

numerous areas of evergreen forest. The banks of the Mekong River in eastern Thailand are generally steep; however, some areas contain large areas of sandflats. A number of *Anopheles* species, to include *An. culicifacies* (B) and *An. pseudowillmori*, are found along the margins of the Mekong River. These species are usually found in flood pools, sand pools, rock pools, and temporary ground pools.

The earliest publication containing references to the anophelines of Thailand is Theobald (1910), whereas the first papers dealing specifically with the genus *Anopheles* and the role of anopheline species in the transmission of malaria in Thailand are those of Barnes (1923a,b). Barnes listed 17 species of *Anopheles* and included notes on their biology and vector relationships. The publications of Barraud and Christophers (1931), Anigstein (1932), and Causey (1937a,b) dealt with both anophelines and culicines. These papers can be important references when there is difficulty in resolving the identity of some specimens. Thurman (1959) provided a checklist of 47 species of anophelines that occurred in Thailand. Scanlon *et al.* (1968) listed 52 species of *Anopheles* known to occur in Thailand, and Harrison *et al.* (1990) listed a total of 72 species of *Anopheles*, including four unnamed species that had been confirmed using cytogenetic and molecular techniques. In this study, we report a total of 73 species of *Anopheles* (Table 3), including 71 named species, a new species near *An. gigas*, and an informally designated species, *An. minimus* C. However, 34 chromosomal forms have been recognized in 14 of the named species (Table 1) (Baimai *et al.*, 1993a,b; 1994; 1995; 1996a,b). These 34 chromosomal forms remain unnamed and require further study to determine if they are distinct species or intra-species genetic polymorphs. These forms include *An. argyropus* (A, B), *An. barbirostris* (A, B, C), *An. crawfordi* (A, B), *An. sinensis* (A, B), *An. aconitus* (A, B, C), *An. culicifacies* (A, B), *An. jamesii* (A, B), *An. jeyporiensis* (A, B, C, D), *An. karwari* (A, B, C), *An. maculatus* (E, K), *An. nigerrimus* (A, B), *An. nivipes* (A, B), *An. subpictus* (B, C, D), and *An. vagus* (A, B) (Table 1). Although 14 of these named species in Table 3 are represented by 34 chromosomal forms, the status of these forms in relation to presently named species, new sibling species or intra-species chromosomal polymorphs has not been resolved because the forms have not been compared to specimens from the type localities. Given the huge number of species and the generic diversity of mosquitoes occurring in Thailand, we feel that studies of these mosquitoes are far from complete.

Notes on habitats

In Thailand, anopheline mosquitoes occur at altitudes ranging from coastal and lowland areas of the central valley to the high mountains of the north. They are frequently

associated with a variety of types of forest cover, including primary and secondary tropical rain forests, wet to dry evergreen forests, and secondary evergreen and deciduous forests. Anopheline mosquitoes are common throughout Thailand and utilize a wide variety of habitats (Table 4). Also, we here propose 13 informal infrasubgenetic categories (Table 3).

Anopheline larvae usually require clean water; however, some are found in highly polluted water with high concentrations of buffalo dung and urine (e.g., *An. barbirostris*), in muddy water, or in brackish water (e.g., *An. baezai*). Most species are found in still to slowly running water, in water-filled containers, or in various other ground-water habitats. A complete listing of known larval habitats based on collection records is provided in Table 4. The majority of habitats that support the development of *Anopheles* larvae contain submerged, emergent, and/or floating vegetation. Larvae are found in both temporary and permanent water sources that are located in a variety of sunlight conditions ranging from direct sunlight to heavy shade.

Feeding behavior

Female anopheline mosquitoes feed primarily on mammalian and avian blood, with the former predominating. Most records from Thailand refer to nocturnal feeding on humans (these records generally resulted from studies on the transmission of malaria). The nocturnal feeding periodicity varies greatly among the different species, e.g., *An. baimaii* and *An. dirus* predominantly feed between 20 00-23 00 hr and *An. minimus* feeds throughout the night without a clearly discernible peak. Mosquitoes like *An. maculatus* and *An. sawadwongporni*, and those of the Barbirostris and Hyrcanus Groups, are predominantly collected between 18 00 and 20 00 hr (Rattanarithikul *et al.*, 1996b). Many species (e.g., *An. minimus* and *An. sawadwongporni*) can be collected during the day while resting in houses or other sheltered areas, whereas some species such as *An. dirus* (in heavily forested areas) (Rattanarithikul, unpublished data), *An. separatus*, *An. barbirostris*, and *An. campestris* (near their larval habitats) will feed during the day (Harrison, unpublished).

Habitats of the Groups and Subgroups of *Anopheles*

A description of the known habitats of each of the members of the various group-level taxa of *Anopheles* follows. A complete listing of the species found in each Group and Subgroup is presented in Table 3, and the known habitats of each species are presented in Table 4.