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INFECTION AND MORTALITY IN CAPTIVE WILD-TRAPPED CANVASBACK DUCKS

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Abstract: Fungal, bacterial and malarial infections, as well as malnutrition caused heavy mortality in a group of wild-trapped canvasbacks (*Aythya valisineria*) held in 10 x 3 x 2 m open-water pens. Deaths occurred between 21 and 158 days after confinement and were associated with infections of *Aspergillus fumigatus, Escherichia coli, Staphylococcus* sp., *Streptococcus* sp., *Klebsiella* sp., *Enterobacter* sp., and *Plasmodium* sp. Infection and mortality was believed to result from reduced resistance associated with confinement. Fourteen canvasbacks released onto large ponds survived throughout the period during which the penned birds died.

INTRODUCTION

Captive wild animals frequently suffer infection and mortality associated with their captive state. This could be related to any of several conditions including inadequate diet, unnatural social interactions and fatigue from constant attempts to escape.

A high rate of mortality was observed in a group of 50 Canvasback ducks (*Aythya valisineria*) collected on the Chesapeake Bay and held in small enclosures for color marking experiments. Attempts were made to identify the agents and conditions associated with the high mortality.

MATERIALS AND METHODS

From November, 1972, to March, 1973, 50 canvasbacks (40 males and 10 females) were live-trapped on Chesapeake Bay. The birds were held in groups of 10 to 20 in wire enclosures measuring 10 x 3 x 2 m with shallow (0-0.6 m) flowing water covering approximately 80% of the pen bottom. Whole corn, duck pellets, and various mixed seeds were given below water, above water, and on land. Birds were observed to feed only on the submerged seeds.

In March, 1973, 10 of these wing-clipped canvasbacks (5 males and 5 females) were released on a 1.6 ha pond whose depth did not exceed 1.5 m. These birds were subsequently observed feeding on submerged corn and presumably on natural food in unbaited areas. No deaths occurred among these birds during the succeeding 4 months, even though mortality continued in the remaining penned birds. In May the six surviving penned canvasbacks were wing-clipped and released in an open-top 0.4 ha 0.9-meter-deep pond. Two of these birds died within 1 week, but the remaining four were observed feeding on numerous occasions and presumably were in good health.

Each morning and evening throughout the observation period the wire enclosures were checked for dead ducks; these were obtained for necropsy. Isolation of infectious agents was attempted only on those birds considered to have died within

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2 to 3 hr. Birds not unduly dehydrated or waterlogged from prolonged submersion were weighed to determine weight changes associated with their condition.

Material from lungs, liver and spleens of 15 birds was streaked onto blood agar and Sabouraud's media with an inoculating loop and incubated 48 hr at 37 C. Primary isolations from these birds were identified by the Maryland State Animal Health Department. Virus isolation was not attempted.

Prior to and throughout the observation period, 12 redhead ducks (*A. americana*) and 12 lesser scaup (*A. affinis*), all hatched and reared in captivity, were housed in the same enclosures as the wild canvasbacks, separated by a wire fence.

RESULTS

Thirty-six of the original 50 birds died in captivity. Data on weight changes of 28 of the dead canvasbacks are presented in Table 1. These birds survived from 21 to 158 days (mean = 73 days), with the average time until death for immature males being 118 (± 46) days, over twice the average time for adults of both sexes (mean = 48 days). Cultures from 3 of the 15 birds examined for infectious agents were negative. These three birds were obviously emaciated and death appeared to be due to starvation. Mean weight loss of the 12 infected birds was 375 g as compared to 382 g for the remainder of the 28 birds. The mean time to death for infected birds was 73 days, the same as the mean for all 28 birds examined.

Aspergillus fumigatus occurred in seven birds, *Escherichia coli* in six, and a nonhemolytic *Staphylococcus* in four. These were the most prevalent organisms encountered. One isolation each was made of *Klebsiella,* an alpha-hemolytic *Streptococcus,* and two of *Enterobacter.* Multiple isolations of two or more of these agents were obtained from seven of the 12 infected canvasbacks. One adult male had a *Plasmodium* infection evident from a greatly enlarged and darkened spleen as well as numerous circulating intraerythrocytic stages of the protozoan.

The 12 redheads and the 12 scaup housed with the canvasbacks all survived until the termination of the observation period.

DISCUSSION

None of the organisms isolated, with the exception of *Plasmodium,* is normally a primary pathogen. Ordinarily they are opportunistic secondary invaders, relying on some debilitating condition to alter the host's defense mechanisms. In this situation the debilitating condition appeared to be associated with confinement, a hypothesis supported by the high rate of survival among those birds released onto the ponds. The hypothesis is further supported by the survival of the penreared redheads and scaup housed in the same enclosure with the canvasbacks, separated only by a wire fence. Their early adaptation to confinement and acceptance of the types of food presented probably eliminated confinement as a stress factor.

The single case of malaria was apparently a relapse of an earlier infection.[4,5] The relapse could have been caused by reduced resistance or by the increasing spring photoperiod. Whatever the cause, this is the first documentation of *Plasmodium* sp. being associated with a pathogenic condition in canvasbacks.

The types of food and method of presentation may have been unacceptable to the unconditioned wild birds, thus resulting in inanition. This, however, does not appear to be the sole problem. Longcore[6] stated that experimentally starved ducks lived an average of 11.5 days and reported an average weight loss for these birds of 33.8% of their original weight. Our weight data are similar to Longcore's, with an average loss of 29% for all birds, ranging from 24% for adult females to 33% for adult males, but survival time of our ducks was considerably longer (mean = 73 days).

The role played by social interaction in debilitating these birds is unknown. It seems likely, however, that a social hierarchy would be established soon after the birds were placed together, thus forcing

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TABLE 1. Weight changes of wild canvasbacks which died in captivity.

Age	Sex	Number	Initial wt (g)	Post Mortem wt (g)	Weight Loss (g)	Days until death
Adult	Male	14	Mean 1321	892	429	49
			S. E. ± 82	± 111	± 143	± 23
			Range 1200-1460	710-1050	210-660	21-85
Adult	Female	4	Mean 1025	775	250	46
			S. E. ± 54	± 99	± 45	± 16
			Range 960-1090	670-990	190-290	23-54
Immature	Male	10	Mean 1201	852	349	118
			S. E. ± 98	± 122	± 123	± 46
			Range 1070-1420	530-960	160-610	27-158

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some birds into a submissive role and reducing their resistance by increasing adrenocortical steroid levels,[1,2,7] thereby allowing otherwise non-invasive organisms to become invasive.

No explanation can be given for the longer survival time of immature males. An age class difference in mortality was also observed by Kabat *et al.*[3] who found that adult hen pheasants showed a higher survival rate than immatures during a 3-week experimental stress period.

The losses of confined wild canvasbacks clearly demonstrates some of the pathological and nutritional problems that can occur during captivity. Larger pen size or small ponds appear to be preferable in holding wild canvasbacks over an extended period.

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