

## Prevalence of heartworm, *Sarconema eurycerca*, Wehr, 1939 (Nematoda), in whistling swan, *Cygnus columbianus columbianus*

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From 1973 to 1976, 795 whistling swans, *Cygnus columbianus columbianus*, were surveyed for microfilariae of the heartworm, *Sarconema eurycerca*, by blood test. Swans were captured on their east coast wintering grounds in Maryland and North Carolina, and on their breeding grounds on the North Slope, Alaska. Prevalence of heartworm in winter was 18, 9, 27, and 19% in 1973, 1974, 1975, and 1976, respectively. Prevalence was 32% in adults on the breeding grounds, 1974. Overall prevalence during 4 years was 20%; prevalence was 19% in adults and 24% in juveniles. Microfilariae were not found in cygnets 4 to 6 weeks of age on the breeding grounds.

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De 1973 à 1976, l'analyse du sang de 795 cygnes *Cygnus columbianus columbianus* a permis d'étudier chez cette espèce la fréquence du parasitisme par les microfilaries du nématode *Sarconema eurycerca*. Les oiseaux examinés provenaient des quartiers d'hiver du cygne sur la côte est, au Maryland et en Caroline du Nord, et des territoires de reproduction du Versant Nord, en Alaska. En hiver, le parasitisme affectait 18% des oiseaux en 1973, 9% en 1974, 27% en 1975 et 19% en 1976. En 1974, le parasitisme affectait 32% des adultes capturés dans les territoires de reproduction. La fréquence moyenne calculée sur les 4 années était de 20% pour l'ensemble des cygnes, de 19% chez les adultes et de 24% chez les cygnes immatures. Dans les territoires de reproduction, les cygnes immatures âgés de 4 à 6 semaines ne portaient aucun parasite.

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### Introduction

*Sarconema eurycerca* was first described by Wehr (1939) from the heart muscle of a whistling swan, *Cygnus columbianus columbianus*. It has since been found in the trumpeter swan, *C. buccinator* (Cowan 1946); Bewick's swan, *C. columbianus bewickii* (Ryzhikov 1958); and the mute swan, *C. olor* (Boughton 1965). The parasite also occurs in Canada goose, *Branta canadensis* (Levine and Hanson 1953); white-fronted goose, *Anser albifrons* (Sonin 1963); and bean goose, *A. fabalis* (McDonald 1969).

Quortrup and Holt (1940) reported the prevalence of heartworm to be 11% in 1937 and 1938, and 23.8% in 1939 in whistling swans examined in Utah. McDonald (in Holden and Sladen 1968) reported a prevalence of 16.2% in moribund or dead swans in the same area during the years 1957 to 1963. Irwin (1975) found heartworm in 12 of 23 whistling swans at Lake St. Clair, Ontario.

Holden and Sladen (1968) examined five juvenile and subadult whistling swans from Chesapeake Bay, Maryland, and all were parasitized by *S.*

*eurycerca*. McDonald (in Holden and Sladen 1978) reported the prevalence of *S. eurycerca* to be 17.4% in juvenile swans from Utah.

### Materials and Methods

In February of 1973 to 1976, 689 whistling swans were captured with a rocket net at Mattamuskeet and Pungo National Wildlife Refuges in eastern North Carolina. Fifty-five swans were captured in funnel traps in Chesapeake Bay, Maryland, during the winters of 1975 and 1976. Fifty-one swans were captured during the months of July and August of 1974 on the North Slope, Alaska, between Prudhoe Bay and the Colville River Delta. During this period, flightless adults, some with cygnets, were located by aircraft and captured on foot. They were designated as mated if members of heterosexual pairs or with broods, and unmated if single, in pairs of the same sex, or in groups.

Swans were aged as cygnets (4 to 6 weeks in July), juveniles (9 months in February), and adults (12 months or older in July and 21 months or older in February). Juveniles had grey plumage on the head and neck during the winter. Adults were all white or with grey flecks on the head or neck during the winter and summer.

Blood samples were collected in 3-mL heparinized syringes and kept for at most 24 h at ambient temperatures (7 to 12°C) before blood tests were performed. Blood-sampling techniques used for the detection and study of *S. eurycerca* microfilariae in

TABLE 1. The prevalence of microfilariae of *Sarconema eurycerca* in whistling swans captured during the winter in Maryland and North Carolina

	1973		1974		1975		1976		Total	
	No. tested	Prevalence	No. tested	Prevalence	No. tested	Prevalence	No. tested	Prevalence	No. tested	Prevalence
<b>Adults</b>										
North Carolina	74	18	110	11	168	25	166	18	518	19
Maryland					32	6	13	15	14	9
Total	74	18	110	11	200	22	179	18	563	19
<b>Juveniles</b>										
North Carolina	13	23	54	6	49	42	55	24	171	23
Maryland					9	44	1	0	10	40
Total	13	23	54	6	58	43	56	24	181	24
<b>Totals</b>	87	18	164	9	258	27	235	19	744	20

the swans were the Giemsa-stained thin smear, the wet mount test (Hanson *et al.* 1956), and the capillary tube test (Schalm and Jain 1966).

### Results and Discussion

The results of the blood survey for microfilariae in whistling swans captured on the east coast wintering grounds of Maryland and North Carolina are presented in Table 1. In 1974 on the breeding grounds, *S. eurycerca* microfilariae were detected in 4 of 18 swans (22%) from the mated segment, in 7 of 16 (43%) from the unmated segment, and in one of 17 cygnets. The combined prevalence of heartworm in the 34 adult swans was 32% (11/34).

The cygnets on the breeding grounds were not included in the prevalence data. Since the prepatent period of *S. eurycerca* is 98 days (Seegar *et al.* 1976), no microfilariae could be present in cygnets 28 to 35 days of age.

Prevalence in juveniles was 6 to 44% and always greater than that in adults of the same sample except in North Carolina, 1974. In adult swans from Alaska, the prevalence was highest in the unmated birds. It is estimated that few whistling swans breed before their third winter and probably most are older at first breeding (Lensink 1973). Therefore, swans which make up the unmated component of the North Slope population probably are the youngest of the adults.

Acquired immunity operating in this host-parasite relationship may lower the prevalence in older swans. Anderson (1956) working on *Splendofilaria fallisensis* in captive ducks found evidence of acquired immunity. Parasitized birds kept through the winter and reexposed to infection in spring did not exhibit increases in microfilariaemia, and in many ducks microfilariae disappeared.

Heavy infestations of *Trinoton anserinum* have

been observed commonly on juvenile swans and more rarely on adult birds. These Mallophaga are vectors of heartworm (Seegar *et al.* 1976). Cygnets probably get their ectoparasites from their parents and it has been demonstrated that 60% of lice sampled throughout the year from infected swans have developing *S. eurycerca* (Seegar *et al.* 1976). The cygnets of infected parents are likely to contract Mallophaga that are capable of transmitting *S. eurycerca*. In such a life cycle, an infected parent could transmit heartworm to an entire brood of cygnets. This type of transmission on the breeding grounds could account for a high prevalence of heartworm in juvenile swans.

Experiments conducted during the summer and winter months on the microfilarial infection of *S. eurycerca* in captive whistling swans indicate that this species has a nocturnal periodicity (Seegar 1977) with a peak in the peripheral blood between 0100 and 0400 hours. Since field sampling was carried out during daylight, the positive results must be regarded as minimal.

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## A note on the stomach contents of adult Atlantic salmon (*Salmo salar*, Linnaeus) from Port Burwell, Northwest Territories

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Stomach content analyses on 28 Atlantic salmon captured at Port Burwell, Northwest Territories, in late August, 1977, indicate that invertebrate prey items were the most important by volume. *Parathemisto libellula* dominated the invertebrate prey group, and *Ammodytes* sp. was the most important fish in the diet of the salmon analyzed. A range extension for *Notoscopelus elongtus kroeyeri* was recorded.

NEILSON, J. D., et D. J. GILLIS. 1979. A note on the stomach contents of adult Atlantic salmon (*Salmo salar*, Linnaeus) from Port Burwell, Northwest Territories. *Can. J. Zool.* **57**: 1502-1503.

L'analyse des contenus stomacaux de 28 saumons de l'Atlantique capturés à la fin d'août, en 1977, à Port Burwell, dans les Territoires du Nord-Ouest, a révélé que ce sont les invertébrés qui constituent, en volume, le groupe de proies les plus important. C'est *Parathemisto libellula* qui constitue la proie prédominante du groupe des invertébrés, alors qu'*Ammodytes* sp. est le poisson le plus commun de la diète des saumons. La présence de *Notoscopelus elongtus kroeyeri* dans les échantillons agrandit l'aire de répartition connue de cette espèce.

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A total of 28 Atlantic salmon (*Salmo salar*) were captured in gill nets set near Port Burwell, Northwest Territories, in August, 1977. This location is near the known northern limit of the Canadian range of Atlantic salmon (Scott and Crossman

1973). The stomachs were retained in 10% buffered formalin for laboratory examination. Major prey groups were identified and enumerated, and the volumetric displacements of the wet prey organisms were determined. Prey identified to a tax-

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