NIGER DELTA UNIVERSITY
WILBERFORCE ISLAND

21ST INAUGURAL LECTURE

THE FISH and ITS PARASITES:
ANGST OF PRODUCERS AND CONSUMERS

PROFESSOR (MRS)
ABIODUN OLUSEYE ADEYEMO
B.Sc., M.Sc., Ph.D. Fisheries Management (Ibadan)

Professor of Fisheries
Faculty of Agriculture
Department of Fisheries and Aquatic Studies.

14th Dec, 2016

THE FISH AND ITS PARASITES:
ANGST OF PRODUCERS AND CONSUMERS
BY ADEYEMO, ABIODUN OLUSEYE

Published 2016

ISSN: 240848667

THE FISH AND IT'S PARASITES: ANGST OF PRODUCERS AND CONSUMERS.

DEDICATION

This Inaugural Lecture is dedicated to the Almighty God, To Whom Alone Belongs Honour, Glory, Power, Knowledge, Wisdom and Dominion Forever

Protocol

The Vice Chancellor, Professor Humphrey Andrew Ogoni
The Registrar
Provost, College of Health Sciences
Deputy Vice Chancellor (Academics)
Deputy Vice Chancellor (Administration)
Dean, Postgraduate School
Members of the Governing Council
The Librarian
The Bursar
Other Principal Officers of the University
Dean of the Faculty of Agriculture
Deans of all other Faculties
Dean of Students
Directors and Heads of Units
Head of Department of Fisheries and Aquatic Studies
Other Heads of Departments
Distinguished Professors and Scholars of Niger Delta University and other Universities
Members of Fisheries Society of Nigeria
Students of the Faculty of Agriculture
Great Nigerian Students
The Cornelius Olufunmi Aderibigbe (a.k.a Emagbadun) Dynasty
Gentlemen of the Press
Distinguished Ladies and Gentlemen

Preamble

Mr. Vice Chancellor Sir, my adventure into Fisheries and Fish Parasites was not a deliberate passion; it was like drifting into the unknown waters. What brought me into Fisheries was just like the cast net of the fisherman catching unsuspecting fish, this net was used by the Joint Matriculation Board and the West African School Certificate Council in Nigeria to gather and sort candidates for admissions into tertiary institutions. I wanted to study Animal Science because I loved to take care of cats, but the net eventually caught me into the basket of Fisheries just the way many of our students are being caught these days and are complaining. I carried out a survey with these students and discovered that 54% of them did not choose Fisheries as a course of study while 64% would still prefer other courses (Adeyemo, 2013a). I always tell our students in the Department that, according to Ecclesiastes 9:10, whatever thy hand finds to do, do it with thy might. The natural science professions are meant to solve real world problems, which are food, shelter and employment. Therefore, I want all our students to know that they are in one of the best noble professions in the world.

My first, second and terminal degrees(B.Sc., M.Sc. and Ph.D.) were in Fisheries Management while my studies were generally in the aquaculture aspect of Fisheries with special interest in fish parasitology. My own journey into the Fisheries profession started with my mentor in Aquaculture - Prof A.E. Falaye, at the Department of Wildlife and Fisheries Management, University of Ibadan. I got interested in Fish Health at the Master's level with several discouraging words and attitude like the adage in my mother tongue that says “otutu ki mu eja lale odo” which translates that “ fish cannot feel cold underneath the sea”, but my mentor and my “oga” in Fish Health – Prof. S.A. Agbede of the Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, kept on nudging me even

when I was almost becoming disconsolate, by providence, i concluded my Ph.D. degree after 14 semesters of registration. Today I am standing before you by the special grace of God and the untiring encouragement from all the people that God had used to guide my part appropriately in life, of note is my surrogate father Prof. J.F. Alfred -Ockiya who was also an instrument God used to mentor me in the academic world, starting from the Rivers State University of Science and Technology, Port Harcourt, after working in an eatery as General Manager for $2^{1}/_{2}$ years with a Ph.D. degree.

Mr. Vice-Chancellor Sir, this is the account of my sojourning in the academic world of Fisheries.

INTRODUCTION

The waters was divided from the waters after God had created light and darkness(Gen 1:6) the waters below was called seas which God made to bring forth fish abundantly (Gen 1: 21). Fish here are referred to aquatic animals, ranging from shell-fishes to mammals that are able to live in the water throughout or most part of their lives. The waters are freshwaters from streams, rivers and lakes mostly inland, marine water of high salinity are found in the oceans, seas and certain inland lakes like the great salt lake of Utah in United States and brackish water that is between freshwater and marine water found are mostly at the coastal mangrove areas. There are more than 30,000 kinds of fish that live in oceans, seas, lakes, rivers, creeks and streams which man has been hunting and dominating since creation. Fisheries is the industry of harvesting or rearing fish, shellfish and other aquatic animals by man. It can also be referred to as a body of water or species of particular aquatic organisms for instance Lake Fisheries or Cod Fisheries. Fisheries can be divided into the capture and culture sectors, the capture fisheries can further be classified into industrial, commercial and artisanal while the culture Fisheries is known as aquaculture. Fisheries and Aquaculture are linked but each sector is unique in its own way of operations. Figure 1 shows the trawler used for industrial and commercial capture fisheries which is usually marine based. The Artisanal Fisheries are small scale fishing with low input, low technology in all water bodies and can either be commercial or household based, the operators of artisanal Fisheries is as shown in Figure 2.

Figure 1: FISHING TRAWLER FOR COMMERCIAL CAPTURE FISHERIES(www.fao.org **2016)**

Figure 2: Operators of Artisanal Fisheries with commercial trawler at the background (cappecffa.cluster.010. ovh.net. Accessed 15/4/2016)

Aquaculture is further defined as the art and science of growing aquatic animals and vegetables in water and widely practiced across the globe. It is an age long practice recorded even in the Bible (Isaiah 19:10). See Figure 3 showing Fish reared in aquaculture system.

Figure 3: Commercial Catfish Production in aquaculture. (fishexpats.com,2016)

Currently, fisheries scientists all over the globe are concerned and convinced of the serious threat facing our seas, these threats are posed by the growth of the world's population, climate change, pollution and the world wide overfishing of marine life and consequently the serious threat on life onshore (Clover, 2005). In the past 30years the quantity of fish off the African coast has decreased by 50% due to the activities of highly industrialized fishermen from Europe, China and Japan, this have seriously impacted on African fish stocks (Winkel, 2009). The livelihoods of local communities are being threatened as it is becoming difficult for them to catch fish near the shore. When environmental problems are accompanied by climate change impacts, these natural problems will be aggravated thus affecting the following Fisheries parameters namely - Fish Growth, Fish Reproduction, Disease Vulnerability of aquatic organisms and man, Survivability of man and aquatic organism and Livelihoods of Aquatic based populace(Adeyemo,2014). A clear problem in oil producing areas is the presence of high

levels of total hydro carbon (THC) when oil spillage occurs as also observed in Alakiri and Orubiri (Adeyemo and Ike,1999) and Aguobiri (Anderson and Adeyemo, 2012). It should be noted that heavy metals accumulate and are highly persistent in the food chain, having cumulative effects in human beings through processes of bio-accumulation and bio-magnification (GESAMP,1991). The consumption of fish products from such waters and other waters polluted by waste is also dangerous in terms of public health concerns (Inyang etal.,2011,2014, Adeyemo,2009a). This requires attention at all levels of

government as cartooned in Figure 4.

Figure 4: Concerns of Fisheries Administrators and Operators.

Therefore, possible solution to pollution and the dwindling fish stock from the sea and inland waters is to augment the supply with fish production through aquaculture. Although USAID 2014 had stated that the world cannot neglect global Fisheries and expect aquaculture to fill the gap. Moreover, the fish meal being used to raise fish in aquaculture is made from wild stocks. FAO (2014) analysed the production in capture fisheries to have remained on the threshold of 90 million tonnes from 2007-2012 whereas aquaculture production increased from 49.9 million tonnes in 2007 to 66.6 million tonnes in 2012. Mohan (2009) stated that the global annual growth rate for aquaculture is 8 – 10% compared to 3% for livestock and 1.6% for capture fisheries making aquaculture to have a comparative advantage in supplying protein to the teeming world population. Aquaculture has various level of production classified into Intensive, Extensive and Semi-Intensive. The intensive system allows high standing crop biomass which is prone to disease occurrence. It should be noted that there are many inherent problems associated with aquaculture, of which fish diseases and parasites formed a very important aspect of public health concerns. This is part of the reasons the World Health Organization(WHO), World Organization for Animal Health(OIE) and Food and Agriculture Organization (FAO) formed a synergy of "ONE HEALTH" approach to counter the flare –ups of diseases arising at the human- animal ecosystem interface, due to mass rearing of animals and interspecies interactions that facilitates emergence of diseases. Evidently, FAO recognizes that global health and food security form twin objectives (FAO, 2015). Fish, mollusks and crustaceans are also animals that are aquatic species; and also have some vital diseases of global health issues. In Nigeria, one of the policies of the National aquaculture strategy is to achieve effective,

national fish food safety and quality assurance, especially in the aquaculture system. This policy is meant to protect consumer's health, which can only be accomplished by producing healthy fish food free of parasites or any such harmful things. Public health concerns in fish production are not limited to water related diseases alone; these other risks are encountered during capture, certain management practices during culture such as fertilization, processing and even consumption of fish.

THE FISH AND MAN

Fish are grown for various reasons: To provide a ready-made material for home
consumption as shown in Figure 5.

Figure 5: My husband with his home grown catfish.

for economic value when grown in commercial quantity as shown in Figure 3, for aesthetic, tourist and recreational values in sport fishing (Figure 6), home and public aquaria or garden ponds as shown in Figure 7.

Figure 6: Outcast sport fishing Miami beach, Florida (www.outcastcharterfishing.com,2016)

Figure 7:Garden pond in home setting for relaxation (www.pinterest.com,2016)

Fish is a first class source of protein; it contains all essential amino acids required by man (Eyo, 2001), it is considered as healthier alternative to red meat or poultry. Fats from non-polluted fish are good for human health, all major fatty acids necessary for human body can be synthesized from the omega 6 linoleic acid and omega 3 alpha linolenic found in fish. It is clear that positive effects of omega 3 polyunsaturated fatty acids(PUFAs) in fish has been reported in preventing cardiovascular diseases though not very specific about dementia or Alzheimer's disease.

DHA (docosa-hexaenoic acid,) also a derivative of omega 3 fatty acid is needed for sound development of the brain and nervous system is found in fish (Alves, 2009).Positive indications of Omega 3 on aggression, depression, dyslexia and dyspraxia was also reported by Richardson, (2004; 2006) Fish flesh is highly nutritive and also use in producing fish meal for raising livestock and farmed fish, the waste is also useful as fertilizer. Fish provides more than 1.5billion people with almost their entire average per capita intake of animal protein and 4.3billion people with at least 15% of such protein (FAO, 2014). Fisheries and aquaculture, no doubt provide livelihood and employment. People engaged in Fisheries are Fishers, Fish farmers, Processors, Traders, Consumers and other ancillary activities as well as Administrators and Scientists. The employment in the ancillary activities such as processing, packaging, marketing and distribution, manufacturing of fish processing equipment, net and gear making, ice production and supply, boat construction and maintenance, research and administration, together with dependents is estimated to support 660-820 million people about 10-12% of the World's population and at least 7% in Africa FAO (2012). The involvement of women in Fisheries with a study in the lower Taylor creek area of Bayelsa State showed that 92.59% played important role in fish marketing (Kingdom et al., 2008), also a

study of fish marketing activities in Yenagoa Local Government Area showed that 85.56% of the respondents were women fish retailers(Kainga and Adeyemo,2012a). At least 50 million women in the developing countries along with their children are involved in Fisheries and aquaculture (USAID,2014) as shown in Figure 8. In West Africa women often finance men's fishing operations in addition to processing and marketing, only a few are involved in fish farming which may be due to issues of land ownership and technological know-how.(Bernadette,1989;FAO 1996; Alfred-Ockiya,2000).

Figure8: Let's share this fish. No! We'll rather go to catch our own "If a woman can catch fish anybody can"

There are many fisheries empowerment programmes at all levels of government in Nigeria but for effective implementation of the various empowerment initiatives in fish production, Adeyemo et al., (2008) advocated for the establishment of Fisheries based industries where inputs can be obtained as at when needed, regular training and re-training of technical personnel and formation of result oriented Fisheries organizations of which the Fisheries Society of Nigeria is the umbrella body. The contributions of Adult education programmes can also be employed to enhance these empowerment initiatives as studied by Zuofa and Adeyemo(2013),that adult education programmes had positive impact in improving the living standards of Rural women and Youth in Bayelsa state. There are also concerns despite all the benefits that can be derived from Fish, these are about public health issues that are not limited to some biological hazards that may build up in aquacultural systems for instance the Cyanobacteria found in freshwater(Bardach1997) but also biotoxins in marine ecosystem like paralytic Ciguatera, Diarrhoeic, Neurotoxin and Amnestic shellfish poisoning(Benenson, 1995).

PERCEPTION OF AQUACULTURE IN NIGERIA

Nigeria has a considerable potential for fresh water, brackish and marine water aquaculture with an extensive inland bodies of water as shown in Figure 9 and coastal line of 853km with 210,900km^2 Exclusive Economic Zone(EEZ). Apart from being a maritime country, about two thirds of the land area lies in the water shed of the River Niger and Benue which empties into the Atlantic Ocean at the Niger Delta. The extensive network of rivers, inland waters, lakes and lagoons is estimated at more than 5 million hectares (Eyo,2003).

Figure 9: Map of Nigeria Showing River Networks and the Gulf of Guinea (www.gstatic.com, 2016)

Fish and fish products produced in the country accounted for about 6% of the gross domestic product in 2006. Nigeria is the second largest producer of farmed fish in Africa with 15.57% after Egypt (FAO, 2012). Fish farming is known to be profitable in Bayelsa State(Kainga and Adeyemo(2012b, 2013) and Mebine and Adeyemo(2012).This offers opportunity for reduction of hunger, poverty alleviation and employment generation, hence with genuine political will and encouragement fish farming will take a turn for good in the state and the country at large. In recent times, the aquaculture sector in Nigeria has been characterized by high capital investment, intense material and labour inputs hence increased production as shown in Figure 10. There are several fish species in the coastal and inland waters of Nigeria examples in Table 2 and Figure 11.

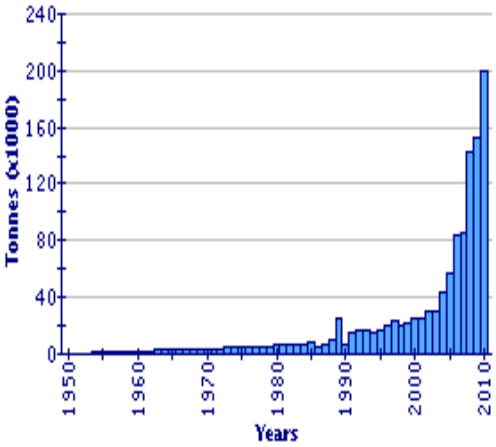


Figure 10: Nigeria Aquaculture Production Trend (FAO, 2007)

Table 2: IMPORTANT FISH SPECIES OF NIGERIAN WATERS. (Compiled by Adeyemo,2016 from Reed et al., 1967; Lagler etal., 1977 and Olaosebikan and Raji,1998)

S/N	CLASS	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	WATER BODY FOUND
A	**Cephalaspid omorphi**	Myxiniformes	Myxinidae	Hag fishes	Myxine glutinosa	Marine
	(Primitive fishes)	Petromyzoniformes	Petromyzo nidae	Lampreys	Petromyzon marinus	Marine
B	**Chondricht hyes**	Chimaeriformes		Chimaeras	Hydrolagus colliei	Marine
	(Rays,Shark s and Chimaeras)	Squaliformes	Squalidae	Dog fish	Squalus blainvillei	,,
		Carcharhiniformes	Carcharhinidae	Requiem shark	Carcharhinus sp	‘’
			Syphrnidae	Hammer head	Syphyrna sp	‘’
		Squantiniformes	Squantinidae	Angel sharks	Squatina sp	‘’
		Torpediniformes	Torpediniformes	Electric rays		
		Rajiformes	Rajidae	Rays and Skates	Raja alba	‘’
			Myliobatidae	Eagle ray	Myliobatis Aquila	‘’
			Dasyatidae	Sting ray	Dasyatis garouaensis	**Freshwater/marine**
			Rhinobatidae	Guitar ray	Rhinobatus rhinobatus	**Marine**
			Mobulidae	Devil ray	Mobula coilloti	‘’
			Pristidae	Saw fishes	Pristis pirottetti	‘’

C	**Osteichthyes**	Lepidosireniformes	Protopteridae	Lung fish	Protopterus annectens	Freshwater/marine
		Polypteriformes	Polypteridae	Bichirs	Polypterus ansorgii	Fresh water
	(Bony Fishes)	Acipensenformes	Acipensaridae	Sturgeons	Acipense oxyrhynchus	Marine
		Anguilliformes	Ophichthidae	Eels	Anguillus sp	Brackish/freshwater
		Elopiformes	Elopidae	Ten pounders	Elop senegalensis	Brackish
			Megalopidae	Tarpons	Megalops atlanticus	Brackish
			Albulidae	Lady fish	Albula sp	Marine
		Clupeiformes	Clupeidae	Sardines	Sardinella sp	Marine
		Osteoglossiformes	Osteoglossidae	Tongue fish	Heterotisniloticus	Freshwater
			Momyridae	Elephant snout fish	Gnathonemus sp	,,,,,,,,,,,,,
					Momyrus sp	,,,,,,,,,,,,,,
			Gymnarchidae	Snout fish	Gymnachus niloticus	,,,,,,,,,,,,,,
			Cynoglossidae	Tongue sole	Cynoglossus senegalensis	,,,,,,,,,,,,,,
		Salmoniformes	Esociacidae	Pikes	Epiplatys fsciatus	,,,,,,,,,,,,,,,
			Umbridae	Murrows	Alestes nurse	,,,,,,,,,,,
			Characidae		Hepsetus odoe	,,,,,,,,,,,,,,
		Cypriniformes	Cyprinidae	Carps	Labeo coubie	,,,,,,,,,,,,,,,
				Common carps	Cyprinus carpio	
			Bagridae	Catfish	Aughenoglamis sp	,,,,,,,,,,,,,,,,
					Bagrus bayad	
					Chrysichthys sp	,,,,,,,,,,,,,,,,
			Claridae	Catfish	Clarias sp	
			Ariidae	Catfish	Arius sp	,,,,,,,,,,,,,,,,
			Malapteruridae	electric catfish	Malapterurus electricus	
			Mochokidae	catfish	Synodontis sp	
			Schilbedae	glass catfish	Schilbe mystus	
			Centromidae	Nile perch	Lates niloticus	
			Citharinadae	Moonfish	Citharinus citharus	Freshwater
			Theraponidae	Tiger fish	Hydrocyon forskali	Freshwater
		Mugiliformes	Mugilidae	Mullets	Mugil cephalus	Freshwater
					Liza falcipinis	Brackish
			Sphyraeni	Barracuda	Sphyraena sp	Brackish
			Polynemidae	Thread fin	Galeoides decadactus	Marine
			Atherinidae	Silver sides	Cerres melanopterus	Marine

			Exocoetidae	Flyingfishes	Hirundichthys sp	Marine
		Beloniformes	Dactylopteudae	Flying gurnards	Dactylopterus volitans	Marine
			Merluccidae	Hakes	Merluccius sp	,,,,,,,,,,,
		Gadiformes	Merluccidae	Codfishes	Merluccius sp	,,,,,,,,,,,
			Batrachoididae	Toad fishes	Perulibrathracas sp	Marine/brackish
		Lophiiformes	Lophiidae	Angel fishes	Lophius vaillanti	Marine
			Serranidae	Groupers/basses	Epinephelus aeneas	Marine
		Perciformes	Carangidae	Jacks	Decapterus sp	
			Carangidae	Pampanos	Caranx sp	,,,,,,,,,
			Lutjanidae	Snappers	Lutjanus sp	,,,,,,,,,
			Pomadasyidae	Grunts	Pomadasys jubelini	,,,,,,,,,,
			Scianiddae	Drums	Laninus pelli	Marine/brackish
			Scianiddae	Croakers	Pseudotolithselongates	,,,,,,,,,,
			Ephippidae	Spade fish	Dentex gibbosus	Marine
			Nandidae	Leaffish	Polycentropsis abbneviata	Marine
			Cichlidae	Tilapias	Tilapia, Oreochromis	Marine
					Sarotherodon/Hemichromis	Brackish/freshwater
			Uranoscopidae	Stargazers	Uranoscopus sp	,,,,,,,,,,,,,,,,,,,,
			Echeneidae	Remoras	Echeneis naucrates	Marine
			Gobiidae	Gobies	Electris vittata	Marine
			Trichiuridae	Cutlass fish	Trichirius cepturus	Marine
			Scrombridae	Mackerels/Tunas	Scromberemobnus sp	,,,,,,
			Stromatidae	Butterfly fish	Schilbe mystus	,,,,,,
			Pantodontidae	Butterfly fish	Pantodon buchholzi	Marine
			Channidae	Snake head	Channa obscura	Freshwater
			Balistidae	Trigger fish		Freshwater
		Tetraodontiformes	Tetraodontidae	puffers	Tetraodon pustulatus	Marine
						marine

Figure 11 : Salt water fishes: www.ilovefishing.co.za ,2016

Culturable Fish Species in Nigeria

The numerable fish species available in Nigerian waters can only be culturable with adequate research into their biology and reproductive potentials in captivity. The few that are being cultured currently in Nigeria are as follows:

Tilapia: This is the tropical freshwater fish with three distinct genus - *Tilapia, Sarotherodon* and *Oreochromis*. They are good pond fish and highly prolific. They are resistant to many diseases, in my study I found that *Oreochromis niloticus* growth was not affected by *Clinostomum tilapiae*, a digenean trematode infection (Adeyemo and Agbede, 2008). It is very hardy, generally found in a wide range of water quality. Most Tilapias are omnivores and perform well in enriched or sewage waters .Reproduction occurs every month once they become sexually matured usually at a relatively small size and may not grow further. Sex ratio for breeding *O.niloticus* was studied and recommended to be 1:1(Adeyemo, 2009b). It is generally accepted and has good taste. Among other fish species, Tilapia is an asset in animal protein production, in view of the high fecundity and hardiness.

Figure 12: *Oreochromis niloticus* raised in the NDU Teaching and Research Farm.

Catfishes: This is the common name for a group of more than 2,500 species of fish, classified in about 30 families and found worldwide. They are called catfishes because of the feelers or barbels located at the mouth suggesting the whiskers of a cat. (Chambers,2009). There are three notable families cultured in Nigeria namely *Clarias* species(Figure 13), *Heterobranchus* species(Figure 14) and *Chrysichthys* species(Figure 15). *Clarias* and *Heterobranchus* are of the same family, with recent development in genetic manipulations an hybrid of F1 generation has been produced from the two species which is disease resistant and fast growing. *Clarias gariepinus* is widely accepted for rearing and consumption in Nigeria. *Chrysichthys* is of the family Bagridae with four species of economic importance namely *C.nigrodigitatus,C.auratus,C.longifilis* and *C. walkeri*,the research on the artificial. propagation is ongoing.(Erondu,1991). *Chrysichthys nigrodigitatus* was raised in cages along with Tilapia by Alfred-Ockiya and Adeyemo,(2010).

Figure 13: *Clarias gariepinus raised in concrete tank by my husband*

Figure 14: Heterobranchus sp (www.fosaf.org.za,2016)

Figure 15: *Chrysichthys nigrodigitatus(www.googleimages .com,2016)*

Heterotis niloticus: commonly called bony tongue or slap water. Is an endangered species and still requires a lot of study for it's multiplication in captivity. Due to general environmental degradation including oil spillages, pollution and destruction of mangrove swamps, this species has lost an estimated 60% of its previous breeding and nursery habitat in Nigeria. Bake and Sadiku (2005) describe a decline in the population density of *H. niloticus* from Oyun reservoir in Kwara State, Nigeria, over a two-year period (January 2002-December 2003), and the recorded decline of the species from similar reservoirs in Nigeria indicates that the species is threatened in this environment. Although, this species has a wide distribution, with no known major widespread threats. It is classified as Least Concern (LC) on the IUCN red list status. It has also been

assessed regionally as Least Concern for eastern, north eastern and western Africa. (Akinyi *et al*.,2010;www.iucnredlist.org). Growth is encouraging in polyculture with *Clarias gariepinus* as studied by Adeyemo and Adeyemo,(2009)

Figure16: Heterotis niloticus (www.cabi.org ,2016)

Produce young ones in large water bodies but bedeviled with high mortality hence low recruitment.I am passionate about this fish and currently researching into its reproduction in captivity,with the TETFUND sponsored Senate Research Grant of the Niger Delta University.

Carp: There are different types like grass carp(*Ctenopharyngodon idella*), mirror carp, Koi carp and common carp(*Cyprinus carpio*)native to Asia and introduced to Nigeria by Austria and Israel when Panyam fish farm in Jos was established in 1954. My sojourn in the Oyo State Ministry of Agriculture gave me opportunity to work on breeding and culturing of carp with my boss, Late Mr Owoyemi. Carps are good food fish and have great aesthetic value as aquaria fish.

Figure 17: Mirror carp

Source:Redmond(2009)

Figure 18: Koi carp

Carp lives in freshwater rivers and shallow lakes. A bottom-feeder, the carp uses its large mouth to churn up mud and debris in search of food, sometimes causing considerable damage to its habitat, this may likely be the reason why this exotic species has not stood the test of time in Nigeria fish culture industry.

Mugil cephalus(mullets) : According to records in www.fish.base .org (2016), adult of mullets are found in coastal waters often entering estuaries and rivers, sometimes far-up-river, lagoons and hypersaline environments. They are usually in schools over sand or mud bottom), between 0 and 10 m, occurring equally in tropical, subtropical and temperate waters. They are mainly diurnal, feeding on detritus, micro-algae and benthic organisms Juveniles feed on zooplankton until about 3.0 cm SL.

Figure 19: Mullet (www.fishing-khaolak.com,2016)

Reproduction takes place at sea, at various times of the year depending on the location. There is absence of an obligatory freshwater phase in the life cycle. Females spawn 0.8 to 2.6 million eggs which develop at sea. Sexually mature at 3 to 4 years. Maximum length reported as 120 cm Widely cultivated in freshwater and brackish ponds.

Citharinus citharius(Moonfish): This is a freshwater demersal and anadromous fish that is yet to be experimented in pond culture. It can reach up to 7kg with maximum length of 58cm. It is a total spawner, common in large rivers,feed on phytoplanktons, detritus and other plant matters. It is a potential aquaculture candidate with unreported good performance in ponds(www.fishbase.org,2016)

Figure 20: *Citharinus species(www.africhthy.org,2016)*

Other culturable fish species are ***Parachanna obscura(Figure 21)***, ***Gymnarchus niloticus(Figure 22)*** and ***Lates niloticus(Figure 23)*** but these are highly carnivorous and still require indepth research on the potentials for aquaculture.

Parachanna obscura(Snake Head): Is a predatory fish native to Africa and Asia but has become invasive in the United States of America.It is a valuable food source that is very prolific, mates five times a year releasing almost 15,000 eggs at each spawn. Feeds on plankton,aquatic insects,molluscs as uveniles but adults are carnivorous.The predatory nature made it highly suspectible to parasitic infections as confirmed by Adeyemo and Daunemughan(2012).

Figure 21: *Parachanna obscura*(www.totalfisherman.com, 2016)

Gymnarchus niloticus: This fish feeds on crustaceans, insects and fish. No pelvic, anal or caudal fins. Possesses an electric organ that extends along almost the entire trunk to the tip of the tail Also equipped with ampullary receptors and two types of tuberous receptors for electroreception. Showed increased electric organ discharge (EOD) rate by 50-60 Hz between 21 and 31°C. It breeds in well-vegetated, marginal areas of swamps and rivers, where a large, floating nest, about 1 m in diameter is constructed. Here the eggs are laid and later guarded by one of the parents. . (Froese and Pauly,2015 in www.fishbase.org)

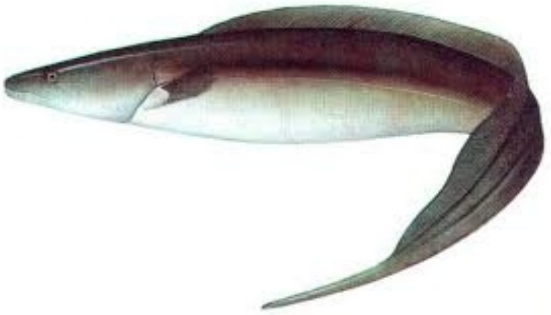


*Figure 22: Gymnarchus niloticus(*www.fishbase.org *2016)*

Lates niloticus: Inhabits channels, lakes and irrigation canals. Adults inhabit deep water, while juveniles are found in shallow water. Feeds on fish especially clupeids and *Alestes*; smaller fish also feed on larger crustaceans and insects. Juveniles are planktivorous. Threatened due to over harvesting Maximum reported size of 180.0 cm corresponding to a weight of 164 kg in Lake Albert. (Froese and Pauly,2015 in www.fishbase.org)

Figure 23: Lates niloticus(www.fishbase.org***, 2016)***

Molluscs and Crustaceans are also culturable examples are periwinkles clams oysters,lobsters and shrimps as shown in Figure 27.

Figure 27: Other culturable aquatic products(www.googleimages.com,2016, Adeyemo, 2016)

Fish Anatomy

A review of the anatomy and physiology of fish is necessary to appreciate the pathological changes occurring in fish and to understand the mechanisms underlying clinical disease manifestations. Figures 28 and 29 illustrate basic fish anatomy.

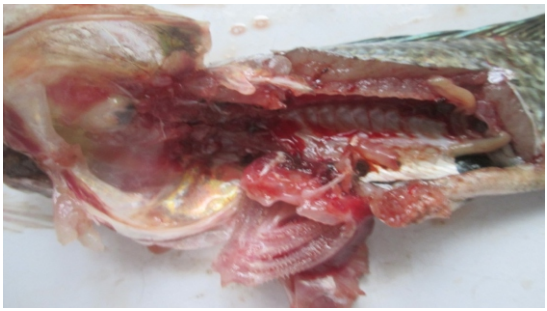


Figure 28: Dissected *Oreochromis niloticus*(Adeyemo,2016)

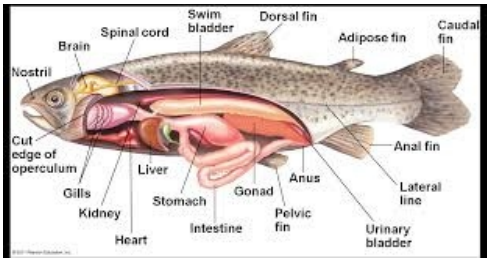


Figure29: Typical Fish Anatomy(www.popista.com ,2016)

The fish body comprises of 10 systems which are summarized by Aderibigbe (1991) as follows:
1. The external anatomy of the fish is the skin, the openings and sensory organs. 2. The skeletal system consists of the axial skeleton, fins and bones which are for movement and locomotion. 3. The muscular system consisting of the muscle blocks made up of red, white and sometimes pink fibres, while there are three types of muscle namely smooth, cardiac and skeletal muscles. The fibres are significant in treatment and diagnosis, the red fibres are good sites for injection of drugs, anti-coagulants and anaesthetics and the white fibres are anaerobic. 4. The digestive system consists of the mouth, buccal cavity shared by respiratory and digestive systems, esophagus, stomach, intestine, rectum and liver, pancrease or hepato-pancrease in some fish species. 5. The reproductive system is called testis in male and ovaries and sometimes uterus in some species.6. The nervous system extends throughout the body and composed the brain, spinal cord and peripheral nerves. Other special organs are the eye, labyrinth associated with equilibrium maintenance and hearing, lateral line, olfactory organs for smelling, gustatory organs for tasting, swim bladder for buoyancy adjustment, sound production and pressure reception.7. The endocrine system is interconnected with the reproductive and nervous systems. It consists of the pituitary, the thyroid gland adrenals, ultimo-branchial gland, corpuscles of stannous, endocrine pancrease, urophysis, pseudobranch and choroid body and organs. 8. The excretory system in fish is rather complex, it is controlled by the skin, gills, gut wall and kidneys. 9. The circulatory system is composed of the heart, arteries, veins, capillaries and lymphatic vessels. The circulated blood consists of plasma similar to mammalian serum and the cellular components are erythrocytes, neutrophils, monocytes, thrombocytes, eosinophil, basophils and mast cells. 10. The respiratory system

principally functions through the gills and performs other functions of gas exchange and excretory.

PARASITES OF FISH

The study of fish parasitology has importance for many reasons: Fish parasites cause commercial losses in both the aquaculture and Fisheries industries and may have human health as well as socio-economic implications in both developed and developing countries. The full understanding of diverse effects of fish parasites on the host is central to development and maintenance of Fisheries worldwide which make effects of parasites on the behavior of fish hosts a clearly important study. It is also of academic interest as recent advances in disciplines of behavioural and evolutionary ecology have given insight into the potential roles that parasites play in shaping the evolution and ecology of host species. Parasites also have a role in maintenance of biological and behavioural diversity of their hosts.

Parasites are organisms that live on or in different kind of organisms known as the hosts, from where they get nourishment. Parasites that are known as fish pathogens have representatives in many phyla of the animal kingdom and classified according to Amlacher, 1966; Roberts,1978;.

They are:

1. Protozoans with four distinct sub-phylum namely:

a. **Sarcomastigophora**: These are flagellates with or without chlorophyll examples are *Trypanosoma*, *Oodinium, Hexamita* and *Ichthyobodo* now known as *Costia*.

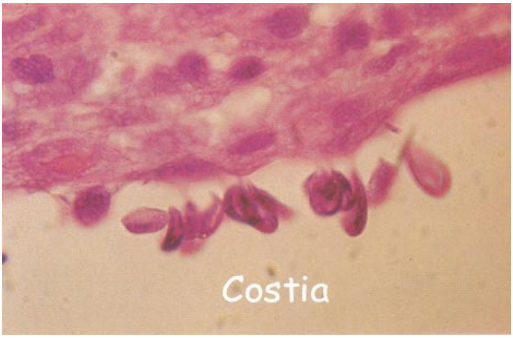


Figure 30: *Costia* (www.koicarp.net,2016)

b. **Ciliophora**: These are ciliates with simple and uniform ciliature. Examples are *Ichthophthirius*, *Chilodonella* and *Trichodina*

Figure 31: Fish infected by Ichthophthirius (www.quora.com, 2016)

Figure 32: Trichodina(www.fishdoc.co.uk, 2016)

c. **Sporozoa**: These are protozoans producing simple and resistant spores with no cilia or flagella except occasionally on male gametes. Examples are Coccidia, Eimeria, Toxoplasma and Dactylosoma.

Figure 33:Sporozoa(amintabin.blogspot.com,2016)

d.**Cnidospora** : These are protozoans that develop spores with one or more polar filaments. Examples are Glugea, Myxobolus, Henneguya and Myxosoma.

Figure 34: Myxozoa(www.tolweb.org ,2016)

2. The second Phylum is **Platyhelminthes** commonly known as flatworms with three classes namely: Monogenean,Digenean and Cestodes.

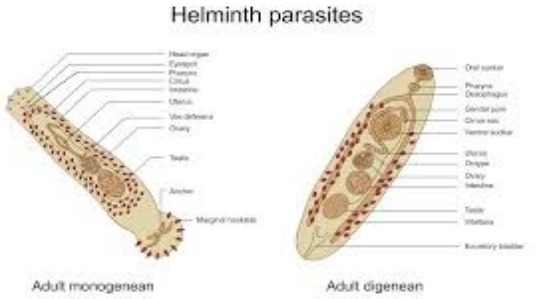


Figure 35:Monogenean and Digenean Trematodes (www.googleimages.com, 2016)

a. Monogenean : These are mostly ectoparasites with no intermediate host in the lifecycle. Usually with posterior organ of attachment known as haptor armed with hooks , clamps or suckers. Examples are *Dactylogyrus* and *Gyrodactylus*.

Figure 36: *Dactylogyrus* (Strohmeyer,2014)

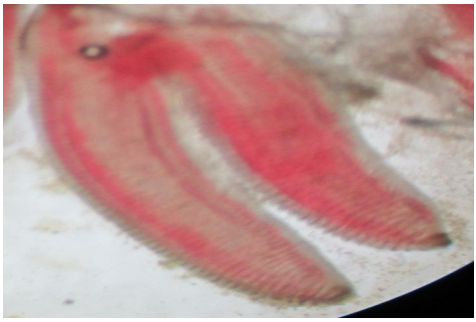


Figure 37:G*yrodactylus* found on the gills of Tilapia (Adeyemo, 2016)

b. Digenean : Mostly endo parasites involving at least one intermediate host in their life cycle. Larvae are sometimes encysted ,while adults usually have two suckers. Examples are *Clinostomum, Sainguinicolis, Bucephalus, Strigeids* and *Heteropiids.*

Figure 38*: Clinostomum tilapiae found in the body cavity of Tilapia*(Adeyemo,2001)

3. **Cestoda:** These are endo parasites with at least one intermediate host in their life cycle. The body is sub divided into segments examples are Caryophyllus and Diphyllobothirium.

Figure 39 : Tapeworm (Encarta, 2009)

The third Phylum is **Ascelminthes** with only one class which is the Nematoda. These worms have cylindrical bodies tapering at both ends. Examples are Trichirus, Camallanus,Anisakids and Capillaria.

Figure 40: Nematode(Strohmeyer,2014)

The fourth Phylum is the **Acanthocephala** with no further classification. These are also cylindrical worms but with armed anterior retractile proboscis carrying hooks for attachment.

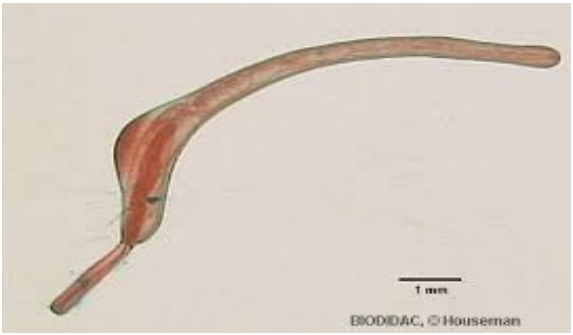


Figure 41: Acanthocephlanan(Strohmeyer,2014)

The Fifth Phylum is **Mollusca** : They are significant in their role as intermediate host to most helminthic parasites .there are also larvae of fresh water bivalves with thin shells and little hooks on their inner edge that are parasitic .

Figure 42: Molluscs that are Parasitic on Fish (Adeyemo,2015)
The sixth Phylum is Arthropoda also with only one class which is Crustacea

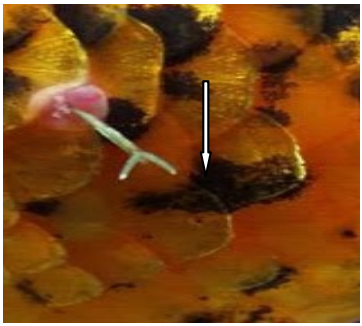


Figure43: Lernae (Strohmeyer, 2014)

Figure 44: Copepods (Strohmeyer, 2014)

Figure 45 : Argulus(www.texaskoi.org , 2016)

The seventh Phylum is Annelida with the class Hirudinea

Figure 46: Leech (Hirudinea)(Encarta Encylopedia 2009)

And the last but not the least and the eight Phylum is Chordata, of family Petromyzonidae, which is the Sea lamprey, a vertebrate parasite that feeds on fish blood using a sucking disk. This action rarely kills the host, but wounds caused by lampreys often become infected.(Chambers,2008b)

Figure 47: Sea Lamprey(www.austin.charityowl.com,2016)

Figure 48: Sea Lamprey showing the disc for sucking(www.nydailynews.com,2016)

CONTRIBUTIONS TO FISH PARASITOLOGY

Aquatic system serves as reservoir for most parasites and of course other pathogens. Information about fish parasites becomes necessary because apart from infecting fish directly, fish are vectors of some parasites of man, especially helminthes. Protozoans are ubiquitous in the aquatic environment meanwhile the external protozoans are the largest group of pathogenic organisms in warm waters but most of them are harmless. Adeyemo and Falaye(2007) reported the incidence of *Henneguya(Figure 49)*, *Trichodina* and Ichthyophythirius in *Clarias gariepinus* without pathogenic lesions.

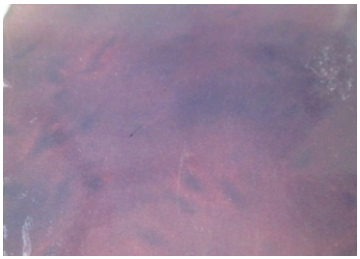


Figure 49: Henneguya found in Clarias gariepinus(Adeyemo and Falaye,2007)

Helminthic infections of fish species in the tropics are familiar especially in the wild for instance, Anisakids sp(Figure 50) a nematode parasite was found in frozen hake surveyed in Yenagoa market by Adeyemo (2011a), *Heteropiid sp was* found in *Synodontis sp*(Adeyemo and Omovwohwovie, 2011), *Camallanus sp(Figure 51 was* found in wild Para*channa obscura by* Adeyemo and Damenughan(2012) these are from capture Fisheries. In the cultured systems, *Clinostomum tilapiae* was found in *Oreochromis niloticus* (Adeyemo et al.,2003,) Caryophilleus and Capillaria was found in *O.niloticus* by Adeyemo and Araoye(2008) *Dibothriocephalus sp, Dactylogyrus sp, Argulus, Capillaria,* were found *in Clarias gariepinus* by Adeyemo and Falaye(2007).

Figure 50: The Anisakids trematode and thefrozen and smoked hake collected in Yenagoa Market(Adeyemo,2011a).

Figure 51: Camallanus found in *Parachanna obscura(Adeyemo and Daunemughan,2012)*

The public health importance and pathogenesis of these occurrences cannot be overlooked because this will determine intervention for prevention. Agbede et al., (2004) looked into the pathogenesis of *Clinostomum tilapiae* infecting *Oreochromis niloticus* and described the morphology using scanning electron microscope (SEM). The SEM of the whole parasite is as shown in Figure 53, while the ventral sucker and oral sucker are further magnified as shown in Figures 54 and 55.

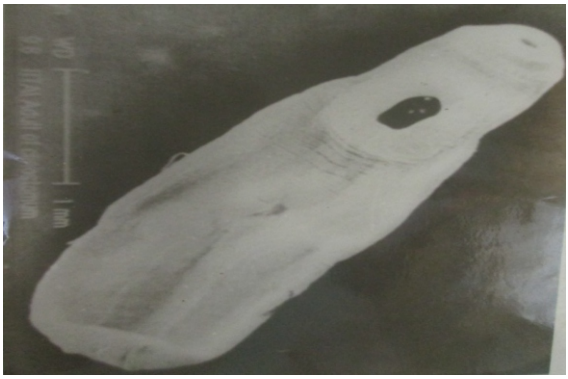


Figure 53: SEM of Adult *Clinostomum tilapiae:* A trematode parasite of *O. niloticus*.

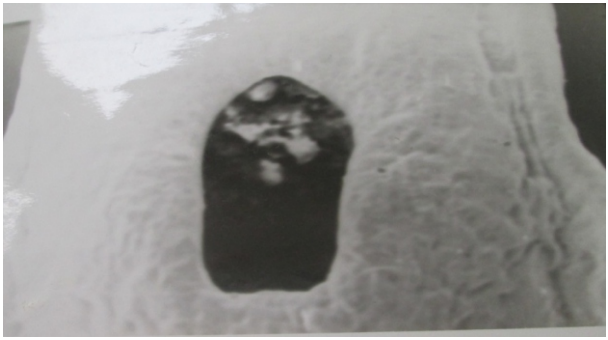


Figure 54: SEM of the Ventral sucker of *Clinostomum tiapiae*: A trematode parasite of O. niloticus(Agbede et al;2004)

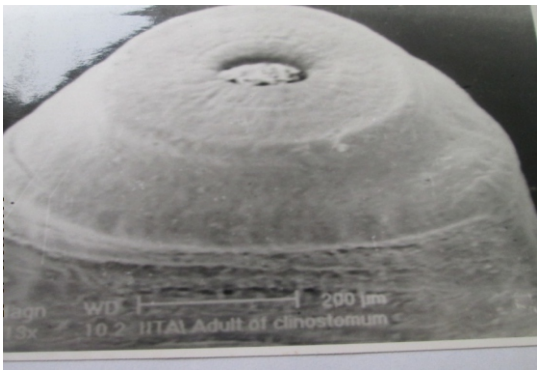


Figure 55: SEM of the Oral sucker of *Clinostomum tiapiae*: A trematode parasite of O. niloticus(Agbede et al;2004)

The electron microscopic features clearly expressed the oral field, oral sucker and the ventral sucker exhibiting muscular appearance which the parasite employs for firm attachment to the epithelium of host. Use of scanning electronic microscopic technique is recommended for future taxonomic studies and identification of parasites to avoid confusion. *Clinostomum sp* has been found in a number of tropical fish including *Chrysichthys nigrodigitatus , Cyprinus carpio, Heterotis niloticus and Synodontis sp.* It has attracted public health importance and high intensity might cause mortalities in isolated cases. *Clinostomum sp* get established around the head region , adult cercaria are found moving freely in the body cavity and the pharyngeal region as shown in Figure 56 while only the cyst containing the metacercariae were found attached to the skin which may impair respiration of skin.The metacercariae en-cysted on the skin is shown in Figure 57. The attachment is firm and would not easily be dislodged as shown by the histological section of the site of attachment as shown in Figure 58. The site of attachment on the fish skin showed the cyst to be double walled suspected to be a form of defensive mechanism to prevent dislodgement.

Figure 56: Adult cercariae of *C.tilapiae* found in *O. niloticus(Adeyemo and Agbede,2007)*

Figure 57: Metacercariae *of C. tilapiae* en-cysted on the skin of *O. niloticus (*Adeyemo *et al*.,2003)

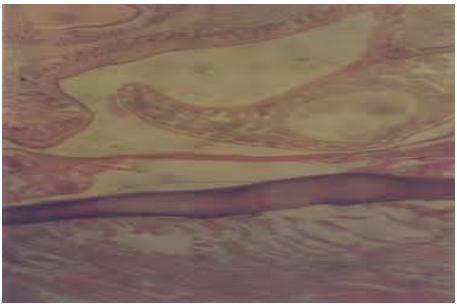


Figure 58: Cyst of *C.tilapiae* on the skin of *O.niloticus* with double wall and partial erosion of the epithtelia(Adeyemo and Agbede,2007)

O.*niloticus* found in Oyo state fish farms were significantly (p>0.05) susceptible to this digenean helminth at 80 % prevalence(Adeyemo et al .,2003), with a parasitic burden between 1-20 infesting the skin and body cavities.(Adeyemo, 2010). Although, the parasite burden was highest in the body cavity followed by the skin and base of the head as shown in Figure 59. The parasite tends to move through the axial region to get into the body cavity suggesting the infection pathway as studied by Adeyemo(2010). Parasitic investigation on wild *Parachanna obscura* by Adeyemo and Daunemughan (2012) also showed that parasitic infection varied with organs depending on infection pathway, feeding habit and environment.

EYE SOCKET (1.3) - BASE OF HEAD (1.6.) - GILLS (2.0)- OPERCULAE(2.9)- PHARYNGEAL REGION (3.5)-SKIN (4.05)-BODYCAVITY (8.6)

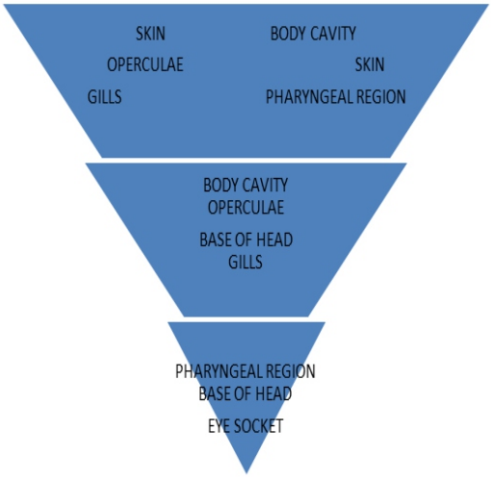


Figure 59: The pathway of infection of *C.tilapiae* in *O. niloticus (Adeyemo,2010)*.

O. niloticus was also shown to respond to antigenic challenge using Agar gel precipitin test (AGPT). The precipitin lines between serum and antigen wells indicating the antibody response of the naturally and experimentally stimulated *O.niloticus* to *Clinostomum tilapiae antigen* (Adeyemo and Agbede, 2006) as shown in Figure 60.

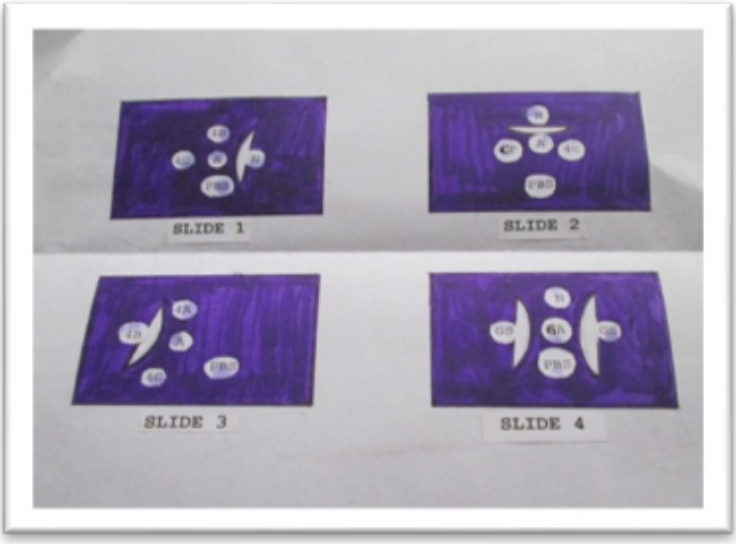
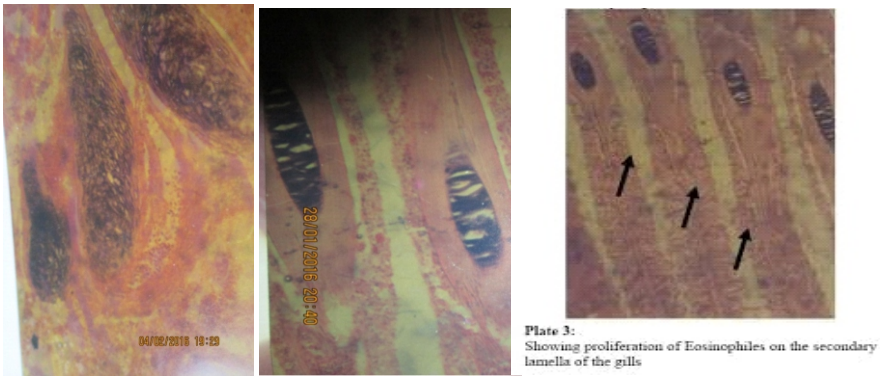


Figure 60: Agar gel precipitin line reactions of *O. niloticus* serum to *C.tilapiae* antigen (Adeyemo,2001).

This may form a baseline research for the development of an antigen-antibody detection assay that will be sensitive, specific and cost effective in fish quarantine procedures. Further work was carried out on the histopathology of Tilapia tissues harbouring *C. tilapiae, which* showed proliferation of oesinophils at the secondary lamellar of the gills as shown in Figure 61 (Adeyemo and Agbede, 2007).



Figur e 61: Histological sections of gills of infected *O.niloticus* showing proliferation of eosinophils. (Adeyemo and Agbede,2007)

FISH CAN GET SICK WITH PARASITES

Parasites are generally harmful to their hosts, although the damage they do ranges from minor inconvenience to debilitating to fatal disease. Most of the chronic diseases of fish are caused by animal parasites. Although parasitic infection depends on environmental conditions, however when the equilibrium which is naturally maintained between host and parasite is disturbed by occasional incidence of new host or parasite strain, infections tends to be favoured.

Figure 62: Illustrations of sick fishes being nursed back to health.(www.googleimages/sick fish, 2016)

Diseases of fish caused by parasites and infectious agents have attracted the attention of veterinarians and fish pathologists from the early days of fish and shell fish farming investigations till date (Roberts, 1978; Moore et al.,1984; Kabata, 1985;Paperna, 1991; Okaeme,1991; Williams and Jones, 1994;Agbede et al., 1997a; Agbede et al.,1997b; Adeyemo, 2006a; Adeyemo, 2006b; Adeyemo, 2008). Fish serves as reservoir and intermediate host to most stages of parasites ranging from protozoans to metazoans and can also be infected with all the other known pathogens namely virus, bacteria and fungi. The common bacterial diseases as reported by Agbede,(2012) were Furunculosis, a bacterial necrosis syndrome caused by Aeromonas sp, Haemolytic syndrome caused by Enterobacter sp while fungal diseases are Aspergilosis(Olufemi ,1998) Saprolegnia sp, Brachiomycosis and Ichthyomycosis(Brown et al.,2004) there has been few reported viral diseases (Roberts,1978) which may be due to many unreported cases of fish mortality. According to my study on fish disease symptoms perceived by 89.39% of fish farmers in Ogbia and Yenagoa Local Government Areas, the fish farmers observed several signs and symptoms but could not identify the corresponding disease, the precautions or remedy (Adeyemo, 2011b). Hence I suggested that the farmers should be on the lookout for such signs as shown Figure 63. Check the eyes,look out for eroded fins,look for growth under the scale and lesions on the skin for scales fish.

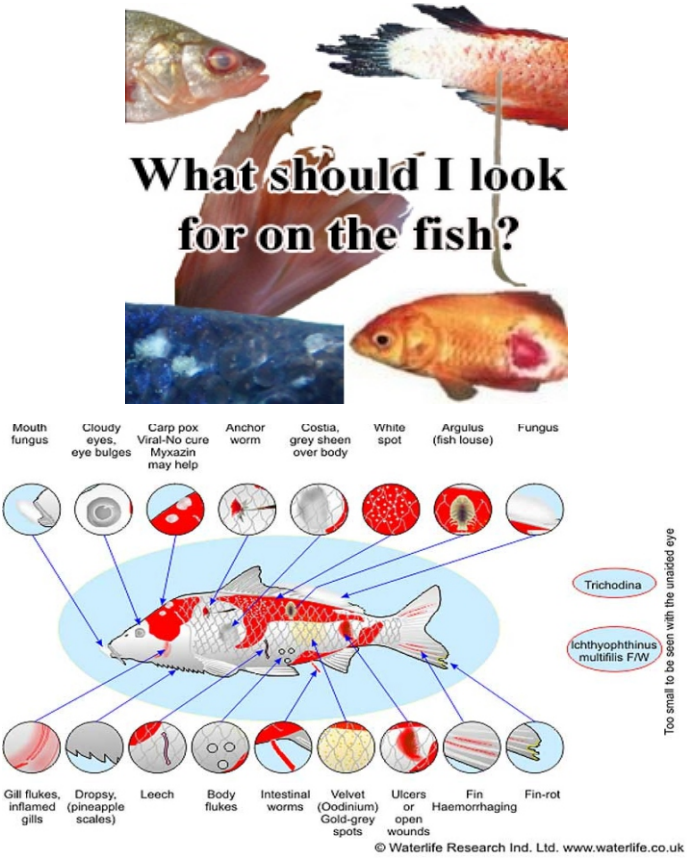


Figure 63 : Signs of Disease on Fish body(www.waterlife.co.uk,2016)

Haemmorhages on the body/fins Lesions at the caudal end cotton wool-like growth on the body

Ulceration on any part of the body
Figure 64: Disease symptoms on the body of sick fishes (fish, 2016).

Other factors responsible for disease or parasitic outbreaks are aquatic weed bloom as reported by Adeyemo and Agbede (2008), healthy fish can acquire parasites especially *Clinostomum tilapiae* within a single growing season in a weed infested pond likewise in extensive system especially in reservoirs and undrain able ponds. Fish culture in the intensive system allows high standing crop biomass, which is prone to disease occurrence, cultured fish must be managed to avoid diseases or reduce severity of diseases, which can be introduced through water and wild fish intrusion. Initial signs of diseases may be resting of fish at the banks or water inlets , food avoidance, dis-oriented and weak swimming, gathering on drainages, rubbing body against facilities. It may actually be difficult to tell when fish is sick until gross indications are observed like swollen belly, protruding eyes, thin or big head, haemorrhages. All these conditions are frequently seen in conditions of over- crowding, poor water quality and other high stress factors in the environment.

FISH AND ITS PARASITES WHAT RELATION WITH MAN

The effects of parasites on the value of fish seemed to have greater impact on visual perception than on human health. Fish parasites reduce the value of fish as food while the presence of some nematode, trematodes and cestodes may actually pose public health risk to producers and consumers. Fish parasites can damage the skin, infect the muscle, spoil the flavor and condition of fish, nobody wants to buy or eat fish that is evidently infected by parasite despite the fact that the parasite may not infect them. It is also important to note that multitudes of parasites have been reported in fish, but only a few species are capable of infecting humans, yet the possible health importance of fish parasites to man can not be overlooked. The most important of the helminths acquired by humans from fish are the anisakid nematodes particularly Anisakis simplex and Pseudoterranova decipiens, Cestode of the genus Diphyllobothrium and digenetic trematodes of the families-Heterophyidae, Opisthorchiidae and Nanophyetidae.

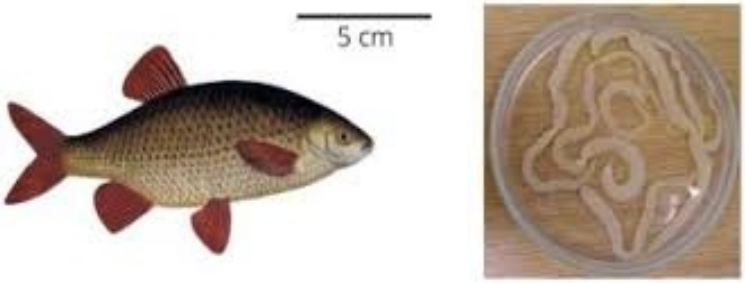


Figure 65: Fish tapeworm. *Diphyllobothrium sp(www.egi.eu, 2016)*

Humans acquire larval stages of the worm by eating raw, inadequately cooked, poorly salted,pickled or smoked fish.(Adams et al.,1997). Infection can also occur by direct contact especially of fish harvesters, vendors and processors. Adams et al.,(1997) made a striking and horrifying description of larva infecting humans as entering the tissue of the gastro-intestinal tract w hen consumed and causes disease or enter the gastric or intestinal mucosa and cause an abscess or eosinophilic granuloma. Some worms may enter peritoneal cavity or just pass out with faeces or vomit or pass up the oesophagus causing tickling throat syndrome which cause the patient to cough up the larvae. In a study in Japan by Ishikura et al.,(1992), 11,629 cases of gastric disorder, 567 cases of intestinal disturbance and 45 cases of extra-gastro intestinal disorder were associated with anisakiasis. The Anisakids parasites were reported in frozen hake sampled in Yenagoa market by Adeyemo(2011a).Anisakids larvae are of importance in fish borne parasitic zoonoses especially in low and middle income populations and the population at risk is expanding because of growing international markets. Although the helminthes mentioned above are associated with social-cultural and behavioural factors, particularly the consumption of raw or undercooked fish.

Figure 66: Parasitic worm found in fish flesh
(www.googleimages.com,2016 www.reddit.com,2016)

These worms are natural. But I am sure you don't want to cook parasitical worms thoroughly for dinner

Figure 67:Parasites on the gills of Roach(www.fw.ky.gov,2016)

Fish food-associated infections by acanthocephalans are rarely reported in humans Protozoan parasites are known to survive in leech gut (Nehili et al., 1994) for example African mammalian trypanosomes, T. brucei and T. congolenses as found by Odoya et al.,(2004) even *Aeromonas hydrophila*(natural flora) and human pathogens (Ahl-Khleif, 2011); HIV and hepatitis B in African leeches were reported from Cameroon(Nehili et al.,1994). Odoya et al.,(2015) therefore suggested a further DNA analysis of the sanguineous fluid to confirm the surveillance and epidemiology of trypanosomiasis for public health concerns.

MUCH ADO ABOUT PARASITES IN FISH CULTURE

The culture of fish has developed to an intensively large-scale operation both in the developed and developing world. In many fish hatcheries/farms in the developing world. Fish parasites that also infect man have many types of life cycles. Usually, a typical life cycle involves invertebrates,snails, fish, birds and a land animal. Parasites of fish that can infect man get into the water through human faeces which carries the eggs.

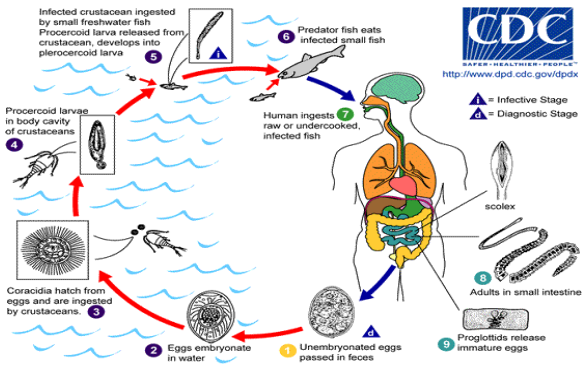


Figure 68: Life cycle *of Diphyllobothirium* spwww.cdc.gov accessed 30-4-16

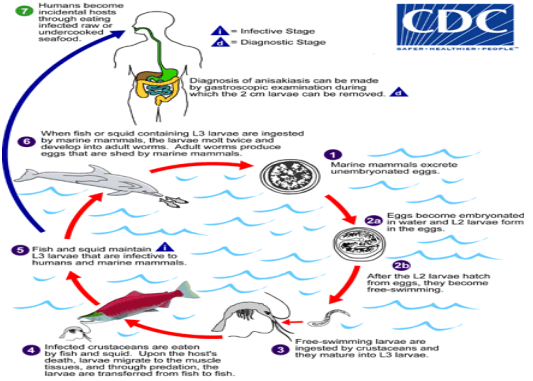


Figure 69:Life cycle of anisakis simplex www.cdc.gov accessed 30-4-16

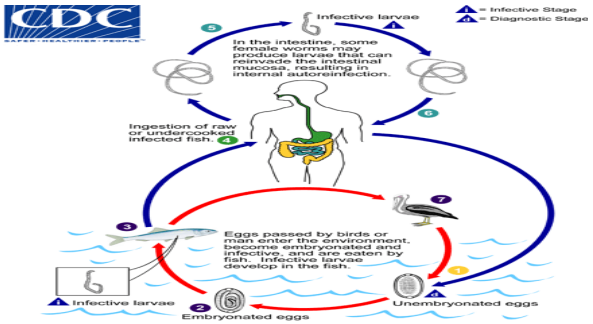


Figure 70: Life Cycle of Capillariawww.cdc.gov accessed 30-4-16

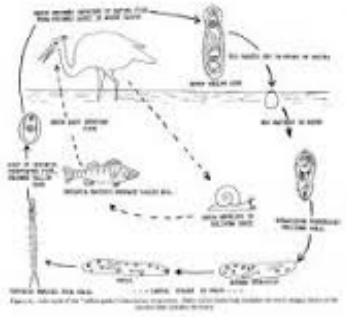


Figure 71:Life cycle of *Clinostomum tilapiae(www.fishpathogens.net,2016)*

Figure 72: Domestic use of water bodies contributing to interface of aquatic organism-human infection(Odoya,2015).

After the egg hatches, the invertebrate and or the snail is infected, when the fish eats the invertebrates or snail, the fish becomes infected. When the fish is eaten raw or undercooked, the larval stage can infect man and migrate through the body, develop to adult parasite and shed eggs that continue the cycle. Examples are Cestodes, Trematodes and Nematodes where fish appears to be first or second intermediate host as shown in Table 2.

Table 2. Helminths of medical and veterinary importance (extracted from Reichendback-Klinke and Elkan, 1965; Piekarski, 1962; and Bauer, 1958) (Cited by Lim, 1992).

Helminth	Final host	**Role of fish in Transmission**	Disease condition in final host (acquired through eating raw/or under-cooked infected - fish)
CESTODA			
1. Diphyllobothrium latum Luhe, 1910 (**Fish tapeworm)**	man, dog, cat, horse fox and pig	As first second-intermediate host (with Pleroceroid in musculature)	Sparganosis (i.e. local swelling inflammation of musculature)
		As second second-intermediate host (by consuming the above), acting as	Diphyllobothrosis (causing pernicious anaemia by its withdrawal of vitamin in alimentary canal).
2. Diphyllobothrium cordatum Leuckart	Birds	As second intermediate host	
DI GENEA			
1. Clonorchis sinensis Looss, 1907 (Chinese Liverfluke)	Man, cat, dog	As second intermediate host (with metaccracariae in musculature).	Heavy infection results in cirrhosis of liver, asutes and oedema.
2. Opisthorchia felineus Rivolata, 1884 (Cat liverfluke)	Man (bile duct), cat (liver)	As second intermediate host (with metaceracariae in musculature)	Chronic infection results in caranomata of bile ducts and pancreas.

3. Opisthorchis tenuicollis Stiles and Hassal	Man	As second intermediate host	
4. Metorchis albidus	Bile canal and liver of man and domesticated animal	As second intermediate host	
5. Heterophyes heterophyes Stiles and Hassal	Cats, dogs, foxes, man	As second intermediate host	
6. Metagoniumus yokogawai	Man, dog, cat, wild carnivores & piscivorous birds	As second intermediate host	Catarrhal dysfunction of alimentary canal
7. Pseudamphistomum truncatum	Man, and carnivorous animal	As second intermediate host	
NEMATODA			
1. Eustoma rotundata Rud.	Man, Seal	As intermediate host	Phlegmonous entritis accompanied by eosinophilia.
2. Gnathostoma spinigerum Owen	Cats, dogs, mink, carnivorous mammals and man	As second intermediate host	Oedematous swelling of face and extremities in human

Parasites are good indicators to managers hence can inform on possible outbreak to help make adequate precautionary measures during production and fish transfer.

Table 3: Types of Fish Borne illnesses in man

TYPES OF FISH-BORNE ILLNESSES		
Types of illness		Causative agent
Infections	Bacterial infections	*Listeria monocytogenes, Salmonella sp., Escherichia coli, Vibrio vulnificus, Shegella sp.*
	Viral infections	Hepatitis A virus, Norovirus, Hepatitis E
	Parasitic infections	Nematodes (round worms), Cestodes (tape worms), Trematodes (flukes)
	Toxi-Infections	*Vibrio cholerae, Vibrio parahaemolyticus Escherichia coli, Salmonella sp.*
Intoxications	Microbial	*Staphylococcus aureus, Clostridium botulinum*
	Biotoxins	Ciguatera, Paralytic shellfish poisoning (PSP), Diarrheic (DSP), Amnesic (ASP), Neurotoxic (NSP), Histamine
	Chemical	Heavy metals: Hg, Cd, Pb. Dioxines and PCBs. Additives: nitrites, sulfites

(Source: www. fao.org (2005)

PREVENTION OF PARASITES IN CULTURE SYSTEMS

Properly constructed facility: A well designed facility reduces drudgery and enhances management practices. Aquacultural facilities like ponds, concrete tanks, plastic tanks as sown inFigure 73 should be constructed with water control devices along with filters to maintain optimum water quality in the rearing facilities. Modern devices as shown in Figure 74 are convenient for home based fish culture and research purposes

Earthen ponds(www.wikiwand.com,2016
www.ambofish.com,2016)

Catfishfarmingnigeria.blogspot.com.
Agriculturenigeria.com Practicalbusinessideas.com
Figure 73: Different Fish culture facilities

Figure 74: Recirculatory water System for fish culture.(www.googleimages/rws)

Avoid overcrowding

Many workers gave stocking density between 20,000 – 50,000 fish per hectare as appropriate in many rearing facilities depending on fish species and other factors. (Omitoyin, 2007). When stocking density is high, pond productivity and fish nutrition tend to decrease. At any given density when enough food is available larger fish will produce a higher yield making stocking of smaller fishes less productive. Therefore fry and fingerlings can be reared to juveniles of about 120g in the nursery before stocking. Within a short period (4-6 months) fish can be harvested for marketing or processing. In order to achieve a marketable weight within a short period, stocking densities should be relatively below 50,000fingerlings per hectare. Over- crowding can lead to high bacterial load of water causing several diseases like fin, tail and gill rot. Over-crowding also makes fish susceptible to stress, stunted growth, death and eventual economic loss.

Guide against stress factors

For fish not to be infected by parasite the key factor to guard

against is stress, which usually predisposes fish to physiological disorders or to infectious diseases in the presence of fish pathogens. Stress response in fish is measured by behavioural changes, production traits (growth, weight gain/loss and food conversion), morbidity and mortality, these factors show the severity and extent of chronic or acute stress and determine productivity(Ehteshanuddin, 2004;Adeyemo,2008). It is important that, stress disposing factors should be carefully guarded against in aqua cultural facilities. At stocking, fry must be allowed to swim gently out of transfer container after acclimatization, that is allowing fry/carrying water temperature to gradually equilibrate to the stocking water temperature.

Quality and Quantity of Water Supply

Fish handling practices involve supply and maintenance of adequate and high water quality at all times, because optimum water quality is paramount to optimum health and productivity in aquaculture.In any fish farm water must be available at all times, the farmer must also have simple water quality meters handy to monitor and keep track of the quality of the fish rearing water(Adeyemo,2013b). Optimum water quality requirements for fish culture for instance were described for *O.niloticus* by Aderibigbe(1988),*Heterotis niloticus* and *Clarias gariepinus* by Adeyemo and Adeyemo(2009). Fertilization and intensive feeding may compound water quality problems if not properly handled. It is of utmost importance to monitor these practices in order to optimize the production of healthy fish free of diseases and parasites.

Avoid Overfeeding

Fish feed must be of high quality and purchased from a reputable company or compounded and used within a short period. Feeding should commence once stocked fish have completely adjusted to the environment this is observed when mortality has reduced or stopped. The farmer must not

overfeed, feeding must be timed, done gradually and regularly at the rate of 3-5% body weight of the stocked fish. This amount should be divided into portions for the whole day and must be given at a specific spot in order to allow visual contact with the fish as the fish soon get used to the spot when in need of food.

Careful handling during cropping

Test cropping should be carried out so that overgrown individuals refer to as shooters are removed without stressing the whole stock. Harvested fish should not be allowed to struggle because struggling after capture will hasten post mortem deterioration. Most fishes should not be touched with bare hands since this removes the protective mucous coat and scales thereby predisposes the fish to various parasitic, bacterial and fungal infections. A sorting table must be used for separating shooters while fish that need to be transferred should be carried with a piece of cloth in case of breeders and scoop/hand nets for smaller fish.

Appropriate Hauling of Fish

Transfers are better done through the water channels in a well-planned facility; if such facility is not available the fry should be collected in concentrated schools with a small meshed seine or mosquito net and place in the adaptation tanks immediately. Tanks and containers for transportation should be filled with cool water from the ponds before draining and harvesting; so that once fish are cropped they are allowed to settle in the transportation containers. Oxygenated water in air tight polythene bags should be used to transport fingerlings. Fish must not be transferred with debris of fed, which must be siphoned carefully to ensure clean water during transfer. Transfers must be done early in the morning or late in the evenings, when fish are less active. Catfishes are known to remain alive for a long time after harvesting but other species

like *Tilapia sp Heterotis sp Cyprinus sp* and some other fish species must be instantly transported to destination. Care must be taken to maintain constant temperature during transportation by using ice cubes or carrying enough water for exchange during the journey. Tough resistant, light weight easy to clean and sanitized plastic should be used to haul live fish meant for marketing. To prevent hauling loss which is delayed mortality, 0.1 –0.3% Sodium chloride\calcium carbonate may be added during hauling to raise total hardness of the water in transit to reduce stress.

Sanitation in Fish Culture Facilities

In any food production line the WHO and FAO required that the hazard analysis and critical control point(HACCP) system must be put in place, and in industrialized processing Good manufacturing practices(GMPs) is usually ensured. In the culture of fish food, there are issues of public health importance which involves the maintenance of hygienic environment including proper sanitation in and around the rearing facilities, removing of mud from pond bottom regularly and exposing the bottom soil to the sun. Such measures may not be possible in deep perennial ponds, therefore, during the dry season, when water level is low, agricultural lime at 2000kg\hectare and potassium permanganate at 3ppm may be used in maintaining sanitation in such ponds. Liming should only be done after determining the pH of pond soil and water. In earthen ponds, grasses should be mowed or cut twice a month during the rains and after each harvest. The use of herbicides must be limited to the time when the fish are already harvested and the pond is empty.

Fertilization is essential in earthen ponds but not in tanks, it must be done only at recommended rate when the pond water is not fertile. Application rates of phosphate fertilizers are: Basic Slag, 25-30kg\ha, Single super phosphate, 114kg\ha and Double super phosphate at 57kg\ha. Organic fertilizers are

applied at the rate of 1000kg\ha for cow dung and 114-228kg\ha for chicken dung.

Managerial efforts to reduce stress factors for fish living in captivity should be intensified during culture because it has been realized that diseases of fishes are generally caused by bad managerial practices. Death of fish may also occur due to bad environmental conditions. Sometimes herbicides and pesticides used in neighboring agricultural farms may also cause fish mortality. All these calamities cannot be easily avoided if management practices are poor.

Drug Treatment

Drug application is the last remedial measure to be resorted to in fish rearing and health management because generally chemical have toxic effect. Sodium chloride (common salt) that appears harmless can kill a fresh water fish when it is kept in 3% saline for more than 5minutes. However, careful a fish farmer may be, drug treatment is almost unavoidable for getting rid of fish parasites and diseases. Drugs can be feed based or water based. Farmers may find it difficult determining which disease is or which treatment t o give, it is important to treat fish ponds occasionally and sometimes draining and disinfecting the pond with just common salt to prevent spread of bacteria or parasite present in water. When fish are injured during handling there is need to add buffers to the water for example phosphate buffer solutions to protect the skin from losing excess body fluids and also cover any route of disease or parasite invasion. During drug treatment water must be aerated continuously. Diseases can be treated by dipping, flushing and bathing. Commonly used disinfectants for fish, are iodine solution, copper sulphate, formalin, malachite green,trichlorfon and potassium permanganate, examples o over –the counter drug that can be administered are described in Table 4. It should however be noted that a **veterinarian or a fish pathologist must be consulted before any drug administration.**

Table 4: COMMON FISH DISEASE SYMPTOMS, DIAGNOSIS AND TREATMENT (ADAPTED FROM www.fishnet.org/sick-fish-chart.htm **(2015)**

s/n	Symptoms/abnormalities	Associated conditions	Prevention/Control
1.	Grey/Whitish colourings, yellow to gray patches on gills, 	Columnaris (cotton wool disease or saprolegnia	Treat immediately with Over –the counter (OTC) antibiotics. Disinfect facilities.
2	White marks on the body 	Ichtyophthirius	OTC medication for ICH
3	Weak Swimming, sluggisgness,lack of appetite	Skin flukes,ulcers	OTC for bacterial infection
4	Blindness ,growth on eyes	Cataracts,cloudy eyes	OTC medication for fungus
5	Caudal wounds or Lesions,ragged or decaying fins  	Fin rot	Check water quality and or try OTC antibiotics for fin /tail rot
6	Big or swollen head, bulging eyes 	Corneybacteriosis, pop eye, tumor	OTC antibiotics such as penicillin and tetracycline
7	Hole in the body/head,weight loss,small worms hanging from body	Hexamita or and leech	OTC medication or/and salt treatment.

8	Swollen Stomach 	Constipation,Tumors,Dropsy	Add 1/8 teaspoon of Epsom salt for every 5gallons of water and monitor for 2weeks.Stop feeding for 2-3days, then try varied diet. Consult a fish pathologist
9.	Haemorrhages on the body,red or bloody gills gasping for air 	Septicemia, Costia, Tricodina, inflammation,Ammonia poisoning	OTC antibiotic treatment, Regular water quality maintenance
10.	Stunted growth	Blood flagellates, neon tetra disease, copepods, ulcers, velvet disease, fish tuberculosis or genetic problem.	OTC medication, Treatment for Neon is difficult trial of medication for gram-negative bacteria or with nalidixic acid as active ingredient may be effective, for TB human strength medication may help, Gene manipulation.
11.	Small dark spots on fins and body 	Black spot,Oodinium,	OTC medication
12.	Erractic swimming,head tipped down inability to balance	Swim bladder disease, flip over or myxobacteriosis.	Check for signs of internal parasites ,stop feeding for 3-4 days and consult a veterinarian

FISH FOOD HANDLING AND PREPARATION.

Depuration technique of holding fish in clean water without feeding for 3-4 days before marketing is a pragmatic way of safeguarding parasite transmission and reducing contaminants of all sorts. Complete removal of gills and visceral during processing and thorough washing of blood traces with portable water cannot be compromised except for small fishes. It is also essential that during processing physical exposure by processors should be minimized through use of protective clothing (Figure 75) Adequate hygiene of processors and proper disposal of waste,through pre-treatment, and detoxification will reduce parasites and pathogens.

Figure 75: Fish processing line with adequate protective clothing(www.twoitrenews.un, 2016)

Elimination of parasites from fish products may not be completely possible and if fish consumption increases globally as predicted (Williams and Jones, 1994), the importance of these zoonoses may increase. In our locality, majority of consumers (65.6%) prefer whole fish, head and bones inclusive(Adeyemo,2013c) and they also want it fresh(Kingdom et al., 2007), we must therefore make special request for proper handling and preparation of our fish food especially in the point and kill joints. Generally, the measures to be taken by consumers, fishers and processors to mitigate the risks of infection include but not limited to avoiding particular areas for fish catch, and if it is the size, species or sex related infection, it is to avoid such size, species or sex of fish. A good example is the hake harvested in the Gulf and North Sea found in our markets but infected with Anisakids, consumers should take extra care to clean the entrails, remove the head even as smoked product. The extent of processing including de-heading, de-gutting, candling, filleting, salting, freezing or smoke drying can all contribute to the control of the risks posed by fish parasites. Freezing and heat inactivation are the most effective means of killing parasites. Parasites will not survive in canning or irradiation methods of processing. Irradiation for fish products may give the product an unpalatable texture and taste, becau se if irradiation is not high enough like 0.5magaRads or 10kGy ,it may not kill the parasite(Farkas,1987). In our locality, the smoking methods of preservation are well accepted and continue to enjoy local research and patronage (Adigio et al.,2015). Hence ability to properly package our fish products will go a long way to command international recognition. Good manufacturing practices (GMPs) and Hazard Analysis and

Critical Control Point (HACCP) are programmes designed to ensure food safety and it is very relevant in fish production and processing.

No matter how you want your fish, whether fresh, dried,canned or in pepper sauce you will get it without contamination, if adequate processing procedures are strictly adhered to .

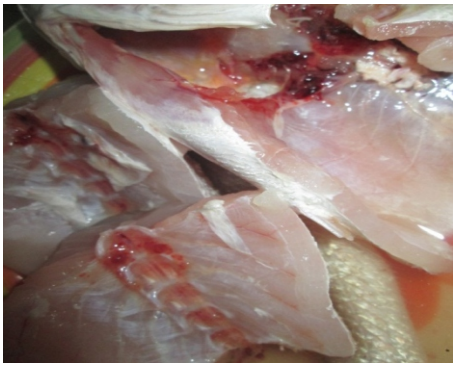


Figure 76 : Fresh Fish (Adeyemo,2016)

Figure 77 : DriedFish (Adeyemo,2016)

Figure 78 : Canned fish products(www.fishnerds.com**, 2016)**

Figure 79 :Fish in sauce(Adeyemo,2016)

CONCLUSION

Mr. Vice- Chancellor Sir, to close- up on these fish matters, I want to conclude by stating that; Production of Fish is profitable and contributes to healthy living. The control of diseases and parasites during fish production depends to a great extent on the stage at which problem is detected; with adequate managerial efforts it can be avoided. Early detection is very important as well as proper diagnosis. But if the first sign of an epizootic is the appearance of numerous dead fish, it may seem late to remedy, hence fish farmers are advised to have frequent visual contact with their stock. PREVENTION IS BETTER THAN CURE.

Hence I propose the following recommendations:

- Establishment of fish health experimental stations and laboratories at least in every region to assist farmers at the instance of any disease occurrence should be a laudable government policy.

- The National government along with Fisheries Industries and Organisations need to establish a formidable team to institute HACCP and GMP policies to mitigate risk of zoonoses through fish.

- To maximize aquaculture production for economic growth, food security and livelihoods, all stake holders must be co-opted into development strategies. For instance the stakeholders were identified for inland fisheries management of Igbedi Creek of Wilberforce Island Bayelsa State by Adeyemo(2012). Also, in aquaculture health management, all concerned stakeholders (parasitologist, fisheries biologists,veterinarians,culturists and processors)

must be involved in the decision making concerning fish health management as advocated by Adeyemo(2013d).

- Research on adaptation of chemotherapeutics to local conditions and development of suitable drugs in aquatic environment should be encouraged through adequate funding.
- Consumers and fish mongers should endeavor to clean fish as much as possible and apply adequate heat for processing to ensure consumption of wholesome nutritious fish.
- On the whole, I wish to assure you all that the benefits of fish production and consumption, no doubt, far outweigh the associated health problems**.**
- **…… . JUST CLEAN RIGHT, COOK RIGHT AND EAT RIGHT.**

Thank you for listening and God bless you richly.

ACKNOWLEDGEMENTS

I bless the name of God most high for giving me life, good health and sound mind to stand before you today to present this inaugural lecture. To him alone be all the glory.

I am indebted to so many people in my life that have made this day a reality.

I am grateful to the Vice –Chancellor of this great University, Prof Humphrey A. Ogoni for approving my presentation at this period. Sir; I greatly admire the humility and openness in your leadership style, to all the principal officers of the University , I say you have been part of the success story, thank you very much.

I sincerely appreciate my academic fathers, mothers and leaders namely Prof.S.A. Agbede, Prof. J.F. Alfred-Ockiya,

Prof. A.E. Falaye, Prof. Ezeri, Prof. E.S. Erondu, Prof. John Buseri, Prof.Chris Ikporukpo, Prof. H.A. Ogoni, Prof(Rev) Dimie, Prof.Gideon Abu, Late Prof. K. Zuofa Late Prof. Nelson Berepubo, Prof. Edmund Allison-Oguru, Prof.Olu Obi, Prof.M.O.Akusu, Prof. T.T. Epidi, Prof.E.M . Ngodigha, Prof. M E. Allison, Prof. T. Asuka Prof. Osa Tawari, Prof(Mrs).Lanre Awotona, Prof. R.I. Keremah, Prof. Joshua Eniojukan, Prof. J.K. Balogun, Prof. Sunny Oniye , Dr(Mrs).Dorcas Bawo, Rev (Dr)A.J.T. Otobotekere, Dr. C.C. Tawari, Prof. C.E. Equmu and so many others too numerous to mention I have learnt one or two things from you. Thanks for being there at the right time.

I also appreciate the cooperation of the Laboratory staff and the administrative staff of the Department, the Faculty and the University at large, I am thankful for the SEM work done through the assistance of Dr Hughes and Mr Makinde of International Institute for Tropical Agriculture, Ibadan.

I am grateful to the Members of the Fisheries Society of Nigeria, Agricultural Society of Nigeria and Zoological Society of Nigeria for academic gossips and support.

I appreciate the contributions of my mentors in the Oyo State Ministry of Agriculture and Natural Resources namely Rev Okeremi , Mr Olatunde Olatunbosun, Late Mr Adebayo Owoyemi, Late Mr Olubowale Ojo, Mrs. E. Bella, Dr.(Mrs) O.A.Olukunle and my colleagues Mr Rasaq, Mr Dele Lawal and Mr Felix Molade.

I wish to appreciate my spiritual role model Pastor Enoch Adejare Adeboye who has sown spiritual seeds into my life without knowing me and to all my spiritual leaders –Brother Kasali Babalola, Brother Serjius Osei, Dr.Emmanuel Ajala, Rev. S.M .Leigh, Pastor Yinka Abimbola, Prophetess Bola Obideyi, Pastor Oluwaniyi, Pastor Adisa, Prof.Gideon Abu, Brother and Sister Peter Ademu-Eteh, Pastor Brenda, Pastor Adeyanju, Pastor Chris Banigo, Pastor Olalere Olagboye and so many others near and far, I thank you for all the wonderful

spiritual seeds you have sown into my life.
Great Nduwa, you are not hidden, your impact shall continually be positive in this community, your family and beyond the shores of this country, thank you all for being my friends and sisters in the Niger Delta.
I thank God for my father Pa Cornelius Olufunmi Aderibigbe (a.k.a Emagbadun(1926 -1983)who was zealously passionate about his children's education but it was not destined for him to glory in their pursuit. Emagbadun, we missed your fatherly nudging to success, may your soul continue to rest in peace. My mother –you are the best, always there to cheer you on, Maami, may God grant you many more healthy years to be with us. . My darling one and only caring husband- Pastor Olumide Rotimi Adeyemo, you gave me the impetus to pursue academic career without reservation, I pray, you will not lose your reward by the grace of God. My daughter Mercy Temitope Adeyemo, you are the apple of my eye, thank you for not complaining. I love you dearly. My darling sisters, Chief(Mrs) Mojisola Hassan, Elder Mrs Oyeyemi Onabanjo, Chief (Mrs) Kikelomo Disu-Alakia, A/Pastor Oluwaranti Sanmi-Lawal and Deaconness Anuoluwapo Idowu, you are all my joy and pride, I feel fulfilled just knowing you are there. I appreciate all my dear brothers in-law –Alhaji (Chief) Kassim Hassan, Apostle Gbadebo Adeyemo, Surveyor Olumuyiwa Onabanjo, Otunba Gbadebo Disu-Alakija,Honourable Saka Sanmi-Lawal and Deacon Adekunle Idowu for their brotherly supportI thank all my brothers and sisters of Emagbadun enclave for being part of my growing up and contributing to my progress especially Mr Tunde and Mrs Bisi Moyosore,also Mr Ayo and Nike Dare. My dear cousins that are always asking after my wellbeing, I am grateful for all your concerns among these are Dr Olatunde Odusan(Olori ebi of our generation), Mr Olumide Onadipe, Mr Lanre Adesanya(my Chairman),Mr Sesan and Mrs Ayo Odusan, Mr Afolabi and Mrs Yinka

Adesanya, Mrs Yemi Amodeni, Mr Olutoye Ariyo, Mr Segun Ariyo and Mrs Yemisi Whyte.

I thank all my friends and colleagues in and outside the University, just to mention a few, Dr,I.A.Ogidi, Dr. P.E Kainga, Prof. John Akpodiete, Dr. Ebube Odoya, Mr. Sunny Eronmosele, Prof(Mrs) Onome Davies, Dr.I.N. Inyang, Dr. T.Kingdom, Dr(Mrs) Ben-Wari, Dr. Tessy Dorgu, Dr.P.C.N. Alikwe, Prof.B.T. Sese, Prof. Ibaba S.Ibaba, Mr John Opigo, Mr Rodger Obubo, Dr.(Mrs) Ebi Ansa, Prof.U.U.Gabriel Mr Aye Itua-Banigo and many others. My dear brothers, sisters and children of the most High God in the Redeemed Apostolic Ministry and Church of God, Onopa Yenagoa, i thank you all for your prayers and spiritual support.

To everyone that has found time to be here I say a big thank you ,I love you all and for all that have travelled a distance to be here I wish you journey mercies back to your various destinations.

I thank all my postgraduate and undergraduate students for carrying on the mantle, the Lord will continually be your helper by the power in the mighty name of our Lord Jesus Christ. AMEN

THANK YOU ALL FOR LISTENING AND GOD BLESS YOU RICHLY.

References

Adams, A.M, Murrel,K.D and Cross,J.H (1997)Parasites of Fish and Risks to Public Health. Rev. Science Tech. Office de International Epizootics 16(2) 652-660.

Aderibigbe, A.O. (1988) Effects of Water Quality Fluctuations on the Performance of Tilapia(*Oreochromis niloticus*) Breeders. B.Sc. Thesis. University of Ibadan.

Aderibigbe, A. O. (1991) Parasites and Parasitic Disease Observed at the Fish Breeding Centre, Oyo State Ministry of Agriculture and Natural Resources. M.Sc. Thesis. University of Ibadan, Ibadan.

Adeyemo, A.O. and Agbede, S.A (1997) Pond Construction, Stocking and Management. In Aquaculture in Ogun State: Management and Veterinary Needs. Ministry of Agriculture. Veterinary Department. Osunfisan, C.O. (Editor). Vet Academic Resources Publishers and Consultants. p11-22

Adeyemo, A.O. and Ike, G.I (Editors) (1999) Post Impact Assessment Stu dies of Alakiri And Orubiri Fields. A Technical Reports Submitted to Shell Petroleum Development Company. Produced by LANKIN NIG LTD..

Adeyemo, A.O. (2001) Incidence and Pathogenesis of *Clinostomum tilapiae*: Trematode Parasite of Tilapia (*Oreochromis niloticus*). PhD Thesis Universty of Ibadan.Ibadan.

Adeyemo, A.O; Agbede, S.A; Taiwo, V.O. and Adedeji, O.B. (2003) Prevalence, Abundance and Intensity of *Clinostomum tilapiae* on Cultured *Oreochromis niloticus* in Oyo State. Tropical Veterinarian. Vol 21(3) :129-133 ISSN 0794-4845

Adeyemo, A.O and Agbede, S.A. (2006) Agar-gel Immunodiffsion reaction of cultured *Oreochromis niloticus* to *Clinostomum tilapiae* antigen. Nigerian Journal of Research and Production. Vol 8(2): 102-106.

Adeyemo, A.O. (2006a) Fish Health Management in Aquaculture Development: Proceedings of the National Association of Women Academics (NAWACS) 5TH Annual Conference**.**

Adeyemo, A.O. (2006b)Procedures for Submitting Fish Samples to the Laboratory for Disease Diagnosis. In Proceedings of the Agricultural Society of Nigeria(ASN) 40TH Annual Conferences.p 494 -496.

Adeyemo, A.O. and Falaye, A.E.(2007) Parasitic Incidence on Cultured Clarias gariepinus. Animal Research International 4(2):702-704.

Adeyemo, A.O and Agbede, S.A. (2007) Histopathology of Tilapia Tissues harbouring *Clinostomum tilapiae* parasites. African Journal of BioMedical Research. Vol. 11:115-118.

Adeyemo, A.O. (2008) Bio-Economic Implications of Fish Diseases. Journal of Agricultural Research and Policies. Vol 3(1):98-101.

Adeyemo, A.O. and Agbede S. A. (2008) Comparative Observation on the Acquisition or loss of Trematode (*Clinostomum tilapiae*) by Tilapia (*Oreochromis niloticus*) Journal of Research in Agriculture. 5 (1): 21-23.

Adeyemo, A.O: Alfred-Ockiya J.F. and Kingdom,T. (2008) Sustaining The Empowerment Initiatives for the Fisheries Sector in Bayelsa State.Nigeria. Journal of Agricultural Research and Policies. Vol 3(4) : 69-72.

Adeyemo, A.O. and Araoye P.A. (2008) Parasites on Cultured Tilapia(*Oreochromis niloticus*: Trewavas) In a Breeding Pond at Ibadan, Nigeria. Nigerian Journal of Fisheries 5(2):158-163.

Adeyemo, A.O and Adeyemo, O.R (2008) Fish Farming Development In Nigeria. In Proceedings of the Agricultural Society of Nigeria (ASN) 42nd Annual Conference. 19th – 23rd October 2008. Abakaliki p 546 - 548.

Adeyemo, A.O. and Adeyemo, O.R (2009) Growth Performance and Nutrient Utilization of *Heterotis niloticus and Clarias gariepinus* under mono and poly-culture systems. Aquafield 5 :1-7.

Adeyemo, A.O (2009a) Public Health Issues In Fish Production. The Nigerian Academic Forum. Vol.16:2(012):31-34.

Adeyemo, A.O. (2009b) Sex Ratio Variation on Breeding Performance of *Oreochromis niloticus.* International Journal of Animal Science Vol 1 No1: 14-18
www.blackwellacademicjournal.com.

Adeyemo, A. O. (2010) Body sites preference in *Clinostomum tilapiae* infection on *Oreochromis niloticus.* International Journal of Animal Science Vol 2 No 1: 121-125.
www.blackwellacademicjournal.com

Adeyemo, A. O. and Omovwohwovie,E.E.(2011*)* Parasitic Incidence On Mochochidae Fish Family At Igbedi Creek, Wilberforce Island .Bayelsa State. International Journal of Pure and Applied Science . Vol 4 (1):122-126

Adeyemo, A.O. (2011a) Occurrence of Anisakids Nematodes on Frozen Hake (Merluccius capensis) In Yenagoa Market, Bayelsa State, Nigeria**.** African Journal of BioMedical Research. Vol. 14:113-116. ISSN 1119-5096

Adeyemo, A.O. (2011b) Fish Disease Symptoms as observed by fish farmers in Ogbia and Yenagoa local Government area of Bayelsa State. Nigeria. Journal of Agriculture and Veterinary Sciences. Vol 3:13-19.
www.cenresinpub.org.

Adeyemo,A.O and Daunemughan, T. (2012) Parasitic Investigation on wild

Parachanna obscura .International Journal of Current Biological and Medical
Science 2(1):195-198. www.currentscidirect.com.

Adeyemo,A.O. (2012) Challenges faced by fishers at the Igbedi creek. Wilberforce
Island .Bayelsa State. Nigeria. Nigerian Journal of Fisheries 8(2): 346-351.

Adeyemo, A.O. (2013a) Perception of Fisheries Students of Niger Delta University to Fisheries
as a Profession. Journal of Agriculture and Veterinary Sciences.

Adeyemo, A.O. (2013b) Quality of Water for Fish Culture. Journal of Agriculture, Socio-economics and
Environment. Vol 1(1):11-16.

Adeyemo, A.O. (2013c) Estimation Of Fillet Yield For Four Tropical Freshwater Fish Species.
Merit Research Journal of Environmental Science and Toxicology Vol 1(2): 012-
015 www.meritresearchjournals.org.

Adeyemo, A.O. (2013d) Effective Fish Health Management Strategy in Nigeria:A
Review. International Journal of Plant and Animal Science. Vol1(1):001-004
www.internationalscholarsjournals.org.

Adeyemo, A.O. (2014) Climate Change and Sustainable Fisheries and Aquaculture in the Niger Delta, Nigeria. Centre for Niger Delta Studies, Niger Delta University, Wilberforce Island, Bayelsa State. First National Conference. Theme: Climate Change, Human Security and Development in The Niger Delta Date: 1st – 4th December, 2014.

Adigio,E.M.,**Adeyemo,A.O.** and Awosusi,D.(2015) Design, Fabrication and Operation of a Smoking Kiln. International Journal of Engineering and Technical Research (IJETR) Vol 3(3):293-296

Agbede,S.A.(2012) Healthy Fish for Man. An Inaugural Lecture delivered at the University of Ibadan

Agbede, S. A **Adeyemo, A.O** and Ezeri, G.N.O.(1997) Fish Health and Hatchery Management. In Aquaculture in Ogun State: Management and Veterinary Needs. Ministry of Agriculture. Veterinary Department. Osunfisan, C.O. (Editor). Vet Academic Resources Publishers and Consultants. p24-26.

Agbede, S.A; Olufemi, B.E. and **Adeyemo, A.O** (1997) Preventive Veterinary Medicine; Fish and Shellfish Hygiene. In Proceedings and Abstracts of the 34th Annual Congress of the Nigerian Veterinary Medical Association . p 32 -36.

Agbede, S.A; **Adeyemo, A.O.** and Taiwo, V.O. (2004) Scanning Electron Microscopic Studies of Clinostomum tilapiae (Ukoli, 1960).**Tropical Veterinarian. Vol 22 (1):1-3.**

Akinyi, E., Azeroual, A., Entsua-Mensah, M., Getahun, A., Lalèyè, P. and Moelants, T.(2010) *Heterotis niloticus.* The IUCN Red List of Threatened Species 2010: e.T182580A7920022. http://dx.doi.org/10.2305/IUCN.UK.2010-3.RLTS.T182580A7920022.en .

Alfred- Ockiya,J.F. (2000) Socio-Economic Activities of Women in Artisanal Fisheries of the Niger Delta,Nigeria. Aquafield 1(1): 30-35.

Alfred-Ockiya, J.F; **Adeyemo, A.O.** and Kingdom, T (2007) Challenges of Developing The Fisheries Resources in Bayelsa State, Nigeria. In Proceedings of Fisheries Society of Nigeria(FISON) 21ST Annual Conference.p 45 -51.

Alfred-Ockiya, J. F and **Adeyemo, A.O.** (2010) Preliminary Fish Cage Culture Trials at Burma Rice Farm .Bayelsa State. In Proceedings of the Agricultural Society of Nigeria ASN) 44th Annual Conference. 18th -22nd October 2010. Ogbomoso p1475 – 1477.

Al-Khleif, A., Roth,M., Menge, C.,Hveser,J.,Baljer, G. and Herbat, W. (2011) Tenacity of Mammalian viruses in the gut of Leeches fed Porcine Blood. J.Med.Microb. 60(6):787-92

Alves, L.(2009)Fats, Omega -3,Omega – 6. In What's the Catch with Fish and Fish Oil….and what you can do. Dos Winkel (Editor)WKT Printing Group. The Netherlands.

Amlacher, E. (1996) Textbook of Fish Diseases. Translated by Canroy ,D.A. and Herman, R.L. TFH Publ.

Anderson, Emmanuel and **Adeyemo, Abiodun Oluseye (2012**)Environmental Impact Of Crude Oil Spillage At Agoubiri Community In Southern Ijaw Local Government Area Of Bayelsa State. 27th Fisheries Society of Nigeria Annual Conference. 2012.Yenagoa.

Bake, G.G and Sadiku, S.O.E.(2005). Food and feeding habits of *Heterotis niloticus* from River Kaduna floodplain. 19th Annual Conference of the Fisheries Society of Nigeria (FISON), 29 November - 03 December 2004, Ilorin, Nigeria.

Bardach,J.E.(1997) Sustainable Aquaculture. John Wiley & Sons Inc. New York.

Benenson,A.S. (1995)(Editor) Control of Communicable Diseases Manual.16th Edition.Official Report of the American Public Health Association.

Bernadette,T.(1989) Women in Aquaculture Production in West Africa. In Proceedings on the Development and Management of Fisheries

in Small Water Bodies . Accra .Ghana.
Giasson,M and Gaidet, J.L.(Edts) FAO Fish Report No 425:129-139.

Chambers,K. A. (2008) Catfish Microsoft Encarta 2009. MC.

Chambers, K. A. (2008b) Lamprey Microsoft Encarta 2009. MC.

Clover,C. (2004) The End Of Line. How Overfishing Is Changing The World And How We Eat.

Ehteshamuddin, S. (2004) Serum Glucose As An Index Of Serum Titer of Corticosteroids During Stress Response In The Catfish (Heteropneutes Fossils (Bloch) In Fish Research. Pandey, B.N (*Editor*) A.P.H. Publisher. New Delhi. P103-107.

Erondu,E.S(1991) Aspects of the Biology of Chrysichthys nigrodigitatus in the New Calabar River and Its aquaculture. PhD Thesis of University of Nigeria. Nsukka.

Encarta Encyclopedia (2009) Microsoft Corporation.

Eyo.A.A. (2001) Fish Processing Technology in the Tropics.NIFFRI.403p

Eyo, A.A. (2003) Fundamentals of Fish Nutrition and Diet Development.An Overview in Proceedings of the National Workshop on Fish Feed Development and Feeding Practices in Aquaculture.

FISON/NIFFR/FAO/NSPFS.

FAO(1996 The State of World Fisheries and Aquaculture. FAO. Rome.Italy
FAO (2005) Small Scale Aquaculture in Sub-Saharan Africa. Revisiting the Aquaculture Target Group Paradigm. Rome. Italy

FAO (2007) Fisheries Statistics(Countries) www.fao.org
FAO (2012) The State of World Fisheries and Aquaculture. FAO. Rome.209pp www.fao.org
FAO (2014) The State of World Fisheries and Aquaculture. FAO. Rome. www.fao.org

FAO (2015) FAO in One Health: Working Proactively Instead of Reactively. Animal Production and Health.Agriculture and Consumer Protection Department. www.fao.org.

Farkas,J (1987) Decontamination Including Parasite Control of Dried, Chilled And Frozen Foods By Irradiation. Acta Alimentaria 16: 351-384.

Froese, R and Pauly,D (2015) (Editors) Fish Base. www.fishbase.org

GESAMP (1991) The oint Group of Experts on Scientific Aspects of Marine Environment.(IMO/FAO/UNESCO/WHO/IAEA/UN/UNEP). The State of Marine Environment UNEP Regional Reports and Studies. No 115

Inyang, I. R. **Adeyemo, A. O and** Ogamba, E. N **(2011)** Impact of Waste Dump On Seasonal Fish Species Composition And Water Quality In The Upper Bonny Estuary.International Journal of Current Biological And Medical Science 1(3):90-94 Www.Currentscidirect.com.

Inyang,I.R; **Adeyemo, A.O., Seiyaboh, E.I.** and Obele,S.G (2014) Effect of Kartodem 315EC on some Biochemical and Metabolic Parameter in *Clarias gariepinus*. Biological and Environmental Sciences Journal for the Tropics. 11(1):159-162.

Ishikura, H.,Kikuchi,K.,Nagasawa,K., Ooiwa,T.,Kakamiya,H.,Sato,N., and Sugane,K. (1992) Anisakidae and Anisakidiosis .In Progress in Clinical Parasitology.Vol 111(Editor- T.Sun) Springer Verlag, New York.

Kabata, Z.(1985) Parasites and Diseases of Fish Cultured in the Tropics.Taylor and Francis. London

Kainga, P.E. and **Adeyemo, A.O.** (2012a) Socio-Economic Characteristics of Fish Marketers in Yenagoa Local Government Area of Bayelsa State. World Journal of Young Reseachers. Vol 2:13-16. www.rrpjournals.com

Kainga,P.E and **Adeyemo, A.O.** (2012b) Economic Survey of Homestead Fish Farming in Selected Communities of Bayelsa State. Nigeria. Journal of Agriculture and Veterinary Sciences.Vol 4:69-75 www.cenresinpub.org**.**

Kainga, P.E and **Adeyemo, A.O**. (2013) Profitability and Resourse Use Efficiency in Catfish (*Clarias gariepinus*) Production in Kolokuma-Opokuma Local Government Area of Bayelsa State Nigeria. International Journal of Agriculture. Photon 124(2013)143-149

Kingdom, T; **Adeyemo, A.O.** and Alfred-Ockiya, J.F(2007) Consumer's Preference of Fish Products in Yenagoa Metropolis. In Proceedings of Fisheries Society of Nigeria (FISON) 21ST Annual Conference.p 359- 362

Kingdom,T; Alfred-Ockiya, J.F. and **Adeyemo,A.O**.(2008)Women' Involvement in Fisheries Activities in Lower Taylor Creek Area.Bayelsa State. Journal of Agricultural Research and Policies Vol 3 (3) : 34-38.

Lagler, K.F., Bardach, T.E., Miller, R.R. and May Passion,D.R.(1977)Ichthyology. John Wiley and Sons Inc.

Lim, L.H.S.(1992) Fish Parasites in Integrated Farming Systems in Peninsular Malaysia. In Integrated Livestock-Fish ProductionSystems. Proceedings of FAO/IPT Workshop. University of Malaysia . Mukherjee,T.K ea al., (Editors) www.fao.org.

Mebine P.W. and **Adeyemo, A.O. (2012**) Small- holding Fish Farmers/Fishers Accessibility to Loans and Credits in Two Communities in Bayelsa State. Nigeria. 27th Fisheries Society of Nigeria (FISON) Annual

Conference. 2012.Yenagoa.

Mohan, C.V. (2009) Health: National Strategies for Aquatic Animal Health Management. Article in the Fish Site. 20/3/09. Network of Aquaculture Centres in Asia –Pacific.

Moore, B. R ; Mitchell, A. J; Griffin, B. R and Hoffman, G. L (1984) Parasites and diseases of pond fishes. United States Department of Interior Fisheries and Wildlife Services. 3rd Report 177-205p.

Nehili,M.C.,Lik, C., Mehihorn,H.,Ruhuru,K.,Dick,W.and Nyayou,M. (1994)Experiment on the possible role of Leeches as vector of animal and human pathogen. A light and Electron Microscopy Study.Parasitology Research 80(4):277-90.

Odoya, E.M.Kalejaiye,M.O.,Ogo,N., Ogo,M.F.,Omotaise,S.O.,Balak,G.G.,Gida,P.N. and Okpala,U.G.(2004) Non-cyclic Transmission Studies on Trypanosomiasis. Survival of African Trypanosomes in Leeches. Proceedings of the 41st Congress of Nigerian Veterinarian Medical Association.

Odoya, E.M**; A.O. Adeyemo**; R. E. Ohenhen and O. H. Bekabain(2015) Leeches-Guide to Survey of African Trypanosomiasis In Wild Animals in Niger Delta Nigeria.

Okaeme, A.N.(1991) Helminth Fauna of Tilapia of Lake in pre and post impoundment conditions. Journal of Aquaculture 6: 1-8pp.

Olaosebikan ,B.D. and Raji, A. (1998) A Field Guide to Nigerian Freshwater Fishes. Fed. College of Freshwater Fisheries. New Bussa.

Olufemi, B.E. (1998) Fish husbandry and Medicine: The Experience of a Tropical Veterinarian. Inaugural Lecture. University of Ibadan.

Omitoyin,B.O (2007)Introduction to Fish Farming in Nigeria. Ibadan University Press.

Redmond, W.A. (2008) CARP. Microsoft Encarta Encyclopedia MC.

Reed,W.,Burchard, J.,Hopson, A. J., Jennes, J.and Yaro I. (1967) Fish and Fisheries of Northern Nigeria. Ministry of Agriculture. Northern Nigeria. Gaskiya. Zaria.

Richardson, A.J. (2004) Clinical Trials of Fatty Acid Treatment in ADHD, Dyslexia, Dyspraxia and the Autistic Spectrum. Prostagladins Leukot . Essential Fatty Acids Vol 70(4):383-90.

Richardson, A.J. (2006)Omega-3 Fatty Acids in ADHD and Related Neuro Developmental Disorders. Int. Rev. Psychiatry 18(2):155-72.

Roberts, R.J. (1978) Fish Pathology. Balliere Tindall. London.

Schlegel, H.G. (2002) General Microbiology. 7th Edition. Cambridge University Press. UK.

Stewart,D.B. and Bernier, L.M. J. (1999)Common Parasites, Diseases and Injuries of Freshwater Fishes in the Northwest Territories and Nunavut Wildlife Disease and Zoonotics. University of Nebraska Lincoln. Canada

Strohmeyer,C.(2014) Fish Parasite and Non Parasite Worms. In Aquariums and Ponds www.aquariumanswers.com.

USAID (2014) Sustainable Fisheries and Responsible Aquaculture: A Guide for USAID Staff and Partners-Fish /Aquaculture Guide. www.usaid.gov.

Williams, H. and Jones, A. (1994) Parasitic Worms of Fish. Taylor and Francis Ltd. London.

Winkel, Dos (2009) What's the catch with Fish. ?! and the Fish Oil……..and What you can do. Conference on World Ocean Day. Rotterdam. Netherland.

www.agriculturenigeria.com ,2016

www. ambofish.com, 2016

www.amintabin.blogspot.com. Accessed 2016

www.africhthy.org 2016

www.austin.charityowl.com ,2016

www.bilde.bin ,2016

www.cabi.org. 2016

www.catfishfarmingnigeria.blogspot.com ,2016

www.cappecffa.cluster.010.wh.net 2016

www.cdc.gov 2016
www.fishbase.org 2016
www.fishdoc.co.uk 2016
www.fishexpats.com 2016
www.fishingkhaolak.ccom 2016
www.fisherman.com 2016

www.fishpathogens.net ,2016
www.fosaf.org.za accessed. 2016
www.googleimages/ ,2016
www.gstatic.com 2016
www.ilovefishing.co.za 2016
www.koicarp.net 2016
www.mediterranentaste.com 2016
www.nydailynews.com,2016
www.outcastcharterfishing.com 2016
www.pinterest.com 2016
www.popista.com 2016
www.practicalbusinessideas.com ,2016
www.texaskoi.org 2016
www.tolweb.org 2016
www.totalfisherman.com 2016
www.twoitrenews.un 2016
www.quora.com2016
www.wikiwand.com ,2016

Zuofa, C. C. and **Adeyemo, A.O**.(2013) Adult Education in Nigeria: Effects of Food, Security, Women And Youth Development. Scottish Journal of Arts, Social Sciences and Scientific Studies. http://scottishjournal.co.uk

PROFILE OF PROFESSOR (MRS) ABIODUN OLUSEYE ADEYEMO

Prof. Abiodun Oluseye Adeyemo was born on the 29th December 1964 in Ibadan,Oyo State to Pa Cornelius Olufunmi (a.k.a Emagbadun)(1926- 1983) of Imowo quarters, Ijebu Ode and Mama Dorcas Olufunmilayo Aderibigbe (Nee Shebanjo) of Ikoto quarters,Ijebu-Ode. Ogun State. She had her primary education at St Mary's Covent School, Oke-Are, Ibadan. She attended Baptist Grammar School Idi-Ishin Ibadan and Olivet Baptist High School for her secondary school O' level certificate and Higher School Advanced level certificate respectively. She had her B.Sc, M.Sc and Ph.D degrees inFisheries Management all from the premier University of Ibadan, Nigeria. During her youth service she worked with the former Bendel State Communal farms. Her career spanned through both private and public sector before joining the academics. After the service year she was employed by a private fishing company- Express Fisheries Nigeria Limited, Lagos as a Fish Sales/Purchasing Officer before she joined the Oyo State Civil Service in the Ministry of Agriculture and Natural Resources as Fisheries Officer 11 in 1990.While in the Ministry of Agric. she was seconded to the Oyo State Agric.Development Programme where she worked as extension agent and later Subject matter Specialist(Fisheries Advisor).She later withdrew her service as Principal Fisheries Officer in 1999 and moved to Port-Harcourt to work with an Environmental company as Operation Manager and later a fast food restaurant (Eltees Eatery) as a General Manager. All the while, she was working on her academic progress and got her PhD in Fisheries Management in 2001. Her academic career started with the Rivers State University of Science and Technology in 2003 as Lecturer 11 before joining the Niger Delta University, Wilberforce Island as Lecturer 1 in 2004. She rose through the ranks to become a Professor of

Fisheries/Aquaculture and the first female Professor in the Faculty of Agriculture, Niger Delta University, and also in the entire Aderibigbe and Adeyemo families. She has served in the University system in various capacities and she is currently the Bayelsa State Chapter Chairman of the Fisheries Society of Nigeria. Prof. Abiodun Oluseye Adeyemo is a minister of the gospel of Jesus Christ. She is happily married to Pastor Olumide Rotimi Adeyemo and blessed with Mercy Temitope Adeyemo. She was ordained along with her husband as deaconess and deacon in the year 2002 in The Redeemed Christian Church of God. She is working in the vineyard with her husband who is the Founder of The Redeemed Apostolic Ministry and Church of God. Onopa, Yenagoa. Bayelsa State.

This comment was made by a mentor about Prof. Adeyemo: "My dear Prof, when I looked back, I have reasons to thank God who raised you from the eatery to a Professorial chair. To Him be all the glory and adoration".

97

TO GOD BE THE GLORY

To God be the Glory! Great things He hath done
So loved He the world that He gave us His son,
Who yielded His life atonement for sin,
And opened the Life gate that all may go in

Chorus: Praise the Lord! Praise the Lord!
Let the earth hear His voice!
Praise the Lord! Praise the Lord!
Let the earth rejoice
Oh come to the father, through Jesus the son
And give Him the Glory, Great things He hath done

Oh perfect redemption, the purchase of blood
To every believer the promise of God
The vilest offender who truly believes
That moment from Jesus a pardon receives
Chorus……

Great things He hath taught us
Great things He hath done
And great our rejoicing through Jesus the son;
But purer and higher and greater will be
Our wonder, our rapture when Jesus we see
Chorus……..

NIGER DELTA UNIVERSITY
INAUGURAL LECTURE SERIES

S/N	Name	Title	Date
1	Engr. (Prof.) Humphrey Andrew Ogoni	Chemical Engineering and Environmental Revolution	10-04-2008
2	Prof. Joshua Fusho Eniojukan	The Touchstone of the Pharmacy Profession	02-03-2011
3	Engr. (Dr.) Dau S. Ziborkere	Post-Harvest Agricultural Processing: Lessons from the Honeybee	30-03-2011
4	Prof. Kingsley Danekete Alagoa	A Probe as a Predictive Tool: A Theoretical Physicist's Pathway (Plasma as a Model)	25-05-2011
5	Prof. Augustine A. Ikein	The Petroleum Question Towards Harmony in Development	26-03-2014
6	Prof. Timothy T. Epidi	Insects: Our Friends Our 'Foes'	28-05-2014
7	Prof. Tuemi Tudou Asuka	Education: The problem of Nigeria	25-06-2014
8	Prof. Olanrewaju Rita-Marie Omobuwajo	What Come's out from the Pot?	16-07-2014
9	Prof. Kolawole Kayode Ajibesin	The Forest is Pregnant	06-08-2014
10	Prof. Chabuovie Menizbeya Sorgwe	African Culture Historiography: A Cogitation on African Identity and Recurrent Problems of Cultural Revival	27-08-2014
11	Prof. Wenikado Sylvester Ganagana	Ozidi Avenges: A Sculpto-Graphotherapeutic and Pictorial Naratology in Art	17-09-2014
12	Prof. Akpoebi Clement Egumu	Agricultural Education for Self-Reliance in the Niger Delta Area	22-10-2014

13	Prof. Christopher Okwuchukwu Ahiakwo	Dispelling Darkness-The Nigerian Experience	28-01-2015
14	Engr. Prof. IfeOluwa Kenny Adewumi	Engineering the Environment	25-02-2015
15	Prof. Youchou Mirabeau	The Divinity Behind the Tripod: The Man, The Invisible World and Death	15-04-2015
16	Prof. Tubonye Clement Harry	"Aid to Aids: A Journey of Serendipity	12-08-2015
17	Prof. Samuel Gowon Edoumiekumo	God, Man And The World: The Nigerian Tripodic "exchangeological" Dilemma	21-10-2015
18	Prof. Beleudanyo Gbalipre Fente	The Barrack Boy with the knife, Health and mathematical Surgical Dicisions in the Mangrove Forest	27-01-2016
19	Prof. Sieyefa Fun-akpa Brisibe	Family Medicine: "The Complexities of differentiating Undifferentiated undifferentiated diseases in a differentiated Proffession"	09-03-2016
20	Prof. Donbebe Wankasi	Sorption: A Prodigy of Life and Living	16-11-2016