



PRELIMINARY REPORT

Project Title: Patterns of diversity, distribution and conservation status of some highly threatened bird's species in a fragmented landscape: the case of the Comoros Island's

County: Comoros

Project ID: 26731-2

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CONTEXTE

The Comoros archipelago is a biodiversity hotspots due to its high level of endemism (Myers et al. 2000). However, this archipelago represents one of the poorest nations in the world and about 72% of the population directly depend on forest resources for subsistence (Bourgoin et al. 2017; Fisher and Christopher 2007). Because of this natural resource dependence, natural habitats on these islands have undergone dramatic changes in their natural landscape and are facing one of the highest rates of habitat loss worldwide (9.3% each year, FAO 2010). Moreover, the islands suffer a fast-growing population that induces a strong need for agricultural areas and wood for construction (Elvidge et al. 2009). This intensive land use is the direct cause of the huge rate of natural habitat loss observed in the archipelago (Ibouroi et al. unpublished results). In the Comoros Islands, endemic and forest dwelling animals are mostly threatened by rapid habitat loss and are classified as critically endangered or endangered by the International Union of the Conservation of Nature (IUCN) because of their small population sizes, and their small distributions (Daniel et al. 2016; Ibouroi et al. 2018, Ibouroi et al. 2019).

Understanding diversity, population sizes and distribution of the mostly threatened species especially those living in a changing habitat is essential to gain insight into how these species respond to habitat fragmentation which is highly needed in order to establish a reliable conservation action (Ibouroi et al. 2018b).

The first field work of our project took place from February to May 2019 in two islands (Anjouan and Mohéli) of the Comoros archipelago. This consisted to:

- Inventory and study the diversity (presence, distribution) of birds and others biodiversity including lemurs, flying foxes;
- Assess the population density and size of some highly threatened species for instance the Anjouan scops owl (*Otus capnodes*), the Grande Comoro scops owl (*Otus pauliani*), the Livingstone's flying fox (*Pteropus livingstonii*), the Mongoz lemur (*Eulemur mongoz*) etc.
- Assess relationships between stakeholders and natural resource uses and their impacts on natural habitats in the Comoros islands. More specifically we assessed (1) how stakeholders perceive benefits from natural resources and how they impact biodiversity, (2) the various knowledge, perceptions and attitudes towards biodiversity and conservation actions. Such information might help (1) to understand the

representation of the local community for this biodiversity, (2) to interpret the ongoing natural habitat evolution and to predict its future allowing us to subsequently propose some relevant long-term conservation actions and habitat management.

The selection of sampling sites was based on published data (Herremans et al. 1991, Louette et al. 2004, Green et al. 2015, Daniel et al. 2016, Ibouroi et al. 2018a, b). In these two islands of Comoros, we sampled sites where a wide variety of habitats were available from low lands with degraded vegetation and under-planted forests (300 m high) to high elevation forest (2,000 m high). This range of habitats is necessary when sampling occurrence data in order to compare sites in which a species is present with sites in which it is absent.

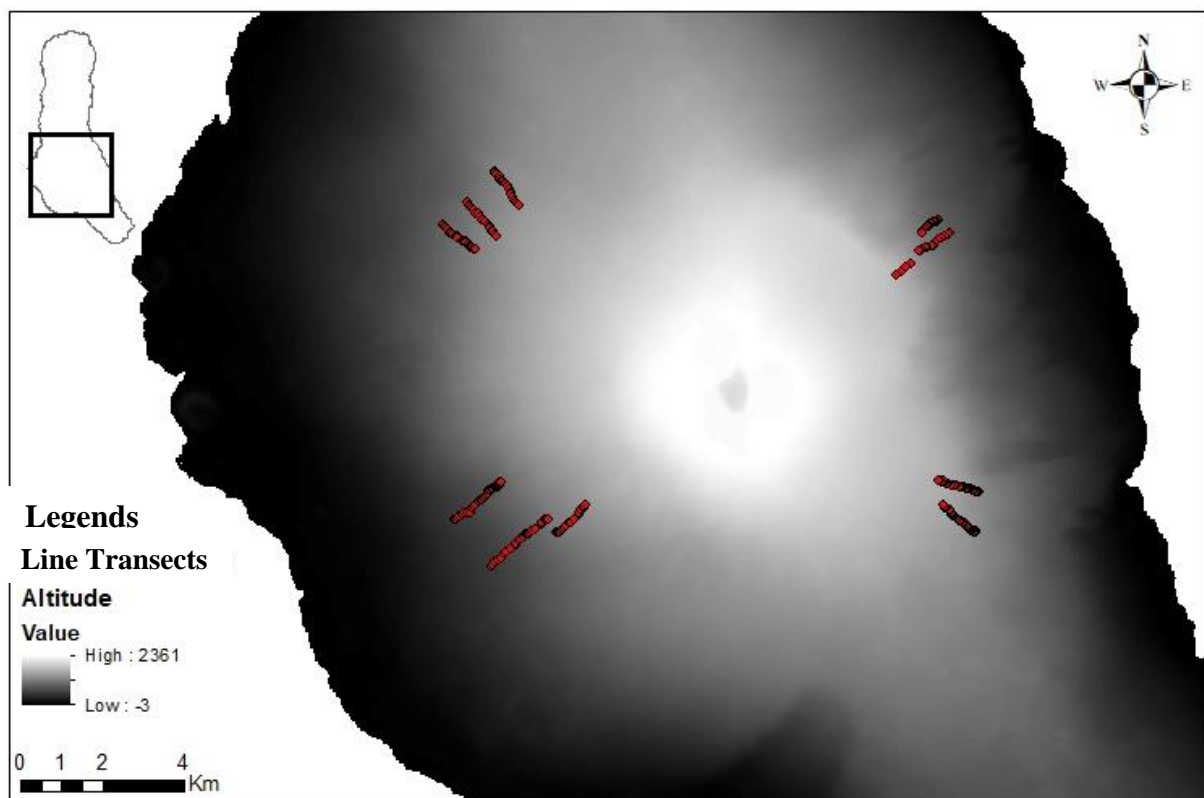


Fig. 1: Representation of line transects following the altitudinal gradient in the Grande Comoro forest especially in the Karthala forest

Line transect surveys

Distance sampling data were recorded along line transects. In each location, transects were apart from each other by approximately 500 to 1,000 m. The starting point of a transect was randomly selected and the trail followed the altitudinal gradient (Fig. 1).

Each transect was visited at least three times in total from 6:30 to 10:30 pm by two to three observers (Ibouroi et al. 2013; Meyler et al. 2012). In each forest, two to three teams worked

simultaneously in the different established transects during surveys. In each survey, observers of each team walked slowly (0.5 to 1km/h) with head lamps along each line transect (Ibouroi et al. 2013; Salmona et al. 2014). During the surveys, when a birds or mammals were observed or heard at a distance of between 0 and 150 m from the center of line transect, estimated perpendicular distance and time of sighting were recorded.

Handling Process and tissue samples collection

In the different visited sites, birds and bats were sampled for genetic analysis. For these sampling process, tissue samples were collected from individuals captured using a black nylon mist net (25 mm mesh, 12 m long, 3 m high, four pockets). One small ear sample was collected from each captured individual and placed in a 1.5 ml tube containing 96° ethanol for laboratory analysis.



Fig. 2: Captured Anjouan scops owl (*Otus capnodes*), photo by Mohamed Thani Ibouroi



Fig. 3: Captured Anjouan scops owl (*Otus capnodes*), photo by Mohamed Thani Ibouroi

DNA from the tissue samples was extracted using the DNeasy blood and tissue kit (No. 69506) in the ‘Genetic markers in ecology’ service at the Center of Functional and Evolutionary Ecology (CEFE, Montpellier, France). We followed the manufacturer’s protocols. As we did not have much tissues of birds to sufficiently carry out genetic analysis

of birds species, only DNA from flying fox was amplified. Amplification was performed with Polymorphism Chain Reaction (PCR) 8 microsatellite loci (A1, C6, PH9, A2, CSP7, A3, and B29) described for *Pteropus rodricensis* and results are in process.



Fig. 4: Handling Process and tissue samples collection of the Livingstone's flying fox, photo by a local guide

Preliminary results

1- Inventory and study of the diversity (presence, distribution) of birds in the Comoros

Tableau 1: Distribution of the inventoried species in the Grande Comoro Island following the altitudinal gradient.

| Species | AltMin | AltMax | Nb total | Nb (400-800) | Nb (800-1200) |
|--------------------------------------|-----------------|-----------------|-----------|--------------|---------------|
| <i>Acridotheres tristis</i> | 706,4955 | 940,9836 | 10 | 7 | 3 |
| <i>Alectroenas sganzini sganzini</i> | 612,9084 | 1115,068 | 26 | 14 | 12 |
| <i>Cinnyris comorensis</i>* | 620,0798 | 1127,385 | 71 | 39 | 32 |
| <i>Circus macroscleles</i> | 732,1238 | 1197,68 | 2 | 1 | 1 |
| <i>Columba polleni</i> * | 696,4157 | 746,1223 | 2 | 2 | 0 |
| <i>Coracopsis nigra</i> | 696,4157 | 758,2222 | 4 | 4 | 0 |
| <i>Coracopsis vasa</i> | 607,3091 | 1197,68 | 26 | 19 | 7 |
| <i>Corvus albus</i> | 696,4157 | 1127,385 | 5 | 2 | 3 |
| <i>Dicrurus forficatus potior</i> | 633,1205 | 1096,437 | 18 | 10 | 8 |
| <i>Eulemur mongoz</i> | 611,3975 | 1042,699 | 18 | 9 | 9 |
| <i>Foudia eminentissima</i> | 620,0798 | 1119,939 | 11 | 4 | 7 |

| | | | | | |
|-------------------------------------|-----------------|-----------------|-----------|-----------|----------|
| <i>anjouanensis</i> * | | | | | |
| <i>Foudia madagascariensis</i> | 696,4157 | 836,3782 | 4 | 1 | 3 |
| <i>Hypsipetes madagascariensis</i> | 623,1854 | 966,8912 | 19 | 11 | 8 |
| <i>Leptosomus discolor</i> | | | | | |
| <i>intermedius</i> | 760,1446 | 919,9473 | 6 | 6 | 0 |
| <i>Nesillas typica longicaudata</i> | 612,9084 | 1135,116 | 32 | 14 | 0 |
| <i>Otus capnodes</i>* | 607,3091 | 1188,371 | 67 | 36 | 0 |
| <i>Pteropus livingstonii</i> | 612,9084 | 1103,307 | 39 | 26 | 0 |
| <i>Pteropus seychellensis</i> | | | | | |
| <i>comorensis</i> | 633,1205 | 1061,897 | 12 | 11 | 0 |
| <i>Rattus sp.</i> | 644,1259 | 644,1259 | 1 | 1 | 0 |
| <i>Streptopelia capicola</i> | 937,9894 | 940,9836 | 2 | 0 | 2 |
| <i>Streptopelia picturata</i> | | | | | |
| <i>comorensis</i> | 620,0798 | 1073,304 | 3 | 2 | 1 |
| <i>Terpsiphone mutata vulpina</i> | 631,2239 | 1127,385 | 23 | 14 | 9 |
| <i>Turdus bewsheri bewsheri</i> * | 610,5905 | 1119,939 | 15 | 4 | 11 |
| <i>Tyto alba</i> | 966,8912 | 966,8912 | 1 | 0 | 1 |
| <i>Zosterops maderaspatanus</i> | | | | | |
| <i>anjouanensis</i> | 633,1205 | 1073,304 | 26 | 11 | 15 |

Nb : encountered number of individuals; Tot : total ; AltMin : minimal altitude ; AltMax : maximal altitude ; * : endemique species of the Comoros ; only endemic species from the Grande Comoro are shown in bold.

Tableau 2: Distribution of the inventoried species in the Anjouan Island following the altitudinal gradient.

| Species | AltMin | AltMax | Nb total | Nb (400-800) | Nb (800-1200) |
|--|-----------------|-----------------|-----------|--------------|---------------|
| <i>Acridotheres tristis</i> | 706,4955 | 940,9836 | 10 | 7 | 3 |
| <i>Alectroenas sganzzini sganzzini</i> | 612,9084 | 1115,068 | 26 | 14 | 12 |
| <i>Cinnyris comorensis</i>* | 620,0798 | 1127,385 | 71 | 39 | 32 |
| <i>Circus macroscyles</i> | 732,1238 | 1197,68 | 2 | 1 | 1 |
| <i>Columba polleni</i> * | 696,4157 | 746,1223 | 2 | 2 | 0 |
| <i>Coracopsis nigra</i> | 696,4157 | 758,2222 | 4 | 4 | 0 |
| <i>Coracopsis vasa</i> | 607,3091 | 1197,68 | 26 | 19 | 7 |
| <i>Corvus albus</i> | 696,4157 | 1127,385 | 5 | 2 | 3 |
| <i>Dicrurus forficatus potior</i> | 633,1205 | 1096,437 | 18 | 10 | 8 |
| <i>Eulemur mongoz</i> | 611,3975 | 1042,699 | 18 | 9 | 9 |
| <i>Foudia eminentissima</i> | | | | | |
| <i>anjouanensis</i> * | 620,0798 | 1119,939 | 11 | 4 | 7 |
| <i>Foudia madagascariensis</i> | 696,4157 | 836,3782 | 4 | 1 | 3 |
| <i>Hypsipetes madagascariensis</i> | 623,1854 | 966,8912 | 19 | 11 | 8 |
| <i>Leptosomus discolor</i> | | | | | |
| <i>intermedius</i> | 760,1446 | 919,9473 | 6 | 6 | 0 |

| | | | | | |
|-------------------------------------|-----------------|-----------------|-----------|-----------|----------|
| <i>Nesillas typica longicaudata</i> | 612,9084 | 1135,116 | 32 | 14 | 0 |
| <i>Otus capnodes</i>* | 607,3091 | 1188,371 | 67 | 36 | 0 |
| <i>Pteropus livingstonii</i> | 612,9084 | 1103,307 | 39 | 26 | 0 |
| <i>Pteropus seychellensis</i> | | | | | |
| <i>comorensis</i> | 633,1205 | 1061,897 | 12 | 11 | 0 |
| <i>Rattus sp.</i> | 644,1259 | 644,1259 | 1 | 1 | 0 |
| <i>Streptopelia capicola</i> | 937,9894 | 940,9836 | 2 | 0 | 2 |
| <i>Streptopelia picturata</i> | | | | | |
| <i>comorensis</i> | 620,0798 | 1073,304 | 3 | 2 | 1 |
| <i>Terpsiphone mutata vulpina</i> | 631,2239 | 1127,385 | 23 | 14 | 9 |
| <i>Turdus bewsheri bewsheri</i> * | 610,5905 | 1119,939 | 15 | 4 | 11 |
| <i>Tyto alba</i> | 966,8912 | 966,8912 | 1 | 0 | 1 |
| <i>Zosterops maderaspatanus</i> | | | | | |
| <i>anjouanensis</i> | 633,1205 | 1073,304 | 26 | 11 | 15 |

Nb : encountered number of individuals; Tot : total ; AltMin : minimal altitude ; AltMax : maximal altitude ; * : endemique species of the Comoros ; only endemic species from Anjouan are shown in bold.

2- Master thesis completion

The first important outcome of our project is the completion of the Master thesis of ALI HASSANI Anziza which supervised by Ibouroi Mohamed Thani, Aurélien Besnard and Claudine Montgelard in the Centre d'Ecologie Fonctionnelle et Evolutive (CEFE) UMR 5175 Campus CNRS-1919 Route du Mende 34293 Montpellier (See the French version of this master thesis in pdf).

3- International Publications

This project allows us to publish some of our results to international journals as referenced:

Ibouroi M.T, Ali-Hassane N, Moindjié S, Ombade M, Mohamed N, Hamidou-Saidou M, Abderemane K, Ali Cheha A, Chiffard J. (2019) The first comprehensive survey of habitat suitability and population size for the endangered Grande Comoro Scops Owl (*Otus pauliani*): implications for its conservation. *Journal of Ornithology*. DOI: 10.1007/s10336-019-01689-0

<https://link.springer.com/article/10.1007%2Fs10336-019-01689-0>

Another paper is currently in submission to another international journal especially the “AMBIO” journal. Ref of this paper is:

Ibouroi M.T, Dhurham SAO, Besnard A, Lescureux N. Poverty is the main driver of unsustainable use of natural resources in the Comoros Islands , in submission to AMBIO.