Researchers Look to Better Understand Extinction Processes of Mammals

June 16 2009

As the human population continues to grow and resource demands soar, biodiversity conservation has never been more critical said University of New Mexico Biology Department postdoctoral researchers Ana Davidson and Marcus Hamilton in a paper released today in the latest issue of the *Proceedings of the National Academy of Sciences* (PNAS).

The paper, titled "Multiple Ecological Pathways to Extinction in Mammals," represents an important advance in understanding the causes of extinction risk in mammals. The research goes beyond previous analyses on extinction risk by identifying specific combinations of ecological traits that cause some species to be at greater risk than others.

"One-quarter of all mammals are in danger of extinction and over half of all mammal populations are in decline, making it critically important for scientists to identify the characteristics of species that make certain ones at greatest risk," said Davidson.

Using a new database of nearly 4,500 mammal species, Davidson and colleagues are using a novel methodological approach, decision-trees, to determine different pathways to extinction in mammals and provide simple rules of thumb that can be used for guiding conservation practice. They are discovering that extinction risk varies widely across mammals and that all kinds of mammals, across all body sizes, can be at risk depending on their specific ecologies.

They also discovered that although large mammals are well-known to be

at risk, 40 percent of all smaller mammals below 5.5 kg also are at risk of extinction. This was a particularly significant finding as 75 percent of all mammals are smaller than this size, and conservation efforts worldwide tend to focus primarily on large, charismatic species, such as jaguars, pandas, elephants, and polar bears.

Mammals with certain ecological traits such as small geographic range, low population density, slow life history, and large body size are known to be at risk of extinction. Davidson and colleagues have taken this knowledge to the next step by identifying how these kinds of traits interact to create different pathways to extinction.

For example, species with small geographic ranges are known to have a proportionally greater risk than those with larger geographic ranges. Because it is not enough to estimate risk from a single variable, this study identifies how traits like the size of the geographic range interact with combinations of other traits such as reproductive rate, population density, and social group size to cause variation in risk.

Davidson and colleagues also have identified other traits not commonly thought to be important predictors of extinction risk, such as living in trees versus living belowground. These kinds of insights highlight the urgent need for more information on the basic natural history of most species, which is still poorly known even for the most well studied groups like mammals, yet, essential to achieving conservation goals.

Unlike previous studies, Davidson and colleagues also identify exactly what is “small,” “large,” “fast” and “slow” by providing a map of extinction pathways that include the ranges of trait values where species are at greatest risk. This map outlining the pathways to extinction in mammals provides tangible results and basic rules of thumb for conservation practice. Their model also provides lists of species predicted to be inherently at risk based on their ecologies, many of

which are have not yet been identified as at risk.

“Since there is extremely limited funding for conservation, it is critical to provide tangible results that help conservationists prioritize their efforts on the ground, and that is a key goal of our research,” said Davidson.

"This newer statistical approach is much better at extracting data than traditional techniques,” added Hamilton. “Many researchers are seeing the usefulness of this tool. It is less restrictive and more flexible, and allows ecologists to work with large, complex data sets.”

Source: University of California San Diego