

## Fish Species Diversity in Major River Basins of Ethiopia: A Review

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**Abstract:** This review paper highlights fish diversity in major river basins of Ethiopia. Ethiopian fresh water systems classified into seven drainage basins. These are the Abay, Awash, Baro Akobo, Omo-Gibe, Rift Lakes, Tekeze and Wabishebele-Genale basins. The country has large fish species diversity in its lakes, rivers and reservoirs. Generally more than 200 fish species found in Ethiopia. The fresh water fish fauna of Ethiopia contains a mixture of Nilo Sudanic, East African and Endemic forms. The Nilo-Sudanic forms are the dominant forms in terms of diversity and represented by a large number of species found in the Baro-Akobo, Omo-Gibe, Tekeze and Abay drainage basin. The highland East African forms are found in the northern Rift valley lakes, highland lakes and associated river systems. The Number of fish species record from the seven drainage basins of Ethiopian has Baro (87), Abay (36), Rift Valley Lakes (32), Wabe-Shebla (26), Omo (26), Awash (15) and Tekeze (10). Howe ever endemicity is highest in Abay, Rift valley and Awash basins. Number of endemic fish species found in drainage basins of Ethiopia records in Abay (23), Rift valley lakes (7), Awash (6), Omo (2) and Baro (1) so far. The current social and economic conditions in Ethiopia, that is high population growth rates and sparse job opportunities coupled with the absence of an effective fisheries management, tend to lead rapidly to decline fish diversity. It is, therefore, important for the government to exercise watershed management approach to arrest this alarming degradation of the catchments of the water bodies. A forestation, soil conservation, controlled grazing and prohibiting of hill side crop farming are some of the measures that should be exercised urgently.

**Key words:** Basin • Drainage • Diversity • Fish • Species

### INTRODUCTION

Ethiopia is endowed with several water bodies that contain a high diversity of aquatic fauna. The inland water body of Ethiopia is estimated to be 7,400 km<sup>2</sup> of lake area and about 7,000 km total length of rivers [1]. The main drainage basins of Ethiopia are flowing away from the rift system either towards the Nile system in the west or to the Indian Ocean in the South east [2].

Ethiopia's ecological diversity and climatic variation is to a large extent explained by its highly variable topography. Altitudes range from 125 m below sea level in the Dallol depression, to 4,620 m above sea level at Ras Dashen. These altitudinal extremes mean that Ethiopia is a country of enormous habitat diversity. Ethiopia, with its different geological formations and climatic conditions, is endowed with considerable water resources and wetland ecosystems, including river basins, major lakes, many

swamps, floodplains and man-made reservoirs. Ethiopia is often referred to as the 'water tower of northeast Africa [3].

Ethiopia has a rich diversity of Ichthyo-fauna in its lakes, rivers and reservoirs, although they are poorly known [4]. The highest fish species diversity in Ethiopia has been recorded from Baro basin, followed by Abay, Wabishebele and Omo-Gibe basins (Table 1). However, endemicity seems to be highest in Abay and Awash basins. This is attributed, in the former case, to the endemic species flock of *Labeobarbus* in Lake Tana [5].

The fresh water fish fauna of Ethiopia is a mixture of Nilo-Sudanic, East African and endemic forms [4, 6, 7]. The Nilo-Sudanic forms are represented by many representative species. For example, the genera *Alestes*, *Bagrus*, *Citharinus*, *Hydrocynus*, *Hyperopisus*, *Labeo*, *Malapterurus*, *Mormyrus*, *Polypterus* and *Protopterus* are some of the representatives from Baro-Akobo, Omo-Gibe and Abay Basins.

Table 1: Number of fish species and endemic species in Ethiopian drainage

Drainage basin	No. of species	No. of endemic species
Blue Nile	36	23
Awash	15	6
Baro	87	1
Omo	26	2
Riftvalley Lakes	32	7
Wabishebele	26	4
Tekeze	10	-

Source: Getahun, 2007

The highland East African forms are found in the northern rift valley lakes (Lake Awassa, Ziway and Langanu and Highland lakes (Lakes Haiq and Tana). The genera include *Barbus*, *Clarias*, *Garra*, *Oreochromis* and *Varicorinus*. They are related to fishes of Eastern and Southern Africa and Arabian Peninsula [8].

The fishes of the high mountain torrential streams largely belong to Cyprinidae [4], adapted to the swiftly flowing floodwaters that occur seasonally. Two genera of fishes (*Barbus* and *Garra*) are dominant in these streams. It appears that there is high endemism of fish, but fauna is not well known. Endemic fishes of the genus *Garra* (eg. *G. dembecha*, *G. duobarbis*) have been described recently [5].

**Exploration, Number and Forms of Fish Species in Ethiopia:** The first information about an Ethiopian fish probably appeared in the narrative of the Portuguese Embassy sent to Ethiopia in 1520 [9]. In the sixties, seventies and early eighties, there was little progress in discovering new fishes in the Ethiopian inland water [10]. Although research on fresh water fish diversity in Ethiopia explorer in the late eighteenth century, the first noted explorer was Ruppell, who described a number of species in the mid -1830,s [11]. There was substantial progress in the studies of Ethiopian Ichthyo-fauna between the first and the second world wars. After a long pause following World War II, the fish diversity studies in the inland waters of Ethiopia was reinitiated in the 1960,s. However, explorers did not find any more new species than those made in the first half of the 20<sup>th</sup> century [9].

In the last three decades knowledge of the Ethiopian lakes and rivers expanded by Ethiopian researchers. Substantial Ichthyo-fauna appeared in publication on Biology, Limnology and Ecology of the commercially important fish species in lakes and rivers: Lake Afdera [12], Lake Ziway [13], Lake Awassa [14], Lake Chamo [15],

Lake Tana [5, 16]. Ecoregion, diversity and conservation of the fresh water fish fauna of Ethiopia Getahun [11] and introduction and transplantation of fresh water fish species in Ethiopia [17].

According to Golubtsov and Mina [9] the total numbers of valid fish species known from Ethiopian inland water bodies is about 168 to 183 including 37-57 countrywide endemics. There are also about 10 exotic fish species introduced from abroad into Ethiopian freshwaters [17]. Golubtsov and Darkov [18] reported the Ethiopian fish fauna includes 180 species categorized in 70 genera and 29 families. However, Getahun [6] reported 152 valued species of which 41 species are endemic to Ethiopia. At this moment, results of various studies indicate that the number of species could increase to 200 and above [19]. There are about 38 species and two sub-species endemic to Ethiopia. Lake Tana from Abay drainage basin exclusively has larger number of endemic species (Eighteen species) in the country [6].

In Ethiopia the rate of degradation of the environment, mainly by deforestation and overgrazing of grasslands by cattle, is very high Gebremariam *et al.* [20] and leads to approximately 1.5 billion tons of soil lost every year from the highlands [21]. This has already resulted in a decrease in biodiversity of the fish fauna in the different drainage basins and the Rift Valley Lakes, compared the number of fish species in Ethiopian drainage basins in the northern and central highlands, the eastern highlands, the Ethiopian Rift Valley and Afar lowlands and the Rift Valley Lakes during the period 1835 to 1995 on the basis of literature with the results from their own surveys in 1995-1997. They reported a reduction in species numbers for each of the drainage basins varying from 40-85% and a reduction of species numbers for the Rift Valley Lakes as a whole of ca. 65% [4].

**Fish Diversity in Drainage Basins of Ethiopia:** The territory of Ethiopia encompasses parts of the catchment areas of two oceans, separated by the northern portion of the Great African Rift. Two major biogeography units, the Nilo-Sudan and the east coast ichthyo-faunal provinces are in contact to this region [22]. That is why the country has Nilo-Sudanic and East African forms in addition to the endemic forms. According to Tedla [23], the Ethiopian fresh water systems can be classified into seven drainage basins. These are the Abay, Awash, Baro Akobo, Omo-Gibe, Rift Lakes, Tekeze and Wabishebele-Genale basins (Fig. 1).



Fig. 1: A map showing the main river basins of Ethiopia

**Blue Nile (Abay) Basin:** The Nile River is the longest in Africa and the second longest in the world. It flows 6,700 km from its source in the equatorial lake basin to the Mediterranean Sea north of Cairo, Egypt. In between, it receives flows from a major tributary, the Blue Nile from the Ethiopian highland plateau, which contributes significantly to the Nile River's total annual flow of almost 84 billion m<sup>3</sup> per year at Aswan, Egypt. Blue Nile (Abay) river basin has a catchment area of 198,890.7 km<sup>2</sup>, covering parts of Amhara and Oromia and Benishangul-Gumuz regional states of Ethiopia.

The Abay Basin is one of the tributaries of White Nile and consists of 36 species Getahun [6] of fish which 23 are endemic [6, 9] (Table 1). Most of the endemic species occur exclusively in Lake Tana. Some of the families of fishes identified with in the Abay and tributary rivers are Mormyridae, Characidae, Cyprinidae, Bagridae, Scheilbeidae, Mockokidae and Cichlidae [24].

Endemicity seems to be highest in Abay (Blue Nile) basin. This is attributed, in the former case, to the endemic species flock of *Labeobarbus* in Lake Tana [5]. Lake Tana is a lake in the northern highlands of Ethiopia and is the source of the Blue Nile. The Blue Nile descends from Lake Tana to Tisisat Falls (ca. 40 m high), effectively isolating the lake's freshwater fauna from the rest of the Nile [25].

Lake Tana from Abay drainage basin exclusively has larger number of endemic species (Eighteen species) in

the country [11]. A total seventeen fish species were recorded in upper head of Blue Nile River [26]. These are included in three families i.e. Cyprinidae, Cichlidae and Clariidae. Among the total numbers of fish species record from Upper head of Blue Nile river threeteen species are endemic to lake Tana, namely *Labeobarbus intermedius*, *L. brevicephalus*, *L. nedgia*, *L. crassibarbis*, *L. surkis*, *L. longissimus*, *L. platydorsus*, *L. gorgorensis*, *L. tsanensis*, *L. acutirostris*, *L. megastoma*, *L. gorguri*, *L. daineillii* [26]. Eight species were identified, namely: *L. intermedius*, *L. forskalii*, *M. kannume*, *L. nedgia*, *L. crassibarbis*, *C. gariepinus* and *O. niloticus*, in Blue Nile River below the Tiss Isat fall [27].

In Beshilo, Ardi and Dura Rivers of Blue Nile basin only five families were recorded namely Cyprinidae, Claridae, Bagridae, Mockokidae and Cichlidae [28] (Table 2). According to Berie [29], also a total of twenty two species were recorded from Beles and Gelgel Beles Rivers of the Blue Nile basin (Table 2). The fresh water of fish fauna of Beles and Gelegel Beles River contain a mixture of Nilo-Sudanic (e.g. *B.docmak*, *B. bajad*, *H. forskalii*, *L. forskalii*, *M. kannume*, *S. serratus* and *S. schall*), highland East Africa (e.g. *L.intermedius*, *L.nedgia*, *C.gariepinus*, *O.niloticus*) and endemic forms [1]. Diversity of the fish fauna of the Blue Nile river basin is dominated by cyprinid fish species (Table 2).

Table 2: Fish species composition in Blue Nile (Abay) river basin

Species name	Omer [26]	Awoke, <i>et al.</i> [27]	Berie [29]		Beletew [28]	
	Upper head of Blue Nile	Blue Nile River	Beles	Gilgel Beles	Ardi	Beshilo
<i>L. intermedius</i>	+	+	+	+	+	+
<i>L. brevicephalus</i>	+					
<i>L. nedgia</i>	+	+	+	+	+	+
<i>L. crassibarbis</i>	+	+				
<i>L. surkis</i>	+					
<i>L. longissimus</i>	+					
<i>L. platydorsus</i>	+					
<i>L. gorgorensis</i>	+					
<i>L. tsanensis</i>	+					
<i>L. acutirostris</i>	+					
<i>L. megastoma</i>	+					
<i>L. gorguri</i>	+					
<i>L. daineillii</i>	+					
<i>Gara dembecha</i>	+					
<i>C. gariepinus</i>	+	+	+	+		
<i>V. beso</i>	+	+	+	+	+	
<i>O. niloticus</i>	+	+	+	+	+	
<i>A. occidentalis</i>	+					
<i>Labeo niloticus</i>	+					
<i>S. schall</i>	+	+				
<i>R. loati</i>	+	+				
<i>L. horie</i>	+					
<i>L. coubie</i>	+					
<i>L. cylindricus</i>	+	+				
<i>H. longifilis</i>	+	+	+			
<i>H. forskahlii</i>	+					
<i>L. bymi</i>	+					
<i>S. serratus</i>	+					
<i>L. degeni</i>	+	+				
<i>B. docmak</i>	+	+	+			
<i>B. bajad</i>	+	+				
<i>M. kannume</i>	+	+				
<i>L. forskalii</i>	+	+	+			
<i>B. macrolepidotus</i>	+					
<i>B. nurse</i>	+					

**Awash River Basin:** The Awash River rises on the high plateau of Showa and flows northwards following the Great Rift Valley where it disappears in the desert near the Djibouti border. This river basin is the most agriculturally important river basin in Ethiopia and covers a total land area of 110,000 km<sup>2</sup> and serves as home to 10.5 million inhabitants. Awash River basin has a catchment area of 110,439.3 km<sup>2</sup>. It covers parts of the Amhara, Oromia, Afar, Somali, Dire Dawa and Addis Ababa states of the country. Therefore, Awash River and its tributaries drain the central highlands, the eastern and north-eastern lowlands [6].

A total of 10 species of fish were described from Awash River and its tributaries [30]. However, Getahun [6] indicated that there are 15 species of fish of which 6 species are endemic. Golubtsov and Darkov [18] also indicated 13-15 fish species found

from this basin. The fish species found in Awash River basins are highland east African forms. These include the genera, *Barbus*, *Clarias*, *Garra*, *Oreochromis* and *Varicorhinus* [5]. According to Tessema *et al.* [31] two families, five genera and six species were recorded from Borkena and Mille rivers of Awash basin.

**Tekeze Basin:** The Tekeze River basin is located in the northwest of Ethiopia, between 11°40' and 15°12' north and longitude of 36°30' and 39°50' east. The area of the basin is about 84, 000 km<sup>2</sup>. The elevation ranges from 537 to 4,517 meters above sea level. About 70 % of the basin falls in the highlands at altitude of over 1,500 m.a.s.l. The upper part of the basin is dominated by rugged mountains while the western part of the basin is almost flat or slightly undulating [32].

Table 3: Fish species composition in Tekeze Basins

Tewabe [42]		Tesfay [30]		Tewabe <i>et al.</i> [36]		
River Basins						
Gendwuha	Guang	Shinfa	Ayima	Angereb	Sanja	Tekeze Reservoir
<i>C. gariiepinus</i>	<i>L. niloticus</i>	<i>L. niloticus</i>	<i>H. niloticus</i>	<i>L. niloticus</i>	<i>Labeo niloticus</i>	<i>O. niloticus</i>
<i>S. schall</i>	<i>S. schall</i>	<i>C. gariiepinus</i>	<i>A. biscutatus</i>	<i>C. gariiepinus</i>	<i>C. gariiepinus</i>	<i>B. docmak</i>
<i>L. intermedius</i>	<i>L. intermedius</i>	<i>S. schall</i>	<i>Labeo niloticus</i>	<i>L. intermedius</i>	<i>L. intermedius</i>	<i>B. bajad</i>
<i>L. nedgia</i>	<i>H. longifilis</i>	<i>L. intermedius</i>	<i>C. gariiepinus</i>	<i>V. beso</i>	<i>V. beso</i>	<i>C. gariiepinus</i>
<i>H. forskhalii</i>	<i>L. nedgia</i>	<i>H. longifilis</i>	<i>S. schall</i>	<i>H. longifilis</i>	<i>H. longifilis</i>	<i>H. longifilis</i>
<i>L. bynni</i>	<i>H. forskhalii</i>	<i>L. nedgia</i>	<i>Lates niloticus</i>	<i>L. nedgia</i>	<i>L. nedgia</i>	<i>M. electricus</i>
<i>S. serratus</i>	<i>L. bynni</i>	<i>A. baremoze</i>	<i>L. intermedius</i>	<i>B. docmak</i>	<i>B. docmak</i>	<i>M. kannume</i>
<i>L. degeni</i>	<i>S. serratus</i>	<i>H. forskhalii</i>	<i>H. longifilis</i>	<i>M. kannume</i>	<i>L. forskalii</i>	<i>H. forskhalii</i>
<i>B. docmak</i>	<i>L. degeni</i>	<i>L. bynni</i>	<i>L. nedgia</i>	<i>L. forskalii</i>	<i>O. niloticus</i>	<i>V. beso</i>
<i>B. bajad</i>	<i>B. docmak</i>	<i>S. serratus</i>	<i>A. baremoze</i>	<i>O. niloticus</i>		<i>R. loati</i>
<i>M. kannume</i>	<i>B. bajad</i>	<i>L. degeni</i>	<i>H. forskhalii</i>			<i>L. niloticus</i>
<i>L. forskalii</i>	<i>M. kannume</i>	<i>B. docmak</i>	<i>L. bynni</i>			<i>L. forskalii</i>
<i>B. macrolepidotus</i>	<i>L. forskalii</i>	<i>B. bajad</i>	<i>S. serratus</i>			<i>L. bynni</i>
<i>L. crassibarbis</i>	<i>B. macrolepidotus</i>	<i>M. kannume</i>	<i>L. degeni</i>			<i>L. nedgia</i>
<i>O. niloticus</i>	<i>L. crassibarbis</i>	<i>L. forskalii</i>	<i>B. docmak</i>			<i>L. crassibarbis</i>
<i>M. hasselquistii</i>	<i>O. niloticus</i>	<i>S. intermedius</i>	<i>L. forskalii</i>			<i>L. intermedius</i>
	<i>M. hasselquistii</i>	<i>L. crassibarbis</i>	<i>B. macrolepidotus</i>			<i>G. dembensis</i>
		<i>O. niloticus</i>	<i>O. niloticus</i>			<i>Small Barbus species</i>
		<i>M. caschive</i>	<i>B. nurse</i>			
		<i>B. nurse</i>				

The Tekeze Basin includes the Tekeze, Angereb and Guang sub-basins. The three rivers form together the Atbara River (In Sudan), which is a tributary of White Nile system entering the Nile downstream from Khartoum. The annual rainfall of the basin shows high variation. It ranges from 5,000 mm in the western part to 1,300 mm in the highlands of the basin.

The Tekeze Basin is the least diverse in fish species compared to the other part of the Nile basin within the limits of Ethiopia. This could be because of the tremendous seasonal variation of water discharge in the system [9]. Mekonnen and Muhammed [33], mentioned some interesting Nilo-Sudanic and east African genera from the Rivers of Shinfa and Ghendwuha which are found in Metema District, North Gondar.

The fish genera identified include *Bagrus*, *Brycinus*, *Clarias*, *Garra*, *Labeo*, *Labeobarbus*, *Mormyrus*, *Oreochromis*, *Synodontis* and *Varicorhinus*. Tesfaye [30] assessed fish diversity in Angereb and Sanja of Tekeze basins were found a total of 10 species of fishes (Table 3). These are included in four orders i.e. Cypriniformes, Siluriformes, Perciformes and Tetraodontiformes and four families i.e. Cyprinidae, Bagridae, Cichlidae and Mormyridae. Some of the species are *Labeo forskalii*, *L. niloticus*, *L. nedgia*, *L. intermedius*, *V. beso*, *M. kannume*, *O. niloticus*, *B. docmak*, *C. gariiepinus* and *H. longifilis* [30]. Lemma [34] also reported about 33-35 species categorized in 22 genera and 9 families, from the

basin. However, there is still less data on fishes of the Atbara and Tekeze systems than other Ethiopian drainage systems. Among the endemic species *G. ignestii* and *Varicorhinus beso* were also identified. However, Melake [35] assessed fish diversity in Baro and Tekeze Basins 10 species have been recorded from Tekeze Basin of which 3 are endemic (*G. duobarbis*, *G. geba* and *G. ignestii*) (Table 3). There is no specified data for the number of fish species and endemism. Recently Golubtsov and Darkov [18] indicated that 34 fish species within 22 genera and 10 families were present in the river basin. According to Tewabe *et al.* [36], a survey of fish diversity in Tekeze hydropower dam a total of eighteen fish species were identified that are included within 13 genera, 7 families and 5 orders (Table 3).

**Rift valley Basins:** The Ethiopian Rift Valley, being the northern part of the East African Rift system, can be divided into three main zones differing in their geological structure: (1) the Afar Rift Systems, (2) the Main Ethiopian Rift of central Ethiopia and (3) the broadly rifted zone of southwestern Ethiopia [37]. The Rift Valley is South of Addis Ababa contains a system of small to medium-sized lakes, some of which are saline. The most fished lakes are Ziway, Langan, Awassa, Chamo and Abaya. Also exploited for fishing are the two largest reservoirs, Fincha and Koka. The Ethiopian Rift Valley encompasses several isolated major basins, as well as a number of smaller

Table 4: Fish species composition in rift valley lakes

Family	Species	Riftvally lake basin					
		Abaya	Chamo	Awassa	Langano	Chew Bahir	Ziway
Family Mormyridae	<i>H. bebe</i>						
	<i>M. cyprinoides</i>	+					
	<i>M. caschive</i>	+				+	
Family Characidae	<i>H. forskhalii</i>	+	+				
Family Cyprinidae	<i>B. kerstenii</i>	+	+				
	<i>Barbus</i> sp.	+	+				
	<i>B. stigmatopygus</i>	+	+				
	<i>B. amphigramma</i>			+	+	+	+
	<i>B. paludinosus</i>				+	+	+
	<i>G. hirticeps</i>	+	+			+	
	<i>G. quadrimaculata</i>	+	+			+	
	<i>L. cylindricus</i>	+	+			+	
	<i>L. horie</i>	+	+			+	
	<i>L. niloticus</i>	+	+			+	
	<i>L. bynni</i>	+	+			+	
Family Bagridae	<i>L. intermedius</i>	+	+	+	+	+	+
	<i>B. docmak</i>	+	+			+	
Family Schilbeidae	<i>S. intermedius</i>	+	+			+	
Family Clariidae	<i>C. anguillaris</i>	+				+	
	<i>C. gariepinus</i>	+	+	+	+	+	+
Family Mochokidae	<i>S. schall</i>	+	+			+	
Family Poeciliidae	<i>A. antinorii</i>	+	+				
Family Centropomidae	<i>L. niloticus</i>	+	+			extinct	
Family Cichlidae	<i>O.niloticus</i>	+	+	+	+	+	+
	<i>T. zilli</i>						+

isolated basins, mostly the crater lakes. The major basins are as follows: the Awash River drainage in the north; two systems of linked lakes (Zwai-Langano-Abijata-Shalla and Awasa-Shallo) and connected lotic waters in the central part; lakes Abaya, Chamo and Chew Bahir and their tributaries in the south. Lake Turkana and the lower reaches of the Omo River occur in the northern Kenya Rift, which is connected with the Main Ethiopian Rift of central Ethiopia by a 300-km-wide zone of overlap [38]. The Abaya and Chamo basins occupy the southern part of the Main Ethiopian Rift of central Ethiopia, whereas the Chew Bahir basin occurs in the zone of overlap of the Main Ethiopian and northern Kenya Rift systems.

The Rift valley is the region with highest number of introduced fish species. The fish fauna of the Ethiopian Rift Valley is characterized by a reduced number of species compared to the neighboring regions belonging to catchment areas of the Atlantic and Indian Oceans [9, 22]. The main factors responsible for the reduced fish diversity are (1) the physical isolation of the Rift Valley basins from each other and from the adjacent river systems and (2) the instability of hydrological conditions determined by the paleo-climatic fluctuations and increased volcanic and tectonic activities in the region under consideration.

Fish faunas of the Southern Rift valley (Chamo-Abaya (21 species) and Chew Bahir (12–14 species) basins are more diverse than in other basins of the Ethiopian Rift Valley (Table 4). Their increased diversity is determined by past connections to the Omo-Turkana basin, while the latter was connected to the White Nile system seven thousand years BP. The vast majority of fish species inhabiting the Chamo-Abaya and Chew Bahir basins are of Nilo-Sudan origin; however, some elements of the East-African ichthyofauna (*Barbus kerstenii* and *Labeo cylindricus*) are present.

According to Vijverberg *et al.* [39] Lake Abaya and Lake Chamo which were dominated by the same larger fish species (*Synodontis schall*, *Hydrocynus forskahlii*). This high similarity is not surprising because both lakes are bordering each other and were, until recently, connected. All other lakes, with the exception of Lake Langano and Lake Ziway, are isolated lakes. Only 13 indigenous fish species inhabit the northern and central portions, while at least 22 species are recorded from the southern one [22]. It is noteworthy, that four species (30%) are endemic to the former portions, while the single endemic species (5%) are known from the latter.

Table 5: Fish species composition in Omo-Gibe basin

Family	Species
	<i>Polypterus bichir</i>
	<i>Polypterus senegalus</i>
Family Mormyridae	<i>Micralestes acutidens</i>
	<i>Labeo horie</i>
Family Bagridae	<i>Bagrus bajad</i>
	<i>Bagrus docmak</i>
Family Poeciliidae	<i>Auchenoglanis biscutatus</i>
	<i>Auchenoglanis occidentalis</i>
	<i>Andersonia leptura</i>
Family Clariidae	<i>Clarias gariepinus</i>
Family Mochokidae	<i>Synodontis schall</i>
Family Cichlidae	<i>Oreochromis niloticus</i>

Sours: Getahun, 2007

**Omo- Gibe Basin:** The Omo-Gibe River basin is known to contain high diversity of fish species with over 70 species listed. The fishery in the Omo basin includes: the riverine fishery along the mainstream Omo River, flood plain fishery (and Dipa Haik) and the lacustrine fishery at Lake Turkana (Bubua and Toltale). Getahun [6], reported a total of 12 species were recorded in the Omo-Gibe basin (Table 5).

**Baro-Akobo Basin:** According to Tedla [23], only eight fish species have been recorded from Baro basin. However, more than 90 fish species were recorded by JERBE [19]. Getahun [6] also indicated that there are 87 fish species were present of which only one species (*Nemacheilus abyssinicus*) is endemic to this basin. More recently Golubtsov and Darkov [18], indicated that there are 113 fish species were recorded included in to 60 genera and 26 families.

The diversity of fish fauna Baro drainage basins contains a mixture of Nilo-sudanic (*Bagrus*, *Citharinus*, *Hydrocynus*, *Micralestes*, *Labeo*, *Mormyrus Polymyrus* and *Polypterus*), East African (*Barbus*, *Clarias*, *Oreochromis* and *Sarotherodon*) and endemic (*Garra*) forms. Melake [35] recorded from Baro and Tekeze drainage basins comprised 51 fish species from Baro River and 10 species have been recorded from Tekeze Basin of which 3 are endemic (*G. duobarbis*, *G. geba* and *G. ignestii*). The highest fish diversity is recorded from the Baro Basin. Low level of endemism is probably because of the Baro Basin having connections (past and present) with the Nile and west and central African river systems and as a result all the fish fauna represent widespread Nilo-Sudanic forms [6].

**Wabishebele Basin:** The Wabi-Shebelle is the major river of the central Somali region. Rising between the Arsi and Bale Mountains, it flows in a southeasterly direction to

Table 6: Fish species composition in Baro and Tekeze Basins

Species Name	Basins	
	Baro	Tekeze
<i>Polypterus bichir</i>	+	
<i>Polypterus senegalus</i>	+	
<i>Gymnarchus niloticus</i>	+	
<i>Heterotis niloticus</i>	+	
<i>Brevimyrus niger</i>	+	
<i>Hippopotamyrus pictus</i>	+	
<i>Marcusenius cyprinoides</i>	+	
<i>Mormyrops anguilloides</i>	+	
<i>Mormyrus caschive</i>	+	
<i>Mormyrus hasselquistii</i>	+	
<i>Petrocephalus bovei</i>	+	
<i>Pollimyrus isidori</i>	+	
<i>Cromeria nilotica</i>	+	
<i>Brycinus macrolepidotus</i>	+	
<i>Brycinus nurse</i>	+	
<i>Hydrocynus brevis</i>	+	
<i>Micralestes acutidens</i>	+	
<i>Distichodus engycephalus</i>	+	
<i>Ichthyborus besse</i>	+	
<i>Nannaethiops bleheri</i>	+	
<i>Citharinus latus</i>	+	
<i>Barbus anema</i>	+	
<i>Barbus humilis</i>	+	
<i>Barbus perince</i>	+	
<i>Barbus stigmatopygus</i>	+	
<i>Garra duobarbis</i>		+
<i>Garra geba</i>		+
<i>Garra ignestii</i>		+
<i>Labeo coubie</i>		+
<i>Labeo cylindricus</i>	+	
<i>Labeo horie</i>		+
<i>Labeobarbus bynni</i>	+	+
<i>Leptocypripis niloticus</i>		+
<i>Bagrus bajad</i>	+	
<i>Bagrus docmak</i>	+	
<i>Auchenoglanis biscutatus</i>	+	
<i>Auchenoglanis occidentalis</i>	+	
<i>Chrysichthys auratus</i>	+	
<i>Schilbe intermedius</i>	+	
<i>Siluranodon auritus</i>	+	
<i>Andersonia leptura</i>	+	
<i>Clarias gariepinus</i>	+	+
<i>Heterobranchius longifilis</i>		+
<i>Chiloglanis niloticus</i>	+	+
<i>Mochokus brevis</i>	+	
<i>Mochokus niloticus</i>	+	
<i>Synodontis batensoda</i>	+	
<i>Synodontis caudovittatus</i>	+	
<i>Synodontis schall</i>	+	
<i>Synodontis sorex</i>	+	
<i>Aplocheilichthys kingii</i>	+	
<i>Epiplatys spilargyreus</i>	+	
<i>Nothobranchius virgatus</i>	+	
<i>Nothobranchius virgatus</i>	+	
<i>Oreochromis niloticus</i>	+	+
<i>Sarotherodon galilaeus</i>	+	
<i>Ctenopoma muriei</i>	+	
<i>Ctenopoma petherici</i>	+	
<i>Tetraodon lineatus</i>	+	

Source: Melake, 2010

Somalia. Wabi Shebelle, with a catchment area of 205,407 km<sup>2</sup>, winds a length of 1340 km inside Ethiopia and a further 660 km in Somalia. The Wabi Gestro, the Ghenale River and the Dawa Parma River drain the southwestern escarpment of the eastern Ethiopian highlands. These rivers unite and become the Juba River, which eventually drains into the Indian Ocean. These Juba tributaries arise just east of Abaya and Chamo Lakes, but are separated from the lake drainages by a high mountainous divide. Midway between the lower courses of the Wabi Shebelle and the Juba there is a low-lying limestone plateau with extensive underground waterways radiating out from it Roberts [40]. The rivers in this ecoregion are believed to host many Nilo-Sudanic fishes similar to the southern rift valley lakes (Lakes Chamo and Abaya). It is believed that these lakes and the Shebelle-Ghenale River basins had former connections with the upper White Nile as recently as 7,500 years ago [40]. Some of the rivers in this ecoregion (e.g., Ghenale River) support abundant populations of fish. For example, Tedla and Woldemariam [23, 41], give witness and exaggerated that it is difficult to take a bath in the river because of the high numbers of the fish.

Endemic fish, including *Bagrus urostigma*, *Labeo boulengeri*, *Labeo bottegi* and *Synodontis geledensis*, live in the rivers of this ecoregion [6]. Most of the Nilotic species found in Lake Abaya, with the exception of *Hyperopisus bebe*, are also present in the Wabi Shebelle-Juba drainage [40]. Another important feature of the area is the presence of subterranean waterways, which are inhabited by the endemic monotypic fish genera *Uegitglanis* and *Phreatichthys*. Both the Clariidae catfish (*U. zammaranoi*) and the cyprinid (*P. andruzzii*) lack visible eyes and are depigmented and scale less [6].

### CONCLUSION

Ethiopia has a rich diversity of Ichthyo-fauna in its lakes, rivers and reservoirs. The fish fauna of Ethiopia contains a mixture of Nilo-sudanic, Highland East African and endemic forms. The total numbers of valid fish species known from Ethiopian inland water bodies is about 168 to 183 including 37-57 countrywide endemics. The highest fish species diversity in Ethiopia has been recorded from Baro basin, followed by Blue Nile, Wabishebele and Omo-Gibe basins. However, endemism seems to be highest in Blue Nile and Awash basins. This

is attributed, in the former case, to the endemic species flock of *Labeobarbus* in Lake Tana. Tekeze Basin is the least diverse in fish species compared to the other part of the Nile basin within the limits of Ethiopia. The Wabi-Shebella ecoregion are believed to host many Nilo-Sudanic fishes similar to the southern rift valley lakes (Lakes Chamo and Abaya). In Rift valley basin is the region where the highest number of introduced fish species are found. Fish communities differ per water body; hence site specific management is important in fishery biology and fish community.

### REFERENCES

1. Teferi, Y., D. Admassu and S. Mengistu, 2002. Length-weight relationship, Body condition and sex ratio of tilapia (*Oreochromis niloticus*) in Lake Chamo, Ethiopia. SINET: Ethiop. J. Sci., 25: 19-26.
2. Gebremariam, Z. and E. Dadebo, 1989. Water resources and fisheries management in the Ethiopian Rift Valley lakes. SINET: Ethiop. J. Sci., 12: 95-109.
3. Abunie, L., 2003. The distribution and status of Ethiopian wetlands: an overview. In: Abebe, Y. D. and Geheb, K. (Eds), 2003. Wetlands of Ethiopia.
4. Getahun, A. and M.L.J. Stiassny, 1998. The freshwater biodiversity crisis: the case of the Ethiopian fish fauna. SINET: Ethiop. J. Sci., 21: 207-230.
5. Getahun, A., 2002. The Nile Basin: Riverine Fish and Fisheries. Dept. of Biology Addis Ababa University, Ethiopia, pp: 19.
6. Getahun, A., 2007. An overview of the diversity and conservation status of the Ethiopian freshwater fish fauna. J. Afrotropical Zoology special Issue, pp: 87-96.
7. Joint Ethio-Russian Biological Expedition (JERBE), 1995. An artificial key for fish species of the Gambella Region (The White Nile in the limits of Ethiopia). Addis Ababa, Ethiopia, pp: 45.
8. Skelton, P.H., D. Tweddle and P. Jackson, 1991. Cyprinids of Africa. In: Winfield IJ, Nelson JS (eds). Cyprinid Fishes, Systematic, Biology and Exploitation, pp: 211-233.
9. Golubtsov, A.S. and M.V. Mina, 2003. Fish species diversity in the main drainage systems of Ethiopia: current state of knowledge and research perspectives. Ethiop. J. Natu. Reso., 5(2): 281-318.



10. Golubstov, A.S., A.A. Darkov, YU. Dgebuadze and M.V. Mina, 1995. An artificial key to fish species of the Gambella region (The White Nile basin in the limits of Ethiopia). Joint Ethio- Russian Biological expedition. Addis Ababa, Ethiopia, pp: 84.
11. Getahun, A., 2005. An overview of the diversity and conservation status of the Ethiopian freshwater fish fauna. In proceeding of the Pan- African fish and fisheries society, Cotonou, Benin, Nov., 2003.
12. Getahun, A., 2001. Lake Afdera: a threatened lake in Ethiopia. SINET: Ethiopia. J. Sci., 24(1): 127-131.
13. Abebe, E. and G. Teferra, 1992. Seasonal Changes in the nutritional status of *Oreochromis niloticus* L. (Pisces: Cichlidae) in Lake Ziway, Ethiopia. Archiv of Hydrobiologie, 124: 109-122.
14. Admassu, D. and E. Dadebo, 1997. Diet composition, Length weight relation and condition factor of *Barbus* species Rüppell, 1836 (Pisces: Cyprinidae) in Lake Awassa, Ethiopia. SINET: Ethiop. J. Sci., 20(1): 13-30.
15. Wood, R.B. and J.F. Talling, 1988. Chemical and algal relationships and salinity series of Ethiopian inland waters. Hydrobiology, 158: 29-67.
16. Dejen, E., 2003. Ecology and potential for fishery of the small barbs (Cyprinidae, Teleostei) of Lake Tana, Ethiopia. PhD Thesis, Agricultural University, Wageningen, the Netherlands, pp: 180.
17. Tedla, S. and F. Hyelemeske, 1981. Introduction and transplantation of freshwater fish species in Ethiopia. SINET: Ethiop. J. Sci., 4: 69-72.
18. Golubstov, A.S. and A.A. Darkov, 2008. A review of fish diversity in the main drainage systems of Ethiopia, pp: 69-102.
19. Joint Ethio-Russian Biological Expedition, 2007. Fish diversity in the main drainage systems of Ethiopia. Addis Ababa, Ethiopia.
20. Gebremariam, Z., W.E. Kebede and Z. Desta, 2002. Long-term changes in chemical features of waters of seven Ethiopian Rift-valley lakes. Hydrobiology, 477: 81-91.
21. Teferra, S., 1994. Basic facts about the population of Ethiopia and its needs. In: Panel on Population Resource Balance, pp: 20-29. The Biological Society of Ethiopia, Faculty of Science, Addis Ababa University, June, 1994.
22. Golubstov, A.S., Dgebuadze, Yu and M.V. Mina, 2002. Fishes of the Ethiopian Rift Valley, pp: 167-258. In: C. Tudorancea and W.D. Taylor (eds.) Ethiopia Rift valley Lakes. Biology of Inland waters Series, pp: 167-258. Backhuys publisher, Leiden, Holland.
23. Tedla, S., 1973. Freshwater Fishes of Ethiopia. Department of Biology. Haile Selassie I University, Addis Ababa, Ethiopia, pp: 101.
24. Ministry of Water Resources (MOWR), 1998. Tekeze River basin integrated master plan project. Sectoral Report Vol - No. 6 Fisheries, pp: 20.
25. Thieme, M.L. and A. Brown, 2007. Lake Tana. In: Fresh water Ecoregion of Africa and Madagascar, pp: 180-181.
26. Omer, M., 2010. Diversity Relative Abundance and Biology of Fish in Upper Head of Blue Nile River, Blue Nile Basin, Ethiopia. MSc. Thesis Bahir Dar University.
27. Awoke, T., M. Mingist and A. Getahun, 2015. Abundance and species compositions of fishes in Blue Nile River, Ethiopia. IJFAS 2015, 2(6): 334-339.
28. Beletew, M., 2007. Diversity, relative abundance and biology of fishes in some Rivers and Cestode parasites of African Catfish (*Clarias gariepinus*) in some Lakes of Ethiopia. MSc. Thesis, Addis Ababa University, pp: 123.
29. Berie, Z., 2007. Diversity, relative abundance and Biology of fishes in Beles and Gilgel Beles Rivers of Abay basin. MSc. Thesis, Addis Ababa University, pp: 112.
30. Tesfaye, G., 2006. Diversity, relative abundance and biology of fishes in Angereb and Sanja Rivers, Tekeze basin, Ethiopia. MSc. Thesis. Addis Ababa University, Ethiopia, pp: 90.
31. Tessema, A., M. Mingist and E. Dejen, 2012. Diversity Relative Abundance and biology of fishes in Mille and Borkena Rivers, Awash Basin, Ethiopia. J. Fish. Int., 7: 70-76.
32. Bizuwork, A., G. Taddese, K. Sonder, D. Peden and Y. Jobre, 2006. Comparative assessment of forage and livestock density in Tekeze River Basin. Ethiop. Vet. J., 10: 25-36.
33. Mekonnen, T. and S. Muhammed, 2002. Riverine fishery survey on Shinfa and Ghendwuha Rivers, in Metema Woreda, North Gondar Zone. Unpublished field Report. Fisheries resource research and training sub-center, Gorgora.
34. Lemma, B., 2008. Introduction to Lake Ecology, Aquaculture and Fisheries in Ethiopia. Haramaya University, Haramaya, Addis Ababa University Printing Press, Addis Ababa, Ethiopia, pp: 416.
35. Melake, T., 2010. Diversity, relative abundance and some biology of fish in Baro and Tekeze basins. MSc. Thesis, Addis Ababa University, Ethiopia.

36. Tewabe, D., G. Goshu and C. Aragaw, 2008. Survey of a newly constructed reservoir, Tekeze hydropower dam, Ethiopia.
37. Woldegabriel, G., 2002. The main Ethiopian Rift System: an overview on and sedimentation processes. In: C. Tudorancea, W. D. Taylor (Eds.), Ethiopian Rift Valley Lakes, pp: 13-43.
38. Ebinger, C.J., T. Yemane, D.J. Harding, S. Tesfaye, S. Kelley and D.C. Rex, 2000. Rift deflection, migration and propagation: linkage of the Ethiopian and eastern rifts, Africa. *Bull. Geol. Soc. Am.*, 112: 163-176.
39. Vijverberg, J., E. Dejen, A. Getahun and Leopold A.J. Nagelkerke, 2012. The composition of fish communities of nine Ethiopian lakes along a north-south gradient: threats and possible solutions. *Animal Biology*, 62(2012): 315-335.
40. Roberts, T.R., 1975. Geographical distribution of African freshwater fishes *Zool. J. Linn. Soc.*, 57: 249-319.
41. Woldemariam, M., 1972. An Atlas of Ethiopia Polgrafico, Priv.Ltd.co Asmara, Ethiopia, pp: 101.
42. Tewabe, D., 2008. Diversity, relative abundance and biology of fishes in Gendwuha, Guang, Shinsa and Ayima rivers, Tekeze and Abay Basins, Ethiopia. Msc. Thesis, Addis Ababa University, Ethiopia, pp: 108.