Seed dispersal in mauritius -- dead as a dodo?

May 7 2008

Walking through the last rainforests on the volcanic island of Mauritius, located some 800 km east of Madagascar, one is surrounded by ghosts. Since human colonisation in the 17th century, the island has lost most of its unique animals. The litany includes the famous flightless dodo, giant tortoises, parrots, pigeons, fruitbats, and giant lizards. It is comparatively easy to notice the loss of a species, but much more difficult to realise how many interactions have been lost as a result.

Recent work has highlighted how it is not species diversity per se, which breathes life into ecosystems, but rather the networks of interactions between organisms. Thus, the real ghosts in Mauritius are not as much the extinct animals themselves, but more importantly the extinct networks of interactions between the species.

Reporting in this week's *PLoS ONE*, Dennis Hansen, Christopher Kaiser and Christine Müller from the University of Zurich investigate how the loss of seed dispersal interactions in Mauritius may affect the regeneration of endemic plants. Why is it important for seeds to be dispersed away from maternal plants? One possible answer is given by the Janzen-Connell model, one of the most studied ecological patterns in tropical mainland forests –but which so far has not been experimentally investigated on oceanic islands.

In essence, the model suggests that for successful seedling establishment, seeds need to be dispersed away from adult trees of the same species, to escape natural enemies that are associated with the adult trees (seed

predators, pathogens, herbivores). The recent loss of most frugivores in Mauritius has left many fleshy-fruited plant species stranded without crucial seed dispersal interactions, leaving the na tural regeneration dynamics of the forests at a virtual standstill.

Within the framework of the Janzen-Connell model, the ecologists investigated seed germination and seedling survival patterns of one of the many critically endangered endemic trees, Syzygium mamillatum (Myrtaceae), in relation to distance from maternal trees. The results showed strong negative effects of proximity to maternal trees on growth and survival of seedlings, suggesting that dispersal is crucial for successful seedling establishment of this species. However, no extant frugivores eat the fruits of S. mamillatum, and most fruits are left to rot on the forest floor. In pristine Mauritius, the fruits would likely have been eaten and the seeds dispersed by ground-dwellers such as the dodo, the giant tortoises or giant lizards.

It may seem an impossible task to resurrect these lost interactions – simply because the Mauritian dodo is, well, dead as a dodo. However, recent studies have suggested rejuvenating lost interactions in currently dysfunctional ecosystems by using analogue species to replace extinct species – so-called ‘rewilding’. In one of the first experimental assessments of the use of ecological analogue seed dispersers, the Zurich group of ecologists successfully used giant Aldabran tortoises as stand-ins for the two extinct Mauritian tortoises in feeding experiments. Seedlings from gut-passed seeds grew taller, had more leaves, and suffered less damage from natural enemies than any of the other seedlings. The results thus show that Aldabran giant tortoises can be efficient analogues that can replace extinct endemic seed dispersers of S. mamillatum.

Overall, while it is acknowledged that oceanic islands harbour a disproportionally large fraction of the most critically endangered plant

species in the world, the study highlights how little we know about how the predictions of the Janzen-Connell model affects the regeneration and longer-term survival of endangered plants on islands. The results potentially have serious implications for the conservation management of rare plants on oceanic islands. Here, plants are often crammed into very small nature reserves, in which seedlings may be unable to disperse far enough to escape high natural enemy pressures around adult trees.

Source: Public Library of Science