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RENAL COCCIDIOSIS IN MALLARD AND PINTAIL DUCKS

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Abstract: Renal coccidiosis was diagnosed in 3 of 45 mallards (*Anas platyrhynchos*) and 2 of 7 pintails (*Anas acuta*) collected in Saskatchewan. Oocysts recovered from two of these birds were similar to, but larger than, those of *Eimeria truncata*. Pathologic changes associated with the coccidial infection as well as that seen in association with other renal parasites are described.

INTRODUCTION

Renal coccidiosis due to *Eimeria truncata* can be a serious disease in domestic geese (*Anser anser*), and renal infection with coccidia has been reported in several wild avian species (Table 1).

Renal coccidiosis in ducks has received little attention and the reports available are often contradictory. Tiboldy¹⁷ failed to transmit *E. truncata* from geese to ducks, but Pavlov¹⁵ and Kucharova et al.¹⁰ have reported this species in the domestic mallard duck. Walden²¹ described a new species, *E. boschadis*, from 1 of 27 mallards examined in Sweden, and also reported another case of coccidiosis which had been described to him by a co-worker. Oocysts in the latter case were said to resemble those of *E. truncata*.²¹ Renal coccidiosis has apparently not been reported in ducks from North America.

The purpose of this report is to document renal coccidiosis in wild mallards and pintails collected in Saskatchewan, and to give a brief description of the pathologic lesions associated with the coccidia and other renal parasitic conditions encountered in these ducks.

METHODS

The impetus for this survey was the discovery of organisms resembling coccidial gametocytes in the epithelium of renal tubules and ureteral branches of an adult female mallard submitted for ne-

cropsy in August of 1973, (Fig. 1). These organisms appeared to be an incidental finding in this case, and no material was available from which oocysts could be recovered. Subsequently, during the regular hunting season (September to November, 1973) specimens were collected from 45 mallards and 7 pintails which had been shot in the vicinity of Saskatoon, Saskatchewan.

The birds were identified as to species and classed as juvenile, (young of the year), or adult on the basis of plumage characteristics;^{1,18} sex was determined by internal examination. One kidney from each bird was fixed in 10% buffered formalin, and several transverse sections were prepared. These were processed routinely, sectioned at 6 μ and stained with hematoxylin-eosin (H&E). The other kidney from each bird was removed, and a small amount of the ureteral content was expressed and examined for oocysts by phase contrast microscopy. In cases in which oocysts were found, the remainder of the ureteral content was placed in a 2% solution of potassium dichromate, and checked for oocysts sporulation at 24 hr intervals.

RESULTS

Gross Findings and Description of Oocysts

Irregular pale mottling of the surface was present on the kidneys of many of the birds, but this could not be related to any specific etiology. In one adult

male mallard, distinct, 1 to 2 mm, white foci were visible throughout the renal parenchyma (Fig. 2). Individual foci teased from the kidney and crushed on glass slides were found to contain large numbers of oocysts (Fig. 3). Material from the ureter of this bird also contained a small number of oocysts. Similar oocysts were found in the ureteral content of one juvenile male mallard, but no gross lesions were evident in that bird.

The oocysts were oval with a truncate end. The oocyst wall was colorless, smooth, and appeared to form a collar about the micropyle, (Fig. 3). The ex-

ternal dimensions (mean, minimum and maximum) of 50 oocysts were:

length—24.0 (21.5-27.3) μ

width—12.4 (11.7-13.7) μ

In oocysts removed from the ureter the sporont was oval and measured approximately 16 x 11 μ . Some oocysts sporulated after 24 hr at room temperature and most were sporulated at 48 hr. Four sporocysts measuring approximately 9.4 x 6.1 μ and each containing two sporozoites were present in the recently sporulated oocysts.

TABLE 1. Reported occurrence of renal coccidiosis in wild birds.

Host	Coccidia	Author
Greylag goose (<i>Anser anser</i>)	<i>E. truncata</i>	3, 21
Greater Snow goose (<i>Anser coerulescens</i>)	<i>E. truncata</i>	20
Bar-headed goose (<i>Anser indicus</i>)	<i>E. truncata</i>	20
Canada goose (<i>Branta canadensis</i>)	<i>E. truncata</i>	3, 5, 6, 21
Ross' goose (<i>Chen rossi</i>)	<i>E. truncata</i>	6
Mute swan (<i>Cygnus olor</i>)	<i>E. christianseni</i> ^a	21
Common eider (<i>Somateria mollissima</i>)	<i>E. truncata</i> ^b	3
	<i>E. somateriae</i>	3, 21
Long-tailed duck (<i>Clangula hyemalis</i>)	<i>E. somateriae</i>	21
Mallard (<i>Anas platyrhynchos</i>)	<i>E. boschadis</i>	21
Woodcock (<i>Philohela minor</i>)	Unidentified	12
Great-horned owl (<i>Bubo virginianus</i>)	Unidentified	7
	(<i>Klossiella</i> sp?)	
Short-tailed shearwater (<i>Puffinus tenuirostris</i>)	<i>Eimeria</i> sp.	14
Cory's shearwater (<i>Puffinus diomedea</i>)	Unidentified	14

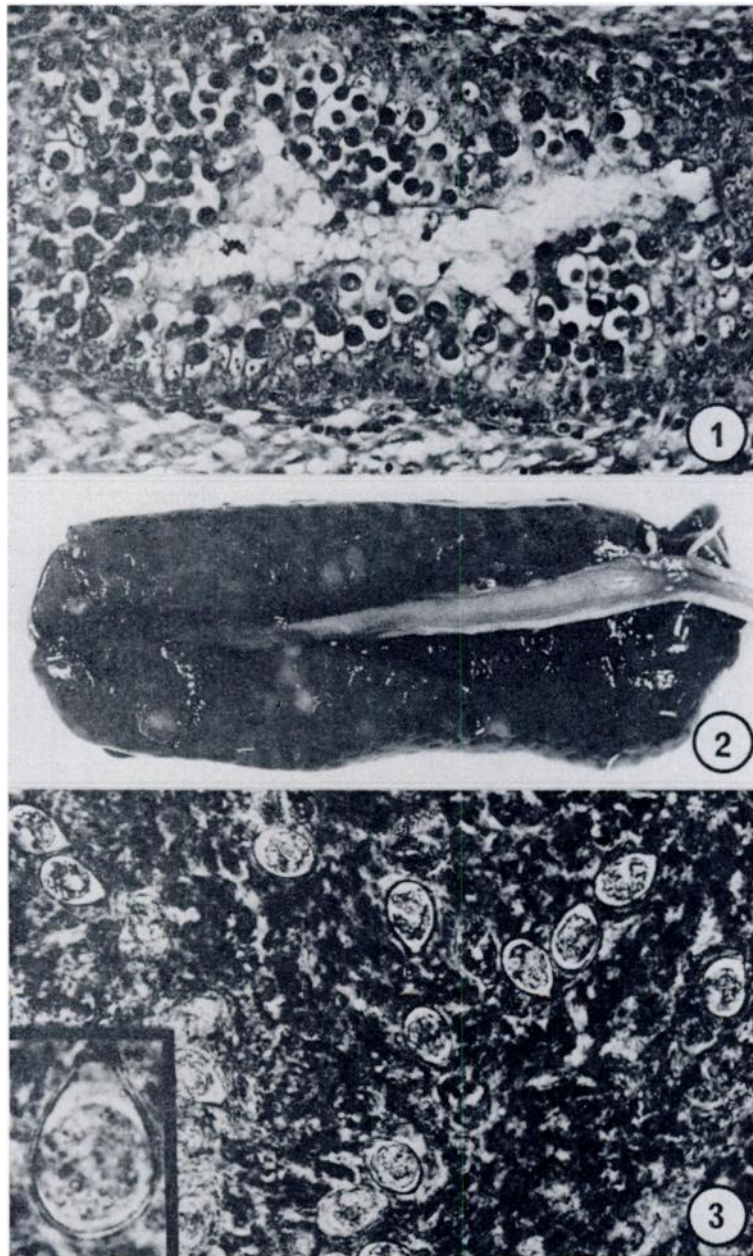
^a originally identified as a variant of *E. truncata*.⁸

^b described by Christiansen,³ regarded as likely a separate species by Walden.²¹

FIGURE 1. Primary ureteral branch of adult female mallard. Numerous intracellular parasites resembling coccidial gametocytes. H&E x 375

FIGURE 2. Kidney of adult male mallard. Numerous 1-2 mm white foci are present in the renal parenchyma.

FIGURE 3. Unstained wet mount of material expressed from foci illustrated in Fig. 2. Numerous oocysts with one truncate pole are present. x 400. Inset x 1000.



Histologic Findings

Lesions due to several etiologic agents were present in the kidneys of these birds (Table 2). The most common lesions were multiple granulomas, most of which contained material recognizable as remnants of trematode ova (Fig. 4). Similar granulomas were seen in both mallards and pintails, but were much more common in juvenile than in adult birds (Table 2). Coccidia were detected histologically in the kidney of four birds including the adult male mallard in which gross lesions were previously described (Table 2). No histologic evidence of coccidial infection was found in the kidney of the other bird from which oocysts had

been recovered. Lesions associated with the coccidia were focal in nature with scattered collections of gametocytes in epithelial cells of primary ureteral branches, cortical tubules and tubules in the medullary tract. No inflammatory cells were present about the gametocytes, but in other areas of the kidney of the same birds, infiltrations of lymphocytes, heterophils and mononuclear cells surrounded tubules distended with oocysts, cellular debris and large numbers of heterophils (Fig. 5).

Parasites were observed in the primary ureteral branches of six birds (Table 2). In three of these birds the parasites appeared to be cestodes (Fig. 6), while those present in the other birds were

TABLE 2. Prevalence of histologic lesions in the kidneys of ducks.

Species	Sex	Age	Number examined	Coccidiosis	(Trematode ova)	Ureteral parasites	
						Trematode	Cestode
Mallard	Female	Juvenile	8	—	5	—	1
		Adult	3	—	—	—	1
	Male	Juvenile	25	1 ^a	9	3	1
		Adult	9	1 ^b	1	—	—
Pintail	Female	Juvenile	4	2 ^a	2	—	—
		Adult	1	—	—	—	—
	Male	Juvenile	2	—	1	—	—
		Adult	—	—	—	—	—

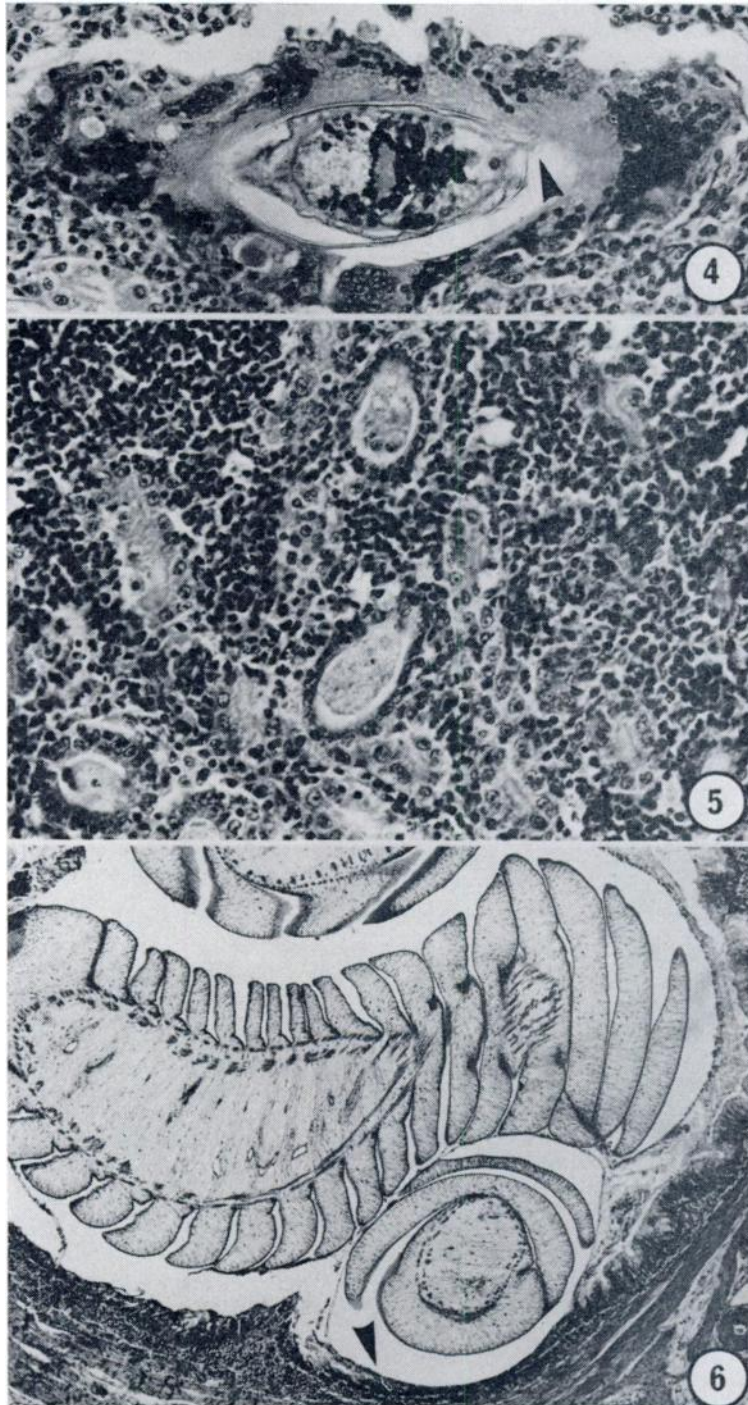
^a No gross lesions, oocysts not observed in ureteral contents

^b Gross lesions, oocysts in ureteral contents

FIGURE 4. Kidney of juvenile female mallard. Granuloma surrounding trematode ovum containing well developed miracidium. Note small spine on ovum (arrow). H&E x 370.

FIGURE 5. Kidney of juvenile female pintail. Intense interstitial infiltration of lymphocytes, heterophils and mononuclear cells about tubules distended with cellular debris and oocysts. H&E x 145.

FIGURE 6. Primary ureteral branch of juvenile male mallard containing parasite resembling a cestode. Note flattening and atrophy of epithelium (arrow) and sub-epithelial cellular infiltration. H&E x 60.



trematodes. Unfortunately no material was available to allow recovery of intact parasites. In two of the birds infected with cestodes and one of those in which trematodes were observed, a diffuse infiltration of heterophils was present throughout the interstitium of the kidney; and numerous heterophils were present in the ureteral walls. These lesions were not seen in birds in which ureteral parasites were absent.

DISCUSSION

The identity of the present species of coccidia is unclear. The external dimensions of the oocysts were similar to those of *E. boschadis*, but the oocysts of that species were described as bottle-shaped with an elongated neck;²¹ however, Walden²² stated, when describing the oocysts of *E. boschadis*, "The variation can be characterized as moderate. It is due primarily to the bottle-necked portion, which can be much less conspicuous than in the specimen drawn". The present species morphologically resembles *E. truncata* but the oocysts are somewhat larger than most descriptions of oocysts of that species; however, some authors^{11,18} have defined a very broad range of dimensions (14 - 27 x 12 - 22 μ) for *E. truncata*, which could include the present coccidia.

It is interesting that all species of renal coccidia described from anseriform birds, (*E. truncata*, *E. boschadis*, *E. christianseni* and *E. somateriae*), are characterized by more or less egg-shaped oocysts with a truncate end. Few, if any, of the descriptions of these species fulfill the requirements proposed by Tyzzer¹⁹ for the establishment of new species of coccidia; and in view of the many factors which can influence oocyst size within even a single species,⁴ re-examination of these coccidia is needed.

The significance of the renal parasites described in this report is unknown.

All of the birds in the study were apparently normal and in good condition; however, the histologic lesions seen in association with the renal coccidia were similar in nature to those reported in renal coccidiosis of domestic geese.⁹

Eimeria truncata can be highly pathogenic for domestic geese, and has also been reported to be pathogenic for greylag²¹ and Canada geese;⁵ *E. somateriae* was pathogenic for the long-tailed duck and common eider,²¹ and *E. christianseni* has been reported to cause lethal coccidiosis in the mute swan.⁸ Walden²² reported that *E. boschadis* was likely non-pathogenic for the mallard; however, his observations were limited to one bird with a light infection. Although *E. truncata* occurs in older domestic geese, the disease produced by this parasite is limited to young goslings. If renal coccidiosis in ducks were to act in a similar manner, mortality could occur in early summer, and birds examined in the autumn, such as in this survey, might represent only subclinical "carrier" birds.

The identity of the trematode ova found in the kidneys is unknown. Many species of trematodes of the family Schistosomatidae have been described as inhabitants of the vasculature of waterfowl, and it seems likely that ova of these species might reach the kidney via the renal portal system and become lodged in the peritubular sinuses; for example, Cheatum² found ova of *Dendrobilharzia anatinarum* in the kidneys of both mallards and pintails. The granulomas associated with the ova appeared to be resolving and it is unlikely that this would be a serious condition. The identity of the trematodes and cestodes in the ureter is unknown; however, trematodes of the genus *Renicola* have been reported from the kidneys of several species of waterfowl.³ The association of a mild ureteritis and interstitial nephritis with these parasites suggests that they could be pathogenic.

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