AN ASSESSMENT OF WATER QUALITY IN INTEGRATED POULTRY- CUM - FISH RESERVOIR, NIFFR NEW- BUSSA

IN REFERENCE TO MAXIMIZING THE WATER RESOURCES POTENTIAL OF NIGERIA FOR SUSTAINABLE AQUACULTURE

UNDER THE SUB- THEME "FISH PRODUCTION AND THE ENVIRONMENT

BY

DR F.O MOODY

SENIOR LECTURER
FEDERAL COLLEGE OF FRESHWATER FISHERIES TECHNOLOGY, NEW BUSSA, NIGER STATE NIGERIA

ABSTRACT

In this reservoir, the parameters being assessed are very important in the aspect of fish culture. There parameters are: physical parameters which includes temperature. (O), Transparency (M). Chemical parameters include: Dissolve oxygen (mg/l) pH concentration and the Biological Parameters which include phytoplankton and zooplankton. The phytoplankton and zooplankton identification and estimation were carried out in the NIFFR Limnology Laboratory. (Green House), New Bussa. Each identified zooplankton and phytoplankton species was placed according to its major group e.g. zooplankton was grouped into three families. ROTIFERA. CLADOCERA and COPEPODS. During this study period it was observed that copepods that copepods have the highest total number of zooplankton both beside the poultry and monk (station 'A' & 'B'). Water temperature of station 'A' (beside the poultry house) range form. 27o C – 29 5 c also same station 'B' (near the monk). Dissolve oxygen station 'A' range form 6:30 mg /l – 7.40 mg/ l while that of station 'B' range from 6.20 mg/ 7.50 mg/ l, turbidity reading of station 'A' ranges from 0.19m – 0.3m while station 'B' ranges from 0. 22m –0 37m. The last parameter, which is pH concentration, in both stations 8.2 was observed this is an indication that the pH was constant. According to some literature review all the water parameters figures obtained were good for fish culture.

SOURCES OF WATER AND FERTILIZERS USED FOR AQUACULTURE IN NIGERIA

Recent diagnostic survey of aquacultural systems in Nigeria shows that water used by aquaculturists in Nigeria is obtained from the following sources as indicated on Table 1. These waters have various types of qualities, which will affect fish production and fish health. The collection of the first rainfall in the year for aquacultural purposes may contain a high percentage of carbonic acid and suspended solids, water from borehole may contain poisonous gases and heavy metals, tap water may contain a high concentration of chlorine that may be injurious to brood stock and their fries, while water from lakes and reservoirs may contain high concentration of floating and suspended algae and/or gases that will have adverse effects on the fish production It is therefore necessary to monitor the quality of these waters before being used for fish culture and when they are being used for culture purposes because these culture systems are fertilized in order to obtain the required fish production.

The results from the recent diagnostic survey also identified the types of fertilizers and supplementary feed that are being used in aquacultural system in this country. Table 2. Although these fertilizers and feed improve the production in the culture systems there are situations where excess of wrong use of these fertilizers and feed have adverse effects on the quality of the culture water such as eutrophication, and its turbid effect on water transparency and disturbance in absorption of oxygen by the culture medium, decomposition and production of poisonous gases such as carbon dioxide, hydrogen sulphide and methane. A notable observation was made during the recent National Diagnostics survey in the South – West zone where pond in Poultry integrated fish culture system received excess poultry waste to the extent that the pond surface was covered with algal scum which had once resulted in mass fish deaths in these ponds. It is therefore necessary to monitor the water quality of the culture medium for the objective indicated above.

WATER QUALITY FACTORS

Water quality factors can be classified into Physical, chemical and Biological. The factors under each of these classifications are so many but in this presentation I will concentrate on the major factors in each group of classification for this discussion. These are:

(i) Physical factors such as water temperature, suspended solids, turbidity and dissolved gases such as oxygen, carbon dioxide and ammonia.

(ii) Chemical factors such as pH, total dissolved solids or conductivity, organic and inorganic fertilizers and pesticides.

(iii) Biological factors such as bacteria, especially the faecal coliforms, plankton eutrophication and parasites.

The methods for assessing these factors will be treated during the practical session but at this point in this lecture is necessary to highlight the limiting levels of these factors that are favourable for successful aquacultural production as indicated on Table 3. If however a fish farmer overshoots any of these limits it may be necessary to apply the following precautions to restore the water quality of the culture medium to a favourable level.

PRECAUTIONS FOR BETTER WATER QUALITY

WATER TEMPERATURE: Try to retain water temperature between 27-32oC for fish eggs to hatch within 24-48 hours and also for fry, fingerlings and bloodstock to feel healthy.

TURBIDITY: avoid using turbid water for fish farming. Turbidity as a result of fin clay particles a algal blooms should be avoided. Turbidity from clay particles can be removed by storing the turbid water in a tank apply alum and allow particles to settle over 24 hours then use the clear water for fish farming. Algal blooms can be avoided by applying recommended dosage of fertilizer (60kg/ha at bi-weekly intervals for inorganic fertilizer and 225 to 567kg/ha for organic fertilizer) to culture medium, by filtering water supply contain the bloom or applying 0.1 to 0.5mg/l copper sulphate to the bloom water in a tank to control the bloom and the clear water can be used for fish culture. This rate is applicable for total alkalinity up to 50mg/l but concentrations higher than this may require 1.0gm/l copper surlphate or more.

TRANSPARENCY High turbidity resulting from clay particles or algal blooms reduces water transparency and diffusion of oxygen into the culture medium at the air/water interphase. Low turbidity with

high water transparency should be encouraged as indicated on Table 3.

DISSOLVED OXYGEN AND B.O.D Eutrophication and its effect high oxygen demand and disturbance in the diffusion of air into the culture medium from the atmosphere should be avoided. Over fertilization of pond with organic and inorganic fertilizer could result in decomposition of excess fertilizers and production of poisonous gases such as CO_2,H_2S, and NH3 etc. The increase in the concentration of these gases will reduce the dissolved oxygen content of the culture medium and increase the Biological Oxygen demand (B.O.D) of the medium. Thus dissolved oxygen content is inversely related to B.O.D.

PH: High pH levels in the alkaline range and low pH levels in the acidic range as indicated in Table 3 should be avoided in the culture medium. At low pH level, application of lime (CaS04) or alum (AlSO4) can be applied to bring down the pH from high alkaline level to an acceptable level.

DISSOLVED SOLIDS: This is the concentration of nutrients in the culture medium and it should be monitored more specially its effect on phytoplankton blooms and aquatic macrophysics especially the resultant effect on oxygen depletion, decomposition and B.O.D.
Similar monitoring needs to be carried out on total phosphate and nitrate contents of the culture medium for the same reasons.

PESTICIDES: Pollution of aquacultural systems through the use of pesticides should be prevented by applying the following precautions.

(i) Avoid sitting fish ponds in areas with residual pesticides or herbicides in the soil

(ii) Avoid locating fish farms in agricultural farms where these chemicals are routinely and intensively used.

(iii) In situations where these chemicals have to be used, direct drainage of runoff into the fish farms must be avoided by rechanelization of the runoff water.

(iv) Crops planted on embankment of fish ponds must not be sprayed.

(v) Application of these chemicals in the vicinity of fishponds must be delayed until the wind is blowing away from the fishpond.

FAECAL COLIFORM BACTERIA: Eutrophication and decomposition of large quality of organic matter in the culture medium, which could result in large quantity of coliform bacteria in the culture medium, should be avoided in order to reduce incidence of bacterial infections and fish disease.

CONCLUSION: High quality water with the necessary water quality parameters in the recommended levels are some of the major factors that will promote successful fish farming.

Table 1: Sources of water used for aquaculture in Nigeria.

a) Rainfall
b) Rivers, streams

c) Lakes and Reservoirs
d) Boreholes and wells
e) Tap water
f) Spring water
g) Run-off
h) Mining padlock

Table 2:Types of fertilizers and supplementary feed used in aquacultural systems in Nigeria

a) Fertilizer: Organic
   (i) Cow dung
   (ii) Poultry manure
   (iii) Pig Manure
   Inorganic
   i) N.P.K.
   ii) Ammonia
   iii) Urea
   iv) Super phosphate

b) Supplementary feed:
   i) Pelleted feed
   ii) Mill sweeping
   iii) Rice bran
   iv) Maize bran
   v) Wheat offals
   vi) Brewery waste
   vii) Kitchen waste
   viii) Palm kernel cake
   ix) Blood meal
   x) Crayfish dust
   xi) Cassava peel
   xii) Soya bean
   xiii) Growers mash
   xiv) Chunked boiled dead chicken

	CULTURE) 100-90 89- 70 69-50 EXC GOOD MED	49-25 24-0 BAD VERY BAD	
Water Temperature Temperature Turbidity in JTU Secchi disc transparency Dissolved oxygen % Saturation) B.O.D_5 mg/l PH units Total solids mg/l Total phosphate (ms PO_4) mg/l Nitrate (as NO3) mg/l Pesticides Faecal coliforms 100ml.	25 – 32oC ±0.75 to ±0.75 ±3.0 0-3 3.14 15-35 30 - 60cm 60cm and above 12-5mg/lit 54-67 80-120 68-79 54-67 0-1.5 1.5-3.5 3.5-6 6.8-7.5 6/4-6.7 3.5-6 0-22 0-225 226-375 0-0.2 0.21-0.3 0.31-0.6 0-2 2.1-7.5 7.6-10 Less than 0.1mg/l (100ppb) 1-1.8 1.8-9 9-60	0-24.90c ±5.0 to ±8.5 as above 34-75 as above 75 34-76 0- 30cm Below 5.0mg/Lit 34-54 33-0 6-12.5 above 12.5 5-5.7 4.9-0 376-500 above 500 0.61-2.4 above 2.41 10.1-35 above 35 Greater than 0 0.1mg/l (100ppb) 600-500 above 500	For tropical fish culture (When plankton bloom causes turbidity).

REFERENCES

Adeniji H.A. (1975a) Monoximis in Kainji Lake Nigeria, proceedings of second world congress international water Res. Asoc Vol. 5 pp 449-453

Adeniji H.A. (1975b): some aspects of the limnology and the fishery development of Kainji lake Nigeria. Arch. Hydrobiol.75 (2) 254-262.

Adeniji H.A (1976): The effect of the out slows from Kainji lake on the dissolved oxygen I the river Niger just below the dam. Paper present of the symposium on volts lake Lagos 6-10 Sept. pp 17

Adeniji H.A (1977): Study of the plankton ecology in Kainji lake and the river Niger KLRI Annual report (1976-77).

Adeniji H.A. (1978): diurnal vertical distribution of zooplankton during stratification in Kainji lake Nigeria. Vern. Internal. Verom. Limnology 20 1677-1683

Adeniji H.A and S.I. Ovie (1981): Study of the abundance and distribution of zooplankton in Asa lake KLRI annual Rep. 1981pp 19-22

Adeniji H.A and S.I. Ovie (1982): Pelgaci primary production of river Niger in the proposed Jabba lake area. Annual report 1983 pp 10—12.

Adeniji H.A. and I.G. Mbagwu (1989): The assessment of the water quality of the Jakara reservoir in Kano State NIFFR Annual Report pp 136-139

Adeniji H.A and Ita E.O (1976): Preliminary investigation into the limnology and Fisheries of Tiga lake. Kano State, Nigeria, Unpublished report to Kainji KLRI New Bussa 20pp

Wetzel R.G. (1975): Limnology W.B. Saunders company 743p.

Ovie, S.I and H.A. Adeniji (1990) Zooplankton culture in our door concrete tank. The effect of local fertilizer on zooplankton population development NIFFR Ann rep. 1990.

Clarke, N.U. (1977): A comparison of the zooplankton of Kainji lake and of the river Niger and swashi Hydrob. Vol 58pp 17-22

Hall C.A.S and Moick (1975): methods of assess aquatic primary productivity.

Heide V. (1982): Lake brokopounds: filling phase limnology of a man-made lake in the mid tropics

Hutchison G.E. (168): a treatise on limnology vol. 11. Introduction of lake biology plankton John Wiey, New York 11115p.

Herderson G.E. (1971): estimation of potential catch fish form Kainji lake based on general ecology of the lake 12p.

Martins M. (1978): Abundant supply of clean water is absolutely essential for commercial fish farm. The commercial fish farming 6p.

Odusola and Olajide (1976): Studies on the variation in the dissolve gasses in the Kainji Lake ecosystem.

Porter K.G. (1978): Enhancement of algal growth and productivity by grassing zooplankton science 192:1332-1334.

Skidmore J.F. (1964): Toxicity of zinc compounds to aquatic animals with species reference to fish quarterly Rev. of Biology 39:227.

Deinnger R.A. (1980: A water quality index for rivers. Water international vol5: 3,16-21.

Ringerberg J. (1981): On the variation incarotenoid content of Copepode limnol Ocenogr 26: 995-997

Prophet W.C. (1982): zooplanton changes in Kansas lakes (1963-1881) journal of freshwater

Visser, S.A (1973): Pre-impoundment features of Kainji area and their possible influence on the ecology of the newly formed lake

Schuurma J.R.M (1932): A seasonal study of the micro flora and microfuna of fleride lake, John Shurg, Transvaal Trans. Rdy Sex South African.20: 333-386.

Settle, O.E. (1940): Probably temperatives of surface water to be so stored above Shasta Da, US Bull Fish Special Rep. No. 10 App. Biol pp 165-173