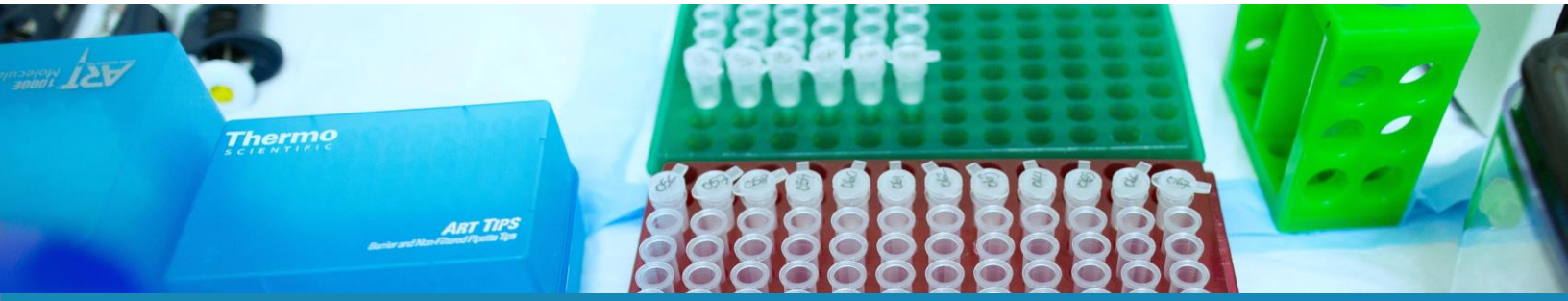

WILDLIFE CRIME TECH CHALLENGE

ISSUE 2: STRENGTHENING FORENSICS

Strengthen forensic evidence

Forensics is defined as the use of science or technology in the investigation and establishment of facts or evidence in a court of law.[1] Government law enforcement— including wildlife rangers, police, customs officers, prosecutors, and judges—all rely on forensic investigation and evidence to successfully prosecute criminals. However, when compared to other types of crime, the investigation of wildlife trafficking does not have a long history of developing and applying forensic tools. This gap means that wildlife crime enforcement agencies can benefit enormously from new, tailored forensic technologies.

We are seeking innovative solutions to two problem areas

The Challenge is specifically calling for tools, processes, and technologies relating to:

- Enhancing the forensic analysis used to combat wildlife trafficking
- Improving the management and sharing of data related to wildlife trafficking

These may include solutions that will enable law enforcement and decision makers to provide timely and accurate answers to the following questions.[2]

1. To what species does a specimen or wildlife part belong?
2. What is its age and geographic origin?
3. What was the cause of death or injury?
4. If law-breaking has occurred, can a suspect be connected to the crime?
5. Are there new wildlife trafficking trends emerging that require a new or rapid response?

The Challenge is also seeking platforms and technologies that can enable the sharing of forensic data, as well as other data, to bring wildlife traffickers to justice.

Current state of the issue: the need for forensic analysis and data sharing

Answering the questions above is not necessarily straightforward. Criminal groups deploy a number of strategies to conceal the identity of wildlife contraband. These include disguising illegal parts to resemble those of species that can be lawfully traded (e.g. rhino horn as cattle horn).[3] With regard to elephant ivory, those engaged in the illegal trade attempt to artificially age products so that they appear to predate the CITES commercial trade ban.[4] Ivory worked before the ban was in place can legally be sold. In other instances, dealers claim that a wildlife product came from a region where the animal was legally captive bred, like a zoo, or that it died of natural causes.

Forensic tools not only allow law enforcement officers to uncover this deception and prosecute criminals, but when aggregated, the data they uncover can be used to identify broader patterns in the illegal wildlife trade. For example, they can help identify geographic poaching hotspots and trafficking routes, uncover trends in the way a specific illegal part is being used, and keep track of how heavily trafficked a particular species may be.[5] These data are most effective when compiled across agencies and countries.

Current efforts in forensic analysis and data sharing

Examples of forensic tools and techniques

The following are just a few examples of the forensic tools used to help tackle wildlife trafficking. Some require laboratory expertise; others could be developed for in situ, real time application by law enforcement.

Several mobile phone applications have been developed to help identify trafficked species. For instance, one application guides users through questions about an animal's appearance, enabling the identification

of 250 illegally traded species.[6] Another tool permits users to browse an online library of endangered Southeast Asian fauna typically in trade, to learn about the distinctive identifying characteristics of each. It also has a function that enables users to alert law enforcement to potentially illegal animal sales.[7]

"Isotope fingerprinting," a method for identifying the geographic origin and age of samples, analyzes the concentration of various chemical elements in a specimen. For example, with elephant ivory and rhino horn, scientists can analyze the isotopic concentration of carbon and nitrogen in samples and determine their geographic origin based on known environmental characteristics of specific territorial ranges.[8]

DNA testing is a rapidly evolving frontier. The ability to match DNA from a sample to a DNA-based species library could greatly increase the accuracy of forensic analysis.[9] If the tools and infrastructure for DNA analysis is advanced, it could be applied at key points of inspection.

Beyond the identification of species, age, and origin, methods for linking suspects to crimes include criminological techniques such as the identification of human fingerprints, or retrieval of hair or clothing fragments. An interesting recent advance allows human fingerprints to be extracted from bird feathers using fluorescent powders and laser light.[10] Additionally, there are decades of crime scene investigation experience and applications that could be adapted for wildlife crime scenes.

Use in criminal investigations

For forensic data to be credible and admissible in court, law enforcement and prosecutors must comply with relevant legislation. Appropriate methods and procedures must be used during crime-scene investigation, and sample collection, shipping, analysis, interpretation of results, and database maintenance must be done according to precise requirements.

To ensure that such procedures are known and followed, a large number of organizations support the dissemination of forensic best practice and create how-to guides for investigators. For example, the United Nations Office on Drugs and Crime (UNODC), on behalf of the International Consortium on Combating Wildlife Crime (ICCWC), is leading the development of a manual on "Guidelines for forensic methods and procedures of ivory sampling and analysis."[11] One possible route for future advancement is through technology-based efforts to raise awareness and to provide training and tools for proper handling and care of evidence.

Examples of tools and systems for sharing and managing forensic data

Several national, regional, and international wildlife forensics networks exist to promote data sharing. One such network provides a helpline and knowledge bank to forensics practitioners around the world, trains government departments in wildlife DNA forensics, and supports the development of new tools.

A partnership project in Uganda uses digital cameras that produce GPS-tagged images to create a spatially referenced database of poaching activity in the country, to which partner organizations can contribute.[12] "Big data" analytical tools are also being used for conservation. One product aggregates images from many cameras across the world and analyzes trafficking and poaching trends.[13]

The way forward

Current trends relating to forensics and data sharing include: developing more accurate and cheaper forensic identification tools; building more comprehensive information libraries; making these libraries more widely accessible; helping investigators adopt best practice; improving data sharing mechanisms; and developing more robust analytical platforms that can provide better analysis of wildlife crime data once it is shared. There are certainly others as well.

Given these trends, potentially important innovations could include, but not be limited to, the following:

- Affordable and easy-to-use DNA testing that can be deployed at key points of inspection
- Photo matching technology that can be integrated into a comprehensive species database
- A complete forensic database containing all identifying characteristics of every known species
- New taxa-specific forensic methods that can overcome current gaps and produce new tools.

These suggestions are simply designed to spur ideas, however, and the Challenge encourages applicants offering technologies not explicitly listed above.

Useful links

- US Fish and Wildlife Service Forensic Lab accessible at http://www.fws.gov/lab/
- Canisius Ambassadors for Conservation: Rhinoceros Conservation accessible at http://www.conservenature.org/learn_about_wildlife/rhinos/rhinoceros_conservation.htm
- ASEAN Wildlife Forensics Network accessible at http://www.asean-wfn.org/
- The Weather Channel: Trafficking Jam accessible at http://stories.weather.com/animalforensics
- Consortium for the Barcode of Life: What is DNA Barcoding accessible at http://barcoding.si.edu/whatis.html
- UNODC Wildlife and Forest Crime Analytic Toolkit accessible at http://www.unodc.org/documents/Wildlife/Toolkit_e.pdf
- UNODC Wildlife and Forest Crime Forensic Guidelines accessible at http://www.unodc.org/unodc/en/wildlife-and-forest-crime/forensic-guidelines.html

[1] Forensic Working Group (FWG), 2014,"Wildlife Crime; A Guide to the use of forensic and specialist techniques in the investigation of wildlife crime."
[2] Forensic Working Group (FWG), 2014,"Wildlife Crime; A Guide to the use of forensic and specialist techniques in the investigation of wildlife crime."
[3] Sims, M.E. and B.C. Yates, 2010. Macroscopic Identification of Rhinoceros Horn versus Cattle Horn. Identification Guides for Wildlife Law Enforcement No. 13. USFWS, National Fish and Wildlife Forensics Laboratory, Ashland, OR.
[4] Identification Guide for Ivory and Ivory Substitutes, by Edgard O. Espinoza, Mary-Jacque Mann, and World Wildlife Fund, 1992
[5] Wasser, SK, B Clark, C Laurie. 2009. The Ivory Trail. Scientific American: 68-76.
[6] Freeland Foundation, 2014, [online] viewed February, 2015, http://www.freeland.org/#!wildscan/chp2
[7] TRAFFIC, 2008. New app to build awareness and information on illegal wildlife trade in South-East Asia. [online] http://www.traffic.org/home/2014/4/9/new-app-to-build-awareness-and-information-on-illegal-wildli.html
[8] Convention on International Trade in Endangered Species of Wild Fauna and Flora, March 3, 2013. www.cites.org/eng/cop/16/inf/E-CoP16i-19.pdf
[9] Consortium for the Barcode of Life 2014, viewed February 2015, http://barcoding.si.edu/whatis.html
[10] Helen McMorris, Kevin Farrugia, Dennis Gentles, March 2015, "An investigation into the detection of latent marks on the feathers and eggs of birds of prey," Science and Justice, Vol. 55, Issue 2, pp. 90-96.
[11] United Nations Office on Drugs and Crime (UNODC), 2014, "Guidelines on Methods and Procedures for Ivory Sampling and Laboratory Analysis."
[12] Uganda Conservation Foundation, Wild Leo Project, 2014, http://www.ugandacf.org/projects/welcome-to-the-wild-leo-project
[13] HP Earth Insights, 2013, [online] http://www8.hp.com/hpnext/posts/harnessing-big-data-drive-environmental-progress-hp-earth-insights-develops-early-warning#.VNp6FocirzI