WILDLIFE CRIME TECH CHALLENGE

PRIZE WINNER PROFILES

Game-changing science and technology innovations to combat wildlife crime

IN PARTNERSHIP WITH

USAID FROM THE AMERICAN PEOPLE

NATIONAL GEOGRAPHIC

TRAFFIC
the wildlife trade monitoring network

Rewarding science and tech innovations that combat wildlife crime.

WHO WE ARE

The Wildlife Crime Tech Challenge is a global innovation competition that rewards innovative science and technology solutions that tackle four wildlife trafficking issues: detecting transit routes; strengthening forensic evidence; reducing consumer demand; and tackling corruption. The Challenge is an initiative of the U.S. Agency for International Development, in partnership with National Geographic, the Smithsonian, and TRAFFIC.

OUR WINNERS

In early 2016, the Challenge, a three-stage competition, selected 16 Prize Winners out of a pool of 300 applicants from 52 countries. The winning innovations range from portable DNA sequencers to data mining tools. Prize Winners received a $10,000 cash prize up-front and will also receive promotional and networking opportunities, and technical assistance to scale or accelerate their solutions. Prize Winners are also eligible to compete for Grand Prizes worth as much as $500,000.

WHAT WE NEED

Our Prize Winners need an active community of supporters that can work with them to stamp out the illegal wildlife trade. Supporters will include:

- **Partners**, such as law-enforcement agencies, mobile telecoms operators, or conservation NGOs, that have robust systems on the ground that can be deployed in concert with prizewinning innovations.
- **Advisors**, in the form of advisory board members or business mentors, that can assist Prize Winners in scaling and accelerating their innovations.
- **Funders**, in the form of foundations and other grantors, angel investors, and providers of seed funding that will enable further development and scaling of Prize Winners' innovations.
- **Technologists** who can leverage the power of science and technology to improve the functionality of prizewinning innovations.

CONTACT US

INFO@WILDLIFECRIMETECH.ORG
WILDLIFECRIMETECH.ORG
@WILDLIFE_TECH

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TRAFFIC the wildlife trade monitoring network

PRIZE WINNERS

Binomial Solutions
Pune, India
http://binomialsolutions.com

BINOMIAL SOLUTIONS

THE PROBLEM

There are fewer than 4,000 wild tigers left on Earth, and many of these live in wildlife protected areas in India where they are targeted by poachers.

Anti-poaching systems currently in use fail to harness the latest technological developments and are susceptible to both power outages and to human error in the collection and storage of critical data.

OUR SOLUTION

Binomial Solutions has developed e-Eye®, a solar-powered, remote-controlled system that combines surveillance tools, including video cameras, with data analysis tools and intelligent software. This innovative combination of hardware and software can:

- Provide live thermal and visible video in all weather conditions.
- Monitor areas prone to human-animal conflict and assist rangers in managing their locations relative to wildlife.
- Gather evidence of illicit activity for potential use in prosecuting crimes.
- Identify events (flood, fire, etc.) and accidents and notify relevant authorities.
- Provide trend analysis such as seasonal movements of humans and wildlife, habitat health, and status of prey base, food, water and other resources.

- Respond to user input to alert authorities rather than requiring round-the-clock monitoring.

WHAT WE NEED

e-Eye® is particularly useful in areas that are not readily accessible to rangers. Binomial Solutions is looking for partners, organizations, individuals, and funding agencies that can help in scaling the system and deploy it in other regions of the world.

ABOUT BINOMIAL SOLUTIONS

Binomial Solutions is a leading IT solutions and service provider focused on developing world class technology solutions for our clients.

Ravikant Singh is the CEO and cofounder of Binomial Solutions, and is responsible for managing the company's growth, formulating and executing strategies, and interacting with clients, employees, investors, and other stakeholders. He holds a Bachelor's degree in engineering and has more than 14 years of experience in the IT industry.

Raja Brij Bhushan is CTO and cofounder of Binomial Solutions, and oversees the company's overall technology focus. A seasoned Agile software expert, Raja is an engineering graduate and a technology evangelist with robust experience in diverse technologies.

CONTACT US

Email:
info@binomialsolutions.com

Bosque Antiguo
Mexico City, Mexico
www.bosqueantiguo.com

BOSQUE ANTIGUO

THE PROBLEM

The below animal species are emblematic in Mexico and Central America and are heavily poached:

- **Scarlet Macaw**: Scarlet Macaw populations in the region have been reduced by trafficking of both chicks and adults for the illicit market for ornamental birds. Some experts project that in as little as 10 years, there will be no more Scarlet Macaws in the region.
- **Military Macaw**: Once abundant, Military Macaw numbers have declined in recent decades. Ecotourism initiatives have been launched to protect the species, which is also trafficked for the pet trade, and is particularly vulnerable because the young spend a long time in the nest.
- **Red-eyed Tree Frog**: Habitat loss and demand from the pet trade has reduced Red-eyed Tree Frog numbers considerably. There is a pressing need for a system that enables captive-bred specimens to be distinguished from wild-caught specimens.

Furthermore, governments in the region are not equipped with adequate tools to detect, prevent, and prosecute the illegal trade of these species.

OUR SOLUTION

Bosque Antiguo is creating special lab kits that will allow the individual genetic identification of the three species mentioned above. These kits will enable the creation of DNA databases detailing the genetic profiles of individuals within these species and allow individual genetic matching for control and forensic purposes. This will strengthen conservation by:

- Enabling authorities to establish a system to record "genetic fingerprints" for all legally owned specimens.
- Registering specimens released as part of reintroduction projects as well as wild specimens to enable identification in illegal market supply chains.
- Serving as a tool for the settlement of legal disputes about the origin of seized specimens.
- Discouraging extraction and encouraging non-extractive benefits of the wildlife such as photography and ecotourism.
- Deterring potential consumers of illegal specimens by introducing the possibility of detection and criminal prosecution.

WHAT WE NEED

Wildlife management authorities in Mexico are interested in establishing genetic profiling as a requirement for legal owners of these species. For us to help meet this need, we require funding for lab testing (including personnel, supplies and equipment). Also, as these species are highly trafficked as pets in markets around the world, and as the tool can be expanded for use with other macaw species, we anticipate needing access to networks of wildlife managers and customs officials in different countries and regions.

ABOUT BOSQUE ANTIGUO

Bosque Antiguo is a non-profit organization committed to biodiversity conservation in Mexico, and a participant in the Reintroduction of the Scarlet Macaw Project in Mexico. Although the reintroduction project is having some success, the illegal removal of individuals from the wild continues to undermine this effort.

Our team includes Patricia Escalante, the legal representative of Bosque Antiguo and a researcher at the Instituto de Biología, UNAM, and Noemi Matías, an expert collaborator in the development of short tandem repeat sequence genotyping and genetic analysis.

CONTACT US

Email:
Patricia Escalante - tilmatura@ib.unam.mx

For the Fishes
Honolulu, USA
www.forthefishes.org

FOR THE FISHES

THE PROBLEM

Tens of millions of colorful tropical fishes are taken from coral reefs each year for household and public aquariums. Up to 90 percent of these may be caught illegally with cyanide, a poisonous chemical and stunning agent that enables easy capture of fish but also weakens and kills wildlife and reefs.

Marine aquarium enthusiasts unknowingly contribute to the harm and destruction of the very animals and places they cherish, in part because the illegal and unsustainable nature of wildlife capture for aquariums is obscured by misconceptions. One of these is that aquarium fish are captive bred, whereas in reality a mere two percent of species kept in marine aquariums can be bred in captivity on a commercial scale.

OUR SOLUTION

We created a mobile app, Tank Watch – The Good Fish/Bad Fish Tool, to empower consumers to make wildlife-friendly purchases for their marine aquariums. Tank Watch delivers information that enables rapid identification of popular aquarium species and their origins, including whether they are potentially captive-bred or definitely captured in the wild. Tank Watch for iOS launched in 2014, and an Android version will launch in mid-2016. Our strategic goals for the app include:

- 200,000+ new users, about 10 percent of global hobbyists, download and use Tank Watch every year.

- A 10 percent reduction, equivalent to as much as one million fish, in coral reef-related wildlife trafficking for aquariums each year.
- The formation of partnerships with major NGOs and corporations to reinforce Tank Watch's conservation message.

WHAT WE NEED

We're seeking funding to engage communications experts and consumer research firms in support of our awareness and behavior change efforts in key areas. We also seek partnerships with key corporate and NGO influencers that will reinforce our conservation messages to their audiences and members.

ABOUT FOR THE FISHES

For the Fishes is a non-profit, tax-exempt, charitable organization based in Hawaii and committed to addressing issues in the supply chain for marine aquariums. Our supply and demand-side strategies are directed locally and globally to facilitate positive shifts at the fishery, distribution, policy and consumer levels.

CONTACT US

Email:
Rene Umberger – rene@forthefishes.org

Jennifer Jacquet
New York, USA
http://environment.as.nyu.edu/page/home

JENNIFER JACQUET

THE PROBLEM

The sale of illegally trafficked wildlife via online marketplaces has surged in recent years. Online retail platforms have made some commitments to reduce the sale of wildlife, but have had limited success. At the same time, the monitoring of the online wildlife trade continues to rely primarily on manual search techniques that typically occur over short periods of time.

OUR SOLUTION

Our solution, an Enforcement Gaps Interface (EGI), is a secure, web-based interface that incorporates a computational model and the power of machine learning. EGI is designed to help NGOs, enforcement agencies, and retailers identify online trafficking of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I species both domestically and internationally. We believe EGI will also be useful in mapping transit routes for trafficked wildlife and wildlife parts.

WHAT WE NEED

We have been engaging with technology companies, NGO experts, and law enforcement in the development of our tool, which is currently available for English-language web sites and will expand to other languages after the current phase of development is completed.

We are seeking funding and/or partnerships to scale our solution and to increase the market of potential users. We intend to build the user interface so that data can be easily yet securely accessed and interpreted.

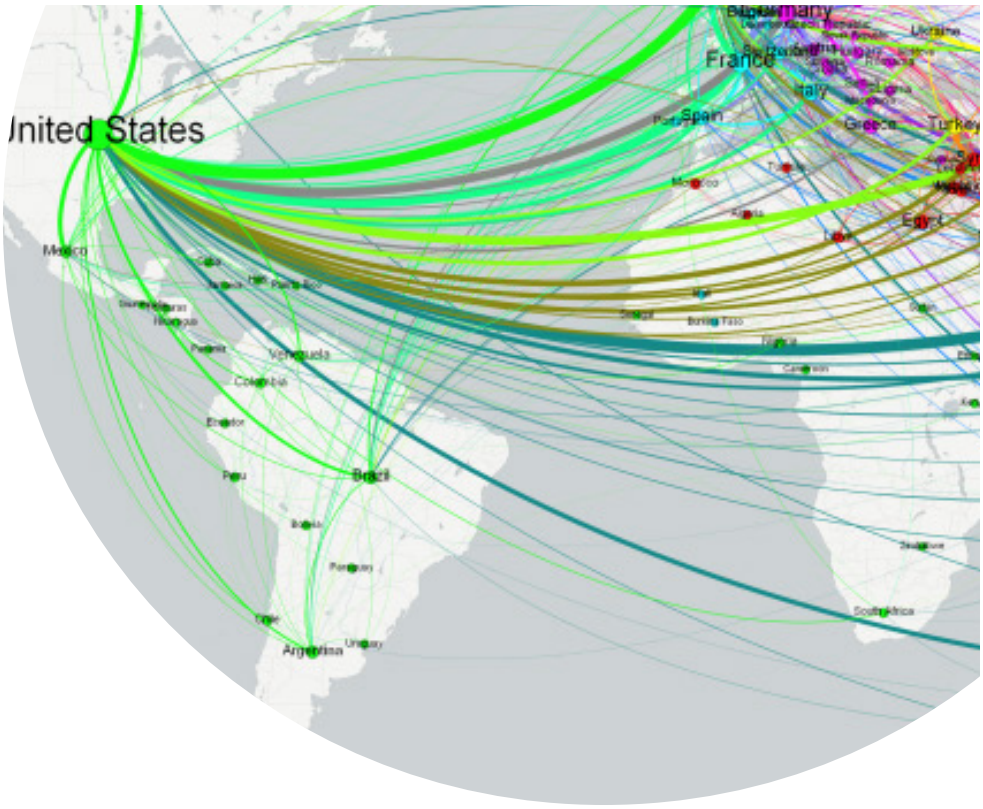
ABOUT JENNIFER JACQUET

Jennifer Jacquet is an Assistant Professor in the Department of Environmental Studies at New York University (NYU). She is joined by Sunandan Chakraborty, a post-doctoral research fellow in the Center for Data Science at NYU. Jennifer's team has expertise in international conservation-related dilemmas, web search, data mining, and machine learning. The team has received funding for this project through August 2017.

CONTACT US

Email:
Jennifer Jacquet - jj84@nyu.edu
Sunandan Chakraborty - sunandan@cims.nyu.edu

GDELT



Kalev Hannes Leetaru
Washington, D.C., USA
http://gdeltproject.org

KALEV HANNES LEETARU

THE PROBLEM

Local information sources around the world, including local news media, citizen reports, and field data, offer rich insights into wildlife crime and its driving forces. But, no single infrastructure exists to collect, translate, analyze, visualize, and forecast all of this data in one place and bring it into the digital era.

OUR SOLUTION

Our solution, the Real-time Global Wildlife Crime Map, Trafficking Routes, and Forecasts, uses the GDELT Project, the largest open-data initiative focused on human society in the world, to leverage the vast volumes of existing data about and related to wildlife crime.

The GDELT Project monitors global print, broadcast, and online media in over 100 languages and uses massive computer algorithms, including deep learning, to translate and synthesize real-time data into a codified catalog of global society.

Our solution sources data from local news reports of activities such as poaching; live imagery emerging from hot spots; changing narratives and norms reflected in the general daily life of those living in production and consumption areas; studies of socio-cultural drivers and enablers provided in academic literature; and NGO reporting.

Our innovation will provide:

- **A real-time map**, updated every 15 minutes and showing wildlife crime as it is reported anywhere in the world's press or local sources in 65 languages, coupled with historical reports and trends for that location and region.
- **Real-time trafficking routes**, derived from network analysis of the locations, people, and organizations associated through the wildlife trade, updated in real-time through global reporting.
- **Historical socio-cultural context**, in the form of 70 years of historical data for use in combination with real-time narratives to provide rich socio-cultural insights into the driving forces behind trafficking.
- **Real-time trends and forecasts**, provided by network and geographic algorithms that combine historical and real-time data to detect emerging trends and generate risk forecasts.

At the operational level, our solution provides real-time alerts and trending spatial patterns that will enable law enforcement to predict likely upcoming wildlife crime target zones and intervene in real-time by increasing patrols in emerging hotspots.

Access to influencer networks will offer insights about likely transit corridors for harvested materials from wildlife crimes occurring in the immediate past; for example, law enforcement officers that encounter a trafficked elephant could use these insights to estimate where its ivory might have been taken next.

At the strategic level, our solution offers influencer diagrams and spatial trends that can assist governments in more precisely allocating their resources.

ABOUT KALEV HANNES LEETARU

GDELT Founder Kalev Leetaru is currently a Senior Fellow at the George Washington University Center for Cyber & Homeland Security. Previously, he was the Yahoo! Fellow and adjunct faculty at Georgetown University's Edmund A. Walsh School of Foreign Service, and a Council Member of the World Economic Forum's Global Agenda Council on the Future of Government. Kalev was also named one of Foreign Policy Magazine's Top 100 Global Thinkers of 2013.

The GDELT Project (http://gdeltproject.org), receives support from Google Ideas, with past support from organizations such as the National Academies.

CONTACT US

Email:
Kalev Hannes Leetaru - kalev.leetaru5@gmail.com

MARS
OMEGA

Mars Omega
London, England
www.marsomega.com

MARS OMEGA

THE PROBLEM

Managing and sharing data, a critical element of combating wildlife trafficking, is a particular challenge in developing country environments. To address this challenge, tools are needed that are easy to use, sophisticated, powerful, and reliable even in difficult environments, and which effectively combine factual data and visual-situation understanding with unstructured human intelligence. This type of tool would enable protected area managers to respond quickly to tactical threats and to anticipate and shape conditions over time to become more resilient to strategic threats.

OUR SOLUTION

JIGZAW is a cloud-based, secure software application that helps capture, aggregate, evaluate, link, and display information from multiple sources.

JIGZAW functions at three levels:

- **Level one** enables the secure sharing of factual data that anyone can use and understand.
- **Level two** has the capability to turn unstructured information into actionable, precise intelligence.
- **Level three** is a specialist service to help users effectively plan and develop strategy.

In 2011, we offered JIGZAW to the Northern Rangelands Trust in Kenya and it has been in use there in 26 conservancies over the last five years.

WHAT WE NEED

Following deployment in Kenya over a five-year period, we know that JIGZAW adds real value to wildlife conservation and we want to scale it up. We need a technology partner with the will, capability, and funding to help us scale up global access to JIGZAW. We would like to recoup our original investment in the system, while making it free or very cheap for use in protected areas worldwide.

ABOUT MARS OMEGA

Mars Omega is a specialist information gathering consultancy, providing clients with appropriate high-order intelligence to facilitate a more informed business decision-making process. Our client-facing executive partners are drawn predominantly from military and intelligence backgrounds. We developed JIGZAW to assist this service.

We are working with Vulcan Inc. using JIGZAW as an integrated intelligence repository to support the development of their Domain Awareness System (DAS) designed to support wildlife protection.

The Northern Rangelands Trust has been covering the cost of maintaining and providing the JIGZAW service since December 2015.

CONTACT US

Email:
Chris Holtom - chris.holtom@marsomega.com

NWC

National Whistleblower Center
Washington D.C., USA
www.whistleblowers.org

NATIONAL WHISTLEBLOWER CENTER

THE PROBLEM

Illegal wildlife trade has increased sharply in recent decades, in part due to the low risk of detection. Trafficking is frequently committed by complex criminal networks that take great pains to conceal their activities, often abusing international transport, logistics and supply chains to move illicit wildlife.

OUR SOLUTION

We are developing the Global Wildlife Whistleblower Program to protect and incentivize insiders to report evidence of illegal wildlife trafficking confidentially and anonymously. The program incorporates a transnational reporting system designed to protect whistleblowers' identities and an educational program informing them of their rights to obtain rewards for reporting crimes. The goals of this innovation are:

- **Internet security**: Establishing cutting-edge data security to protect the confidentiality of whistleblowers reporting through our online platform.
- **Attorney referrals**: Using the online platform to facilitate the representation of whistleblowers by experienced legal professionals, thereby ensuring that whistleblowers qualify for monetary rewards.
- **Education and outreach:** Using the online platform to reach and educate potential whistleblowers worldwide about their rights to protection and about

monetary rewards available under U.S. wildlife protection laws.

WHAT WE NEED

We need funding for two essential areas of our online platform: to secure the technology to protect whistleblower identity when submitting informational intake forms online; and to establish our education and outreach program, primarily through an informational website. We will use short instructional video clips, in the relevant languages, to explain about whistleblowing, how the program works, and how an individual can be rewarded for providing information that will lead to successful prosecution of wildlife crimes.

ABOUT THE NATIONAL WHISTLEBLOWER CENTER

The non-partisan and not-for-profit National Whistleblower Center (NWC) is the premier advocate for whistleblowers worldwide. Our track record in establishing legal precedents and successfully advocating for strong whistleblower legislation is unmatched. NWC did the foundational research on the intersection between wildlife protection laws and whistleblower reward laws. NWC has international breadth: we are currently assisting whistleblowers in Switzerland, Russia, Brazil, China, Singapore, and Lebanon. The team includes:

- **Gina Green** (Board Chair) is a former VP of the Nature Conservancy, and has over 25 years experience as a natural resource and environmental planning professional and advocate.
- **Stephen Kohn** (Director) is a world expert on whistleblower law who has represented whistleblowers for over 30 years, published seven books, and teaches on the subject.
- **Bassem Youssef** (Security Advisor) was an FBI Supervisory Special Agent from 1988-2014. He retired as the Chief of the Counterterrorism Division's Communications Analysis Unit, with expertise in internet security.
- **Mar Guidote** (Advisory Board) is the Deputy Chief of Party for the Ecofish Project, and an acclaimed Filipino journalist and activist focused on combating wildlife trafficking.
- **John Kostyack** (Advisory Board) is a former General Counsel for the National Wildlife Federation and an expert on wildlife trafficking law.
- **Swapan Mehra** (Advisory Board) is an advocate for whistleblower rights in India and a technology expert with a focus on ecological modeling.
- **John T. Webb** (Consultant) serves on the Federal Advisory Council on Wildlife Trafficking. From 1978 until 2011, he was on the U.S. Government team to interdict, investigate, and prosecute domestic and transnational wildlife crime.

CONTACT US

Email:
contact@whistleblowers.org

New England Aquarium

Protecting the blue planet

New England Aquarium
Boston, USA
www.aquariumtradedata.org

NEW ENGLAND AQUARIUM

THE PROBLEM

Illicit wildlife trade is hidden in legally documented shipments because no system exists to analyze shipments at the "species per box" level or in real time. Furthermore, port authority agencies spend up to $1 million annually to maintain data systems that require inspectors to manually assess shipping invoices for illegal content. It can take months for these data to become available, which greatly hinders the ability to effectively monitor wildlife trade crimes. Efficient identification and pursuit of wildlife trade crime requires a system that enables shipment invoices to be evaluated at the species per box level and in real time.

OUR SOLUTION

Our solution is a "smart invoice" technology called Automated Shipment Forensics (ASF) that will help port inspectors find illegal trade hidden in plain sight. ASF uses computer vision to convert the paper copy of each shipping declaration and invoice into a digital format which is saved to a background server that conducts real-time forensic analyses on shipment information.

ASF technology will be provided to port agencies through a tablet-based service that generates a digitized "smart invoice" linked to a database that detects the presence of illegal species and determines a pattern-matched probability assessment of illegal trade. AFS provides real-time forensics on suspicious trade activity, and eliminates the need for port agents to manually sift through paper invoices. The service will also

include access to basic biological information, images, and descriptions of the imported species.

WHAT WE NEED

We need funding to provide our tablet-based service to port agents. Our projected development will occur in two stages:

- **Launch:** ASF will provide real time forensics of the marine aquarium trade with a focus on the largest global markets: the United States, the Philippines, and Indonesia. The marine aquarium trade encompasses over 40 countries, contains over 8,000 U.S. import shipments with over 2,500 species, and brings 10 million individual fish per year into the United States.
- **Phase II:** ASF technology will be customized for use with other wildlife and natural-resource products.

ABOUT NEW ENGLAND AQUARIUM

The New England Aquarium is home to the pre-eminent marine research group focused on the most urgent problems facing the oceans, and, as a public institution, provides regional, national, and global leadership in marine conservation. This project to detect illegal wildlife trade is a collaboration between the Aquarium and Roger Williams University.

CONTACT US

Email:
Dr. Michael Tlusty – mtlusty@neaq.org
Dr. Andrew Rhyne – arhyne@rwu.edu

Paso Pacifico
USA/Nicaragua
www.pasopacifico.org

PASO PACIFICO

THE PROBLEM

The illegal harvest of turtle eggs poses a major threat to sea turtle populations in Central America. Every year millions of sea turtle eggs are taken by poachers for sale on the black market. Stolen eggs include those of the critically endangered Hawksbill and Leatherback sea turtles, as well as the Green and Olive Ridley sea turtles. At some sites, more than 90 percent of nests are destroyed. Poachers dig up the nests, remove the eggs, and sell them to intermediaries, who in turn transport them to markets to be resold to bars and restaurants where they are consumed as a delicacy. The trade routes and destination markets for trafficked eggs are largely unknown, making it difficult to combat this illegal trade. Furthermore, recent evidence suggests Asian markets are an emerging destination for sea turtle eggs.

OUR SOLUTION

Paso Pacífico has developed artificial sea turtle eggs to detect trafficking routes. The eggs are cast with silicone rubber molds created with 3D printers and embedded with GPS/GSM tracking devices. Incorporating special-effects techniques developed in Hollywood, the eggs simulate the look, weight, and feel of real sea turtle eggs and thus can go undetected by poachers and traffickers. Cellular networks transmit location data as the eggs are transported to markets within and even beyond the region. Artificial egg prototypes will be planted in nests over the coming months and will help combat the illegal trade by:

- Enabling the mapping of trade routes and location of primary markets

throughout the region.

- Supporting close coordination and data sharing among law enforcement, government, and conservation NGOs.
- Creating a model for tracking wildlife products across illegal trade-routes with the use of GPS-GSM.

WHAT WE NEED

Paso Pacífico is offering companies and organizations working at the intersection of the tech and marine sectors to participate as partners in the testing and implementation of the artificial eggs. We invite experts in GPS/GSM, bluetooth and other communication technologies to advise us. We are also seeking alliances throughout Central America to help implement this solution on the ground.

ABOUT PASO PACIFICO

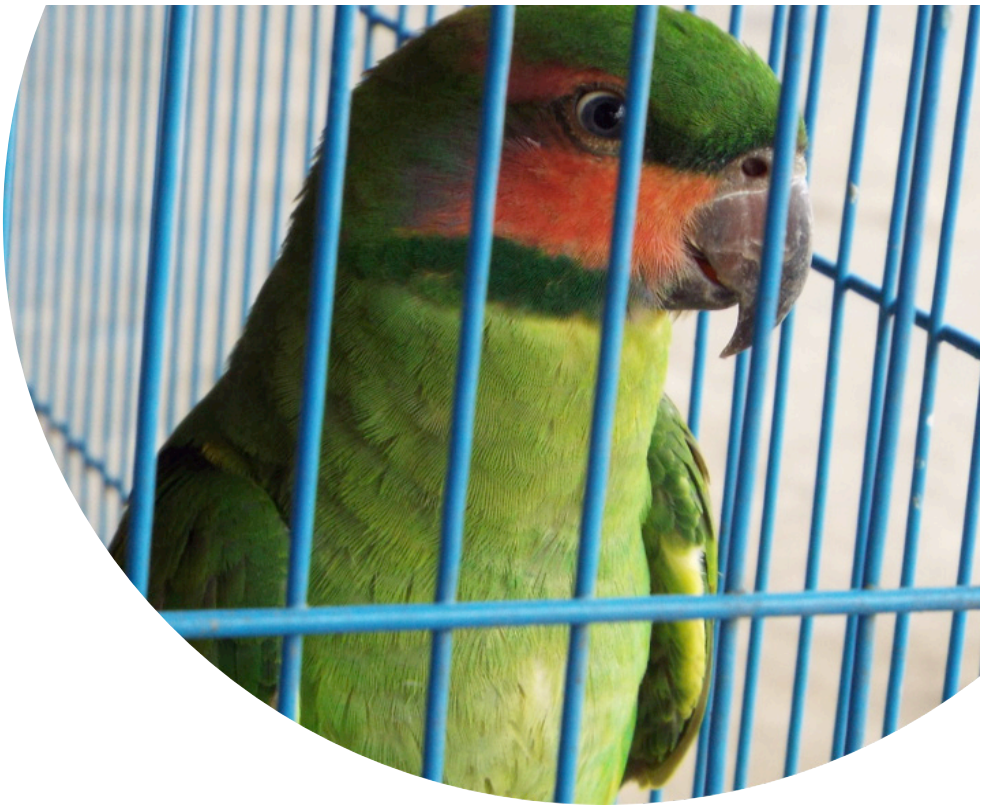
Founded in 2005, Paso Pacífico is a not-for-profit conservation organization that uses cutting-edge technology and community partnerships to protect Central America's most endangered wildlife habitats. The team includes over 40 people on the ground in Nicaragua doing grass-roots conservation at the ecosystem level. One initiative, led by twelve male and female community rangers, is a sea turtle protection program that covers five priority nesting beaches.

The artificial egg team is led by executive director Dr. Sarah Otterstrom, an ecologist and Ashoka Fellow, and by conservation scientist Dr. Kimberly Williams-Guillen, who is widely recognized for her innovative research into wildlife in human-dominated ecosystems. Combined, the two team leaders have more than forty years of experience in the region.

CONTACT US

Email:
Dr. Sarah Otterstrom - sarah@pasopacifico.org
Dr. Kim Williams-Guillen - kim@pasopacifico.org

PLANET INDONESIA



Planet Indonesia
USA/Indonesia
www.planetindonesia.org

PLANET INDONESIA

THE PROBLEM

There's a saying on the island of Java that to become a man, one must have a wife, horse, house, dagger, and a bird. Indonesia has the third-highest number of threatened bird species in the world, a major consequence of the rampant wild bird trade. One study in Jakarta conducted over just three days found over 18,000 birds for sale. Trade in songbirds differs from other wildlife trafficking enterprises in that demand is rooted in strong cultural traditions and gender roles. Without immediate action it is likely many species will disappear forever. An innovative solution engaging a variety of stakeholders is imperative to fight crime and save Indonesia's songbirds.

OUR SOLUTION

Our solution is a smartphone app that engages users in data collection through citizen science. The app appeals to the cultural pride in avian ownership by engaging users in a game-like data collection process. Users collect data and identify birds and, in doing so, generate scores to compete with other hobbyists in their area, and even win prizes based on proficiency. We will use user data to trace supply chains, report illegal shipments, and advocate for stricter protection of species within Indonesia.

WHAT WE NEED

We are currently seeking additional funding to develop more advanced versions of our app. Initial pilot prototypes have been created and are currently undergoing field testing. Additional funding will enable us to further develop the app's capabilities by,

for instance, adding features such as live data streaming and visualization, news updates for users on protected species, and data-collection competitions between users.

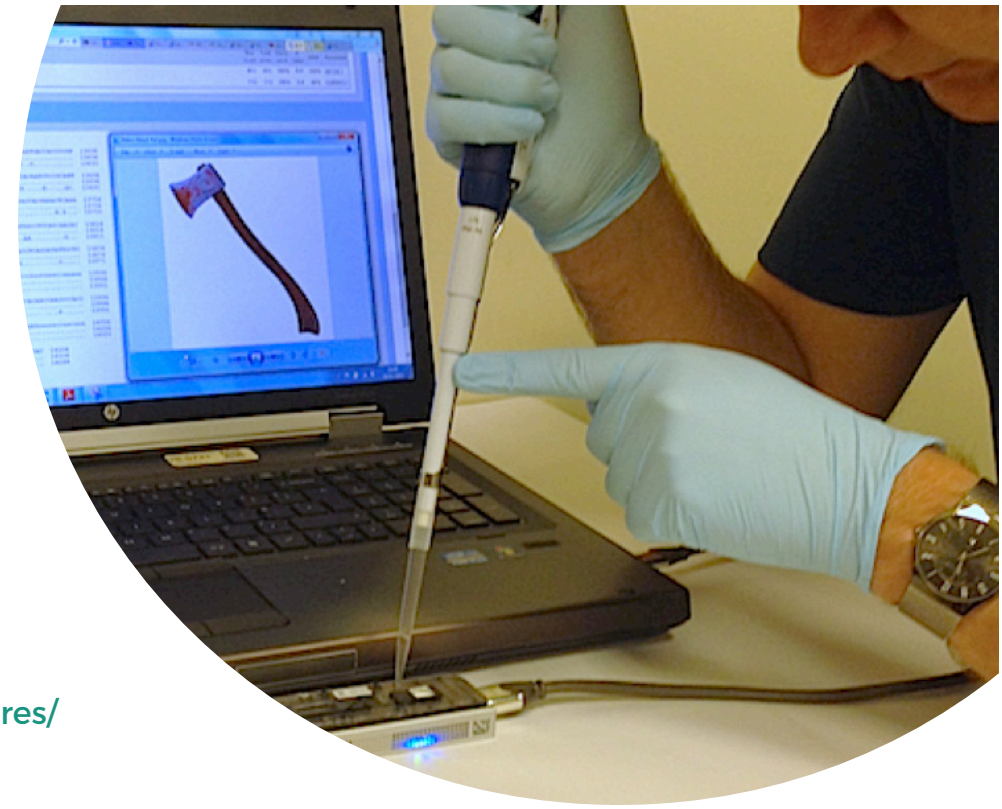
ABOUT PLANET INDONESIA

Planet Indonesia is an international not-for-profit based in West Kalimantan, Indonesia. We are currently the only organization actively addressing the wild-bird trade in our region. Our projects address community finance and well-being as well as gender inclusion and conservation technology. Planet Indonesia is a member of two International Union for the Conservation of Nature (IUCN) working groups related to the songbird and hornbill trade, as well as a member of the Asian Species Action Partnership.

The app is currently available for both iPhone and Android systems. Simply search for Planet Indonesia in the app store!

CONTACT US

Email:
Adam Miller – adam.miller@planetindonesia.org



University of Leicester
Department of Genetics
Leicester, UK
http://www2.le.ac.uk/centres/forensic-science/ajfgu

UNIVERSITY OF LEICESTER

THE PROBLEM

The illegal trade in wildlife often goes undetected because evidence—bushmeat from a gorilla, caviar from protected sturgeon, a bloodstain on a poacher's machete—defies simple visual identification. Even live specimens of protected species in the pet trade can be difficult to classify just by sight.

Identifying species often requires specialist skills and lengthy laboratory examination. A rapid DNA test which could be performed at a market, customs post, or in a protected area would allow for the arrest of criminals and the confiscation of evidence for use in criminal proceedings. Such a test would also provide a powerful deterrent and potentially reduce consumer demand for illegal wildlife products.

OUR SOLUTION

A hand-portable, laptop-powered MinION DNA sequencer and a VolTRAX sample-preparation device are being developed by our partner Oxford Nanopore Technologies. We are working with Oxford Nanopore Technologies to develop a method to read the DNA "barcode genes" used to identify organisms in the lab.

The MinION/VolTRAX currently in development will:

- Automate the entire process for use by non-skilled operators.
- Analyze a biological trace to reveal the species of origin in approximately one hour.

- Enable timely intervention in instances of wildlife crime.

WHAT WE NEED

Our team has unrivaled experience in developing, validating, and implementing novel forensic technologies into live casework, and our partner Oxford Nanopore Technologies is a world leader in portable DNA sequencers. Our primary requirement is for funding to bring on researchers that can undertake the necessary work. To complement our current partners, Kenya Wildlife Services and Panthera, we are also actively seeking others to provide authenticated test material and to trial the application in remote casework settings.

ABOUT THE UNIVERSITY OF LEICESTER

Dr. Jon Wetton has more than 25 years of research and development and casework experience in non-human forensics. He is a co-director of the Alec Jeffreys Forensic Genomics Research Unit which is based within the University of Leicester's Department of Genetics and is famous for the invention of DNA fingerprinting. The other team members include Ms. Gurdeep Matharu, who has been instrumental in the development of advanced tests from trace samples for domestic cats and dogs; Dr. Celia May, an expert in single DNA molecule analysis with prior experience of the current Oxford Nanopore Technologies platform; and Ms. Tunde Huszar, a forensic scientist pursuing a Ph.D in forensic genomics, and who focuses on interpretation of DNA sequencing data.

CONTACT US

Email:
Dr. Jon Wetton – jw418@leicester.ac.uk

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi

University of Pretoria
Veterinary Genetics Laboratory
Faculty of Veterinary Science
Pretoria, South Africa
http://rhodis.co.za/

UNIVERSITY OF PRETORIA

THE PROBLEM

The number of rhinos poached in South Africa for their horns increased to over 1,000 per year from 2013 to 2015, a rate of about 3 rhinos per day. Rhinoceros horn is a high value commodity that is used for medicinal and decorative purposes in Southeast and East Asian countries, primarily China and Vietnam. Rhinoceros horn currently has the highest value of any illicit product traded globally, and yet the risks and penalties for poaching and trafficking are very low, making it a lucrative black market item for international criminal syndicates.

OUR SOLUTION

Our solution RhODIS®—the Rhino DNA Index System—enables the tracing of rhino horn through individualized DNA profiling, which provides a means of linking the trafficked product to its origin. The origin might be a rhino carcass, a rhino that was sampled when alive, or a horn that has been stolen from a museum or stockpile. This effectively puts the poacher back at the crime scene and provides investigators a tool to trace trafficking routes and criminal networks.

RhODIS® now includes standardized sampling methods, training of officials, and an electronic app for collecting sample data. New molecular technologies being developed are continually incorporated into RhODIS as part of research and development. The project aims to:

- Establish RhODIS® as the global standard for rhino-crime investigation.

- Enable rapid transfer of DNA and case information between range, transit, and consumer country laboratories to support cross border investigations.
- Develop the next generation of RhODIS® using genome technologies.

WHAT WE NEED

The RhODIS® team would welcome:

- Technical support to develop and improve a secure web portal for information sharing worldwide.
- Funding for equipment purchases and for technical costs of sequencing the black rhinoceros genome and for the next generation RhODIS® test. Our aim is to make this available on a global scale to scientists involved in forensic wildlife testing in both rhino consumer and range states.
- Funding support for training and distribution of standard operating procedures for rhinoceros sampling and inter-laboratory testing.

ABOUT THE UNIVERSITY OF PRETORIA

RhODIS® is a program of the Veterinary Genetics Laboratory of the University of Pretoria, based in Pretoria, South Africa. Our small team has dedicated its efforts to using molecular techniques to support rhinoceros crime investigations. The program has been supported by South African National Parks, private rhino owners in South Africa, the Namibian government, the Lowveld Rhino Trust in Zimbabwe, and wildlife authorities in Malawi, Uganda, Zambia and Kenya. The program covers rhinos in all these countries. RhODIS® had over 20,000 individual animals represented on the database in 2015.

CONTACT US

Email:
Cindy Harper – vgl@up.ac.za

University of Technology Sydney
Center for Forensic Science
Sydney, Australia
http://bit.ly/1rV3A0E

UNIVERSITY OF TECHNOLOGY SYDNEY

THE PROBLEM

Illegal wildlife trade has rapidly escalated into an international crisis, threatening biodiversity, increasing the risk of disease, and pushing many species towards extinction. A major issue in the enforcement of wildlife trafficking is the lack of a rapid and accurate method to distinguish legal from illegal wildlife parts, such as rhinoceros horn from cattle horn. Rapid identification of wildlife samples at points of entry would greatly assist law enforcement to seize forensic evidence and prosecute offenders.

OUR SOLUTION

We are developing a portable electronic nose (NOS.E) that can be used by frontline personnel to rapidly identify wildlife parts and confirm whether a crime has occurred onsite without the need for laboratory analysis. NOS.E uses the unique odor signatures of different wildlife species to rapidly determine the identity and geographic origin of trafficked samples. Our solution can be used globally to differentiate a diverse range of trafficked species including large cats (e.g. tigers, leopards), elephants, rhinoceros, pangolins, bears, sea turtles, sharks, and a range of exotic birds and reptiles, all of which have distinct odor signatures. A prototype is being developed for testing by border enforcement and wildlife trade compliance officers.

WHAT WE NEED

Funding and partnerships are required to develop and scale this product for validation by frontline personnel. The prototype will be tested on a range of species to ensure its applicability to major trafficking routes and wildlife products. The prototype must be handheld, easy to use, and affordable for border enforcement agencies throughout the world. NOS.E can be deployed at airports, seaports, mail centers, and other border crossings to identify imported and exported wildlife contraband.

ABOUT THE UNIVERSITY OF TECHNOLOGY SYDNEY

Professor Shari Forbes of the University of Technology Sydney (UTS) Centre for Forensic Science is an internationally recognized forensic chemist with expertise in the odor profiling of forensic evidence. Associate Professor Steven Su is a leading engineer in the UTS Faculty of Engineering and Information Technology. Together with their team of research associates and assistants, they study and develop electronic noses that mimic the capabilities of dogs trained to detect trafficked contraband including wildlife.

This project is being carried out in collaboration with the Australian Museum Research Institute, a globally recognized leader in wildlife forensics. Partnerships have also been established with the Australian Department of the Environment – Wildlife Trade and Biosecurity Branch, to validate NOS.E at border crossings and other points of entry.

CONTACT US

Email:
Shari Forbes – shari.forbes@uts.edu.au

University of Washington
Center for Conservation Biology
Seattle, USA
http://conservationbiology.uw.edu

UNIVERSITY OF WASHINGTON

THE PROBLEM

Pangolins, widely considered the most trafficked mammal in the world, currently face unsustainable levels of harvest for their meat, which is eaten as a delicacy, and for their scales, which are used in traditional medicine.

Over the last decade, more than one million pangolins have been taken from the wild. However, little is known about the populations being targeted or their numbers in the wild. The wide distribution of pangolins further complicates efforts. Eight species are found in forty-eight countries in Asia and Africa, making it difficult to identify the source populations being targeted by poachers.

OUR SOLUTION

Our solution aims to focus law enforcement on the most problematic areas by using DNA assignment of pangolin seizures to identify the poaching hotspots that supply the bulk of the international pangolin trade.

The solution will be implemented in three steps:

- development of genetic markers that can distinguish between the eight pangolin species and between populations within each species
- creation of a global genetic reference map by using geo-referenced tissue samples from museums and filling gaps in the map with wild dung samples

located by detection dogs across the pangolin range

- pinpointing of the source(s) of large seizures of pangolin meat and scales by comparing their genotypes with our geo-referenced DNA map

WHAT WE NEED

Our main needs to develop the solution include:

- Funding for genetic-marker development and to compile the reference map.
- Partnerships in the form of collaborators for collection of pangolin samples from range states.

ABOUT THE UNIVERSITY OF WASHINGTON

The University of Washington's Center for Conservation Biology was established at the University of Washington in 2001 with the mission to develop and apply noninvasive field, laboratory, and analytical methods to inform wildlife policy impacting threatened and endangered species around the world.

The Center focuses on the development and application of noninvasive laboratory and field tools for monitoring population health, abundance, and distributions of multiple species over large remote areas, as well as DNA-based assignment of geographic origin of seized contraband.

The Center has developed and applied genetic methods to track the origin of large ivory seizures, successfully identifying the major elephant poaching hotspots across Africa, as well as tools to link major dealers to multiple seizures.

CONTACT US

Email:
Sam Wasser – wassers@uw.edu
Hyeon Jong Kim – hk11@uw.edu

YIARI (Yayasan IAR Indonesia)
Bogor, Indonesia
http://yayasaniarindonesia.blogspot.com

YIARI

THE PROBLEM

The slow loris is a small, nocturnal primate found in Asia that is unique in being the world's only venomous primate. Slow lorises are heavily trafficked throughout Indonesia via animal markets and online. Little is known about the areas where slow lorises are captured or the numbers that are being harvested.

Slow loris subspecies enjoy differing levels of protection under Indonesian law. However, the current taxonomy of slow lorises is based on visual assessment of the animals, and species are not always classified correctly. This complicates the enforcement of wildlife protection laws and provides a loophole for traffickers to exploit.

OUR SOLUTION

YIARI aims to create a genetic database so that DNA samples of newly confiscated lorises can be analyzed and compared with stored genetic data taken from captive and wild slow lorises. This process will enable the identification of the source location of individual lorises, the main poaching hotspots, and also provide the most comprehensive taxonomic data on Indonesian lorises. Data on poaching and trading hotspot areas will be shared with the Indonesian Nature Conservation Agency and the police so they can focus their activities and resources appropriately.

Previous confiscations of lorises that have led to the prosecution of criminals have resulted in a significant drop in the numbers of slow lorises displayed in markets. The

deterrent created by these prosecutions is essential in reducing the illegal wildlife trade in this and other commonly traded protected species.

WHAT WE NEED

We need funding for the collection, transportation, analysis, and storage of samples. The project currently focuses on Indonesian slow lorises, but we are keen to develop partnerships with like-minded organizations so that our methods can be expanded and applied to other taxa found in Indonesia's numerous wildlife markets.

ABOUT YIARI

YIARI, or Yayasan IAR Indonesia, was established in 2008 to rescue and conserve wildlife, with a focus on the rescue, rehabilitation, and release of Indonesian primates. We operate what is currently the world's largest rescue center for slow lorises in Java, Indonesia. YIARI is pioneering what is the first systematic reintroduction of these primates into their habitat in Indonesia. In addition to YIARI's efforts to combat the trade in slow lorises through undercover investigations and capacity building for government staff, we also conduct education and awareness activities and run campaigns to increase knowledge about animal welfare and conservation and to reduce demand for slow lorises as pets, with the long-term aim of strengthening the conservation of these species.

CONTACT US

Email:
informasi@internationalanimalrescue.org

ZSL
LET'S WORK
FOR WILDLIFE

Zoological Society of London
London, UK
https://www.zsl.org

ZOOLOGICAL SOCIETY OF LONDON

THE PROBLEM

Our priceless museum collections are protected by advanced alarm systems, yet our nature reserves and the wildlife that live there often have little or no protection. Criminal groups are targeting these protected areas to illegally poach wildlife. Park managers have small teams and are unable to fully secure these vast and remote landscapes. We urgently need custom, low cost, low maintenance technology to scale up law enforcement and stop illegal poaching before it happens.

OUR SOLUTION

Instant Detect is a multi-sensor alarm system for protected areas. Covert, low power sensors are placed in the field to detect humans and send instant alerts to rangers. The rugged system communicates via the global Iridium satellite network at a discounted rate, allowing it to work anywhere in the world. This greatly expands rangers' capacity to monitor intrusion routes around the clock. Instant Detect has:

- Been deployed in seven sites globally across land and sea.
- Caught trespassers and provided photographic evidence for prosecution.
- Helped safeguard tigers, elephants, and rhinos.
- Monitored illegal fishing vessels.

- Operated long term in extreme environments, including Antarctica.
- 100 protected area specialists registered for version 2.0.

WHAT WE NEED

We need your help to scale this proven technology to a mature product and protect 100 of the world's top priority sites by 2019. New funding will:

- Reduce the system cost and help get ID into the hands of those that most need it.
- Increase coverage by enabling the addition of hundreds of low-cost, low-power sensors and by enabling a choice of satellite, GSM, TV White Space, or WiFi transmission.
- Improve compatibility by enabling information on the movements of poachers to be shared with trusted third-party analytics tools.
- Scale operations. By offering an end-to-end service, we hope to achieve a sustainable income model incorporating ongoing updates and donation of free systems.

ABOUT THE ZOOLOGICAL SOCIETY OF LONDON

The team comprises: conservation technology lead Sophie Maxwell; senior technical specialist Alasdair Davies; project manager Emily Smith; and field specialist Chris Gordon.

Our solution partners are: Cambridge Consultants; Iridium; Seven Technologies Group; Nominet, Wireless Innovation Ltd; and the Kenya Wildlife Service.

CONTACT US

Email:
Sophie Maxwell – sophie.maxwell@zsl.org