BIONOMICS OF IMPORTANT GENERA OF MOSQUITOES OF NEW MEXICO

Portions of this chapter were obtained from the University of Florida and the American Mosquito Control Association Public Health Pest Control site at http://vector.ifas.ufl.edu/.

Those casually acquainted with mosquitoes may believe that all types are much the same; indeed, the similarities among species are considerable. There are, however, many differences in appearance from species to species and even among some varieties within species. These morphological differences, especially notable in the larval and adult stages, permit accurate identification of most species. Behavioral differences permit various species to occupy numerous ecological niches with relatively little overlap. Thus, knowledge of the source or breeding habitat of mosquitoes can provide strong clues to their identification.

Mosquito control requires knowledge of the behavioral and habitat differences among species in order to plan and carry out a treatment program. The trained worker first identifies the problem species. With identity established, useful correlations are immediately available, such as the type of breeding habitat and where to search for larvae. A working knowledge of the behavior and habitats frequented by various species aids in determining the kinds of survey and control strategies best suited for the task.

Mosquitoes are not adapted to life in moving waters, but they can occupy the quiet pools and seepage areas near flowing streams. Aquatic environments differ chiefly in the chemistry of the water (acid or alkaline; fresh, salt or brackish). These environments may be natural or man-made and may also differ in the amount or type of vegetation present and the amount of sun or shade. The distinctive egg-laying habit of each species of mosquito determines its larval habitat. Although some species utilize more than one type of habitat, most mosquitoes can be categorized in general terms by their preference for either permanent water, floodwater, transient water, or artificial container and treehole habitats. **These categories can be combined into two major larval habitat categories: standing water (permanent and transient) and floodwater (including natural and artificial containers as well as floodwater).**

Standing water species deposit their eggs, either singly or in rafts, on the surface of permanent or transient pools of shallow, standing water. They usually produce several generations (broods) each year and overwinter or survive harsh environmental circumstances as mated, engorged females. In contrast, **floodwater species** deposit their eggs out of water but in locations subject to periodic flooding, such as damp soil in depressions or inside tree holes and artificial containers. They produce one to several broods annually and overwinter or survive harsh environmental circumstances in the egg stage. Habitats can change quickly, as when a fresh water pool becomes stagnant, so current conditions may not always be as expected. Such temporary changes due to spatial, chemical or temporal factors can contribute to association with multiple habitat types.

First, we will group mosquitoes by genera, with broad characteristics of the bionomics of each genera discussed. Second, specific larval habitats are grouped with mosquito species generally found in those habitats listed.

FLOODWATER MOSQUITOES

Aedes (Ochlerotatus) (26 species in NM)

Note: Some experts favor the elevation of the subgenus *Ochlerotatus* to genus level, while others believe this to be premature or inaccurate. Most authorities, including the American Mosquito Control Association, retain the use of *Aedes* as the generic epithet. However, be aware that you may find *Ochlerotatus* used by some sources.

Eggs

1. Laid singly in depressions in soil subject to flooding or inundation with rain or melting snow, or above the waterline in artificial containers or treeholes.
2. Serve as the overwintering stage.
3. May lie dormant in dry soil for up to five years (eggs may require a period of desiccation and/or freezing).
4. May hatch within a few hours when area re-floods if conditions are favorable.

Larvae

1. Common in temporary pools of rain or snowmelt runoff, irrigation wastewater, inundated floodplains or pastures, roadside ditches, along margins of streams, and artificial containers and treeholes.
2. Egg hatch to adult may be completed in 10-14 days in warm weather.

Adult Females

1. Fierce, aggressive biters.
2. Rest in vegetation during day, but will bite if disturbed or on cloudy days.
3. Most active in evening.
4. Long flight range: up to 100 miles has been recorded. Dispersal from breeding site is influenced by terrain, wind speed and direction.
5. May be single-brooded or produce several generations per year.
6. Common throughout the state.

Important Species in New Mexico:

Aedes aegypti: Found in Las Cruces area. Peridomestic: breeds almost solely in artificial containers around homes. Vector of dengue fever and yellow fever.

Aedes vexans: Found statewide. Utilizes wide variety of temporary pools. Females are persistent biters which prefer cattle but readily feed on humans. Migration of several miles from breeding site towards city lights has been observed. Vector of dog heartworm.

Aedes dorsalis: Found statewide. Eggs hatch after flooding during first warm weather in spring—breeding is continuous in warm weather and a large variety of larval habitats is used. Females are vicious biters, attacking day or night.

Psorophora (6 species in NM)

Eggs

1. Deposited in small depressions or cracks in the soil subject to flooding by rain or irrigation.
2. Serve as the overwintering stage.

Larvae

1. Found in temporary rain-filled pools, overflow of irrigation water.
2. Rapid development: egg hatch to adult in as few as 5 days in warm weather.
3. Larvae are predacious on other mosquito larvae.

Adult Females

1. Vicious, persistent biters.
2. Serious pest of livestock.
3. Populations can be large after heavy rainfall.
4. May produce several generations per year on irrigated land.
5. Most common in southern and eastern portions of state.

STANDING WATER MOSQUITOES

Anopheles (7 species in NM)

Eggs

1. Laid singly on surface of water in permanent and semi-permanent ponds with aquatic vegetation; one New Mexico species (*An. judithae*) is a treehole breeder.
2. Boat shaped with lateral floats.

Larvae

1. Found in sunlit or partly shaded pools and seepage areas, often with algal mats or other aquatic vegetation; occasionally brackish or alkaline water.
2. Lack siphon tube, rest horizontally at water surface.
3. Life cycle completed in one to several weeks depending on species and water temperature.

Adult Females

1. Will enter homes in search of blood meal.
2. Rest in cool, humid, shady areas during the day; most active at night.
3. Mated female overwinters: hibernates in houses, outbuildings, cellars, caves, animal burrows.

Important Species in New Mexico:
Anopheles hermsi: New species formerly considered to be *Anopheles freeborni*; probable vector of malaria in New Mexico.

Culex (10 species in NM)

Eggs

1. Laid on surface of water and glued together to form a raft; 100-200 eggs per raft.
2. Found in newly-created surface pools.
3. Hatch in 2 to 3 days or less.

Larvae

1. Found in wide variety of habitats including ditches, rain barrels, grassy pools, irrigation floodwater, marshes, hoof prints, ornamental ponds, fresh or saline water, foul water in corrals, sewage lagoons, cesspools, and artificial containers.
2. Larval development 7 days to <4 weeks depending on water temperature and food availability.

Adult Females

1. May enter homes at night in search of blood meal.
2. Rest in buildings, shaded porches, or vegetation during day.
3. Peak activity within two hours after sunset.
4. Some species prefer birds and rarely bite man.
5. *Culex tarsalis* prefers nestling birds in spring but switches to mammals in late summer and fall (important in transmission of virus from birds to horses and humans).
6. Host-seeking flights may average 100 yards a day, eventually dispersing several miles from breeding site.
7. Produce several generations per year.
8. Attracted to CO_2 baited light traps and especially to gravid traps.
9. Mated females overwinter.

Important Species in New Mexico:
Culex tarsalis, the vector of Western equine encephalitis, St. Louis encephalitis, and West Nile virus; found statewide. ***Culex quinquefasciatus*****,** vector of West Nile virus, found statewide.

Culiseta (3 species in NM)

Eggs

Laid in rafts on the surface of the water.

Larvae

1. Tolerate cool water—some species overwinter as larvae, though not the three species found in NM.
2. Found in variety of aquatic habitats: snowpools, springs, ground pools, rain barrels, polluted or clear water, occasionally artificial containers.
3. Usually first larvae found in spring.

Adult Females

1. Found statewide.
2. May bite man, but prefer other hosts.
3. NM species overwinter as inseminated females.

UNCOMMON NEW MEXICO MOSQUITOES

Coquilletidia perturbans

Eggs laid on surface of water with heavy emergent vegetation, larvae and pupae attach to submerged stems. Overwinter as larvae. Females important pests. Distribution limited to NE border of state.

Orthopodomyia spp.

Eggs deposited in treeholes, occasionally artificial containers close to water line. May overwinter as larvae if water does not freeze solid. Adults are not known to bite man. Limited distribution in NM.

Uranotaenia spp.

Breed in sunlit grassy pools, or those with emergent or floating vegetation. Adults are not considered serious pests. Distribution in SE and NE New Mexico.

FLOODWATER HABITATS

Rain and floodwater pools: These pools form the breeding location for a large number of species, especially *Psorophora* and *Aedes*. The pools disappear in dry weather and support no true aquatic vegetation, though usually a layer of leaves and other detritus settles on the bottom.

Snowpools: Several *Aedes* species are found in pools formed by melting snow in the spring, usually at higher elevations. Some of these species are: *Ae. campestris, Ae. cataphylla, Ae. communis, Ae. fitchii, Ae. hexodontus, Ae. implicatus, Ae. increpitus* and *Ae. pullatus.*

Irrigated pastures: Many mosquitoes in New Mexico breed readily in water associated with irrigation, whether flooded pastures, tail water, or leaking or clogged irrigation ditches. Some species that thrive in this habitat are: *Ae. dorsalis, Ae. melanimon, Ae. nigromaculis, Ae. trivittatus, Psorophora spp.,* and *Cx. tarsalis.*

Tree holes: Tree holes or rot cavities support a rather extensive and unusual mosquito fauna, with many species breeding almost exclusively in this habitat. Resident species are *An. judithae, Ae. hendersoni*, *Ae. Monticola,* and *Orthopodomyia spp.*

Artificial containers: Several species breed in man-created sites around human dwellings. Tin cans, fish pools, cisterns, rain barrels, gutters, old tires, etc. serve as excellent larval habitat when they contain water. Species most often encountered are *Ae. aegypti*, *Cx. quinquefasciatus*, *Cx. coronator, Cx. restuans*, *Cx. salinarius*, *Cx. tarsalis, Cs. incidens* and *Cs. inornata*.

STANDING WATER HABITATS

Permanent water group. Mosquito groups readily assigned to the permanent water group are *Anopheles,* several *Culex* species and *Coquillettidia perturbans.*

Freshwater marsh: Mosquito species often found in freshwater marshes include *An. crucians*, *Cx. salinarius*, *Cx. tarsalis*, *Cx. erraticus* and *Cx. thriambus*.

Lakes: Where vegetation occurs only in a narrow band along the lakeshore, larvae are confined to this littoral zone, but when many species of floating or emergent plants are present larvae may be found throughout the lake wherever cover is afforded and also in marshy areas around the lakes. *An. crucians*, *Ur. sapphirina*, *Cx. salinarius*, *Cx. erraticus*, *Cx. erythrothorax* and *Cq. perturbans* are found in these habitats.

Ponds: There is no clear distinction between a pond and a lake except that ponds are generally smaller. Grassy woodland ponds or fluctuating ponds occupy shallow depressions and are filled by rainwater or surface run-off. They are usually of uniform depth but the area they cover will vary, depending on rainfall. They may contain larvae of *An. crucians*, *Culiseta inornata*, *Cs. impatiens, Cs. incidens, Cx. quinquefasciatus*, *Cx. restuans*, *Cx. salinarius*, *Cx. erraticus*, *Cx. tarsalis,* and *Ur. sapphirina. Aedes* may also be found in these woodland ponds, taking advantage of the fluctuating water levels by laying their eggs just above the water line: *Ae. cataphylla, Ae. fitchii, Ae. trivittatus.*

Transient water group. Mosquito groups readily assigned to the transient water group are *Anopheles spp., Culex spp*., and *Culiseta spp*.

Salty, brackish or alkaline waters: Species adapted to this type of water include *Cx. salinarius*, *Ae. sollicitans, Ae. nigromaculis* and *Ae. dorsalis*.

Seepage areas: The seepage areas around ponds or streams most often breed *An. punctipennis*, *An. franciscanus, An. hermsi,* and *An. pseudopunctipennis*.

Drainage ditches: Ditches built to drain high groundwater or irrigation runoff often become clogged with vegetation and thus become a mosquito breeding source. Some species found in this type of habitat include: *Cx. quinquefasciatus, Cx. restuans, Cx. salinarius, Cx. tarsalis, Cs. inornata,* and sometimes *Anopheles.*

That many species are found in multiple habitat types and some in very specialized habitats illustrates the complexity of the problem faced by control agencies. While habitat association with many species is quite specific, others thrive in a variety of situations. Thus, the detection of adults of these latter species in routine surveys does not provide an immediate indication of the related breeding site(s).