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Authors: HIBLER, C. P., GATES, G. H., WHITE, R., and DONALDSON, B. R.

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# OBSERVATIONS ON HORSEFLIES INFECTED WITH LARVAE OF *Elaeophora schneideri**

Species of horseflies in the genera *Hybomitra* and *Tabanus* (Diptera: Tabanidae) collected in the Gila Forest, New Mexico during June, 1968, were infected with a filarioid larva having morphological features similar to adult *Elaeophora schneideri* Wehr and Dikmans, 1935 (Hibler, Adcock, Davis and Abdelbaki, 1969. Bull. Wildlife Disease Assoc., 5: 27-30). Horseflies were collected in the Gila Forest during June, 1969, and the filarioid larva with which they were infected was experimentally inoculated into mule deer and domestic sheep. Later that year adult *E. schneideri* were recovered from these animals, thus establishing the basic biological cycle of this parasite and incriminating horseflies as a natural intermediate host (Hibler, Adcock, Gates and White, 1970. J. Wildlife Diseases, 6: 110-111).

Concurrently with the infection of deer and sheep, a number of preliminary observations were made on horseflies. The objective was to evaluate the potential threat of elaeophorosis to the elk population by determining the percentage of horseflies infected with the larva of *E. schneideri*. Observations and collections were made throughout the Gila Forest, but data from wilderness and primitive areas is limited (Fig. 1). Motor vehicles are not permitted access, and pack trips were too time consuming to permit more extensive coverage this year.

Estimates of the horsefly "population" were based on the number of individuals observed swarming about and feeding on wild and domesticated animals. While such observations cannot be considered too accurate, perhaps they will serve to illustrate the density of horseflies until more refined information can be obtained. Relative abundance of the genera *Hybomitra* and *Tabanus* was based on actual count of samples collected at random with a net. Collection sites were selected at random (Fig. 1).

Recent correspondence with L. L. Pechuman regarding horseflies found in New Mexico has revealed some errors in our previous identification of the species infected with *E. schneideri* (Hibler, Adcock, Davis and Abdelbaki, 1969. *Op. cit.*). Pechuman believes the species identified as *Tabanus marginalis* Fabricius is actually *Tabanus gilanus* Townsend. He separates *Hybomitra sonomensis* var. *phaenops* (Osten Sacken) into *Hybomitra sonomensis* (Osten Sacken), a west coast species, and *Hybomitra phaenops* (Osten Sacken), the species found in the Rocky Mountain region. Present information indicates several additional species in both genera may be involved in the biological cycle of *E. schneideri* in New Mexico. Until the number of species present has been determined, and the role of each in the biological cycle evaluated, only generic names will be used.

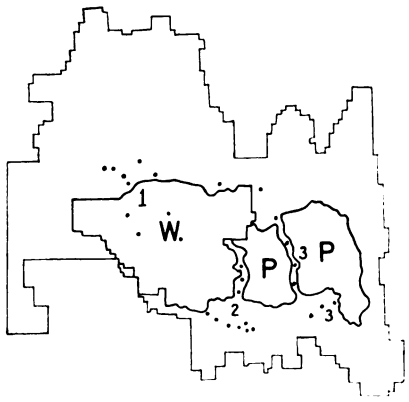



FIGURE 1. *The main Gila National Forest with the wilderness* (W) *and primitive* (P) *areas outlined. Collection sites are designated by a dot, and collection areas denoted by numerals. Numeral 1 is the northern and northwestern region, 2 is the central and southern region, and 3 is the eastern and southeastern region.*

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Emergence of horseflies began between the first and fourth day of June this year, but the population was insignificant until June seventh. From this date onward horseflies increased rapidly in number, with the population reaching a peak about June fifteenth. The population then remained essentially stable until July eighth. Summer rains began on this date and few horseflies could be found thereafter.

The northern and northwestern regions of the forest supported the highest population of horseflies. After the population reached a peak, individual animals had 20 to 30 horseflies swarming about, with at least one alighting to feed every 2 or 3 minutes. This was roughly estimated to be between 20 and 30 horseflies feeding per hour. Species in the genus *Hybomitra* were the only horseflies captured.

The horsefly population in the central, southern, eastern and southeastern regions was considerably lower than in the northern and northwestern regions. Individual animals had 5 to 15 horseflies swarming about, with one alighting to feed every 4 or 5 minutes, or roughly 10 to 15 feeding per hour. Species in the genus *Hybomitra* outnumbered species in the genus *Tabanus* by at least a 50:1 ratio in all these regions.

The number of horseflies estimated to be feeding per hour may be conservative. A tame mule deer exposed in the southern region of the forest on July third was attacked and bitten by approximately 75 horseflies over a period of 1.5 hours (Hibler, Adcock, Gates and White, 1970. *Op. cit.*). An accurate count was difficult to obtain because the animal became extremely agitated during the period of exposure. Horses and mules used in the forest were attacked by horseflies with merciless ferocity. At least 100 continuously swarmed about one of these animals, and 10 to 20 fed at any given time. Incredibly, motor vehicles were subjected to similar attacks, especially in the northwestern region. Four individuals with nets could easily collect 100 horseflies in 5 minutes as they attacked a vehicle, and do so without perceptibly diminishing the numbers present. Horseflies also swarmed about humans, often in considerable numbers; fortunately, they seldom attempted to alight and feed.

Horseflies were found above elevations of 6,000 feet, but were most numerous above 7,000 feet. Daily activity was not significantly different from that observed last year (Hibler, Adcock, Davis and Abdelbaki, 1969. *Op. cit.*). They were active from about 9 AM to 5 PM, with maximum activity ocurring between 11 AM and 2 PM. Activity was greatest when daily temperatures were 90-100° F and the relative humidity was less than 10%. Cool ($< 70°$ F), cloudy, or windy days sharply reduced activity. The forehead and face of animals were apparently preferred feeding sites, but a few did feed on the legs. Complete engorgement with blood required about three minutes.

Although horseflies emerged between the first and fourth day of June, infected individuals were not found until June tenth. Those examined from June tenth until June fourteenth were infected with the first stage larva of *E. schneideri*. From June fourteenth until June nineteenth, they were infected with first and second stage larvae. Between June nineteenth and July eighth, horseflies infected with first, second, and third stage larvae were collected. After June twenty-fifth however, horseflies infected with the third stage larva were much more abundant than those with earlier stages. The time required for development to the third stage is presently unknown, but the above observations indicate that two weeks is a reasonably accurate figure.

The species of *Hybomitra* are the most abundant and therefore, the most important horseflies in the biological cycle of *E. schneideri* in the Gila Forest. Only 10 horseflies in the genus *Tabanus* were captured this year. Two of these were infected. One had a single larva, the other had 14.

The results of the collection and examination of horseflies in the genus *Hybomitra* for larva of *E. schneideri* are summarized in Table 1. The totals include all three stages. However, the most important horseflies in the Gila Forest are those with the third stage larva.

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TABLE 1. *Summary of collections and examinations of horseflies in the genus* Hybomitra *for larvae of* E. schneideri.

| Area | Region of forest | Number of horseflies examined | Number infected | Per cent infected | Average number larvae | Range | Total larvae |
|---|---|---|---|---|---|---|---|
| 1. | Northern and Northwestern | 272 | 41 | 15.0 | 9.8 | 1-48 | 404 |
| 2. | Central and Southern | 575 | 134 | 23.3 | 20.5 | 1-181 | 2,743 |
| 3. | Eastern and Southeastern* | 70 | 6 | 8.6 | 4.5 | 1-12 | 27 |
| TOTALS | | 917 | 181 | 19.7 | 17.5 | 1-181 | 3,174 |

*Unusually windy conditions resulted in fewer horseflies from these regions. Time would not permit scheduling additional collecting trips.

Analysis of data collected between June nineteenth and July eighth revealed that 156 of 765 (19.1%) horseflies in the genus *Hybomitra* collected throughout the forest were infected with a total of 2,652 third stage larvae. Infected individuals had an average of 17 larvae, a range of 1 to 181.

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C. P. HIBLER
*Department of Pathology*
*College of Veterinary Medicine and*
*Biomedical Sciences*
*Colorado State University,*
*Fort Collins, 80521*

and

G. H. GATES, R. WHITE
and B. R. DONALDSON
*New Mexico Department of Game*
*and Fish, Santa Fe, 86501*

May 29, 1970

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