

MAINTENANCE GUIDEBOOK VII TERMITE, INSECT, AND RODENT CONTROL

CHAPTER EIGHT - DOMESTIC MOSQUITOES AND THEIR MANAGEMENT

SECTION A CHARACTERISTICS AND RECOGNITION

1. GENERAL

Mosquitoes usually are incidental pests in and around buildings, since their normal breeding habitats are outdoors. However, a few species can be considered truly peri-domestic, breeding regularly in urban settings and entering houses. Only those that are frequent pests indoors will be discussed in this chapter.

Mosquitoes invade dwellings during the warmer months from March to October, depending on the region of the country. They have an erratic hovering flight, and frequently make a high-pitched sound. However, other nonbiting flies such as crane flies, midges, or fungus gnats also have similar flight patterns and are mistaken for mosquitoes.

Adult mosquitoes have one pair of oar-shaped wings, as do most true flies, although mosquito wings are partially covered with scales. The females have sharp, lancet-like proboscises used for sucking blood, whereas the males do not, but do have large bushy antennae. Eggs are laid singly or in rafts (depending upon species) either on or near the surface of a body of water.

Larvae, sometimes called wigglers, live in water, usually developing through four stages to become pupae. The larvae (Fig. 8-1) feed on organic debris on the bottom or suspended in shallow pools.

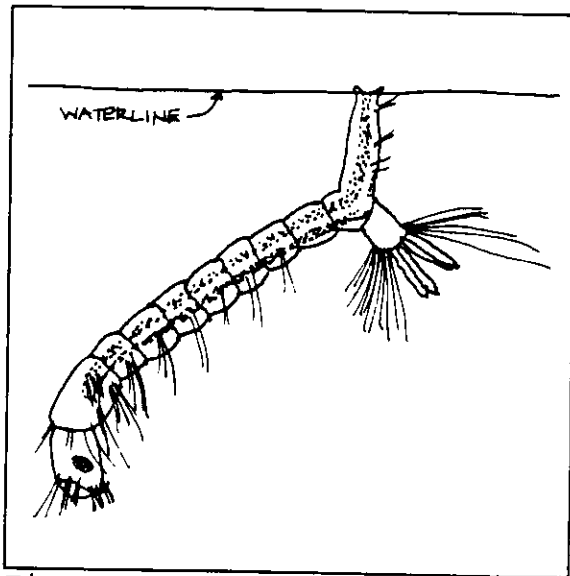


Figure 8-1

The depth of pools inhabited by mosquitoes is limited by the need for larvae to return regularly to the surface to obtain air through an air tube on their posterior ends. Pupae have a "question-mark" shape (Fig. 8-2) and are active swimmers, but do not feed.

Adult mosquitoes emerge from pupae at the surface of water, but usually do not feed until the second or third night after emergence. Their entire life cycle can take place in ten to fourteen days, depending upon temperature, with adults living less than two weeks on average.

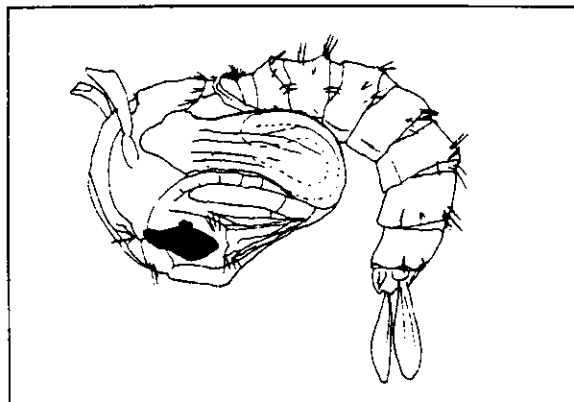


Figure 8-2

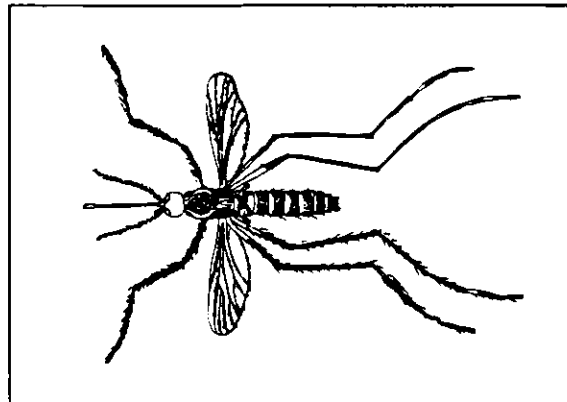


Figure 8-3

2. BIOLOGY OF DOMESTIC MOSQUITOES

a. *Aedes aegypti*

The so-called Yellow Fever mosquito is found along the Gulf Coast to Texas, and the Atlantic Coast from Florida to southern New Jersey. There is also a focal pocket of this species in the greater New York metropolitan area. Its distribution may, in some years, include the midwestern states east of the Mississippi and south of the Great Lakes. The adult has a black-and-white appearance, the thorax being black with a silvery white lyre-shaped marking on it (Fig. 8-3). The abdomen is pointed.

The female is a fierce daytime biter, and may drink nectar from flowers as an alternative food source between blood meals. Most breeding sites are within 100 feet or so of dwellings, since they prefer to feed on human beings. Adults also prefer to rest indoors in the heat of day, in closets, pantries, garages, and basements. As temperatures drop to 40 degrees F, these mosquitoes quickly die out. They do not truly over-winter, hibernating instead in structures or reinfesting an area each year from a base in more southern states where they may breed nearly year-round.

Eggs are deposited singly, but in groups, above the water's edge in artificial water-holding containers around or in the dwelling—flower pots, vases, old tires, or bird feeders. Hatching occurs when the container is flooded with water and covers the eggs. The preferred water habitat is relatively clean, still, and moderate in temperature. Larvae develop quickly, becoming pupae

in seven to ten days under favorable conditions. Adults generally emerge from pupae after two to three days.

Aedes aegypti is one of the most efficient carriers of arboviral diseases such as dengue, yellow fever, eastern equine encephalitis, and St. Louis encephalitis. Although dengue and yellow fever do not occur in the continental U.S., dengue is a problem in Puerto Rico.

b. *Aedes albopictus*

The Asian tiger mosquito, introduced from Asia in 1985, has spread from its entry point of Texas to the eastern states south of New Jersey and the midwestern U.S. east of the Mississippi and south of the Great Lakes. It also occurs in Hawaii and the Pacific Trust territories.

The adults are black-and-white in appearance, similar to *Aedes aegypti*, and differing principally in having a silver streak dividing the middle of the thorax instead of a white lyre-shaped marking (Fig. 8-4).

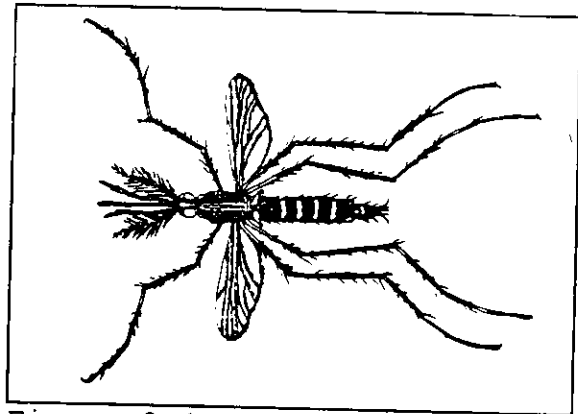


Figure 8-4

The biology of this species, including larval biology and biting behavior, is similar to that of *Aedes aegypti*. The main distinction is that females choose a broader range of egg-laying

sites, often utilizing tree holes in addition to flower pots, vases, cans, and old tires. Females are less likely to feed on people than *Aedes aegypti*. The egg stage over-winters in the northern states, while breeding may continue year-round in the south.

This species is a known carrier of many arboviruses, including dengue, encephalitis viruses, and other viral diseases not normally indigenous to the U.S. Its presence in and around dwellings could become serious.

c. *Aedes triseriatus*

The tree-hole *Aedes* is generally considered a woodland species, and it has a wide distribution throughout the Mississippi Valley and eastward from Maine to Florida. It often occurs where homes are interspersed in woodland areas. Adults have silvery markings on the periphery of the thorax, which in turn surround a small elliptical silver marking on a background of brownish scales. Adults are fierce daytime biters and often enter homes. Eggs are deposited in tree holes or

domestic water containers, and can over-winter even in the northern states. Larvae live year-round in the south. Their biology, in terms of alternate food sources, life expectancy, and duration of life stages, is similar to other *Aedes* species. *Aedes triseriatus* frequently flies to lights at night. This species is a potential carrier of encephalitis viruses and also is a transmitter of dog heartworm. It is a serious potential threat if abundant around dwellings.

d . *Aedes vexans*

Aedes vexans occurs throughout the continental U.S. and Alaska. The adult has an unmarked thorax and white bands on the legs and abdomen. It is a true floodwater breeder. Its larvae develop in large numbers following spring runoffs, when meadows and woodland pools are flooded. Unlike the other *Aedes* species mosquitoes discussed, this species prefers to lay eggs in sewage-contaminated water.

The egg stage over-winters in the northern states, while in the south larval development may continue year-round. Biting occurs in the early morning, early to late evening, or even daytime hours in shaded areas. Adults readily fly toward lights at night; they also are migratory and may fly ten miles or more from the larval habitat to seek hosts. This species feeds on domestic animals much more readily than *Aedes aegypti* or *Aedes albopictus*.

Aedes vexans is a fair potential carrier of encephalitis viruses and a moderately efficient carrier of dog heartworm, so its presence should not be treated lightly. Moreover, it is such a persistent biter that even small populations are irritating.

e. *Culex pipiens* complex

House mosquitoes consist of several species, two of which are major pests in the U.S. The northern species, *Culex pipiens* occurs in a band across the northern tier of the U.S., while *Culex pipiens quinquefasciatus* occurs in a band across the southern tier of the U.S. from middle California to Delaware. These species overlap across the middle tier of states. They are a rather dull light-brown with light-white bands across the base of each abdominal segment.

The last abdominal segment is blunt at the end in contrast to the pointed abdomen of the aedine mosquitoes. The house mosquitoes lay egg rafts containing 200 or more eggs each in foul water such as ground pools, tire ruts, catch basins, open cesspools, and street and roof gutters. They may also lay eggs in basements, where larvae may continue to develop even in winter. Eggs hatch in a day or two and may develop through all larval stages in six to ten days if temperatures are high, or several weeks if temperatures are low.

Although house mosquitoes are capable of transmitting encephalitides viruses experimentally, they are unlikely natural carriers because of their low human-blood feeding preference and comparatively short life span.

Adults of *Culex pipiens* and *Culex pipiens quinquefasciatus* feed principally in the evening on birds and domestic animals, but will feed on people if given the opportunity. In southern states, *Culex pipiens quinquefasciatus* is a biting pest which is frequently found in dwellings. Adults hibernate in the northern states, while breeding takes place year-round in the southern tier of states.

f. ***Culex tarsalis***

Although not normally considered a domestic pest, *Culex tarsalis* is widespread (distribution includes the mainland states except the northeast and mid-Atlantic states from North Carolina northward excluding New Jersey). Its presence in peri-domestic situations can be a serious problem, particularly in western states where large populations develop rapidly. Adults are small brownish mosquitoes with white rings and lines on the legs and proboscis. Adults prefer to feed on birds, but will also viciously attack people and domestic animals. This species hibernates in cellars and rock piles in the northern tier of states, but may breed year-round in warmer areas. In domestic settings, adults will lay eggs in ground pools, tire ruts, seepage areas, sewage overflows, and even artificial containers. Larvae quickly develop in large numbers over a six-to-ten day period under favorable conditions, and a full life cycle can occur in as few as twelve days. *Culex tarsalis* is a frequent natural transmitter of encephalitides viruses, especially St. Louis and western equine encephalitis.

SECTION B INSPECTION

When residents express concerns about mosquitoes it should be determined which species are present, and where their larvae are. The best procedure is to aspirate biting adults or catch them in insect nets when they land on human hosts, and kill them for identification. The species can be identified by determining if the abdomen is pointed (generally aedine species) or blunt (generally *Culex* species). The inspection starts on the basis of such identification. The aedine larval mosquitoes may be found in domestic water containers and tree holes, while the *Culex* species larval mosquitoes are found in foul water areas in and around the building. Identification of adult and larval mosquitoes is work for mosquito taxonomy specialists, and if necessary, their assistance, or that of state health departments should be sought.

SECTION C MOSQUITO MANAGEMENT

The best approach to managing mosquito populations is eliminating the larvae in their breeding habitat or the breeding habitat itself. A first step is not to keep water in pots or cans. Often this just means letting plants dry out thoroughly between waterings. Sometimes major corrections have to be made to reduce runoff from rains, especially in catch basins or in ground pools. In other cases, it is better to catch the rain water in ponds so deep that larval mosquitoes cannot readily make their way from the surface to the bottom where the food is, and back to the top to gather oxygen. In addition, larger impoundments often produce predators such as frogs, fish, or predatory insects, so mosquitoes will not thrive there. Water in tree holes can usually be aspirated. If the water is removed in the spring, there will be no problem for months or perhaps even a year. Spaces having sewage backups or periodic flooding may require a permanent solution for continuous drainage.

If source reduction is not practical, mosquito larvicides may need to be used. This type of solution can become expensive if the larval habitats have to be continually re-treated. There are relatively few pesticides registered for larval mosquito control in the U.S. Some of them include *chlorpyrifos* granules or *Bacillus thuriangiensis* (a bacterial insecticide) impregnated granules or "doughnuts." These formulations can be spread with a manual spreader where the breeding pools are small. Light petroleum oils spread on the surface of waters also control larvae.

Adult mosquito control is frequently more challenging than larval control. Exclusion by use of screening is certainly the best means of preventing indoor infestations. Adult mosquito control, by black lights or "bug zappers" is ineffective outdoors and is destructive of the natural insect predators of mosquitoes such as crane flies and syphrid flies. Repellents containing a high concentration of diethyl toluamide (25-33 percent) in an extender formulation provide the greatest protection, lasting at least six hours. Mosquitoes on screens can be killed by resmethrin. Fogging or ultra-low volume (ULV) treatment outdoors is rarely warranted.

END OF CHAPTER EIGHT