

AN ASSESSMENT OF FEEDING DAMAGE THRESHOLD OF *SIMULIUM VITTATUM*, A BLACK FLY PEST OF HORSES IN VIRGINIA

L. H. TOWNSEND, JR., E. C. TURNER, JR. AND W. A. ALLEN

Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061

ABSTRACT. Three levels of scabbing damage to horses' ears, slight, moderate, and intense, were selected to assess the effects of black fly feeding on horses in the field. One of these categories was assigned to each ear examined. The numbers of black flies present in the ears were recorded. The numbers of flies found feeding (95% confid. inter.) and associated levels were: slight, 3.1-4.5; moderate, 11.3-14.1; intense, 20.3-23.5. Simultaneous feeding

by 14 or more flies per ear was accompanied by adverse behavior of the animal because of the resulting sores. The percent surface scabbing (mean \pm s.d.), measured from 35 mm color slides of representative ears, was: slight, 4.3 ± 1.7 ; moderate, 10.8 ± 4.2 ; and intense, 24.5 ± 4.5 . The blood meal volume for *Simulium vittatum* females was determined to be 2.5 ± 0.3 mm.³

Simulium vittatum Zetterstedt (Diptera: Simuliidae) females take blood meals by feeding on the inner surface of the ears of large animals. Livestock on pasture are suitable hosts. Blood meal identifications indicated that this species may prefer horses to cattle (Downe and Morrison 1957). Anderson and DeFoliart (1961) reported that *S. vittatum* was one of the common black fly pests of Wisconsin livestock. They observed 25 females feeding in the ear of a cow. Over 200 adults were recorded in the ear of a horse in Utah (Knowlton and Rowe 1934).

The feeding of *S. vittatum* on mules and draft horses disrupted farm operations in Tennessee (Snow et al. 1958). In Virginia, operators of rental riding stables and private horse owners experienced difficulty in handling animals attacked by this black fly species (Townsend and Turner 1976). Private owners also were concerned about blood and scabs in their horses' ears, a result of intensive feeding by these gnats.

Black fly feeding activity on horses was observed in southwestern Virginia during 1973 and 1974. We assessed the extent of feeding damage while recording numbers of simuliids in the ears. The blood meal volume of *S. vittatum* also was determined.

MATERIALS AND METHODS

ASSESSMENT OF FEEDING DAMAGE. DUR-

ing the initial stage of the study, we viewed and compared the degree of black fly feeding damage in the ears of several horses. We selected 3 levels of scabbing damage, slight, moderate and intense. The percent scabbing was measured by projecting 35 mm color slides of the host's ear on 400 grid per sq. in. graph paper. The ear outline was traced and the scarified areas marked. Total numbers of squares in the ear outlines and numbers of squares representing damage were used to calculate a percent scabbing for each damage level.

BLOOD MEAL VOLUME. We collected engorged *Simulium vittatum* females from the ears of horses in the field to determine blood meal weight. Also, unengorged females were caught in a CO₂-baited trap similar to that described by Adkins et al. (1972). All specimens were frozen immediately on dry ice for transport to the laboratory. Replete and unfed flies were weighed in groups of 10 on an electronic balance. We followed the calculations of Foulk (1967) to obtain the corresponding blood meal volume.

RESULTS AND DISCUSSION

ASSESSMENT OF FEEDING DAMAGE. Environmental conditions during the field work were within the feeding activity parameters defined by Underhill (1940).

Table 1 contains mean fly counts from evaluated ears. The 95% confidence intervals for the means are: slight, 3.1–4.5; moderate, 11.3–14.1 and intense, 20.3–23.5. The extent of surface scabbing appears in Table 2. Ears classified as having slight scabbing did not require treatment or control measures. Most moderately scabbed ears caused horses no noticeable discomfort. However, if these horses were pets, owners frequently treated the condition or requested veterinary assistance. Often at commercial riding facilities having many animals, preventive measures were applied only in cases of intense feeding damage. This condition frequently caused the horses to be headshy. Owners stated that these normally gentle animals were difficult to handle during the black fly season. The abnormal behavior of the horses was caused by irritation of the ear sores. Some action was required so that riders would not be frightened or endangered unnecessarily by the horses' actions.

Several animals with moderately damaged ears and all of those with intensely scabbed ears reacted adversely to our attempts to place lead ropes around their necks and to examine the feeding sites. We seldom encountered resistance from these horses after vaseline petroleum jelly had been applied to the ears. The vaseline prevented feeding by black flies and allowed the ears to heal (Townsend and Turner 1976).

Field estimates of percent damage were consistently greater, by approximately a factor of 3, than the percentages determined by grid count. While it was difficult to assess visually with accuracy the extent of damage in the field, we had no trouble assigning one of the 3 categories to an ear condition.

BLOOD MEAL VOLUME. We saw no evidence of partial feeding by *Simulium vittatum* females.

The mean weight (\pm s.e.) from 10 groups of 10 engorged *S. vittatum* females was 4.1 ± 0.1 mg. The corresponding values for 6 groups of 10 unengorged females were 1.6 ± 0.01 mg. Random weight pairings of replete

Table 1. *Simulium vittatum* females present in the ears of horses in the field.

No. ears examined	Mn. no. flies/ear*	Damage assess. categ.
41	3.8 ± 2.3	Slight
56	12.7 ± 5.2	Moderate
76	21.9 ± 7.2	Intense

* mean \pm s.d.

and unengorged groups of flies enabled us to calculate the mean blood meal weight and 95% confidence intervals, which were 2.4 ± 0.3 mg. The weight ratio of engorged to unengorged females was 2.5. Woodward and Chapman (1965), measuring blood meal volumes of female mosquitoes, found that weight doubled after feeding. The corresponding ratio for a ceratopogonid, *Leptoconops kerteszi* (Kieffer), was approximately 2.5 (Foull 1967).

The blood meal volume for *S. vittatum* was 2.5 ± 0.3 mm³. This is comparable to blood meal data from other simuliid species (Bennett 1963; Fallis 1964).

CONCLUSIONS

The feeding activity of *S. vittatum* females can cause intense scabbing in the ears of livestock. Irritation from these sores in the ears of saddle horses creates handling problems for their owners. Simultaneous feeding by 14 or more black flies in an ear is associated with the intensity of scabbing (greater than 10%) which results in adverse behavior of the animal.

Table 2. Intensity of feeding damage to horse ears caused by *Simulium vittatum* females based on evaluation of 35 mm color slides.

No. slides examined	Percent surface scabbing*	Damage assess. categ.
6	4.3 — 1.7	Slight
4	10.8 — 4.2	Moderate
4	24.5 — 4.5	Intense

* mean \pm s.d.

The blood meal volume for *S. vittatum* was determined to be 2.5 ± 0.3 mm³.

References cited

- Adkins, T. R., Jr., W. B. Ezell, Jr., D. C. Shepard and M. M. Askey, Jr. 1972. A modified canopy trap for collecting Tabanidae (Diptera). *J. Med. Entomol.* 9:183-5.
- Anderson, J. R. and G. DeFoliart. 1961. Feeding behavior and host preferences of some black flies (Diptera: Simuliidae) in Wisconsin. *Ann. Entomol. Soc. Amer.* 54:716-29.
- Bennett, G. H. 1963. Use of P₃₂ in the study of populations of *Simulium rugglesi* (Diptera: Simuliidae). *Can. J. Zool.* 41:831-40.
- Downe, A. E. R. and P. E. Morrison. 1957. Identification of blood meals of blackflies (Diptera: Simuliidae) attacking farm animals. *Mosquito News* 17:37-40.
- Fallis, A. M. 1964. Feeding and related behavior of female Simuliidae (Diptera). *Exper. Parasitol.* 15:439-70.
- Fouk, J. D. 1967. Blood meal size of *Leptoconops hertesi* (Diptera: Ceratopogonidae). *Mosquito News* 27:424.
- Knowlton, G. F. and J. A. Rowe. 1934. New bloodsucking flies from Utah (Simuliidae). *Ann. Entomol. Soc. Amer.* 27:580-4.
- Snow, W. E., E. Pickard and J. B. Moore. 1958. Observations of black flies (Simuliidae) in the Tennessee River basin. *J. Tenn. Acad. Sci.* 33:5-23.
- Townsend, L. H., Jr. and E. C. Turner, Jr. 1976. Field evaluation of several chemicals against ear-feeding black fly pests of horses in Virginia. *Mosquito News* 36:182-6.
- Underhill, G. W. 1940. Some factors influencing feeding activity of simuliids in the field. *J. Econ. Entomol.* 33:915-7.
- Woodward, D. B. and Chapman, H. C. 1965. Blood volumes ingested by various pest mosquitoes. *Mosquito News* 25:490-491.