

Drone trials: progress report

Since the trials began on 22 March, we have flown the drone multiple times at Tomago Wetlands and several times at Hexham Swamp. Unfortunately, bird numbers have been low for most visits which has somewhat limited the experiments we have been able to do. However, good progress is being made, as briefly outlined below. NB the battery life is 30 minutes which allows c. 25 minutes of flying time and hence limits what we can do in each attempt. There are four spare batteries but the drone has to be returned to base and a replacement battery inserted.

1. Effects on birds

We have found that the drone can be flown right over the top of shorebirds and waterbirds at heights of 10-20m provided that its approach seems non-threatening to them. Best method to date: raise the drone to 15-20m while at some distance from the birds; fly towards them at 1-2 km/h; if the birds become restless pause the approach until they re-settle. On numerous occasions incoming birds have landed near the drone, in some cases directly below it. Conversely, if the drone is moved quickly towards birds or is raised or lowered while near them, they are more likely to be disturbed. This is thought to be from a combination of visual cues plus noise (because the drone makes more noise when it is moving).

2. Manoeuvring the drone

Steering the drone manually, to a visual target, is not easy and takes considerable time. The landscape from above often looks quite different to the horizontal perspective and also it has proven to be quite difficult for an observer to correctly estimate the distance that the drone is away from the target. A far more promising option is to fly the drone to a pre-set waypoint. This method has proven successful in our latest trials but with the original control software it was cumbersome. A different drone app, designed for waypoint based control and incorporating Google Earth imagery, has now been sourced and installed. This new app allows a flight route to be pre-planned, with all heights, speeds, etc pre-programmed. Also, the route can be saved and then re-loaded as required. Thus, a repeatable systematic survey should be able to be achieved. *NB this is yet to be confirmed.*

3. Counting birds a single image

The terrain and any birds present can be watched while the drone is in flight, and also continuous video can be recorded. However, the most likely way that a bird count will be obtained is from taking still images and post-processing those. Manual counting of birds in each image is one option; however, Bob McDonald has sourced some freeware point-count software called ImageJ which looks promising (and there are more sophisticated point-count options available if needed). ImageJ was developed for counting cells. It counts the birds in an image very quickly and can discriminate based on size (e.g. there could be separate counts done of the numbers of swans and teal in an image). We have not had enough birds in any image to really test this software.

4. Counting birds at a wetland

Based on the trials to date, here is how we think a total count can be obtained:

- Fly the drone between a series of pre-programmed waypoints, at the above speed and height ranges.
- At each waypoint, hover the drone and take a series of photographs such that a full panorama view is obtained.

- Integrate the series of photographs and do an automatic count (using ImageJ) of the birds present.
- Repeat this at each waypoint.
- Integrate the overall results making allowance as best is possible for the overlap of the views obtained at the other waypoints.
- With this methodology, it should be possible to monitor the wetland in a systematic way each time.

This concept will be investigated as far as is feasible during the remainder of the 3-month trial period. An issue is that currently there are not enough birds around to really challenge and refine the counting methodology.

5. Other applications

- We have flown the drone over two Black-necked Stork nest trees (with nests not currently active) and are of the opinion that it will be a viable way in future to check the status of those nests or the nests of raptors. The drone could be flown quite high for this application, so that the birds are not disturbed. *NB this is yet to be confirmed.*
- We have flown the drone on a trajectory over reeds in Hexham Swamp alongside the Pipeline Track, to look for flattened areas as indicators of possible presence of an Australasian Bittern. Although we didn't spot anything interesting in that single transect we think this worth pursuing further after we have the waypoint / fixed route matter fully sorted.
- Monitoring changes in habitat. This can be carried out using the waypoint methodology and returning to the exact same locations on a six-monthly or annual basis and recording the vegetation. Often, there can be a relationship between species and numbers present and changes in habitat.

6. Next steps

In mid-April the trials will be suspended for ~6 weeks due to Bob's absence. In the meantime, our aim is to refine the waypoint-based fixed route technique and establish if it seems feasible to obtain total counts using integrated sets of images from each of the waypoints. The trials will be at either Tomago Wetlands or Hexham Swamp depending on where birds seem more numerous. Tomago is more private and will be the focus site, all other things being equal.

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