4 Introduction to the mosquitoes (Order Diptera: Family Culicidae): classification, morphology, life-cycle and control principles

Species

Some authorities place the small non-biting flies belonging to the Dixidae and Chaoboridae as subfamilies (Dixinae and Chaoborinae) of the family Culicidae but in this book the classification given in the world catalogue of mosquitoes by Knight and Stone (1977) is followed, that is the family Culicidae contains only mosquitoes. There are some 3100 species of mosquitoes belonging to 34 genera arranged in three subfamilies, — Toxorhynchitinae, Anophelinae (anophelines) and Culicinae (culicines).

The most important man-biting mosquitoes belong to the genera Anopheles, Culex, Aedes, Mansonia, Haemagogus, Sabethes and Psorophora.

Distribution

Mosquitoes have a world-wide distribution, they occur throughout the tropical and temperate regions and extend their range northwards into the arctic circle; the only area from which they are absent is Antarctica. They are found at elevations of 5500 m and in mines at depths of 1250 m below sea level. Some genera have a restricted distribution and may be confined to certain areas of the world, the genera Haemagogus and Sabethes for example are found in only Central and South America. Some mosquitoes may occur in only a few countries or localities, whereas others, such as Culex pipiens fatigans* (= C. quinquefasciatus) and Aedes aegypti are widespread in the tropical regions of the world.

Medical importance

Anopheles species are primarily of medical importance as vectors of human malaria (Plasmodia spp.) but they are also vectors of filariasis (Wuchereria bancrofti, Brugia malayi and B. timori) and certain arboviruses. The genus Aedes contains important vectors of yellow fever, dengue, encephalitis viruses and many other arboviruses, and also vectors of W. bancrofti and B. malayi. Certain Culex species transmit W. bancrofti and a variety of arboviruses and Mansonia species transmit Brugia malayi, and sometimes Wuchereria bancrofti and a few arboviruses. Haemagogus and Sabethes species are vectors of yellow fever and a few other arboviruses. Psorophora species are important mainly as nuisance mosquitoes, but they also transmit arboviruses including occasionally yellow fever.

Several mosquitoes in other genera have also been incriminated as vectors of various arboviruses, and many other species although not carriers of any disease can nevertheless be troublesome because of the serious biting nuisances they cause.

External morphology of mosquitoes

Adults (figure 4.1)

Mosquitoes possess only one pair of functional wings — the fore wings, the hind wings are represented by a pair of small knob-like halteres. They belong to the suborder Nematocera of the order Diptera (table 2.1, p. 6). They can be distinguished from other flies of a somewhat similar shape and size (for example Dixidae, Chaoboridae and Chironomidae) by (1) the possession of a conspicuous forwardly projecting proboscis, (2) the presence of numerous appressed scales on the thorax, legs, abdomen and wing veins,

* Culex pipiens is a species complex: the tropical form is often called C. pipiens fatigans and this name has been used in this book to avoid confusion and introducing an unfamiliar name, although it has recently been established that more correctly the name C. quinquefasciatus has priority.
and (3) a fringe of scales along the posterior margin of the wings.

Mosquitoes are slender and relatively small insects, measuring about 4–6 mm in length, although some species can be as small as 2–3 mm while others may be as long as 10 mm. The body is distinctly divided into a head, thorax and abdomen.

The head is more or less globular in shape and has a conspicuous pair of kidney-shaped compound eyes. Between the eyes arises a pair of filamentous and segmented antennae, which in females have whorls of short hairs between the segments (that is pilose antennae) but in males, with a few exceptions in genera of no medical importance, the antennae have many long hairs giving them a feathery or plumose appearance. All species of mosquitoes can be conveniently sexed by examination of the antennae, individuals with feathery antennae are males (figure 4.2b) while those with only short and rather inconspicuous antennal hairs are females (figure 4.2a). Just below the antennae are a pair of palps, which may be long or short, dilated or pointed at their tips, depending on the sex of the adults and whether adults are anophelines or culicines (figure 4.21). Arising between the palps is the single elongated proboscis, which contains the piercing mouthparts (sometimes termed the biting fascicle) of the mosquito. In mosquitoes the proboscis characteristically projects forwards (figure 4.1).