Scientists identify 'DNA barcodes' to help track illegal trading of wildlife products

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(PhysOrg.com) -- Researchers from several institutions including the University of Colorado at Boulder have sequenced DNA "barcodes" for as many as 25 hunted wildlife species, providing information that can be used to better monitor the elusive trade of wildlife products, or bushmeat.

Identifying such DNA barcodes can help wildlife officials crack down on illegal bushmeat trafficking since many animal species are in sharp decline from illegal trade estimated to be worth $5 billion to $8 billion annually, said Andrew Martin, CU-Boulder associate professor of ecology and evolutionary biology and a study co-author. Barcodes also can help monitor legal harvest of tropical animals as researchers often use the composition of species in markets as an indication of the health of the wildlife community in forests.

"It's a really amazing study in which science brings together cultures and people living on separate continents faced with very different challenges," said Martin. "Barcoding is an essential tool for the identification of natural products and is becoming the technique of choice for monitoring wildlife trade. The ultimate goal is to have barcodes for every animal on the planet."

The DNA barcodes generated from the study have been added to an online, open-access repository called the Barcode of Life Data Systems and to the National Center for Biotechnology Information's GenBank library.

A paper of the findings was published in the September online edition of *Conservation Genetics*.

The DNA barcode system is valuable for its precision at the level of species, according to researchers. Without it, processed and prepared meats, hides and other goods are often unidentifiable once they reach the marketplace.

Enforcing wildlife laws such as those imposed by the Convention on the International Trade of Endangered Species or the U.S. Endangered Species Act will still be very difficult, or inefficient at best, said Martin. Suspected contraband must be confiscated and sent to a laboratory for gene sequencing, which typically requires days for results.

The team of scientists from CU-Boulder, Barnard College and the American Museum of Natural History used a region of a mitochondrial gene known as COX1 to generate DNA barcodes of 25 commonly traded mammal and reptile species in Africa, Central and South America. The study included Old World monkeys, alligators, crocodiles, antelope and wild pigs.

The COX1 gene is agreed upon by scientists as a viable segment of the genome to use in barcoding, said Martin. The COX1 gene is a relatively small DNA segment in which mutation is rapid enough to distinguish closely related species but also slow enough that individuals within the same species have similar barcodes.

Research took place at CU-Boulder laboratories, the American Museum of Natural History in New York and in the field with the collection of hundreds of blood and tissue samples. The U.S. Fish and Wildlife Service also provided specimens from confiscations of leather handbags, belts and shoes.

Mitchell Eaton, who led the research as a doctoral student at CU-Boulder, said technologies to support rapid or automated DNA barcoding have yet to be developed but the first step is for scientists to build a catalog of barcodes. "This is not something where you can wave a scanner over a piece of meat in an airport to know the animal's identity, that kind of technology is well into the future."

Eaton is now affiliated with the Patuxent Wildlife Research Center of the U.S. Geological Survey.

Monitoring illegal wildlife trafficking is not the only purpose of DNA barcodes. The codes also can furnish information on diversity in ecosystems, invasive species, pathogens in food supplies and the impact hunting by humans has on forest wildlife, according to the researchers.

"Much of the wildlife harvest in tropical countries is legal and supports rural inhabitants who have few other options for obtaining protein," said Eaton. "Because subsistence harvest and the more insidious forms of commercial hunting are both largely unregulated, ecologists and conservationists would like to better understand the extent and impact of the use of wildlife resource in these regions."

"Collecting samples for genetic barcoding will provide a means for more accurate species identification and a better understanding of hunting impacts on species abundance and composition," said Eaton.

The DNA barcoding in the study was successful enough to individually identify closely related species that previously had been lumped together, said Martin. The team is hoping to modify the length of barcode sequences to increase the success rate of species identification from processed leather products, which is currently a challenge due to high levels of DNA degradation.

Source: University of Colorado at Boulder (news : web)