Electronic Supplement

to the paper

On the Asymptotic Behavior of Spatially Implicit Models of Competition of two Species with Overcolonization

http://www.model.u-szeged.hu/index.php?action=edoc&cmd=show_edoc&edoc_id=29

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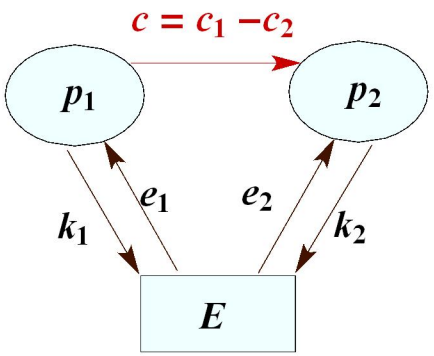
Description

The following demonstration interactively shows the behavior of the followig metapopulation model with overcolonization



$$p_1' = k_1\, p_1(1 - p_1 - p_2) - e_1\, p_1 + c\, p_1\, p_2$$
$$p_2' = k_2\, p_2(1 - p_1 - p_2) - e_2\, p_2 - c\, p_1\, p_2\,,$$

where we use the following notations:

- $p_1, p_2 \geq 0$: density of territories occupied by species 1 and species 2, $p_1 + p_2 \leq 1$
- $k_1, k_2 > 0$: global rates of colonization of empty patches
- $e_1, e_2 \geq 0$: global rates of extinction
- c: global relative rate of overcolonization ($c > 0$: species 1 is stronger; $c < 0$: species 2 is stronger)

Species 1

k_1 0.4

e_1 0.5

Species 2

k_2 0.4

e_2 0.1

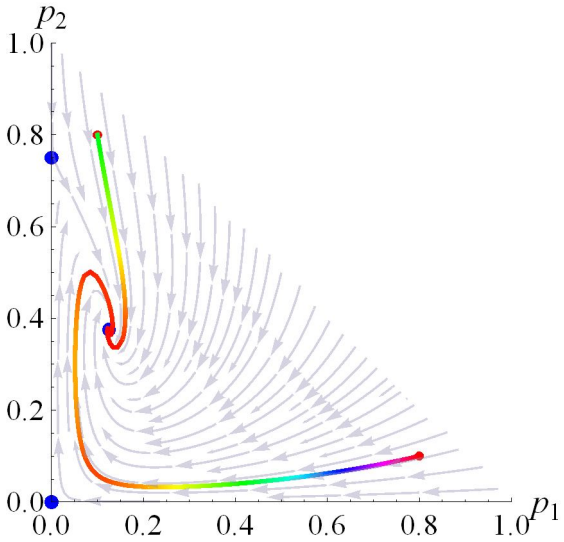
c 0.8

T 1.5

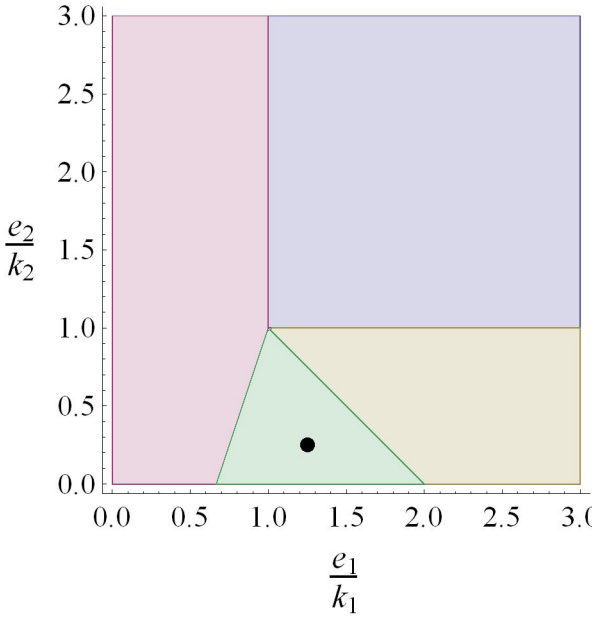
Init. Values: Alt–Click

Reset locators

Phase space



Parameter space



Equilibria: {0., 0.75} {0.125, 0.375} {0., 0.}

Tips for experiments

No overcolonization:

$c = 0$

Hierarchic overcolonization:

$c = k_1$

When $\frac{e_1}{k_1}, \frac{e_2}{k_2} < 1$, change e_1 to move the point in the figure on the right hand side into the green region.

General large overcolonization, stable coexistence

$0 < c,\ c > k_1 - k_2$

When $\frac{e_2}{k_2} < 1$, change e_1 to move the point in the figure on the right hand side into the green region.

General small overcolonization, unstable coexistence

$0 < c < k_1 - k_2$

When $\frac{e_1}{k_1}, \frac{e_2}{k_2} < 1$, change e_1 to move the point in the figure on the right hand side into the brown region.

Singular cases:

$c = k_1 - k_2 = e_1 - e_2;\ \frac{e_1}{k_1} < 1; \frac{e_2}{k_2} < 1;$

Change any of the parameters to move from one attractivity domain to another.