Myiasis by Wohlfahrtia vigil in Nestling Microtus pennsylvanicus

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of 57 Taiwan macaques, *Macaca cyclopis* (Kuntz and Myers, 1967, op. cit.) examined in Taiwan, Republic of China. One rhesus monkey (*Macaca rhesus*) of 100 examined from China was found to be infected with a single cysticercus (Bezubik and Furmaga, 1959, Acta Parasitol. Pol. 7: 591–598). It appears therefore that exposure to eggs of *T. hydatigena* in the environment leads to sporadic infection of sub-human primates in many parts of the world. However, the prevalence and, in several cases, the intensity of these infections in monkeys in Sudan is higher than reported elsewhere. *Taenia hydatigena* is a common parasite of small ruminants in central Sudan and its characteristic cysticerci are seen frequently at slaughter (Sulaiman et al., unpubl. data). Infections with many large cysts are unusual, and the manner in which these come about in subhuman primates is unclear. Vervets and red monkeys around human habitations in Blue Nile province often feed on garden vegetables. Perhaps in this way they come into close contact with eggs derived from feces of the canine definitive hosts scattered around dwellings.

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Myiasis by *Wohlfahrtia vigil* in Nestling *Microtus pennsylvanicus*

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The grey flesh fly, *Wohlfahrtia vigil* (Walker) (Diptera: Sarcophagidae) is an obligate, myiasis-producing parasite, often associated with captive mink (*Mustela vison*), fisher (*Martes pennanti*), fox (*Vulpes fulva*), and in rabbits, cats, and dogs (Kingscote, 1935, Annu. Rep. Ont. Vet. Coll. 1934, pp. 51–69; Strickland, 1949, Can. Entomol. 81: 58–60; Lopushinsky, 1970, J. Wildl. Dis. 6: 98–100). Only a few cases have been reported in wild species: nestling cottontail rabbits (*Sylvilagus floridanus*) (Beule, 1940, Trans. N. Am. Wildl. Conf. 5: 320–328; Yuill and Eschle, 1963, J. Wildl. Manage. 27: 477–480), newly hatched northern shoveler (*Anas clypeata*) and blue-winged teal (*Anas discors*) ducklings (Wobeser et al., 1981, Can. Field Nat. 95: 471–473), and adult Townsend voles (*Microtus townsendii*) (Boonstra, 1977, Can. J. Zool. 55: 1057–1060). We report the first known occurrence of *Wohlfahrtia vigil* parasitizing nestling meadow voles, *Microtus pennsylvanicus*.

We found nests by tracking lactating females with a spool-and-line technique (Boonstra and Craine, 1986, Can. J. Zool. 64: 1034–1036) on a 2.5-ha study area near Toronto during the spring and summer of 1985. This study was part of an investigation into the population dynamics of meadow voles. Trapping methods are listed in Boonstra and Rodd (1983, J. Anim. Ecol. 52: 757–780). Females were tracked 2 days per wk from 17 April to 24 July.

On 5 June a nest containing five young (approximately 4 days old) was found in which all the young had severe cutaneous

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myiasis. One was dead and the other four were moribund. All were necropsied and each had two or three small circular openings in their skin varying in size from 0.2 to 0.4 cm in diameter and located behind the ears, along the hips, and in the inguinal region. Each contained several active fly larvae ranging in size from 1 to 3 mm. The mean number of larvae per vole was 10.8 ± 1.5 (SE) (n = 5, range 7–15). Two of the carcasses were placed in separate sealed containers to allow the larvae to pupate. After 7 days, three larvae about 1 cm long emerged and began exploratory movements away from what remained of the carcasses, which had been reduced to skin and bone. By day 9 all the larvae had pupated. Sixteen days later, three adult flies emerged overnight and two were used for identification. The adult flies and their pupal cases were deposited in the National Museum of Canada Invertebrate Collection (accession number IZ1986-034).

Three other parasitized nests were discovered over the next 4 wk, the last being on 9 July. The infested nestlings ranged in age from 3 to 14 days. The nests, located above ground, were constructed of finely-shredded dry grass in the shape of a slightly flattened dome with no observable opening. The four infested nests were dispersed randomly over the study area with a minimum of 45 m between them.

The lactating meadow voles travelled well established tunnel systems back to their nests, probably following their own scent trails (Madison, 1980, Behav. Ecol. Sociobiol. 7: 65–71). Since meadow voles rarely wander from the nest until 1 wk old (Godfrey, 1953, J. Mammal. 34: 503–505) it is likely that the adult flies had to enter the nest to larviposit. In every case, all the young in a nest had been parasitized and we expected none to survive since the affected tissue often comprised as much as 30% of the body area. All nestlings discovered were toeclipped for later identification. None of the infested young were ever seen again. Of 43 nests located during this period, four (9.3%) had been parasitized (22 out of 196 young).

In the study by Boonstra (1977, op. cit.), only adult Townsend voles were found parasitized by *Wohlfahrtia*. From 1978 to 1985, over 20,000 meadow voles have been live-trapped in southern Ontario (Boonstra and Rodd, 1983, op. cit.) but no instances of parasitism of post-weanling voles have been found. Thus, in *M. pennsylvanicus*, *Wohlfahrtia* parasitism appears to be restricted to nestlings. Nestlings also may have been parasitized in Boonstra's (1977, op. cit.) population, but because he was not able to examine nests, their occurrence went undetected. Boonstra (1977, op. cit.) postulates that primary infestation of Townsend voles by botflies (*Cuterebra* spp.) created breaks in the skin through which a secondary infestation by *Wohlfahrtia* could occur. We have never found cuterebrid botfly parasitism in meadow voles and thus the absence of *Wohlfahrtia* in post-weanling voles may be related to the absence of cuterebrids. Our finding that nestlings were the only segment of the population attacked by the flesh fly larvae agrees with previous studies (Beule, 1940, op. cit.; Yuill and Eschle, 1963, op. cit.; Lopushinsky, 1970, op. cit.; Wobeser et al., 1981, op. cit.). Nestlings may be vulnerable to *Wohlfahrtia* attack because of their thinner skin, underdeveloped body covering, umbilical scars, or inadequate grooming. Further indications that the flesh fly requires broken or thin skin in order to gain entry to the subcutaneous layer comes from our observation that the body regions most affected were near openings such as the anus, ear and umbilical cord.

The importance of parasitism by *Wolhfahrtia* in affecting population dynamics of meadow voles is probably minimal owing to its low prevalence. However, if the local density of the flesh fly was high, it could result in significant infant mortality

which would not be detected using standard techniques to census microtines.

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Parasites and Serological Survey of the Common Brushtail Possum (*Trichosurus vulpecula*) from Kangaroo Island, South Australia

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The common brushtail possum (*Trichosurus vulpecula*) is the most familiar and abundant of the Australian possums and may be a host for various metazoan parasites and microbiological agents of such diseases as leptospirosis and tuberculosis which also infect grazing livestock and man (Presidente, 1984, *In* Possums and Gliders, A. Smith and I. Hume (eds.), Surrey Beatty and Sons Pty. Ltd., Chipping Norton, N.S.W., pp. 171–190). Possums are extremely abundant on Kangaroo Island, South Australia. Although normally arboreal they come into close contact with domestic ruminants because they frequently feed on the ground, probably due to a lack of predators (Inns et al., 1979, Natural History of Kangaroo Island, Royal Society of South Australia, Adelaide, South Australia, pp. 91–102). An investigation was therefore carried out at the South Australian Department of Agriculture Research Centre at Parndana, Kangaroo Island, to assess the extent to which possums may be hosts for parasites and diseases known to occur in ruminants in the same area.

Thirty-one possums were captured in cage traps and a further nine road-killed animals were collected from areas around the research center during March and April 1985. Blood samples were collected from the jugular vein of 30 of the trapped animals. The age of each possum was estimated from its total body length (Presidente, 1982, *In* The Management of Australian Mammals in Captivity, Evans (ed.), The Zoological Parks Board of Victoria, Melbourne, Victoria, pp. 55–66). The possums ranged in age from 14 mo to >24 mo (mature). Nineteen males and 12 females were less than 24 mo and a further five male and four females were estimated to be older than 24 mo of age. Each animal was examined for the presence of external parasites. The gastro-intestinal tract was removed and the stomach, small and large intestine were washed separately, preserved in 10% formalin and the washings examined microscopically for helminths.

Specimens of the mite *Ornithonyssus* sp. (family Dermanyssidae) were recovered from the ears of five possums. Because the mites were exclusively males and nymphs they could not be identified further. The tick *Ixodes tasmani* is a common parasite of possums in eastern Aus-

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