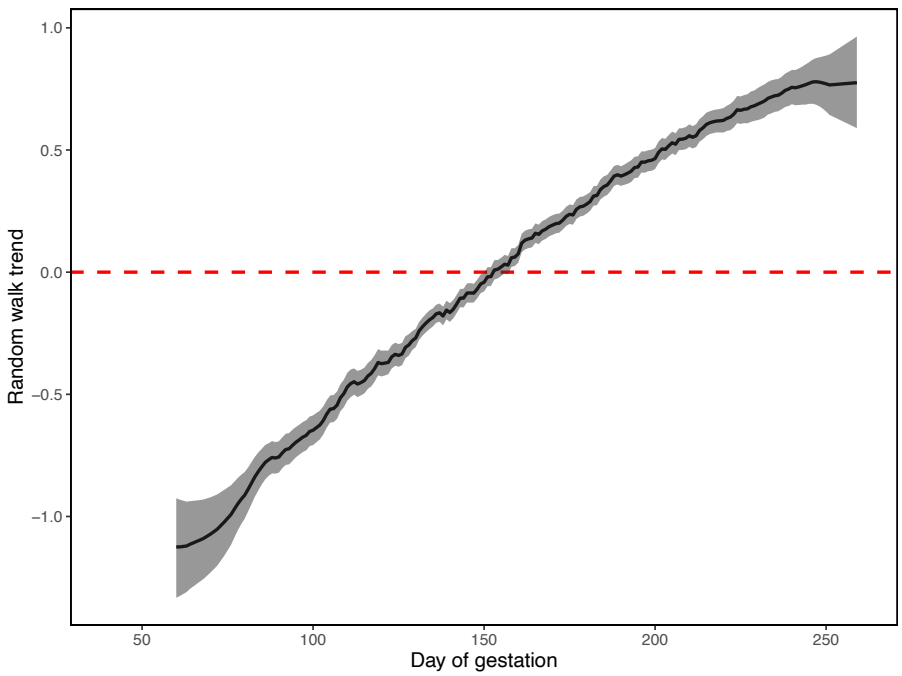

Fig. S1. Fitted (solid line) random walk (rw1) smoother with 95% credible intervals (shaded area) for a gamma GLM for Antarctic blue whale (*Balaenoptera musculus intermedia*) foetus size against day of gestation assuming a nominal day of conception of 1st August.

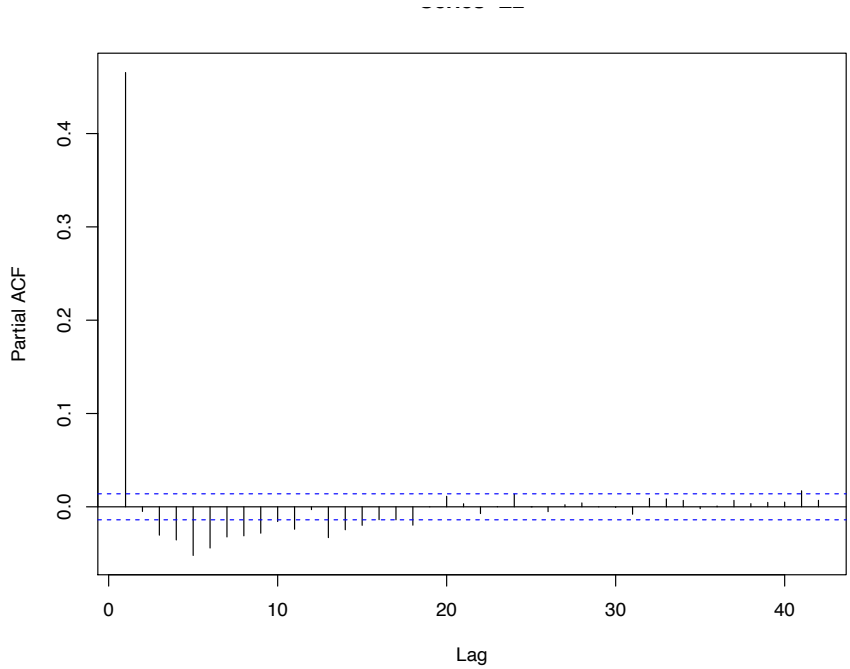

Fig. S2. Partial autocorrelation function of model residuals. Dashed horizontal line indicates 95% confidence intervals.

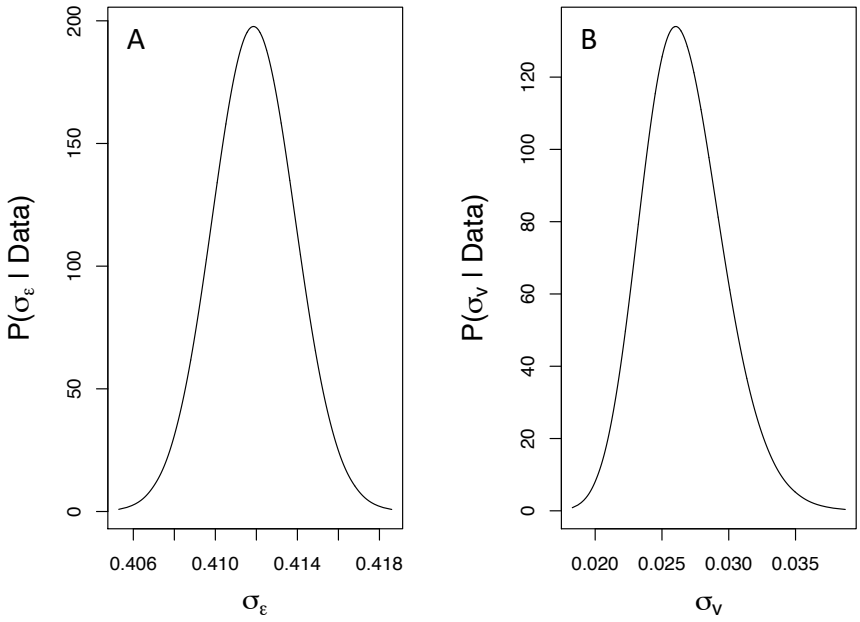

Fig. S3. A) Marginal posterior distribution of σ_ε. B) Marginal posterior distribution of σ_v.

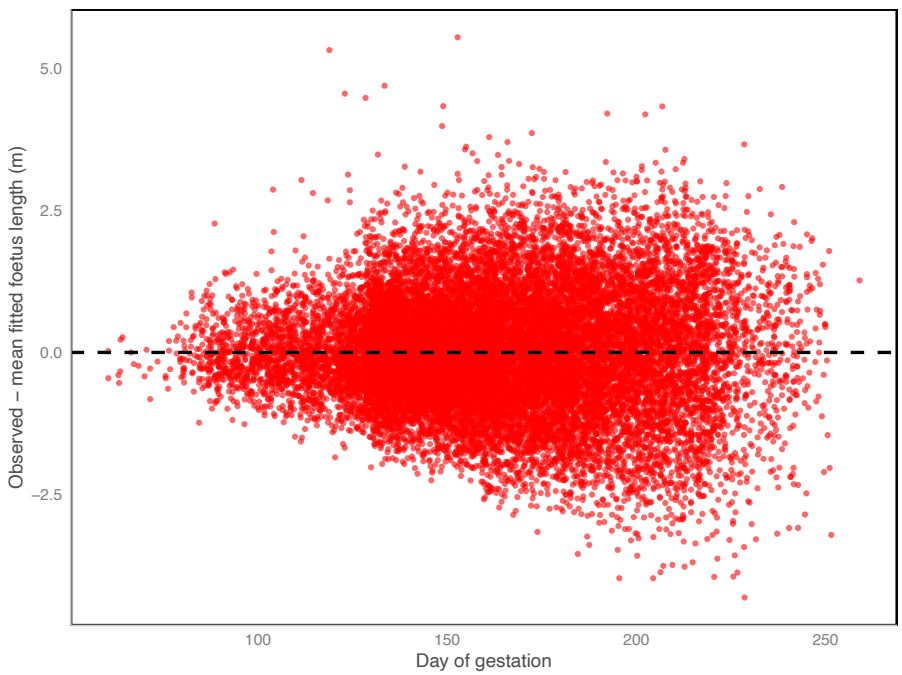

Fig. S4. Difference between fitted estimates of Antarctic blue whale (*Balaenoptera musculus intermedia*) foetus length (m) and observed foetus length as a function of day of gestation modelled with a random walk (rw1) gamma GLM assuming a nominal day of conception of 1st August. Horizontal black dashed line indicates unity.

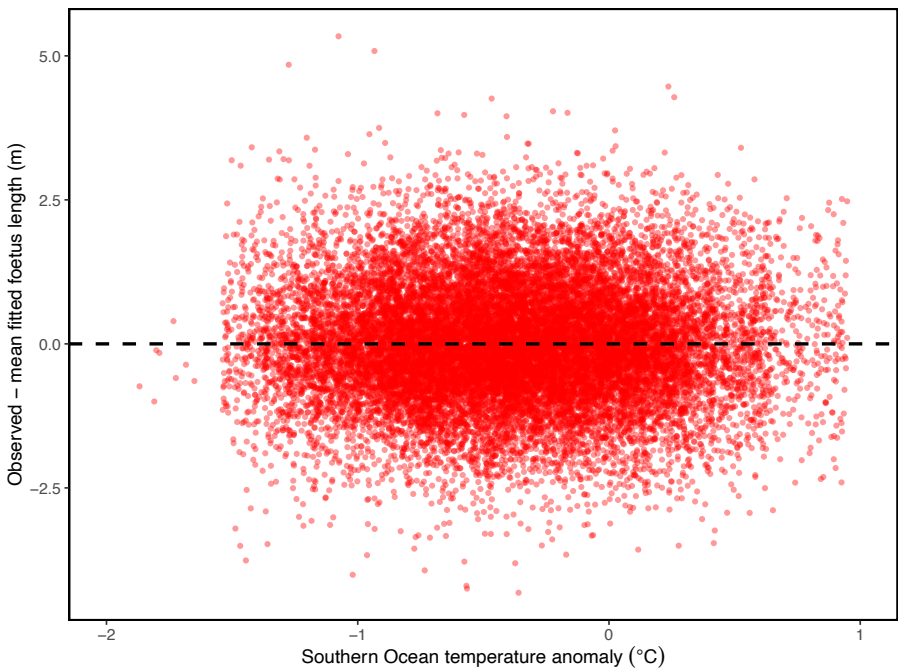

Fig. S5. Difference between fitted estimates of Antarctic blue whale (*Balaenoptera musculus intermedia*) foetus length (m) and observed foetus length as a function of average Southern Ocean temperature anomaly (°C) during the preceding austral winter (April-September). Horizontal black dashed line indicates unity.

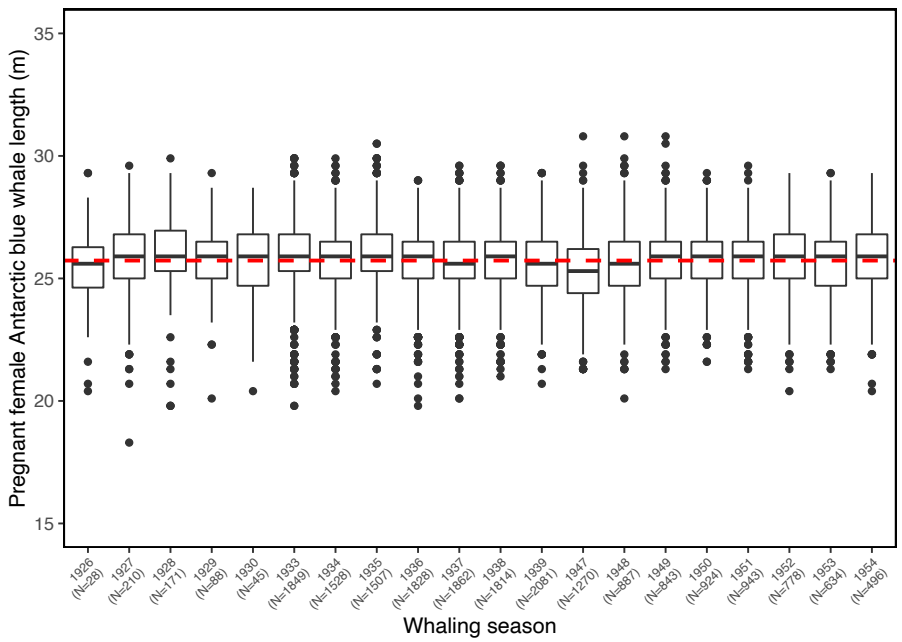

Fig. S6. Boxplots of pregnant female Antarctic blue whale (*Balaenoptera musculus intermedia*) lengths (m) caught in the 1926-1954 whaling seasons. Horizontal red dashed line indicates mean female length. N is the number of females measured in each whaling season.

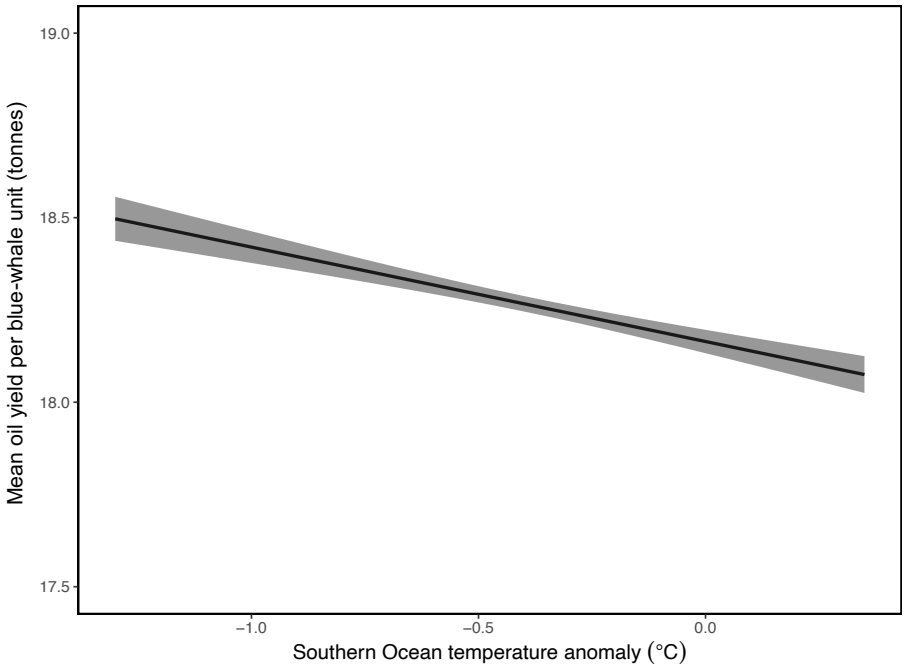

Fig. S7. Mean (solid line) fitted baleen whale oil yield (tonnes), with 95% credible intervals (shaded area), as a function of average Southern Ocean temperature anomaly (°C) during the preceding austral winter (April-September).