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Assessment of Current Challenges and Opportunities of Fisheries of South Wollo Lakes, Amahara Region, Ethiopia

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Abstract: Assessment of current challenges and opportunities of South Wollo lakes fisheries was conducted from February to May, 2013. The major objectives of the study were to assess the current challenges and opportunities of fisheries and recommend fishery development and management for sustainable utilization of the 4 lakes found in South Wollo. Structured questionnaires, checklists and PRA were used for generating the data. The data collected were analyzed using SPSS Version 16. Lakes Golbo and Maybar fisheries recently have been stopped due to excessive growth of macrophytes and perception on existence of devil that kills fisherman, respectively. The fishing activities in both lakes, Logo and Ardibo were active urging proper fishery management. The age distribution of the respondents in Lake Logo and Ardibo was found to be not >57 which revealed that most of the fishermen in the 2 lakes are within the productive age (<65 years). In case of literacy level, only 10 and 28.3% in Lake Ardibo and Lego, respectively are illiterate while the majority was found to have at least basic education. With respect to the marital status, the majority of fishermen in Lake Ardibo (80%) were married, most of the Lake Logo's fishermen (65%) on the other hand were found to be single. This was supposed to have its own share in determining the resource utilization pattern of the 2 lakes. In view of their income source while 35% of Lake Ardibo's fishermen are solely dependent on capture fishery, in case of Lake Logo these were found to be 44%. With respect to their fishing practices, all fishermen of Lake Ardibo use a mesh size of >8 cm unlike that of Lake Logo's fishermen who use <8 cm mesh size. As true for most part of the country, the most preferred fish species in all lakes was Nile tilapia. But starting from the year 2003, the fishermen of Lakes Lego, Ardibo and Maybar and the local people in South Wollo have started to use common carp. Moreover due to intensive training delivered on common carp dish preparation, recently the fish has good price in Dessie, Kombolcha and Hayq. Concerning the income of fishermen of the lakes, the minimum and maximum income were reported to be 300 and 1800 Birr for Lake Logo and 150 and 1500 for Lake Ardibo. The univarate analysis showed that no statistically significant difference in monthly income from fishing between fishermen of Lake Logo and Ardibo ($p>0.05$).

Key words: Devil, fishermen, perception, lakes, South Wollo

INTRODUCTION

The fishery resource has significant socio-economic contribution through generating income, employment and used as a cheap protein sources for local people in developing countries including Ethiopia (Demissie, 2003).

Ethiopia is uniquely rich in water resources. It has numerous water bodies including ponds, lakes, rivers, reservoirs and wetlands. Based on the estimation of FAO (2001) the surface area of major lakes and reservoirs is 7,334 km^2 and the length of rivers is 7,185 km.

Even though, the diversity of the Ethiopian fish fauna is not fully researched, these water bodies give a refuge for >150 species in 29 families of which around 40 of them are endemic to Ethiopia (Getahun, 2007). Even though, no systematic survey and assessment of the potential of all water bodies have been made, the rough potential harvest estimate from 7 main lakes, 2 small lakes and 1 reservoir covering a total area of 7,005 km^2 was about 51,500 ton of fish per year.

Fisheries provide an alternative source of protein, micronutrients, essential fatty acids and minerals. They contribute to food security by providing an accessible and cheap protein source for the poor that supplement other locally available food sources (Thorpe *et al*., 2006). Over 1 billion people worldwide depend on fish as their main source of animal protein. Fish are particularly important source of protein in developing countries where protein intake is low (Thorpe *et al*., 2006). In general,

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fish provide over 20% of total animal protein intake for >2.6 billion people in developing countries and specifically in Africa the number of people directly dependent on income from fisheries is estimated to be 50-60 million (Heck *et al*., 2007).

Before 50 years ago, fisheries had insignificant role in the Ethiopian economy due to abundant land-based resources and a sparse population density. But starting from the 1940 and 50s, the rapid population growth which resulted in a shortage of cultivable land and depletion of land resources forced the people to look for other occupations and sources of food from water resources at a subsistence level. Also, the rapidly growing demand for fish in the capital city by foreigners and modern town dwellers contributed to the start of commercial fishing as a new practice in Rift Valley lakes (from the 1950s) and later in Lake Tana (late 1980s). Even though, no systematic survey and assessment of the potential of all water bodies have been made, the rough potential harvest estimate from 7 main lakes, 2 small lakes and 1 reservoir covering a total area of 7,005 km^2 was about 51,500 ton of fish per year.

South Wollo lakes, Logo, Ardibo, Maybar and Golbo are some of the highland lakes found in Amahara region. These lakes have significant socio-economic contribution for the local people in their respective localities. The first 2 lakes cover almost 99% of the lakes total area and 90% of the potential.

The multiple activities in aquatic and Wetlands ecosystems have increasingly come into conflict. Major challenges of such systems include: Pollution by silt load, water level fluctuation, over-exploitation of specific fish species, conflict of interest in the use of the water, surrounding area in the form of deforestation, water logging, flooding, overgrazing, population pressure and degradation. This has contributed to rendering the resources environmentally unstable (Lemma, 2004).

Poor marketing system for fisher products, lack of post harvesting technology, poor infrastructure and poor extension and research service are among the ecological, technical and socioeconomic problems to be mentioned in Ethiopian water bodies (Tefera *et al*., 2009).

Amahara region in Ethiopia has set both fishery proclamation (92/1996) and implementation law (50/1999) to guide fishery activities and management in water bodies of the region. South Wollo lakes (Maybar, Ardibo, Logo and Golbo) fishery potential, current status and the fishery management practiced in these lakes is not known.

Though, many researchers have been conducted on biology and hydrology of Lake Logo and Ardibo, socio-economic data were limited. Therefore, the purpose of this study was to assess the current fisheries condition of South Wollo lakes, Logo, Ardibo, Maybar and Golbo.

MATERIALS AND METHODS

Study area: South Wollo lakes Hayk, Ardibo, Maybar and Golbo are the 4 major lakes located in Northern part of Ethiopia. L. Hayk found at 11°11.9'37.3"N latitude and 39°41'12.3"E longitude with an altitude of 1830 m, Ardibo located 11°10'26.9"N latitude and 39°45'19.2"E longitude, Maybar 10°59'13.7"N latitude and 39°39'10.9"E with an altitude of 2463 m and L. Gulbo. The first 2 lakes cover almost 99% of the lakes total area and 90% of the potential (LFDP, 1995) (Fig. 1).

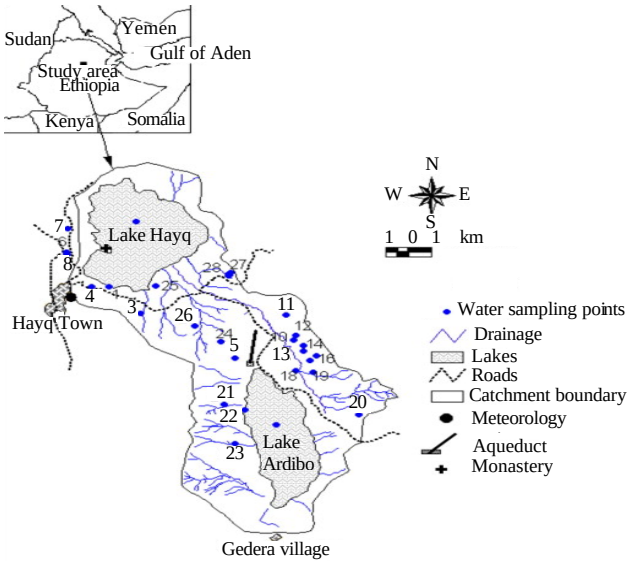

Fig. 1: Map of Lake Hayq/Logo and Lake Ardibo where fishery activities are active

Methodology: Structured questionnaires were used for 80 fishermen selected randomly from Lake Logo and Ardibo. In addition to questionnaires, PRA was conducted to make pair wise ranking. For lakes Maybar and Golbo, personal communication with key informants and woreda animal production experts was conducted. For all lakes secondary data were taken from woreda animal production experts. Moreover, 30 hotels preparing fish dish in Dessie, Hayq and Kombolcha were selected purposely and interviewed.

The information collected include number of fishermen and their family dependants, family size, type of fishing gears used, type of fish caught, monthly income from fishing, fish consumption habits and preference, type of fish used for preparation of fish dish in hotels, average price of fish dish in hotels at Kombolcha, Hayq and Dessie.

Statistical analysis: Descriptive statistics (mean, minimum, maximum and percentage values) and inferential statistics (univarate and t-test) were used to analyze the collected data using SPSS Software Version 16.

RESULTS AND DISCUSSION

Demographic information: A total of 80 fishermen, 60 from Lake Logo and 20 from Lake Ardibo were contacted for face to face interview. Table 1 shows demographic information, average family size, educational level, average age and marital status. All fishermen in both lakes were males. Average family size was 3.65+0.46 in Ardibo and 2.67+0.303 in Logo.

Most of the fishermen in Lake Logo depends mainly on fishery as source of income (44.4%) unlike the case in Lake Ardibo where the contribution of fishery was 35% (Table 2).

Fish composition of South Wollo lakes: The recently fish species, common carp and Nile tilapia exist in 4 lakes of South Wollo and contributing a lot in food security, monetary and employment opportunity were stocked by Sebeta National Fish and other Aquatic Life Research Center and South Wollo Agriculture and Rural Development office (Table 3).

Fishermen categories and practices: According to Tefera *et al.* (2009), there are four categories of fishermen involved in Lake Tana and rivers around Lake Tana, these are full time fishermen, seasonal fishermen, contractual fishermen and parttime fishermen. Fishermen in Lake Logo were mainly full time fishermen since they do not have access for agricultural activities unlike Lake Ardibo fishermen who were seasonal due to access for mixed farming (Fig. 2).

Fishing practice and production potential: The fishing activities in Lake Logo are very intensive due to high

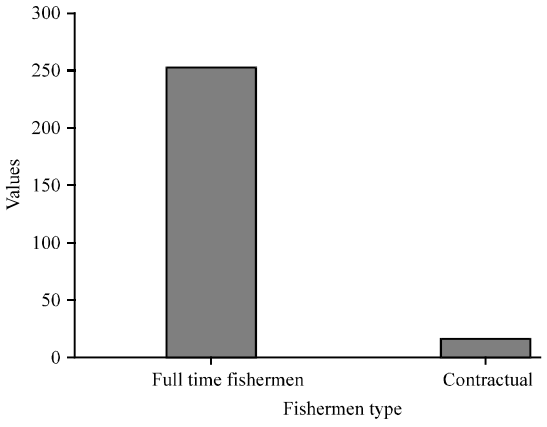

Fig. 2: Fishermen types in Lake Logo

Table 1: Background of sampled respondents from Lakes Ardibo and Logo

Respondatnts structure	Ardibo	Logo
Average family size	3.67	2.65
Average age	33.7+2.09	26.57+0.746
Minimum age	22	16
Maximum age	57	46
Education		
Illitrate	2 (10%)	17 (28.3%)
Basic	6 (30%)	3 (5%)
Primary	10 (50%)	20 (33.3%)
Secondary	2 (10%)	18 (30%)
Higher	0 (0%)	2 (3.3)
Martial status		
Single	4 (20%)	39 (65%)
Married	16 (80%)	21 (35%)
Divorced	-	-

Table 2: Means of livelihood of respondents for fishermen in Logo Ardibo and Logo

	Lakes (%)	
Source of income	Ardibo	Logo
Fishery	1 (35)	27(44.4)
Mixed farming and fishery	12 (60)	14(23.3)
Fishery and recreation	0 (0)	6 (10.0)
Fishery and animal farming	1 (5)	5 (8.3)
Fishery and crop	0 (0)	8 (13.3)

Table 3: Fish species composition of South Wollo lakes

		Fish	
Lake	Scientific name	Common name	Local name
Ardibo	*Oreochromis niloticus*	Nile tilapia	Kereso
	Cyprinus carpio	Common carp	Duba
Logo	*Oreochromis niloticus*	Nile tilapia	Kereso
	Cyprinus carpio	Common carp	Duba
	Clarias gariepinus	Catfish	Kereso
Maybar	*Oreochromis niloticus*	Nile tilapia	Shimbro
	Cyprinus carpio	Common carp	Tikurie (Duba)
Golbo	*Clarias gariepinus*	Catfish	Ambaza
	Oreochromis niloticus	Nile tilapia	Kereso

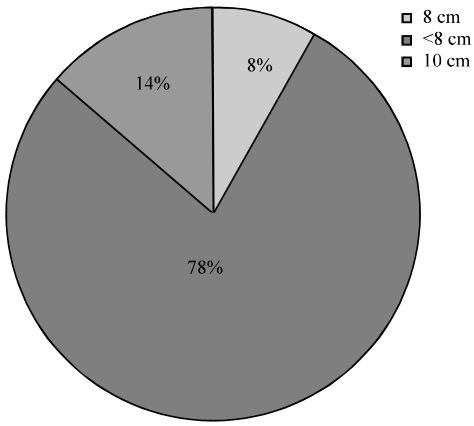

Fig 3: Gillnet mesh sized used by fishermen in Lake Logo

number of fishermen. According to Tehulederie District Office of Agriculture and Rural development, there are over 525 fishermen around the lake higher than the rest lakes.

The fishermen in Logo are practicing illegal fishing using gillnet mesh size <8 cm, less than the recommended mesh size. The fishermen use either gillnet <8 cm or monofilament, 78% of fishermen in Lake Logo use mesh size of <8 cm. This illegal fishing in this lake resulted in stunted growth (Fig. 3). The fishermen in Ardibo since they are all member of Logo-Ardibo fishermen association, all of them use mesh size ≥8 cm gillnet. Fishing in Lake Maybar has stopped since December, 2004 EC due to the death of fishermen association leader. Fishing in Lake Golbo has also stopped, since 2001 EC due to low fishing efficiency of the association. According to Golbo Kebele animal production expert and personal observation, there was excessive macrophytes growth in the lake that prevent fishing activitites. The gillnet and the fish may not have contact due to existence of excessive macrophytes. Lake Logo and Ardibo cover almost 99% of the lakes total area and 90% of the potential (LFDP, 1995).

Fish consumption and marketing: In all lakes, the most preferred fish species was Nile tilapia similar to other localities in the country. Since 2003, the fishermen of Lakes Logo, Ardibo and Maybar and the local people in South Wollo have started to use common carp. Due to intensive training deliver on common carp dish preparation, recently the fish has good price in Dessie, Kombolcha and Hayq.

The independent t-test analysis showed that there was no significant difference in monthly income from fishing between fishermen of Lake Logo and Ardibo ($p>0.05$). The average income of fisherman of Lake Logo was higher (765±46.73) than Ardibo (715±75.04). The minimum and maximum income of fishermen were 300 and 1800 for Lake Logo and 150 and 1500 for Lake Ardibo.

Table 4: Price of fishes of Lake Logo and Ardibo

	Price in ETB	
Fish species in filleted form	Lake Logo	Lake Ardibo
Tilapia	5-8	3.5-6.5
Catfish	10-100	-
Common carp	5-40	4-20

Table 5: Average price different fish dish in Dessie, Kombolcha and Hayq towns

Hotels	Average price of d/t fish dish in Ethiopian Birr (ETB)
Dessie	39.99
Kombolcha	37.20
Hayq	39.60

Table 6: Major constraints and their proposed solution in Lake Logo and Ardibo

Lakes	Constraints	Rank	Causes	Proposed solution
Logo	Destruction of macrophytes	3	Absence of breeding ground	Conservation
	High no of fishermen	2	Overfishing beyond MSY	Limit the input and the out puts
	Lack support from government	4	Poor fishery management	Implementation of the law of proclamation and enforcement
	Illegal fishing gears for tilapia	1	Small sized fish	Gillnet mesh size ≥8 cm
	Lack of other fishing ground	5	High pressure	Try to see Riverine fishery
Ardibo	Lack modern fishing tools	1	Less production, more time	Credit access for purchasing modern tools
	Lack of buffer zone	2	Siltation, absence of breeding ground	Avoid close contact with lake littoral region
	Less support from government	4	Poor fishery management	Implementation of the law of proclamation and enforcement
	Absence of screen for outlet of irrigation canal	3	Skipping of fish fingerlings	Construction of screen to prevent fish leave out
	Water volume reduction	5	Less fish production from lake and poor service	Sustainable utilization of irrigation system

The price of tilapia and common carp fish species which are found in both Lake Logo and Ardibo varies due to access to more market for Lake Logo (Table 4). The price of average fish dish in was highest in Dessie (39.99), followed by Hayq (39.6) and Kombolcha (37.2) as shown in Table 5.

Major challenges of fisheries of South Wollo lakes: The major challenges for Lake Golbo fishery and Maybar was excessive growth of macrophytes and perception on the existence of devil that may kill any fishermen trying to catch fish, respectively. The major challenges for Lakes Logo and Ardibo is stated in Table 6.

CONCLUSION

The fishery of Lake Logo is in severe problem due to illegal fishing and high number of fishermen resulted in overfishing of Nile tilapia. The size of tilapia caught for market from Lake Logo is the least compared to most Ethiopian lakes. Fisheries of Lake Ardibo are relatively stable due to good fishery management implementation by the fishermen of Lake Logo-Ardibo Fishermen Association. The fisheries of both Maybar and Golbo has stopped duet to perception on existence of devil and poor fishing efficiency, respectively. Fisheries of Lake Maybar has stopped after the death of chairman of fishermen on December, 28/04/2004. Fisheries of Lake Golbo has stopped, since 2001 due to poor fishing efficiency of fishermen as the result of excessive growth of macrophytes Fisheries in Lake Logo and Ardibo needs fishery management where as for Lakes Maybar and Golbo fishery development should come in to practice. Irrigation canals in Lakes, Maybar, Golbo and Ardibo should have screen to prevent fish fingerling skipping. Further, study on factor affecting on stunted growth of tilapia in Lake Logo and physico-biochemical investigation of Lakes Maybar and Golbo should be conducted.

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