

# Azores Spasm: Movement

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## Parameter: `adult_movement`

The `adult_movement` parameter helps determine the degree to which fish disperse to other patches. The absolute value isn't what's important here, it's the value of `adult_movement` parameter relative to the distance between adult habitat patches. When density-dependence is not included in the model, fish are redistributed from a patch to others using the following steps:

- The distance between two patches is checked against a normal distribution with a mean of 0 and a standard deviation of `adult_movement`. The value ( $f(x)$ ) of the normal distribution curve at that point is saved for each combination of patches.
- For all the mature fish in a given patch, they redistribute to other **adult** (check with LT) habitat patches with the probability of the value calculated above divided by the sum of the values for each possible movement combinations from the patch in question to all other adult patches (including itself). This creates a dataframe as follows:

Using `adult_movement = 100`

from	to	dist	prob_move
410	410	0.0000	0.4910319
410	611	155.8307	0.1458164
410	676	168.9189	0.1178992
410	741	182.0478	0.0936382
410	742	201.5165	0.0644612
410	929	213.8060	0.0499418
410	679	227.3249	0.0370652
410	753	415.6721	0.0000869
410	754	435.1408	0.0000380
410	819	448.3104	0.0000212

- In this example, where `adult_movement` is on the same order of magnitude but smaller than the distance between the selected patch and it's nearest neighbor, we would see roughly half of the adults stay put and the other half redistribute to the other patches. The three furthest patches (where `dist > 4 * adult_movement`) receive almost zero immigrants from the selected patch.
- As `adult_movement` increases, so does the standard distribution of the curve used to calculate probability. This places the patches relatively closer together in space in the context of the movement of the fish. Therefore, as `adult_movement` increases to and beyond the value of `max(dist)` for a given patch, we would expect a more even distribution of fish from that patch to all others.
- In the current parameter space, the two closest patches are 19.8145829 units apart and the farthest distance between two patches is 448.3104106 units.

\*The sensitivity of fish in a selected patch to the value of `adult_movement` can be seen below:

