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Authors: KOCAN, R. M., and KNISLEY, J. O.

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## Incidence of Malaria in a Wintering Population of Canvasbacks (*Aythya valisineria*) on Chesapeake Bay

R. M. KOCAN and J. O. KNISLEY

Bureau of Sport Fisheries and Wildlife  
Patuxent Wildlife Research Center  
Laurel, Maryland 20810

### Abstract

Canvasback ducks wintering on Chesapeake Bay had a 6% incidence of *Leucocytozoon simondi* and 2% incidence of *Haemoproteus*. Sub-inoculation of whole blood into Pekin ducklings produced a *Plasmodium* infection rate of 31%. Females were more frequently infected (12/22) than males (15/68). The parasite was identified as *P. circumflexum*.

There are relatively few reports on the occurrence of *Plasmodium* in waterfowl<sup>1,2,3</sup> and only three documented cases in North American diving ducks.<sup>4,5,6</sup> Most reports have resulted from examination of a single infected birds and little or nothing is known of the parasite's effect on the host. Reports on *Leucocytozoon* have shown that practically every species

of waterfowl examined becomes infected and that this parasite is highly pathogenic in young birds.

To follow up the report of a *Plasmodium*-infected canvasback in Michigan,<sup>4</sup> a wintering population of canvasbacks was examined in order to determine the infection rate and to initiate studies on the effect of the parasite on ducks.

### Materials and Methods

During banding operations on Chesapeake Bay (Cove Point, Md.) in January 1970, 3 ml samples of blood were taken from 88 canvasbacks (68 males and 20 females). From these samples, blood films were made and examined for *Leucocytozoon*, *Haemoproteus*, and *Plasmodium*. Each of the blood samples was inoculated intravenously (2 ml each) into 5-day-old Pekin ducklings. Blood films of these recipient birds were examined microscopically three times weekly for 6 weeks.

Four serial transfusions from two of these recipient ducklings were made to increase the parasitemia in our experimental ducklings. When a heavy parasitemia resulted (20-30 percent) five 1-week-old ducklings were each infected with 1 ml of blood from the heaviest infected duckling. Blood sample then were taken 3 times per week and counted with a Coulter Counter to determine if red cell loss resulted from infections by this species of *Plasmodium*.

### Results

Blood films of the trapped ducks revealed an infection rate of 6% *Leucocytozoon* and 2% *Haemoproteus*. Inoculation of ducklings with this blood produced *Plasmodium* infections in 12 of 20 fe-

males (60%) and 15 of 68 males (22%) for an overall infection rate of 31% among the 88 recipient ducklings. These infections ranged from extremely light (1 or 2 parasites per slide) to moderate

(up to 5 parasites per  $10^6$  cells), No red cell loss or other pathological effects were observed in the recipients.

Serial passage of blood from two of the recipients produced extremely high parasitemias in five 1-week-old ducklings after four transfers. The mean red cell

loss was  $1.4 \times 10^6$  (1.1 to 1.6) or 56 percent red cell destruction. These ducklings showed no other signs of illness and no mortality resulted.

On the basis of morphological characteristics, the parasite was identified as *P. circumflexum*, identical to the isolate from the Michigan canvasback.<sup>4</sup>

#### Discussion

Since the canvasbacks were sampled during the winter when hematozoon infections are usually latent, no discussion of the effect of these hematozoa on the host is possible. It is assumed that infection occurred either on the breeding grounds when the ducks were first hatched or on a subsequent return to the breeding areas.

The very light, transient parasitemias observed in the recipient Pekins would at first indicate that the *Plasmodium* is non-pathogenic for ducks. Although this may well be the case, it must be remembered that our infections were blood-induced and in a different host species. It is not known what happens to young canvasbacks following transmission of the infection by mosquitoes. The readily adaptable nature of the parasite following serial transfers in ducklings indicates that it may produce more than a transient infection in its natural host.

The higher infection rate in females (60%) than in males (22%) is difficult to explain although it may be due to chance in view of the small samples studied. Since the females remain on the potholes during the entire summer and the males congregate on the large staging areas, it is possible that the males are exposed to fewer infected mosquitoes, thus reducing their risk of becoming infected.

Study of the canvasback on its breeding grounds is necessary to ascertain the effect of parasitism on the survival of ducklings and to explain the different infection rates in males and females. This type of work is even more critical for *Leucocytozoon*, since laboratory transmission of this organism is unreliable and its effect on other waterfowl species has been devastating.

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