Workshop on Drones (Unmanned aerial vehicles; UAVs) for Monitoring African Penguin Colonies:
Tuesday 06 July 2021
Note of Meeting

(1) Attendees

Darrell Abernethy (DA)	Aberystwyth University
Jason Brook (JB)	Aberystwyth University
Meyer Etienne de Kock (MD)	University of Pretoria
Cloverly Lawrence (CL)	SANParks
Lourens Leeuwner (LL)	EWT
Takdeera Lewis (TL)	University of Pretoria
Katta Ludynia (KL)	SANCCOB
Deon Geldenhuys (DG)	Cape Nature
Azwianewi Makhado (AM)	Department of Forestry, Fisheries and the Environment
Makhudu Masotla (MM)	Department of Forestry, Fisheries and the Environment
Alistair McInnes (AM)	Birdlife
Alexis Olds (AO)	Cape Nature
Matt Pretorius (MP)	EWT
David Gordon Roberts (DR)	SANCCOB
Ralph VanStreels (RV)	Institute of Research and Rehabilitation of Marine Animals (IPRAM), Brazil
Lauren Waller (LW)	SANCCOB

(2) Objectives

1. To hear how drones have been used in mammalian or avian research, in South Africa, Namibia or elsewhere.
2. To identify how and where drones will be valuable in monitoring penguin colonies in South Africa and Namibia.
3. To develop the outline for a proof-of-concept project
4. To explore what further research is required, if any, to inform the use of drones for penguin colony monitoring.

(3) Agenda: Please see Appendix

(4) Meeting Outline, Key Points and Actions

Important: Please note that slides and images from the presentations linked to this report should not be used without the owner's permission.

4.1. The meeting commenced with six presentations that provided insight into the variety and logistics of UAVs in practice:

I.   MD described how UAVs were used to monitor wildlife in several countries in Africa and the Middle East (copy of presentation available here). He explained the variety of data that could be obtained, how these can be analysed and some of the potential errors. Of particular note was his research into the spectral reflection of dama gazelle, which is unique to the species and can be used to identify animals in mixed grazing herds. He also provided examples of UAV use in pelicans and described the reaction of ungulates to UAVs. His presentation is available in the meeting folder.

II.   JB described the use of multi rotor UAVs in agricultural research and the equipment that was available for such work (copy of presentation available here). He provided examples of the information that can be obtained, how automation and machine-learning can assist and how UAVs can assist in precision agriculture. His presentation is available in the meeting folder.

III. LL described how UAVs are used in raptor research, particularly assessing the nests of martial eagles, and how cost-effective they are in applying flappers to power lines (to make them more visible) compared to current methods.

IV.   RV provided an overview of how UAVs are used in seabird research in South America (copy of presentation available here). The nature of the habitat (rocky ground, penguins nesting in crevasses), age of birds (chicks – camouflaged), season (dry better than wet) and species (some very sensitive to UAVs; might be cumulative effect) must all be taken into account when considering the use of drones.

V.   AM described how the DFFE is using UAVs for mammal and avian counts, particularly in the southern Atlantic islands and Antarctic (copy of presentation available here). UAVs were used for nesting birds, seals and whales and were found to be cheaper and more efficient than using helicopters or ground counts – 43% - 96% more with UAV-derived imagery and 92% - 98% for colonies. He explained some of the technological challenges in using UAVs but advised that drones were being developed in-house at DFFE.

VI.   DG described how UAVs were used to count African penguins on Dyer Island and how the method compared to traditional ground counts (copy of presentation available here). The former resulted in a 20% to 40% increase in birds counted across different zones on the island compared to ground counts. Reasons for the lower counts using observers was difficulty in getting sufficiently close to the birds, counting when the birds group together

and viewing obstructions. Conclusions from the project included increased accuracy when using UAVs, reduced disturbance, lower costs and ability to document breeding habitats and track spatiotemporal changes in avian populations.

4.2. The following points arose from the discussion that followed the presentations:

- Sensitivity of avian species to disturbance by UAVs varies among species but must be considered: Arctic terns were indicated to abandon nests very quickly when disturbed while roseate terns, swift terns, cormorants and African penguins (APs) on Dyer Island appear to tolerate it well. This is an area that should be further investigated.

- Spectral imaging could be applied to penguins. One would need to collect feathers and investigate the spectral signature.

- The use of infra-red should be considered but might be difficult due to limitations on how heat can be visualised. Other spectra should be identified. For vegetation analysis, using thermal camera alongside RGB might assist in distinguishing between birds and background.

- Possibility of using UAVs to count moulting APs was discussed. Might be worth considering e.g. on Halifax or Mercury Islands, but could be difficult if moulting not synchronised, as happens on Dassen.

- Should consider comparing ground counts with fixed point camera and UAVs on Bird Island.

4.3. MP presented on the legal framework for using UAVs in South Africa:

- UAVs in South Africa are referred to as remotely piloted aircraft (systems), RPAS, with the last term applied to include the piloting system, software etc.

- Obtaining all the permits required to use UAVs for research is time-consuming and expensive. For EWT, it took five years to obtain all five licences needed. However, this time has been reduced recently due to increased capacity at the CAA.

- UAVs are regulated by the South African Civil Aviation Authority and their website contains all the information for obtaining an RPAS Operating Certificate (ROC): http://www.caa.co.za/Pages/RPAS/RPAS%20operators%20certificate.aspx

- There are four types of operation foreseen in legislation (Commercial, Corporate, Non-profit and Private), each with its own level of approval. "Commercial" requires the highest level, requiring an Air Service Licence, RPAS OC, RPAS Letter of Approval, Remote Pilot Licence, Certificate of Registration and RPAS Maintenance Technician, while "Private" requires none. http://www.caa.co.za/Pages/RPAS/Information%20for%20owners%20and%20operators.aspx

- For a Commercial Licence, there are nine steps to obtaining an ROC, commencing with a Letter of Intent and finishing with a demonstration and base inspection.

- Airspace across South Africa is designated at certain places and for different heights. Specific authorisation is required for these. Further information can be found at: https://www.atns.co.za/rsakmz.php

- There are various alternatives to obtaining a Commercial Licence, including hiring organisations already authorised or flying one's RPA under an existing ROC.

4.4. There was lengthy discussion around what, if any, proof-of-concept project should be pursued under the MeerWissen project:

- There was general agreement for a comparative project of a UAV v ground counting, using an off-the-shelf machine. This could include looking at disturbance/stress in APs and other species nesting in proximity to them. It could also include using different sizes of UAVs, flying at different heights and/or using different sensors.

- There was strong support for investing in the Dyer Island work already underway rather than commencing a new project. DG agreed with this proposal, advising there was scope for continuing the project.

D. Abernethy
21 July 2021

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Appendix: Programme

Time	Activity	Lead
0900 - 0915	Welcome and Introductions	Darrell Abernethy
0915 - 1030	Reports on drone experiences (15 min talk + 5 min Q&A)	
	0915 – 0930: Mammal/avian conservation/research	Meyer Etienne De Kock (UP)
	0930 – 0945: Ecology/disease epidemiology research	Jason Brooks (AU)
	0945 – 1000: Raptor conservation/research	Lourens Leeuwner (EWT)
	1000 – 1015: Seabird research/conservation: S. America	Ralph Vanstreels (IPRAM)
	1015 – 1030: Penguin conservation/research	Deon Geldenhuys (Cape Nature)
1030- 1100	Legal framework for use of drones in South Africa	Matt Pretorius (online), EWT
1100 - 1115	*Comfort Break*	
1115- 1200	What is needed from drones: Identifying what will assist conservation/research	
	1115 – 1135: Perspective from Stakeholders	
	1135 – 1200: Discussion	
1200 - 1400	What will a proof-of-concept project look like?	
	(a) What is the most feasible or priority objective?	
	(b) Where/how should it be done and what will the project achieve?	
	(c) What other projects should be considered?	
1400	Close	