# A long range communication model for foragers.

Ricardo Martínez-García[1,2,*], Cristóbal López[1], Justin M. Calabrese[2].

[1] *IFISC, Instituto de Física Interdisciplinar y Sistemas Complejos*
*CSIC-Universidad de las Islas Baleares 07122-Palma (Mallorca).*
[2] *Smithsonian Conservation Biology Institute, 1500 Remount Road, Front Royal, VA 22630.*

We present a random walk model for the movement of a population of interacting individuals looking for resources. The problem is studied using numerical simulations of the microscopic stochastic dynamics as well as a macroscopic advection-diffusion equation for the density of foragers.

The dynamics of the particles is governed by two mechanisms which induce biases in the random movement. On the one hand they move following local gradients of resources. On the other hand, we assign to each walker a *calling function* which switches on whenever it finds a good patch of resources. This term models the communication process observed in some ungulates, as gazelles in the Mongolian eastern steppe.

We use the mean first passage time of the population of individuals through the boundaries of the patches of resources as a measurement of the efficiency of the search. We focus our interest in its behavior with the length of the communication range, finding an optimal value at intermediate scales. Other dynamics properties, as the distributions of first passage times, and statics, as the stationary distributions of individuals are also studied[1].

---

* ricardo@ifisc.uib-csic.es
[1] R. Martínez-García et al. (In preparation).