Mosquito Distribution and Abundance

in the

Arkansas-White-Red River Basins

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THE STUDY reported here was undertaken to consolidate and amplify information on distribution and abundance of mosquitoes in the Arkansas-White-Red River Basins. These data are essential for planning programs to alleviate health and nuisance problems caused by mosquitoes. Historically, mosquito-borne malaria, encephalitis, yellow fever, and dengue have been hazards adversely affecting the public health and economy of the general area. At present, malaria is a notable potential problem while the problem of encephalitis is seasonally recurrent. The great majority of area mosquitoes are biting pests and severely affect man and animals in certain basins. The increasing development of western water resources projects has intensified existing problems and enhanced the possibility of others developing. Of primary concern is the relation of water resources projects to production of *Culex tarsalis*, the principal vector of encephalitis. Various mosquito pest species are also of special concern in certain areas, as for example, the rice-growing regions of Arkansas and Louisiana.

The mosquito fauna is quite varied in the States where the Arkansas-White-Red River Basins are located: Arkansas, Colorado, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas. The area distribution of mosquitoes is markedly affected by geographic factors, especially topography and meteorology. The Arkansas-White-Red River area extends from the alpine habitats of Colorado and New Mexico through the plains country of Texas, Oklahoma, and Kansas into the rolling hills and piedmont zones of Arkansas and Missouri and the lowlands of Louisiana. Scarce precipitation characterizes the semiarid western reaches of the territory where in some parts the average annual rainfall is 8 inches. There is heavy rainfall in the eastern sections where some localities may receive an average of 64 inches a year. The annual rate of evaporation varies generally from east to west, from 55 inches to about 114 inches. Soil types and vegetative growth also vary widely throughout the area.

The approximate mosquito-breeding season for Arkansas-White-Red Basins of the western-

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most States, Colorado and New Mexico, is June–September, while the period of May–October generally covers the season for northern Louisiana and Arkansas. The period of June–September is the approximate mosquito season in southern Missouri. There is a striking gradient in densities of *C. tarsalis* in the area studied; this species is abundant in the western portion and scarce in the eastern portion of the basins.

Density and Distribution

The records summarized in the table are from published reports and recent unpublished observation of larval and adult mosquitoes. Species, distribution, and abundance of mosquitoes are listed by States. The "Relationship to Man and Animals" column refers to species known to be vectors of disease or to species from which an etiologic agent has been isolated. Pest species are designated by biting ferocity and distribution. Species that occur locally in small numbers or that do not feed on man or higher animals are considered unimportant.

In this report, no attempt is made to arbitrate taxonomic problems; however, the species designations comply with generally accepted nomenclature. The following is a clarification of certain points:

Anopheles occidentalis is generally considered to be a Pacific coast species, and early records of its occurring in Colorado are referrable to *Anopheles earlei.*

Aedes alleni is presently known as *Aedes zoosophus. Aedes lateralis, Aedes gonimus,* and *Aedes hisuteron* are synonyms of *Aedes sticticus.* Placing the *Aedes idahoensis* record from Colorado under *Aedes spencerii* has been considered by some taxonomists. *Aedes bimaculatus* reported from Oklahoma has been determined to be *Aedes fulvus pallens.* The Louisiana records for *Aedes dorsalis* are probably errors.

Culex apicalis, long known to workers in the southern United States, is now considered to be *Culex territans* in the southeast United States, as based on minute, but apparently valid distinctions. *Culex inhibitator* is generally thought to be a West Indies species, most United States records being referrable to *Culex erraticus.* Recent studies indicate that *Culex stigmatosoma* is found locally in western Oklahoma although its presence in Colorado has been questioned by some workers.

Deinocerites epitedeus, as reported from Texas, possibly was confused with *Deinocerites spanius.*

The following are recent additions to State records of species distribution: *Anopheles franciscanus, Aedes canadensis, Aedes increpitus, Aedes mitchellae, Aedes nigromaculis, Aedes trivittatus, Culex restuans, Orthopodomyia signifera, Psorophora confinnis, Psorophora cyanescens, Psorophora discolor* and *Uranotaenia sapphirina* for New Mexico, and *Psorophora discolor* for Colorado.

The species of mosquitoes indicated below are related to disease transmission:

Anopheles quadrimaculatus, Anopheles albimanus, and *Anopheles freeborni* are proved vectors of malaria. *Aedes aegypti* is the vector of yellow fever and dengue fever; *Aedes aegypti, Aedes dorsalis, Culex pipiens, Culex stigmatosoma, Culex tarsalis, Culiseta inornata, Culiseta melanura,* and *Mansonia perturbans* can transmit encephalitis.

Summary

The States in which the Arkansas-White-Red River Basins lie have markedly different biotic environments and support a wide variety of mosquitoes which are represented by 10 genera and 100 valid species and subspecies. The disease-vector and pestiferous characteristics of many species are important factors in the public health and general economy of the area. The tabulation presented indicates the distribution and population density of mosquitoes and the relation of mosquitoes to man and domestic animals in individual States of the Arkansas-White-Red River Basins.

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States

KEY: I—Abundant and widely distributed. II—Abundant and locally or seasonally distributed. III—Scarce but widely distributed. IV—Scarce and locally distributed. V—Present but abundance unknown. N—New to State records. ?—Identification questionable.

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Anopheles:									
albimanus	Vector	------	--------	--------	------	------	--------	------	IV
atropos	Unimportant	------	--------	--------	II	------	--------	------	IV
barberi	----do	III	--------	III	II	III	--------	IV	IV
bradleyi	----do	------	--------	--------	II	------	--------	------	IV
crucians	Pest	III	--------	IV	I	III	II	II	II
earlei	Unimportant	------	IV	--------	------	------	--------	------	------
franciscanus	----do	------	III	IV	------	------	II (N)	IV	IV
freeborni	Vector	------	III	--------	------	------	II	------	IV
georgianus	Unimportant	------	--------	--------	II	------	--------	------	------
pseudopunctipennis	Pest	IV	III	III	IV	IV	II	III	II
punctipennis	----do	II	IV	I	I	I	III	II	II
quadrimaculatus	Vector	I	IV (?)	II	I	I	--------	II	II
walkeri	Unimportant	III	--------	IV	II	IV	--------	------	IV
Aedes:									
aegypti	Vector, Pest	III	--------	IV	I	IV	IV	III	III
atlanticus	Pest	III	--------	IV	I	IV	--------	IV	IV
atropalpus	Unimportant	IV	--------	IV	------	IV	IV	IV	II
bimaculatus	----do	------	--------	--------	--------	--------	--------	------	IV
campestris	----do	------	II	--------	--------	--------	V (?)	------	------
canadensis	Pest	II	II	IV	II	IV	V (N)	II	IV
cataphylla	Unimportant	------	IV	--------	------	--------	--------	------	------
cinereus	----do	IV	IV	IV	------	IV	--------	IV	------
communis	----do	------	IV	--------	--------	--------	--------	------	------
dorsalis	Vector, Pest	------	II	III	V (?)	III	II	II	II
dupreei	Unimportant	V	--------	IV	II	IV	--------	IV	IV
excrucians	----do	------	IV	--------	--------	--------	--------	------	------
fitchii	----do	------	IV	--------	--------	--------	--------	------	------
flavescens	----do	------	IV	IV	------	IV	--------	------	------
fulvus pallens	----do	V	--------	--------	II	--------	--------	IV	IV
grossbecki	Pest	IV	--------	--------	II	IV	--------	------	------
idahoensis	Unimportant	------	III	--------	--------	--------	--------	------	------
impiger	----do	------	V	--------	--------	--------	--------	------	------
increpitus	----do	------	III	--------	--------	--------	II (N)	------	------
infirmatus	Pest	II	--------	--------	I	IV	--------	------	IV
intrudens	Unimportant	------	IV	--------	--------	--------	--------	------	------
klotsi	----do	------	V	--------	--------	--------	--------	------	------
mitchellae	Pest	V	--------	--------	II	------	V (N)	V	IV
nearcticus	Unimportant	------	V	--------	--------	--------	--------	------	------
nigromaculis	Pest	IV	II	II	V (?)	III	II (N)	II	II
pionips	Unimportant	------	V	--------	--------	--------	--------	------	------
pullatus	----do	------	III	--------	--------	--------	--------	------	------
punctor	----do	------	IV	--------	--------	--------	--------	------	------
riparius	----do	------	V	--------	--------	--------	--------	------	------
scapularis	----do	------	--------	--------	--------	--------	--------	------	II
sollicitans	Pest	II	--------	IV	I	IV	V	V	II
spencerii	Unimportant	V	--------	IV	--------	--------	--------	------	------
sticticus	Pest	V	III	III	II	I	--------	III	V
stimulans	----do	------	III	IV	------	IV	--------	------	------
taeniorhynchus	----do	II	--------	--------	II	------	--------	------	II
thelcter	Unimportant	------	--------	--------	--------	--------	--------	V	II
thibaulti	Pest	III	--------	--------	II	IV	--------	------	IV
tormentor	----do	V	--------	--------	II	IV	--------	IV	IV
triseriatus	----do	III	IV	III	I	II	--------	III	II
trivittatus	----do	V	III	III	IV	II	IV (N)	IV	IV
vexans	----do	I	II	I	I	I	II	II	I
zoosophus	Unimportant	------	--------	IV	------	------	--------	III	III

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States—Continued

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Culex:									
abominator	Unimportant								IV
apicalis	do		IV				IV		
chidesteri	do								IV
coronator	do								IV
declarator	do								IV
erraticus	Pest	III		IV	I	III		III	I
interrogator	Unimportant								IV
nigripalpus	Pest				IV				III
peccator	do	V		IV	II	III		III	V
pilosus	do				II				
pipiens	Vector, Pest	V	III	III		I		III	
quinquefasciatus	Vector, Pest	I		III	I	II	II	III	I
restuans	Pest	III	IV	II	I	II	IV (N)	III	III
salinarius	do	III	III	II	I	II	II	II	II
stigmatosoma	Vector, Pest							IV	V
tarsalis	Vector, Pest	III	II	I	II	III	II	II	I
territans	Unimportant	II		III	I	III		III	III
thriambus	do							IV	II
Culiseta:									
alaskaensis	do		IV						
impatiens	do		III			IV			
incidens	Pest		III				II	IV	IV
inornata	Vector, Pest	II	II	I	I	I	III	II	I
melanura	Vector, Pest	V	IV		IV	IV		IV	IV
morsitans	Unimportant		IV						
Deinocerites:									
epitedeus	do								V (?)
spanius	do								IV
Mansonia:									
perturbans	Vector, Pest	III	IV	IV	II	IV		IV	II
titillans	Pest	V							II
Orthopodomyia:									
alba	Unimportant			IV	IV	IV			III
signifera	do	III		III	II	IV	V (N)	IV	III
Psorophora:									
ciliata	Pest	II		III	I	III		IV	I
confinnis	do	I	IV	II	I	II	IV (N)	II	I
cyanescens	do	II		IV	I	II	V (N)	III	I
discolor	do	II	IV (N)	II	I	III	IV (N)	III	II
ferox	do	II		III	I	III		IV	II
horrida	do	III		III	II	III		IV	IV
howardii	do	III		IV	I	IV		IV	III
longipalpus	do	V		IV	IV	IV			V
mexicana	Unimportant								V
signipennis	Pest	V	III	III		IV	IV	III	II
varipes	do	II			II	IV		IV	IV

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States—Continued

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Toxorhynchites:									
septentrionalis	Unimportant	III		IV	II	IV		IV	III
Uranotaenia:									
lowii	do	IV			I				II
sapphirina	do	III		IV	I	III	V (N)	III	II
syntheta	do	V					V	III	III
Total number of species	100	53	46	47	53	51	30	51	72

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ideas

Typhoid Tracer Technique

MONROE COUNTY, N. Y. The source of sporadic cases of typhoid fever in the vicinity of Spencerport was sought by laboratory procedures used, it is believed, for the first time in this country, according to the December 21, 1953 issue of the *Bulletin*, published by the New York State Department of Health.

Robert W. Bacorn, district health officer of the area, employed the technique for stream and sewage pollution study when the repeated use of usual epidemiological investigations failed to locate the contaminating agent of stream water drunk by the typhoid victims.

Swabs impregnated with selective culture media were placed for several days in the sewage effluent of Spencerport where it discharged into the stream. Laboratory examination of the swabs identified typhoid bacilli of the same bacteriophage type as had been recovered from each of the typhoid cases. This evidence established the village as a likely source of the typhoid bacilli.

By planting swabs through the sewerage system, a single block of the town was identified as harboring the carriers. Within this block, the investigation centered on a convalescent home.

Through stool specimen examinations, 3 of the 18 occupants of the home were found to be carriers of the bacilli type that had been responsible for the typhoid cases. Further investigation aimed to determine whether these persons were chronic carriers.