

## HOW TO RUN THE MODEL<sup>1</sup>

Model developed by:

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The code was developed with NetLogo 4.1.3 and all results presented obtained with that version. The released version was saved under the version NetLogo 5.3.1. We did not test if this change of versions affected the results (if in doubt, please contact the author). NetLogo versions can be downloaded here: <https://ccl.northwestern.edu/netlogo/download.shtml>. Please note that the program will not run under NetLogo 6.X.X.

### Directories:

DOC:

- This file.

CODE:

- turtle\_ibm6.nlogo: the main program file to load at startup
- directory "extensions": the required NetLogo extensions to run the model (array, gis, profiler).

DATA:

- maps: the map files at the png format. The file named sooi\_all represent the Southwest Indian Ocean and its oceanic currents. The other files are demo files and where not used for the model. They provide demo files to show that the model could run under a different map. File format: see below.
- sites: the geographic coordinates of the nesting and foraging grounds as well as the proportional coefficient of the relative importance (nesting numbers) of each rookery. The files named sooi\_all\_feedingpatches.txt and sooi\_all\_nestingsites.txt were used for the model. The other files are demo files and where not used for the model. They provide demo files to show that the model could run under different initializing conditions. File format: see below

RESULTS.

- It will be empty at startup. For each simulation a text file will be created if you say so on the interface. File format: see below.

### Input file formats:

MAP:

Maps are PNG files. White code is coastal barrier areas. Black is ocean waters. Red and blue are u,v ocean currents.

NESTING SITES:

Col 1	Longitude (decimal degrees)
Col 2	Latitude (decimal degrees)

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Col 3	Number of nesting turtles (relative unit)
Col 4	Integer ID

#### FEEDING PATCHES.

Col 1	Longitude (decimal degrees)
Col 2	Latitude (decimal degrees)
Col 3	Integer ID

#### Output file format:

TURTLE_ID	Turtle identifier number
NEST_ID	Current nesting site identifier number
T_DAYS	Current time of simulation in days
E_LEVEL	Current energy level
NEST_STRATEGY	Current nest strategy indice
FEED_ID	Current foraging patch identifier number
FEED_STRATEGY	Current feeding strategy indice
TURTLE_MODE	Current mode (-1 prenesting; 1 postnesting; 2 nesting; 0 foraging or foraging mi
LONGITUDE	Current longitude
LATITUDE	Current latitude

#### Workflow

To run the program, start NetLogo 5.3.1 and open “turtle\_ibm6.nlogo”. The user interface of the program will show. The interface shows several parameters described in the paper and ODD. A complete list of this parameters in alphabetical order is given below.

Once the right parameters are set up, running the model is pretty straightforward. Example values for parameters are given below.

*To run the model:*

1. Check all parameters values.
2. Click “Setup All”
  - a. Alternatively, clic “Setup Map” then “Setup Turtles And Sites”
3. Click “Go” to run the model
4. Click “Go” to stop the model
5. Click “Write” if you want to write any output file (see above).

The button “Profiler” is a test button. Clicking the button will run the program with current parameters for 1000 days and printout performances. This can be useful for estimation of model run time.

#### INTERFACE BUTTONS:

Button name	Keyboard Shortcut	Action
Setup All	A	Setup the map, sites and turtles

Setup Map	M	Setup the map
Setup Turtles and Sites	T	Setup sites and turtles
Go	G	Run the model
Write	W	Write output files
Profiler	P	Run the program for 1000 days and printout performances

## INTERFACE PARAMETERS:

Field	Example value	Definition
"allocate-new-feeding-patch-method"	decreasing-exponential	method of feeding patch assignment
"display-plots"	TRUE	should graphics be displayed
"energy-loss-migration"	1	level of energy loss per time unit during migration
"energy-loss-nesting"	5	level of energy loss per unit of time while nesting
"feeding-patch-allocation-exponent"	7	probability exponential coefficient for feeding site allocation
"feeding-patch-fidelity-strategy"	fixed	type of fidelity strategy to feeding patch (fixed, random)
"feeding-patch-leaving-threshold"	500	level of energy required to leave feeding patch
"fidelity-strategy-indice"	0.1	indice of fidelity strategy for the current simulation (if fixed)
"foraging-migration-decision"	strategy-around-threshold	what is the trigger of the foraging migration
"foraging-migration"	TRUE	enable migration between feeding patches
"initial-feeding-patch-allocation"	decreasing-exponential	method to allocate feeding patch
"intake-proportion"	1.00E-04	proportion of energy gain per unit of time while foraging relative to feeding patch ressource level
"keep-tracks"	FALSE	level of feeding strategy for the current simulation
"max-nesting-duration"	45	maximum number of days nesting
"maximum-feeding-patch-resource-level"	1000	maximum level of available ressource in a feeding patch
"minimal-energy-for-prenesting"	0	minimal energy to enter prenesting migration
"minimal-remigration-interval"	0	minimal number of days between two nesting seasons
"movie"	FALSE	should a movie be exported
"N-GTURTLES"	7000	total number of turtles in the model
"nesting-attribution-method"	fixed	initial attribution of nesting sites (fixed = proportional to nesting rookery size)
"nesting-strategy-indice"	0.1	level of energy required to leave feeding patch
"nesting-strategy"	fixed	type of nesting strategy to feeding patch (fixed, random)
"number-of-days-of-integration"	51	period over which to count the number of nesting females
"perturbation-intensity"	0.1	perturbation range
"perturbation-range"	1000	perturbation intensity
"perturbation-type"	latitude-dependant	perturbation type
"perturbation-x"	0	perturbation longitude
"perturbation-y"	-26	perturbation latitude
"prenesting-start-method"	distance-	should prenesting be triggered depending on the

	dependant	distance for feeding patch
"record-migration"	TRUE	should migration be recorded in the output
"record-nesting"	TRUE	should nesting event be recorded in the output
"record"	TRUE	should the be an output
"running-on-supercomp"	FALSE	is the netlogo program running on a supercomputer (ignore)
"sea-currents"	TRUE	should sea currents be considered (scenario 3)
"site-depletion"	TRUE	should feeding patch be depleted
"the-map"	sooi_all	which map should be used