Ringing dataset to inform equipment of geolocator

Raphaël Nussabumera\* (ORCID: 0000-0002-8185-1020 ; twitter: rafnuss) and Colin Jacksona

aA Rocha Kenya, Watamu, Kenya

\*corresponding author: [raphael.nussbaumer@arocha.org](mailto:raphael.nussbaumer@arocha.org)

# Abstract

# Introduction

The Spotted Ground Thrush (Geokichla guttata) was still relatively common on the coastal forest of Kenya in the 70s and 80s, but since, they have become much scarser with an estimated >80% decline between 1980-2000 (\cite{Ndanganga2008}). The reason for this decline hasn't been fully elluciated as their wintering ground has been protected for the entire period, while their breeding grounds had remains largely unkown.

The tragedy of the Spotted Ground Thrush is likely not the only one intra-african migrant, although little is known about African bird population trend. Indeed, afro-tropical migration is complex and diverse \{Benson1982}, and are the result of a fine-tuning with the climate and habiat constrains \cite{Hockey2000}. The combined effect of the rapid habitat destruction and climate change impacting the african continent can be expected to affect migrant bird more than resident as their migration route, timing relies on the predicatbility of food which itselft depends on habitat and weather \cite{Vickery2014}. Effective protection of intra-african migrant species, as in the exemple of SGT, has to start with a better understanding their migration: its route, stoppover site, timing, trigger (rain? temperautre, etc), the variability of route, the influence of age and sex...

Uncovering some of these question has been made easier in recent year thanks to the deployement of geolocator (ref). Their low cost, low weight and additional measurement (pressure, temperature etc..) \cite{Meier} have allowed to study various aspect of the migration strategy \cite(McKinnon2018a).

Arguably, a major limitation with this technology is the necessity to recapture the bird equip in the following year(s) to retrieve the data [ref to the 20% threashold].

Several controle factor affect the recapture rate such as

* location of equipement (breeding site, wintering, stopover),
* the timing (in link with location or within season early in the year, or late),
* sex,
* age,
* breeeder/non-breeder,
* size or weight.
* In general,
* male : greate site fidelity for shorebird (\cite{Weiser2015})
* previously tagged individual improve return rate \cite{Weiser2015}
* breeding succes improve return rate \cite{Weiser2015}
* early breeder have higher return rate \cite{Weiser2015}

Because of juvenile mortality and fidelity of breeding/wintering site, most study focus on adult bird.

These have to be consider with care in link to the study objectiv as to not biais result.

[Blackburn2017 connectivity study equpping paleartic migrant at their wintering site. ]

All study have focuse on the effect of geolocator on bird, here we focus on the pre-deployement analysis using existing ringing database with the aim to optimize the equipement ringing session effort

Most study have focus on long-distant migrant with relatively well-known migration timing and route. Here intra-african which have more complex and variable movement.

Most study on breeding site, here on wintering site.

In this study, we aims at showing an exemple of how a ringing database can help to plan the equipment of geolocator. The utlimate objectif is optimize the equipement planification as to maximize the recovery rate of the geolocator. The parameters to controle this optimization is how many geolactor can be deploy, when to deploy them, on which bird (age and sex). This has obviously be done in link with the research question and hypothesis of the study.

We are applying this methodology on RCRC two intra-african migrant arriving in mid-May in the coast of kenya and leaving in the last months of the years.

# Materials and methods

## Ringing Site and Database

Mwamba field study center is located on the coast of Kenya (3°22'36.3"S 39°59'16.9"E) on a strips of residential costal scrub/forest that have benefit from little change over the last 50 years (Alemayehu2016). More generally, it is located on the coastal flyway, and locally a green belt along the coast (creek blocking/forest disapeared elswhere). For instance, in 2019, while the rest of the area was expericenced a dry year, the site remained the last one wet which resulted in an higher-than-usual capture of paleartic migrant. The ringing station started in 1998 but it was mainly in 2002. Still ongoiong but data up to mid-2019.

- `r nrow(dmrcrc)` ringing session, `r length(unique(dm$SpeciesID))` species, `r nrow(dm)` entries.

The ringing sessions are relatively well-spread throughout the year, although with a higher intensity in Spring. Over the years, there is a more heterogenous distribution: very good coverage between 2003 and 2007, variable from 2008 to 2012.

Ringing effort:

- weather: assumed to averaged out over the year.

- Total nets length is `r mean(dmrcrc$NetsLength,na.rm=TRUE)`m in average () number and length of nets. `r sum(is.na(dmrcrc$NetsLength))`/`r nrow(dmrcrc)` have no net lengths recorded.

- duration of ringing: `r sum(is.na(dmrcrc$NetsDuration))`/`r nrow(dmrcrc)` `r mean(dmrcrc$NetsDuration,na.rm=TRUE)` (std=` sqrt(var(dmrcrc$NetsDuration, na.rm=TRUE))`)

**Results**

**Discussion**

**Acknowledgments**

This work was supported by the the Swiss Ornithological Institute and A Rocha Kenya

**Declaration of interest statement**

**References**

**appendices (as appropriate);**

**table(s) with caption(s) (on individual pages);**

**figures;**

**figure captions (as a list).**