New Data Collection, Analysis and Sharing Tools Help Protect Threatened Species

Science Newsline

ATHENS, GA — New tools to collect and share information could help stem the loss of the world's threatened species, according to a paper published today in the journal Science. The study—by an international team of scientists that included John L. Gittleman, dean of the University of Georgia Odum School of Ecology—was led by Stuart L. Pimm of Duke University and Clinton N. Jenkins of the Instituto de Pesquisas Ecológicas in Brazil.

"As databases coalesce and policymakers have access to greater information, we see real and improving successes for conservation science," Gittleman said.

The paper's authors reviewed recent studies in conservation science, looking at rates of species extinction, distribution and protection to determine where there were crucial gaps in knowledge, where threats to species are expanding and how best to tailor protection efforts to be successful.

By combining studies of the fossil record and of molecular analyses, they found the current rate of extinction—driven primarily by human activity—was roughly 1,000 times higher than the natural, background extinction rate—an alarming number that is likely to grow, they said.

"Online databases, smart phone apps, crowd sourcing and new hardware are making it easier to collect data on species," Pimm said. "When combined with data on land-use change and the species observations of millions of amateur citizen scientists, they are increasingly allowing closer monitoring of the planet's biodiversity and threats to it.

"For our success to continue, however, we need to support the expansion of these

technologies and develop even more powerful technologies for the future."

The International Union for Conservation of Nature's Red List of Threatened Species, a global database that assesses the threat status of the world's known plant and animal species, is one of the chief sources of biodiversity information. It covers approximately 71,000 species today, but with greater investment could expand to its target of 160,000 species.

Projects that allow the general public to collaborate with scientists are becoming useful sources of knowledge on a large scale. Online databases such as iNaturalist.org [1] and DiscoverLife.org [2] — based at UGA — rely on amateur observers to contribute photographs for identification by scientists, providing valuable information about species distributions.

"One of the most exciting opportunities made possible by new technology is that we can combine existing databases such as the Red List with constantly updated maps of where species live, maps of areas that are protected, maps of land-use change, human impacts and threat and the species observations of amateurs," Pimm said. "Rather than rely on local snapshots of biodiversity, we can fashion a detailed global perspective of Earth's biodiversity, the threats to it and how to manage them."

One factor playing a role in extinction is the way species are distributed across the globe.

Species with naturally small geographic ranges are more common than those with large ranges, but they are also more vulnerable to threats such as loss of habitat. Many small-ranged species also tend to cluster together in the same areas. Those areas not only harbor the highest numbers of species, they also happen to suffer very high rates of habitat destruction-a sort of double-whammy that puts many species at risk for extinction.

But the fact that many vulnerable species are located together also offers an efficient way to target scarce conservation resources.

"This knowledge offers the hope that we can concentrate our conservation efforts on critical places around the planet," Pimm said.

New tools for mapping and data collection, analysis and sharing are helping scientists determine where those critical places are. However, major conservation challenges remain.

There are still enormous gaps in knowledge about how many species there are, where they live and their risks of extinction. Only about 13 percent of the world's land area and roughly two percent of its ocean area are currently under any sort of legal protection. And for aquatic species, whose threats often come from activities taking place on land far from where they live, land use management may prove just as important as protecting their habitat.

"The gap between what we know and don't know about Earth's biodiversity is still

tremendous, but technology is playing a major role in closing it and helping us conserve biodiversity more intelligently and efficiently," said coauthor Lucas N. Joppa, a conservation scientist at Microsoft's Computational Science Laboratory in Cambridge, U.K.

"The bottom line question is, are we doing better at protecting and saving threatened biodiversity?" Gittleman said. "The answer is a resounding ‘yes,' and we can do even more by embracing the new opportunities advancing technologies provide."

Besides Pimm, Jenkins, Gittleman and Joppa, the paper's coauthors are Robin Abell of Haverford, Pennsylvania; Tom M. Brooks of the International Union for Conservation of Nature; Peter H. Raven of the Missouri Botanical Garden; Callum M. Roberts of the University of York, U.K.; and Joe O. Sexton of the University of Maryland.

For more information on the Odum School of Ecology, see www.ecology.uga.edu [3].

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