

NOTES ON THE BLACKFLIES (SIMULIIDAE) OF
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There have been no published notes on the blackflies in New England with the exception of O'Kane (1926) on the New Hampshire species. Johnson (1925) listed four species of blackflies from Rhode Island. Published work in neighboring localities is also limited. Twinn (1936) published on his studies in eastern Canada. Collins, Travis and Jamnback (1952) and Jamnback (1952) reported on blackfly control in the Adirondacks, in upper New York, and deFoliart (1951) wrote an unpublished thesis on the blackflies of the same region.

Data were secured by state-wide collections and by making weekly collections and seasonal history and ecological observations near Kingston for the entire year of 1952, except January, at four streams selected because they are fairly representative of the state's streams.

Some specimens were reared in the laboratory to obtain series of life history stages to facilitate identification. Rearing equipment for larvae collected in the field consisted of a five gallon aquarium filled with pond water aerated with a Marco air pump and an air stone. Around the air stone was placed a column of rocks as sites of attachment for the larvae. It was found that maximum development resulted when

the pond water was siphoned off and new pond water was added about every three days. Cheesecloth was arranged in tent-like fashion over the aquarium so that adults could be collected as they emerged. The aquarium with its attachments was placed in an ice box when low temperatures were desired in order to simulate outside temperatures. Pupae collected in the field were placed on moist cotton in a shell vial. In another dry shell vial a strip of absorbent paper was placed. The vials were fastened mouth to mouth and wrapped in paper to exclude light except for a small area at the end of the dry tube. Being positively phototropic, the adults upon emergence would crawl to the dry tube where their cuticle and wings would harden normally.

Prosimulium hirtipes (Fries) was found to be the most abundant species in the state. This species overwinters in the larval stage and has one generation a year. It was found in large numbers in nearly every stream examined in all five counties of the state. Adults of this species were also the most commonly observed. Specific collection localities included Allenton, Ashton, Chepachet, Clayville, Diamond Hill, Fairlawn, Hope Valley, Kingston, Lonsdale, Manville, North Scituate, Peace Dale, Richmond, Slocum, Summit, Usquepough, Wallum Lake, Westerly, and West Greenwich. In the state as a whole, large larvae were collected by February 9, and by March 8, large larvae were predominant in many streams. Pupae were first collected April 3 and were last found in abundance May 13. Adults were collected from April 3 until June 14.

Near Kingston, *P. hirtipes* (Fries) was found predominantly as half-grown larvae when collections were started on February 10, 1952. Mature larvae were found

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as early as March 12 and the majority of larvae were mature by April 2. Pupation was first observed on April 7, and occurred during mid-April. However, a few adults were collected April 7, indicating pupation as early as about April 1. Adults started emerging in large numbers during the second week in April and emergence continued for a week or more. After this time larvae and pupae were scarce, and were not found after May 12. Adults were not collected after May 20, except for one adult on June 14. No representatives of this species were seen thereafter until newly hatched larvae of a new, overwintering generation were observed on December 6. Although eggs were not found, it is presumed that the species spent the summer and fall in this stage. This species was found to attack man on occasion.

Prosimulium magnum D. & S. was collected only in Kingston and Allenton. In these localities it was present in most of the streams but never in large numbers. The life history of this species apparently is similar to that of *P. hirtipes* (Fries) but development appears to be a few days later.

Near Kingston, third and fourth instars were collected on March 9, and mature larvae on April 2. Larvae and pupae were collected until May 15. Pupae and adults were collected from April 23 to May 15. Larvae were not found in the fall but were probably overlooked. This species was not observed to bite.

Larvae and pupae of an undescribed species of *Prosimulium* were collected near Kingston during the study but not in sufficient numbers to determine its life history. Dr. Alan Stone had already obtained specimens of this same species from other states and the Kingston specimens were turned over to him for incorporation into his study.

Cnephia mutata (Mall.) was collected at Allenton, Chepachet, Carolina, Clayville, Diamond Hill, Hope Valley, Johnston, Kingston, North Scituate, Peace Dale, Sakonnet, Summit, Westerly, and West Greenwich. In the state as a whole, small

larvae outnumbered large larvae 2 to 1 on February 9. On March 28, large larvae outnumbered small larvae 4 to 1. Large larvae outnumbered pupae 3 to 1 on April 3. Adults were first collected April 10 and the last collection was made May 9.

Near Kingston, it was found to be an abundant species especially along the coast. Its abundance was generally the result of its presence in a large number of streams rather than occurring in great densities in any one locality. In a few instances it approached and even exceeded *P. hirtipes* (Fries) in density. It is similar to *P. hirtipes* (Fries) in that it overwinters in the larval stage and has one generation a year. On February 10, larvae were mostly in the third and fourth instar. Mature larvae were not observed until April 2 but were common from that date until mid-April. Occasional mature larvae were collected until June 14. Pupae were present through April with large numbers being observed from the middle of the month until May 1. Adults were also present during this period with the emergence reaching its peak about April 23, at which time mating was commonly observed. Adults were last observed May 8. The overwintering larvae of the next year's generation were first observed on December 13 when large numbers of first and second instars were taken. The eggs were not found. This species does not appear to bite man.

Cnephia dacotense (D. & S.) was found breeding in small numbers in a few streams. At Diamond Hill it was found at a ratio of 8 large larvae to 1 pupa on April 3, 1952.

Near Kingston, two mature larvae were collected on May 8, 1952.

Simulium venustum Say was collected at Arcadia, Allenton, Beach Pond, Exeter, West Greenwich, Westerly, and West Kingston, and was the prevalent species in the state in summer.

Near Kingston, it was found to overwinter in the egg stage and to have five generations in 1952. Larvae were first

noted on March 26. Third and fourth instars were observed April 7. Growth was relatively rapid and pupation was noted April 20, and by April 23 approximately one-third had emerged. Adults were commonly observed swarming from late April until mid-June. Thereafter the generations overlapped to a large degree and all life history stages could be collected at the same time. Peaks of emergence were observed during the second and third weeks of June, the second and third weeks of July, the first two weeks of September and the first week of October. Larvae were not found after October 2, and the last pupae were found on October 25. Overwintering eggs were not found. This species is a pest of man in Rhode Island but was observed to bite rarely, during the first two generations.

Simulium quebecense Twinn was collected as a pupa near Escoheag, on April 9, 1952.

Simulium aureum Fries was collected near Kingston. Four larvae in the fourth and fifth instar were taken on May 8, and a single pupa on September 6, 1952.

Simulium decorum Walker was collected as a pupa near Kingston on May 8, 1952.

Simulium tuberosum (Lundstr.) was collected as a single, mature larva near Kingston on September 6, 1952.

Simulium vittatum Zett. was collected at Allenton, Arcadia, Diamond Hill, Hope Valley, Kingston, Lonsdale, and West Kingston. In the state as a whole, pupae were collected as early as February 21, and were taken abundantly as early as March 4. On April 3, large larvae still outnumbered pupae 5 to 3 in one locality. It overwinters in the larval stage and is a multiple generation species. It was found in larger larval concentrations than any other species. It was generally restricted to streams formed by pond or swamp outlets, commonly on or below dams or waterfalls.

Near Kingston, nearly all larvae had reached the fifth and sixth instars by February 10, although no mature larvae were found until the first of March. Pupae

from the overwintering larvae were first collected about March 1, but pupae were not abundant until the end of March. By March 15, ten percent had pupated and seventy-five percent had pupated by March 26. Adults of the first generation emerged during late March and the first week in April. Throughout the spring and summer months, although the subsequent generations overlapped considerably, peaks of emergence were observed to occur during the last two weeks of May, July, and September. Larvae of the new overwintering generation hatched during the first week in October and were nearly all in the third and fourth instars by October 30. During December, many larvae developed to the fifth and sixth instars, but no mature larvae were observed. This species was not observed to bite man.

P. hirtipes (Fries) and *C. mutata* (Mall.) were present in much larger numbers in the colder streams, whereas, *S. vittatum* Zett. was much more prevalent in the warmer streams. However, since *S. vittatum* Zett. is commonly associated with pond and bog outlets, types of streams which not only maintain higher temperatures but also contain water with different chemical properties and larval foods than the colder spring-fed streams, temperature is probably not the only factor involved. *S. venustum* Say was found in both the warm and the cool streams.

P. hirtipes (Fries) was the only species found abundantly in streams which dry up during the summer.

The result of these stream preferences was the formation of definite larval associations. *P. hirtipes* (Fries) and *C. mutata* (Mall.) were commonly found breeding together. *S. vittatum* Zett. was found in nearly pure populations in its favored habitat during the winter but in association with *S. venustum* Say during the summer. *S. venustum* Say largely replaced all the other species in the various other types of streams during the summer.

P. hirtipes (Fries) was observed to prefer stones as a site of larval attachment, whereas *S. vittatum* Zett. and *S. venustum*

Say were more often found on plant material when such was available. *C. mutata* (Mall.) showed no preference.

The economic importance of blackflies in Rhode Island is considerably less than in northern New England. Although larval densities obtained in this study were as high as 200 per square inch of infested area, average figures were never higher than 70 per square inch for any of the streams observed. These densities are not as high as those reported by other workers from more northern areas. Nevertheless, blackflies are a source of numerous complaints and more would be heard of them if it were not that residents at the present time accept them as an inescapable pest. They are locally known as "Buckie flies," since the attacks, presumably by *P. hirtipes* (Fries), coincide with the migration of the alewife, a fish known locally as the "Buckie." It was the experience of the writers that during many trips in the field from mid-April to mid-June of 1952, the head was surrounded the entire time by swarms of first one and then the other of the two major species, *P. hirtipes* (Fries) or *S. venustum* Say. The number varied from 5 to 150 adult females. These swarms themselves constituted a considerable nuisance, and in addition, flies frequently landed on the skin and occasionally bit. Of the insects of medical importance in the state, they rank far behind the mosquitoes but ahead of the punkies (Heleidae) and deer flies (Tabanidae). The principal sufferers are the trout fishermen since the trout season in Rhode Island closely parallels the blackfly season. Early gardeners and golfers are also plagued by blackflies.

Summary.—Geographical and seasonal history data obtained from various places over the state are presented.

At Kingston, collections made weekly at four selected streams throughout 1952 resulted in seasonal history pictures of five of the more common species:

Prosimulium hirtipes (Fries) was the most abundant species. It was predominantly a half-grown larva on February 10.

Most larvae were mature by April 2 and pupation occurred predominantly during mid-April. Adults emerged in large numbers during the second week in April and continued a week or more. Adults had virtually disappeared by May 20. Overwintering larvae were first observed December 6.

P. magnum D. & S. never was taken in large numbers. Its seasonal history is similar to *P. hirtipes* (Fries) but development is apparently a few days later.

Cnephia mutata (Mall.) was abundant as the result of its occurrence in a wide variety of streams rather than local high densities. Larvae occurred until mid-April and thereafter in small numbers until June 14. Pupae were present during April, especially during the last half of April. Adult emergence reached a peak about April 23. Overwintering larvae were first observed December 13.

Simulium venustum Say underwent five generations in 1952 in the area studied. Larvae were first noted March 26. Pupation occurred during the last two weeks in April with first generation adults emerging during that period. Subsequent emergence peaks were noted during the second and third weeks in June, the second and third weeks in July, the first two weeks of September and the first week of October. Larvae were not found after October 2.

Simulium vittatum Zett. underwent four generations in 1952 in the area studied. Nearly all larvae had reached the fifth and sixth instar by February 10, although no mature larvae were found until March 1. Pupae were abundant by the end of March. Adults emerged during late March and early April. Subsequent emergence peaks were noted during the last two weeks of May, in July, and in September. Overwintering larvae hatched during the first week in October.

Cnephia dacotense (D. & S.), *Simulium decorum* Walker, *S. tuberosum* Lundstr., *S. aureum* Fries, *S. quebecense* Twinn, and one undescribed species of *Prosimulium* were collected in small numbers.

P. hirtipes (Fries) and *C. mutata* (Mall.) larvae and pupae developed together primarily in the colder streams during winter and early spring. *S. vittatum* Zett. larvae and pupae occurred in nearly pure populations in the relatively warm lake and bog outlets during the winter but in association with *S. venustum* during the summer. *S. venustum* Say larvae and pupae occurred in practically all types of streams during the summer, at which time the other species were generally scarce or absent.

P. hirtipes (Fries) is the most important pest series. *S. venustum* Say is also of some importance. While control is feasible under some circumstances, blackflies by no means attain the economic importance in Rhode Island that they do in northern New England.

Literature Cited

- COLLINS, D. L., B. V. TRAVIS and H. JAMNBACK. 1952. The application of larvicide by airplane for control of blackflies (Simuliidae). *Mosquito News* 12(2):75-77.
- DE FOLIART, GENE R. 1951. The life histories, identification and control of blackflies (Diptera, Simuliidae) in the Adirondack Mountains. Ph.D. Thesis, Cornell University.
- JAMNBACK, H. 1952. The importance of correct timing of larval treatments to control specific blackflies (Simuliidae). *Mosquito News* 12(2):77-78.
- JOHNSON, C. W. 1925. Fauna of New England, 15. List of the Diptera or two-winged flies. Occasional Papers Bost. Soc. Nat. Hist. VII. 326 pp.
- O'KANE, W. C. 1926. Blackflies in New Hampshire. N. Hamp. Agr. Expt. Sta. Tech. Bul. 32. 24 pp.
- TWINN, C. R. 1936. The Blackflies of Eastern Canada (Simuliidae, Diptera). Pts. I and II, *Canad. Jour. Res.* 14(9/10):97-120. 131-150.

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