

Additional file 3

Validating the methodology using males and immature birds

GWfG males are known, through direct observation in the breeding grounds, to not incubate the clutch (Stroud, 1982). Second year birds that return to the breeding grounds in the year following their hatch year have been found to not breed (Weegman et al., 2016). Therefore we would expect both males and second year birds to not show signs of incubation when using our classifier and therefore provide an alternative approach to validate our methodology.

Male and immatures bird were tagged with different tag types (Ecotone GSM device, 24g) that collected data at lower resolution than the tags used in the main part of this study. The tags used on males collected GPS fixes every 30 mins and ACC burst every 10 mins therefore we re-sampled the data in the main part of study to have a GPS fix every 30 mins and a ACC burst every 12 mins (changing the ACC sampling interval to 10 mins was not possible as the data was originally collected at an interval of 6 mins). Standardising the sampling rates across the two tag types would allow classification of males and immatures using the training data set in the main part of the study. We then ran our classifier on the male and immature data ($n = 5$), using the five known breeders from 2019 and 2019 in the training data set. Not a single day for any of the male or immature birds was classified as incubating (Fig S5). For tag UCOL35 two days did fall below the ODBA threshold to be classified as incubating but they didn't fall below the requisite threshold for either DDIST (Fig S6) or NSD (Fig S7). (Note: the days that fall below the threshold for NSD do not coincide with the days that fall below the ODBA threshold).

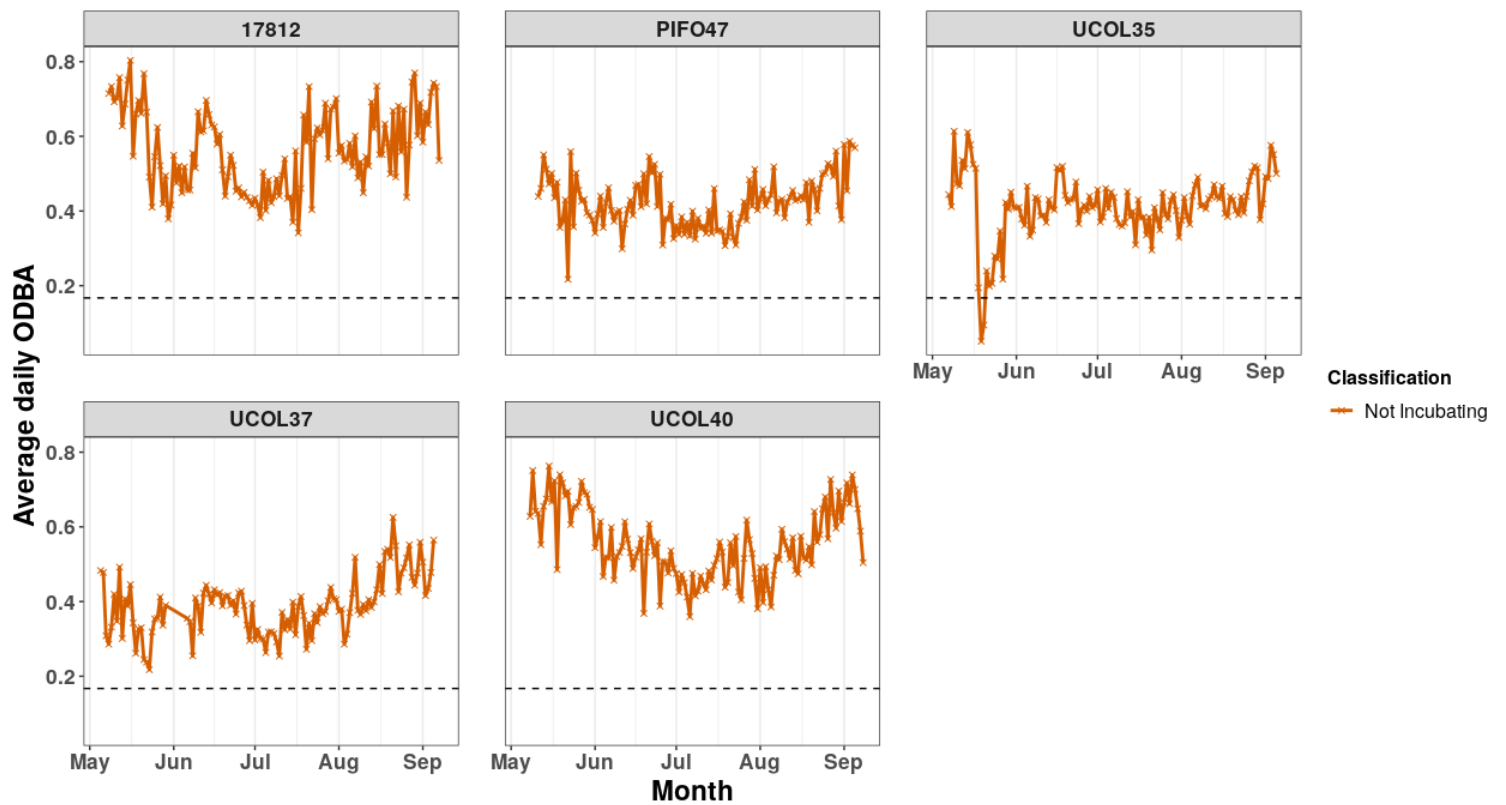


Fig S5. Breeding classifications of male and immature GWfG during the breeding season plotted against the average daily ODBA values. The dashed line represents the 95th quantile of average daily ODVA values for incubating days, determined using a set of known breeders. Below this value days are given a score of 2 (see main text). (PIFO47, UCOL35, UCOL37 & UCOL40 are males. 17812 was an immature)



Fig S6. Breeding classifications of male and immature GWfG during the breeding season plotted against the distance between successive median daily locations (DDIST). The dashed line represents the 95th quantile of DDIST values for incubating days, determined using a set of known breeders. Below this value days are given a score of 2 (see main text). (PIFO47, UCOL35, UCOL37 & UCOL40 are males. 17812 was an immature)



Fig S7. Breeding classifications of male and immature GWfG during the breeding season plotted against daily median net squared displacement (NSD). The dashed line represents the 5th quantile of NSD values for not incubating days, determined using a set of known breeders. Below this value days are given a score of 2 (see main text). (PIFO47, UCOL35, UCOL37 & UCOL40 are males. 17812 was an immature)

References

- Stroud, D. A. (1982). Observations on the incubation and post-hatching behaviour of the Greenland White-fronted Goose. *Wildfowl*, 33, 63–72.
- Weegman, M. D., Bearhop, S., Hilton, G. M., Walsh, A. J., Weegman, K. M., Hodgson, D. J., & Fox, A. D. (2016). Should I stay or should I go? Fitness costs and benefits of prolonged parent–offspring and sibling–sibling associations in an Arctic-nesting goose population. *Oecologia*, 181(3), 809–817. doi:10.1007/s00442-016-3595-4