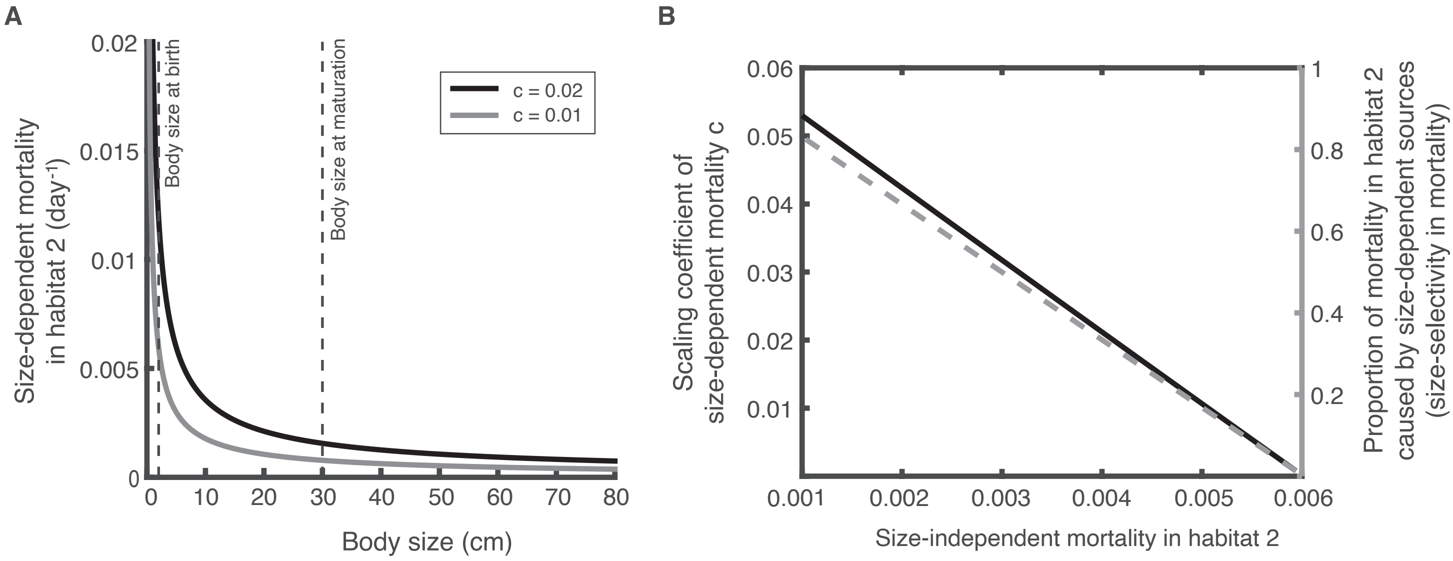

Figure S1. A) Size-dependent mortality in habitat 2 following an exponential function (Size-dependent mortality = c * (Body size)$^{-d}$; d = 0.75). B) Combinations of scaling coefficient of size-dependent (c) and size-independent mortality in habitat 2 (black solid line, left axis) that result in the same overall mortality (i.e. equal life expectancy) in this habitat for an individual shifting habitat at 19.5 cm (life expectancy in this habitat is 166.67 days for any combination). This body size at habitat shift is the evolutionary end-point when size-dependent mortality and size-independent mortality in habitat 2 equal 0 and 0.006 day^{-1} respectively (right bottom corner). Each combination of scaling coefficient of size-dependent (c) and size-independent mortality in habitat 2 corresponds to a certain level of size-selectivity (i.e. proportion of mortality caused by size-dependent sources; grey dashed line, right axis).

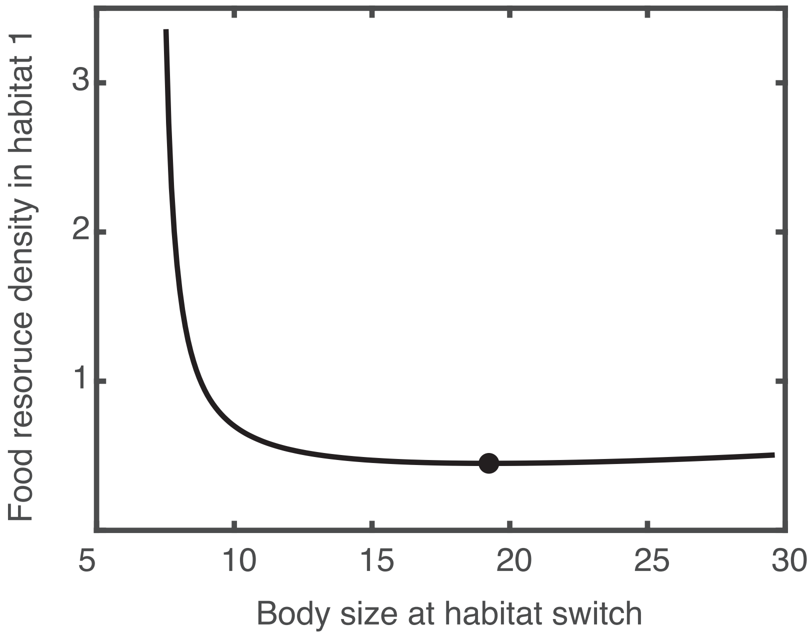

Figure S2. Food resource density in habitat 1 in the equilibrium, as function of body size at habitat shift. The evolutionary end-point corresponds to the body size at habitat shift that minimizes this function. The function quickly decreases as body size at habitat shift increases at low values of the trait. However, as it approaches the minimum, the funtion flattens. Computed minimization results in the evolutionary end-point equal to 19.26 cm (back dot). Size-independent mortality = 0.0057, maximum size-dependent mortality = 0.00056 day^{-1}. Other parameter values as in table 1.

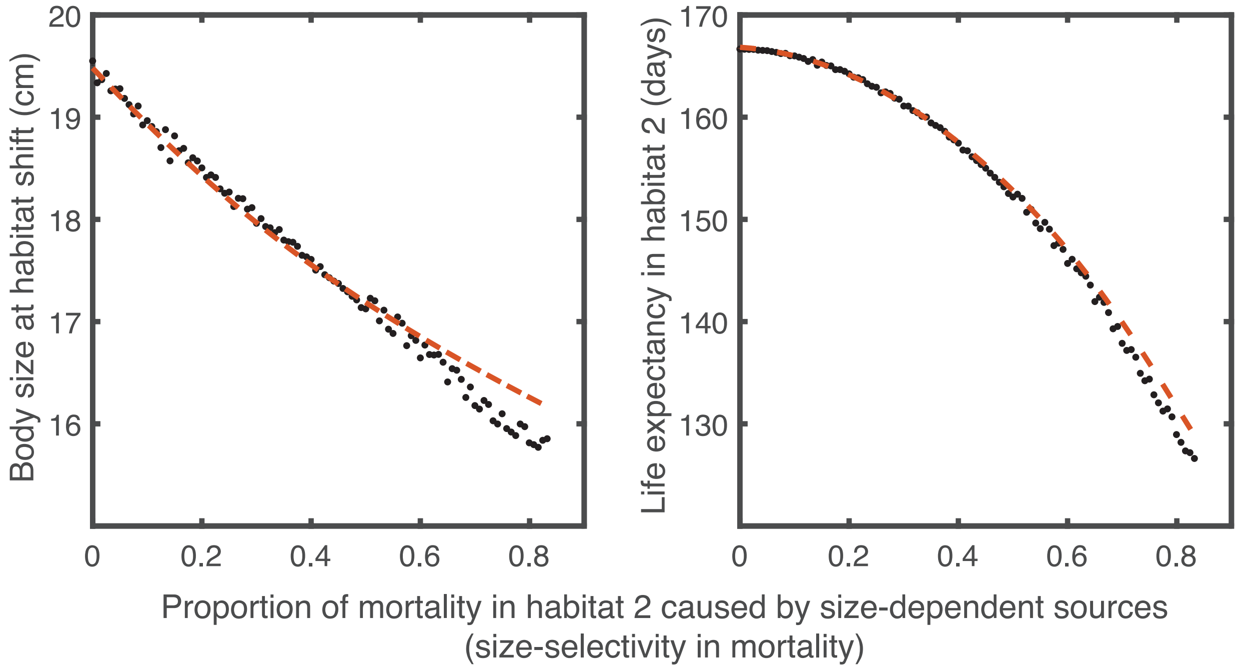

Figure S3. Evolutionary end-points (left) and resulting life expectancy in habitat 2 (right) as a function of the proportion of mortality in habitat 2 caused by size-dependent sources. Black dots show the results from the optimization method to determine the evolutionary-end points (same as in figure 3), while the red dashed lines show the results from the adaptive dynamics method (CSSs) implemented in the R package PSPManalisys (version 0.2.2; de Roos, 2019). Size-selectivity in mortality is varied (higher towards the right of the horizontal axes) following the combination of size-independent and maximum size-dependent mortalities shown in figure 2. Other parameter values as in table 1.

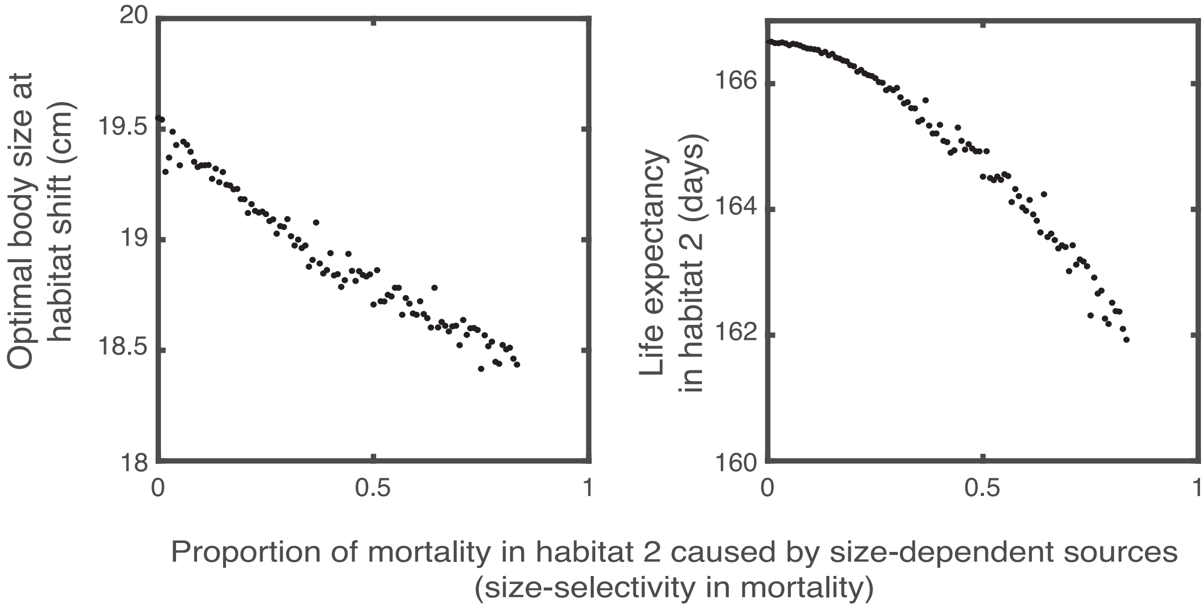

Figure S4. Evolutionary end-points (left) and resulting life expectancy in habitat 2 (right) as a function of the proportion of mortality in habitat 2 caused by size-dependent sources. These results are obtained from the optimization method to determine the evolutionary-end points (same as in figure 3). Size-selectivity in mortality is varied (higher towards the right of the horizontal axes) following the combinations of size-independent and scaling coefficient of size-dependent mortality (size-dependent mortality is an exponential function of body size) shown in figure S1B. Other parameter values as in table 1.

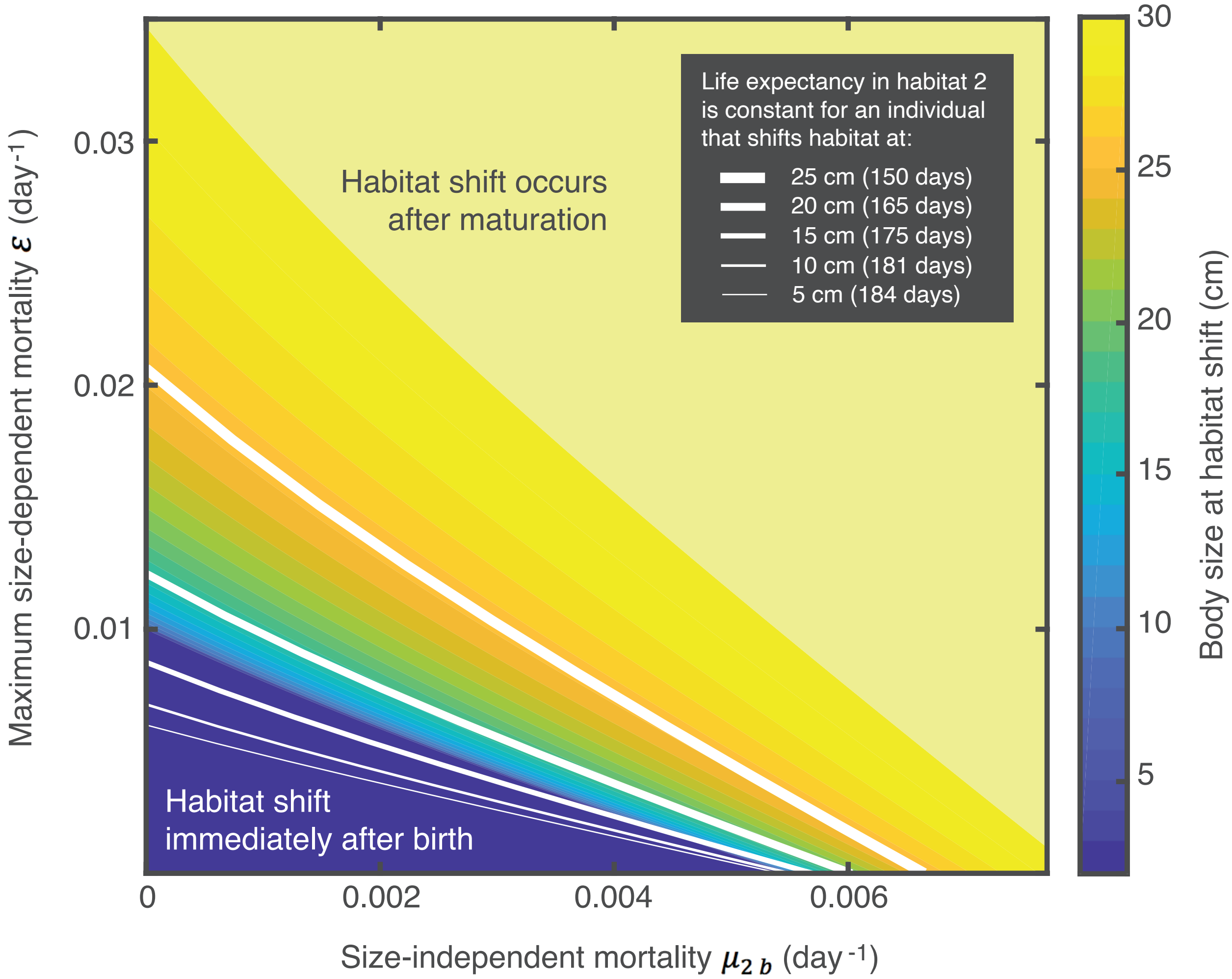

Figure S5. Optimal body size for individuals to shift habitat (colorbar) as a function of the maximum size-dependent mortality (vertical axis) and the size-independent mortality (horizontal axis) in habitat 2. Isoclines (white lines) show the combinations of size-dependent and size-independent mortality at which the life expectancy in habitat 2 (in parentheses) is constant for an individual shifting habitat at a body size of 5, 10, 15, 20 and 25 cm. These body size values correspond to the optimal body size to shift habitat when individuals only experience size-independent mortality and this mortality is equal to the value at the intersection of the isoclines with the horizontal axes. Given that the adaptive dynamics framework implemented in the R package PSPManalysis (version 0.2.2; de Roos, 2019) produces smooth (CSSs) curves corresponding to the optimal body size at habitat shift (fig. S3), we used this method to compute the optimal body size at habitat shift for this heatmap.