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HEMATOZOA IN SAGE GROUSE FROM COLORADO¹

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Abstract: Blood films from 361 sage grouse (*Centrocercus urophasianus*) from North Park, Colorado, were examined for hematozoa. Parasites found were: *Plasmodium pedioecetii*, *Haemoproteus canachites*, *Leucocytozoon bonasae*, *Trypanosoma avium*, and microfilariae. The sage grouse represents a new host record for *Plasmodium*. Prevalence of parasitism was not age or sex related, with no significant ($P > 0.05$) differences between age or sex class. Parasite burdens increased significantly ($P < 0.05$) from January through May. As these burdens rose prior to the emergence of potential vectors, probably it was a true relapse associated with the resumption of the hosts' sexual activity.

INTRODUCTION

Sage grouse (*Centrocercus urophasianus*) occur in 11 western states and two Canadian provinces¹ and are major game species in at least five states. While widely distributed, this unique species of grouse has experienced population declines in some areas, especially at the periphery of its occupied range.^{1,7} Suspected causes of apparent declines in population levels are primarily related to habitat alteration,^{6,7,8} although cause and effect are poorly documented.

Protozoan and helminth parasites of sage grouse have been reported by several workers.^{7,9,10,11} Review of available references on parasites of sage grouse reveals that no systematic studies have been made on parasite burdens of this species. Only three studies^{5,12,14} have reported on the prevalence of hematozoa in sage grouse. Stabler *et al.*¹² examined bone marrow from three birds from Colorado and reported no parasites, while Clark *et al.*⁵ checked blood from one sage grouse from central Washington with negative results. In 1974 Stabler *et al.*¹⁴ examined blood films from 30 sage grouse from Colorado, of which 27 were

positive for hematozoa (*Haemoproteus canachites*—6; *Leucocytozoon bonasae*—27; *Trypanosoma avium*—8; microfilariae—4). Prevalence of parasitism by age, sex, and time of year, was not given.

Because of the dearth of available information on the normal hematozoan burden of this important game species, this survey was undertaken.

MATERIALS AND METHODS

Sage grouse were located with spotlights and captured at night on their roosts with long-handled nets. In early morning they were caught on strutting grounds using cannon nets.³ A few were captured during the daytime in late summer with long-handled nets. In addition, samples were obtained each year from a few birds shot by hunters. All records were from North Park, Jackson County, Colorado. North Park is a high (2435–2590 m elevation) sagebrush (principally *Artemisia tridentata*) dominated intermontane valley in north central Colorado near Walden. The study area has been previously described.^{2,3}

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TABLE 1. Prevalence of blood hematozoa by age, sex and month from sage grouse in North Park, Colorado.

	Birds Examined	Number Positive [□]	P.	H.	L.	T.	M.
<i>Adult Males</i>							
January-March	10	1 (10.0)		1			
April	62	17 (27.4)		4	13	1	
May	31	27 (87.1)		3	26	9	1
July-September	4	4 (100.0)			4		
Subtotals	107	49 (45.8)		8	43	10	1
<i>Yearling Males</i>							
January-March	7	1 (14.3)			1		
April	46	15 (32.6)		1	14		
May	34	21 (61.8)		3	20	4	1
July-September	4	4 (100.0)			4	2	4
Subtotals	91	41 (45.1)		4	39	6	5
<i>Chick Males</i>							
July-September	12	12 (100.0)		2	12	3	1
<i>Total Males</i>	210	102 (48.6)		14	94	19	7
<i>Adult Females</i>							
January-March	12	2 (16.7)		2			
April	51	21 (41.2)	2	3	17	3	1
May	11	9 (81.8)		4	8	1	
July-September	7	7 (100.0)		3	6	3	1
Subtotals	81	39 (48.1)	2	12	31	7	2
<i>Yearling Females</i>							
January-March	4	1 (25.0)		1			
April	35	13 (37.1)		2	10	1	
May	18	14 (77.8)		3	14	1	
July-September	6	6 (100.0)		1	6		2
Subtotals	63	34 (54.0)		7	30	2	2
<i>Chick Females</i>							
July-September	7	7 (100.0)			7	1	
<i>Total Females</i>	151	80 (53.0)	2	19	68	10	4
<i>Grand Total</i>	361	182 (50.4)	2	33	162	29	11

□ Percent positive presented in parentheses.

Note: P. = *Plasmodium*; H. = *Haemoproteus*; L. = *Leucocytozoon*; T. = *Trypanosoma*;
M = *Microfilaria*.

Blood was obtained from a toenail of birds trapped for banding. Films from hunter-killed birds were made from any bleeding wound. They were labeled by date, age, and sex, and were subsequently stained with Giemsa. All films were first scanned under low magnification (150X) before being examined under oil (1455X). In all, 361 usable films collected in 1974-76 were examined.

RESULTS AND DISCUSSION

The data were compiled by age (adults = second year of life and older; yearlings = 6 to 15 months of age; chicks = 4 to 12 weeks of age), sex, and time of collection. No significant differences ($P > 0.05$) were found between years (1974 vs 1975; 1974 vs 1976; 1975 vs 1976) and the data were pooled. Results are presented in Table 1.

Differences in prevalence of parasitism between adults versus yearlings, and males versus females, were not significant ($P > 0.05$). There were significant differences ($P < 0.05$) between samples from May versus January-through-March in both sex and age classes (Table 1). It is evident that the number of birds showing parasitemia increased from January through May, with all birds ($N = 40$) being positive in the July-through-September period.

An examination of the data by time interval revealed some important facts. Only five of 33 birds (15%) in the January-to-March period showed a parasitemia, with no mixed infections. Of 194 birds checked in April, 66 (34%) showed parasites, three (5%) with mixed infections ($L,T-1$; $L,H-1$; $L,H,P-1$). (See Table 1 for abbreviations.) Of 94 grouse examined in May, 71 (76%) showed parasites, and 36 (51%) had mixed infections ($L,T-15$; $L,T,M-2$; $L,H-13$; $L,H,T-3$; $L,M-3$). There was parasitemia in all 40 of the July-September

birds, seven (18%) with mixed infections ($L,H-1$; $L,H,M-1$; $L,T,M-1$; $L,M-4$).

In North Park male sage grouse generally arrive on leks and commence displaying about 15-20 March. Mating starts about 1 April with egg laying commencing in late April and May. Coincidentally, the percentage of parasitemias begins to rise, reaching its height in May. Ceratopogonids appear in early May with simuliids and culicids appearing in mid-to late May and early June. By early August most potential vectors are gone as North Park becomes quite dry. Hippoboscids are on the grouse throughout the year. It is to be regretted that collections of these insects were not made so that specific identification could have been accomplished.

From the above sequence of events it appears that the rise in parasite incidence is a true relapse phenomenon, beginning soon after the resumption of sexual activity, and preceding the appearance of most potential vectors. Such a reproduction-related relapse was described by Chernin,⁴ who showed that the rise in parasitemia of *Leucocytozoon simondi* in the domestic duck was directly related to increase in sexual (hormonal) activity (egg laying).

It is of interest that the *Plasmodium* reported here is the same species (*P. pedioecetii*) as recently described from other Colorado galliforms by Stabler and Kitzmiller.¹³

For comparative purposes, studies of sage grouse hematozoa in other areas of their occupied range would have merit. This is especially true for areas that have relatively less moisture than North Park. Studies should sample birds during all times of the year, especially in the October-through-March period. Different age and sex classes should also be sampled.

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