THE ECONOMIC IMPACT OF DISEASES AND PARASITIC PROBLEMS IN FRESHWATER FISH PRODUCTION

by

OKAEME, A.N*., OBIEKEZIE, A.I**., and
OGBONDEMINU, F.S*.

*Kainji Lake Research Institute, New Bussa

**Institute of Oceanography University of Calabar

ABSTRACT

Diseases and parasitic problems could constitute significant economic losses in fish production if not controlled, thus the need to continue monitoring its prevalence. Based on field studies on feral and intensively raised fish at the Kainji Lake Research Institute, some diseases and parasitic problems have been identified. These include; helminthiasis, fungi disease; protozoa which include Myxosoma sp., Myxobolus spp., Henneguya sp., Trichodina sp., Ichthopthrius sp. bacterial mainly Aeromonas sp., Pseudomonas sp., mechanical injuries; death due to unknown causes and economic assessment of myxosporidian infection. Suggestion for disease control in fish production are recommended.

INTRODUCTION

The prevalence of disease and parasites of fresh water fish under natural condition is usually low incidence because of expanse of water and reduced risk of contact between parasites and fish (Hoffman and Bauer 1971). However under intensive management the crowded condition of large population of fish would result in heavy parasitic infection, disease and loss of fish. It is important to study the parasitic and disease conditions under natural conditions because it serves as a basis to providing needed information on potential risk of disease expected under intensive management. Common parasites and diseases of fish have been studied and reported in developed countries (Hoffman 1960, 1970, 1976), but in Nigeria there is paucity of information. This paper examines the results of findings of parasites and disease of fishes from Lake Kainji and associated tributaries of River Niger and the indoor hatchery and reservoir of the Kainji Lake Research Institute, New Bussa.

MATERIALS AND METHOD

Investigations on disease and parasites of fish were conducted from 1978 to present based on samples from field and indoor hatchery. Diagnosis were based mainly on gross pathology of post-mortem findings, and isolation of organism by microscopy examination. Fishes were submitted by staff of Fisheries Division of Kainji Lake Research Institute and from field collections. Feral fish were examined from Lake Kainji, and tributaries of River Niger, and from indoor hatchery and reservoir of the Kainji Lake Research Institute (KLRI). An estimate of the economic significance of disease in a Myxobolus sp. infection in Tilapia sp. was assessed by estimated weight loss and fecundity based on Gonado-somatic ration.

RESULTS AND DISCUSSION

Table 1 gives the summary of results of pathological investigation on some fish species from Lake Kainji and tributaries of River Niger and Table II, hatchery conditions. The most prevalent problem is helminthiasis in feral conditions with the external helminths of Clinostomum tilapia tend to disfigure the skin and the gills and the yellow-whitish nodules metaceraria of Acanthocephalus sp. distortes the gut system. Based on number of fish samples examined Sarotherodon niloticus is more susceptible to helminth infection with infection rate of 52.94% compared to Sarotherodon galilaeus 29.41% and T. zilli 17.65%. When compared to pre-impoundment studies of parasites of Sarotherodon and Tilapia spp. (Ukoli 1965), there is a considerable increase in both infection rate and fauna of helminths affecting Tilapia sp.

Cases of septicemia conditions were observed both in hatchery and feral conditions. In the indoor hatchery septicemia conditions were associated with skin lacerations, ulceration and diarrhoea in fish. Escerichia coli, Enterobacter aerogenes, Aeromona anitratum, Pseudomona aeruginosa, P. flourescens, Citrobacter diversus, Staphylococcus epidemidis have been isolated. In feral condition during the beginning of rainy season mortality of fish is usually observed in Lake Kainji. Death is associated with physiochemistry of stratification and oxygen level in the Lake, and sand toxicity due to high salt content in water at beginning of the rains because the gills tend to clog with black greyish alluvial soil deposit. Similar toxicity have been observed in Panyam fish farm (personal - communication McCharm E.S.). Secondary bacteria associated with the conditions are due to Pseudomanas sp., Aeromonas sp., Staphyloccoccus spp. with characteristic signs of red sores of skin, Necrotic epithalium; and bloat. Such characteristic signs due Aeromona sp. and Pseudomona sp. infections have been reported in fish in North America (Gaines and Rogers 1975). Fungal infections were also diagnosed with prediliction for the skin and gills. It is usually observed as cotton-white blooms around the gills or creamy white spot on the skin. Microscopic examination readily reveal lactophenol stained hyphae consistent with Saprolegnia sp. Mortality due to fungal infection in the hatchery could reach 10-20%.

Protozoan infection found of economic significance in indoor hatchery were Myxosoma sp., Myxobolus spp. and Trichodina sp. They are free-living fresh water protozoan organism which becomes very intensive under changing environmental condition. Although the prevalence of protozoan is 2-5%, it is worthy of note because in countries like North America with high intensive fish culture the diseases due to protozoan infection could reach epidemic proportion (Hoffman and Bauer 1971) and generally regarded as a world-wide problem for freshwater fisheries (Hoffman 1976). Myxosporean infection has been found to be of economic significance at KLRI. It would result in staunted growth, extensive colonization of the gonads of fish followed by hypertrophy and atrophy as myxospore as released and finally loss of fecundity. Table III gives the summary of cost-benefit analysis.

While disease and parasitic conditions needs further investigations the significance of findings is the need for investors to be aware of the economic consequence of health and management in fish production. In order to achieve an accelerated fish production, investors must plans on how to handle and prevent disease outbreaks.

RECOMMENDATIONS

i. Investigation on nation-wide basis into fish parasites and disease should be pursued so as to advise farmers of disease prevalence in the area of operation.

ii. Proper health record of fish culture should be kept in farms. Information should include records on mortality disease and parasitic incidence, drug used and amount spent in any disease control. The information would be useful in planning budget for subsequent years. It would also aid investors to determine the impact of mortality on cost-benefit of fish production.

iii. Trained professionals on fish pathology should be fully assimilated as an integral part of fish production in particular intensive fish culture through regular consultation.

iv. Importation of fingerlings should be under strick surveillance to avoid importation of new strains of infection into the country.

v. Research on disease of fish, drug and vaccine trails should be encouraged.

A disease and parasite free or controlled environment is an integral part of the panacea to fishery development and production when hygiene and management is adequate.

ACKNOWLEDGEMENT

My sincere thanks to Mr. E.O. Ita, Head of Department of Fisheries, Kainji Lake Research Institute for stimulating my interest in these studies and for his encouragement. The Director, Dr. J.S.O. Ayeni for permission to present the findings.

REFERENCES

AKINTUNDE, E.A. (1976) The Biology of Tilapia and Serotherodon species of Lake Kainji, Nigeria with special reference to Serotherodon galilaeus. Unpublish MPh. L. Thesis, University of Ife 200p.

GRAINES, Jr. J.L. and ROGERS, W.A, (1975) Some skin lesions of fish p. 429-422. University of Wisconish Press.

HOFFMAN, G.L. (1960) Synopsis of straigeoidea (Trematoda) of fishes and their life cycles. U.S. Fish and Wildlife Service. Wash. Fishery Bulletin 975: 439-469.

HOFFMAN, G.L. (1970) Intercontinental and transcontinental dissemination and transfaunation of fish parasites with emphasis on Whirling disease (Myxosoma cerebralis). Amer. Fisheries Society, Wash. D.C. Special Pub. 5: 69-81.

HOFFMAN, G.L. and BAUER, O.N. (1971) Fish parasitology in Water Reservoirs: A review of Reservoir Fisheries and Limnology, Special Publication 18: 495-511.

HOFFMAN, G.L. (1976) Fish diseases and parasites in relation to the environment. Fish Pathology. 10: 123-128.

UKOLI, F.M.A. (1965) Preliminary report on the helminthic infection of fish in the River Niger, at Shagunu. In The First Scientific report of the Kainji Biological Research team edited by E. White. Niger Dam Authority p. 70 - 73.

TABLE I - ABNORMALITIES FROM FERA FISH BASED ON GROSS PATHOLOGIC EXAMINATION

Parasitic/Disease Condition	No Cases	Organ	Host
Helminth:			
Clinostomum tilapia	35	Skin	SAN, SAG
Electrotaenia malapterurus	15	Intestine	MAL
Euclinostomum heterostomum	7	Skin	SAN
Aranthocephalus sp. metacercaria	26	Intestine	SAN, SAG
Neoascus sp.	23	Skin	SAN, SAG TZ
Acanthogyrus sp.	30	Intestine	SAN, SAG
Acanthostomum sp.	2	Intestine	BAG
Annalid:			
Hirudo sp.	2	Operculum	BAG, CL
Protozoa:			
Icthyopthrius multifillis	2	Skin	SAN
Ameoba	5	Gill, skin	
Eimeria sp	9	Intestine	SAN, SAG TZ
Costia sp	1	Skin	MAL
Hexamita sp	10	Intestine	SAN, SAG
Unidentified flagellates	3	Intestine	SAN, SAG
ABNORMALITIES:			
Staunted growth	1	Whole fish	SAN
Laceration on skin	4	Skin	SAN, SAG
Toxicity (Gill clogging)	10	Gill	SAN, SAG
Necrotic epithelium	3	Skin	SAN, SAG CL
Exophthalmia (Popeye)	2	Eye	SAN, MAL
Fungi:			
Saprolegnia sp.	10	Skin	SAN, SAG
Tumour:			
Skin papilloma	3	Skin	SAN
Mesenchyma adenoma	1	Skin, Internal Organs	CL
Traumatic neoplasma	1	Tail	MAL

TABLE II - PARASITES AND DISEASES OF CULTURED FISH AT KAINJI LAKE RESEARCH INSTITUTE HATCHERY AND RESERVOIRS

Host species	Parasitic/Disease Condition	Organs affected
SAG	Acanthogyrus sp.	Intestine
SAN	Myxosoma sarigi	Eye
SAG	Myxobolus israelensis	Spleen
SAN	Myxobolus spp.	Ovary Gill
	Myxobolus isrealensis	Spleen Ovary
SAN,SAG	Trichodina sp.	Gill
Hb	-do-	Gill
Hb	Myxobolus sp.	Pvary
	Myxidium sp.	Gall bladder
	Henneguya pseudolamellaris	Accessory Breathing Organ
SAN,SAG, CL	Saprolegnia sp.	Skin oparudum
CL	Ameoba sp.	Skin gill
SAN, SAG	Eimeria oocyst	Gut system
Hb, CL	Hexamita	Following
	Unidentified ciliates	Diarrhoea
SAN	Benign tumour	Skin
SAN	Lymphomatosis (Virus)	-
SAN	Lamproglenia momodi	Gill
	Ergasilus sp.	"
	Argulus africanus	"

SAN, S. niloticus, SAG, S. galilaeus; Hb, Heterobranchus bidorsalis CL. Clarias spp., BAG, Bagrus sp; MAL. Malaptururi.

[illegible] INFECTION IN SAROTHERODON sp. AND ITS ECONOMIC CONSEQUENCE

arameters	Infected fish	Uninfected fish
Whole weight at maturity	4.1-78.4gm	1.2-2kg
Standard length	5.1-12cm	4.19-49.7cm
Gonado-somatic ratio male	0-.012	0.54-12.1
Female	0-.048	8.1-53.20
Estimate in 10,000 fish at production cost ₦3/kg	₦121-2352[c]	₦36,000[a]-60,000[b]
Labour for removal of condemned fish at 0.5k/fish	₦500[e]	
Drug and chemical treatment to arrest situation 44 gallon of 10% ammonia solution at ₦10 per 2.5 litre	₦792[f]	
Approximate expected losses excluding dummy risk	₦37168-58940[d]	
100% infection loss	₦37168-58940	
10% infection loss	₦3716.8-5894	

$d = (a-c \ldots\ldots+e+f)$ $a=(₦3x1.2kg \times 10^4)$, $c=(₦3x4.1-78-.4gmx 10^4)$

Akintunde 1976.