

## THE BLACKFLIES OF BRITISH COLUMBIA (SIMULIIDAE, DIPTERA)

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### General.

In a paper which the writer prepared for the 1929 meeting of the Society, it was stated that an investigation of the blackfly fauna of British Columbia was being undertaken, and that this would be reported on at a later date. We are now in a position to give at least a preliminary list of this rather neglected but most important family of blood-sucking flies. During the past winter some 2,000 adult specimens have been worked over, the great proportion of these consisting of reared material from a number of streams in the province. An even more extensive accumulation of larvae and pupae await identification; they consist of about 100 collectings from some seventy-five streams of various types. While most of our collecting has been in the dry belt in the Kamloops district, much material is also available from the Kootenay, Okanagan, Chilcotin and Coast districts, and Vancouver Island.

Eleven undescribed pupae and about the same number of undescribed larvae have been taken. Isolated rearings have definitely associated the respective adults with six of these. Pressure of work makes it impossible to deal in any detail with more than one of these at the present time, but this particular form has such unusual peculiarities that it is described herewith.

Although F. W. Edwards of the British Museum has indicated in a recent paper his opinion that the family consists of the single genus **Simulium** (with the possible exception of **Parasimulium**) and that the other divisions of various authors must sink to sub-generic rank; the writer is, in this paper, following the classification given in Dyar and Shannon, "The North American Two-winged Flies of the Family Simuliidae," since no opportunity has yet occurred for a careful perusal of the paper cited.

One of the most troublesome and most generally distributed species in the province is **Simulium venustum** Say, which is the main blackfly that attacks man. It breeds in moderately small streams, often with comparatively sluggish flow and containing much aquatic vegetation. **Simulium arcticum** Malloch and **Simulium vittatum** Zetterstedt are two other outstandingly abundant and generally distributed blackflies; both appear to prefer the larger animals, and the former is not known to attack man. **Simulium vittatum** Zetterstedt breeds in rather small streams, but **Simulium arcticum** Malloch develops in the larger rivers where suitable shallows and ripples occur. We have found it to be abundant in such streams as the Athabasca at Jasper and in the Okanagan river. There are strong indications that it breeds in parts of the Fraser and Thompson canyons. While the above three forms are widely distributed and occur under very diverse topographical conditions, certain other British Columbia species are restricted to rather high elevations, the two most noticeable among these being **Prosimulium fulvum** Coquillett, the common, red, mountain blackfly, and **Prosimulium novum** Dyar & Shannon; both of these attack man as well as horses and other large animals.

**Concise List of Known British Columbia Species of Simuliidae  
to June, 1932**

- Prosimulium pleurale** Malloch.  
 “ **novum** Dyar & Shannon.  
 “ **dicum** Dyar & Shannon.  
 “ **dicentum** Dyar & Shannon.  
 “ **fulvum** Coquillett.  
 “ **hirtipes** Fries.  
 “ **pancerastes** Dyar & Shannon.  
**Eusimulium aureum** Fries.  
 “ **mutatum permutatum** Dyar & Shannon.  
 “ **clarum** Dyar & Shannon.  
 “ **minus** Dyar & Shannon.  
 “ **boreale** Malloch.  
**Simulium vittatum** Zetterstedt.  
 “ **kamloopsi**—new species.  
 “ **decorum katmai** Dyar & Shannon.  
 “ **virgatum canadensis**—new race.  
 “ **hunteri** Malloch.  
 “ **sayi** Dyar & Shannon.  
 “ **arcticum** Malloch.  
 “ **venustum** Say.

**NOTES ON SPECIES**

In the following notes only the main salient “recognition marks” are given for each species and no attempt is made to give more than a brief summary regarding distribution, early stages, breeding places, host preferences, etc. The writer has under preparation a more comprehensive paper dealing with the **Simuliidae** as they occur throughout Western Canada and these points will then be dealt with in considerable detail, together with descriptions of early stages and male and female genitalia. Dissections of the latter have been made in nearly all cases to verify identifications in the present paper. The bionomics of **Simulium virgatum** var. **canadensis** were briefly indicated in the author’s paper published in No. 26 of the Proceedings (1929) and further observations are given in the case of this species to amplify our former notes.

Genus **Prosimulium** Roubaud

Species characterized by the entire length of the radius being setose, the radial sector having a long fork, the hind basitarsus not produced and no dorsal incision at the base of the second hind tarsus; this segment fairly long. All of the seven species occurring in the province are large to medium sized blackflies.

**Prosimulium pleurale** Malloch

This is a fairly long greyish species distinguished from all others of the genus by the three patches of hair on the pleura; the claws are bifid with a thumblike basal projection and the legs brownish yellow; the thoracic integument is uniformly dark brown and is clothed with rather coarse yellowish white scales.

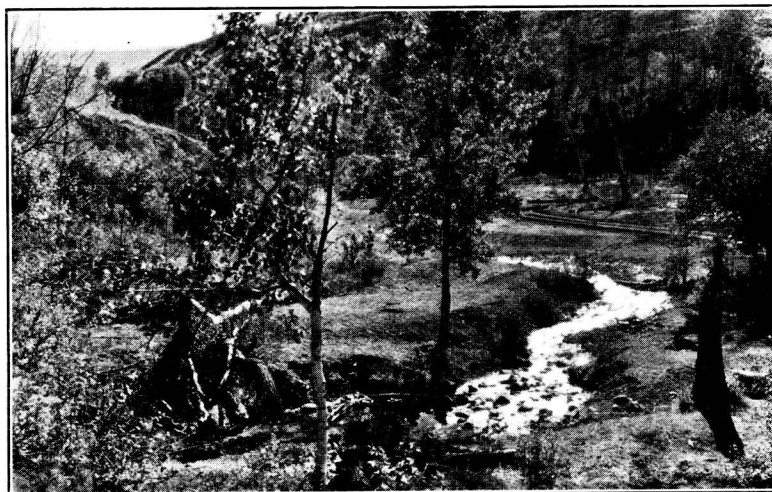
Nothing is known of the early stages or breeding places. It does not appear to be particularly common in British Columbia and is represented in our collections only from the Kamloops, Nicola, Chilcotin and Lillooet districts. (In the latter place taken by E. R. Buckell and

M. Ruhmann). Malloch, and Dyar and Shannon record it from Kaslo, which is the type locality.

**Prosimulium novum** Dyar & Shannon

Medium sized black species with unicolorous dark mesonotum clothed with yellow scales; the black antennae are very distinctly nine-jointed instead of eleven as in all other species; claws simple.

The preferred type of stream, early stages and males are unknown, and although a search was made for larvae and pupae in a number of high mountain streams no specimens that could be identified with this have been located. It is the dominant blackfly during July in the mountains in the vicinity of Kamloops and adjoining the North Thompson valley. Our specimens were mainly taken at from 4,000 to 5,000 feet. We have specimens from the Kootenays (taken by C. B. Garrett) and Dyar and Shannon record it from Kaslo. It is sometimes quite a serious pest to horses on high mountain sheep ranges and will also attack man.



Cold creek, Kamloops, B.C. A small permanent cool stream that is very well aerated. *Eusimulium boreale*, *Prosimulium dicentum*, *Simulium virgatum canadensis* and *Simulium sayi* bred from this stream in very considerable numbers. A few *Prosimulium fulvum* also reared here.

**Prosimulium dicum** Dyar & Shannon

No specimens came to hand during extensive collecting over four years. According to Dyar and Shannon this is a medium sized species, dark in colour with pale pilosity; the legs being dark or in part brownish yellow; the antennae are entirely dark and the stem vein is black pilose; claws simple.

Early stages and male unknown. Dyar and Shannon record this apparently very rare species from Prince Rupert.

**Prosimulium dicentum** Dyar & Shannon

A dark robust species of medium size; mesonotum unicolorous brownish black, unusually densely clothed with fairly long yellow scales so that little of the integument remains visible; legs with tarsi black, but femora and tibiae almost entirely yellowish; claws simple; stem vein pale pilose; antennae entirely black.

The group in which **dicentum** and **hirtipes** belong embraces several species which superficially resemble each other very closely and are hard to separate in dried specimens. We have large series of the hitherto unknown male, pupa and larva, the pupa being of the same type as **hirtipes** and **magnum**, no definite case being made. Each breathing organ consists of upwards of 100 very fine filaments. Male genitalia rather like **exigens**, clasper with three terminal claws. The preferred breeding places appear to be fairly small streams with stony shallows. This was one of the commonest species in rearings from a number of streams in the dry belt but very few were obtained in the numerous collections made on the wing or from animals.

#### **Prosimulium fulvum** Coquillett

The uniform orange yellow colour of this large mountain species is so conspicuous that it cannot be confused with any other; the tarsal claws are simple.

This is a very widely distributed and common blackfly in the mountains of British Columbia. It occurs in the mountains of the lower mainland; is one of the most abundant species at elevations of from 4,000 to 5,000 feet in the Kamloops district and North Thompson valley, and in the Rocky Mountains in the easterly limits of the province. E. R. Buckell has collected large series from the Barkerville district, and Dyar and Shannon record it from the Kootenays; the former has also taken specimens at Prince Rupert. The early stages are unknown, although the writer has reared this species on several occasions from a small, shallow, cold stream in the Kamloops district. The pupae were so rare here that in a miscellaneous lot of more than 1,000 pupae worked over nothing that could be this species was located. It will attack both man and the larger animals, but appears to prefer the latter; horses often suffer considerably from it on high mountain sheep ranges.

#### **Prosimulium hirtipes** Fries

A fairly large dark species superficially resembling **dicentum**; the mesonotum is dull black and fairly densely clothed with yellowish scales, these, however, not so closely placed as in **dicentum**; legs dark yellowish brown; antennae with basal two joints pale; stem vein pale pilose; claws simple.

No specimens that can be definitely placed as this species are present in British Columbia material, but we have specimens from Banff (C. B. Garrett) that obviously belong here. Malloch records it from Kaslo and Laggan. Dyar and Shannon indicate that this species does not occur west of the Mississippi, but is replaced in western North America by closely allied forms. The early stages have been described and adults are stated to occur early in the year. There is little definite information regarding their biting habits but apparently they occasionally attack man and livestock.

#### **Prosimulium pancerastes** Dyar & Shannon

This species is stated by Dyar and Shannon to be almost indistinguishable from **hirtipes** in the female but to show marked differences in male genitalia. It is possible that the specimens recorded from British Columbia by Malloch as **hirtipes** may belong here, and it is evident that this particularly closely allied group of species is in need of further detailed studies with rearings from isolated pupae. **Prosimulium hirtipes** has a very wide distribution in Europe and America but the early stages

are unfortunately not known from the former. Dyar and Shannon record **pancerastes** from the following points in British Columbia; Prince Rupert, Kaslo and Laggan. It appears to be fairly common.

Genus **Eusimulium** Roubaud

Species falling in this genus have the radius setose for its entire length but the radial sector is simple and not forked as in **Prosimulium**. The hind basitarsus may be produced apically or not, and a dorsal incision on the second hind tarsal joint may be present or absent. Only five species have so far been definitely identified from British Columbia.

**Eusimulium aureum** Fries

Rather small species characterized by the somewhat coarse bright golden scales that densely clothe the mesonotum; this species has a most unusual characteristic in that the postnotum bears a small number of golden scales; legs are bi-coloured with yellow predominating; fore coxae yellow; basal two joints of antennae yellow in strong contrast to remainder; claws bifid with strong thumblike basal projection.

This is a rare species and only a few specimens have come to hand during four years collecting in British Columbia; they are all from the Kamloops district and were reared out of four-filament pupae from small shallow permanent streams. It does not appear to be a blood-sucker and consequently is seldom collected.

**Eusimulium mutatum permutatum** Dyar & Shannon

Medium sized very dark brown species; mesonotum uniform dark brown with sparse scattering of pale fine scales; antennae brown and cylindrical, not tapered; very prominent apical projection on hind basitarsus, but no incision on second hind tarsus; spurs on hind tibiae unusually long; claws simple.

This appears to be very rare in British Columbia since there is only a single representative among nearly 2,000 specimens examined. This was taken by T. K. Moilliet and R. Turner from a brush plateau at 4,000 feet elevation in the North Thompson district. Little is known of the blood-sucking habits but this particular specimen was taken on a horse. Malloch, and Dyar and Shannon record this species from Kaslo and Prince Rupert, the latter place being the type locality for the western race **permutatum**.

**Eusimulium clarum** Dyar & Shannon

This species is rather similar in appearance to **minus** and to the eastern **johannseni**; in fact **clarum** might better be considered as a western variety of the last-named species, especially since the pupae are similar with but four respiratory filaments on each side. Male and female genitalia, however, show distinct differences in the two forms. **Eu. clarum** is a small blue-grey species with dark legs: the dark grey mesonotum, when denuded, has two rather broad darker central vittae narrowly divided, vestiture much as in **minus**, pale and slightly iridescent; dorsal plates on abdomen reduced; tarsal claws bifid with strong thumblike basal tooth; hind basitarsus produced and dorsal incision on second tarsal segment; stem vein pale pilose.

The breeding places were found to be small to moderate sized, swift flowing, shallow streams with stony ripples; pupae often being attached to trailing submerged grass. Specimens were taken only in the dry belt in the Kamloops, Nicola and Okanagan districts, and are prob-

ably restricted to the drier parts of the province. Little is known of the blood-sucking habits, but on one occasion this species was found feeding on the head of a young long-eared owl (*Asio wilsonianus*).

A most unusual migration of these blackflies was observed in the town of Kamloops during late June, 1930, when very large numbers were noted on house screens in the centre of the town. Conditions were very dry, and, with the exception of the large Thompson river, all streams within a radius of eight miles had completely dried up at this time.

#### *Eusimulium minus* Dyar & Shannon

A small dark species very similar to *johannseni* and *clarum*; general colour dark grey to black; mesonotum black, without noticeable markings, fairly closely covered with short, pale, somewhat iridescent scales; dorsal abdominal plates black, sparsely haired, less reduced than in *clarum*; legs dark, freshly emerged specimens show paler areas centrally on the femora and tibiae, joints dark; tarsal claws bifid with strong thumblike basal tooth; hind basi-tarsus produced apically and dorsal incision on second tarsal joint; stem vein black pilose.



Paul creek, Kamloops, near source. Semi-permanent small stream with many stony ripples. *Simulium venustum* and *S. vittatum* breed here in great numbers. A few *S. decorum katmai* and *Eu. aureum* also reared from this stream.

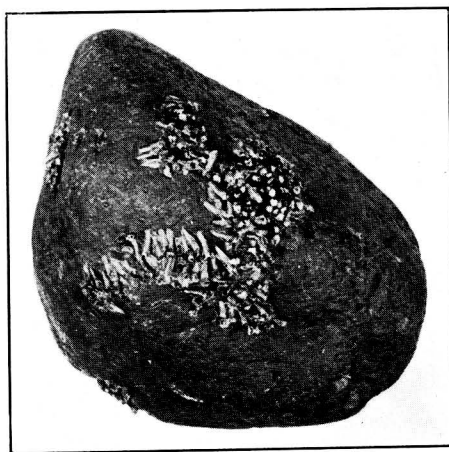
The hitherto unknown male is black without thoracic ornamentation, the mesonotum being clothed with rather long pale to golden scales. Male genitalia rather like that of *clarum*, but with bridge on side piece narrower; drawn out angle at tip of clasper more acute; adminiculum with strong, dark, basal prongs; arms not toothed as in *clarum* but broad and rounded, side plates pointed and strongly chitinized.

Series of adults of both sexes were reared from a shallow, sluggish stream flowing from a beaver dam at Lone Butte, Cariboo district. Pupae, which were mainly attached to trailing aquatic vegetation, have eight filaments on each side. Three filaments arise from one stem, one is single and there are two paired filaments. Pupal case rather coarsely woven with irregularly sized openings towards anterior end, these not in form of regular wide "lattice work" as in *arcticum*. Nothing is known of the blood-sucking habits.

**Eusimulium boreale** Malloch

A fairly large greyish species; mesonotum with long fine whitish scales; grey black integument ornamented with two central brown vittae expanding club-shaped posteriorly, broad lateral vittae on each side of same colour; scutellum with very long dense white pile; abdominal pile pale and not very dense dorsally, but very closely placed laterally and ventrally; extremely long and dense on abdominal scale; outstanding characteristic a patch of white hair anteriorly below the lateral margin of scutum on membranous part of mesopleura; stem vein pale pilose, (males black pilose), antennae and legs wholly dark; basitarsus not produced, no incision on second tarsal segment; claws bifid, produced thumblike at base. Male genitalia will be described in a later paper.

The description above is given rather fully since this species has previously been meagrely represented in collections by less than half a dozen poor specimens. The thoracic ornamentation of the female has apparently been previously overlooked. This species is one of the commonest in the Kamloops district and large series of both sexes have been reared from a number of streams, these mainly small and rather slow-flowing over rocks; **dicentum** is usually found with it. The early



Blackfly pupae on stone from Meadow creek near Kamloops, B.C. **Prosimulium dicentum** in mixed colonies with **Eusimulium boreale**—latter with boot shaped case.

stages have been hitherto unknown and the pupae have breathing filaments of a rather peculiar character. Each breathing organ has five stout rootlike tubes of varying sizes spread fingerwise and arising from a bulbous base, two tubes paired; from all five tubes are a very large number (approximately 200 in all) short hairlike white filaments of about equal size and mainly simple. Case pale grey, of smooth texture and boot-shaped. It is doubtful if this species is ever very troublesome as a blood-sucker since only a single specimen was taken on the wing, in spite of the fact that it was the dominant species in a number of dry belt streams examined.

Genus **Simulium** Latrielle

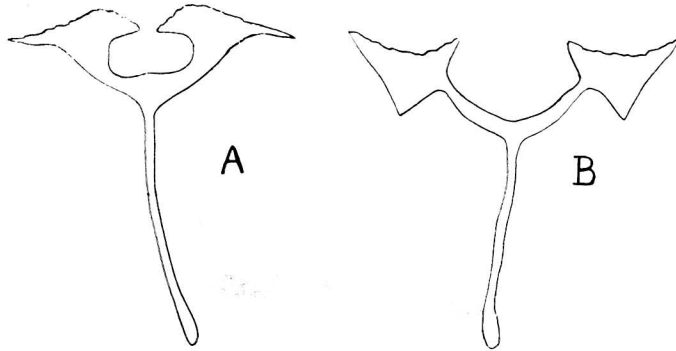
In this genus the radial sector is simple as in **Eusimulium** but instead of being setose the entire length, is bare of setae from the stem

vein to base of radial sector; hind basitarsus produced lappet-like apically and second hind tarsus with distinct dorsal incision. Eight species have been recognized in the British Columbia fauna.

### ***Simulium vittatum* Zetterstedt**

A medium sized grey and black species readily recognizable by the strikingly ornamented mesonotum and series of three rows of large black spots contrasting strongly with the grey abdomen; mesonotum five-striped as follows: central linear black stripe often infuscated broadly at sides, dorso-lateral stripes curved and dilated at each end, very broad markings to lateral edges of mesonotum; mesonotal scales, small, scattered and pale; legs contrastingly bi-coloured; stem vein pale pilose; antennae brownish grey, two basal joints yellowish; claws simple.

In most of the males reared in isolation from typical sixteen-filament pupae there are no distinct silvery vittae on the velvety black thorax, although in a few specimens there is an indication of such ornamentation. There is probably no other blackfly in North America with so wide a distribution and it is also reported as being common in various parts of Europe. It is a very troublesome pest of the larger domestic



#### FEMALE GENITAL FORK

A. *Simulium kamloopsi* new species.

B. *Simulium vittatum* Zett. (drawing adapted from Dyar and Shannon)

animals, the insides of the ears being the preferred place for feeding, although it will attack other parts as well. Man is by no means exempt from its attacks but where large animals are available it appears to prefer them. The breeding places are small to moderate sized streams with stony ripples, often containing much trailing aquatic vegetation on which large numbers of pupae may be attached. Our specimens are mainly from the dry interior from the Kamloops district, the southern Okanagan and Cariboo district, but it is undoubtedly fairly generally distributed throughout the province. Dyar and Shannon record it from northern British Columbia at Taku in the Cassiar district.

### ***Simulium kamloopsi*—new species**

Colouration of adult female as in *vittatum*, but uniformly smaller and genital fork different, arms not widely separated but inner tri-



angular projections almost meeting, plates quadrately and broadly expanding from near base, outer edge irregular, tapering on each side to sharp point; cerci and anal lobes as in **vittatum**.

Male mesonotum velvety black with two very broad and distinct silvery stripes extending from anterior edge to well back on mesonotum, tapering posteriorly, each stripe expanding laterally L-shaped at anterior marking of mesonotum; broad central area dividing stripes about equal to width of stripes at middle of mesonotum; male genitalia much as in **vittatum**, clasper with three stout terminal teeth.

Pupae with each respiratory organ of ten filaments, not sixteen as in **vittatum**. No variation noted in large series examined.

Type locality—Kamloops, B.C.

Holotype —Male, No. 3444, Canadian National Collection, Ottawa.

Allotype —Female, Canadian National Collection, Ottawa.

Paratypes —70 reared females and 60 reared males distributed in Canadian National Collection, U.S. National Museum, British Museum and author's collection.

This species was 85% dominant in Peterson creek, Kamloops, at the end of August, 1928 (See p. 51, B.C. Entomological Society Proceedings No. 26, 1929). At this time about 20% had reached the pupal stage. A very few **Simulium virgatum canadensis** and **S. sayi** occurred with it, although the former species was dominant in this stream in the very early spring. Nothing is known of the blood-sucking habits.

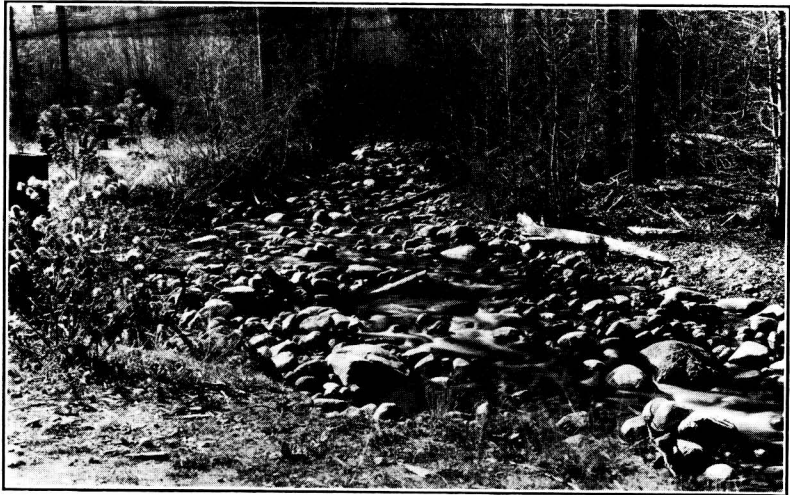
#### **Simulium decorum katmai** Dyar & Shannon

Fairly large grey species with mesonotum unusually large and strongly arched, giving even more of a humped appearance than other species examined; mesonotum without distinct ornamentation but colour not uniform, centre brownish black shading into bluish pearlaceous on each side, two luteous brown patches laterally on each side of anterior margin; mesonotal scales brassy, very small, fine and evenly but rather sparsely distributed; long hairs of scutellum and pre-scutellar depression sparse, black; abdominal tergites wide, sub-shining, bluish grey, vestiture sparse, basal four segments black, opaque; legs bicoloured, mainly brownish yellow except at apical half of basitarsus and remaining tarsal segments, tip of femora and tibiae, fore tibiae with white pollinose patch, fore coxae yellow; claws simple; face opaque, grey; frons sub-opaque; antennae with basal two segments yellowish brown; stem vein pale pilose.

A rather full description is given of this species since previous descriptions are all too meagre. It appears to have a very wide distribution in North America but to be quite rare. About twenty specimens came to hand from British Columbia in four years; these were all from the Kamloops and Nicola districts. The early stages are still unknown although this species was originally described in 1848. Several specimens were reared from a mixed lot of pupae in June, 1930, from a small permanent stream with many rocky ripples, flowing through a well wooded gorge, but they occurred in such small proportions among **Simulium venustum** and **S. vittatum** that we were unable to associate the larvae and pupae.

***Simulium virgatum canadensis***—new race

Medium sized pale grey species with bicoloured legs; mesonotum with faint reddish tinge beneath grey surface pollen; ornamented with three distinct dark vittae, central one linear and very narrow, lateral ones broad, curved and dilated into pear-shaped spots anteriorly, giving a lyre-shaped pattern, mesonotal scales fine, yellow and closely and uniformly distributed; frons and face opaque with pale grey pollen, eyes deeply incised; legs with more yellow than typical *virgatum*, but similar to *S. virgatum chiapanense* Hoffmann; fore coxae yellow; fore tibiae with white pollinose area; all femora and tibiae yellow except for dark brown apices; mid tarsi with basal half of first segment yellow; hind tarsi with basal two-thirds of first segment yellow, second segment yellow on basal half; balance of all tarsal segments dark brown to black; claws with small sub-basal tooth; basal abdominal tergites brown black velvety, apical four slightly sub-shining but not so markedly as in *decorum katmai*; vestiture very sparse, black; stem vein dark pilose.



Shingle creek, Penticton, B.C., April, 1929. Rocks and boulders very heavily encrusted with larvae and pupae. Almost entirely *Simulium virgatum canadensis* and *S. arcticum*, latter less abundant.

Male genitalia show distinct differences from the typical *virgatum* and the female genitalia are different from both *virgatum* proper and the race *chiapanense*. Differences in the male are as follow: inner angle of side piece broadly produced, cone-shaped, instead of outer angle as in *virgatum*; chitin not absent on inside as indicated in Dyar and Shannon illustration; clasper much more slender with small lobe on inner side at base; has similar terminal tooth; other parts very similar. Female genital rod with forks more widely spread, thickening of handle of plate rather more pronounced than in *virgatum* but not nearly so spatulate as in *chiapanense*; tips of forks not pointed, spear-shaped but rounded and swollen with small sub-apical lobe. The exact status of this form can hardly be decided until the early stages of *virgatum* and *chiapanense* have been found and recorded; for the present it is probably best to consider it as a new race rather than a distinct species.

**S. virgatum canadensis** is very widely distributed in British Columbia and we have taken it on Vancouver Island, throughout the dry interior in the Kamloops district and Okanagan and in the Kootenays. Although it is the dominant species at times in many small permanent and semi-permanent streams, comparatively few adults were taken biting and while it will attack the larger domestic animals it does not appear to attack man to any extent. In the paper on this species in the 1929 Proceedings of the Society, tentative notes were given on the bionomics as observed during the one year, 1928. Additional observations make it necessary to amend these somewhat since there is now evidence that several broods occur from the early spring to the autumn.

On June 1, 1930, pupae were very abundant in a small permanent stream near Kamloops, only a very small proportion had emerged by this date but heavy emergence occurred between June 8 and 16.

On August 3, 1931, another permanent stream, larger than the above and running swiftly over small boulders, contained great numbers of larvae and pupae of **virgatum canadensis** with practically no other species present. Some emergence of adults occurred here on August 6 but the main emergence would take place from mid to late August.

Another fairly large permanent stream with many ripples over small boulders examined on September 1, 1931, was found to contain only this species; a fairly large proportion were in the pupal stage. Emergence was noted on September 2 and considerable emergence occurred in laboratory rearing cages to September 11. In the stream it undoubtedly emerged in large numbers to late September.

Type locality of race **canadensis**—Kamloops, B.C.

Holotype—Male, No. 3454, Canadian National Collection, Ottawa.

Allotypes—Female, Canadian National Collection, Ottawa.

Paratypes—70 reared females and 40 reared males distributed in Canadian National Collection, U.S. National Museum and author's collection.

#### **Simulium hunteri** Malloch

This belongs to the **virgatum** group but is slightly larger and darker than the last species; the dark vittae on the mesonotum are of much the same appearance but the vestiture of this part is coarser and the scales are larger; frons shining and face sub-shining; fore coxae yellow; legs bicoloured; claws as in **virgatum canadensis**; fore tibiae with similar pollinose patch; apical four abdominal segments shining, black; stem vein dark pilose.

This species is not particularly common but has a fairly wide distribution in British Columbia. We have taken it in the Kamloops district, the Kootenays and at 4,000 feet elevation near Vancouver. It has been recorded by Malloch, and Dyar and Shannon from the Kootenays at Ainsworth, from the Cassiar at Glenora and Dyar has taken it in the Skeena district at Kwinitza and also records it from Laggan. It attacks horses, cattle and man freely. Nothing is known of the breeding places, early stages or male.

#### **Simulium sayi** Dyar & Shannon

This is the third representative of the **virgatum** group and is about the same size as that species but is even darker than **hunteri**; the fore coxae differ from either of the last two species in being dark and there

is no white pollinose patch on the tibiae; same type of mesonotum ornamentation but vestiture not so coarse as **hunteri** or as fine as **virgatum canadensis**; frons and face opaque, grey; legs with black predominating; claws with small sub-basal tooth; abdomen with colouration similar to **hunteri**; stem vein dark pilose.

This species has previously been recorded only from Colorado and the early stages and male have hitherto been unknown. In the male genitalia the side piece is strongly shouldered as in **virgatum canadensis** and the clasper is somewhat similar in shape but with a moderately long, slender terminal tooth. Specimens were reared from several small streams in the Kamloops district—in one stream pupae were extremely scarce among various other species in June, but were dominant in September, 1930. In another stream in 1928 this species was dominant in July. The breathing organs consist of eleven filaments on each side, these three and four branched from three main basal stems. The pupal case has a fairly long pointed visor-like projection forward. Horses and cattle are attacked.



Okanagan river at Okanagan falls, B.C. Type of rocky ripples responsible for great numbers of blackflies. Larvae and pupae of **Simulium arcticum** abundant. Freshly emerged adults noted in April.

### **Simulium arcticum** Malloch

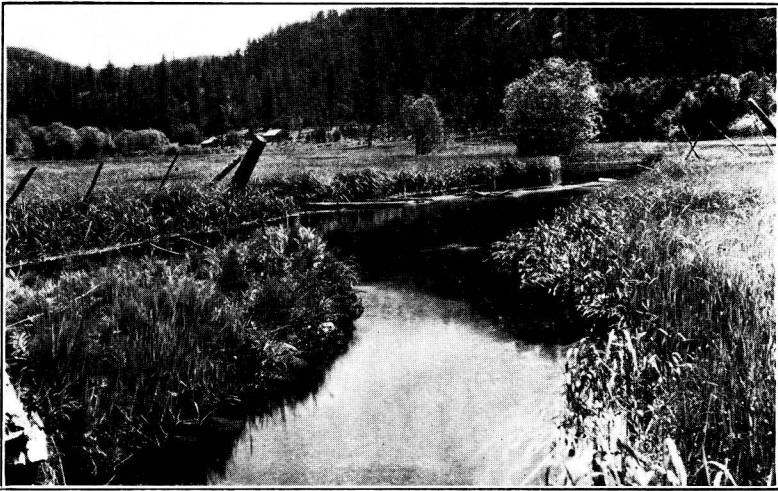
Small to medium sized dark species with markedly bicoloured legs; mesonotal pilosity brassy and fairly long and well distributed; anterior mesonotum with large lateral pollinose areas; apical four abdominal segments shining, remainder velvety black; frons shining; face opaque; stem vein pale pilose; fore coxae yellow; fore tibiae with white pollinose area; claws with small sub-basal tooth.

This is one of the most widely distributed and abundant species in western Canada, and one of considerable economic importance owing to its serious attacks on livestock, death sometimes being caused. It is annoying to man from its habit of flying into the face, but its blood-sucking appears to be restricted to the larger animals. The preferred breeding places are large rivers at points where rocks and boulders

form shallow ripples; it also occurs, however, in smaller permanent streams. The pupae have twelve filaments on each side and cases with characteristic large "lattice work" openings anteriorly. They often encrust rocks in very great numbers. Our specimens are mainly from the Kamloops district, North Thompson valley, Okanagan valley and Fraser and Thompson canyons. The type locality is Kaslo, and Malloch also records it from Bear lake. Additional records given by Dyar and Shannon are Lake Atlin, Kokanee Mountain, Lillooet and Hazelton.

### **Simulium venustum** Say.

As in the case of **arcticum**, rather variable in size and colouring; blackish with markedly bicoloured legs; mesonotum dark, sub-shining; vestiture not as abundant as in **arcticum**, scales very fine and pale, too scanty to obscure dark integument; abdominal colouration much as in **arcticum**; frons shining, face opaque; stem vein pale pilose in some, apparently dark in others; fore coxae yellow; white pollinose patch on tibiae; claws simple.



Campbell creek near Kamloops, B.C., a slow-flowing, winding stream with much trailing aquatic vegetation. **Simulium venustum** here in great numbers in July; in early June larvae and pupae mainly **Eu. boreale** and **Pro. dicentum**.

Few Canadian blackflies have a wider distribution or are as abundant as this species, which is almost always the main culprit when fishermen and campers are tormented by swarms of these pests. Comparatively few Canadian species are definitely known to attack man sufficiently to be noticeably troublesome, but this species more than makes up for any hesitancy on the part of the others. It does not appear to have very marked host preferences but will readily attack most animals and is even a serious pest to birds. Very large series are included in our British Columbia material from the Kamloops and Nicola districts, Okanagan, North Thompson valley, Kootenays and Chilcotin (Mr. Buckell procured large series from the Barkerville district). Dyar and Shannon record it from Prince Rupert, Lake Atlin and Bear Lake. Small permanent streams with much aquatic vegetation, and even irrigation ditches are

often the source of great numbers of these flies. During June and early July this was the dominant species in a number of streams in the Kamloops district.

**Species recorded from adjacent territory in western United States and Yukon which may occur in British Columbia**

In addition to the species listed as definitely known from the province the following will probably be found as further collecting is undertaken:—**Prosimulium exigens** D. & S.; **Eusimulium canonicolum** D. & S.; **Eusimulium pugetense** D. & S.; **Simulium bivittatum** Malloch; **Simulium piperi** D. & S. and **Simulium venator** D. & S.

**Description of a new pupa with unusual breathing organs and the corresponding larva**

Of the eleven hitherto unknown pupae discovered during these investigations the one described below has perhaps the most unusual characteristics; it has certain features that are rather unique as far as North American species are concerned and we have failed to find anything quite like it in the foreign literature at our disposal. Unfortunately it is not possible to state at the present time if it represents a new species or belongs to one of the blackflies already known in the adult stage, as for instance **Prosimulium fulvum**. Larvae were thickly encrusted on a cedar bough trailing in a fairly large swift-flowing mountain torrent in the Eagle valley near Revelstoke; few were found on rocks and boulders. The larvae were mainly fully developed and a number were placed on damp cotton wool where several of them pupated after two or three days. As is usual under these conditions, no pupal case was spun, but from the strong development of the two posterior hooks and arrangement and number of the various spines on the abdomen it seems probable that this is one of those species in which an irregular matting of threads takes the place of the ordinary well-constructed type of cocoon.

**Pupa.** Large, 5mm. long by 2 mm. wide; orange yellow in colour, only freshly pupated specimens available; mesonotum rather prominently humped, indications of three dark vittae; breathing organs in the form of two very stout tubes, ringed with a number of shallow constrictions and lying sub-parallel to each other, one tube shorter and smaller in diameter than the other; the common base from which they arise is very short and the division occurs fairly near the point of attachment on the thorax; from the apical quarter to apex of each large main tube arise a number of long thread-like filaments of rather uniform size; they are most numerous at the apex of the tubes and total thirty-seven in all, sixteen on the smaller tube and twenty-one on the larger; the apical segment of the abdomen is armed with a pair of unusually strong sharp hooks projecting in a dorsal direction; on each of the third and fourth segments dorsally are eight forwardly projecting, short curved hooks on the apical border; ventrally there are two forwardly directed hooks on each of the segments five, six and seven; from the third to terminal segments dorsally there is a band of closely placed minute spines at the base of the segments; these project posteriorly, and each band numbers several hundred.

**Larva.** When full grown 9 mm. long; yellowish; pupal respiratory histoblasts black and peculiar character of these organs plainly visible; triple anal gills simple without any small lateral "buds"; head capsule yellowish anteriorly but shading to brown posteriorly, markings brown as follow: central broad diffused stripe with pair of lateral spots each side of this; apical antennal segment thin, dark brown, basal segments broader and pale yellow.

#### BIBLIOGRAPHY

- Cameron**, Canadian Dept. Agr. Bul. 5, New Ser. Tech. 1922.  
**Dyar and Shannon**, Proc. U.S. Nat. Mus. Vol. 67, 1927.  
**Edwards**, F. W., Diptera of Patagonia and S. Chile, Pt. II, Fasc. 4, Brit. Mus. 1931.  
**Hart**, 7th Ann. Rept. State Entomologist for Illinois, P. 32, 1912.  
**Hearle**, Proc. B.C. Ento. Soc. No. 26, P. 48, 1929.  
**Hoffmann, C. C.**, Los Simulidos de la Region Onchocerosa de Chiapas; Sobre Tiro Del Cuarto Numero de Los Anales del Instituto de Biologia, Tomo I.  
**Jobbins-Pomerey**, U.S. Dept. Agr. Bull. 329, 1916.  
**Johannsen**, N.Y. State Mus., Bul. 68, P. 336, 1903.  
**Malloch**, U.S. Dept. Agr. Bur. Ent., Tech. Ser. No. 26, 1914.  
" " , Rept. Can. Arct. Exped. 1913-18, Vol. III., C. P. 41, 1919.

### EPIDAPUS SCABIES. Hopk. AS A GREENHOUSE PEST IN VANCOUVER

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One morning during the first week in October, 1931, a commercial greenhouse grower from North Vancouver brought over for identification and suggestions of control, a quart milk bottle of rich greenhouse soil in which were enormous numbers of minute white worms. They resembled soil nematodes but were too big for these, being about 2 mm. long: microscopic examination showed them to be Dipterous larvae. They swarmed all through the soil but were distinctly gregarious, collecting together in white masses which showed as large as 50 cent pieces through the sides of the bottle. Slowly these masses moved from place to place while all larvae seemed restless, travelling incessantly.

Since the problem of control was immediate, the earth was transferred to a large stender, some being treated immediately with a cold saturated solution of sodium silico fluoride and some set aside for dessication at normal warm laboratory temperature. In two hours the larvae treated with fluoride solution were unharmed while those in the drying soil sample had left the surface of the soil and had collected on the bottom of the receptacle where the soil was still damp. Within six hours most of those in the drying soil were dead, so the owner was immediately advised by telephone to allow the affected soil to dry out as fast as possible, if necessary by turning on extra heat and by deeply raking over the soil at intervals to accelerate the drying out process without adopting any further treatment. He did this and rid his house of the pest within a few days. Up to the time of writing, March, 1932, he has had no further trouble with them.

#### History of the Outbreak

From this man and from other sources, I find that this type of infestation has appeared within the last six years, at least twice in North Vancouver and once in Vancouver itself. In all three cases the