

Novel analysis identifies highly biodiverse hotspots

E. E. LOUIS, JR. Biologists in Madagascar have come up with a highly detailed conservation plan using a new tool for identifying biodiversity hotspots, which analyses an unprecedented range of species in small geographical areas.

Where the world's major biodiversity hotspots lie on the world map may be well known, but planning protected areas within these sizable patches requires working out the hotspots' hottest parts — a controversial task. Most conservation strategies focus on saving individual species, but Claire Kremen and Alison Cameron of the University of California,

Berkeley, and their colleagues have considered the Madagascan ecosystem as a complex web of co-habiting species (C. Kremen *et al. Science* **320**, 222–226; 2008). The method, they say, could be rolled out for use anywhere around the globe.

Madagascar has an especially rich biodiversity with a large proportion of species found nowhere else in the world, including lemurs and many orchids. But only a small fraction of original habitat remains, and how to conserve this remainder has become a contested issue. Kremen's group has come up with a plan of unprecedented detail, putting their cards on the table before October, when a ban on mining in the country's most biodiverse areas comes up for review.

In 2003, the island state's President Marc Ravalomanana proclaimed that protected areas would be tripled in size to cover 6 million hectares — one-tenth of the country — by 2008. That deadline has held for the initial stages of identifying conservation areas, although legal protection covering the full expansion will wait until 2012. So far, the 1.7 million hectares that were gazetted five years ago have swelled to 4.3 million hectares, leaving a further 1.7 million hectares to be assigned. "We're at a critical point," says James MacKinnon, Conservation International's technical director for the region. "We have to make some really hard decisions about the last 1.7 million hectares and this study will be very helpful for that."

The new research suggests ways to expand



Safety in numbers: woolly lemurs, only found on Madagascar.

the existing protected areas and how reserve land added to the total since 2003 might be refined. Unlike previous models that set priorities, this one handled data for 2,315 species across six major taxonomic groups (including often-ignored insects and plants). And it used spatial resolutions of those species' ranges of less than one square kilometre. It took Kremen and Cameron several years, just to gather the information together and considerable computing horsepower to ponder the problem.

With their colleagues they drew proposed extensions to the existing network of reserves so that protected land and sea covered as much of all the species' ranges as possible. And the researchers weighted the species according to how endangered they were and corrected for the tendency of distributional models to overestimate the geographical range of each species.

They were under pressure to come up with results. In October 2004, Madagascar's ministries of mines and environment agreed a two-year moratorium on mining and large-scale logging in regions that might make the reserve quota. This was extended in 2006, says Mandimby 'Dimby' Razafimpahanana, the chief analyst for SAPM, an organisation that represents the national system of protected areas. "But the mining guys don't want to renew it again," he says. Kremen and her colleagues' results, along with the recommendations of two earlier analyses, will provide the scientific basis for the horse-trading to come. ■

Anna Petherick