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INVITED ESSAY

Man-made lakes, ecological studies and conservation needs in Nigeria

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Abstract: The benefit derived from the creation of man-made lakes in Nigeria and other developing countries is usually associated with great risks. Whenever we establish a dam, it appears we dam the inherent consequences to the detriment of man and his environment. Debts were incurred by the countries concerned, man and animals were displaced, arable lands destroyed including degradation of forest and wild life resources. The creation of dams have also ignored the prevention of man and his life stock from the inherent spread of water borne diseases. The purpose for which a dam is created is threatened if man is indiscriminately exposed to the risk of water borne diseases. The poor and uneconomic management of the fish resources is also another major issue of concern. In order to tap the full potentials of reservoir projects and to promote conservation, it is important to have a round table talk involving all stake holders during the planning stage of such projects. Therefore apart from the engineering works, there is also need for collaboration with all experts from related fields especially the biologists, sociologists and economists for bio-socio-economic reasons during the planning and implementation stages of dam projects in Nigeria and other developing countries.

Key words: Artificial lakes, dams, conservation, fish resources, Nigeria.

The quality and the quantity of food available constitute a very important factor among others in the balance of a population within a complex community as that of the aquatic and terrestrial environments. The creation of embankments such as dams, dikes, etc., may disrupt this balance by interfering with the quality and the quantity of the available food items, living space, inter and intra specific competition and the limnological conditions (Araoye and Jeje 1999).

Recent reports have shown that the gains from the River Basin Development Project are quite enormous, however there are risks associated with such benefits. The point of the matter is whether their benefits outweigh the risks or not. The benefits include the storing of water for power generation, irrigation, fisheries, navigation, flood and erosion control purposes. Reports have also indicated that power supply from large dams account for about a quarter of the world's total supply of electricity (Dellere 1989). However, most of these benefits highlighted are not usually devoid of financial and environmental problems. As we try to maximize the benefits of dam projects, we should also try to minimize its negative effects through a better planning and management. Debts have been incurred heavily by some third world countries that have engaged in large water projects, people have been displaced, arable lands were destroyed, forest and wild life resources degenerated. The spread of water borne diseases and the collapse of coastal fisheries are also harmful consequences of such big projects. Some of these problems though were foreseen, they were not considered as crucial until when the harm was done and could no longer be ignored (Anonymous 2000).

In Nigeria, as well as in other developing countries (Goldman 1976), the issue of

conservation or environmental protection is of less interest whenever it comes to building dams for electricity and irrigation. This is probably because of the need for industrialization and agricultural production in order to alleviate the problems of poverty. Hence other valuable resources such as fisheries and wild life conservation are usually ignored at the planning and implementation stages of the construction of big or small dam projects. Conservation also includes the prevention of man and his life stock from the inherent spread of water borne diseases that are associated with the establishment of large water bodies for electricity and irrigation projects. The success of the project for which a large dam is established is also threatened if man is indiscriminately exposed to the risk of water borne diseases within his environment (Fig. 1). Farmers and fishermen around man-made lakes established by the Niger River Basin Development Authority Ilorin, Nigeria, have complained of serious attack by schistosomiasis on members of their families. Afisherman along Kampe (Omi) lake in Kogi State of Nigeria told me he had spent over N30 000 (Thirty thousand Naira), which is equivalent to about $230 annually to treat himself, his wife and two of his children that were infected with schistosomiasis. This does not include indirect cost such as the inconveniences and the cost of transportation from their fishing settlement where no hospital exists to the town where medical attention can be received. The annual income of this fisherman may not exceed N50 000 per annum because they constitute the very low income group and yet they face the poorest living conditions despite the fact that they are the group of people that supply 70 to 80% of the fish consumed locally by Nigerians.

Fig. 1. Indiscriminate exposure to water borne diseases around Kampe (Omi) dam in Kogi State, Nigeria.

Whenever we establish a dam, it appears we damn the inherent consequences to the detriment of man and his environment. In the desire to improve the life quality of man through the provision of electricity to enhance the process of industrialization, we encroach adversely into the environment without making the adequate provision to protect it from the degradation of biodiversity. Plants are destroyed (Fig. 2), while man and animals are also displaced. There is a need for a round table talk during the planning stage of dam projects where all stake holders can contribute to the building of the dam in order to have minimal effects of the negative side of the project. The various clashes that usually arise between different interest groups after the creation of man-made lakes (e.g. between those who want to farm and those who want to fish or between those who want to graze and those who want to farm) would be minimal.

I have also observed with dismay that in some places where man-made lakes were primarily established for electricity and irrigation in Nigeria, the surrounding communities lack piped water, hence the people make use of the raw water from the lake for washing and drinking without any form of purification, and this has compounded the problem of water borne diseases (Fig. 3). The bacteria count obtained from these water bodies were usually higher than the recommended minimum standard of not more than 100 bacteria/ml of sample (Anonymous 2000). This falls short from WHO`s (Anonymous 1985) requirements that drinking water must be devoid of pathogenic organisms and be free from bacteria indicative of sewage pollution. There must be education to the communities on the life cycle of some pathogenic organisms and the risk of contacting water borne diseases through indiscriminate

Fig. 2. Trees of economic importance destroyed due to the construction of Kampe (Omi) dam in Kogi State, Nigeria.

Fig. 3. Exposure to water borne diseases: washing and drinking from an artificial lake in Nigeria.

exposure to such water bodies. This can be achieved through community sensitization and advocacy programs, which should have commenced even before the creation of such water bodies. After the creation of the water bodies there should be monitoring and evaluation in order to assess the impact of the sensitization and advocacy program.

The poor and uneconomic management of lake fisheries is another major issue of concern. The creation of a dam also provides an ecosystem for the proliferation of a wide range of aquatic organisms (Umaña and Collado 1990, Saliu 1989, Chow *et al.* 1994, Umaña *et al.* 1997, López-López and Serna-Hernández 1999), of which the fish fauna (Willoughby 1976, Fagade and Adebisi 1979, Fagade 1983, Ulloa Rojas *et al.* 1988, Mora *et al.* 1997, Araoye 1998, Araoye 1999, Araoye and Jeje 1999, Araoye 2000a, Fawole and Arawomo 2000, Araoye 2001, Duarte and Araújo 2002, Saliu 2002a, b) occupies a vital position in promoting socio-economic activities of the surrounding communities (Araoye 2000b, Achionye-Nzeh and Omoniyi 2002, Fawole 2002), if well managed (Fig. 4).

What interests me in the study of the ecology of *Synodontis schall* in Asa dam, Ilorin, Nigeria, for my Ph.D. at the University of Ibadan, was its distribution and abundance within its environment. The scramble for this fish at a popular fish market in Ilorin, shows that it is highly relished by the community. This

Fig. 4. Women are not excluded in the fishing activities along man-made lakes especially around the middle belt and Southern part of Nigeria.

is because of its small to medium size range that has made its price affordable especially to the low income group. Both fresh and dried fish are usually available at the local fish markets almost through out the year, and most abundant during the dry season. I get interested in studying its environment in relation with its feeding habits, distribution and abundance, reproductive biology, age and growth studies and gill net efficiency. I noticed that this fish was diverse in its feeding habits because it feeds on a variety of food items including insects, mollusk, detritus, plant materials and fish scales (Araoye and Jeje 1999). These food items were dispersed all along the surface, shore and bottom habitats which constitute the three major ecological niches of their environment (Araoye 1999). Even though this fish was classified as omnivore in the environment of Asa dam (Araoye and Jeje 1999), reports from River Benue showed that *S. schall* was grouped among the predatory species because their choice of food ranged from an assortment of invertebrates to other fishes (Fagade 1983). The distribution of the wide variety of food items along the surface, shore and bottom avails the fish the opportunity to explore the different habitats at different seasons of the year (Araoye 1999). The presence of a physostomous swim bladder, the bony shield of the head and high fat deposition provided the fish the opportunity to explore the bottom habitat despite higher pressure (Willoughby 1976). The production potential of this fish has been hampered due to un-controlled fishing around the dam and the lukewarm attitude towards the management of the lake fisheries. In my study of the gill net efficiency, it was noticed that fish specimen below the age group one were captured by the fishermen. Hence it was suggested that the use of net meshes below 7.62 cm around the lake should be discouraged (Araoye 1998). *Synodontis* are unique in the sense that they are specially armored due to the presence of well developed cephalo-nuchal shield attached with sharp dorsal and pectoral spines. It was funny to Professor Adewolu, one of my colleagues, when she saw me in my laboratory with a mini saw blade that was being used initially to cut this bony shield of the head from the dorsal surface to expose the brain in search of the pair of the otoliths. It was also interesting to detect a defect in the size of a pectoral spine in one of the specimens out of the 813 specimens that I worked with. This defect was a rare occurrence caused by an injury which probably became infected during healing (Araoye 2000a).

Although this fish spawns annually and exhibited high fecundity, there is still a great threat to its sustainability if fishing and natural mortality continue to progress over the recruitment rate in this environment. The preponderance of the juveniles of this fish in the fishermen catches during the months of November to December was as a result of the progeny that emerged from the reproductive activities which was at its peak in July to August (Araoye 2001). This indicates poor and uneconomic fishing activities due to bad management of the lake fishery. The enforcement of fishery rules and regulations to protect valuable water resources in Nigeria and other West African countries is taken with levity. The factors that are responsible for this problem are many ranging from defects in the policies and the mode of implementation to defects in the expertise, attitude and practices of the fishermen and their communities particularly the consumers. Due to ignorance, there is a general belief among the local fishermen that fishery resources can never be depleted or exhausted because it is a gift from heaven. Unless we correct this erroneous perception, our fishery resources would continue to remain in a state of emergency. Hence I recommended advocacy program to sensitize the fishermen and the community on conservation needs in order to sustain this fish species as others as well (Araoye 2000c). This program would involve the training of peer educators on conservation, and also information dissemination on conservation needs through dramas, role plays and use of IEC (Information, Education & Communication) materials such as posters, hand bills, etc. Although I have started on this program along Kampe (Omi) dam, however funding is another major obstacle facing fishery experts in Tropical West Africa. Assistance from

international agencies, private agencies and non-governmental organizations (NGOs) may bring succor to this major obstacle.

I worked with six fishermen leaders for fishing and record keeping during my study in Asa dam, because I wanted the information from my research findings to get to the grass roots. Most of the researches that have been carried out in the past on fish biology did not carry the grass roots along hence their findings may not be impacted because such findings only circulate within the academic environment. I was a full time post graduate student because I took a study leave. I was able to sustain the study financially through my little savings and through the little stipend of N3600 per annum (approximately $28 per annum) being paid to me as award for post graduate teaching assistant only between the year 1991-1993. I was able to win this award through the assistance of my supervisor, C.Y. Jeje of the Department of Zoology University of Ibadan, Nigeria. Further help was received from J.S. Omotosho of the Department of Biological Sciences, University of Ilorin, who assisted in the identification of the fish species, while S.S. Ogbogu of the Department of Zoology, Obafemi Awolowo University, Ife, Nigeria, helped in the identification of the various insects. The libraries of the University of Ibadan and University of Ilorin were most useful for literature review, while N.G. Willoughby of Natural Resources Institute (N.R.I.), United Kingdom sent me relevant publications of his work on the genus *Synodontis*. The Chief Laboratory Technologist of the Department of Zoology University of Ibadan, O.A. Ibrahim also supported me in water sample analysis while the meteorological unit of the Ilorin International Airport supplied meteorological data. For now, I have decided to remain in fisheries development and ecological programs because I want to practice my academic knowledge for the benefit of the people in order to sustain the aquatic resources particularly fisheries. I still hope to end my academic career in the University here or abroad. Since I completed my PhD program in 1997, I have met and worked with over 500 local fishermen and my experience with them has been very exiting. Although I experienced communication problem with some of them, who don't speak my local language or English due to illiteracy, however I am able to overcome this problem because a few among them attended elementary schools and can interpret my messages to their colleagues in their local language. In the past these fishermen and poachers usually run away from government officials but this orientation has started changing due to enlightenment programs and they are now getting closer and becoming more friendly not only to the government officials but also to the environment in which they operate.

Apart from the primary objective of creating these water bodies, there is usually no interest for the tapping of some other benefits that could be derived from such projects to alleviate poverty. Hence the full potentials of such water bodies remained untapped and wasted. Big dam projects are supposed to be of multipurpose use, therefore it is not only the engineers who may be interested in the construction works alone, but there is also the need to involve experts from other related discipline for bio-socio-economic reasons. Hence biologists, sociologists and economists are to join hands together with the engineers during the planning and the implementation stages of man-made lake projects in Nigeria and other tropical regions.

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RESUMEN

La creación de represas y lagos artificiales en Nigeria y en otros países en vías de desarrollo, produce importantes beneficios, pero trae también grandes riesgos, pues es difícil evitar sus consecuencias inherentes, hacia el detrimento del hombre y su ambiente. Los países que desarrollan este tipo de proyectos deben adquirir deudas, desplazar personas y animales y enfrentar la destrucción de tierras que podrían utilizarse para cultivo, así como también la degradación del bosque y la vida silvestre. Se ha ignorado además, el riesgo que representa para el hombre y su ganado, la exposición indiscriminada a enfermedades transmitidas por el agua. El manejo pobre y antieconómico de los recursos pesqueros es otro factor importante a considerar. Con el objetivo de lograr un mejor aprovechamiento del potencial de las represas y promover la conservación, es importante organizar mesas redondas que involucren a todos los que participan durante la fase de planeamiento de los proyectos. Además de los trabajos de ingeniería, se necesita de la colaboración interdisciplinaria de expertos en áreas relacionadas, para los aspectos bio-socio-económicos de las fases de planeamiento e implementación de los proyectos de embalse, tanto en Nigeria como en otros países en vías de desarrollo.

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