An integrated survey of local knowledge in resource utilization and management in relation to climatic and land use changes in Kigoma Area, Lake Tanganyika

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Introduction

Lake Tanganyika is the world’s second largest and deepest fresh water resource with a catchment basin of 231,000 sq. km excluding Lake Kivu (Coulter, 1991). Studies already carried on Lake Tanganyika and around its catchment areas indicate environmental changes around the lake (Plisnier, 1997) and an evident gap in the information available on ecological as well as local limnologic conditions in its watersheds. Mwamgongo is one of the lake’s deltas with a high disturbance rating (Cohen, 1998). It is not known whether these changes are solely due to climatic changes or to a combination of these and anthropogenic impacts. These changes affect the ecological integrity of the lake and its catchment basin; hence they compromise the natural resource base upon which local communities’ livelihood is based. Local knowledge does not seem to have been recorded in efforts to assess some of these changes. This study aims at finding out and recording existing knowledge from local people in two target areas: Mwamgongo and Katonga villages. This will generate some benchmark information bank on local indigenous knowledge on the lake’s resources in relation to long term climatic and anthropogenic changes. Local indigenous communities are key stakeholders in the utilization and management of natural resources. They form an accumulated bank of knowledge about such resources due to their day-to-day interactions within the resource area over long periods of time. We rely on them to use the same knowledge to perpetuate conservation ethics in the belief that meaningful development, improved livelihoods and community welfare can only be sustained if development is based on sound conservation principles. Local communities possess vital information which is rarely used and/or consulted by policy makers, development/resource managers and resource planners. Their continued interactions with the natural resource base enables them to have their knowledge firmly entrenched into their lifestyles and resource use/management patterns. It is thus imperative that successful management and utilization of any resource requires full and active participation of the local people within its vicinity.

Study Area

The first area surveyed was Mwamgongo, situated at the lakeshore edge of a small (8.5 sq.km) watershed found 30 km north of Kigoma Bay in Kigoma Town, Tanzania (Fig.1). Mwamgongo one of the big rural villages in this Kigoma district has seven sub-villages namely: Busolo, Buseke, Kashoko, Kamasa, Nyandiga, Mpemba and Mgazo spread in and around several hills. Its southern border is Gombe Stream National Park (GSNP), Bugamba in the north, the lake to the west and Kalinzi. Human population is estimated around 8000 people (TACARE, 1998). This village has significantly grown as a result of eviction of communities from Gombe SNP initially, the villagisation program introduced by the Tanzanian Government in 1972 where people were concentrated in certain areas, and the inflow of refugees from neighboring countries (Burundi, Rwanda and Democratic Republic of Congo).

I chose Mwamgongo for study because of its size, location, presumed human impacts on resources arising out of unplanned human settlements due to influx of refugees (1975) and evictions from Gombe (GSNP). The sedimentation studies had also showed effects on the lake from the land and this would provide opportunity for finding out details about this.

The second survey site was Katonga, a small village in Bangwe Division situated 4-5 km to the south of Kigoma Bay. This village was considered for purposes of comparison due to its semi-urban setting. It would provide knowledge, attitudes and practices for comparisons.
Methodology

Methods used for these two surveys were field visits for reconnaissance, visits to homes for interviews, field testing of the questionnaire, observations, administering of two sets of questionnaires and discussions with focus groups for data collection. Questionnaire A aimed at interviewing fishermen, practicing and/or retired about winds, waves, micro-climate and weather change patterns, wind induced wave activity in the lake, fish catches, and lake water and population changes.

Questionnaire B, comprising three parts, sought information about local knowledge on land use practices, fuel use and related environmental changes observed (Appendix 1). Complimentary information was collected from literature, verbal discussions and field observations. It is expected that results from this data will provide preliminary information about fishing and other resource uses in relation to environmental changes around Lake Tanganyika, Kigoma Area.

Results of Questionnaire A

This questionnaire comprised five parts: preamble, winds, waves, questions on other related issues and personal observations. Eighteen respondents were interviewed in both Mwamgongo (12) and Katonga villages (6). The pre-survey field test response is included in this data analysis.

The preamble covered information on the individual respondent (including his/her name if there was no objection), age, educational level, where s/he lived, family size & dependents and present or past livelihood activities. Questions on the main income earning activities and main occupation would appear as if they are repeated but actually enhanced the understanding of livelihood activities. The second and third parts covered questions on knowledge about winds and waves respectively while the fourth dealt with knowledge on related environmental changes. The last section involved observations by the investigator on physical features, settlement patterns, housing status, fishing gear and other buildings. Where it was difficult to observe as in the case of ownership of fishing gear the question was politely put to the interviewee for response.

Preamble

Ages of the interviewees ranged from 31 to over 80 years. Majority of these (67%) had primary school level of education, 16.7% had no formal education while 5.5% had either been up to college, adult classes or secondary school (middle school in colonial era).

Winds and Waves

Respondents interviewed appeared knowledgeable about winds in their own areas as well as far away. They identified eighteen different winds, seven of which were named by at least five respondents, five by over seven different respondents and the rest by between one and two respondents only. Table 1(a) gives details on the main winds named.

Table 1a: The five more quoted winds during the survey

<table>
<thead>
<tr>
<th>WIND NAME</th>
<th>ALTERNATIVE NAME</th>
<th>TOTAL OF RESPONDENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kaskazi</td>
<td>Ubangwe; Ingunza</td>
<td>18</td>
</tr>
<tr>
<td>2. Kusi</td>
<td>Rukuga; Kunza; Olubangwe;</td>
<td>15</td>
</tr>
<tr>
<td>3. Lukuga</td>
<td>Rukuga; Mulema; Kapata; Lualaba(in Congo)</td>
<td>13</td>
</tr>
<tr>
<td>4. Kalala</td>
<td>Mwela;</td>
<td>7</td>
</tr>
<tr>
<td>5. Nyamori</td>
<td>Kibirizi/Luegere</td>
<td>7</td>
</tr>
</tbody>
</table>

Other winds mentioned were Malagarasi, Easterly, Westerly, Kahama, Misozi, Kapurukutu, Tendalubangwe, Pumbwe or Kimpunga, Muharuro (a local wind from Manyofu Hills), Nyabasai and Karamba and Baraga (this last one in Burundi).
All the winds mentioned except Kahama were said to cause waves of varying intensity and strength. These waves were therefore called by the same names except for Kaskazi whose wave would be called Kifunda if it was extra strong. This wave is not observed every year. Table 1 (b) shows most significant winds/waves named.

Micro-climate changes

Twelve fishermen affirmed that weather patterns, rainfall amounts and periods, or temperatures had changed. Rainfall was claimed to have decreased. The rains are reported to start after expected periods for instance in November instead of October. Some reported that storms in these later years were of less intensity and strength than those of the 1960/70’s.

Two fishermen indicated that temperatures around Kigoma had increased to near Dar es Salaam levels, which was not the case in the earlier years (before the 1970’s).

Lake water levels are noted to have dropped significantly from the 1960’s. Highest water levels were claimed to have been recorded around 1964-1966 period from what some fishermen remembered. This, they asserted was the only time at which water levels in the lake rose to cover Nondwe rock found in the lake between Kibirizi and Kalalangambo villages. In 1997/98, water levels also rose but levels were below those of the 1960’s.

Organisms in the Lake

Fishermen were interviewed for their knowledge on populations of organisms and although their responses are varied, it is generally observed that populations of fish, shrimps, jellyfish and water plants had decreased compared to populations available in the 1960’s and 1970’s. They were particularly concerned about some fishes that were now no longer fished in some areas like L. angustifrons and Boulengerocromis microlepis., and a local water plant species called “malebe” in Kiha language in Mwamgongo area. Some big animals like the hippopotamus were no longer seen.

Other Observations

Most interviewed fishermen fish at night (11) only or night and day (3) and generally catch more Lates stappersii than other fishes when the water is transparent.

On whether they knew where some fish species went to, when they were not fished, some fishermen responded that the fish retreated to greater depths maybe to breed, or migrated to other areas in search of feed and/or ran away from predators.

Of the eighteen fishermen interviewed, only seven had had their fathers as fishers before. They also reported that nearshore farms had decreased in the study areas but increased in others. Katonga was reported not to be a farming area particularly.

Results of questionnaire B

Introduction

This questionnaire comprised three sections: a preamble, resource use/environment questions and observations. Twenty individuals from seven different villages were interviewed in three days.

Preamble

This part covered the same personal questions as in questionnaire A. These questions revealed that active farmers were mainly younger members of the community aged below 50 years. Of the twenty interviewed, 60% had primary school education, 30% had no education while 5% had secondary and university levels of
education (Figures 1a & 1b). Most respondents were found to be aged between 31 and 60 years and had family sizes of 4 to 6 members (Figure 2a & 2b).

The second section had questions on knowledge regarding resource use and related matters on the general environment while the last section dealt with observations by the investigator. Where it was difficult to observe, as in the case of fishing gear sometimes, the question was politely put to the respondent and data recorded as the case was in questionnaire A.

**Fuel Use**

The majority of the interviewees (75%) use firewood for fuel (Figure 3). Twenty percent use charcoal either alone or in combination with firewood. This indicates a heavy dependence on natural vegetation in the area, a fact that was observed in more bare land and areas with few or without trees. A significant difference was observed between the vegetation in Mwamgongo and the neighboring Gombe (GSNP). Gombe area had dense natural vegetation while little tree cover was seen in Mwamgongo except at some of the inaccessible hills tops.

The nearest point from which firewood and charcoal were fetched was 0.1 km and took ten minutes while the furthest point was 14.4 km away and involved walking for over six hours. Those who obtained fuel from nearby points either purchased from hawkers or from nearest markets.

**Land use & tenure practices**

The aim here was to establish existing land tenure systems and rights and farming practices. Data collected showed that seventy five percent of the respondents farmed individually on small plots that were mainly less than 2 acres (one acre = 70 x 70 meters). The largest farm size mentioned was 6 acres. All farmers used hand hoes to cultivate fields. They grew crops mainly for food (50%) and for sale if there was an extra harvest (30%). The dominant crop grown was cassava. Certain crops though like palm trees were specifically grown for sale (Figure 4).

**Soil conservation**

Questions here aimed at establishing erosion control and afforestation programs known to and carried out by the farmers. This would assess soil conservation awareness and knowledge on afforestation values. Ninety percent of the respondents knew that trees protected soils from erosion while five percent did not know.

Of the ninety percent who knew, sixty percent had planted some trees around their homes or on their plots while thirty five percent had not. Varied reasons were given for not planting trees and included such answers as: “I did not know that I could plant few trees”; “I am not able to maintain the seedlings”; “I have no plot on which to plant trees”; “the farm is very far”; “my life is short” (Figure 5a & 5b).

Respondents were questioned on how often they changed their farming fields. Responses here reveal farming practices and knowledge on soil preservation and crop rotation patterns. Forty percent changed their plots after 2 to 5 years (Figure 6).

On whether the farmers used any soil conservation methods in their fields when farming, respondents said they faced several barriers although they had tried. Figure 7 shows the responses. Most farmers had therefore resorted to using round ridges as opposed to contour farming methods recommended by government officers. This was due to lack of adequate space and inability to mobilise neighbors for this purpose. They had therefore borrowed Mbeba ridges from a neighboring country for use on their mostly small sized farms (Figure 8).

Farmers were asked to say whether they had noted any major changes their plot’s soil or fertility since they started farming. Answers are given in Figure 9.
Observations made showed that erosion marks were significantly present; land mostly bare and human settlements mainly concentrated or nucleated.

**Discussion**

It is important to note the following points in the discussion of these findings:

Sample sizes in the two surveys are relatively small (38 respondents in the two sites) and these communities were not prepared at all before the surveys began. This is likely to affect reliability of data collected. All questions were prepared and written in English whereas interviews were administered in Kiswahili. In some cases this was done through interpretations through a third party. For some local names/words, it was not possible to seek interpretations at all. This calls for further follow up to complete the report. Data recorded has not been fully analyzed. I went into the community through a local NGO but observations show that our arrival in Mwamgongo was viewed as an extension of the government’s ploy to monitor the existing ban on beach seine fishing methods. This may affect responses from this community.

Fishing is not just a way of life but an economic activity that many families rely on for their day-to-day earning. This is exemplified by the number of fishermen who have no other relatives within their families in the same business. It is also apparent that most fishers drop out of school at primary level or never go to school at all indicating the influence that fishing has on near shore communities.

The community showed indifference to the ban on some fishing methods emphasizing that they had traditional methods that they used before that did not affect fish populations negatively. It was suggested that they be involved in the decision making regarding this only resource that they heavily relied on in the village. Observations reveal that the policing of the ban was not as strong and in any case, it was only strongly enforced at Gombe (GSNP) and its immediate surroundings. This indicates that the effect that this ban is supposed to create may not be due to lack of effective enforcement. It is not possible for any government and especially in developing countries to have adequate manpower and other resources to enforce such a ban. The practical solution is to involve such local communities in the management so that they can act as policing agents in their own environment. They always will know the area better than any outsider including their own government’s policy makers.

It was generally noted that fish catches had decreased and this conforms to records kept by the country’s Fisheries Research Institute TAFIRI at Kigoma (Pers. Comm.). A larger percentage of respondents used firewood alone while the next large category used firewood and charcoal and only five percent used only charcoal. These three categories accounted for 95% of all fuel used in Mwamgongo. Except for the five percent respondent who happened to be in the village during this survey, there would not have been a fourth category. This indicates a very heavy dependence on natural vegetation in the area, a fact that was observed in more bare land and in deforested areas. Significant difference was observed between the vegetation in Mwamgongo and the neighboring Gombe SNP. Gombe area had dense natural vegetation while little tree cover was seen in Mwamgongo except at some of the inaccessible hill tops as earlier noted.

About the land Tenure, 75% of respondents cultivated as individuals on small pieces of land scattered around the hills according to ones ability to lease. Land was controlled by the man but mostly cultivated by women. This made it difficult for farmers to adequately practice soil conservation methods recommended by the Government. It also meant that every available space was maximized for the production of food. Any extra from a good harvest would then be sold to supplement the family’s income. Lack of land ownership and lease hold rights also meant that land was put to maximum pressure whenever for returns available.

Respondents were aware (90%) that trees were important to the conservation of their environment, for fuel, fruits and shade/flowers. Only 60% of these had however planted some trees despite the fact that a tree nursery was within their reach. A village nursery exists in the village tended to by a VINA who is employed by a local NGO. Most found it not suitable to plant trees around houses as settlements were concentrated making it impossible to find space for such an activity. This detached them from their plots making them have identification with or sense of ownership for the land on which they lived.
The majority of respondents had noticed changes in soil or fertility (vigor) since they started farming on their plots. Some soil had even changed color in addition to losing fertility. They also revealed that crop yields (harvests) had decreased over time and that the soils were exhausted. Some members were reported to have migrated out of the village in search of other economic activities. The government ban on beich seine fishing had not assisted the community or the populations of fish that the government aimed at protecting. It is claimed that some of those fishermen who lost their jobs due to the ban have become seaway robbers just to earn a living (Pers. Comm.).

Conclusions

Mwamgongo community is aware that their environment has changed. They also know that some of the causes to these changes are due to human activities. This community acknowledged that some of the negative changes could be alleviated through their participation in decision making regarding use and management of such resources. This, they were aware would be a positive step in control of fishing, land uses and tree planting. Some however say they are helpless as they are too old to participate in any productive/change activities. This is an attitude that could be changed with more understanding and involvement in decision making. Such older members of a society are influential and their acceptance of an idea could stimulate and catalyze a substantial number of villagers; young and old, towards change in attitudes, perceptions and cause them to actively participate in environmental conservation. It is recommended that a list of locally influential persons be established as one step in the beginning of involving this community in the conservation and sustainable management of their own environment.

Recommendations

This study was done in a very short period and in the frame work of the Nyanza Project Training program on Tropical Lakes. It is recommended that adequate follow ups be made in the same context or otherwise to establish further information on findings of this short survey. Subjects of further exploration include fishermen knowledge and participation in control of fisheries on Lake Tanganyika, water currents and breeding patterns. Land is a non-renewable vital resource. It is necessary that land users are involved in decision making on land.

Generally, the two communities are rich with products that are exported out of the country such as fish and Pemba soil. Sustainable harvesting of these resources is paramount and affects the community’s development and welfare. Since communities live with these resources and usually know more about them it is important that they be consulted at all times. A list of those interviewed is available from the author on request.

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References
