

The newsletter of the Society for Wildlife Forensic Science

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SWFS NEWS

Inside this edition: Rhino DNA Forensics • Lab Updates • SWFS Meets CITES

Malaysia opens National Wildlife Forensic Laboratory (NWFL) Complex

by Jeffrine Rovie Ryan Japning

In December 2015, Malaysia completed construction of a dedicated National Wildlife Forensic Laboratory (NWFL), which allows it to better assist local, regional and international law enforcement. Since 2009, Malaysia's Wildlife DNA Forensic Laboratory has processed over 500 enforcement cases – and that number will continue to grow with this now expanded wildlife forensic capacity.

Background

The Department of Wildlife and National Parks (DWNP) of Peninsular Malaysia has engaged in wildlife forensics since 2004, in collaboration with Department of Chemistry, Malaysia.



Malaysia's National Wildlife Forensic Laboratory (NWFL) Complex, completed in December 2015.

Since 2007, DWNP has invested in capacity development for wildlife forensics with the establishment of the Wildlife Genetic Resources Bank (WGRB) which consist of two units; (1)

Cryogenic Depository Centre (CDC) and (2) Wildlife Forensic DNA Unit (WFDU).

Welcome from the SWFS President

Dear SWFS members,

Welcome to the Society's newsletter. First of all, well done for making the time to download, open and read this far; we all have busy lives. Hopefully this publication will provide an interesting five-minute break from the daily routine and give you a snapshot of recent news and developments in the field of wildlife forensics.

We've tried to mix it up in terms of science and policy, we plan to have some regular features such as recent publication lists, and we will of course keep you updated on future events. Despite these best intentions, I notice that we seem to have two articles on rhino DNA in the same issue! To avoid this happening again, let's have contributions from other species and other techniques, please. The newsletter belongs to all of us and we would love to hear from you in the next edition.

The board of SWFS has recently met to discuss Society matters including our growing relationship with international partners (see article on page 16), the future development of SWGWILD (Standards and Guidelines Group – watch this space) and moves towards offering a laboratory audit process through SWFS. We'll inform you of major initiatives as we move forward and summarize developments in the next issue.

I'd like to formally express the Society's thanks to Laurel Neme for volunteering as our editor, to Brandt Cassidy (Communications Director) for coordinating this issue and to Patty Bliss, who few of you will know, but who has contributed vital time to the design and publication of the newsletter for us. Let us know if you have any suggestions or questions and enjoy reading.

Regards, Rob Ogden.



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Society for Wildlife Forensic Science www.wildlifeforensicscience.org

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Letter from SWFS Director of Communications

Hi Folks,

We are excited to be publishing our first newsletter of the Society for Wildlife Forensics Science. We hope to use this newsletter as a forum to foster communication between all our members and keep everyone informed about new events related to the field. We expect to publish twice a year, in January and July.

I wanted to thank all who provided information for this first edition and ask that everyone please consider contributing news for the next edition. Items can be big or small and might include recent cases, research papers, presentations at meetings, visits to other organizations, field work or other news related to wildlife forensics.

This newsletter is for everyone so please feel free to submit not only your news items but also suggestions about the format and what should be included. In order to continue to produce this newsletter, we are going to need all of your help.

Also, please keep me up to date concerning new publications from the membership. We are including a reference section in the newsletter and I will be updating our online reference list on the SWFS website. While you can submit items to any of the board members, your first point of contact should be me, Brandt Cassidy at bcassidy@dnasolutionsusa. com.

I look forward to expanding this mode of communication so we can continue to be connected between our society meetings. I am also looking forward to seeing everyone in Edinburgh, Scotland in 2017. Until then - Keep it wild!

-- Brandt Cassidy

Upcoming Meetings of Interest



Next SWFS Meeting June 5-9, 2017 Edinburgh, Scotland www.wildlifeforensicscience.org



Wildlife Disease Association 65th International Conference July 31 - August 5, 2016

Hosted by Cornell University at Greek Peak Mountain Resort Cortland, New York, USA www.wda2016.org



International Society for Forensic Genetics (ISFG) 27th International Congress 2017 Seoul, South Korea August 28 – September 1, 2017 www.isfg2017.org

A Look Back at SWFS

Dear Society for Wildlife Forensic Science members,

It is with great pleasure I am writing this for our first ever SWFS Newsletter. This has been a concept for many years but seeing it come to fruition is very exciting. A big thanks to our new President, Rob Ogden and our Director of Communications, Brandt Cassidy for making this happen, as well as Laurel Neme for her assistance in designing the newsletter. We all hope this will be a regular occurrence so please take the opportunity to contribute when you have the chance.

The Society for Wildlife Forensic Science has made amazing strides since the idea for it was conceived one late Friday afternoon in 2009 -- a mere six years later we have 120 scientists in 60 labs representing 15 countries.

It is truly an international effort to develop wildlife forensics into a discipline that can be utilized by law enforcement to enforce domestic and non-domestic laws designed to protect wildlife. Each and every one of you have made it your mission to assist with this endeavor and you should be proud of what has been accomplished.

Our first meeting in Ashland Oregon in April 2009 was a great success with a vote at the general meeting that made the Society a formal entity.



by Dee Dee Hawk, Former SWFS President

At Jackson, Wyoming in 2012, we had nearly 115 scientists participate in training opportunities and presentations by the membership. At the most recent meeting in June 2015 in Missoula Montana, we had over 120 scientists participate representing an unprecedented 15 countries and 25 US states.

This meeting was successful on numerous levels but one of the most important highlights was the arrival and presentations of wildlife forensic scientists from Africa (Botswana, Gabon and Kenya) and Southeast Asia (Indonesia, Malaysia and Thailand). These scientists, hosted by TRAFFIC, TRACE Wildlife Forensic Network, IUCN and USAID, gave presentations about their case loads and forensic challenges. This meeting was also attended by William Woody, the Chief of Law Enforcement for the US Fish and Wildlife Service. The fact that so many of you would travel around the world to Missoula Montana is a testament to the dedication of those in this discipline.

The Society gives scientists in this discipline a venue to meet and discuss projects, problems and challenges.

Another accomplishment of The Society for Wildlife Forensic Science was the creation in 2011 of SWGWILD (Scientific Working Group for Wildlife Forensics). The mission of SWGWILD is "to provide a certification pathway and rigorous consensus-based standards for the unique needs of wildlife forensic science." Without such leadership, development of wildlife forensic science will be hindered and existing laboratories could be threatened with closure, resulting in the loss of those resources to the law enforcement community.

SWGWILD continues to be extremely successful and has various work products including Standards and Guidelines which were adopted by SWFS in 2012, a White paper that was distributed to numerous NGOs and US legislative personnel, and a certification program. The requirements for this certification include components of formal and informal educational, case work, proficiency testing, letters of reference and proof that the Standards and Guidelines designed by SWGWILD are being followed. Currently 23 scientists have passed the rigorous requirements to become "Certified Wildlife Forensic Scientists".

Building Capacity for Rapid Rhino Horn ID

by Greta Frankham and Kyle Ewart

As a consumer country for illegally trafficked wildlife, Australia is a relatively minor player in the international market. However, Australia is located on the doorstep of one of major hubs of illegal trade – Southeast Asia, where demand from countries like Vietnam and China drive the illegal trade in products from some of the most iconic species on the planet such as tiger bone, elephant ivory, pangolin, and of course rhino horn.

While Australia may not see the magnitude of trade that Asia does, Australia does, unlike many Southeast Asian countries, have the resources and capacity to advance the tools available to enforcement agencies, especially through the research carried out in our lab, The Australian Centre for Wildlife Genomics (ACWG) at the Australian Museum Research Institute (AMRI) in Sydney.

The ACWG is the only





Greta Frankham (left), Kyle Ewart (right) and Ross McEwing, meet with Dr. The Dang Tat (centre) and his team at Vietnam's IEBR laboratory.

ISO/IEC 17025 accredited wildlife forensics laboratory in the region carrying out case work for the Australian government (enforcement and customs) and for police organizations.

Earlier this year, three members of the ACWG team were lucky enough to attend the 2015 Society for Wildlife Forensic Science meeting in Missoula Montana. At the meeting Kyle Ewart (winner of the student award) presented an example of the research carried out at the ACWG, as part of his undergraduate degree, in which he developed and validated a rapid DNA based PCR test for species identification for rhino horn.

Determining real rhino horn from fake is crucial for any criminal investigation that may arise from a seizure. While this type of forensic analysis is regularly carried out within a week or two at the ACWG, a lack of resources and limited trained staff to process seizures in many consumer countries means that it can take much longer to produce a result there. This often leads to very low conviction rates and enforcement outcomes, which is especially problematic in countries with strict time constraints on intelligence gathering.

As a result of Kyle's presentation and our attendance at SWFS, Kyle and myself (Greta Frankham) were invited by our fellow SWFS colleague Dr Ross McEwing from TRACE Wildlife Forensic Network and Royal Zoological Society of Scotland, to travel to Hanoi in Vietnam to spend a week working with him in Vietnam's CITES mandated lab, the Institute of Ecology and Biological Resources (IEBR), implementing Kyle's test and training local staff.

Building Capacity for Rapid Rhino Horn ID



ABOVE: Kyle Ewart oversees training in DNA extraction techniques at the bench. BELOW: Greta Frankham oversees training of local staff.

During our stay we had unprecedented access to seized horn samples and worked with over 70 rhino horn samples from a couple of recent seizures.

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resources available at institutions represented by SWFS members such as the AMRI and TRACE. It also highlighted an area where SWFS can help make a real difference in developing countries, by sharing expertise and providing in-house training within these labs.

It is hoped that this is the first of many more successful collaborations between ACWG, TRACE and the Southeast Asian wildlife forensics labs. There are already plans for a reciprocal visit, with some IEBR staff planning to visit the ACWG for further training in forensic protocols and procedures in early 2016.

Once on the ground in Vietnam, we also took the opportunity to optimize our test on the qPCR platform, which was already available in the IEBR laboratory and is common in other regional labs. Developing the test on this platform has improved the utility and potential to roll out this test in different labs across Southeast Asia which face similar problems with wildlife trade.

We had a very productive week working alongside the IEBR staff and were able to determine species identification for over 85% of the horns sampled, which included predominantly white rhino horns with a small number of black rhino horns.

As a result of the visit, IEBR staff are now trained in a method that can provide a presumptive species identification to authorities within 24 hours to progress enforcement actions. This is important because Vietnam has a 20 day intelligence gathering window.

Definitive testing via DNA sequencing can also be carried out down the track if required.

This international capacity building opportunity showcased the value of the scientific expertise and



Starting From Scratch: The Wild Journey to Accreditation

by Dr Lucy M.I. Webster

The only dedicated wildlife DNA forensic service provider in the United Kingdom is located in Edinburgh, Scotland. The Wildlife DNA Forensic (WDF) unit was established in 2011, within Scottish Government laboratories Science and Advice for Scottish Agriculture and in (SASA) collaboration with TRACE Wildlife Forensics Network. At this point I was the only full time member of staff. From the start ISO: 17025 international testing standard was on my mind while setting up protocols and procedures to analyze non-human DNA evidence. In 2009, a European Union Council Framework Decision was issued to ensure forensic service providers for all member states were accredited to this standard for human DNA analysis by 2013. Thus, in order to demonstrate our service as equally reliable to human DNA analysis providers, the WDF unit would also need ISO: 17025 accreditation.

Other types of testing at SASA have had this level of accreditation for many years (such as testing for pesticide residues in the tissues of animal poisoning victims). This accreditation was of value, as it meant the prior establishment of a quality management system at SASA, and that local expertise about the ISO: 17025 standard and the process of gaining accreditation with the UK Accreditation Service (UKAS) was available for me to tap into. However, in spite of these benefits, the task of getting all of the validations and documentation in place should not be underestimated!

Whilst steadily carrying out validation studies and producing Standard Operating Procedures (SOPs) from the word go, it was late in 2013 that I held discussions with UKAS about applying for ISO: 17025 accreditation. This was incredibly useful, as it enabled me to work through all of the tests that are run to develop the most appropriate plan of action. Given that the majority of testing is DNA-based species identification, this seemed an obvious starting point for accreditation. I picked four published tests that are run routinely in my laboratory for species identification and set to work with one year to produce all of the necessary documentation required for the accreditation process.

It's amazing how quickly a year can pass! Juggling casework, proficiency tests and research projects whilst making progress on my documentation was not easy. In preparation for accreditation I had several internal audits, where trained SASA auditors reviewed my work to suggest areas for improvement. In November 2014 my submission was made to UKAS for accreditation "Species identification in bv mitochondrial DNA sequencing". This submission included 8 SOPs, 2

> validation reports covering the methodology being assessed and a quality manual for the WDF unit. All other documentation relating to the ISO: 17025 standard (e.g. training and equipment records, record sheets, audit reports) were prepared, but held locally.

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Lucy Webster and Sherryn Ciavaglia hosting a Wildlife DNA Forensic event for kids at SASA. *photo by SASA*



The Wild Journey to Accreditation

Within a month of submission, UKAS had identified some difficulty in finding an appropriate assessor for the WDF unit. As this was a new area for UKAS, they decided to go belt and braces and send two assessors – one with forensic expertise (Andy) and the other with non-human genetics expertise (Helen). The date for my onsite assessment was set for August 2015.

The build up to the UKAS visit was quite hectic. I had been in touch with Andy after my initial submission, who had suggested some additional validation work to conduct for accreditation. We had also bought a new piece of equipment (Qiacube) in April 2015 for automated DNA extraction and he suggested we validate this to include in the assessment.

Andy and Helen arrived for their two day visit and quickly realized that it was going to be a difficult audit, as I could not be in two places at once! I spent time in the lab with Helen, while Andy was raking through my case files. As Helen would write up her notes on the laboratory and analytical work, Andy would cross-examine me on my chain of custody process, case file management and reporting.

In our close-out meeting at the end of day two, I was delighted to be told that, provided I adequately completed their improvement actions, an extension to the scope of SASA's ISO: 17025 accreditation would be recommended. This extension would specify the work of the WDF unit, to include forensic analysis and species identification by mitochondrial DNA sequencing.

The improvement actions listed by UKAS are not trivial. More SOPs need to be written. As it turns

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out, a one-person unit has a lot of procedures they keep in their head rather than written on paper. Case file management is one example of this. From the laboratory side a better temperature monitoring system for the fridges and freezers also needs to be implemented.

At least I am no longer working alone. Sherryn Ciavaglia, another SWFS member, started work at SASA in late September 2015 – making the move from Australia to Scotland! That's commitment for you. She is already helping me to get my improvement actions ready for UKAS, as well as providing the necessary resilience that the WDF unit needs to maintain service levels and increase the number of tests we can offer.

We have until the end of January 2016 to submit our continued on page 9



FIGURE 1. SPECIES IDENTIFICATION workflow within the WDF unit extracted from the Quality Manual. Codes in brackets refer to specific SOPs for each method.

Accreditation

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improvement actions, which then need to be approved by our assessors. So the accreditation journey is not yet over! In fact, it is a continual process. In the future we want to gain accreditation under "flexible scope" to allow us to carry out DNA based species identification using a multitude of test methods, not just the four assays used as a starting point. We also want to attain accreditation for DNA profiling of the non-human species that we have validated at our lab.

Accreditation to the ISO: 17025 standard is a big step. It requires a considerable investment of time and costs for both the assessment and the ongoing improvement actions. However, it sets the bench mark for wildlife forensic testing in line with human forensic work. It also provides the judiciary, the forensic and scientific communities, and the public with confidence in our methods by meeting standards that are recognized at an international level.

Next SWFS Meeting June 5-9, 2017 Edinburgh, Scotland

New Center for Wildlife Forensic Research

A new Center for Wildlife Forensic Research has been created at the University of New Haven, in association with the Department of Forensic Sciences. The Center is focused on projects that will facilitate various aspects of wildlife forensic casework and research. While still relatively new, it currently consists of three scientists, along with multiple students working on both projects and casework. Active projects range from work with shark and cartilaginous fish speciation, toxin identification in avian species, understanding cation mobilization in certain bovine diseases, and biomarkers of time since death.

We hope to actively grow the Center and be able to assist working labs with their research needs. If you have ideas or projects of need or interest, we have students to engage, and lead scientists to ensure that research efforts are being done correctly. Please feel free to contact us, if you have any questions, at the following email address: wildlifeforensics@newhaven.edu

Cheers

Dr. R. Christopher O'Brien

Dr. Virginia M. Maxwell

Dr. Robert H. Powers



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Malaysia's National Wildlife Forensic Laboratory (NWFL) Complex

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Under the WFDU, a small laboratory, the Wildlife DNA Forensic Laboratory (WDFL) was set up to assist the Enforcement Division of DWNP in cases involving wildlife crimes.

In 2009, the WDFL was upgraded and renovation work was conducted to comply with the ISO 14644-1 classification (Clean Room Class 1000) to cater to the increasing amount of enforcement cases received. Since then, over 500 enforcement cases have been registered and processed by the lab and WDFL is now recognized as one of the leading laboratories dedicated to wildlife forensics in Southeast Asia.

Achievements

Various steps and actions have been taken by DWNP to enhance capacity in wildlife forensics. This includes acquiring of analytical instruments and machines required to conduct the lab processes as well as training of personnel.

In late 2012, a proposal was approved to develop and upgrade the WDFL. This upgrading involved building a new complex to separate all the critical processes in the lab into several laboratories. Work started in 2013 and was completed in December of 2015, when it was given the new name: National Wildlife Forensic Laboratory (NWFL), which suits its role as the leading dedicated wildlife forensic laboratory in Malaysia.



ABOVE: The establishment of Wildlife DNA Forensic Laboratory (WDFL) in 2007 **BELOW:** The renovated WGRL to comply with the ISO 14644-1 classification (Clean Room Class 1000)



Malaysia's National Wildlife Forensic Laboratory (NWFL) Complex

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Through the establishment of the NWFL, DWNP is optimistic that the ability to handle wildlife forensic cases will be further enhanced and on the same par with the other international forensic laboratories. This will directly assist in the efforts to curb wildlife crimes both locally and internationally.

In line with the physical development of the lab, DWNP has also put in effort in human capital development for the activities related to wildlife forensics. DWNP personnel have participated in training and workshops to produce experts in wildlife forensics. As a result, several personnel have been acknowledged by international organizations (e.g. TRACE Wildlife Forensics Network UK) and identified as experts in wildlife forensic science.

Additionally, DWNP intends to assist other Southeast Asian countries in the development of their own wildlife forensic capacity. Through collaborative networking, NWFL plans to conduct trainings, workshops, conferences and research projects in wildlife forensics. NWFL will strive to become a centre of reference and excellence in the field of wildlife forensics in the Southeast Asian region.



The development progress from 2014-2015 of the new NWFL complex.

Other activities in NWFL

The new complex also consists of other laboratories, several including the Wildlife Genetic Research Laboratory, to conduct wildlife genetic research activities, Molecular Zoonoses and a Laboratory dedicated to activities related to wildlife zoonotic research. The research conducted using these latest biotechnology application includes:

- Using e-DNA (environmental DNA) and i-DNA (invertebrate derived-DNA) to screen the presence of wildlife in a particular protected area. Micro-predators such as leeches, flies, mosquitoes and other biting insects are the examples of i-DNA, collected while water samples from lakes, rivers, and saltlicks are some examples of e-DNA samples.
- NWFL will also expand the capacity for cryopreservation to collect semen and oocytes from wildlife to be kept in the Biobank.

NWFL is dynamically also conducting wildlife disease surveillance through the establishment of the Wildlife Disease Surveillance Programme (WDSP) launched in 2011. Under this programme, a dedicated and well trained team known as the Outbreak Response Team (ORT) is entrusted with conducting wildlife surveillance sampling.

Overview of 2015 SWFS Meeting

When border agents seize two tons of smuggled ivory, how do they tell where it's from? When meat on sale in Southeast Asia is suspected to be from a tiger, how can the police prove it? And when blood in a hunter's truck is thought to come from a poached deer, where's the evidence? These are questions frequently asked of wildlife forensics scientists.

Wildlife forensics is a lonely field. Globally, there are fewer than 100 laboratories and under 200 full- and part-time practitioners. Because it's so small, the Society of Wildlife Forensic Science (SWFS) conference, held in conjunction with the North American Forensic Entomology Association (NAFEA) from June 22-26 in Missoula, Montana, provided a vital "onestop shop" for scientists to share experiences, exchange information and build the relationships needed for collaboration.

"It's the single most important gathering of wildlife forensic

scientists," noted Ed Espinoza, deputy director of the US National Fish and Wildlife Forensic Lab.

Prior to the official meeting, roughly 100 participants from 15 countries and 25 US states attended a range of seminars. These included workshops on: forensic entomology, where participants saw the stages of insect colonization firsthand; courtroom training, where participants explored admissibility requirements for expert witness testimony and observed a mock trial; genomics, which provided an overview of next-generation sequencing technologies that can deliver larger volumes of data than current techniques; animal abuse, which applied forensic science to dog, cat, horse and other animal cruelty cases; and isotope analysis, which explained the use of isotope ratios for understanding animal migration and movement, geographic origins of specimens, and age dating of evidence.

Leading scientists also advised

by Laurel Neme

on a range of other topics, such as certification and proficiency testing, accreditation for laboratories, and DNA databases. They also shared their latest research on techniques, such as the selection of appropriate genetic markers for identification of various species, the use of macroscopic wood anatomy combined with mass spectrometric chemical analysis to fight illegal logging, the role of detection dogs in gathering evidence, and how sexual dimorphism of insects can provide more accurate time of death.

Other highlights included explanations on the history and admissibility of expert witness testimony by legal scholar Edward Imwinkelried, professor of law emeritus at University of California-Davis, and U.S. Fish and Wildlife Service Law Enforcement Chief William Woody talking about the June 19 crush of one ton of confiscated elephant ivory in New York's Times Square.



Overview of SWFS 2015 Meeting



Society of Wildlife Forensic Science board answers questions. From L to R: Ed Espinoza (former Vice President SFWS, Deputy Director NWFL), DeeDee Hawk (former President SWFS, Lab Director Wyoming's Wildlife Forensic and Fish Health Lab) and Rob Ogden (President SFWS, Program Director TRACE Wildlife Forensics Network). *photo by Laurel Neme*.

With such a large variety of animals involved in the trade, most wildlife labs by necessity focus on a smaller subset of species—which makes this type of exchange that much more important. For example, Wyoming's Wildlife Forensic and Fish Health Laboratory concentrates on 13 big game species.

Many also build expertise primarily in one subfield, such as genetics or pathology. Worldwide, the National Fish and Wildlife Forensic Lab in Ashland, Oregon is the only full-service crime lab dedicated to wildlife, meaning it includes morphology, genetics, pathology, chemical analysis, ballistics and more under one roof.

Further, labs in different places are often at different stages of development in terms of casework. Because it was established in 1989, the US National Fish and Wildlife Forensic Lab is most advanced, with over 25 years of case experience. In contrast, wildlife labs in Kenya and Botswana are just starting out.

"[SWFS] members often operate in a professional vacuum," explained DeeDee Hawk, former SWFS president and director of Wyoming's Wildlife Forensic and Fish Health Laboratory. "This meeting is a great resource. We hear what others are doing and it gives you ideas for what incorporate vou can yourself or where to go for help."

One example was a side event on June 24 where wildlife forensic scientists from Africa (Botswana, Gabon and Kenya) and Southeast Asia (Indonesia, Malaysia and Thailand) discussed their caseloads and forensic challenges.

This exchange of experiences becomes even more important at a

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time when species extinctions are happening rapidly and the variety of species in the trade is increasing dramatically.

"We don't work in an area that's very well resourced," says Rob Ogden, SWFS president and program director of TRACE Wildlife Forensics Network. "We have to make the best use of the resources we've got, and to do that, we have to collaborate and maximize impact."

The Montana meeting was the Society's third. The first two were held in 2010 (in Ashland, Oregon) and 2012 (in Jackson Hole, Wyoming). The next one is planned for 2017 in Edinburgh, Scotland.

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Robert Kimsey, President of the North American Forensic Entomology Association, discusses components of his evidence collection kit at Forensic Entomology Workshop. *photo by Laurel Neme*.

RhODIS: Rhino DNA Database Update

The Veterinary Genetics Laboratory (VGL) is located at the Faculty of Veterinary Science of the University of Pretoria in South Africa. It has been providing a DNA profiling and parentage testing service to the horse, cattle and dog industries since 2000.

The method to extract sufficient nuclear DNA from rhinoceros horn to obtain an individual STR based DNA profile was developed in 2009 and has subsequently been validated and published in the journal Forensic Science International: Genetics. This method is now used routinely in the VGL to individually identify rhinoceros horns from stockpiles and to link recovered horns to individual poaching cases.

The method provides a tool to link a horn trafficker to a poaching incident or a poacher caught with horns in his possession with the carcass of an individual rhinoceros poached in an African country, effectively placing the criminal at the scene of the crime.

The principle of the **RhODIS**[®] database is based on the CODIS system of human DNA profiles of the FBI, hence the name. The main aim of this database is the forensic application of recovered matching horns to individual rhinoceros poached carcasses. DNA profiles obtained from evidence items recovered from poachers, including clothing with blood

and axes and knives used to remove the horns, are also linked via the database to specific poaching incidents.

South African legislation, published in 2012 specifies that samples must be collected from each rhinoceros that is handled for treatment, movement or hunted and from each loose horn in the country and that these samples must be submitted to the VGL for addition to the RhODIS[®] database. This has resulted in a significant increase in the number of DNA profiles of rhinoceros on the database that now exceeds 15 000 individuals of both the white and black subspecies of African rhinoceros. The database includes samples from the majority of rhinoceros range states specifically, Namibia, Zimbabwe, Zambia, Kenya, Uganda, Botswana and Malawi. Each poaching incident in South Africa is investigated and DNA samples are collected as part of the standard operating procedure in the appropriate sampling kit and submitted to the VGL.

The test panel used provides a DNA profile that not only gives the unique ID of each animal but also includes loci which are species specific and a gender marker. The DNA profile can be obtained from any part of the horn from samples collected from the base to the tip of the horn with the central part of the horn providing the best quality sample. DNA profiles have been obtained from horns dated to 1888 and 1938 using this method.

The DNA test method uses less than 20mg of horn and microscopic samples have been collected that provided complete DNA profiles. The horn sample is collected by simply drilling using a clean drill bit. Rhinoceros horn powder has been sampled and profiled in a few cases in which this has been recovered, often providing mixed DNA profiles of different rhinoceros.



RhODIS: Rhino DNA Database

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The function of RhODIS® has extended beyond DNA profiling to the collection of field samples to ensure that the integrity of data used in cases. This has been done by the development and distribution of a RhODIS[®] sample collection kits. Three sampling kits have been developed; the forensic kit for collection of samples from poached animals, the routine kit for collection of samples from live animals and the horn kits for the collection of samples from rhinoceros horn. These kits, that include sealable forensic evidence bags and barcoded labels, ensure that all field samples are collected following chain of custody principles. Training courses, to ensure that field sample collection is done correctly and to provide a basic understanding of the principles of DNA profiling in the context of forensic case work, are provided and over 400 police and other officials have received RhODIS® training in South Africa and other countries including Namibia, Kenya and Swaziland.

The VGL launched eRhODIS[™] which is an android based app in November 2013. The app supports





the collection of the field data and is used with the kits to ensure that field data is accurate and immediately available in electronic format to the laboratory and the authorities.

The power to trace rhinoceros parts using this method is increasing with increasing numbers of rhinoceros DNA profiles being added to the database. This provides a rapid means of tracing recovered horns from anywhere in the world, making RhODIS[®] a global tool to support the investigation of illegal rhinoceros horn trade.

The evidence provided by this method has led to the conviction and subsequent sentencing to 10 years imprisonment of Xuang Hoang, a Vietnamese man that tried to smuggle rhino horns from South Africa, which included horns from a poached rhinoceros. The horns were linked through DNA testing by the VGL.

Two Mozambican citizens were also sentenced to a total of 16 years in prison after being apprehended in the Kruger National Park with rhino horns in their possession. The horns were linked with DNA to a carcass found poached in the park previously. A second similar case in the Kruger National Park resulted in a 29 year sentence for each of the two poachers that were apprehended.

Another case in which a wanted Zimbabwean poacher was finally apprehended in South Africa with horns that were positively linked to poached animals on a private game farm resulted in a 10 year sentence. Trace amounts of horn found in bags that had previously contained horns were also linked to rhino poached in the Kruger National Park. In another case, horns recovered from a trafficker in Singapore were linked via the RhODIS[®] database to a rhinoceros poached in the Kruger National Park less than 6 weeks prior to their recovery in Singapore. Several more such links have been made using DNA profiles from recovered horns and from the poached animal on the RhODIS[®] database.

Dr. Cindy Harper can be reached through her email: cindy.harper@up.ac.za

SWFS Meets CITES

In early October, Ed Espinoza and Rob Ogden were invited to meet the CITES Secretariat, to introduce SWFS and discuss how the two organizations can work together. Despite it being a cold, grey, damp Geneva morning, the CITES welcome was very warm and we enjoyed positive and lively

discussions with the Secretary-General, John Scanlon, the Head of Enforcement, Ben Janse van Rensburg and the Chief of Scientific Services, Tom De Meulenaer, among others.

The SWFS team took the opportunity to raise a number of



FROM LEFT TO RIGHT: Ben Janse van Rensburg, Rob Ogden, John Scanlon, Ed Espinoza, Tom De Meulenaer, Pia Jonsonn, and Daniel Kachelreiss.

issues that we felt were important to improve the global uptake and application of wildlife forensics to support CITES regulations. These included the need to ensure that any new regulations and decisions relating to species are actually enforceable, and are not compromised by ambiguous taxonomy or a lack of reference materials.

We emphasized what 'forensic science' is really about and discussed the need for forensic scientists to be engaged during strategic planning and the development of new projects to support CITES law enforcement.

The CITES Secretariat recognized SWFS as a body of wildlife forensic expertise from around the world and expressed their enthusiasm for developing relationships with the Society. A range of practical steps were discussed that will hopefully see SWFS and CITES working closely together over the coming years.

CITES Meets SWFS

It was an excellent meeting in reinforcing the distinction between identification, traceability and forensics, and the science of forensics and its application in the criminal justice system. We have since agreed to closely cooperate with SWFS as we work with UNODC in undertaking a global review of laboratory capacity.

On November 20, 2015, CITES issued a notification on global forensic capacity to address trafficking in wildlife (see: https:// cites.org/sites/default/files/notif/ E-Notif-2015-061.pdf) which outlines CITES decisions to increase the use of forensic analysis to support the implementation and enforcement of CITES.

Paragraph 5 of this notification notes that: To promote and increase the use of wildlife forensic science in the investigation of wildlife crime offences, the CITES Secretariat, in cooperation with the United Nations Office on Drugs and Crime, will undertake a global

by John Scanlon, CITES Secretary-General

review of laboratory capacity in close cooperation with the Society for Wildlife Forensic Science. This work will not only be of benefit in the context of elephants, but also for combating other wildlife crimes more effectively. The purpose of this work is to identify facilities involved in the development or application of identification techniques, in a forensic context, to support law enforcement and to combat illegal trafficking in CITES-listed species.

Recent Publications in Wildlife Forensics

In this section we provide a list of recent wildlife forensic publications pulled from web of science and other sources. We aren't commenting on their quality or advocating their application. If you know we've missed something, particularly one of your papers, please let us know for inclusion in the next edition. If you want to provide a review to highlight a particular publication, we're happy to consider a submission.

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Johnson, T.A, Iyengar, A., *Phylogenetic Evidence for a Case of Misleading Rather than Mislabeling in Caviar in the United Kingdom*, Journal of Forensic Sciences, 60(1), January 2015, pp. S248-S253.

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Harms, V., Nowak, C., Carl, S., Munoz-Fuentes, V., Experimental evaluation of genetic predator identification from saliva traces on wildlife kills, <u>Journal of Mammalogy</u>, 96 (1), February 2015, pp. 138-143.

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Carvalho, D. C., Palhares, R.M., Drummond, M.G., Frigo, T.B., DNA Barcoding identification of commercialized seafood in South Brazil: A governmental regulatory forensic program, Food Control, Volume 50, April 2015, pp. 784-788.

Mondol, S., Sridhar, V., Yadav, P., Gubbi, S., Ramakrishnan, U., Tracing the geographic origin of traded leopard body parts in the indian subcontinent with DNA-based assignment tests, Conservation Biology, 29(2), April 2015, pp. 556-564.

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Hange, R., Khedkar, G., DNA barcode-based wildlife forensics for resolving the origin of claw samples, Genome, 58(5), May 2015, p. 224.

Mwale, M., Dalton, D.L., Roelofse, M., Radebe, T., Labuschagne, K., Kloppers, A., Musekwa, T., Parusnath, S., Kotze, A., *Progress in the barcoding of illegally traded South African wildlife species at the National Zoological Gardens of South Africa*, Genome, 58(5), May 2015, pp. 259-260.

McClure, P.J., Chavarria, G.D., Espinoza, E., Metabolic chemotypes of CITES protected Dalbergia timbers from Africa, Madagascar, and Asia, Rapid Communications in Mass Spectrometry, 29(9) May 15, 2015, pp. 783-788.

Kinuthia, J., Harper, C., Muya, S., Kimwele, C., Alakonya, A., Muigai, A., Gakuya, F., Mwaniki, M., Gatebe, E., The selection of a standard STR panel for DNA profiling of the African elephant (Loxodonta africana) in Kenya, Conservation Genetics Resources, 7(2), June 2015, pp. 305-307.

Zou, Z.T., Uphyrkina, O. V., Fomenko, P., Luo, S.J., *The development and application of a multiplex* short tandem repeat (STR) system for identifying subspecies, individuals and sex in tigers, <u>Integrative</u> Zoology, 10(4) July 2015, pp. 376-388.

Richards, N. L., Zorrilla, I., Fernandez, I., Calvino, M., Garcia, J., Ruiz, A., *A preliminary assessment* of the palate and tongue for detecting organophosphorus and carbamate pesticide exposure in the degraded carcasses of vultures and other animals, <u>Vulture News</u>, Volume 68, July 2015, pp. 32-51.

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Goncalves, P.F.M., Oliveira-Marques, A.R., Matsumoto, T.E., Miyaki, C.Y., *DNA Barcoding Identifies Illegal Parrot Trade*, Journal Of Heredity, 106, September 2015, pp. 560-564.

Kavakiotis, I., Triantafyllidis, A., Ntelidou, D., Alexandri, P., Megens, H.J., Crooijmans, R.P.M.A., Groenen, M.A.M., Tsoumakas, G., Vlahavas, I., *TRES: Identification of Discriminatory and Informative SNPs from Population Genomic Data*, Journal Of Heredity, 106(5), September-October 2015, pp. 672-676.

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Aarnes, S.G., Hagen, S.B., Andreassen, R., Schregel, J., Knappskog, P.M., Hailer, F., Stenhouse, G., Janke, A., Eiken, H.G., *Y-chromosomal testing of brown bears (Ursus arctos): Validation of a multiplex PCR-approach for nine STRs suitable for fecal and hair samples*, Forensic Science International – Genetics,, Volume 19, November 2015, pp. 197–204.

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