

A survey on fishes in Chefa Wetland around Kemisse,  
Oromia Zone, Ethiopia

By

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Vol.2(3):28-32, March 2014

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Accepted 17 March 2014

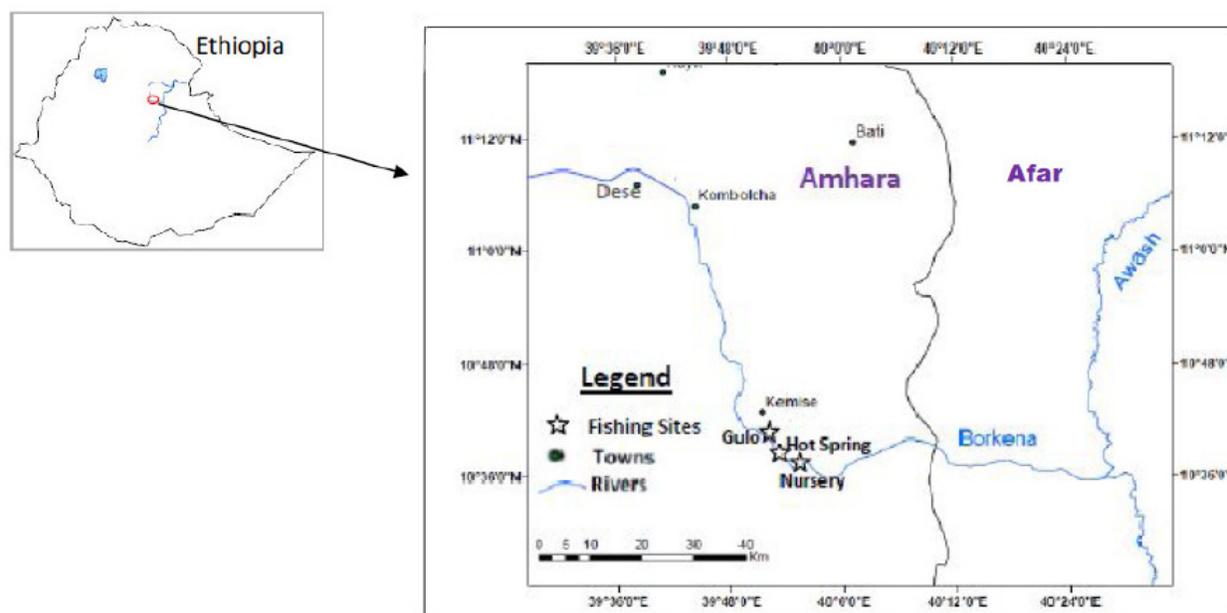
A preliminary survey of fishes was carried out in Chefa wetland in April and October, 2009 using gillnets of stretched mesh size from 6-12 cm, monofilaments of different mesh size, hook and line, and beach seines. A total of 1171 fish specimens were collected in both dry and wet seasons from the three sampling sites: Gulo, Hot spring and Nursery sites. Fish species identification was made using appropriate techniques Index of Relative Importance (IRI) and Shannon index (H') were used to evaluate abundance and diversity of fishes in Chefa wetland. Two families, three genera and four species were recorded from the three sites. Family Cyprinidae was best represented in all sites. *Clarias gariepinus*, *Garra dembecha*, *Labeobarbus intermedius* and *Labeobarbus nedgia* were recorded in Chefa wetland. *Clarias gariepinus* and *Gara dembecha* were the dominant fish species in Chefa wetland with percentage IRI of 40 and 31.4 in dry season but during wet season, *Clarias gariepinus* and *Labeobarbus intermedius* were the dominant fish species in the wetland with percentage IRI of 68 and 26 respectively. The Shannon diversity index value of Gulo site was higher than either of Hot spring and or Nursery in dry season (0.94, 0.69 and 0.9) respectively. Chefa wetland has high fishery potential nonetheless the vegetation (*Typha latifolia*) used as nursery ground for fish is destroying at an alarming rate to use it as raw material for mattress and other house hold materials. Therefore, proper wetland management should be implemented.

**Key words:** Chefa, Gillnet, Index of relative abundance and Wetland.

## INTRODUCTION

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<sup>2</sup> and the length of rivers is 7,185 km. Although the diversity of the Ethiopian fish fauna is not fully studied, these water bodies give a refuge for more than 150 species in 29 families: of which 40 of them are endemic to Ethiopia (Abebe, 2007). It may be mentioned here that wetlands of Ethiopia are distributed

throughout the country covering approximately 2 % (22,600 km<sup>2</sup>) of its total surface area (EPA, 2004). Their ecosystems provide significant provisioning, regulating, supporting, and cultural and amenity services to Ethiopia. In addition, they have critical importance for the well-being of human and natural environment. As a result, there is a growing realization on the tangible benefits of wetlands (such as water, pasture/fodder and crop production) in particular and other services in general. By tradition, wetlands have different socio-economic values.



**Figure 1.** Map of Chefa wetland with sampling sites (Gulo, Hot .spring and Nursery).

These include, of food crops through agriculture by draining and recession, important sites for dry season grazing, resource extraction, raw materials, papyrus supply, fish harvesting, source of medicinal plants and sites for tourist attraction and various traditional ceremonies. They are also part of the rural people's economy as they traditionally play an important role for rural communities through the provision of water, and other materials, for both humans and livestock (FPA, 2003). From the above background, a survey was carried out to identify fish diversity, quantify the relative abundance of fish species and to examine some biological aspects of the dominant fishes in Chefa Wetland of Ethiopia.

## MATERIALS AND METHODS

### Study area

The study was conducted in Chefa wetland located 300 km north of Addis Ababa, Ethiopia at  $10^{\circ} 32'$  and  $10^{\circ} 58'$  N latitudes and  $39^{\circ} 46'$  and  $39^{\circ} 56'$  E longitudes. The Chefa plain semi-wetland is found along the Borkena and Jara River Basins. Its total area is estimated 82,000 ha (FAO, 1987). The altitude extends from about 1445 - 1520m (Figure 1).

### Sampling

In this study, three sampling sites were selected that

were based on considering human activities, interference by farm animals and vegetation coverage (Table 1). Each sampling site was sampled twice at dry and twice in wet seasons. Gillnet of stretched mesh size of 6 - 14 cm and hook and lines were used to sample fish by setting the net and the hook for 14 hours overnight at deeper part of the river. Monofilament with mesh size of 5 - 55 mm was set on rivers for one hour to sample small-sized fish species. In addition to this, beach seines were used in suitable areas of the wetland.

Total length, fork length, standard length and weight of all specimens of fish were measured. Photographs were taken for each species. After having all possible information individual specimen taken, they were fixed in 10% buffered neutral formalin and then transferred to 4% formalin in glass jars and transported to the laboratory for further identification and measurement.

Gulo site was located in Gulo village where the bank of Borkena River is exposed to agricultural activity. Hot spring site was located near the hot springs in Chefa. While, nursery site was located near Artumafursie nursery where the bank of the river was covered with vegetation.

### Laboratory studies

Specimen of fish were soaked in tap water for one day to wash the formalin and were identified to species level using specimen deposited at Bahir Dar Fish and Other Aquatic Life Research Center and by using identification keys (Golubtsov et al., 1995).

**Table 1.** Sampling sites in Chefa wetland.

Fishing site	Location			Distance from nearby town
Gulo	1417 m	10°42'09" N	39°49'08" E	4km Kemisse
Hot spring	1401 m	10°37'55.4" N	39°55'42.2" E	10 km Cherete
Nursery	1394 m	10° 38' 09" N	39° 55' 58.2" E	15km Kemisse

**Table 2.** Physico-chemical parameters.

Sites	Physico-chemical parameters			
	pH	Dissolved Oxygen	Temperature	Transparency
Gulo	7.5	5	29.8	20
Hot spring	5	4	37.1	40
Nursery	8	6.4	28.2	75

### Species diversity and relative abundance

Estimation of relative abundance of fish was made by the contribution of the catch in each sampling effort. An Index of Relative Importance (IRI) and Shannon diversity index (H') was used to evaluate relative abundance and diversity of fish, respectively. An index of relative importance was a measure of relative abundance or commonness of the species based on number and weight of individuals in catches as well as their frequency of occurrence (Kolding 1989). The IRI gave a better replacement of the ecologically important species rather than the weight, number or frequency alone.

Index of relative importance

$$IRI_i = \frac{(\% W_i + \% N_i) \% F_i}{\sum_{j=1}^{i=1} (\% W_j + \% N_j) \% F_j} * 100$$

Where, %  $W_i$  and %  $N_i$  are percentage weight and number of each species of total catch, respectively. %  $F_j$  is a percentage frequency occurrence of each species in total number of settings. %  $W_j$  and %  $N_j$  are the percentages weight and number of total species in total catch, respectively.

The Shannon index of diversity (H') was a measure of species weighed by the relative abundance (Begon et al. 1990). Shannon index of diversity (H') was calculated using the formula below:

$$H' = -\sum P_i \ln P_i$$

Where,  $p_i$  - the proportion of individuals in the fish species.

Shannon index was used to indicate diversity of fishes at different sampling sites or rivers.

## RESULTS AND DISCUSSION

### Abiotic parameters

Physical and chemical parameters (temperature, transparency, conductivity, oxygen and pH) that were taken from all sites in Chefa wetland were analyzed and the result of the analysis showed differences in all parameters. The pH and DO value was the lowest in Hot spring site due to debris of sphagnum plants and highest temperature. The transparency value was the highest in Nursery sites, probably due to purification/buffering potential of Chefa wetland (Table 2).

### Fish species composition and Abundance

Chefa wetland has four species (*Clarias gariepinus*, *Gara dembecha*, *Labeobarbus intermedius* and, *Labeobarbus nedgia*) grouped under family Claridae and Cyprinidae. Family Cyprinidae was highly represented in the wetland. Among the three sites in dry season, Nursery site was the highest fish specimens (321) and Hot spring was the lowest (117). In the wet season, Hot spring was the highest (217) where as Gulo was the lowest (178) fish specimens (Table 3).

### Species Diversity and Abundance

Chefa wetland was found to be dominated by family Cyprinidae mainly by genera Barbus and Garra. The result of the present study was similar to those of Robert

**Table 3.** Fish species composition and abundance in Chefa Wetland by sites.

Sites	Fish species	Season	
		Dry	Wet
Gulo	<i>Gara dembecha</i>	130	155
	<i>Labeobarbus intermedius</i>	35	3
	<i>C.gariepinus</i>	49	20
	<b>Total</b>	220	178
	Hot spring	<i>L.intermedius</i>	0
<i>C.gariepinus</i>		56	36
<i>G.dembecha</i>		61	107
<i>L.negia</i>		0	1
<b>Total</b>		117	217
Nursery	<i>C.gariepinus</i>	0	34
	<i>G.dembecha</i>	126	79
	<i>L.intermedius</i>	82	93
	<i>L.nedgia</i>	23	2
	<b>Total</b>	321	208

**Table 4.** % IRI of dominant fish species in Chefa Wetland.

Fish species	Sites					
	Gulo		Hot spring		Nursery	
	Dry	Wet	Dry	Wet	Dry	Wet
<i>G. dembecha</i>	30.80	2.48	27.5	1.9	35.2	0.80
<i>L. intermedius</i>	16.50	0.48	0	70.6	46.90	71.2

**Table 5.** Shannon index and number of fish species in Borkena and Mille Rivers.

	Sites					
	Gulo		Hot spring		Nursery	
	Dry	Wet	Dry	Wet	Dry	Wet
H'/N						
H'	0.94	0.43	0.69	1.04	0.9	1.07
N	3	3	2	4	3	4

(1975) and Getahun and Stiasny (1998) that fish species in Awash basin are dominated by family Cyprinidae (genera Barbus) and Garra. Percentage IRI of *G. dembecha* was higher at Nursery (35.2%) and lower at Hot spring (27.5) in dry season and it was higher at Gulo (2.4%) and lower (0.80) at Nursery site in the wet season. Percentage IRI of *L. intermedius* was comparatively higher at Nursery (46.9%) and lower at Hot spring (0) in dry season whereas it was higher at Nursery (71.2%) and lower at Gulo (0.48%) in wet season (Table 4).

### Shannon diversity index

The number of fish species was higher in dry season than wet season in all sites as a result the Shannon

diversity index (H') was higher in dry season in all sites except Gulo. In dry season Shannon diversity index was the highest at Gulo (0.94) and the lowest at Hot Spring (0.69). In the wet season, Shannon diversity index was the highest at Nursery (1.07) however, found to be the lowest at Gulo (0.43) (Table 5).

### CONCLUSION AND RECOMMENDATION

Fish diversity of Chefa wetland was found to be lesser when it was compared to those of other studied wetlands in Ethiopia, yet the abundance was higher. *Clarias gariepinus* was revealed to be consumed by the people around Kemisse unlike most people living in Amhara Region. The watershed of Chefa wetland was degrading

faster. Therefore, afforestation program should be in place around the wetland. Further work on the socio-economic aspects of fishing in Chefa wetland is warranted. In addition, training on the prevention of post-harvest loss and preservation of their catch should be a priority for the fishermen.

### ACKNOWLEDGEMENTS

We would like to thank the Amhara Regional Agricultural Research Institute (ARARI), Bahir Dar Fish and Other Aquatic Life Research Center and Bahir Dar University for budget and logistic support which is required for field and laboratory work.

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