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## Floriane Plard, Jean-Michel Gaillard, Tim Coulson, A. J. Mark Hewison, Mathieu Douhard, Francois Klein, Daniel Delorme, Claude Warnant and Christophe Bonenfant. 2015. The influence of birth date via body mass on individual fitness in a long-lived mammal. *Ecology* 96:1516-1528.

Appendix A.Description of the model describing the early life stage and adult stage traits in roe deer including the parameter estimates of the different models, the plots of the survival and the inheritance function for birth date and, the diagnostic plots of the different models.

**Table A1.** Parameter estimates and their standard errors for the selected models describing the early life stage and adult stage traits.  $s_{id}$  and  $s_{year}$  give the standard deviations of the random effects on maternal identity and year, respectively, when included in the model. **A. Early survival** (**Recruitment function of the IPM).** Influence of maternal body mass  $(BM_M)$  and individual birth date (BD), with a threshold date on May 12<sup>th</sup>) on individual early survival (to 8 months of age). **B. Yearling body mass (Inheritance function for body mass).** Influence of individual birth date (BD), of maternal body mass  $(BM_M)$  and of sex on individual yearling body mass. **C. Yearling survival.** Influence of individual yearling body mass  $(BM_M)$  on individual birth date (BD), on individual adult body mass  $(BM_M)$  and of sex on individual yearling body mass. **C. Yearling survival.** Influence of individual yearling body mass  $(BM_Y)$  on individual yearling body mass  $(BM_Y)$  on individual adult body mass. **E. Adult survival** was independent of both adult body mass and birth date. Early survival and yearling survival were modeled using generalized linear mixed models with a logit link and a binomial error. Adult survival was estimated using a capture-mark-recapture model. Other life history traits were modeled using linear mixed models.

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A. early survival	. early survival value SE					
Intercept	-0.24	3.64				
BD	-0.04	0.02				
$BM_M$	0.25	0.08				
$s_{id}$	0.91					
$s_{year}$	0.24					
B. yearling body mass	value	SE				
Intercept	20.90	4.62				
BD	-0.09	0.02				
$BM_M$	0.39	0.13				
sex	-1.16	0.38				
$s_{id}$	1.46					
$s_{year}$	0.60					
var(residuals)	1.36					
C. yearling survival	value	SE				
intercept	-4.24	3.88				
$BM_Y$	0.53	0.26				
$s_{year}$	2.19					
Adult stage traits						
D. adult body mass	value	SE				
Intercept	19.49	3.53				
BD	-0.05	0.02				
$BM_Y$	0.63	0.02				
var(residuals)	2.32					
E. adult survival	value	SE				
E. adult survival	value 0.82	SE 0.01				

**Table A2.** Model selection (A.) and parameter estimates (B.) for the inheritance function for birth date. Influence of maternal birth date  $(BD_M)$  and body mass  $(BM_M)$  on offspring birth

date. k indicates the number of estimated parameters, LL is the maximum log Likelihood,  $\Delta$ AIC indicates the difference in the AIC between two competing models, and wi corresponds to Akaike weights. The selected models are indicated in bold. 1 represents the constant model (i.e. intercept only). The inheritance function for body mass was modeled with a linear mixed model.  $s_{id}$  and  $s_{year}$  give the standard deviations of random effects on maternal identity and

year, respectively.						
A. Models	k	LL	$\Delta AIC$	wi		
$BM_M + BD_M$	6	-304.071	1.330	0.179		
$BD_M$	5	-304.406	0	0.347		
$BM_M$	5	-305.128	1.443	0.169		
1	4	-305.533	0.254	0.306		
<b>B.</b> Estimates		value	SE			
Intercept		112.90	15.38			
$BD_M$		0.17	0.11			
$s_{id}$		4.33				
$s_{year}$		4.02				
var(residuals)		21.61				



Figure A1. Influence of yearling body mass on yearling and adult survival for female roe deer at Trois Fontaines, France. Observed mean yearling survival for a given yearling body mass are represented by filled circles whose size is proportional to the number of yearlings of a given body mass. Data used to estimate adult survival are capture-mark-recapture data and are thus not presented in the figure.



Figure A2 Influence of maternal birth date on offspring birth date for female roe deer at Trois Fontaines, France.



**Figure A3.** Diagnostic plots of the models describing the early and adult life history traits with a Gaussian distribution. For each trait, we present a plot of the residuals against the fitted values (right panels) and the distribution of the residuals (left panels).



**Figure A4.** Diagnostic plots of the models describing the early and adult life history traits with a binomial distribution. For early and yearling survival, we present a plot of the binned residuals against the fitted values.