



FINAL REPORT

The Pinstripe Damba and Bihera Turtle: Endemic Freshwater Species Conservation in Madagascar

Country: Madagascar

Site location: Lake Tseny in Sofia Region

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Section 1:

Introduction

Fish and other freshwater resources sustain human livelihoods across Madagascar. Yet overfishing, habitat destruction and the invasion of exotic species have left many systems on the brink to collapse. The survey conducted in October 2010 at the lake confirm that Lake Tseny is of crucial importance for human livelihoods and the survival in the wild of at least 3 endemic cichlid fish species one of which is critically endangered (*Paretroplus menarambo* (CR)) and a turtle (*Erymnochelys madagascariensis* (CR)).

Project members

- 1) **Roles in the project:** Project leaders
Name: Eunicia Mamilaza:
Current occupation: student, preparing her masters at department of the science of Agronomy and forestry.
Experience: Completed a DSS diploma on communitarian development at the economy department of Antananarivo University then worked as Community conservation in Madagasikara Voakajy.
- 2) **Roles in the project:** Turtle specialist
Name: Willy Sylvio Mananjara:
Current occupation: Project assistant at the sustainability and outreach programme department.
Experience: I have completed a DSS diploma on tortoises in western Madagascar; I have completed a DEA (Masters) on hunting of endemic frogs by people for food. My background is therefore in the conservation and sustainable use of amphibians and reptiles. I am a native of Mahajunga in western Madagascar.
- 3) **Roles in the project:** Fish assistant
Name: Ralambo Justin
Current occupation: Student preparing masters on fish ecology.
Experience: I visited Lake Tseny in 2010. I have accompanied Dr Paul Loiselle (WCS) and teams from Toronto Zoo and Denver Zoo on fish surveys. I am a student at the Department of Animal Biology, University of Antananarivo.

Section 2:

Aim and objectives

The overall goal of this project is the conservation of the wetland habitats in Lac Tseny through application of sustainable and traditional management that supports endemic species conservation and peoples' livelihoods. The specific objectives are:

1. Determine the species composition of fish in the lake Tseny
2. Produce a map of Lake Tseny
3. Assessing the hunting pressure on *Erymnochelys madagascariensis* and determine the evolution of the abundance of this species and its habitat through interviews.

Methodology

Experimental fishing sessions with two to four fishermen were conducted at 5.30 to 8.00am and 15.00 to 17.00pm in each site to determine the specific composition of fishes in Lake Tseny. Two types of nets were used: seine nets (harato varilava) and gill nets (harato doboka). The two end panels were made of 25 – 30 mm stretched mesh while the center panel of 3 – 5 stretched mesh. Gill nets had stretched mesh sizes of 70 – 100 mm, were between 150 – 200 mm in length and 50 – 80 cm in height. All captured fishes were identified visually, and photographs were taken for further identification. A few individuals were also measured (from the tip of the snout to the posterior end of the midlateral portion of the hypural plate) and weighed with an electronic kitchen scale, whenever possible, by a single individual. Fishes were released at the northern or southern extreme of their collection site after marking. During fieldwork in March 2012, additional observations of fishermen catch were done in the village of Ambario for nine consecutive days.

For mapping we used googlEarth, community consultation and water depth mesurment using Hondex Digital Depth Sounder. A first map was produced using image from GooglEarth, the boundaries of the lake was determined using this method. Information collected during field visits prior to October 2011 was added on the map. This was then taken to a meeting with local communities during the fieldwork in November 2011. Participants located and identified human settlements on the map. These were visited as verification and to record GPS coordinates. Fish breeding areas were located with informal interviews with fishermen during the fieldwork in November 2012. Data on water depth were collected during all fieldworks, using a Hondex Digital Depth Sounder. Measurements were taken every 50 m on 22 transects across the lake, while seated in canoes with one researcher activating the sounder and a second marking a waypont and recording the depth. Interference by paddling and speed were kept to a minimum.

A test of the questionnaire was conducted in August 2011; data were collected in November 2011. All villages within 2.5 km of the lake boundary (n = 10) were visited (MAP). Interviews were conducted with adults and participation was voluntary. Willingness to be interviewed was checked after the introduction of the team and the objectives of the interview, and at different times during the interview. Questions were on recent consumption of *E. madagascariensis*, knowledge of its legal status, and perception of the population trend.

Outputs and Results

Objective 1: Determine the species composition of fish in the lake Tseny.

During the community meeting in September, ten sites were identified as being good sites for catching *damba*. Six of these were visited during our fieldwork. Each site was visited three times except Ankotondratsy, which did not appear to be adequate for the three target endemic cichlid species and was visited only once (Table 1). A total of 1,785 fishes were collected, belonging to four orders, five families and twelve species (Table 2).

At each site revisited, endemic cichlids collected over the first two sessions were marked. There were respectively 48 *P. sp. affin. kieneri*, 19 *P. menarambo* and three *P. lamnabe*, but only three fishes were recaptured (two *P. sp. affin. kieneri* and one *P. menarambo*). Hence, population size estimate was not possible.

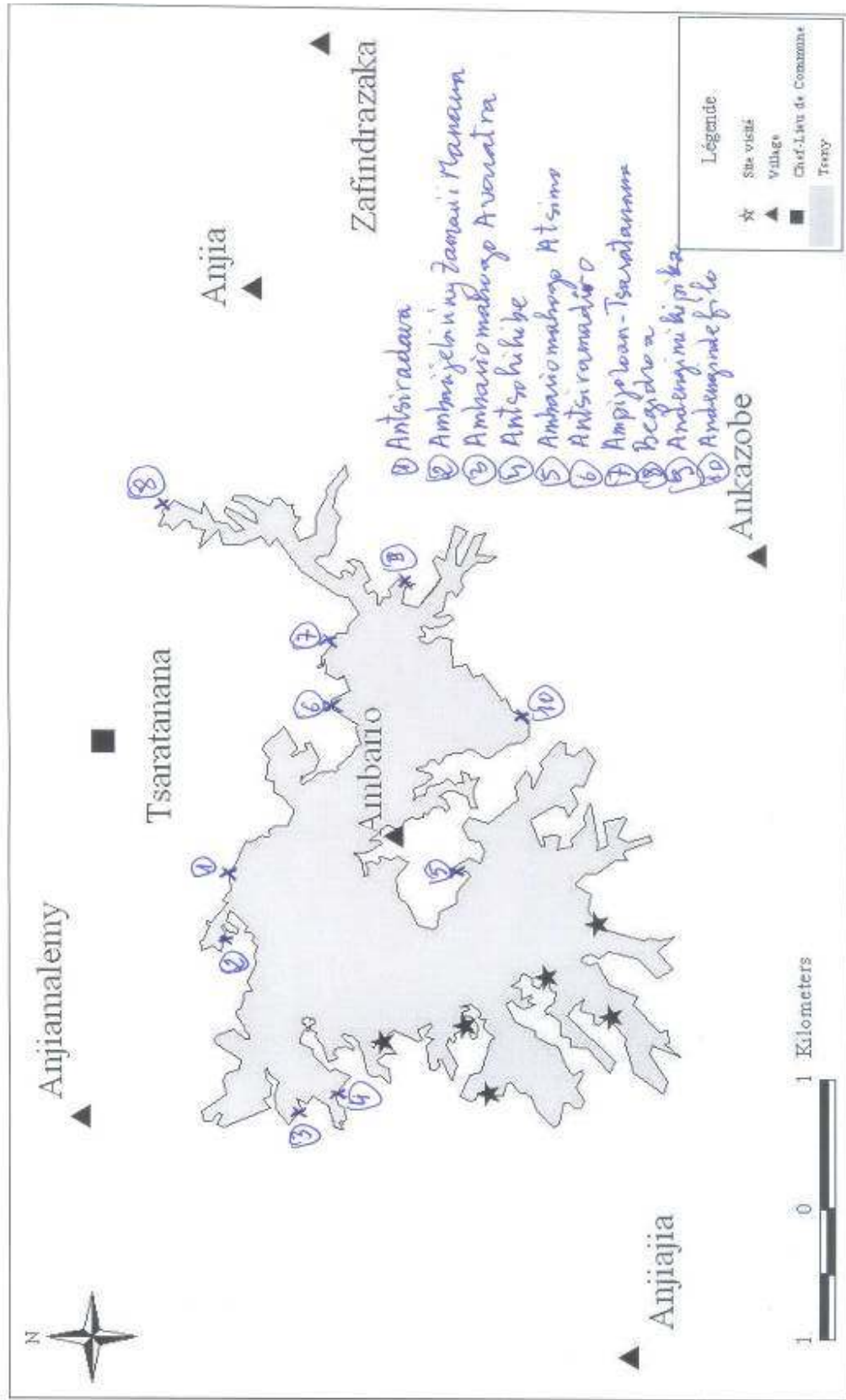


Fig. 1: Damba sites visited in September 2011 (stars) and identified during a community meeting in November 2011 (numbered).

Table 1: Summary of capture sessions conducted, number of species and individuals captured at each site and the number of endemic cichlids per site

Site	N capture sessions	N species	N individuals	Menarambo	Lamenabe	Kotsovat
Ambalafary	3	9	243	4	1	49
Ambariomanevika	3	5	465	7	0	14
Ambariotsakotsako	3	6	149	1	1	24
Ampijoroan'Anjajia	3	7	207	5	1	0
Ankoba	3	3	470	12	0	0
Ankotondratsy	1	4	251	0	0	1

In March 2012, a total of 356 fishes were handled, belonging to three orders, five families and ten species (Table 2). The introduced Mozambique tilapia *Oreochromis mossambicus* was the most frequently observed species (63.4%) in the catch. Only ten individuals of the three native species (*Paretroplus menarambo*, *P. lamenebe* and *Glossogobius giuris*) were present, with respectively five, one and four individuals. Considering the two seasons, Lac Tseny has 12 fish species (Appendix 1), of which four are native to the country. The three species of the genus *Paretroplus* are endemic.

Objective 2: Produce a map of Lac Tseny, indicating depth profile, human settlements and fish breeding areas with local community

Within 2.5 km of Lac Tseny, ten villages were identified, divided into four Fokontany: Zafindrazaka, Tsaratanàna, Anjajia and Ankazobe. A total of 16 potential sites for observing and capturing Damba were identified throughout the project (Fig.1). Water was 4.0 ± 1.5 (SD) m deep. Endemic cichlids breed near or within sunken forest that are located in a few areas within the lake (Fig. 2) while other species can breed everywhere within the lake.

Table 2: List and measurements (\pm SE) of fish species observed in Lac Tseny

Order	Family	Species	Vernacular names	Occurrence	IUCN Status	N	Weight (g)	SL (cm)
Clupeiformes	Clupeidae	<i>Sauvagella robusta</i>	Varilava	Native	DD			
Elopiiformes	Megalopidae	<i>Megalops cyprinoides</i>	Besisika	Introduced	NE	1	126.0	19.9
Osteiglossiformes	Arapaimidae	<i>Heterotis niloticus</i>	Toratisy	Introduced	LC	1	758.0	41.0
Perciformes	Channidae	<i>Channa maculata</i>	Fibata	Introduced	NE	4	546.6 \pm 101.6	32.9 \pm 2.5
	Cichlidae	<i>Oreochromis mossambicus</i>	Ragnaobe	Introduced	NT	15	63.7 \pm 7.8	12.6 \pm 0.7
		<i>Oreochromis niloticus</i>	Papaoaly	Introduced	NE	8	263.4 \pm 150.4	14.5 \pm 3.4
		<i>Paretroplus lamnabe</i>	Lamenabe	Native	DD	4	26.5 \pm 3.2	9.1 \pm 0.3
		<i>Paretroplus menarambo</i>	Damba menarambo	Native	CR	14	38.3 \pm 12.8	8.7 \pm 0.7
		<i>Paretroplus sp. kieneri</i> [*]	Kotsovato	Native	NE	68	38.6 \pm 2.5	9.6 \pm 0.3
		<i>Tilapia rendalli</i>	Borivava	Introduced	LC	218	7.5 \pm 1.5	4.5 \pm 1.1
		<i>Tilapia zillii</i> [*]	Lako fisaka	Introduced	NE	183	28.2 \pm 3.3	7.0 \pm 0.3
	Gobiidae	<i>Glossogobius giuris</i>	Amborodo	Native	NE	5	104.2 \pm 25.9	17.2 \pm 1.6

^{*} Captured only September and October

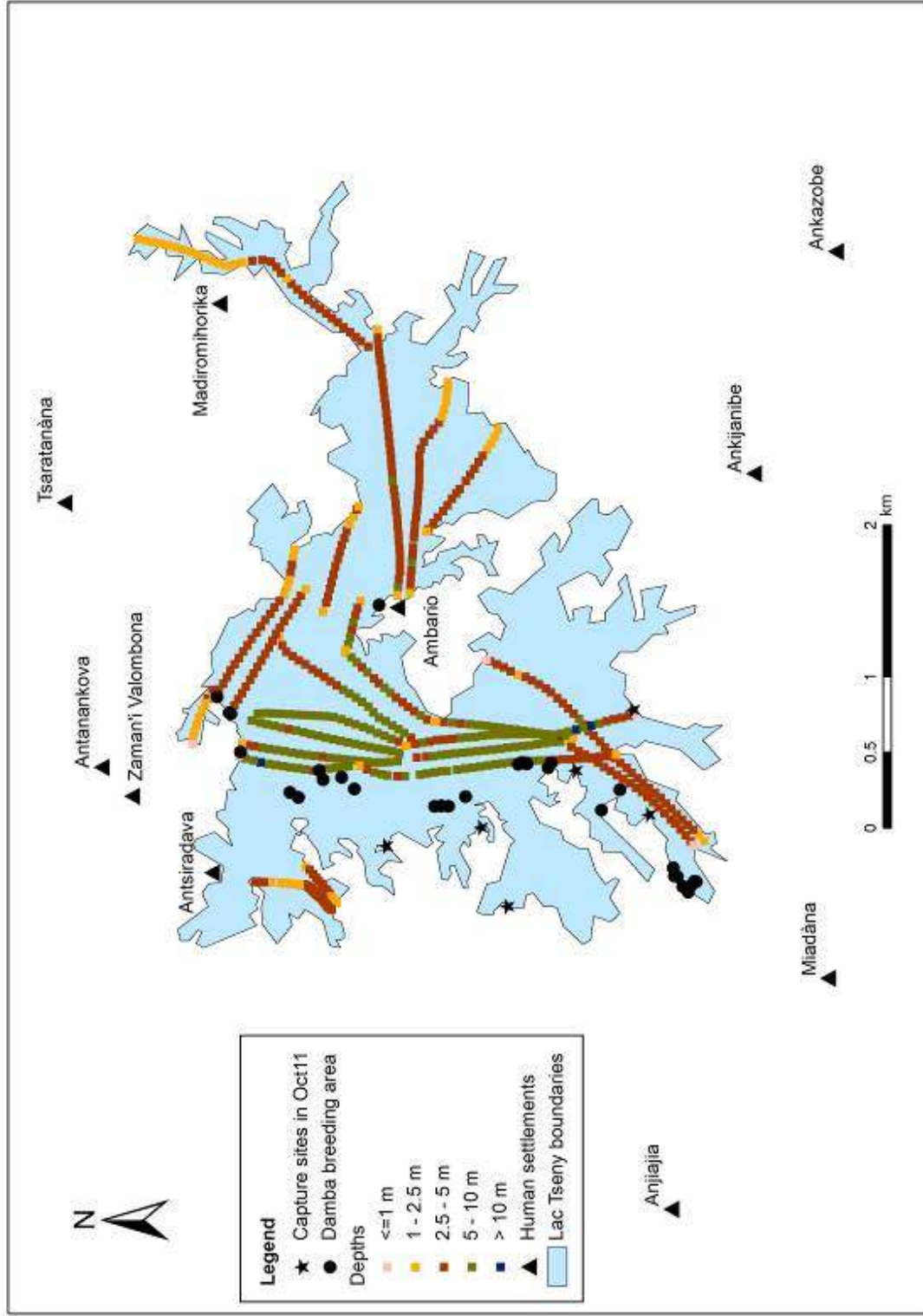


Fig. 2: Depth profile, human settlements and Damba breeding areas in Lac Tseny

Objective.3: Assess the hunting pressure on *Erymnochelys madagascariensis* and determine trends in the abundance of this species and important basking/breeding habitats

A total of 267 households were visited to assess Bihara consumption. All accepted to be interviewed. Forty percent of the people interviewed have already eaten *E. madagascariensis* in their life. Eggs, juveniles and adults are all consumed by the population, and the latest reported consumption was from October 2011 (*lohataona*). Although *E. madagascariensis* is protected under the Malagasy legislation, 97% of the interviewees think that it can be hunted and consumed. Tortoises are generally collected at the edge of the lake where females lay their eggs, but can also be captured at deep water.

Only seven (2.6%) interviewees reported consumption of bihara during 2011. The current population of bihara in Lac Tseny is estimated to be 24.9 ± 1.7 (SE) % of its size before 1990. People are aware of that the species is declining, but still consume it because of its taste. When compared to other delicacy in the area (chicken and helmeted guineafowl), and two other turtle species present in the lake, Bihara was ranked first by 36.5 % of the interviews, second by 20.8% and third by 32.5%.

Achievements and Impacts

This project allowed stakeholders to understand the Importance of the lake in terms of critically endangered freshwater species conservation. Throughout different meeting and the sensitization support produces, local fishers aware of the existence of laws that govern their main activities and that they ignore for long time. These impacts are strengthened by the tight collaboration between key partners especially the ministry of environment and those of continental fishing. These two ministry department have different strategy in term of specie management and this project allowed the establishment of a local management plan which need an improvement and enforcement. In fact, fishing officer dealt only with the restriction of use of illegal net and didn't concern about the conservation status of threatened freshwater species. As a result, during the local restitution of the project, all stakeholders represented by the local authorities, University, fishers and private institutions decided that a strong management plan that enhance the participation of all partners need to be established and in which the community involvement and responsibilities is boosted while scientific research and monitoring will continue to support sound decision making.

During the project, eighty seven posters have been produced (15 size A2 and 72 size A3) as well as two hundreds sticker (202 stickers size A5) to enhance the awareness on laws and freshwater species conservation in each village.

Section 3:

Conclusion

- Endemic fishes species in Lac Tseny are rare in the catches of fishermen while introduced species are abundant. Considering the types of nets used and the increasing number of fishermen in the area, they are unlikely to escape. Fishermen agree that they are declining, habitat degradation is reported to be the main cause of this decline
- Similarly, *E. madagascariensis* is declining, although some people think that they are moving to the large rivers during the wet season, when the water level is increasing and the lake is communicating with the Bemarivo River.
- With its 760 hectares, Lac Tseny is among the largest lake of the Sofia Region and is the only lake where wild population of the critically endangered pinstriped damba occurs. Hence, efforts for the conservation of this lake are necessary. Conservation measures should take into account the fact that over 90% of the population around this lake are fishermen.

In the future

- *Support the efforts of the regional fishery service:* The Sofia regional fishery service is currently recording the number of fishermen around Lac Tseny and distribute fishing licenses.
- *Set up management comity of Lake tseny:* This comity enforces the community involvement on the management of the Lake and is composed by fishers representatives from each village. It promotes the respect of laws related on fishing activities and the locally applied conservation plan agreed by all stakeholders.
- *Zoning for habitat management and restoration:* Unlike introduced fishes, endemic cichlids have specific habitat requirements for breeding. With local communities, measures to conserve and re-create those habitats will be identified and tested.
- *Explore Lac Tseny and other lakes in the Region:* Captures during this project were conducted in the western part of Lac Tseny. Further investigations are needed to determine if endemic species can be found in other parts of the lake. Additionally, based on GIS exploration, there are many other lakes within Sofia Region which are likely to host endemic cichlids. The type specimen was collected in Lake Sarodrano which is now degraded. These nearby lakes need to be investigated.
- *Monitoring:* Number and sizes on endemic cichlids captured by fishermen annually need to be monitored to follow up the population trend. The 2020

targets challenge conservationists and the population in Madagascar not to allow the extinction of *P. menarambo* and *E. madagascariensis* in Lac Tseny. An increase of the population is even expected over the next ten years