Journal of Biological Science and Bioconservation *Volume 4, June 2012*

www.cenresin.org
ISSN 2277-0143

COMPARATIVE GROWTH AND SURVIVAL RATE OF THE AFRICAN CATFISH (*Clarias gariepinus*) LARVAE REARED IN WATER SOURCED FROM STREAM AND TAP WATER

A.M. Idi-Ogede
Department of Biology
College of Education, Zuba-Abuja

ABSTRACT
A four-week comparative study was carried out to compare the growth and survival rates of *Clarias gariepinus* reared in stream and tap water. Twenty liters of water from each of the sourced water were measured into six glass aquarium tanks (56cm by 30cm) and each treatment replicated three times. One hundred six-day old larvae of *Clarias gariepinus* were stocked into each of the aquarium tanks. The larvae were fed with Zooplankton. At the end of the 30-day culture period, the growth and survival rates were higher in stream water than in tap water. There were significant difference ($p<0.05$) between the means of water quality parameters, survival rates, mortality rates, weight and total length of *Clarias gariepinus* reared in the two water (stream and tap water). Based on these, recommendation was made to consider water parameters in rearing fish.
Key words: *Clarias gariepinus*, stream water, tap water, survival and mortality rates.

INTRODUCTION
Fish is heavily traded food commodity and fastest growing agricultural commodity on international market; commercially valuable species have been captured (Evans, 2005). It is no longer possible to get enough fish from our natural water bodies by artisanal fishermen and trawling by fishing companies, because capture fisheries has become very competition coupled with the fact that stocks in the water bodies are over exploited and are not being replenished (Sylvia, 2003). Inland waters across the country are currently under high pressures (Gogwin, 2005). Fish farming continues to be revolutionized by new findings all with a bid to make it cheaper, easier, more profitable and convenient (Sade, 2003). Many lakes, streams and rivers are already dried up. Lake Chad has shrunk from 15, 000 to 500 Km^2 in 40 years (Andrew, 2006). The need for the production of quality fish seed for stocking the fish ponds and natural water bodies has increased steadily (Brain and Army, 1980). Artificial propagation methods constitute the major practicable means of providing enough quality seed for rearing in confined fish enclosure waters such as fish ponds, reservoirs and lakes (Charo and Oirere, 2000). The production of marketable fish begins with stocking of fish fingerlings or juveniles into a rearing environment that assures optimum and rapid growth to allow harvest in shortest possible time. The fish farmer has to obtain adequate number of young fish to meet his production goals. The possibilities of obtaining quality fish seed in adequate numbers from natural sources are limited. The most popular fish species that have proved desirable for culture in Nigeria are the Clariid fishes; *Clarias gariepinus*, *Heteroclarias sp.* and *Heterobranchus species* (Adekoya et al., 2006). The predominant attainment of Clariidae in both hatchery and consequently table fish production in Nigeria's aquaculture, stem from the fact that they are the most important food fish sourced by

consumers (Jeje, 1992). In Nigeria, fish is much valued for delicacies (food), medicinal, cultural and other reasons. Its pervading influence therefore has caught the interest of several authors (Girin and Person-le Ruyet, 1977; Hogendoorn, 1981, Beadle 1981, Ritcher et al., 1982, Legendre, 1988; Ayinla and Nwadukwe, 1988; Nwadukwe et al., 1991; Fagbenro et al., 1991; Makinde, 2001; Aluko et al., 2003; Adekoya, 2006). The African catfish (*Clarias gariepinus*) as an important food fish in Nigeria has remained an important candidate for research. Anthony (1982) asserted that *Clarias gariepinus* is one of the most resistant, widely accepted and highly valued fish that could be cultivated in Nigeria. In his own observation, Akinwumi (1999) stated that catfish can withstand any adverse conditions, convert feed to fat at a faster rate, grows bigger than any other fish and command consumer preference. Philip (2005) confirmed that catfish mortality rate is not high when compared to other species that die off as soon as they are exposed to some environmental conditions. In views of these, this study was therefore undertaken to examine the comparative growth and survival rates of *Clarias gariepinus* larvae reared in water sourced from stream and tap water.

MATERIALS AND METHODS

A total of one hundred (100) six-day old larvae of *Clarias gariepinus* were stocked into six glass aquarium tanks of 56cm by 30cm containing 20 liters from stream and tap water replicated three times. They were fed with Zooplankton, 2,000 Daphnis and 100ml of water per meal three times a day (i.e., 0730-0830 hour, 1300-1400 hour and 1700-1800 hour) morning, afternoon and evening throughout the 30-day study period. Mortality and survival rates were checked and noted on daily basis.

FISH SAMPLING

Fish specimens were sampled at 10-days interval. The mean weight of fish was calculated from the number of fish in the containers. All weighing of fish was done with a digital weighing balance (Ohaus JE 500. Ohaus corporation, New Jersey, USA).Total length was measured in millimeter (mm) from the tip of the snout to the tip of the caudal fin using a measuring board. Mean weight gain and mean length gain was calculated after each sampling. Fish survival and mortality rates were calculated by expressing the number of fish surviving as a percentage of the number stocked.

WATER QUALITY PARAMETERS

Water was changed every two days and drained on the third day. Samples of water were taken and analyzed to determine levels of temperature, dissolved oxygen, p^H, hardness and conductivity. Water temperature and dissolved oxygen were determined daily (09.00 and 14.00 hour) using a thermometer and oxygenometer (Cole Parmer model 5946; sigma chemical, Berlin, Germany).The values of p^H were also measured daily using an Orion digital P^H Meter (Model 210; sigma chemical, Lisbon, Portugal);Conductivity was measured using a portable meter (Model WTW LF 90) at 10-days interval. Hardness was also estimated at 10-days interval using methods described by Amold et al., (1980).

STATISTICAL ANALYSIS

All the data were managed with Microsoft office excel 2003. Data were analyzed with One-way ANOVA procedure using Statistical Package for Social Sciences (SPSS version 16 for window). The significance between means were analyzed statistically using student's t-test as described by Steel and Torrie (1980) and Duncan's Multiple Range Test (Duncan, 1955) at 95%.

RESULTS AND DISCUSSIONS:

The results of this study are presented in Tables 1-3 below.

Table 1: Mean water quality parameters for the two sources of water. (Mean of 8 readings ±SD).

	Temperature (^oC)	DO (mg/l)	pH	Hardness (mg/l)	Conductivity (µcms^{-1})
Stream water	26.06 (±0.22)^a	4.67 (±0.50)^a	7.57 (±1.12)^a	1.25 (±0.46)^a	24.25 (±1.147)^a
Tap water	28.35 (±2.41)^b	4.55 (±0.14)^a	7.78 (±0.162)^a	1.36 (±1.03)^a	26.01 (±0.25)^b

Parameters with the same superscript in the same column are not significantly different p>0.05.

Table 1 present the result of water quality parameters for the two sources of water (Stream and tap water). Stream water had mean temperature of 26.06(±0.22)^{0}C, tap water had 28.35(±2.41)^{0}C. The higher temperature in tap water may be due to absorption of heat during treatment and pumping while stream water was exposed to atmospheric air which causes cooling effect on the water body. Sharp changes in temperature usually affect fish because they can not easily adapt to changes in temperature. This is in line with Adeniji and Ovie (1999) who stated that a sharp increase or decrease in temperature affects fish growth and development. Mean dissolved oxygen in stream water was 4.67±0.50mg/l while tap water had 4.55±0.14mg/l.The highest dissolved oxygen in stream water though not significant (p>0.05) compared with tap water may be due to the fact that stream water was exposed to atmospheric air. The differences in oxygen content between the two water samples was not significant (p>0.05) because tap water also absorbed oxygen during the time of collection. Their dissolved oxygen can be used for rearing fish. This is in agreement with Hussein (2006) who recommended dissolved oxygen of 4-7 mg/liters for carp.Mean p^H for stream water was 7.57(±1.12) while tap water had 7.78(±0.16). This is in agreement with Boyd and Lightkoppler (1979) who opined that for fish population to thrive in water, it is necessary to keep the p^H around 6.7 to 8.6.There was no significant difference (p>0.05) between the mean hardness of the two water samples. The concentrations were too low. It concurred with Hussein (2006) who stated that concentrations less than 20 mg/l may cause problems in hatcheries. The mean conductivity of stream water was 24.25±1.14µcms^{-1} while tap water had 26.01±0.38µcms^{-1}.The higher conductivity of tap water may be due to presence of untreated mineral salts. This is in disagreement with the report of Ayinla and Nwadukwe (1987) that supported conductivity of 18 - 24 µcms^{-1} for fish growth and survival.

Table2: Mean survival and mortality rates of *Clarias gariepinus* reared in stream and tap water.

	Survival rates (%)	Mortality rates (%)
Stream water	75[a]	25[a]
Tap water	61[b]	39[b]

Means with the same alphabet in the same column are not significantly different p>0.05.

Table 2 summarized the survival and mortality rates in stream and tap waters. The stream water had higher survival rates (75%) while tap water had higher mortality rates (39%). The high mortality in tap water may be due to sharp changes in water quality parameters. This is in agreement with Boyd and Lightkoppler (1979) and Hussein (2006) who affirmed that cultivable fishes can tolerate different ranges in P^H but sudden fluctuation in P^H are harmful.

Table3: Final mean weight and total length of *Clarias gariepinus* reared in stream and tap water

	Mean weight (mg)	Mean total length (mm)
Stream water	10.70[a]	27.18[a]
Tap water	10.05[a]	26.00[b]

Means with the same alphabet in the same column are not significantly different p>0.05.

Table 3 showed the final mean weight and total length of *Clarias gariepinus* reared in stream and tap waters. There was no significant difference (p>0.05) between the final mean weight of stream water (10.70) and tap water (10.05).There was however significant difference (p<0.05) between the mean total length of stream water (27.18) and tap water (26.00). These may be due to alterations in water quality parameters.

CONCLUSION

It was observed that fish held in stream water had higher growth and survival rates than tap water. This may be due to adequate amount of dissolved oxygen, temperature, P^H , conductivity and hardness. The higher mortality in tap water may be due to low dissolved oxygen content and higher temperature.

RECOMMENDATION

From the result of this study, it is recommended that water parameters should be considered while rearing fish.

REFERENCES

Adekoya, B.B., T.O. Ayansawo; A.A.Idowu; O.A. Kudoro and A.A. Salisu eds (2006): In " Directory of fish hatcheries in Ogun state" Ogun state Agricultural Development Programme (OGADEP), Abeokuta, 18 pp.

Adeniji, H.A and Ovie, S.I (1999): Culture of Natural Fish Food (Algal Isolation and growth care characteristic), NIFFK Report, P. 13-16.

Akinwumi, A. (1999): Breaking new ground in Fishing: The Punch, May 23, 1999, P.30.

Aluko, P.O., D. Woru and A. Aremu (2003): "Development of triploid breeding live in Heterobranchus . Clarias Hybrid used in aquaculture". Nigeria journal of Fisheries, Vol.1, No1.

Amold, E.O., Joseph, J.C and David, J (1980): Standard methods for the examination of water and waste water, 15^{th} edn. American Public Health Association, Washington, DC.

Andrew, B.(2006): Slow Death of Lake Chad. Daily Trust, April 20, 2006 P.24-25

Anthony, A.D. (1982): Identification of Nigeria Freshwater Fishes. University of Jos Press, Jos, Nigeria. P.25.

Ayinla, O.A. and F.O. Nwadukwe (1988): "Effect of season in controlled Propagation of African catfish. *Clarias gariepinus* (Burchell 1822)".In: Garry M. Bernecsek and Howard powels (Editors), Aquaculture Systems. Research in African. Proceedings of a workshop, 14-17 November, 1988, Bouake, Coted' voire, IDRC, pp 198-210.

Beadle, L.C. (1981): The inland waters of tropical Africa.An introduction to tropical limnology. 2^{nd} edition, Longman: London and New York 475 pp.

Boyd, C.E and F. Lightkoppler (1979): Water quality management in pond Fish culture. Alabama, Auburn University, R &S series. (22):30-111. (pro). AID/ DSAN-G 0039.

Brain, F.D. and Army, C (1980): Induced Fish breeding in South East Asia. Report of the workshop held in Singapore 25^{th}-26^{th} November, 1980 10 RC-178e.

Charo, H. and Oirere, W. (2000): River-based artificial propagation of the African catfish: *Clarias gariepinus* : An option for the small fish Farmer. NAGA-The ICLARMQ. Jan-march, 2000. 23(1): 14-16.

Duncan, D.B (1955): Multiple ranges and Multiple F-test, Biometrics 11:1042.

Evans, A (2005): A Profit Approach: The Punch, Tuesday, August 30 2005, P.3.

Fagbenro, O.A., A.A. Salami; and H.J. Sydenham (1991): "Induced ovulation and spawning in the catfish. *Clarias isheriensis* using pituitary extracts from non piscine sources". Journal of Applied aquaculture 1 (4): In press.

Girin, M. and P.J., Peron-Le Ruyet (1977)):"Lelerage levarire des poisons marins: chaines alimantaries et aliments composes. Bulletin Francais de pisciculture 264:88-101.

Gogwin, S. (2005): Inland water under pressure: Daily Trust, September3 p.32.

Hogendoorn, N. (1981): Controlled propagation of African catfish, *Clarias lazera* (C&V). Effect of feeding regime in fingerlings culture, Aquaculture: 24:123-131.

Hussein, S.M. (2006): Encyclopedia of fish culture Vol. 1 pp. 1-900.

Jeje, C.Y.(1992): Post-larval feeding of *Clarias gariepinus* (Burchell,1822) on culture Zooplankton and artemia diets. Proceedings of the 10th Annual Conference of Fisheries Society of Nigeria (FISON), Abeokuta, 16th-20th November, 1992. 129-137 pp.

Lengendre, M (1988):Bilan des premiers essays d'elevage di und silure African. *Heterobranchus longifilis* (Clarridae), en milieu laquanaire (laqure Ebrie Cote d'ivorire).In Garry M. Bernacsek and Howard poewls (Editors); Aquaculture systems Research in Africa. Proceedings of a workshop, 14-17 November 1988, Bouake, Coted'ivore, IDRC, pp.211-232.

Makinde, O.O. (2001): The impact of artificial breeding of culturable fish species on aquaculture in Nigeria. University of Agriculture (UNAAB). (Department of Aquaculture and Fisheries Management) Abeokuta. Seminar paper (September2001)23pp.

Nwadukwe, F.O., O.A. Ayinla and N.J Abby-kalio (1991): Effects of various doses of acetone dried powdered carp pituitary extract and seasonal changes on fecundity and hatchery propagation of *Heterobranchus longifilis* (val,1840) (pisces: Clariidae). In: J.G. Tobor and B.I.O. Ezenwa (eds) Towards self sufficiency in fish production in Nigeria. Proceedings of a seminar.10th December, 1991. NIOMR, Lagos pp. 40-45.

Philip, J. (2005): Catfish Farmers yet to Satisfy Home Demand: The Punch, January 6, 2005, P.24.

Richter, C.J.J and R. Van Der Hurk (1982): Effect of 11 De esoxycorticosterone –acetate and carp pituitary suspension on follicle maturation in the ovaries of African catfish. *Clarias lazera* (C&V) Aquaculture 29:53-66.

Sade, O (2003): Cheap Approach to raising Fish: Nigeria Tribune, April 20 2003 P.31.

Steel, R.G.D and Torrie, J.H (1980): Principles and procedures of statistics, biometrical approach, 2nd edn. MC. Grow Hill, New York, USA, 481 pp.

Sylvia, A.(2003): Depleting Fish stock in Nigeria: The Punch, August 1 2003, P.52.