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HEMATOZOA OF WOOD DUCKS (*AIX SPONSA*) IN MISSOURI

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ABSTRACT: We examined 371 wood ducks (*Aix sponsa*) for hematozoa from two localities in Missouri (USA) in 1989 and 1990. Thirty-seven (10%) harbored one or more species of blood parasites. *Haemoproteus nettionis* was the most common parasite, occurring in 36 (10%) of the birds. *Leucocytozoon simondi* was found in two (0.5%) and microfilaria occurred in five (1%) of the wood ducks examined. Infections were more prevalent in adults (18%) than in immature birds (2%). There was no difference in prevalence between sex, location, or year. Based on seasonal prevalence, transmission probably did not occur at either location in the summer. Increased prevalence in the winter samples occurred after northern wood ducks migrated into the sample areas.

Key words: *Aix sponsa*, blood parasite, *Haemoproteus nettionis*, hematozoa, *Leucocytozoon simondi*, microfilaria, wood duck.

INTRODUCTION

Extensive surveys of the blood parasites of wood ducks (*Aix sponsa*) have been conducted in the northern United States, all the states in the Atlantic Flyway, and in Canada (Herman et al., 1971; Bennett et al., 1974, 1975; Greiner et al, 1975; Thul et al., 1980). Prevalence data concerning breeding and wintering populations of wood ducks in the Mississippi Flyway (USA), however, are limited.

The wood duck is one of the few waterfowl species that not only has migratory populations that breed in the north, but also has populations that breed throughout its wintering range. Breeding populations of wood ducks have been found from Nova Scotia to the southern tip of Florida (Bellrose, 1980). This behavior has made the wood duck an excellent subject for epidemiological studies of blood parasites in wild waterfowl populations.

Blood parasites, or hematozoa, occurring in wood ducks include *Haemoproteus nettionis*, *Leucocytozoon simondi*, and *Plasmodium* spp. (Herman et al., 1971; Thul et al., 1980). *Leucocytozoon simondi* is a major factor in the disease and extensive mortality that limit the success of young waterfowl in some areas (Bennett and MacInnes, 1972; Bennett et al., 1974). The microfilaria of onchocercid helminths, usually *Splendidofilaria fallisensis*, also have been observed in the blood of wood ducks (Bennett et al., 1974, 1975).

The black flies, mosquitoes, midges, and lice that transmit these hematozoa are restricted geographically by climate, topography, or other environmental factors (Herman, 1968; Thul et al., 1980). Hematozoa are transmitted to waterfowl in those areas where suitable insect vectors exist (transmission ranges). Thul et al. (1980) estimated the transmission ranges of these blood parasites in wood ducks in the Atlantic Flyway. They stated that the southern limit for the transmission of *H. nettionis* appeared to coincide approximately with the Virginia-North Carolina (USA) border, or approximately 37°N latitude. This range, transposed to the Mississippi Flyway, extends well into southern Missouri (USA). Therefore, *H. nettionis* could possibly be transmitted to waterfowl in Missouri if conditions were consistent in both flyways.

Herman (1968) found *L. simondi* occurred primarily north of 43°N latitude, while Thul et al. (1980) described its range above 42°N latitude. In either case, Missouri is located south of the described range of transmission for *L. simondi*. The ranges for *S. fallisensis* and *Plasmodium* spp.

were found to be similar to that of *L. simondi* (Thul et al., 1980). Our objective was to estimate the prevalence of blood parasites in the breeding and wintering populations of wood ducks in Missouri.

MATERIALS AND METHODS

We examined 371 wood ducks over a 2 yr period, July 1989 through November 1990, at two locations in Missouri: Ted Shanks Wildlife Management Area (39°30'N, 91°00'W) and Duck Creek Wildlife Management Area (37°05'N, 90°05'W). Both sites are state-managed wetland areas comprised mainly of river bottom hardwood forests, marsh habitats, and agricultural lands. These areas are covered with water from late August through late March.

Blood samples were taken from trapped wood ducks throughout July and August and from hunter-killed birds in November. Sampling equipment and techniques used were described by Bennett (1970) and Bennett et al. (1975). Blood smears were scanned at low power (100×) for larger hematozoa, then viewed at a higher power (1,000×) until a minimum of 10,000 erythrocytes were viewed per slide. Representative blood slides have been deposited in the National Parasite Collection, Beltsville, Maryland (Nos. 82060–82063) and the International Reference Center for Avian Hematozoa, St. John's Newfoundland, Canada (Nos. 116605 to 116608). A chi-square test was used for all comparisons (Sokal and Rohlf, 1987).

RESULTS

Two species of hematozoa, *Haemoproteus nettionis* and *Leucocytozoon simondi*, and a filarial nematode, possibly *Splendidofilaria fallisensis*, were detected (Table 1). *Plasmodium* spp. were not found. Thirty-seven (10%) of the wood ducks were infected with one or more blood parasite species. Double infections occurred in five adult males and in one female.

There was no statistical difference ($P = 0.99$) in prevalence between 1989 and 1990; therefore, the data from these two years were combined for the analysis of independence of sex, age, and location. There was no significant difference ($P = 0.92$) in prevalence between sexes. Infections were significantly ($P < 0.001$) more prevalent in adult wood ducks (18%) than in immature wood ducks (2%). When data from adults and juveniles in the winter samples were analyzed separately to eliminate the bias of the summer samples in favor of juveniles and adult females, adults had a significantly ($P = 0.0013$) higher prevalence than immatures, 25% versus 5%, respectively. There was no significant difference between the Ted Shanks and Duck Creek areas during the summer ($P = 0.60$) and winter sampling periods ($P = 0.40$). Infections in migrating or wintering populations were significantly ($P < 0.001$) more prevalent (32 of 188), than in breeding populations (5 of 183) (Table 1).

TABLE 1. Prevalence of hematozoans in wood ducks at Duck Creek and Ted Shanks Wildlife Management Areas, Missouri, 1989 to 1990.

		Number infected			
	Number examined	*Haemoproteus nettionis*	*Leucocytozoon simondi*	Microfilaria	Total
Duck Creek					
Summer					
AHY(M)[a]	3	0	0	0	0
AHY(F)	26	1	0	0	1
HY	47	0	0	0	0
Total	76	1	0	0	1
Winter					
AHY(M)	35	7	0	2	7
AHY(F)	15	2	0	1	2
HY	36	2	0	1	3
Total	86	11	0	4	12
Ted Shanks					
Summer					
AHY(M)	3	0	0	0	0
AHY(F)	30	4	0	0	4
HY	74	0	0	0	0
Total	107	4	0	0	4
Winter					
AHY(M)	35	8	2	1	8
AHY(F)	29	11	0	0	11
HY	38	1	0	0	1
Total	102	20	2	1	20
Totals					
AHY(M)	76	15	2	3	15
AHY(F)	100	18	0	1	18
HY	195	3	0	1	4
Total	371	36	2	5	37

[a] AHY(M) = after hatching year male; AHY(F) = after hatching year female; HY = hatching year bird.

DISCUSSION

Of the 371 wood ducks sampled during 1989 and 1990, over half (53%) were immature. However, the large number of immature wood ducks sampled was desirable because this age class would best illustrate if parasite transmission occurred on these study areas (Bennett et al., 1982). If the appropriate insect vectors were present and active transmission was occurring, then immature birds would be expected to harbor infections. However, parasitemias were not observed in any of the immature wood ducks sampled at either area during the summer sampling periods (Table 1).

Four adult females from Ted Shanks and one from Duck Creek harbored *H. nettionis* during the summer sampling period. These five hens had low grade parasitemias, with a mean (±SD) intensity of 7.2 (±2.9) parasites per 10,000 erythrocytes. Thus, we believe that the hens probably contracted their infections in previous years and at different areas as result of their dispersal behavior (Bellrose, 1980). These infected individuals could serve as a reservoir for the transmission of blood protozoans to other waterfowl in these areas if a suitable vector were present, as suggested by Fallis and Bennett (1966). After examination of the banding data it was found that four parasite-free wood ducks were recaptured. Examination of the subsequent blood samples showed that they had remained uninfected.

Based on these observations, we suggest that suitable insect vectors were not present, or that factors such as habitat preference, behavior, or densities of the host or insect vector may act to inhibit transmission of these blood parasites (Bennett et al., 1975; Thul and O'Brien, 1990).

We found infections were significantly more prevalent in adults. This was consistent with the findings of Thul and O'Brien (1990) in Florida (USA), where they also concluded that active transmission was not occurring. The difference in migration chronology of northern wood duck populations versus those populations from more southerly regions may be a plausible explanation. Wood ducks in the upper Mississippi Flyway typically begin fall migration in early September, with the adult males being the first to move (Bellrose, 1980). Immature wood ducks may not begin their migration with adults but may rely on stimuli such as climatic conditions, food availability, instinct, or hunting pressure to initiate their fall migration.

With these behaviors in mind, the timing of winter collection is critical. Our winter collection time was restricted to early November; thus samples may have included both infected adult migrants, and the uninfected immature population that fledged locally or had dispersed from other areas where active transmission was not occurring. The arrival of the infected migratory population also was the most likely explanation for the increased prevalence observed in the winter samples.

Using data obtained from the model presented by Thul and O'Brien (1990), we found a higher percentage (31%) of northern migrants harvested at Ted Shanks than at Duck Creek (21%). Ted Shanks lies virtually in the confluence of the Mississippi River, while Duck Creek is located approximately 100 km away at its nearest point. Therefore, the percentage of northern migrants an area in Missouri received may have been influenced by its proximity to the Mississippi River, This may explain the presence of *L. simondi* and the higher prevalence of *H. nettionis* in the winter samples at Ted Shanks.

The lower percentage of migrants in the wood duck harvest at Duck Creek also may have been a result of the tendency of wood ducks in the southeast region of Missouri to remain year-round during years with mild winters, as suggested by band return data collected by the Missouri Department of Conservation. Therefore, many uninfected local wood ducks may have been included in the winter samples.

Based on our results, the southward limit of active *H. nettionis* transmission in the Mississippi Flyway lies north of the 37°N latitude as described by Thul et al. (1980) in the Atlantic Flyway. It is certainly pos-

sible that the southern limit may lie somewhere above 39°30'N latitude, since we concluded that no infections or reinfections occurred at the northern collection site. The estimated limit for the active transmission of *L. simondi* and *S. fallisensis* remains 42°N latitude, as described by Thul et al. (1980), because Missouri is initially located well south of this described range.

The use of the parasite tag model (Thul and O'Brien, 1990) in Missouri, as well as other southern states in the Mississippi Flyway, ultimately requires further field and laboratory studies investigating the distribution and abundance of these hematozoa. Thus, the significance of this biological tag model as a viable tool, when used in conjunction with existing banding programs, in wood duck management will become apparent.

In general, blood parasites were detected in relatively few wood ducks. Although the levels of parasitemia reported in this survey were too low to be of clinical significance, the hematozoa remained active and viable in the wintering waterfowl populations in Missouri. The breeding wood duck population in Missouri did not appear to be subject to the effects of blood protozoa as do their counterparts breeding in the northern and northeastern regions of North America.

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LITERATURE CITED

BELLROSE, F. C. 1980. Ducks, geese, and swans of North America. Stackpole Books, Harrisburg, Pennsylvania, 543 pp.

BENNETT, G. F. 1970. Simple techniques for making avian blood smears. Canadian Journal of Zoology 48: 585–586.

———, AND C. MACINNES. 1972. Blood parasites of geese of the McDonnell River, N.W.T. Canadian Journal of Zoology 50: 1–4.

———, W. BLANDIN, H. W. HUESMANN, AND A. G. CAMPBELL. 1974. Hematozoa of the Anatidae of the Atlantic Flyway. I. Massachusetts. Journal of Wildlife Diseases 10: 442–451.

———, A. D. SMITH, W. WHITEMAN, AND M. CAMERON. 1975. Hematozoa of the Anatidae of the Atlantic Flyway. II. The Maritime Provinces. Journal of Wildlife Diseases 11: 280–289.

———, D. J. NIEMAN, B. TURNER, E. KUYT, M. WHITEWAY, AND E. C. GREINER. 1982. Blood parasites of prairie anatids and their implication in waterfowl management in Alberta and Saskatchewan. Journal of Wildlife Diseases 18: 287–296.

FALLIS, A. M., AND G. F. BENNETT. 1966. On the epizootiology of infections caused by *Leucocytozoon simondi* in Algonquin Park, Canada. Canadian Journal of Zoology 44: 101–112.

GREINER, E. C., G. F. BENNETT, E. M. WHITE, AND R. F. COOMBS. 1975. Distribution of the avian hematozoa of North America. Canadian Journal of Zoology 55: 1762–1787.

HERMAN, C. M. 1968. Blood protozoa of free-living birds. *In* Diseases in free-living wild animals, A. McDiarmid (ed.). Symposium of the Zoological Society of London Number 24, Academic Press Inc., New York, New York, pp. 177–195.

———, J. O. KNISLEY, JR., AND G. D. KNIPLING. 1971. Blood parasites of wood ducks. The Journal of Wildlife Management 35: 119–122.

SOKAL, R. R., AND F. J. ROHLF. 1987. Introduction to biostatistics. W. H. Freeman and Company, New York, New York, 363 pp.

THUL, J. E., AND T. O'BRIEN. 1990. Wood duck hematozoan parasites as biological tags: Development of a population assessment model. *In* Proceedings of the 1988 North American Wood Duck Symposium, L. H. Fredrickson, G. V. Burger, S. P. Havera, D. A. Graber, R. E. Kirby, and T. S. Taylor, (eds.). Gaylord Memorial Laboratory, University of Missouri, Columbia, Missouri, pp. 323–334.

———, D. J. FORRESTER, AND E. C. GREINER. 1980. Hematozoa of wood ducks (*Aix sponsa*) in the Atlantic Flyway. Journal of Wildlife Diseases 16: 383–390.

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