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A REVISED LIST OF THE MOSQUITOES OF OHIO WITH SOME NEW DISTRIBUTION AND SPECIES RECORDS[1]

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Venard and Mead (1953) published an annotated list of mosquitoes which presented distribution records and notes on the relative abundance of mosquitoes known in Ohio up to that time. In 1965 the Ohio Department of Health's Encephalitis Field Unit initiated a state-wide California Group arbovirus surveillance, and since that time 736,021 mosquitoes have been collected and identified to be tested in virus studies. These data have resulted in a better knowledge of the abundance and distribution of Ohio mosquitoes, and have established new records for three mosquito species.

In a review of the recent literature on North American mosquitoes, Carpenter (1970) listed several species from an unpublished list of Ohio mosquitoes by Dr. Carl E. Venard: *Aedes dupreei, A. implicatus, A. mitchellae, A. riparius, A. spencerii,* and *Culex tarsalis.* All of these species are rare or uncommon and, with the exception of *A. mitchellae* and *C. tarsalis,* have not been found in our collections. A total of 52 species is reported in this article.

Methods of mosquito collections as described by Sudia and Chamberlain (1967) were used in these studies. Briefly these methods included the use of the CDC light trap (Sudia and Chamberlain, 1962), supplemented by dry ice (Newhouse *et al,* 1966); human biting collections were also made. Primarily female mosquitoes were collected by these methods.

Symbols used in the following revised list of Ohio mosquitoes are: species new in Ohio are shown by (*); distributions are indicated as (W) widespread or (L) local; the relative abundance is listed as (A) abundant, (C) common, (U) uncommon, (R) rare, and (I) insufficient data.

NEW OHIO RECORDS

The number of individuals collected

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TABLE 1.—Mosquitoes of Ohio

Aedes
- *abserratus* (Felt and Young) (R-I)
- *aurifer* (Coquillett) (U-L)
- *canadensis* (Theobald) (A-W)
- **cantator* (Coquillett) (C-L)
- *cinereus* Meigen (C-W)
- *dorsalis* (Meigen) (C-L)
- *dupreei* (Coquillett) (R-I)
- *excrucians* (Walker) (I-I)
- *fitchii* (Felt and Young) (I-I)
- *grossbecki* Dyar and Knab (U-W)
- *hendersoni* Cockerell (R-I)
- *implicatus* Vockeroth (R-I)
- *mitchellae* (Dyar) (R-I)
- *riparius* Dyar and Knab (R-I)
- *sollicitans* (Walker) (A-L)
- *spencerii* (Theobald) (R-I)
- *sticticus* (Meigen) (C-W)
- *stimulans* (Walker) (A-W)
- *thibaulti* Dyar and Knab (R-I)
- *tormentor* Dyar and Knab (R-I)
- *triseriatus* (Say) (C-W)
- *trivittatus* (Coquillett) (A-W)
- *vexans* (Meigen) (A-W)

Anopheles
- *barberi* Coquillett (U-W)
- *crucians* Wiedemann (U-L)
- **perplexens* Ludlow (R-I)
- *punctipennis* (Say) (C-W)
- *quadrimaculatus* Say (C-W)
- *walkeri* Theobald (U-W)

Culex
- *erraticus* (Dyar and Knab) (U-W)
- *pipiens* Linnaeus (A-W)
- *restuans* Theobald (A-W)
- *salinarius* Coquillett (C-W)
- *tarsalis* Coquillett (U-W)
- *territans* Walker (C-W)

Culiseta
- *inornata* (Williston) (C-W)
- *melanura* (Coquillett) (U-L)
- **silvestris minnesotae* Barr (U-L)
- *morsitans dyari* (Coquillett) (U-L)

Mansonia
- *perturbans* (Walker) (C-W)

Orthopodomyia
- *alba* Baker (R-I)
- *signifera* (Coquillett) (U-W)

Psorophora
- *ciliata* (Fabricius) (C-W)
- *confinnis* (Lynch Arribálzaga) (C-W)
- *cyanescens* (Coquillett) (R-I)
- *discolor* (Coquillett) (R-I)
- *ferox* (Humboldt) (U-W)
- *horrida* (Dyar and Knab) (R-I)
- *varipes* (Coquillett) (R-I)

Toxorhynchites
- *rutilus septentrionalis* (Dyar and Knab) (U-W)

Uranotaenia
- *sapphirina* (Osten-Sacken) (C-W)

Wyeomyia
- *smithii* (Coquillett) (R-I)

are added in parentheses after the month of collection.

Aedes cantator (Coquillett). Specimens from Ohio were first recognized in 1967; they were collected in Lake County and were identified at the First Army Medical Laboratory, Fort Meade, Maryland. They have been taken in moderate abundance in Lake County by light trap and daytime biting collections, nearly always with *Aedes sollicitans* (Walker) and *A. dorsalis* (Meigen).

Lake County: Painesville Township, Willoughby, Fairport Harbor; 1969—July (5), September (159), October (47); 1970—June (3). Holmes County: Killbuck; 1969—August (1).

Anopheles perplexens Ludlow. Known in this State from females collected in light traps.

Ashland County: Mifflin (Charles Mill Reservoir), Savannah; 1969—August (4).

Culiseta silvestris minnesotae Barr. Adult females have been taken in five counties in northeastern Ohio. Collections were made in light traps located in marshy areas.

Columbiana County: Leetonia: 1969—July (1). Holmes County: Holmesville; 1969—August (6). Lake County: Fairport Harbor, Painesville Township; 1968—July (1); 1969—July (15), August (3); 1970—July (13), August (37). Stark County: Beech City; 1969—July (1). Wayne County: Rittman; 1969—July (1).

NOTES ON OTHER SPECIES

Culex tarsalis Coquillett. This species was considered rare by Venard and Mead (1953). It has been collected in light traps in scattered localities and probably occurs throughout the State.

Defiance County: Camp Libby; September (1). Erie County: Castalia; August (10). Franklin County: Hilliard; August (2). Hamilton County: Cincinnati; September (6). Knox County: Gambier; October (1). Lake County: Willoughby,

Mentor (Beach Park); July (1), September (1). Licking County: Newark; September (1). Lorain County: Lorain; August (2). Ottawa County: Catawba, East Harbor State Park; August (8). Summit County: Akron (Sand Run Park); August (1).

SALT MARSH MOSQUITOES. Venard and Mead reported finding *Aedes sollicitans* (Walker) in Lake County and *A. dorsalis* (Meigen) in Wayne, Lucas, and Lake Counties. Both species appear to be extending their range in Ohio. Larvae, males, and females have been collected in several localities. Breeding usually takes place in brackish water near salt mining operations, oil wells, or in industrial waste water containing salt. In a few localities, they have become sufficiently abundant and irritating to require aerial and ground control. In addition to the above, we now have the following records.

Aedes dorsalis (Meigen).

Allen County: Lima July (1). Defiance County: Camp Libby; July (1). Delaware County: Sunbury; September (3). Erie County: Sandusky; August (1). Franklin County: Columbus; July (1). Hamilton County: Cincinnati; August (1). Hancock County: Findlay; July (1). Harrison County: Cadiz; August (1). Huron County: New London; July (1). Knox County: Mt. Vernon; July (4). Ottawa County: Catawba Island; August (5). Summit County: Akron, Barberton; June (8), July (11), August (9).

Aedes sollicitans (Walker).

Allen County: Lima; July (7). Clark County: Medway; August (2). Franklin County: Columbus; May (1). Morgan County: Rose Farm; September (1). Summit County: Akron, Stow, Barberton; June (10), July (3). Tuscarawas County: Newcomerstown, Gnadenhutten; May (82), July (214). Wayne County: Rittman; July (5), August (7).

TREE-HOLE BREEDING MOSQUITOES. Two species have recently been recorded as new to Ohio by other workers.

Orthopodomyia alba Baker. Truman and Craig (1968) and Zavortink (1968) reported this species from northern Ohio localities. We have collected this species in one additional location.

Knox County: Gambier; October, November, December, 1971 (24 larvae from 2 tree holes).

Aedes hendersoni Cockerell. This species was reported from Summit County, Ohio by Truman and Craig (1968).

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PROCEDURES FOR THE MASS REARING OF A MERMITHID PARASITE OF MOSQUITOES[1]

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ABSTRACT. Procedures were developed for the exposure of larvae of *Culex pipiens quinquefasciatus* Say to preparasitic *Reesimermis nielseni* Tsai and Grundmann to obtain high yields of nematodes. Also, methods of collecting large numbers of emerging postparasitic nematodes and of culturing them were evolved. Maximum nematode production was obtained when hosts were reared at densities of 0.35 square centimeter of surface area per host, were exposed to preparasitic nematodes at a 1:12 ratio and fed optimum amounts of food. These procedures can produce infective stage nematodes at a cost of about 7–10 cents per million.

The mermithid nematode *Reesimermis nielseni* Tsai and Grundmann was studied extensively from 1967–1971 at the Gulf Coast Marsh and Rice Field Mosquito Investigations Laboratory, Lake Charles, Louisiana. It was found to be an effective control agent against certain mosquito species and to be self-perpetuating once established (Petersen *et al.* 1968, Petersen *et al.* 1969, and Petersen and Willis 1970, 1971). However, an economical method of mass rearing *R. nielseni* had to be developed before extensive field testing could be accomplished. The method developed is reported here.

Since all known attempts to culture mermithid nematodes in vitro have failed, these parasites must be mass reared in a suitable arthropod host. *Culex pipiens quinquefasciatus* Say has proved to be such a host for *R. nielseni* because it is easily maintained in colony, is highly susceptible to attack by the nematode, and can be reared rapidly and in crowded conditions (Petersen and Chapman 1972). The procedures we evolved for the mass rearing of *C. p. quinquefasciatus* are modifications of those described by Gerberg (1970), Gerberg *et al.* (1969) and De Meillon and Thomas (1966).

Adult *C. p. quinquefasciatus* (a laboratory strain selected for diurnal feeding on guinea pigs) were maintained at high densities (densities not determined) in 91 x 61 x 61-cm cages (Fig. 1) in an insectary at 80±5% R.H. and 26–27° C. and provided with raisins as a source of carbohydrates. Then 3 to 5 days after the mosquitoes obtained a blood meal, egg rafts were collected by placing plastic oviposition containers (8 x 13 x 11 cm) half filled with water in the cages overnight. The egg rafts were then removed and counted, and the desired numbers were placed in separate containers for hatching. Rafts obtained at these conditions averaged about 125 eggs with 90+ percent hatch, and at 27° C., the holding temperature, essentially all the eggs hatched

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