

Tabanus sulcifrons Macquart. This large species was very abundant during much of its flight season. Only males were found when it first appeared on July 26. Both sexes were abundant between August 3 and 15. By August 21, the population had decreased but both sexes were still present on September 4.

Although on August 29, a number of species were still found in the area, they were represented by only a few individuals. *Chrysops vittatus* was still fairly common but the population was low in comparison with earlier in the season.

The species most annoying to humans varied as the season progressed. In order

of appearance these were *Chrysops ater*, *C. indus*, *Hybomitra illota*, *C. niger*, *C. calvus*, *C. callidus*, *C. macquarti*, *C. vittatus* and *Tabanus sparus milleri*.

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HISTORY OF MOSQUITO OCCURRENCE IN MISSOURI

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Early newspaper accounts of insect plagues indicated that mosquitoes were perhaps a greater enemy of the pioneers than the Indians. Countless references to mosquitoes may be found in early journals and diaries. Bradbury (1819) who traveled in the western part of the United States from 1809-1811, recorded in his diary that he had to keep one hand free at all times to brush away the mosquitoes from his body while traveling in certain regions of the Missouri River. Prince Paul of Wurttemberg, some years later, fought mosquitoes throughout the entire length of his trip up the Missouri and was eventually forced to cancel his exploration of Kansas. On the Missouri River near Council Bluffs

he recorded seeing a mosquito 1 inch long. He also noted that mosquitoes were so thick in certain places that one could scarcely see his companions at a distance of twenty paces.

In times of flood when the Mississippi and Missouri Rivers inundated large sections of the country, the mosquitoes spread from the river lowlands to the highlands. An interesting account of such an invasion was described in a letter by Gottfried Duden (1826). Duden stated . . .

"Now I can tell you something about the plague of mosquitoes. About six weeks ago, I experienced something which, judging from all my former experiences, I should have regarded as something simply impossible. Everywhere in valleys and on highlands, there were such swarms of mosquitoes that in shady places, one could scarcely keep them from ones nose and mouth. . . . They are found over the whole earth but in such numbers I should have expected them only in swamps and never

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in highlands. That their presence was quite unusual during other years I had noticed nothing whatever of such a thing." . . .

Pioneer settlers looked upon the mosquitoes, then unknown as the carriers of malaria, as evils to be philosophically endured. Duden (1826) related how "the little pests" could be dispersed by simply building a fire before the entrance to a house. The "Jeffersonian Republican" of September 3, 1836, commented in a lighter vein similar to that of Duden's: . . . "Shocking! We see it stated in some of the papers that the mosquitoes are making terrible work among the emigrants in Arkansas . . . killing some by inches and swallowing the others whole" . . .

From 1824 to 1827 Gottfried Duden visited Warren County in order to determine its suitability as a goal for emigration from Germany. He wrote in his diary the following remarks: . . .

"After the ticks come the mosquitoes, that is, our common "Schnaken," "Sing Mucken," (*Culex pipiens*); there are no other mosquitoes here. Hardly anyone thinks about snakes, wolves, bears, or tigers. The mosquitoes are, however, hardly any worse than they are during the warm summers in Germany. But summer is warm here every year and so people have learned to protect themselves from them. The beds are covered with gauze curtains and a person sleeps more comfortably here in a swarm of mosquitoes than in a room with only two in Germany."

To the pioneer the disease of the nineteenth century was malaria, and its favorite hunting ground was the valley of the Mississippi. The months of July, August, and September were called the "sickly season." Malaria was so widespread that it affected nearly every section of the state and was an important factor in shaping the everyday life of the settlers. Locally the disease was called the "Shakes" or "Missouri Chills" (Lanser, 1949). According to Ackerknecht (1945) the initial increase of malaria in the state came between 1805 and 1815. By 1820 a high

endemic-epidemic level was reached and maintained for fifty years until a decrease began in the seventies. Between 1910 and 1920, malaria had disappeared from most of the state except the southeastern counties.

The writings of the physicians who lived in the developing west and south during the first half of the nineteenth century gave some indications as to the prevalence of malaria in the mid-west. The well-known Daniel Drake, M.D., of Cincinnati, Ohio (1830) stated . . . "that there is a noxious gas given out throughout the great Mississippi Valley system which affects the people of the west and the south. . . ." The same author, in his "Diseases of the Interior Valley of North America (1850-1854)," ranked malaria as one of the most important diseases, and described it as prevailing extensively throughout the Mississippi Valley, extending from Wheeling on the upper Ohio to New Orleans, Chicago on the Great Lakes, Burlington and Galena and the upper Mississippi, and the western towns of Arrow Rock and Lexington on the Missouri River.

In Saline County, Missouri during 1812-1820, one of the early settlements was abandoned because of the prevalence of "shaking agues." Similarly, a history of Howard County revealed that during its development, a town on the Missouri River with a population of approximately 1,000 was deserted because of malaria sickness. Although the proper treatment of malaria was known by some during this period, its cause was not (Shyrock, 1936). Dr. John Sappington (1844), of Saline County, made an extensive study of this disease and theorized that low, marshy lands and stagnant water were the causal agents of malaria. This pioneer Missouri physician contributed much to the cure and prevention of malaria through the use of quinine. Sappington was early convinced of the benefits of quinine in the treatment of malaria and soon established a reputation for the treatment of this disease from Lexington to Jefferson City. In 1872, Dr. Sappington began the wholesale

manufacture of his famous "Anti-Fever-Pills." Each pill contained one gram of quinine, three-fourths of a grain of licorice, one-fourth grain of myrrh, and enough sassafras oil to give the mixture a pleasant taste. The prescription suggested that the pills be taken every 2 hours, day and night, at any stage of the fever until the fever was broken and thereafter at greater intervals until the debility and anemia had subsided. Sappington concluded that the universal practice of purging, vomiting, and bleeding was unnecessary and harmful.

It was not surprising that the pills found a ready and growing market throughout the intensely malarious districts of the west and south, and at times the demands greatly exceeded the supply. Dr. Sappington constructed a small house in which to manufacture the pills and employed 15 to 25 agents to distribute the pills among storekeepers and the general public. The healing effects of the medicine were widespread in Missouri as well as in Arkansas, Alabama, Illinois, Kentucky, Indiana, Michigan, Tennessee, and the Republic of Texas.

The total number of pounds of quinine that Dr. Sappington used in the preparation of his pills was not known. His letters, preserved in the State Historical Society of Missouri, show that he dealt with John Farr, of Philadelphia, the first chemist in this country to manufacture quinine. Farr expressed great surprise at the amount of his orders, e.g., a single order for 500 pounds, and had difficulty in providing supplies. Quinine, indeed, was a gift from the gods to many of the early pioneers in Missouri.

Mosquitoes, presumably less abundant now than in the pioneer period of Missouri, are still important pests. Their greatest abundance today may be found in the lowlands of southeastern Missouri, in those counties bordering the Missouri and Mississippi rivers, and in the vicinity of certain oxidation lagoons throughout the state.

Smith and Enns (1967 and 1968) recorded nine genera and 53 mosquito species for the state. *Aedes hendersoni* and

Aedes riparius were reported for the first time. Two genera, *Culex* and *Culiseta*, and at least four species have readily adapted their breeding habits to sewage lagoons having high organic content and emergent vegetation. Of these four species, two, namely, the *Culex pipiens* complex and *Culex tarsalis* are the most important species associated with sewage lagoons since both species are excellent vectors of arboviruses. Although malaria does not occur in Missouri today, the anopheline group is well represented by six species including *Anopheles barberi*, *A. crucians*, *A. pseudopunctipennis*, *A. punctipennis*, *A. quadrimaculatus*, and *A. walkeri*.

Public health problems associated with mosquitoes today are those of mosquito annoyance and the potential for encephalitis epidemics. These threats to the populace of Missouri are held in check by organized mosquito control supported by various public health agencies together with the research facilities of the University of Missouri.

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