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Source: Journal of Wildlife Diseases, 11(1) : 17-22

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-11.1.17

ENDOPARASITES OF BLACK-BELLIED WHISTLING DUCKS IN SOUTHERN TEXAS

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Abstract: Endoparasites detected in the black-bellied whistling duck (*Dendrocygna autumnalis*) include one nasal mite, four nematodes, three trematodes, five cestodes, and two acanthocephalans. Each of these represents a new host record. Overall, 47% of the birds were parasitized with an average of 12 helminths per infected bird. Helminths were significantly more common in juveniles than in adults; more females than males were parasitized, but the difference was not statistically significant. No correlation existed between the parasite load and the physical condition of the host. Tissue damage in infected birds was minimal and limited to nematode cysts in the proventriculi. Parasite loads were light, apparently reflecting the food habits of the host.

INTRODUCTION

The life histories of the whistling or tree ducks (*Dendrocygna* spp.) are among the least known of all waterfowl, and accordingly, even less is known of their parasites. Of the eight whistling duck species, the black-bellied whistling duck (*D. autumnalis*) is distributed in southern Texas, Mexico, and the Neotropics sympatric, in part, with the winter distributions of some well-known North American game ducks and geese. This region also includes portions of the New World breeding range of fulvous whistling ducks (*D. bicolor*). The parasites of many species of waterfowl, including the whistling ducks, are listed by Lapage.[7]

This paper reports a study of the endoparasites found in black-bellied whistling ducks residing in southern Texas. Our objectives were (1) to identify the endoparasites of black-bellied whistling ducks exclusive of filarids and protozoans, (2) to determine the prevalence and intensity of endoparasitism, (3) to determine if parasite loads varied with sex, age, or physical condition of the host, and (4) to examine the hosts for gross pathological effects related to parasitism.

METHODS

Black-bellied whistling ducks were collected on two occasions in Nueces County, Texas approximately 56 km from Corpus Christi. On 25 March 1971, 86 birds were collected from a flock of over 500 attracted to pre-baited sites; another 24 birds were taken on 15 February 1972. Opportunities to obtain similarly sized samples were limited to the late winter and spring months because of the species' seasonal gregariousness.

Each bird was sexed by cloacal examination in the field and subsequently confirmed by gonadal examination in the laboratory. Age was determined by the presence or absence of a bursa. All birds were frozen for later examination.

The physical condition of each bird was evaluated by measuring the depth

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of the breast muscles at a point 2.5 cm from the anterior end of the keel and 1 cm to the right of the keel. The perpendicular distance to the sternum (i.e. depth of the muscle tissue) was then compared to the depth of the keel and expressed as a decimal fraction. The result, the so-called Emaciation Index (E.I.), has been cited as a reasonable estimation of a bird's physical condition by its developers.[5] The E.I. of a bird in good condition approaches .80 or more whereas one in poorer condition might have an E.I. of .50 or less. The E.I. assumes that parasitism causes a loss in the host's body weight as manifested by reduction of the breast muscle tissue.

The organs and structures examined included: nares, nasal cavities, trachea, syrinx, lungs, esophagus, proventriculus, ventriculus, small intestine, large intestine, ceca, cloaca, gonads, heart, liver, gall bladder, kidneys, pancreas, and spleen. Solid organs such as the liver and kidneys were teased apart; all tissues were examined with a dissecting microscope. The contents of the gastrointestinal tract were also examined but they were not washed through a screen fine enough to detect such small parasites as *Strongyloides* and *Capillaria*. Some birds were ultimately omitted from our analysis because they (1) were examined prior to the development of a fully satisfactory washing technique for the gastro-intestinal tract or (2) their nasal cavities were not opened as this examination precludes the preparation of study skins.

Nematodes were preserved in 70% ethyl alcohol with 10% glycerine, cleared in glycerine alcohol, and left unmounted. Cestodes, trematodes, and acanthocephalans were preserved in AFA, stained in Semichon's carmine, cleared in xylene, and mounted in permount. Nasal mites were preserved in 70% ethyl alcohol, cleared in lactic acid, and mounted in modified Hoyer's mounting medium.

Nomenclature of parasites follows Yamaguti[14] and Strandtmann and Wharton[13] although some of our specimens are not yet identifiable beyond the generic level.

RESULTS AND DISCUSSION

Earlier work listed only two helminths —a cestode, *Lateriporus biuterinus,* and a nematode, *Cyathostoma* sp.—and two arthropod parasites, *Freyana dendrocygna* and *Acidopnoctus hopkinsi,* of black-bellied whistling ducks.[7] Later, McDaniel et al.[9] found an additional six ectoparasites, all arthropods, but made no examination for endoparasites. Our study revealed 15 species of endoparasites, each representing a new host record.

A nasal mite, *Rhinonyssus rhinolethrum,* was found in 12 of 94 black-bellied whistling ducks (13%). The intensity of infection varied from 1 to 7 (average of 3) mites per infected bird. Strandtmann and Wharton[13] listed 17 other species of aquatic birds serving as hosts for this nasal mite. This species is likely transmitted by direct contact during preening.[12]

Three species of cestodes were encountered in the small intestine. The prevalence and intensity of parasitism for these and other helminths are shown in Table 1. One of two species of *Sobolevicanthus,* apparently a new form, was the most common endoparasite of black-bellied whistling ducks. *Sobolevicanthus* spp. parasitize various aquatic birds throughout the world. Larval forms occur in Encopedpoda, Amphipoda, and Ostracoda.[14] A third cestode of the small intestine, *Anomotaenia* sp., was rarely present.

A cosmopolitan cestode, *Cloacotaenia megalops,* occurred in the lower intestinal tract of 4% of the birds. Pillars[10] reported that heavy infections of this helminth apparently contributed to the death of many ducks in England during 1922. A second cestode, *Dicranotaenio* sp., was located in the large intestine although, in a single case, one specimen was also found in the small intestine. *Cyclops* spp. serve as intermediate hosts.[14]

Corynosomo peposacae, an acanthocephalan, has been recorded in waterfowl from Brazil and Argentina[14] as well as in a single bird in our study. A second species of the same genus was also located in the small intestine of a single black-bellied whistling duck.

Two nematodes, *Echinuria uncinata* and *Tropisurus crami* (= *Tetrameres crami*), were found encysted in proventriculi. *E. uncinata* encysts in the proventricular submucosa of black-bellied whistling ducks and many other species of waterfowl. *Daphnia* spp. serve as intermediate hosts.[14] *E. uncinata* may cause nodules in the gizzard and proventriculus so large that they obstruct food passage.[4,11] *Tropisurus crami* is likewise found in other North American waterfowl.[11] Some birds were also infected with a nematode, *Parhadjelia neglecta* (= *Hadjelia neglecta*), under the koilin lining of the ventriculus. *Porrocaecum* sp. was present in the small intestine. Nematodes of this genus occur in birds throughout the world. Earthworms serve as intermediate hosts for some of the species, and after ingestion, the larvae enter the submucosa of the bird's gizzard. After 7 days, the larvae leave the gizzard and mature in the small intestine.[14]

Apatemon gracilis, a trematode, occurred in our sample of black-bellied

TABLE 1. Prevalence and intensity of helminth parasites in 90 black-bellied whistling ducks from southern Texas.

		Prevalence of Infection		Number Helminths [a]	
Species [b]	Locale in Host	Number Infected Ducks	Percent	Average	Range
Echinuria uncinata	Proventriculus	4	4	10	1-24
Tropisurus crami[c]	Proventriculus	5	6	3	1- 4
Parhadjelia neglecta[d]	Ventriculus	6	7	1	1- 2
Sobolevicanthus sp.	Small intestine	25	28	15	1-85
Sobolevicanthus sp.	Small intestine	1	1	1	1- 1
Anomotaenia sp.	Small intestine	1	1	4	4- 4
Apatemon gracilis	Small intestine	5	6	2	1- 3
Zygocotyle lunata	Small intestine	3	3	1	1- 1
Porrocaecum sp.	Small intestine	1	1	1	1- 1
Corynosoma peposacae	Small intestine	1	1	1	1- 1
Corynosoma sp.	Small intestine	1	1	1	1- 1
Cloacotaenia megalops	Cloaca and large intestine	4	4	4	1- 9
Dicranotaenia sp.	Large and small intestine	3	3	2	1- 3
Echinostoma revolutum	Cloaca and large intestine	2	2	2	1- 3
Total		42	47	12	1-92

[a] Helminths per infected whistling duck
[b] Nomenclature follows Yamaguti[14]
[c] *Tetrameres crami* of some authorities
[d] *Hadjelia neglecta* of some authorities

whistling ducks as well as in other anseriforms. Snails are the first intermediate hosts and leeches act as a second intermediate host.[6] We found a second trematode, *Zygocotyle lunata*, in the small intestine. Various New and Old World waterfowl are parasitized by this fluke.

Echinostoma revolutum was found in the lower intestinal tract of whistling ducks. Freshwater snails of many genera serve as first intermediate hosts, and tadpoles, frogs, and snails serve as second intermediate hosts.[6] This fluke occasionally occurs in numbers sufficient to cause fatal hemorrhagic diarrhea in pigeons.[1]

Relationships Between Parasite Load and Host Biology

No conclusive relationship was established between host sex and the incidence of endoparasitism. Of the 34 male hosts examined, 13 (38%) were parasitized whereas 29 of 56 females (52%) were infected, but these differences were not significant ($X^2=1.06$, $P>.05$).

The prevalence of parasitism was significantly greater ($X^2=6.13$, $P<.05$) in juvenile black-bellied whistling ducks than in adults (Table 2). That higher rates of infection occur in younger birds is not uncommon.[5] Juvenile black-bellied whistling ducks were also more intensely parasitized than were adults (14 vs. 6 helminths per bird, respectively).

Pathology

No relationship using the E.I. method was established between the parasite load and the physical condition of the host. There are at least three possible explanations: (1) the parasite load does not affect the physical condition of the host in a measurable way, (2) the E.I. method for evaluating physical condition is not adequate, or (3) that only excessive parasite loads, beyond those we found in our sample, affect the physical condition of black-bellied whistling ducks; such birds may be quickly eliminated and thus rarely encountered in a population sample. The last explanation seems likely. Cornwell and Cowan[5] found that heavy parasite loads indeed affected the E.I. of canvasbacks (*Aythya valisneria*), and it seems reasonable that this relationship should hold for other species. The intensity of the parasite load we found seems remarkably light when compared to those found elsewhere.[3,5] The range of E.I.'s in our sample varied from 0.71 to 1.00, but this index did not vary in proportion to the parasite loads in the sample.

Although relatively small parasite loads were found in our sample, the kinds of parasites involved may be much more important than the total numbers of parasites. Other workers found that small numbers of tissue-destroying helminths caused death whereas massive tapeworm populations (i.e., 40,000-plus

TABLE 2. Relationship of host age with the prevalence and intensity of helminth parasitism in black-bellied whistling ducks from southern Texas.

Age	Number Whistling Ducks Examined	Prevalence of Infection: Number Infected Ducks	Prevalence of Infection: Percent	Number Helminths[a]: Average	Number Helminths[a]: Range
Juvenile	53	31	58[b]	14	1-92
Adult	37	11	30	6	1-24
Total	90	42	47	12	1-92

[a] Helminths per infected whistling duck.

[b] Prevalence of infection significantly different between age groups ($P<.05$).

individuals) in canvasback ducklings failed to produce detectable effects.[5]

The only tissue damage we observed was associated with nematodes encysted in the proventriculus. These cysts, 3-5 mm in diameter, did not occur in numbers or sizes sufficient to block the proventriculus or otherwise interfere with its functions. The cysts of *Tropisurus crami* were dark red and averaged three per infected bird; only one nematode was present in each cyst. The proventricular cysts of *Echinuria uncinata* were yellow and averaged two cysts per infected bird, with one to eight nematodes in each cyst.

The nematodes, *Parhadjelia neglecta*, found under the gizzard lining probably damage the lining and epithelium, but this was not evident, perhaps because of the few helminths actually present (Table 1).

Most of the black-bellied whistling ducks we examined were in good to excellent physical condition as measured by the E.I. method. In any case, we found no relationship between parasite loads and this measure of the birds' welfare. Less than half (47%) of the birds were parasitized, and those indeed having parasites were rather lightly infected. Tissue damage attributed to the parasitism was minimal and of no apparent consequence. Parasite loads in whistling ducks are most likely related to food habits, with those species and individuals eating snails and other animal matter having higher rates of parasitic infection than those feeding exclusively on plant materials. Lavery[8] compared the extent of parasitism in the wandering whistling duck (*Dendrocygna arcuata*), a species which frequently eats molluscs, and the plumed whistling duck (*D.eytoni*), a dry-land grazer; these birds were infected with intestinal helminths at rates of 87% and 7%, respectively. Black-bellied whistling ducks, primarily grazers, but also eating 8% by volume of animal foods,[2] fall within the range of parasitism found in the Australian whistling ducks that Lavery studied.

Acknowledgements

We are indebted to the M. P. Wright family for access to their property and for assistance with making our collections. R. W. Strandtmann, S. D. Casto, H. N. Buscher, and S. D. Schmidt assisted with identification of the parasites. The manuscript benefited from the reviews of D. J. Forrester, G. W. Cornwell, M. K. Rylander, and J. E. George.

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Received for publication 20 November 1973