

The Anopheline mosquitoes of Burma

2. Subgenus *Myzomyia* Blanchard

Groups *Neomyzomyia* and *Pseudomyzomyia*

Christophers

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Khin-Maung-Kyi. *The Anopheline mosquitoes of Burma. 2. Subgenus Myzomyia Blanchard Groups Neomyzomyia and Pseudomyzomyia Christophers.* Union of Burma J. Life Sci. (1971) 4, 297-305. The distribution, bionomics, relation to malaria, and susceptibility to insecticides of the six anopheline species and varieties under the groups *Neomyzomyia* and *Pseudomyzomyia* of the subgenus *Myzomyia* so far recorded in Burma, are presented. *A. balabacensis balabacensis* is found to be highly anthropophilic and exophilic, and maintaining hyperendemic malaria during the monsoon, wherever it is present in thickly forested areas of Burma. Although this species is highly susceptible to DDT, it is not easy to control by house spraying alone, due to its natural exophilic habit. *A. sundaicus*, though not a vector of regular annual importance, was proved by indirect epidemiological evidences, to be responsible for sharp local outbreak of malaria in Arakan coastal areas of Burma. So far this species does not appear to develop complete resistance to DDT in Burma. The remainder species of these groups—*A. tessellatus*, *A. vagus*, *A. subpictus* and *A. kochi* are not proved to be taking part in malaria transmission, in this country.

This is the second of a series of papers on the distribution, bionomics, relation to malaria, and susceptibility to insecticides of the anopheline mosquitoes of Burma, and deals with six anopheline species and varieties, under the groups *Neomyzomyia* and *Pseudomyzomyia* of the subgenus *Myzomyia*, so far recorded in Burma.

The six anopheline species and varieties are:—*A. kochi*, *A. balabacensis balabacensis*, *A. tessellatus*, *A. vagus*, *A. subpictus*, and *A. sundaicus*. These will be dealt with one by one.

A. KOCHI DONITZ

A. kochi is a medium-sized mosquito, and could be easily identified even with the naked eye, and distinguished from all other anopheline species, by the tuft of scales that are prominent on the under surface of the abdomen.

Paper read at the Fifth Burma Research Congress on April 8, 1970.

Distribution

This species is mainly found in foothills and/or narrow river valleys in association with jungle. It is so far recorded from Akyab (Mayu Range), Kyaukpyu (Ngalapwi creek), Myitkyina, Mawlaik (Kabaw and Kale valleys), Katha (Wuntho and Indaw townships), Shwebo, Mandalay (Mogok, Thabcikkyin, Madaya and Maymyo foothills), Kyaukse (Myittha township adjoining Shan States border), Meiktila (Thazi-Kalaw foothills), Yamethin, Taunggyi (Kalaw, Pindaya and Nyaungshwe townships), Kyaukse, Mawchi Mines, and Pa-an districts (Fig. 1).

Bionomics

Breeding places

This species is essentially a stagnant-water breeder, and found mainly in pools, swamps, hoof-prints, road-side drains, cart-tracks and uncultivated rice-fields. It is also occasionally found in irrigation channels and sandy-beds of streams. It was often found in association with *Culiseta*. It prefers to lay eggs in water fully exposed to sunlight.

Seasonal prevalence

Macan (1948) recorded this species at Kabaw and Kale valleys in Mawlaik district from August to November. Feegrade (1926) recorded it during May to October at Hsipaw in Northern Shan States. At Papun, Maung-Gale (1926) found this species during September to October. Tin (1940), at Amherst, collected this species during January to February. At Mawchi Mines in Kayah State, James (1941) recorded this species during October. Fox (1949) collected this species during September to December at Mandalay-Maymyo foothills area. At Wuntho in Katha district, Tin (1937) recorded this species during September to November.

This species was recorded throughout the year in Katha, Mawlaik, Mandalay and Southern Shan States during the present malaria eradication period by the author and his staff. The peak season was found to be June to October. In other localities, it was recorded only during the monsoon season. In general, it might be said that *A. kochi*, because of the nature of its breeding places, reaches a peak of abundance during the rainy season.

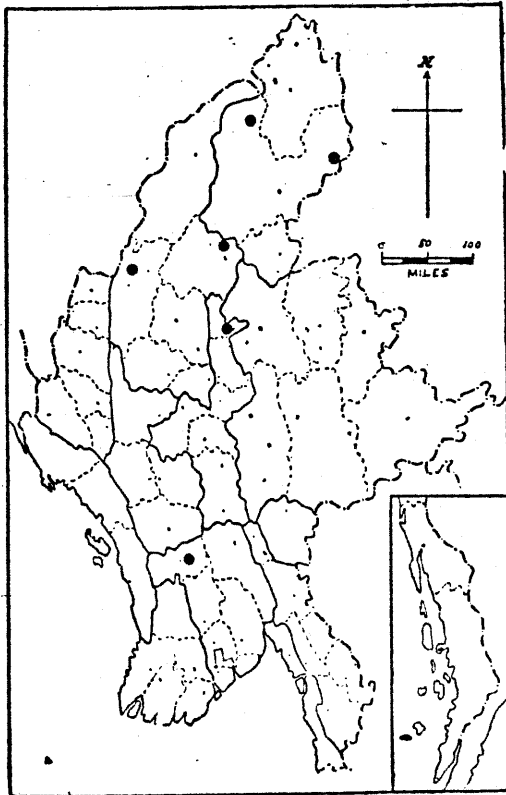


Figure 1.—Map of Burma showing the distribution of *A. kochi*.

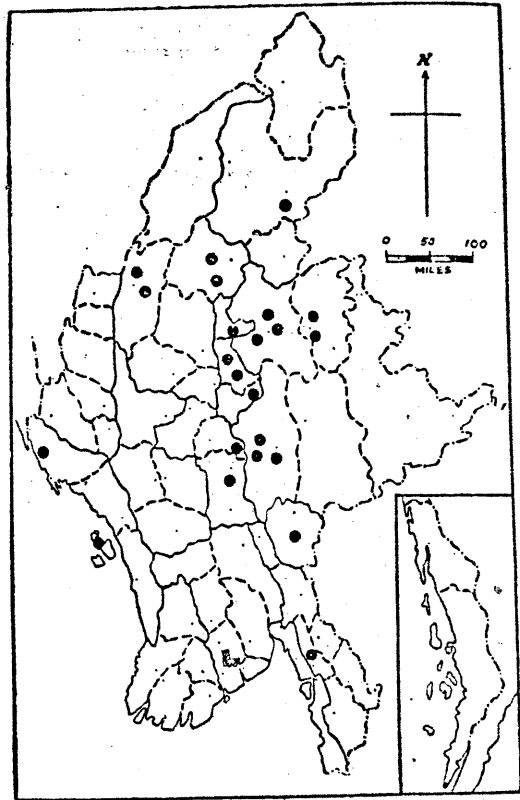


Figure 2.—Map of Burma showing the distribution of *A. balabaccensis balabaccensis*.

Feeding preferences

Macan (1948), in the Kabaw valley, and Watson (1944), at Myitkyina, found small numbers entering tents at night. It was stated that in neither case cattles were present. Fox (1949), in the foothills region of Mandalay-Maymyo road, found one specimen in a total of 1,144 anophelines entering houses at night and 7 in a total of 2,872 anophelines feeding cattle.

During the present malaria eradication period only on two occasions that this species was recorded biting man. The first occasion was at Nampalone village in Tamu township where out of a total of 54 *A. kochi* specimens collected at night by baits, only two were from human. (unpublished Departmental Report by Klin-Maung-Kyi & Maung-Winn, 1967 Report on Entomological Survey at Indo Burma border areas). Subsequently in October 1968, the author and his staff at Bonchaung village in Katha district, recorded one specimen by human-bait as against a total of 47 by cattle-baits. On no other occasion was this species, found biting man. Therefore, it might be stated that like other jungle

ANOPHELINE MOSQUITOES OF BURMA

anopheline species, *A. kochi* has a high preference for cattle blood. These results are in agreement with the results of similar investigation done by other malaria workers in the neighbouring countries.

Wharton (1953), based on his studies in feeding preference of *Anopheles* in a rubber estate in Malaya, summarized that *A. kochi* prefer cattle to any other animal. Similar results were also furnished by Davidson & Ganapathillai (1956), based on their observations on the bionomics of adult anophelines in an inland valley in Malaya.

Biting time

No information was obtained from previous malaria workers in Burma, regarding the exact biting time of *A. kochi*. Only during the present malaria eradication period that a considerable amount of the above information has been accumulated due to routine studies in fixed catching stations.

At Dalangyun village of Lewe township in Yame-thin district, author and his staff recorded in September, 1968, a total of 22 anophelines by cattle-bait outdoor during the first quarter of the night—1800 to 2100 hours, out of which 7 were found to be *A. kochi*. During the second quarter of the night, only two *A. kochi* were observed as against, 12 other anophelines. No specimens were collected during the subsequent quarters of the night. At Pinwe village in Katha district, during October 1968, the author and his staff recorded 2 *A. kochi* by cattle-bait outdoors during the first quarter of the night. But no specimens were caught during the subsequent quarters. Similar biting patterns of *A. kochi* were also observed in Mandalay, Toungoo, Moulmein and Shwebo districts.

Therefore, in general it might be said that the biting time of *A. kochi* would be from dusk to midnight with intense activity particularly during the first quarter of the night—1800 hours to 2100 hours.

Daytime resting places

Fox (1949) stated that the adults were seldom recorded in day catches and invariably only in small numbers. Tha-Gyaw (1927) at Myitkyina and James (1941) at Mawchi Mines, found small numbers in houses, but the data were not furnished.

Maung-Gale (1926, & 1927) at Papun and Mawlaik, did not find this species in houses but recorded them as resting in vegetation and scrub jungle. The author and his staff did not find *A. kochi* resting indoors during daytime throughout the present malaria eradication period. This might probably be due to the impact of insecticides in the observation areas, in addition to its natural outdoor resting habits.

Relation to malaria

There are no records of any dissections on this species in Burma. It would seem to be almost

entirely a jungle species. When found on humans, it was present in such small numbers that it could not be regarded as a vector of any importance.

A. BALABACENSIS BALABACENSIS BAIAS

An account of this species has been presented in detail by the author in his separate series of papers (Khin-Maung-Kyi 1970). Therefore, only a brief description of it will be made here.

A. balabacensis balabacensis is a member of the *leucosphyrus* complex which comprised several species and sub-species. Malaria workers in Burma continued to refer to the *leucosphyrus* group of species (*A. b. balabacensis*) as *A. leucosphyrus* (Macan, 1950; Fox, 1949; Venkat-Rao, 1956 and Venkat-Rao & Deplhin, 1957). However, the recent work on systematics of this group in Malaya has led to a considerable knowledge on *A. leucosphyrus* group of anopheline mosquitoes (Reid, 1949; Colless, 1950, 1956, 1957). On the basis of this work, Colless split the *leucosphyrus* group into 13 members known by different nomenclatures.

Only three members of the group have been definitely incriminated as vectors of malaria in South-East Asia. These are *A. b. balabacensis* type, *A. leucosphyrus* type, and *A. leucosphyrus* (Celebes form). The only form which has been recorded with certainty in Burma (specimens collected by T. T. Macan and referred to as *A. leucosphyrus*) is *balabacensis* (Colless, 1950). So far, other members of the group have not yet been recorded in Burma.

Distribution

A. b. balabacensis has a limited distribution in Burma. It has been recorded from Akyab, Mawlaik (Kabaw valley), Katha, (Wuntho and Indaw), Mandalay (Madaya township), Thazi-Kalaw Road, Myingyan (Mount Popa), Prome, Toungoo-Thandaung Road, Moulmein (Chaungzone), Myitkyina (Hukaung Valley and Ledo Road), Hispaw and Mawchi Mines (Fig. 2).

Bionomics

Breeding places

This species is capable of breeding in a great variety of stagnant water in the jungle, but never exposed to sunlight.

Seasonal prevalence

It is essentially a monsoon species prevalent from June to October with a peak in September. Only on very few occasions has it been reported as being numerous during the pre-monsoon or post-monsoon period, and then in very small numbers.

Feeding preference

There are strong evidences that the species feeds entirely on man.

Biting time

The biting activity of this species varies from place to place. But the main biting time was found to be during the second and third quarters of the night i.e., from 2100 hours to 0300 hours.

Daytime resting places

A. b. balabacensis confined itself to jungle conditions and was extremely difficult to find in human habitations during daytime. Adults could only be collected in comparatively greater numbers during human-bait collections at night.

Relation to malaria

Macan (1948) at Kabaw valley, dissected a total of 165 specimens out of which two gland infections were detected, thus showing a sporozoite infection rate of 1.2 per cent. (Lal & Maung-Thein, 1958) in Hukaung Valley in Kachin State, dissected a total of 2,061 specimens during 1956-58 showing a sporozoite rate of 0.2 per cent. The author and his staff at Madaya township in Mandalay districts, dissected 204 specimens during 1959 showing a sporozoite rate of 1.0 per cent. Unpublished Departmental Report by Khin-Maung-Kyi, Report on Entomological Studies in Botegone village in Madaya township, Mandalay 1959). Although dissections were done in Chaungzone township in Moulmein district and Wuntho township in Katha district, negative results were obtained probably due to scarcity of specimens.

It is undoubtedly a major vector during monsoon wherever it occurs in the thickly forested areas of Burma.

Elsewhere, *A. b. balabacensis* is an important vector in Assam (Clark & Chowdhury, 1941), Thailand (Scanlon & Sandhinand, 1965), Cambodia (Eyles, Wharton, Cheong & Warren, 1963), North Borneo (McArthur, 1947, 1950a, 1950b, and 1951), Java, Brunei, Sarawak and Philippines.

Taxonomic notes

The adult of Burmese species (*A. b. balabacensis*) of the *leucosphyrus* group can be differentiated from *leucosphyrus* (type) by the following characters:—

1. Presector dark spot of vein 1, longer extending basally at least to the level of the numeral dark spot on the costa; hind tarsal segment 4 usually with no basal band.....*A. leucosphyrus* (type)
2. Presector dark spot of vein 1, about the same length as that on the costa; hind tarsal segment 4 with a distinct basal pale band.....*A. b. balabacensis*

A. TESSELLATUS THEOBALD

This species is not widely distributed in Burma, and has never been found in abundance. Although it has been recorded in hilly and forested areas, it is mainly to be found in plains, especially the large rice growing areas of the Irrawaddy delta.

Distribution

This is recorded from Akyab, Sandoway, Mawlaik (Kabaw valley), Katha (Indaw township), Shwebo, Mandalay (Madaya and Maymyo foothills), Kyaukse, Meiktila (Thazi township), Yamethin (Lewe township), Bhamo, Myitkyina, Toungoo, Pegu, Prome, Tharrawaddy, Pyapon, and Moulmein districts. In the Shan States, it is recorded in Lashio and Taunggyi districts. It is also recorded in Papun district in Kawthoolei State (Fig. 3).

Bionomics

Breeding places

This species breeds in stagnant water. It has been found in tanks, ditches, drains and borrow-pits,

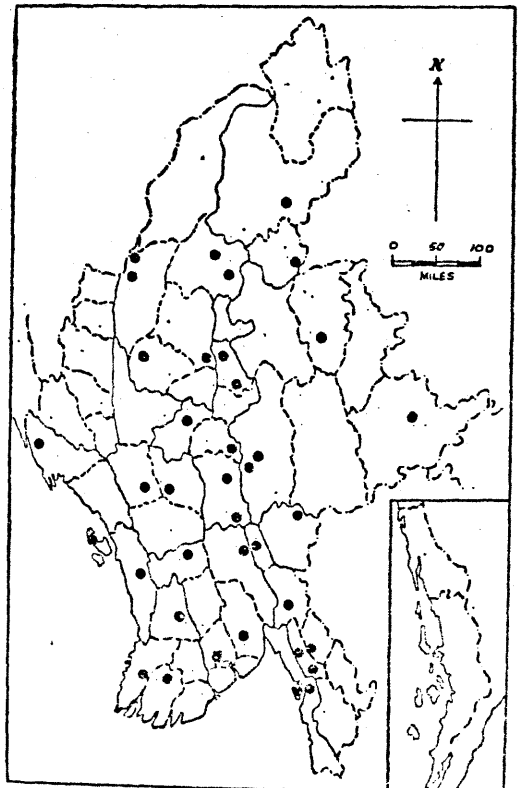


Figure 3.—Map of Burma showing the distribution of *A. tessellatus*.

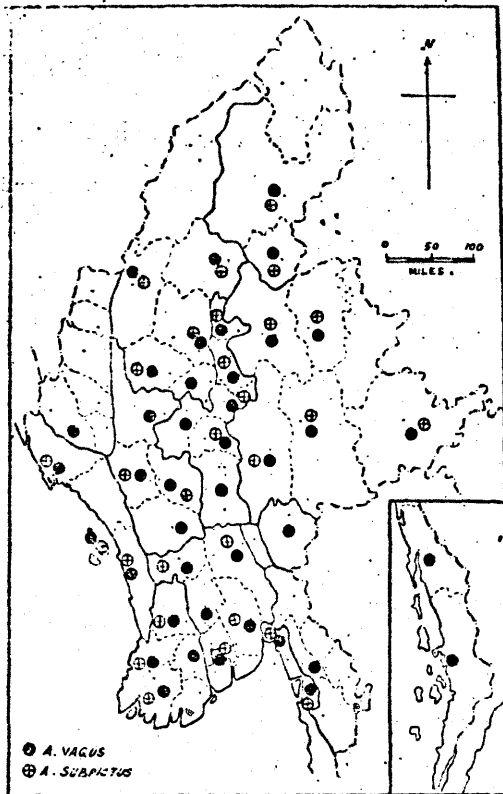


Figure 4.—Map of Burma showing the distribution of *A. vagus* and *A. subpictus*.

always in association with vegetation. It appears to tolerate some degree of pollution. At Pegu, Fox (1949) found larvae of *A. tessellatus* in muddy pools in association with *A. vagus*. The author recorded some larvae in October 1961, breeding in clear sandy stream close to Sezone village in Kyaukse district (Unpublished report of the Malaria Eradication Programme, Burma, 1961).

Seasonal incidence

At Akyab, Feegrade (1924) recorded this species from August to November. Lin (1936) recorded this species from June to November in Sandoway. At Kabaw valley in Mawlaik district, Macan (1948) recorded it between September to October. At Bhamo, Feegrade (1925) collected this species from July to November. At Toungoo, and Pegu areas, Fox (1949) recorded this species between June to December. At Mandalay-Maymyo foothills, this species was prevalent during October and December (Yofe & Fox, 1946).

During the present malaria eradication period, the author and his staff recorded this species both during and just after the monsoon. But it was scarce during the winter and pre-monsoon months.

Feeding preferences

Based on his observations at Toungoo, Pegu and Mandalay-Maymyo foothills areas, Fox (1949) concluded that when the species was abundant, the majority of *A. tessellatus* are deviated to cattle. Macan (1948) in Kabaw valley, observed small numbers in military tents, but not present near cattle. In Mandalay, Kyaukse and Katha districts, the author and his staff observed that, only 3–8 per cent of the *A. tessellatus* were collected by human bait, as against 90–95 per cent from the cattle. But if cattle were absent, the majority of the adults could be deviated to human.

In general, it might be concluded that a large proportion of *A. tessellatus* prefer cattle blood to human blood.

Biting time

The author's experience was that this species invaded late and the peak biting period lay between 1200 hours and 0300 hours.

Daytime resting place

At Papun, Maung-Gale (1926) recorded adults in houses. Feegrade (1924) recorded adults in houses at Bhamo and Singh (1940) at Kengtung found in houses at a time when no larvae could be detected. The author collected some adult specimens from tree-holes in Sezone village in Kyaukse district during the September 1959, but no specimens were observed in sprayed human dwellings during daytime. As the above are the only records of adult *A. tessellatus* being found during day catches, it may be assumed that as a general rule, this species does not rest in houses by day in Burma.

Relation to malaria

No dissection has been carried out on this species in Burma. In view of its limited distribution, its relative scarcity, and the fact that it is mainly a feeder on cattle, it can be regarded as of little importance as a vector of malaria in Burma. But in Formosa, *A. tessellatus* is an efficient vector when its density is high (Chow, Watson & Chang, 1950).

A. VAGUS DONITZ

A. vagus is widely distributed throughout the country. It is found in all types of topography, but is most abundant in the plains, and the Irrawaddy delta. It is the most commonest anopheline mosquito in Burma.

Distribution

This species is found in Akyab, Kyaukpyu, Sandoway, Paletwa, Mawlaik, Katha, Shwebo, Monywa, Sagaing, Mandalay, Kyaukse, Meiktila, Myingyan, Yamethin, Bhamo, Myitkyina, Magwe, Pakokku, Mindat, Minbu, Thayetmyo, Toungoo, Promé, Pegu, Rangoon, Tharrawaddy, Bassein, Henzada, Myaungmya, Maubin, Pyapon, Moulmein, Tavoy, Mergui, Thaton and Pa-an districts. It has also been recorded in Northern and Southern Shan States, and Kayah State (Fig. 4).

*Bionomics***Breeding places**

Larvae of *A. vagus* could be found in all types of stagnant water, either clear or polluted. It is very common in muddy pools, borrow-pits, stagnant drains, marshes and paddy fields. It has also been recorded from the edges of streams and irrigation channels.

Seasonal incidence

In many areas, especially in Pegu, Irrawaddy, and Tenasserim divisions, this species has been recorded throughout the year with a peak during and just after the monsoon following an extension of potential breeding grounds.

In the Dry Zone region in central Burma where breeding places tend to dry rapidly, this species was found mainly during the monsoon months of September to October.

Feeding preferences

Macan (1950) recorded in Akyab, a total of 180 specimens in night catches from cattle-sheds, but no specimens were detected in houses. Fox (1949) at Mandalay-Maymyo foothills, collected a total of 521 specimens in cattle-sheds at night as against 7 specimens in houses. *A. vagus* is observed in almost every locality of the country, as being mainly found in cattle-sheds or near cattle at night rather than in houses. But this species use human dwellings and other outdoor shelters as its day-time haunts.

The evidences so far accumulated suggest that this species feeds mainly on cattle.

Biting time

The peak biting time of this species appears to be about midnight depending on the climatic conditions.

Daytime resting places

In almost all areas of Burma, this species has been common in day catches in both houses, paddy-sheds and cattle-sheds, although the proportions resting in houses were comparatively small. *A. vagus* is the commonest species to find resting in houses during the months of September and October, in South Burma areas.

Relation to malaria

Lalor (1913) at Katha, dissected 113 specimens with negative results. Feegrade (1924) at Akyab and at Pwinbyu in Minbu district dissected a total of 75 specimens without finding any positive. Tin (1936) dissected at Sandoway, a total of 359 specimens without finding any gut or gland infection. Fox (1949) at Rangoon, dissected 679 specimens with negative results. No dissections were carried out on this species during the present DDT period.

The large number of negative dissections together with its cattle-feeding habit, makes it certain that, this species plays no part in malaria transmission in Burma.

A. SUBPICTUS GRASSI

This species is closely related to *A. vagus*, and although not so widely distributed or so prevalent as the latter species, is always found in close association with it. In the Irrawaddy and Pegu divisions, it is recorded as being very prevalent.

Distribution

A. subpictus has been recorded from Akyab, Kyaukpyu, Sandoway, Mawlaik, Katha, Shwebo, Monywa, Mandalay, Kyaukse, Meiktila, Yamethin, Myitkyina, Bhamo, Magwe, Minbu, Toungoo, Prome, Pegu, Rangoon, Bassein, Henzada, Myaungmya, Moulmein, and Thaton districts. It has also been recorded in almost every district in Shan State. Presumably, it occurs in other areas also (Fig. 4).

Breeding places

It is found in association with *A. vagus* in all types of stagnant water collections such as muddy pools, borrow-pits, drains and paddy-fields. The larvae of this species is able to tolerate a certain degree of water-pollution.

Seasonal prevalence

In Pegu, Irrawaddy and Tenasserim divisions it has been recorded throughout the year with an increased prevalence during and after the monsoon. In Mandalay, Magwe and Sagaing divisions and Kachin State it is mainly to be found during and just after the monsoon. In the Shan State it is most prevalent at the start of the monsoon.

Feeding preferences

The adults are mainly found in cattle-sheds at night.

Biting time

Intense biting on the cattle was observed during the first quarter of the night—1800 to 2100 hours.

Daytime resting places

In general, this species behave like *A. vagus* and tends to rest in houses and cattle-sheds by day.

Relation to malaria

There are no dissection records on *A. subpictus*. However, as in the case of *A. vagus*, with which this species closely resembles, there is no evidence to suggest that it plays any part in the transmission of malaria in Burma.

ANOPHELINE MOSQUITOES OF BURMA

A. SUNDAICUS RODENWALDT

This species is confined to coastal areas and the lower reaches of the Irrawaddy delta where the creeks are subject to tidal influences. These situations correspond to those in which it is found in other countries.

Distribution

A. sundaicus is so far recorded from Akyab, Kyaukpyu, Sandoway, Bassein (Pyinkhayaing island), Myaungmya (Labutta township), Pyapon and Moulmein districts (Fig. 5). Presumably, it occurs also in other coastal districts of Burma.

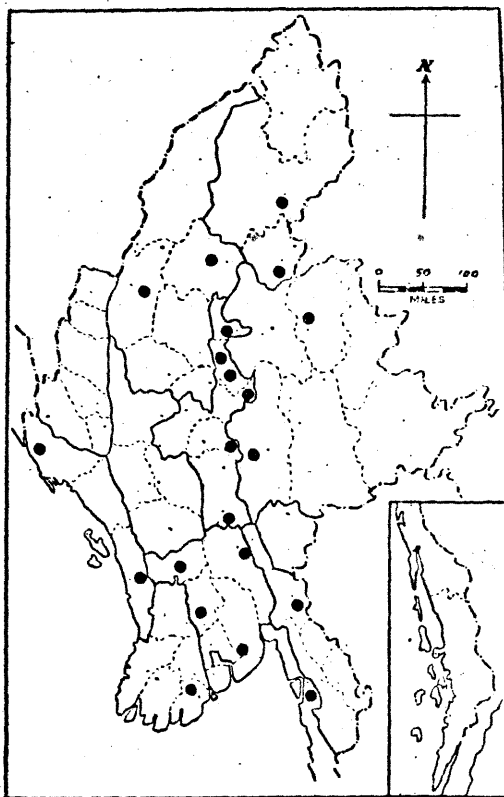


Figure 5.—Map of Burma showing the distribution of *A. sundaicus*.

Bionomics

Breeding places

Macan (1950) recorded larvae in Arakan coastal areas, in borrow-pits and in dammed off creeks and lagoons which showed tidal rise and fall, and where there was an algal blanket. At Kyaukpyu, Lalor (1912) found larvae from brackish ponds and also

shallow water in paddy-fields. Feegrade (1924) at Akyab, recorded larvae from brackish pools formed by tides near the sea water inlet. At Pyinkhayaing island in Bassein district, larvae of this species in paddy-fields close to sea water inlet (Unpublished report of the Malaria Eradication Programme, Burma, 1957).

Seasonal incidence

Macan (1950) recorded that both larvae and adult forms of this species increased during the periods of May to July, and again in November to December. He postulated that these increases were due to the expansion of breeding places following the Spring and Autumn equinoctial tides. Lalor (1912) took the greatest number of specimens during the period December to February. At Pyinkhayaing, the highest density was recorded during the months of October and November. At Ngalapiwi in Kyaukpyu district, it was found to be increased during the period of December to January (Marcus Winn, personal communication). At Sandoway, the highest numbers was observed during December. But the abundance of this species appears to vary from year to year.

Feeding preferences

Macan (1950) observed this species feeding freely on man during the month of October. He stated that 120 adults were captured in houses during night catches, as against 11 specimens from cattle. During the month of November adults were collected in very large numbers on and near the cattle.

The feeding preferences of *A. sundaicus* were studied in detail by the entomological staff of the Malaria Eradication Programme at Kyaukpyu, Pyinkhayaing and Amherst areas. The results indicated that this species feeds indiscriminately on man or cattle, the proportion feeding man in any locality being dependent on the man/cattle ratio in that locality.

Biting time

There are no recorded observations of the biting time of *A. sundaicus* in Burma, by the pre-war malaria workers. However, the author's personal experience in Pyinkhayaing island indicates that, feeding takes place more during the first quarter of the night, than the second quarters. The intense biting activity was noted to be mostly between 1800 hours and 2000 hours. But, at Akyab and Kyaukpyu in Arakan division, biting takes place mostly during 2100 hours and 2400 hours.

Daytime resting places

All the pre-war malaria workers have recorded that a large proportion of this species used to rest in houses by day. But during the present insecticide treatment period, the proportions resting in sprayed houses and cattle-sheds are negligible in comparison to those that are collected on cattle at night.

Relation to malaria

Lalor (1912) at Kyaukpyu, dissected 480 specimens without finding any infections. Feegrade (1924) at Akyab and Macan (1950) in Arakan, dissected 50 and 378 specimens respectively, with negative results. The author, at Pyinkhayaing, dissected 623 specimens during October and December with negative results. (Unpublished report of the Malaria Eradication Programme, Burma, 1957).

But Tyssul-Jones (1950) based on his indirect epidemiological evidences at Kyaukpyu, concluded that *A. sundaicus* is a vector in this area. There is also an unpublished record regarding the observation of a few gut infections of this species by a T.C.A. malaria demonstration team, operating in Akyab area, during 1951-53.

Afridi (1945) recorded that this species was responsible for malaria epidemics at Cox's bazaar (the then Bengal portion of Arakan and now in East Pakistan-Burma border) during the autumn of 1943 and spring of 1944. Iyenger (1939, 1940) found infection rate of *A. sundaicus* between two and six per cent in Calcutta.

Covell (1944) in his general survey noted that although *A. sundaicus* is responsible for regular annual malaria transmission in certain areas, and in others its distribution is patchy and it tends to cause irregular local outbreaks of malaria which vary from year to year in different localities.

The bionomics of *A. sundaicus* in Arakan are identical with those of this species elsewhere. Even though, therefore, this species has not been found infected in Burma, it seems likely that, in Burma, it causes sharp local outbreaks of malaria in different places of the coastal areas of the country.

Susceptibility to insecticides

The programme of country-wide DDT spraying commenced in Burma, in 1954. Since the inauguration of the above programme, susceptibility

tests were organized in different localities of Burma, in order to detect the resistance or the trend of level of susceptibility of the different anopheline species to insecticides.

At Ngalapiwi village in Kyaukpyu district the LC 50 value of *A. sundaicus* to DDT in 1962 was 0.3 per cent as against 0.32 per cent in 1964 and 0.34 per cent in 1967. At Akyab, 100 per cent mortality of *A. sundaicus* was observed with 3 per cent DDT in 1962, 1964 and 1968. At Sandoway, 80-85 per cent mortality of the same species was observed with 2 per cent DDT in 1967.

At Pyinkhayaing village in Bassein district, 61-85 per cent mortality of *A. sundaicus* was observed with 1 per cent DDT and 100 per cent mortality with 2 per cent DDT during 1961-64 (Khin-Maung-Kyi, 1969).

From the above results, it might be concluded that *A. sundaicus* do not appear to develop resistance to DDT, although a gradual vigour tolerance was observed in some areas.

SUMMARY

The distribution, bionomics, relation to malaria, and susceptibility to insecticides of six anopheline species and varieties under the groups *Neomyzomyia* and *Pseudomyzomyia* of the subgenus *Myzomyia*, so far recorded in Burma, have been presented.

That *A. balabacensis balabacensis* is a potential vector during monsoon in the thickly forested areas of Burma, has been described.

That the role of *A. sundaicus* as a vector responsible for sharp local outbreak of malaria in Arakan coastal region, is briefly discussed.

That the susceptibility status of these two species to DDT has been reviewed.

That *A. tessellatus*, *A. vagus*, *A. kochi* and *A. subpictus* are not concerned in malaria transmission in Burma, have been described.

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