

Appendix B. List with the assesement of intrinsic identifiability of different temporary emigration models.

Intrinsic identifiability of the temporary emigration models, assessed with computer algebra (see Appendix A for MAPLE code used for the assessment). Table entries are the parameters that are separately identifiable, the number of estimated parameters when k capture occasions are considered. Model notations follow Lebreton et al. (1992). S : survival probability, ψ^{OU} : transition probability between observable and unobservable state (emigration), ψ^{UO} : transition probability between unobservable and observable state (immigration), p : on-site recapture probability. In the model notation, subscript t refers to time, g to group, and $.$ to constancy. In the parameter notation, superscript $g1$ refers to group1, superscript $g2$ to group2, the subscript m refers to the last capture occasion and subscript 1 to the first capture occasion. Note: ψ_1^{UO} is never estimable, but this is not stated explicitly in this table.

Model	Identifiable parameters	Number of estimated quantities
1: $S_{g^*t}, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_{g^*t}$	None	$8k-20$
2: $S_{g^*t}, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_t$	None	$7k-18$
3: $S_{g^*t}, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_g$	None, but p^{g1} and p^{g2}	$6k-10$
4: $S_{g^*t}, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p.$	None, but p	$6k-11$
5: $S_{g^*t}, \psi_t^{OU}, \psi_t^{UO}, p_{g^*t}$	None, but p^{g1}_2 and p^{g2}_2	$6k-13$
6: $S_{g^*t}, \psi_t^{OU}, \psi_t^{UO}, p_t$	None, but p_2	$5k-11$
7: $S_{g^*t}, \psi_t^{OU}, \psi_t^{UO}, p_g$	None, but p^{g1} and p^{g2}	$4k-5$
8: $S_{g^*t}, \psi_t^{OU}, \psi_t^{UO}, p.$	None, but p	$4k-6$
9: $S_{g^*t}, \psi_g^{OU}, \psi_g^{UO}, p_{g^*t}$	All, but $S^{g1}_m, S^{g2}_m, p^{g1}_m, p^{g2}_m$	$4k-2$
10: $S_{g^*t}, \psi_g^{OU}, \psi_g^{UO}, p_t$	All, but S^{g1}_m, S^{g2}_m, p_m	$3k$
11: $S_{g^*t}, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	$2k+4$
12: $S_{g^*t}, \psi_g^{OU}, \psi_g^{UO}, p.$	All	$2k+3$
13: $S_{g^*t}, \psi_{.}^{OU}, \psi_{.}^{UO}, p_{g^*t}$	All, but $S^{g1}_m, S^{g2}_m, p^{g1}_m, p^{g2}_m$	$4k-4$
14: $S_{g^*t}, \psi_{.}^{OU}, \psi_{.}^{UO}, p_t$	All, but S^{g1}_m, S^{g2}_m, p_m	$3k-2$
15: $S_{g^*t}, \psi_{.}^{OU}, \psi_{.}^{UO}, p_g$	All	$2k+2$
16: $S_{g^*t}, \psi_{.}^{OU}, \psi_{.}^{UO}, p.$	All	$2k+1$
17: $S_t, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_{g^*t}$	All, but $S_{m-1}, S_m, \psi_1^{OUg1}, \psi_{m-1}^{OUg1}, \psi_m^{OUg1}, \psi_1^{OUg2}, \psi_{m-1}^{OUg2}, \psi_m^{OUg2}, \psi_2^{UOg1}, \psi_m^{UOg1}, \psi_2^{UOg2}, \psi_m^{UOg2}, p_2, p_m$	$7k-15$
18: $S_t, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_t$	All, but $S_m, \psi_1^{OUg1}, \psi_m^{OUg1}, \psi_1^{OUg2}, \psi_m^{OUg2}, \psi_2^{UOg1}, \psi_m^{UOg1}, \psi_2^{UOg2}, \psi_m^{UOg2}, p_1, p_m$	$6k-11$

19: $S_t, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_g$	All, but $S_m, \psi_m^{OUg^1}, \psi_m^{OUg^2}, \psi_m^{UOg^1}, \psi_m^{UOg^2}$	5k-6
20: $S_t, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p.$	All, but $S_m, \psi_m^{OUg^1}, \psi_m^{OUg^2}, \psi_m^{UOg^1}, \psi_m^{UOg^2}$	5k-7
21: $S_t, \psi_t^{OU}, \psi_t^{UO}, p_{g^*t}$	None, but $p_2^{g^1}$ and $p_2^{g^2}$	5k-11
22: $S_t, \psi_t^{OU}, \psi_t^{UO}, p_t$	None	4k-10
23: $S_t, \psi_t^{OU}, \psi_t^{UO}, p_g$	None, but p^{g^1} and p^{g^2}	3k-4
24: $S_t, \psi_t^{OU}, \psi_t^{UO}, p.$	None, but p	3k-5
25: $S_t, \psi_g^{OU}, \psi_g^{UO}, p_{g^*t}$	All, but $S_m, p_m^{g^1}, p_m^{g^1}$	3k
26: $S_t, \psi_g^{OU}, \psi_g^{UO}, p_t$	All, but S_m, p_m	2k+1
27: $S_t, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	k+5
28: $S_t, \psi_g^{OU}, \psi_g^{UO}, p.$	All	k+4
29: $S_t, \psi_{.}^{OU}, \psi_{.}^{UO}, p_{g^*t}$	All, but $S_m, p_m^{g^1}, p_m^{g^2}$	3k-2
30: $S_t, \psi_{.}^{OU}, \psi_{.}^{UO}, p_t$	All, but S_m, p_m	2k-1
31: $S_t, \psi_{.}^{OU}, \psi_{.}^{UO}, p_g$	All	k+3
32: $S_t, \psi_{.}^{OU}, \psi_{.}^{UO}, p.$	All	k+2
33: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_{g^*t}$	All, but $\psi_1^{OUg^1}, \psi_m^{OUg^1}, \psi_1^{OUg^2}, \psi_m^{OUg^2}, \psi_2^{UOg^1}, \psi_m^{UOg^1}, \psi_2^{UOg^2}, \psi_m^{UOg^2}, p_1^{g^1}, p_1^{g^2}, p_m^{g^1}, p_m^{g^2}$	6k-10
34: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_t$	All, but $\psi_1^{OUg^1}, \psi_m^{OUg^1}, \psi_1^{OUg^2}, \psi_m^{OUg^2}, \psi_2^{UOg^1}, \psi_m^{UOg^1}, \psi_2^{UOg^2}, \psi_m^{UOg^2}, p_1, p_m$	5k-7
35: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_g$	All	4k-2
36: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p.$	All	4k-3
37: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_{g^*t}$	All, but $\psi_1^{OU}, \psi_m^{OU}, \psi_2^{UO}, \psi_m^{UO}, p_1^{g^1}, p_m^{g^1}, p_1^{g^2}, p_m^{g^2}$	4k-5
38: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_t$	All, but $\psi_1^{OU}, \psi_m^{OU}, \psi_2^{UO}, \psi_m^{UO}, p_1, p_m$	3k-4
39: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_g$	All	2k+1
40: $S_g, \psi_t^{OU}, \psi_t^{UO}, p.$	All	2k
41: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_{g^*t}$	All	2k+4
42: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_t$	All	k+5
43: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	8
44: $S_g, \psi_g^{OU}, \psi_g^{UO}, p.$	All	7
45: $S_g, \psi_{.}^{OU}, \psi_{.}^{UO}, p_{g^*t}$	All	2k+2
46: $S_g, \psi_{.}^{OU}, \psi_{.}^{UO}, p_t$	All	k+3
47: $S_g, \psi_{.}^{OU}, \psi_{.}^{UO}, p_g$	All	6

48: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	5
49: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_{g^*t}$	All, but $\psi_1^{OUg1}, \psi_m^{OUg1}, \psi_1^{OUg2}, \psi_m^{OUg2}, \psi_2^{UOg1}, \psi_m^{UOg1}, \psi_2^{UOg2}, \psi_m^{UOg2}, p_{g^*t}^{g1}, p_{g^*t}^{g2}, p_m^{g1}, p_m^{g2}$	$6k-11$
50: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_t$	All but $\psi_1^{OUg1}, \psi_m^{OUg1}, \psi_1^{OUg2}, \psi_m^{OUg2}, \psi_2^{UOg1}, \psi_m^{UOg1}, \psi_2^{UOg2}, \psi_m^{UOg2}, p_1, p_m$	$5k-8$
51: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_g$	All	$4k-3$
52: $S_g, \psi_{g^*t}^{OU}, \psi_{g^*t}^{UO}, p_g$	All	$4k-4$
53: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_{g^*t}$	All, but $\psi_1^{OU}, \psi_m^{OU}, \psi_2^{UO}, \psi_m^{UO}, p_{g^*t}^{g1}, p_{g^*t}^{g1}, p_{g^*t}^{g2}, p_{g^*t}^{g2}$	$4k-6$
54: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_t$	All, but $\psi_1^{OU}, \psi_m^{OU}, \psi_2^{UO}, \psi_m^{UO}, p_1, p_m$	$3k-5$
55: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_g$	All	$2k$
56: $S_g, \psi_t^{OU}, \psi_t^{UO}, p_g$	All	$2k-1$
57: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_{g^*t}$	All	$2k+3$
58: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_t$	All	$k+4$
59: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	7
60: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	6
61: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_{g^*t}$	All	$2k+1$
62: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_t$	All	$k+2$
63: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	5
64: $S_g, \psi_g^{OU}, \psi_g^{UO}, p_g$	All	4

Literature cited

Lebreton, J.-D., K. P. Burnham, J. Clobert, and D. R. Anderson. 1992. Modelling survival and testing biological hypotheses using marked animals: a unified approach with case studies. *Ecological Monographs* **62**:67-118.