

ECOLOGICAL OBSERVATIONS ON THE BLACKFLIES AND PUNKIES OF CENTRAL ALASKA

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During the 1947 season, a study was made of the biting insects and their control in central Alaska by the Alaska Insect Control Project. This project was supervised by B. V. Travis of the Orlando, Fla., laboratory of the U. S. Bureau of Entomology and Plant Quarantine and recommended by the Army Committee for Insect and Rodent Control. The ecological observations of the Biology Section on blackflies and punkies are presented for the period 5 May to 24 August 1947. The study was made in central Alaska from Anchorage to Fairbanks and Circle, and from there to Tok and Valdez along the highways and railroads. Special trips were made to Nome, Mt. McKinley National Park, and Adak in the Aleutian Islands.

The collections and observations were made by the author and all other members of the project. The determinations were made or confirmed by Dr. Alan Stone, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine. The ecological observations are preliminary and represent one season during which there was less rainfall than usual.

BLACKFLIES (Simuliidae)

The species of Simuliidae locally known as "White-Sox" which were collected in central Alaska represent four genera and twenty species. Larvae and pupae of the genus *Eusimulium* were typically found in cold streams with a variable flow rate. *E. pugetense* was found in cold waterfalls and mountain streams, while *E. aureum* was in warm slow-moving water from lake outlets. The genus *Simulium* was typically collected in relatively warm slow-moving streams, often from lake outlets. The uncommon genus *Cnephia* was collected in cold streams. The species of

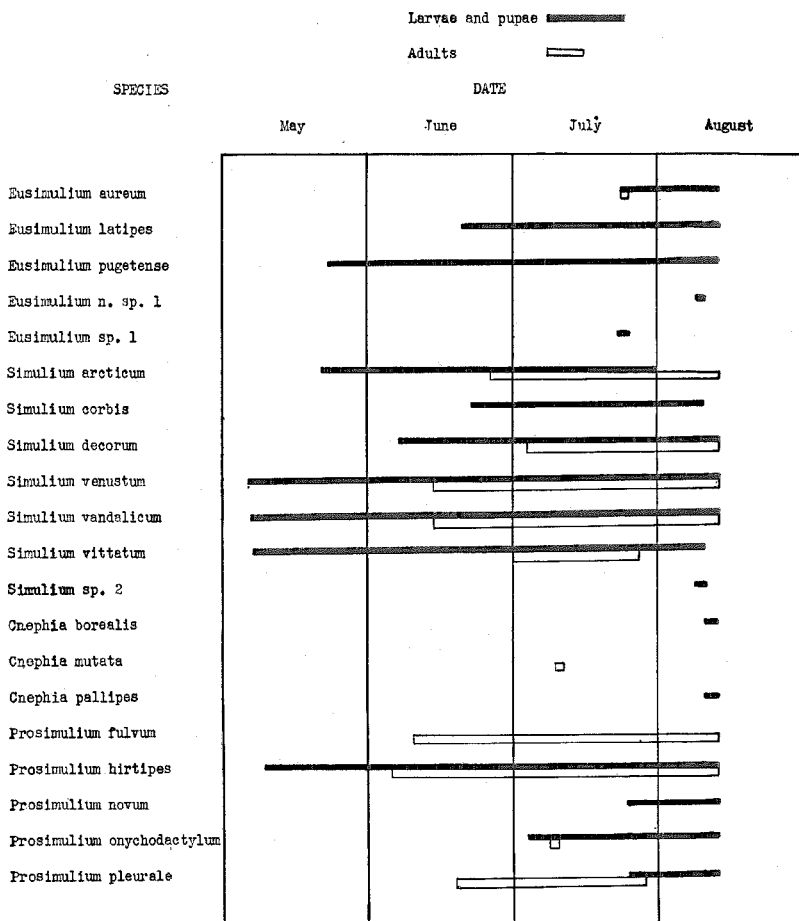
Prosimulium were typically found in fast, tumbling mountain streams with clear cold water. The dates of collection of larvae, pupae, and adults of each species are presented in Fig. 1.

The largest populations occurred at the outlets below lakes where the under-water surfaces and vegetation were frequently black with larvae and pupae. Along one outlet stream a population was estimated at 100,000 *S. venustum* larvae per square foot. The associations of each species of larvae and pupae in the various stream habitats are shown in Table 1. The numbers represent the number of times two species were found in the same habitat and emphasize the specificity of each species to its typical habitat.

The adult populations were quite large in some localities and they were said to be important biting pests, especially along streams in the evening. Members of the project experienced few bites during the season. *Simulium venustum* and *Prosimulium hirtipes* were the only important biting pests observed.

The flow rates of streams were measured by timing the surface flow of a floating object. Flow rates are represented as slow (1-100), medium (100-200), and fast (200-plus feet per minute). Most of the streams are small, ranging from 1 to 20 feet in width, and from an inch to 12 inches deep. A few large rivers were examined but usually no black flies were found in them. The temperatures of the streams varied considerably throughout the season, but the water was generally cold. Temperatures ranged from 36° to 76° F., with averages ranging from 42° to 66° F. The oxygen determinations were made by the Winkler method. The population figures are estimates of the average number per square foot.

FIG. 1. Collection dates of blackflies in Alaska, 1947



NOTES ON SPECIES

1. *Eusimulium aureum* (Fries).—This species was found in five streams in the south central part of the area from near sea level to about 2,500 feet elevation. The streams were lake outlets, marsh and bog drainage streams with bottoms composed of sticks, wood and rock. Pupae were also found at the outlet of a beaver dam. The average water temperature was 56° F. and average pH 7.3.

2. *Eusimulium latipes* (Fries).—Locally common and widespread, this species was found most frequently at lower elevations

from sea level to about 1,000 feet. Larvae and pupae were collected in 12 small shallow streams. They were common on wood and rocks, and were occasionally found on vegetation. Populations of this species were sometimes over 1,500 per square foot of surface, but the usual populations were about 50 per square foot. The average temperature was 52° F. and average pH 7.5.

Adults were observed in the field, especially at the streams where they were emerging.

3. *Eusimulium pugetense* D. & S.—

TABLE I. Larval Associations of Alaskan Blackflies, 1947.

Species	Species																		
	<i>Eusimulium aureum</i>	<i>Eusimulium latipes</i>	<i>Eusimulium pugetense</i>	<i>Eusimulium n. sp. 1</i>	<i>Eusimulium sp. 1</i>	<i>Simulium arcticum</i>	<i>Simulium corbis</i>	<i>Simulium decorum</i>	<i>Simulium venustum</i>	<i>Simulium vandalicum</i>	<i>Simulium vittatum</i>	<i>Simulium sp. 2</i>	<i>Cnephia borealis</i>	<i>Cnephia pallipes</i>	<i>Prosimulium hirtipes</i>	<i>Prosimulium novum</i>	<i>Prosimulium onychodactylum</i>	<i>Prosimulium pleurale</i>	
<i>Eusimulium aureum</i>	x							1	3	3	1								
<i>Eusimulium latipes</i>		x	5				2		6	6	1		1	1	1			3	
<i>Eusimulium pugetense</i>		x		1					3	3			3	3	10	3		5	3
<i>Eusimulium n. sp. 1</i>				x					1	1		1							
<i>Eusimulium sp. 1</i>					x				1	1					1			1	
<i>Simulium arcticum</i>						x			1	1	1								
<i>Simulium corbis</i>							x		3	3	1		1	1				1	1
<i>Simulium decorum</i>								x	2	2	1								
<i>Simulium venustum</i>									x	x	9	1	2	2	3			3	3
<i>Simulium vandalicum</i>										x	9	1	2	2	3			3	3
<i>Simulium vittatum</i>											x							1	
<i>Simulium sp. 2</i>												x			2	2	1	2	2
<i>Cnephia borealis</i>													x		2	2	1	2	2
<i>Cnephia pallipes</i>														x	2	2	1	2	2
<i>Prosimulium hirtipes</i>															x	8	8	4	4
<i>Prosimulium novum</i>																x		2	2
<i>Prosimulium onychodactylum</i>																		x	1
<i>Prosimulium pleurale</i>																			x

This widespread and not uncommon species was found in 16 streams at altitudes from near sea level to about 3,000 feet elevation. Typical habitats of this species were cold mountain streams, bases of waterfalls, and cold bog drainage streams. The bottoms of the streams and waterfalls were composed of rocks and slabs of schist and gneiss. The populations were low, seldom more than 5 larvae and pupae per square foot of rock surface. The larvae and pupae were found singly and not clustered. The average temperature was 42° F. and average pH 7.3.

4. *Eusimulium* new species 1.—Pupae collected in Caribou Creek at the 82 milepost near Nabesna.

5. *Eusimulium* species 1.—This species was collected only near Lowe River about 16 miles from Valdez at an elevation of 600 feet. Three larvae and three pupae were found on bare rock cliffs covered with brown-colored algae. The water

flowing over the cliff face in a thin film was clear and cold.

6. *Simulium arcticum* D. & S.—This species was found in two streams, a lake outlet, and a bog drainage stream, in coastal areas below 500 feet elevation near Anchorage and Palmer. The larvae and pupae were estimated at about two per square foot on rocks and up to over 1,000 per square foot on wood. The average temperature was 51° F. and average pH 8.0.

An adult female was collected in the Chugach Mountains at an elevation of 4,000 feet.

7. *Simulium corbis* Twinn.—This relatively rare but widespread species was found in four streams along the coast and in the interior near Slana and Tok up to an elevation of 2,000 feet. The streams were bog and marsh drainage type in level and mountainous country. The populations were small, only one pupa being

collected in each of the stations. The water temperatures were from 45.5° to 52.5° F. and the pH 7.5.

8. *Simulium decorum* Walk.—This species was widespread and not uncommon in adult collections, but larvae and pupae were found in only three streams at Bear Lake, Sourdough, and Slana at elevations below 1,000 feet. The streams were lake outlets and bog drainage types. The larvae and pupae were found also at the base of small waterfalls at the end of culverts in two localities. At Bear Lake the larvae and pupae were found in large numbers on the rocks and were compacted into thick masses about ¾ inch deep. Two distinct larval development periods were observed. The dark stained water averaged 62° F. and pH 7.5.

9. *Simulium venustum* Say.—This widespread species was collected in 24 relatively slow streams from Circle and Fairbanks to Anchorage at altitudes from sea level to 2,000 feet. The streams were lake outlets or drains from marshes and bogs. In one stream the dissolved oxygen ranged from 7.0 to 9.0 p.p.m. and averaged 8.5 p.p.m. The total alkalinity composed mainly of bicarbonates ranged from 100 to 120 p.p.m. and averaged 110 p.p.m. This species was the most abundant black fly in Alaska. Populations of over 1,000 larvae and pupae per square foot of bottom surface were observed at lake outlets. One estimate of 100,000 larvae per square foot was based on sample counts of vegetation. The water was usually stained and averaged 59° F. and pH 7.6.

Two definite generations were observed, and it is possible that three distinct broods developed, at least in a few favorable localities.

10. *Simulium vandalicum* D. & S.—Same data as *S. venustum* but less common.

11. *Simulium vittatum* Zett.—This species was found in six relatively slow streams in the southern part of the central Alaska region, especially in the coastal region under 1,000 feet elevation. The streams were typical lake outlets with beds composed of rocks, logs, sticks, and occasionally some vegetation and sand. The

dissolved oxygen averaged 8.5 p.p.m. and ranged from 7.0 to 9.0 p.p.m. The total alkalinity composed mainly of bicarbonates ranged from 100 to 120 p.p.m. and averaged 110 p.p.m. in one stream. The populations of larvae and pupae were abundant locally. At the height of a developing generation the populations were sometimes 1,500 or more per square foot of rock or wood surface. The water temperatures averaged 66° F. and the pH averaged 8.2.

Two distinct generations of larvae and pupae were observed to develop and a third brood was noted in some places which might develop to adults or overwinter in the larval stage. Adults of this species were collected in Adak in the Aleutian Islands on August 3.

12. *Simulium* species 2.—This undetermined species was found in Caribou Creek at the 82 milepost near Nabesna. The water was fast and clear.

13. *Cnephia borealis* (Mall.).—Collected from Valdez to Tok in three streams similar in type to those of *C. pallipes*.

14. *Cnephia mutata* (Mall.).—A single adult female was collected in a bog area near sea level at Pigot Bay. The specimen was collected when it alighted on the observer along with large numbers of *P. hirtipes* at about 6:00 p.m. in an area shaded from direct sunlight.

15. *Cnephia pallipes* (Fries).—This was a northern species found in four streams from Circle to Tok and Slana and was also collected at 3,000 feet elevation in the Sheep Mountains. The streams were mountain and bog drainage type with rocky bottoms. The populations averaged about 3 larvae and pupae per square foot of rock surface.

16. *Prosimulium fulvum* (Coq.).—Adults of this species were fairly widely distributed throughout the region and were most common in the southern part of the area, especially along the coast. The adults were collected from sea level to altitudes of 3,000 or more feet, but larvae and pupae were not discovered despite searches in streams near where the adults were found. Swarms of 25 or more females were observed flying

around humans. They often landed on the head and face, rarely on the lower part of the body. They were attracted to the skin, and occasionally probed, but there were no substantiated records of bites. The females were nervous when approaching a human and did not land readily. They were present in small numbers throughout the day, but were most common and active early in the morning and late in the evening. They were also collected by sweeping the vegetation with an insect net.

17. *Prosimulium hirtipes* (Fries).—This species was commonly found in cold, fast mountain streams and some cold bog drainage streams from near sea level to elevations of 4,000 feet. Larvae and pupae were collected in 37 widely distributed streams. This species extended higher in the mountains than other blackflies, and at high altitudes, while uncommon, was the only species present. The average population in the streams was about 15 larvae and pupae per square foot of rock surface. They were often found on the lower side of rocks, but also occurred on wood. The pupae were single or sometimes clumped, often with sand or dirt adhering to the loose pupal fibers. The average temperature was 43° F. and average pH 7.2. The developmental period was relatively long and only one generation was observed to develop, although two somewhat distinct flights of adults appeared. Swarms of about 100 adults were observed flying around persons and landing rates of 20 per minute were counted. The upper part of the body was the most subject to attack and the bite was painful, causing swelling and redness on some people. The adults were found biting at all hours of the day, but were more active after 5:00 p.m. and became most numerous late in the evening. They were also found in buildings and open areas where they were bothersome pests.

18. *Prosimulium novum* D. & S.—This species was collected in the northern part of the area, and in the Sheep Mountains at an elevation of 3,000 feet. It was found in 18 fast cold streams. The populations averaged about five larvae and pupae per

square foot of rock surface. These were most commonly found on the under sides of rocks. The temperature averaged 41° F., and pH 7.4.

19. *Prosimulium onychodactylum* D. & S.—This widely distributed species was found in 11 clear mountain and bog drainage streams and waterfalls at elevations from near sea level to 1,000 feet. The larvae and pupae were commonly found on rocks and gravel, especially light-colored rocks with cracks and rough surfaces. The pupae were usually found separate from other species. Several pupae were sometimes clumped together, often with fine sand or dirt entangled in the loose pupal strands. The populations averaged about five larvae and pupae per square foot of rock surface. Nearly 300 larvae and pupae were collected, but the pupae were difficult to rear in the laboratory, and only one male and one female were reared. The average of stream temperatures was 45° F., and pH 7.4.

No adults were observed in the field except one male emerging from the pupal case in the water.

20. *Prosimulium pleurale* Mall.—This is a northern species found in the region around Circle and south in the Alaska Range to Tok and Slana. It was absent in all collections in the southern part of the area even at high altitudes. The larvae and pupae were collected in 11 fast clear streams at altitudes of 800 and 2,000 feet. The streams were mountain and bog drainage type with bottoms composed of rocks and boulders. The population averaged about eight larvae and pupae per square foot of rock surface.

Adults of this species were collected from three localities in the interior at altitudes of 500 to 1,000 feet. They were attracted to humans but the biting habits were not observed.

PUNKIES (Heleidae)

The genus *Culicoides* includes the small biting midges commonly known as "punkies" or "no-see-ums" in the north woods of the United States and Canada. In Alaska they are usually called "no-see-ums" or "moose-flies." They are called

"sand-flies" along the coast in the southern United States and in some tropical regions.

The biology of the punkies has not been studied in Arctic areas and very little is known of their taxonomy, distribution or habits. In the present study, eight species were found of which three, *C. obsoletus*, *C. yukonensis*, and *C. tristriatulus*, were abundant and were important pests.

The females were collected as they came to bite on the hands, face, and clothes of the observer. In an attempt to make a comparative approximation of the abundance of the different species, counts of the landing and biting rate per minute were made. While these rates were only approximations of the populations, they were useful for comparison.

The adults were not important pests until relatively late in the season in central Alaska. They were first observed biting about the middle of June and increased in numbers and species after this date. The dates of biting and collecting records for the adults are shown in Table 2. The females were found biting at all hours of the day from 6:00 a.m. to 11 p.m. In early July the maximum activity occurred after 8:00 p.m., and adults were bothersome until 11:00 p.m. This peak of activity was correlated with a decrease in air movement, temperature, and light, and an increase in relative humidity. The biting habits were unpredictable and somewhat variable, sometimes lasting for only a short period. In a given station, adults would be very abundant on one evening, while on the

following evening at exactly the same time none would appear, especially if there was a light breeze.

Other genera of the family Heleidae to which *Culicoides* belongs were also collected. These genera were *Dasyhelea* and *Atrichopogon* which were collected from the clothing, but bites were not observed.

NOTES ON SPECIES

1. *Culicoides obsoletus* (Meigen).— This species was the most abundant and widely distributed. It was common at lower altitudes and was found locally abundant along the coast as well as in several localities in the interior up to 1,000 feet elevation. They were observed biting more frequently in woods or nearby wooded areas, especially in the daytime, but in the evening were also found biting in open areas. Adults were locally abundant in *Carex* marshes along the coast, and were commonly found near habitations, but they were not observed to be troublesome pests in buildings. The females were observed biting from 8:00 a.m. to 11:00 p.m., but relatively few bit during the day. Landing rates of over 20 per minute were observed several times. They landed on all parts of the body and readily bit the exposed skin.

2. *Culicoides yukonensis* Hoffman.— This was the most widely distributed no-see-um of the interior where it was locally abundant. It was usually absent or very rare in the coastal areas. The adults were found from near sea level to an elevation of about 2,000 feet. They were frequently found in larger stream valleys, including the Yukon River at Circle. Open bogs and *Carex* marshes were the usual habitats in which the adults were most frequently encountered. They were also found biting in spruce forests and at the edges of woods in open fields. They were not common around habitations unless these were located in bogs or marsh areas. Biting occurred throughout the day to a limited extent, but large numbers were noticed only in the evening and for a relatively short period of time on favorable evenings when there was little or no

TABLE 2. Collection dates for adult *Culicoides* in Alaska, 1947.

Species	Date			
	June	July	August	Sept.
<i>C. tristriatulus</i>	—	—	—	—
<i>C. obsoletus</i>	—	—	—	—
<i>C. yukonensis</i>	—	—	—	—
<i>C. sordidellus</i>	—	—	—	—
<i>C. biguttatus</i>	—	—	—	—
<i>C. species 1</i>	—	—	—	—
<i>C. species 2</i>	—	—	—	—
<i>C. species 3</i>	—	—	—	—

breeze. From 5:45 p.m. to 7:30 p.m. a large population was active and biting in the Gulkana area in an extensive open bog. Landing rates of over 100 females per minute on one leg from ankle to knee were counted. All parts of the body were attacked but the lower part of the body was attacked more, especially if there was a slight breeze.

3. *Culicoides tristriatulus* Hoffman.—Along the coast this species was very abundant locally, and small clouds were formed when the females swarmed around a person. It was restricted to the coastal region.

The largest populations were found on the tide flats and salt grass marshes along the coast. They were also found in bogs, open fields, and in sitka spruce-hemlock forests but in smaller numbers. The females were found in almost any habitat in the evening and were noticed around army camps and habitations. They were observed as far as 2 miles inland from the coast and were biting when collected over 2 miles at sea on a boat.

Adults were observed to bite in the morning from 6:00 to 10:00 a.m. in moderate numbers and to be very limited in activity during the day, when only a few bites were observed in wooded areas and in tall coastal vegetation. The greatest activity occurred in the evening from 6:00 to 10:30 p.m., with a maximum of biting from 7:00 to 8:30 p.m. Biting and landing rates of 20 per minute were observed several times, and in the swarms the rate was much higher. Up to 50 adults per square inch were counted on hats. The biting period extended over a longer period in the evening than observed for *C. yukonensis*, and a few were collected while biting after dark. All parts of the body were attacked, but the largest numbers were observed around the head and a hat was the best place to collect the specimens.

4. *Culicoides biguttatus* (Coq.).—One specimen of this species was collected as it alighted on the forehead of a man about 2:00 p.m. near Eklutna Lake. The habitat was a small bog near a stream and the area was open and unshaded.

5. *Culicoides sordidellus* (Zett.).—This species was collected as it attempted to bite man near Pigot Bay, Alaska, at about 6:00 p.m. in a sitka spruce-hemlock forest.

6. *Culicoides* species 1.—This species was collected in two localities along the coast in the Anchorage area. Females were collected in a spruce woods, in a nearby abandoned field with scattered trees, and at the border of a salt marsh. Biting occurred only from 8:00 p.m. to 11:00 p.m., and none were collected throughout the day.

7. *Culicoides* species 2.—A single female was collected as it alighted on an observer in the Anchorage area about 1 mile from the coast. It was taken about 9:00 p.m. in an abandoned field with scattered trees near a spruce-birch forest.

8. *Culicoides* species 3.—Three specimens were collected as they alighted on an observer near the coast in the Anchorage area. They were taken about 9:00 p.m. in an abandoned field with scattered trees near a spruce-birch forest, at an altitude of 150 feet.

SUMMARY

An ecological study of the blackflies Simuliidae and punkies *Culicoides* of central Alaska was made by the Alaska Insect Control Project from May to August, 1947.

Four genera including twenty species of blackflies ("white-sox") were collected of which *Simulium venustum* and *Prosimulium hirtipes* were the only important biting species. Blackflies were not observed to be very troublesome pests this season and few bites were experienced.

Eight species of *Culicoides* ("no-see-ums") or ("moose-flies") were collected of which three, *C. obsoletus*, *C. yukonensis*, and *C. tristriatulus* were abundant biting pests.

The distribution, habitats, abundance, and biting habits of these insects were observed in relation to control operations. The observations are preliminary and represent one season during which there was less rainfall than usual.