

Developpement of an original aerial-based  
inventory method: first steps towards the use of  
mini **Unmanned Aerial Vehicle** in **elephant inventory**

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1 Introduction

2 Aerial survey

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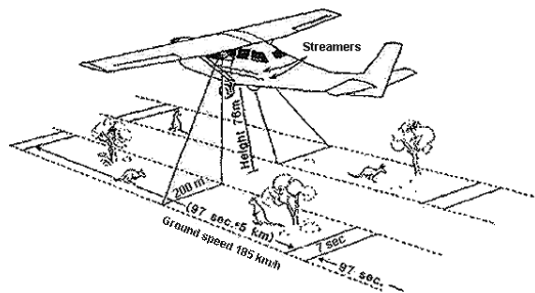


Elephant populations are **decreasing** in West-Africa.

Management requires inventory.

Inventory are achieved by sampling the total area of interest.

Fixed-width Transect (Strip) inventory is the most preconized method.



# UAVs: Unmanned Aerial Vehicles

"UAVs are to be understood as uninhabited and reusable motorized aerial vehicles" (Blyenburg, 1999).

These vehicles are **remotely controlled**, **semiautonomous**, **autonomous**, or have a combination of these capabilities.

# The mini-UAV Gatewing X100



# The mini-UAV Gatewing X100

UAV characteristics:

- ▶ 2 kg, 1m wingspan
- ▶ Electric propulsion
- ▶ Completely **autonomous flight**
- ▶ Cruise speed: 80 km/h
- ▶ Catapult launched
- ▶ Flight duration of max 45 min

The digital camera:

- ▶ Amateur camera
- ▶ **10 Mpixels**<sup>1</sup>

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<sup>1</sup>Resolution of **3 cm** at 100m Above Ground Level

# Context

Traditionnal Aerial-Based wildlife inventory have several drawbacks, as e.g.

- ▶ Price
- ▶ Risk
- ▶ Operator dependence
- ▶ Estimation of animal density not very accurate

UAV aerial inventories show advantages:

- ▶ Quick, relatively cheap and non-risky
- ▶ Images consist in permanent documentation

Nevertheless, it remains a lot of uncertainties:

- ▶ Measurement of the inventoried surface?
- ▶ Detection of animals?

## Main Research Question

- 1 Are aerial elephant inventory with UAV feasible?

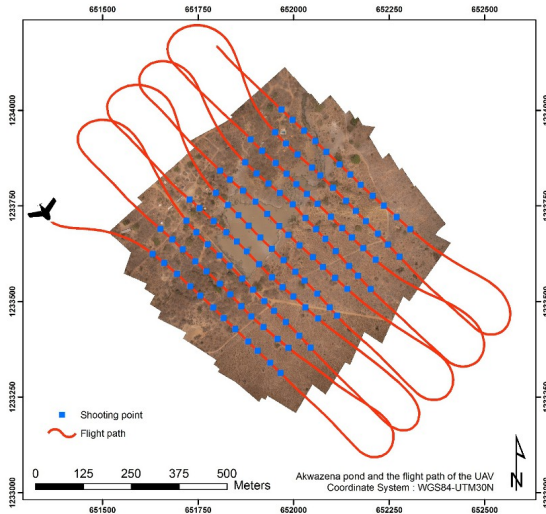
## Specific Research Questions

- 1 On wich altitude should fly the UAV?
- 2 Are the elephants disturbed by the presence of a mini-UAV?
- 3 Are the elephant easily detectable?
- 4 How the inventoried surfaces can be measured?
- 5 Is images overlapping a necessity?

We performed test flights in the **game ranch of Nazinga**, Burkina Faso



# Flights above the Akwazena pond for testing the detectability.



Strip flights along transects for testing the inventory feasibility.



It worked nicely...



# Results





## Specific Research Questions

- ▶ On which altitude should fly the UAV?
- ▶ Are the elephants disturbed by the presence of a mini-UAV?

## Results

- ▶ It is necessary to strike a balance between the **size of the animals on the pictures** and the **surface inventoried** (100m AGL)
- ▶ The animals do not seem to be disturbed by the UAV.

# Elephant Detectability



# Images overlap



# Conclusions

Unmanned Aerial Wildlife inventory: an interesting perspective, but still lot of improvements of the systems are required:

- ▶ Flight duration
- ▶ Images resolution
- ▶ Flight planning software adapted for transect flights<sup>2</sup>
- ▶ Algorithm for (semi-)automatic detection of Elephant



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<sup>2</sup>similar than corridor mapping

Thank you for your attention...

