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PATHOLOGY OF *PARADILEPIS SCOLECINA* (CESTODA: DIPLEPIDIDAE) IN THE WHITE-NECKED CORMORANT *(PHALACROCORAX CARBO)*

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An immature white-necked cormorant, killed by a motor vehicle, was found on the causeway which crosses the south end of Lake Nakuru, Kenya. The lower abdomen had ruptured, exposing the intestine, and the sex could not be determined. The small intestine, and to a lesser extent the large, were studded with 1-2 mm white smooth hemispheric nodules (Fig. 1). The intestines were preserved in 10% formalin, and pieces were imbedded in paraffin wax, sectioned, and stained with haematoxylin and eosin, and by the Giemsa and Gram's methods.

The intestinal lesions were associated with the presence of tapeworms, their scoleces embedded so deeply into the wall of the intestine that they had penetrated the mucosa, submucosa and all but a very thin layer of muscle beneath the serosa (Fig. 2). Tapeworm strobilae extended into the lumen of the intestine. The cavity occupied by the scolex con-



FIGURE 1. Intestine of white-necked cormorant with raised nodules visible on the serosa.

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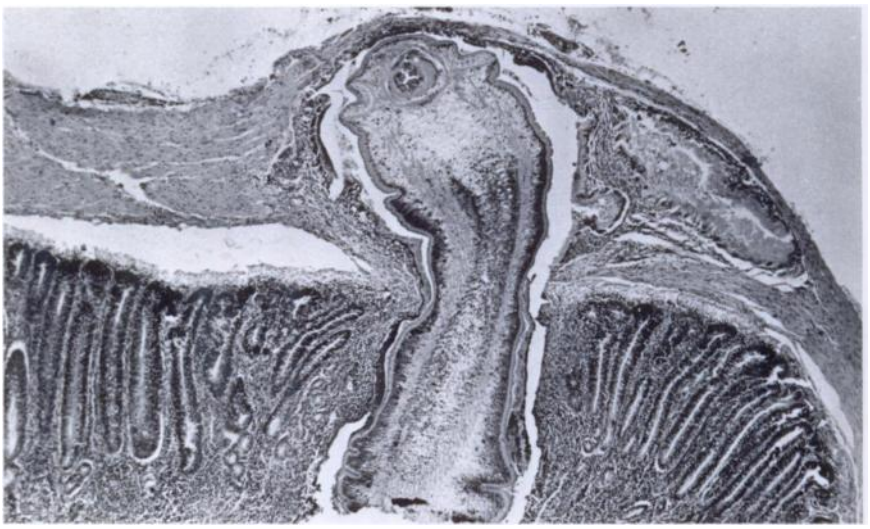


FIGURE 2. Histologic section through an intestinal nodule containing *Paradilepis scolecina*. 30×. H & E.

formed to the shape of the suckers and rostellum with its hooks. In apposition to the cuticle of the worm was a layer of eosinophilic cellular debris. More peripherally, there were concentric layers of multinucleate giant cells, and fibrocytes, sparsely infiltrated with macrophages, eosinophils and lymphocytes. The zone of fibroplasia blended into the normal smooth muscle of the intestinal wall. The space immediately surrounding the worm revealed a loose mass of cellular debris which contained a network of gram-negative bacilli. In many cases there were lateral outpouchings from the cavity containing the worm (Fig. 2). These were loosely filled with cellular debris and bacilli and appeared to have been created by withdrawal and repositioning of the head of the worm. There was no evidence that the bacteria were invasive.

Very little serosal and subserosal tissue remained to separate the worm from the peritoneal cavity. The serosa appeared to be normal. It is remarkable that penetration of the gut wall could be so consistently deep without the occurrence of complete penetration and ensuing septic peritonitis.

Tapeworms recovered from the nodular lesions were identified as *Paradilepis scolecina* (Rudolphi, 1819). Worms in preservative, stained whole mounts and histologic sections are deposited in the Commonwealth Institute of Parasitology, Helminth Collection Number 3586.

To determine if the present case (November, 1980) represented a common or an isolated occurrence, a search was made for similar cases in our laboratory files. There were necropsy records of twenty-two white-necked cormorants, all from Lake Nakuru. Nodular intestinal tapeworm lesions were seen in 7 of the 22 birds; in neither of the two examined in 1976, but in 3 of 16 in 1977, and in all four examined in 1980. Only one tapeworm lesion was found in each of the three birds found affected in 1977, whereas all four birds examined in 1980 had many lesions, the last one most heavily infected.

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The lesions in all affected birds were similar. None of the cormorants had died of peritonitis. They were found either dead of other causes, or weak and susceptible to capture by hand.

Baer (1959, Rep. Explor. Parcs Nat. Congo Belge. 1: 1-162) has published a photograph of a nodular intestinal lesion caused by *Paradilepis delachauxi* in the long-tailed cormorant, *Phalacrocorax africanus*. His illustration shows the parasite in the center of a more pronounced lesion, apparently composed of fibrous connective tissue which has securely walled off the parasite from the serosa. The nodular lesion in Baer's illustration had increased the thickness of the intestinal wall by approximately three times. The lesions in our cormorants showed much less fibrosis.

Khalil and Thurston (1973, Rev. Zool. Bot. Afr. 87: 226-227) described encysted dilepidid larvae, loosely attached to the intestinal wall, from several species of fish, including *Tilapia nilotica* and *T. zillii*, in Uganda. The only fish in Lake Nakuru is *T. grahami*, which was first introduced into the lake in or about 1960 (Vareschi, 1979. Oecologia (Berl.) 37: 321-335). Subsequently, Lake Nakuru has become a favored habitat for several species of piscivorous birds. White-necked cormorants are particularly abundant and have a breeding colony at the mouth of the Njoro River. *Tilapia grahami* should be examined as a possible intermediate host for *P. scolecina*.

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