

**LION STATUS AND POPULATION SIZE AT RUNGWA GAME
RESERVE AND LUGANZO GAME CONTROLLED AREA, TANZANIA,
EAST AFRICA**

(First Partial Report)



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February, 2012

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Introduction:

The African lion (*Panthera leo*) is the most important game species in East Africa, and Tanzania is known to have the greatest number of lions in Africa (Mesochina et al., 2010). However, controversy exists over the value of sport hunting to conservation with the lion issue serving as the main topic within this controversy. In Tanzania's game reserve areas, hunting safari companies engage in land stewardship that includes anti-poaching patrols and enforcement against illegal lumber activities, thereby protecting vast tracts of prime wildlife habitat. Anti-hunting organizations have based their facts with empirical data, however, at the same time, it is the responsibility of the hunting community as well as the wildlife managing authority, to ensure that hunting of the big cats is done in a sustainable way, therefore *insitu* lion population studies are needed in hunting areas to determine the real situation of the lion on these hunting concessions.

Project Objective:

The purpose of this project is to test different non-invasive techniques previously used in Kenya and South Africa (Ogutu and Dublin, 1998; Funston et al., 2003) to obtain spatial patterns of lions within Rungwa game reserve and Luganzo game controlled area in Tanzania where trophy hunting is active. Specific objectives include:

- (1) To determine lion population density at Rungwa game reserve and Luganzo game controlled are using call-in stations.
- (2) To determine lion and other carnivore relative abundance using remote-sensing cameras in the study areas.
- (3) To provide management suggestions to Tanzanian authorities and hunting operators.

Methods:

Objective 1. Call-in Stations.

Population surveys have involved the use of call-in stations throughout the study area (Packer, 1990; Ogutu & Dublin 1998; Mills et al., 2001). Attempts were made to identify individual lions by means of photographs and video taken at call-in stations. Individuals were identified with unique marks, scars, and whisker patterns. (Pennycuick & Rudnai, 1970).

We surveyed the study areas during the dry season (August-September 2011) because the response to call-in stations has been tested and found to be higher during this season (Ogutu & Dublin 1998; Smuths *et al.*, 1977).

Call-in stations consisted of a loudspeaker system (FoxPro connected to two 40-M 4-ohm horn speakers on a wooden tripod) and we used sound recordings (buffalo in distress sounds) at night to call in lions (Ogutu & Dublin 1998). Positions for these calling stations were determined *a priori* by means of GIS and also, a 5 X 5 km grid super imposed on a 1:125,000 map of Rungwa and Luganzo areas. Each calling station was located in the field using a hand held GPS device (Packer, 1990; Ogutu & Dublin, 1998).

To allow for approximate total effective area coverage, one calling station for every 25 km² was set. Individual calling stations were at least 5 km apart to ensure effective separation. This separation is based on known distances of the general effectiveness of sound recordings (3-5 km) (Funston et al., 2003; Ogutu & Dublin, 1998). A maximum of three calling stations per night were used; approximate calling times were from \pm 1900 h, to 2300 h with \pm 30-60 minutes allowed for moving between calling site locations, each with a one-hour duration of continued calling with shorts silent intervals of about 3-5 min (Funston et al., 2003; Packer, 1990).

Lions will be classified according to age and sex with attempts to identify each individual lion. For this purpose, lion faces (both sides if possible) were photographed using a digital camera (set to ISO 800), telephoto lens (200-300 mm), and electronic tele-flash. Also, a video camera with infrared vision was used to record lions. We documented scars, spots, and other distinctive features to assist identification of individuals and groups during the current survey. The gender and age classes of all lions were recorded. All information collected on individual lions was recorded on data sheets. In addition, recorded response times of lions to calling stations, weather conditions, and lion roars or other lion activities were recorded for data interpretation. All data has been analyzed into an appropriate computer database and programs such as ArcMap 10 and CAPTURE to determine probability of capture, population closure tests and population density (Karanth and Nichols 2002).

The Presence of other large carnivores (e.g., leopards and hyenas) also was recorded to assess their population size and to characterize general carnivore diversity. Calling station data was supplemented with additional observations and relevant data whenever possible (e.g., lion spoor and Professional Hunter records) to obtain an indication of possible additional lions not recorded

during the survey. To maintain sampling consistency and to minimize bias, calling stations were not used under adverse weather conditions such as during strong winds, rain, or thunderstorms.

Objective 2. Remote sensing cameras.

We have used 25 remote-sensing digital cameras that were superimposed on a grid pattern over the study area. Cameras were set 2 - 5 km apart in optimal locations where tracks and other signs indicate the presence of wildlife (Balme et al., 2009). Cameras were checked every 2 -3 days to assure proper functioning and to check if images of target animals were taken. We are in the process of identifying large carnivores (i.e., lions, leopards and hyenas) by scars, spots and other body marks (Balme et al., 2009; Karanth and Nichols 1998). Photographs with verified identifications will be used to determine the number of “re-calls” or recaptures of individual animals. All camera data will be entered into an appropriate computer database and program CAPTURE will be used to determine probability of capture, determine population closure tests, and population density (Karanth et al., 2004; Karanth and Nichols 2002). Also, during field trips, tracks from lions and lion prey species presence were recorded on a GPS unit to develop an abundance prey and track map.

Objective 3. Management recommendations.

We will combine the results of this survey and the population analysis of the different carnivore species to establish the relative abundance and density of these species to develop a set of management recommendations for the Tanzanian authority (TAWIRI & Wildlife Division) and hunting companies.

Preliminary Results:

We did our field work from August through October of 2011. During this field work we established 29 call-in stations at Luganzo and 33 at Rungwa with a total of 62 call-in stations. We also set 25 remote-sensing camera stations (500 camera/trap nights at Luganzo and 550 camera/trap nights at Rungwa). Our preliminary results are as follows:

Luganzo Game Controlled Area.

- Call-in stations (number of felines shown) - 13 lions; 9 leopards
- Remote-sensing cameras (number of photos) - 27 lion; 22 leopard

Rungwa Game Reserve.

- Call-in stations (number of felines shown) - 29 lions; 6 leopards
- Remote-sensing cameras (number of photos) - 32 lion; 5 leopard

We found that lion response (lions shown vs. number of call-in stations) was 17% for Luganzo and 41% for Rungwa. We are in the process of analyzing these results so they will help us to

determine the density of lion as well as other carnivores on each study area. Even though that we are still in this process, we think that our results on density for lion on each study area will be similar to what Mesochina et al. (2010) reported for the areas around Luganzo and Rungwa.

During our remote-sensing camera survey, we recorded other carnivore species shown at camera sites. Table 1, shows the species presence per study area.

Table 1. Carnivore species photographed at Luganzo (L) and Rungwa (R) during the survey period.

Especies	Scientific name	Study Area
Lion	<i>Panthera leo</i>	L, R
Leopard	<i>Panthera pardus</i>	L, R
Cheetah	<i>Acinonyx jubatus</i>	R
Serval	<i>Leptailurus serval</i>	L, R
Spotted Hyena	<i>Crocuta crocuta</i>	L, R
Stripped Hyena	<i>Hyaena hyaena</i>	L
Wild hunting dog	<i>Lycaon pictus</i>	L, R
Black-backed Jackal	<i>Canis mesomelas</i>	L, R
Side-striped Jackal	<i>Canis adustus</i>	L, R
Spotted genet	<i>Genetta tigrina</i>	L, R
Honey Badger	<i>Mellivora capensis</i>	L, R
Civet	<i>Civetticus civetta</i>	L, R

Acknowledgments.

We would like to thank Dr. Victor Kakengi and Mr. Alex Lobora from the Tanzania Wildlife Research Institute (TAWIRI). Special gratefulness to Mrs. Nebbo Mwina and Mr. Alex Choya from the Tanzania Game Division. And also to Mr. Fidelcastor Kimario and Mr. Godfrey Nyangaresi from Mweka College for their support to develop this important project. At the same time, we would like to thank the Robin Hurt Wildlife Foundation, the Caesar Kleberg Wildlife Research Institute, the Lubbock Safari Club, and the Wild Cat Conservation Inc. for providing the necessary funding and logistic support to conduct this project in Tanzania.



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