

# NOTES ON THE AEADES OF MONTANA

(*Diptera, Culicidae*)

By HARRISON G. DYAR

A brief report on the mosquitoes of Montana is given in the Fourteenth Annual Report of the State Entomologist of Montana, December, 1916, by J. R. Parker. He lists (omitting *Culex*, *Culiseta* and *Anopheles*):

- Aedes curriei* Coquillett, the most abundant species.
- Aedes sylvestris* Theobald, the next in abundance.
- Aedes nigromaculis* Ludlow, the third in abundance.
- Aedes spencerii* Theobald, the fourth in abundance.
- Aedes pullatus* Coquillett, in timber at high altitudes.

## NOT COMMON

- Aedes campestris* Dyar & Knab.
- Aedes fletcheri* Coquillett.
- Aedes stimulans* Walker (group).
- Aedes idahoensis* Theobald.
- Aedes hirsuteron* Theobald.
- Aedes fuscus* Osten Sacken.

A cursory passage of the State reveals certain additional information, which is here noted.

The writer passed through Montana by the Northern Pacific Railroad, and made a few stops for collecting. The course of the railroad is as follows: Entering Montana on the west from the northern spur of Idaho, it follows up Clark's Fork of the Columbia River, passing beyond the entry of the Flat-head River, and crosses the divide of the Mission Range at (1) Evaro, (3,971 feet); proceeding downward by a sharp grade into the valley of the Hell Gate River, (2) Missoula (3,323 feet) is reached; the road then follows up the valley of that stream to (3) Drummond (3,967 feet); a tributary of this same stream is followed practically to its source, whence the road rises sharply and crosses the Continental Divide at (4) Homestake (6,356 feet); it then descends into the valley of the Missouri River, passing (5) Whitehall (4,371 feet); thence it ascends a tributary of the Missouri, the Gallatin River, nearly to its source, passing (6) Bozeman (4,773 feet), well up in the narrower part of the Gallatin Valley; a low divide is crossed through the Gallatin Range and the road descends into the valley of the Yellowstone River, passing (7) Big Timber (4,094 feet) and (8) Laurel (3,311 feet). No stops were made after Laurel, the road following the same valley as it widens into the plains, almost to the eastern border of Montana.

Unfortunately, no stop was feasible at Homestake (4), so nearly all the collections are from river valleys. The wooded mountains should yield other species, such as *Aedes pullatus* and *trichurus* as at Kaslo, British Columbia, and *Aedes aestivalis*, as at Sandpoint, Idaho. This forested mountain region connects along the Coeur d'Alene-Bitterroot chain with the main Rocky Mountains, and the mosquitoes mentioned not improbably follow into western Montana. Indeed, Parker lists two of them, namely, *pullatus* and *hirsuteron* (= *aestivalis*).

Disregarding the high forested regions and the sparsely wooded mesas and hills, and referring only to the river valleys, the following conditions appear: Mosquitoes are naturally abundant and certain species have been evidently much increased in numbers by artificial conditions. Five species were

observed to be able to take advantage of these, by breeding successfully in pools produced by irrigation. While originally these forms were doubtless confined to a single annual generation following the spring snows, now they breed as often as the obliging farmers furnish suitable pools. These species are: *Aedes curriei*, *nigromaculis*, *vexans*, *trivittatus* and another referred to under *spencerii* below.

The river valleys furnish two faunal areas, one the river bottom itself, wooded, often densely clothed with cottonwood and willow; the other the high flood-plain, destitute of trees and resembling a prairie. Characteristic of the latter region are *Aedes curriei*, *nigromaculis*, and *idahoënsis*. *A. vexans* also invades it, though commoner in the river bottom. The habits of *trivittatus* are probably similar to those of *vexans*, although being a rarer species, specimens were captured only by the river, though bred from prairie pools. The males of *curriei*, *nigromaculis*, and *idahoënsis* swarm on the prairie; *vexans* only by the river; the swarming of *trivittatus* was not observed.

Exclusively river-bottom species are: *Aedes aldrichi*, *cine-reus*, and *sansoni*. *Aedes campestris* and *fletcheri*, listed by Parker, were not taken by me. Parker does not indicate the localities where he found them. Both are prairie species.

#### THE LOCALITIES

(1) **Evaro**, 3,971 feet. In spite of the comparatively low elevation, this has much the character of a mountain meadow, a typical breeding place for the early snow-water species. A flat marshy area, draining in both directions, is surrounded by hills clothed with pine forest. When visited, the season was far advanced; not only had all breeding of the early species ceased, to be replaced by larvæ of *Culex* and *Culiseta*, but the mosquitoes themselves were nearly gone. Only seven specimens were found in a day's collection, though earlier they must have been numerous, as was stated to have been the case by the station agent.

*Aedes idahoënsis* Theobald. One female.

*Aedes sansoni* Dyar & Knab. Two females. Not certainly

determinable by the adults alone. I would have expected *mimesis*, which occurs at Kaslo, British Columbia, to the northward of this region, and the character of the breeding ground—marshes—indicates this species rather than the river-pool *sansoni*; but the wing scales are as in *sansoni*.

*Aedes pullatus* Coquillett. Two females. A large species of the black-legged group, the mesonotum clothed with dark brown scales without dark bands, the wing-scales black. This does not agree well with *pullatus*, but in the absence of full data I do not venture to separate it.

*Aedes aestivalis* Dyar. Two females. A smaller species of the black-legged group with gray lateral vestiture on the mesonotum. Both specimens are worn and in too poor shape for exact determination; but as *aestivalis* abounds at Sandpoint, Idaho, in a not wholly dissimilar region, the determination is made tentatively.

(2) Missoula, 3,223 feet. Situated in the broad prairie flood-plain of the Hell Gate River at the junction of two forks. The plain is surrounded by high hills, mostly bare of trees on their aspect toward the town, but wooded on the northern slopes toward the river canyon.

*Aedes idahoënsis* Theobald. Eighty-seven males and fifty-three females. Of the latter 20 are atypical, having the black and white scales on the wings not contrasting, though some are at least pale, and so transitional toward *aldrichi* Dyar & Knab.

*Aedes vexans* Meigen (*sylvestris* Theobald). Eight males and fifty-seven females.

*Aedes sansoni* Dyar & Knab. Twenty-four males and forty-seven females.

*Aedes cinereus* Meigen (*fuscus* Osten Sacken). Five females.

*Aedes triseriatus* Say. One female.

*Aedes* sp. One female with black legs and black wing-scales, possibly a specimen of *pullatus* strayed from the forested hills above. The specimen is badly rubbed. It was taken in Reno Park in the well-forested river bottom.

A pool was found by the river, filled by waste water coming through the railroad track, which contained many pupæ and a few larvæ of *sansoni*, *vexans*, and *cinereus*.

(3) Drummond, 3,967 feet. Though practically of the same altitude as Evaro (1), this place has the characteristics of a river-valley locality. There is a broad flood-plain without trees where the town is situated. A short walk brings one to the river, which has many overflow pools and channels, for the most part lined with low willow bushes. One day's collecting was spent here, entirely in the river bottom.

*Aedes spencerii* Theobald. Three females.

*Aedes idahoënsis* Theobald. One male, 68 females. Of the latter, 3 transitional toward *aldrichi* and one toward *spencerii*.

*Aedes vexans* Meigen. One male and 50 females.

*Aedes sansoni* Dyar & Knab. One male and 100 females.

*Aedes mimesis* Dyar. Two males and 25 females.

*Aedes cinereus* Meigen. Eighty-nine females.

*Aedes canadensis* Theobald. Thirty-one females.

*Aedes curriei* Coquillett. Eighteen females.

*Aedes* sp. One female with black legs, too much rubbed for determination.

(4) Homestake, 6,356 feet. On the crest of the divide. The mountain slopes to the west both steep and dry; but on the east the descent is more gradual and there is opportunity for breeding pools. Interesting species should occur.

(5) Whitehall, 4,371 feet. Of the same general character as Drummond (3). The flood-plain is well marked and treeless, the river bottom clothed with low willow bushes. Collections were made both on the prairie and river bottom.

*Aedes idahoënsis* Theobald. Ten males and 110 females. Of the latter three intermediate toward *aldrichi* and six toward *spencerii*.

*Aedes vexans* Meigen. Four males and 83 females.

*Aedes sansoni* Dyar & Knab. Nine females.

*Aedes mimesis* Dyar. Four females.

*Aedes cinereus* Meigen. Two females.

*Aedes curriei* Coquillett. Forty-six females.

*Aedes nigromaculis* Ludlow. Thirty-six females.

(6) **Bozeman**, 4,773 feet. This is situated toward the head of a valley. The prairie is undulating, while the river is small. A considerable area of valley is covered with dense bushes of *Crataegus* and dwarf poplar.

*Aedes idahoënsis* Theobald. Twenty males and 59 females, the latter all typical.

*Aedes vexans* Meigen. One female.

*Aedes sansoni* Dyar & Knab. One hundred and eighty females.

*Aedes mimesis* Dyar. Four females.

*Aedes cinereus* Meigen. Four females.

*Aedes canadensis* Theobald. Ten females.

*Aedes nigromaculis* Ludlow. One female, small and lightly colored.

(7) **Big Timber**, 4,094 feet. The town is on the edge of the prairie, whence one descends a rather steep hill to the river bottom. This latter is wide, with many dead channels and marshes, covered with willow bushes and groups of tall cottonwoods. From the latter the place gets its name. Collecting was done both on the prairie and in the river bottom.

*Aedes idahoënsis* Theobald. Ninety-eight females, of which 6 intergrade toward *aldrichi*.

*Aedes aldrichi* Dyar & Knab. Twelve males and 184 females.

*Aedes vexans* Meigen. Seventy-four females.

*Aedes sansoni* Dyar & Knab. Three females.

*Aedes cinereus* Meigen. Three females.

*Aedes curriei* Coquillett. Eight females.

*Aedes nigromaculis* Ludlow. Thirty-one females.

(8) **Laurel**, 3,311 feet. Farther down the Yellowstone Valley than Big Timber, the conditions intensified. The prairie is wide, the town situated a mile and a half from the river, while it is an equal distance to the sparsely pine-clad bluffs that border the valley. Irrigation is much resorted to. The river is large, with steep bank on one side, but low on the other, the bed enclosing low islands and forming marshes and dead channels. Collecting was done on both prairie and river bottom.

*Aedes idahoënsis* Theobald. Twenty-three males and 19 females.

*Aedes aldrichi* Dyar & Knab. Sixty females.

*Aedes vexans* Meigen. One hundred and fifty-six females.

*Aedes cinereus* Meigen. Five females.

*Aedes curriei* Coquillett. Forty-two males and 654 females.

*Aedes nigromaculis* Ludlow. Thirty-eight males and 726 females.

*Aedes sansoni* Dyar & Knab. One female.

*Aedes trivittatus* Coquillett. Thirty-eight females.

*Aedes* sp. One female. A black-legged species of large size, too much worn to identify.

*Psorophora signipennis* Coquillett. Three females.

A number of pools formed by seepage from irrigation ditches on the prairie contained larvæ and pupæ of *Aedes curriei*, *vexans*, *nigromaculis*, and *trivittatus*, of which 124 specimens were bred.

The above collections show relative abundance as follows: *A. nigromaculis* first with 832 specimens, *curriei* second with 768 specimens, *idahoënsis* third with 550 specimens, and *vexans* fourth with 434 specimens. It almost seems as if Mr. Parker must have accidentally transposed the labels on his determined *idahoënsis* and *spencerii*, for I got only two of the latter, while the former was one of the common species. Except for this discrepancy, I find the same species abundant as does Parker. The relatively different order is largely accidental. In a general way, *curriei* is the most widespread and abundant species. My collections were influenced by a local abundance of *nigromaculis* at Laurel. Similarly, *idahoënsis* is more abundant in western than in eastern Montana, and my collections plainly have a larger western proportion than Parker's, as I did not collect east of Laurel, which is near the middle of the State.

#### THE SPECIES

##### *Aedes curriei* Coquillett.

A widespread species, especially on the prairie. The coloration varies greatly. The males swarm over bushes or prominent objects. At Laurel, on the prairie, just at sunset, a

rapid swarm was observed in a low bush about three feet from the ground. It was netted and proved to be *curriei*. Half an hour later, when it was getting too dark to see distinctly, another group of males was seen in a taller bush (*Sarcobatus vermiculatus*), circulating among and over the top branches. They did not swarm over the writer's head, although some *idahoënsis* were doing so at the time, and as I approached the bush the two swarms became slightly mixed, though the *idahoënsis* were higher. Next evening I visited the same bush and observed two swarms over it. One was over the top of the bush and proved to be *idahoënsis*; the other a little to one side and below the top, on the lee side, was *curriei*. Also the same evening, in the open, a swarm gathered over my head, partly mixed with *nigromaculis*. In netting mosquitoes to avoid their bites one night in walking from the river to the town at Laurel, of about 600 specimens so caught three were males of *curriei*. They had evidently been swarming over my head.

As determined by Knab, the larvæ appear in the early snow pools on the prairie. In the presence of irrigation, however, other broods appear, probably every time favorable pools are formed. I establish the fact that eggs will hatch the same year as laid. At Reno, Nevada, I got *curriei* eggs from captive females, allowed them to dry, then added water in about ten days and a part of the eggs hatched. The water was poured off and the procedure repeated, when more eggs hatched. There is thus seen to be no physiological difference between *curriei*, the inland form, and *quaylei* of the Pacific coast, as was supposed. Both hatch whenever they get water.

The larvæ of *curriei* (Laurel, Montana) have the head hairs single like *quaylei* of the coast, and *onondagensis* of New York. The comb scales are evenly fringed with long spines, quite as in *quaylei*. In *onondagensis* there is a slight differentiation of the central spine, but not on all the scales. *Curriei* from Reno, Nevada, have single head hairs and a slight differentiation of the central spine of the comb scale.

*Aedes campestris* Dyar & Knab.

Recorded by Parker, the determination by Knab. This is

very close to *curriei*, differing principally in being slightly larger. There may be a few specimens among my 768 *curriei*, but I have not detected them and more probably *campestris* inhabits a different area from that traversed by me.

The two specimens differ in the male genitalia. Not as radically as given in the monograph, which should be corrected on this point, but sufficiently. In *curriei*, the basal lobe of the sidepiece has two spines, a large curved one centrally and a shorter straight one at the margin. In *campestris* the middle spine is straight and about as stout as the outer one in *curriei*, while the outer one is absent, being represented by two stout setæ. This is an unexpected divergence, since the two spines are present and of the same structure in *curriei*, *quaylei*, *onondagensis*, and even the European *dorsalis* Meigen, though somewhat approximate in the latter. In *campestris*, however, the type is altered.

#### **Aedes canadensis** Theobald.

Not found in the plains and in the river valleys only near the mountains. The species is characteristic of the northern Atlantic coast region, extending even to Florida. It ranges westward through Canada to the Rocky Mountains. The species is not recorded by Parker.

#### **Aedes nigromaculis** Ludlow.

This species is characteristic of the prairie section of the river valleys. It never comes into the timbered country. I did not encounter it west of the Great Divide.

The males form a loose active swarm above prominent objects on the prairie. On the evening of July 15, at Laurel, they gathered above the writer's head, rising to a great height when disturbed, gradually settling to two or three feet above the head. After half an hour the swarm became partly confused with a swarm of *curriei*, which gathered in a similar position, but lower. Another visit to the *Sarcobatus* bush mentioned above, after sunset, showed three swarms of males, *nigromaculis* above the bush high up, *idahoënsis* above but lower, and *curriei* low and a little to one side.

The egg is long, slender, spindle-shaped, a little flattened on one side, shining black, laid singly.

Eggs deposited about July 20 were allowed to dry and water was added on August 2. The larvæ hatched in considerable numbers within 15 minutes after the addition of the water. The habit is the same as with *curriei* and *trivittatus*, part of the eggs hatching whenever submerged, and overwintering is not necessary for emergence.

Consequently the larvæ occur in irrigation pools, frequently in large numbers. The larva (see Plate II) has the tuft of the tube far out, beyond the pecten which runs nearly to the end of the short tube; pecten with detached teeth outwardly; anal segment ringed by the plate; comb-scales seven to ten, in a patch, not in a line, the single scale with long sharp central spine and fringe of a few slender ones at base; head hairs both single, ante-antennal tuft in fours.

#### *Aedes fletcheri* Coquillett.

Superficially similar to *nigromaculis*, replacing it on the prairies of Saskatchewan and Alberta. The coloration is the same, but more yellowish in *fletcheri*, paler and suffused. There is no white ring on the proboscis, but this is also sometimes absent in *nigromaculis*. The species enters Montana at the northern part, as our single record proves, Big Fork, Flathead County, 1904 (E. M. Ricker). Mr. Parker's specimen seems not to have been preserved in the collection. I did not meet with the species.

#### *Aedes riparius* Dyar & Knab.

A single specimen, Dillon, Montana, August 4, 1908 (R. A. Cooley), in the collection of the National Museum, agrees with this species. It is close to *fletcheri* in coloration, but differs in the abdomen, which in *riparius* is lightly suffused with whitish scales, in *fletcheri* strongly so. However, they differ in habit, *fletcheri* being a prairie species, while *riparius* frequents the timber along the river bottoms. I did not meet with this species. Dillon is in the Beaver Head valley, a tributary of the Missouri. The species ought, perhaps, to have been en-

countered by me at Whitehall, unless it frequents high timber, of which there was none at that place.

### *Aedes sansoni* Dyar & Knab.

The types of *sansoni* are five specimens, numbered, respectively, 10, 13, 14, 17, and 20 by the collector. Nos. 10, 13, and 14 are females, 17 and 20 are males. No. 20 is *Aedes curriei*, as shown by the genitalia. No. 17 has lost the abdomen, but has the sides of the mesonotum very white, as is also the case in the females, Nos. 13 and 14. No. 10 has the usual mixture of brown and white, the brown predominating, and may be selected as the type. The wings show a sprinkling of white scales along costa and subcostal vein.

*A. sansoni* was described from Banff, Alberta, a locality on a river flowing from the Rocky Mountains. In the monograph, we added certain other specimens, namely: Larvæ from Kaslo, British Columbia; a male from Juliaetta, Idaho; male and females from Eureka, California, and females from Fieldbrook, California. I have lately removed the California specimens to *increpitus* Dyar (Ins. Insc. Mens., v, 15, 1917). I now propose to remove the Kaslo larvæ. The larvæ agree with *abfitchii* essentially, and will be found referred to under the heading *mimesis* below. This will define *sansoni* as the river-pool species of the Rocky Mountain streams, and definitely associate the Banff female with the male from Juliaetta, Idaho. Males from Missoula, Montana, agree. Larvæ from Missoula are of the typical river-pool form (see Plate II), indistinguishable from *stimulans* Walker of the east or *increpitus* Dyar of California. The three species separate on male genitalia:

- Basal lobe of sidepiece weak, tuberculate, sparsely setose, accompanied by a very strong spine.....*stimulans* Walker  
 Basal lobe of sidepiece tuberculate and diffused, without a strong spine.  
 Filament of harpago slenderly sickle-shaped, expanded at basal third (see Plate II).....*sansoni* Dyar & Knab  
 Filament of harpago with angular expansion beyond middle.  
*increpitus* Dyar

*A. sansoni* was common in all the wooded river bottoms.

although, by the time I reached Laurel, they had become scarce and worn.

The egg is elliptical, rather thickly fusiform, a little flattened on one side, large, shining black, laid singly.

Eggs obtained about July 15, 1917, though repeatedly wet, failed to hatch and appear destined to hibernate.

*Grabhamia vittata* was described by Theobald from Pecos Canyon, New Mexico, the description being indeterminate and applying to any species of the *cantans* group. Mr. Theobald had males and larvæ, but the genitalia were not described and the larvæ were wrongly associated, being those of *Culiseta incidens* Thomson. The species therefore rests solely on the locality. This is in the Rocky Mountain range and therefore we probably have to do with the species of that region. There are but two of the *cantans* group known from the region and probably but two occur, judging from the analogy of California, where we have two, *increpitus* Dyar in the river pools and *palustris* Dyar in the marshes. I have identified the river pool species as *sansoni* Dyar & Knab; but the name *vittata* remains indeterminate.

The foregoing was written under the assumption that the two Rocky Mountain forms of the *cantans* group were indistinguishable in the female adult. While the manuscript was in the printer's hands, I have gone over the matter more carefully. In California, *palustris* is distinguishable from *increpitus* by the excess of white scales on the wings. It occurred to me that the same might be true of *mimesis* as compared with *sansoni*. A careful examination of females showed that two series could be separated on this character. The distinction is not as marked as in the Californian forms, but it is there. On this basis, I re-examined the three females of *vittata* Theobald which are before me from the lot that furnished Theobald's types, and they are all *sansoni*.

But whether a restriction of *vittata* be made or not, the name becomes a homonym and must be dropped. Bigot described *Culex vittatus* in 1861, which is considered a synonym of *Aedes sugens* Wiedemann. Therefore the name *vittatus* or *vittata* cannot be used again in the genus.

**Aedes mimesis**, new species.

I propose the name *mimesis* for the unnamed form, since both *sansoni* and *vittata* apply to the river-pool species, the type being the male from Drummond, Montana, mentioned below. The type number is 21553, U. S. Nat. Mus.

The larva of *mimesis* will be the larva from Kaslo, British Columbia, which so closely resembles that of *abfitchii*. As to the genitalia, I have a specimen from Drummond, Montana, which differs distinctly from *sansoni* and comes very close to *palustris* of California. This is entirely as it should be, *sansoni* of the Rockies representing *increpitus* of the Sierras, while *mimesis* of the Rockies represents *palustris* of the Sierras. The genitalia runs as follows:

Basal lobe of sidepiece conical, setose, with a stout seta on the inner angle, but without a strong spine. Filament of harpago small, sickle-shaped.

Spines of basal appendages long.....*palustris* Dyar

Spines of basal appendages moderate.....*mimesis* Dyar

The habitat of *mimesis* appears to be more restricted than that of *sansoni*. I encountered the species only at Drummond, Whitehall, and Bozeman; a small series from Aweme, Manitoba (June 13-July 10, 1910, N. Criddle), are all *mimesis*; no *sansoni* being present.

**Psorophora signipennis** Coquillett.

Three specimens, Laurel, Montana, July 15, 1917, biting after sunset on the prairie. Previous records of this species are from Mexico, Texas, and New Mexico. The present record extends the known range considerably.

**Aedes vexans** Meigen (*sylvestris* Theobald).

Males were observed swarming after sunset at Big Timber in the river bottom, in little open glades under willows and on the dark side of bushes. The species is abundant, flying both on the prairie and river bottom, though much more abundant in the latter location. Larvæ were found breeding in temporary irrigation pools.

Hatching experiments were not conducted with this species, but the inference is that part of the eggs will hatch

whenever wet, whether of the same season's deposition or of the previous season's. This is the case with *curriei*, *nigromaculis*, and *trivittatus*, the three other species inhabiting the irrigation pools with *vexans*.

#### *Aedes trivittatus* Coquillett.

Found only at Laurel and probably confined to the eastern half of Montana. The adults frequent the river bottom by preference, though they must at least make excursions into the prairie, as larvæ occurred in temporary irrigation pools a mile and a half from the river. The species is rare and cannot be considered as especially troublesome.

The egg is thickly fusiform, pointed at the ends, a little flattened on one side, rather large, shining black, laid singly.

Eggs deposited July 25, 1917, were submerged a few days later and larvæ immediately hatched, but leaving many unhatched eggs in the water. The habit is the same as in *curriei*, that part of the eggs hatch whenever submerged and that the cold of overwintering is not a necessary prerequisite to hatching.

#### *Aedes cinereus* Meigen. (*fuscus* Osten Sacken).

This species is confined to the river bottoms and vicinity in the arid country. The little mosquito is a bad biter in the timber and low willows. Males were seen swarming after sunset at Laurel in the river bottom between arched willows about seven feet from the ground. Also males were netted in willows at Lake Cushman, Washington. In the latter case the swarming could not be witnessed, but was undoubtedly taking place. No specimens were seen on the prairie, nor were larvæ bred from temporary irrigation pools in the open. At Missoula an artificial pool under willows was inhabited by the larvæ. In New Hampshire I bred the species from roadside pools following rain, together with *vexans* and *canadensis*. These three species will, therefore, breed in accidental pools all summer, but only *vexans* takes advantage of irrigation pools in the open, the other two species being confined to forested country.

**Aedes triseriatus** Say.

A single female was taken at Missoula. This is the eastern tree-hole species and was hardly to have been expected in the Rocky Mountain region. At Kaslo, British Columbia, on Kootenai Lake, *A. varipalpus* was the tree-hole inhabiting form. This is not listed by Parker.

**Aedes pullatus** Coquillett.

This name is used in a general sense to cover the black-legged species of high altitudes. The true *pullatus* doubtless occurs, as we have it from Juliaetta, Idaho, but other similar species have been confused. Solitary rubbed specimens referable to the group were taken here and there, but without males or larvæ certain determination cannot be made. These species fly in May, and, at the time of my visit, had mainly disappeared.

**Aedes prodotes**, new species.

Mesonotum gray at the sides, a dark brown shade over the disk; in this two narrow lines of small dark brown scales; short lateral stripes posteriorly; area of antescutellar space light gray. Abdomen black with basal segmental white bands; venter whitish scaled with medioventral black stripe, crossed by apical segmental black bands. Legs black; femora white below nearly to tip; knee-spot white; tibiæ with a few gray scales. Wing scales black. Palpi, antennæ, and proboscis black.

*Genitalia* (see Plate II).—Sidepiece with a well-developed apical lobe; basal lobe conical, setose, with an accompanying single spine; harpago long, slender, curved, uniform; filament long, angularly expanded on one side at base, then tapering to a curved point.

Type, male, No. 21546, U. S. Nat. Mus.; Bozeman, Montana, May 7, 1907 (R. A. Cooley); another male is the same, Banff, Alberta, 1908 (N. B. Sanson), but the vestiture of the mesonotum is indistinct.

The female adult is apparently indistinguishable from *pullatus* or *tahoënsis*. The male genitalia are similar to *lazar-ensis*, but differ slightly in the shape of the filament of the

harpago. The coloration of the mesonotum makes an association with *lazarensis* impossible.

#### *Aedes aestivalis* Dyar.

Two rubbed females from Evaro (1) are tentatively referred here. The species is abundant in northern Idaho and has been discussed on a previous page. Several specimens from Drummond, listed under *aldrichi*, come very close to *aestivalis*, and, taken alone, would easily be so determined. I think, considering the circumstances, that they are aberrations of *aldrichi*.

#### *Aedes spencerii* Theobald.

Only three specimens were captured among numerous *idahoënsis*. *A. spencerii* is dominant on the prairies of Saskatchewan, as shown by Knab, and is represented in southern Montana by *idahoënsis*. Quite possibly the species intergrade on middle ground. The occurrence of so few *spencerii* in this region suggests that it may be here an aberrational form of *idahoënsis*, becoming dominant in the north.

*A. spencerii*, as found in Saskatchewan, is a medium-sized species, the wing-veins bicolored, the abdomen with a dorsal whitish stripe, often much suffused with white, occasionally the dorsal stripe more or less completely absent; mesonotum gray or yellowish gray, anterior angles brown, dorsal brown stripes usually completely conjoined into a band and touching the short posterior stripes; occasionally the dorsum is suffused with a brown shade. Legs with white scales, often numerous, the tibiæ largely white-scaled above.

The three specimens referable here, from Drummond (July 10), are all of the gray form, old and worn. Two fresh specimens of the yellow form were bred from pupæ in irrigation pools at Laurel, July 17-18. No adults were seen flying at this place. The larva was not obtained, nor has a larva corresponding to that of *spencerii* been taken in Montana. Mr. Parker sent two larvæ on slides, Laurel, August 25, 1914 (R. W. Wells), and Harlem, May 28, 1915 (R. A. Cooley), which do not coincide with any known species (see Plate II).

Head hairs single; air-tube with 17 teeth, the last two or three detached, the tuft arising beyond; lateral comb of eighth segment of 21 scales, each with a large central spine; anal segment not ringed by the plate, which runs close to the ventral line.

If the larva of *spencerii* were unknown, I should be inclined to assign this larva to it. As it is, further investigations must be made. I do not think the larva can be *idahoënsis*, which should be closer to *spencerii* than this is. There is thus a fifth species, whether *spencerii* or not cannot yet be said with certainty, breeding in irrigation water after the disappearance of the early spring brood, but in negligible numbers.

#### **Aedes idahoënsis** Theobald.

Very common on the limited prairie surrounded by mountains, especially in western Montana. At Laurel females were scarce, though males were still swarming, and the species seemed to be disappearing. It was rare at Sandpoint, Idaho, in forested country. All the specimens taken in western Montana have the abdomen with basal bands only. At Drummond a few *spencerii*-like forms were taken, as noted above. Farther east the typical form obtained again.

At Bozeman the males were observed swarming. I went out toward the prairie at sunset, and, as the sun set, males were seen in a swarm over my head. The group would augment in number, then diminish, keeping about a foot overhead, all the individuals facing toward a light breeze which blew from the south. Two boys, perched on top of a water tank, called out that there were mosquitoes up there, but they were not bitten. The tank was at least 25 feet from the ground. At the same time females were attempting to bite in the grass about ankles and knees. At Laurel the males were repeatedly seen swarming over low isolated bushes (*Sarcobatus vermiculatus*) in company with *nigromaculis* and *curriei*, but always in separate swarms, each with its own relation to the bush.

The species exhibits a certain variability. The intergradation toward *spencerii* in the Missouri valley has been noted. The species also intergrades toward *aldrichi* at the timber in the river valleys, which it invades to some extent.

Eggs obtained from captive females are long, slenderly spindle-shaped, shining black, laid singly.

*Aedes aldrichi* Dyar & Knab.

This is the smallest *Aedes* known to me. While varying in size, as all mosquitoes do, the average is small and often minute. When biting, and the proboscis is driven far down, the little insect tips up behind and sometimes loses hold with all its legs, suspended by the proboscis. The species inhabits the river bottoms strictly, never straying far from the edge of the timber. It is a close ally of *idahoënsis*, but smaller, the wing-scales all dark. The mesonotum has the two dorsal brown lines narrow and separated, the anterior angles gray. Certain intergrades occur, as noted above, but not in the typical dense forested areas.

A mount was prepared from a male taken in the timber with numerous females of typical *aldrichi*, at Big Timber, July 13, 1917. The genitalia (see Plate II) have the apical lobe of the sidepiece well rounded off and bulbous, continued narrowly basally, but not reaching basal lobe, clothed with small, sparse, nearly straight setæ; basal lobe expanded, tubercular, a moderately stout spine arising from the inner (ventral) margin, without long setæ, the setæ on the inner margin of the lobe becoming dense, but not much longer than elsewhere; filament of harpago angularly expanded near the middle.

The genitalia are, therefore, much as in *idahoënsis* and *spencerii*, differing in the reduction of long setæ which accompany the spine of the basal lobe in those species.