

## A LIST OF THE MOSQUITOES OF LIBYA

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Information on the mosquitoes found in Libya is not readily available as it appears only in rare Italian and French publications. The purpose of this article is to review the literature on the Culicidae indigenous to Libya and to record the species of mosquitoes collected by the writer and others since 1957.

Brighenti (1930) listed the anopheline mosquitoes collected by the Italian workers in Tripolitania. La Face (1936) reviewed the available literature and recorded the anopheline species collected from various parts of Libya with primary emphasis on Tripolitania and Cyrenaica.

Vermeil (1935) recorded the species collected by various French workers in the Fezzan. He also recorded the collection of *Anopheles (Cellia) broussesi* Edw. from Gat, Fezzan. This is the only record of this species occurring in Libya.

Senevet and Andarelli (1956) listed the species of anophelines found in North Africa. This publication contains a description of each species including egg, larval and adult morphology; and the biology of each species including larval habitat, association with other Culicidae, hibernation, degree of domesticity, geographical range, anthropophilic or zoophilic, and its role as a vector of malaria.

Rioux (1958) listed the Culicidae found in the Middle Mediterranean Region. This publication also includes the taxonomy, morphology, and biology of each species. The majority of the culicine mosquitoes found in Libya are listed in this publication.

Goodwin and Paltrinieri (1959) de-

scribed the epidemiology of oases malaria and listed the anopheline mosquitoes responsible for transmission of malaria in oases as well as in the coastal regions of Libya.

Libya is situated between 20 degrees and 33 degrees north latitude, and between 9 degrees and 25 degrees east longitude. It is bounded on the north by the Mediterranean Sea, on the west by Tunisia and Algeria, on the south by French Equatorial Africa, French West Africa, and Sudan, and on the east by Egypt. The inset map on Figure 1 shows the location of Libya in relation to other African countries. There are over 1,200 miles of coastline and the total land area is 683,000 square miles. The country is arid and composed largely of rocky and sandy deserts. A narrow oasis-like coastal belt extends for 30 to 40 miles inland in which the majority of the agriculture of the country is found. Beyond the coastal belt is the "Gebel" or mountain range which is approximately 2,000 feet high. The mountains in Tripolitania are barren and rocky whereas those of Cyrenaica are covered with considerable vegetation. Southward the "Gebel" descends into the rock and sand expanse of the remainder of Libya. There are no rivers in the country and very few flowing streams.

The only permanently inhabited areas in the desert are the oases. These consist of isolated areas of vegetation composed of palm trees, alfalfa and barley. These oases are arranged in long relatively narrow, broken lines with an east-west orientation. They occur where the water table is sufficiently near to the surface to permit the digging of shallow wells to supply water for man, his animals, and for irrigation.

The annual rainfall varies from an average of 14.5 inches along the coast to 0.5 inch in the true desert. The temperature along the coastal belt ranges from

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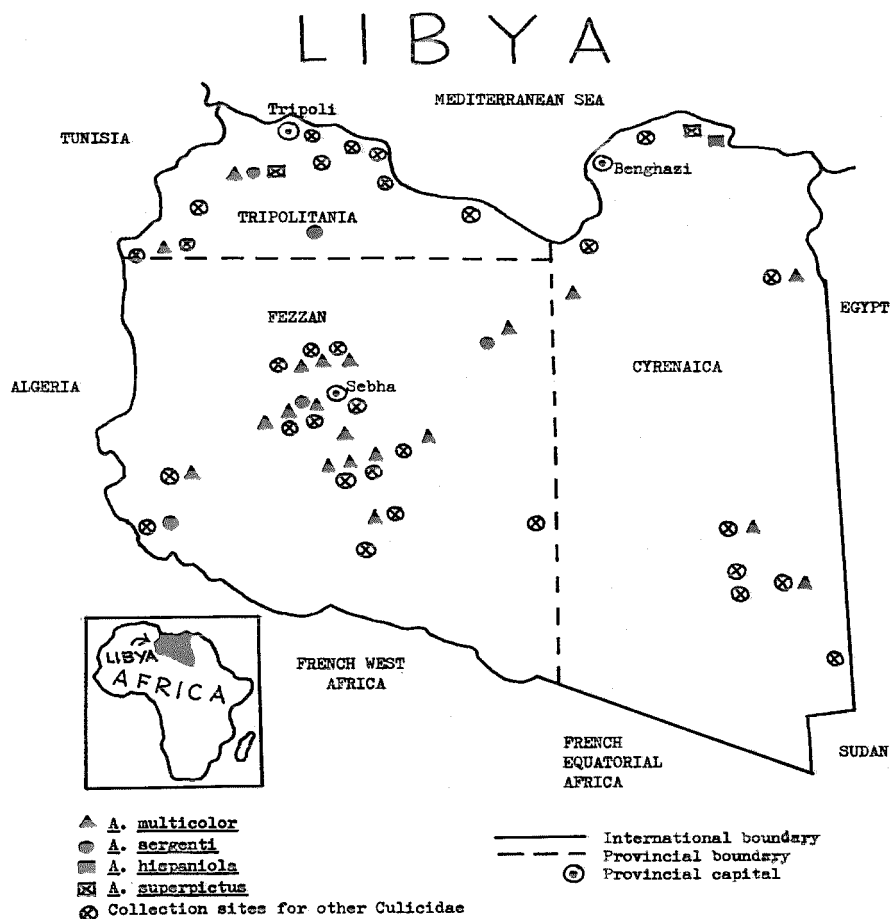


FIG. 1.—Map of Libya showing the distribution of the more important Anophelines and collection sites for other species of mosquitoes

43° F. in winter to 113° F. in summer. The temperatures in the desert range from 30° F. to 125° F.

There are approximately 1,200,000 inhabitants in Libya. The population is composed of Arab, Berber, Taureg, Negro and other ethnic groups. Europeans, including Italians, Greeks, and others, are

found primarily in the cities. A large portion of the population is nomadic or semi-nomadic.

The following is a list by province of the species of mosquitoes reported from Libya by various workers prior to 1957; the letter symbols used are explained at the end of the list.

Genus *Anopheles*

- (*Cellia*) *multicolor* Camb. (C) (F); (L)  
(V)  
(*Cellia*) *sergenti* (Theob.) (C) (F); (L)  
(V)  
(*Anopheles*) *hyrcanus* (Pallas) (C); (S)  
(*Cellia*) *superpictus* Grassi (C) (F); (L)  
(V)  
(*Cellia*) *hispaniola* Theob. (E); (V)  
(*Cellia*) *broussesi* Edw. (F); (V)  
(*Anopheles*) *algeriensis* Theob. (T); (B)  
(L)  
(*Anopheles*) *coustani* Laveran (T); (B)  
(L)  
(*Anopheles*) *lunbranchiae* Fall. (T); (B)  
(*Cellia*) *pharoensis* Theob. (T); (L)  
(*Anopheles*) *claviger* (Meig) (T); (B)  
(L)  
(*Anopheles*) *sacharovi* Favre (T); (U)  
(*Anopheles*) *coustani* var. *ziemannii* Grun-  
berg (T); (U)

Genus *Culex*

- (*Culex*) *pipens* L. (C) (F) (T); (R)  
(*Culex*) *univittatus* Theob. (F); (R)  
(*Culex*) *laticinctus* Edw. (T) (U)  
(*Barraudius*) *pusillus* Macq. (F) (T); (R)  
(*Neoculex*) *deserticola* Kirkpatrick (T);  
(U)

Genus *Culiseta*

- (*Allotheobaldia*) *longiareolata* (Macq.)  
(F) (R)

Genus *Aedes*

- Aedes* (*Ochlerotatus*) *mariae*. Sergent  
and Sergent (F); (V) (R)  
*Aedes* (*Ochlerotatus*) *caspius* (Passal) (F)  
(T); (R)  
*Aedes* (*Ochlerotatus*) *detritus* (Hal.) (T);  
(R)

Genus *Uranotaenia*

- Uranotaenia unguiculata* Edw. (T); (U)

During the period from February 1957 to July 1960, the writer and other malaria eradication personnel conducted extensive surveys on the insect vectors of human diseases in addition to pre-eradication malaria surveys in all parts of Libya. The major emphasis was on the collection of

anopheline mosquitoes in connection with the pre-eradication surveys. Culicine mosquitoes were collected whenever possible. All these specimen mosquitoes were collected by dipping for larvae and examining the native houses for adults. Light traps or animal traps were not used. The following is a list by province of the species of mosquitoes collected from 1957-1960.

Genus *Anopheles*

- (*Cellia*) *multicolor* Camb. (C) (F) (T)  
(36)  
(*Cellia*) *sergenti* (Theob.) (C) (F) (T)  
(16)  
(*Cellia*) *superpictus* Grassi (C) (T) (5)  
(*Cellia*) *hispaniola* Theob. (C) (3)  
(*Anopheles*) *algeriensis* Theob. (T) (1)  
(*Anopheles*) *coustani* var. *tenebrosus*  
Donitz. (T) (1)  
(*Anopheles*) *marteri* Senevet and Pru-  
nelle (C) (1)  
(*Anopheles*) *hyrcanus* (Pallas) (T) (2)

Genus *Culex*

- (*Culex*) *univittatus* Theob. (F) (T) (10)  
(*Culex*) *theileri* Theob. (T) (1)

Genus *Culiseta*

- (*Allotheobaldia*) *longiareolata* (Macq.)  
(C) (F) (T) (6)

Genus *Aedes*

- (*Ochlerotatus*) *dorsalis* (Meig) (F) (2)  
(*Ochlerotatus*) *detritus* (Hal.) (C) (1)  
(*Ochlerotatus*) *caspius* (Pallas) (C) (1)

Genus *Uranotaenia*

- Uranotaenia unguiculata* Edw. (F) (T)  
(4)

Symbols: (C) Cyrenaica; (F) Fezzan; (T) Tripolitania; (B) Brighenti 1930; (L) LaFace 1936; (R) Rioux 1958; (S) Senevet 1956; (V) Vermeil 1953; (U) ICA Health Staff. (Numbers) Numbers of localities where species were found.

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## OVIPOSITION RESPONSES OF *CULEX PIPIENS QUINQUEFASCIATUS* SAY TO WATERS TREATED WITH VARIOUS CHEMICALS

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The female mosquito's choice of oviposition site is influenced by many factors. Among the species that lay their eggs singly or in rafts on the surface of the water, this choice may be affected by type of vegetation, degree of shade, and amount of protection from wind and wave action. The choice of oviposition site will also be affected by the physical and chemical properties of the water available.

The chemicals present in different types of water that may influence the female's choice of oviposition site have not been extensively investigated. Lund (1942) in studies of *Anopheles quadrimaculatus* Say found no evidence of any preference in water samples containing a series of different chemicals or differing in hardness, pH, and calcium ion concentration. Wallis (1954) showed that *Aedes aegypti* (Linnaeus) was repelled by a 3 percent salt solution but preferred a 0.25 percent salt solution over distilled water. A 1 percent sodium chloride solution was shown by Zuleta (1950) to be repellent to *Culex fatigans* Wied. (*Culex pipiens quinquefasciatus* Say) but a 1 percent magnesium solution was not. He also found that this species preferred well-matured grass in-

fusion to rainwater. Gerhardt (1959) found that *Culex peus* Speiser laid eggs in field-test plots which contained fermenting dog food, casein, fat, or sugar and did not lay eggs in an untreated control plot. *Culex tarsalis* Coq. and *Anopheles freeborni* Aitken also laid eggs in these plots as fermentation subsided, but not in the control plots.

Materials and Methods.—One hundred and fifty-one chemicals were tested in water samples against gravid females of *Culex pipiens quinquefasciatus* Say to determine if they were attractive or repellent.<sup>2</sup> Some comparative tests of the attractiveness of natural breeding and distilled waters were also made.

The tests were made in screen cages measuring 12x12x12 inches that were fitted with a cloth sleeve on one side. Twenty to 25 blood-fed females, not over 5 days old, were used in each test. Acetone or water solutions of the chemicals were added to 350 cc. of distilled water in 400-cc. beakers. The chemicals were tested at 5, 25, and 50 p.p.m. In the multiple-choice tests three beakers containing different strengths of the chemical and one containing distilled water were used. The beakers were placed in the four corners of the cage. In the single-choice tests one beaker containing the chemical in 350 cc.

<sup>1</sup> A cooperative project between the Entomology Research Division of the U. S. Department of Agriculture and the Bureau of Vector Control of the California Department of Health. San Standing and Claude Hirst of the Bureau of Vector Control assisted with the project.

<sup>2</sup> Most of the chemicals tested were synthesized by chemists of the Entomology Research Division.