Detecting effects of spatial memory and dynamic information on animal movement decisions

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Appendix S3 Animated trajectories

To clarify the mechanisms of the four candidate models, we simulated example trajectories, one from each model. For this, we used the first landscape pair (see Appendix A.1, Fig. 1) and the movement parameters from the main parameter set ($\kappa = 5.5$, $\lambda = 1.6$, $\rho = 1$, $\alpha_{\text{res}} = -1$, $\alpha_{\text{mem}} = -4$, $\alpha_{\text{com}} = -5$, $\beta_1 = 1$, $\beta_2 = 2$, $\beta_{\text{mem}} = 0.03$, $\gamma_1 = 0.01$, γ_2=0.05). To play and control the animations, please use Acrobat Reader.

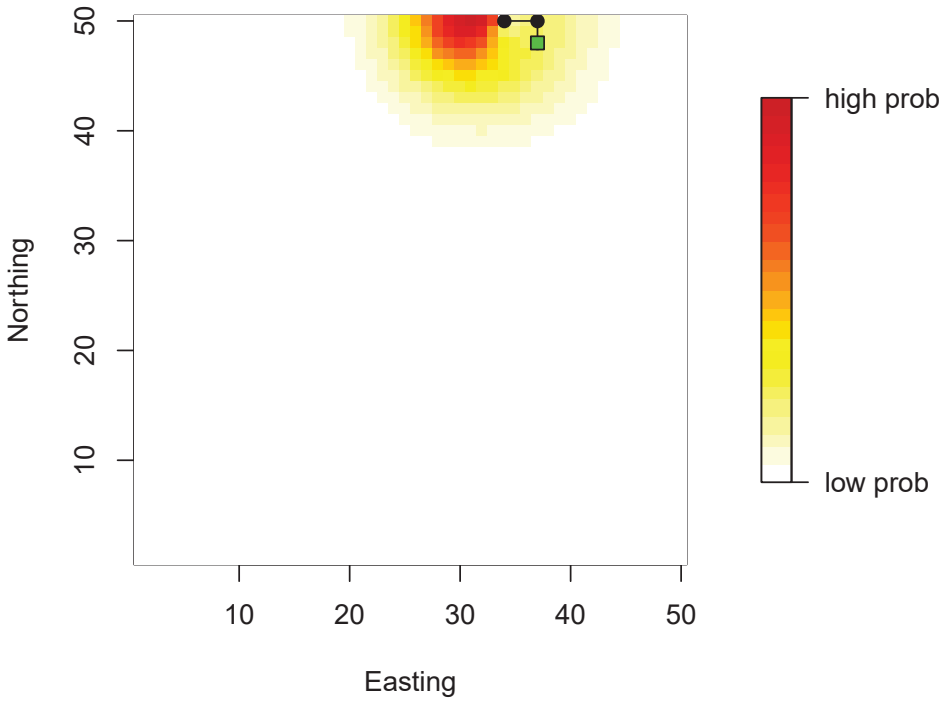

Fig. 1. Animated trajectory from null model. At each step, the animal makes a movement decision according to the general movement kernel k, which is centred around the current location (black dot). Once the new location is chosen (circled black dot), the movement kernel is updated according to the new location. The starting point of the trajectory is marked by a green square. Once the trajectory is more than 50 steps long, only the last 50 steps are shown.

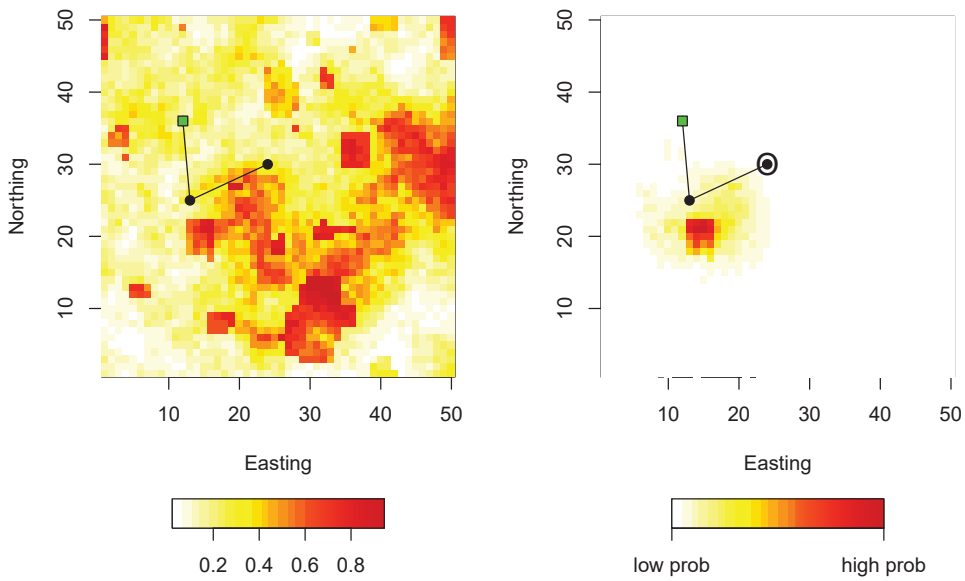

Fig. 2. Animated trajectory from resource model. At each step, the animal makes a movement decision according to the product of general movement kernel k and weighting function w. The weighting function is a logistic function of static resources. The left plot depicts the trajectory on the weighting function, which is the same as the resource selection function in Fig. 1 in the main text of the paper. The right plot shows the actual step probabilities. The step probabilities are obtained from the kernel, centred around the current location (black dot), weighted by the resource preferences. Once the new location is chosen (circled black dot), the step probabilities are updated according to the new location. The starting point of the trajectory is marked by a green square. Once the trajectory is more than 50 steps long, only the last 50 steps will be depicted.

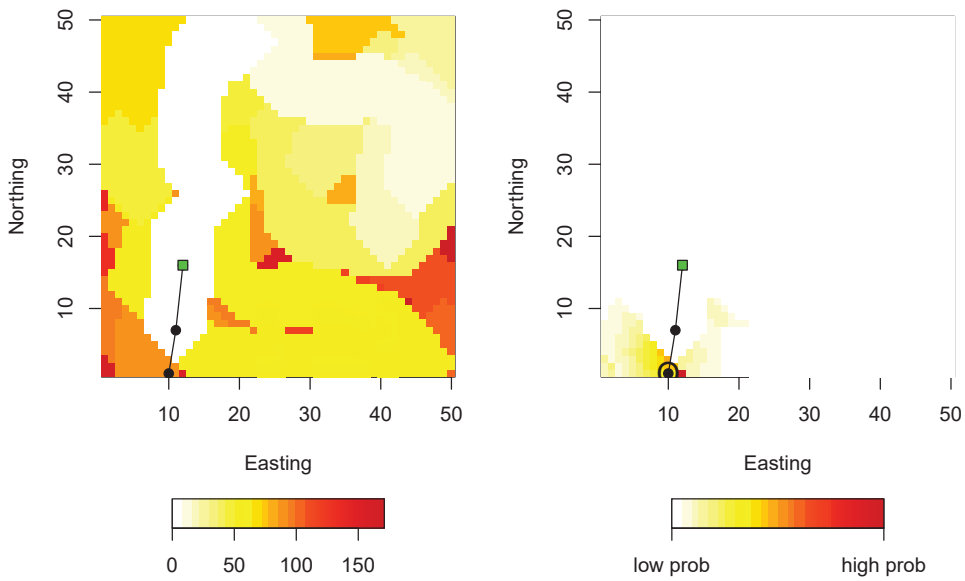

Fig. 3. Animated trajectory from memory model. At each step, the animal makes a movement decision according to the product of general movement kernel k and weighting function w. The weighting function is a logistic function of time since last visit. Recently visited locations are avoided, while locations with long time since last visit are attractive. Time since last visit is a dynamic variable that changes continuously as the animal moves through the home range. The left plot depicts the change of the time since last visit for all locations based on movement. The right plot shows movement according to the step probabilities. The step probabilities are obtained from the kernel, centred around the current location (black dot), multiplied by the weighting function based on time since last visit. Once the new location is chosen (circled black dot), the step probabilities are updated according to the new location. The starting point of the trajectory is marked by a green square. Once the trajectory is more than 50 steps long, only the last 50 steps will be depicted.

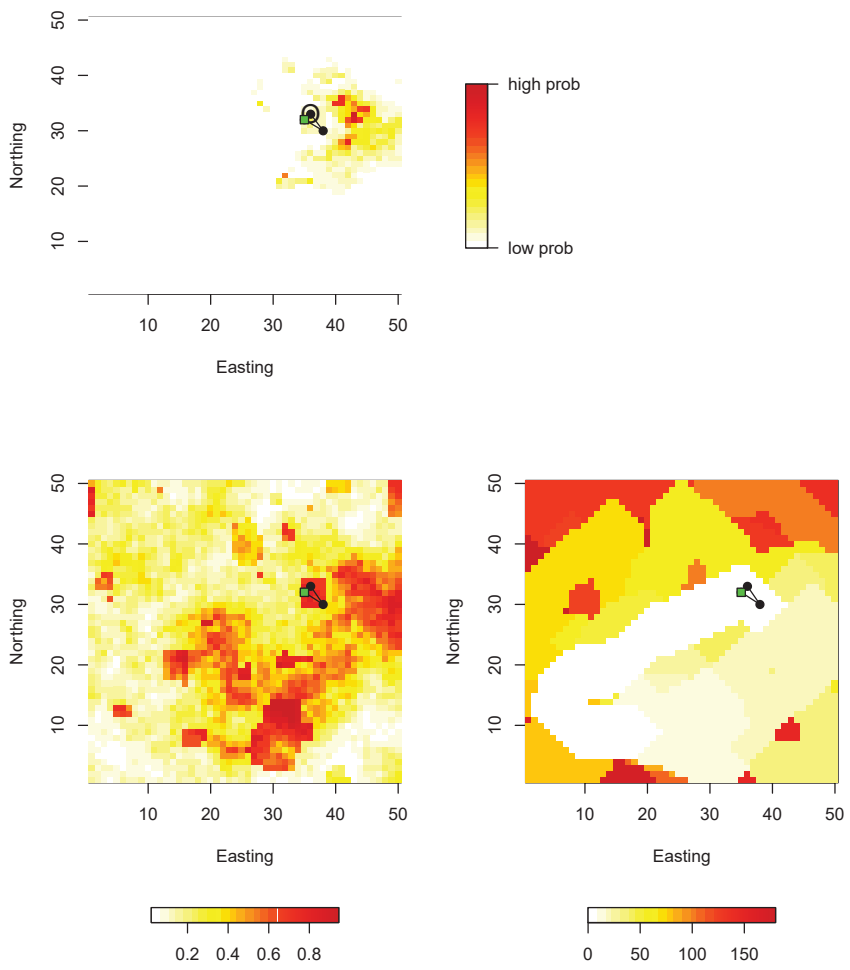

Fig. 4. Animated trajectory from combination model. At each step, the animal makes a movement decision according to the product of general movement kernel k and weighting function w. The weighting function is a logistic function of both resources and time since last visit, including interactions. The lower left plot depicts the movement on the static part of the weighting function, which is the part pertaining to the resources. This is the same as in Fig. **??**. The lower right plot depicts the change of the time since last visit based on movement. The upper plot shows movement according to the step probabilities. The step probabilities are obtained from the kernel, centred around the current location (black dot), multiplied by the weighting function based on combined effects of resources and time since last visit. Once the new location is chosen (circled black dot), the step probabilities are updated according to the new location. The starting point of the trajectory is marked by a green square. Once the trajectory is more than 50 steps long, only the last 50 steps will be depicted.