: 29 (M, F, P, L) (as species); east fork of Nakara River and Shirahama, Iriomote Is.; Yarabu Peninsula, Ishigaki Is.

Synonymity between *yamadai* and *yaeyamae* was suggested by Sasa and Kamimura (1971); Tanaka (1971) treated *yaeyamae* as a subspecies of *yamadai*. We obtained all stages of *yamadai* from Amami Oshima and *yaeyamae* from Ishigaki and Iriomote Is. The adults and larvae are identical with each other in all respects, with the one exception that the posterior pronotal lobe of the adult has a broader dark-scaled dorsal area in *yamadai* and a narrow dark-scaled dorsal margin in *yaeyamae*. Gentry (1957) recorded *Toxorhynchites* sp. from Okinawa Is., it may likely be this species, but we have not seen any specimens from this island. Until sufficient specimens from Okinawa Is. are available, we treat provisionally *yaeyamae* as a subspecies of *yamadai*.

Distr. Subsp. *yamadai*: Ryukyu Arch. (Amami Guntô). Subsp. *yaeyamae*: Ryukyu Arch. (Yaeyama Guntô).

ACKNOWLEDGMENTS

We are indebted to the entomologists mentioned in the text and others of Okinawa Prefecture for specimens as well as other help. We also wish to thank the following individuals for literature: Dr. Narao Fukuhara, Institute of Agricultural Science, Tokyo; Captain Bruce M. Furlow, U. S. Army Health & Environment Activity, Okinawa; Dr. Tadashige Habe, National Science Museum, Tokyo; Dr. Shigeo Kitaoka, National Institute of Animal Health, Tokyo; Mr. Motoyoshi Mogi, Nagasaki University, School of Medicine; Prof. Kikuo Matsuo, School of Medicine, Kyoto Prefectural University; Prof. Manabu Sasa, Institute of Medical Science, Tokyo University; Dr. Shun'ichi Ueno, National Science Museum, Tokyo; Dr. Ronald A. Ward, Medical Entomology Project, U. S. National Museum, Smithsonian Institution.

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Fig. 1

Mosquitoes of the Ryukyu Archipelago 63 spp.

