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# LEAD POISONING AND PARASITISM OF NON-MIGRATORY CANADA GEESE IN FLORIDA

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**Abstract.**—Lead poisoning was diagnosed in two non-migratory Canada Geese (*Branta canadensis*) from Leon County, Florida in 1982. Concentrations of lead in the livers of these two geese were 27 and 31 ppm (wet weight). These geese and two others contained eight species of helminths which included six nematodes, one trematode, and one cestode. Intensities were not high and it was concluded that these helminth infections were of little pathologic consequence.

Populations of Canada Geese (*Branta canadensis*) have declined in the southeastern states during the past several decades (Clapp et al. 1982). In Florida the Canada Goose has been found as a winter migrant as far south as Lake Okeechobee (Crider 1967). Since 1971 the numbers of these migratory geese have remained at around 1,000 birds. Virtually all of these geese are found within 40 km of St. Marks National Wildlife Refuge. In addition to these migratory geese, there is a flock of 300-400 non-migratory birds in Leon and Jefferson counties (T. Goodwin, Fla. Game and Fresh Water Fish Commission, pers. comm.). According to Stevenson (1976) these are descendents of captive Giant Canada Geese (*B. c. maxima*).

Little is known about the parasites and diseases of Canada Geese in Florida, except that Thul et al. (1980) reported blood films from 52 non-migratory geese were negative for blood parasites. In this paper we discuss concentrations of lead and the helminth parasites of four non-migratory Canada Geese from northwestern Florida.

## METHODS

On 27 January 1982 the Florida Game and Fresh Water Fish Commission was notified that a number of resident Canada Geese had died at Southwood Farms, Leon County. Between 12 and 15 carcasses had been buried, and most could not be retrieved. However, one frozen carcass was submitted for evaluation. On 11 March 1982 three additional geese from the same area were killed accidentally during trapping operations, frozen and subsequently sent to us for health and disease analyses.

At necropsy samples of liver, kidney and bone (humerus) were obtained from the four geese for lead analysis. Tissues were weighed and dry-ashed at 450 °C overnight. After

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cooling, the ash was dissolved in concentrated nitric acid and then heated to dryness on a hot plate. The material was then redissolved in hot 5N hydrochloric acid and transferred quantitatively to a volumetric flask. The amount of lead in the tissue extracts was determined using a Perkin-Elmer model 2380 atomic absorption spectrophotometer equipped with an HGA-400 graphite furnace and deuterium arc background corrector. The operating conditions were as follows: drying at 100 °C for 15 sec with 10 sec ramp; charring at 450 °C for 15 sec with 10 sec ramp and atomization at 2300 °C for 6 sec with 1 sec ramp. Sample peak heights were compared against a commercially-available lead standard and the metal concentration expressed as  $\mu\text{g}$  lead per g of tissue (ppm), wet weight. Contents of the esophagus, proventriculus and gizzard were examined for the presence of lead shot.

All major organs were examined for helminth parasites according to the techniques described by Forrester et al. (1974). Representative specimens of the parasites have been deposited in the U.S. National Parasite Collection (Beltsville, Maryland) as USNM Helm. Coll. Nos. 79667-79675. Ecological terms such as prevalence and intensity are used as defined by Margolis et al. (1982).

## RESULTS AND DISCUSSION

Weights and measurements of the four Canada Geese are given in Tables 1 and 2. Goose no. 1 (found dead) had several signs of lead poisoning (Table 2). The bird was emaciated (i.e. pectoral muscles were atrophied and subcutaneous fat was depleted) and the proventriculus and esophagus were greatly impacted and distended with food. Concentrations of lead in liver, kidney and bone (Table 2) were of such a magnitude as to confirm a diagnosis of lead poisoning (Adler 1944, Bagley et al. 1967, Locke and Bagley 1967, Szymczak and Adrian 1978). Four lead pellets were in the contents of the gizzard.

Concentrations of lead in tissues of the other three geese (nos. 2, 3 and 4) varied from <1–182 ppm (Table 2). Goose no. 4 was very emaciated and had a lead concentration of 27 ppm in liver tissue, which is indicative of lead poisoning (Szymczak and Adrian 1978). None of these latter three geese had impactions of the esophagus or proventriculus and no lead shot was found in their gizzards.

**Table 1. Measurements of four non-migratory Canada Geese from Leon County, Florida.**

Goose no.	Sex	Measurements (cm)				
		Total length <sup>1</sup>	Tail	Tarsus	Bill	Wing
1	F	84.2	14.5	9.2	5.8	47.0
2	F	90.0	14.7	9.0	5.6	45.0
3	M	85.7	14.6	9.0	5.7	45.2
4	M	87.8	15.0	9.5	5.8	48.0

<sup>1</sup>Tip of bill to tip of tail.

Table 2. Relationships of lead concentrations (ppm, wet weight) and physical condition of four nonmigratory Canada geese from Leon County, Florida.

Goose no.	Weight (kg)	No. lead shot in gizzard	Lead concentrations			Index of emaciation <sup>1</sup>	Impaction of proventriculus and esophagus
			Liver	Kidney	Humerus		
1	2.56	4	31	47	138	++	Yes
2	3.02	0	7	13	182	+	No
3	3.02	0	<1	2	18	0	No
4	1.95	0	27	45	48	+++	No

<sup>1</sup>0 = no emaciation, + = slight emaciation, ++ = moderate emaciation, +++ = considerable emaciation.

Lead poisoning in waterfowl has been reported from various parts of North America (Trainer 1982). Although most common in dabbling ducks such as Mallards (*Anas platyrhynchos*) and Northern Pintails (*A. acuta*), lead poisoning has been seen in Canada Geese in Wisconsin (Trainer and Hunt 1965), Delaware (Bagley et al. 1967, Locke and Bagley 1967), and Colorado (Szymczak and Adrian 1978). In addition, the National Wildlife Health Center (Madison, Wisconsin) has documented lead poisoning in Canada Geese from North Dakota, Iowa, Nebraska, Minnesota, Michigan, Ohio, Massachusetts, Tennessee, Wyoming and California (L. Locke, U.S. Fish and Wildlife Service, pers. comm.). The two cases of lead poisoning reported herein not only add Florida to this list of states, but also provide the first accounts of lead poisoning in any species of waterfowl from Florida.

There is no information on the prevalence of lead shot in gizzards of Canada Geese in Florida, but such information is available for other species of waterfowl. Baker and Thompson (1978) reported that 17% of 9,632 gizzards from 15 species of ducks in Florida contained lead shot. Diving ducks had higher prevalences (23%) than dabblers (11%).

Table 3. Site and intensity of infection of helminths of four non-migratory Canada Geese from Leon County, Florida.

Helminth	Site <sup>1</sup>	Goose no.			
		1	2	3	4
Nematoda					
<i>Amidostomum anseris</i>	PR,GI	0	0	8	6
<i>Epomidiostomum crami</i>	PR,GI	0	3	7	5
<i>Trichostrongylus tenuis</i>	LI,CE	34	48	2	33
<i>Tetrameres</i> sp. <sup>2</sup>	PR	0	3	11	4
<i>Capillaria</i> sp. <sup>3</sup>	SI	0	0	1	0
<i>Contraecium</i> sp. <sup>4</sup>	SI	0	3	0	0
Trematoda					
<i>Hypoderaeum conoideum</i>	LI	1	0	0	0
Cestoda					
Unidentified fragments <sup>5</sup>	SI	0	1	1	0
Total no. helminths		35	58	30	48

<sup>1</sup>PR = proventriculus; GI = gizzard; SI = small intestine; LI = large intestine; CE = ceca.

<sup>2</sup>Specimens do not fit published descriptions of species in subgenus *Petrowimeres*. Total length = 7.2-7.4 mm. Left spicule = 765-924  $\mu$ m; right spicule = 96-113  $\mu$ m.

<sup>3</sup>Only one female recovered.

<sup>4</sup>Immature specimens.

<sup>5</sup>Specimens in poor condition due to freezing and recovery techniques.

Eight species of helminths (six nematodes, one trematode, and one cestode) were found in the four geese (Table 3). Three of the nematodes (*Amidostomum anseris*, *Epomidiostomum crami*, and *Trichostrongylus tenuis*) have been reported previously from Canada Geese (McDonald 1969). None of these latter species was found in Wood Ducks (*Aix sponsa*) or Mottled Ducks (*Anas fulvigula*) from Florida, but the trematode (*Hypoderaeum conoideum*) was found in 6 of 78 Mottled Ducks (Kinsella and Forrester 1972, Thul et al. 1985). Intensities of infection were low compared to similar data from Wood Ducks and Mottled Ducks in Florida (Kinsella and Forrester 1972, Thul et al. 1985) and were probably of little pathologic consequence to the geese.

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