

SOME CULICIDAE OF THE REELFOOT LAKE REGION

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During the summers of 1936 and 1937, the facilities of Reelfoot Lake Biological Station were generously made available to the Division of Malaria Investigations of the United States Public Health Service, in whose temporary employ the authors were making a study of *Anopheles walkeri* (Theobald) at Reelfoot Lake, Tennessee. Although a major portion of this period was given to an intensive study of this one species of mosquito, opportunity was concurrently afforded for observations on the Culicidae in general of this region.

The authors present herein a list of twenty species of mosquitoes which they collected at Reelfoot Lake between June 15 and September 15, in 1936 and 1937. It is in no wise pretended that this list is complete or exhaustive. Duty to a specialized major problem permitted no time for collections from much of the territory in this veritable mosquito paradise. Moreover, since the period of investigation did not begin until mid-June, undoubtedly several species which have only a spring occurrence, notably members of the genus *Aedes*, were not encountered. In addition to the usual manual methods of collection, an electric light mosquito trap after the design of Headlee (1932) was used to great advantage, fourteen of the twenty species being at one time or another collected by this method. For fourteen of these twenty species, both male and female were taken and the male hypopygium prepared for purposes of identification. Larvae of only fourteen of the twenty were collected.

A list of the species obtained is presented with brief observations and, in compliance with editorial suggestions, a few items of interest regarding each. For keys of identification and details of morphology, the reader is referred to such comprehensive publications as Matheson's *Handbook of the Mosquitoes of North America* (1929), or Dyar's *Mosquitoes of the Americas* (1928).

Psorophora howardi (Coquillett). This is one of our extremely large mosquitoes, colloquially known as a "gallinipper," possibly because its formidable size (length 9 mm., wing 7 mm.) makes it appear

almost capable of taking a gallon of blood at one nip. The colorful beauty of this species, although seldom appreciated, is considerable, its abdomen being clothed dorsally with iridescent purple and yellowish green scales. No larvae were collected, but the species is known to breed in temporary rain pools and is fairly common throughout the Reelfoot region during the summer months. Adults were rarely taken by light trap.

Psorophora ciliate (Fabricus). This is another "gallinipper," equally as large and colorful as *Psorophora howardi*, being grossly

TABLE 1

Breeding places and frequency of capture by light trap of mosquitoes collected in the Reelfoot Lake region

SPECIES	Frequency of Capture by Light Trap†	BREEDING PLACES						
		Rain Pools	Grassy Pools	Marshes	Ponds	Tree Holes	Artificial Containers	Running Water
<i>Psorophora howardi</i>	†	x†						
<i>Psorophora ciliata</i>	†	x†						
<i>Psorophora ferox</i>	††	x†						
<i>Psorophora varipes</i>	†	x†	Larvae not collected in Reelfoot Region					
<i>Psorophora cyanescens</i>	†	x†						
<i>Aedes triseriatus</i>	-					x		
<i>Aedes vexans</i>	††	x	x	x				
<i>Culex salinarius</i>	††		x	x				
<i>Culex erraticus</i>	††		x	x	x			
<i>Culex quinquefasciatus</i>	-	x	x				x	
<i>Culex apicalis</i>	-		x	x				
<i>Masonia perturbans</i>	††			x				
<i>Orthopodomyia signifera</i>	-					x		
<i>Megarhinus septentrionalis</i>	-					x		
<i>Uranotaenia sapphirina</i>	†††		x	x	x			
<i>Anopheles punctipennis</i>	†			x				x
<i>Anopheles quadrimaculatus</i>	†††		x	x	x			
<i>Anopheles walkeri</i>	†††			x				
<i>Anopheles crucians</i>	††		x	x				
<i>Anopheles barberi</i>	-					x		

* None taken; † Rarely taken; †† Moderately common; ††† Very common, x Indicates occupied breeding places; x† Larvae not collected in Reelfoot Region.

quite similar to that species except that its legs are more heavily scaled and conspicuously banded. The breeding places of both species are much the same, and the larvae of both, like many other members of this genus, are carnivorous, feeding on the larvae of other mosquitoes breeding in the same pools and not uncommonly on their own brood mates. Adults were rarely taken by light trap.

Psorophora ferox (Humboldt). This is one of the commonest daytime attackers in the lowland forests about Reelfoot Lake, especially a few days after a rain when its fierce biting may become almost intolerable. It does not enter houses. Of medium size and dark scaled, it is easily recognized by the snowy white tips on its hind legs. Eggs are laid on the bottoms of dry rain pools, hatch immediately at the next rain, the larvae developing rapidly reach maturity in a few days. Adults were fairly commonly taken by light trap.

Psorophora varipes (Coquillett). Except for its smaller size and conspicuous silver-scaled patches on the sides of the thorax, this species closely resembles *Psorophora ferox*. In the Reelfoot Lake region the two were often found occurring together although *P. varipes* was almost entirely confined to damp forests and marshes adjacent to them, whereas *P. ferox* occurred in drier, less marshy localities. *P. varipes* was rarely taken by a light trap.

Psorophora cyanescens (Coquillett). This is a medium-sized, dark mosquito without any very distinctive gross characteristics. It attacks fiercely even in bright sunlight. Its breeding habits are similar to other members of the genus mentioned above. It is only moderately common in the Reelfoot region, occasionally being taken by a light trap.

Aedes triseriatus (Say). This is a tree-hole breeder. Eggs are laid in cavities in stumps of trees where water collects, sometimes in wooden water barrels or troughs. Adults were not seen at Reelfoot, the species being collected only in the larval stage.

Aedes vexans (Meigan). This is one of the most widely distributed of mosquitoes being found in the temperate climates of America, Europe, Asia, the Philippines, and elsewhere. It breeds abundantly in meadow rain pools, marshes, foul roadside puddles, city dumps, or hog wallows. The adults may migrate five to ten miles from their breeding places in search of food, returning later to oviposit on the dry earth of depressions. This is one of our most annoying pest mosquitoes, often making life in open-air resorts almost unbearable and not infrequently entering homes. At Reelfoot, the species was common everywhere throughout the summer, but larvae were found chiefly in August and September. Adults were commonly taken by light trap.

Culex salinarius (Coquillett). Named *salinarius* because it was originally found breeding in salt marshes, this small reddish brown

mosquito has a wide distribution from the Atlantic seaboard throughout most of the Mississippi Valley. It was found to be a common inhabitant of Reelfoot's saw grass (*Zizaniopsis miliacea*) marshes where adults were often observed during the day and numerous larvae collected from heavily vegetated pools. Occasional females were found in light trap catches. It bites man readily and not uncommonly enters houses.

Culex erraticus (Dyar and Knab). This small dark species is the most abundant representative of its genus at Reelfoot. It attacked man readily, beginning about mid-afternoon on bright days or at any hour on cloudy ones, and was found still pestiferous late at night. Larvae were taken most abundantly in heavily vegetated water bodies including the open lake, marginal marshes and bayous, but were also found in temporary pools. Identification of the imago is difficult due to its close similarity to related forms. King and Bradley's recent publication (1937) on the members of this group was helpful in this regard. The species was taken in limited numbers by light trap.

Culex quinquefasciatus (Linnaeus). In southern United States and in tropical or subtropical climates around the world, this small gray mosquito is a common household insect. It prefers to breed in artificial containers about dwellings, but may occur in rain pools far from human habitations. In tropical climates the adult female is the vector of the filaria worm, *Wuchereria bancrofti*, which in man causes filariasis with its frequently associated elephantiasis. Charleston, South Carolina, is the only endemic area of this disease in the United States. At Reelfoot the species was comparatively uncommon.

Culex apicalis (Adams). This is another small dark mosquito with a wide distribution in America, Europe, and Asia. At Reelfoot it was found chiefly during the late summer breeding in marshy areas about the edge of the lake. Adults have been observed to bite cold-blooded animals such as frogs, turtles, and snakes; they do not attack man.

Mansonia perturbans (Walker). This husky, shaggy-winged, striped-legged "bloodhound" without question takes first honors for packing the most painful bite of all the Reelfoot mosquitoes. Swooping boldly down on its prey, it alights with the caress of a branding iron. A medium-weight woolen sweater is quite inadequate defense against the proboscis of this species, and one of its favorite tricks is to perform a gluteal puncture through the thick canvas bottom of a camp stool. Breeding takes place in marshes containing sedges and other types of vegetation. Eggs are laid in masses on the water's surface; the larvae on hatching descend to the bottom and attach their caudal air tubes to the stems or roots of various aquatic plants from which they derive their oxygen supply. The winter is passed as partially grown or mature larvae. The pupal period is also spent under water. Adults emerge throughout the summer, may fly several miles, and are troublesome house enterers. This species is common

at Reelfoot. No attempt was made to study the breeding of *Mansonia* there. It was commonly taken by light trap.

Orthopodomyia signifera (Coquillett). This is another mosquito which breeds in water-containing tree holes. The adults are beautifully marked by six lines of gleaming white scales overlying the deep brown of the dorsal thorax. They were obtained at Reelfoot only by the rearing of larvae.

Megarhinus septentrionalis (Dyar and Knab). This very large mosquito (length 8 mm., wing 6 mm.) spends a carnivorous larval life in water-containing tree holds, feeding on larvae of other tree-hole breeders. Beefy red in color, a larva looks its butcherous character. In striking contrast, the gorgeously scaled adults fly by day and feed on flower nectar, no record of their biting human beings being known. For their butterfly-like feeding habits the adults are equipped with a very long, curved proboscis, a morphological characteristic befitting the name given to this genus (mega = large + rhinus = nose, *Megarhinus*). At Reelfoot, the species was obtained only by collections of larvae from tree holes.

Uranotaenia sapphirina (Oslen-Sacker). The smallest and probably the most abundant mosquito at Reelfoot, it was caught in large numbers by light trapping. Breeding was observed in numerous sites including lake, bayous, and saw grass marshes. Adults have not been known to bite man. The species is as beautiful as it is harmless. Examination with a hand lens discloses lines of brilliant blue scales on the head, thorax and wings, well justifying its name *sapphirina*.

Anopheles punctipennis. Member of the genus *Anopheles* are transmitters of malaria throughout the world. The importance of various species as carriers of the disease varies with their individual habits. Although it has been conclusively proven by laboratory experiments that *A. punctipennis* is capable of carrying malaria, it is relatively harmless because of its habits. It seldom enters occupied houses and has a very distinct food preference for cattle and other large domesticated animals. It prefers to breed in or near clear running water, although it will accept marshy pools. The species was found breeding in both types of places at Reelfoot and was fourth most common of the five *Anopheles* collected there. It was occasionally taken by light trap and was found rarely during the day resting beneath houses.

Anopheles quadrimaculatus (Say). This species is the chief carrier of malaria in eastern America, and the whole problem of this disease centers around the control of its breeding. It prefers ponds, marshes, grassy pools, and similar sites where plankton is abundant. Its preferred food is human blood, for which it enters houses readily and there finds favorable shelter between meals. *A. quadrimaculatus* is the most common anopheline in the Reelfoot region, readily taken by light trap and found during the day resting in almost every hollow tree, cow sheds, under houses, bridges, and similar dry, shaded sites.

Anopheles walkeri (Theobald). Until a few years ago, this little known anopheline was considered very rare. However, it has been recently found to be abundant in localities scattered throughout eastern America from Canada to Florida and westward to Arkansas and Wisconsin. The presence of the species at Reelfoot was long overlooked until LePrince and Johnson (Johnson, 1936a and 1936b) recognized it in 1935. It is now known to be abundant there, the second most common anopheline. It attacks man readily, but does not seem very prone to enter inhabited dwellings. *A. walkeri* is easily caught in light traps. Its strongly preferred breeding grounds are in heavily vegetated pools of marshes overgrown with cat-tails, saw grass, or similar marsh vegetation, while its inclination to adapt itself to other breeding grounds is slight. It also shows a distinct preference for beds of marsh vegetation as its diurnal haunt, being found most often resting among plant roots close to the humid surface of the marsh. The species has been shown capable of transmitting malaria under experimental conditions (Matheson, *et al.*, 1933; Kitchen and Bradley, 1936), but the extent of its causal relationship to the disease in localized areas of its abundance has not been demonstrated.

Anopheles crucians (Wiedemann). This species occurs most commonly along the Atlantic coastal region from New York to Mexico. It is held to be an important vector of malaria in certain portions of this range, although it shows a marked food preference for the blood of domesticated animals. At Reelfoot it was collected in numbers feeding on cows and was the third most common anopheline taken by light traps. Larvae were found chiefly in richly vegetated and densely shaded marsh pools. During the day adults were taken resting in cow sheds and in marsh thickets near their breeding pools.

Anopheles barberi (Coquillett). This is a rare species breeding in tree holes. It has been shown experimentally to be capable of carrying malaria (Stratman-Thomas and Baker, 1936), but because of its rarity does not contribute to the problem of the disease. A few larvae were collected from one tree hole at Reelfoot.

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HOW TO PREPARE STUDY SKINS OF BIRDS

An interesting and well illustrated article explaining just how to skin a bird and prepare the skin for a permanent collection is begun on the first page of Ward's Natural Science Bulletin, the March, 1938, number and will be continued in the April number of this same publication. This should be of considerable value to high school teachers who may wish to skin and preserve birds found dead. Most birds of course are protected by laws and should not be shot. Ward's Natural Science Bulletin is published by Ward's Natural Science Establishment, Inc., 302 Goodman Street, North, Rochester, New York, who handle the tools needed for this work and also those needed by biologists. They will be glad to sent a copy of each of these issues to any interested members.