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Source: Bulletin of the Wildlife Disease Association, 2(2) : 30-33

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-2.2.30>

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New Wild Bird Hosts For Pox Viruses

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Received for publication 12 January, 1966

ABSTRACT

Pox lesions were described in three new species of wild birds: Swainson's thrush (*Hylocichla ustulata*), gray-cheeked thrush (*Hylocichla minima*) and brown creeper (*Certhia familiaris*). These birds were collected during bird banding activities on Long Point, Ontario.

Individual cases of pox infection in wild birds have been observed occasionally during bird banding operations, and epizootics of pox have been described in chipping sparrows (Musselman, 1928) and mourning doves (Kossack and Hanson, 1954). Probably pox virus infection is more prevalent in wild birds than these accounts indicate. The present study was undertaken to determine if there were additional hosts for the virus.

During bird banding activities on Long Point, Lake Erie, Ontario, in the spring and fall of 1965, approximately 16,000 birds were captured and banded. A small number of birds with skin abnormalities were found. Three new avian hosts of pox viruses were captured at the same location, on a small ridge which crossed the peninsula approximately eight miles from its base.

On April 23, 1965 a brown creeper (*Certhia familiaris*) with a pea-sized dark brown nodular growth on the hind toe of the left foot was trapped in a mist net. The weather was cold and wet, and of the more than 700 birds trapped that day, about thirty died either in the nets or immediately after removal from the nets. The affected bird, which appeared otherwise healthy, was kept for further observation in a small holding box, but it was found dead several hours later. The carcass was kept five days at cool outdoor temperatures before it was brought to the laboratory.

Part of the lesion was fixed in 10% formalin. The rest was ground with sterile saline to which antibiotics (750 units penicillin, 750 mg. neomycin, and 750 mg. streptomycin per ml.) were added and used for inoculation of the cho-

rioallantoic membranes of 12-day-embryonated chicken eggs. Histological sections of the toe lesions were stained with haematoxylin-eosin and with haematoxylin-phloxine-saffron. Examination of a cross section of the toe lesion revealed an outer layer of hypertrophied skin. This enclosed a large amount of fibrous connective tissue which surrounded islands of enlarged epithelial cells. Many of these cells contained eosinophilic cytoplasmic granules, which were either arranged in clumps or scattered throughout. Nuclei were displaced toward the cell membranes or were completely missing. Some of these islands of epithelial tissue had undergone necrosis. Recent proliferation of abnormal epithelial cells appeared to have been derived from the stratum germinativum of the overlying skin. These cells, which were in better state of preservation, contained large intracytoplasmic inclusions or Bollinger bodies (Goodpasture, 1928), typical of infection with pox virus.

Results of attempts to isolate the virus on the chorioallantoic membrane were as follows: the first series of eggs inoculated developed small white streaks on the surface of the membrane. Histologically the mesoderm was thickened and oedematous. The entoderm was almost normal, whereas the ectoderm was markedly proliferated, containing rounded, vacuolated cells. No intracytoplasmic inclusions were seen in these cells. In the second chicken embryo passage, however, the changes were more pronounced. Congested capillaries surrounded by necrotic tissue were scattered in the form of islets throughout the thickened mesoderm. The entoderm was in part normal, in part proliferated

to form finger-like processes. The ectoderm was thickened and in some areas separated from the underlying mesoderm. Numerous enlarged cells, some of which were filled with pink staining granules which were considered to be Bollinger bodies, were found in the finger-like processes of the entoderm and in the ectodermal layer. (Mayr and Wittmann, 1956). Later this brown creeper pox strain was lost because of bacterial contamination. Unsuccessful attempts were made to transmit the virus to three-day-old chickens by intradermal inoculation of chorioallantoic membrane material into the plucked scalp.

Of 1079 brown creepers banded at the Long Point Breakwater station during 1965, this was the only one found infected with pox virus. In a subsequent study of skins in the Royal Ontario Museum, further evidence of pox infection in the brown creeper was obtained. One of 229 brown creepers examined had a matchhead-sized brown nodular skin proliferation on a toe. This was brown creeper no. 38.8.1.459, male, collected June 13, 1936 by C. E. Hope in the Thunder Bay district of Ontario. Although the tissues had been dried and stored for 29 years, satisfactory histological sections were made after first soaking the specimen for three weeks in buffered 10% formalin and for 24 hours in 3% hydrogen peroxide. Large granular Bollinger bodies were seen in hypertrophied epithelial cells. No attempts were made to isolate the virus.

On September 25 and 26, 1965, 465 birds of 37 species were banded at the Long Point Breakwater station. Pox infection was diagnosed histologically in 3 Swain-

TABLE 1 Wild Birds Examined for Poxvirus Infections in Ontario, 1965

Species	Number Examined	Location	Pox infection
Brown Creeper (<i>Certhia familiaris</i>)	1079	Breakwater	1
Chipping Sparrow (<i>Spizella passerina</i>)	281	Royal Ontario Museum	1
Field Sparrow (<i>Spizella pusilla</i>)	115	Lighthouse, Long Point	1
Gray-cheeked Thrush (<i>Hylocichla minima</i>)	209	Breakwater	1
Robin (<i>Turdus migratorius</i>)	31	Guelph	1
	151	Breakwater	1
	546	Royal Ontario Museum	1
Slate-coloured junco (<i>Junco hyemalis</i>)	608	Breakwater	2
	432	Royal Ontario Museum	3
Song Sparrow (<i>Melospiza melodia</i>)	155	Dundas Marsh	1
Swainson's Thrush (<i>Hylocichla ustulata</i>)	165	Breakwater	3
Towhee (<i>Pipilo erythrophthalmus</i>)	290	Royal Ontario Museum	2
Whitethroated Sparrow (<i>Zonotrichia albicollis</i>)	452	Royal Ontario Museum	1
Woodthrush (<i>Hylocichla mustelina</i>)	74	Royal Ontario Museum	1
Yellow-shafted Flicker (<i>Colaptes auratus</i>)	105	Breakwater, Long Point	1
	159	Lighthouse, Long Point	1
	241	Royal Ontario Museum	1

son's thrushes (*Hylocichla ustulata*) and one gray-cheeked thrush (*Hylocichla minima*). These, to the best of my knowledge, also were new host records. No attempts at virus isolation were made. Except for very small nodular foot lesions, all of these birds appeared to be healthy. After small pieces of the lesions were excised for histopathologic study, the birds were released. Their food habits made it very difficult to keep them in captivity. At the Breakwater station 165 Swainson's

thrushes and 209 gray-cheeked thrushes were banded in 1965, and at the Royal Ontario Museum skins from 297 Swainson's thrushes and 151 gray-cheeked thrushes were examined.

During 1965 pox lesions were observed in Ontario in several species of wild birds in which pox disease had been reported previously to occur (Chipping Sparrow-Musselman, 1928; Field Sparrow-McGaughey and Burnet, 1945; Flicker-Labisky and Mann, 1961; Junco-Worth, 1956; Robin-Good-

pasture and Anderson, 1962; Song Sparrow-Worth, 1956; Towhee-Goodpasture and Anderson, 1962; Whitethroated Sparrow - Worth, 1956; Woodthrush - Goodpasture and Anderson, 1962). These birds were not only from the Breakwater station but also from other locations of banding activity and from skins of the Museum's bird collection (Table 1).

Although 16,000 birds were banded on Long Point in 1965 the incidence of observed pox lesions in wild birds was comparatively low. It was possible that minor le-

sions were overlooked in the rush to band as many birds as possible during the migration seasons. In this study, pronounced lesions were seen only in the yellow-shafted flickers. Lost toes, crippled feet, warty lesions covering the whole foot or lesions at the base of the bill, as has been reported by Musselman (1928) and McGaughey and Burnet (1945), were not observed. Climate may play a role in the distribution of pox virus among birds, especially as precipitation (Musselman, 1928) affects the abundance of mosquito vectors (Kligler and Ashner, 1929).

ACKNOWLEDGEMENTS

The cooperation of members of the Ontario Bird Banding Association is gratefully acknowledged. I am indebted also to Dr. J. Barlow and his associates of the Royal Ontario Museum, Toronto, for their advice and assistance in making available the skins of the bird collection. I wish to express my appreciation to Dr. L. Karstad, Division of Zoonoses and Wildlife Diseases, Ontario Veterinary College, for his help and guidance during this study.

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