

**Supplementary Material - Using movement data from satellite telemetry to infer nesting
status and breeding propensity of a colonial breeder, the American common eider
(*Somateria mollissima dresseri*)**

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24 *Sensitivity testing of the decision tree*

25 Multiple lines of biological reasoning were considered when developing the thresholds of
26 the relevant parameters between breeding status classifications. Various scenarios were
27 examined when developing the decision tree to investigate the effect that shifting those
28 thresholds had on breeding propensity estimates. Throughout testing, we noted that altering the
29 threshold between a failed nesting attempt and a successful nesting attempt would shift some
30 individuals' breeding status classifications; these changes had very little overall impact on
31 breeding propensity estimates, as both failed and successful nesting attempts were included in
32 estimate calculations (Figure S1). However, shifting the threshold between the potential
33 prospecting and failed nesting attempts comparatively had much larger implications for breeding
34 propensity estimates (Figure S1). It was also noted that adjusting the percent probability of the
35 limited movement state below 80% did not substantially impact breeding status classifications,
36 and only at approximately >90% probability did status assignments begin to experience
37 alterations. Thus, >80% probability was selected as an appropriate threshold given the ecological
38 context and provided a buffer which ensured relevant data were retained.

39 An alternate decision tree was created to demonstrate the impact the established
40 thresholds had on breeding status classifications and thus breeding propensity. The alternate tree
41 was designed with larger buffers around what was considered a biological constraint in the main
42 decision tree, with a more generous definition of what constituted a prospecting bird, with longer
43 periods of time in the limited movement state considered prospecting instead of a nesting
44 attempt. It also allowed for a shorter period of time in the limited movement state to be
45 considered a successful breeding attempt. These thresholds were shifted as much as possible

while staying true to the construction and behavioural meaning of each of the breeding status categories. The alternate breeding status decision tree was as follows:

1. Is there a sequence of at least 22 d with consistently >80% probability of the limited movement state with at least 19 d with colony overlap of a single island during the likely regional nest initiation window?
 - a. Yes – assigned “successful nesting attempt”
 - b. No, then
2. Is there a sequence of 8-21 d with consistently >80% probability of the limited movement state with at least 6 d with colony overlap of a single island during the likely regional nest initiation window?
 - a. Yes – assigned “failed nesting attempt”
 - b. No, then
3. Is there a sequence of 2-7 d with consistently >80% probability of the limited movement state with at least 2 d with colony overlap of a single island during the likely regional nest initiation window?
 - a. Yes – assigned “potential prospecting”
 - b. No – assigned “skipped breeding”

Altering the parameters of the decision tree could change breeding status assignments and thus estimates of breeding propensity. The effect of these decisions was tested and an example of how changes to the tree could affect breeding propensity were calculated. Although changing the threshold between failed and successful nesting attempts by 2 d less in the limited state and 2 d

more overlapping a colony shifted the breeding status of multiple individuals, this did not affect the measure of breeding propensity (Figure S1). However, changing the threshold between potential prospecting and failed nesting attempts by 2 d more in the limited state and 1 d more overlapping a colony had much larger implications for breeding propensity (Figure S1). Overall, the example alternate decision tree caused a 4% decrease in breeding propensity, at 49% across breeding regions. By year, propensity decreased by 2% in 2022 (44% successful and failed nesters, 24% potential prospectors, and 32% skipped breeding), decreased by 4% in 2023 (44%, 15%, and 41%, respectively), and decreased by 6% in 2024 (57%, 16%, and 27%, respectively). With this alternate decision tree, breeding propensity decreased across almost every region, including in New Brunswick by 5% (63%), Nova Scotia by 12% (47%), Québec by 5% (25%), Newfoundland by 1% (54%), and Labrador by 5% (78%). Breeding propensity did not change in Maine despite the alternate decision tree and remained at 71%. Additional alternative measurements of breeding propensity could include removing time restrictions by area on the initiation windows in the decision tree, however trialing this also resulted in very little change to overall breeding propensity.

Thus it was deemed less biologically relevant and a less accurate representation of breeding status assignment in the context of this species for this project. This decision was made specifically regarding the duration of the sequence in the limited movement state for a successful nesting attempt, as well as the lower threshold for a failed nesting attempt. Eiders incubate on average for 24-26 d and a shorter incubation duration of 22 d (i.e., the sequence in the limited movement state) was not thought to accurately reflect a successful clutch [1]. In contrast, initiation of incubation typically occurs after the second or third egg of a clutch is laid, meaning that a sequence of 7 d in the limited movement state may have allowed time for nest initiation

and could no longer be considered a prospecting individual [1]. Thus, this decision tree was investigated but ultimately disregarded. However, for the sake of testing how sensitive the decision tree was to these thresholds, each individual was once again categorized into the four breeding assignments based on the alternate decision tree and breeding propensity was calculated and compared to the main decision tree as an example of the sensitivity testing conducted.

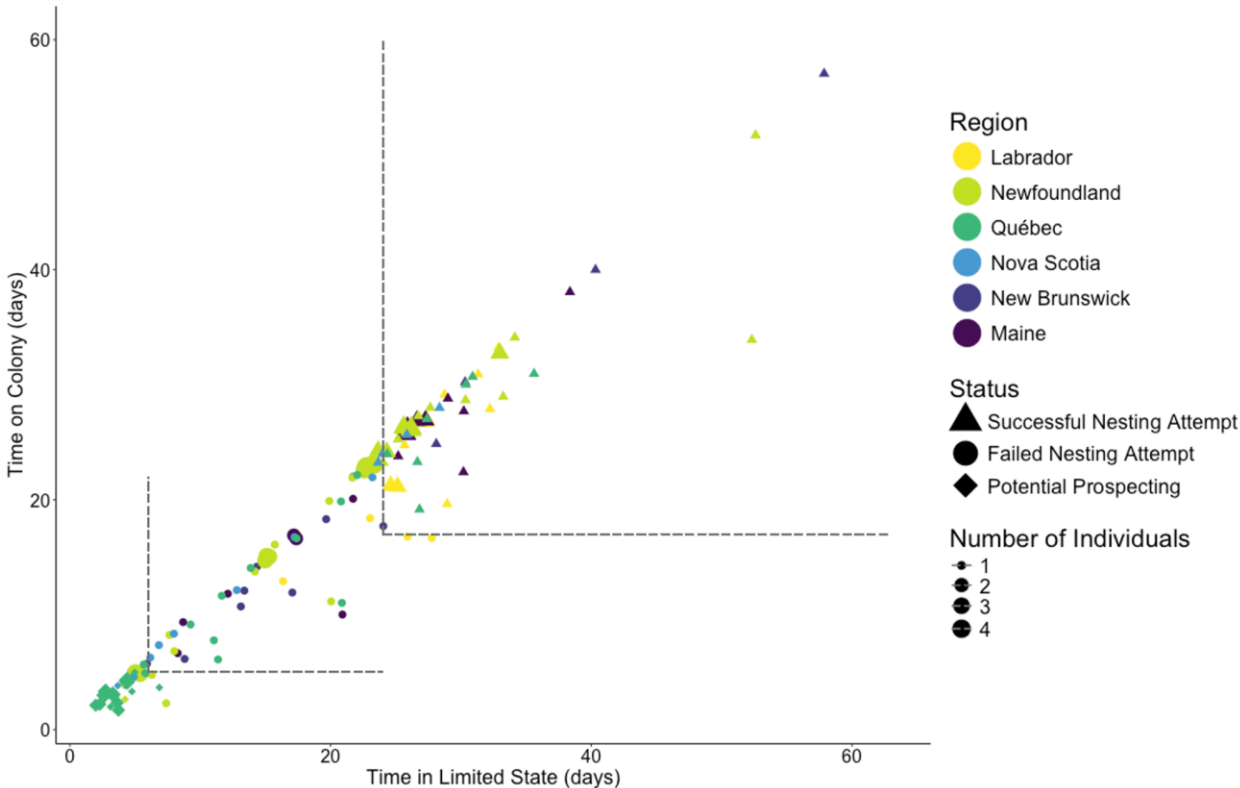


Figure S1 PTT-equipped American common eider (*Somateria mollissima dresseri*) hens were assessed for sequences of time spent in the limited movement state (with consistently >80% probability, i.e. time in limited state) with coinciding periods of colony overlap of a single island (i.e. time on colony) during the regional nest initiation window. Each individual was organized into the four breeding status classifications (successful nesting attempt, failed nesting attempt,

potential prospect, and skipped breeding) by the decision tree using these identified periods. The boundaries between classifications based on the final decision tree are indicated by the dashed lines. Alternate scenarios were developed by shifting these boundaries. Breeding status indicated by shape and breeding region indicated by colour. Birds assigned as skipped breeding do not spend any time on colony and in the limited state, and as this is a constant and thus does not influence the boundaries within the decision tree, this figure does not include individuals assigned as skipped breeding.

Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

References

1. Beuth JM, Mcwilliams SR, Paton PWC, Osenkowski JE. Habitat use and movements of common eiders wintering in southern New England. *J Wildlife Manage.* 2017;81(7):1276–86.