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Mule Deer and Elk Responses to Horsefly Attacks

Abstract

Mule deer (*Odocoileus hemionus hemionus*) and elk (*Cervus elaphus nelsoni*) are both greatly disturbed by horseflies. However, the two species exhibit distinctly different behaviors for coping with horsefly attacks. The compatibility of these behaviors with habitat preferences and other species-specific behaviors are discussed. Elk were found to attract relatively three times as many horseflies as did deer.

Little is known about the effect horseflies have on mule deer and elk behavior, although some researchers (Rue 1978, Murie 1951, Gruell and Roby 1976, Anderson 1958, Brazada 1953) believe that they substantially affect the summer distribution of these ungulates. We gained further insight into the disturbance effects of horseflies by observing tame, free-ranging deer and elk in the mountains of northern Utah. Observations were made during the course of a broader study which documented the daily activity patterns and habitat preferences of big game in aspen (*Populus tremuloides*) and lodgepole pine (*Pinus contorta*) vegetation types (Collins 1979).

Daily activity patterns and the degree to which deer and elk were disturbed by flies were determined by scan sampling (Altmann 1974) tame, free-ranging individuals or groups of animals every 10 minutes for several 24-hour periods through the summers 1977 and 1978. Additionally, densities of horseflies at 1.5, 15, and 30 m from the animals were determined by counting the number of fly landings per 5 minutes on a 575 cm² hemisphere of a glossy black ball. A hand-held pole was used to suspend the ball 120 cm above the ground and 120 cm in front of the observer. The observer wore the same clothing during all observations to avoid differentially affecting the orientation of the insects (Bracken *et al.* 1962). All observations were made with the ball suspended in direct sunlight, the observer's back turned toward the sun.

Horseflies caused extreme disturbance to deer and elk during feeding and resting in the aspen type but were only occasionally disturbing in the lodgepole pine type, where flies were much less dense. The most abundant horsefly in the aspen type was *Hybomitra opaca*, a species which was present June through mid-August but most disturbing during July. *Tabanus punctifer* also occupied the type, but in too few numbers for reliable assessment of densities.

The activity of both species of flies was approximately the same in all subunits of the aspen type when ambient air temperature was 17° C or higher. Winds (measured up to 30 km/h at 120 cm height) and openness of habitat did not deter the flies; consequently, the deer and elk benefited little by moving from one subunit to another. The exception to this observation occurred when temperature lag in the forested subunit (attributable to shading) delayed the onset of fly activity and temporarily (≤ 1.5 h) provided fly-free habitat after flies had become active in open subunits. At such times, the elk, which preferred feeding in meadow bottoms, readily moved to the forest. Deer typically were already feeding in the forested areas, and hence their distribution was less affected by flies. By contrast, the elk achieved considerable relief from mosquito attacks in the lodgepole pine type by moving from generally preferred resting sites to upland sites which were exposed to breezes (Collins *et al.* 1978). Darling (1937) found that red deer (*Cervus elaphus*) in Scotland moved to windy sites when they were harassed by small tabanids, but ran frantically when larger species became prevalent. *Hybomitra opaca* and *Tabanus punctifer* probably are able to persist under windy conditions because they have greater mass and flying strength than smaller flies and mosquitos.

During severe attacks the animals frequently ran to escape fly concentrations building up around them. In the case of deer, this behavior characteristically involved running from one bed to another, then quickly bedding down again. Generally, these movements were back and forth between 4-6 beds located within 40 to 50 m of each other. Such beds often became as much as 30 cm deep with repeated use. Deer preference for specific resting sites may represent predator-defense behavior, since greater familiarity with resting locale and possible escape routes is more essential for deer (which are typically solitary in summer) than for gregarious elk that benefit from group surveillance of surroundings.

Elk, on the other hand, did not remain in one general area when they ran from flies but moved several kilometers during the day. The distressed behavior of one elk usually stimulated the same behavior in others, and when one ran, all ran. Such social facilitation would never allow them to adopt the deer's fly-evading behavior of making short dashes between beds but may result in the elk finding areas which are more fly-free. Initially, we expected severe horsefly disturbance would lead to decreased grazing time. This was not the case, however, as the animals compensated for time lost during fly attacks by grazing more during the cooler part of the day and night.

Early in the study, elk were observed to rest more fitfully than deer during fly attacks. Measurements of fly densities at various distances from deer and elk confirmed our speculation that elk attracted relatively more flies than deer (Fig. 1). The only reason we can suggest for this observation is that the greater size of elk and their inclination to run relatively long distances during fly attacks lead to greater CO₂ production and higher body surface temperatures, both of which make the animals easier for the flies to locate (Anderson *et al.* 1974, Thorsteinson 1958). Thorsteinson (1958) suggested that motion may also act as an attractant to horseflies. Tashiro and Schwardt (1953) reported that, in cattle groups, the larger animals always attracted more flies than smaller ones. Others (Duncan and Vigne 1979, Freeland 1977) believe that animals in groups are less susceptible to horsefly attack than are individual animals.

Both deer and elk exhibited acute awareness of the different insect species pre-

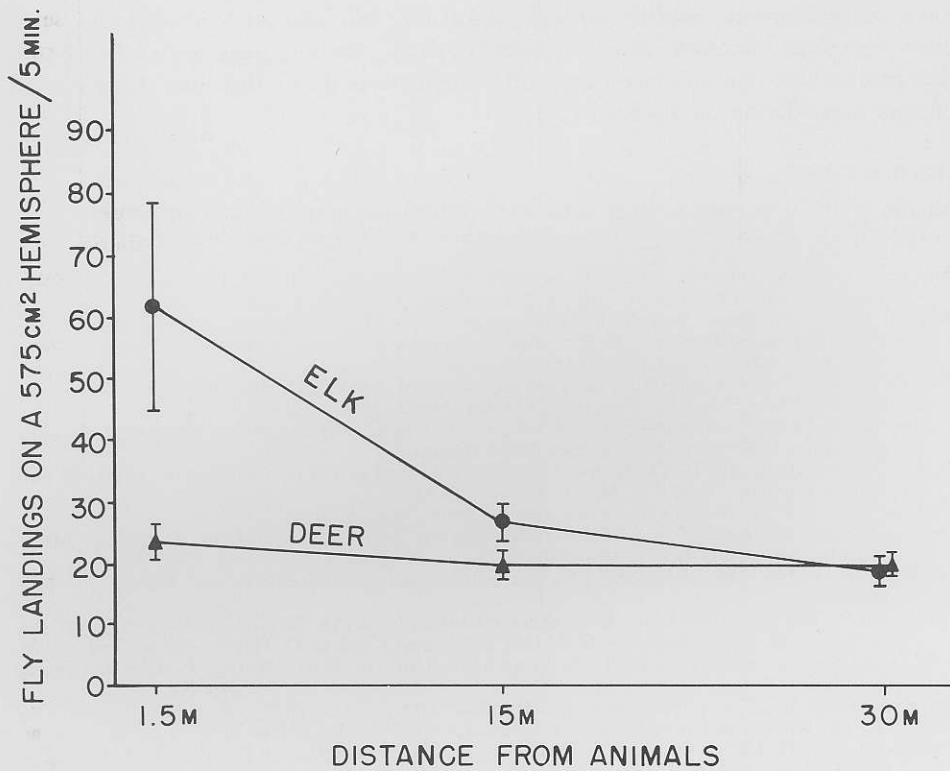


Figure 1. Fly activity at various distances from deer and elk; vertical bars represent standard deviations. The hemisphere was the visible side of a black ball suspended by a pole 120 cm from the observer and 120 cm above the ground.

sumably caused by differences in wing beat vibrations and resulting sounds. The presence of *Tabanus punctifer* within 2 or 3 m of the animals elicited wide-eyed alertness and often caused the animals to charge through vegetation where they normally would not travel. Individually or in low numbers, *Hybomitra opaca* were much less disturbing, although the deer and elk continually flicked their ears, stamped their legs or twitched that portion of their skin where *H. opaca* were hovering in search of a feeding site.

Neither deer nor elk made any movements to avoid white-faced hornets (*Vespula maculata*) that hovered near or landed on them. Close observation revealed that the wasps were methodically capturing horseflies (usually in mid-air), dismembering them and taking only the abdomens of their prey back to the hive. Wasps were efficient predators of horseflies, usually requiring only a few seconds to capture their prey. However, their benefit to deer and elk appeared marginal at high fly densities. Certainly the wasps benefited from the association, especially that with elk, since frequently as many as 150 flies were on or around them.

In conclusion, we believe that horseflies have a great direct impact on deer and elk behavior. This is not evident in terms of reduced grazing time but is manifest in a variety of comfort and escape movements which must be energetically costly to the

animals. In addition to that energy required for increased movement, increased muscle tonus and excitement associated with fly disturbance may also result in elevated metabolism; this should be investigated. Apparently elk are relatively more harassed by horseflies than are deer, and this factor may differentially favor deer rather than elk occupancy of some areas during the fly season.

Literature Cited

- Altman, J. 1974. Observational study of behavior: Sampling methods. *Behavior* 49:227-265.
- Anderson, C. C. 1958. The elk of Jackson Hole: A review of Jackson Hole elk studies. *Wyo. Game and Fish Comm. Bull. No. 10.*
- Anderson, J. R., W. Olkowski, and J. B. Hoy. 1974. The response of tabanid species to CO₂-baited insect fly traps in northern California. *Pan-Pacific Ent.* 50:255-268.
- Bracken, G. K., W. Hanec, and A. J. Thorsteinson. 1962. The orientation of horseflies and deer flies (Tabanidae:Diptera). II. The role of some visual factors in the attractiveness of decoy silhouettes. *Can. J. Zool.* 40:685-695.
- Brazada, A. R. 1953. Elk migration patterns and some of the factors affecting movements in the Gallatin River Drainage, Montana. *J. Wildl. Mgmt.* 17(1):9-23.
- Collins, W. B. 1979. Feeding behavior and habitat selection of deer and elk on northern Utah summer range. Utah State Univ., Logan, Ph.D. thesis.
- , P. J. Urness, and D. D. Austin. 1978. Elk diets and activities on different lodgepole pine habitat segments. *J. Wildl. Mgmt.* 42(4):799-810.
- Darling, F. F. 1937. *A Herd of Red Deer.* Oxford Univ. Press, London.
- Duncan, P., and N. Vigne. 1979. The effect of group size in horses on the rates of attack by blood-sucking flies. *Anim. Behav.* 27:623-625.
- Freeland, W. J. 1977. Blood sucking flies and primate polyspecific associations. *Nature* 269:801-802.
- Gruell, G. E., and G. Roby. 1976. Elk habitat relationships before logging on Bridger-Teton National Forest, Wyoming, pp. 110-121 in M. S. Boyce and L. D. Hayden-Wing (eds.). *Proceedings of the Elk-Logging-Roads Symposium.* Univ. of Idaho; Forest, Wildlife and Range Exp. Sta.
- Murie, O. 1951. *The Elk of North America.* The Stackpole Co., Harrisburg, Pa.
- Rue, L. L., III. 1978. *The Deer of North America.* Crown Pub., Inc., New York.
- Tashiro, H., and H. H. Schwardt. 1953. Biological studies of horseflies in New York. *J. Econ. Ent.* 46:813-822.
- Thorsteinson, A. J. 1958. The orientation of horseflies and deer flies (Tabanidae:Diptera). I. The attractance of heat to tabanids. *Ent. Exptl. et Appl.* 1:191-196.

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