DISTRIBUTION AND OCCURRENCE OF BACTERIAL FISH DISEASES IN THE DIFFERENT CULTURAL FACILITIES OF LAKE KAINJI AREA

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ABSTRACT

Fish farming practices in the Lake Kainji Area of Nigeria are categorized under seven main cultural facilities, namely, earthen ponds/reservoirs, indoor/outdoor concrete tanks, plastic tanks, floating cages/hapas, aquaria, sewage and feral conditions.

Bacteria isolates associated with diseased fish conditions recorded varied significantly ($P<0.05$) with different cultural facilities. The highest bacteria isolates and bacterial disease incidence of 33% and 46% respectively, was associated with diseased fish in the indoor/outdoor concrete tanks. While the least incidence of bacteria isolates (3.5%) and bacterial disease (3%) was associated with diseased fish in the aquaria and feral conditions.

Nine Gram-negative and two Gram-positive bacteria genera were isolated during this investigation. *Pseudomonas* spp (23.6% and *Staphylococcus* spp (14.3%, were the predominant Gram-negative and Gram-positive bacteria genera in the different cultural facilities, respectively. This paper highlights the relevance of occurrence and distribution of bacterial isolates associated with diseased fish to bacterial fish diseases under different cultural facilities

INTRODUCTION

Bacterial infection resulting in mass losses in fish production is an important economic limiting factor in intensive aquaculture (Herman, 1970; Bullock, 1971; Wolke, 1975; Kabata, 1985, Okaeme et al, 1986; 1988). Bacterial pathogens are easily transmitted from fish to fish via skin and gills where fish are stocked at high intensities (Sarig 1975; Meyer and Hoffman, 1976) and subjected to stress when basic hygiene for maintaining good water quality is overlooked (Duijin, 1973; McCarthy, 1977; Okaeme and Ibiwoye, 1989). The increase in fish culture had led to an increased in the variety and incidence of bacterial disease (Kighorn, 1983; Austin and Allen-Austin, 1985).

Representatives of sixteen gram-negative and nine Gram-positive bacteria genera have been implicated as putative pathogens of freshwater and/or marine fish (Skerman *et al.*, 1980). While others serve as commensals, the incidence of such infections is uncommon (Bullock *et al*, 1971; Meyer and Bullock, 1973). In Nigeria, few studies (Ogbondeminu and Okaeme, 1985; Okaeme *et al.*, 1986; Fasanya *et al*, 1988; Okaeme, 1989 and Nzeako, 1990) had incriminated the Gram-negative bacteria of the genera *Aeromonas, Escherichia, Flavobacterium. Klebsiella. Myxobacterium. Myxococcus (Chondrococcus), Proteus and Pseudomonas:* the Gram-positive bacteria of the genera *Staphylococcus and Streptococcus* contributing to infections recorded in fish farms.

This study highlights the relevance of the distribution and occurrence of bacteria isolates from diseased fish to bacterial fish diseases under different cultural facilities presently in practice in the Lake Kainji Area of Nigeria.

Materials and Methods:

180 diseased fish studied, comprising of 72 *Oreochromis niloticus*, 54 *Sarotherodon galilaeus*. 36 *Clarias gariepinus* and 18 *Heterobranchus bidorsalis* were harvested into sterile polythene and immediately examined for any pathogen on the skin and body.

Bacteria-cultures were done, using the methods described by Bullock (1961, 1971), Horsley (1977) and Carter (1979). This was done using the inoculation of each sterile? swab obtained from lesion sites, skin, gills, spleen, kidney, liver, blood and intestinal fluid into enriched Blood Agar (5% defribinated sheep blood to Trypticase Soy Agar), MacConkey Agar, Nutrient Agar and Mannitol Salt Agar. The culture plates were incubated at 22°C for 24-4hours (Lallier and Higgins, 1988). The isolation and identification of the bacteria isolates were done at the Diagnostic Laboratory of NIFFR and the Bacteriology Laboratory of the National Veterinary Research Institute (NVRI), Vom, Plateau State confirmed them to the species level.

Data collected were analysed by two-way analysis of variance as described by Duncan (1955).

Results and Discussions:

Prevalent bacterial fish disease responsible for mortalities and loss in productivity in different cultural facilities of

Lake Kainji area have been documented. The bacterial isolates (Table 1) associated with diseased fish in order of frequency of occurrences were nine Gram-negative bacteria of the genera: *Pseudomonas* (32.3%, *Aeromonas* (22.6%, *Escherichia* (9.7), *Myxobacterium* (16.5%) and 3.2% for *Klebsiella, Flavobacterium, Enterobacter, Myxococcus* and *Proteus, Staphylococcus* and *Streptococcus* were the two Gram-positive bacteria isolates of 9.7% and 3.2% occurrence, respectively. The fact that Gram-negative bacteria, were more frequently isolated, compared to the Gram-positive bacteria, further confirmed observations from elsewhere on the significance of gram-negative contamination to the disease of freshwater teleost (Bullock, 1964; Wolke, 1975; Skerman *et al.*, 1980; Kabata, 1985).

The distribution of bacteria isolates recorded which differed significantly ($P < 0.05$) with the different cultural facilities were 23.6%, 19.5% and 14.3% for *Pseudomonas spp, Aeromonas spp, Myxobacterium* sp and *Staphylococcus* sp, respectively. While same (4.8% distribution was recorded for *Escherichia* sp, *Flavobacterium* sp, *terobacter* sp, *Myxococcus* sp, *Proteus* sp and *Streptococcus* sp. The variation in the distribution of bacteria isolates in the different cultural facilities suggested that a regulatory mechanism is in existence which might include natural inactivation processes, absorption to sediments and uptake by fish (Ogbondeminu and Okaeme, 1986). The presence of the species of *Pseudomonas, Aeromonas, Escherichia and Staphylococcus* is of public health significance (Jansen, 1970) because of their primary role as occupational disease of fish handlers.

The number of bacteria isolates associated with diseased fish in the different cultural facilities is presented in Table 2: 33%, 30% 10% and 6.7% were the relative percentage bacteria isolates associated with diseased fish from the concrete tanks, earthen ponds/reservoirs, floating cages/ hapas, sewage and plastic tanks respectively. While the same (3.5% was recorded for the aquaria and feral conditions.

The incidence of bacterial diseases which differed significantly ($P<0.05$) with bacteria isolates in the different cultural facilities recorded were 46.5%, 22%, 19.5% and 6% for concrete tanks, earthen ponds reservoirs, floating cages/hapas and sewage conditions respectively. While the plastic tanks, aquaria and feral conditions had same (3%) bacterial diseases incidence recorded. Fish were most prone to bacterial diseases in the concrete tanks, compared to other cultural facilities. This might be due to highest tendency to mechanical injuries coupled with high stocking density and stress in concrete tanks.

70% of the bacterial diseases recorded was primarily due to bacteria isolates while secondary causal agents or contributing predisposing factor occurred for 30% of the diseases incidence presented in Table 3.

Bacterial haemorrhagic septicaemia, pop eye, fin rot, red spot, bacterial white diarrhoea and gill rot respectively had 34.8%, 21.7%, 17.5%, 13%, 8.7% and 4.3% of the bacterial diseases incidence primarily due to bacterial isolates. While 12.5%, 6.5%, 6% and 3% were recorded for predisposing factors such as stress, blum toxicity, mechanical injuries and asphyxiation, respectively. Okaeme *et al.*, (1988) and Okaeme (1989) confirmed that bacteria flora of the genus *Aeromonas, Pseudomonas* and *Micrococcus* were often in septicaemic conditions as secondary bacterial conditions. However, the slime bacteria *Myxobacteria* sp were found as pure culture of the skin ulceration in *Clarias lazera* which quickly leads to mortality in this scalessness fish because of easy of damage and bruises on contact with the abrasive surface f the concrete tanks. Thus, in most bacterial infections predisposing factors are required for them to cause diseases manifestations (Bullock, 1971; Wolke, 1975; Kabara, 1985).

Strategies towards reducing bacterial disease incidences in aquaculture in view of the ubiquitious nature of bacteria isolates therefore could be as follows:-

1. Investigation of recruited fish and adoption of quarantine procedures.
2. Disinfect fish in hyamine bath 2 – 3 ppm for one hour before introduction into pond/tank.
3. Dispose dead fish and cull affected fish.
4. Avoid over crowding by stocking at NIFFR recommended rates.
5. Do not over fertilize the pond/tank to avoid excessive algal bloom and the consequent depletion of dissolved oxygen. Use of 3 – 7 ppm Copper Sulphate spot spraying over water colonized by algae exceeding. Monitor and flush polluted water at all times.
6. Practice feeding at NIFFR recommended rates.
7. Restrict visitors to pond/tank area.
8. Apply suitable and correct dosage of antibiotics to control disease.

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e 1: **Occurrence and distribution of bacteria isolates associated with diseased fish in the different cultural facilities in the Lake Kainji Nigeria.**

Bacteria isolates Gram-negative genera	% Occurrence (n=279)	% Distribution
Pseudomonas	32.2	23.6
Aeromonas	22.6	19.0
Eischerichia	9.7	4.5
Myxobacterium	6.5	9.5
Klebsiella	3.2	4.8
Flavobaterium	3.2	4.8
Enterbacter	3.2	4.8
Myxococcus		4.8
Proteus		
Gram-positive genera		
Staphylococcus	9.7	13.2
Streptococcus	4.8	4.8

Table 2: Bacteria isolates associated with bacterial diseases prevalent in the different cultural facilities in the Lake Kainji area, Nigeria.

Cultural Facilities	% Fish Sample (N180)	% Bacteria isolates (N279)	% Bacterial diseases prevalent (N297)
Earthen ponds/reservoirs	45	30.0	22.0
Concrete tanks (indoor/outdoor	54	33.0	46.5
Plastic tanks	9	6.7	3.0
Floating cages/hapas	36	3.5	3.0
Aquaria	9	3.5	3.0
Sewage	18	10.0	6.0
Feral	9	3.5	3.0

Table 3: Diseased conditions associated with bacteria isolates in the different cultural facilities in the Lake Kainji Area of Nigeria.

Cultural facilities	Bacterial isolates	Fish Species Sampled	Fish tissue harbouring isolate	Clinical Signs	Diseases diagnosis	Prevalent rate (%) N=33)
Earthern ponds or reservoirs	*Eischerichia coli-Streptococcus fecalis*	*Oreochromis niloticus*	Gill, blood	Lethargy	Stress	9.5
	Pseudomonas aeurogi-nosa	*O. niloticus*	Gill	Acute death	Asphyxiation.	3.0
	Putrifaciens, E. coli	*Heterobranchus, bidorsalis.*	Gill, Gill, kidney	Lethargy	Stress	3.0

	Pseudomonas sp. Myxobacterium sp.	*O. niloticus*	Gill, liver	Excitation followed by lethargy	Blum toxicity.	6.5
	Klebsiella sp. E. coli.	*Sarotherodon galilaeus*	Spleen	Lethargy		
Indoor concrete tanks	*P. flourescens Myxobacterium sp*	*O. niloticus S. galilaeus*	Lesion sites	Red dorsal/caudal fin with open ulcer on the adjoning muscle and skin.	Red spot disease	9.0
	Aeromonas hydrophila	*Clarias gaiepinus*	Lesion sites, blood, spleen kidney	Abdominal dropsy.	Bacterial Haemonrrhagic Septicaemia	6.5
Outdoor concrete tanks	*Pseudomonas sp. A. liquefaciens Flavobacterium sp.*	*O. niloticus*	Eye, kidney, blood	Exopthalmia	Pop Eye disease	15.0
	Pseudomonas sp A. hydrophila Streptococcus sp.	*C. gariepinus*	Lesion, sites, blood, spleen kidney	Skin ulceration with plague	Bacterial Haemorrhagic Septicaemia	9.5
	A hydrophila Pseudomonas sp.	*H. bidorsalis*	Lesion, sites, spleen, kidney	Skin and muscle ulceration	Bacterial Haemorrhagic Septicaemia.	6.5
Plastic tanks	*A hydrophila Pseudomonas sp*	*C. gariepinus*	Lesion, sites, liver, kidney	Petechial haemmorrhages of the pectoral fin and skin of the abdomen with abdminal, distension	Bacterial Haemorrhagic Septicaemia	3.0
Floating Cages/ Hapas	*P. flourescens Aeromonas sp.*	*O. niloticus*	Lesion, sites, kidney	Ulceration of the dorsal fin with white whorling appearance	Fin Rot disease	13.0

	Enterobacter, aerogenes. S. epidimidis	*O. niloticus S. galilaeus*	Intestinal fluid,	Lethargy with frequent defaecation	Bacterial White Diarrhoea disease	6.5
Aquaria	*Pseudomonas sp.*	*O. niloticus*	Gill	Acute death following, imbalanced, behaviours.	Stress	3.0
Sewage	*Myxococcus, sp. Proteus sp.*	*S. galilaeus*	Gill	Necrotic areas on the lamella	Gill Rot disease	3.0
	Aeromonas sp	*S. galilaeus*	Skin	Skin laceration with dermatities	Mechanical, injuries.	3.0
Feral	*S. epidimi*	*C. guriepinus*	Skin	Skin laceration with dermatitis	Mechanical, injuries	3.0

FISHERIES RULES AND REGULATIONS IN 23 STATES OF NIGERIA: A NOTE

BY

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ABSTRACT

In order to make a sound proposal to the Kainji Lake Fisheries Management and Conservation Unit regarding the amendment of the existing Fisheries Laws and Regulations, including the raise of fishing license fees, the Fisheries Departments of 21, Nigerian States were visited in August – September 2000, their staff interviewed, existing documents revised, and the results compared with Kebbi and Niger State.

INTRODUCTION

The Nigerian-German Kainji Lake Fisheries Promotion Project (KLFPP) is working towards the improvement of the living standards of fishing communities around Kainji Lake. A community-based fisheries management plan is being implemented since 1993. Nigerian implementing agencies are the Fisheries Departments of Niger and Kebbi States and the National Institute for Freshwater Fisheries Research (NIFFR), coordinated by the Federal Department of Fisheries (FDF). Sponsored by the German Federal Ministry for Economic Co-operation and Development (BMZ) the German Development Cooperation Agency GTZ assists the Nigerian agencies in project implementation.

On the initiative of KLFPP in 1997, both Kebbi and Niger States gazetted revised versions of their Fisheries Edicts and established the Kainji Lake Fisheries Management and Conservation Unit (KLFMCU). This Unit was put in charge of the community-based management of Kainji Lake aquatic resources. Since then KLFMCU on behalf of the States has issued fishing licenses for fishermen, banned the noxious fishing method beach seine (dala)