

## ECOSYSTEM FUNCTIONING AND DUNG BEETLES

Olivier Dangles, Carlos Carpio, and Guy Woodward  
All photos by Olivier Dangles



Photo 1. Master students have built 50 plastic mesh screens needed for the dung beetle exclusion experiment. They transport them to the study site under the seemingly interested eye of an Amazonian tapir, a frequent and tame visitor of the Yasuni Research Station of the Pontifical Catholic University of Ecuador ([www.yasuni.ec](http://www.yasuni.ec)).

A major challenge of ecological research is to assess the functional consequences of species richness loss over time and space in global biodiversity hotspots, where extinctions are happening at an unprecedented rate. In this study we propose a conceptual model that incorporates body size as a critical aspect of community responses to environmental change. The model was tested in biodiversity–ecosystem function experiments performed over two years in the Yasuni National Park in the Ecuadorian Amazonian rain forest, one of the most speciose ecosystems on the planet. We set up a two-year enclosure removal experiment in which we manipulated access to resources by the whole community of dung beetles, depending on their size. Our results demonstrate, for the first time in an animal assemblage in a tropical ecosystem, that although species may appear functionally redundant under one set of environmental conditions, many species would be needed to maintain ecosystem functioning at multiple temporal and spatial scales.



Photo 2. A student establishes a transect in the study area, along which several plastic mesh screens will be disposed.



Photo 3. Installation of plastic mesh screens of different mesh size apertures. The screens will allow a body-size partition of the ~70 dung beetle species found in this zone. Two types of resources (tuna and dung) were used as baits to attract dung beetles.



Photo 4. A large dung beetle (*Oxysternon conspicillatum*) is excluded from the resource material by a plastic mesh.



Photo 5. A smaller dung beetle (*Canthon luteicollis*) is able to enter the mesh screen and rolls a dung ball.

These photographs illustrate the article “Size-dependent species removal impairs ecosystem functioning in a large-scale tropical field experiment” by Olivier Dangles, Carlos Carpio, and Guy Woodward, published in *Ecology* 93:2615–2625, December 2012. doi: <http://dx.doi.org/10.1890/12-0510.1>