

Nematodes in Birds of the Order Pelecaniformes.—Oglesby's report (*Auk*, 77: 354, 1960) of nematodes being a possible cause of death of a White Pelican, *Pelecanus erythrorhynchus* Gmelin, invites additional observations and comments. In 1957 I prepared as museum specimens two White Pelicans found dead or dying within the Everglades National Park. Stomachs of both contained masses of nematodes, and penetration of the stomach mucosa by some of these was noted. A third such bird was autopsied by staff members of the University of Miami's School of Medicine. According to Dr. J. W. Beck (pers. comm.) nematodes almost packed its stomach, and numbers of these were embedded in the stomach wall. He believed that these may have been contributory to the bird's death.

Large numbers of nematodes are also found in stomachs of pelecaniform birds that are in apparent normal health. L. J. Thomas (*J. Parasit.*, 23: 429-431, 1937) reported the presence of more than 200 individuals of *Contraecaecum spiculigerum* Rud. in stomachs of each of two specimens of *Phalacrocorax a. auritus* collected in Illinois. I have counted more than 100 nematodes in each of two stomachs of *Anhinga anhinga* and have made notations as to the "large numbers" of nematodes being present in stomachs of 15 of 24 birds of this species collected in south Florida. Comparable numbers of *Phalacrocorax a. floridanus* taken from both marine and fresh-water habitats in south Florida were similarly infected. Stomachs of *P. africanus*, *P. carbo lugubris*, and *Anhinga rufa*, which I collected in Kenya, contained nematodes in considerable numbers. The presence of large numbers of nematodes within the stomachs of certain species, at least, of the families Phalacrocoracidae, Anhingidae, and Pelecanidae is not unusual. I am inclined to regard such as characteristics of these families. Nematodes from stomachs of anhingas and cormorants collected in south Florida have been identified by Dr. T. C. Orihel, Research Fellow, Public Health Service, as belonging to the Genus *Contraecaecum* RAILLET & HENRY. J. F. A. SPRENT (*J. Parasit.*, 40: 608-617, 1954) summarized information of life cycles of members of the family Ascarididae. Larval forms of *Contraecaecum* are recorded from both marine and fresh-water fish. Pelecaniforms, being largely piscivorous, can receive almost continuous infection. The time required for development to sexual maturity within the final host is apparently unknown, nor is the life span of the adult known, but it can be estimated as probably several months according to Orihel (pers. comm.). With continuous infection, a large population of adults is possible for the final host.

That large populations of these adult nematodes do not necessarily damage the final host seems evident. Why does penetration of the mucosa not occur in birds in apparent normal health? What conditions may bring about such penetration?

Fishes that I have taken from stomachs of pelecaniform birds frequently contained numerous adult nematodes wriggling about through the partly, or sometimes scarcely, digested carcasses. Presumably the nematodes penetrate these fish while feeding upon them. If the host is sick or disabled to the extent that it can no longer procure fish, then the nematodes may shift feeding activities to the only other food source present, the tissues of the host's alimentary tract.

Birds of these families swallow fish whole, and the fish are often of considerable size. Digestion would be expected to be a slow process. Penetration of the ingested fish by large numbers of nematodes may contribute to the breaking up of the food masses as well as to the penetration of them by digestive juices. If this is so, then the hypothesis suggests itself that the pelecaniform-nematode relationship may be, to a degree, mutualistic. This, of course, requires confirmation.—OSCAR T. OWRE, *Department of Zoology, University of Miami, Coral Gables, Florida.*