ECOLOGY OF SITATUNGA IN UGANDA

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INTRODUCTION:

Sitatungas have a wide distribution across Africa, but in central Uganda, sitatunga populations have not been formally assessed to determine whether they are stable or decreasing – as recently as 2008 the species was suspected of being highly endangered in portions of Uganda(1,2). As a game species, sitatunga offer an incentive for conservation of them and their habitat(3). Understanding the density and habitat use of sitatunga will allow wildlife managers to make informed prescriptions for the sustainable harvest and management of the population and its preferred habitat.

The main reason why little information about sitatunga is known appears to be the difficult habitat in which they live. Sitatunga are adapted for life in dense vegetation in wetlands and papyrus marshes, making traditional population survey techniques problematic4. Determining to what extent sitatunga are reliant on marsh habitat can aid managers in estimating population size and extent, which will improve management decisions.

STUDY AREA:

The research will take place in central Uganda, in the marshes of the Mayanja river system, which is part of the Nile watershed. Central Uganda lies between 900 and 1100 m above sea level, and contains multiple lakes, rivers, and swamps. This region is characterized by two dry seasons, December to February and June to August. On average, little of the land is permanently cultivated.

METHODS:

Objective 1 – Estimate home range size of adult male and female sitatunga.
We will calculate home range using relocations of radiocollared individuals.
We will estimate home range using minimum convex polygons and kernel density estimators to assess possible bias in other estimation(5). Kernel density estimators supply estimates of the utilization distribution (UD), which is a probability surface representing an animal's space use(6). We will use UDs to inform space-use models, and home-range estimates will improve density estimates

Objective 2 – Establish movement, habitat use, and activity patterns of adult sitatunga.
We will establish a camera trap grid in known sitatunga habitat. We will install two trail cameras at each trap location in an attempt to capture images of both flanks of the individual to aid in identification(7). To augment camera trapping efforts, we will locate observers at machans over open lanes in papyrus marshes during sunrise and sunset hours. Images will be compiled into a library for use as a reference in identification to individual, using coat markings and horn features as identifiers(8). Once a home range is identified from telemetry data, we will use UDs to establish how space use varies according to habitat type by calculating resource selection functions and comparing the relative importance of habitat type to space use(6). Camera trap data in conjunction with movement data from GPS collared individuals will provide a temporal and spatial record of habitat use for an individual sitatunga, which will allow for modelling of habitat selection and activity patterns, even if not all individuals are identifiable(9).

Objective 3 – Estimate density and distribution of sitatunga in central Uganda
We will use both telemetry and camera trap data to develop a spatially-explicit capture-recapture (SECR) model of density. Home range information from telemetry data will be incorporated into SECR analysis(9). We will use a Bayesian framework using SPACECAP in program R.
Once we have developed a density model for sitatunga in the study area, we will extrapolate the model to other areas of sitatunga range to estimate population sizes.

Objective 4 – Assess connectivity of sitatunga habitats and dispersal among populations We will collect genetic material from three sources – harvested individuals, individuals captured as part of the radiotelemetry effort, and from scat piles from transect searches. We will process sampled material for both mitichondrial and microsatellite DNA analysis. Mitochondrial DNA (mtDNA) is passed matrilineally, thus we will assess genetic variability and immigration rates from this analysis(10). We will analyze microsatellite data using program STRUCTURE to determine the genetic diversity of the sitatunga population in the study area and to establish patterns of paternity. We will perform an assignment test to determine if the population is closed or if immigration is taking place. We will calculate gene flow from both mtDNA and microsatellites to determine the average number of migrants per generation and to assess male versus female dispersal(11).

IMPACT:

At the completion of this project, a full report with results will be shared with the UWA to inform management decisions involving sitatunga and their habitat. SECR model output and habitat information can be extrapolated to other areas of sitatunga range which will enhance understanding and conservation. We expect that there will be interest in results from wildlife mangers in other parts of sitatunga range, which may provide for collaboration in future research projects. In particular, genetic analysis can be implemented in other parts of sitatunga range to assess broad-scale dispersal patterns, identify subspecies, and determine connectivity. During field activities, we will take pictures, record video, and write journal-style essays for sharing on blogs and in social media to communicate with a layperson audience regarding the importance of conservation, field research, and African wildlife in general. We expect that there will be broad interest in the project, and that social media can provide opportunities to connect with the public. Because sitatunga are at least partially reliant upon wetlands for habitat, we expect that improved understanding of wetlands in sub-Saharan Africa will aid in their preservation. One of the major ecosystem services provided by wetlands is the maintenance of biodiversity, but climate change is negatively affecting wetlands across Africa. Therefore, understanding the ecology of a large mammal endemic to African wetlands can aid in preservation of this important landscape feature.

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