The Physics of Foraging: Bumblebee Flights under Predation Risk

Friedrich Lenz and Rainer Klages

School of Mathematical Sciences, Queen Mary University of London, Mile End Road, London E1 4NS, UK

Thomas C. Ings and Lars Chittka

School of Biological and Chemical Sciences,

Queen Mary University of London, Mile End Road, London E1 4NS, UK

Aleksei V. Chechkin

Institute for Theoretical Physics, NSC KIPT,

ul. Akademicheskaya 1,UA-61108 Kharkov, Ukraine

We study bumblebees searching for nectar in a laboratory experiment with and without different types of artificial spiders as predators. We find that the flight velocities obey mixed probability distributions reflecting the access to the food sources while the threat posed by the spiders shows up only in the velocity correlations. This means that the bumblebees adjust their flight patterns spatially to the environment and temporally to predation risk. Key information on response to environmental changes is thus contained in temporal correlation functions and not in spatial distributions.

[1] F.Lenz, T.Ings, A.V.Chechkin, L.Chittka, R.Klages, arXiv:1108.1278 (2011)