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# ANOPHELES MOSQUITO RECORDS AND OBSERVATIONS IN MONTANA \*

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The persistence of malarial infections in returned service men has evoked among public health personnel a renewed interest in anopheline mosquitoes. In areas such as Montana, where malaria has never been a problem, knowledge of potential vectors is often fragmentary. This inadequacy applies equally to distributional facts and to observations on mosquito habits and life histories.

Although anopheline mosquitoes have been known to occur in Montana for many years, Mail (1934) could cite only seven records for the two species, *Anopheles punctipennis* and *Anopheles maculipennis*, taken in the State. The former was reported from a single locality, and six scattered collection points were indicated for the second species.

Aitken (1939) distinguished three subspecific forms of *Anopheles maculipennis* in North America. Two of these were characterized by unicolorous wings: *Anopheles maculipennis freeborni* Aitken from the United States west of the Continental Divide, and *Anopheles maculipennis aztecus* Hoffman from the Valley of Mexico. *Anopheles maculipennis occidentalis* (D. and K.) recognized by a bronze or silver patch on the apical wing fringe, ranges in a narrow strip along the west coast, north to the Canadian Northwest Territory and across the continent below the international boundary to New England. Aitken's subsequent studies of the *Anopheles* complex (1941, 1945) included examinations of all available Montana material. Most of the *maculipennis* specimens had the silver-tipped wings of *occidentalis*, but *freeborni* was represented in collections from the Bitter Root Valley of western Montana.

Collections and observations made by the writer during the spring of 1946 yielded more material from western Montana than had been anticipated. Random collections were made during April, and a more complete survey was conducted in May. The gross results of the 1946

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collections have been summarized elsewhere (Pletsch, 1946). Larval collections were carried out in 47 localities covering 10 western Montana counties. Eleven positive samples were obtained, representing 7 of the 10 counties. Adult mosquito collections were made in 55 localities throughout 11 counties. Adult *Anopheles* were captured in 12 of these localities representing 7 of the 11 counties. These findings emphasized the desirability of a recapitulation of Montana *Anopheles* records, observations, and collected specimens. Observations in this north temperate area are needed to supplement the published data on nearctic anopheline distribution and habits (King and Brandley, 1941).

Figure 1 graphically summarizes Montana anopheline collections to date. Identification of specific collection points may be accomplished from the detailed tabulation of specimens, presented as an appendix to this paper.

*Anopheles maculipennis freeborni* Aitken has now been found in four Montana counties, all west of the Continental Divide, at elevations ranging from 2700 to 3900 feet above sea level. This form is a recognized malaria transmitter in California. The more recent collections confirm and augment the Montana distribution of *freeborni* as shown by Aitken (1941, 1945). Seasonal collection dates extend from May 28 to November 22. Both male and female *freeborni* were present in the three series collected in May, 1946. The May 28 collection in Sanders County included 33 females and 27 males, all under a single highway bridge. A nearby marsh yielded only one *Anopheles* larva, yet the finding of numerous males suggested the completion of one generation before the end of May.

*Anopheles maculipennis occidentalis* (D. and K.) is clearly Montana's most widely distributed anopheline form. In line with the adaptability indicated by its extensive North America distribution, it has been collected in Montana from 13 counties on both sides of the Continental Divide, and at elevations from 2100 to 4500 feet above sea level. Specimens from the lower altitudes (Blaine, Phillips and Valley counties) have not been examined by the writer but were listed by Aitken (1945). Altitude apparently exercised an effect on *occidentalis* only over a very wide range, while *freeborni* is found only in the mountain valleys. The general prevalence of *occidentalis* in western Montana, and its overlapping with *freeborni*, suggests a logical revision of Aitken's distribution May (1945) to show the concurrence of these two forms west of the Continental Divide (one collection in Lake County yielded six *freeborni* and one *occidentalis* beneath the same highway bridge).

Seasonal collection data for *occidentalis* extend from April 12 to August 3. Several of the females collected by the writer on April 19 and 28, 1946, in abandoned tourist cabins appeared engorged or gravid. Two specimens from April 28 collection were dissected. The midgut of the first contained the remains of a recent blood meal. The abdomen contained 97 partially developed ova which lacked the elongate proportions of mature eggs. In the second specimen the gut showed no obvious blood meal, but the abdomen contained 126 elongate, well-developed eggs. All *occidentalis* specimens from the State now in the collections at Bozeman and Hamilton, Montana, are females with the exception of one male. This male and three female *occidentalis* were collected on May 30, 1946, near Kalispell (Flathead County).

In limited instances observers have found *occidentalis* rather common in the State. Dyar (1929) wrote of specimens later listed by Aitken as *occidentalis*. "The 'malaria mosquito' was rather common on the west side of Glacier Park in 1926, hibernating adults entering the cabin in early spring. Larvae were found in the warmer algae-filled pools along the larger lakes and marshes..." Mail (1934) did not include in his account of Montana mosquitoes a significant field observation made by him in 1929. On April 28 he collected near Manhattan (Gallatin County) specimens of *occidentalis* and noted, "Adults only... Certainly if these are hibernating adults they show remarkable preservation. Think personally they are this spring's emergence but they precede any of the local *Aedes*, none of which are out yet. In willow brush alongside river... adults biting fiercely and quite numerous."

A lone record of *Anopheles punctipennis* (Say) in Montana has been cited repeatedly in the literature. Mail (1934) wrote, "There is only one record of this mosquito in Montana and this is from Lolo in the Bitter Root Valley, on the Pacific side of the Divide," but he quoted Hearle's description of this species, "the writer not having a specimen of this species at hand." The collection at Montana State College includes one *Anopheles* specimen labeled, "Lolo, Mont. April 24, 1909," but this specimen is a typical *occidentalis*. Regardless of the status of the Lolo record, the occurrence of *punctipennis* in the State was confirmed during 1946 by three new records west of the Divide. On May 24 one female was found in an abandoned stable (Mineral County) where one *occidentalis* had been taken on April 19. A lone male *punctipennis* was found with 60 *freeborni* specimens collected in Sanders County (May 28). On May 30 several anopheline larvae and pupae were collected on a woodland pool near Polson (Lake County).



## SUMMARY

1. An analysis was made of all available anopheline distribution records from Montana.

2. *Anopheles punctipennis* (Say) is recorded in Montana only from the Pacific side of the Continental Divide.

3. *Anopheles maculipennis freeborni* Aitken has been collected from western Montana at elevations ranging from 2700 to 3900 feet. *Anopheles maculipennis occidentalis* (D. and K.) has been taken from both sides of the Divide at a wide range of elevations (2100-4500 feet). Several localities in western Montana have yielded both *freeborni* and *occidentalis*.

4. Females of *freeborni* have been collected from May 28 to November 22, with numerous males found from May 28 to October 21. The more limited seasonal distribution of *occidentalis* includes females collected from April 12 to August 3. The only male on record was taken on May 30. Four specimens of *Anopheles punctipennis*, including one male, were obtained from May 24 to 30, 1946, in three Montana counties.

5. Dissection of *occidentalis* females collected on April 28, 1946, indicated the presence of well-developed eggs on that date. Egg counts from two dissected females showed 97 and 126 eggs present.

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## RECORDS OF MONTANA ANOPHELINES

County	City	Date	Identified by	Remarks	Specimens now at
<i>Anopheles maculipennis occidentalis</i> (D. and K.)					
Ravalli	Florence	June 29, 1914	**		?
"	Victor	July 12, 1918	T. H. G. Aitken		Mont. State
Missoula	Lolo	Apr. 24, 1909	D. J. Pletsch		"
"	Missoula	June 24, 1914	T. H. G. Aitken	Acc. No. 112, 3	"
Gallatin	Manhattan	Apr. 28, 1919	"	Acc. No. E29-314	"
Lewis and Clark	Helena	?	**		?
"	Clasoil	Apr. 12, 1932	T. H. G. Aitken		Mont. State
Glacier	No. Fk. Ranger Sta. Glac. Pk.	July 3, 1924	**		?
Blaine	Chinook	Aug. 3, 1927	**		?
Phillips	"	?	**		?
Valley	Glasgow	July 11, 1921	**		?
Powder River	Powderville	Apr. 21, 1916	**		?
Mineral	DeBorgia	Apr. 19, 1946	D. J. Pletsch	Acc. No. E46-11	Mont. State
"	Haugan	Apr. 28, 1946	"	Acc. No. E46-12	"
Ravalli	Darby	May 22, 1946	"		"
Flathead	Kalispell	May 30, 1946	"	Acc. No. E46-36	"
Lake	Ronan	May 30, 1946	"	Acc. No. E46-38g	"
Powell	Garrison	May 31, 1946	"	Acc. No. E46-41b	"
<i>Anopheles maculipennis freeborni</i> Aitken					
Ravalli	Hamilton	July 2, 1932	T. H. G. Aitken	"Goats"	Hamilton
"	"	Nov. 22, 1932	"		"
"	"	Aug. 8, 1933	D. J. Pletsch		"
"	"	July 1936	T. H. G. Aitken	Light trap	"
"	"	Oct. 20, 1939	"	Outhouse	"
"	Darby	Oct. 21, 1939	"		"
"	Lake Como	July 29, 1935	**		?
Sanders	Hot Springs	May 28, 1946	D. J. Pletsch	33 ♀ 27 ♂	Mont. State
Lake	Ronan	May 30, 1946	"	Acc. No. E46-38g	"
Granite	Bearmouth	May 31, 1946	"	Acc. No. E46-40	"
Ravalli	Hamilton	Nov. 7, 1946	"	"in occupied residence"	"
<i>Anopheles punctipennis</i> (Say)					
Mineral	DeBorgia	May 24, 1946	"		"
Sanders	Hot Springs	May 28, 1946	"	with 60 <i>freeborni</i>	"
9 Lake	Polson	May 30, 1946	"	reared from pupae	"
<i>Anopheles maculipennis</i> ? (De-scaled)					
Lake	Finley Point	Nov. 7, 1941	D. J. Pletsch	Numerous in outhouse	"
Flathead	Kalispell	May 29, 1946	"	under bridge	"

\*\* Specimens listed by Aitken (1945)