

ARTICLES

NOTES ON THE BIOLOGY OF SOME SPECIES OF UTAH
BLACKFLIES (DIPTERA: SIMULIIDAE)¹B. V. PETERSON²

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Little is known of the habits and habitats of many of the western species of blackflies. From 1951 to 1958 observations were made on several species that occur in Utah and are presented below as a contribution to the knowledge of the western blackfly fauna.

Prosimulium exigens DYAR AND SHANNON. In Utah, the immature stages of *P. exigens* are found usually in streams of small to moderate size, although occasionally they occur in the larger streams. Most frequently the streams range from less than 1 foot to 5 feet in width, from about 4-24 inches in depth, and have current velocities from 0.82-4.3 feet per second. Most of the streams have an abundance of emergent aquatic vegetation or trailing grasses and branches from streamside vegetation, and many shaded areas. The stream beds are usually of mixed mud and gravel. Rarely are larvae and pupae found in any numbers in streams with very rocky bottoms or lacking in aquatic vegetation, although small rocks are preferred for attachment.

The species overwinters as larvae and emergence occurs in the spring; the adults, at elevations up to about 7,000 feet, have usually disappeared by early June. However, at elevations above 10,000 feet gravid females have been collected as late as September 11 (1956). The later emergence at higher altitudes is probably related to the lower temperature of the water, as was

pointed out for the Alaskan species of blackflies by Sommerman *et al.* (1955). There is only one generation each year at any given locality and, in general, emergence is complete by the time the stream temperature reaches approximately 65° F.

The larvae are found usually in discrete groups of various sizes. Many such groups constitute a population that is itself sharply differentiated, one population often being separated from the next in the same stream by a mile or more. This was the case in Utah, in Red Butte Canyon and City Creek Canyon, where collections were made over an eight-year period. Often this made the search for the species difficult, but when found there was no scarcity of specimens. The factors that produce this type of local distribution remain unknown.

The larvae were found occasionally attached to the substrate by the anterior end, being held firmly in place by means of a small mass of silken material exuded from the labial or silk glands. The body of the larva floated downstream, but was held close to the substrate. When touched, they immediately attached themselves by the anal hooks in the usual manner and released their hold anteriorly to curl up on the substrate. This unusual position may be a resting attitude.

When the mature larvae are ready to pupate, they congregate to spin their sock-like cocoons. The pupae occur in rather large masses, often 1/2-1 inch thick, 8-10 inches in diameter, and often are covered by sediment. Many such masses may occur within a small area. Larvae have been observed to work their way under a layer of pupae in search of a suitable position in

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which to pupate. The pupa, just prior to emergence, pushes itself from its cocoon so that the entire cephalothorax is exposed and emergence of the adult is made easier. Often these pupal masses are so thick that adults emerging from the lower layers cannot work their way to the outside; many such trapped and dead individuals have been collected. The author has observed that it is easier to rear a small group of *Prosimulium* pupae than it is to rear individual pupae, and there may be some positive thigmotropic response which, in some way, facilitates their development.

Newly emerged and older adults of both sexes have been found resting during the heat of the day in culvert pipes and under bridges where it was cool and moist.

The oviposition habits of *P. exigens* are discussed by the author in another paper (Peterson, 1959).

Prosimulium fulvum (COQUILLET). Little is known about the biology of *P. fulvum* in Utah. On June 28, 1958, three miles northeast of Mirror Lake, Duchesne County, at an elevation of 10,950 feet, numerous mature larvae and several pupae of this species were found in a small stream on an alpine meadow. The stream varied from 4-12 inches in width, and from 1-4 inches in depth. Larvae were found on the sides and undersurfaces of rocks and were frequently attached to *Lycopodium*. Pupae were all found singly on the undersides of rocks. Two adults were collected as they emerged.

Most biological observations on *P. fulvum* have been made by workers in Alaska. Sommerman *et al.* (1955) mentioned that the species was confined to small, cold, tumbling streams. The larvae seemed to prefer the undersides of loose stones, while pupae were found at the edge of, or actually in, the moss that covered rocks. There was one generation a year, and the species overwintered in the larval stage.

Records of *P. fulvum* biting man and other animals have been provided by Hearle (1932) in British Columbia, and in Alaska by McAtee (1922), Sailer (1953),

and Sommerman *et al.* (1955). On the other hand, Jenkins (1948), also working in Alaska, observed that females would fly about humans but did not bite.

Prosimulium onychodactylum DYAR AND SHANNON. Mature larvae of *P. onychodactylum* are generally found from late May until mid-July. They occur in streams varying in width from 1-25 feet or more, with depths of 2 inches to about 4 feet, and with current velocities ranging from less than 1 foot to 8 feet per second. They seem to prefer sandy or silty areas of the streams where there are few rocks but an abundance of vegetation. Larvae tend to become concentrated on the upper or lower surfaces of grass blades and trailing branches, and often congregate on the darker portions of these. On several occasions larvae were found densely grouped on the dark bands of the stems of *Equisetum*, but none were found on the green portions. Jenkins (1948) stated that the larvae and pupae were found commonly on rocks and gravel, especially on light colored rocks with cracks and rough surfaces. Sommerman *et al.* (1955) stated that this species probably overwintered in the egg stage in Alaska, and that hatching appeared to start when the temperature was a degree or two above freezing. This is probably the case in Utah also, because small immature larvae have been collected from water as cold as 37° F. while mature larvae were found in streams in which temperatures averaged between 47-55° F. Judging from the larval collections over a three-year period, there is a single generation per year in Utah, conforming with the situation in Alaska.

No pupae or adults have been taken in Utah. Sommerman *et al.* (1955) mentioned that the pupae seemed to be limited to sandy areas where they attached their sandy and pebbly cases to logs or loose stones, usually at the line of contact with the sand. The feeding habits of the female are not known.

Eusimulium aureum (FRIES). *Eusimulium aureum* is widespread over the state and the immature stages can be found in

most streams. The larvae and pupae are generally most abundant in small, warm, rather slow-flowing streams that have an abundance of trailing vegetation.

The female oviposits on leaves, rocks, and sticks, depositing the eggs in a compact mass, one layer deep. DeFoliart (1951) reported that eggs were deposited in such a manner that they stood on end. After hatching, larvae require from two to five weeks for complete development, the time being dependent upon the water temperature (Sommerman *et al.*, 1955; Stone and Jamnback, 1955). Pupae require about a week for full development.

Adults have been collected in Utah from late April to the middle of September. There appears to be a constant overlapping of generations in the Salt Lake Valley, and larvae, pupae, and adults are present almost constantly during the above mentioned period. However, the adults, although rather widely distributed throughout Utah, have not been observed to occur in large numbers at any one time. There are probably three to four generations per year. Jobbins-Pomeroy (1916) reported five to six generations each year in South Carolina, but Davies (1950) in Ontario, and Stone and Jamnback (1955) in New York, reported two annual generations for this species.

The female does not appear to bite man in Utah, and Hocking and Richards (1952) stated that it was only rarely attracted to man in Labrador. Fallis and Bennett (1958) reported that it feeds on birds in Ontario.

Eusimulium baffinense (TWINN). *Eusimulium baffinense* is a rare species in Utah. Mature larvae have been collected only a few times although special efforts were made to find them in 1957 and 1958. Knowlton and Maddock collected one adult male on July 15, 1943, and Dr. Knowlton informed the writer (in litt., 1958) that he had taken the species (no sex or numbers mentioned) in a light trap at Logan, Cache County, on June 30, 1957.

Larvae were collected on several occasions but were all taken from the same

stream in Logan Canyon. The stream was about 12 inches wide, 2-6 inches deep, and had a hard, mud bottom with a few scattered small rocks. The stream flow was about 2 feet per second and the water temperature was 50° F. An abundance of grass was growing both on the bottom and along the banks. The larvae were attached to the undersides of the trailing grass, and were associated with larvae of *Simulium canadense* Hearle, *Eusimulium aureum*, *E. canonicolum* Dyar and Shannon, *Prosimulium exigens*, *P. flaviantennus* (Stains and Knowlton), and *P. onychodactylum*. Collection records obtained by the author in Utah would indicate that the winter is probably passed in the egg stage, and that there is one annual generation. The adult female is unable to bite due to its weakly developed mouthparts.

Eusimulium canonicolum DYAR AND SHANNON. Larvae and pupae of this species have been collected in streams varying from 1-30 feet in width, from 2-36 inches in depth, and having current velocities of 2-6 feet per second. The specimens were collected at elevations from 6,000 to 10,000 feet. The smaller streams had beds of mud and gravel while the larger streams had rocky bottoms. Immature stages were found on trailing grass and willows, dead sticks, and rocks. The stream temperatures varied from 57-63° F. during the period when pupae were present. The species was found in association with *E. aureum*, *E. baffinense*, *Simulium arcticum* Malloch and *S. tuberosum* (Lundström).

Observations on the feeding and oviposition habits of this species are presented in another paper (Peterson, 1959).

Eusimulium latipes (MEIGEN). This species has been collected in Utah at elevations from 4,725 to 10,050 feet. In every case, larvae and pupae were found in small spring-fed streams varying from 6-36 inches in width, ½-6 inches in depth, and having current velocities of 1-2 feet per second. These streams all had mud or sand bottoms with a few scattered small rocks, and an abundance of trailing grasses. Several of these streams dried up near the

TABLE 1.—Summary of the preferred larval and pupal habits for nine species of Utah blackflies

Species	Preferred stream types				Preferred substratum			
	Width (ft.)	Depth (in.)	Water velocities (ft./sec.)	Bottom	Max. water temp. during pupal stage	Trailing vegetation	Sticks	Loose rocks
<i>P. exigens</i>	<1-<25	4-24	<1.0-4.3	Mud-gravel, with scattered small rocks	65° F	+	+	++
<i>P. flaviantennus</i>	<1-3	2-24	<1.0-4.5	Mud-gravel; rocky	72° F	+	+	++
<i>P. fulvum</i>	<1	1-4	<1.0	Rocky	65° F	+	-	++
<i>P. onychodactylum</i>	<1->25	2-48	<1.0-8.0	Silt; sand	-	++	+	-
<i>E. aureum</i>	<1->25	1-24	<1.0-4.0	Mud-gravel; rocky	70° F	++	+	+
<i>E. baffinense</i>	<1-2	2-6	<1.0-2.0	Mud; mud-gravel	-	++	-	-
<i>E. bicornis</i>	<1	1-2	<1.0	Mud	-	++	-	-
<i>E. canonicolum</i>	<1-30	2-36	<2.0-6.0	Mud-gravel; rocky	63° F	++	+	+
<i>E. latipes</i>	<1-3	0.5-6	<1.0-2.0	Mud; sand with scattered small rocks	65° F	++	-	+

TABLE 2.—Summary of some life history data for nine species of Utah blackflies

Species	Known altitudinal distribution (ft. above sea level)	Number of annual generations	Over-wintering stage	Larval associates
<i>P. exigens</i>	4,200-11,000	1	larva	<i>P. flaviantennus</i> , <i>P. fulvum</i> , <i>P. onychodactylum</i> , <i>E. aureum</i> , <i>E. baffinense</i> , <i>E. latipes</i> , <i>S. canadense</i> , <i>S. piperi</i> , <i>S. tuberosum</i> , <i>S. venustum</i> , <i>S. vittatum</i> .
<i>P. flaviantennus</i>	2,700-7,000	1	larva	<i>P. exigens</i> , <i>E. aureum</i> , <i>E. baffinense</i> , <i>S. tuberosum</i> , <i>S. venustum</i> .
<i>P. fulvum</i>	10,050	1?	larva?	<i>P. exigens</i> , <i>E. latipes</i> .
<i>P. onychodactylum</i>	4,250-9,600	1	egg?	<i>P. exigens</i> , <i>E. baffinense</i> , <i>S. canadense</i> , <i>S. defoliati</i> , <i>S. vittatum</i> .
<i>E. aureum</i>	2,625-11,000	3-4	egg	<i>P. exigens</i> , <i>P. flaviantennus</i> , <i>E. baffinense</i> , <i>E. canonicolum</i> , <i>E. latipes</i> , <i>S. arcticum</i> , <i>S. vittatum</i> .
<i>E. baffinense</i>	6,000	1?	egg?	<i>P. exigens</i> , <i>P. flaviantennus</i> , <i>P. onychodactylum</i> , <i>E. aureum</i> , <i>E. canonicolum</i> , <i>S. canadense</i> .
<i>E. bicornis</i>	7,000	1?	egg?	
<i>E. canonicolum</i>	6,000-10,000	1-2?	egg?	<i>E. aureum</i> , <i>E. baffinense</i> , <i>S. arcticum</i> , <i>S. tuberosum</i> .
<i>E. latipes</i>	4,725-10,050	1	egg	<i>P. exigens</i> , <i>P. fulvum</i> , <i>E. aureum</i> , <i>S. vittatum</i> .

end of summer. Water temperatures ranged from 47-65° F. during periods when the larvae were mature and pupae were present. Mature larvae and pupae appear during the latter part of May at elevations near 4,725 feet, and have been collected as late as September 11, at elevations near 10,050 feet. Larvae and pupae were found most frequently on trailing grasses, but in very shallow and slow-flowing water, they were usually collected from the undersurfaces of small rocks.

There appears to be but one generation per year in Utah in any given locality; the winter is passed in the egg stage. Sommerman *et al.* (1955) mentioned that there are one or two generations a year in Alaska depending upon stream conditions, and that the winter is passed in the egg stage. This agrees with observations of Stone and Jamnback (1955) in the Adirondacks. Edwards (1920) stated that there was a single generation each year in Britain, but he said the species overwintered in the larval stage.

In Utah, *E. latipes* is not known to bite humans. This agrees with observations by Hocking and Richards (1952) in Labrador, Stone and Jamnback (1955) in the Adirondacks, and Davies and Peterson (1956) in Ontario. In Britain, however, *E. latipes* was reported to feed on humans (Edwards, 1920; Smart, 1944) and cattle (Stewart, 1932). This species was reported to feed on birds in Ontario (Anderson, 1956; Davies and Peterson, 1956; Fallis and Bennett, 1958).

A summary of the preferred larval and pupal habitats, and some life history data for nine blackfly species that occur in Utah, are presented in Tables 1 and 2.

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