**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Wildbook \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Project:  Web app for automated identification of species in the wildlife trade using Computer vision algorithms and database containing local laws and conservation status

Stage:  Proof of Concept

Challenge issue addressed:  2 challenge issues are addressed: [strengthening forensic evidence and intelligence](http://wildlifecrimetech.org/evidence) and detecting traffic routes

Target user:  wildlife law enforcement agents and customs officials; scalable to public consumers

**Summary Statement (750 chars)?**

Malaysia is a major node for illegal wildlife traffic in Southeast Asia. The Malaysian Department of Wildlife and National Parks (DWNP) is responsible for wildlife law enforcement and providing forensic evidence to prosecute wildlife traffickers. Wildlife shipments containing live animals are frequently intercepted by DWNP and they have identified a need for a field deployable tool to accurately identify a confiscated animal and differentiate endangered from more common species. We propose to develop a prototype app for wildlife enforcement officers that uses automated pattern recognition software and computer vision algorithms to accurately identify an animal from a photo and record its location and legal status in Malaysia. This could be scaled up by developing a mobile app that included more wildlife species, regions other than SE Asia, and multiple languages.

**Organization Details (1500 chars)?**

Our Mission: EcoHealth Alliance leads cutting-edge research into the critical connections between human and wildlife health and delicate ecosystems. With this science we develop solutions that promote conservation and prevent pandemics.

Our Vision: To be the organization leading the change in perspectives, policy and practices that increase global capacity to respond to emerging threats at the intersection of health and the environment.

EcoHealth Alliance pioneered the field of conservation medicine, a discipline that addresses the link between ecological disruption of wildlife, livestock, and human health and survival. EcoHealth Alliance is committed to unifying biodiversity conservation, ecology and health by its leadership and strategic role with its local conservation partners. These partnerships allow EcoHealth Alliance to gain insight into specific issues from disease outbreaks to the protection of wildlife sanctuaries.

Congruent with our mission to protect the health of wildlife and people across the planet, EcoHealth Alliance is working to reduce the negative impacts of the illegal wildlife trade. As a multi-billion dollar a year industry, the global wildlife trade is second only to narcotics. The potential threats to humans and animals are extensive including the spread of disease, the introduction of invasive species, and the extinction of wildlife populations.

**Partners (750 chars)?**

The Government of Malaysia’s Department of Wildlife and National Parks (DWNP) will help prioritize animal species for the prototype app; provide a large library of animal images necessary to train and evaluate the software; and work with us to test the program by collecting new images from live animals. The Audio-visual Systems group at the Fraunhofer Institute for Digital Media Technology (IDMT) in Germany is a world leader in multi-modal signal processing, pattern recognition, and computer vision. They are one of the few groups that have adapted facial detection and recognition software to wildlife as a tool currently used by biologists for wildlife conservation. They will adapt their existing facial recognition algorithms for great apes to new wildlife species and train the software to optimize accuracy in species recognition for this app.

**(3000) Character Description?**

Malaysian wildlife is heavily impacted by illegal trafficking as many of the species that enter the illegal wildlife trade are sourced from Malaysia. DWNP is the federal agency responsible for protecting and managing wildlife in Peninsular Malaysia and its officers are responsible for combatting illegal wildlife traffic. DWNP has identified the need for a mobile technology that provides accurate information to wildlife enforcement officials and customs officials about the animals that they confiscate or encounter during wildlife raids. We propose to develop a prototype web-based app (usable from mobile or laptop web browsers) that will use image recognition software to accurately identify an animal species using photographs of a specimen. EcoHealth Alliance will develop this app in partnership with Fraunhofer IDMT, an applied research group with expertise in developing automated facial recognition software and one of the few groups in the world that have adapted this technology for use in wildlife conservation.

We will develop a program using algorithms originating from automatic pattern recognition and computer vision. The facial recognition algorithms that we developed for identifying individual Great Apes will serve as the underlying technology, and we will adapt and extend them to recognize other animals on a species level (e.g. pangolins or civets). The program will use photographs, taken by a mobile phone, of the animal’s body and/or body parts such as the face, torso, or the limbs at the time of confiscation to identify the species. It will also record the time and location that the image was taken, using the embedded GPS information from the mobile phone camera (or GPS location can be manually entered. This will help identify trafficking routes. The program will access a database to provide current information to the user on the conservation status and Malaysian laws pertaining to each animal species. This information will help wildlife enforcement officials more rapidly identify illegal wildlife and differentiate between endangered and more common species within a genus.

To demonstrate proof of concept, we will work with DWNP to select 3 to 5 animals that are native to Malaysia (and other SE Asia countries) and that are commonly found in the illegal wildlife trade. We will train the program using photographs of each of these species, as well as related species and work towards minimizing identification error, thereby maximizing accuracy.

The web-app will link to a database, via GSM networks or WIFI, populated with images of the target and related species within the same genus, collected by a network of DWNP field agents and field scientists from EHA working in Peninsular Malaysia along primary wildlife trafficking routes. The database will also contain information about the species’ natural history, its distribution, various local names, current population status (e.g. abundance) within Malaysia and across its entire home range, global and local conservation status, and legal status in Malaysia.

**Stage of Innovation (1500 chars)**

This software is at the proof of concept phase. Since our algorithms have already achieved very promising results even in highly challenging scenarios including non-cooperative subjects, partial occlusion, cluttered background and poor lighting conditions, we are extremely confident that our technology can be adapted to robustly differentiate between different animal species. Our group has developed the facial recognition software for chimpanzees and found up to an 80% accuracy rate when tested on wild chimpanzees (90% with captive chimps). This shows proof of concept that automated image recognition can differentiate among individual animals within a species based on facial patterns. Given the task at hand, where most of the above mentioned challenging factors can be decreased to a minimum, we propose to adapt this technology to robustly differentiate among highly trafficked mammalian species that may be encountered by wildlife authorities in Malaysia.

The goal of this project is to improve the accuracy of existing technology and expand its use case to help combat wildlife trafficking by training the image recognition algorithm on key wildlife species found in the trade. This will be created for a web-based platform, using Google Chrome or other browsers. It will require a laptop, tablet or smartphone (Android or iOS) with WIFI or a 3G GSM network. If our program has sufficient accuracy to be useful, we will scale it up as a mobile app that will require the same hardware and enough memory store a database containing a large image library and information about conservation and legal status of each animal, in multiple languages.

**Business Plan (3000 chars)**

Existing technology is web based, and our tech group at EHA, in partnership with Fraunhofer IDMT, will first create a web-based program, trained on a limited number of high-priority wildlife species. Once we have a working prototype that is optimized for accuracy, we will field test it with the Malaysian DWNP. This technology is scalable to expand the range of species and to be adapted to other countries and regions. We would pursue additional funds to develop it as a mobile app that can be used by Android and iOS systems. As part of the scaling process, we would seek to partner with wildlife departments in other southeast Asian countries and China, as well as TRAFFIC and ASEAN WEN, in order to enhance uptake of this tool by other organizations on the frontlines of combatting wildlife trafficking and to leverage other available data for species found in the illegal trade. The app would need to be adapted to local languages, but the wildlife image database would be relevant and applicable to all the SE Asian countries along the trade routes, as well as China.

The target user base is the wildlife law enforcement officers who need forensic evidence and information at the point of arrest/confiscation, *before* genetic information can be obtained. For this initial proof of concept phase, we propose to develop the web-based app and train it on 3-5 key wildlife species. This will involve gathering an extensive image library for each target species as well as related species; identifying key morphometric features, and training our program to differentiate species with high accuracy and minimal error. We estimate the cost of developing the basic program and training it on 4-5 key wildlife species over a 12-month period will be approximately $375,000. This would include a 6-9 month development period followed by a 3-4 month evaluation and parameter tuning period. During the evaluation and refinement period, we will conduct training sessions for DWNP officers to field test the app. Our group would leverage existing resources available to the Government of Malaysia and EcoHealth Alliance, including in-kind contributions of personnel time and provision of archival image data. The result of this project would be a working prototype that has been field tested and optimized for accuracy.

This concept is highly scalable. The application of this technology need not be limited to the Asia context. Given the resourced, this app could be expanded to include wildlife species originating in the Americas and Africa. Ecohealth Alliance works directly with wildlife agencies in Africa, Latin America, Asia, and the United States and we would leverage our network of wildlife biologists and wildlife officers to participate in providing image data for species in the wild and in captivity. Should we be successful in developing this concept, we are confident that we could produce a functional and effective tool for strengthening forensics and improving wildlife departments’ ability to identify traffic routes.