Ecological Archives **E089-106-A1**

Tom Lindström, Nina Håkansson, Lars Westerberg, and Uno Wennergren. 2008. Splitting the tail of the displacement kernel shows the unimportance of kurtosis. *Ecology* 89:1784–1790.

Appendix A

Implicit derivation of variance and kurtosis in a two dimensional displacement function.

Displacement was modelled as a symmetric kernel where the proportion, *P*, of the population starting in one cell ending up at a distance, *D*, after one time step.

$$P(D) = \frac{e^{-\left(\frac{D}{a}\right)^b}}{S} \tag{A.1}$$

where *b* and *a* are parameters regulating ν and κ of the displacement function. Kernels given by this equation includes uniform (*b*=∞), Gaussian (*b*=2) and Laplace (*b*=1) distributions. *S* scales the cumulative probability to one. In our case we have two-dimensional dispersal and *S* is therefore the volume under the kernel. This is given by

$$S = 2\pi \frac{a^2}{b} \Gamma\left(\frac{2}{b}\right)$$

ν depends on both *b* and *a* and is given by

$$\nu = a^2 \cdot \frac{\Gamma\left(\frac{4}{b}\right)}{\Gamma\left(\frac{2}{b}\right)}$$

where Γ is the gamma function. κ depends only on *b* and is given by

$$\kappa = \frac{\Gamma\left(\frac{6}{b}\right) \cdot \Gamma\left(\frac{2}{b}\right)}{\left(\Gamma\left(\frac{4}{b}\right)\right)^2} \tag{A.2}$$

To get kernels with given ν and κ, *b* and *a* must be calculated from these. *b* can not be solved explicitly but can be given implicitly from Eq. A.2. *a* can then be given from ν and *b* as

$$a = \sqrt{\frac{\nu \cdot \Gamma\left(\frac{2}{b}\right)}{\Gamma\left(\frac{4}{b}\right)}}$$

The variance and kurtosis of Eq. A.1 is limited by $0 < \nu < \infty$, $4/3 < \kappa < \infty$.