

ECTOPARASITIC INFECTIONS ON FISH OF VOLTA LAKE, GHANA

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schizogony, an inflammatory infiltrate consisting of lymphoreticular cells was found in the lungs, livers, and spleens of all of the penguins (Fig. 3). The livers also showed extramedullary hematopoiesis. The bone marrow was very cellular in all cases showing both myeloid and erythroid hyperplasia.

In the sixth penguin, which was used for the canary and duck inoculations, there were no exoerythrocytic schizonts in the tissues; but gametocytes as well as trophozoites and immature schizonts were present in peripheral blood erythrocytes. The hematocrit in this penguin was 27.5 compared with normal values of 40-44 determined in apparently normal penguins. Hematocrit values for the other five penguins were not determined. There was no malarial pigment in any of the tissues.

A complete clinico-pathologic description of this outbreak is in preparation. In so far as we know, this is the first occurrence of *Plasmodium elongatum* reported in African penguins.

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ECTOPARASITIC INFECTIONS ON FISH OF VOLTA LAKE, GHANA

The construction of Akosombo Dam in 1964, resulted in the inundation of the Volta River basin, forming the largest known man-made lake.

Unfortunately, limited data are available on the ectoparasites of fish in the Volta River before inundation. In a survey conducted by Thomas on the Black Volta only one species of Monogenea was found (Thomas J. D., 1957, J. W. Afr. Sci. Ass. 3:178). In a later study carried out by Prah et al. in 1964 quote: "About 1.7% of 405 fish from the Volta Lake and rivers draining into it, showed helminthic infection with *Clinostomum* sp. and copepod infection with *Lernaea* sp. and *Ergasilus* sp." (Prah, S. K. et al. 1966, Man-made lake Inter. Symp. Accra).

Materials and Methods

For the collection of the ectoparasites, live fish were placed, each species in a separate jar, in 1%-2% formalin solution. After a few hours the solution strength was increased to 4% by adding more formaldehyde. Material was studied usually within one week after collection. In addition, gill parasites were collected also from specimens of rare fish species obtained from collections of the Zoology Department of the University of Ghana.

Results

Results of the survey are presented in Table 1*. Sites of collection were: The upper lake, at Yeji and Mpaha (UL), the middle sector, at Kpandu and Kete Krachi (ML), in the Afram River sector (AF) and also in Mawli River, one of the northern tributaries of the Volta River (UR). Prevalence of infection is given as the number of fish found infected. The load of the infection is represented by figures following prevalence index numbers: h, for heavy infection, m for medium and l for low infection. In the Lake fish, over 30 species of Monogenea were found belonging to 14 genera, the majority of which are endemic to the African continent. Taxonomic studies on these species were published recently. Others are in preparation (Paperna, I., 1965, Bamidgeh, 17:107, 1968 a, Proc. Helm. Soc. Wash 35 (2): 200, and b, in press, Bamidgeh). The Protozoa and Crustacea are being processed and studied, therefore, complete taxonomic data on these groups are not yet available.

Discussion

Few fish species, notably those of Mormyridae were found free from any external parasites. In East Africa, Mormyridae are found to be infected with parasitic Crustacea (Fryer, G. 1959. Proc. Zool. Soc. Lond. 132:517). Of all ectoparasite groups, Monogenea were the most common. Fish were infected with Ergasilids and Cnidosporidia (*Myxobolus*). On the other hand, Branchiura and other copepodid parasites, other than *Ergasilus*, were rare.

In earlier studies (Thomas, *loc. cit.* and Prah et. al. *loc. cit.*) fish were obtained from fishermen, thus, such fish, apparently being dead when obtained, were likely to have lost the majority of their ectoparasites, while the remainder became deeply embedded in thick mucus. Immersion of live fish in a dilute formalin solution prevents the formation of mucus and enables easy detection of the ectoparasites.

In view of the different methods of collection, there is no point in comparing recent results with earlier studies. Consequently, the possible changes in the ectoparasitofauna of the fish due to the formation of the lake could be estimated only from further surveys in river environments in West Africa.

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* See page 137 for Table 1.

TABLE 1: Ectoparasites of Fish of Volta Lake, Ghana

Fish species	Locality	No. studied	Monogenea			Ciliata Urocladai (Trichodina etc.)	Myxosporidia			Crustacea parasitica		
			Dactylogyridae	Gyrodactylidae	Diplozoidae		Nyrobolus	Thelohanellus	Henneguya	Ergasilidae	Lamproglana	Branchiura (Argulus and Gnathopetia)
Mormyrus sp.	UL	9										
Gnathonemus sp.	AF	3										
Petrocephalus bane	UL	10										
Alestes baremose	UL	10	10.m		1.1					2.1		
A. macrolepidotus	AF	3										
	ML	1	1.1									
	UR*				X*							
A. nurse	UL	5	5.h							3.m		
A. leuciscus	UL	9	3.1							9.h		
	UR	1	1.1			1.h						
Microalestes spp.	AF	4		4.h								
	UR	3	1.1									
Hydrocynus sp.	UL	1	1.h				1			1.h	1.h	
Hepsetus odoe	AF	1										
Citharus citharus	UL	1	1.h						1	1.1		
Distichodus rostratus	UL	5	5.h						5	3.1		
Laboe coubie	UL	6	6.h		6.1		6					
L. senegalensis	UL	2	2.h				2	2				
Barbus macrops	UR	7	4.m			4.1	7		7			
	ML	2										
	AF	6				1.1						
Synodontis membranaceus	UL	17	4.1			2.1	17			8.h		
S. gambiensis	UL	3								3.h		
Synodontis sp. (juv.)	UR	4	2.1				4					
Schilbe mystus	UL	9	9.h			4.1						
	UR	7	7.h									
Eutropius niloticus	UL	7	3.1									
Physalia pellucida	UL	9	2.1							2.1		
Bagrus docmac	UL	1										
Clarias lazera (juv.)	UR	3	@	3.m						3.h		
Chrysichthys nigrodigitatus	UR	6	3.1									
	ML	4	1.1									1.1
	AF	5	5.h									
Auchenoglanis occidentalis	AF	1	1.1									
Malapterurus electricus	AF	1										
Ophiocephalus obscurus	AF	6	@									
Heterotes niloticus	AF	1	1.h				1					
Lates niloticus	UL	1	1.h	1.1						1.h		
	ML	1	1.h									
Tilapia zilli	ML	1	1.1									
	AF	2	2.m			2.1	3			2.h		
	UR	3	3.m							3.h		
T. nilotica	ML	1	1.m							1.h		
T. galilaea	ML	9	2.1				3				2.1	
	AF	9	2.m			1.1	4					
Pelmatochromis guentheri	ML	8	4.m							2.1		
	AF	1	1.h									1.m
Hemichromis bimaculatus	AF	5	5.m	2.1		2.1						
	ML	1	1.h									
H. fasciatus	AF	8	8.h	8.1								
Pellonulla afzeliusi	UL	13	6.m			4.1				6.m		
	UR	7										
Cynotriasa mento	UL	2								2.1		
	ML	3										

@ Same host in smaller streams, also was infected with Dactylogyridae.

X* Diplozoon ghanense collected from the same host by Thomas.