

Final report

Monitoring and Capacity Building in Four Madagascar Unprotected Important Bird Areas (IBAs)

Application ID: 15074-1

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I. Introduction

This project funded by the Rufford foundation grant revealed the bird conservation works at four unprotected Important bird areas (IBAs) identified by BirdLife International under the project Zicoma (1999).

Fieldwork data collecting for this project was started in September 2014 in respecting the proposed timetable of project in proposal without paying attention first on the respect of fieldwork visit period of project Zicoma for each site.

In addition, I didn't visit some sites that Zicoma team visited during my first fieldwork because of misunderstanding on site name and location, difficulty of access in certain season and question of security.

After revisiting some potential sites, I could advance this final report to the Rufford foundation that supported this work.

II. Objectives

The proposed works for this project have the following objectives:

- To record the actual status on the water bird population, threat and ongoing conservation effort in four target priorities unprotected Important Bird Areas of Madagascar (Tsiribihina delta and Upper Tsiribihina river, Tambohorano wetlands, Bemamba wetland complex, Bombetoka bay and Marovoay wetlands);
- To build capacity of local people around the target wetland IBA on monitoring skill and BirdLife strategy plan (conservation program and policies);
- To outline the changes on the water bird population, threat and ongoing conservation effort at four target IBAs;

- To inform these changes for updating data of partners (BirdLife, Peregrine Fund, Durrell Wildlife, Ramsar, Wetland International, AEWA and others).

III. Study sites

This project focused on four targeted important bird areas identified by BirdLife International in Zicoma (1999). Their choice was based on their conservation status which are partially protected or totally unprotected.

These four IBAs (MG024, MG059, MG035 and MG038) include the following sub sites:

- **MG024 (Bombetoka bay and Marovoay wetlands)** containing the following sub sites: Boanamary (new protected area), Katsepy, Mataitromby (new protected area) and Maroavoay

- **MG059 (Tsiribihina delta and Upper Tsiribihina river 44°26.00' East, 19°45.00' South)** with the following sub sites: Andopitaly, Soarano, Ambakivao, Kaday, mangrove of Borengo, salt marshes, river, Lake Kimanomby, Lake Hima and Lake Masoarivo

- **MG035 (Tambohorano wetlands)** comprising the following sub sites: Tambohorano, Bemoramba, Nosy Ve, Mandrozo (new protected area), Manapape

- **MG038 (Bemamba wetland complex)** including Lake Bemamba (Hunting reserve) as sub site.

IV. Methodologies

IV.1. Methods for the realisation of objectives 1 and 2

Fieldwork for collecting data on water bird, threats and ongoing conservation effort, with capacity building :

- Water bird data: setting transects, surveys, observations and counting number of individuals using line transect with fixed bands in distance sampling (Zicoma 1997, Waite 2000) for evaluating species richness, conservation status, IBA status, species diversity, number of endemic and threatened species and density of target species ($D=10Nk/L$ where D =density, N =total number of individual inside and beyond of fixed band, K = detectability index and L = line transect length).
- Threats data: inquiring of local people and estimation using MARP approach and direct observation for getting threat list, their types and their impact using some quantitative data.
- Ongoing conservation effort: inquiring of local people and direct observation to list and type any conservation action and research running at each target IBA from 1999 (IBA launching)
- Training local people around study site on IBA monitoring skill, IBA Africa strategy plan, role of local Site Support Groups (SSG) and eco-tourism.

Data analysis for each studied site including:

- Evaluating species richness of four target IBA
- Calculating species diversity of four target IBA
- Assessing the number of threatened species of four target IBA
- Evaluating the number of endemic species of four target IBA

- Estimating density of threatened waterbird.

IV.2. Methods for the realisation of objective 3

By comparing data in Zicoma 1999 and those of survey 2014-2015, we can deduct if studied item is improved or stable (no change) or declined. Each studied unit (wetland bird states, threats and on-going conservation actions) will have different number of items with improved or stable or declined status.

By combining the total number of studied item (species A1, A2, A3 etc..) improved, stable and declined per studied unit (waterbird, threat and on - going conservation), we can deduct percent of IBA improved, stable and declined according to dominant status of IBA (item improved or stable or declined).

IV.3. Methods for the realisation of objective 4

Producing and distributing a summary data or report on conservation status of four target habitat (actual states, changes and trends on their bird states, threats and on-going conservation actions) to the partners (BirdLife International, ASITY, Peregrine Fund, Durell Wildlife, Ramsar, Wetland International, AEWA and others).

V. Results

V.1. Realisation of objectives 1 and 2

V.1.1.- Actual status of water bird population data in the studied IBAs

Table 1: Status of water bird population, threats and on-going conservation of four studied IBAs

	Bombetoka bay and Marovoay wetlands	Tsiribihina delta and Upper Tsiribihina river	Tambohorano wetlands	Bemamba wetland complex
Species richness (all species)	55	60	59	33
Species richness (species A1: threatened species)	8	9	9	5
Species richness (species A2: species with restricted areas)	5	5	6	5
Species richness (species A3: West biome)	4	4	5	4
Species richness (species A4i: gregarious species with number over passed the threshold)	2	2	2	2
Conservation status of IBA	Getting protection status but there is not	Still not protected	Only the Lake Mandrozo got	Still not protected

	yet an effective conservation in ground		protection status	
Species diversity (Shannon - Weiner index)	0,753	0,791	0,898	0,847
Number of endemic species	5	6	7	5
Number of threatened species	8	9	9	5
Density (number of individuals / ha) of target species 1 (<i>Actophilornis albinucha</i>)	0,59	1,10	2,18	2,18
Density (number of individuals / ha) of target species 2 (<i>Anas bernieri</i>)	5,80	8,13	10,83	10,4
Density (number of individuals / ha) of target species 3 (<i>Ardea humbloti</i>)	2,84	15,80	5,37	6,63
Density (number of individuals / ha) of target species 4 (<i>Ardeola idae</i>)	2,27	2,27	4,26	
Density (number of individuals / ha) of target species 5 (<i>Charadrius thoracicus</i>)	45,49	48,12	44,26	23,02
Density (number of individuals / ha)	7,31	8,90	7,31	5,76

ha) of target species 6 (<i>Haliaeetus vociferoides</i>)				
Density (number of individuals / ha) of target species 7 (<i>Tachybaptus pelzelni</i>)			8,90	
Density (number of individuals / ha) of target species 7 (<i>Glareola ocularis</i>)		7,31		
Density (number of individuals / ha) of target species 8 (<i>Phoeniconaias minor</i>)	500,19	15,69		
Density (number of individuals / ha) of target species 9 (<i>Threskiornis bernieri</i>)	68,86	60,34	98,79	
Density (number of individuals / ha) of target species 9 (<i>Zapornia olivieri</i>)			36,34	

- *Charadrius thoracicus* is found at moderate density at the four study sites
- Bombetoka lodges high density of *Phoeniconaias minor*
- *Threskiornis bernieri* is found at higher density at three sites (Bombetoka, Tsiribihina and Tambohorano wetlands)
- Only the Lake Mandrozo of Tambohorano wetland lodges *Zapornia olivieri*

V.1.2.- Actual status of threats in the studied IBAs

Table 2: Status of threats of four studied IBAs

	Bombetoka bay and Marovoay wetlands	Tsiribihina delta and Upper Tsiribihina river	Tambohorano wetlands	Bemamba wetland complex
Threat 1: Shrimp farm at Bombetoka	x			
Threat 2: Hunting, eggs/chicks collection and destruction of waterbird colonies	x	x	x	x
Threat 3: Net fishing			x	x
Threat 4: Transformation of wetland habitat to rice field		x	x	x
Threat 5: Development of invasive plants		x	x	
Threat 6: Palm-wine production				x
Threat 7: Sedimentation		x	x	x
Threat 7: collecting of mangrove's woods for selling at the town of Mahajanga	x	x	x	

Wood collecting for charcoal production	x	x	x	
Disturbance from collection of crabs	x	x	x	

x = presence

- Hunting, eggs/chicks collection and destruction of water bird colonies are the most common threats running at four habitats in addition to the growing of transformation of wetland habitat to rice field, collecting of mangrove's woods, sedimentation, charcoal production and disturbance from eggs/chicks collecting of water bird colonies.

- Quantitative estimating of threat was difficult since each study has sub-sites and the estimation will not be a representative of study site

V.1.3.- Ongoing conservation effort in the studied IBAs

Table 3: Status of on-going conservation of four studied IBAs

	Bombetoka bay and Marovoay wetlands	Tsiribihina delta and Upper Tsiribihina river	Tambohorano wetlands	Bemamba wetland complex
Conservation action and research 1	Voronosy Project for conservation of endangered wetland bird <i>Threskiornis bernieri</i> in 2006	Small conservation researches led by Durrell wildlife conservation trust	The Peregrine fund Project for conservation of Lake Mandrozo in 2012 which became new	Small conservation researches projects of divers NGO (The Peregrine fund

			protected area	
Conservation action and research 2	Bombetoka and Beleboka Project of the association Fanamby to make part (75 hectares of 148 200 ha) of IBA as new protected areas in 2008	Small conservation researches projects + tourist circuit	Small conservation researches projects + tourist circuit	Small conservation researches projects + tourist circuit
Conservation action and research 3	Conservation researches projects + tourist circuit	Research reports and papers	Research reports and papers	Research reports and papers

V.1.4.- Training local people around study site on IBA monitoring skill, IBA Africa strategy plan, role of local Site Support Groups (SSG) and eco-tourism.

Selected local guides were trained on waterbird survey and monitoring. Few days of training per study site worked for initiating a long term monitoring program. A participatory monitoring program needs to be developed for involving local people in conservation research.

Information and training on **IBA Africa strategy plan, role of local Site Support Groups (SSG) and eco-tourism** are likely better to carry out as a long-term project since most of local guides are analphabetic and their training session needs long-term project and repetition to make the training more productive.

IV.2. Realisation of objective 3

Tables below summarizes the result obtained per site

IV.2.1. Bombetoka bay and Marovoay wetlands

Table 4: Analyzing changes in Bombetoka and Marovoay wetlands IBAs

	Zicoma 1999	Actual (2014-2015)	Changes	Comments
Water bird population (Bombetoka bay and Marovoay wetlands)				
Species richness (all species)	7	55	Increased	Probably all waterbird species of IBA were not registered in Project Zicoma report, team would interested only on survey of important species of BirdLife's IBA criteria (A1, A2, A3 and A4i)
Species richness (A1)	5	8	Increased	<i>Actophilornis albinucha</i> , <i>Charadrius thoracicus</i> and <i>Threskiornis bernieri</i> are additional threatened species found after Zicoma 1999
Species richness (A2)	3	5	Increased	<i>Actophilornis albinucha</i> and <i>Charadrius thoracicus</i> are

				additional A2 species found after Zicoma 1999
Species richness (A3)	3	4	Increased	<i>Charadrius thoracicus</i> is additional A3 species found
Species richness (A4i)	3	2	Decreased	- The two previous A4i species (<i>Egretta alba</i> and <i>Egretta dimorpha</i>) in Zicoma 1999 didn't reach their threshold during the survey 2014-2015. - <i>Charadrius thoracicus</i> over passed its threshold
Species diversity (Shannon - Weiner index)	0,378	0,753	Increased	Probably Zicoma 1999 registered only important species (A1, A2, A3 and A4i)
Number of endemic species	4	5	Increased	
Number of threatened species	5	8	Increased	
Abundance (number of individual) of target species 1 (<i>Actophilornis albinucha</i>)	0	2	Increased	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 2 (<i>Anas bernieri</i>)	15	8	Deceased	Number of individuals may fluctuate over time and sub - sites

Abundance (number of individual) of target species 3 (<i>Ardea humbloti</i>)	7	2	Decreased	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 4 (<i>Ardeola idae</i>)	?	1	Increased	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 5 (<i>Charadrius thoracicus</i>)	?	16	Increased	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 6 (<i>Haliaeetus vociferoides</i>)	2	2	Stable	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 7 (<i>Phoeniconaias minor</i>)	1	114	Increased	Number of individuals may fluctuate over time and sub - sites
Abundance (number of individual) of target species 8 (<i>Threskiornis bernieri</i>)	?	13	Increased	Number of individuals may fluctuate over time and sub - sites
Abundances (number of individual) of target species 9 (<i>Egretta dimorpha</i>)	286	14	Decreased	Number of individuals may fluctuate over time and sub - sites
Abundances (number of	700	11	Decreased	Number of individuals may

individual) of target species 10 (<i>Egretta alba</i>)				fluctuate over time and sub - sites
Threats (Bombetoka bay and Marovoay wetlands)				
Degradation of mangrove: collect of mangrove's wood for selling at the town of Mahajanga	Presence	High	Increased	Two big pirogues full of mangroves woods from the Bombetoka bay were observed on seashore of Mahajanga
Destruction of nesting water bird colonies	Presence	Still running	Increased	I didn't see this threat during the visit because of season (non-breeding period) but collect of water bird chicks and eggs is still operational every year according to local guides
Water bird hunting	Presence	Still running	Increased	Some visitors and hunters from the hotels of Mahajanga town passed there sometimes
Development of shrimp farm at Boanamary salt pans	Presence	Still running	Increased	
Overfishing at the Lake Amboromalandy	Presence	Still running	Increased	
Development fish farm at the Lake Amboromalandy	Presence	Still running	Increased	

Development of rice fields at Marovoay	Presence	Still running	Increased	
Destruction for charcoal production	No data	Running	Increased	
Disturbance from collection of crabs	No data	Running	Increased	
Ongoing conservation effort (Bombetoka bay and Marovoay wetlands)				
Conservation actions underway	Classified forest for the Mangrove and islands of Betsiboka (old protection law from the government)	<p>- Association Fanamby (2008-2009): For making Bombetoka-Belemboka as new protected area (in process but not yet definitive) but this project to make this site as definitive protected area was not completed in term because of political strike event 2009.</p> <p>- Project Voronosy (2006-2007): Malagasy Association Voronosy was created to protect the species in Bombetoka Bay by changing the attitude of</p>	Increased	<p>- Conservation status of site is increased in term of law (received formal protection law) but the process to get full protection is not completed.</p> <p>In addition, since there is not organism responsible on implementation of conservation in ground for the site, conservation status of sites is still decreased in term of conservation in ground because there is not</p>

		villagers towards the bird and its habitat (Perschke 2006) for protection. This project developed as well captivity breeding of Madagascar Sacred Ibis but finished because of suddenly died of project leader		
Development of ecotourism	No signaled	Mentioned and heard during the visit	Increased	- Boat circuit with tourists circulated sometimes - Boats circuits are already launched and developed at website (http://www.mosaique-malgache.com/circuits/oiseaux/)
Training local people on monitoring skill and BirdLife strategy plan (Bombetoka bay and Marovoay wetlands)				
List & type (number)	No data	Partially success because of high rate of alphabetic people at local villages around the study sites. Few people understood and followed well the training sessions. To make success this part of	Increased	

		project (training local people), we need to carry out it as part of long-term project with participatory monitoring		
Number of informed partners on changes of IBA status (Bombetoka bay and Marovoay wetlands)				
Number & list	No data	We continue to provide to the partners data, reports and paper produced from this project	Increased	- Regional direction of Forest and environment Marovoay was informed about verbally the changes

A1, A2, A3 and A4 are classes of species according to the BirdLife International criteria:

A1: Threatened species listed in IUCN red list

A2: Species with restricted range (according to the five categories of endemic bird area of Madagascar classified by BirdLife International)

A3: Species affiliated to the Biome of West

A4i: Gregarious species with number of individuals over passing the threshold fixed by BirdLife International

IV.2.2. Tsiribihina delta and Upper Tsiribihina river

Table 5: Analyzing changes in Tsiribihina delta and Upper Tsiribihina river

	Zicoma 1999	Actual (2014-2015)	Changes	Comments
Water bird population (Tsiribihina delta and Upper Tsiribihina river)				
Species richness (all species)	47	60	Increased	Three species more
Species richness (A1)	8	9	Increased	<i>Actophilornis albinucha</i> is the additional species found in 2014-2015 survey
Species richness (A2)	4	5	Increased	<i>Actophilornis albinucha</i> is the additional species of 2014 survey
Species richness (A3)	4	4	Stable	No change
Species richness (A4i)	8	2	Decreased	Previous species A4i (<i>Ardea humbloti</i> , <i>Arenaria interpres</i> , <i>Sterna bengalensis</i> , <i>Dromas ardeola</i> , <i>Glareola ocularis</i> and <i>Phoenicopterus ruber</i>) in Zicoma 1999-2001 didn't reach their threshold

				from 2014-2015 surveys
Species diversity (Shannon - Weiner index)	0,654	0,791	Increased	
Number of endemic species	5	6	Increased	
Number of threatened species	8	9	Increased	
Abundance (number of individual) of target species 1 (<i>Actophilornis albinucha</i>)	0	6	Increased	
Abundance (number of individual) of target species 2 (<i>Anas bernieri</i>)	40	12	Decreased	
Abundance (number of individual) of target species 3 (<i>Ardea humbloti</i>)	50	12	Decreased	
Abundance (number of individual) of target species 4 (<i>Ardeola idae</i>)	2	1	Decreased	
Abundance (number of individual) of target species 5 (<i>Charadrius thoracicus</i>)	47	17	Decreased	
Abundance (number of individual) of target species 6	6	2	Decreased	

<i>(Haliaeetus vociferoides)</i>				
Abundance (number of individual) of target species 7 <i>(Phoeniconaias minor)</i>	29	3	Decreased	
Abundance (number of individual) of target species 8 <i>(Threskiornis bernieri)</i>	11	10	Decreased	
Abundances of target species A4i <i>(Arenaria interpres)</i>	322	13	Decreased	
Abundances of target species A4i <i>(Dromas ardeola)</i>	598	39	Decreased	
Abundances of target species A4i <i>(Glareola ocularis)</i>	250	2	Decreased	
Abundances of target species A4i <i>(Phoenicopterus ruber)</i>	1154	198	Decreased	
Abundances of target species A4i <i>(Sterna bengalensis)</i>	3300	29	Decreased	
Threats (Tsiribihina delta and Upper Tsiribihina river)				
Exploitation of woods for house building and dry woods for cooking	Presence	High	Increased	
Collect of nestling/eggs of	Presence	Still running	Increased	

colonial nesting water bird's (herons)				
Overfishing at the river	Presence	Still running	Increased	
Development of shrimp farm (Aquamen) becoming salt producer	Presence	Becoming salt producer company after virus crisis of shrimp	Increased	
Hunting of flamingos	Presence	Still running	Increased	
Development of rice fields on the edge of lakes and marshes	Presence	Still running	Increased	
Ongoing conservation effort (Tsiribihina delta and Upper Tsiribihina river)				
Conservation action underway	Managed by regional forest of Belo Tsiribihina (representative of ministry of forest and environment)	<ul style="list-style-type: none"> - Managed by regional forest of Belo Tsiribihina (representative of ministry of forest, environment and ecology) - Durrell Wildlife Conservation trust leads waterbird surveys and monitoring project around there sometimes - WWF - Mac Arthur project 2010: Mangrove ecosystem in 	Increased	Still managed by the government but threats increased because of lack of conservation action in ground

		western Madagascar: analysis of its vulnerability to climate change. - WWF-Mac Arthur conservation Project 2011-2013: Adaptation au changement climatique des écosystèmes de mangroves vulnérables de Tsiribihina et Manambolo (partie Ouest de Madagascar) - Tsiribihina delta Blue Carbone / forest workshop project of Blue ventures-WWF-WOI		
Development of ecotourism	No signaled	Circuit developed on Tsiribihina river	Increased	Web is developed for tourists circuits passing at Belo Tsiribihina (http://www.mada-diary-tour.com/circuits/tsiribihina-et-tsingy/)
Training local people on monitoring skill and BirdLife strategy plan (Tsiribihina delta and Upper Tsiribihina river)				
List & type (number)	No data	Same problem as mentioned at the above IBA of Bombetoka	Increased	
Informing partners on changes of IBA status (Tsiribihina delta and Upper Tsiribihina river)				

Number & list	No data	Pending: we continue to distribute data, report and paper from this project	Increased	
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A1, A2, A3 and A4i are classes of species according to the BirdLife International criteria:

A1: Threatened species listed in IUCN red list

A2: Species with restricted range (according to the five categories of endemic bird area of Madagascar classified by BirdLife International)

A3: Species affiliated to the Biome of West

A4i: Gregarious species with number of individuals over passing the threshold fixed by BirdLife International

IV.2.3. Tambohorano wetlands

The sub sites include Bemoramba, Nosy Ve, Mandrozo (New protected area) and Manapape.

Table 6: Analyzing changes in Tambohorano wetlands

	Zicoma 1999	Actual (2014-2015)	Changes	Comments
Water bird population (Tambohorano wetlands)				

Species richness (all species)	38	58	Increased	
Species richness (A1)	6	9	Increased	<i>Zapornia olivieri</i> , <i>Areola idae</i> and <i>Tachybaptus pelzelinii</i> are newly recorded species in 2014-2015
Species richness (A2)	5	6	Increased	Only <i>Zapornia olivieri</i> differs 2014 survey from Zicoma 1999
Species richness (A3)	4	5	Increased	Only <i>Zapornia olivieri</i> differs 2014 survey from Zicoma 1999
Species richness (A4i)	6	2	Decreased	<i>Egretta dimorpha</i> , <i>Himantopus himantopus</i> , <i>Sterna bengalensis</i> and <i>Sterna dougallii</i> didn't reach their threshold in 2014-2015
Species diversity (Shannon - Weiner index)	0,660	0,898	Increased	
Number of endemic species	5	7	Increased	
Number of threatened species	6	9	Increased	
Abundance (number of individual) of target species 1	1	2	Increased	

<i>(Haliaeetus vociferoides)</i>				
Abundance (number of individual) of target species 2 <i>(Actophilornis albinucha)</i>	1	13	Increased	
Abundance (number of individual) of target species 3 <i>(Ardea humbloti)</i>	6	4	Decreased	
Abundance (number of individual) of target species 4 <i>(Charadrius thoracicus)</i>	61	15	Decreased	
Abundance (number of individual) of target species 5 <i>(Anas bernieri)</i>	67	16	Decreased	
Abundance (number of individual) of target species 6 <i>(Threskiornis bernieri)</i>	90	19	Decreased	
Abundance (number of individual) of target species 7 <i>(Egretta dimorpha)</i>	251	7	Decreased	
Abundance (number of individual) of target species 8 <i>(Himantopus himantopus)</i>	945	6	Decreased	

Abundances of target species A4i (<i>Sterna bengalensis</i>)	3200	5	Decreased	
Abundances of target species 9 (<i>Sterna dougalii</i>)	883	3	Decreased	
Threats (Tambohorano wetlands)				
Overfishing and transforming marshes to rice fields on lakes	Presence	Still running	Increased	Lakes are very disturbed by fishermen and rice cultivators
Collecting eggs and nestling of nesting colonial water bird (terns and herons)	No data	Presence	Increased	People takes eggs and nestling of Terns nesting on rocks of island and herons nesting on mangroves
Fishing and collect of crabs around island and mangrove	No data	Running	Increased	
Hunting water bird on lakes	Mentioned	Still running	Increased	
Development of plants invasive	Presence	Still running	Increased	
Collecting mangroves' woods for building	Not data	Running	Increased	
Ongoing conservation effort (Tambohorano wetlands)				
Conservation action underway	No data	- Lake Mandozo is among the new protected area ,	Increased	

		- Still no conservation action in ground on the let of IBA - Other conservation research run at Mandrozo and Tambohorano mangroves carried by The Peregrine Fund and other NGOs		
Development of ecotourism	No data	No information		
Training of local people on monitoring skill and BirdLife strategy plan (Tambohorano wetlands)				
List & type (number)	No data	Same problem as mentioned at the above IBA of Bombetoka and Belo Tsiribihina	Increased	
Informing partners on changes of IBA status (Tambohorano wetlands)				
Number & list	No data	Pending: we continue to distribute data, report and paper from this project	Increased	

A1, A2, A3 and A4i are classes of species according to the BirdLife International criteria:

A1: Threatened species listed in IUCN red list

A2: Species with restricted range (according to the five categories of endemic bird area of Madagascar classified by BirdLife International)

A3: Species affiliated to the Biome of West

A4i: Gregarious species with number of individuals over passing the threshold fixed by BirdLife International

IV.2.4. Bemamba wetland complex

Table 7: Analyzing changes in Bemamba wetland complex

	Zicoma 1999	Actual (2014-2015)	Changes	Comments
Water bird population (Bemamba wetland complex)				
Species richness (all species)	10	33	Increased	
Species richness (A1)	6	5	Decreased	<i>Zapornia olivieri</i> and <i>Phoeniconaias minor</i> were not found during the survey 2014-2015. Presence of <i>Charadrius thoracicus</i> on saltmarshes beside mangrove and sand beach
Species richness (A2)	5	5	Stable	
Species richness (A3)	4	4	Stable	
Species richness (A4i)	6	6	Stable	
Species diversity (Shannon -	0,577	0,847	Increased	

Weiner index)				
Number of endemic species	5	5	Stable	
Number of threatened species	6	5	Decreased	
Abundance (number of individual) of target species 1 (<i>Actophilornis albinucha</i>)	1	13	Increased	
Abundance (number of individual) of target species 2 (<i>Phoeniconaias minor</i>)	1	0	Decreased	
Abundance (number of individual) of target species 3 (<i>Zapornia olivieri</i>)	1	0	Decreased	
Abundance (number of individual) of target species 4 (<i>Haliaeetus vociferoides</i>)	4	2	Decreased	
Abundance (number of individual) of target species 5 (<i>Anas bernieri</i>)	30	16	Decreased	
Abundance (number of individual) of target species 6 (<i>Ardea humbloti</i>)	50	5	Decreased	
Abundance (number of	0	11	Increased	

individual) of target species 7 (<i>Charadrius thoracicus</i>)				
Abundances of target species A4i (<i>Egretta alba</i>)	500	6	Decreased	Few individuals were found with number under threshold
Abundances of target species A4i (<i>Plegadis falcinellus</i>)	1265	17	Decreased	Few individuals were found with number under threshold
Abundances of target species A4i (<i>Egretta ardesiaca</i>)	2000	5	Decreased	Few individuals were found with number under threshold
Abundances of target species A4i (<i>Chlidonias hybrida</i>)	600	0	Decreased	Few individuals were found with number under threshold
Threats (Bemamba wetland complex)				
Hunting and egg collection of colonial nesting waterbird	Presence	Still running	Increased	
Transforming marshes to rice fields	Presence	Still running	Increased	
Development of invasive plants	Mentioned	Still developing	Increased	
Overfishing	Mentioned	Running	Increased	
Forests cutting and firing	Mentioned	Still running	Increased	
Sedimentation in lake	Presence	Still running	Increased	
Ongoing conservation effort (Bemamba wetland complex)				
Conservation action underway	Classified as	- No conservation in ground	No changed	

	hunting reserve since 1972	nor effective management was carried out at the site - Some research conservation projects passed sometimes such as monitoring wetland bird carried by the team of Durrell wildlife trust and Peregrine fund	but threats Increased	
Development of ecotourism	No data			
Number of trained local people on monitoring skill and BirdLife strategy plan (Bemamba wetland complex)				
List & type (number)	No data	Same problem as mentioned at the above IBAs	Increased	
Number of informed partners on changes of IBA status (Bemamba wetland complex)				
Number & list	No data	Pending: we continue to distribute data, report and paper from this project	Increased	

A1, A2, A3 and A4i are classes of species according to the BirdLife International criteria:

A1: Threatened species listed in IUCN red list

A2: Species with restricted range (according to the five categories of endemic bird area of Madagascar classified by BirdLife International)

A3: Species affiliated to the Biome of West

A4i: Gregarious species with number of individuals over passing the threshold fixed by BirdLife International

IV.2.5. Summary of changes in the studied IBAs

Taking together the number of items improved, stable and declined, we can estimate the percent (%) of IBA improved, stable (no change) and declined in term of wetland bird states, threats and on-going conservation actions.

Table 8: Summarizing changes in four studied IBAs

	Bombetoka		Tsiribihina		Tambohorano		Bemamba	
	Waterbird (number)	Waterbird (%)	Waterbird (number)	Waterbird (%)	Waterbird (number)	Waterbird (%)	Waterbird (number)	Waterbird (%)
Declined	5	28	13	62	9	50	11	58
Improved	12	67	7	33	9	50	4	21
Stable	1	6	1	5	0	0	4	21
Total	18	100	21	100	18	100	19	100

	Bombetoka		Tsiribihina		Tambohorano		Bemamba	
	Threats (number)	Threats (%)	Threats (number)	Threats (%)	Threats (number)	Threats (%)	Threats (number)	Threats (%)
Decreased	0	0	0	0	0	0	0	0
Increased	9	100	6	100	6	100	6	100

Stable	0	0	0	0	0	0	0	0
Total	9	100	6	100	6	100	6	100

	Bombetoka		Tsiribihina		Tambohorano		Bemamba	
	On-going conservation (number)	On-going conservation (%)		On-going conservation (%)	On-going conservation (number)	On-going conservation (%)	On-going conservation (number)	On-going conservation (%)
Decreased	0	0	0	0	0	0	0	0
Increased	2	100	2	100	1	100	1	100
Stable	0	0	0	0	0	0	0	0
Total	2	100	2	100	1	100	1	100

Dominant characters are highlighted in yellow, for instance: status of waterbird population is improved in 67% of studied characters (A1, A2, A3 etc...) at Bombetoka IBA, declined in 62% at Tsiribihina IBA, 50% of improved and declined at Tambohorano IBAs and declined in 58% at Bemamba IBA.

Taking account only these dominant characters, table below showed presence (1) and absence (0) of dominant character at each IBA enabling us to estimate percent of IBAs improved, stable and declined in term of analysed characters in waterbird population, threats and on - going conservation.

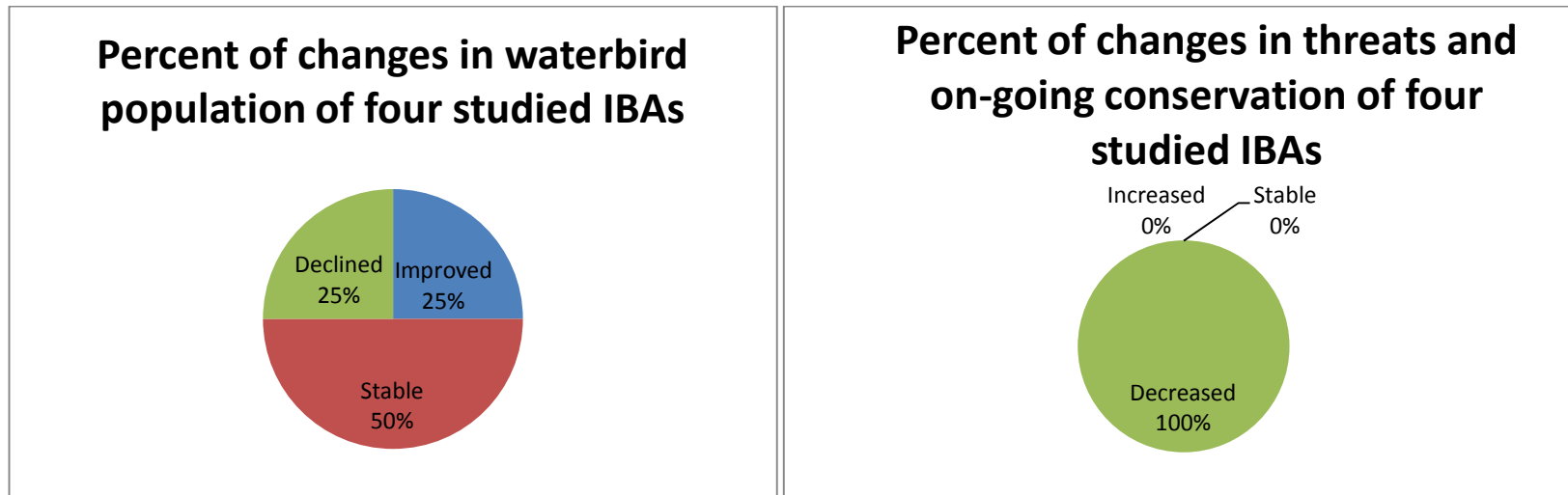
Table 9: Percent of IBAs improved, stable and declined

	Bombetoka bay and Marovoay wetlands	Tsiribihina delta and Upper Tsiribihina river	Tambohorano wetlands	Bemamba wetland complex	Percent (%)
IBA improved in	1				25

term of wetland bird states					
IBA stable (no change) wetland bird states			1		25
IBA declined in term of wetland bird states		1		1	50
IBA improved in term of threats	1	1	1	1	100
IBA stable (no change) in term of threats	0	0	0	0	0
IBA declined in term of threats	0	0	0	0	0
IBA improved in term of on-going conservation actions	1	1	1	1	100
IBA stable (no change) in term of on-going conservation actions	0	0	0	0	0
IBA declined in term	0	0	0	0	0

of on-going conservation actions					
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Figure 1: Percent of changes in four studied IBAs



Among the four studied IBAs (100%), 1 IBA (**Bombetoka bay and Marovoay wetlands**) is improved in term of waterbird population when another IBA (**Tambohorano wetlands**) is stable and 2 other IBAs (**Tsiribihina delta and Upper Tsiribihina river and Bemamba wetland complex**) are declined.

V.3. Realization of objective 4

Producing and distributing a summary data or report on conservation status of four target habitat (actual states, changes and trends on their bird states, threats and on-going conservation actions) to the partners (BirdLife International, ASITY, Peregrine Fund, Durell Wildlife, Ramsar, Wetland International, AEWA and others) are still running since we improve this summary data after further data analysis we have done in our report and paper from this project to make them more useful for these target partners.

VI. Discussion

- Water bird of Bombetoka IBAs may not fully listed in Zicoma reports, Zicoma 1999 and Birdlife 2001, only shortlist of important bird was reported.
- We compared only water bird species, we didn't include forest bird
- On-going conservation research are not sufficiently reported or completely published in media (websites, library, scientific paper...).
- Timetable of fieldwork and amount of areas visited during data collecting may differ between Zicoma 1999 and RGS project fieldwork time.

VII. Conclusion

This project enabled us to update conservation status of four target IBAs in which we conclude that some sites inside of these IBAs are progressed to be included in new protected areas such as the case of Lake Mandrozo of Tambohorano IBAs and mangrove of Tsiribihina IBAs.

The protection status of Bombetoka IBA is underway.

The Bemamba IBAs, some parts of Bombetoka, Tsiribihina and Tambohorano didn't yet get any protection.

This project constitute an useful step for involving local people on waterbird survey and participatory monitoring and clarified the steps that we need for improving the conservation of these IBAs.

VIII. References

BirdLife 2001. Important Bird Areas in Africa and associated islands - Madagascar

Zicoma 1999. Les zones d'Importance pour la conservation des oiseaux à Madagascar. Projet Zicoma, BirdLife Madagascar, Antananarivo.

<https://blueventures.org/conservation/blue-forests/>

<http://www.mada-diary-tour.com/circuits/tsiribihina-et-tsingy/>

<http://www.birdlife.org/datazone/species/factsheet/>

Photos



Shrimp farm of AQUAMEN (in Tsiribihaha delta IBA)



2 eggs on Kittlitz's plover nest at Maroavoay lake (Bombetoka IBA)

Exploitation of Mangrove woods from Bombetoka bay to sell to Mahajanga for houses and fences building:



Island at the Lake Mandrozo's water plan



Pirogues with full of mangrove woods

Examples of trained local guides for Bird survey from Marovoay and Mataitromby (Bombetoka bay):



Example of member of local conservation team built by Fanamby association at Mataitromby (Bombetoka bay):



Types of fishing practiced at Lake and fish treatment (drying) at Mangrove camp:



Fishing net



Treating fish before drying



Collected fish



Drying fish

Photo examples of some project's target species:



Threskiornis bernieri



Ardea humbloti



Anas bernieri