**Journal**: Ecology

**Manuscript Title**: Evidence for seasonal compensation of hunting mortalities in a long-lived migratory bird

**Authors**: Frédéric LeTourneux1\*, Gilles Gauthier1, Roger Pradel2, Josée Lefebvre3 & Pierre Legagneux1,4

**Appendix S4**: E-Surge Syntax for model M10 (Table 1)

**Initial settings – Data**Number of occasions: 119  
Number of states: 21   
Number of events: 4   
Number of groups: 2  
Number of age classes: 1

**Initial settings – Options**Link function = Generalized Logit   
Overdispersion coefficient = 2.000

**Model matrices – Gepat file**%%%% VERSION 2.0 %%%%%%

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%%%% Initial state %%%%%%

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**Shortcuts**

band -> [ [f(1 2)]]

col -> [ [f(3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18).g(2)]]

Hsummer -> [ [f(11 12 13 14 15 16 17 18)]]

Hfall -> [ [f(7 8 9 10 15 16 17 18)]]

Hwinter -> [ [f(5 6 9 10 13 14 17 18)]]

Hspring -> [ [f(4 6 8 10 12 14 16 18)]]

summer -> [ [t(1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117)]]

fall -> [ [t(2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98 102 106 110 114 118)]]

winter -> [ [t(3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99 103 107 111 115 119)]]

spring -> [ [t(4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116)]]

seasons -> [ [t(1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97 101 105 109 113 117,2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98 102 106 110 114 118,3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99 103 107 111 115 119,4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116)]]

hunt -> [ [t(1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35,36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74,75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119)]]

**Model Definition – GEMACO***Initial state*

- STEP 1 (summer heterogeneity ring + collar)to

- STEP 2 (fall heterogeneity collar only)

i

- STEP 3 (winter heterogeneity collar only)

i

- STEP 4 (spring heterogeneity collar only)

i

*Transition*- STEP 1 (Collar loss)

i

- STEP 2 (Survival)

spring.hunt + summer + fall.hunt(1,2:3) + winter.hunt(1:2,3) + col.hunt(2,3).seasons

*Event*

- STEP 1 (Encounter probabilities)

firste+nexte.[band.[seasons(2 3 4)+summer.[f(2)+g(2)+t]]+   
f(19 20).[fall&[summer.hunt(1)]+[winter+spring+[summer.hunt(2 3)] ].t] + col.[summer.[Hsummer+t] + fall.[Hfall+t] + winter.[Hwinter+t] + spring.[Hspring+t]]]+others

- STEP 2 (constrain ring recovery < collar recovery)

f(4).hunt

**IVFV (Initial Values and Fixed Values)***Fixed values: Event*

*Parameter indices for values fixed to 1:* 24

*Parameter indices for values fixed to 0:* 25, 57, 260

**Initial values used for optimization:**

Text file for initial values of model M10 provided below. The first line provides the number of parameters to estimate in each section (initial values, transitions, events). In all subsequent sections, values in the 2nd column are initial parameter values. Values in the 1st column indicate whether the line represents an initial value (0), a fixed value on the real ]-ꝏ, ꝏ[ scale (1), or a fixed value on the [0, 1] scale (2).

Initial values are provided on the real scale, and this was an important detail to reach convergence on a global minimum. In order to achieve this, the option for initial values ‘From Last Model’ must be selected in the ‘Advanced Numerical’ window, and then the text file provided below must be loaded by clicking on the ‘IVFV’ button and selecting ‘Open IVFV file’ from the ‘File’ drop down menu at the top of the IVFV window. This allows providing initial values on the real scale while setting some values to 0 on the [0,1] scale.

6 17 240

########## INIT ###############

0 -0.708

0 -0.708

0 -1.650

0 0

0 0

0 0

########## TRANSITION #########

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0 3.178

0 3.178

0 3.476

0 2.944

0 2.944

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########## EVENT ##########

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