

Lake Bosomtwe Fisheries:

The Threats to Biodiversity and Livelihoods in the Bosomtwe Basin

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Introduction

Lake Bosomtwe is a relatively small, circular (10km diameter, 78m deep) lake in the forest zone of Ghana. It is located 35km southwest of Kumasi (Fig 1). There are twenty-four (24) towns and villages surrounding the lake (fig 2). Abonu, where the main road from Kumasi terminates is the most well-known town.

There are four (4) principal species of fish in Lake Bosomtwe, one of which is believed to be endemic.

The systematics and biology of these and those of some inflow rivers was the subject of a study by Whyte 1975. Since then, visiting scientists and students have investigated various aspects of the history, geology and fisheries of the lake but have not reported of the conservation status of neither the lake basin resources nor the fishes in the lake.

Lake Bosomtwe was the main source of fish for the tables of the Kings of the Ashantis, and laws were made so that the lake would not be fouled. (Owusu-Nimoh, 1978). Natural occurrences in the lake helped to strengthen and change these laws into superstitions.

The four (4) cichlids, probably the only fishes in the lake presently are trapped in this endorreic habitat with some species showing adaptive radiation in their external morphology and niche preferences.

Several field visits and interactions with fishers and community groups in all the fishing villages by the author in the last 5-years have revealed that there is a decline in both fish catches and in the sizes of individual fishes.

There are also substantial threats to the lake environment and lake fishes. Community leaders and fisher folk in their naivety attribute the decline in fishery to three principal causes:-

- i. Interferences in the natural processes of the lake by scientific investigations,
- ii. Holiday makers and tourists who desecrate the lake and physically scare fishes to deeper waters, and
- iii. the neglect of custom due to modernity, and the non-performance of rites to appease the god of Bosomtwe.

With some financial support from Friends of the Earth (FOE) Ghana, the author and two other colleagues, between August and September 2002, through participatory methodologies collected information on:-

- i. fishes and fishery in Lake Bosomtwe,
- ii. living conditions in fishing communities,
- iii. social patterns and social interactions in fishing communities, and
- iv. community power structure.

Lake Bosomtwe Fishery

The interactions with community leaders, traditionalists, fishers and ordinary people were designed to appraise and understand the environmental and social stresses in the Lake Bosomtwe basin, and more particularly, stresses to fishes and fishery, with the view of developing interventionary livelihood strategies for fishing communities in the Lake Bosomtwe basin.

Sixteen (16) Lake communities were visited (page 3 and also Fig 1). It is estimated that there are more than 1000 fishermen operating in Lake Bosomtwe from the 24 communities surrounding it. The average number of fishermen in each community is about 45. There could be more than 100 fishermen in the larger towns such as: Anyinatiase, Adwafo, Obo, Pipie No. 2, Amakom and few others. Fishing pattern is similar in all the communities.

Traditionally, the fishermen operate with primitive 18ft wooden planks as fishing crafts (plates 1, 2 & 3). Fishing gears are 3 types and include:-

- i. a relatively small wire mesh trap which allows fly to escape, and not capable of exploiting deeper waters,
- ii. efficient gill nets (25m X 2m – 3 m, and 4cm stretched mesh) in the shallow near-shore waters, and
- iii. 1m – 2m radius cast nets.

A fisherman operating in Lake Bosomtwe may own 4-5 gill nets some of which are set permanently. Nearly all fishermen own wire mesh traps and 70% - 80% of them own cast nets.

Fishing begins at dawn and ends at dusk each day of the week and throughout the year. Individual catches are low, less than 5kg per fisherman per net or trap. The fishes landed by fishermen are a mixture of the four principal species in various proportions.

There are no catch statistics for Lake Bosomtwe fishery but it was observed that individual landing by fishers was very low.

Table 1 shows fish catch statistics at Abonu in September 2002 involving 5 fishers each operating a cast net for 30 minutes in the morning (11.00 a.m. – 11.30 a.m.).

Lake communities where PRAs were conducted:-

1. Abonu
2. Obo
3. Asisriwa
4. Pipie No. 2
5. Konkoma
6. Amakom
7. Atafram
8. Agyamanu
9. Ankaase
10. Dompaa
11. Bansa
12. Adwafo
13. Abrodwum
14. Abaase
15. Anyinatiase
16. Datieso

Table 1 – Fish catch data

Fish Species	No. caught	Total weight (gm)	Average weight (gm)	Average length (cm)	% of total
<i>T. busumana</i> (Paripari)	5	59.6	11.9	8.5	8.2
<i>T. discolor</i> (Kaenbre)	48	1477.4	30.8	12.1	78.6
<i>S. galilaeus multifasciatus</i> (Apatre fufuo)	4	104.8	26.2	11.7	6.6
<i>H. fasciatus</i> (Komfo)	4	121.1	30.3	12.7	6.6
Totals	61	1763.2			100

These results (Table 1) suggest that there are only 4 principal species of fish in Lake Bosomtwe currently. Confirmation of this was echoed in all the 16 villages visited. These fishes which have been described by White 1975 were easily identified by fishers in all the villages by their vernacular names:- Paripari (*Tilapia busumana*) Kaenbre (*Tilapia discolor*), Apatre fufuo (*Sarotherodon galilaeus multifasciatus*) and Kamfoo (*Hemichromis fasciatus*). The fishes are generally small in size, 8.5cm – 12.7cm in length and 11.9gm – 30.8 gm in weight. Fish populations appear to be restricted to the shallow near shore waters rarely beyond 50 m from the shore and not below 20 m deep.

Fish catches are very low and various proportions of all the 4 species of fish comprise fish landings throughout the year. Information from the various fishing communities, however, suggests that even though fish landed is always a mixture of the 4 types, there are both monthly and seasonal variations in species dominance. *T. discolor* was more dominant, in fish landed in September. (78% of total catch).

Fishermen spend several hours on the water and use a variety of fishing gear, some of which are permanently set in the water in order to catch sufficient quantities of fish to make a living. Probably it is only in Lake Bosomtwe fishery that fishermen count the fishes in the catch rather than weigh the catch! Field observations of fishing activities, discussion and interactions in fishing communities and experimental fishing in Lake Bosomtwe all seem to suggest that there has been a drastic reduction in fish stocks over the last 20 – 25 years.

White 1975 recorded 9 genera of fishes belonging to 5 families:-

Barbus ablabe, *B. trispilos* (Cyprinidae); *Roloffia petersii*, *Epiplatys chaperi* (Cyprinodontidae); *Amphilius atesuensis* (Amphiliidae); *Heterobranchus isopterus* (Clariidae); *Chromidotilapia guntheri*; *Tilapia discolor*, *T. busumana*, *Sarotherodon multifasciatus*, and *Hemichromis fasciatus* (Cichlidae).

Threats to Fishery

Field observations over the years and the results of this study indicate that only 4 species of the family Cichlidae presently inhabit Lake Bosomtwe. Population sizes of these four groups of fishes are unknown. What is known is that they are unequally represented, individual sizes are small, and most fishermen are losing or have lost their livelihoods. The fishes of Lake Bosomtwe itself are heavily stressed. The major threats to Lake Bosomtwe and its fishes are both internal and external.

Internal threat factors:-

i) Over Fishing

Each of the 24 surrounding villages contributes on the average 40-50 fishermen to Lake Bosomtwe fishery (960 – 1,200 fishermen) one half of whom will be fishing every day of the week and throughout the year. Lake Bosomtwe fishermen use relatively inefficient wire mesh traps, efficient gill nets (50m X 2m and 4 cm stretched mesh) some of which are set permanently, and cast nets.

Wire mesh traps are relatively inefficient and allow fish to escape and cannot exploit relatively deeper waters. However, gill nets (totaling about 4,800-6000) in the lake, 50% of which are permanent in the water, and cast net (1000) employed daily on the lake remove a substantial quantity of fish from the lake. There are no catch

statistics available, but results (Table 1) indicate that 1.7kg of fish can be harvested by 5 fishermen in 30 minutes, i.e. 0.68kg/hr/fisherman.

Simple arithmetic shows that approximately 2720.0kg of fish are harvested in the 4-hour fishing day from Lake Bosomtwe. 2.7 tons of fish/day from a sterile lake like Lake Bosomtwe cannot be nothing less than over fishing. Besides the greater portion of the lake volume is inhospitable (Whyte 1975).

The indigenous cichlids particularly the mouth brooders of a relatively low fecundity are particularly vulnerable to increased fishing pressure.

ii) **Annual Overturn**

This phenomenon, resulting in massive fish kills over the entire lake or in localized areas of the lake is what the traditionalists associate with the god. What is known is that stratification involving deoxygenation below 10m - 15m is disturbed for about one month twice annually. (Beadle, 1974). The more violent of these disturbances occurs in late August to early September. Wind induced overturn resulting from atmospheric instability during this period lowers the oxygen boundary resulting from atmospheric instability during this period lowers the oxygen boundary to about 50m allowing enough anoxic and H₂S-charged water to the surface to kill fish.

In recent times, this phenomenon is much reduced in its intensity and often localized and of a shorter duration rendering the traditional belief in the Bosomtwe basin that the gods are angry with the people over a number of issues. The most important of these issues, which was echoed in all the communities visited, had to do with the performance of some customary rites. The custodian of the lake is the Asantehene, who has transferred his power of control to the Asamanhene of the Kokofu Traditional area. In 1987 the Asantehene Opoku Ware II died a few years later in 1990, the Asamanhene also died.

As traditional overseers of Lake Bosomtwe, the present Asamanhene should have made sacrifices of a dog then a cow with authority from the present Asantehene. To date, no such sacrifices have been made so the lake is angry and has "hidden" its fish. One would say these are mere local beliefs but who knows what would happen when the rites are performed may be, we will begin to experience the periodic overturns ("Atudoro") once more.

iii) **Deforestation**

The dramatic effects of logging and slash-and-burn agriculture are very evident now in the Lake Bosomtwe basin. The loss of rainforest canopy has resulted in soil erosion at the rims and slopes of Lake Bosomtwe, leading to the adverse effects of siltation from runoff into the lake. The destruction of vegetation along the shoreline has not only modified the breeding grounds of fishes but must also alter the dietary needs and patterns of fish species which include those which feed on epiphytic algae and those that feed on seeds or terrestrial insects.

iv) **Agrochemicals**

There has been an accelerated use of agrochemicals by local farmers in Ghana over the years. Lake Bosomtwe basin is noted for the production of plantain, maize, cassava, and various vegetables, together with some cocoa and oranges. Fertilizers used in agriculture and pesticides for the spray of crops drain into the lake where they will accumulate and may lead to deleterious eutrophication and the death of fish.

v) **External Factors**

Physical Developments

Over the past 15 years, Lake Bosomtwe has been identified as a major tourist attraction. Consequently there has been increased infrastructural development in the lake basin. A few new hotels have sprung up, some on

the very shore of the lake. If his trend continues, as it is very likely to waste water and sewage effluents from these hotels will raise pollution and eutrophication problems since such establishments have no wastewater treatment facilities installed.

Socio-economic Pressures

The lakeside communities, which are all Akan (Asante) through their history of the lake, have developed a close association with it. The lake was revered and several laws and taboos were in place to protect the lake and its fish. There was no fishing in the lake on Sundays; only the traditional craft (“padua”) was allowed; women during their menstrual period were not to enter the water.

Sacrifices were to be offered to the lake by the Asamanhene of Kokofu Asaman on behalf of the Asantehene. The isolation of the lake communities and the integrity of their culture is no longer absolute. Furthermore, there is an ever-increasing demand from the rapidly growing lakeside communities for more fish. These have resulted first to a loss of cohesion of traditional societies, loss of value in traditions, and a shift to commercial values. There is therefore the conflict between the aspirations of the local people, and the very valid aim of protecting Lake Bosomtwe fishery and conserving the lake as a sustainable resource.

Visitor Pressure

Lake Bosomtwe by virtue of its location and history and the fact that it is the only large body of water in the forest zone of Ghana and very close to the second largest city, Kumasi is a very attractive spot for tourists and holidaymakers. The rather indecent behaviour of some tourists and visitors and the disrespect for local tradition according to the lakeside communities are major concerns of the people, and could be contributing to the decline in fish.

Abonu, probably the largest lakeside town is very popular with holidaymakers and 1000 – 2000 people can overwhelm the “beach” here during public and national holidays. A first class road from Kumasi has improved public access to Abonu while the construction of hotels and guesthouses near the shores of the lake is not only resulting in habitat destruction but also increasing the external pressures on the lake environment.

Conclusion

There is evidence therefore that Lake Bosomtwe and its fish are being threatened by numerous problems. Most of these problems are inter dependent and interact with one another. In addition, there seems to be a very poor appreciation of the true importance economic, scientific, historical or otherwise of Lake Bosomtwe.

Unhealthy rivalry or sometimes petty jealousies between communities overlapping mandates between traditional authorities and government institutions are also contributing to the environmental and natural resources management problems in the Lake Bosomtwe basin.

Effective basin management to maintain biological diversity requires reliable statistics or information on rate of harvest of natural resources such as fish and others, fishing/harvesting methods overtime, in order to determine the level of exploitation and the status of the natural resources.

Identifying and strengthening the appropriate institution to manage Lake Bosomtwe is a major challenge. Friends of the Earth (FOE) Ghana and concerned departments in the Kwame Nkrumah University of Science and Technology, Kumasi are making good progress in addressing these issues.

However, significant advances are required in the following areas:-

- Environmental education at the community level.
- Community based fisheries management committees.
- Alternative Livelihood Programs – to ease pressure on fishery.

- Repackaging and strengthening traditional authority on natural resource exploitation.
- Institutional collaboration. Bekwai District and Bosomtwe -Atwima-Kwawonma District to be proactive and liase effectively in the management of Lake Bosomtwe and its basin.
- Tourism development in Lake Bosomtwe basin and code of ethics for tourists of Lake Bosomtwe.

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