**Main .m scripts:**

**Pb\_foraging\_dyn\_prog\_model\_F\_mat.m –** creates model and solves it using backwards induction. Mater model file. Makes use of the functions in folder “functions”.

**params\_F.m –** sets parameters for SDP model

**rgb.m –**

**Monte\_carlo\_execute.m –** runs Monte Carlo simulations for an individual following the optimal decision rules (as determined by running pb\_foraging\_dyn\_prog\_model\_F\_mat.m and then using the saved workspace ResultWorkspace.mat); plots one simulation as well, with key events denoted with symbols.

**Determine\_scaling\_factor.m –** runs many (1000) Monte Carlo simulations and saves the proportion of spring days that the simulated individual spends in the active ice when she has a litter of cubs of the year. The user must then use matlab’s curve fitting GUI to fit an exponential curve. The parameters of this curve are then entered in the bottom part of the script to plot the scaling factor. Creates Figure 1 in the text.

**functions:**

The following functions are all called by the main script pb\_foraging\_dyn\_prog\_model\_F\_mat.m. They can all be found in the folder “functions”.

**terminal\_cond\_F.m -** sets terminal condition of SDP model

**dpe\_solve\_F\_mat –** solves the stochastic dynamic programming model using backwards induction; uses linear interpolation for energetic values between discretized states

**w\_1\_mat.m, w\_2\_mat.m, w\_2\_loss\_mat.m, w\_3\_mat.m, w\_3\_loss\_mat.m, w\_4\_mat.m –** overwinter dynamics of a bear in states eta = 1, …, 4 at the end of spring; “\_loss” files are for her state change if the reproductive attempt is aborted over winter

**linear\_interp\_w\_1\_mat.m, linear\_interp\_w\_2\_mat.m, linear\_interp\_w\_2\_loss\_mat.m, linear\_interp\_w\_3\_mat.m, linear\_interp\_w\_3\_loss\_mat.m, linear\_interp\_w\_4\_mat.m -** linear interpolates fitness values for overwintering functions; “\_loss” files are for her state change if the reproductive attempt is aborted over winter

**RMR\_mat.m –** calculate the total energetic losses a female bear experiences over a summer, dependent on initial energy reserves on the first day of summer. RMR for “resting metabolic rate”

**Mass\_mat.m –** estimates a bear’s mass from storage energy and length

**epsilon\_F\_mat.m –** assigns probability of mating each day in spring

**Ai\_F\_mat.m –** calculates bear’s daily energy requirements

**milkFun\_mat.m –** milk function; calculates amount of milk the female produces depending on her state

**Yi\_F.m –** expected energy gained if a prey item is caught in each patch

**stateChanges\_mat.m –** define daily changes in energetic state, depending on reproductive state

**ValueFunctions\_mat.m –** calculate value functions, based on state changes and probabilities of these state changes

**linear\_interp\_1\_mat.m, linear\_interp\_2\_mat.m, linear\_interp\_3\_mat.m, linear\_interp\_4\_mat.m –** calculates fitness function for each possible new state; linear interpolation performed when necessary

**Plotting Code:**

Scripts for creating the plots and several of the results in the manuscript.

**Result\_plots.m –** plots the results from pb\_foraging\_dyn\_prog\_model\_F\_mat.m; Figures 2, 5, in text and S3-S6 in Supplementary Material.

**MeanState.m –** 10000 Monte Carlo simulations of a 10 year old bear’s energy stores throughout spring. Creates Figure 3 in text.

**mean\_x\_1.csv – mean\_x.4.csv, mean\_x. csv, x\_all.csv** – intermediate csv files created by MeanState.m. Used for plotting Figure 3 in text, if don’t want to run all 10000 Monte Carlo simulations again.

**Percent\_time\_in\_patch.m –** 100 Monte Carlo simulations performed for varying lengths of spring. Used for plotting Figure 4 in text.

**Perpack\_COY.csv, perpack\_yrl.csv –** intermediate csv files created by Percent\_time\_in\_patch.m.

**Reproductive\_thresholds\_and\_R0\_against\_t\_breakup.m –** Calculates and plots changes in the reproductive energy thresholds for varying tbreakup dates, as well as concurrent changes in the female’s expected lifetime fitness. Figure 6 in text.

**pregvals.csv, COYvals.csv, R0vals.csv –** intermediate csv files created by Reproductive\_thresholds\_and\_R0\_against\_t\_breakup.m

**Monte Carlo functions:**

These functions are called by Monte\_carl\_execute.m and are required for Monte Carlo simulations.

**Monte\_carlo\_F\_mat.m –** Monte Carlo simulations of an individual, assuming they make the optimal decisions at each time step

**Monte\_carlo\_plot.m –** Creates plot of one Monte Carlo simulation; Figure S2 in text.

**.csv and .mat files:**

**scl.csv –** created by Determine\_scaling\_factor.m

**perpack.csv –** created by Determine\_scaling\_factor.m

**Initial\_x.csv –** Vector of initial state conditions required by Determine\_scaling\_factor.m; note, this csv must be strictly numeric for when it is called by other functions.

**ResultWorkspace.mat –** workspace and results created from pb\_foraging\_dyn\_prog\_model\_F\_mat.m; called by