

and is the Western representative of *H. autumnalis*, Strom., differing from this latter species in having red shadings to lines and mesial space. Strange to say that, although *californiata* has no described varieties of the Eastern form occurring here, there is one which is generally listed under the name of *Hydriomena autumnalis*, Strom., var. *crokerii*, Swett, which has the green shadings of the typical form replaced by yellow and has an intensely black, irregular median band, which separates it at once from any other variety. It was described by Swett in Can. Ent. XLII., page 278, 1910, from specimens sent to him by Mr. A. J. Croker, of this City (Victoria, B.C.).

The other one is *Hydriomena autumnalis*, Strom., var. *columbiata*, Taylor (Can. Ent. XXXVIII., page 399, 1906). It is easily distinguished by its much larger size and its narrow mesial area, which is shaded with dark cinerous where the typical species is white.

There is also another species like *californiata* occurring here, and that is *Hydriomena irata*, Swett. These two species are separated chiefly by the length of the palpi, which in *irata* is short, not exceeding 1 mm. in length, and is moderately long in *californiata*, and also by the time of their emergence, *irata* flying early in May, while *californiata* does not appear until the end of June. There is generally a period of from six to seven weeks between them.

Hydriomena edenata, Swett, is another species which has in some cases been labelled as *californiata*, but is easily distinguished by the wide black bar at the base of the inner margin, and by its much larger size, my specimens being 35 mm. in expanse. Its early appearance would also separate, as it emerges towards the end of March, and is, I believe, the first species of this genus to appear.

Hydriomena speciosata, Packard, which occurs here fairly plentifully, varies but very little, but there is a distinct colour variety of it which is much scarcer, and was first taken by the late Rev. G. W. Taylor at Departure Bay in 1908. It is a very pretty variety, and differs from the normal *speciosata* in having all the pea-green areas of the typical form replaced by olive-brown. It was named *H. speciosata*, Packard, var. *taylori*, by Swett, who described it in Can. Ent. XLII., page 277, 1910.

This concludes my remarks on the more variable species of this genus. There are a few other species I would like to have touched upon, but lack of time prevents me on this occasion.

NOTES ON THE LIFE-HISTORIES OF BLOOD-SUCKING DIPTERA OF BRITISH COLUMBIA, WITH SPECIAL REFERENCE TO THE TABANIDÆ.

BY SEYMOUR HADWEN, D.V.SCL., AGASSIZ, B.C.

Mr. Chairman and Gentlemen,—First of all, I intend to give you a list of the species of Tabanidæ which are known to me to occur in British Columbia. I wish to refer to the pioneer work of Mr. R. V. Harvey, who was the first to do any systematic work on this important group of insects, and who published the first list of species. Most of my collecting has been done on the Lower Fraser and on Vancouver Island, and there are doubtless a number of up-country forms yet to be recorded. The determinations of Harvey's specimens were made by Professor Hine, as were also some of my own. Others I sent to the British Museum. This has led to a little confusion in one or two species. For instance, Professor Hine names one of the species *Tabanus insuetus*, O. S.; whereas the authorities at the British Museum refer to it as an *Atylotus*. Hine's *Tabanus fratellus*, Wills., the British authorities name *T. patullus*, Walk. Hine also gives priority to *T. captonis*, Martin, over *T. comastes*, Wills.

I shall now give you a list which Mr. Harvey gave me of the Tabanidæ in his collection. I have collected all these forms myself, and in addition have found three more species which I am adding to his list.

LIST OF TABANIDÆ IN THE COLLECTION OF R. V. HARVEY, VICTORIA, B.C., 1914.

Name.	Specimens.	Locality.	Dates.	Collector.
<i>Pangonia fera</i> , Wills. . . .	1	.....	July 8th, 1885	C. V. Piper.
<i>Silvius gigantulus</i> , Loew.	3	Vancouver	July 3rd, 15th, 1903	Harvey.
	1	Grouse Mt., 4,000 ft.	July 9th, 1907	Harvey.
	4	Hope Mts., 4,000 ft.	July 15th, 27th, 1906	Harvey.
<i>Chrysops frigidus</i> , O. S. .	2	Hope Mts.	July 27th, 1906	Harvey.
	1	Hope Mts.	July 17th, 1908	Bush.
<i>Chrysops proclivis</i> , O. S.	3	Grouse Mt.	June 24th, 1907	Harvey.
			July 9th, 1907	Harvey.
			July 3rd, 1904	Harvey.
	1	Shawnigan	July 24th, 1904	Harvey.
	1	Laggan	July 22nd, 1901	Osburn.
<i>Chrysops excitans</i> , Walk.	2	Vancouver	June 11th, 1905	Harvey.
	1	Goldstream	Aug. 10th, 1902	Harvey.
	2	Nicolum R.	July 11th, 1906	Harvey.
<i>Chrysops noctifer</i> , O. S. .	2	Vancouver	May 13th, 1907	Harvey.
			June 19th, 1903	Harvey.
	1	Grouse Mt.	June 24th, 1907	Harvey.
	1	Cheam Mt., 6,000 ft.	Aug. 10th, 1908	Bush.
	1	Goldstream	July 4th, 1908	Harvey.
	1	Hope Mts.	July 16th, 1906	Harvey.
<i>Tabanus ægrotus</i> , O. S. .	1†	Mt. Finlayson, 1,300 ft.	July 18th, 1904	Harvey.
	3‡	Wellington . . . . .	.....	Rev. Taylor.
<i>Tabanus affinis</i> , Kirby . .	2	Victoria	July 20th, 1902	Osburn.
	1	Goldstream	July 20th, 1902	Osburn.
	1	Vancouver	July 25th, 1907	Harvey.
	1	Grouse Mt.	July 9th, 1907	Harvey.
	2	Similkameen	July, 1908	Bush.
<i>Tabanus fratellus</i> , Wills.	1	Port Renfrew	Aug. 10th, 1902	Osburn.
	3	Hope Mts.	July 18th, 25th, 1906	Harvey.
<i>Tabanus sequax</i> , Wills. .	4	Grouse Mt.	July 1st, 1904	Harvey.
			July 14th, 1903	Harvey.
			June 25th, 1907	Harvey.
	1	Cheam Mt.	Aug. 11th, 1903	Harvey.
	1	Similkameen	July 24th, 1906	Harvey.
<i>Tabanus sonomensis</i> , O. S.	3	Vancouver	July 18th, 1903	Harvey.
			July 7th, 1906	Harvey.
	5	Grouse Mt.	July 9th, 1907	Harvey.
<i>Tabanus comastes</i> , Wills. (= <i>T. caponis</i> , Martin)	1	Grouse Mt.	July 19th, 1903	Harvey.
	1	Cheam Mt.	Aug. 5th, 1903	Harvey.
	1	Lulu Island	June 16th, 1906	Harvey.
	1	Hope Mts.	July 26th, 1906	Harvey.
<i>Tabanus septentrionalis</i> , Loew.	3	Laggan	July 22nd, 1901	Osburn.
<i>Tabanus osburni</i> , Hine. . .	1†	Vancouver	June 15th, 1907	Sherman.
	3‡	Field . . . . .	.....	.....
	4	Hope Mts.	July 14th, 20th, 1906	Harvey.
	2	Similkameen	July 24th, 1906	Harvey.
<i>Tabanus hirtulus</i> , Bigot. .	many	Mt. Lehman . . . . .	.....	Hadwen.
<i>Tabanus nivosus</i> , O. S. .	5	Mt. Lehman . . . . .	.....	Hadwen.
<i>Tabanus insuetus</i> , O. S. .	many	Mt. Lehman . . . . .	.....	Hadwen.

† Male.

‡ Females.

SEASONAL PREVALENCE OF THE DIFFERENT SPECIES.

Chrysops noctifer, O. S., is invariably the first to make its appearance. I have recorded it as early as April 30th (1910). Its season is at its height by the end of May; its numbers then diminish gradually, and by the middle of June very few are to be found. This fly bites cattle and horses on the flanks and shoulders and is a serious pest at times.

Chrysops proclivis, O. S. This fly appears about the middle of May, is a pest in June, and becomes rare towards the end of July. Its biting habits are much the same as those of *C. noctifer*.

Chrysops frigidus, O. S. This is a comparatively rare species. My best catch was of nine specimens on July 15th, 1912. On the 25th of the same month I caught only two. In other years also I have captured only a few specimens.

Tabanus hirtulus, Bigot. This is invariably the first of its genus to appear. It comes in the latter part of May. Its season is at its height in June, and it disappears about the middle of July. It is undoubtedly the worst pest of cattle on the Lower Mainland. It bites on all parts of the body, but is frequently seen on the teats.

Tabanus affinis, Kirby; *Tabanus captonis*, Martin. These flies appear a little after *T. hirtulus*. They are at their worst in July. They bite cattle and horses mainly on the shoulders and face. It seems that animals are very helpless against flies which rest on their faces, especially when they are in the field. In the bush, of course, it is a different matter, as they can simply rub their noses against the bushes.

Tabanus sonomensis, O. S. It appears about July 15th and continues up to the middle of August. It is the most annoying fly after *T. hirtulus*, and bites on the neck, face, shoulders, and flanks. Its bite appears to cause a good deal of pain and hæmorrhage.

Tabanus insuctus, O. S., appears in the middle of July and has a short season. It is not a serious pest in those districts where I have collected it. Most of the flies I have caught were biting on the abdomen.

Tabanus fratellus, Wills. It only occurs in the hottest weather, not before July 15th. This fly is a bad pest; it bites exclusively on the abdomen and might easily be overlooked by the casual observer. Its habits are sluggish; it crawls slowly over the hairs and can easily be taken by hand.

Tabanus nicosus, O. S. Only seen twice; five specimens were caught.

Tabanus sequax, Wills. Only a few captured.

Silvius gigantulus, Loew. Appears in July in limited numbers. It bites the neck by preference.

Tabanus acrotus, O. S. Taken only on Vancouver Island; occurs in the Dry Belt, but I have not taken it in the Lower Fraser. This is the largest of all the species described. It occurs in July. Considering its size, it seems to cause animals surprisingly little annoyance.

NOTES ON OTHER DIPTERA.

It may be of interest to the members for me to give a few notes on other Diptera.

Stomoxys calcitrans. This fly appears with great regularity about the middle of April. In three different years its first appearance has been recorded, twice on the 20th and once on the 22nd of April at Mount Lehman, Chilliwack, and Agassiz.

Hæmatobia serrata, the horn-fly, and the black-flies, Simuliidæ, appear about the same time, though I cannot give the exact dates. Mosquitoes seem to return each year at almost the same dates, which shows that the seasons must be very similar. In 1910-11 I took careful notes which illustrate this. They were as follows:—

Culicinae (Notes taken at Mt. Lehman, B.C.).

1910, March 16th; 1911, March 12th. Biting-animals. These were ragged-looking insects and had no doubt survived the winter.

1910, April 21st; 1911, April 25th. First larvæ.

1910, May 18th. Larvæ and egg-rafts found in water-butts.

1911, same period. Not so plentiful.

1910, July 5th. Mosquitoes scarce.

1911, July 5th. Mosquitoes very numerous.

1911, July 5th. Mosquitoes came from the flooded lands of Sumas prairie, which

are about fifteen miles distant from Mount Lehman; they came in on a north wind and took about three days for their journey.

Some of you may wonder how some of these results have been obtained. However, the solution is comparatively simple. With many insects it would appear, I imagine, to be very difficult to determine when their numbers were actually on the increase or decrease, since they have several hosts. But in this case with biting-flies the hosts are limited to domestic animals. As an example of my method of determining the comparative numbers of the different species, I give the records for July 5th, 15th, and 25th, 1911:—

	July 5th.	July 15th.	July 25th.
<i>C. proclivis</i>	25	7	2
<i>T. fratellus</i> .....	..	30	8
<i>T. affinis</i>	5	9	..
<i>T. captonis</i>	8	16	17
<i>T. hirtulus</i>	21	19	1
<i>T. nivosus</i> .....	..	4	1
<i>T. insuetus</i>	1	3	7
<i>Silvius gigantulus</i>	3	4	..
<i>Chrysops frigidus</i> .....	..	9	2
<i>T. sonomensis</i> .....	..	..	1
<i>C. noctifer</i>	1	..	..
Totals of flies caught	64	101	39

Since I have been living on the Lower Fraser River I have made many attempts to find the breeding-places of the Tabanidae, up to the present time without success. The country is a difficult one to work in owing to the amount of water, both stagnant and running, and the heavy timber. The place where most of my observations were made was at Mount Lehman. This is a heavily wooded place, surrounded by hills. During the whole time I was there I was never able to capture a male, and the thought struck me that perhaps the flies did not actually breed there. There was one field in which the flies were always plentiful during fine weather. I did my best to find out where they went in wet weather, but without success, although I beat the bushes round the field a number of times. In speaking about this to entomologists in the Province, they one and all agreed that males were more frequently encountered in the mountains, so it appeared to me that there was a possibility of the warm rocks attracting the females also, during the cold weather. There is a crying need for work to be done on the Tabanidae in Canada. As far as I know, no life-history work has ever been seriously undertaken. The Tabanidae are insects of great economic importance, and if their life-histories were known it is quite possible that something could be done to reduce their numbers.

In closing, I have to record a new fly for the Province, *Hypoderma lineatum*. I was successful in breeding this fly from the larvæ last summer. I had already taken the larva of this species, but there were no records of the adult fly in our proceedings.

Your President requested me to say something about tick paralysis for the benefit of the members who had not read my paper in "Parasitology."*

I shall conclude my address by expressing the hope that the members of this Society will devote more attention to this important group of blood-sucking flies than has been accorded to them hitherto.

* This information, being already published, is not included in this paper.—SECRETARY.