

Population estimate of the Australasian Gannet colony on Farewell Spit, November 2024.



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Introduction

To assist an ongoing research project aimed to check for signs of High Pathogenicity Avian Influenza (HPAI) in Australasian Gannets at Farewell Spit being carried out by Birds New Zealand, DOC commissioned a census of the colony using an Unmanned Aerial Vehicle (UAV) to update the estimate of breeding pairs.

Methods

Previous experience with flying a UAV over Australasian Gannets in the Marlborough Sounds has shown that Gannets have no reaction to the UAV, even when flown a few metres above birds. Despite this, at Farewell Spit, initially the UAV (DJI Marvic 3) was flown >60m above the colony, and then lowered to test birds reaction (see Appendix 1). As these birds also showed no adverse effects to the UAV, images were taken from 15-40m above sub-colonies depending on the size of sub colonies to collect single images of each sub-colony for counting (see Appendix 2 for vertical images of individual colonies).

The Farewell Spit colony is separated into several sub colonies; for consistency I followed the same numbering system as used by the Birds NZ project team (Figure 1) (Rob Schuckard Pers. Comm.).

Figure 1. Sub colony numbering of Australasian Gannet Colony at Farewell Spit (Image from Terry Green/DOC).



Caspian Terns breeding at the far end of the colony reacted to the UAV when <20m high, rising up and dive bombing the UAV. As such Images of sub-colony 7 were taken quickly, and the UAV moved away from the area as soon as practical. By the time the UAV was halfway to sub colony 6, the terns had returned to their nests. These birds were just starting to lay, and being early in the breeding cycle may have caused this adverse reaction.

Individual photos of each sub colony were counted using the free software Dot Dot Goose (Erst, 2024), separating different classes of breeding birds, and other birds within the colony area –

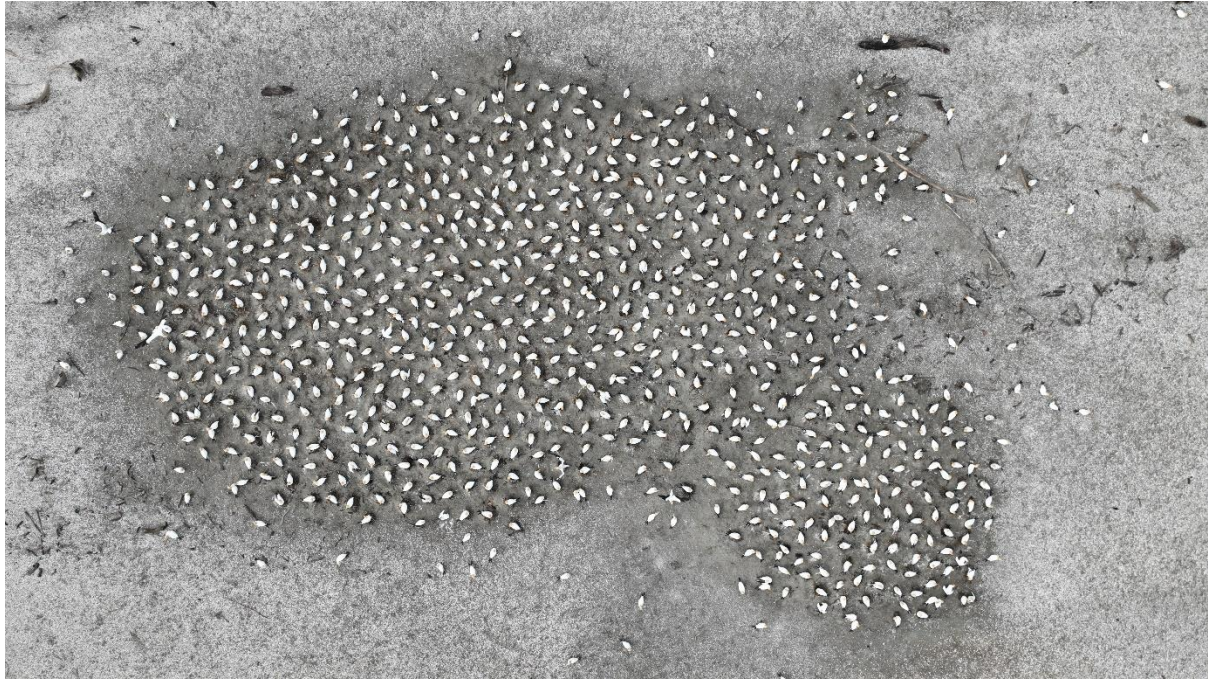
- Apparently Occupied Nest, centre (AONc): birds on nests within the central part of sub colony. Ground surveys indicated that almost all birds beyond 1-2m of sub colony edges were on eggs or young chicks.
- Apparently Occupied Nest, edge (AONe): birds on nests around the edge of sub colony. Ground surveys indicated that many nests on the outer fringe (1-2m) of sub colonies were birds just laying, and this count includes birds that had formed a nest, but had may not have had an egg yet.
- Partner at nest: partner in attendance at an AON.
- Loafing bird: Additional bird within image around sub colony, this will include partners of birds arriving or departing from sub colonies, or pre-breeding birds loafing at colonies.

Results

The aerial UAV surveys were carried out in near perfect conditions, on 5, 6 and 7 November 2024. Images from 7 November were from 08:30, in dead calm conditions, which had the highest number of additional and loafing birds, so these were used for the final count. The

Gannets displayed no impacts to UAV flights, even when at low altitude (Appendix 1), and excellent images of each sub-colonies were collected (Figure 1).

Figure 2. Image taken from UAV of sub colonies four and five, showing where the two sub colonies have merged together.



Sub colonies two and three have started to merge, but these were separable with a narrow strip yet to be fully occupied by breeding birds. Sub colonies four and five have also merged, though more completely (Figure 2). In consultation with Rob Schuckard a line was drawn on the image separating these two sub colonies through the merging point between the old sub colonies

A total of 3,538 breeding pairs were recorded across the seven sub colonies (Table 1).

Table 1. Results of UAV aerial survey of Australasian Gannet colony at Farewell Spit, 7 November 2024.

Count category	Sub Colony							Total
	One	Two	Three	Four	Five	Six	Seven	
AONc	313	1,759	195	114	521	170	36	3,108
AONe	37	186	39	21	70	56	21	430
Total AON	350	1,945	234	135	591	226	57	3,538
Partner at nest	37	121	11	11	32	12	5	229
Loafing bird	42	168	37	37	50	11	3	348
Total additional birds	79	289	48	48	82	23	8	577

Additional UAV flights – Arctic waders

Further to the Gannet flights approval was given to test the response of mixed Arctic wader flocks (predominantly Bar-tailed Godwit and Red Knot) to the UAV for potential future use. During flights, a spotter was used to watch the wader flock for flight responses.

In the first flight the drone was launched 300m from the roosting flock, the UAV took off, and flew straight up without moving forward towards the flock. When the UAV was at c.60m, the entire flock took flight and moved to a new site c.600m away (the tide being about $\frac{3}{4}$ high, there was still plenty of roosting options). Once the birds had re-settled, at a height of 120m (maximum flight height allowed) the UAV moved slowly towards the flock, but when still >400m away the flock again took flight. At this point the flight was abandoned and the UAV returned and landed.

The next day a second flight was made to further test approaching at a higher altitude, as it was felt the second approach yesterday may have been impacted by the waders already being agitated from the first movement away. The UAV was launched c1000m from the wader flock, and again flew directly vertically to a height of 120m. As the waders had not taken flight, the UAV slowly approached the flock, however when the UAV was c500m from the flock, and still at 120m the flock took off and flew away. This flight was immediately abandoned and the UAV returned and landed.

Farewell Spit has a restricted air space, where low level flying is not permitted. As such, this may mean that waders here are more sensitive to UAV flights than at other locations. Other studies have found shorebirds to not be as affected by UAV flights as we found (Wilson *et al.* 2023). Further investigation in Aotearoa of UAV impacts on a range of birds is warranted, and collating information on species impacts is recommended. A study using UAV has been initiated in Aotearoa, but there is no centralised reporting of UAV impacts of different species.

Acknowledgements

This mahi was managed by Graeme Taylor, and I am grateful for his support throughout. Rob Schuckard provided comments on sub colony locations, which helped fix boundaries on merging sub colonies. Terry Greene (DOC) provided access to the sub colony map image to use in this report.

References

Ersts, P.J. [Internet] DotDotGoose (version 1.7.0). American Museum of Natural History, Center for Biodiversity and Conservation. Available from https://biodiversityinformatics.amnh.org/open_source/dotdotgoose. Accessed on 2024-11-20.

Wilson, J. P., Amano, T., & Fuller, R. A. (2023). Drone-induced flight initiation distances for shorebirds in mixed-species flocks. *Journal of Applied Ecology*, 60, 1816–1827. <https://doi.org/10.1111/1365-2664.14467>

Appendix 1

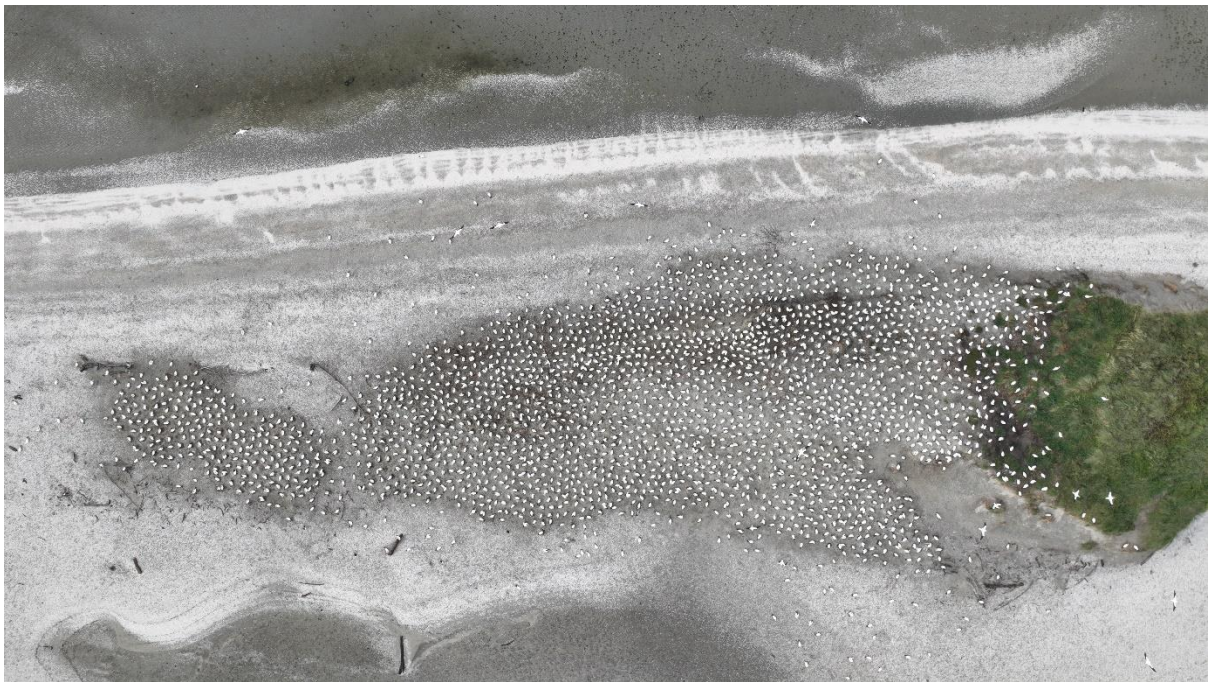


Appendix 1: Photo showing the UAV (in circle) hovering over the gannets filming Rob Schuckard preparing to catch a gannet with a long pole. Note the lack of reaction from nesting birds to both the UAV and the person approaching.

Appendix 2



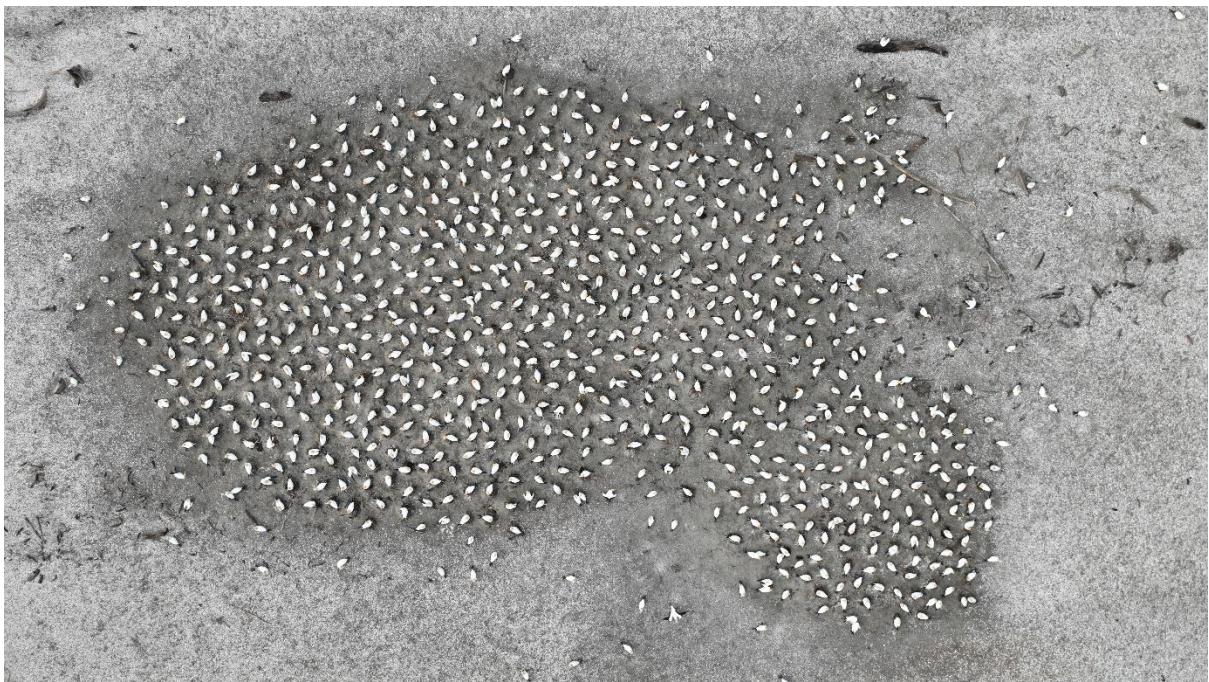
Sub-colony 1



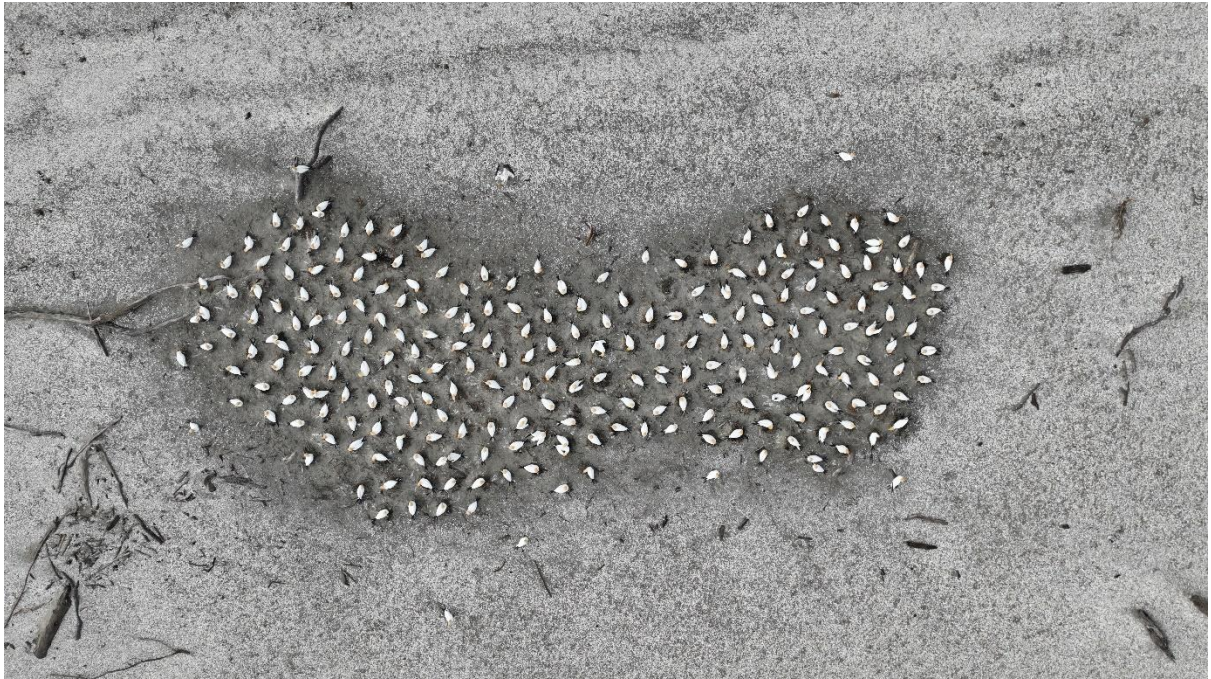
Sub-colony 2 and 3. Colony 2 is the largest, with three the small colony merging into 2.



Clos up Sub colony 3



Sub colony 4 and 5. Colony 5 is the larger, with colony 4 merging from bottom right.



Sun colony 6.



Sub colony 7.