GLOBAL UNMANNED SYSTEMS

The Role of Drones in Vertebrate Fauna Monitoring

Use of drones in vertebrate fauna survey

Outline:

- Faunal groups that can be efficiently surveyed with UAVs

- Advantages and disadvantages of using UAVs in terms of the data gathered

- Other potential use of drones for collecting information of vertebrate fauna or their habitat

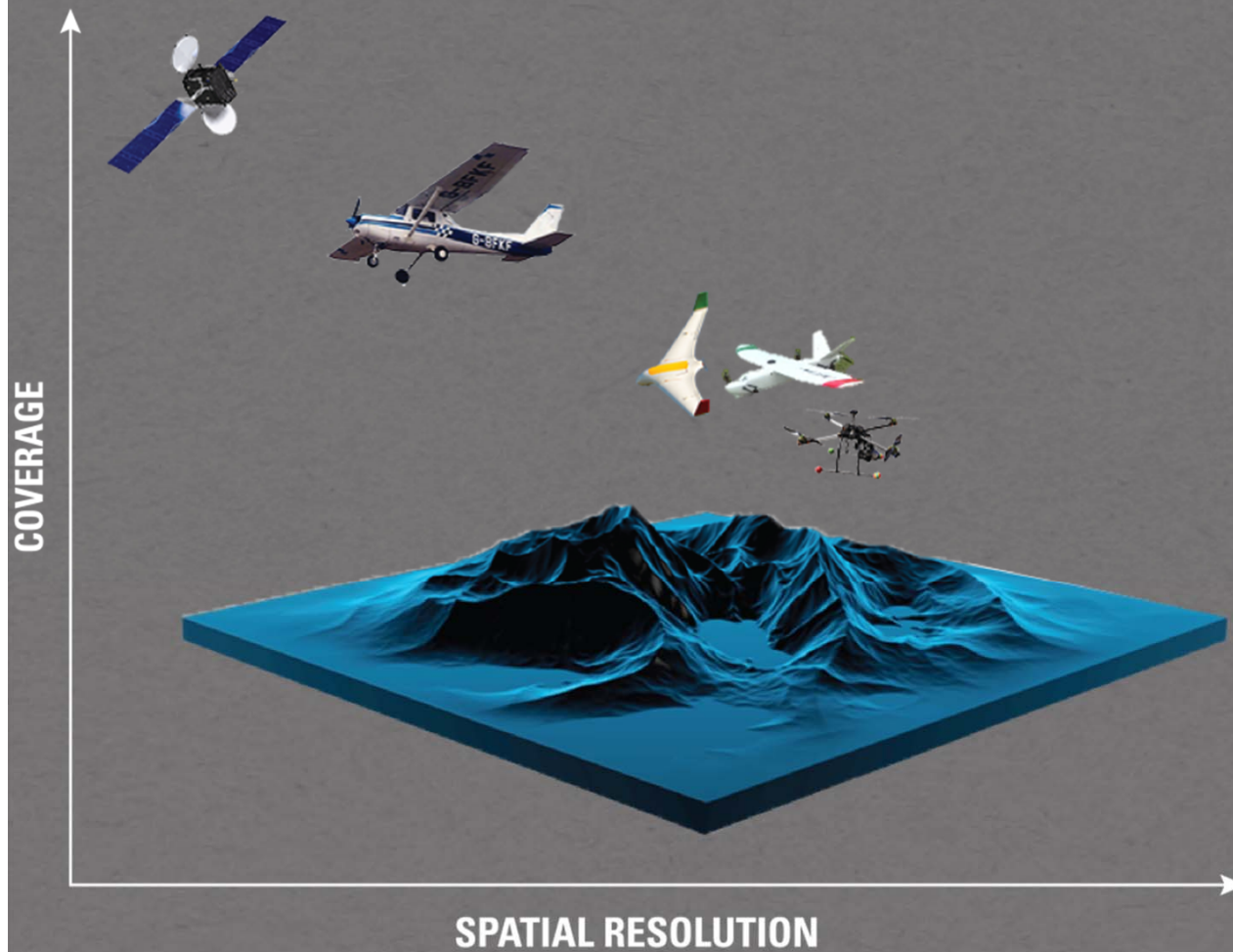- Logistical and compliance issues with use of drones

Gartner "Hype Cycle" 2015

Drones are at the peak of the "Inflated Expectations"
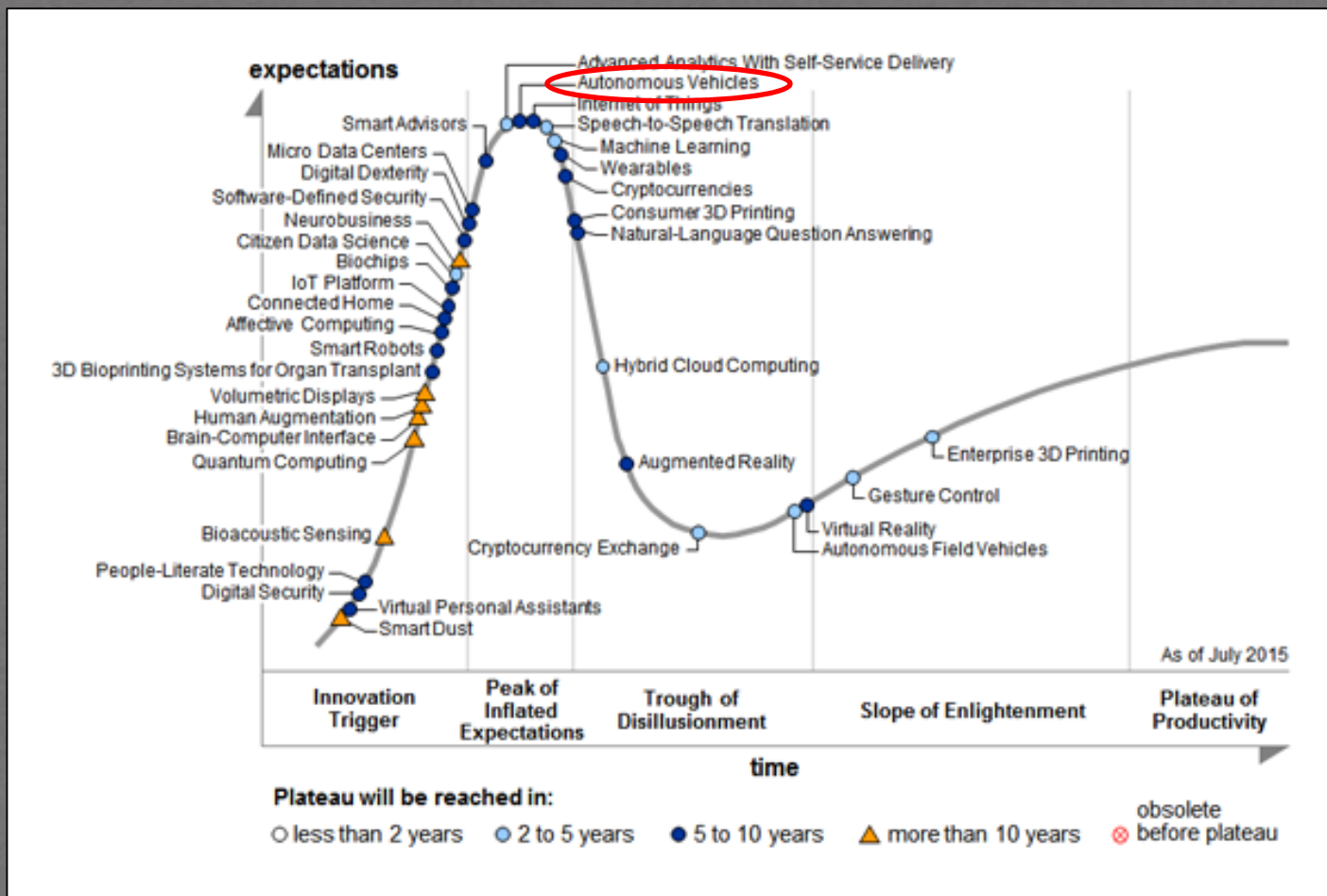
Concept

A complimentary suite of technologies offering unique advantages in terms of spatial and temporal resolution

COVERAGE

SPATIAL RESOLUTION

State of technology

Increasing size/range/endurance/sensor capacity but corresponding increase in:

- Cost
- Operational complexity
- Operating logistics
- Import/export complexity
- License/permitting complexity
- Consequences in the event of an accident

VTOL Multi-rotor   GUS Fixed Wing

Scheibel Camcopter

Boeing ScanEagle

Global Hawk

Small Unmanned Aerial Systems (UAS) – represent a cost-effective solution fitting perfectly into a historic "hole" in the remote sensing spectrum

Regulations

- Drones (mandatory)

  - Regulations undergoing upheaval (Globally)

  - Within line-of-site, <120m altitude, daytime and in non-populous areas

- Wildlife (guidelines)

  - Researchers calling for "code of best practice" to help mitigate or alleviate potential disturbance to wildlife related to UAV use

  - University of Adelaide (UoA) has developed a set of recommendations

Code of Best Practice

- UoA consider this code should be a first and guiding step in the development of species specific protocols to reduce potential disturbance to wildlife

- UoA recommendations cover:

    - Application of good science through a precautionary approach

    - Appropriate equipment, training and compliance with civil aviation regulations

    - Exercising minimum wildlife disturbance flight practices, and ceasing operations if they are disruptive

Comparison in the context of fauna surveys

	Manned Aircraft	Small UAVs
Area Coverage	Large areas, rapidly	Smaller, more targeted areas, with high degrees of flexibility
Cost	High mobilisation costs, lower costs per unit of area	Reduced mobilisation costs, higher costs per unit of area.
Safety	Manned – high consequence in event of an accident	Unmanned – lower consequences in event of an accident
Subjectivity	Debate over methods and accuracy (requires spotters)	Drone only records data – less subjective
Flexibility	Rapidly increasing costs for repeat flights	Very flexible

Drones in Fauna Surveys

Capture datasets that are either very difficult or impossible to acquire using conventional methods; with increased spatial and temporal flexibility.
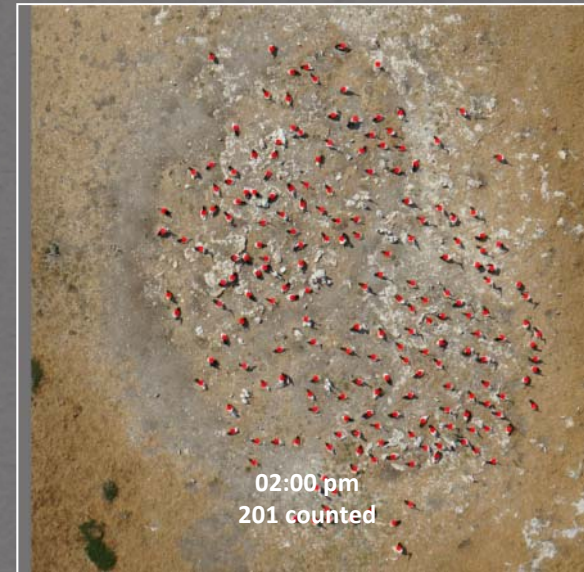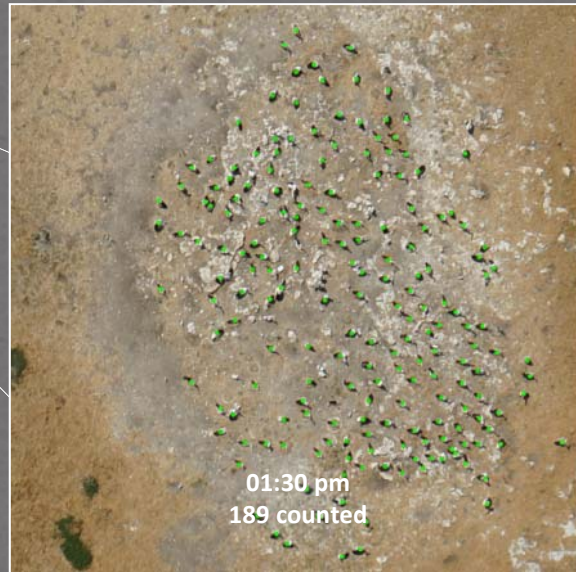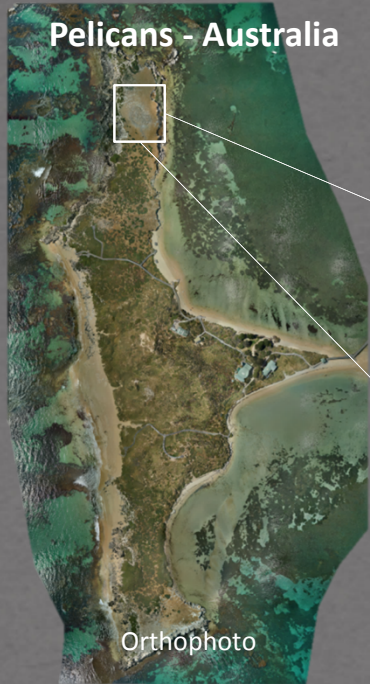
General Areas:

- Population counts
    - Herds, flocks, schools etc.
    - Nests, burrows
- Habitat and range mapping
- Distribution and locations

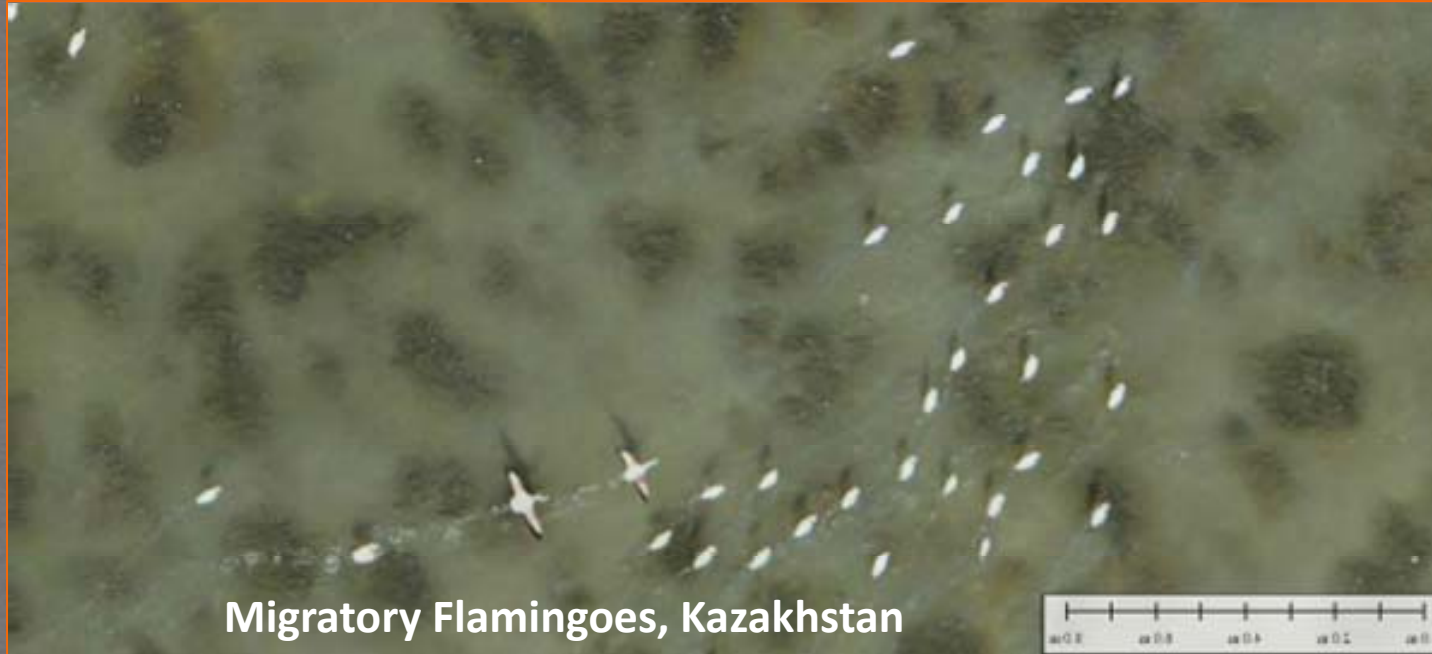# Wildlife Ecology - Nesting Birds

Pelicans - Australia

Orthophoto
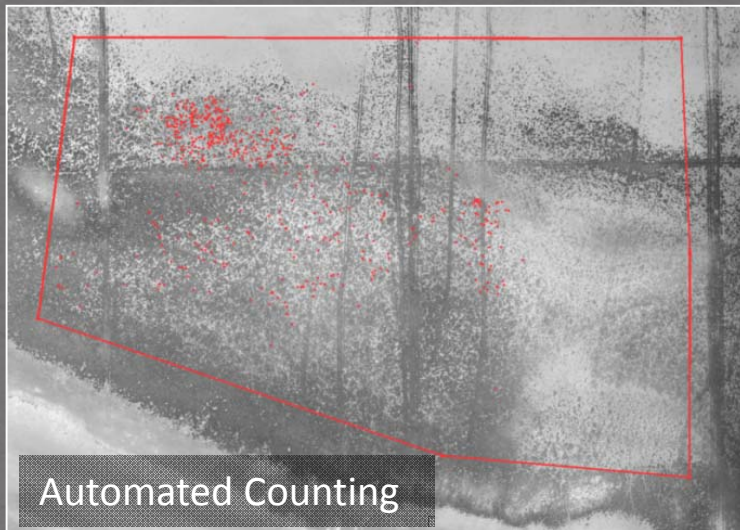
01:30 pm
189 counted

02:00 pm
201 counted

Benefits

- Unimpeded access to remote site
- Resolution vs. disturbance:
    - no disturbance to target
    - resolution tailored to resolve individual birds
- Timely
- Cost-effective
- Reduced H&S risk

Wildlife Ecology – Migratory Birds

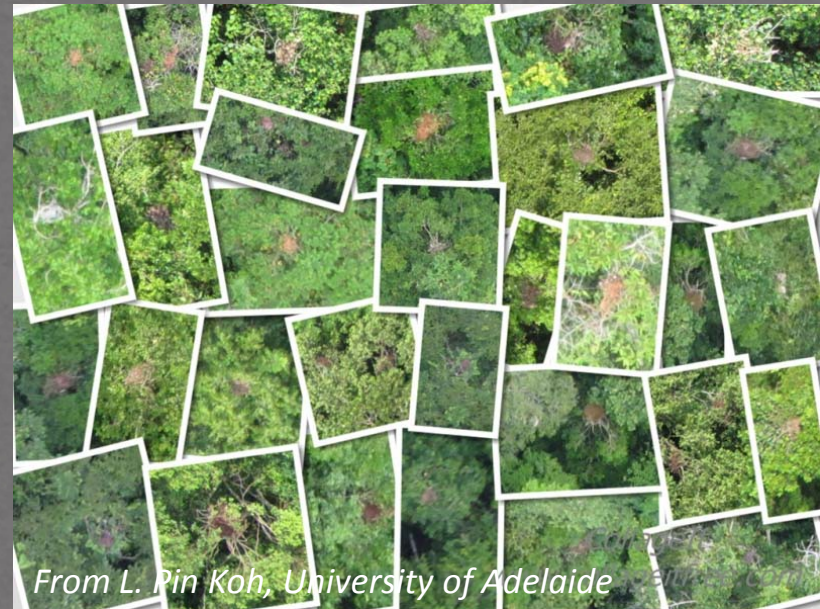Migratory Flamingoes, Kazakhstan

Automated Counting

Benefits

- Unimpeded access to remote site
- No disturbance to target
- Resolution tailored to resolve individual birds
- Timely
- Cost-effective
- Reduced H&S risk

Wildlife Ecology – Nest Counts & Inspections

From D. Bird, McGill University

From L. Pin Koh, University of Adelaide

From raptorial birds to orangutans….

Small multi-rotors used to provide:

- **Non-lethal measurements of whale body condition**

- **Recording of animal behaviour**

- **Population counts**

- **Minimal disturbance; no chance of boat strike**

Copyright: Murdoch University Cetacean Research Unit

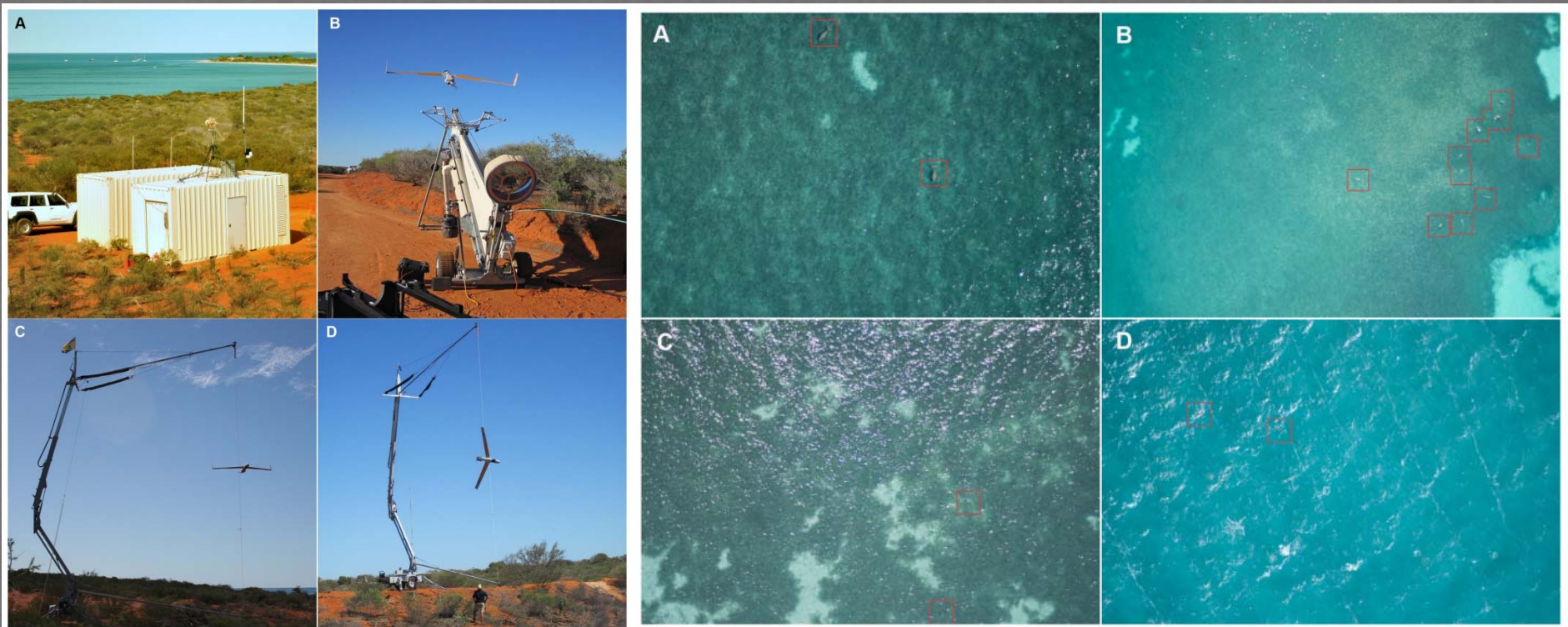*From: F Christiansen, Murdoch Cetacean Research Unit*

Dugongs

Beyond line-of-site, long endurance fixed wing marine mammal surveys:

- Comparably expensive to manned aviation surveys (twin engine, 6 spotters etc.)
- Zero subjectivity if image analysis algorithms are implemented

From: A Hodgson, Murdoch Cetacean Research Unit

Thermal

Koalas

From: Queensland University of Technology

- Low resolution – often impossible to distinguish different species
- Works best when there is highest contrast between target and background e.g. early morning

Sandhill Cranes

From: USGS

Drones & GIS

- Drones are a tool – one of many available
- Often complimentary rather than a "silver bullet" or "new paradigm"
- Applying a suite of GIS tools can improve outcomes in fauna counts

Case Study:
Elephants in the context of poaching, Kenya:
- Vast habitat range
- GIS-based predictive analysis was used to rationalise resources based on summed risk values:
  - Land cover type
  - Proximity to roads and water features
  - Past poaching incidents

Relevance:
- Similar methods could be adopted for fauna surveys
  - Areas of maximum /minimum likelihood
  - Presence/absence surveys to confirm
  - Weight total area for likely abundance accordingly based on land cover types etc.

Total Poaching Risk Map
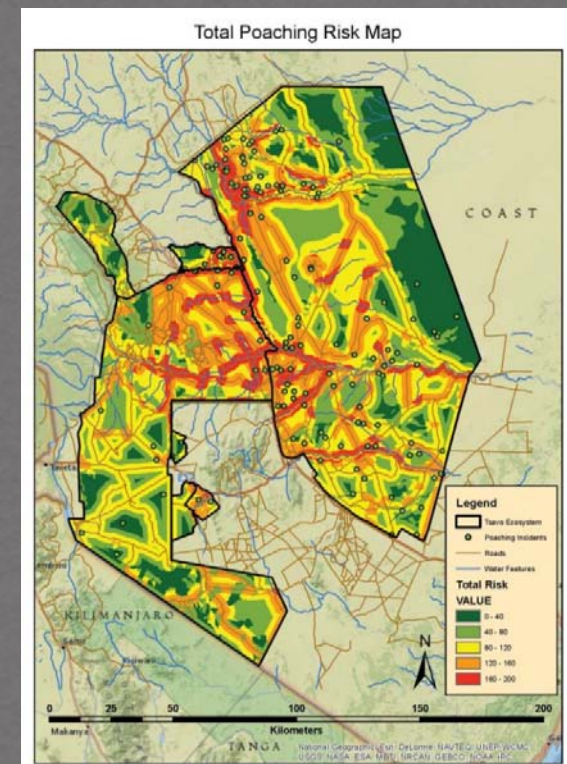
Word of Caution & Questions

Sometimes the fauna object to being watched.....