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Appendix A. Selection of the best tag loss and dispersal models in each site.

Akaike's information criterion values ($QAICc$) and numbers of parameters (np) for each release site, for starting (less constrained) and best models for:

- (step 1) recovery parameter (r),
- (step 2) resighting parameter (p) with the best model for r ,
- (step 3) strata transition parameter (ψ) with the best model for r and p , and
- (step 4) survival parameter (ϕ) with the best model for r , p and ψ .

Numbers of models tested for each step are indicated in bold. Subscript letters indicate the effect: t, year; c, constant over time; a, time since release (e.g. $a_{1,2}$: time since release effect with first class for the first year after release and second class for the following years, $a_{1,1,2}$: time since release effect with first class for the first two years after release and second class for the following years, $a_{1,2,3}$: time since release effect with first class for the first year after release, second class for the second year after release and third class for the following years).

All $QAICc$ values have been computed using a multi-strata model (tag loss or dispersal) including live recaptures and dead recoveries.

Resighting and transition models: met , col and cod correspond respectively to the probabilities of resighting of metal, colour and code bands. In all cases, we assume that the transitions color→code, code→color, metal→code and metal→color are fixed and correspond to re-banding events. Concerning the transitions color→metal and code→metal (loss of long distance identification marks), several models are presented in which rates of loss of color ($\psi_{losscol}$) and code bands ($\psi_{losscod}$) are different.

Other notations: im: parameter for individuals released as immature ; ad: parameter for individuals released as adult ; $a_{1\times t}$: time since release effect with first class for the first year after release varying with time and second class for the following years constant over time ; A→B: dispersal from release site A to site B ; ar: age at release effect i.e. parameters differed

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between individuals released as immature and as adult ; *: the long term survival rates of individual released as immature and as adult are equal.

Further details on intermediate models can be provided upon request to corresponding author.

Best models for each step are indicated in bold.

Causes - Tag loss model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	$\phi_{t \times ar}$	$\psi_{losscol_{t \times ar}}, \psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}}, p_{col_{t \times ar}}, p_{cod_{t \times ar}}$	$r_{t \times ar}$	2191.43	330
simpler structure on r	$\phi_{t \times ar}$	$\psi_{losscol_{t \times ar}}, \psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}}, p_{col_{t \times ar}}, p_{cod_{t \times ar}}$	11 models tested (i.e. combinations $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1 \times t}; \times ar$) best: $r_{a1,2}$	1834.25	282
simpler structure on p	$\phi_{t \times ar}$	$\psi_{losscol_{t \times ar}}, \psi_{losscod_{t \times ar}}$		60 models tested (i.e. combinations of $t \times ar; c \times ar; a_{1,2} \times ar; a_{1,2,3} \times ar; a_{1,1,2} \times ar$ for met, col, and cod and combinations of $c; t; a_{1,2}$ for met, col and cod) best: $p_{met_t}, p_{col_c}, p_{cod_{a1,2}}$	$r_{a1,2}$	1401.31 189
simpler structure on ψ	$\phi_{t \times ar}$		36 models tested (i.e. combinations of $t \times ar; c \times ar; a_{1,2} \times ar; a_{1,2,3} \times ar; a_{1,1,2} \times ar$ for losscol and losscod; combinations of $c; t; a_{1,2}; a_{1,1,2}$ for losscol and losscod; and 8 combinations of $a_{1,1,\dots,2}$ for losscol and losscod c) best: $\psi_{losscol_{a1,1,1,1,1,1,1,1,2}}, \psi_{losscod_c}$	$p_{met_t}, p_{col_c}, p_{cod_{a1,2}}$ $r_{a1,2}$		1127.9 96
simpler structure on ϕ		30 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; \times ar$ and equalization of long-term survival for best model (*)) best: $\phi_{im_{a1,1,2^*}}, \phi_{ad_{a1,2^*}}$	$\psi_{losscol_{a1,1,1,1,1,1,1,1,2}}, \psi_{losscod_c}$	$p_{met_t}, p_{col_c}, p_{cod_{a1,2}}$ $r_{a1,2}$		1021.9 37

Baronnies - Tag loss model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}}; p_{cod_{t \times ar}}$	$r_{t \times ar}$	453.49	84
simpler structure on r	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}}; p_{cod_{t \times ar}}$	11 models tested (i.e. combinations t; c; a _{1,2} ; a _{1,2,3} ; a _{1,1,2} ; a _{1×t} ; ×ar) best: r_c	402.2	67
simpler structure on p	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	25 models tested (i.e. combinations of t×ar, c×ar, a _{1,2} ×ar, a _{1,2,3} ×ar, a _{1,1,2} ×ar for met, cod and combinations of c, t, a _{1,2} for met, cod) best: $p_{met_c}; p_{cod_c}$	r_c	334.21	37
simpler structure on ψ	$\phi_{t \times ar}$	11 models tested (i.e. combinations t; c; a _{1,2} ; a _{1,2,3} ; a _{1,1,2} ; a _{1×t} ; ×ar) best: $\psi_{losscod_t}$	$p_{met_c}; p_{cod_c}$	r_c	315.93	29
simpler structure on ϕ	30 models tested (i.e. combinations of t; c; a _{1,2} ; a _{1,2,3} ; a _{1,1,2} ; ×ar and equalization of long-term survival for best model (*)) best: $\phi_{im_{a1,1,2^*}}; \phi_{ad_{a1,2^*}}$	$\psi_{losscod_t}$	$p_{met_c}; p_{cod_c}$	r_c	279.06	14

Navacelles - Tag loss model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	ϕ_{ad_t}	$\psi_{losscol_t}, \psi_{losscod_t}$	$p_{met_t}; p_{col_t}; p_{cod_t}$	r_t	496.07	86
				12 models tested (i.e. combinations $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1\times t}$; with parameter fixed to 0 from 1998 to 2004)		
simpler structure on r	ϕ_{ad_t}	$\psi_{losscol_t}, \psi_{losscod_t}$	$p_{met_t}; p_{col_t}; p_{cod_t}$	$r_c (0 \text{ from } 1998 \text{ to } 2004)$	453.13	75
				63 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}$; with parameter fixed to 0 from 1998 to 2004 for met, col and cod)		
simpler structure on p	ϕ_{ad_t}	$\psi_{losscol_t}, \psi_{losscod_t}$		$r_c (0 \text{ from } 1998 \text{ to } 2004)$		
				best: $p_{met_c}; p_{col_c}; p_{cod_c} (0 \text{ from } 1998 \text{ to } 2004)$	352.31	45
simpler structure on ψ	ϕ_{ad_t}		35 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}$; with parameter fixed to 0 from 1998 to 2004)	$p_{met_c}; p_{col_c}; p_{cod_c} (0 \text{ from } 1998 \text{ to } 2004)$	$r_c (0 \text{ from } 1998 \text{ to } 2004)$	
			best: $\psi_{losscol_c}; \psi_{losscod_c}$		315.67	27
simpler structure on ϕ		9 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}$; with parameter fixed to 0 from 1998 to 2004)	$\psi_{losscol_c}; \psi_{losscod_c}$	$p_{met_c}; p_{col_c}; p_{cod_c} (0 \text{ from } 1998 \text{ to } 2004)$	$r_c (0 \text{ from } 1998 \text{ to } 2004)$	
	best: $\phi_{ad_{a1,2}}$				305.95	15

Navacelles - Dispersal model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	$\phi_{ad_{NAV} t}$	$\Psi_{NAV \rightarrow CAU t}$	$p_{NAV t}$	$r_{NAV t}$	369.4	49
simpler structure on r	$\phi_{ad_{NAV} t}$	$\Psi_{NAV \rightarrow CAU t}$	$p_{NAV t}$	12 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1,1,1,2}; a_{1 \times t}; with parameter fixed to 0 from 1998 to 2004)$		
simpler structure on p	$\phi_{ad_{NAV} t}$	$\Psi_{NAV \rightarrow CAU t}$		9 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; with parameter fixed to 0 from 1998 to 2004)$	$r_{NAV a1,1,2}$	
simpler structure on ψ	$\phi_{ad_{NAV} t}$		$p_{NAV a1,2}$		310.52	30
simpler structure on ϕ	$\phi_{ad_{NAV} t}$	$\Psi_{NAV \rightarrow CAU t} (0 \text{ from } 1998 \text{ to } 200)$	$p_{NAV a1,2}$	$r_{NAV a1,1,2}$	300.04	26
	$\phi_{ad_{a1,2}}$				279.85	17

Verdon - Tag loss model

	ϕ	ψ	p	r	$QAICc$	np
less constrained	ϕim_t	$\psi losscod_t$	$p_{met_t}; p_{cod_t}$	r_t	291.24	30
simpler structure on r	ϕim_t	$\psi losscod_t$	$p_{met_t}; p_{cod_t}$	<u>5 models tested (i.e. combinations c; $a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1\times t}$)</u> <u>best: r_c</u>	270.72	22
simpler structure on p	ϕim_t	$\psi losscod_t$	<u>21 models tested (i.e. combinations of t; c; $a_{1,2}; a_{1,2,3}; a_{1,1,2}$ for met, and cod)</u> <u>best: $p_{met_t}; p_{cod_t}$</u>	r_c	270.72	22
simpler structure on ψ	ϕim_t	<u>7 models tested (i.e. combinations c; $a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1,1,1,2}; a_{1,2,3,4}; a_{1\times t}$)</u> <u>best: $\psi losscod_c$</u>	$p_{met_t}; p_{cod_t}$	r_c	263.11	18
simpler structure on ϕ	<u>7 models tested (i.e. combinations c; $a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1,1,1,2}; a_{1,2,3,4}; a_{1\times t}$)</u> <u>best: $\phi im_{a1,1,2}$</u>	$\psi losscod_c$	$p_{met_t}; p_{cod_t}$	r_c	258.8	14

Verdon - Dispersal model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	$\phi_{im_{VER} t}$	$\Psi_{VER \rightarrow BAR t}$	$p_{VER t}$	$r_{VER t}$	291.23	29
simpler structure on r	$\phi_{im_{VER} t}$	$\Psi_{VER \rightarrow BAR t}$	$p_{VER t}$	<u>5 models tested (i.e. combinations c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1xt})</u> best: $r_{VER c}$	280.05	24
simpler structure on p	$\phi_{im_{VER} t}$	$\Psi_{VER \rightarrow BAR t}$	<u>5 models tested (i.e. combinations c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1xt})</u> best: $p_{VER t}$	$r_{VER c}$	280.05	24
simpler structure on ψ	$\phi_{im_{VER} t}$	<u>7 models tested (i.e. combinations c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1,1,1,2}; a_{1,2,3,4}; a_{1xt})</u> best: $\Psi_{VER \rightarrow BAR a1,1,2}$	$p_{VER t}$	$r_{VER c}$	268.9	21
simpler structure on ϕ	<u>7 models tested (i.e. combinations c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1,1,1,2}; a_{1,2,3,4}; a_{1xt})</u> best: $\phi_{im_{VER} a1,1,2}$	$\Psi_{VER \rightarrow BAR a1,1,2}$	$p_{VER t}$	$r_{VER c}$	265.06	17

Diois - Tag loss model

	ϕ	ψ	p	r	$QAICc$	np	
less constrained	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}; p_{cod_{t \times ar}}}$	$r_{t \times ar}$	297.22	54	
simpler structure on r	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}; p_{cod_{t \times ar}}}$	r_c	best: r_c 227.81	43	
simpler structure on p	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_{t \times ar}, p_{cod_{t \times ar}}}$	r_c	25 models tested (i.e. combinations of $t \times ar$, $c \times ar$, $a_{1,2} \times ar$, $a_{1,2,3} \times ar$, $a_{1,1,2} \times ar$ for met, cod and combinations of c , t , $a_{1,2}$ for met, cod) best: $p_{met_t}; p_{cod_c}$	168.71	29
simpler structure on ψ	$\phi_{t \times ar}$	$\psi_{losscod_{t \times ar}}$	$p_{met_t}; p_{cod_c}$	r_c		150.11	20
simpler structure on ϕ	$\phi_{t \times ar}$	$\psi_{losscod_c}$	$p_{met_t}; p_{cod_c}$	r_c	30 models tested (i.e. combinations of t ; c ; $a_{1,2}$; $a_{1,2,3}$; $a_{1,1,2}$; $\times ar$ and equalization of long- term survival for best model (*)) best: $\phi_{im_{a1,1,2^*}}; \phi_{ad_{a1,2^*}}$	130.56	11

Diois - Dispersal model

	ϕ	Ψ	p	r	$QAICc$	np
less constrained	$\phi_{\text{DIOIS } t \times ar}$	$\Psi_{\text{DIOIS} \rightarrow \text{BAR } t \times ar}, \Psi_{\text{DIOIS} \rightarrow \text{VER } t \times ar}$	$p_{\text{DIOIS } t \times ar}$	$r_{\text{DIOIS } t \times ar}$	429.28	65
simpler structure on r	$\phi_{\text{DIOIS } t \times ar}$	$\Psi_{\text{DIOIS} \rightarrow \text{BAR } t \times ar}, \Psi_{\text{DIOIS} \rightarrow \text{VER } t \times ar}$	$p_{\text{DIOIS } t \times ar}$	11 models tested (i.e. combinations $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1 \times t}; \times ar$) best: $r_{\text{DIOIS } c}$	333.26	54
simpler structure on p	$\phi_{\text{DIOIS } t \times ar}$	$\Psi_{\text{DIOIS} \rightarrow \text{BAR } t \times ar}, \Psi_{\text{DIOIS} \rightarrow \text{VER } t \times ar}$		11 models tested (i.e. combinations $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; a_{1 \times t}; \times ar$) best: $p_{\text{DIOIS } c}$	283.32	45
simpler structure on ψ	$\phi_{\text{DIOIS } t \times ar}$			28 models tested (i.e. combinations of $t \times ar, c \times ar, a_{1,2} \times ar, a_{1,2,3} \times ar, a_{1,1,2} \times ar$ for DIOIS \rightarrow BAR and DIOIS \rightarrow VER; and combinations of $c, t, a_{1,2}, a_{1,1,2}$ for DIOIS \rightarrow BAR and DIOIS \rightarrow VER) best: $\psi_{im \text{DIOIS} \rightarrow \text{BAR } a_{1,2}}, \psi_{ad \text{DIOIS} \rightarrow \text{BAR } a_{1,2}}, \psi_{im \text{DIOIS} \rightarrow \text{VER } c}, \psi_{ad \text{DIOIS} \rightarrow \text{VER } c}$	226.49	31
simpler structure on ϕ		30 models tested (i.e. combinations of $t; c; a_{1,2}; a_{1,2,3}; a_{1,1,2}; \times ar$ and equalization of long-term survival for best model (*)) best: $\phi_{im \text{DIOIS } a_{1,1,2}*}, \phi_{ad \text{DIOIS } a_{1,2}*}$	$p_{\text{DIOIS } c}$	$r_{\text{DIOIS } c}$	196.52	22