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## ***Haemoproteus tinnunculus* in the American Kestrel (*Falco sparverius*)**

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Unspecified species of *Haemoproteus* have been recorded from American Kestrels in Texas (Couch, 1952, Field Lab. 20: 146–154), Georgia (Love et al., 1953, J. Parasitol. 39: 52–57), Colorado (Stabler and Dattel, 1959, J. Colo.-Wyo. Acad. Sci. 4: 59; Stabler and Holt, 1965, J. Parasitol. 51: 927–928) and Panama (Huff and Wetmore, 1967, Bull. Wildl. Dis. Assoc. 3: 178–181); and *Haemoproteus elani* de Mello, 1935 has been recorded from kestrels in Oklahoma (Kocan et al., 1977, J. Wildl. Dis. 13: 304–306). However, there are no published identifications of *Haemoproteus tinnunculus* (Wasielewski and Wülker, 1918) emend. Wingstrand (1947, K. Sven. Vetenskapsakad. Handl. 24: 1–31) in this avian host in North America. This investigation reports the presence of this parasite in kestrels residing in the environs of Montreal, Quebec.

Eight wild kestrels (3 nestlings and 5 breeding adults) and 50 captive-reared kestrels (born and raised in captivity under conditions that would allow exposure to arthropod vectors) were sampled from June to August 1981 within a 10-km radius of the Macdonald Campus of McGill University, Ste. Anne de Bellevue, Quebec. The five wild adult kestrels were caught in mist nets located below their nest sites where a live Great Horned Owl (*Bubo virginianus* (Gmelin)) was tethered to elicit adult defensive behavior. Blood smears were made and fixed in the field and subsequently stained with Giemsa ac-

cording to the protocols previously described by Bennett (1970, Can. J. Zool. 48: 585–586). All slides were examined under a 100× oil immersion objective for a minimum of 10 min. Slides with haemoproteid infections were sent to the International Reference Centre for Avian Haematozoa for specific identification of the parasites (IRCAH Accession Numbers 86100–86105). Infection intensities were calculated by counting the number of parasitized cells seen in 10,000 erythrocytes.

Six kestrels (10%) were found to be parasitized with *Haemoproteus*; no other blood parasites were observed. All infected birds were adults; five were wild-caught and one was captive. While all five wild-caught adults were infected, the three nestlings were not, and it is possible that the latter group was sampled prior to patency of the haemoproteid. Infection intensities were 2–93 ( $\bar{x}$  = 42, SD = 44.3) in wild-caught kestrels and 6 in the captive kestrel. Bennett et al. (1972, J. Parasitol. 58: 1143–1147) formulated a working hypothesis which suggested that haemoproteids are family specific, although this may require further investigation. Haemoproteids can also be separated on morphometric characters. On the basis of these criteria, the haemoproteids seen in the six kestrels (Fig. 1) were identified as *H. tinnunculus*. This constitutes the first identification of this species in both American Kestrels and in North American falconids. Although Kocan et al. (1977, J. Wildl. Dis. 13: 304–306) designated *H. elani* as the haemoproteid in kestrels from Oklahoma,

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FIGURE 1. *Haemoproteus tinnunculus* from *Falco sparverius*. A and B. Mature macrogametocyte. C. Macrogametocyte and microgametocyte. D. Microgametocyte.

this diagnosis could be questioned since *H. elani* was described from an accipitrid (*Elanus caeruleus* (Desfont.)) not a falconid. *Haemoproteus tinnunculus* can now be considered to be more nearly cosmopolitan in its distribution although most records, as summarized by Bennett et al. (1982, A host-parasite catalogue of the

avian hematozoa, Memorial Univ. Nfld. Occ. Pap. Biol. No. 5, 243 pp.), indicate that it is most commonly encountered in the Old World.

Infection of the captive kestrel suggests the presence of a local vector as opposed to infections being acquired in the kestrels' southern range during winter migration. Several species of *Culicoides* (Diptera: Ceratopogonidae) are known vectors of *Haemoproteus*; these include *C. sphagnumensis* Williams and *C. stilobezzioides* Foote and Pratt (Fallis and Bennett, 1960, Can. J. Zool. 38: 455-464). Both species have been previously reported from Quebec (Duffy, 1979, Bionomics of the genus *Culicoides* Latreille (Diptera: Ceratopogonidae) at Lac Serpent, Quebec, M.Sc. Thesis, McGill Univ., Montreal, Quebec, 278 pp.) and are therefore possible vectors of *H. tinnunculus* in this region. The significance of these results cannot be fully realized until further research is undertaken to determine the identity of the vector and the possible pathogenicity of *H. tinnunculus* to the American Kestrel. Members of the genus *Haemoproteus*, with the exception of one report (Julian and Galt, 1980, J. Wildl. Dis. 16: 39-44), are not known to cause serious pathogenicity or mortality to their hosts (Bennett et al., 1976, *In Wildlife Diseases*, Page (ed.), Plenum Press, New York, New York, pp. 25-33).

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