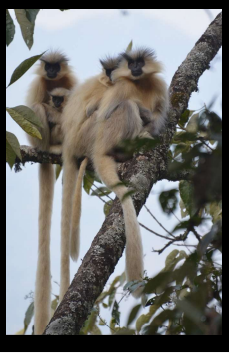


EXTIRPATION RISK OF *THE* ENDANGERED GOLDEN LANGUR *TRACHYPITHECUS GEEI* (KHAJURIA, 1956) INSIDE AND OUTSIDE BIOLOGICAL CORRIDORS, LANGTHEL SUB-DISTRICT, TRONGSA, CENTRAL DISTRICT BHUTAN

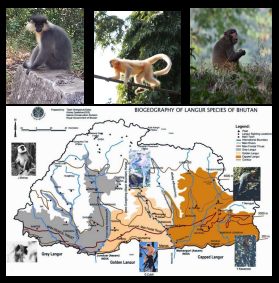
Kuenzang Dorji
Primate Behavior ,M.Sc.

INTRODUCTION

Bhutan is a conservation stronghold for seven species of non-human primates:

Slow loris ,Assamese macaque, rhesus macaque, Nepal gray langur, golden langur, Capped langur and *Macaca munzala*,

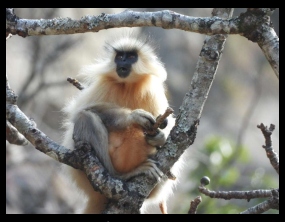
Primates species of Bhutan are exposed to two broad category of threats: Habitat and Population



Dedicated to my late mother who left us on June 7, 2019

RESEARCH OBJECTIVES AND HYPOTHESIS

- Group size and structure and sex ratio;
- Winter feeding range and associated natural and anthropic risks; and
- Characteristics of sleeping sites and trees and the associated natural and anthropic risks.



I assumed that the group size of the golden langur will be bigger; feeding range is larger, and groups more vulnerable to extirpation outside than inside the biological corridors.

PRESENTATION OUTLINE

- Introduction
- Hypothesis and Research Objectives
- Facts about Golden Langur
- Materials and Methods
- Results and Discussion
- Conclusion
- Recommendations
- Acknowledgement

FACTS ABOUT THE GOLDEN LANGURS

- The world's top 25 most endangered primates and are distributed in Bhutan and India
- A leaf eating golden orange colobine monkey which are sexually dimorphic
- Found in warm broadleaved forests of Dagana, Sarpang, Trongsa, Tsirang, Wangduephodrang, and Zhemgang districts

FACTS ABOUT THE GOLDEN LANGURS CONT..

- Live in uni-male/multi-female groups of 3 to 9 individuals, bi-male/multi-female groups of 8 to 15 individuals, and multi-male/multi-female groups
- Attain maturity (Male:5-7 years and Female-4 years
- Endangered (IUCN) Red List
- Appendix-I (CITES).
- Schedule–I species (FNCA 1995, Bhutan)

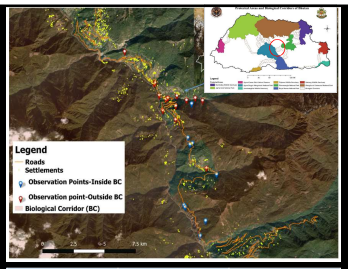
METHODS

Data collection: November 2019 to April 2020-Emphasized on winter season

- **Scan sampling** along roads (both primary and farm roads) and existing trails as transect lines-
- **Minimum Convex Polygon (MCP)** method
- **Heat Map**-GIS analysis tool
- **Remote cameras and sign surveys**
- **Key informant interview**
- **Vulnerability risk assessment** based on exposure pathways.

STUDY SITES

- Two distinct landscapes that measures 338.83 sq.km .
  - Adjacent to 2,642 people
  - 76 kilometers of roads,
  - 28 kilometers of power transmission lines and
  - 564.27 ha of agricultural land
  - The biological corridor (BC) that connects Phrumshingla National Park (PNP), Jigme Singye Wangchuk (JSWNP), and Royal Manas National Parks (RMNP) and have enforced protection



Landscape types	Area in Sq.Km	Administration Jurisdiction
Outside BC	184.79	Zhemgang Forest Division
Inside BC	154.09	Nature Conservation Division (NCD), Department of Forests and Park Services

ANALYSIS

- Calculate proportions and ratios
- Perform t-test to determine the difference on group mean size
- Qualitative Risk Analysis (QRA) based on risk exposure pathways
- Pearson correlation to test the relationship between tree DBH, tree height, and langur group sizes.

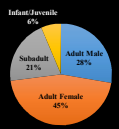
MATERIALS AND METHODS

- Equipment:
  - spotting scope (Vortex Viper HD 20-60x85 Spotting Scope)
  - binoculars (Celestron 8x42 Nature DX Binocular)
  - Global Positioning Unit (GPS), Smartphone GPS and app (SW Maps),
  - Camera (Nikon COOLPIX P1000 Digital Camera),
  - Reconyx camera trap,
  - Samsung Tablets,
  - Compass (SUNTO),
  - Hypsometer
  - Clinometers (SUNTO), and
  - Diameter tape for measuring tree girth.

RESULTS

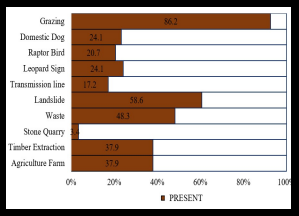
- **Frequency of Golden Langur Encounters**
  - **297 individuals**
  - 24 langur groups ranging inside (n = 9) and outside (n = 15) the BC
  - Outside BC (10.33) times and Inside BC (6.33) times
- **Golden Langur Group Size and Composition and Sex Ratio**
  - **Mean group size(Inside BC:9.55 individuals; outside BC: 13.73)**

Landscape type	Adult Male: Adult Female	Adult Female: Sub adult	Adult Female: Infant
Outside BC	1:1.55	1:0.46	1:0.11
Inside BC	1:1.77	1:0.43	1:0.20



RESULTS CONTD

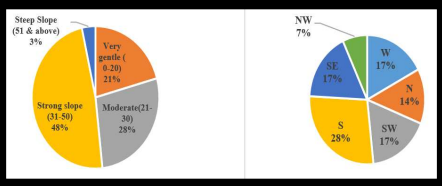
- **Locations and Characteristics of Sleeping Sites**
  - Langurs slept in 28 tree species from 21 Linnean families and 14 orders.
  - The two most frequently used species were *Sapium insigne* (9 times) and *S. eugeniigolium* (4 times) which has spreading, open shape
- **Anthropic and Environmental Factors**



CONCLUSION

- Golden langur living outside the BC has variation in group size and social structure, and have larger group sizes with multi-male/multi-female structure.
- Golden langurs sleeping in tall, large trees with spreading branches to accommodate all group members in one tree.
- Golden langurs were threatened by the presence of natural predators (leopard, python. and raptors), but natural predation of golden langur appears to be a rare event.
- Golden langurs feed on cultivated fruits and vegetables accelerating the human-langur interactions
- Golden langurs were most vulnerable to mortality caused by electrocution, road kill, and dog kill.

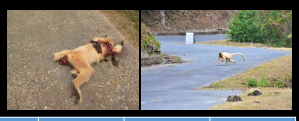
RESULTS CONTINUE



RECOMMENDATIONS

- Installation of speed limit signage and speed breakers to limit the speed
- Installation of insulated electric cables and fencing around power transformers
- Refrain domestic dogs freely ranging in langur feeding area
- Initiate community-based awareness program.

RESULTS CONTINUE..



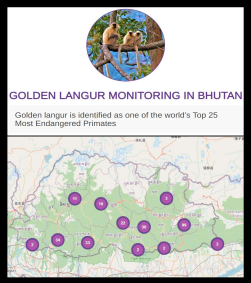
- **Golden Langur Extirpation Risks**

Landuse	Electrocution	Road Kill	Retaliatory kill	Habitat disturbance	Group Structure	Predation
Outside	OBC1, OBC2, OBC4, OBC7, OBC8, OBC9, OBC10, OBC12, OBC13, and OBC14 (10)	OBC1, OBC7, OBC8, OBC9, and OBC10 (5)	OBC1, OBC4, OBC8, OBC9, OBC10, OBC13, and OBC14(7)	OBC3, OBC7, OBC8, OBC9, OBC10, OBC12, OBC13, and OBC14 (8)	OBC2 and OBC9 (2)	OBC3 and OBC9 (2)
Inside	IBC-07	IBC1 and IBC3	IBC2 and IBC8	IBC03		IBC03

OBC9 is the group most vulnerable to extirpation. Groups OBC8 and OBC10 are moderately vulnerable to extirpation, and group OBC7 is the least vulnerable.

FUTURE RESEARCH

- Ecological and behavioral flexibility of golden langur
- Primate conservation Research through Citizen Science
- Golden langur conservation threats at local level
- Phylogeny of hybridized golden langur
- Bhutan Primate Conservation Society



ACKNOWLEDGEMENT

- Committee members
  - Dr Lori Kay Sheeran
  - Dr. Tim Englund
  - Dr. Kathleen Barlow
  - Dr. Jennifer
- Field Research Assistants (Ratan Giri, Kado Rinchen, Namgay Dorji)
- Central Washington University
- Rufford Foundation
- Family members