



Volume 16

Issue – 1, March 2022

### **Towards Sustainable Fisheries in Lake Itasy, Madagascar**

RANDRIANTIANA Rolland<sup>1</sup>, RAHERINOTAHIANA Mahaimanampisoa<sup>1,2</sup>,  
ANDRIAMIALITINA Jean Alison<sup>3</sup>, ANDRIAHARIMALALA Tahiana<sup>4</sup> and  
RASOLOARINIAINA Jean Robertin<sup>1\*</sup>

<sup>1</sup> University of Antananarivo - Institut d'Enseignement Supérieur d'Antsirabe-Vakinankaratra - Mention Environnement,

<sup>2</sup> University of Antananarivo - Institut d'Enseignement Supérieur de Soavinandriana-Itasy - Mention Environnement,

<sup>3</sup> University of Antananarivo - Ecole Supérieure de Sciences Agronomiques,

<sup>4</sup> Centre National de Recherches sur l'Environnement.

\* Corresponding author. **E-mail:** [ratsim17@gmail.com](mailto:ratsim17@gmail.com)

### **Introduction**

Lake Itasy is the third largest lake in Madagascar, and a mainstay of fisheries for the local communities. The lake is the habitat of indigenous fish species including eels (*Anguilla mossambica*, *A. bengalensis labiate* and *Anguilla marmorata*), trondro mainty (*Ptychochromoides itasy*), bully sleeper (*Ratsirakia legendrei*), gobie (*Chonophorus macrorhynchus*), and marakely (*Paratilapia polleni*), a Malagasy endemic species introduced there in 1924 (Lévêque, 1997). Another endemic, *Ptychochromoides itasy*, constitutes 40% of the fishing catch in 1930 (Moreau, 1979). The introduction of exotic species in the 1950s, including common carp (*Cyprinus carpio*), several species of tilapia, black-bass (*Micropterus salmoides*), and snakehead (*Channa maculata*), has resulted in considerable ecosystem changes at Lake Itasy (Breuil & Grima, 2014).

The local production methods have impacted the natural habitats of the fish as well. Despite yearly restocking efforts, the lake's fish stock is now in decline. The unsustainable use of small-mesh nets and the failure to observe the fishing season are the main causes. As a result, the yield and the size of captured fish have declined significantly. The endemic fish *Ptychochromoides itasy*, *Paratilapia* sp., and *Ratsirakia* sp. have disappeared from many of their original habitats (Sparks and Stiassny, 2003). Nowadays, tilapias and carp are mostly caught in Lake Itasy.

Given how important fisheries is as livelihood for the local communities, it is essential to understand its management, consequences, and how the local communities are engaged in

this enterprise, which is the purpose of this study done between 2018 and 2019. It was part of a project titled “Endemic fish species diagnostic in Lake Itasy catchment area - towards a conservation strategy.”

### **Approach**

The Itasy Region has more than 68 natural lakes, and this study focused on Lake Itasy with an estimated surface area of 3,500 ha (Fig 1), about 130 km to the west of Antananarivo. In November-December 2019, we surveyed 133 fishermen operating on the lake. The demographic structure of the fishing communities and their social organisation was characterized.



**Fig 1.** Lake Itasy from the west bank  
Pic credit: RASOLOARINIAINA

### **Findings**

#### ***Fisheries pattern***

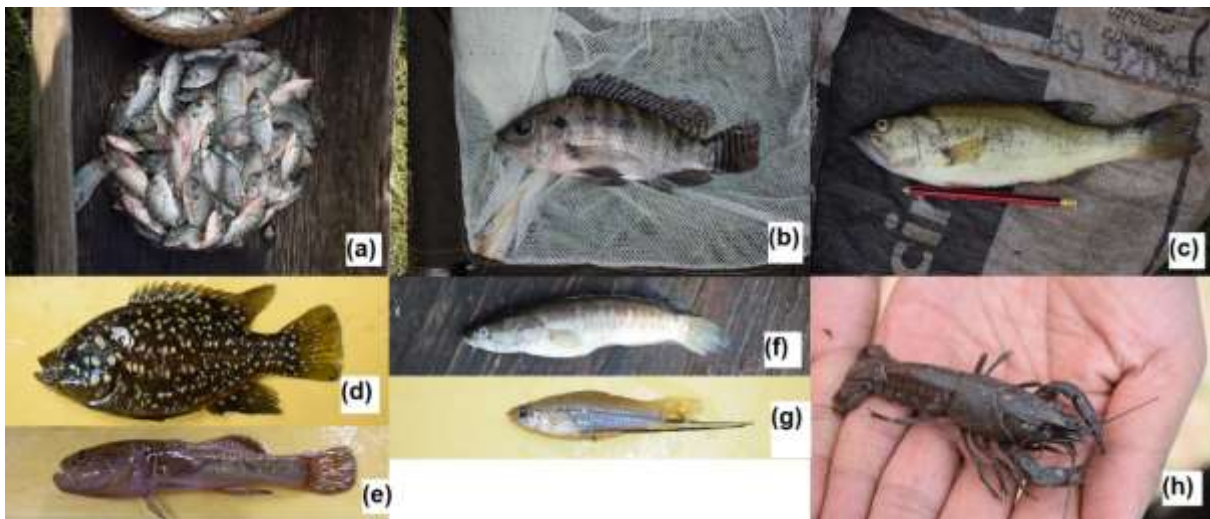
In Lake Itasy, 96% of the fishing community is comprised of men and women and children take to it occasionally for recreation. The age of the fishermen varied from 16 to 60 years old, and they were mostly farmers (80%). They follow traditional fishing practices.

Fishing gear include gill nets, cast nets, hand lines, traps, seine nets, and dugout canoes (Fig 2).



**Fig 2.** Sample of fishing techniques: **(a)** Fishers using gill net, **(b)** traps 'installation  
Pic credit: RASOLOARINIAINA

Usually two fishermen go fishing and as one drives the pirogue, the other catches the fish. They go fishing twice a day: in the morning from 7 to 11 am and in the afternoon from 1 to 5 pm. Their catches varied from 5 to 6 kg of fish per day. To increase the catch, some of them go out at night (5%). The most caught species include tilapia (83%) (*Coptodon rendalli*, *Coptodon zillii*, *Oreochromis niloticus* and *Oreochromis mossambicus*) and carp (16%) (*Ciprinus carpio*). Other species rarely caught (1%) are (*Micropterus salmoides*, *Ratsirakia* sp., *Awaous aenofuscus*, and *Anguilla marmota*) or absent (*Paratilapia polleni* and *Ptychochromoides itasy*). Small fish species namely *Xyphophorus helleri* and *Gambusia holbrooki* are collected by women using mosquito nets (Fig 3).



**Fig 3.** Fish and crayfish species: **(a)** Fisher's daily catch, **(b)** *Oreochromis niloticus*, **(c)** *Micropterus salmoides*, **(d)** *Paratilapia* sp., **(e)** *Ratsirakia* sp., **(f)** *Channa maculata*, **(g)** *Xyphophorus helleri*, **(h)** *Procambarus* sp. Pic credit: RASOLOARINIAINA

### **Community organisation**

Most fishermen do not belong to any form of a professional organisation (Association/cooperative), especially for those whose fishing activity is exclusively subsistence. However, 22 village-based fishermen's associations have been identified around

Lake Itasy. These associations are grouped in two federations: "Union Aigle" (Ampefy, Analavory and Soavinadriana), and "Union Baraoa" (Antoby-Est and Manazary). The associations serve as an interface with the political and administrative public authorities like Communes, Fisheries Service and NGOs like PROSPER and APDRA.

### ***Threats***

Human activities have taken a toll on the resources of Lake Itasy. Slash and burn farming and deforestation led to the erosion of the catchment areas resulting in siltation. Much shrinkage of the water body has happened over time. Agricultural run-off with pesticide and chemical residues has polluted the Lake leading to a worrisome loss of aquatic habitat. In addition, demographic growth, economic downturn, and local land issues triggered an overuse of the fisheries resources of the lake. Itasy Region population in 2019 was estimated at 897,962 people with a density of 137.6 habitants per km<sup>2</sup> (INSTAT, 2019). Fishing has become a last resort activity taken up to ensure the daily subsistence of scores of fishermen. Fortunately, aquaculture is resilient in this area. It is dominated by fishpond and cage systems for the culture of tilapia and carp. But 70% of the fishing equipment used by the local fishermen is non-regulated (mesh size less than 25 cm). Besides, the closing period for fishing, which runs from October 15<sup>th</sup> to December 15<sup>th</sup>, is hardly adhered to. There is poor monitoring, control, and surveillance of the Lake because the local Inland Fishery Section is weak and understaffed (Breuil & Grima, 2014). Thus, there is low and ineffective compliance with the existing regulations. An overpopulation of predators like *Channa maculata* and *Procambarus* sp (Fig 3) has upset the ecological balance of the Lake. All these issues have resulted in a decline of fishery catches.

### **Conclusion**

This study highlights the factors determining the sustainability of fisheries on Lake Itasy vis-à-vis fishing effort, the fish stocks, and the environmental degradation. Fishing effort had peaked, and fishing pressure resulted in depleted harvests. There is a dire need for effective fisheries management for sustainability of the enterprise, and stakeholder coordination is of the essence.

The 22 fishermen associations assessed around Itasy Lake influenced the fishing practices of their members and can potentially conserve fishery resources. Capacity building of associations would pay rich dividends for the cause. Also, compliance with fishery regulations and legislations concerning minimum mesh size of gear, fish size, and fishing seasons is important to a better future. Moreover, 'no fishing' areas must be created in the Lake to conserve native species and to allow stock regeneration. Moreover, fish farming should be promoted by training the local community in the enterprise and funding made available. Watershed management to reduce erosion and siltation of the Lake is an absolute must for the overall health of Lake Itasy.

### **Acknowledgments**

We thank the Ministry of Fishery and Blue Economy for granting access to Lake Itasy. We are grateful to the people of all the study sites and the local authorities for allowing us to work in their communities and for providing assistance. Special thanks to Mrs.

Rakotoarimino for her useful comments on the draft. This study was financed by the Rufford Small Grant (ID 25051-1) and the Idea Wild material grant.

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