Population demography and spatial ecology of Saddlebills *Ephippiorhynchus senegalensis* in the Greater Kafue and Liuwa Ecosystems of Zambia

Project Report: June–July 2019

Jonah Gula, MSc Student
Texas State University San Marcos
jonah.gula@yahoo.com

Funded by:

AFRICAN BIRD CLUB

TEXAS STATE UNIVERSITY
The rising STAR *of Texas*

Acknowledgements

The pilot field season of this project was made possible by the financial support of African Bird Club, Texas State University's Thesis Research Support Fellowship, and the Lamar and Marilynn Johanson Graduate Endowment in Biology, as well as private donations from Jamie Magiera, Melania Willis, Kathy Sparks, Mariana Rivera Rodriguez, and Patrick Barrera. I am especially grateful to Loretta Gosting, who provided funding to purchase five GSM transmitters to be deployed on Saddlebills. Thanks to my advisors, Clay Green, Gopi Sundar, and Sarah Fritts, for their support and help with funding proposals and much more. Special thanks to Amukena Mungole, Andre Botha, and Nyambi Nyambi for their tireless effort and commitment during our trying fieldwork, and to Sprina Liu, Kevin Graham, and Marcie Herry from the Dallas Zoo for allowing me to practice handling Saddlebills in their collection prior to fieldwork. This project would also not have been possible without the support of African Parks Zambia and the Liuwa Plain National Park staff, particularly Ian Pollard, Sally Reece, and Deon Joubert. I would like to thank the many people who helped in various ways leading up to and during the field season: Griffin Shanungu, Chaona Phiri, Chinga Lufwino, Daan Smit and the Zambian Carnivore Programme Liuwa team, John Silume, Mobita Kayawa, Mary Gula, and Kathy Brautigam. Finally, thanks to the villagers in Liuwa Plain National Park who welcomed our continual interrogation about the whereabouts of *mulombwe*.

Summary

The overall aim of this project is to describe the demographic characteristics and spatial use patterns of the Saddlebill Stork, which has never been the subject of an ecological study. The novelty of the research, however, came with innumerable risks and challenges that ultimately caused the project to evolve over the course of its development and implementation.

Unfortunately, the pilot field season followed western Zambia's driest rainy season in recorded history (40 years), which had a significant impact on the success of the fieldwork. The drought resulted in very few remaining pools and therefore few Saddlebills. Additionally, the lack of water created significant human fishing pressure that led to prey depletion and direct disturbance by fishermen. These unanticipated challenges out of our control resulted in only one Saddlebill capture in Liuwa Plain National Park. The adult female that was captured was fitted with a GSM transmitter, representing the first unit ever deployed on the species for tracking movement.

Even though we failed to accomplish the capture objective for the pilot field season, we gained vital knowledge about (1) capturing adult Saddlebills, (2) Saddlebills' sensitivity to human activities, and (3) the effect that irregular climate events can have on Saddlebills. Although there has not been a download from the GSM unit yet, the single stork we captured will provide the first information on Saddlebill movement, which may prove to be particularly significant during this extremely dry year.

Introduction

The Saddlebill Stork *Ephippiorhynchus senegalensis* has never been the subject of an ecological study, and the true status of the species across its range is unclear despite its current conservation assessment. There is a need for baseline information on population and spatial ecology to help inform a scientific conservation assessment and to determine the effectiveness of protected areas in conserving the species. The Saddlebill has potential to act as a flagship species for waterbirds given that it is a wetland generalist. Additionally, evidence of large-scale dispersal movements by juveniles (Gula et al., in review) suggests the species may also help in measuring landscape wetland connectivity.

This project set out to describe population demography and spatial ecology in two major ecosystems in western Zambia, Kafue and Liuwa Plain National Parks, using aerial surveys and telemetry. The research is the basis of my Master's Thesis at Texas State University and ultimately aims to understand the value of protected versus unprotected wetlands for waterbirds in Zambia.

Methods

Due to logistical and financial challenges, fieldwork in June–July only occurred in Liuwa Plain National Park, which has since become the only study area for the project. Aerial counts were carried out in the park to count Saddlebills and map the distribution of individual storks, as well as for capture reconnaissance. Due to a significant drought (see below), survey effort focused on the limited remaining water sources, which were easily detectable from the air.

Since no breeding occurred this year and juveniles were not available for capture (see below), we employed a variety of methods in our attempt to capture adult Saddlebills. Nightly, we tried to spotlight-capture storks located in remaining pools–a method that was met with success several times in Zimbabwe (U. Bryson, pers. comm.). In this technique two or three people with spotlights approached and surrounded Saddlebills that were spending the night in shallow pools. Ideally, the stork would be attracted to the light or move away onto land where it could be surrounded and netted while it was disoriented by the approaching lights.

We also used simple fishing line snares along a central rope line suspended in shallow/grassy water. After locating storks we either slowly pushed them from the pool and set the snare lines or set them in an adjacent pool. While stepping during foraging in the pool the stork should drag its foot along the water's surface and get caught in a snare loop. Then we would use a net to secure the stork's head and safely capture it. Similarly, we employed short snare lines surrounding a staked fish on the shore of a pool in hopes of baiting storks.

Upon capture, a stork was fitted with a backpack-style GSM transmitter, which records hourly locations and transmits them when the bird is within range of a cell phone tower.

Results & Discussion

The research was initially planned for both Kafue and Liuwa Plain National Parks, which proved to be overly ambitious and, ultimately, logistically unfeasible with the resources available. Therefore, it was decided Liuwa Plain alone offered the best opportunity to successfully answer the project's questions since the logistical challenges presented in Kafue were too great.

Unforeseen challenges out of our control characterized the pilot field season. The 2018–2019 rainy season in western Zambia was the driest in recorded history (40 years), which had significant implications for Saddlebill Storks and this research. No evidence of breeding (i.e. occupied nests or juveniles) was observed this year by personnel from this project or others working in Liuwa Plain National Park. This meant we had to switch our telemetry focus to adults for this season since no juveniles were present to capture.

The drought also meant very few pools–and therefore Saddlebills–remained in the study area, which we designated as a 20km radius from basecamp due to logistics and fuel expenses. During flight surveys a maximum of 40 storks were counted in the park at the few remaining water sources, the majority of which were located in difficult to access areas (Figure 1). African Parks conducted a full census of Liuwa in July and counted roughly 40 storks as well. These results are in significant contrast with the International Crane Foundation's survey estimates from July 2003, in which they estimated 314 Saddlebills based on a count of 157. Since Saddlebills can be individually identified by their bill pattern, I determined there were only twelve Saddlebills (three singletons, three pairs, and one trio) consistently within our rough study area, most of which exhibited no clear behavioral or spatial patterns. Figure 1 shows the distribution of sightings during fieldwork.

The lack of water in the study area also created a concentrated fishing pressure from the Lozi people that reside within the park. Not only did fishermen deplete pools over the course of our time in the park, but also they often disturbed storks and caused them to fly away during our capture attempts and observation periods. We visited most remaining pools within the study area on a daily basis and observed the disappearance of most or all waterbirds (including Saddlebills in some instances) following fishermen deploying gill nets. At several pools Saddlebills never returned after we observed fishermen activity.

Over the course of three weeks, with an average of 10 hours of effort per day, only one adult female Saddlebill was captured in a fishing line snare and fitted with a GSM transmitter. Our snaring effort resulted in 16 misses in which storks walked and foraged around/over our snare lines but were never trapped. Our nightly attempts to spotlight storks resulted in 15 flushes (stork flew upon initial approach or spotlighting) and 7 misses (stork was surrounded by spotlights and within 10 meters before it flew). We also incidentally captured one adult Wattled Crane in a snare.

The first Saddlebill Stork ever fitted with a tracking unit, captured 26 June 2019.

It is unclear why the spotlight method failed given its success on three occasions in Zimbabwe. The snares seem to work best if there is a specific foraging spot that storks return to even after being pushed away, which is the context in which we successfully trapped the female. During our initial trapping effort we used small reed floats on each snare loop but the storks appeared to deliberately avoid them and walk around the lines. This may be because fishermen use similar floats on their gill nets and the storks may be familiar with avoiding them. We soon came to develop the opinion that Saddlebills are fairly intelligent and easily recognized our attempts to snare them.

Although we failed to deploy all five transmitters, we left with valuable knowledge about what does and does not work for capturing adult Saddlebills. Critically, we also confirmed that Saddlebills are sensitive to human disturbance and more so than sympatric species. We often found Wattled and Grey Crowned Cranes, herons, Hamerkop, Fish Eagles, and shorebirds near fishing activity or immediately returning to pools after fishermen left. Saddlebills, on the other hand, either never returned or did so days later. It is expected that in dry years Saddlebills and other waterbirds will not breed due to lack of water and prey, but the effect of concentrated fishing pressure, although only qualitative here, has not been previously described. As shifts in weather patterns, such as this year's drought, continue to increase in frequency due to climate change, the dynamics we observed in Liuwa may become more frequent and widespread across the Saddlebill's range.

Due to the challenges that resulted from the unforeseen drought, we hope to return to Liuwa in December 2019 to deploy the remaining four transmitters. The rains are forecast to begin in late November so the increasing amount of water should cause Saddlebills to return to the park. In addition to a larger number of Saddlebills

available for capture, we will return with new techniques to ensure success. We would like to employ a net gun since many storks allowed a close approach in a vehicle or with a spotlight. Similarly, a weighted cast-net (which is not used in western Zambia and was therefore not available to us) may be practical in some of the pools with higher banks. We plan to use snares if we locate storks that have high fidelity to specific forage spots. Finally, we will conduct follow-up aerial counts to determine how abundance and distribution changed from the dry season. Flights may also allow us to detect active nests depending on when the storks begin breeding in the park.

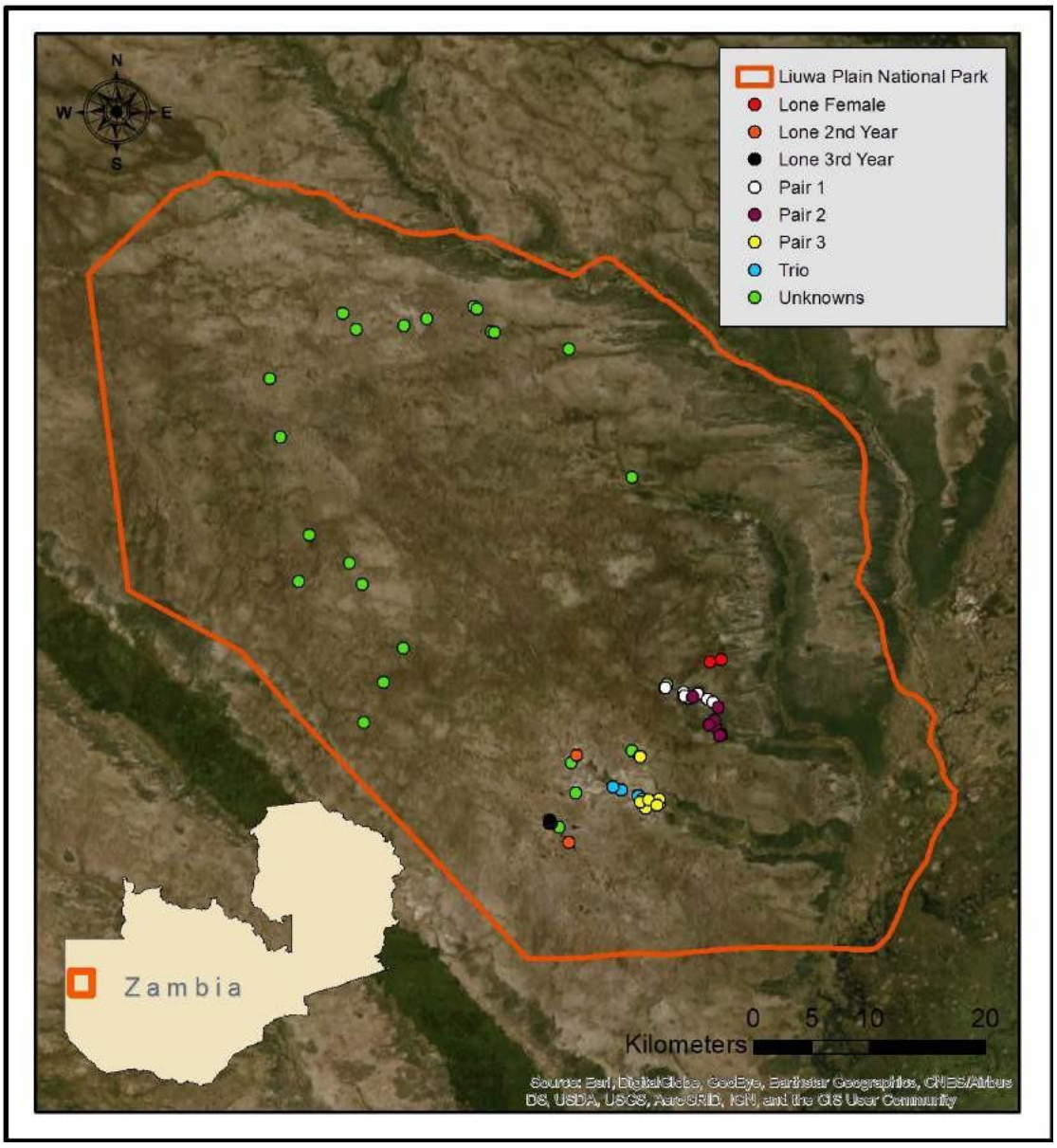

Figure 1. Locations of Saddlebill Stork sightings in Liuwa Plain National Park, June-July 2019. Storks with unknown identities were recorded in flight or while spotlighting. Individuals within our rough study area were identified using bill patterns.