In wake of 'super typhoon,' researchers measure blow to biodiversity

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In November 2013, as Super Typhoon Haiyan made landfall in the Philippines with the highest-ever recorded wind speed for a Category 5 tropical cyclone, it wreaked near complete devastation for miles. The cost was dear for both humans and wildlife.

Rafe Brown, associate professor of ecology and evolutionary biology at the University of Kansas, already had spent years researching biodiversity in the country. He said watching the TV coverage of Haiyan was "one of the most profoundly saddest events in my life."

"The death toll was so high, the calculations of loss of life so obviously underestimated—it was like the global disaster relief community had no idea what they had to deal with," Brown said. "A major metropolitan area and university town where I had spent many fine days interacting with colleagues and students —Tacloban City—had been reduced entirely to rubble. And the devastation in more far-flung areas of the archipelago was completely unknown. I found myself wondering: What about all those forests? What happened to the sites we had surveyed in the last five years? Were the areas where we established survey transects flattened completely? What species still remained in the most devastated forests?"

Because Brown, who also serves as curator-in-charge of the Herpetology Division at KU's Biodiversity Institute, had compiled such an extensive record of biodiversity in the Philippines through prior investigations, he realized he could be of help to the country and the scientific community

if he were able to characterize the extent of Haiyan's toll on wildlife in the area. Now, he has secured a one-year, $125,000 award from the National Science Foundation, a grant designed to address a particular need of high urgency in a rapid time frame.

"Several of the areas we have surveyed prior to the typhoon are considered particularly biodiverse, with high numbers of mammal species, birds, amphibians and reptiles," said Brown. "We now need an immediate 'after' glimpse of the diversity right after the storm. Our project is aimed at providing that picture of the aftermath…such that followup studies can be conducted at five, 10 and maybe 15 or 20 years from now, to document how recovery transpires in these natural systems."

Brown, along with KU colleagues Robert Moyle and A. Townsend Peterson, will train a field team of personnel and graduate students to survey habitat affected by Haiyan where biodiversity datasets had already been produced before landfall of the storm. Comparing the "before" and "after" data will reveal the extent of the super typhoon's destruction, as well as the ability of various species to bounce back from catastrophe.

"The methods we will employ will be the same methods we undertook for the previous surveys, using the same trails, the same transects and sampling measures, and even the same people who conducted the work," said Brown. "We'll standardize the effort so that statistical comparisons can be made, and then encourage future researchers to use these same methods again over the next decade or two."

While it's impossible to predict all of the aftereffects of Haiyan on the wildlife of the Philippines, the KU researcher said some species truly could be scattered to the winds.

"These typhoons are often devastating to low-lying areas because storm surge can scour coastal plains and eliminate everything that lives there," Brown said. "They're often also heavily damaging to mid- and upper-montane areas because the heavy rainfall causes landslides and flattens forests if winds are strong enough. There is no doubt that they also transport species from one area to another—small animals, literally blown from one island to the next—but these details have seldom been quantified to date. This is an ancillary goal of our new project, to measure the amount of storm-associated translocation of populations of land vertebrates from one island to another."

Brown said that the Philippines is an attractive nation in which to study biodiversity because of the stark contrasts, such as habitable islands versus inhospitable intervening seaways, along with the known geological history of the archipelago, the rich legacy of data compiled by scientists over centuries to draw upon, and the very clear and, at times, simplified communities of vertebrates that inhabit the 7,100 landmasses of the archipelago.

However, he said that his findings could shed light on how species thrive or fail in the aftermath of natural disasters anyplace on Earth.

"This award addresses a particular high-urgency need for surveys post-Haiyan but fits into the general framework of our research program in that we seek to understand how such exceptionally high levels of land vertebrate diversity can exist in the island archipelagos and biodiversity hotspots like the Philippines," said Brown. "It may relate to the frequency of natural disturbance. That is, if chronic and periodic natural disturbance is typical of a forest community, it is conceivable that such a forest community may remain particularly diverse because it contains a combination of stable, resident community species and also a cohort of 'edge' species or species that invade an area following the impact of natural disturbance. Our data may provide a direct measure of the

predictions of this 'intermediate disturbance hypothesis' in a real-time empirical system. Such an opportunity is quite rare—only coming along once or twice in a lifetime."

Provided by University of Kansas