User guide to code and simulations

The purpose of this model is to explore the effects of landscape structure on population fitness under *habitat-based* and *cue-based* mechanisms of habitat selection. Specifically, we evaluate the case of mobile species that are present in two habitat types of which one is better quality (source) than the other (sink), but where individuals have innate habitat choice behaviors that cannot be modified after landscape change.

1. Model Version 10

Version 10 is the latest version of our MATLAB code (a cleaned up version of the one we used for our second simulation experiment). Because of changes made in terminology after the code was written, some terms are used differently than in the paper, as explained below:

*Habitat categories: *source* is interchangeable with *forest*, and *coffee* with *sink*.

*Selection types: *habitat-based* selection is termed *categorical*, and *cue-based* is termed either *continuous* or just as *canopy percent cover*.

Following is a brief description of what each file does. File names written in blue show those where we changed the variables of interest to create the scenarios described in the paper. File names written in green show other variables that can easily be changed to create different scenarios. File names written in red show those files that are not expected to be changed unless dealing with a different system.

`master.m` – MATLAB code, calls all other files in the appropriate sequence

>code (f)

>>outer (f)

`binornd.m` – MATLAB default function
`immediate_neighbors.m` – neighborhood area & number of patches
`lognrnd.m` – MATLAB default function
`nearest_neighbors.m` – no user-serviceable parts
`normrnd.m` – MATLAB default function
`parameters.m` – parameters to be set once during simulation experiments
`rndcheck.m` – MATLAB default function
`set_vars_outer.m` – preconditioning
`speak_1.m` – no user-serviceable parts
`speak_3.m` – no user-serviceable parts)
`statsizechk.m` – MATLAB default function

>>simulation (f)

`binomial_offspring.m` – related to breeding
`breeding.m` – related to breeding
`collect_bird_identities.m` – related to data collection
`collect_sim_data.m` – related to data collection
`initial_conditions.m` – no user-serviceable parts
`landscape_composition.m` – related to landscape transformation
`lognormal_vegetation.m` – input data for canopy cover
`randsample.m` – MATLAB default function
`speak_2.m` – no user-serviceable parts
`updated_census.m` – related to data collection
`updated_dispersal.m` – related to dispersal
`winter.m` – related to survival

>user (f)

`preferences.m` –main parameters changed to create scenarios[1]
`updated_prelimdata.m` – set file name to match scenario, writes output as Excel file

[1]**habitat_type:** 0 - habitat-based selection, 1 - cue-based selection
configuration: 0 - random, 1 - lateral, 2 - radial, 3 - percolation
preferred_habitat: 0 - equal-preference, 1 - adaptive, 2 - maladaptive, 3 - percent canopy cover
preferred_cover: proportion from 0 to 1
search: neighborhood areas 1 (9 cells), 2 (25), 3 (49) and 4 (81)
prop_coffee: proportion from 0 to 1
capture: 0 – show only census results, 1 – do census and sampling
forest_detectability: for sampling, probability of detection from 0 to 1
coffee_detectability: for sampling, probability of detection from 0 to 1

2. Simulations with global dispersal (2014)

Output from 540 scenarios (50 runs for 15 years), labelled as follows:

`hab`: 0 for habitat-based selection, 1 for cue-based selection
`config`: 1 for lateral, 2 for radial, 3 for percolation
`prop`: proportion of coffee/sink in the landscape
`prefhab`: 0 for neutral, 1 for adaptive, 2 for maladaptive, 3 for cue-based
`prefcov`: 0 for habitat-based, percentage canopy cover threshold from 40-80
`search`: 1 or 4 but all correspond to global dispersal searching 3 patches
`forest/coffee`: habitat-specific detection probabilities during sampling

Each Excel file contains:

A) `A1:H2` scenario information
B) `M5:AA54` total population in the landscape [CENSUS]; B = C+D+E+F
C) `M57:AA106` total number of individuals in source/forest [CENSUS]
D) `M109:AA158` total number of individuals in sink/coffee [CENSUS]
E) `M161:AA210` total number of floaters detected in source/forest [CENSUS]
F) `M213:AA262` total number of floaters detected in sink/coffee [CENSUS]
G) `AF5:AT54` total population in the landscape [SAMPLE]; G = H+I+J+K
H) `AF57:AT106` total number of individuals in source/forest [SAMPLE]
I) `AF109:AT158` total number of individuals in sink/coffee [SAMPLE]
J) `AF161:AT210` total number of floaters detected in source/forest [SAMPLE]
K) `AF213:AT262` total number of floaters detected in sink/coffee [SAMPLE]
L) `AZ5:BM54` juvenile production in source/forest [mean no. juveniles per breeding adult]
M) `AZ57:BM106` juvenile production in sink/coffee [mean no. juveniles per breeding adult]
N) `BS5:CF54` mean size of individuals in source/forest [mean size-corrected body mass]
O) `BS57:CF106` mean size of individuals in sink/coffee [mean size-corrected body mass]

3. Simulations with local dispersal (2015)

Output from 480 scenarios (30 runs for 15 years), labelled as follows:

`hab`: 0 for habitat-based selection, 1 for cue-based selection
`config`: 1 for lateral, 2 for radial, 3 for percolation
`prop`: proportion of coffee/sink in the landscape
`prefhab`: 0 for neutral, 1 for adaptive, 2 for maladaptive, 3 for cue-based
`prefcov`: 0 for habitat-based, percentage canopy cover threshold from 30-90
`search`: 1 for 9-cell neighborhood, 2 for 25-cell, 3 for 49-cell, 4 for 81-cell

Each Excel file contains:

A) `A1:F2` scenario information
B) `M5:AA34` total population in the landscape [CENSUS]; B = C+D+E+F
C) `M57:AA86` total number of individuals in source/forest [CENSUS]
D) `M109:AA138` total number of individuals in sink/coffee [CENSUS]
E) `M161:AA190` total number of floaters detected in source/forest [CENSUS]
F) `M213:AA242` total number of floaters detected in sink/coffee [CENSUS]
G) `AY5:BM34` juvenile production in source/forest [mean no. juveniles per breeding adult]
H) `AY57:BM86` juvenile production in sink/coffee [mean no. juveniles per breeding adult]
I) `BR5:CF34` mean size of all individuals in source/forest [mean size-corrected body mass]
J) `BR57:CF86` mean size of all individuals in sink/coffee [mean size-corrected body mass]
K) `BR109:CF138` mean size of all floaters [mean size-corrected body mass]
L) `BR161:CF190` mean size of adults in source/forest [mean size-corrected body mass]
M) `BR213:CF242` mean size of adults in sink/coffee [mean size-corrected body mass]