Annals of West University of Timişoara, ser. Biology, 2017, vol. 20 (2), pp.123-130

PARASITES FAUNA OF FARMED AFRICAN CATFISH (*Clarias gariepinus*) IN OSOGBO, OSUN STATE, SOUTHWESTERN NIGERIA

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Received 11 June 2017; accepted 18 December 2017

ABSTRACT
This study was aimed at providing baseline knowledge about parasites fauna of farmed fish in Osun state in the Southwestern Nigeria, to better understand the parasite fauna occurrence, distribution and diversity in the commercial aquaculture fish species. A total of 155 fish comprises of 52% female and 48% male fish were randomly selected from randomly selected fish farms in the three seatorial zones of Osun State and examined for parasites using routine parasitological techniques. 8 parasite species were recovered among which Trichodina colisae (33.15%) *was predominant in prevalence while Capillaria aerophila* (11.26%) was the least in prevalence. *Two parasites - Diphyllobothrium latum and Amirthalingamia macracantha were recorded for the first time in the state. Of all examined fish, 62 (40.00%) were found to harbor at least one parasite species, with higher prevalence in male fish and in adult fish. The patterns in parasite numbers and composition reflect differences in fish culture system use, water source, stocking densities, management practices and diet. Earthen Pond System (EPS) had the most abundance of the parasites while Flow-through Concrete Pond System (FCPS) had the least compared to other culture systems. Correlation of physic-chemical water parameters, stocking density, water source and type of diet and prevalence of parasites were studied. There were significant correlation among the parameters studied and parasite prevalence. The parasite diversity was similar between farms; however, some farms were dominated by parasites in lower numbers, whereas some had parasites in relatively high intensities. Given the results of this study, we concluded that examined fish species were infected with parasites. Generally, the occurrence and diversity of parasites in these fish species highlight the likelihood of disease outbreak in aquaculture systems in the study area. This requires awareness in fish health management among potential farmers, service providers and researchers.*
KEY WORDS: *Farmed Catfish, Culture systems, parasites, Risk factors, Southwestern Nigeria.*

INTRODUCTION

Several works on parasitic infections associated with the holding of animals in artificial and often crowded conditions are well documented in Nigeria (Rufai & Awi-waadu, 2010; FAO, 2010; Basson *et al.,*1987; Bichi & Dawaki, 2010; Edema *et al.,* 2008; Akinsanya *et al.,* 2008). However, because aquaculture is a recent development in Osun State, *little*

information is available on parasite fauna and its implications on cultured fishes. There is also a lack of basic information on the possible risk factors. In an attempt to fill some of the gaps in our knowledge, a sampling survey of some selected fish farms in Osogbo where fish are reared in different aquaculture systems was undertaken to determine the faunas of farmed fish under different farm conditions; To examine the prevalence of the parasite fauna on fish samples from the different farms; To determine the intensity of parasite fauna of farmed fish between different fish culture systems. To determine the risk factors for the infections in the different farm environments.

Several studies have revealed rich parasitic fauna in freshwater fishes (Rufai & Awi-waadu, 2010; Edema *et al.,* 2008; Bichi & Yelwa (2010); Akinsanya *et al*., 2008; Oniye *et al*. 2004; Busch *et al.* 2003) which affect fish health, growth and survival. Most of these studies recorded various types of freshwater parasitic groups of economic importance, including protozoans - microsporideans and myxozoans; helminths such as monogenea and the digenean trematodes (flukes), cestodes (tapeworms), nematodes (roundworms) and Acanthocephala (thorny headed worms) The arthropod parasites are represented mainly by the copepods (Marcogliese, 2002), while the annelid parasites are the leeches.

Aquaculture production in East Africa is already been adversely affected by Fish disease out-breaks (Subasinghe *et al*. 2001; Bondad-Reantaso *et al*. 2005). Although aquaculture is increasing, the risk of losing profits due to diseases and parasites is already manifesting (Bondad-Reantaso *et al*. 2005; Barker *et al*., 2002). Despite the minimal profit margins for fish farmers in aquaculture, aquaculture remains the great potential for reducing the national fish deficit. Cases of aquatic diseases incidences leading to mortality rates of 60% have been reported in hatcheries and grow-out systems in Nigeria (FAO, 2010). Infectious parasites and bacteria are reported to affect private and public fish farms with profound effects (Steigen *et al*. 2013). Consequently, concerns for risks of trans-boundary disease transmissions cannot be ignored; transmission of parasites to farmed tilapia and catfish from wild fish had been reported in East Africa (Groenewald, 1964). Parasitic infections remain a challenge even to hatchery operators, causing significant economic losses. The possibility of using beneficial nematodes to control parasitic infection in both hatchery and culture ponds requires attention. Control measures practiced by fish farmers in the study areas are not specific and therefore not very effective and well understood largely due to insufficient information that can guide researchers, policy makers and farmers to develop control or preventive strategies against potential fish parasitic diseases. The importance of parasitic diseases as a fish production risk factor can significantly negate the marketability of aquaculture products. This paper therefore contributes to the knowledge base by providing baseline knowledge about parasites fauna of farmed fish in Osogbo South-western Nigeria, to better understand the parasite fauna occurrence, distribution and diversity in the commercial aquaculture fish species and the risk factors for the development of comprehensive control strategy.

MATERIALS AND METHODS

The study was carried out in the three senatorial zones (East, West and Central) of Osun State, Southwestern Nigeria from February to April 2017. Three local government areas (Iwo, Ife and Osogbo) were selected from the three zones with one from each zone. The selection of local government area was done based on the number of fish farms available in the

area. It was established that Osogbo (Central), Iwo (West) and Ilesa (East) had higher number of fish farms among the local government areas of Osun State. The study covered fifteen commercial fish farms of which six (6) were sampled in Osogbo, five (5) in Iwo and four (4) from Ilesa respectively. 10 live fish (asymptomatic and symptomatic) samples were randomly harvested from different culture systems from each farm. Pond size and physicochemical pond water quality were assessed. Water test kits (Tetra Gmbh, Germany) were used to measure ammonia level. Analysis was done according to the manufacturer's instructions. Water PH was measured using PH scale. Live fish were transported in 20-L buckets (with source water) to the TETFUND Zoology laboratory, Department of Biological Science laboratories at Osun State University, Nigeria. Samples were collected in batches, killed and immediately examined. Complete internal and external autopsies for ectoparasites and endoparasites were carried out as decribed by Research Animal Diagnosis Services, Reseach Model and Services, Charles River. Slides were prepared by crushing or scraping tissues rather than by taking surface smear. A scraping of the entire organ was made in the case of the gills, gall and urinary bladders. Light microscopy was routinely used for searching such preparations and for identification of parasites, and an arbitrary scale was decided for measuring intensity of infestation of protozoan species. In metazoan infestations, total numbers of parasites were counted.

RESULTS AND DISCUSSIONS

A total of 155 *Clarias gariepinus* were examined. Out of this total, 62 (40.00%) fishes were positive for parasitological examination with higher prevalence in male hosts (63.52%). Fish were infected with single or multiple parasitic infections (Table 1).

A total of 4 ecto-parasites and 4 endo-parasites representing three 4 classes of parasites – Cestodes, Nematodes, trematodes and protozoa were recovered. Figure 1 shows the parasites recovered in the three senatorial zones and their prevalence: Trematodes recovered were of *Dactylogyrus extensus* (28.56%); Cestoda – *Diphyllobothrium latum* (30.46%); *Amirthalingamia macracantha* (25.92%); *Nippostrongylus brasiliensis* (16.22%), *Capillaria aerophila*. (11.26%), *Trichuris muris* (15.96%) and Protozoa – *Trichodina colisae* (38.62%), *Ichthyophthirius multifiliis*(15.33%) (Fig.2) in Central zone while The trematode parasitic eggs recovered from the Western zone were of *Dactylogyrus extensus* (33.25%); Cestoda – *Diphyllobothrium latum* (32.12%); *Amirthalingamia macracantha* (18.32%); Nematoda - *Nippostrongylus brasiliensis* (23.28%); *Capillaria aerophila* (10.56%), *Trichuris muris* (10.67%) and Protozoa – *Trichodina colisae* (33.15%); *Ichthyophthirius multifiliis* (13.33%)(Fig.2) and the prevalence recorded in the Eastern Zone include the *Dactylogyrus extensus* (37.55%); Cestoda – *Diphyllobothrium latum* (%); *Amirthalingamia macracantha* (30.12%); Nematoda - *Nippostrongylus brasiliensis* (23.22%), *Capillaria aerophila* (14.26%), *Trichuris muris* (18.96%) and Protozoa – *Trichodina colisae.* (43.12%), *Ichthyophthirius multifiliis*(18.33%). The data indicates that *Trichodina colisae* (33.15%) *was predominant in prevalence while Capillaria aerophila* (11.26%) was the least in prevalence**.**

Figure 2 shows the patterns in parasite numbers and composition in the different fish culture system use in all the sampling farms. Earthen Pond System (EPS) (38.62%) had the most abundance of the parasites while Flow-through Concrete Pond System (FCPS) (14.32) had the least compared to other culture systems. Chi – square analysis showed that infection is significantly higher ($p<0.05$) in fish sampled from farms running earthen pond culture system

than those from concrete culture systems. There were significant correlation of physic-chemical water parameters, stocking density and prevalence of parasites in this study.

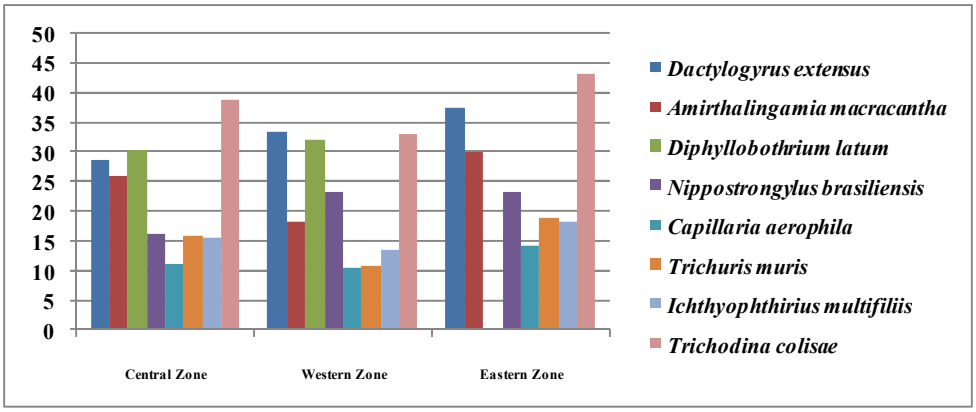

FIG. 1. Prevalence of parasites recovered in *C. gariepinus* sampled in different farms in Osun state . (n=155).

FIG. 2. Prevalence of parasites recovered in the different culture systems. (N=155).

Figures 3 & 4 showed the prevalence in relation to types of diet and source of water, the patterns in parasite numbers and composition reflect differences in types of diet and source of water. There were significant correlations among parasite prevalence and types of diet and source of water. Pond that is fed with feed combination had the most abundance of the parasites while Pond that is fed with foreign feed had the least compared to other type of diets. Chi – square analysis showed that infection is significantly higher ($p<0.05$) in fish fed with feed combination.

TABLE 1. Prevalence of parasites recovered in *C. GARIEPINUS* sampled in Osun State (N=155).

Zone	No of Farms	Total no san	Total no inf	Prevalence	Prevalence according to sex (%)			
					Male		Female	
					No sampled	No infected	No sampled	No infected
Central	6	63	24	38.62	36	23 (68.89)	27	12 (44.44)
West	5	51	20	33.15	28	16 (57.14)	23	10 (43.47)
East	4	41	18	43.12	21	15 (71.43)	20	11 (55.00)
		155	62	40	85	54 (63.52)	70	33 (47.14)

TABLE 2. Prevalence of parasites on *Clarias gariepinus* in relation to the stocking densities and physic-chemical parameters in the three senatorial zones of Osun State.

ZONES	STOCKIND	DO (mg/l)	PH	NH4 level (r	Prevalence (%)						
	MEAN	MEAN	MEAN	MEAN	Dl	Am	Nb	Ca	Tm	Tc	Im
CENTRAL	50kg/m^3	6.75	6.89	0.72	30.46	25.92	16.22	11.26	15.96	38.62	15.33
WEST	60kg/m^3	5.8	5.2	1.25	32.12	18.32	23.28	10.56	10.67	33.15	13.33
EAST	100kg/m^3	5.1	4.45	1.45	37.55	30.12	23.22	14.26	18.96	43.12	18.33

Dl = *Diphyllobothrium latum* ; Am = *Amirthalingamia macracantha*; Nb = *Nippostrongylus brasiliensis*; Ca = *Capillaria aerophila;* Tm = *Trichuris muris* ; Tc = *Trichodina colisae* and Im = *Ichthyophthirius multifiliis*

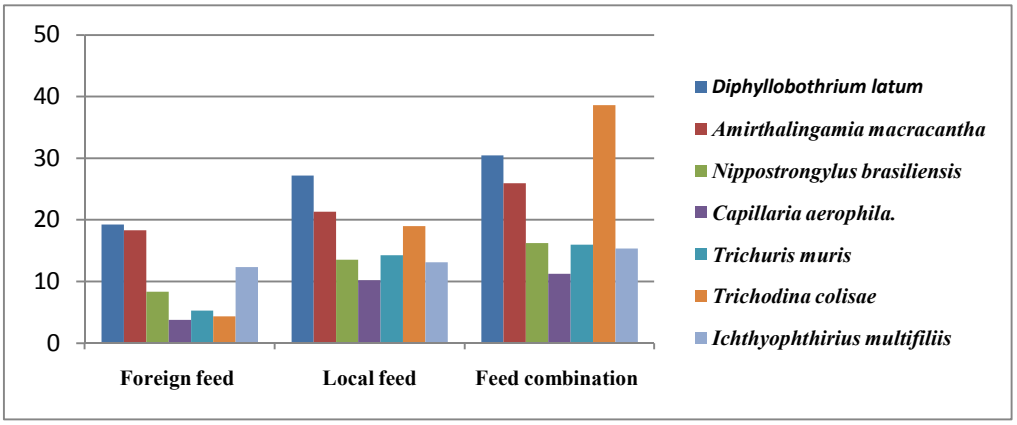

FIG. 3. Prevalence of infections in relation to types of diets

Parasites prevalence was highest in the culture system that utilizes river as source of water. Pond that is fed with borehole as source of water had the least compared to other source (Figure 4). The parasite diversity was similar between culture systems/farms/zones (Figure 1&2). There were cases of mixed infection where more than one parasite type was found in a single fish.

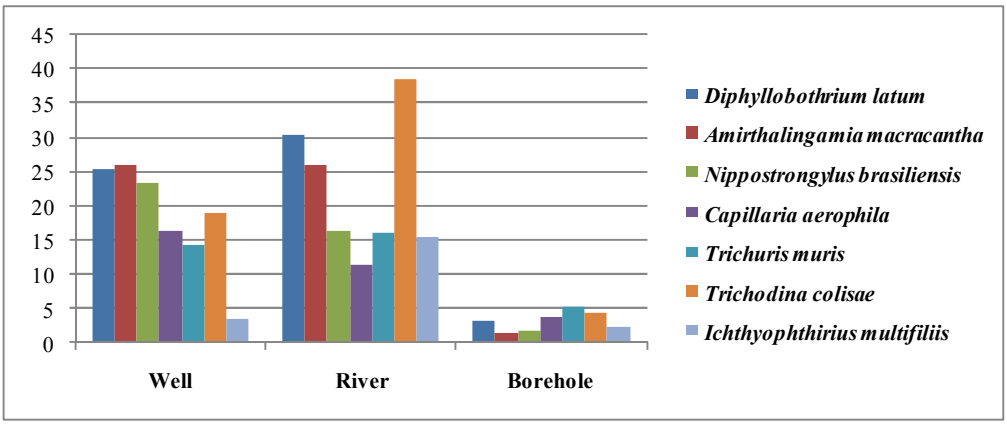

FIG. 4. Prevalence of infections in relation to sources of water

The results of the present study showed that *Dactylogyrus extensus*; *Diphyllobothrium latum*; *Amirthalingamia macracantha*; *Nippostrongylus brasiliensis*; *Capillaria aerophila; Trichuris muris*; *Trichodina colisae* and *Ichthyophthirius multifiliis* were found parasitizing *Clarias gariepinus* in Osun State, south-westhern Nigeria. It was revealed from the study that *Trichodina colisae* was the most prevalent parasite in all the zones (Figure 2). This is consistent with the findings of Anosike, *et al.,* 1992 who also reported *Trichodina* species as the most abundant parasites species in the sampled culture systems. The parasite diversity was similar between culture systems/farms/zones (Figure 1&2), this may be attributed to similarity in host ecology and movement of broodstock and fingerlings across zones as discovered from the oral interview had with the farmers. Most testified to sometimes buy their stocks from other zones. The present result showed that *Diphyllobothrium latum* was not recovered from samples from Eastern zone (figure 2). This is possible if the crustacean copepod which serves as the first intermediate host of the parasite is absent in the study area. There is need to study the availability of this host in the study area. Present result also showed that prevalence from the earthen pond culture system (EPS) had a different pattern from those from other culture systems. The most outstanding difference was in prevalence rate. All the EPS sampled in the three zones had higher prevalence than other culture systems. This may be attributable to the source of water used in these culture systems. All the EPS in the three zones had river as their source of water. This indicates that the parasite was probably transferred into the pond through run-off water from infected source. This is in agreement with Oniye *et al*. (2004) who attributed occurrence of parasites to run-off water from infected source. The lower prevalence of parasite species recorded in the other culture systems may probably arose from transfer of fish or the type of diet and water source. The high prevalence of infection recorded in the concrete pond system (CPS) fed with local feed compared with that fed with foreign feed in this study further corroborates the fact that infection might have been contacted through contaminated diet. This instance illustrates a further risk involved in feeding fish with feed produced in contaminated sites. The least prevalence recorded in FCPS (Figure 1) may be due to the use of only foreign feed as diet and borehole as source of water. This is consistent with Rufai & Awi-waadu (2010)

who recorded lowest mean parasites' prevalence in concrete pond flow-through culture system and attributed it to continuous water flowing-through the system; the few infections recorded may be due to transferring fish from one pond to another.

There was a clear-cut relationship between parasites' prevalence and the differences in the physic-chemical parameters of the pond waters across the sampled culture systems and zones, those culture systems with low oxygen, low pH level and high NH_4 level had higher prevalence of parasites' infections. This is consistent with Paperna & Laurencin (1979) who reported the affinity of these parasites to low oxygen and salinity environment.

These results showed a slightly higher prevalence in relation to stocking densities (Table 2). This may be due to the fact that high density increases ammonia production level. This is in agreement with the findings of Yi (2000) who attributed bad water quality to high stocking densities with resultant reduction in pond water oxygen levels due to increase in ammonia level.

The lowest parasites' prevalence recorded in FCPS compared with the other culture systems studied indicated that the practice of continuous water flowing through the system may either hinders parasites, especially ecto-parasites attack and attachment on fish and or cause dislodgement of established parasites on fish.

Findings indicated a total prevalence of 40.0% in the total samples. This prevalence is low compared to the findings of Anosike *et al*. (1992) and Onwuliri & Mgbemena (1987) who both reported 52% and 59.8% in cultured species respectively. This probably may mean that there have been a slightly better management practices in some aspects of pond management in the three zones. Most of the culture systems used in the studied area was concrete pond system (CPS) with borehole as source of water. Aghoghovwia (2011) reported that parasitism of fish varies among different farms, rivers, streams and lakes depending on several factors prevailing and the aquatic ecosystem.

Consequently, the key parameters influencing parasites' prevalence in this study include water source, types of diet, high stocking densities, low dissolved oxygen (DO), high ammonia level, run-off water entering the pond and of course the practice of moving brood stocks and fingerlings from one culture system to another/ farm to farm/zone to zone.

Although high prevalence of infection was recorded in this study, they presented no problem in the present investigation; several works had shown that the species recorded in this study could prove troublesome. Concurrent infestations of *Trichodina borealis* and *Gyrodactylus unicopula* have had more serious pathological effects than either species alone with massive skin lesions forming and heavy mortalities of untreated fish occurring (Bakke *et al.* 2002). Similarly, Green *et al*., 1989 reported a fish kill in Kentucky associated with heavy infestations of *Trichodina spp.* and other ciliate parasites as effects of manures and chemical fertilizers on the production of *Orechromis niloticus* in earthen pond.

CONCLUSIONS

Slightly heavy fish parasitism was recorded in this study; it is important that fish farmers continue good management practices like building higher dikes around earthen pond to prevent run-off water from entering the pond, avoidance of overcrowding and taking care not to introduce already infected broodstock to farm and producing their local feed from

uncontaminated site. Good farm management practices should be ensured as this will reduce greatly, any risk of infection in fish.

ACKNOWLEDGEMENTS

The author is most grateful to the zoology laboratory Technologist Mrs. O. E. Ogunlana for providing technical support for the study. The author also wishes to acknowledge Mrs. O. O. Ajiboye for his input in the research.

REFERENCES

- Aghoghovwia O. A. 2011. Physico-chemical characteristics of Warri River in the Niger Delta region of Nigeria. Journal of Environmental Issues and Agriculture in Developing Countries, 3 (2): 40-46.
- Akinsanya B., Hassan A. A., Adeogun A. O. 2008. Gastrointestinal helminth parasites of the fish Synodontis clarias (Siluriformes: Mochokidae) from Lekki lagoon, Lagos, Nigeria. *Revista de Biologia Tropical*, 56, 4: 2021-2026.
- Ayanda O. I. 2009. Comparison of parasitic health infection between the sexes of Clarias gariepinus from Asa Dam Ilorin, north-central Nigeria. *Scientific Research and Essays*, 4, 4: 357-360.
- Barker DE, Cone DK, Burt MDB. 2002. *Trichodina murmanica* (Ciliophora) and *Gyrodactylus pleuronecti* (Monogenea) parasitizing hatchery-reared winter flounder, *Pseudopleuronectes americanus* (Walbaum): effects on host growth and assessment of parasite interaction. *J Fish Dis* 25:81–89
- Basson L, Van As JG. 1987. Trichodinid (Ciliophora; Peritricha) gill parasites of freshwater fish in South Africa. *Syst Parasitol* 9:143–151
- Bichi A. H., Dawaki S. S. 2010. A survey of the ectoparasites on the gills, skin and fins of Oreochromis niloticus at Bagauda fish farm, Kano, Nigeria. Bayero *Journal of Pure and Applied Sciences*, 3, 1: 83-86.
- Bichi A. H., Yelwa S. I. 2010. Incidence of piscine parasites on the gill and gastrointestinal tract of Clarias gariepinus (Teugels) at Bagauda fish farm, Kano. *Bayero Journal of Pure and Applied Sciences,* 3, 1, 104-107.
- Bondad-Reantaso MG, Subasinghe RP, Arthur JR, Ogawa K, Chinabut S, Adlard R, Tan Z, Shariff M. 2005. Disease and health management in Asian aquaculture. *Vet Parasitol* 132: 249–272
- Busch S, Dalsgaard I, Buchmann K. 2003. Concomitant exposure of rainbow trout fry to *Gyrodactylus derjavini* and *Flavobacterium psychrophilum*: effects on infection and mortality of host. *Vet Parasitol* 117:117–122
- Edema C. U., Okaka C. E., Oboh I. P., Okogub B. O. 2008. A preliminary study of parasitic infections of some fishes from Okhuo River, Benin City, Nigeria. *International Journal of Biomedical Health Science*, 4, 3, 107-112.
- FAO. 2010. The State of World Fisheries and Aquaculture 2010. *Food and Agriculture Organization, Rome, Italy,* ISBN-13: 9789251066751, Pages: 214.
- Groenewald AAVJ. 1964. Observations on the food habits of *Clarias gariepinus* Burchell, the South African freshwater barbel (Pisces: Clariidae) in Transvaal. *Hydrobiologia* 23:287–291
- Marcogliese D.J. 2002. Food webs and the transmission of parasites to marine fish. *Parasitology* 124, S83–S99.
- Oniye S.J., Adebote D.A., Ayanda O.I. 2004. Helminth parasites of *Clarias gariepinus* (Teugels) in Zaria, Nigeria. *J. Aquat. Sci.,* 19: 71-76.
- Paperna I., Laurencin F.B. 1979. Parasitic infections of sea bass, *Dicentrarchus labrax* and gilt head sea bream, *Sparus aurata*, in mariculture facilities in France. *Aquaculture*, 16: 173-175.
- Green, B.W.; Phelps, R.O.; Alvarengi, H.R. (1989) The effect of manures and chemical fertilizers on the production of Orechromis niloticus in earthen pond: A note of infestation of *Orechromis niloticus* with *Trichodina spp. aquaculture* 76(1/2):37-42
- Rufai & Awi-waadu, 2010, Water quality, stocking density and parasites of fish in different culture systems in some selected fish farms in Rivers state, Nigeria. *African journal of Applied Zoology and Environmental Biology,* 12(1) 17-21**.**
- Subasinghe RP, Curry D, McGladdery SE, Bartley D. 2003. Recent technological innovations in aquaculture. Review of the State of World Aquaculture, *FAO Fisheries Circular*. 59–74.
- Yi P. 2000. The effect of initial stocking density on growth, stress and parasite infection in grass carp (*Ctenopharyngodon idellus*) in pond farming. Department of marine and freshwater biology, *University of Tromso, Tromso*. Page 35.