

Feature article

LAKE AFDERA: A THREATENED SALINE LAKE IN ETHIOPIA

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ABSTRACT: Lake Afdera is a saline lake located in the Afar region, Northern Ethiopia. Because of its inaccessibility it is one of the least studied lakes of the country. It supports life including three species of fish of which two are endemic. Recently, reports are coming out that this lake is used for salt extraction. This paper gives some insight on the most probable dangers on the ecology of the lake if such activity is allowed to take place before environmental impact assessment was conducted.

Key words/phrases: Afdera, conservation, Ethiopia, fishes, saline lake

INTRODUCTION

Lake Afdera is located some 700 km north of Addis Ababa (12.6°N and 41°E, Fig. 1) at an altitude of 80 meters below sea level. “Afdera” by the local (Afar) language means inaccessible. The depression is under active volcanic and tectonic activities (Williams *et al.*, 1977). The molten black rocks and gravels all around the area and the hot springs that drain the lake, the only source of water other than the scanty precipitation, witness this reality. It is a rainfall deficit area receiving an average annual rainfall of about 100 mm (Wood and Lovett, 1979). A similar isolated and closed lake, Lake Asale, is found north of Lake Afdera at an altitude of 150 m below sea level. Awash River feeds the other lakes in that region (Abbe, Afambo, Bario and Gamari).

The surface area of Lake Afdera is 70 km²; maximum depth is about 80 m; salinity = 160 gram per liter; conductivity = 250,000 K₂₀ ($\mu^{\circ}\text{cm}^{-1}$); pH = 6.55 (Wood and Talling, 1988). The air, lake water and spring water temperatures in November around noon were 40° C, 33° C and 50° C, respectively. The

very high salinity is accounted by the high evaporative concentration and the lake's geological history of having marine inputs from the Red Sea (Gionfiantini *et al.*, 1973). Unlike the other saline lakes in Ethiopia (Lakes Abijata, Shala, Chitu and Metahara) the pH of Lake Afdera is low in the acidic range.

THE FISH FAUNA

Fishes were collected by the author in the vicinity of one hot spring in the southwestern portion of the lake. It is a location where the freshwater meets the saline lake water. The fishes strategically inhabit areas between the saline waters of the lake and the hot waters of the spring. Seine net (mesh size 6.25 mm) was utilized to collect fishes at this area and three species were identified:

1. *Danakilia franchettii* (Vinciguerra, 1931)

Fishes of this species were first collected by B.R. Franchetti in 1929 and identified as *Tilapia franchettii* by Vinciguerra in 1931. Thys van den Audenaerde (1969) assigned the new genus name *Danakilia*. Fishes of this endemic genus show noted sexual dimorphism and are found in large numbers in the vicinity of the hot springs that flow into the lake.

2. *Lebias dispar* (Rüppell, 1829)

This Killifish (known previously as *Aphanius dispar*) is widely distributed in shores of the Red Sea and Mediterranean Sea.

3. *Lebias stiassnyae* was recently discovered from the lake (Abebe Getahun and Lazara, 2001) and is endemic.

The above fishes were collected from a small segment of the lake (about 100m² area) at the shore where one of the hot springs joins the lake. It is not known whether or not these fishes thrive in the interior and even at shores where other springs join the lake. The exact number of springs joining the lake is also not known. Although the lake is reported to be biologically unproductive (Wood and Talling, 1988) no further mention was made as to the extent of its life forms (microbial, phytoplankton, zooplankton and others). Based on the fact that one endemic genus and one endemic species of fishes are identified from

a small portion of the lake, and the lake's isolation for a long time, it is reasonable to suspect that other novel life forms can also be found in this lake.

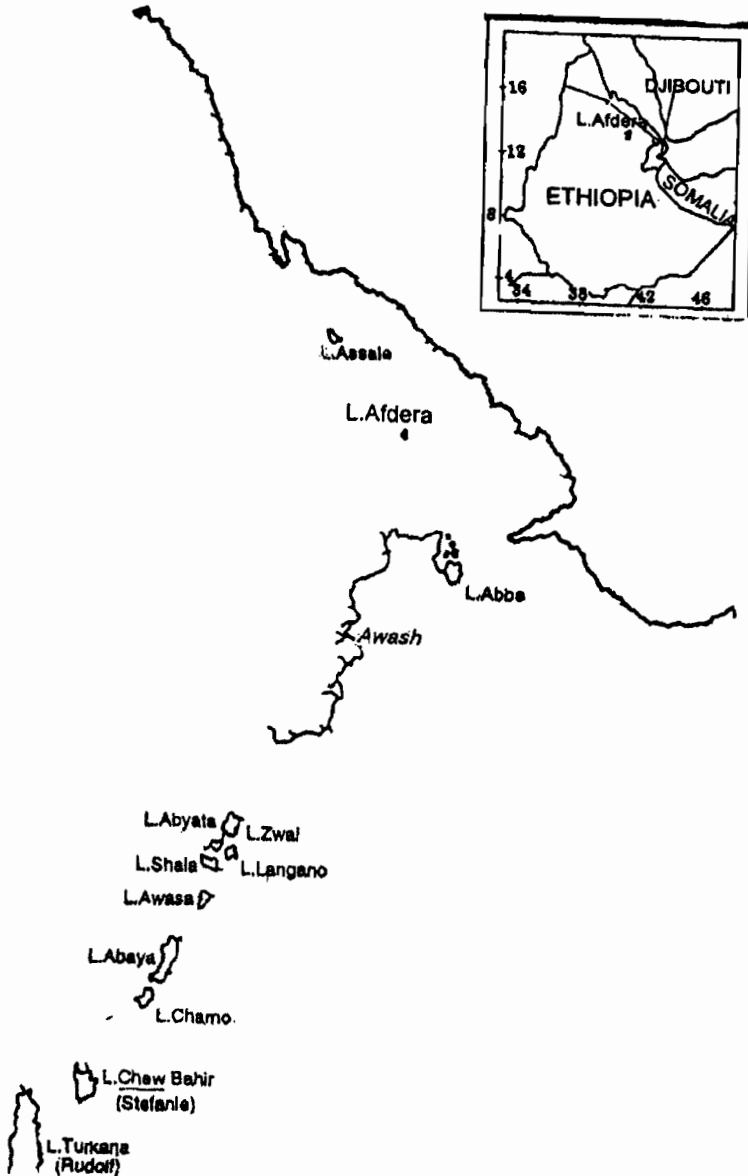


Fig. 1. Geographic location of Lake Afdera.

THREATS TO THE ECOSYSTEM

It is known that many of the streams and some of the lakes of Ethiopia are not well studied for their faunal diversity in general and their fish fauna in particular (Abebe Getahun and Stiassny, 1998). Accordingly, except sporadic visits, there have not been prior ecological and biological studies of Lake Afdera. By the same token, there have not so far been major human activities in and around the lake. However, the lake is facing potential threat now. A new gravel road is under construction to connect the lake to the main asphalt road that goes to the Red Sea port of Assab. One of the objectives is to make the lake a source of edible salt for the presently landlocked Ethiopia and production has already started. Salt extraction needs canalizations of the lake water and, thus, much water level reduction is expected due to large surface area evaporation. Associated with the salt extraction, or any activity therein, the spring waters which are the main source of freshwater to the lake and on which the above species of fish depend, could be blocked from entering the lake and thereby affecting life in the Lake.

Therefore, the above economic activity, although vital to the country's needs, has to be undertaken with caution. The ecosystem has to be studied well before implementing such large-scale economic activity on the lake that could affect life forms and the ecosystem at large. It is recommended that a team of scientists should study the impact of this activity and the risks involved pertaining to the loss of biodiversity. Its outcome would be helpful to avert any future demise of this interesting lake, which at present appears to be at risk.

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